The Engineering and Mining Journal

VOL. LXXXIII. NEW YORK, MARCH 16, 1907. NO. 11.

The Low-grade Copper Deposits at Ely, Nevada

Steam Shovels Will Be Used in Working These Extensive Orebodies. Concentrating and Smelting Works Will Treat 5000 Tons Per Day

BY WILLIAM STARR BULLOCK

Ely, Nevada, which is now attracting such attention throughout the mining field because of the rapid development of its enormous low-grade sulphide deposits, is in White Pine county, not many miles from the Utah line. The town itself lies in the beautiful Steptoe valley at the mouth of Robinson cañon. Throughout the latter, in a belt at present estimated to be approximately 12 miles east and west, an immense porphyry intrusion cuts through the country shale and limestone of the district.

The surface outcrops are badly weathered, and the leached zone seems to extend in depth from 100 to 250 or 275 ft., so far as present workings indicate. Chalcopyrite and chalcocite are the most frequent ores encountered, although bornite. in comparatively small pockets, is more common than in most copper-bearing orebodies.

It is the belief of engineers thoroughly familiar with the district that values will not persist for more than 400 or 500 ft. below the zone of oxidation; but so extensive are the orebodies laterally that they may not be exhausted for generations.

In few cases are the walls of the orebodies clearly defined; and on the borders of the ore zone values are reduced gradually below the limit of pay ore. The formation of the deposits is generally loose, and although timbering is required in nearly all of the workings, the ore is very easily drilled and shot. The cost of operating, after having actually located the ore shoot, should be comparatively low.

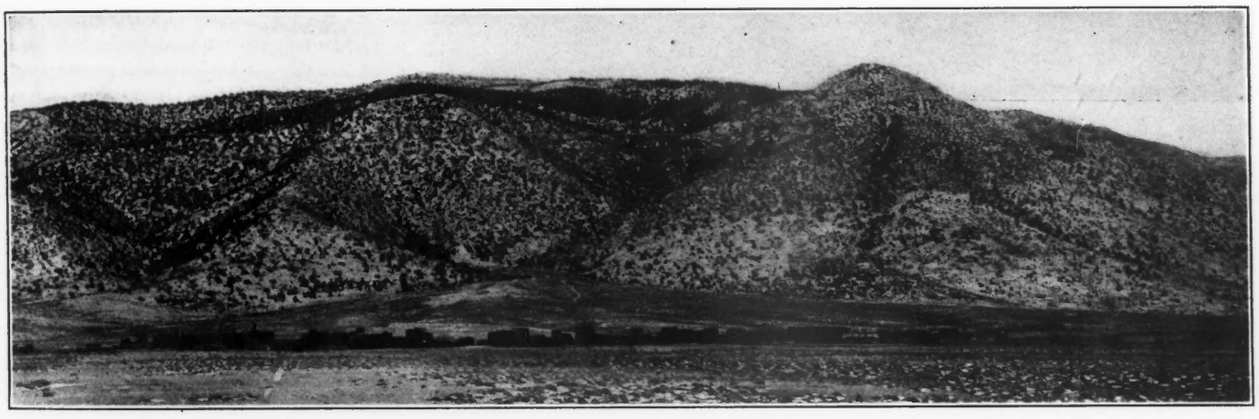
The Veteran Workings

To date the best developed properties in the Robinson district are those of the Cumberland Ely Copper Company and the Nevada Consolidated Copper Company. Each of these holdings is considerably over 1000 acres in extent. Four shafts are now down on various portions of the Cumberland Ely ground, and development work is going forward rapidly. The company's Veteran workings are a mine in themselves. Here are found some of the best values in the district, assays from the Manhattan drift, running off from the main tunnel at the 166-ft. level, showing from 5 to 9 per cent. copper and about $2 gold.

At the 360-ft. level of the main shaft drifts have been run for over 500 ft., north and south, and for 175 ft. east and west. Each of these drifts is in ore all the way, and although millions of tons have been blocked out, the extent of the orebody here can only be surmised. It is little more than a year ago since active development work was undertaken on the Veteran, but for the time elapsed this has been one of the most successful propositions in the entire district.

Assay values at the Veteran in its lower workings run from 2½ to 3 per cent. In the Ada and Jupiter shafts of the Cumberland Ely Company values are slightly lower. An average in either of these two mines is hardly above 2¼ per cent. In the Jupiter drifts more or less limestone is encountered, and dikes of leached porphyry are occasionally in evidence. It would seem, therefore, that these workings are still somewhat above the pay ore which in this locality is probably some 500 ft. below the surface.

The "Wedge" shaft, which is now being put down at a point about half a mile from the Jupiter, and midway between it and the Ada shaft, has cut into a good showing of copper sulphides at the 95-ft. level. The collar of the Wedge shaft is several hundred feet lower down in the gulch than the shaft-houses of either the Ada or the Jupiter. It seems probable that the orebody dips under the hill from the Wedge, in the direction of the other shafts.



SITE FOR SMELTING WORKS, MC GILL, NEVADA

Nevada Consolidated

The workings of the Nevada Consolidated are three—the Ruth, the Star Pointer and the Eureka. In June, 1904, J. Parke Channing made a report of the company's holdings, and again in July, 1905, visited the property and examined its development work. At this time he reported an abundance of ore, urged the construction of a railroad to connect Ely with the Southern Pacific system, 140 miles to the north, and suggested the installation of a concentrating and smelting plant capable of treating 1000 tons of ore per day.

