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History of Smelting in the Joplin District

The Development of an Important Industry in a Few Strong Hands from Many Primitive and Small Undertakings

BY DOSS BRITAIN

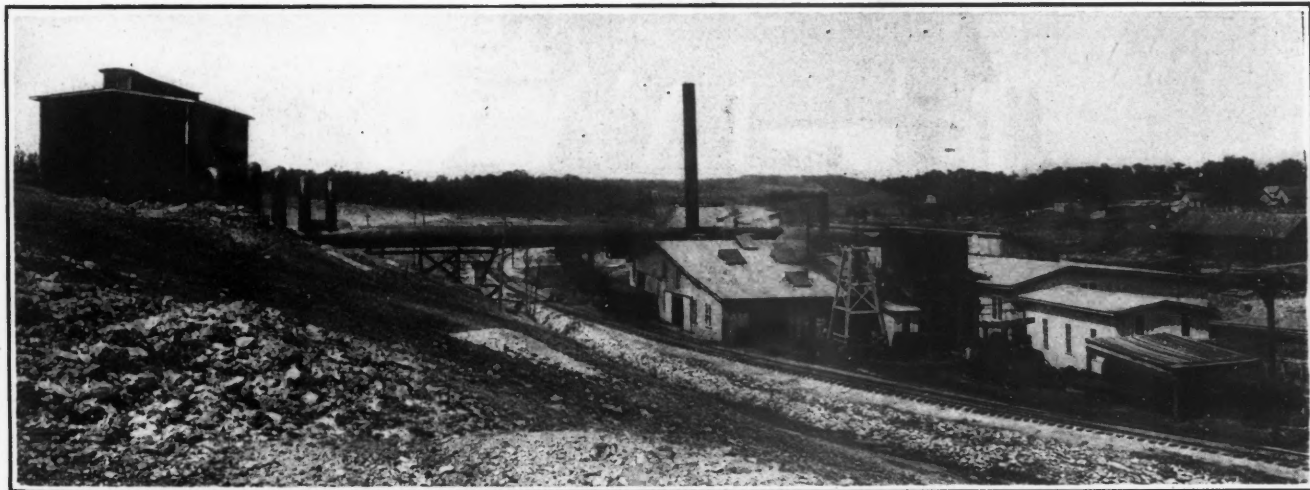
The metallurgical methods which have been employed in the Joplin district involve the use of log furnaces, air furnaces, ore hearths, and blast furnaces for lead, and the Belgian furnace for zinc. Log furnaces have been used in two forms; air furnaces in one; ore hearths in three; blast furnaces in two.

The earliest form of the log furnace was used by the hunters and Indians before trade had penetrated far into the forest. It consisted of two flat stones arranged on edge in the form of a V. It was usually constructed on a hillside with

by the Osage Indians who inhabited this country and were probably its first smelters.

A larger and more permanent form of log furnace took part in the early smelting of the Joplin district. It consisted of a large pit excavated in the hillside with hearth and trench like those of its predecessor. A layer of logs was placed on the bottom and covered with lead ore. Alternate layers of logs and ore succeeded until the pile was of the required height when it was set on fire and sufficient heat developed to smelt the ore.

the charges of the air furnaces, their efficiency is largely a matter of conjecture, probably being below 60 per cent. of the metallic content of the ore. Three men were employed at each eye and three charges, each of 3000 lb., were smelted in 24 hours. As there were no "trails" or "goose-necks" in which to catch the fumes, popularly called "arsenic," they accumulated in the smokestacks which were frequently cleaned by the smelters climbing as high as possible and striking repeatedly the sides of the stack with a club.



WORKS OF THE GRANBY MINING AND SMELTING COMPANY, GRANBY, MO.

the hearth slanting toward the mouth and containing a small trench down which the lead could flow into a vessel. Wood and lead ore were placed in the furnace and ignited. As heat developed sufficiently some of the metal was extracted, molded into bullets, and the hunter, deserting his furnace, went on his way to construct another when the exigencies of his rude life demanded. These furnaces were necessarily small and designed often for only a day's use. The ore was a chance discovery soon deserted or from a deposit known traditionally, and alternately visited by hunters and Indians. A furnace of this kind was discovered a few years ago on Pierson creek, Green county, Mo., by Prof. E. M. Shepard, of Drury college. It was filled with ashes and slag and is supposed to have been constructed

In both forms of the log furnace the waste of lead was very great; only a small percentage of the lead content was saved by the first form, while it is estimated that the second saved one-half.

AIR FURNACES AND HEARTHES

The air furnace once employed in the Joplin district was a simple form of reverberatory in which roast-reaction smelting was effected. The furnace employed by Moffett & Sergeant had a hearth 4x9 ft. and a fire box at one side $2\frac{1}{2} \times 6\frac{1}{2}$ ft.; the smelting hearth sloped toward the chimney end and the lead smelted from the ore was drawn off into a pot at that end. The smokestack was 18 in. in diameter and 50 ft. high. The furnace was fired with cordwood.

As no accurate accounts were kept of

The ore hearths used in Joplin smelting were of three forms, the Scotch hearth, the water-back Scotch hearth, and the jumbo water-back Scotch hearth, all being a low fireplace partially surrounded by three walls, and consisting essentially of a shallow basin for holding the ore and combustibles. A blast is furnished from a row of holes at the back. The smoke and fumes are carried off through a chimney. A workstone in front of the fire constructed with a drain provides means for the smelters to separate the slag from the lead and draw off the metal into pots. The plain Scotch hearth was built to hold two tons of lead.

The water-back Scotch hearth was larger and the walls were kept cool by circulating water. Otherwise it was the same as the plain Scotch hearth. The

jumbo Scotch hearth, prevalent today, is still larger than the water-back Scotch hearth, this being the only difference between them. The efficiency of the Scotch hearth is about 65 to 66 $\frac{2}{3}$ per cent., that of the water-back hearth about 67 $\frac{1}{2}$ per cent.; that of the jumbo 70 to 72 $\frac{1}{4}$ per cent.¹

As the blast furnace in this district has been used only for treating some of the products of the hearth furnaces or in connection with the manufacture of sublimed white lead, its comparative efficiency in handling galena ores alone cannot be indicated.

EARLY SMELTING OPERATIONS

The earliest regular smelting done in what is now known as the Joplin district, including that territory from Springfield and Aurora on the east to Galena and Baxter Springs on the west and from Alba and Neck City on the north to Granby on the south, was with Scotch

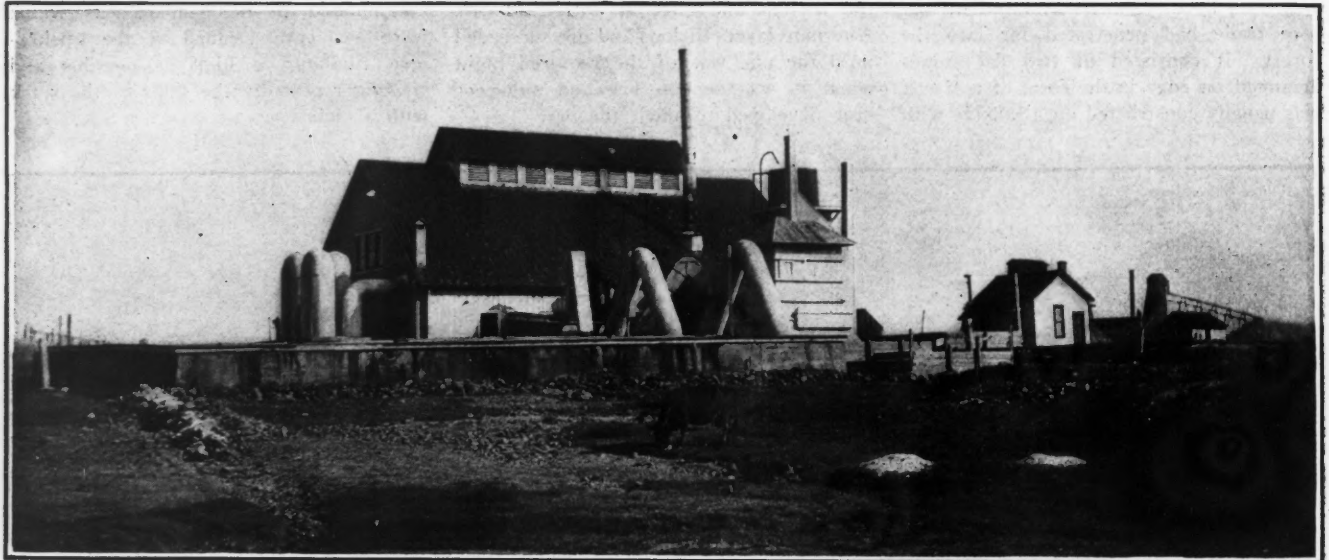
The second smelter to be erected in the Joplin district was that of Hartlerhodes in 1855. His furnace was located on Hickory creek, five miles southeast of Neosho, and consisted of two Scotch hearths. It is on record as having lost over half the metallic content of the ores smelted. In 1868, years after the cessation of this smelter, its slag was hauled by John Kingston, now manager of the Granby Mining and Smelting Company's plant at Granby, to Granby, Mo., where it was resmelted and much of the remaining metal extracted.

In 1856, the year following the erection of the Hartlerhodes smelter, Kennett & Blow put up three Scotch hearths at Granby. This partnership continued to smelt lead for a period of nine years, when in 1865 it was reorganized as the Granby Mining and Smelting Company, which has been one of the most successful and prominent companies operating in

series of steel settling chambers where the blue fume is obtained; next through 200 ft. of trail and goosenecks into a bag room 98x44 ft., containing 640 bags, 18 in. in diameter and 30 ft. long. The white fume is obtained here.

Ores for this smelter are obtained principally from the mines owned by the company at Granby, Joplin, and Oronogo. The mines of Morgan county also contribute to this smelter. The ore, which consists chiefly of galena and carbonates, is first cleaned in the mill running in connection with the smelter, the concentrate assaying 82 to 85 per cent. metallic lead. The materials smelted and their metallic content are as follows: Lead concentrate, 82 to 85 per cent. lead; white fume, 73 per cent. lead; blue fume, 66 per cent. lead; and slag, 40 per cent. lead. The slag is sometimes smelted on a regular slag eye; sometimes it is sold.

The charge of the jumbo Scotch hearth



CARTERVILLE LEAD SMELTER

hearth. In 1852 George W. and William S. Moseley bought what later became known as the Moseley mines and the same year established a works consisting of two Scotch hearths of capacity for 3000 lb. of ore in 12 hours. This smelter was located two miles north of their mines on Cedar Creek. The blast was produced by water power.

In order to encourage the industry of smelting at this early date, the Indian Agency gave the proprietors of this furnace a subsidy to build flat boats for transporting their product down Grand river from Gilstrap's Ferry to the Arkansas river, thence to the Mississippi river, and thence by steamboat to New Orleans, which was their market till 1854 when the firm failed. The old Moseley mines which were the incentive for this early venture are still producing.

¹By these figures the author refers to the percentage of lead extracted from the weight of the crude ore—EDITOR.

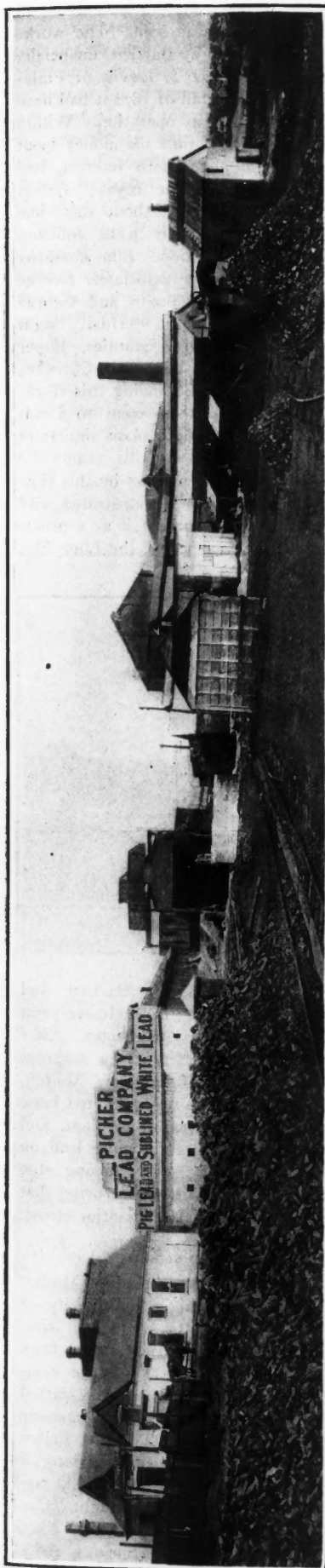
the lead and zinc fields of the southwest. This company was originally composed of Henry Key, Peter Blow, James Eades, the noted engineer, and Barton Bates, and was the outgrowth of the partnership of Kennett & Blow. During the year of reorganization the present smelting plant was built, with eight Scotch hearths capable of smelting 3000 lb. of ore in seven hours. These were succeeded by five water-back Scotch hearths of capacity for 7000 lb. of ore in seven hours, and these by five water-back jumbo Scotch hearths of capacity for 14,000 lb. of ore in seven hours, the last being the present equipment of the plant. The eye basins are made of cast iron and are 13 in. deep, 22 in. wide and 48 in. long.

OPERATION OF JUMBO WATER-BACK SCOTCH HEARTH

While melting is in progress the gases are drawn off by a 6-ft. fan through a

consists of galena, 12,400 lb.; white fume, 1200 lb.; blue fume, 400 lb.; lime, one lushel; and 1000 lb. Kansas lump coal per shift. A charge is smelted by four men in 10 hours; and the products, expressed in percentages of the original lead content are, metallic lead, 85 per cent.; white fume, 9.5; blue fume, 3; and slag, 2.5 per cent. An average assay of the slag gives lead, 40; iron, 6 to 11; zinc, 9.5 to 10 per cent.

The lead is molded into pigs weighing approximately 85 lb. and is sold in the general market. About 100 men are employed in the smelter, mill and machine shop. The smeltermen are required to recover metallic lead from the constituents of the charge in the following proportions: From ore, 65 per cent. of the lead content; from white fume, 60 per cent.; and from blue fume, 50 per cent. Men fulfilling the requirement are paid \$2 per day; if they produce less than the



WORKS OF THE PICHER LEAD COMPANY, JOPLIN, MO.

requirement, they are penalized; for more than the requirement they receive an additional ¼c. per lb. above the amount required. The men average about \$3 per day. The present plant of the Granby Mining and Smelting Company at Granby is shown in an accompanying illustration. At this smelter is one of the old pigs of lead smelted by Kennett & Blow before the Civil war.

During the same year of the organization of Kennett & Blow and the erection of their smelter in 1856, William Tingle and his partner Fitzgerald operated a hearth (some claim a log furnace) at the mouth of Leadville Hollow, 2½ miles northwest of Joplin. The blast was produced by two large bellows operated by water power. This smelter continued in operation till 1861. Tingle, who operated this smelter at one time with McKee, owned almost all of the land of the Granby Mining and Smelting Company at Joplin.

DETAILS OF SMELTING OPERATIONS IN 1860

During the activity of Kennett & Blow at Granby and Tingle on Turkey creek, E. St. George Noble, one of the hardest pioneers of his time, and his brother John Noble, in 1859 erected a smelter four miles south of Granby on the site of the old Hartlerhodes smelter. At this time the country was a wilderness, and when the engine was being hauled from St. Louis to its destination, the road had to be cut out ahead of the wagon. After two years of operation this smelter was burned by the Federal troops in 1861. It consisted of four Scotch hearths and a cupola or blast furnace for the fumes.

The accounts of this old smelter are remarkably complete, and the conditions surrounding the smelting of lead at that early date are recorded in accurate detail. Ore cost \$16 per 1000 lb.; 75 per cent. of the ore was extracted as metallic lead, and in 12 hours 24,000 lb. of ore yielded 18,000 lb. of pig lead. The process was divided into first-smelting and second-smelting, the first yielding 65 per cent. at a cost of \$85.68 per 24,000 lb. of ore; the second, 10 per cent. at a cost of \$28.04. Nine bushels of coal and ¾ cord of fine split wood were provided for each hearth; likewise 3000 lb. of ore, this amount being smelted in six to seven hours, called a "tour." Out of every 24,000 lb. of ore were obtained 7000 lb. of slag which washing and meshing or crushing reduced to 5000 lb., divided into two parts, 3500 lb. being "rich slag" and 1500 lb. "poor slag." The first after smelting left 875 lb. of slag, reducible by washing and meshing to 650 lb. This was added to the original 1500 lb. of poor slag and the two reduced in the cupola as was also the 3500 lb. of rich slag, the 5650 lb. of slag producing 2400 lb. of metallic lead or about 42½ per cent.

The force required to treat this amount of ore in the manner described included

the following men: One superintendent, one engineer, one fireman, two smelters on each eye (one front smelter and one back smelter), one coal man, one blacksmith, and one carpenter. The actual cost of treatment is given in detail in the accompanying table.

EXPENSE AND PROFIT OF A DAY'S RUN OF THE NOBLE SMELTER IN 1860.

Hauling 24,000 lb. ore @ \$.50 per 1000 lb.	\$12.00
Meshing and washing @ \$.35 per 1000 lb.	8.40
Sixteen smelters, front hands.	16.00
Sixteen smelters, back hands.	12.00
Superintendent	2.50
Engineer	1.25
Fireman	1.25
Coal man	1.90
Blacksmith	1.00
Carpenter	1.00
Charcoal, 72 bushels @ 7½c.	5.40
Fine split wood, 3 cords @ \$5 per cord	15.00
Lime	.50
Wood for engine, 2½ cords @ \$1.50 per cord	3.75
Oils, candles, wear, etc.	4.63
Total	\$85.68

SECOND SMELTING, 7000-LB. SLAG.

Washing and meshing @ \$1 per 1000 lb.	\$7.00
Smelting 3500 lb. @ \$3.57 per 1000 lb.	12.50
Washing and meshing refuse.	.87
Smelting 2150 lb. @ \$3.57 per 1000 lb.	7.67
Total	\$28.04

TOTAL COST OF PRODUCING.

Smelting, as above.	\$113.72
Cost of ore, 12 tons @ \$32.	384.00
Transportation to St. Louis @ \$1.36 per 100 lb.	244.80
Total cost in St. Louis, 9 tons	\$742.52

RECEIPTS.

Nine tons pig lead @ \$5.40 per hundred	\$972.00
Commission, 2½ per cent. of gross receipts	24.30
	\$947.70
Less cost in St. Louis.	742.52
Profit	\$205.18
Profit per ton.	20.52

OTHER PIONEER SMELTERS

At Oronogo, probably about 1859, Tom Livingstone and Parkinson operated two Scotch hearths. After the war the bellows which supplied the blast was actuated by a treadwheel turned by a horse. While this smelter was in operation before the Civil war Livingstone operated another plant at Livingstone's ford, on Center creek. The place was then known as French Point on account of a French colony which Livingstone brought from the smelters of southeast Missouri. Lead ore for this furnace was obtained from Minersville and Duff's diggings, or Leadville, between Joplin and Minersville. The blast was operated by water from a large spring near the smelter. The plant was destroyed during the war by Federal troops for Livingstone was a staunch Confederate. The first car of ore from the Livingstone smelters was sold to Drucker & Co., on Commercial alley in St. Louis.

During the year 1871 two lead smelters were started, one of which was destined to play an important role in the history of Joplin smelting. One of these was the

smelter of Riggin & Chapman, who operated a lease on the land of the Joplin Mining and Smelting Company, in the Kansas City bottoms. The smelter was rather large, including three or four air furnaces and six or eight Scotch hearths. After operating for a year it was sold to the fee owners of the land, the Joplin Mining and Smelting Company, in the known as the Kansas City Mining and Smelting Company. This company was composed of John H. Taylor, president; Fritch Taylor, general manager; Thomas H. Swope, T. E. Bradford, and George Crogan. It held 160 acres of mining land in the Kansas City bottoms, and continued to operate the smelter with its own ores till 1877.

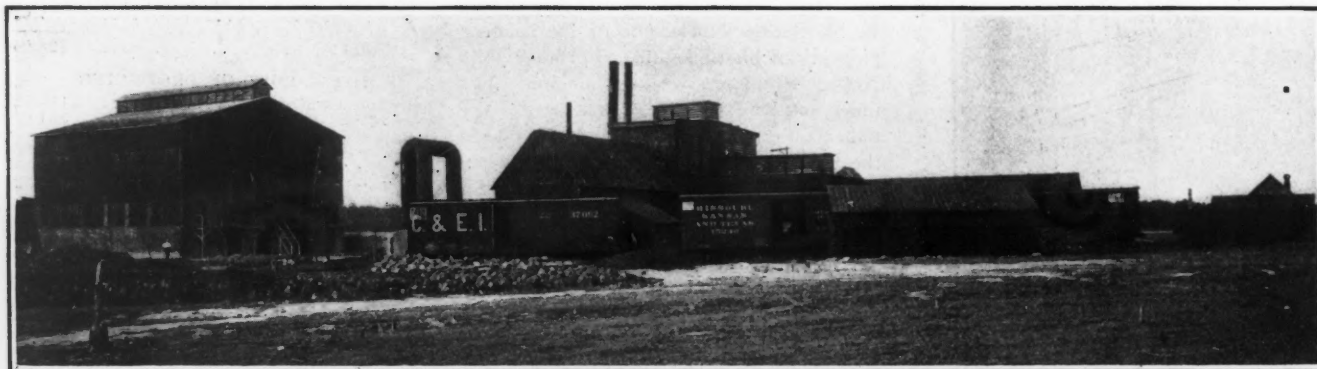
A smelter, which was to play a more important part, was that started by Moffett & Sergeant at the foot of Moon Range hill, where in August, 1871, the first ore discovery that started the Joplin camp was made. Moffett & Sergeant had previously been partners at Minersville, now Oronogo. Attracted by shines of

Philadelphia, a three-quarter interest in the Lone Elm tract in the northwest part of the present city of Joplin, and leased the remaining one-fourth, the terms of the lease being that a royalty of \$1 was to be paid to the owner for every 1000 lb. of lead taken from the lease. After making this transaction Moffett & Sergeant organized the Lone Elm Mining and Smelting Company, with E. R. Moffett, president; J. B. Sergeant, vice-president; W. A. Botkin, secretary. Mr. Botkin was soon succeeded by George A. Case.

During the same year, 1876, the Lone Elm Mining and Smelting Company built a large smelter of 16 Scotch eyes¹ and after placing it in commission abandoned the old furnace at Moon Range hill. The new plant was operated till 1886, when it was sold to the Moffett Smelting Company, composed of O. R. Moffett and others, which sold the same year to the Joplin Lead Company, composed of L. P. Cunningham and others. This company, the following year, sold to the Picher Lead Company, which has

smelter. Thereafter they were to receive a royalty of one cent per pound on all white lead which was sold. The works were begun in 1876 by Bartlett, financially sponsored by George T. Lewis, of Philadelphia, and in the fall of 1878 it had been completed and set in operation. Within two years from that time the money spent in erecting the plant, with interest, had been recovered and the royalty system had come into effect. About this time the services of Bartlett were solicited elsewhere and the Lone Elm company paid Bartlett and his associates, George T. Lewis, Joseph Solomon and George Harding \$75,000 for the exclusive right to the process in three counties, Jasper and Newton, in Missouri, and Cherokee county, in Kansas. Following this transaction, Bartlett, in 1880, went to Leadville, Colo., and put up a plant similar to the Joplin works.

The success of the process by this time had been completely demonstrated and realizing the importance of it as a profitable commercial enterprise, the Lone Elm



PETRAEUS SMELTER, GALENA, KAN.

mineral in the dumps of old mines which had been gophered for the shallow lead deposits before the war, they left Minersville and came to Joplin in 1870. Their smelter consisted at first of one air furnace; later three more were added. The fumes were either buried or thrown into near-by streams. Within two months after the first furnace was started it was completely swamped by the great supply of lead ore which poured in for treatment.

The ore was weighed on steelyards, and the weight of the pig lead was determined in the same way. The lead was hauled to Baxter Springs, Kans., which was then the nearest railway station and shipped over the Kansas City, Ft. Scott & Gulf railroad, then known as the "Joy Road," which finally placed it in St. Louis.

As this venture had met with marked success, the founders of the enterprise began to aspire toward larger operations. They needed a larger smelter and they wanted it on their own land. Accordingly they bought from Joseph J. Solomon, of

operated the plant with great success ever since. During this succession of transactions there was much litigation and dissatisfaction.

BARTLETT PROCESS

While the plant was in the hands of the Lone Elm Mining and Smelting Company, E. O. Bartlett, the inventor of the Bartlett process for making white lead, came to Joplin and installed apparatus for catching the fumes which up to that time had been wasted. The process thus introduced depends upon volatilizing the lead of the ores in furnaces, and leading the fumes through long trails and goose-necks into a bag room where the condensed dust is caught in woolen bags as sublimed white lead.

The terms under which the process was introduced were that Bartlett and his associates were to construct the works and were to have all receipts from the sale of white lead till they had been reimbursed, with interest at 6 per cent., for all expenditures in the erection of the "Eye" is a Missouri and Wisconsin term for smelting furnace.

company agreed to pay Bartlett and associates \$500,000 for the exclusive right to the patents in the United States. After this transaction and after paying Sergeant \$250,000 for his half interest, Moffett, now virtually the sole owner of the Lone Elm company, enlarged the plant and began the manufacture of white lead on a large scale. It was during the prosecution of this new enterprise that business and financial difficulties arose.

GROWTH OF THE LEAD-SMELTING INDUSTRY

Out of the smelting business Moffett and Sergeant built up a multiplicity of other enterprises, stores, banks, zinc, lead, and coal mines, and a railroad from Joplin to Girard, Kan. With the completion of this line, another was started into Arkansas, but the railroad interests of the company were sold to the Frisco system for \$550,000. Other accessions of business followed and the firm fell, carried down by its own great weight. Undaunted, the redoubtable Moffett in 1887, built a smelter at Crystal Springs, Ark., beside what appeared to be a veritable

mountain of lead ore. The plant was in all respects, except that it was smaller, an exact duplicate of the present Picher Lead Works. But within one year, owing to a dearth of ore the venture failed. Its originator died after several years spent in philosophic retirement on a farm. J. B. Sergeant, also of the pioneer firm, Moffett & Sergeant, in 1894, began the erection of a lead smelter between Joplin and Webb City, but abandoned the project almost as soon as begun.

When the Picher Lead Company acquired the plant begun by the Lone Elm Mining and Smelting Company, an agreement was made with E. O. Bartlett to reconstruct and enlarge the old works and manage it for a one-fourth interest. Since this time the business has grown to such an extent that the plant has this year been doubled. The present plant is shown in one of the illustrations which accompany this article.

The year following the advent of Moffett & Sergeant brought Davis &

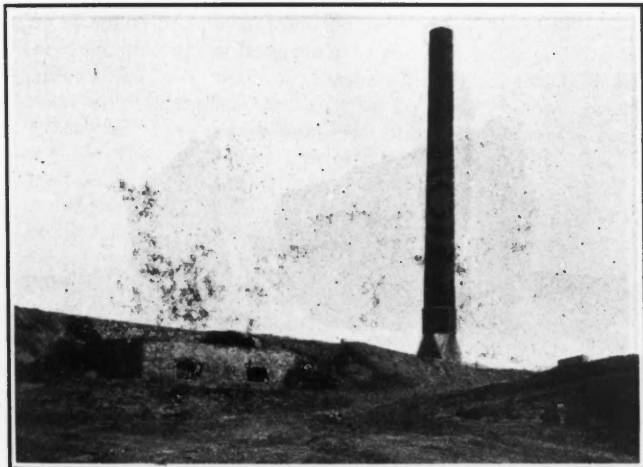
BEGINNING OF ZINC SMELTING

After the lead smelter had ceased to operate the members of the company became interested with T. A. McClelland, Tom Connor, O. H. Picher, William Byers, E. Zelliken, L. P. Cunningham and C. H. Brewster in the organization of the Joplin Zinc Company, which in 1881 began the first zinc smelter ever operated in the Joplin district. It was located west of Joplin, 800 ft. east of the lead smelter of the West Joplin Lead Company, and consisted of 1200 retorts. It operated under this regime till all the stock was acquired by Murphy, who in 1898 sold to the Empire Zinc Company. In 1900, on account of the high cost of coal, this company closed the plant and sold the equipment. The chimney shown in one of the accompanying illustrations is all that now remains of Joplin's first zinc smelter. Murphy secured coal under contract for 65c. per ton, but when the contract expired, soon after the sale to the Empire company, the rate was increased.

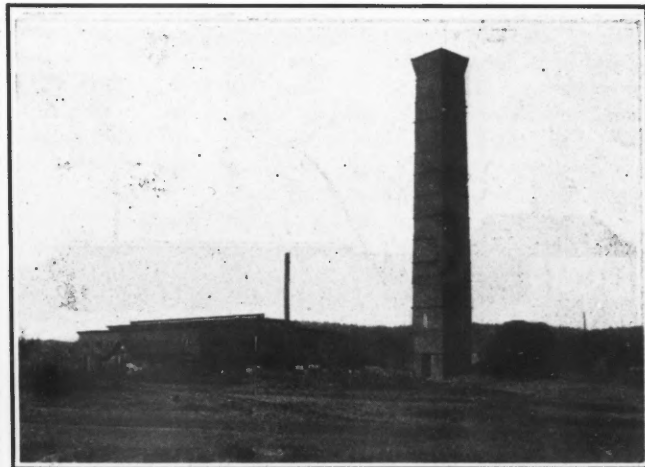
abandoned. During the same year Fairbanks & McClusky also operated a smelter north of Joplin, on Turkey creek, and also smelted much neutral mineral. This smelter continued in operation till 1875.

PERMANENCY NOT THE RULE

The year 1874 was a prolific year in the smelting business. This year flourished the Jasper Lead and Mining Company, begun the year before; Teeters & Pender, and the Saginaw smelter also began operations. The Jasper Lead and Mining Company was popularly known as the "Hannibal Company," because it was largely composed of Hannibal, Mo., men. It held a lease on Picher field in the southeast part of Joplin and in 1873 built a lead smelter which operated till the next year, when on the night of May 20, 1874, it was burned in the only labor troubles Joplin ever experienced. This smelter, which consisted of four air furnaces, was never rebuilt, for the lease of



EMPIRE ZINC COMPANY



HUMPHREY ZINC COMPANY

REMAINS OF OLD WORKS IN THE JOPLIN DISTRICT

Murphy, who in 1872 built a plant consisting of four air furnaces and located in the Kansas City bottoms northeast of the principal business section of Joplin. During the early 70's this smelter was the principal rival of that of Moffett & Sergeant. It continued in operation till 1880, when its operators abandoned the location and, organizing the West Joplin Lead and Zinc Company, built west of Joplin a larger smelter consisting of six Scotch hearths. After running for a short time the plant was closed down. The West Joplin Lead and Zinc Company was composed of Pat Murphy, Thomas C. Tootle, of St. Joe, and Thomas K. Hannah, of Kansas City. These men had been associated in freighting across the plains. The Tootle and Hannah families were wealthy and influential in business in their respective cities and later became mutually interested in the smelting of lead.

During the same year, 1872, in which Davis & Murphy began operations, S. B. Corn and Julius Thompson erected four or six large air furnaces in East Joplin. This firm dealt largely in "neutral mineral," mineral which, according to the leases governing it, was to have been smelted by the lessors, who usually were the operators of smelters. Such mineral was under a ban, for at this time few mining lands were held except by the smelters. Neutral mineral was usually purchased clandestinely from mining operators who, without regard to the terms of their leases, marketed their ore wherever best terms were obtainable. The Corn & Thompson smelter operating under these conditions experienced a checkered career and was short lived.

In 1873, at Grove creek, two miles east of Duenweg, Pat Murphy built a lead smelter consisting of two Scotch hearths and operated it for one year, when it was

Picher field reverted to O. H. and W. H. Picher, who built a smelter, replacing the air furnaces of the preceding works with Scotch eyes, which at this time were adopted by Moffett & Sergeant and by Davis & Murphy. This smelter operated from 1876 to 1880.

Teeters & Pender who also began operations in 1874, continued till 1876. Their smelter was small, consisting of one or two Scotch eyes and was located on Turkey creek. They handled largely neutral mineral. The Saginaw smelter, which was located at Saginaw, then called Thurman, which began in 1874, like that of Teeters & Pender, also ceased operations in 1876, after having been in commission 18 months. This smelter, which was also small, was first operated by S. B. Corn, who had previously operated in East Joplin. After a time the smelter was leased to James Zane. Zane then sold to Moffett & Ser-

geant, who had obtained a lease on the Thurman land and who later closed the smelter and dismantled it.

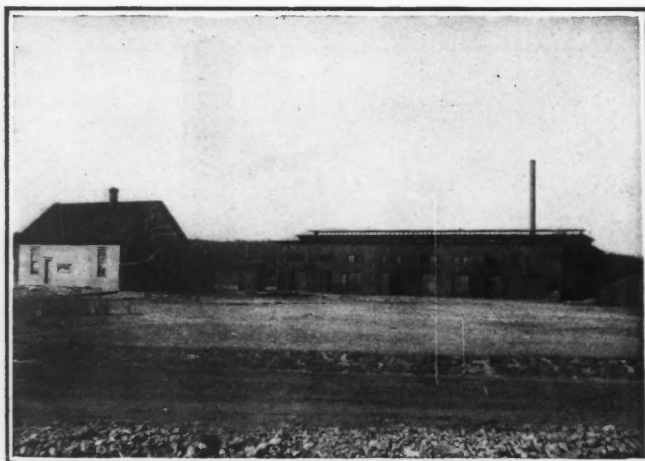
The only smelting enterprise begun in 1875 was that of John Wise and his brother, Henry Wise, located on Turkey creek. It consisted of a single air furnace and operated about two years, being dismantled the latter part of 1876.

In 1876, besides the smelter of Picher Brothers on Picher field, that of Porter & Dorsey was also begun in the Kansas City bottoms on the present site of the Kansas City Southern passenger station. It was located on the Porter land, which consisted of 80 acres lying between Broadway and Seventh street. It was a small smelter, but during the introduction and early operation of the Bartlett process for catching the lead fumes at the plant of the Lone Elm Mining and Smelting Company, experiments were also tried at the plant of Porter & Dorsey for catching the fumes in water. These were unsuccessful and the plant was dismantled in 1880.

city of Galena. It consisted of three eyes capable of smelting 24,000 lb. of ore every 24 hours. In 1880 the Pichers added two eyes and in 1881 W. B. Stone, John M. Price and Howard Gove incorporated under the name of Howard Gove & Co., and added three more. This gave the smelter a capacity of 72,000 lb. of ore in 24 hours. The Gove company retained control of the smelter for two years. In 1883 the South Side Mining Company, in which Colonel Stone held large interests, bought it and operated till 1886 when the company closed the plant and arranged to sell its ores to the Picher Lead Company, which the following year took charge of the original Lone Elm plant.