Today the railroad from Ely to Cobre, on the Southern Pacific, is an established fact. The Nevada Consolidated properties have, according to estimates more

than sixty million tons of material blocked out, and a concentrating and smelting plant with a daily capacity of 10,000 tons is in process of erection.

The Ely to Cobre Railroad

The railroad runs all its way through Steptoe valley, which is almost as level as a billiard table, and varies from seven to ten miles in width between imposing mountain ranges. Throughout its entire length, there is neither cut, fill nor trestle of any magnitude, and little ballasting was necessary. The line is being rapidly pushed forward west of Ely through the Robinson cañon to connect with the mines. Here some tunneling and considerable filling is necessary. Taken as a whole, however, the Nevada Northern is built on one of the best natural roadbeds of the entire West.

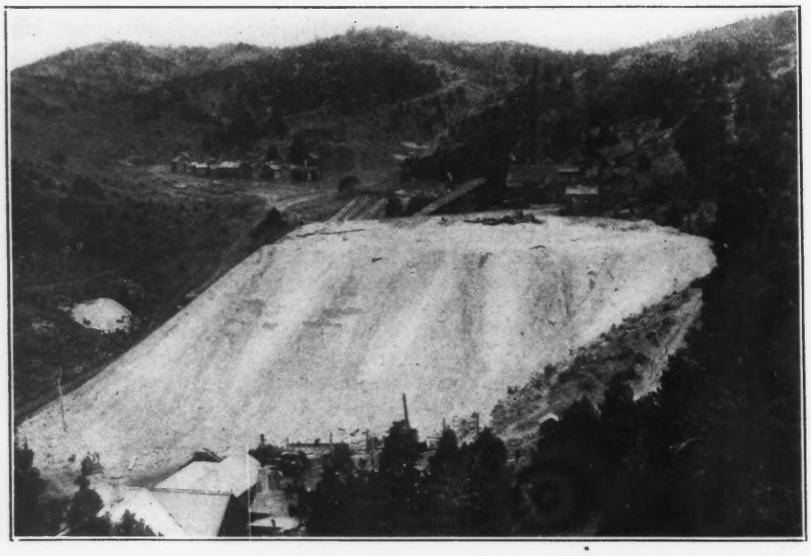
Already the road is bringing in large quantities of supplies, machinery and equipment for the mines, and for the new city which is rapidly coming into existence. Within two months the Western Pacific will tap the Nevada Northern, and establish a through Pullman service from Salt Lake City. The Clark lines are pushing east from Goldfield and Tonopah, with Ely as an objective point, and still another line is being surveyed from the South.

Operations on a Large Scale

Probably never before in the entire history of mining in the United States have such large sums of money been put in the work of development and preparation in so limited a period, as is the case in Ely. Some of the largest financial interests in the East are putting millions of dollars into the work of development of the Nevada Consolidated and the Cumberland Ely mines, the Nevada Northern Railroad and the mammoth concentrating and smelting plant, all of which properties are jointly owned by the two companies instanced. Millions more are waiting investment here as soon as the opportunity offers. The proposition is really commercial, rather than mining, in many of its aspects, for there is no question of ore. It is simply a question of the difference between the cost of mining and smelting and the market value.

Steam-shovel Mining

When the railroad is completed up the gulch to Copper Flat, daylight mining by means of steam shovels will be undertaken at the Eureka mine of the Nevada Consolidated on a very extensive scale. Over 3000 ft. of drifts and tunnels have developed "ore in sight" on the Eureka property. By the use of a battery of ten-ton steam shovels the mountain side can be torn away at a rate which will make the 80,000-ton ore dump of the Eureka look insignificant by comparison. Very probably better results from steam-shovel work can be obtained in the Ely district than at the Utah Copper Company's Bingham mine, in Bingham Cañon. The formation here, although in many ways similar, is easier to work.