Some of the eyes of the Galena plant were bought by the Pichers; others were sold in St. Louis. These eyes were supposed to save 66 $\frac{2}{3}$ per cent. of the metallic content of the ore, but the actual proportion saved was considerably higher. When special care was used, the ground swept, and the stack cleaned 69 $\frac{4}{5}$ per

During the same year Galena once more became a center of interest. The second zinc smelter to be erected in the Joplin district was being promoted by E. W. Humphrey. It was located just north of Galena and consisted of five Belgian blocks. The plant was further equipped with gas producers installed by Smith & Seamans, of Pittsburg, in opposition to adverse prophecies of engineers. Though gas producers have since been operated with success this equipment failed of satisfactory results, and the smelter was operated at a loss till 1892, when it burned. All the portable fixtures were sold to the Bruce Smelting Company, at Bruce, Kan., the Memphis railway hauling the material free of charge in consideration that the smelter should be located on its line. Nothing remains of this old plant but the chimney shown in one of the illustrations. In all \$150,000 was lost in this ill-starred venture, including \$75,000 bonus given by the city of Galena.



MONLUX CHAT MILL



REMAINS OF CASE & SERAGE SMELTER, GALENA, KAN.

No more smelters were erected after this till 1877, when the Granby Mining and Smelting Company erected a large plant just north of the present Picher Lead Works. It consisted of six Scotch eyes and a stack to catch the smoke. Running in connection with the smelter was also a concentrating plant. In 1878 the equipment was moved to Granby and the rich tailings from the mill were sold to the Lone Elm Mining and Smelting Company.

GALENA DISTRICT

Up to this time the industry of smelting in the Joplin district had been confined to the vicinity of Joplin, Granby and Oro-rogo. In 1879 was organized the Galena Lead and Zinc Company which that year built the first smelter in Galena, Kan. It was designed for smelting lead ores, and was located on land owned by the company 800 ft. west of the boundary of the

cent. could be saved. Nevertheless this company found little profit in the smelting business. Originally plans had been made to locate the smelter at El Paso, but a change in the tariff restrictions about this time discouraged the attempt. About the time this smelter began running some of the lead ores of the district became more valuable as fluxes of western gold and silver ores than for the pig lead they produced and were difficult to obtain for smelting purposes.

The year after this Galena smelter closed down another was started at Aurora which was just beginning to give promise of becoming a rich mining camp for both lead and zinc ores. It first consisted of two Scotch hearths, but in 1889 it came into possession of the Rogers Smelting Company, of which A. H. Rogers was president and J. M. Maret general manager, and another hearth and a slag eye were added. In 1890 this smelter was dismantled and the equipment sold.

RECENT ENTERPRISES

The same year this smelter was burned, George A. Case, who had long been associated with Moffett & Sergeant, joined interests with D. A. Preston in mining operations, organized with J. B. Serage, the Case & Serage Lead Company, which in 1892 built a smelter at Grand Falls, four miles south of Joplin on Shoal creek. A short time thereafter Case bought out Serage only to continue operation till 1895 when a portion of the plant was destroyed by fire. Soon after his dissolution with Case, Serage decided to enter the smelting business alone, and in 1896 built a lead smelter near the site of that of the Galena Lead and Zinc Company. After operating till 1897 it was sold to the American Smelting and Refining Company and dismantled. The ruins are all that is left of this old smelter. Serage erected another smelter in 1901 in the south part of Joplin, known as Blendeville, but injunction proceedings were soon afoot against the

smelter fumes and within one year he was forced to move.

Carterville was the next site selected, and by 1903 Serage had succeeded in constructing a third plant into which was incorporated much of the machinery and equipment of the Blendeville plant. Misfortune, however, seemed to travel in the wake of Serage; after having been in operation about a year the plant was burned early in February, 1904. It was promptly rebuilt and as promptly burned in the following January, 1905, and again rebuilt during the same year. In the meantime the plant had undergone some changes in ownership. Originally put up by Serage, it was rebuilt after the first fire by Serage and Walter Foreman, who had acquired an interest. They then sold the whole plant to the Lawrence Shot and Lead Works, of Omaha, a short time before the second destruction of the plant in 1905. The present plant was built by this company soon after, but has never been operated except for test purposes. It consists of four jumbo Scotch hearths. The Carterville lead smelter is shown in an accompanying illustration.

The next smelter to be erected in the Joplin district was that of Bender & Aldred, large manufacturers of litharge in Pittsburg. They had bought the site of the old Humphrey zinc smelter, and in 1898 built the lead smelter consisting of six Scotch eyes. The pig lead from this smelter was used at the litharge plant in Pittsburg, but after operating for about a year the smelter was dismantled. The portable appliances were sold to the Carter White Lead Company, the smoke to the Pichers, and the land and buildings to G. C. Monlux, who has converted the building into a chat mill.

THE PETRAEUS COMPANY

The last smelter to be erected in the Joplin district was built in 1902. In March of that year the C. V. Petraeus Smelting and Manufacturing Company organized under Missouri laws with a capital stock of \$50,000, with C. V. Petraeus, president, R. A. Farnham, vice-president and general manager, and J. I. McLaren, secretary and treasurer. In September, 1902, R. F. Robinson and J. K. Vingert bought a half interest in the company, including that of Petraeus, and Robinson succeeded to the presidency. The company then became known as the Galena Smelting and Manufacturing Company, and has since retained that title. The next change to occur was a reorganization of the company between Aug. 1, 1906, and February, 1907, during which time the plant was closed down. Reorganization resulted from the purchase of three-fourths of the stock by the Hammar Brothers White Lead Company, of St. Louis. The present officers of the company are: Frank Hammar, president; Park Hammar, vice-president; Earle

Thompson, secretary; Percy Hammar, treasurer; and J. I. McLaren, general manager.

This company manufactures the "S. M." brand of corroding pig lead. Before the Hammars became interested it was marketed largely with Carter, Swift and Hammar; since, chiefly with Hammar.

The equipment of the plant consists of four single jumbo Scotch furnaces, blast furnace, bag room, 100x68 ft., containing 680 bags 30 ft. long and 6 ft. in circumference made of cotton cloth of 44 threads to the inch both ways. The charge for a hearth includes: 7000 lb. galena lead ore, one bushel stone coal (Kansas), one bushel lime. The ore assays from 77 to 82 per cent. A hearth charge is smelted by two men in seven hours, three shifts per day being worked. The blast furnace takes galena, carbonates, gray slag from the hearths, and blue fume.

Fifteen charges of the blast furnace include: Galena ore, 45,000 lb.; coke, 2100; gray slag, 6000; blue fume, 7500; carbonates, 500; "ashes," 1500; black slag, 15,000; cast iron, 600; soft iron, 600; iron cinders, 300; and tin cans, 600 lb. The "ashes" entering into the charge are the coarser particles of blue fume which settle in the trail before reaching the suction fan. The black slag comes from the blast furnace. The blast furnace operates eight hours per day.

The average proportions of lead in the materials smelted are as follows: Galena, 77 to 82 per cent.; carbonates, 72; gray slag, 35; blue fume, 72 to 75; "ashes," 56; and black slag, 7/10 per cent.

The smelters are required to produce on the hearths pig lead amounting to 60 per cent. of the ore and from the 15 charges of the blast furnace 11,810 pounds of pig lead, or 25.7 per cent.

The black slag contains: Silica, 22 to 28 per cent.; lime, 20 to 24; iron, 24; zinc, 7; lead, 0.7; and variable matter, 16.3 to 26.3 per cent. The gray slag contains: Lead, 35 per cent.; iron, 1.67; and zinc and variable matter, 63.33 per cent.

The men required at each hearth are: two smelters, paid \$2.20 per 7000 lb. of ores melted; one yard man and one molder, each receiving \$1.65 per 7000 lb. of ore. The blast furnace requires one feeder, at \$2.50; one tapper, \$2.25; and four yard men, \$1.90 per eight hours.

The lead from the hearths and blast furnace is molded into pigs and remelted in a refining kettle of 9000 lb. capacity in which it is purified by poling. It is then molded into pigs and is ready for shipment. The blue fume from the hearths and blast furnace is drawn by a 90-in. Buffalo exhaust fan through an 800-ft. trail 6x4 ft. in the clear into the bag room where it accumulates. It is periodically ignited after being shaken from the bags to the floor. No white fume is made.

Mining and Labor in the Transvaal

SPECIAL CORRESPONDENCE

The gold output in August was the largest ever reported. It was declared at 555,027 oz. fine gold, valued at £2,357,602. This is an improvement on the previous record, made last December, of 4860 oz. The record for August is accounted for by the fact that the Robinson Gold mine decided to reduce the amount of gold held in reserve, and placed 11,750 oz. in the output declaration for the month. The Robinson declared 35,714 oz., valued at £151,703, for August. The Simmer & Jack did remarkably, turning out 25,228 oz. gold, valued at £107,161.

During August there were 8665 stamps at work in the Transvaal, of which 8300 were at work on the Rand. The number of unskilled laborers at work remains practically the same. There was a small new producer in August, the Spes Bona, a mine which appears on the list after being closed down for about 10 years. It is a small property in the Central Rand, which has been handed over to tributers to work. During September another gold producer should again enter the ranks, the York mine, a small property on the West Rand which has been closed down for a long time.

As the time for their departure draws near the Chinese coolies are getting somewhat out of hand. They all knew that by the terms of their contract they had the right to sign on again for three years. The majority of the coolies wanted to do so, and now that they know that they will not be allowed to exercise the right given them in the contracts, many of them are exasperated. Some of the baser sort find themselves without money, and in order to collect sufficient cash with which to pay their debts and have a sum to take back to China, they have gone on raiding expeditions to outlying houses and farms. Several of them have been killed in their attempt to rob houses, but unfortunately they have been successful in a few cases, and have not only robbed, but killed as well.

Much attention is being paid to base metals in the Transvaal just now. Besides tin a lot of work is being done in copper, lead and zinc. The Messina Copper Company is shipping high-grade concentrates every month. The Edendale Estates, a lead proposition, seems to be doing fairly well, and in the western Transvaal discoveries of zinc and lead are reported. It is a question whether these properties can be worked to advantage until the labor situation is clearer.

In Sweden, 97 works were in operation during 1906 for the production of forge iron and steel.

Improvements in Milling Missouri Zinc Ores

A Discussion of the Question Whether or Not It Would Pay to Treat Further the Mineral Discarded in the Tailings

B Y W. E. F O R D*

The mill practice in vogue in the great zinc field in southwestern Missouri has handled an enormous daily tonnage for many years at an extremely low cost. It has also sent thousands of tons of zinc away in cars loaded with tailings to be used as road ballast. Many thousands of tons remain in our tailings not yet removed and hundreds more are being added daily to swell this complement of waste. The thought of our community of mill men is becoming more and more centered upon the reduction of this waste. With increasing depth of mines and their extension into beds containing lower percentages of values, made possible by better facilities for increasing capacities, the problem of how profitably to increase our saving at once compels attention and stimulates criticism. Suggestions from visiting engineers imbued with practices of other fields are largely impracticable though always containing much that is profitable for thought. It is remarkable that almost universally these suggestions or innovations prove of merit only when they have been made to conform to our ruling practice and have become "Missouri-ized." This leads us to the conclusion that that mode of treatment which has been the outgrowth of local conditions is apt to be the best for the field in which it grew.

In taking up this subject and applying its discussion to this district, we have, mainly, two minerals to consider, zinc blende and galena. The rules and methods prevailing in our general practice are mainly satisfactory as to the latter; little, if any, difficulty is found in reaching a high saving of lead. The best practice for concentration of blende will effect a satisfactory saving of lead, in the same mill. The losses incurred are mainly in the blende. These conditions being prevalent, we shall consider blende alone as the mineral to be recovered.

THE PROBLEM ANALYZED

Our subject may be stated as a problem, and the remarks upon it as an attempt at a solution of it. This, then, is the problem:

Given, a chert-lime gangue carrying zinc blende, extract to a commercially profitable degree of completeness the blende.

The problem involves: First, determining the limit of percentage of extraction which will return satisfactory profits

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on the outlay of labor and expense of installation; second, the best method of mill treatment.

Before taking up these divisions of our subject in their regular order, some general observations upon the character of the ore, the ruling practice and its results, are pertinent. Properly to individualize each mine, to analyze the physical characteristics of the ore and to prescribe the proper treatment, after having taken into account the commercial phases of the situation, this is the art involved in the solution of the problem. Therefore, he who does it well is an artist in his line, and is sure to be successful.

We meet mainly with three general classes of associations and sets of physical conditions in which blende appears; these, for convenience, may be named class *A*, class *B* and class *C*. Class *A* comprises blende occurring in large or clearly defined crystals and in the free state, in boulder formation or in certain hard-ground sheet formation, where, after primary crushing, there are few, if any, middlings. Class *B* is represented by blende occurring in and after primary crushing in large measure adhering to a hard, dense black chert of high specific gravity. Class *C* comprises blende occurring in a soft mud, sand and boulder formation in small irregular crystals partially disseminated.

In the early history of zinc concentration in this district, mines yielding ores belonging to class *A* were the rule and little if any attention was paid to materials represented in class *B*, and only the free and easily collected portions of class *C* were sought.

EQUIPMENT DETERMINED BY CONDITIONS

These conditions brought forth the rougher jig which permitted the rapid treatment for which the district is famous. Its later application to ores of the other classes was gradually brought about by its increase in size and the larger volume of feed sent to it, changes which have resulted in its retention. Universally recognized as a wasteful machine, its retention is due to its ability partially to concentrate enormous loads at an extremely low cost. In the treatment of ores of class *A* this machine is invaluable, and doubtless it will not be supplanted until some entirely new method, other than jiggling, is brought into use. Blake crushers and Cornish rolls are retained for two reasons: They are sufficiently efficient for the work to be done and will

crush to a ruling size for less cost per ton than any of the more modern crushing machines.

The simplicity of the mills enables men of moderate means and of little experience to build and operate them. Their low cost justifies their erection upon mines of short life where a more elaborate mill would not be desirable because of its cost. This type of mill will not be supplanted in these zinc fields, but additions and extensions will be introduced from time to time which will improve its efficiency, and the effort to carry the percentage of saving farther will grow with the market price of the concentrates.

Applied to ores of classes *B* and *C* the prevailing system does not recover as large a percentage of the valuable mineral as may be saved at a profit by other means. The average extraction is about 65 per cent. and not 75 per cent. as stated in a folder recently issued by the JOURNAL. For mines representing these two classes the mills will be extended and improved and this will be accomplished soon, for a solution is inevitable according to the law of necessity. This brings us to the solution of the problem as applied to mines involving these two classes.

THE LIMIT OF ECONOMY IN SAVING

In order to determine the limit of extraction, to find how far we can afford to go with the refinements for effecting a high degree of saving at one operation and eliminate the added expense of treatment in tailing mills, we must know the probable life of the mine and familiarize ourselves with the characteristics of the ore. The latter is readily done by taking a general average sample, carefully crushing to milling size, separating into a number of different sizes, weighing each size to determine its quantity or percentage of the whole, and assaying each size separately.

Hand panning will show by optical observation the condition of the minerals and enable us to determine to which class the ore properly belongs. In mines of classes *A* and *C* the concentration may be carried farther because the crushing cost is low. In class *B* we must look carefully at this item of cost. Crushing with our Cornish type of rolls cannot be made successful, on a large scale, after reaching a size with a maximum of about 3 mm. Therefore, if the blende is largely in a very finely disseminated state, it is best to allow for a considerable loss, or to justify preparation for saving it, the

blende should be present in large enough quantities to warrant the introduction of more expensive crushing machinery necessary to insure better recovery. In this case we shall also be confronted with a large increase of slimes, which are expensive and difficult to save, and also bring a low price and are not always readily salable. The attractive assays given by this class of ores should not be allowed unduly to influence one to the confusion of sound judgment.

IMPROVEMENTS SUGGESTED

Applied with care to mines represented in class *A*, our present system is all that could be desired and the extraction can be maintained at 85 per cent. or better when the mills are not neglected or crowded.

In mills designed to treat ores included in classes *B* and *C* some new features must be added, at the same time retaining the great advantages of our old and tried system. The disseminated condition of the blende lost at once suggests more thorough crushing. To crush to a degree of fineness which will liberate a satisfactory percentage of the blende would increase crushing costs to a prohibitive degree, and also the sliming of ores, and, farther, it would diminish jig capacity. The first thing, therefore, is to liberate the blende at a low crushing cost. Crushing may be divided into primary and secondary, primary crushing being that which precedes jigging and secondary crushing that done after jigging to free the ore in the middlings. It is evident that if we crush primarily to a size sufficiently small to free all the blende we shall have to crush an enormous proportion of barren gangue. If we stop primary crushing at a point which will enable us to collect the middlings on the jig and return them to the rolls for secondary crushing, there will be a smaller volume to crush and a reduced crushing cost.

The first step is to determine the size to which primary crushing should be carried. Screens with 7-mm. to $\frac{3}{8}$ -in. round holes give the proper maximum size in ordinary cases. Reduction to this size should be performed by graduated crushing; that is, screens to remove the fines must be introduced so that only the oversize is crushed. By this means the rolls are not overloaded with fines and the amount of slime made is kept at the minimum.

After crushing, jigging is, of course, the next step. It is here that we must make an elaboration in order to effect the desired high degree of saving and properly to separate our middlings for re-grinding. The change most desirable is to segregate the roughing into three parts by sizing, and to give three individual roughers each a separate size. The first rougher may treat a size ranging from 7 to 4 mm.; the second, from 4 to 2 mm.; the third, 2 mm. and finer. To get ac-

curate work out of this fine rougher the sludge or extreme fines may be screened off before jigging, and sent direct to the sand department, although this screening may be done with good results after jigging. By this latter means a large proportion of the fine material will be retained in the concentrates of this rougher, though the free settling conditions will be somewhat retarded by the presence of the fines.

In the case of the ores of class *A*, the blende particles being free and having smooth and glossy outer surfaces, they readily settle through the interstices in the rougher bed regardless of their size. In the case of classes *B* and *C*, of which we are now treating, this is not true. The middling blende, having rough, irregular surfaces, clings to the gangue and is held in suspension by friction against associated particles. By close sizing of the feed, a relatively larger interstitial space is present to allow settling, gravity being given proper opportunity to assert itself. The proper plunger action and volume of water may by this means be supplied to each size and the construction of each jig may be adapted to the particular size which it is to treat.

ADVANTAGES OF SIZING

I wish here to defend the introduction of an adaptation of what is generally called the German sizing system. I am fully aware that this system has been introduced in several mills and that the path of its introduction is strewn with wrecks and failures. Yet I offer as evidence of its value a mill now using it in a manner both mechanically and commercially successful. Earlier trials have failed for a number of reasons, mainly because of an attempt to abolish the "cleaner and rougher" system. This was a mistake, for there is every reason to retain both. The introduction of the system of sizing is merely and solely to facilitate the work of the rougher, increasing both its efficiency and capacity.

Having thus prepared our ore for rougher treatment, we will follow it a little further. The coarse now goes to a rougher with wide cells, large plungers and long, slow stroke. This jig should have a strong fall or reduction in height of each consecutive cell from head to foot. In the next size, the jig should have a slightly faster motion, less fall and shallower bed, retaining the wide cell and large plunger. The same reduction is to be introduced in the third or fine rougher. With a rich feed carrying a high percentage of blende, some clean concentrates may often be taken from the head of the rougher, though the better rule is to carry the bed so thin that this tendency to clean entirely will be reduced, the thin bed being more sensitive and more effective in settling the blende.

The roughers should be equipped with proper draws for removing the accumu-

lations of ore and middlings from the beds at the tail of each cell. Some recent devices for this purpose are doing good work. Care, however, should be used in selecting from those offered to secure one which can be regulated without opening or closing a hole or set of holes. The old gate and dam idea is the best. The opening and closing arrangement will always choke. A proper adjustment of the gate and dam principle will secure a continuous draw which can be so adjusted that it will draw only as may be required. Too much stress cannot be laid upon the importance of both a continuous draw and the proper placing of the device. The continuous draw admits of a uniform effect from plunger action and consequently more effective work in every particular. Two or three ports placed across the tail end of a cell will insure a uniform drawing across the entire width of the cell. The tail end of the cell is selected because of the tendency of the blende to pile up at that end, and because near that end the particles are more perfectly stratified than at the head.

TREATMENT OF MIDDINGS

Having now carried the process to the point of securing the middlings, we will next proceed to their further treatment. Since the blende which they contain cannot be cleaned without crushing for separation, it is evident they should all be crushed. To secure this result they should be conveyed to secondary rolls, which should either be rigid rolls grinding to a certain size, or they should be passed over a screen with openings of the required size, the undersize returning to the head of the system, the oversize returning to the rolls for further grinding. I am of the opinion that a rigid roll would be the most economical.

From these roughers the concentrates should all pass to a cleaner which should be equipped with draws similar to those recommended for the rougher jigs. The feed going to this cleaner will not, under proper conditions, contain more than 20 per cent. silica. Therefore any tails from this jig are likely to carry $2\frac{1}{2}$ to 5 per cent. blende, and to be rather small in quantity. They should be returned for secondary crushing and no rejections should be made from it. The purpose of this jig being to make a high grade of concentrates making no rejections, the preparation of it should be in accordance with this requirement and no concern for losses is necessary.

It is well to bear in mind that the application of this elaboration of the system requires much careful study of detail. Though containing nothing new to concentrating men of today, it brings up new situations and in this district presents some difficulties to be overcome. One important point is to preserve our present low milling cost. In an ore of class *B* or *C* carrying 6 per cent. blende

it will reduce the losses in the tails from 25 to 50 per cent., and the increase in the cost of milling is not more than 10 to 20 per cent.

TREATMENT OF FINES

The advantages of these improvements are not confined to securing a better extraction of blende from the middlings, but the changes are equally helpful in preventing excessive losses in fines. That part of the ore which we designate as fines consists of those particles which, because of their small dimension, will not settle effectively in plunger jigs. Careful observation places the dividing point at that size which will pass through a screen having 1-mm. round perforations. Separating this size from the coarser particles early in the process has important advantages. It relieves the finest of the three roughers from the presence of an accumulation on the top of the beds of a stratum of very fine material which obstructs the jig action. The tails from the coarse jigs may be sent directly to their destination which aids in securing economical mill arrangement and operation. Until recently it was impracticable to do this because no screening device in use would separate these fines from the coarse at a low screen cost. There are now, however, screens which receive and discharge their load with very little of the abrasive action so destructive to both trommels and shaking screens. The use of these new devices has shown that the cost per ton for fine screening can be brought lower than for handling the coarser sizes. The screens to which I refer belong to that class of which the "Callow" and the "King" are types.

In concentrating fines great care upon all points is essential. Regularity of feed, proper distribution and sizing and absolute control of the water in the feed and that supplied for washing purposes are necessary. In the early history of milling this problem was left to the tailings or sludge man who, by industry and careful attention, reclaimed a good proportion of the waste. The introduction of concentrating tables as accessories to the mills has been a natural sequence. Their operation, however, almost invariably falls far short of the profit that might be obtained. The cause of this is directly and solely neglect of the essentials named.

Fines may be sized with sufficient accuracy, by a system of hydraulic classification, which can be installed for a small sum, the cost of maintenance being almost nothing. Proper settling systems are being introduced by the best contractors, but there is still a tendency to make the classifiers too small. Complete control of the water accompanying the feed to the table is a matter which receives too little attention. If the classifiers are properly arranged this control offers no difficulty. The great bulk of the

water will be carried to the finest feed and can there be removed.

The question of the introduction of machines designed to save the blende particles which are too fine for table work can usually be answered by means of a screen analysis. In ordinary mill work the remaining mineral is not in sufficient quantity to warrant an additional outlay.

In conclusion let me urge operators to pay more attention to the matter of daily losses. The ruling practice is to pick up a handful from the general tailings once or twice a week and decide in a casual way by observation whether the work is good or bad. A system of daily samples carefully collected by means of automatic samplers and frequent assays will teach many valuable lessons. If the work is done carefully the lessons learned will return a profit on the outlay.

The Dunderland Iron Ore Company, Ltd.

We have referred on several occasions during the last five years to the Dunderland Iron Ore Company, which was formed in the spring of 1902 to work the iron-ore deposits of that name in Norway, near the Ranen Fjord. The deposit is of low grade, and the method of working is to grind fine, concentrate by the Edison magnetic process and make the concentrates into briquets. Many eminent men are connected with the venture, especially iron-masters, who do not mind putting up some money and backing the scheme, in the hopes of securing a new supply of iron ore. Large sums of money have been spent in opening up the property and erecting plant on an extensive scale, without first ascertaining whether the method of dealing with the ore is a practicable one commercially. As a matter of fact, all three parts of the concentration process have given great difficulties; the grinding, magnetic concentration and the briquetting processes having to be continually modified, as work proceeds. The capital expenditure is increasing from year to year, and there appears to be no finality in this direction. The directors have already issued the whole of the £2,000,000 share capital and spent £500,000 raised on debenture bonds. They are now proposing to increase the borrowing powers of the company by the creation of £500,000 new debentures.

In the report for the year ended March 31 last, the directors announce that half of the fine grinding plant has been remodelled, and that the remainder of this part of the plant is now being altered. The report is not very explicit, but it glows with the usual indefinite optimism. We quote it at length:

"The processes for the treatment of iron ore at Dunderland are, in their nature, continuous and interdependent,

each section having to wait in a great measure on the success of the preceding section. Owing to the intermittent output of properly ground ore pending the alterations above referred to, it has not yet been possible to bring the blowing and separating processes to a high state of efficiency, but the results obtained are encouraging. During July the extraction of iron equaled 41 per cent. of the iron present in the crude ore treated, but in August 54 per cent. was extracted, and the improved extraction during August lowered the cost of production of concentrates seven shillings per ton. The figures for September are not yet completely to hand, but as far as they are available they show a further improvement. Your directors therefore feel confident that on the completion of the alterations and improvements now in progress, an increased output and higher rate of extraction will be obtained, whereby further substantial reductions in the working costs should be effected.

"The general manager in Norway, Mr. Bremner, who took over the administration at Dunderland some time subsequent to the last general meeting, states as the result of a careful computation, that within the next six months the output of briquets should reach 800 tons a day, at a cost which unless some great and unexpected depreciation in the price of first-class iron ores occurs, your directors consider will enable the company to provide the interest on its debenture stock and leave a considerable balance of profit. The working of the plant has clearly proved that a concentrate rich in iron and sufficiently free from deleterious matter can be obtained from Dunderland ore, and that this concentrate can be briquetted and will command a ready sale. The 29,000 tons of briquets already sold at the date of this report have realized good prices and have given satisfaction. A further stock of 7000 tons is ready for delivery. Although the company's plant can be run throughout the year, the summer is the most favorable season for constructional work. During the past summer there have been widespread disputes between the labor unions and employers in Norway, and this company experienced in consequence great difficulty in obtaining an adequate supply of skilled workmen, resulting in an unavoidable delay in the completion of adjustments of the plant. You have been informed that an arrangement satisfactory both to the company and to the men, and binding over a period of three years, has been concluded."

The Elmore vacuum oil process is reported to be making a good separation of tin and copper ore at the Dolcoath mine, Cornwall. A plant is being shipped for the Avino mine, in Mexico, also one for the Zinc Corporation at Broken Hill, New South Wales.

Lead and Zinc Mines of North Wales

A District of Much Geological and Historical Interest. Features of the Ore-deposits. Association of Blende and Fluorspar. Ore Dressing

BY EDWARD WALKER

Lead and zinc ores are found in various parts of England and Wales. One of the most interesting occurrences is in the Flintshire district of North Wales, which is no longer a producer of great consequence, but is of considerable historical and geological interest. Its total output in 1906 was only 6122 tons of lead ore and 6415 tons of zinc ore.

to 1300 ft. above sea-level. It extends from the sea shore at Point of Air, to Wrexham. Almost parallel with this range is the higher range of the Clwydian Hills, which are composed of Silurian rocks and are non-metalliferous. The highest point of this range is Moel Famma, 1820 ft. which is near the Rhosesmor mine.

	1905.		1906.	
	Lead Ore.	Zinc Ore.	Lead Ore.	Zinc Ore.
Halkyn.....	1,087	651	796	794
East Halkyn.....	890	194	467	129
Rhosesmor.....	2,829	152	3,083	150
Panbymwyn.....	135	192	215	351
Llynypandy.....	359	.....	.....	.....
Milwr.....	202	1,108	186	564
Trelogan.....	268	1,524	300	1,831
North Hendre.....	971	.....	846	28
Minera.....	228	2,660	229	2,568
Total, tons.....	6,969	6,481	6,122	6,415

POSITION AND GEOLOGY

The accompanying map gives an idea of the situation of the field and its geological structure. It is in the counties of Flint and Denbigh in the northeast corner of Wales, not far from Chester and Liverpool. The veins occur in a strip of country approximately 25 miles long and four miles wide, running from northwest to southeast. The veins outcrop generally in an east-west direction. There are also a number of north and south cross-courses, but these as a rule are not so metalliferous as the east and west veins. The veins, in many cases, are almost vertical and in practically every case the dip is steep. Their width is variable, from an inch to 5 ft.

The veins occur for the most part in the mountain limestone or the millstone grit, just where these rocks begin to dip under the coal measures. The millstone grit is mostly in the form of chert, and the limestone is often the black variety. The country is heavily faulted and the geological details are difficult to fill in accurately. It requires a great deal of local knowledge, before the deposits and the veins can be properly followed up. I believe the failure of mining operations in this district is as often attributable to the lack of study of the local geology, as to the absence or exhaustion of the ore.

The lead occurs chiefly as massive galena with occasionally some cerussite. The zinc occurs as blende, but is selcom massive, being mixed with gangue, such as chert, limestone, calcite and fluorspar. Galena and blende do not always occur together. Some of the lead veins contain no blende, but it is rare for the blende to be entirely unassociated with galena. When the blende and galena occur in the same veins they are not intimately mixed, and then separation is effected by the ordinary system of concentration. As a general rule, the galena is easily dressed out, but the blende is not so readily recovered, especially where fluorspar occurs. The district in which the veins are found consists of a range of hills varying from 800

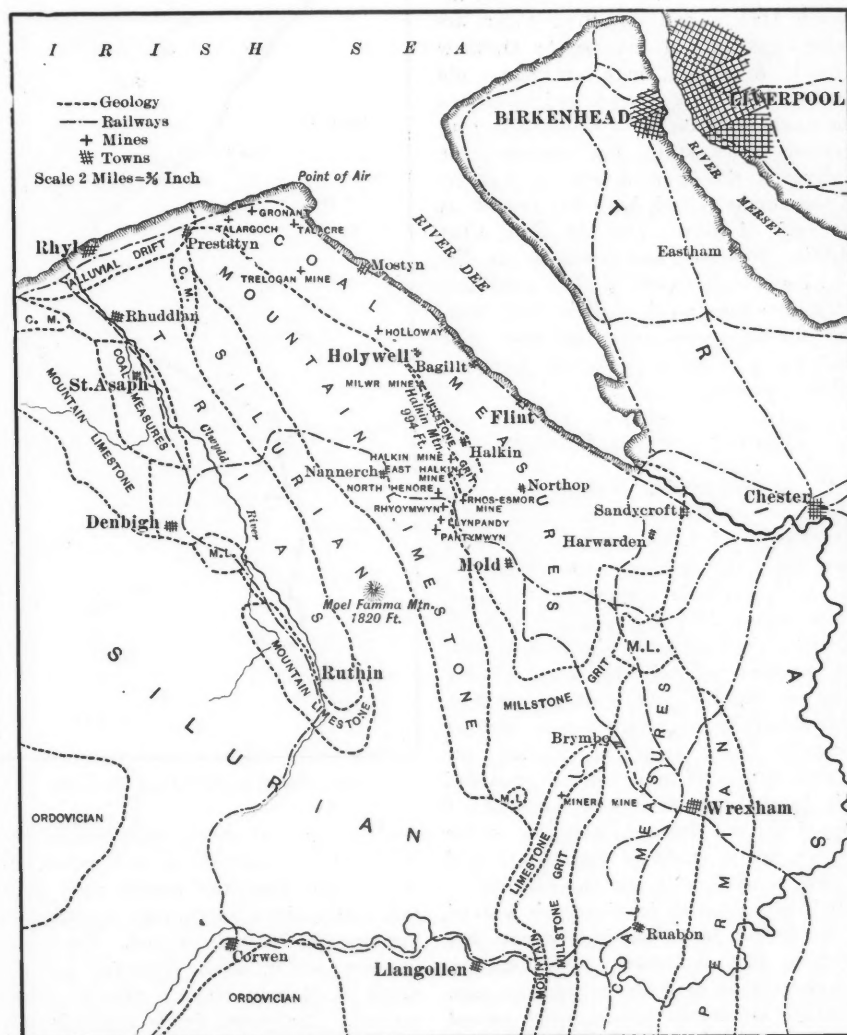


FIG. 1. MAP OF NORTH WALES LEAD-ZINC REGION

THE MINES AND THEIR PRODUCTION

At the present time nine principal mines are in operation. The relative importance of the mines is shown by the following figures which cover the years 1905 and 1906:

It will be seen from these figures that the North Hendre and the Llynypandy produce lead only. In addition Halkyn, East Halkyn and Rhosesmor are important producers of lead, with a production of zinc of secondary importance. Minera, Trelogan and Milwr are more

noted for their zinc than for their lead.

MANAGEMENT OF THE MINES

The financial control and the management of all these mines are in the hands of local people. The Halkyn, Llynypandy, Pantymwyn and one or two other smaller producers not mentioned in the table are in the hands of Matthew Francis & Son, of Halkyn. The East Halkyn and the Rhosesmor are worked by one company controlled in Chester. The Milwr and the North Hendre are independently worked, also being controlled in Chester. The Trelogan belongs to Brunner, Mond & Co., whose works are in Cheshire, and the Minera is held in part locally and in part by the Swansea zinc smelters.

There are a number of other mines besides those in the table that are being worked to some extent. For instance the North Halkyn and the Bryn Celyn are being explored and reopened by Matthew Francis & Son. There are many old shafts all over the district, and several of the workings make some claim to be considered mines still. For instance, the Talargoch, the Gronant and the Talacre, at the northerly end, have fine records at the back of them. The Cat Hole, Clwt Militia, Holloway, and others in the district between Holywell, Halkyn and Mold have also done good work in their time, and during recent years attempts have been made to reopen some of them, but without success.

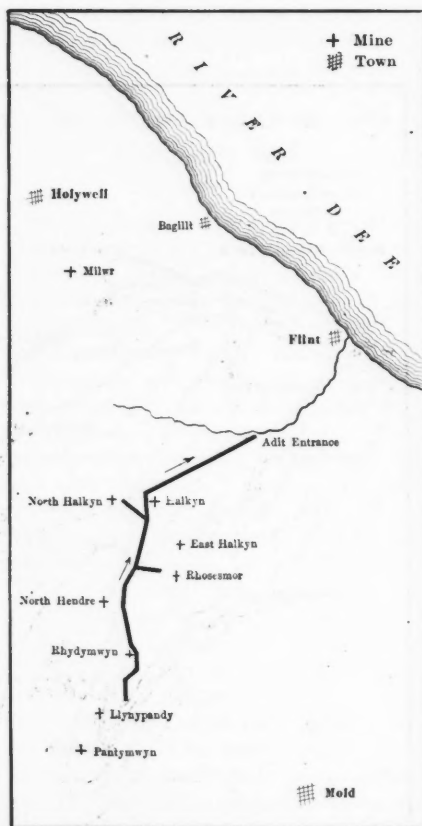
PROSPECTS OF THE DISTRICT

At the present time it is probable that Rhosesmor is the only one with more future before it than past behind it; and even there the zinc ore now being won has an inseparable content of fluor spar, which makes the ore unpopular with the smelters. The output at the Halkyn mine has dropped seriously this year, and the fears are that the mine is on its last legs. The Milwr is not producing so well as formerly. The veins at Minera are largely exhausted and ore is produced only from the south end of the mine. I hope I am not doing an injustice to the district, but a study of the history and present conditions is not encouraging.

It is probable that lead ore was worked in the district from time immemorial, but anything like systematic operating was not undertaken until about 130 years ago, when the Grosvenor family, which owned most of the land, started work at Halkyn. There are no records of the output of those days, but tradition has it that the Grosvenors made a big fortune out of lead. In 1818 the original John Taylor was called in to advise, and he imported Matthew Francis' ancestor from Cornwall to superintend the development. The Taylor regime continued until about 1882. After such extensive workings, it is not to be wondered at that there is little left.

WATER AND DRAINAGE

One of the difficulties met with, especially in the Holywell, Halkyn and Mold district is the large amount of water encountered. The volume of water to be removed is so great that pumping is quite out of the question. That is to say, the production of the mines could not meet the cost of an adequate pumping installation. The drainage is chiefly done by adit, and the tunnel driven for this purpose in the Halkyn district is a noteworthy piece of engineering. In a separate map I give a plan showing the extent of this tunnel. It is about 50 years since the work was first commenced and various sections of it have been undertaken at different times. The tunnel ex-



THE HALKYN DRAINAGE TUNNEL

tends about four miles, with branches to North Hendre and Rhosesmor mines. At the present time the tunnel runs quite full, and is able to drain only a portion of the mines at its southern end. The outlet is about 300 ft. above sea-level, and the depth at Halkyn mine is 660 ft. below surface. The incline of the tunnel is only sufficient to give the water a flow.

DEPTH OF WORKINGS

Owing to the amount of water in the strata, it is not possible to do much mining below the tunnel level. It is true that at its southern end and at North Hendre there is some pumping done, but the extra depth obtainable for working is not more than 50 ft. The water question practically limits the depth at which

operations can be conducted. It is probable, if new shafts were sunk and powerful pumps were provided, that several new horizons of ore would be discovered. At the present time it does not look as if the necessary capital for such work would be available.

TREATMENT OF THE ORES

None of the lead or zinc mines of the district smelts its ores. The lead ores are sold chiefly to Walkers, Parker & Co., at Bagillt on the coast; some ore goes also to Quirk, Barton & Burns, at St. Helens, Lancashire. The lead output at Minera goes to Vivians at Swansea. The zinc output is sold to Swansea and to Germany. The zinc output of Minera goes to Vivians, Dillwyns, and the Swansea Vale Company, who control the mine nowadays. The zinc output at Trelogan goes to Brunner, Mond & Co., at Northwich, where it is used for the production of electrolytic zinc by the Hoepfner process. The zinc ores, before going to the smelters, are generally roasted for sulphuric acid at Muspratt's chemical works at Flint, belonging to the United Alkali Company.

The treatment of the ores is on orthodox lines. The ore is crushed in rolls and sized to four or six different sizes from 10 mm. to 1 mm. These different sizes are sent to their own jigs, which usually have four compartments. The first compartments invariably produce very high-grade lead concentrates. The contents of the other three hutches generally have to be re-crushed and treated over again. It is not possible, as a rule, to get a good zinc concentrate in the coarser jigs. Anything below 1 mm. goes to tables such as the Wilfley, Green's, or Wynnes', and the slimes are treated on buddles. Until 10 or 15 years ago the saving of values at most of the mines was not closely studied and some of the old plants were crude. The finer sands and slimes were a good deal neglected, so that the tailings heaps and the dumps of low-grade ore contain workable quantities of ore. At the mines where the lower grades are now being treated there is, in most cases, plenty of room for the study of modern concentrating plant.

The concentrating tables that are in use are, with the exception of the Wilfley, of local design and manufacture. The Wilfleys are seen at their best at Trelogan and Halkyn. They were first introduced at Halkyn; in fact I believe the Halkyn installation contains the first of these tables ever erected in the British Isles. The other plant comprises Green's vanner, Wynne's vanner, Wynne's slimer, and the knife buddle. I will give a brief account of these.

GREEN'S VANNER

The illustration shows Green's vanner. It is the invention of, and is made by, George Green, of Aberystwyth. The table is carried on inclined hinged legs *A*, and receives a vanning motion by means of an eccentric and connecting rod. The

action is similar to that of the Ferraris table and the Buss table, described in the columns of the JOURNAL a few years ago. In fact the table may be called an improved or developed Ferraris table of the old type. The modern Ferraris table, made by Krupps, is mounted on springy ash strips instead of the inclined hinged legs.

WYNNE'S VANNER

Wynne's vanner or the "Record," as it is called, is noteworthy for having an unusually long and slow throw. The stroke is 5 or 6 in. with 90 strokes per minute.

Illustration where it is at work on the slimes at Minera. The machine consists of a smooth, fixed surface with a double tilt, upward along the course of the surface, and downward from the feed side to the discharge side. There are a number of rubber pushers mounted on bars and continuously moved up the course of the table, from right to left in the picture. The slimes are fed on at the far side toward the right hand, and water runs down the table. As the rubbers travel up the table, they carry the slimes forward and the water washes the lighter particles down over the other side.

other end of the cylinder. Pulp of all kinds of fineness is operated on. The machine is often used for cleaning the lead concentrates found in the second hutches of the jigs.

THE RHOSESMOR MINE

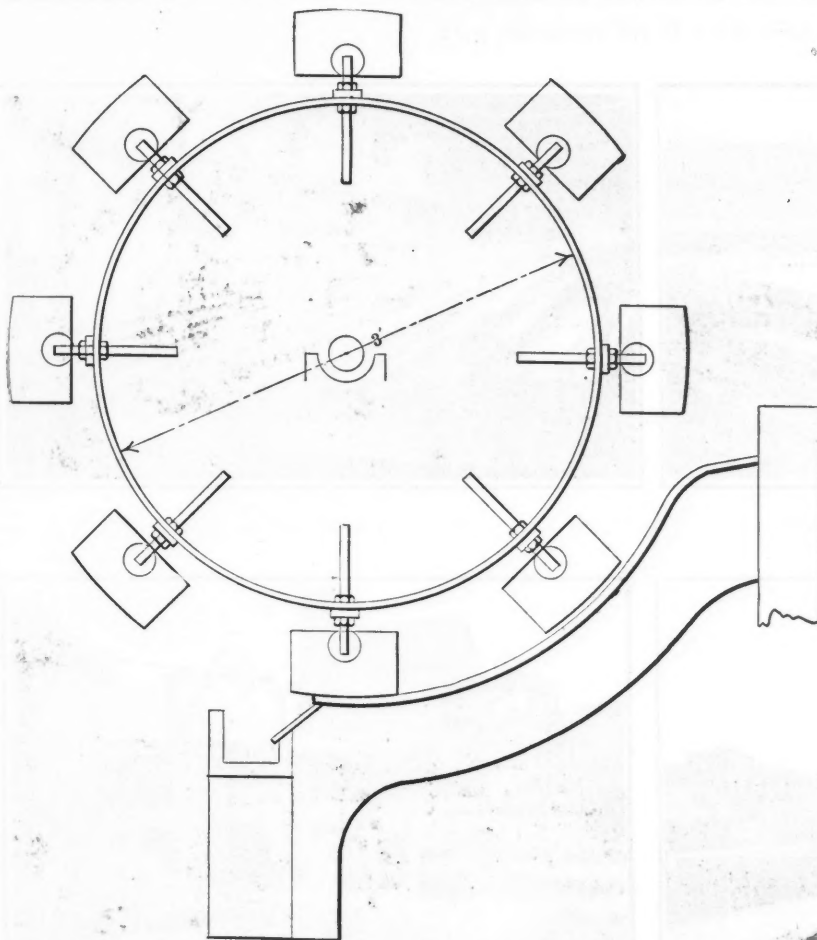
As already mentioned, the Rhosesmor, operated by the East Halkyn Mining Company, is at present the best representative of the neighborhood. The illustrations herewith give a general view of the surface works, two interior views of the dressing plant, and a view of the buddles. At this mine a new electrical plant has just been put in and considerable economy has thus been obtained. Only sufficient pumping is done to provide water for the dressing plant and for the boilers, the remainder of the drainage being effected through the Halkyn tunnel. A line of electrical wires has been erected to take power to the East Halkyn mine belonging to the same company, and eventually the East Halkyn ores will be carried to Rhosesmor for treatment.

The present production is about 300 tons of concentrates per month. Of this 200 tons are lead concentrates and the remainder are zinc. The lead concentrates run about 6 or 7 oz. silver to the ton. The first compartments of the jigs give high-grade galena running 84 to 86 per cent. lead. The second compartments contain galena mixed with cerussite, which brings down the lead contents to 75 per cent. The third and fourth hutches contain zinc, and the contents go to be re-ground. At the present time it is unfortunate that there is a certain amount of fluor spar in the ore, and this cannot be got rid of. The smelters are not buying Rhosesmor zinc concentrates readily, and the stock of them is accumulating. I do not know whether it would pay to try a flotation process. I do not think it would, if each mine worked independently. The best course would be for the various mines to join in the purchase of a small unit, and send all their concentrates to this central point.

The ore is crushed coarse to begin with and trommels divide it into sizes of 10, 8, 6 and 4 mm. The ore that has been sized out before crushing is separated into 3, 2 and 1 mm. All these grades are jigged separately. The sizes below 1 mm. go to Green's tables. The tailings containing slimes go over some more Green's tables, and the middlings are sent over Wynne's tables. Some of the old slimes from the first set of Green's tables are now being treated on the buddles shown in the illustration.

THE HALKYN MINE

I give herewith a view of the Halkyn mine. The dressing plant is on similar lines to that at Rhosesmor, except that Wilfleys are used instead of Wynne's and Green's tables. Some of the jigs have six compartments instead of four. The con-



VERTICAL CROSS SECTION OF KNIFE BUDDLE

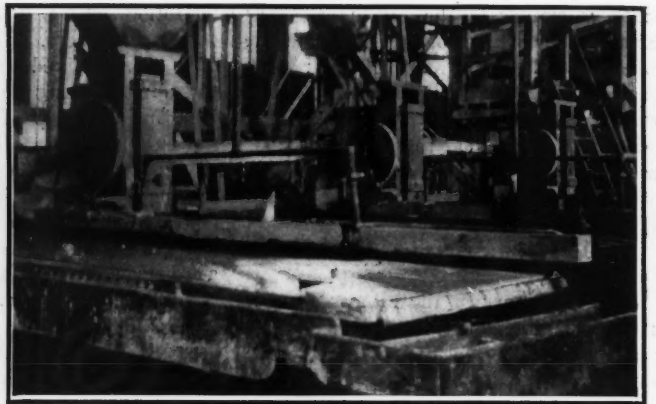
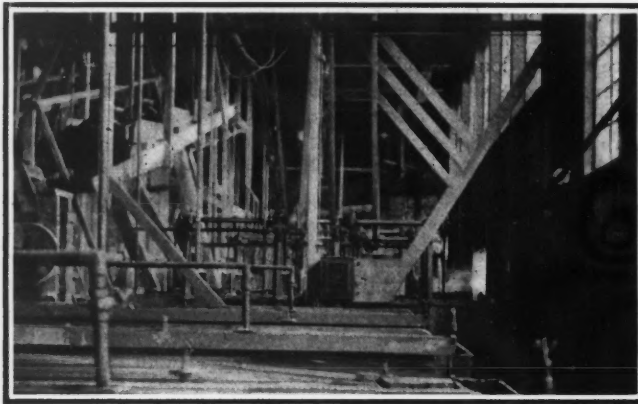
THE KNIFE BUDDLE

The knife buddle, a sketch section of which is given, consists of a quarter segment of a cylinder. A shaft bearing a number of arms revolves eccentrically with the axis of this cylindrical surface. At the end of the arms are knives adjustable at the desired angle and arranged to travel up the cylindrical surface. The knives nearly touch the cylindrical surface at the bottom, and slightly recede from it on their way up. The pulp is fed at one end of the machine on to the cylindrical surface, and water runs down from the top. The inclined knives push the pulp upward and forward. The lighter particles are washed off the cylindrical surface, and the heavier ones are discharged over the

The motion is obtained by an eccentric and by means of two cranks on shafts parallel, but a few inches apart. These cranks have pins which are connected by a drag link. The driving wheel is on the shaft of one crank and the eccentric on the other. In this way the forward throw is made quick and vigorous. It is claimed that coarse and fine sands can be treated on the table without classification, and that it acts automatically as a separator of the slimes, which pass off separately from the coarser gangue. I show this table in the accompanying illustration where it is at work at the Minera mine.

WYNNE'S SLIMER

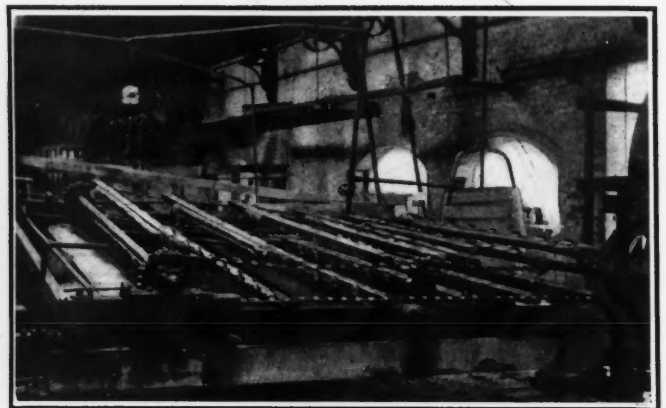
This machine is shown in another il-



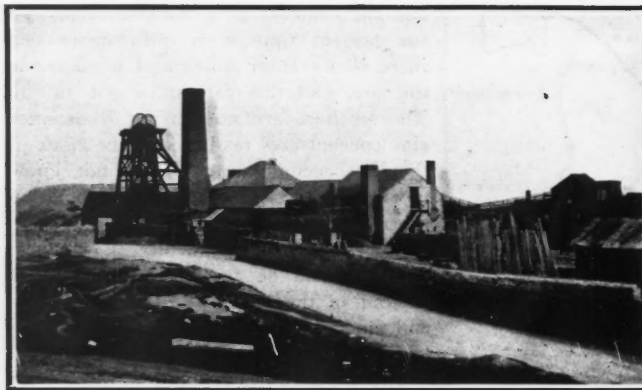
ORE DRESSING PLANT AT THE RHOSMOR MINE



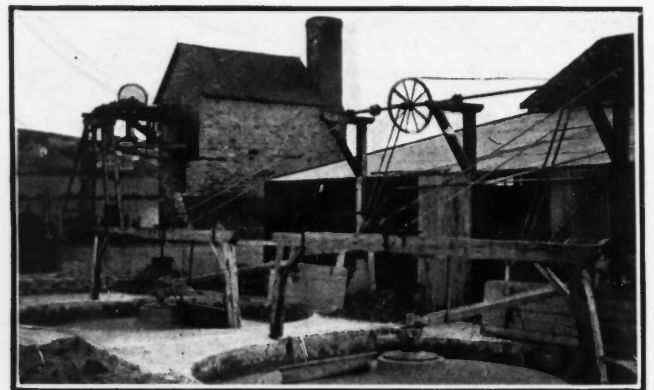
WYNNES VANNING TABLE, MINERA MINE



WYNNES SLIMER, MINERA MINE



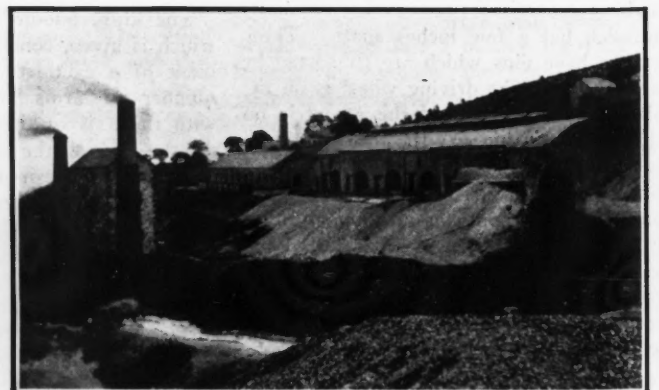
HALKYN MINE



BUDDLES AT RHOSMOR



PUMPING AND HAULING SHAFTS, MINERA MINE



OLD ZINC DISTILLING HOUSE

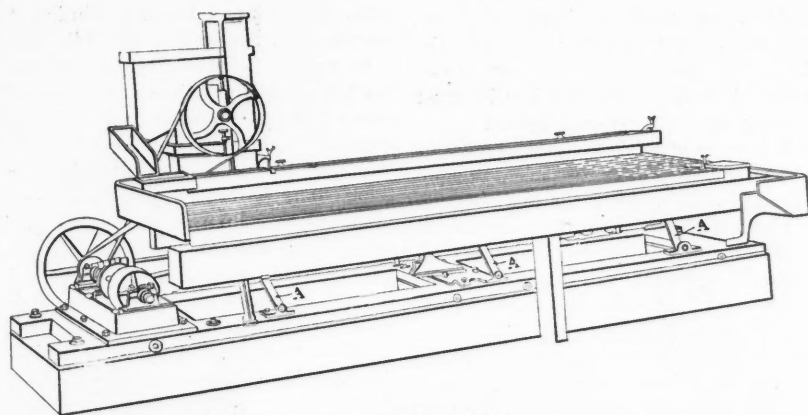
tents of the second hutch are cleaned by means of knife buddles and the tailings re-ground.

The output of this mine has fallen off seriously of late. For many years the average was 400 tons galena and 100 tons of blende concentrates per month. At the present time the output is only 60 tons each per month.

THE TRELOGAN MINE

The output at the Trelogan mine has not come up to expectation, and the dressing plant is only half occupied with ore from the mine. During the nights the plant treats ore from the mine, and during the days ore from the dumps. In this way 200 tons of mine stuff and 250 tons of dump are treated during a week, and an output of about 170 tons of concentrates per month is obtained. Of this, five parts are blende and the remainder galena.

The dressing plant at Trelogan is a very good one, and special attention has been given to saving values in the slimes.



GREEN'S VANNER

There is an excellent installation of Wilfleys and a great variety of buddles and rag-frames such as I described in my series of articles on Cornish practice recently.

The credit for the design of this plant is due to J. H. Collins, and it is unfortunate that the ore reserves and developments have not come up to expectations and given him the opportunity of showing good dressing results. As it is, the plant can hardly be doing its best, seeing that it runs on a short supply and has to treat dump and mine ore alternately. The dump ore is much oxidized, which adds to the difficulty of adjusting the plant to its alternate work.

THE MINERA MINE

The Minera mine, at Wrexham, of which several views are given, has probably yielded as much ore as any in the district. I have no exact record of the output, but I judge by the immense extent of the tailings heaps. At the present time the output of concentrates is only 135 tons of blende and 24 tons of galena

per month. The blende concentrates average 60 per cent. zinc, the lead concentrates 81 per cent. lead and 5 oz. silver. The contents of the ore mined are $2\frac{1}{2}$ lead and $8\frac{1}{2}$ per cent. zinc. The mine has had a checkered existence of recent years. Some 15 years ago it was decided to erect distilling furnaces, but it was soon found that distilling could not be done here. For the last 10 years the local directorate has been reinforced by assistance from the Swansea zinc houses, and representatives of Vivians, Dillwyns and the Swansea Vale Company are on the board. These Swansea houses take the whole of the zinc output and divide it, while the lead goes to Vivians.

FINANCE AND PROFITS OF THE MINES

Though the outputs of the mines are comparatively small, the profits are satisfactory. The capitalization is low, as there has been no inflation of capital by promoters.

To give an example, the East Halkyn

tributed £15 per £1 share as dividends on a share capital of £10,000. The best years were from 1887 until 1900. During 1898 the dividend was at the rate of 150 per cent. In those days the price of lead ore was about one-half what it is now.

The Halkyn District Mines Drainage Company, which built the drainage tunnel already referred to, has a paid-up capital of £72,770, all of which represents actual expenditure. Since the constitution of the present company in 1875 dividends have been paid amounting in all to 250 per cent. The income is derived entirely from royalties based on the output of the various mines drained by the tunnel.

New Mining Districts in Southern California

SPECIAL CORRESPONDENCE

Southern California is participating in the activity of the adjoining regions in Nevada. The copper discoveries in Inyo county are being exploited at several points, and in some places with promising results. Several old districts, abandoned years ago because they were inaccessible, are now being reopened. Thus, in certain portions of the desert and mountain region of San Bernardino county, considerable prospecting is being carried on in sections heretofore overlooked. Many persons believe that the ledges of southern Nevada run south on well defined lines into this portion of California. At Cima, between Barstow and a point where the Salt Lake road branches off for Las Vegas, a number of prospects have lately been located, and subsequent investigation shows a continuation down toward Banning. There are many prospectors now ranging throughout that county, and there will be many more as soon as the hot weather period passes by.

Among the old districts the Corn Springs region in the Chuckawalla mountains, between 30 and 40 miles from Salton, Riverside county, is being revived. Its isolation has kept back development, but the roads and water-holes have lately been marked with guide-posts, and numbers of prospectors are coming in from Nevada and Arizona. Dry washers are being worked in the vicinity and ore is being shipped out to the smelters at El Paso and San Francisco.

The year 1906 was the most prosperous one yet enjoyed by the Zeehan-Montana silver-lead mine in Tasmania. Of concentrated ore shipped, 2100 tons went to Antwerp, averaging 69.5 per cent. lead and 91 oz. silver, and 2642 tons went to the Tasmanian Smelting Company, 62 per cent. lead and 67.3 oz. silver. The amount received by sales of ore was £81,000 and £32,000 was distributed as dividends.

Mining Company as at present constituted, was formed in 1890 with a capital of £15,000. This was increased to £20,000 in 1900 (only £17,500 actually paid up) when the Rhosesmor mine was acquired. From the beginning in 1890 to the time of writing, the total dividends have been $237\frac{1}{2}$ per cent. on the present capital of the company. The accounts for the half-year ended June 30 show profits of £7690, out of which £4375 was paid as dividend, at the rate of 50 per cent. per annum on the paid-up capital. In addition £1000 was written off for depreciation and £2000 placed to reserve fund. At the two mines combined the output of lead concentrates yielded £23,436 and the zinc concentrates £1070. The underground expenses were £4850, surface expenses, including dressing, £2257. Coal, steel, lumber, etc., came to £1890, management charges were £520, directors' fees, £500, royalties and rents, £7061. These, with sundry small items of income and expenditure, left a profit of £7690, as already mentioned.

The Halkyn Mining Company, since 1883, as at present constituted, has dis-

Shrinkage in Stock Values

After the recent decline had brought prices on the New York Stock Exchange to the low level of the year, or lower, the newspapers began to reckon up what was described as the total shrinkage of capital since last December. They reached the conclusion, said the New York *Evening Post* of Oct. 19, that a "three-billion-dollar loss" had been incurred during the nine or ten past months. Some of them, going into further details, computed a \$400,000,000 loss in the copper stocks alone. This method of measuring prosperity by arithmetic is not new; everyone remembers the two or three billions loss which holders of securities were told had been brought upon them by the second Cleveland administration, and the similar sum which had been added to their store in McKinley's first term. The *post hoc* argument is a favorite on the stump, and the orators of 1896 and 1900 fairly reveled in billion-dollar figures, which may be supposed to have had convincing effect upon their audiences.

The recurrence of the argument, continues the *Post*, suggests the inquiry, just how much of sense there really is in it. Everyone knows how the sum is done. We begin, say, with Union Pacific. The common stock sold at \$183 per share last January and \$116 this week; there are 1,954,000 shares outstanding; therefore the shrinkage has been from \$357,500,000 to \$226,600,000, or \$130,900,000. Here would be at least a fair start toward the formidable three-billion-dollar total of which investors are supposed to have been mulcted since the beginning of the year.

All this is simple enough; but it seems to involve some further question as to exactly what, after all, has happened. To begin with, is the community three billions poorer than it was last January? One perceives himself to be at once confronted with the question, what we mean by a community or an individual becoming poorer. One test of that question is, whether or not the man or group of men in question can buy as much as they were able to buy before. If we are talking about income as applied to the ordinary expenses of life, they undoubtedly can. A share of Union Pacific, quoted at 183 on the Stock Exchange last January, paid \$10 per annum to the holder; quoted at 116 last Wednesday, it still paid the same \$10.

The stock might go as low as 50, and still it would make exactly the same contribution as before toward rent and grocers' bills; always supposing the dividend to be kept up. Now, of course, the dividend may be on the eve of reduction; Thursday's action by the Amalgamated directors did cut down the shareholders' buying power. The 8 per cent. per annum previously paid on the company's 1,538,000 outstanding shares, put \$12,304,000 each year into the hands of holders, to

be used as they saw fit. With the dividend now reduced to a 4 per cent. annual rate, the same shareholders will get only \$6,152,000. Here, at least, is a genuine loss for somebody; but the simple stating of the case in this way shows that the favorite method, whereby fall in the stock's price from 121¼ last January to 48½ last Thursday is alleged to have caused a loss of \$111,800,000 on the 1,538,000 shares, is somehow fallacious.

What has happened after all, then, when quoted prices of a group of stocks have been cut down 10 per cent., or 50 per cent., from the prices of a few months ago, if dividends have not been reduced? There are two real consequences. One arises from the fact that the owner feels himself less rich, knows that he would realize less capital if necessity forced him to turn his securities into cash, and perhaps has also an uncomfortable fear that the fall in price has foreshadowed a cut in dividends. The other, with which the Wall street market chiefly concerns itself, has to do with his power as a borrower. If his occupation is that of banker or speculator, his hundred shares of Union Pacific meant to him, last January, the right to ask his bank for a credit of say \$15,000, whereas at present prices he must get along with a trifle over \$9000.

It is true, only a relatively small part of the outstanding shares of any company are used by their holders for this purpose, and where they have been thus employed, even Wall street promptly recognizes an important offsetting advantage through the resultant reduction of bank loans, the relaxed strain on financial institutions, and the consequent easier money market. Nevertheless, these considerations, affecting as they do the ordinary investor and the Wall street shareholder, show why, even in 1903, when prices fell but when dividends, outside of a few industrial companies, were hardly cut at all, the whole community declared itself impoverished. The every-day investor advised his wife to go easy on her millinery bills, the banker talked of sub-letting a portion of his office, and dealers in automobiles or jewelry complained of a vanishing trade; yet incomes were as a rule exactly what they had been before.

But these considerations suggest the further question, whether the welfare of the community as a whole is seriously impaired by such crippling of its borrowing power. The Stock Exchange would certainly say it is. Projects and schemes dependent on borrowed money must largely be laid aside, and that is a process which Wall street does not like. But what if the whole community—Wall street and every other section of it—had got into the habit of living on borrowings, of capitalizing its hopes, and of spending somebody else's money because of the ease with which collateral could be put up to secure the loan? Once in a while it is no misfortune to the people as a whole if

they get a reminder that money is best spent when it has been earned, and that the safest business projects are those with real capital and personal conservatism behind them. It is lessons of this sort which are most forcibly inculcated by a "three-billion-dollar shrinkage" in securities.

Determination of Zinc Oxide

A method for the separation and determination of zinc oxide in zinc-white, zinc-dust, paints and lithophone is described by J. Tanibon in *Bull. Soc. Chim.* (Vol. 1, 1907 pp. 823-829). The principle of the separation depends on the solubility of zinc oxide in a solution containing ammonia, ammonium chloride and ammonium carbonate. The following procedure is applicable in the separation of zinc oxide from zinc-white. A 10-gram sample is shaken for several minutes in a stoppered flask containing 300 c.c. of an ammoniacal solution composed of equal volumes of ammonia (22 deg. B.), 20 per cent. ammonium carbonate solution (and 20 per cent. ammonium chloride solution. The residue insoluble in this solution is washed with ammonium carbonate, boiling water, and finally with alcohol. The difference in weight from the amount originally taken is the weight of the zinc oxide, which may be titrated, if desired, by sodium sulphide solution. The same method may be applied to the determination of zinc oxide in zinc dust. Products such as lithophone which contain salts soluble in water are boiled therein and the sample is dried and weighed again before the alkaline leaching solution is applied.

British Iron Ore Supplies

The official returns give the supplies of iron ore available in Great Britain for the last two years as follows, in long tons:

	1905.	1906.	Changes.
Mined in G. Britain	14,590,703	15,500,406	I. 909,703
Imported.....	7,344,786	7,823,084	I. 478,298
Pyrites residue ...	524,059	569,493	I. 45,434
Total.....	22,459,548	23,892,983	I. 1,433,435
Exports.....	26,179	18,712	D. 7,467
App. consumpt'n	22,433,369	23,874,271	I. 1,440,902

There was an increase in ore mined in all the British districts. The large part of the imports were from Spain, which furnished 5,949,131 tons. Other considerable exports were 391,615 tons from Greece; 363,739 from Norway; 351,736 from Algeria; 222,499 from Sweden; 220,919 from France; 161,953 from Russia.

Assuming that there was no material change in stocks, which is probable, the consumption of iron ore per ton made was 2.34 tons in 1905, and 2.37 tons in 1906. The proportion of domestic ore used, which was 65.1 per cent. of the total in 1905, fell very slightly, to 64.9 per cent. last year.

Sheet-ground Mine in Southwest Missouri

Daily Reports of Providence Mining and Milling Company at Webb City Show Remarkably Uniform Conditions and Costs of Operation

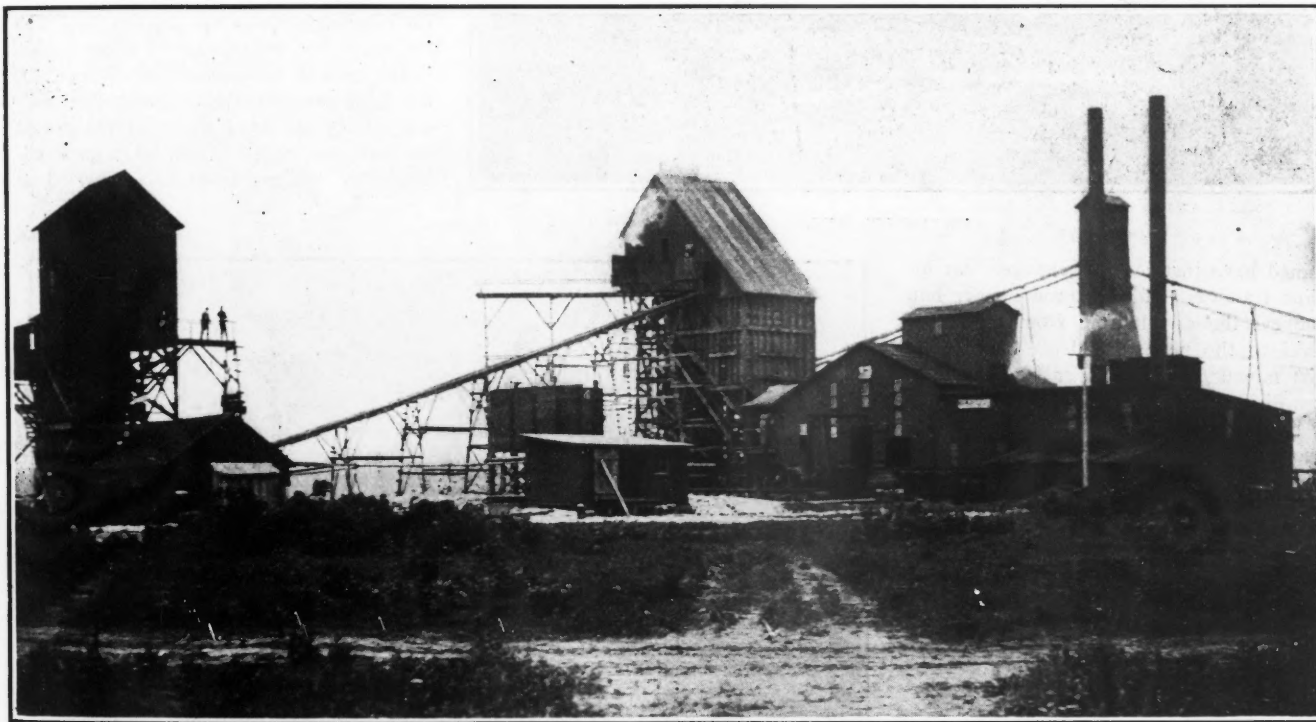
B Y D. T. B O A R D M A N *

The Webb City sheet-ground mine, here described, is typical of southwest Missouri. The mining public, engineers and investors realize little of the present importance and of the development which zinc sheet-ground mining has attained in the last few years in this district. There are richer mines and bigger mills than the property described, but it is extremely doubtful if there is any property in the district, mining under the same conditions, which returns better interest for the capital invested, considering the percentage of ore found in the dirt, royalty, etc. The copies of reports, figures, and details of the property give a sur-

enterprise as any mining can. Take a given tract of land owned in fee with ore yielding 3 per cent. of blende. With ore selling at \$40 per ton (the last two years averaged \$44.14) and allowing 90c. per ton for cost of mining and handling 300 tons per day and 300 days in a year, the profit may be figured as follows:

One ton dirt (ore), yielding 60 lb. of jack @ 2c. per lb.....	\$1.20
Cost of mining and milling.....	0.90
Profit per ton.....	\$0.30
Profit on 300 tons per day.....	\$90.00
Profit, 300 days a year.....	\$27,000.00
Pumping, repairs, etc. (Sundays)...	2,000.00
Net profit for year.....	\$25,000.00

mile north of Webb City. It is surrounded on all sides by valuable mines. Cornering on the northeast is the Underwriters land, where the famous Yellow Dog mine is located, which is one of the very rich zinc mines of the world. The Providence was formerly known as the "Old Red," and was one of the first sheet-ground mines opened up in the district. Since Jan. 1, 1906, under the management of Charles T. Orr, it has entered the front rank of the producers. A disastrous fire occurring on the night of Oct. 15, 1906, completely wiped the old plant out of existence. Foundations were laid for a new mill three days later and



RED DOG MILL, LOOKING NORTHWEST

prising but true statement of what can be done in the district by a judicious investment in a modern mining plant of not more than \$35,000 for complete top and underground equipment, shaft sinking and development work being, of course, extra. Ten thousand dollars may be allowed for drilling the ground, sinking two shafts and developing a sheet run of ore that would warrant the expenditure of the sum named.

Sheet-ground mining comes as near to the fixed conditions of a manufacturing

Repairs and insurance are figured in the cost of 90c. a ton, but no more depreciation. The above gives a fair basis for figuring on how low grade an ore can be handled and what the actual profits will run to when the percentage of blende in the dirt runs from 4 to 10 per cent., as it does in some properties. On leased land the royalty charged by the land owner must also be added to the cost per ton, and the profits reduced accordingly.

THE PROVIDENCE MINE

The Providence ground comprises a 40-acre lease on the Ashcraft land about one

on Dec. 12, 1906, eight weeks after the fire, a new and enlarged mill, one of the finest in the district, was grinding out jack.