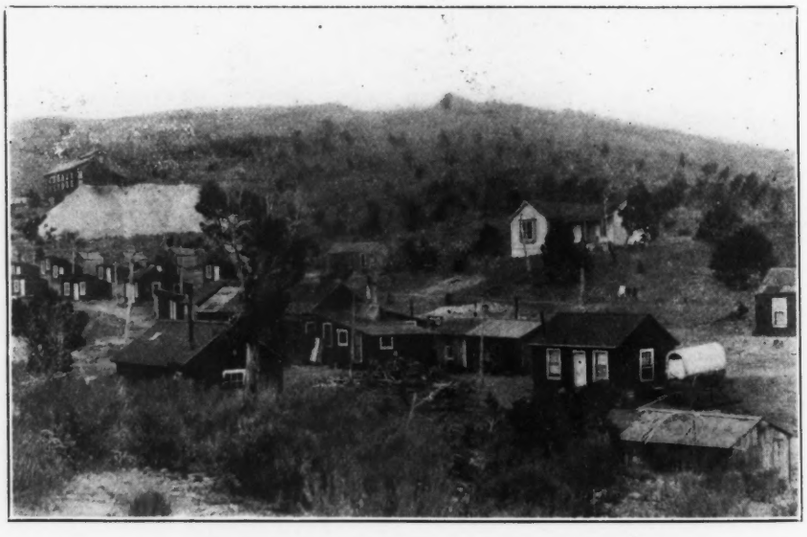


RUTH ORE DUMP AND SHAFT HOUSE

The Ruth Mine

The Ruth mine is well developed; and its orebody is uniform for hundreds of feet along the main tunnel and in the drifts. The dump here is the largest in the district, and contains over 100,000 tons of ore. The shaft is driven in the hillside at about a 35 per cent. incline, and at the 600-ft. level the main tunnel extends through the orebody for over 2000 ft. Shaft, tunnel and drifts are well timbered. The Ruth tunnel is now being extended toward the Star Pointer mine on the other side of the hill, and will connect with a drift coming in the opposite direction from the 280-ft. station of the Star Pointer shaft. This shaft is the largest mine shaft in the State. It has four compartments and is 25½ by 5½ feet within timbers.

Only about 1200 ft. more of tunneling remains to be done to connect the two shafts. When this is completed, an electric tram system will be installed and the ore on the Ruth dump and from the mine workings will be trammed to the crushing plant, shortly to be installed at the Star Pointer shaft. Drifts from the upper levels of the Ruth have encountered leached ore within 100 or 200 ft. of the station; but the commercial orebody is considerably over 200 ft. in depth, and it will last for many years. Average assay values here are slightly in excess of 2.7 per cent. copper, with traces of gold and silver.



EUREKA ORE DUMP AND CAMP, COPPER FLAT

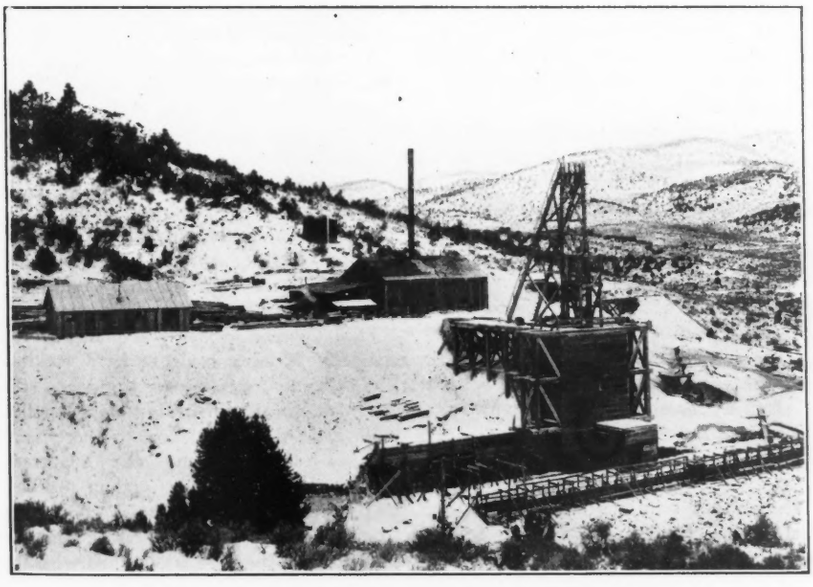
From the hill top between the Ruth and Star Pointer can be seen the shaft-houses of the Eureka, Bunker Hill, Bee Hive,

Giroux and Alpha mines to the west, and just over Pilot Knob the Veteran workings. Looking easterly from the same eminence, one notes the Ruth, Jupiter and the Wedge properties. All of these workings are within a belt less than one-half a mile wide, north and south, and over six miles from east to west. There seems to be little question that the underlying orebody is practically continuous throughout this belt, and that the great bulk of it contains commercial ore. While this is by no means the extent of the ore zone, it seems to be the most productive section of it which has thus far been developed.

The Smelting Works

The completion of the smelter, the first unit of which will probably be in operation before the end of the year, makes it possible to handle profitably many thousand tons of ore which otherwise would be valueless from a commercial standpoint. The smelter site is 14 miles north of Ely on the eastern slope of Steptoe valley. The natural water supply at hand is amply sufficient to treat over 25,000 tons of ore per day.

In order to avoid complications similar to those which have arisen at Butte and Bingham about the question of smoke nuisance and water pollution, the company purchased over 8000 acres of land. The site is ideal for a reduction plant, and every economy which engineering skill can devise has been considered in the layout of the works.



STAR POINTER SHAFT, NEVADA CONSOLIDATED MINES

An idea of the ground area covered may be gathered from the fact that the concentrating mill is more than a mile from the smelter, and that $20,000 worth of copper cable for power transmission will be used between the two structures. Over 12 miles of standard railroad tracks will be put down in the smelter yards.

The smokestack is to be 550 ft. in hight, the tallest in the country, and will be 23 ft. inside diameter at the top. The dust chambers between the smelter and the stack are 50x150 ft., and the dust flues 16x19 ft. inside and 1600 ft. in length. The first unit of the power plant will include two 1500-kw. General Electric generators, two 750-kw. Bullock generators, one 60,000-cu.ft. and one 12,000-cu.ft. blower, and one 1000-cu.ft. high-pressure air compressor. In addition there will be eight 400-h.p. Babcock & Wilcox boilers equipped with Sturtevant forced-draft fan blowers. The condensers and air pumps will be on a proportionately extensive scale.

The Concentrating Plant

The first unit of the concentrating plant will include 120 Wilfley tables, 96 Frue vanners, 8 Huntington mills, 6 sets of rolls and 24 trommels. The concentrator, smelter, power plant and all other units of the plant will be so constructed that the capacity can be doubled in the most economical manner. The first unit of the plant will be capable of handling approximately 5000 tons of ore per day, and by the time it is in operation the mines will be in readiness to furnish fully that amount regularly.

VETERAN MINE CAMP, CUMBERLAND-ELY MINES

The smelter plant will furnish electric power to the mines, 22 miles distant, over a transmission line carrying 40,000 volts.

History of the Camp

Ely has been known as a mining camp for over 40 years. Following the silver excitement at Hamilton, some 50 miles distant, in the early 60's, dozens of prospectors drifted in to Robinson cañon in search of gold and silver. Their methods were crude, they had a constant struggle for existence, and fortunes did not result

The history of the camp for the next 35 years is rather a disappointment. A few who stuck to the district located fairly good claims and at times the camp seemed prosperous, but values did not hold and so much copper was encountered as to make cyaniding a failure. The existence of the copper deposits here has been known for years, but their extent was never realized until early in the present century. Further than this the ores were mostly of low grade, the question of transportation was an unsolved problem, and it required both time and money to determine the extent and richness of the mineral zone.

Today the orebodies have been explored, transportation established, concentrating and smelting provided for and every economy installed that modern engineering skill could devise. The district is now entering upon an era of prosperity which seems destined to continue for many years to come.

Electrolytic Precipitation of Cyanide Solutions

The Process Perfected at the San Sebastian Mine, San Salvador, Yields Fine Gold and Separates the Copper in a Marketable Form

BY CHARLES P. RICHMOND*

At the San Sebastian mine, located near Santa Rosa, in the republic of Salvador, and belonging to the Butters Salvador Mines, Ltd., of London, an improvement on the Siemens & Halske method of electrical precipitation is successfully used. It is particularly adapted to the very refractory nature of the ore, which is a complex mixture of sulphides, in which at least four distinct minerals have been identified: pyrite; marcasite; a mineral similar to enargite, but containing antimony—determined qualitatively only; copper, 38 per cent.; sulphur, 26 per cent.; arsenic, 9 per cent.; telluride of copper, rickardite; copper, 40 per cent.; tellurium, 56.5 per cent., with silica, sulphur, and antimony present in small quantities.

Silver is present in the ore in very small quantities. Free gold, in the unoxidized zone, is of common occurrence, but the greater part is combined with the telluride and sulphide. Telluride of gold undoubtedly exists, but is so finely disseminated and obscured that absolute identification is lacking. The quantity of copper varies and apparently bears no close relation to the gold content. The amount extracted by cyanide averages from 1.5 to 2.5 lb. av. per ton of ore treated.

Course of Ore Through the Mill

The cycle of the ore from the time it reaches the mill may be briefly given, as follows: Breaking in Blake-Marsden crushers; drying in rotary dryer; crushing in No. 5 Krupp ball mills to 40 mesh; roasting in Jackling furnaces—which reduces the sulphur from 3.5 to 0.25 per cent.; elevation of roasted ore with weak cyanide solution to sand collecting tanks; separation of sand and slime; agitation and filter-box treatment for slime; gravity percolation for sand, and recovery of gold and copper by means of combined electrical and zinc precipitation.

The gold extraction has averaged 95 per cent. during the period of operation, about four years. The only drawback to the process was the poor character of the product obtained for shipment. The gold and incidentally the copper, were precipitated on lead foil cathodes. Cupellation refining was impossible because of the large excess of copper, hence these cathodes were milled, sampled and shipped to the smelters. The average composition of the product was: Gold, 3.73 per cent.; copper, 65 per cent., and the remainder lead from the cathode.

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The smelters paid nothing for the copper and lead, and only 32s. 6d. per fine oz. for the gold.

Tinned iron cathodes, similar to those in use at the Charles Butters & Co., Ltd., Minas Prietas and Virginia City plants, where the slimy low-grade precipitate is recovered from the bottom of the boxes, had already been tried at this plant, and were discarded in favor of lead foil for two reasons; first, because of the excessive quantity of gold necessary to coat the plates before any values would slime to the bottom; and second, because of the difficulty and loss in scraping off the dense hard deposit of gold and copper.

The Improved Product

It was left to the writer to overcome these objectionable features by obtaining a product on which full value could be realized. This product has been successfully produced and at present the gold, copper and lead are sufficiently separated to bring their respective values.

The gold precipitate, separated from the copper and lead, is melted into bars 750 to 850 fine at a cost of 1 penny per fine ounce of gold. These bars are shipped to the refiners and realize 84s. 11½d. per fine ounce, less a charge of 2 pence per bullion ounce for refining.

The copper is shipped to the smelters as copper cement and brings prevailing prices, also a return for the small amount of gold which it contains.

The lead cathodes, not being destroyed, are returned to the precipitation boxes for further use.