The ground is of sheet- or blanket-vein formation, lead and jack occurring in both sheet and disseminated forms between layers of flint. Two principal runs of ore have been developed. The upper on the 165-ft. level, carrying an 8-ft. face containing good lead and jack, is separated from the lower and leaner run by a 5-ft. barren sheet of white cottony flint. When the levels have overlapped the dividing partition has often been shot

*Superintendent, Providence Mining and Milling Company, Joplin, Mo.

or caved through. Timbers are used in parts of the old ground where pillars were left too far apart. The roof will peel off in great slabs of flint, if left unsupported.

Both levels are now being carried together in the southwest corner of the mine. It means mining 5 ft. of absolutely dead ground, but it gives a 23-ft. working face. The increased production and the lower cost per ton of the dirt

broken to the round with 50 to 60 lb. of 40 per cent. dynamite; this includes squibbing. The stope is taken up with machines on tripods.

Shovelers are paid by the can (7c. each) which amounts to about 15c. per ton. They make from \$3 to \$5 per day. One man established a record for the week ending July 1, 1907, shoveling six hundred 1000-lb. cans. His check for the week's work was more than \$42. A tub-

ber of cans hoisted daily from both shafts is about 900, weighing about 1000 lb. each. As many as 635 cans have been hoisted from one shaft in eight hours. This includes time taken to hoist men and steel, a remarkable feat considering that there are but 480 minutes in a working day.

POWER AND PUMPS

Pumping is done with a 5-in. duplex Worthington compound steam pump. The pump is seated on the upper level of the old mill shaft; a similar auxiliary pump is seated on an intermediate level. A suction operated by hydraulic pressure of water from the discharge column pipe removes the water from the west or dipping face to the main sump. By the present arrangement there is practically no chance for the water to hold up operations entirely. The lower levels can be used as a vast sump and all the mining carried on from the upper level.

In building the new mill the aim was to provide a plant of large capacity with low first cost and low cost of operating. It is one of the best equipped and smoothest running mills in the district, and was erected in the record time of seven weeks.

The power is supplied by three 150-h.p. high-pressure Atlas return-flue boilers. They are fired with natural gas at 10c. per 1000 cu.ft. Crude oil is an auxiliary fuel. Steam pressure is carried at



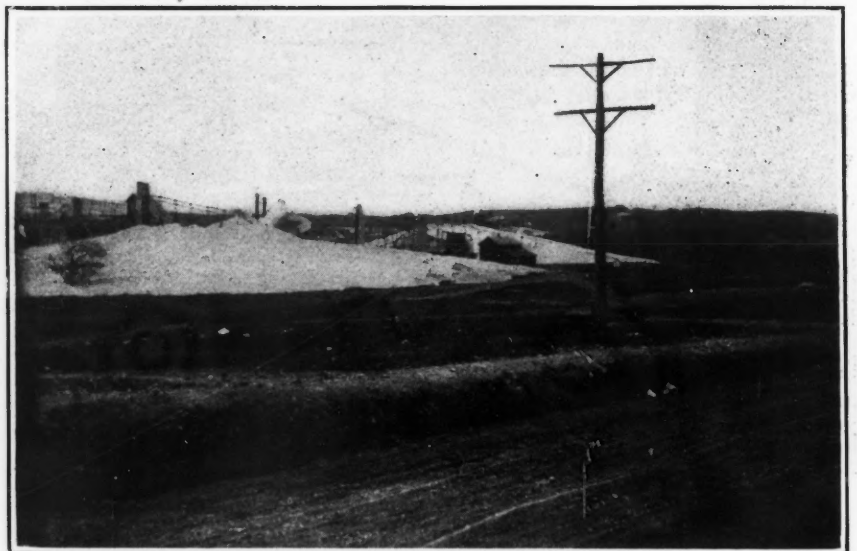
PROVIDENCE MILL

mined have justified this change. An incline tramway, with a 50-ton hopper bin, conveys the dirt hoisted from the lower level to the new Providence mill. The dirt mined from the upper level alone is run direct to the mill shaft.

The advantages gained by the use of two shafts are numerous: It insures good ventilation, a prime necessity; it allows the ground to be opened up faster and shortens the distance necessary to run the tubs underground; it reduces the cost of mining, for it soon enables enough dirt to be hoisted on the day shift to run the mill continuously 14 to 15 hours, the night crew keeping up all the repair work.

BREAKING GROUND

The ground is broken with Ingersoll drills of both the D-24 and E-32 type. The machines are mounted on 7-ft. columns carrying an 8- to 9-ft. heading. A round of four holes 8 to 10 ft. deep is drilled in one eight-hour shift, together with the setting up of the machines, squibbing and firing holes. The aim in drilling is to slab off the face and not to pull the holes. Pillars about 27 ft. in diameter are left every 49 ft. Two working drifts or more are obtained for each machine, so that the holes drilled one day can be squibbed as the men come off shift and the previous day's drilling fired. Thus the machines keep a day's work ahead of the shovelers. From seventy-five to one hundred 1000-lb. cans are



VIEW FROM THE RED DOG MILL, LOOKING SOUTH AT THE PROVIDENCE "40." MISSOURI MULE TAILING PILE TO THE LEFT AND PROVIDENCE TO THE RIGHT

hooker takes the cans from the ground cars at the station by switch. Hoisting is practically a continuous operation, the hoistman slacking his rope on landing the empty just enough to allow hooking another can. He pulls up without a signal. The can is steadied an instant in the center of the shaft by the tub-hooker and it then whizzes off to the top, the whole round trip taking barely 40 seconds. Freeman-Sampson geared hoists are used over both shafts. The average num-

140 lb. In the engine room is a 13x18-in. Atlas Corliss-valve engine of 110 rated h.p. for driving the mill. An Imperial Rand compressor of the duplex, cross-compound steam and air end type, furnishes air for the machines. Its capacity is 1750 cu.ft. of free air per minute or 25 drills. A condenser to take the exhaust from the compressor, and a Cochrane boiler feed-water heater increases the efficiency of the power end of this plant 10 to 15 per cent. above that of

the ordinary engine rooms of the district. A 5-kw. dynamo driven by an Atlas baby engine furnishes electric light for the mill on night shifts and lights the pump seat, station landings and parts of the main runways of the mine.

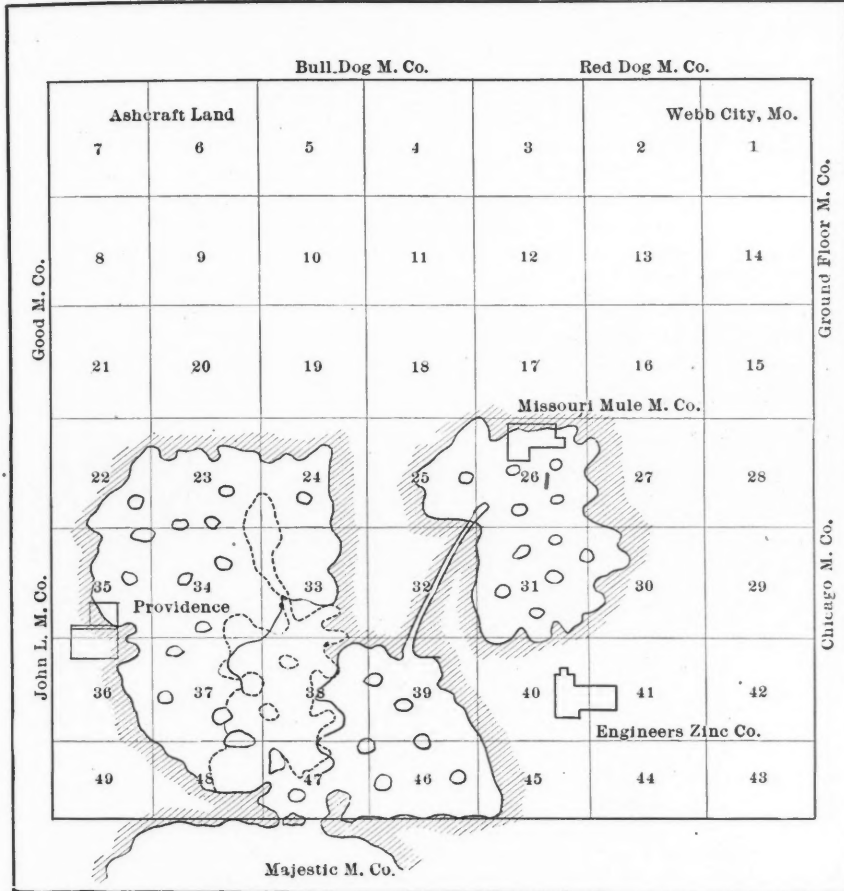
Steam power and engines were chosen in preference to gas engines, on account

would more than offset the saving realized in the fuel bill.

MILL

The mill is of the general southwest Missouri type with the following distinctive features: It is fed by a 16-in. crusher, an intermediate shaking screen

slow stroke, about 100 per minute. The cleaner also has six cells, 30x42 in., the stroke being faster and shorter, about 190 per minute. The last two cells on each jig are driven by an independent drive; the fast stroke is an innovation and aids



MAP OF UNDERGROUND WORKINGS, PROVIDENCE MINE

SUMMARY OF THE DAILY REPORTS, WEEK ENDING FEB. 23, 1907.

Tons Dirt Hoisted.	Jack Produced.	Lead Produced.	Pay Roll.	Expense.	Expense and Pay Roll.	Gross Value Ore.	Net Value Ore.	Net Earnings.
352.8	16,740	8,000	\$201.32	\$115.07	\$316.39	\$695.17	\$625.65	\$308.26
368.0	16,740	8,000	\$200.70	125.05	325.75	695.17	525.65	299.91
398.0	13,790	7,000	208.89	120.05	328.94	590.70	531.63	202.69
435.0	22,000	10,000	207.76	125.13	332.89	892.64	803.38	470.49
374.85	15,410	7,000	201.00	123.06	324.06	623.90	561.51	237.45
351.0	20,990	7,000	197.04	117.81	314.85	738.30	664.47	349.62
2279.65	105,670	47,000	\$1216.71	\$726.17	\$1942.88	\$4235.88	\$3812.30	\$1868.42
								52.21
								\$1816.21
								131.00
								\$1947.21

Average tons milled and mined per day..... 379.94
 Average yield of mineral from dirt..... 3.35 1/2 per cent.
 Average cost of mining and milling per ton..... 85c.

of the lower first cost, less time required for installation, known reliability and because steam was necessary for pumping. Gas engines driven by natural gas would have reduced the monthly power bill, but the management was not satisfied from the results obtained in the district in regard to "the continuous service rendered." A few shutdowns in a month

sending the undersize directly to the dirt elevator. The first rolls are 36 in. Two 30-in. rolls take the oversize from a screen following the dirt elevator. The chat rolls are 24 in. All the crushing machinery is of Oronogo make. The life of a roll shell is found to be about 4500 tons of dirt. The roughing jig has six cells each 36x48 in. The rougher does its best work on a long

DAILY REPORT, PROVIDENCE MINING AND MILLING COMPANY, JOPLIN, MO., FEB. 22, 1907.

LABOR ACCOUNT.

NO. AND OCCUPATION OF MEN.	Total Hours.	Rate Per Day.	Total Cost.
Jigmen (2).....	20	{ 3.75 } { 3.50 }	\$ 7.30
Crusher feeders (2).....	20	2.50	5.00
Cullmen (4).....	40	2.25	9.00
Engineers (2).....	24	3.00	6.00
Firemen (1).....	12	2.50	2.50
Hoistermen (3).....	24	2.75	8.25
Blacksmith (1).....	8	3.50	3.50
Blacksmith helper (1).....	8	2.50	2.50
Pumpman (1).....	12	2.75	2.75
Ground boss (1).....			4.28
Machine men (9).....	{ 24 } { 48 }	{ 3.00 } { 2.75 }	25.50
Machine helpers (9).....	{ 24 } { 48 }	{ 2.50 } { 2.25 }	21.00
Shovelers (13).....	780	0.07	54.60
Powderman (1).....	16	{ 3.50 } { 3.00 }	6.50
Trackman (1).....	8	2.75	2.75
Brunomen (2).....	16	2.25	4.50
Tub pushers (3).....	24	2.00	6.00
Tub hookers (2).....	16	{ 3.50 } { 3.00 }	6.50
Sludgemen [Table] (2).....	20	{ 3.50 } { 2.50 }	5.50
Superintendent (1).....			4.11
Extra men (4).....	40	2.25	9.00
Total.....			\$197.04

SUPPLIES AND MAINTENANCE.

Amount.	Substance.	Rate.	Total Cost.
9	Boxes powder.....	\$4.50	\$40.50
600 ft.	Fuse.....	0.40	2.40
23,200 cu.ft.	Gas.....	0.125	29.00
	O & M.....		40.00
	Liability insurance.....		5.91
	Total S & M.....		\$117.81
	Labor.....		197.04
	Total expense.....		\$314.85

ORE ACCOUNT.

Tubs dirt hoisted (upper).....	434
Tubs dirt hoisted (lower).....	346
Tons dirt hoisted.....	351
Per cent. of ore in dirt.....	3.98
Cars of jack.....	23
Cars of lead ore.....	7
Pounds of jack.....	19,550
Pounds of sludge.....	1,440
Pounds of lead ore.....	7,000
Total value jack @ \$41.....	\$430.30
Total value lead ore @ \$44.....	308.00
Combined value.....	\$738.30
Less royalty.....	73.83
Net value of ore.....	\$664.47
Expenses.....	314.85
Profit.....	\$349.62

Miscellaneous data: Total amount of jack in bins, 37,560 lb.; total amount lead ore in bins, 106,770 lb. Mill run 12.5 hours and lost one hour on the day shift on account of choking of crusher and rolls. Night shift ran the mill 3.5 hours to clean out the hoppers and then did general repairing. Extra men were cleaning up some of the dirt around the old mill. Jack to Wilson, 84,540 lb. Sludge lead, 330 lb.

materially in cleaning chatty ores. Two Ford tables handle the sludge, and by the saving made paid for themselves in 60 days. Series of settling tanks take the overflow water from both jigs. The settlings are returned to the sludge elevator

and thence to the tables. Every practical device has been put into operation to save the ore.

The mill, although built with a guaranteed capacity of 250 tons in 10 hours, has handled on test runs more than 400 tons in that time.

Daily reports and weekly summaries keep the management in close touch with each day's work and furnish a basis for comparison and improvement. A daily report and a weekly summary of the Providence Mining and Milling Company, showing the arrangement of the data, accompany this article.

Prospecting by Deep Well Drilling

By L. C. CORNELL*

One of the most economical methods of prospecting and by far the most rapid is that employing the deep-well drill. Assume, for example, that the ground to be prospected comprises a group of claims covering a blanket deposit of ore. A series of holes, say four or five, drilled across the supposed mineral bearing area may determine the extent of the ore and show the dip of the deposit; and by more extensive drilling the value of the orebody may perhaps be determined with considerable accuracy. The drill records would also give data for an estimate of the cost of sinking a shaft by showing the formations and the amount of water that probably would be encountered. Should no ore be found, the expense of sinking a shaft would be avoided. It is possible to put down a hole to a depth of about 400 ft. securing samples of the formations pierced. This may be done in any formation on land and, I might almost say at sea, for some wells are being drilled several hundred yards from shore on the Pacific coast.

There are many different kinds of equipment for drilling and each is adapted to certain formations. The crude-oil producers have more nearly attained perfection in deep drilling than any other class of operators, but their work needs no comment and I shall confine my remarks to drilling with cable tools, commonly known as "churn" drilling.

DRILLS SHOULD HAVE AMPLE CAPACITY

It is unfortunate that churn drilling often costs the mining companies much more than it should. Most mining engineers know little about this method of prospecting and therefore frequently get unsuitable equipment and sometimes incompetent drillers. Unfortunately many manufacturers rate their machines higher than their

*Driller with Steptoe Valley Smelting and Mining Company, Ely, Nev.

actual capacity. A well known firm recently sold two machines to a mining company operating in the Ely, Nev., district. The machines were supposed to be capable of drilling to a depth of 1000 ft. and an expert driller was sent out by the firm that sold the drills. After three months' operation one hole was down 400 ft., and another 195 ft. but it was impossible to reach greater depth. I then took charge of the work, the company desiring to give the equipment another trial. Although against my advice, I was instructed to move the rigs to another location and make another attempt. I succeeded in getting a hole down 600 ft., but at much greater cost than if the equipment had been suitable for the work. Since it was impossible to drill as deep as it was desired to go, the holes were almost valueless. The outlay by the company, including the cost of two useless machines, was probably \$15,000.

COST AND EQUIPMENT

To those who expect to prospect by drilling, the services of a competent and reliable deep-well driller are most important. He should examine the ground to be drilled, before deciding upon the equipment to be used. With proper rigs the cost of drilling to a depth of 3000 ft. should not average more than \$1.50 per ft. If it is desired to prospect to a depth of, say 400 ft. only, or to drill shallow holes for blasting, preparatory to steam-shovel work, there are many machines of the portable and traction type that will do the work economically. Such machines will not, however, drill to a depth greater than 900 ft. in mountainous territory as cheaply as the standard drilling rig. The standard equipment, with "calf-wheel" attachment for handling the pipe or casing, is the best for drilling deep holes in difficult ground. A strong derrick 24 ft. square at the top, 64 to 84 ft. high, with cable shaft, sand reel, etc., proportionately strong, permits the use of the long heavy string of tools necessary in the difficult, broken formation found in most mining districts.

The "calf-wheel" attachment, in addition to being valuable as a means of reaming the hole in a formation that caves, or will not stand up, is of great value in getting accurate samples. Since the casing can be hoisted the length of the stroke of the tools, the hole can be reamed out to the size required to let the casing down on the bottom and then, by sand pumping, the hole can be thoroughly cleaned. After drilling the next screw (about 5 ft.) the hole is sand pumped again; the material thus raised is an accurate sample of the 5 ft. drilled. The casing prevents the walls in the upper part of the hole from caving or sluffing and thus spoiling the sample.

After securing the sample, the casing is again hoisted, the hole under-reamed, for the 5 ft. just drilled, and the casing set on the bottom ready for drilling another

screw. This process is repeated indefinitely. The cost of standard equipment is given in the accompanying table.

COST OF EQUIPMENT FOR DRILLING.

12,000 ft. timber and lumber at \$40...	\$480
Rlg irons and nails.....	250
Boiler and engine.....	700
Cable and sand line.....	750
Drilling tools and sand pumps.....	500
Fishing tools.....	500
Casing	1200
Casing kit, elevators, etc.....	500
Miscellaneous	250
	\$5130

The cost may be increased or reduced \$1000 more or less, as the driller may find advisable after inspecting the ground to be drilled.

COST OF MOVING

The principal advantage of the standard rig is the cost of moving from one location to another. This objection is not serious for, if the average cost of the holes drilled is less, the cost of moving does not signify even if it happens to be 25 per cent. of the cost of drilling the holes. As a matter of fact there is little difference between the cost of moving a machine and that of a standard rig, because the latter is dismantled and moved in parts, and can be set up wherever the material can be hauled by wagon. The labor items of moving are: tearing down rig, one day's work for two men; hauling 15 wagon loads; rebuilding, two days' work for four men. By the use of about 200 ft. of new lumber each time the rig is moved, the apparatus may be kept in as good condition as when first built. The tools and machinery should last from four to five years of constant operation. The cost of wear and tear on drilling and cable, sand line, machinery, etc. is included in the estimated cost of \$1.50 per foot of holes drilled, the first cost of equipment not being considered.

Sources of Arsenic

Among the most important sources of arsenic may be mentioned the following: The silver mines of Saxony, Germany, those of tin and pyrites of England, arsenico-pyrites or mispickel of Spain, and auriferous mispickel in the Province of Ontario, Canada. The United States is said to consume more than one-half of the world's production of metallic arsenic, white arsenic (arsenious acid), orpiment, and red sulphide of arsenic. Spain in 1905 exported 1750 tons of white arsenic to the United States and 246 tons to France. Germany produces the largest quantity of metallic arsenic and arsenious acid. England has fallen far behind, although it held the first place in 1902. In France there are three mispickel mines: Two in the Department of the Aude and one in that of the Puy-de-Dome. The production of these three mines in 1905 amounted to 3117 tons.

Coal Mining in Southern West Virginia

The Field Yields Steam Coal of Superior Quality and is Worked by Simple Methods. Dust and Gas Cause Frequent Explosions

BY FLOYD W. PARSONS

No other State has shown such an increase in the production of coal during the past year as West Virginia. Located somewhat distant from large manufacturing centers and points of considerable consumption, the coal from this field has become famous solely because of its excellent composition and ready adaptation for steam, domestic and coking purposes. The southern part of West Virginia contains three important coalfields: The Kanawha field starts near Charleston, W. Va., and extends about 30 miles up the Kanawha river to Kanawha falls. The New River field starts at Kanawha falls and extends about 20 miles up New river to a point beyond Prince on the Chesapeake & Ohio railroad. The third field lies farther south and is known as the Pocahontas district; development in this latter territory extends over into Virginia.

THE KANAWHA FIELD

The territory embracing what is known as the Kanawha field has a slightly larger area than the New River district. The Kanawha measures contain six persistent coal beds. These six seams are known as the Stockton, Coalburg, Winifrede, Cedar Grove, Campbell's Creek and Eagle seams. The supposed equivalents of these seams in the Allegheny series are known as the Upper Freeport, Lower Freeport, Upper Kittanning, Middle Kittanning, Lower Kittanning and Clarion. The Stockton seam is not extensively mined because of its patchy and interrupted distribution and for the reason that this coal bed contains numerous partings of dirt and shale. The coal shows about 60 per cent. carbon, 35 per cent. volatile matter and runs low in ash and sulphur. It is probable that when the cleaner veins are worked this seam will be more extensively opened up and the coal made marketable by washing.

The Coalburg seam is mined at the town of that name and is suitable for both steam and domestic purposes. This coal does not contain as much fixed carbon as the Stockton seam and runs higher in sulphur and ash. The seam averages about 6 ft. in height and contains several slate partings.

The coal seam next below the Coalburg vein is known as the Winifrede bed and is also of the splinty variety, having a composition similar to the Coalburg and Stockton coals. The Winifrede seam lies about 120 ft. below the Coalburg bed and like the seams already described contains several slate and bone partings. The Cedar Grove bed lies about 275 ft. below

the Winifrede seam, the coal being softer and not of the splinty type. The Cedar Grove seam averages less than 3 ft. in thickness, but is successfully mined because of its great purity and excellent quality. Both the Winifrede and Cedar Grove coals were first worked at the towns of Winifrede and Cedar Grove.

The Campbell's Creek and Eagle coal seams lying below the Cedar Grove bed are similar in character to the other Kanawha coals. The product of the mines operating in the Campbell's Creek seam is generally used for gas purposes, although at several plants, the output is used to produce a fair quality of coke. An average sample of coke made from this coal shows fixed carbon, 89.30; volatile matter, 1.90; ash, 8.50; sulphur, 1.04; phosphorus, 0.029 per cent. The Campbell's Creek seam makes an excellent showing in Logan, Lincoln, Wyoming and Boone counties and the future will probably show this seam largely developed in this territory.

NEW RIVER-POCAHONTAS FIELD

It is probable that no other State in the Union has within its boundaries a bituminous coalfield containing seams so commercially valuable as the district known as the New River field. The coal beds here embraced vary from 24 in. to 8 ft. in height and were first mined less than 30 years ago at the town of Nuttallburg on the Chesapeake & Ohio railroad. For quality and uniformity of deposition they are only equaled by the best Cardiff coal in southern Wales.

The formations known locally as the New River and Pocahontas coals are known in Pennsylvania as the Pottsville series No. 12. This name has been given to the formation on account of its remarkable development in the Schuylkill gap at Pottsville, where it shows a conglomerate and sandstone structure about 1350 ft. thick, and marks a break in that locality between the overlying coal formation and the underlying red shales of the Mauch Chunk series.

The two principal coal seams that are mined in the New River-Pocahontas field are known as the Fire Creek or Quinimont seam below, and the Sewell or Nuttall bed about 270 ft. above the Fire Creek seam. The former bed corresponds to the Pocahontas No. 4 seam, while the Sewell bed is the Pocahontas No. 5. The Fire Creek seam is generally worked along New river from Prince to Beury and Fire Creek. The seam gets thinner

and fades out of the section in passing down New river northwestward. The bed measures from 30 in. to 5 ft. and contains practically no slate or bone partings.

The croppings of the Fire Creek seam occur along the New river cañon with such regularity that anyone familiar with the geology of the field cannot be mistaken in the location of the coal bed. The Raleigh conglomerate sandstone which occurs between the Fire Creek and the Sewell seams forms a valuable base from which to measure down to the Fire Creek and up to the Sewell coal.

The Fire Creek seam is seldom broken or faulted, but the coal often thins out and disappears entirely. In dealing with these squeezes, the mine superintendent encounters the most serious problem the field presents. The method generally pursued when an entry runs into a squeeze, is to continue driving in the coal along the edge of the squeeze. In this way, an entry is sometimes driven entirely around a squeeze and the extent and nature of the trouble is determined. Experience has shown it more advisable when a squeeze is encountered to determine the location of the trouble by drilling and securing a number of cores.

Economy of operation has often made it necessary, when an entry has been run along the irregular edge of a squeeze, to return and continue the main haulageway on the same course originally planned.

COAL DUST A DANGEROUS FACTOR

The mines in the New River region lying at a considerable elevation above water level are in most cases dry and dusty. It is probable that no pulverized coal in the mines of any other field is so readily inflammable. When, in addition, the mine is gaseous and the miners are careless in firing shots, the conditions are dangerous indeed.

In no other district does the coal dust in a mine so readily lend itself to aiding and increasing the force of a gas explosion as in the New River-Pocahontas field. An inquiry into the nature of all the explosions that have occurred in southern West Virginia during the past four years shows conclusively that coal dust has been the most important factor in the disasters. In most of the explosions that have recently occurred, the route of greatest destruction and force has followed the intake airway, showing that coal dust has played the most important part in these accidents.

The general system of ventilating the



UNDERGROUND DEVELOPMENT, SUN MINES NEW RIVER FIELD, W. VA.

mines in the New River field is to use large mechanical ventilators operating generally as exhaust fans. Fire-bosses are employed at all important mines; but safety lights are only used for testing gaseous places.

CHEMISTRY OF THE NEW RIVER COALS

A general average of a number of samples of New River coal shows the following excellent composition: Volatile matter, 22.10; fixed carbon, 72.92; sulphur, 0.75; ash, 2.60; phosphorus, 0.007; water, 1.72 per cent. To this remarkable composition the additional feature of being readily converted into coke may be added. Actual practice has shown that this coal will produce a coke yield of about 71 per cent. The low phosphorus content is also an important factor as it indicates a wide range of consumption for the coke as a metallurgical fuel.

The pavement underlying the Sewell seam is smooth and regular, which feature adds greatly to the successful mining of this bed. The Sewell coal is so free from partings and impurities that the coal may be counted as commercially valuable when not more than 2 ft. thick.

The low volatile content and high fixed carbon of the New River coals causes them to give off an intense heat with a nearly smokeless flame. Recent tests have shown that on an average a pound of New River coal will produce over 15,200 B.t.u. The small proportion of sulphur insures safety from spontaneous combustion on shipboard, so that the coals have become famous as fuel for steamships and naval purposes. The small amount of ash that is present is heavy and drops from the coal as the latter burns, leaving a fresh surface for combustion and making a comparatively small amount of clinker.

NEW RIVER COKE

The coke which is produced from New River and Pocahontas coals is of the highest purity and can be mixed advantageously with other cokes having a higher percentage of ash and consequently a greater sustaining power in the blast furnace. In very high furnaces the New River coke is sometimes found too light because of its low ash content. The soft columnar structure which is so typical of Connellsville coking coal, is everywhere in evidence in the New River coal beds. An average analysis of several samples of New River coke shows: Fixed carbon, 91.26; volatile matter, 1.06; ash, 7.54; sulphur, 0.75; phosphorus, 0.009; moisture, 0.14 per cent.

METHODS OF MINING

The coal beds throughout southern West Virginia are generally flat or on a slight incline, and, as a consequence, the methods of operation are neither complicated or difficult. The serious problems encountered in the anthracite field and other districts where the coal seams

are irregular and lie on a variable pitch are here unknown. It is possible to plan the entire underground development of a property before sinking the shaft or driving the drift, and the only reason for changing these plans is a change in the quality of the coal or thickness of the seam. The width of entry, size of pillars and dimensions of rooms depend upon local conditions such as the height of coal and depth of cover. One general company operating a dozen or more mines may apply some definite system of development to each of its properties, but will necessarily modify the size of pillars and width of places according to the weight of the overlying measures and the strength of the roof and bottom.

In the accompanying map is shown the underground development of the Sun mine, one of the largest producers in the New River field. This operation is located on Loup creek, about 10 miles above Thurmond, and is owned by the New River Smokeless Coal Company. The coal seam at this property averages about 6 ft. in height and is of exceptional purity. The roof and bottom are strong so that few falls occur. The remote workings are somewhat gaseous, although no serious accidents have so far occurred.

The property to be worked by this mine is irregular in shape, and for that reason the Simpson and Bradley entries on the left of the main entry were started for the purpose of reaching remote corners of the property that could not be successfully worked by following the general plan of mining. The mine when first opened was started on the double-entry system, and has been later changed to the four-entry system in order to furnish a sufficient supply of air at the working faces. Rooms were originally driven from both sides of each pair of entries, but this system has been changed so that at present rooms are only driven from one entry, and no room is permitted to break through into the entry above. The length of rooms varies from 350 to 500 ft., while the entries are driven 10 ft. wide, with a 30-ft. pillar between.

The panel system of mining has not been generally adopted in this southern field, and it is only within the past four years that any definite system of working on fixed centers has been adopted. Since many of the independent companies have been bought up and consolidated into larger companies, the irregular and careless methods of development have been generally abandoned and more improved systems with modern machinery have been installed.

Along New river, where the coal seams lie high in the hills, it is the general custom to lower the output in mine cars or monitors on an inclined self-acting plane. Since the coal throughout the New river and Pocahontas fields is so pure that washing is unnecessary, and the natural location and advantages are favorable to

cheap mining, it therefore results that the production of coal in this field is a profitable industry.

LABOR CONDITIONS

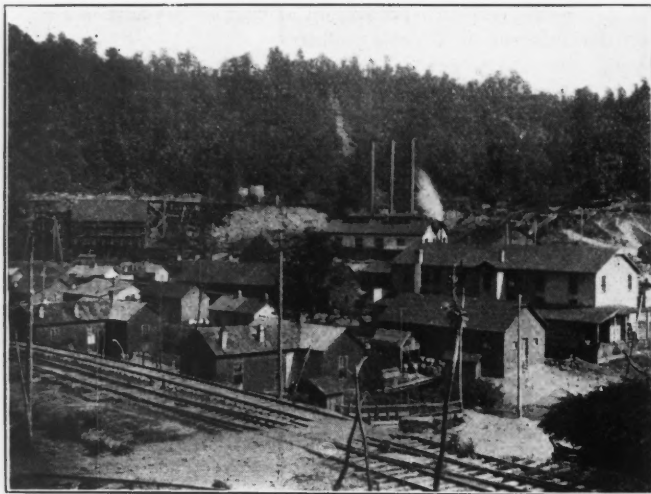
The one condition that has lately caused greater anxiety on the part of coal-mine managers operating in the New River and Pocahontas field is the problem of a sufficient labor supply. The miners generally live in company houses and deal at company stores so that there are few ties to bind them to any special mine or locality. Furthermore, there is a lack of legitimate amusement, and living is rough at the best.

Many of the miners are Italians, Hungarians and Slavs, while a large proportion of the employees are negroes. The latter class would make excellent miners if they could be induced to work regularly; but the darky thinks it necessary to lay off a couple days after each pay day and try to spend the money he has earned.

The native inhabitants of this region, although not numerous as the country was thinly settled before coal operations were commenced, are typical back-woodsmen. It is probable that no more provincial people can be found than the early squatters who settled this territory. Few of these inhabitants work regularly in the mines and most of them have practically no visible means of subsistence. It is not unusual to find that many of the old settlers have been no farther from home than the boundaries of their own county and until coal mining became general, many of them had never seen a railroad train.

It is interesting to watch one of these individuals when traveling from one mining camp to another. As soon as he is seated in the railroad coach, whether it be summer or mid-winter, his window is immediately hoisted without any regard to the comfort of his fellow passengers. Few or no windows are found in these squatters' cabins, so it is possible they cannot see well through a pane of glass. It is also a fact that few of these native settlers would ever think of apologizing or begging your pardon for any accidental intrusion. They evidently think that if they were to apologize, you would immediately think they were afraid of you. To have you entertain any such idea would, in their opinion, be most discreditable.

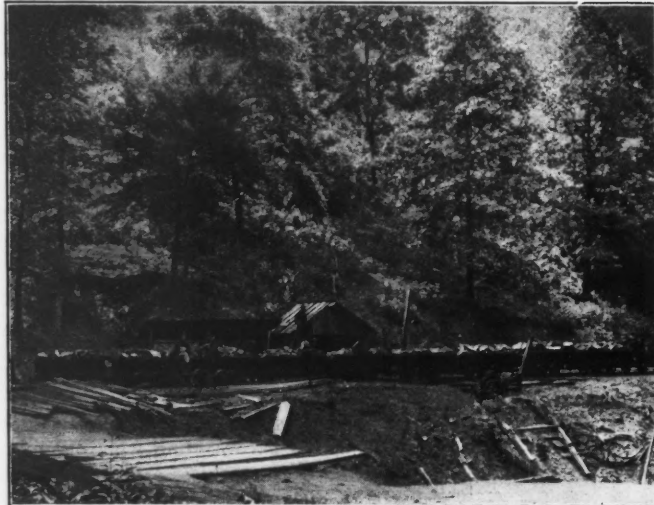
As far as labor unions are concerned their existence in the New River and Pocahontas fields is more nominal than real. At the time of the anthracite strike in 1902, the miners in this field also quit work and a general suspension of mining operations ensued. The strike lasted for about a year and resulted unsatisfactorily to the miners. During this suspension a number of the mines imported labor and succeeded in breaking the deadlock. During this strike considerable trouble



NEW RIVER AND POCAHONTAS CONSOLIDATED
COAL COMPANY'S PLANT, MINDEN



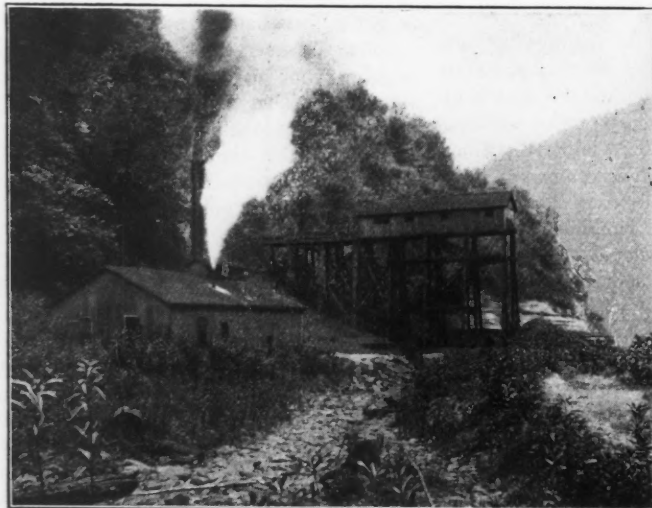
TIPPLE, CARBON COAL COMPANY, CARBON,
CABIN CREEK



TRIP OF CARS FROM MINE, WINIFREDE COAL COMPANY



ONE OF THE WINIFREDE COAL COMPANY'S TIPPLES, WINIFREDE, W. VA.