The purpose of this article is to detail how these results are obtained, that they may be intelligently utilized if required. To do this it is necessary to describe first the electric process as improved by Charles Butters and installed at this plant.

Electrical Precipitation

The cyanide solutions first entering the electrical precipitation box contain an average of 16.0 dwt. gold per ton, and flow through at the rate of 150 tons per 24 hours. The box is 30 ft. long 10 ft. wide and 4 ft. 8 in. deep, as shown in Fig. 1, with a bottom slope of 1 in. to the foot. It is divided by weir partitions into twelve compartments, ten of which are used to precipitate, while the last two settle the solution preparatory to entering the zinc boxes. Each compartment contains 25 anodes and 24 cathodes. The anodes are rolled lead plates ⅛ in. thick 22 in. wide and 4 ft. long.

To protect the lead plates from the combined action of the current and the cyanide solution, they are first peroxidized in a solution of permanganate of potassium, with or without the addition of sulphuric acid. Experiments are now being tried with plates peroxidized in the following bath: permanganate of potash, 1 per cent.; sulphuric acid, 2 per cent.; current strength, 2½ amp. per sq.ft.; time under current, 6 hours.

The average life of an anode is from 8 to 12 months. The chemical action which finally destroys them does not appear to result in a dissolving or wasting away of the lead, but apparently is an oxidizing effect by which the lead is slowly converted into peroxide. The final result is complete disintegration. The disintegrated anodes are smelted in a small cupola furnace, and a pair of rolls will soon be installed for making new plates.

For the old lead-foil cathodes previously used have been substituted lead plates of the same size but 1/16 in. in thickness. These cathodes receive no preliminary treatment.

Electrical connection to the plates is made by means of cast-lead lugs to which is soldered the copper wire. They are then inserted in a wooden head and secured with wooden pegs. They hang in the box, 3 in. apart, the extension of the wooden head resting upon two horizontal strips nailed to the sides of the compartments. The 10 compartments are connected in series, the current strength being one amp. per sq.ft. of anode surface, with resistance from 4.0 to 4.5 volts for each compartment.

The gold and copper precipitate on the cathodes, forming a dense hard coating. There is no tendency to slime and the cathodes can be lifted out and handled with little danger of loss. There is a gradual accumulation of low-grade precipitate on the anodes and in the bottom of the box with a gold content of from 5 to 50 oz. per ton. With this one exception all the gold is obtained with the copper on the cathodes.

To complete the electrical connection and allow of the easy removal of the cathodes for refining some device other than soldering was necessary. This requirement was met by placing copper bars 1¼ in. wide and ¼ in. thick along the tops of the box partitions. Brass carriage bolts are cut off at the head and the end screwed into the bar, the threaded end standing upright about 2 in. high. A vertical slot is then cut down to the bottom