F. C. TODD'S COAL TIPPLE, MORRIS CREEK, W. VA.



TWO TIPPLES, CARBON COAL CO., ON SEPARATE SEAMS, CABIN CREEK

occurred between the deputies and the strikers, and one of the most serious battles that ever occurred in any labor trouble happened on the mountains near Beckley, W. Va., In this fight, several hundred miners and more than a hundred deputies took part. At the present time the operators in this field do not recognize any labor union, and will not countenance or permit agitators or organizers of the miners' union to enter any of the camps.

The Joplin District

Zinc ore is found in several parts of Missouri, but the only important mines are those of the Joplin district, by which is understood a rather irregular area comprising the mines of Galena, Kan., Oronogo, Webb City, Carterville, Joplin and minor places in Jasper county, Mo., Granby in Newton county and Aurora in

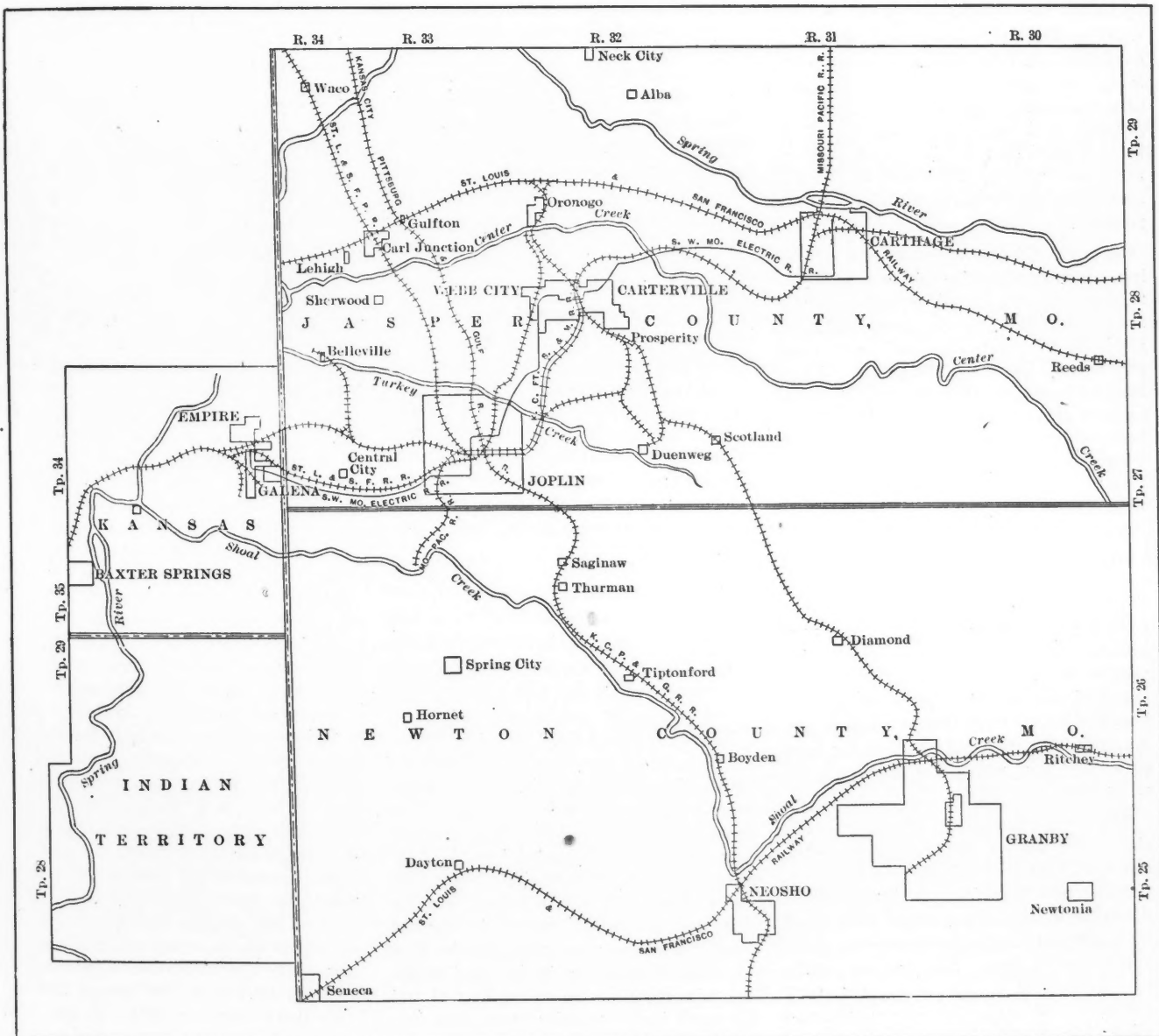
Lawrence county, besides various less well known mining centers.

The country rock of the region is chiefly limestone of the Lower Carboniferous formation, which immediately underlies the adjacent coal measures of Kansas. This limestone is not everywhere ore bearing throughout the district, but only in local areas where the conditions have favored the deposition of mineral. Surrounding such areas are broad tracts of barren ground.

Broadly considered the ore deposits are sheets and lenticular masses of brecciated and mineralized chert, more or less intermingled with limestone or the products of its alteration and decomposition, and surrounded everywhere by limestone. The sheets are much the larger, but also they are generally low in grade, wherefore they have not been worked extensively until within four or five years, when the richer lenses, previously worked began to be exhausted. Many of the old lenses were of great size, especially in the

vicinity of Webb City and Joplin, Mo., and Galena, Kan., where stöpes occur 75 to 150 ft. wide, 40 to 80 ft. high, and 200 to 400 ft. long, from which all the material extracted was milled. The smaller lenses were 15 to 50 ft. wide, 5 to 30 ft. high and 100 to 500 ft. long. In one instance near Joplin a channel of ore was followed for 1000 ft. These lenses and channels are frequently of highly irregular shape, often sending out sheets and pipes into the surrounding barren country rock. They are connected with a system of fissures in the country rock.

The more common lenticular masses of mineral-bearing chert in general lie nearly horizontal. The distribution of mineral through the chert is irregular. The blende occurs impregnated in the chert, so that frequently the fragments of the latter appear cemented together by the blende which everywhere permeates the mass in a net-work. In the sheet ground the mineral is leaner and more finely disseminated.



MAP OF THE JOPLIN DISTRICT

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

In order to extinguish a mine fire by means of carbon dioxide gas, 7 per cent. of the mine capacity must be filled with the gas.

The Cumberland coal region, in Maryland and the adjoining counties of West Virginia, is the only bituminous district where accurate statistics have been kept from the beginning, 66 years ago. The total shipments to the end of 1906 were 152,678,056 tons. In 1842, the first year reported, shipments were 1708 tons; in 1906 they were 7,188,037 tons. This is the largest output ever reported for the region.

When acid water is the only thing available for condensing purposes, the water end of the pump should be cast of hard iron, much heavier than the ordinary trade condenser. Internal webs and partitions should be eliminated as much as possible, and the water end should be bronze lined and bronze fitted. When the water is very acid, the water end should be cast entirely of acid-resisting phosphor bronze.

In shaft sinking the walls are usually left untimbered when they are self sustaining, but sets of heavy single timbers are placed from four to seven feet apart vertically to divide the shaft into compartments. These timbers are simply fitted into notches or steps cut in the rock on each side of the shaft and then tightly fastened in place by wooden wedges. When the sides of the shaft are not self sustaining complete timbering is necessary.

Electric hoists are becoming popular in both bituminous and anthracite fields. The cost of electric current may be small as shown in the case of a hoist recently installed in the anthracite field, for use in sinking a shaft. The hoisting of a bucket and its contents, weighing 1 ton, a distance of 100 ft., required only $\frac{5}{8}$ of a k.w. per hour. If the power costs 5c. per k.w. per hour, the current used per hour cost only $3\frac{3}{8}$ c. or 15 k.w. per 24 hours at 75 cents.

The experience of shot-firers has shown that there is economy in using the strongest caps with all kinds of dynamite. Careful tests have shown that ordinary dynamite is more powerful when fired with quintuple force caps than when quadruple force is used. The mistaken policy of economizing in this way leads many consumers of explosives into buying caps of as low grade as triple force, thereby sustaining a loss of explosive force of the

dynamite perhaps 10 times as great in value as the difference in the price of the caps.

A recent report on the new Campine coalfield in Belgium states that the borings and other preliminary work prove that it is of much value and importance. Its development will be slow and difficult, however, owing to the depth of the coal seams and the quantity of water in the upper strata. The coal is 600 to 675 m. below the surface, averaging 650 m. The preliminary estimate of the cost of sinking two working shafts to a depth of 600 m. is \$2,400,000. A considerable part of this cost is due to trouble anticipated from water and quicksand.

When installing turbine pumps experience shows that the suction and discharge pipe should be larger than the openings in the pump. This is especially necessary when the pipe is of any considerable length. As the friction increases with the velocity it is better to install a larger pipe line than to run the pump considerably above its capacity in order to overcome the extra head due to insufficient pipe size. The cost of the increased pipe size will be saved in a short time by the difference in the horse-power used in raising the same quantity of water.

In laying tracks on a steep slope care should be taken to guard against the sliding of the road bed. Sliding may be prevented by placing center props. This practice is somewhat objectionable on account of the decrease in the clear space between the two tracks and the limited space of the sectional area of the slope. The method in general use in the southern anthracite field is to lay long sills across the floor at intervals of 7 to 12 ft, depending on the dip. The ends of these sills are sunk at least 6 in. in the notched ribs which hold them rigid. Rails and ties are then spiked to the sills.

The compound arrangement of steam cylinders on pumps used in mines is for the purpose of using steam expansively, thus saving about one-third of the steam necessary for a simple duplex pump. The steam after being used in a high-pressure steam cylinder is expanded into the low-pressure cylinder without interfering with the working parts of the expansive valve gear and additional power is thereby saved. In mines less than 300 ft. deep this type of pump can be installed to the best advantage, as the saving in fuel and the small boiler capacity more than justify the additional first cost over the simple duplex.

Common usage has shown that for standing ropes, guys, and transmission of power, seven-strand wire ropes are best. Wire ropes with 19 wires to the strand possess the greatest flexibility and should therefore be used for hoisting ropes and in mines, elevators, etc. It has been found advisable to use the largest practical drums, sheaves and pulleys and to avoid high speeds, as ropes thus properly used will last considerably longer and give better service. Coarse ropes are more durable than flexible when the drums and pulleys are large enough. Wire rope is damaged more and also quicker by rust than by the wear of constant use. Overlapping of wire ropes on drums must be avoided. Galvanized wire should not be used for running ropes.

For mine service, the electrically driven pump has some very desirable features, as follows: 1. All steam lines are eliminated from the mines, with their necessary repairs and annoying, destructive heat. 2. Electrical transmission losses are practically negligible as compared with steam transmission losses, an advantage that increases with the distance from the power plant. 3. Several small electrically driven pumps at considerable distance apart throughout the mine may be operated with much greater economy than a similar number of small steam pumps, and with possibly as great economy as one large steam pump doing all the work at one station. 4. An electric motor when working under normal load is producing its highest efficiency, but may be operated at a considerable variation above, for a short time, or below the normal load for any length of time, without materially affecting the efficiency. 5. The relative cost of pumping by steam and electricity depends largely on the cost of generating the electric current. When the pumping is done by one large steam pump of such size as to introduce an economical design, and located within a reasonable distance from the boilers, the cost of pumping is in favor of the steam plant, except in case the electric current is generated by waterfall. If, on the other hand, the mine requires several small pumps at various points, the cost of pumping is much in favor of the electric system. 6. As the mines develop the sump or basin may be changed to a new location in which it is necessary to remove the pumps and relocate them near the sump. It has been found much easier to remove electric than steam pumps.

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The American Mining Congress

This organization holds its 10th annual meeting at Joplin next week. The choice of the place was well made. There are few American mining districts which are so accessible and have so many features of interest in a compact area, many points of which are easily reached by trolley car and all points by short railway journeys. At the mines and mills the visitors from the great mining country west of the Rocky Mountains will see many unique features of practice which may profitably be studied.

In this issue we present several noteworthy articles of timely interest. The historical sketch by Mr. Brittain is the result of a painstaking study, and being based largely on information collected from the men who made the history is appropriately put on record for the interest of those who are now visiting the district and for the benefit of historians.

The technical contributions of Mr. Boardman and Mr. Ford are particularly noteworthy. Mr. Ford gives the details of the extraordinarily low cost of mining for which the Joplin district has long been famous. The marvelous energy with which the work is carried on, and especially the remarkably high efficiency of labor, are things to be seriously considered by operators in the Far West. The mucker and trammer who earned \$42 in a week at the regulation contract price of 14c. per ton is an object lesson in himself. There are other things of interest and importance which will develop from an analysis of Mr. Boardman's figures.

The conveyer-hoist at the Yellow Dog mine is something unique in mining practice. It has been running long enough now to develop its conditions in regular operation and we understand it has thoroughly demonstrated the economy of the system. Undoubtedly the latter can be advantageously applied to many forms of ore deposit.

Mr. Ford's article is an earnest and well considered plea for further improvement in the Joplin milling practice. He discusses the problem not merely in the abstract but offers practical suggestions which deserve very careful consideration. Our own acquaintance with the Joplin district dates back to the time when all the concentration was done with hand jigs. Along in the '90's came the steam mills, which were of somewhat unique

design and developed one particularly good feature—the Cooley jig. The system of "rougher" and "cleaner" was particularly adapted to the Joplin ore, but it has had an effect upon ore-dressing practice elsewhere. It is noteworthy that nearly of the improvements in Joplin milling practice have developed in the district itself; but little has been borrowed from the outside.

This was largely because of the failure of outside engineers when they attempted to make improvements in 1899. Their mistake was due to their neglect to familiarize themselves with the local conditions, particularly their failure to recognize that the lens orebodies then chiefly mined were comparatively small and would not stand an elaborate, expensive mill. This was singularly unfortunate because these engineers really offered some good ideas to which the Joplin millmen shut their eyes for several years. For example it was obvious that if "sludge-mills" could profitably rework a tailing pile, the man who made the tailings could do the same thing, and by putting fine grinders and tables in his mill could make a clean job of the treatment at the first handling. Later the Joplin millmen themselves realized this and now nearly all the modern mills have tables.

We may here refer to a mistake which Mr. Ford makes in assuming that in a recent article we said the average saving from the disseminated ore was 75 per cent. whereas he puts it at only 65 per cent. Our statement, which was only an approximate generalization (because there are no complete statistics on the subject), referred to the general average of all classes of ore—Mr. Ford's A, B and C—and not to class C alone.

The extensive mining of the large deposits of low-grade sheet ground has introduced a new era in Joplin mining practice because these deposits are so large that it is a safe venture to erect more costly plants for their exploitation. This has led to many improvements, and all will heartily agree that it is a creditable mining and milling practice that makes money out of zinc ore worth only \$1.25 per ton as hoisted from the mine. The closeness of the margin stimulates attention upon further improvements, among which one of the most alluring possibilities is a further increase in the percentage of extraction, as Mr. Ford points out.

The Upward Reaction in Copper

Two views may be taken of the recent sharp reaction in copper. (1) It is partly the result of speculation and will be but temporary. (2) It is simply the rebound to the point where the great decline ought to have stopped. This rebound, whether temporary or lasting, was undoubtedly affected in the first place by speculative influences.

The failure of domestic consumers to participate in the recent large transactions to any great extent and the further weakness in spelter and lead, both of which are largely consumed in connection with copper are ominous to the stability of the present price for copper, but on the other hand there was strong evidence that extensive buying was about to begin when the price was around 15c. several weeks ago.

It is believed that the decline might have been checked then had it not been for bad management and vacillation on the part of certain sellers, but failing thus to receive effective support the market became utterly demoralized under the offerings of producers who were compelled to realize money.

The suspension of operations by the Greene company and a multitude of small producers avowedly because they cannot make money at present prices is something for consumers to think about seriously. European consumers evidently made up their minds that they were securing extraordinarily cheap copper when they bought at about 12c.

The sales for export in October are bringing \$12,000,000 to \$15,000,000 in money to this country and correspondingly are relieving the financial pressure under which producers have been laboring. This creates a very different situation from that of early October.

Reduction in Cost of Copper Production

The restoration last week of the old rate for labor at Butte means an important reduction in the cost of producing copper in that district. Two years ago the cost of mining per ton of ore was about \$3.50, and the cost of carriage to the reduction works, concentration, smelting, and refining was about \$2.50, mak-

ing a total of about \$6 per ton of ore. In the case of ore yielding 60 lb. of refined copper per ton, which was approximately the average of the Anaconda company in 1905, the cost per pound of copper was a little more than 10c. Out of the mining and smelting cost of \$6 per ton about \$3.50 is due to labor. Consequently, the advance in wages from \$3.50 to \$4 per day, increased the cost of production by about 50c. per ton of ore, which is a little more than 0.8c. per lb. on 60 lb. of copper. This is regained by the recent reduction. Probably the actual difference is greater, because in general the efficiency of labor decreases with increase in wages, and *vice versa*.

The position in other copper-mining districts is similarly affected by the grade of the ore and the cost of mining, and the proportion of labor in the latter. Among the western districts, however, the labor cost at Butte is rather higher than elsewhere. Since Nov. 1 reductions in wages have been made in several other districts and nearly all doubtless will follow. At Lake Superior the Calumet & Hecla has made a cut of 12½ per cent. and the Copper Range 5 per cent.

At Butte this miners' union voted by a large majority to accept the reduction, thus complying with its contract. This is gratifying. A few months ago there was grave doubt as to the willing fulfillment of this contract, but later the serious position of the copper-mining industry has been so clear that none could fail to recognize it. The entering into of these contracts was something like playing with fire. There is certainly ground for satisfaction in that the sharpness of the decline eliminated all danger of labor troubles.

The Transvaal Report

Owing to our desire to give in this issue a good deal of matter relating to zinc and lead mining—of particular interest at the moment in view of the meeting next week of the American Mining Congress at Joplin, Mo.—we have postponed the publication of further extracts from the report of the Transvaal Rope and Safety Catch Commission, the first of which was published in our issue of Nov. 2. This is one of the most important of recent contributions to the literature of mining engineering, and we intend in

early numbers of the JOURNAL to reprint all of its essential portions.

WE DO NOT THINK that anyone will take very seriously the indictment of James Douglas and several persons connected with the interests of Phelps, Dodge & Co. for alleged illegal entries of coal land in the Southwest; their reputations are too high to warrant any belief that they have knowingly inspired, or connived at, fraudulent actions. The Copper Queen company is in need of fuel supplies for the great industries which it conducts in Arizona and has been endeavoring to secure them in a legitimate way. We uphold the policy of the administration looking toward the conservation of the natural resources—timber, coal, oil, gas and minerals—but certainly it is not intended that they be conserved from the actual needs of the present, which would be an absurd deduction. The crusade is against speculators, not against honest industrialists, and especial care should be taken that the latter be not caused to suffer through technicalities or otherwise.

IT HAS BEEN ANNOUNCED that Alfred James will be the next president of the Institution of Mining and Metallurgy. Mr. James is at present one of the vice-presidents of the Institution and is distinguished as a cyanide metallurgist. He has been a great traveler and is well known in all the districts of the world wherein the extraction of gold by cyanide solution is practiced. His elevation to the presidency of this eminent international organization of professional men will be warmly welcomed by his numerous friends in five continents.

THE PURCHASE OF the controlling interest of the Tennessee Coal Iron and Railway Company is one of the many private transactions that have been led up to by the financial troubles. That this particular transaction is to the interest of the State Corporation is a matter that admits of no doubt. On the other hand even this acquisition is a long way from giving the Steel Corporation a monopoly, wherefore there ought not to be any objection on that account.

THE ENGINEERING AND MINING JOURNAL was awarded a gold medal by the International Jury at the recent Exposition Internationale du Livre et des Industries du Papier at Paris.

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

Mechanical Production of Low Temperatures

For some time I have desired to make some comments on the article by Sidney F. Walker, in the JOURNAL of June 22, on the "Mechanical Production of Low Temperatures," but this is my first opportunity to do so, which, I trust, will be a sufficient explanation of the tardiness of my criticism.

Mr. Walker's article is interesting and, in a general way, accurate, but there are two or three errors, due to a failure to understand the principles involved, to which it may not be amiss to call attention.

In regard to the "dense air" ice machine, the object of using a closed system and a high pressure is not so much the ease of conveyance of the "cold," when generated, but a reduction of the loss due to producing a greater lowering of temperature than necessary in the ordinary air machine with an open circuit. The reason for this is that a relatively small expansion from atmospheric temperature is all that is necessary to cool the air down to the ordinary temperature of application. An expansion which lowers the pressure in the ratio of two to one is sufficient to reduce the temperature from + 70 deg. F. to - 35 deg. F. A pressure expansion of two to one means, of course, considerably less than a two to one expansion by volume and - 35 deg. F. is much lower than the ordinary temperature of application of refrigerating fluids. It should be understood that there is a very heavy loss theoretically and still heavier practically, in producing a temperature any lower than that absolutely required for the work in hand, so that a volumetric expansion of one and one-half to one would, theoretically, be almost enough to produce the required degree of cooling.

This would mean an expansion from a pressure of 7.5 lb. by gage to that of the atmosphere. This would involve enormous air cylinders, great losses by cylinder friction, port friction, radiation, etc.; but if we make a closed system and expand from 225 lb. down to 150 lb., the expansion ratio remains the same while the cylinders are reduced to about one-tenth of the size required with the low pressure; and the various losses mentioned are greatly reduced also. It is, of course, much easier to carry this dense cold air to the point of application than air at at-

mospheric pressure; but this is a minor advantage of this system. The principle one is that we reduce the enormous loss in the ordinary air machine, caused by so great a compression and expansion ratio as to produce a far lower temperature than that required, with a consequent heavy loss.

The inability to transmit the working fluid without loss by conduction is the less important phase of the disadvantage under which a compressed-air refrigerating system works, caused by the absence of latent heat in the working fluid. The more important loss caused by this is that no appreciable quantity of refrigeration can be done except by cooling the refrigerating fluid to a much lower temperature than is required for the purpose in view. In a machine using a condensible vapor as its working fluid, the condensed vapor may be transmitted in the form of liquid at atmospheric temperature and without loss by conduction to any desired distance within reason; but what is much more important, it can be expanded, at the point of utilization, down to a pressure just low enough to give the temperature desired, and as the heat which it will absorb will be used by it as latent heat of evaporation, it will be taken in at that temperature and no lower. With an air machine, on the other hand, if it is desired to produce a given temperature, as for instance zero, then if the air be delivered to the point of utilization at - 50 deg. F., it can absorb only about 12 thermal units per pound of air, in being warmed up to the temperature of application, while a pound of ammonia, expanded at the proper pressure, will take up 500 thermal units without going below zero at all.

As has been mentioned above, the power required for producing a unit of refrigeration increases very rapidly as the temperature produced is lowered; hence in this respect alone, a vapor machine has an enormous advantage over a permanent gas machine. In the matter of conveying the refrigerating medium into close places like mines, the air machine is not much better off than the ammonia machine because, to be at all efficient, the air machine must be on a closed system just as the ammonia is, while the latter has now been so far perfected that the smell of ammonia is now almost the rarest thing about it. Of course the safety would be somewhat greater with the air machine, but the efficiency would be much less.

In regard to the standing of the carbonic acid machine, Mr. Walker is also in error. Carbonic acid occupies a position intermediate between air (or the other gases formerly called permanent) and vapors like ammonia, which can be condensed at ordinary temperatures. This difference may be tersely stated as the difference in their critical temperatures. That of air and the permanent gases is, I believe, about - 150 deg. F., that of carbonic acid + 88 deg. F.; and that of ammonia about + 130 deg. F. The result is that the air is always worked above its critical temperature, that is, as a gas, and must have an expansion cylinder to do any refrigeration at all; ammonia is always worked below its critical temperature and so can be alternately condensed and evaporated; while carbonic acid, particularly in warm climates, may be either above or below its critical temperature.

In the case of a vapor condensing to a liquid with a high latent heat, the external work of expansion, during evaporation, is so small, compared to the internal work, that the former may be neglected; for instance the loss of refrigeration by expanding ammonia through an expansion valve instead of through an expansion cylinder is about 1 per cent. With a gas, on the other hand, there is no refrigerating effect, or none of any importance, unless an expansion cylinder is used.

Carbonic acid occupies an intermediate place between these two, and as its transformation from a gas to a condensable vapor is not a sudden one it partakes partially of the nature of ammonia even when worked above its critical temperature; but the loss from the absence of an expansion cylinder under such circumstances is very much greater. It is safe to say that under all ordinary circumstances a carbonic acid machine is less efficient than an ammonia machine, its only advantage being its comparative odorlessness and the small size of cylinders required, the latter advantage being offset by the high pressure necessary.

I have no desire to detract from the reputation of either the air or the carbonic acid machines, but it should be distinctly understood that there are reasons of a high degree of importance, theoretically and practically, which cause ammonia to be much better than either air or carbonic acid under ordinary circumstances, when economy in power is one of the first considerations. When this consideration becomes insignificant as compared with safety, odorlessness, etc.,

then, of course, the other machines have to be considered.

JOHN J. SMITH.
New York, Sept. 21, 1907.

Filing Notes and Clippings

I have recently read the article by Schuyler Frazier in the JOURNAL of Aug. 17, 1907, under the above heading, and am interested by the similarity of the method described to that which I have adopted. I consider, however, that mine is more convenient in some respects.

The main idea is the same, i.e., filing the clippings by subjects in plain folders which are kept in pasteboard filing-cases of small legal size. These will take a full page of the JOURNAL. But in my system, besides writing the subject on the folder, each subject has a number, which is also placed on the folder, as well as on each clipping. The folders are then placed in the filing cases in numerical order. The number of any subject may be easily found by glancing at a key with subjects arranged in alphabetical order.

In case two good articles come on opposite sides of the same sheet, the more important is placed in the folder bearing its number, and a reference is made to the other on a sheet of paper placed in its proper folder. Thus each folder will contain a sheet bearing references to articles on its subject that are placed in other folders.

ADVANTAGES

One advantage of this system lies in the ease with which subjects can be found and replaced. It is easier, to my mind, to locate a certain folder when numbered than when labeled with only the subject, and it is also easier and much surer to replace a folder in its proper position by number than by alphabetical order. Another advantage is the readiness with which articles can be located that are placed in other folders because on the same sheet with more important articles. The chief advantage, however, lies in the ease of labeling each clipping, by only a number, so that it may always be returned to the same folder. To this end, when two articles are on opposite sides of the same sheet, a circle is drawn around the number of the less important article.

It is always best to have a key when filing clippings, even if the folders are labeled with only the subject. Otherwise the same subject may masquerade under several different headings, and the articles be dispersed in several folders, with no means of detecting the trouble but by looking over all the folders. The subject in the key will of course depend entirely upon the individual interests. I give my key as an example of subjects that are interesting to a young graduate of a mining school who is trying to learn something about mining.

KEY FOR FILE

(1) Miscellaneous; (3) Accidents and Antidotes; (2) Assaying; (13) Building and Construction; (4) Cost-keeping; (6) Districts; (7) Filing; (17) Geology; (15) Hydraulics and Piping; (8) Labor and Organization; (16) Law; (5) Machinery and Lubrication; (9) Metallurgy; (14) Miscellaneous Mineral Products; (10) Power; (11) Prospecting and Examination; (12) Surveying; (40) Milling (General); (41) Amalgamation; (49) Concentration; (49.1) Jigs; (49.2) Magnetic Separators; (49.3) Sand-savers; (49.4) Slime-savers; (42) Crushers and Grinders; (42.1) Stamps; (43) Elevators and Conveyers; (44) Processes; (44.1) Chlorination; (44.2) Cyanidation; (44.3) Flotation; (45) Sampling; (46) Screens; (47) Sorting; (48) Testing; (70) Mining (General); (71) Blasting; (72) Delivery; (73) Development; (74) Drainage; (75) Drifts, Cross-cuts, and Tunnels; (76) Drilling; (78) Haulage; (79) Head Frames; (80) Hoisting; (81) Lighting; (82) Open-pit Mining; (83) Placer Mining; (84) Raises and Winzes; (86) Shafts; (87) Stations; (88) Stock-piles and Trestles; (89) Stopping; (77) Timbering; (90) Underground Mining Methods; (85) Ventilation.

EXPLANATION OF KEY

One word in my key may call for explanation. I use the word "Delivery" in a restricted sense, meaning the transportation of ore or rock from the slope to the main haulage-way. It therefore covers mucking, shaking chutes, mills, gravity planes, etc. The word seems to fill a gap and complete the sequence Stopping, Delivery, Haulage, Hoisting.

By using a decimal system of numbering, all the articles on any main subject are seen to be kept together, though in several folders. This is not essential, but is often convenient.

Although I have not used this system long, it works admirably so far. I should be glad of any comparisons or comments, either privately or through the JOURNAL.

E. E. WHITE.

Ishpeming, Mich., Sept. 20, 1907.

The Card System in Colorado

The editorial in the JOURNAL of Sept. 14, p. 506, on "The Card System in Colorado," has been brought to our attention. The article is in many respects so inaccurate that we take this opportunity of acquainting you with the true facts of the case. By reason of the prominence of your publication, our silence might be misconstrued by your many readers, and we, therefore, trust that our reply may be given a position at least as prominent as that of the article referred to.

Now, as to your opening statement,

"The card system has been abolished by its originator at the Smuggler Union mine." Permit us to state that, while the card system as such has, it is true, been abolished, yet it has been succeeded by a more stringent and effective system. The Smuggler Union employs all men through a central office where the records of every applicant are examined, and no man, whether he has a card or not, will be accepted if he is connected with, or in sympathy with the Western Federation of Miners. In fact, the mine referred to runs a continuous advertisement for help, concluding with the words, "No Western Federation men need apply." As a matter of fact Bulkeley Wells did not originate the card system at all. It was suggested by a member of our association who operates in another district, and was first put in operation at Cripple Creek, not at Telluride.

As to his reasons for discontinuing its use it is only fair to Mr. Wells to say frankly that this was forced upon him by the management of the Liberty Bell Company, which, jointly with the Smuggler Union, had for many years maintained the card system, and suddenly dropped it in consequence of a threatened boycott by the local branch of the Western Federation of Miners.

The developments of the trial at Boise are sufficient to convince the ordinary reader that some effective measures are necessary to keep a certain class of men in check in the Cripple Creek district.

PURPOSE OF THE CARD SYSTEM

The card system simply gives the applicant's record. It is a system of reference by which our members can be advised whether or not an applicant for work is a good workman or an honest citizen; for the most serious difficulty the mine owners at Cripple Creek have had to contend with is the practice of ore stealing. The men naturally object to being searched, and yet, until recently, it is well known that vast amounts of high-grade ore were secreted and disposed of by dishonest miners. The card system prevents known "high-graders" from obtaining employment in the district. In Leadville, which is in the main a low-grade camp, such conditions do not obtain, and the card system is unnecessary to keep track of that class of men.

Again a large number of individuals attracted by the high wages at Cripple Creek, foment trouble upon any excuse. Most of them are members of the Western Federation; some of them are not. No employer of any one of these men escapes trouble. The purpose of the card system is to close any opportunity for these men to remain in the camp under their various aliases. The card system is, in fact, a protection even more for the more capable miners than for the mine operators, and this fact is realized by a large majority of the desirable men.

THE RESULTS

Now, as to the results: We have only to point to the record of the past two years at Cripple Creek. Nobody who is really well informed as to the conditions now prevailing there as compared with those of a few years ago, will question the statement that the change as a whole has been eminently satisfactory to the mine owners and the more reputable business men.

As to the attitude of the miners, we quote from an article in the *Denver Republican* of Sept. 29. The article contains an interview with Axel Swanson, State labor commissioner. He had been in the Cripple Creek district for several days, inquiring into labor conditions. He said: "I visited numerous properties of the district and talked with a large majority of the miners employed. I found these satisfied with present conditions and few who objected to the card system of the Mine Owners' and Operators' Association, which is in fact none other than a card of recommendation. I also found a large number of miners now at work who would be unwilling to continue if the card system were abolished. Others believe that strife and trouble would surely ensue if the element that left the camp returned." The article further states, quoting Mr. Swanson: "If the prosperity of the district depends upon the abolishment of the card system, I would so recommend, but first it would be necessary to take such steps and establish such safeguards as would keep out professional agitators and trouble breeders."

In conclusion he said: "It remains the duty of every business man to protect the men who stood firm during the troubles of the last three years and to see to it that such plans are formulated as will assure protection to all property and vested interests as well as to all men who desire to earn their living in peace and contentment."

You will permit us to point out that the present card system merely supersedes that previously enforced by the Western Federation of Miners, under which any man who failed to produce a card was given 30 days to leave the district. There was no question then of seeking other employment. A man had to be thankful for the chance to go elsewhere, for how-ever residents in the Eastern States may regard the action of the Western Federation of Miners, none of the men concerned were under any illusion as to what would happen to them if they refused to comply. Under the present system our members simply agree that no man whose record is not clear of violence or robbery shall be employed by them. We do not insist that they shall leave the district, or prevent them from obtaining work from those who are not members of the association. If this be un-American, then we fail to understand the underlying principle

of the government of the United States that "In union there is strength."

Colorado Mine Operators' Ass'n.,
W. E. PASMORE, Sec'y.
Denver, Colo., Oct. 19, 1907.

The Mitchell Mining Company

George Mitchell, late president of the Mitchell Mining Company, is a well known metallurgist and an experienced mining man. T. H. France, mining engineer, of the City of Mexico, is a well known mining engineer; also of high standing.

In 1904, I made a thorough geological examination and report upon the mines of the Mitchell Mining Company at La Dicha for Mr. Mitchell, which he published and widely circulated for financing purposes. At the time of making this report Mr. Mitchell had thorough mining samples made of each day's work from the separate headings. As stated distinctly in my report and as instructed by my client, the assay values, furnished from the records of the company, were used by me as the bases for my estimates.

Some time later Mr. France was sent to sample the mine for investors and in the *JOURNAL* of June 23, 1906, stated that he found 1,800,000 tons of ore that can be smelted, carrying only 1.86 per cent. copper. In the *JOURNAL* of June 30, 1906, Mr. Mitchell reaffirms that there is 2,500,000 tons of ore, averaging over 4 per cent.

It has long been apparent to me that this discrepancy in engineering results should be adjudicated by a thorough and impartial sampling of the mine. Inasmuch as the Mitchell stock, with a capitalization of \$8,000,000 (which has sold far above par value), is now depreciated to a very low level, now is an appropriate time for settling the discrepancy between Messrs. Mitchell and France by a complete and thorough impartial sampling and measurement of the mines. In my opinion no stockholder or investor should advance further funds until this has been done. At least my endorsement of the property will be held in suspense until this is done.

ROBT. T. HILL.

New York, Oct. 31, 1907.

A report of the commissioner of mines published in *Eisen-Zeitung* (June 22, 1907), gives an account of a discovery of copper in British East Africa, in the valley of the Tsavo river. The most important find is about 70 km. west of Tsavo station. The ore is both native copper and sulphide in a large quartz reef, which runs from the foot of Mount Kiulu southeast through the valley. Its extent has not yet been determined. In addition to the copper, there are traces of gold and platinum also suspected. Assay shows 30 per cent. copper in the reef.