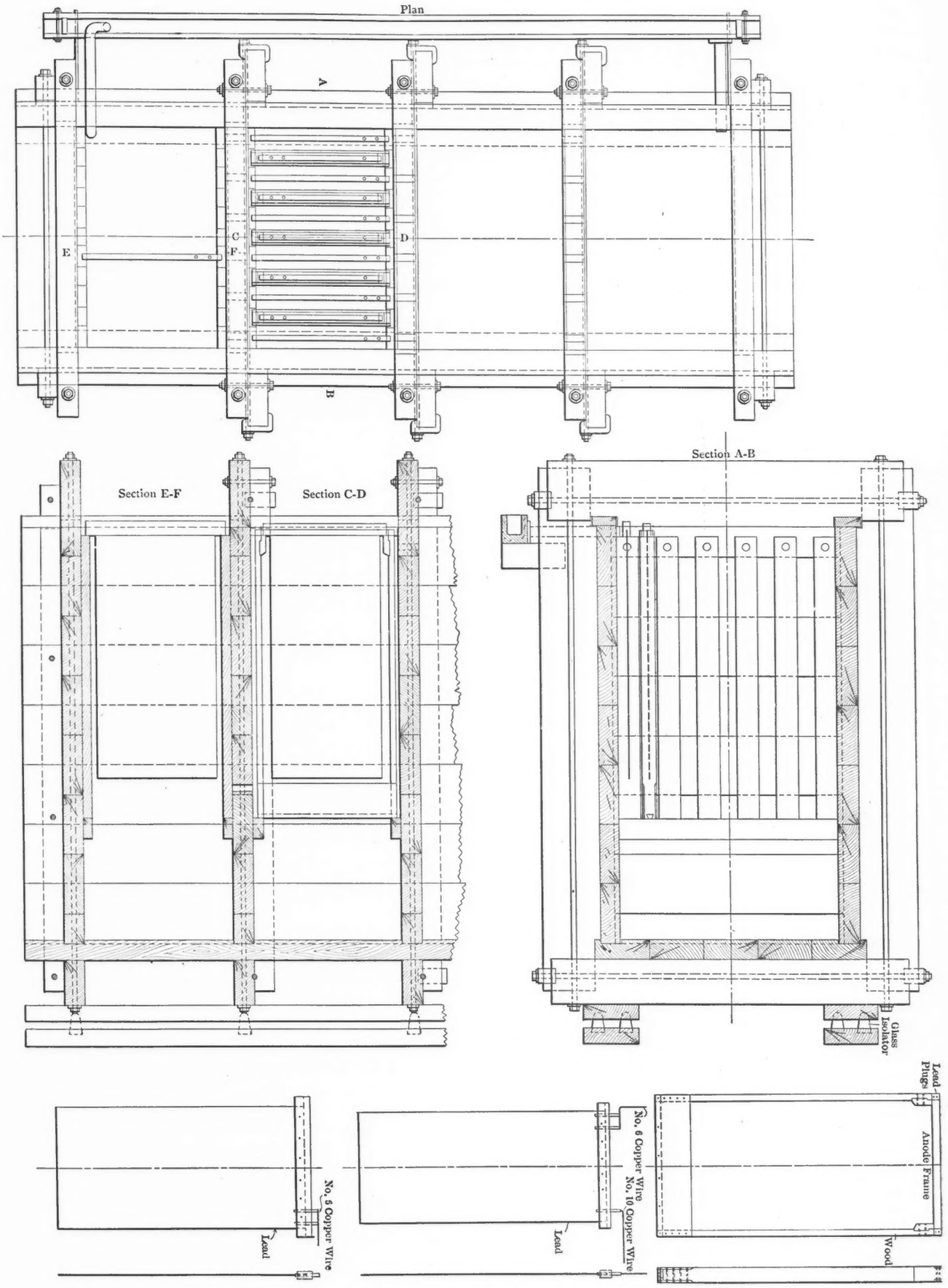


FIG. 1. PLAN AND SECTIONS OF ACID REFINING TANK, WITH DETAILS OF ANODE AND CATHODE

of the threads. The wires from five anodes and cathodes of opposite compartments are laid in this slot and a tight connection secured by screwing them down with a butterfly nut. These bolts are spaced 19 in. apart, and six of them connect the cathodes of one compartment to the anodes of the next. It is by this means possible to remove any of the cathodes without interrupting the flow of current or solution.

After passing the electrical section the solution flows direct to the zinc boxes. There are two of these, 22 ft. long, each containing 14 compartments 2 ft.x 1 ft. x 2 ft. deep. Each box receives one-half of the flow. The electrical section extracts from 80 to 90 per cent. of the gold, nearly all the copper that is precipitated and regenerates a high percentage of cyanide. The tail solution from the zinc carries from 0.06 to 0.10 dwt. per ton, giving a total extraction of about 99.5 per cent.

One curious feature is that the tail solutions still carry a high percentage of copper. Table 2 gives in detail for each month the result of a year's precipitation. The variation in the amount of KCN regenerated per lb. of gold and copper precipitated remains unexplained. The amount of copper shown in the table to have been precipitated agrees reasonably closely with the amount recovered and sold.

Electrical Refining

The lead cathodes are allowed to remain in the cyanide electrical box for a period of from 20 to 30 days. In that time they will have increased in weight from 8 to 12 lb., which represents the accumulated deposit. They are then removed and after draining, are placed in an acid box containing dilute sulphuric acid of from 2 to 3 per cent. strength, where their function is reversed to that of an anode. They hang in a wooden frame with closed bottom and open sides, over which is stretched a cotton-cloth sack. The cathodes in this box are lead plates 1/16 in. in thickness.

The box contains four compartments, each holding 5 anodes and 6 cathodes. The distance between plates is 4 in. The compartments are connected in series and receive a current of 450 amp. The average resistance of the box is 8 volts, and the current strength about 5 amp. per sq.ft. of anode surface. As an anode, the copper on the plate dissolves, passes through the cloth side of the frame and precipitates on the cathodes, where it slimes and falls to the bottom of the box. The gold, released from the copper, falls to the bottom of the anode frame.

When the plates are cleaned down to the lead they are lifted out, washed and replaced in the cyanide electrical box to receive a new deposit of gold and copper. The time required to clean a plate varies from 48 to 72 hours, depending upon the weight of deposit it carries.

Two electrical connections are necessary for each anode, one of No. 10 copper wire, which is used when the plate is a cathode in the electrical precipitation box. The other is a No. 6 wire, and is used in the refining box for the heavier current. Both wires are permanently soldered to the lead lugs cast on the plate.

Both the cyanide electrical box and the acid refining box are on the same electric circuit, which does the work of precipitation and refining. Cathodes are first removed from the head of the cyanide box and, as refined, are replaced, thus gradually working down to the end. This requires from 25 to 30 days, and by this time the cathodes at the head of the box are again ready to refine.

To prevent short circuits in the acid box between the cathodes and the cloth sides of the anode frames, it is necessary to circulate the solution, passing alternately up and down the compartments. A lead air injector lifts the solution over the side of one end compartment and discharges into a wooden launder which delivers by gravity into the opposite end of the box. Holes in the partitions direct the flow, and in this way uniform density of solution is secured.

The time between clean-ups varies from 15 to 25 days, depending upon the quantity of copper accumulated in the bottom.

The copper capacity bears a definite ratio to that of the anode frames, where the gold slime accumulates so that when the former is full the latter is about ¾ full. By that time the cloth sacks, weakened by acid, should also be replaced.