New Publications

TRANSACTIONS OF THE INSTITUTION OF MINING AND METALLURGY. VOL. XVI; SIXTEENTH SESSION, 1906-1907. Pp. 444, illustrated, 5½x8½ in.; paper. London, England: Institution of Mining and Metallurgy and E. & F. N. Spon, Ltd. New York: The Hill Publishing Company. Price, in New York, \$7.50.

This volume, just published, contains a number of valuable papers, and we take this opportunity of congratulating the Institution on the increasing value of the literature it publishes. Among other interesting papers in the present volume are those by Mr. Loud on the "Wallaroo Smelting Works;" by Mr. Swinney on the "Tavener Process for Smelting of Zinc Gold Slimes;" by Mr. Garthwaite on "Some Sampling Results," and by Dr. Hatch and Dr. Simon on "Siberian Gold-fields." The quality of the discussions shows that mining men from all parts of the world attend the meetings of the Institution and contribute their views and experiences.

A KEY TO CORNISH MINING. By E. W. Meyerstein, London, England: *The Mining Journal*. Price (in London), 5 shillings.

This book gives a very good outline of the tin-mining industry of Cornwall. The author is a member of the London Stock Exchange and is an active pioneer in obtaining London money for the reopening of Cornish mines on modern methods and with modern plant. Naturally, he writes optimistically and even enthusiastically of the future of Cornwall as a field for investment, but his facts are correct and his arguments legitimate. The book is a straightforward and honest expression of opinion by a man desirous of obtaining capital for mining ventures, and as an example of this type of book is to be commended. In the more technical part of the book there are one or two errors which might easily be altered when reprinting. For instance, when explaining the difference between tin, black tin, cassiterite, ore, etc., which—as has been mentioned in some articles in the *JOURNAL* recently—are used by Cornishmen and others in a very confused way, the author says "In Cornwall the best lode stuff seldom averages over 72 per cent. metal." Yet in the glossary of mining terms he says that "lode stuff" is the undressed mineral from the lodes; the two statements being obviously contradictory.

Sources of supply of nitrogen in making cyanide are the products of the destructive distillation of shale and coal in mineral oil and gas works. Atmospheric nitrogen promises to be an important source in the near future.

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

Oct. 30—The drop in the price of copper and the resultant reduction of force in many mines, has brought numerous miners to the prominent mining camps in California from Montana, Arizona, and other copper-mining sections. Moreover, the conditions in Nevada are such that with the approach of winter, miners are coming back from that State also. The result is that Grass Valley and other prominent gold-mining camps in this State will no longer suffer from a scarcity of good miners, as has been the case for the past summer.

The president has signed proclamations creating additions aggregating 490,451 acres to the Stanislaus and Lassen Peak national forests in California. The addition to the Stanislaus embraces a tract of land 55 miles long, covering 348,570 acres and including the famous Calaveras group of big trees. The addition to the Lassen Peak aggregates 141,881 acres. The Shasta national forest in California has been increased by the addition of 37,000 acres in Siskiyou county. The miners can locate mineral land in these reserves, but they are generally not at all satisfied with the way the men in charge of the reserves restrict them in the use of the timber necessary for mining purposes.

Petroleum is expected to advance materially in price in this State owing to the fact that the reserve supply in the big fields of Kern and Santa Barbara counties is by no means as large as was supposed, and that the consumption has about caught up to the production, if it does not exceed it. The demand for fuel oil was never greater than at present. The Union Oil Company and the Doheny interests have obtained from the Miller & Lux estate the mineral rights on about 50,000 acres of land in the McKittrick and Temblor districts. The Union has 50,000 acres of oil land in the Temblor district and Doheny 30,000 acres near McKittrick, in Kern and San Luis Obispo counties. This may eventually mean a Union pipe line from McKittrick, Kern county, to the coast.

The North California Mining Company has now in course of construction or completed, nearly sixty miles of mining ditches. These ditches will be used for carrying water upon the several placer claims this company is preparing to operate in Plumas county.

The LaGrande Mining Company, of Stanislaus county, will by December or January be ready for dredge mining

operations on a large scale. The dredge is ready and the machinery will soon be in place. The piece of ground on which it will work consists of 800 acres. The company has installed a modern and powerful electric power plant above La Grange.

At Reno, Nevada, the United States Government through its representatives has commenced suit against the Central Pacific Railroad Company, the United States Trust Company of New York and the Southern Pacific Company for the absolute cancellation of the patent issued upon mines and mining grounds in the White Horse mining district. The complaint states that William H. Mills, former land agent of the Central Pacific, R. L. Fulton and others joined in a conspiracy to defraud the Government by means of false reports in gaining patent to the ground which consists of about 15,000 acres in White Horse district. The patent was published in an obscure manner. The United States Trust Company sold a mortgage on the land and, unknown to the Government, the Southern Pacific claimed an interest. The petition asks that the patent be canceled and the mortgage removed. A notice of *lis pendens* was filed in Reno to prevent the Southern Pacific from selling the land. The decision in the Federal suit will settle the title to the mines in the district.

A rich strike has been made in the drift gravel mines of the Prevolcanic Channel Gold Mining Company on the American river near the Lake Tahoe State road, 18 miles east of Placerville, El Dorado county. Men have been a long period trying to locate the pay channel under the lava and the deposits now found are said to carry heavy coarse channel nuggets. Exceptionally rich gravel is also reported in the Bellevue mine (formerly the Thistle shaft) in Sierra county on the border of Plumas county. The mine was operated several years through a shaft, which had finally to be given up owing to the property becoming flooded, and subsequently an extensive tunnel was run in which the recent strike was made.

Mr. Ricky, president of some of the Nevada banks which recently suspended, while in San Francisco this week, said that increasing labor troubles were mainly responsible for the financial depression in Nevada mining camps. "As a result of these industrial disturbances," he said, "we noticed gradual withdrawal of funds by depositors, who disgusted with

the strife, took their money to other places. Lessors of mining properties, unable to prosecute their work, threw up their leases and went away. In two months more than \$2,000,000 was taken from our banks by disappointed miners and speculators who left the State because of the industrial unrest. Then came the break in stocks all over the country, affecting collaterals of all varieties."

Salt Lake City

Oct. 30—The Prince Consolidated Mining Company has been formed here to absorb the properties of the Phoenix Reduction Company, at Pioche, Nev., consisting of something over 1000 acres and including the Prince mine from which a large tonnage of lead-silver ore has been produced in the past. It will have a capital of 1,000,000 shares of \$2 par value. Col. J. H. Hackett, of Louisville, Ky., will be president, and Anthony H. Godbe, of Salt Lake, manager.

All of 2000 men have been discharged by the Bingham mining companies during the past 60 days, which is a consequence of the general policy of curtailment. In fact, outside of the Utah Consolidated, Utah Copper and one or two others, there is not a mine in the camp that is not partially or entirely out of commission. The Boston Consolidated and Ohio Copper companies pulled off practically all the working forces during the past week; but orders have been given to proceed uninterruptedly with mill construction. The Boston Consolidated's initial plant is nearing completion, while that of the Ohio company should be ready for commission soon after the first of the year.

Salt Lake being the headquarters of nearly all the principal mining companies operating in the Yerington, Nev., district, the fact that the miners' union, which recently called a strike in that camp, has declared it off, has been received with a good deal of interest. The union demanded recognition, also an increase of 50c. a day in wages. The men are now willing to go back at the old scale. The strike was aimed principally at the Nevada Douglas Copper Company, which employs the greatest number of men in the district. This company, however, forestalled the miners a little by closing down for a few days and taking on an entirely new working crew.

The special meeting of shareholders of the Honerine Mining Company, operat-

ing in the Stockton district, resulted in the re-election of the old board of directors which organized with F. A. Baird, of Chicago, president; C. M. Dupont, of Salt Lake, secretary. The directors have levied an assessment of 45c. a share to pay off the indebtedness of the corporation, about \$200,000. An effort is being made to effect a consolidation with several adjoining properties and operate them through the Honerine drain tunnel.

The Ajax Mining Company, one of the oldest mining concerns operating in the Tintic district, cleared an indebtedness of about \$40,000 during the past year and now has over \$20,000 in the treasury. During the year ending Oct. 1 last, 8091 tons of ore were marketed and 981 ft. of development work performed. Thomas Weir, of Salt Lake, has been re-elected president and J. M. Burt, secretary.

The Supreme Court of the United States has rendered a decision in favor of the defendant in the case of Leonidas M. Lawson and others against the United States Mining Company, which has been pending in the courts for the past six years. The ownership of the Kempton and Ashton lodes was involved and developed ores of the value of about \$3,000,000. Col. E. A. Wall, of Salt Lake, is the principal loser as a result of this decision.

The Utah Copper Company has started the seventh section of its Garfield mill. During October the six sections produced 4000 tons of concentrate, averaging about 30 per cent. copper.

Denver

Nov. 2—The Continental Railway Tunnel Company enterprise has not been materially affected by the Wall street financial storm. As regards the monetary conditions here, the action of the banks has made very little difference. Small cheques and pay rolls are paid in cash as usual, and the wise conservation of cash, by issuing clearing-house certificates for large amounts, has simply acted as a deterrent on the hysterical and the hyper-timid, who would rush in and withdraw their deposits to hide them.

The Interstate Commerce Commission has been investigating the methods of the Barber asphalt company in the alleged crushing of competition in the production and marketing of gilsonite from the fields of Eastern Utah. The American Asphalt Association, with headquarters in St. Louis, and backed by Anheuser-Busch capital, charges that by extortionate freight rates of the Uintah Railway Company, which is owned by the Barber company, the association has been forced out of business. The Uintah Railway is 55 miles long, and operates between the gilsonite veins at Dragon, and Mack, a station on the Rio Grande Western, and charges 20c. per ton mile. As both parties are financially strong, the fight is likely to be a protracted one.

The Cripple Creek drainage tunnel is in over 1000 ft. and work is progressing favorably.

The Central Colorado Power Company has laid off about 1000 men, and it is stated here for the reason that while the company has plenty of money to go ahead with, it was thought wiser to suspend operations until the securities market improves, and thus conserve the funds on hand.

Duluth

Nov. 2—In spite of untoward financial conditions and a diminution of orders for finished products iron-ore shipments are maintained at the highest possible rate. Minnesota shipments for October were 4,935,000 tons, of which the two Steel Corporation roads carried 3,780,000 and the Great Northern the remainder. The Duluth, Missabe & Northern road shipped more ore during the month than in any similar period of its history. Its tonnage for October was 2,502,000 tons. Last year's total of 38,522,239 tons is not far above the traffic of this year to the close of October, and the Minnesota roads alone will make up the difference during the present month. Last year shipments were continued from some docks to Dec. 15, later than they will be this fall. A good many vessel contracts expire with October, others continue through November, and some hold until Dec. 5, which is the final date of hull insurance on the lakes. It looks like a total ore movement from the Lake Superior region of about 40,500,000 tons for this year, two million tons above the 1906 total.

Toronto

Nov. 1—The case against Law & Co., mining brokers, of Toronto, for violation of the provisions of the Mining Act regarding the issue of prospectuses, etc., came up in the Police Court on Oct. 30. Counsel for the defense objected to the information, which embraced all the offences specified in six clauses of the act, as being too vague and sweeping. The prosecuting counsel stated that the Crown was prepared to prove that these provisions had been violated in every particular. Police Magistrate Kingsford inclined to the view that the charges were not sufficiently specific and postponed the case until Nov. 6 to enable the prosecution to amend the information. The directors of the Highland Mary Mining Company this week issued a writ against the *Canadian Mining Journal*, claiming \$50,000 damages for libel and asking for an injunction preventing the *Journal* from publishing anything further about their affairs.

Vernat & Vocher, of Paris, France, are making arrangements to establish an agency in Hull, Quebec, for the purpose of conducting a large export trade with France in Canadian mica.

Cananea, Sonora

Oct. 30—This camp, in which the Greene-Cananea Copper Company is the leading factor, will be almost idle by the middle of November. During the past few weeks, the Greene has been discharging men right and left, and most of the smaller companies, doing prospecting and development work, have ceased operations for the present. The Greene first cut off night work, then stopped its properties on Sunday and now is out with the announcement that all work except that absolutely necessary will cease Nov. 10. The president of the company is reported to have stated that "the production of copper will be reduced to a minimum as rapidly as possible, that development work will be continued in order that when the mines resume they may be able to make copper as cheaply as possible, and the close-down will be maintained till copper can be sold for a reasonable price and the surplus disposed of." The company's costs have been understood to be in the neighborhood of 13c. per pound of copper since the recent change in management. The company has been busily engaged under the direction of Dr. Ricketts, in rebuilding its furnace equipment, and six of the eight blast furnaces had been overhauled and enlarged before the orders to close came. Exploration and development on the Cananea Central portion of the property, which shows rich ore in quantity but is scarcely ready for mining in quantity yet, will be maintained.

Other groups of properties in the district, from the international line to the Manzanel mountains on the south and the Azuls to the southwest, are closed or preparing to suspend. The Arizpe and Ortega companies, in the Manzanel, are down. The Fay-Cananea in the Azuls, is employing a few men; all the various properties grouped around the Greene, with one exception, are either closed or preparing to stop work. The Cananea-Bisbee, on which New York interests have spent about \$200,000 in explorations during the past six months, is closed pending negotiations that are not now likely to be satisfactorily concluded, according to reports. Cananea Eastern, West Cananea, Suisun and numerous others are idle. The exception seems to be the Calumet & Sonora, which is developing its Catilina claims and is shipping silver-lead ores running up to \$150 to the ton.

Probably 5000 men have been discharged from Cananea mines in the past 30 days and more are going every day. Some of these go to Magdalena camp, where the Black Mountain Mining Company is employing more than usual in its gold properties, some to the new Southern Pacific railway development in southern Sonora, some to Moctezuma, Nacosari, Cumpas, and other parts of the state, and some into Arizona.

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

Alaska

Contracts have been let for the construction of the Copper River & Northwestern railroad (the Guggenheim road) and construction has already been begun. The tidewater terminus is to be Cordova.

Arizona

GRAHAM COUNTY

Campbell—Among the strikes reported from the new gold and silver field during the week is one on a claim belonging to this group which is located about 2½ miles southeast of Morenci. Specimens carrying free gold in quantity and running up in the thousands to the ton were exhibited. Thus far the work has shown up nearly a ton of very rich ore and the vein still continues in good form. Other finds of less value have been made in the same vicinity.

Detroit Copper Mining Company—The property, located at Morenci, is producing copper at the usual rate of 1,700,000 lb. per month. During the first twelve days of this month an average of 1100 tons of ore was milled daily, but since then the tonnage has fallen off, due to scarcity of water. The company has not curtailed its production of copper since the drop in the price of the metal. More men are being hired daily, and prospect work is being pushed with greater rapidity than usual.

Gold Belt Development and Reduction Company—The company, located 3½ miles northwest of Morenci, has resumed shipments from the copper property, but on a smaller scale than formerly. Shipments are being made by wagon to Morenci and by rail to the Shannon smelter at Clifton and comprise only high-grade ore. Work continues on the low grades, the ore being held in reserve.

PINAL COUNTY

Ray Consolidated Copper Company—This company which is developing about 1000 acres of land near Kelvin, has, according to Seeley W. Mudd, the consulting engineer, its 250-ton mill on the Gila river nearly ready for operation. The ore does not occur in veins but in great rock masses through which the copper-bearing minerals are disseminated as fine veinlets and grains. The orebody is similar to those at Ely, Nev., and Bingham, Utah. The mill will be used as an experimental plant to determine the best method for treatment.

YAVAPAI COUNTY

Independence—A 54-oz. bar of gold bullion was brought in from this mine to miles south of Prescott. The mine is equipped with Huntington mills and a 50-ton cyanide plant.

Mother Lode Copper Company—This company has given an option on its properties in Copper basin, about 10 miles west of Prescott, to Kansas City men.

Peerless Mining Company—This company has started work at its mines on Turkey creek, 18 miles south of Prescott. A large quantity of silver-lead ore was shipped from this property a few years ago.

California

BUTTE COUNTY

Cape Horn Mining Company—This recently formed company at Cherokee, W. M. Wilson, manager, is preparing to develop the Cape Horn gravel mine on a large scale. A road to the mine is partly finished. The ditch of the Oro Water, Light and Power Company passes close by the mine and will furnish water and power.

Newton Mining and Developing Company—This company, near Bucks Ranch, S. J. Norris, manager, has made its first clean-up. At this property steam scrapers are to carry the gravel to a central point where it will be washed in sluices.

CALAVERAS COUNTY

Gwin Mine Development Company—At this property, D. McClure, superintendent, the orebody recently found, further south than others in the mine, is proving even better than was expected. Its extent is not yet known.

Lindsay—This old mine at Angels, first worked in 1855, will shortly be put in operation again, by A. Illich, A. M. McSorley and Thomas G. Peachey.

Lightner—This mine, at Copperopolis, was recently sold to Eastern men and will be worked on an extensive scale.

EL DORADO COUNTY

Sherman—The machinery from the River Hill mine, recently given up, is being removed to this mine near Placerville, where drifting is being carried on from four levels.

INYO COUNTY

Granite Contact Mines Company—A rich shoot has been found in the tunnel

being driven in No. 5 claim of this company at Skidoo. The ledge in the Gold Bird claim is increasing in importance with depth.

KERN COUNTY

Yellow Aster Mining Company—The water supply for this mine has been increased by deepening one of the wells at Goler, seven miles from the mine. The lift is 1400 ft. to the mine.

LOS ANGELES COUNTY

Beach Sands—Gold has been found in the sand bluffs two miles north of Playa del Rey, five miles from Santa Monica.

MARIPOSA COUNTY

Pocahontas—New lessees have charge of this copper mine, with David Ross as superintendent. Extensive improvements are being made. The copper ore is shipped to Le Grand, and thence to smelters.

Yosemite Dredging and Mining Company—This company has been organized to dredge the Merced river for gold, with the following directors: Wm. Popper, Bart Noyes, F. M. Parcells, W. F. Sawyer and Clay Slocum.

NEVADA COUNTY

Anchor—Work is under way preparing for the new 10-stamp mill of this mine at Graniteville.

Ethel—This mine at Washington has been sold to J. H. Keil and W. R. Greenlaw, of Milwaukee, Wis., and an electric power plant is being put in. A new and lower tunnel is to be run. Albert Maltman will continue superintendent.

Excelsior Consolidated—This company has bought from Mrs. Alice Bonfield the Union, Excelsior and other of the old old Hartley claims at Meadow Lake.

Lecompton—The pumps are at work unwatering this old mine which has been consolidated with the Treadwell, Daybreak and Freedom claims, at Willow Valley. As soon as the mine is dry the incline shaft will be deepened.

Lincoln—This mine at Nevada City under bond to H. Hicks, will shortly be worked on a large scale, a company having been organized to carry on operations.

Nevada County Midas—Grading for the plant of the Morning Star mines of this company on Randolph Flat has commenced. A pumping and hoisting plant will be erected.

PLACER COUNTY

Herman—Considerable new machinery continues to arrive for this mine near Deadwood. A complete electric power and compressor plant is being put in as well as a new 30-stamp mill.

Three Queens—Geo. Wingfield has given up the bond he held on this mine at Forest Hill. Some months ago some rich pockets of gold were found in this property, which is owned by M. Savage.

PLUMAS COUNTY

Consolidated Copper Gold Mines Company, of Nevada—Good copper ore, carrying gold and silver, has been struck in this mine in Ward Creek district.

Plumas National—At this mine near Greenville, owned by W. F. Rodde and W. Stampfli, a rich strike has been made in the 1800-ft. tunnel. The owners have been doing development work on the mine for years, having re-located it after abandonment and after the mill was removed.

SAN BERNARDINO COUNTY

Crackerjack Bonanza—This company has decided to grant leases within a restricted area in the Bonanza ground and a number of applications have been made. Shipments of the higher-grade ore sacked, are to be made to Salt Lake, Utah.

Ord Mountain—There is a revival of interest in this district and a number of claims have lately changed owners. There have been some disputes over claim boundaries.

SHASTA COUNTY

Gold Leaf—Operations have been resumed at this mine, Middle Creek, with 75 men. The mine is under contract to furnish fluxing ores for the smelter at Coram.

Midas—The ledge in this property at Harrison Gulch (Knob P. O.) has been recovered in the 1100-ft. level and in new ground. L. A. McIntosh and Captain J. H. Roberts are the principal owners. The strike is in the opposite side of the creek from the main or old workings. There is a fine plant on this property, which was productive for some years, until the ledge was lost recently.

SIERRA COUNTY

It is expected that the North Yuba river, from Goodyear's Bar to Sierra City, will be dredged for gold by Shasta county men. The bed of this river is quite rocky and a new type of dredge is to be tried.

Kate Hardy—This claim at Forest has been bonded to San Francisco men, who have set miners at work.

TUOLUMNE COUNTY

Golden Key Gold Mining Company—This company is about to begin operations

on the property three miles above Hughes station in Mocassin creek.

Colorado

ARAPAHOE COUNTY

American Zinc and Chemical Company—The directors of this company, controlled by Pittsburg capitalists, which has been exploiting the Dewey zinc extraction process, on Oct. 25 decided to wind up the affairs of the company. The company failed to develop the new process on a paying basis. The company owns 80 acres of land, on which there is a mortgage of \$25,000, and has additional liabilities amounting to \$25,000. The Dewey process consisted of sulphate roasting, leaching of zinc sulphate, evaporating to dryness and calcining to zinc oxide.

DOLORES COUNTY

United Rico—This company has 73 men at work, including those engaged upon new construction. Some promising developments have recently been made in the mines. The property was lately examined by Edgar J. Meyer, mining engineer, in the interest of his brother, Eugene Meyer, Jr., of New York.

LAKE COUNTY—LEADVILLE

A Y & Minnie—The improvements at this mill, made during the summer, are now bearing fruit, as the mill is handling 100 tons daily of a good grade of lead-zinc concentrates, while about the same tonnage of crude ore is being sent direct to the smelter.

Brecco Hill—Hanifen & Reynolds, leasing on No. 1 shaft of the Penn, are shipping 100 tons daily of a good grade of iron, and at the same time prospecting at the lower levels for the body of sulphide that is supposed to pass through this part of the property. At the adjoining property, the Chippewa, occasional shipments of silicious gold ore are being sent out from the bottom level; these bodies are found in the porphyry, but are irregular. The Fannie Rawlins, Big Four, Highland Chief, Little Vinnie, etc., are shipping regularly.

Eclipse—The tunnel being driven on this claim, Empire Gulch, has cut the vein, which is 5 ft. wide, and ore bins are being erected. The ore carries silver and the gangue rock is limestone.

Fryer Hill—A large body of oxidized iron has been opened in the Buckeye, but at present it does not carry sufficient silver to make it pay-ore.

Grandview—The crosscut in this mine, Empire Gulch, has cut a vein 70 ft. from the foot of the incline. The vein is 4 ft. wide, running high in lead.

Greenback—The Utah syndicate has taken charge of this property, Carbonate hill, and filed papers of incorporation; the company is known as the Greenback Mining Company. The directors are W. H.

Clark, W. V. Rice, J. S. Bransford, Duncan McVichie and A. C. Ellis, with H. S. Emlaw as resident manager. A Knowles pump is being installed at the 900-ft. level, and the work of unwatering the property will start soon.

St. Kevin—This district has been unusually active during the past summer and considerable development work has been carried on at a number of claims, among them being the Amity, Griffith and Wilkesbairre. Although the main ore-bodies have not been opened in any of them, occasional shipments of good ore have been sent out from them all. Work will be continued during the winter on each of them.

Sunday—M. A. Nicholson and associates took a lease on this and adjoining property, Ball mountain, early in the summer, and have sunk the new shaft south to a depth of 700 ft.; from that point a crosscut was run to the vein. The vein was a little over 5 ft. wide and drifting is now being pushed north and south; from this development work 40 tons daily are being shipped. The ore is a copper sulphide carrying some gold and silver and a little lead.

Weston Pass—A good body of lead ore has been opened in the Ruby and shipments will start within a few days. Sinking at the Colin Campbell has been completed and the ore shoot located. Both properties will continue at work during the winter.

Georgia

LUMPKIN COUNTY

A strong vein carrying free gold has been opened on the Dry Hollow property, near Dahlonega. Active operations are being carried on by Dr. W. W. McAfee, the owner.

Idaho

WASHINGTON COUNTY

Peacock—G. W. Boggs, manager of this mine in the Seven Devils district, now has 21 men employed at the mine, developing, taking out ore and getting things in shape for the winter. He started work on the tramway from the mine to the railroad across Snake river this fall. It will be about five miles long and will cost about \$10,000 per mile.

Illinois

CHRISTIAN COUNTY

Penwell Coal Company—The surface plant of this company, near Pana, was destroyed by fire Oct. 23. The loss is about \$125,000, and the mine is put out of commission for the present. Much of the plant was nearly new. The mine employed about 500 men.

MCLEAN COUNTY

Consumers' Coal Company—This company has been organized to open a new coal mine near Bloomington, and will begin sinking a shaft soon. George G. Rowland is engineer in charge.

Indiana

VERMILLION COUNTY

Oakhill—This coal mine, controlled by the Deering Syndicate, caught fire Oct. 25. The fire spread to the entries and for a time endangered the lives of a score of miners. By persistent effort the flames were extinguished. The fire was due to spontaneous combustion.

VIGO COUNTY

Saline Illinois Coal Mining Company—This company has been incorporated with a capital of \$150,000. The company proposes to open coal mines, build tipples and do a general coal-mining business, with chief office in Terre Haute. A. M. Higgins, R. J. Fuller and K. C. Ranolds, directors.

Michigan

COPPER

Mohawk and Wolverine—It has been announced that a reduction of 5 per cent. in wages will be made at these mines.

Osceola—Five drills have been re-installed at the old Osceola branch of this mine, which makes 15 drills now at work.

IRON

Buffalo & Susquehanna Mining Company—The general offices of this company are to be removed to Iron River, Michigan.

Fogarty—The Verona Iron Mining Company has blocked out a considerable tonnage in this mine. The deposit is narrow and is cut by a longitudinal horse or dike which narrows with depth.

Munroe Iron Mining Company—This company has taken options on the old Chicago mine and on the Fesing property, which is in the Crystal Falls district.

Missouri

JOPLIN DISTRICT

Alabama—The 300-ton mill of Jamot Brown at Porto Rico made its first run last week.

New Strike—A 55-ft. face of ore was struck on the land of Harry Harris, four miles northwest of Carthage, by a company of Carthage and Alba men. The strike was made at 165-ft. depth, and the cuttings show rich lead and jack.

Seneca—The first turn-in, of 22 tons of jack, from the mine of Gordon and Wilkes was made recently.

Scott & Coleman—A 7x10-ft. shaft is being sunk on the C. W. Tooker land at

Aurora. It is being sunk on an 80-ft. face of ore and will be 250 ft. deep. A \$50,000-mill will be erected.

Sherwin-Williams—It is reported that the zinc-oxide plant east of Joplin will soon be remodeled and its capacity doubled. The plant will generate its own electricity for lighting and power.

Whitsett—A. M. Sheldon, of the Old Dominion Mining Company, has bought the Whitsett mine in the sheet-ground district of Porto Rico. The reported price was \$65,000.

North Carolina

DAVIDSON COUNTY

Thomasville—M. L. Jones has shipped a \$3600 brick to the mint at Charlotte as the result of one week's work at his mine.

RANDOLPH COUNTY

Davis Mountain—A crusher has been installed at this mine and further development will be prosecuted.

Hooverhill—This property in Tabernacle township was sold at public sale and was bought in by Doughan Davis for \$8500.

ROWAN COUNTY

Union Copper Company—Operations have stopped at this mine at Gold hill and work will not be resumed until the copper market improves. About 100 men were laid off. The Gold Hill Company is still in operation, but its suspension is looked for.

WATAUGA COUNTY

Silver-Lead Mine—A. M. Dougherty is opening a silver-lead mine on Laurel fork, five miles from Boone.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Ore Production—Production from the Goldfield district for the week ended Oct. 25 is reported as follows: Shipped to Western Ore Purchasing Company, 2530 tons; Nevada Goldfield Reduction Company, 1210; smelters, 950; Combination mill, 560; Kinkead mill, 140; total, 5390 tons, of \$508,920 estimated value.

NYE COUNTY—BULLFROG

Belle—Mining operations have been resumed on the property, under the management of T. Bossemeyer. A crosscut is being run from the foot of the 280-ft. inclined shaft to pick up the vein. Near the surface the vein was much broken.

Denver—The south drift at the 450-ft. level is showing a full breast of ore of milling grade. The management states that parts of the vein at this level are above milling grade and by hand picking a large amount of shipping ore can be obtained. The south drift is out about

45 ft., and is in good ore all the way. The north drift, which is also being continued, is not showing as good values, but is holding a good milling average with a full breast of ore.

Gibraltar—The lessees in the stope off No. 1 tunnel are breaking rich ore. This is the richest ore being won on the field at present. It is probable that, owing to the success of Phillips & Moesser's lease, other portions of this mine will be operated by lessees.

Golden Scepter—The tunnel has been driven a distance of 180 ft. and it will probably require to be driven 40 ft. farther before the Hobo vein is encountered. The miners found it difficult to make rapid headway in driving the tunnel owing to the extraordinary hardness of the country rock and the bad way it fractures on blasting.

Lee Bonanza—The west crosscut has been driven in toward the vein for a distance of 90 ft. and there are indications that the vein will soon be cut. The crosscut being driven toward the east is out 120 ft., and the country remains unchanged.

Lee State Line—Mining was recently started on this property and the shaft is down 30 ft., on a vein 3 ft. in width and carrying ore of milling grade. The management proposes continuing the shaft to the 150-ft. level before developing the vein by lateral workings.

Montgomery Shoshone—The old hoist on the double compartment shaft has been dismantled and the shaft, which extends to the 400-ft. level, is being used as a chute for handling ore from the upper levels. The new mill is working well and more than 100 tons of ore are being treated every day. Concentrates from the tables are being sacked for shipment.

NYE COUNTY—MANHATTAN

Crescent-Eureka—The shaft has been sunk to the 145-ft. level and is on the vein all the way from the surface. In places streaks of ore giving high assay values are obtained. The shaft will be continued to the water level, which should shortly be reached, when a drift will be run to connect with a shaft in the old workings.

Indian Camp—A new hoist has been erected on the Kendall-Douglas lease and rapid progress is being made in shaft-sinking. The drift at the bottom level is in ore and 18 in. of the vein gives good assay returns.

Mineral Hill—The shaft is down to the 170-ft. level. At that depth a band of exceptionally hard country is met that retards progress in sinking. The manager proposes to continue the shaft another 100 ft. before commencing to drift, with the view of picking up the Thanksgiving vein, which crosses the company's property.

Stray Dog—A large amount of lateral work is being done. Large reserves of milling ore are already opened up for stoping, both in the oxidized and sulphide zones. Some high-grade shipping ore, taken out in the course of the development operations, is being sacked for shipment.

Thanksgiving—Development work has been hampered, owing to the hoist being disabled through trouble with one of the boilers. This has been remedied and work will go forward as usual. Some rich ore is being obtained at the 350-ft. level.

Union—The Kendall-Douglass lease on Union No. 9 is showing a large body of high-grade shipping ore. The Cram-La Lime lease on Union No. 4 is sacking ore averaging very high. The Rose-Nash lease on the same claim is developing a body of stripping ore which at present is over 8 ft. in width.

NYE COUNTY—TONOPAH

Ore Shipments—Shipments over the Tonopah railroad for the week ended Oct. 25 were: Tonopah Company, 1790 tons; Tonopah Extension, 143; Belmont, 344; Midway, 104; Jim Butler, 61; total, 2442 tons. Ore sent to mills was: Tonopah Company, 2170; Belmont, 680; Montana Tonopah, 1260; total, 5110 tons. This makes total output for the week 6552 tons, of \$294,240 estimated value.

California—Development operations are in full swing again in the 600- and 750-ft. levels under the management of Mark E. Kerr. It is proposed by the new owners of the mine to equip the property with a new hoist of greater power than the present one and resume sinking to a deep level.

Extension—The north crosscut at the 1050-ft. level is out 700 ft. and there are no changes of importance noticeable in the formation. Development work in other levels is being carried on as usual and between 200 and 300 tons of ore are going forward to the smelters weekly.

Midway—An accident to the cage last week did considerable damage to the main shaft and caused the closing down of the mine for repairs for several days. Fortunately none of the miners was hurt when the cable broke. The high-grade ore on the 435-ft. level continues to keep its usual assay value and the big ledge at the 385-ft. level is developing a large amount of ore of shipping grade.

Montana—The new mill is at present being fed with ore from the old dumps. This will all be cleared away before any large quantities of ore are freshly broken in the mine. The mill is running at its full capacity of 40 stamps, crushing 180 tons a day, or an average of 4½ tons to the stamp. All of the machinery in the mill is running smoothly and the saving of

values is considered by F. L. Bosqui, the company's consulting metallurgist, to be satisfactory.

Oregon

BAKER COUNTY

Almost a quarter of a century ago efforts were made to build a railroad from Baker City southeasterly along lower Powder river through Eagle and Pine valleys to Snake river. W. L. Vinson, of Baker City, has now raised the necessary capital, and residents of Baker county have raised \$110,000. Most of the right-of-way has been donated, and work begun. The building of this railroad will afford transportation to the copper belt and will open up large bodies of valuable timber land.

Columbia Gold Mining Company—This company has recently put its second battery of 10 stamps into commission and is now turning out concentrates for the smelter at the rate of 100 tons monthly. Manager Baillie has entered into a contract with the smelter to supply 1000 tons of crude silicious ores, two lots of which have already been shipped.

Ruth—Robert Nunn is making regular shipments from the Ruth mine in Cable Cove, and another new shipper is the Red Boy mine in the Greenhorn district.

Pennsylvania

BITUMINOUS COAL

Amelia Coal Company—This company's property, including 1100 acres of coal land, has been sold to parties from Cleveland, Ohio. It is on the line of the Wabash railroad, in Washington county, near the West Virginia line.

Pittsburg Coal Company—This company is making extensive improvements at its plants in Fayette county. At Rowe's Run two shafts are being put down 300 ft., to open up a large tract of coking coal, and 350 coke ovens are under construction. A reservoir with a capacity of 15,000,000 gal. water has been built. The Rowe's Run plant will have a large central power house. Colonial No. 2 coke plant, near Smock, is being enlarged by the building of 370 coke ovens, making 400 in all.

This company's financial statement for the nine months ended Sept. 30 is as follows:

	1906.	1907.	Changes.
Earnings.....	\$3,714,408	\$4,207,364	I. \$492,956
Charges.....	2,307,801	2,098,315	D. 209,486
Net surplus.....	\$1,406,607	\$2,109,049	I. \$702,442

The charges this year were made up as follows: Reserve for depreciation of coal lands, \$550,880; depreciation of plant and equipment, \$730,142; interest on bonds, \$817,293. The increase in earnings this year was 13.3 per cent.

South Dakota

LAWRENCE COUNTY

Tinton Tin Company—With the revival of interest in this section there is further talk of reorganization.

Connie May Morris—R. H. Spencer, of British Columbia, is to superintend work of development on this group recently purchased by Easterners. A new prospecting shaft will be sunk 100 ft.