At clean-up time the acid solution is siphoned into a storage tank. The anode frames are raised and allowed to drain over the box. They are then placed in an upright position on a washing board over a tank, provided with a filter bottom, and the cloth sack is cut down the sides and removed. The gold slime in the bottom of the frame is washed into the tank, and the frame well scrubbed. The old sacks are washed over the same tank, placed in a dryer and burned. When thoroughly drained the gold slime is removed from the tank, dried and smelted in graphite pots.

The copper slime is flushed through 1½-in. holes bored in the side of each compartment one inch above the bottom. Outside, the stream is diverted by a copper funnel into a cement launder in the floor. This runs outside the building and discharges into a tank with a filter bottom. When drained the copper slime is dried, sampled and boxed. The time required for a clean-up is 7 hours.

As lead, in the presence of a strong oxidizing agent can be readily peroxidized, it would appear that the lead anodes would, after removal of their copper, speedily peroxidize in the presence of the oxygen liberated by the electrolysis of the solution. This action, if long continued, would peroxidize and desintegrate the lead. But the law that the current will follow the line of least resistance, and that that line will be through those anodes which still contain copper, prevents this action from

TABLE 1. RESULT OF A YEAR'S PRECIPITATION.

Month and Year.	Solution Entering Electrical Box.		Solution Leaving Zinc Boxes.		Lb. Av. of Copper Precipitated.	Lb. Av. of KCN Regenerated.	Fine Oz. of Gold Precipitated.	Ratio of Gold to Copper, Gold = 1.	Lb. of KCN Regenerated per lb. of Copper & Gold Precipitated.	Percentage of Regeneration KCN.
	Per Cent. Cu.	Per Cent. KCN.	Per Cent. Cu.	Per Cent. KCN.						
May, 1905	0.063	0.096	0.046	0.102	1,136	401	2,282.5	1 : 7.25	0.31	6.2
June, "	0.065	0.101	0.052	0.105	903	278	2,817.8	1 : 4.67	0.25	3.9
July, "	0.091	0.099	0.070	0.118	1,618	1,464	3,306.3	1 : 7.13	0.71	19.2
August, 1905	0.119	0.087	0.094	0.127	2.196	3 531	3,200.2	1 : 10.00	1.46	46.0
September, 1905	0.102	0.117	0.070	0.152	2,106	2,303	3,228.8	1 : 9.51	0.99	30.0
October, 1905	0.090	0.102	0.053	0.157	2,536	3,770	3,097.7	1 : 11.94	1.37	53.9
November, 1905	0.116	0.103	0.074	0.170	3,051	4,506	3,994.2	1 : 11.21	1.35	65.0
December, 1905	0.105	0.136	0.075	0.164	2,097	1,957	2,102.1	1 : 14 55	0.87	20.6
January, 1906	0.086	0.143	0.063	0.192	1,980	4.191	2,691.0	1 : 10.73	1.93	34.2
February, 1906	0.079	0.163	0.061	0.198	1,965	3,843	3,942.1	1 : 7.27	1.72	21.4
March, 1906	0.088	0.132	0.057	0.166	2,915	3 226	3,923.3	1 : 10.83	1.01	25.7
April, 1906	0.075	0.135	0.047	0.156	1,888	1,483	3,356.4	1 : 8.20	0.70	15.5
Total					24,391	30,953	37,942.4	1 : 9.37	1.14	28.46

TABLE 2. RESULTS OF REFINING.

Date of Clean up.	No. of Cathodes Refined.	Gold Product.				Copper Product.				
		Dry Weight of Slime Before Melting in Oz. Troy.	Weight of Gold Bullion Oz. Troy.	Gold Fineness.	Total Fine Oz.	Dry Weight of Copper Slime in Lb. Av.	Oz. of Gold per Ton of 2000 Lb. Av.	Per Cent. of Copper.	Total Fine Oz. Gold.	Total Lb. Av. of Copper.
July 5 to July 23	173	3,495	2,690	794.6	2,137.48	1,541	3.36	84.7	2.58	1,305
July 23 to August 9	136	3,248	2,021	740.4	1,496.33	1,649	2.22	86.0	1.83	1,418
August 9 to Sept. 3	196	5,141	2,508½	835.9	2,097.01	2,226	1.82	87.0	2.02	1,936
Sept. 25 to Oct. 17	153	6,283	2,086½	782.1	1,631.85	1,861	3.72	84.8	3.46	1,578

becoming harmful. The cleaned anodes receive but a small amount of the total current and the peroxidizing effect is small.

Conditions are encouraged whereby but part of the anodes are cleaned off at one time, the remaining anodes serving to protect them until they are removed.

Fig. 2 is a plan of the box showing the anodes in place. The figures are the number of amperes flowing through that anode at the time the reading was taken. Anodes marked with a star are in the finishing stages. There is some loss of current by short circuits seen by comparing the sum of the total amperes of the different compartments.

Table 2 covers a period of over two months' refining and gives, in detail, the value and quantity of the two products obtained. The cost for acid, power, labor, and cloth, amounts to 3 pence per fine ounce of gold refined. The net returns from the copper more than pay all the expenses of acid box refining and melting of gold slime. As the lead cathodes, under the present system, are not destroyed, but returned for further use, the saving in lead amounts to about 500 lb. monthly.