Molson—A vein of ore 25 ft. wide and carrying free gold has been encountered near the surface. The property adjoins the Uncle Sam at Roubaix.

Lucky Strike—A new steam hoist and electric dynamo to supply both mine and mill with power and light are being installed. The new 30-stamp mill on Elk creek will be started about Jan. 1.

Beaver Fraction—Much of the ore now being handled by the Mogul Mining Company is coming from an open cut on this property.

Boswell—A good looking body of cyaniding gold ore is being opened up on Dead Dog hill.

Far West—A body of ore assaying high in silver and in gold has been uncovered in this old property owned by the Hattanbach brothers. The property will probably soon be re-opened.

Spanish R—New ground has been added to the patented holdings in the Carbonate camp, and it is believed that work will shortly be resumed on a larger scale.

Titanic—A number of old claims in the Carbonate district have been re-located; the company now owns 600 acres.

Carpenter-Richards—A high-grade gold strike is reported in the tunnel near Englewood at 500-ft. depth. The find proves the continuity of the old Bald mountain shoots through the divide into the east side.

PENNINGTON COUNTY

Belt Group—Henry Wagner and associates, of Yankton, have acquired this property by purchase from the Keystone owners and will expend a large sum for the development of its copper prospects.

Cuyahoga—Manager Gira is building a saw mill which will furnish lumber for a 75-ton treatment plant to be erected during the coming spring. A small force of miners is kept busy developing.

Spencer Group—This ground on Castle creek has just been sold outright to men from Broken Bow, Neb., who have been operating several months on bond and lease. They are driving a tunnel toward the ledge.

Burlington—New machinery is being installed following the recent visit of Iowa stockholders who authorized a further expenditure. The shaft now down 150 ft. will be continued.

School of Mines—The new metallurgical laboratory is being fitted up with a complete stamp mill, a cyanide mill and special amalgamation features.

Crown Mining Company—The holdings seven miles south of Rochford have been sold by James D. McNichel and A. E. Wyatt, of Rockport, Mo., to Col. James A. Clark, the old Black Hills mining man. Colonel Clark will start work with miners next month, developing the gold ledges.

Texas

MILAM COUNTY

Central Texas Fuel and Development Company—This company has been organized to develop coal lands in Milam county on a large scale.

Utah

SALT LAKE COUNTY

Tintic Ore Shipments—During the week ending Oct. 26 the output of this camp reached 132 carloads, the contributing mines and amounts being: Ajax, 2; Beck Tunnel, 7; Black Jack, 2; Carisa, 3; Colorado, 9; Centennial Eureka, 42; Eagle & Blue Bell, 6; Eureka Hill, 2; Grand Central, 8; Lower Mammoth, 10; May Day, 5; Mammoth, 5; Scranton, 8; Tintic Iron, 9; Uncle Sam, 5; Victoria, 3; Yankee Consolidated, 6 cars.

Colorado—A second cave has been encountered in this Tintic mine, with high-grade shipping ore in evidence on all sides.

Last Chance—This property, owned by the Nevada-Utah Mines and Smelters Corporation, has let out 50 men and stepped production entirely for the time being.

New England Gold and Copper—This is one of the few Bingham companies that has not curtailed its production. It is a silver-lead producer.

Ute Copper—This company, operating in Bingham, has its new compressor plant in operation and development work is being pushed.

Yampa—The alterations planned by this company in its Bingham smelter are being made. More furnace capacity is being added, and by the end of the year the plant will be in condition to treat 700 tons of ore daily. At the mine, the steam plant is being discarded and when production is resumed, the compressor will be electrically equipped. A small force of men is engaged in re-timbering certain portions of the mine workings.

Philippine Islands

CAMIGUIN

H. A. Ferguson, geologist, Division of Mines, who recently returned from an exploratory trip to the Batanes and

Babuyanes islands, north of Luzon, reports a quantity of sulphur in a solfatara, on Camiguin island. He believes there is a possibility of commercial development there.

MINDANAO

Under direction of the Division of Mines, Warren D. Smith, H. M. Ickis and M. Clark have begun geological explorations in Mindanao. The line to be surveyed will extend from Zamboanga through the Lake country and along the Agusan river to Surigao.

Canada

BRITISH COLUMBIA—BOUNDARY DISTRICT

The Granby Consolidated Mining, Smelting and Power Company, Ltd., has reduced the wages of its employees 50c. a day. This will affect all the miners in the Phenix camp as the British Columbia and the Dominion Copper companies will make a similar reduction. The Grand Forks Labor Union will decide as to whether the men will accept the reduction or go on strike.

ONTARIO—COBALT DISTRICT

Airgoid—The working force of this mine, which adjoins the Nova Scotia, has been laid off. It is said that the mine has been sold to the owners of the Nova Scotia.

Bailey—A 15-in. vein of decomposed calcite, cobalt and silver has been struck close to No. 2 tunnel on a hill top. A shaft will be put down on the vein. Three other veins were also discovered in a drift from No. 1 tunnel about 100 ft. in. All carry native silver.

Foster—The last car of ore shipped to the smelter netted \$36,119. A vein of smaltite 6 to 10 in. wide has been found at the 75-ft. level, where No. 8 and No. 5 veins cross.

Little Nipissing—Operations have been resumed and a new vein, several inches wide, of calcite, with specks of native silver, cobalt and smaltite, has been found.

Nancy Helen—The main shaft is down 123 ft. and will be sunk to the 200-ft. level. At the 100-ft. level two drifts have been started; one, southeast on the main vein, shows the vein to have an average width of 8 in. of rich ore. Native and wire silver 1 and 1½ in. thick is found.

Nipissing—The officers of the operating company have issued a brief statement showing the financial condition of the mine on Oct. 1. Cash and bullion amounts to \$413,715. Ore in transit and at the smelters is valued at \$446,037, while the ore sacked at the mine is estimated to be worth \$90,000. The total cash or quick assets is \$949,752 which, after deducting \$180,000 for dividend purposes, leaves \$769,752 surplus. Re-

cently two new veins were found. Prospecting will keep on until stopped by weather; 350 men are at work.

O'Brien—The Ontario Government has received \$51,992 as royalties on the output for the three months ending Sept. 30, on the basis of 25 per cent. of the value of the ore mined.

Silver Bar—Work at this mine, which had been suspended during the summer, was recently resumed, the property having been taken over by Michigan capitalists. It is reported that a rich vein has been struck while drifting at the 150-ft. level.

Temiskaming & Hudson Bay—The new vein has been stripped to a considerable extent, showing up better than on the surface. An assay showed \$80 silver to the ton. The ore was taken from the uicolite end of the vein. The vein is located 300 ft. north of the main shaft and a crosscut, at the second level, will be extended north, so that the new vein can be worked from the main shaft.

Trethewey—A vein 8 in. wide has been found in the drift at the 50-ft. level a few feet from the new shaft. It yields good ore with considerable native silver.

Mexico

GUANAJUATO

Santa Brigida—Shewell & Fulton have purchased this mine as well as the Cayetano, the Noche Buena and the Patrocinio in the Santa Rosa district, and are examining other properties for Eastern capitalists.

OAXACA

Oaxaca Smelting and Refining Company—Jos. T. Wallace was appointed receiver of this company upon petition of the American Trust Company, of Boston, Mass. It is the purpose of the bondholders to reorganize immediately.

SONORA

Fundicion—The smelting works of the Compania Metalurgica y Refinadora del Pacifico, S. A., will be blown in early in December. The company has been in the market for the purchase of custom ores since Nov. 1.

Africa

RHODESIA

Gold production in September is reported as 53,622 oz. bullion, being 936 oz. less than in August, but 5212 oz. more than in September, 1907. For the nine months ended Sept. 30, the total was 409,399 oz., bullion in 1906, and 454,226 oz. in 1907; an increase of 44,827 oz. The bullion reported this year was equal to \$8,356,075, or 404,261 oz. fine gold.

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, Nov. 6—The coal trade in the West shows little change in conditions, except that complaints of car shortage are increasing. The demand for steam coal keeps up better than had been expected, and the local markets show considerable strength. The approach of winter has strengthened the demand for domestic coal, and there seems to be generally a good condition. Mines are working as well as the railroad service will permit. The Lake trade is quieter than usual at this season and there is no great rush of late shipments.

In the East the bituminous trade is still in good shape. Demand for steam coal at seaboard points continues strong, and the coastwise trade is active. Prices at the chief seaboard points are stronger than at any time during the season.

The anthracite trade is steady for the domestic sizes, and there is a good demand for these everywhere. The steam sizes are less active than they have been, but the demand has fallen off only in moderate degree.

Coastwise trade, as with bituminous coal, is active. The main trouble now is with the New England railroads, which are not handling coal promptly at the eastern receiving ports. This makes a good deal of trouble for vessels.

No decision was reached by the representatives of the United Mine Workers and the Operators of the Central Competitive field, relative to a restoration of the interstate agreement, at the meeting held in Indianapolis Oct. 29. The opinion prevails, however, that the prospects for such restoration are good and another meeting will be held Dec. 19. It was not expected that any action would be taken last week.

COAL TRAFFIC NOTES

Coastwise shipments of coal from the chief Atlantic ports for the eight months ended Aug. 31 are reported as follows:

	Anthracite.	Bituminous.	Total.
New York.....	10,987,371	7,663,572	18,650,943
Philadelphia...	1,572,445	3,248,116	4,820,561
Baltimore.....	167,405	2,412,277	2,579,682
Newport News..	.....	1,628,290	1,628,290
Norfolk.....	.....	1,121,653	1,121,653
Total.....	12,727,221	16,073,908	28,801,129
Total, 1906....	10,175,616	14,638,476	24,814,092

The total shipments this year show an increase of 3,987,037 tons, or 16.1 per cent. The proportion of shipments from the ports this year was: New York, 64.8; Philadelphia, 16.7; Baltimore, 9.0; Newport News, 5.6; Norfolk, 3.9 per cent. New

York includes all the New York harbor shipping points.

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to Oct. 26 were as follows, in short tons:

	1906.	1907.	Changes.
Anthracite.....	3,636,025	4,656,934	I. 1,020,909
Bituminous.....	26,226,579	32,074,344	I. 5,847,765
Coke.....	10,380,045	11,515,031	I. 1,134,986
Total.....	40,242,649	48,246,309	I. 8,003,660

The total increase this year was 19.9 per cent.

The coal tonnage originating on the lines of the Southern Railway for the eight months ended Aug. 31 was: Tennessee district, 1,145,043; Alabama district, 1,400,760; total, 2,545,803 short tons.

New York

ANTHRACITE

Nov. 6—The market for anthracite coal shows little change from last week. Prepared sizes are in slightly better demand and small steam sizes are flat. Prices are quoted as follows: Broken, \$4.75; egg, stove and chestnut, \$5; pea, \$3.25; buckwheat No. 1, \$2.75; buckwheat No. 2 or rice, \$2.15@2.25; barley, \$1.75, all f.o.b. New York harbor.

BITUMINOUS

The demand for all classes of bituminous coal is exceedingly strong, and in many instances consumers have accepted lower grades of coal when the desired grades were not obtainable. Large volumes of coal are coming forward, but they are absorbed as soon as the shipments arrive. The last consignments of coal are being shipped to complete Maine port orders.

The far East is still calling for considerable coal, although there are large quantities at nearly all the shipping ports. In fact, many vessels are on demurrage before they are able to obtain a berth. Trade along the Sound is receiving considerable coal, but vessels are held up for a week or 10 days before they are able to discharge. This is due partly to the boatmen's strike and partly to the accumulation of vessels in this territory.

New York harbor trade is very strong and fair grades of steam coal easily bring \$2.85@3 f.o.b. New York harbor ports. The strike among the boatmen has affected the situation in that harbor; freights have been raised to 25c. per ton, against a former rate of 16@18c. In the all-rail trade the demand is good except

to certain New England points where shipping is at a standstill. Between the mines and tidewater the demand is good and the price asked ranges about \$1.50 per ton f.o.b. mines. Car supply seems to be slightly improved, although there are many complaints on this score. Transportation from mines to tide is about the same as last week, cars taking a little longer than schedule to run through.

In the coastwise vessel market, vessels are affected by the strike, but rates do not seem to have advanced. Quotations are as follows: From Philadelphia to Boston, Salem and Portland, 90@95c.; to Portsmouth, \$1@1.10; to Newburyport and Lynn, \$1.25@1.30; to Saco and Bangor, \$1.50; to Augusta, \$2.25 per ton. No ice-clauses have so far been demanded, although it was rumored last week that certain captains were insisting that these should be included in the contract.

Birmingham

Nov. 4—The coal mines in Alabama are still very active. If there is to be any change in conditions, so far the operators have not given any forecast. The railroads are a little slow in furnishing cars. The production is still at the top notch and, as far as can be learned, there is to be no curtailment. Several of the smaller operators are watching conditions, though there has been no disturbance to this date. Collections are not at what they should be, but it is believed that the flurry will all be over in a few weeks. Coal prices have not fallen. Large consumers of coal have not advised operators of any desire for abatement of shipments and there is still a scramble on for cars. The work of developing in the coalfields is still on. The estimate of 15,000,000 tons of coal in Alabama for 1907 is still made.

Coke is in good demand with fair prices obtaining. It is expected the production will be continued at the present rate and if necessary there will be some accumulation.

Chicago

Nov. 4—Sales of coal are somewhat checked by the financial conditions, but are heavy as compared with the sales of a year ago. Dealers in the city and country alike are buying, in many cases, only enough coal to carry them along with current orders, and not stocking up for the winter. The same thing is true of con-

sumers, large and small. Railroads are buying well, and there is no check to the volume of coal needed for general steam purposes. Eastern and Western coals share in the lessened sales, with Western perhaps faring better than Eastern, because of the tendency of the consumer to buy more cheaply under present conditions.

Prices of Western coals remain fairly firm, lump being \$2.25@2.75, run-of-mine \$1.75@2.25 and screenings \$1.10@1.50. The tendency toward cheaper coals and mild weather has strengthened somewhat the market for fine coals.

Eastern coals are in general easier. Smokeless is nominally at \$3.25 for run-of-mine and \$4.30 for lump, but these prices have been cut 10 to 25c. on some sales. Hocking is advanced in circular price to \$3.65, but much has sold at the former price of \$3.50. Pittsburg No. 8 and Youghiogheny are fairly firm, the former at \$3 for 1 1/4-in. and the latter at \$3.25 for 3/4-in. lump.

Cleveland

Nov. 5—The coal market opened out weak Monday, with a fair supply of coal on hand and greatly reduced orders being carried by coal companies. A representative of one of the largest coal companies in the city said Monday: "This flurry in the money and stock markets is playing hob with the coal business. Collections are very poor. Customers cannot pay cash for drafts with bill of lading attached, because the banks will not lend them money either in this city or outside to finance their acceptances. The supply in the city is not large, but I am afraid that the laying off of men at Columbus and here, and a number of other extensive evidences of retrenchment will force us to curtail production, for with the mines running full shift now stocks are piling up and we have not the facilities for moving the coal. The car shortage in this locality is the only saving grace to the situation. Prices this week are around \$1.20 at mine for mine-run and \$1.25@1.30 for 3/4-in.; slack is selling at 70c. These prices are all 10c. under those prevailing at this time last year."

Coal dealers in general voice this sentiment, and developments in the market are awaited with interest, though it is not expected that there will be much further decline in prices.

Indianapolis

Nov. 5—Coal-mine operators in the Southern Indiana district report a scarcity of miners. One of the chief reasons is the fact that certain classes of young men who heretofore sought employment in the mines have secured work outside, and no man will work under the ground when he can do as well outside. What is true of this section is also true of other mining districts in the State.

The Indiana Railroad Commission will allow railroad officials 20 days in which to file briefs in the case in which certain roads are charged with discrimination in rates when shipping coal to connecting lines. It is known that a score of roads will file extensive briefs and the roads where coal traffic originates and those which receive it, will contest vigorously any attempt to change the rates on coal. The point which the railroad officials emphasize is that it is of vast importance that connecting railroads have fuel coal; that the prompt shipments made for the public depend largely on the ability of the roads to get fuel and that the unwritten agreement or practice of roads hauling material for connecting lines at a reduced rate should not be broken up.

The Southern Indiana railroad has secured a temporary restraining order against the Indiana Railroad Commission to prevent the putting into effect the rules promulgated for furnishing and distribution of cars to the coal mines. The commission is preparing to fight the case.

Pittsburg

Nov. 5—There is no material change in the coal markets. Prices remain on the basis of \$1.40@1.50 for mine-run coal at mine, but most of the new orders booked this week were at the maximum price. The supply is not equal to the demand, and there is a greater shortage of railroad cars than a week ago. It is estimated that less than 60 per cent. of the requirements is being furnished by the railroads and there are no indications of an improvement in the near future. The rivers were navigable again during the week and over 3,000,000 bu. of coal went to lower ports, the bulk of the shipment being made by the Monongahela River Consolidated Coal and Coke Company.

Connellsville Coke—Operations have been suspended at a number of coke plants and production is considerably curtailed this week. The demand has fallen off owing to the blowing out of a number of blast furnaces. Prices, however, remain fairly firm, furnace coke being quoted at \$2.65@2.85, and foundry coke at \$3.25@3.40. The *Courier* in its weekly report gives the production at 418,385 tons in both fields. The shipments aggregated 14,134 cars distributed as follows: To Pittsburg, 4940 cars; to points west of Connellsville, 8302 cars; to points east of Connellsville, 892 cars.

Foreign Coal Trade

Exports of coal and coke from the United States for the nine months ending Sept. 30, are reported as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1906.	1907.	Changes.
Anthracite	1,670,256	2,076,541	I. 406,285
Bituminous.....	5,620,074	7,742,602	I. 2,122,528
Total coal.....	7,290,330	9,819,143	I. 2,528,813
Coke.....	577,207	682,583	I. 105,376
Total.....	7,867,537	10,501,726	I. 2,634,189

These figures do not include coal bunkered, or sold to steamships engaged in foreign trade. The coke exported went chiefly to Mexico and eastern Canada; the distribution of the coal was as follows:

	1906.	1907.	Changes.
Canada.....	5,475,780	7,442,822	I. 1,967,042
Mexico.....	857,215	844,907	D. 12,308
Cuba.....	487,796	573,633	I. 85,837
Other W. Indies.....	237,076	319,132	I. 82,056
Europe.....	72,619	186,799	I. 114,180
Other countries.....	159,844	451,850	I. 292,006
Total.....	7,290,330	7,819,143	I. 2,528,813

The increase in exports to Europe was in shipments to Italy, which took 128,092 tons this year. The exports to other countries were chiefly to South America. The exports to Canada—75.8 per cent. of the total in 1907—were, in detail, as follows:

	1906.	1907.	Changes.
Anthracite	1,643,570	2,041,865	I. 398,295
Bituminous.....	3,832,210	5,400,957	I. 1,568,747
Total.....	5,475,780	7,442,822	I. 1,967,042

The increase in anthracite this year was 24.2 per cent. and in bituminous 40.9; the total gain being 35.9 per cent.

Iron Trade Review

New York, Nov. 6—Dullness and a strict conservation continue to be the rule in the iron and steel markets. In the present condition of the financial markets no one is willing to make future commitments, and the new business transacted at present is almost entirely in small orders for immediate use. It looks as if everyone was getting ready for a season of restricted trade, but it is not always easy to curtail operations at short notice. Some blast furnaces have already shut down, and others are preparing to follow. This is especially the case with a number in the East which are so situated that they cannot work at a profit unless pig iron is at a high level. Other furnaces are holding on, either because they have contracts to fill, or because they are disposed to try the effect of lower prices on the market.

It is understood that the chief producing interest will follow market conditions closely and will close part of its works as fast as demand falls off, and orders are filled. It will not accumulate stocks of unsold material in any event. The coming in of specifications on outstanding contracts is watched closely, and much will depend on the course of these for the next month or so. There is still a very large tonnage of finished material under contract, as was shown by the Steel Corporation's report, published last week. It is possible that some orders for rails will be placed, as there will be a large ton-

nage needed for repairs and renewals in any event.

A conference of the makers of steel billets was held in Pittsburg last week, but no definite results seem to have been reached. It was reported that the old Billet Association would be revived, but this was not the case.

An important result of the financial disturbance has been the transfer to the United States Steel Corporation of a controlling interest in the Tennessee Coal, Iron and Railroad Company. This interest has been held by a speculative party, headed by John W. Gates and Grant B. Schley. Apparently this clique has been hard hit, and the immediate motive of the transfer has been to relieve the banks which were carrying large loans with Tennessee stock as collateral. Doubtless the Steel Corporation appreciated the opportunity, which it was in a position to take. It is announced that the majority interest in the stock is transferred, payment being made in second-mortgage bonds; not a new issue, but bonds now in the corporation's treasury. Opportunity will be given to minority holders to transfer their stock on the same terms. The immediate effect of this transaction on the steel trade will not be great, but there may be important future consequences, on which comment must be reserved for the present.

Steel Rail Specifications — No final action was taken on the steel-rail question at the meeting of the American Railway Association last week. The proposed new section, putting increased weight of metal in the web of the rail, was approved, but the question of phosphorus allowable was referred to a committee of experts for further consideration.

Iron and Steel Exports—Exports of iron and steel, including machinery, from the United States for September, and the nine months ended Sept. 30, are valued as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1906.	1907.	Changes.
September.....	\$13,400,682	\$16,830,833	I. \$3,430,151
Nine months...	126,698,883	146,231,080	I. 19,532,197

The total increase for the nine months was 15.4 per cent.. The leading items of export for the nine months were, in long tons:

	1906.	1907.	Changes.
Pig iron.....	60,415	60,385	D. 30
Billets, ingots & blooms	170,462	60,293	D. 110,169
Bars.....	64,411	75,607	I. 11,196
Rails.....	250,278	253,249	I. 2,971
Sheets and plates.....	78,969	92,448	I. 13,479
Structural steel.....	83,891	102,187	I. 18,296
Wire.....	126,293	116,325	D. 9,968
Nails and spikes.....	47,492	45,645	D. 1,847

The chief decreases were in wire and in billets, ingots and blooms. The larger gains were in bars and structural steel.

Iron and Steel Imports—Imports of iron and steel, including machinery, in the United States for September and the nine months ending Sept. 30, are valued by the Bureau of Statistics as follows:

	1906.	1907.	Changes.
September.....	\$2,832,199	\$2,902,301	I. \$ 70,102
Nine months.....	24,376,887	31,698,020	I. 7,321,133

The increase for the eight months was 30 per cent. The chief items of the iron and steel imports for the nine months were, in long tons:

	1906.	1907.	Changes.
Pig iron.....	229,876	449,147	I. 219,271
Scrap.....	10,438	24,969	I. 14,531
Ingots, blooms, etc.....	14,977	11,465	D. 3,512
Bars.....	25,607	30,341	I. 4,734
Wire-rods.....	13,444	13,299	D. 145
Tin-plates.....	37,756	46,706	I. 8,950

There are considerable increases in pig iron, in scrap—chiefly steel scrap—and in tin-plates.

Iron Ore Movement—Exports and imports of iron ore in the United States for the nine months ended Sept. 30, are reported as follows, in long tons:

	1906.	1907.	Changes.
Exports.....	234,310	157,843	D. 76,467
Imports.....	818,030	972,340	I. 154,310

Most of the exports were to Canada. Imports were from Cuba, Spain and Algeria.

Imports of manganese ore for the nine months were 155,409 tons in 1906, and 142,120 tons in 1907; a decrease of 13,289 tons.

Baltimore

Nov. 6—Imports for the week included 505 tons ferromanganese. Two cargoes of iron pyrites, 8281 tons, were received from Spain. Arrivals of iron ore were 6000 tons from Cuba.

Exports of copper for the week were 790 long tons.

Birmingham

Nov. 4—While there is a general curtailment of production in the Birmingham district, the blowing out of furnaces being an everyday occurrence of late, the iron-makers are being left in such shape that on a moment's notice, a resumption of operation can be had. The iron market is exceedingly quiet. There are no indications of any buying taking place now until toward the end of the year, and it is proposed to make just enough iron to fill orders on hand. In addition to this, there is a railroad-car shortage that is being felt. The conditions in this territory are doubtful. Iron is not being shipped out in great quantity. The shortage of ready cash in the banks brought about a condition that called for great care in handling the situation. It was necessary to issue Eastern exchange, checks, sums ranging from \$5 up. This was used the same as currency in this territory the past week, even in meeting pay rolls. Merchants and dealers throughout the district accepted the exchange the same as currency and so far the tide has been stemmed. The retrenchment policy, because of the financial market, is being pushed rapidly. Two companies, allied concerns, blew out four furnaces in the

past week. Another company stopped all preparations to blow in a furnace.

The production at the Ensley steel plant is heavier right now than it has been in a year. The cast-iron pipe foundries, machine shops and other industries are in the same position almost as the pig-iron makers. The manufacturers of iron are not offering their iron under \$18 per ton, No. 2, foundry, for immediate delivery. No iron is being offered at all under \$17, so far as can be heard.

Chicago

Nov. 4—Small sales continue in the local pig-iron market. The general conditions of business are affecting the market to the extent of cutting prices below the standard quotations that have existed for the last month—\$22.50 for Northern No. 2 and \$18 Birmingham (\$22.35 Chicago) for Southern No. 2—by 50c. or \$1 on many orders. On the greater part of the business done perhaps 50c. less than the quotations would be about the actual price.

Coke is easier, the demand being almost wholly for immediate needs, in small lots. The price remains \$5.90, with the probability that this price will weaken soon, because of the supply and the tendency to make orders as small as possible.

Cleveland

Nov. 5—It is now estimated that the season's movement of ore from the Lake Superior ranges will exceed 41,000,000 tons, and many are predicting 42,000,000 tons. Ore carriers are moving freely and the month's total is already very heavy, with a large fleet now on its way down the lakes. Bad weather has interfered to some extent with the movement. Cars are scarce and the movement of ore from the docks inland is slow. The movement for the month amounted to about 6,250,000 tons but all the figures are not yet in. Most of the ore carriers will be out of commission after this week and there will be a good supply of wild tonnage. Conneaut and Ashtabula broke all records in receipts for the month.

The pig-iron market is reported easier, with little business outside of actual contracts. The following prices are quoted for the balance of the year; Bessemer, \$22.90; No. 1 foundry Northern, \$21.50@22; No. 2, \$21@21.50; No. 3, \$20@21; No. 2 Southern, \$21.35@21.85; gray forge, \$20 @20.50 per ton.

Philadelphia

Nov. 6—If all of the influences and tendencies underlying the pig-iron situation were balanced it would appear that the market is in favor of buyers, and that prices are receding rather than holding their own, and that some of the furnaces which have been blown out within the past few weeks will remain out until

market conditions favor resumption. Some Eastern makers are not attempting to push iron on the market and will probably hold their stocks until they can see a little farther. In consequence of this policy iron has been selling rather slowly and at prices favorable to the buyers. There is scarcely any inquiry this week for iron of any kind for next year's delivery. Prices remain nominal, as they were last week, and the larger makers are not soliciting business. Basic iron will probably be the first to move.

Steel Billets—Billets are weakening and this explains the retail character of recent business. Consumptive requirements are large, but buyers hesitate to purchase in a large way and believe that the situation is working more in their favor.

Scrap—The scrap market is irregular and the holders of scrap are unable to dispose of their stock promptly. Heavy scrap is the only thing that is of interest. Nothing is being done in the lighter kinds. Steel scrap is hard to move at current prices, but the dealers cannot quote anything less if they are to get their money back.

Pittsburg

Nov. 5—There is no improvement in the iron and steel trade and prices in some lines are easier. Production is being curtailed by the closing of several mills. Among the more important are the Bellaire and Columbus works of the Carnegie Steel Company. The four blast furnaces at these places also have been blown out. According to reports today fully 10 blast furnaces in the Pittsburg, Valley and Wheeling districts have been closed since Nov. 1. Others are scheduled to go out of blast shortly. The suspension of operations is being done slowly, but it is figured that a number of large plants will be idle by the first of next month. Shapes and plates still rank among the important lines, and the mills will be kept going steadily the rest of the year. Merchant bars and tin-plate are the weakest of the finished products. Prices of bars continue to be shaded, but tin-plate prices remain unchanged as there is absolutely no demand. The leading interest is operating less than 40 per cent. of its tin-plate mills but is still running about 75 per cent. of its sheet mills. Black sheets are being shaded about \$2 a ton by independent interests, but very little new business is being booked. Small orders in most of the finished lines are received, but there is a notable falling off in specifications. No cancellations of orders are reported but customers are not taking the material as freely as was expected when the orders were taken.

Pig Iron—The announcement this week that the ascertained average of bessemer pig iron for October was \$21.88½, Valley furnaces, shows that during the month sales of 1000 tons or more

were made at a lower price than \$22, which has been given out as the nominal quotation owing to the absence of any transactions. It is evident that some iron sold as low as \$21.50, Valley, but the sales were not made public. Yesterday 100 tons of bessemer sold at less than \$21 at furnace. No. 2 foundry iron for prompt shipment is higher and Valley furnaces are quoting \$21, but no sales are recorded. Gray forge is quoted nominally at around \$19.40, Pittsburg. For basic iron \$19, Valley, can be shaded, but there have been no transactions of any consequence.

Steel—The billet market is considerably disturbed and it is reported that bessemer billets have sold as low as \$27. The nominal quotation is \$28 and \$29 is named for open-hearth billets. While the price fixed by the Carnegie Steel Company for sheet-bars is \$31, it is known that sales are being made at \$1 less. Plates are firm at 1.70c. but merchant steel bars are weak and the regular price of 1.60c. is being shaded.

Sheets—There is no change in the sheet market. Black sheets are still quoted at 2.60c. and galvanized at 3.75c. for No. 28 gage, but some independents are cutting black sheets \$2 a ton.

Ferro-Manganese—Prices have declined, sales having been made during the week at \$53.50@54 per ton.

Metal Market

NEW YORK, Nov. 6.

Gold and Silver Exports and Imports

At all United States Ports in Sept. and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Sept. 1907..	\$ 1,503,836	\$ 2,734,086	Imp. \$ 1,230,250
" 1906..	1,178,922	31,431,038	" 29,152,116
Year 1907..	49,879,813	30,837,287	Exp. 19,042,526
" 1906..	35,789,962	111,776,017	Imp. 75,986,055
Silver:			
Sept. 1907..	6,048,457	3,789,113	Exp. 2,259,344
" 1906..	3,594,311	3,262,559	" 331,752
Year 1907..	47,970,793	34,454,571	" 13,516,222
" 1906..	45,441,339	32,994,069	" 12,447,270

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 Nov. 2 and years from Jan. 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	\$ 610,000	\$ 130,378	\$ 871,120	\$ 43,199
1907.....	34,818,544	8,785,126	44,257,182	2,562,641
1906.....	6,022,183	92,410,135	44,982,510	1,891,080
1905.....	34,430,033	10,405,053	29,319,712	3,805,597

Exports of gold for the week were chiefly to Panama; of silver to London. Imports for the week, both gold and silver, were from Mexico, South America and Japan.

Specie holdings of the leading banks of the world, Nov. 2 are reported as below, in dollars.

	Gold.	Silver.	Total.
Ass'd New York	.....	.....	\$175,913,900
England.....	\$158,646,520	.....	158,646,520
France.....	567,143,850	\$187,520,500	744,664,350
Germany.....	158,245,000	43,850,000	202,095,000
Spain.....	77,915,000	128,185,000	206,100,000
Netherlands....	33,966,500	25,532,500	59,499,000
Belgium.....	15,716,665	7,858,335	22,575,000
Italy.....	180,535,000	24,516,000	205,051,000
Russia.....	627,345,000	26,175,000	653,520,000
Aust.-Hungary.	227,205,000	58,645,000	285,850,000
Sweden.....	21,225,000	.....	21,225,000

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.

Silver Market

SILVER AND STERLING EXCHANGE.

Oct.-Nov.	Sterling Exchange.	Silver.		Nov.	Sterling Exchange.	Silver.	
		New York, Cents.	London, Pence.			New York, Cents.	London, Pence.
31	4.8400	59½	27 1/8	4	4.8650	60½	27½
1	4.8550	59¼	27½	5	.....	.....	28 1/8
2	4.8650	59½	27½	6	4.8575	60½	28

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Shipments of silver from London to the East are reported by Messrs. Pixley & Abell as follows, for the year to Oct. 24:

	1906.	1907.	Changes.
India.....	£ 13,291,696	£9,841,954	D. £ 3,449,742
China.....	430,700	68,400	D. 362,300
Straits.....	1,750	625,950	1. 624,200
Total.....	£ 13,724,146	£10,536,304	D. £ 3,187,842

Imports for the week were £13,000 from New Zealand; £2000 from the West Indies; £165,000 in bars and £15,000 in Mexican dollars from New York.

The director of the mint on Nov. 1 bought 200,000 oz. silver, 100,000 oz. delivered at the Philadelphia mint and 100,000 at the New York assay office. The price paid was 59.891c. per oz., delivered.

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars.....	\$0.47½	\$0.49
Peruvian soles and Chilean.....	0.41	0.46
Victoria sovereigns.....	4.83	4.86
Twenty francs.....	3.87	3.92
Spanish 25 pesetas.....	4.78	4.80

Other Metals

Oct.-Nov.	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.
31	14½	14	66½	32	4.75	5.25	5.10
1	@14½	@14½	67	31½	4.75	@5.30	@5.15
2	14½	14	.....	31½	4.75	5.20	5.05
4	@15	@14½	65½	31½	4.75	@5.25	@5.10
5	.....	.....	65	.....	.....	5.15	5.00
6	@15	@14½	68½	30½	4.75	@5.15	@5.00

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 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.

Copper—The buying movement which we reported in our last issue continued up to the end of last week, but since Monday there has been little doing. The European buyers seem to have covered their requirements for the near future, and the domestic buyers are still generally averse to contracting ahead on account of the disturbed financial conditions, although they have made more or less purchases, particularly of Lake, to supply immediate requirements. At the close the market is quiet at 14¾@15c. for Lake copper, 14@14¼c. for electrolytic in ingots, cakes and wirebars. Business in casting copper has been done during the week at an average of 13¾@14c.

In London a considerable business was done, and a large bear account for early prompts was forced to cover, so that at one time a backwardation of £2 existed. As high as £67 for spot and £65 for three months was done, but toward the close of the week the market declined and it closes at £63 12s. 6d. for spot, £63 for three months.

Refined and manufactured sorts we quote: English tough, £60; best selected, £67; strong sheets, £72.

Statistics for the second half of October show an increase in the visible supplies of 2000 tons.

Copper Sheets and Wire—The base price for copper sheets is 20c. per lb.; of wire, 16½@16¾c. per pound.

Tin—The end of last week the London market showed a fairly firm tone, but since the beginning of this week the advance was not upheld and prices declined continuously till at the close they reach £138 10s. for spot, £140 10s. for three months. Very little business was done in this market, a curious fact being that notwithstanding that London futures are at a premium over spot, just the reverse is the case here; spot tin is at a premium over import prices, while future tin can be bought at a discount. The market closes weak at 30½c. per lb.

Statistics for the month of October show a decrease in the visible supplies of 1000 tons.

Visible stocks of tin reported on Nov. 1 were, in long tons:

	In Store.	Afloat.	Total.
London.....	3,339	4,495	7,834
Holland.....	417	183	600
U. S., exc. Pacific ports....	1,543	1,095	2,638
Total.....	5,299	5,773	11,072

The total shows a decrease of 1472 tons from the October report.

Lead—The price of the American Smelt-

ing and Refining Company for desilverized remains unchanged at 4.75c. New York and 4.67½c. St. Louis, but it is expected that a reduction will be made because this schedule is so much out of harmony with the actual situation. Outside brands have been sold this week at further concessions, transactions having been made at 4.50@4.55c. New York and 4.37½@4.40c. St. Louis.

The European market for lead has been quiet. Lead for near-by delivery continues scarce and at the close £18 is quoted for Spanish lead, £18 2s. 6d. for English lead.

The Broken Hill Proprietary Company during the half-year ended May 31, 1907, sold 24,372 tons lead; 2857 tons in Australia and New Zealand, 4831 tons in China, India and Japan and 16,954 tons in Europe. The trade in the far East is growing, 2850 tons having been sold there in the current half-year up to Aug. 31. Sales to Europe are at the average price ruling during the month of arrival. For all sales to China, Japan and India, also Australia and New Zealand, the price is fixed at time of sale.

Spelter—The market is quiet and there is little demand. The metal has been offered at lower prices and at the close we quote St. Louis 4.95@5c., New York 5.10@5.15 cents.

The London market is unchanged at £21 15s. for good ordinaries, £22 for specials.

Zinc Sheets—The base price is \$7.50 per 100 lb.—less discount of 8 per cent.—f.o.b. cars at Lasalle and Peru. The freight rate to New York is 27.50c. per 100 lb.

Antimony—The market is lifeless both in New York and abroad and there is no demand for the metal. The quotations are, therefore, only nominal, as follows: Cooksons, 11¼@11½c.; Hallett's, 10@10¼c.; ordinary brands, 9¼@9½c.

Nickel—For large lots, New York, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities, 50@65c., same delivery.

Quicksilver—New York prices have advanced considerably. Quotations are \$45 per flask for lots of 100 flasks or over, and \$46 for smaller orders. Retail sales are made at 62@63c. per lb. The London price is £8 5s. per flask, with £8 3s. 9d. quoted from second hands.

Platinum—The market is inclined to be weak in so far as confidence is concerned. Prices, however, have not suffered except in the purchase of scrap. The recent uncertainty in the industrial world, especially among large manufacturing concerns using platinum for electrical purposes, has materially affected the platinum market. Prices are: hard metal, \$29; ordinary, \$26.50; scrap, not more than \$19 per troy ounce.

Minor Metals—For minor metals and their alloys, wholesale prices are, f.o.b. works:

	Per Lb.
Cadmium, 99.5% f. o. b. Hamburg....	\$1.27@1.35
Chromium, pure (N. Y.).....	80c.
Copper, red oxide.....	50c.
Ferro-Chrome (60).....	9c.
Ferro-Chrome (7% carbon, per lb. Cr.)	10¼c.
Ferro-Chrome (66-71% Cr., 6% C.)....	12c.
Ferro-Chrome (66-71% Cr., 6.5% C.)....	11¼c.
Ferro-Chrome (60-70% Cr., 1% C. or less)	38c.
Ferro-Molybdenum (50%).....	90c.
Ferro-Titanium (20%).....	80c.
Ferro-Tungsten (37%).....	30c.
Ferro-Vanadium (25-50% per lb. vanadium contents).....	\$4.50@5.50
Magnesium, pure (N. Y.).....	1.50
Manganese, pure 98@99% N. Y.....	75c.
Manganese-Copper (30@70%) N. Y....	45c.
Molybdenum (98@99%, N. Y.).....	\$1.55
Phosphorus, foreign red (f. o. b. N. Y.)	90c.
Phosphorus, American yellow (f. o. b. Niagara Falls).....	42c.
Tungsten (best) pound lots.....	\$1.10
Ferrosilicon (50%) spot. Ex. ship Atlantic ports.....	\$110 ton.

Variations in price depend chiefly on size and condition of orders.

Imports and Exports of Metals

Copper—Exports of copper from the United States for the nine months ended Sept. 30 are reported as below by the Bureau of Statistics of the Department of Commerce and Labor, in long tons, of 2240 lb. each.

	1906.	1907.	Changes.
Great Britain.....	17,579	12,756	D. 4,823
Belgium.....	1,720	796	D. 924
France.....	26,484	21,204	D. 5,280
Italy.....	5,929	6,113	I. 184
Germany and Holland..	87,402	73,389	D. 14,013
Russia.....	2,757	1,665	D. 1,092
Other Europe.....	8,538	7,835	D. 703
Canada.....	1,469	1,045	D. 424
China.....	1,802	.....	D. 1,802
Other countries.....	172	222	I. 50
Total metal.....	153,852	125,025	D. 28,827
In ores and matte.....	4,564	5,141	I. 577
Total.....	158,416	130,166	D. 28,250

The total decrease was 18.8 per cent. The actual quantity of ores and matte reported this year was 78,703 tons, of which 64,622 tons went to Canada, 13,747 to Mexico, and 334 to Europe.

Imports into the United States of copper and copper material for the nine months ended Sept. 30, with re-exports of foreign metal, are reported as follows; the figures give the contents of all material in long tons of fine copper:

	Metal.	In ore, etc.	Total.
Mexico.....	28,807	12,968	41,775
Canada.....	10,118	3,717	13,835
Great Britain.....	10,750	.....	10,750
Japan.....	2,663	.....	2,663
South America.....	.....	2,554	2,554
Other countries.....	16,856	1,903	18,759
Total imports.....	69,194	21,142	90,336
Re-exports.....	344	.....	344
Net imports.....	68,850	21,142	89,998
Net imports, 1906.....	55,834	17,129	72,963

The total increase in the imports was 17,025 tons, or 23.3 per cent. The actual tonnage of ores and matte imported this year from Mexico was 88,159 tons; from Canada and Newfoundland, 90,410; from South America, 19,226; from other countries, 32,644 tons. Included in the metal receipts from other countries were 5044 tons from Europe and 299 from Cuba.

The exports and net imports compare as follows for the nine months:

	1906.	1907.	Changes.
Exports.....	158,416	130,166	D. 28,250
Net imports.....	72,963	89,988	I. 17,025
Excess, exports.....	85,453	40,178	D. 45,275

The decrease in the excess of exports this year was 53 per cent.

Tin—Imports of tin into the United States for the nine months ending Sept. 30, were as follows, in long tons:

	1906.	1907.	Changes.
Straits.....	10,990	10,451	D. 479
Australia.....	792	522	D. 270
Great Britain.....	20,170	18,421	D. 1,749
Holland.....	386	790	I. 404
Other Europe.....	1,165	871	D. 294
Other countries.....	234	101	D. 133
Total.....	33,677	31,156	D. 2,521

The decrease in the total imports this year was 7.5 per cent.

Lead—Imports of lead into the United States in all forms, with re-exports of imported metal, are reported as below for the nine months ended Sept. 30, in short tons of 2000 lb. each:

	1906.	1907.	Changes.
Lead, metallic.....	10,991	8,169	D. 2,822
Lead in ores and base bullion.....	56,411	47,416	D. 8,995
Total imports.....	67,402	55,585	D. 11,817
Re-exports.....	35,908	35,556	D. 352
Net imports.....	31,494	20,029	D. 11,465

Of the imports this year 42,332 tons were from Mexico and 4768 tons from Canada. Exports of domestic lead were 65 tons in 1906, and 128 tons in 1907; an increase of 63 tons.

Spelter—Exports of spelter, zinc dross and zinc ores from the United States for the nine months ending Sept. 30 are reported as below, zinc ore being in long tons, the others in short tons:

	1906.	1907.	Changes.
Spelter.....	3,622	393	D. 3,229
Zinc dross.....	10,652	8,260	D. 2,392
Zinc ores.....	22,730	13,991	D. 8,739

Imports of spelter for the nine months were 2123 tons in 1906, and 1316 tons in 1907; a decrease of 807 tons. Imports of zinc ore for the three months, July 1 to Sept. 30, were 19,474 tons calamine and 2033 tons other ores; 21,507 tons in all. Previous to July the imports of ores were not reported.

Antimony—Imports of antimony into the United States for the nine months ended Sept. 30 were as follows, in pounds:

	1906.	1907.	Changes.
Metal and regulus.....	5,309,067	6,160,060	I. 850,993
Antimony ore.....	1,470,767	2,475,348	I. 1,004,581

There was a considerable increase in metal, and a large gain in ore.

Nickel—Imports of nickel ore and matte into the United States for the nine months ended Sept. 30 were 11,219 tons in 1906, and 12,143 tons, containing 13,815,477 lb. metal, in 1907. The nickel contents were not reported last year.

Exports of nickel, nickel oxide and nickel matte for the nine months were 8,817,594 lb. in 1906, and 6,979,881 lb. in 1907; a decrease of 1,837,713 lb. this year.

Quicksilver—Exports of quicksilver from the United States for the nine months ended Sept. 30 were 407,619 lb. in 1906, and 345,297 lb. in 1907; a decrease of 62,322 lb. this year.

Platinum—Imports of platinum into the United States for the nine months ended Sept. 30 were 8663 lb. in 1906, and 4799 lb. in 1907; a decrease of 3864 lb. this year.

Aluminum—Exports of aluminum from the United States for the nine months ended Sept. 30 were valued at \$225,410 in 1906, and \$259,984 in 1907; an increase of \$34,574 this year.

British Metal Imports and Exports

Copper—Imports and exports of copper in Great Britain for the nine months ended Sept. 30 were as follows, in long tons, the totals giving the copper contents of all material in long tons:

	1906.	1907.	Changes.
Copper ore.....	71,475	80,235	I. 8,760
Matte and precipitate.....	55,139	54,934	D. 145
Fine copper.....	54,811	49,630	D. 5,181
Total imp., fine copper.....	89,529	85,151	D. 4,378
Exports.....	31,366	37,797	I. 6,431
Re-exports.....	11,563	13,962	I. 2,399
Total exports.....	42,929	51,759	I. 9,830
Balance, imports.....	46,600	33,392	D. 13,208

Of the imports in 1907 the United States furnished 604 tons matte and 14,399 tons copper; against 4589 tons matte and 19,367 tons copper last year.

Tin—Imports and exports of tin in Great Britain for the nine months ended Sept. 30 were as follows, in long tons:

	1906.	1907.	Changes.
Straits.....	26,872	26,700	D. 172
Australia.....	3,418	4,323	I. 905
Other countries.....	2,394	2,023	D. 371
Total imports.....	32,684	33,046	I. 362
Exports.....	6,226	6,636	I. 410
Re-exports.....	24,661	21,819	D. 2,842
Total exports.....	30,887	28,455	D. 2,432
Balance, imp.....	1,797	4,591	I. 2,794

Imports of tin ore and concentrates were 15,958 tons in 1906, and 15,761 in 1907; a decrease of 197 tons. Of these imports this year 12,566 tons were from Bolivia.

Lead—Imports and exports of lead in Great Britain for the nine months ended Sept. 30 were, in long tons:

	1906.	1907.	Changes.
United States.....	14,292	17,503	I. 3,211
Spain.....	84,326	77,325	D. 7,001
Australia.....	39,444	35,420	D. 4,024
Germany.....	13,277	3,309	D. 9,968
Other countries.....	4,627	11,624	I. 6,997
Total imports.....	155,966	145,181	D. 10,785
Exports.....	34,194	34,320	I. 126
Balance, imports.....	121,772	110,861	D. 10,911

The lead credited to the United States is chiefly Mexican lead, refined here in bond.

Spelter—Imports and exports of spelter in Great Britain for the nine months ended Sept. 30 were, in long tons:

	1906.	1907.	Changes.
Spelter.....	66,678	66,221	D. 457
Zinc sheets, etc.....	14,053	13,876	D. 177
Total imports.....	80,731	80,097	D. 634
Exports.....	5,779	4,905	D. 1,474
Balance, imports.....	74,952	75,792	I. 840

Imports of zinc ore are not reported separately.

Quicksilver—Imports of quicksilver into Great Britain, with re-exports of foreign metal, for the nine months ended Sept. 30 were as follows, in pounds:

	1906.	1907.	Changes.
Imports.....	2,822,701	2,917,596	I. 94,895
Re-exports.....	1,538,858	1,773,239	I. 234,381
Net imports.....	283,843	144,357	D. 139,486

The quicksilver imported is chiefly from Spain and Austria.

Wisconsin Ore Market

Platteville, Wis., Nov. 2—The market for 60 per cent. zinc ore fell back to \$40 this week, a decline of \$2 per ton from the price paid last week. The highest price paid for top grades of zinc ore was \$41 per ton. No sales of lead ore were reported during the week just closed.

Shipments from the district for the week ended Nov. 2 were, in pounds:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Benton.....	595,060	.....	.....
Highland.....	448,500	.....	.....
Hazel Green.....	367,500	.....	.....
Platteville.....	462,800	.....	.....
Linden.....	268,650	.....	.....
Elmo.....	175,600	.....	.....
Galena.....	141,950	.....	.....
Livingston.....	105,000	.....	.....
Mineral Point.....	46,400	.....	.....
Cuba City.....	.....	87,900	.....

Total for week..... 2,611,460 87,900

Year to Oct. 26..... 86,748,977 4,290,390 425,700

No shipments were reported from the Rewey or Harker camps for the week.

Missouri Ore Market

Joplin, Mo. Nov. 2—The highest price paid for zinc ore was \$44 per ton, on a base price of \$41 to \$38 per ton of 60 per cent. zinc, averaging, all grades, \$39.10, or \$1.82 per ton decline. The highest price paid for lead was \$51.50 per ton, early in the week, closing tonight at \$42, and averaging \$48.96, or \$2.64 lower than a week ago. The actual decline from one week end to another was over \$10 per ton.

The check-payment system, inaugurated by the banks of the district, to safeguard stripping the district entirely of money, has created a forced shut-down of a number of mines, the employees refusing to work and accept checks in payment of labor, because the banks have announced that they will pay cash only to the amount of 20 per cent. of the face of the check. Hundreds of miners sold their checks tonight at a discount of 20 to 40 per cent. on the face, and talk was rife tonight that there would be an exodus to the West.

Following are the shipments of zinc and

lead from the various camps of the district for the week ending today:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,537,630	1,170,920	\$101,025
Joplin	1,874,090	64,930	39,883
Galena	1,094,200	60,220	21,509
Duenweg	814,590	89,370	18,525
Oronogo	677,810	.....	13,963
Aurora	565,710	13,180	10,773
Prosperity	270,370	105,240	8,038
Badger	295,840	.....	8,203
Granby	490,000	20,000	6,020
Spurgeon	139,230	70,680	3,653
Carthage	141,400	.....	2,969
Alba-Neck City	102,500	.....	2,050
Cave Springs	74,520	4,180	1,468
Playter	74,170	1,200	1,397
Sarcoixie	63,020	.....	1,324
Reeds	53,110	.....	1,062
Stott City	43,250	.....	875
Totals	10,311,490	1,599,920	\$240,737

44 weeks.....504,133,670 75,340,720 \$14,099,074
Zinc value, the week, \$201,563; 44 weeks, \$11,379,594
Lead value, the week, 39,174; 44 weeks, \$2,719,480

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	45.38	May	78.40	79.56
June	43.83	44.82	June	80.96	73.66
July	43.25	45.79	July	74.31	68.18
August	43.56	43.22	August	75.36	69.54
September	42.58	40.11	September	79.64	63.52
October	41.55	39.83	October	79.84	51.40
November	44.13	.....	November	81.98	.....
December	43.68	.....	December	81.89	.....
Year	43.24	.....	Year	77.40	.....

Chemicals

New York, Nov. 6—The general market is without change and little new business is being done. Antimony products are normal, but white arsenic shows a marked tendency to weakness, although prices are not quoted at any reduction. It is predicted, however, that the next few weeks should see a decided drop in price.

Copper Sulphate—There are no new developments in the market and prices remain the same as last week at \$5.50 per 100 lb. for carload lots and \$5.75 for smaller quantities. Exports of copper sulphate from the United States for the nine months ended Sept. 30 were 18,447,942 lb. in 1906, and 6,352,899 lb. in 1907; a decrease of 12,095,043 lb. The exports this year contained approximately 709 long tons of copper.

Nitrate of Soda—There seems to be but little disposition among consumers to purchase for future requirements. Supplies are fairly plentiful and hence the market shows considerable dullness. Prices are as follows: For spot delivery and also for the balance of 1907, 2.37½@2.40c. for 95 per cent.; for 1908, 2.42½c.; for 1909, 2.40c. The price for the 96 per cent. grade, these deliveries, is 5c. per 100 lb. higher.

Imports of nitrate into the United States for the nine months ended Sept. 30 were 270,782 long tons in 1906, and 288,305 tons in 1907; an increase of 17,523 tons.

Phosphates—Exports of phosphates from the United States for the nine months ended Sept. 30 were, in long tons:

	1906.	1907.	Changes.
Crude and rock	753,738	788,395	I. 34,657
All other	20,060	30,177	I. 10,117
Total	773,798	818,572	I. 44,774

The larger exports this year were 232,572 tons to Germany; 143,351 to Great Britain; 109,859 to France; 69,572 to Italy.

Shipments of hard phosphate rock from Florida for the nine months ending Sept. 30 were 453,159 long tons, against 458,675 tons in the same period of 1906, showing a decrease of 37,214 tons. Shipments of land pebble were 395,468 tons during the nine months as compared with 385,840 tons in 1906, an increase of 9628 tons. Tennessee export rock shipped through Pensacola showed a decrease of 15,178 tons, the figures for the three-quarters of 1907 and 1906 being 74,062 and 89,240 tons respectively.

Shipments of Peace river pebble from Florida were 31,719 tons in the nine months of 1907 and 35,662 tons in the same period of 1906, a decrease of 3943 tons.

Sulphur—Imports of sulphur and pyrites into the United States for the nine months ended Sept. 30 were, in long tons:

	1906.	1907.	Changes.
Sulphur	62,835	15,401	D. 47,434
Pyrites	426,238	481,564	I. 55,326

The decrease in imports is due to the utilization of Louisiana sulphur in place of the Sicilian product. Estimating sulphur contents of pyrites, the total imports of sulphur were 233,330 tons in 1906, and 208,027 tons in 1907, a decrease of 25,303 tons.

Heavy Chemicals—Imports of heavy chemicals into the United States for the nine months ended Sept. 30 are reported as follows, in pounds:

	1906.	1907.	Changes.
Bleaching powder	77,419,001	83,082,845	I. 5,663,844
Potash salts	198,613,607	225,279,105	I. 26,665,498
Soda salts	15,206,713	14,331,147	D. 875,566

Exports of acetate of lime for the nine months were 51,620,542 lb. in 1906, and 59,432,727 lb. in 1907; an increase of 7,812,185 lb. this year.

British Chemical Trade—Exports of heavy chemicals from Great Britain for nine months ended Sept. 30 were as follows in cwt. of 112 lb. each:

	1906.	1907.	Changes.
Bleaching powder	729,352	788,555	I. 58,603
Muriate of ammonia	90,191	121,178	I. 30,987
Soda ash	1,219,883	1,531,637	I. 311,754
Bicarbonate of soda	292,532	337,482	I. 44,950
Caustic soda	1,151,308	1,107,987	D. 43,321
Soda crystals	128,389	139,743	I. 11,354
Soda sulphate	719,519	711,086	D. 8,433
Sulphuric acid	70,604	59,927	D. 10,677

Exports of copper sulphate were 40,281 tons in 1906 and 41,681 tons in 1907; an increase of 1400 tons.

Imports of chemicals and raw materials into Great Britain for the nine months ended Sept. 30 were, in long tons:

	1903.	1907.	Changes.
Nitrate of potash	165,301	176,958	I. 11,657
Nitrate of soda	87,508	92,673	I. 5,165
Phosphates	348,073	386,738	I. 38,665
Sulphur	21,073	13,085	D. 7,988
Pyrites	564,080	576,586	I. 12,506

Estimating sulphur contents of pyrites the total imports of sulphur were 246,705 tons in 1906, and 243,721 tons in 1907; a decrease of 2984 tons.

Mining Stocks

New York, Nov. 6—Stock Exchange movements during the week have been of little significance so far as the daily quotations have been concerned. The large imports of gold arranged for have been an encouraging feature so far as money market conditions are concerned. The holiday on Tuesday gave an opportunity for conference and it is understood that some arrangements were made to strengthen the position of banks and trust companies, the effect of which may be apparent later. Some outside buying of securities has been reported, but not enough to have any marked effect on the market. The situation is not sufficiently cleared as yet to permit the market to right itself.

On the curb market the transactions continue moderate, and prices variable. The copper shares were firmer, as a rule, but not active.

The most important event of the week has been the transfer of control of the Tennessee Coal, Iron and Railroad Company to the Steel Corporation, which is referred to elsewhere. One effect will probably be to take Tennessee stock out of the speculative market.

Boston

Nov. 5—Copper mining shares are doing better. Forced liquidation has cleaned and trading has quieted down, which is a favorable feature, with money so stringent as it is at present. Along with other cities the banks here are using clearing-house certificates to pay balances and so far \$7,320,000 have been issued. Odd-lot buying has been a marked feature of the week's doings. The wage cut announced by various mines, it is estimated, is equivalent to 1c. a pound in the cost of production which is quite an item. The trend of prices has followed the movements of Amalgamated pretty closely. This stock had a \$4 range in this market during the week, varying from \$52.50 to \$48.50 and closing \$1 above last week at \$51. Copper Range and North Butte also show marked improvements. The former rose \$4 to \$54.50 and the latter \$5 to \$44.

The high-grade copper shares also held well. Calumet & Hecla is \$610; Osceola is up \$4 to \$82; Quincy \$4 to \$80; and Wolverine rose \$5 to \$110. Tamarack is firm at \$65 and Calumet & Arizona is up \$5 to \$105. Mohawk is \$1.50 higher

at \$46.30, Old Dominion, \$1.87½ higher at \$23.37½ and Utah Consolidated \$2.75 higher at \$33.75. United States Smelting rose sharply to \$30.75, having touched \$27.50 a few days previous and the preferred rose \$4.50 to \$38. Atlantic is \$2 higher for the week at \$11; Allouez \$1.50 at \$23.50; Centennial \$1.75 at \$21.50; Isic Royale \$2.37½ at \$16.87½; Parrot \$1, at \$11, and Shannon also \$1 at \$11. The latter company opened its transfer books Nov. 4, to facilitate the transfer of stock, owing to the purchase of many odd lots Parrot Copper directors are not expected to declare a dividend at their meeting next month. The company, an Amalgamated subsidiary, has been paying 25c. quarterly. The curb has been quiet and steady.

STOCK QUOTATIONS

NEW YORK Nov. 4		BOSTON Nov. 4	
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine.....	1	Adventure.....	1
Am. Nev. M. & P. Co.....	50%	Allouez.....	23
Amalgamated.....	33%	Am. Zinc*.....	22½
Anaconda.....	33%	Arcadian.....	3½
Balaklala.....	4	Atlantic.....	10
British Col. Cop.....	4½	Bingham.....	6½
Buffalo Cobalt.....	1½	Boston Con.....	12
Butte & London.....	¾	Calumet & Ariz.....	104
Butte Coalition.....	15½	Calumet & Hecla.....	610
Butte Cop. & Zinc.....	1	Centennial.....	21
Cobalt Contact.....	1	Con. Mercur.....	25
Colonial Silver.....	1	Copper Range.....	54½
Cum. Ely Mining.....	5½	Daly-West.....	10½
Davis Daly.....	4½	Franklin.....	7½
Dominion Cop.....	14½	Greene-Can.....	6
El Rayo.....	2½	Isle Royal.....	16½
Foster Cobalt.....	70	La Salle.....	9½
Furnace Creek.....	20	Mass.....	9
Giroux Mine.....	3½	Michigan.....	9
Gold Hill.....	7½	Mohawk.....	46
Granby, New.....	¾	Mont. C. & C. (new).....	7½
Greene Gold.....	¾	Nevada.....	7½
Greene G. & S.....	¾	North Butte.....	44
Greenw'r & D. Val.....	75	Old Colony.....	21
Guanajuato.....	2½	Old Dominion.....	23½
Guggen. Exp.....	120	Oscoda.....	81
Hanapah.....	35	Parrot.....	107½
McKinley Dar.....	¾	Phoenix.....	75
Micmac.....	3	Quincy.....	79
Mines Co. of Am.....	1½	Rhode Island.....	10
Mitchell Mining.....	1½	Santa Fe.....	10
Mont. Sho. C. (New).....	2½	Shannon.....	10½
Nev. Utah M. & S.....	7½	Tamarack.....	65
Newhouse M. & S.....	6½	Trinity.....	11½
Nipissing Mines.....	7%	United Cop., com.....	11
Old Hundred.....	6½	U. S. Oil.....	8½
Silver Queen.....	¾	U. S. Smg. & Ref.....	30½
Stewart.....	½	U. S. Sm. & Re. pd.....	38
Tennessee Cop'r.....	25	Utah Copper.....	33½
Union Copper.....	2½	Victoria.....	4½
Utah Apex.....	2%	Washington.....	105
West Columbus.....	11	Winona.....	3
		Wolverine.....	105
		Wyandotte.....	105

N. Y. INDUSTRIAL	
Name of Comp.	Clg.
Am. Agri. Chem.....	13½
Am. Smelt. & Ref.....	68½
Am. Sm. & Ref., pf.....	85½
Bethlehem Steel.....	8½
Colo. Fuel & Iron.....	16½
Federal M. & S., pf.....	55
Inter. Salt.....	11
National Lead.....	36½
National Lead, pf.....	36½
Pittsburg Coal.....	14½
Republic I. & S.....	57½
Republic I. & S., pf.....	57½
Sloss-Sheffield.....	33½
Standard Oil.....	392
Tenn. C. & I.....	135
U. S. Red. & Ref.....	135
U. S. Steel.....	24½
U. S. Steel, pf.....	84½
Va. Car. Chem.....	13½
Va. I. Coal & Coke.....	32½

ST. LOUIS Nov. 2	
N. of Com.	High. Low.
Adams.....	.40 .25
Am. Nettle.....	.03 .02
Center Cr'k.....	2.25 2.00
Cent. C. & C.....	67.00 65.00
C. C. & C. pd.....	77.00 75.00
Cent. Oil.....	125.00 110.00
Columbia.....	4.00 2.00
Con. Coal.....	27.00 25.00
Doe Run.....	140.00 125.00
Gra. Bimet.....	.30 .25
St. Joe.....	15.00 13.00

NEVADA STOCKS. Nov. 6. Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.	Name of Comp.	Clg.		
TONOPAH STOCKS					
Belmont.....	1 12½	Golden Sceptre.....	..		
Extension.....	1.25	Homestake King.....	.50		
Golden Anchor.....	.04	Montgomery Mt.....	.04		
Jim Butler.....	.46	Mont. Shoshone C.....	4 75		
MacNamara.....	.17	Original Bullfrog.....	.03		
Midway.....	.45	Tramp Cons.....	.19½		
Montana.....	1.40	MANHAT'N STOCKS			
North Star.....	.08	Manhattan Cons.....	.27		
Tonopah & Cal.....	..	Manhat'n Dexter.....	.09		
Tono'h Mine of N.....	7.75	Jumping Jack.....	.10		
West End Con.....	.40	Stray Dog.....	.10		
		Indian Camp.....	.06		
GOLDFIELD STOCKS					
Adams.....	.05	GREENW'R STOCKS			
Atlanta.....	.22	Furnace Creek.....	.25		
Blue Bell.....	.07	Greenwater & D.V.....	.06		
Blue Bull.....	.16	Green'r Cop. M. & S.....	.06		
Booth.....	.20	United Greenw'r.....	.05		
Columbia Mt.....	.18	MISCELLANEOUS			
Comb. Frac.....	.87	Golden Boulder.....	.20		
Cracker Jack.....	.07	Hay-ceed.....	.30		
Dia'dfield B. B. C.....	.15	Lee Gold Grotto.....	.14		
Goldfield Belmont.....	.16	Nevada Hills.....	3 50		
Goldfield Con.....	4.06½	Nevada Smelting.....	1 00		
Goldfield Dalsey.....	.75	Pittsburgh S. Pk.....	1 10		
Goldfield Mining.....	..	Round Mt. Sphinx.....	.30		
Great Bend.....	.29	COLO. SPRINGS Nov. 2			
Jumbo Extension.....	.76	Name of Comp.		Clg.	
Jumbo Mining.....	..	Acacia.....	..		
Katherine.....	.06	Black Bell.....	..		
Kendall.....	.10	C. C. Con.....	4		
Laguna.....	..	Dante.....	5½		
Lone Star.....	.08	Doctor Jack Pot.....	6½		
Lou Dillon.....	.06	Elkton.....	49		
May Queen.....	.07	El Paso.....	37		
Mohawk.....	..	Flindlay.....	40		
Oro.....	.09	Gold Dollar.....	6½		
Red Hill.....	.23	Gold Sovereign.....	3½		
Red Top.....	..	Isabella.....	29½		
Roanoke.....	.08	Index.....	..		
Sandstorm.....	.17	Jennie Sample.....	..		
Silver Pick.....	.24	Jerry Johnson.....	..		
St. Ives.....	.34	Mary McKinney.....	..		
Triangle.....	.06	Pharmacist.....	3		
BULLFROG STOCKS					
Amethyst.....	..	Un. G-ld Mines.....	80		
Bullfrog Daisy.....	..	Windicator.....	80		
Bullfrog Mining.....	.04	Work.....	15		
Bullfrog Nat. B.....	.09				
Gibraltar.....	.13				
Gold Bar.....	.37				

Assessments

Company.	Delinq.	Sale.	Amt.
Alturas, Ida.....	Nov. 8	Nov. 29	\$0.02
Andes, Nev.....	Oct. 30	Nov. 20	0.10
Del Monte, Cal.....	Nov. 20	Dec. 11	10.00
Diamond Creek, Cal.....	Oct. 20	Nov. 26	0.02
Dollarhide, Ida.....	Nov. 8	Nov. 29	0.02
Emerald, Utah.....	Dec. 14	Jan. 11	0.01
'49 Gold Placer, Ut.....	Nov. 13	Dec. 6	0.02
Herkimer Gravel, C.....	Oct. 7	Dec. 28	0.03
Homerite, Utah.....	Dec. 7	Jan. 11	0.45
La Palma, Mex.....	Oct. 26	Nov. 26	0.08
New Bunker Hill, C.....	Oct. 31	Nov. 21	0.05
Overman, Nev.....	Oct. 23	Nov. 13	0.05
Patosi, Nev.....	Oct. 29	Nov. 21	0.10
Patterson Creek, Ca.....	Oct. 19	Nov. 11	0.01
Pitts. C. M. & M., U.....	Nov. 4	Nov. 25	0.01
Provident Oil Mfg., Ca.....	Dec. 7	Dec. 27	0.01½
Redfield, Cal.....	Oct. 21	Nov. 11	0.01½
Sorba G. & S., Utah.....	July 30	Nov. 2	0.10
Trade Dol. Ex., Ida.....	Nov. 4	Nov. 20	0.01
Union Con.....	Nov. 15	Dec. 6	0.10

New Dividends

Company.	Payable.	Rate.	Amt.
Alaska Mexican.....	Oct. 28	\$0.50	\$90,000
Alaska Treadwell.....	Oct. 28	1.00	200,000
Am. Zinc, Lead & Smg.....	Nov. 1	0.50	40,000
Batopilas.....	Dec. 31	0.12½	56,250
Doe Run.....	Nov. 15	0.60	29,531
Goldfield Con.....	Nov. 15	0.10	500,000
Herla.....	Oct. 19	0.02	20,000
Jamison.....	Oct. 15	0.02	7,800
Mammoth.....	Oct. 25	0.05	20,000
May Day.....	Oct. 24	0.01½	12,000
Mexican Lead, pd.....	Nov. 1	3.50	43,750
N-whouse.....	Nov. 20	0.50	300,000
New River Coal, pd.....	Nov. 1	1.50	56,426
North Star.....	Oct. 1	0.20	50,000
Penn. Steel, pd.....	Nov. 1	3.50	588,749
Portland.....	Oct. 15	0.04	120,000
Rio Tinto, com.....	Nov. 1	0.60	375,000
Rio Tinto, pd.....	Nov. 1	51.40	4,273,000
U. S. C. I. Pipe & Fdy., com.....	Dec. 2	1.00	125,000
U. S. C. I. Pipe & Fdy., pd.....	Dec. 2	1.75	218,750
U. S. Smg., Ref. & Mg., com.....	Nov. 1	0.87½	304,646
U. S. Smg., Ref. & Mg., pd.....	Nov. 1	0.87½	656,250
U. S. Steel Corp., com.....	Dec. 30	0.50	2,451,513
U. S. Steel Corp., pd.....	Nov. 30	1.75	6,905,497
Warwick I. & S.....	Nov. 15	0.30	43,674

Monthly Average Prices of Metals AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January.....	65.288	68.673	30.113	31.769
February.....	66.108	68.835	30.464	31.852
March.....	64.597	67.519	29.854	31.325
April.....	64.765	65.462	29.984	30.253
May.....	66.976	65.381	30.968	30.471
June.....	65.394	67.090	30.185	30.893
July.....	65.105	68.144	30.113	31.366
August.....	65.949	68.745	30.529	31.637
September.....	67.927	67.792	31.483	31.313
October.....	69.523	62.435	32.148	28.863
November.....	70.813	..	32.671	..
December.....	69.050	..	32.003	..
Year.....	66.791	..	30.868	..

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

Month.	NEW YORK.		LONDON.	
	Electrolytic	Lake.	1906.	1907.
January.....	18.310	24.404	18.419	24.825
February.....	17.869	24.869	18.116	25.236
March.....	18.361	25.065	18.641	25.560
April.....	18.375	24.224	18.688	25.262
May.....	18.475	24.048	18.724	25.072
June.....	18.442	22.665	18.719	24.140
July.....	18.190	21.130	18.585	21.923
August.....	18.380	18.356	18.706	19.255
September.....	19.033	15.565	19.324	16.447
October.....	21.203	13.169	21.722	13.551
November.....	21.833	..	22.398	..
December.....	22.885	..	23.350	..
Year.....	19.278	..	19.616	..

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1906.	1907.	Month.	1906.	1907.
January.....	36.390	41.548	July.....	37.275	41.091
February.....	36.403	42.102	August.....	40.606	37.667
March.....	36.602	41.313	September.....	40.516	36.689
April.....	38.900	40.938	October.....	42.852	32.620
May.....	43.313	43.149	November.....	42.906	..
June.....	39.260	42.120	December.....	42.750	..
			Av. year.....	39.819	..

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January.....	5.600	6.000	16.850	19.828
February.....	5.464	6.000	16.031	19.531
March.....	5.350	6.000	15.922	19.708
April.....	5.404	6.000	15.925	19.975
May.....	5.685	6.000	16.769	19.688
June.....	5.750	5.760	16.819	20.188
July.....	5.750	5.288	16.525	20.350
August.....	5.750	5.250	17.109	19.678
September.....	5.750	4.813	16.266	19.765
October.....	5.750	4.750	19.350	18.531
November.....	5.750	..	19.281	..
December.....	5.900	..	19.609	..
Year.....	5.657	..	17.370	..

New York, cents per pound. London, pounds sterling per long ton.

AVERAGE PRICE OF SPELTER

MONTH.	New York.	
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