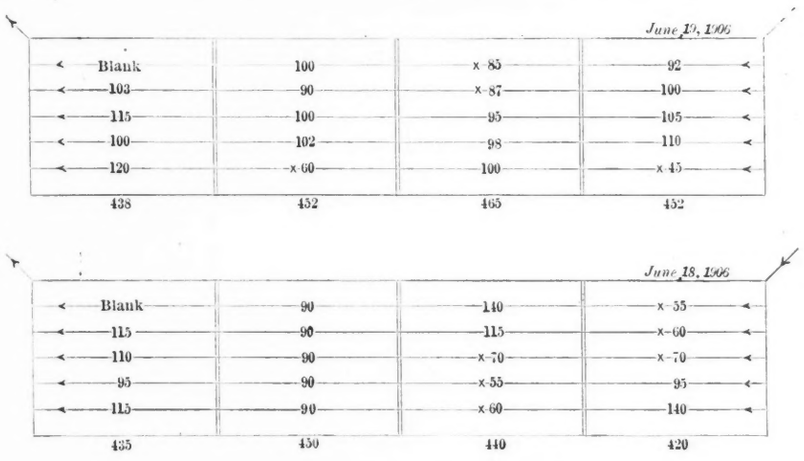


FIG. 2. DIAGRAM OF BOX WITH ANODES IN PLACE

With this system of precipitation and refining some of the difficulties encountered in cyaniding cupiferous ores are eliminated. With the constant removal of the copper from the solutions, their extractive power is maintained unimpaired. High cyanide consumption, due to the copper, is partly offset by the regeneration of cyanide in the electrical box, and the receipts for copper recovered in the refining; while the ability to ship a fair grade of bullion eliminates excessive treatment charges.

By kind consent of Charles Butters, and the courtesy of H. P. Garthwaite, resident director of Butters Salvador Mines, Ltd., I am enabled to present this paper.

Although many metallurgists have been interested in this problem, there was very little literature on the subject, and practically all details had to be worked out on the spot.

Hydraulic Mining in California

SPECIAL CORRESPONDENCE

The Gillett-Englebright bill amending the Camminetti law, or California hydraulic mining law, has passed the House of Representatives. It grants permit to mine without impounding works in localities where no damage can be done, a permit from the California-Debris Commission still being necessary. This bill is intended mainly as a relief to small hydraulickers, and as such will be of great benefit, if finally passed. The area of auriferous gravel exempt from the operations of the present law is located in the northwestern end of the State in the counties of Humboldt, Siskiyou, Trinity and Del Norte. The debris from the mines in those counties dumps into the Klamath river, which has been declared non-navigable and which carries it out into the ocean. The bulk of the gold-bearing gravel area of the State is located in the watersheds of the Sierra Nevada mountains, the rivers of which flow into the Sacramento end of the San Joaquin. It was to protect these rivers and the lands of the Sacramento and the San Joaquin valleys that hydraulic mining was prohibited by decisions of the court, and afterward by the Caminetti law.

The Government and State debris barrier in the Yuba river is to be raised another 8-ft. step, which will make the hight 22 feet. This is expected to be the last time that barrier will be raised, and if any additional barriers are needed they will be built a short distance above this one. The spillway built last year is to be made considerably wider, in order to take a larger portion of the flow of the river at all seasons of the year. The contract just let also includes the placing of a large quantity of stone at the foot of the barrier where the water washed the gravel away. The contract price is $151,068, this being over $46,000 less than the next lowest bid received at the offices of the California Debris commissioners, in San Francisco. These barriers are not dams, in the usual sense of the term. They do not hold water, but by checking the force of the current they cause it to drop much of the sand and clay carried along in suspension, and interpose an effective obstacle to gravels rolled along the bottom by the torrential stream. These gravels are the most injurious material that can reach the Sacramento river, as they are too heavy to be carried along by the water, and so tend to lodge and create bars obstructive to navigation.

An interesting feature of these Government barriers across the Yuba is that they rest upon deep deposits of material such as that they were built to impound, and not upon bedrock. This engineering work is purely remedial in character. It was not designed to enable hydraulic mining to be continued or resumed.

Utilization of Oil Shales

A Government publication, issued by the geological survey office, London, treats of the "Oil shales of the Lothians," dealing with (1) the geology of the shale fields (2) methods of working the seams, and (3) the chemistry of the oil-bearing mineral. The workable seams of oil shale in Scotland all occur in the calciferous sandstone series, which has two subdivisions. The upper, known as the oil-shale group, is over 3000 feet in thickness, and contains, in its higher parts, beds of coal usually of inferior quality, and farther down, about six main seams of oil shale, interstratified with beds of sandstone, shale, fire clay, marl, and estuarine limestone. The lower group, in which no oil shales of economic importance have yet been found, consists of white sandstone, and shales, passing downward into gray, green, and red shales, clays, marls, and sandstones, with beds of argillaceous limestone or cement stone.

Good shale can, as a rule, be distinguished by its brown streak, toughness, and resistance to disintegration by the weather. Oil shale resembles hard dry wood or dry leather, and its quality in the field is measured by the degree of facility with which it can be cut and curled up with the edge of a sharp knife. It is free from grittiness, and is often flexible as well as tough.

With reference to the yield of crude oil and sulphate of ammonia the experts have found a remarkable variation in the character of different seams and of the same shale in different places. It seems to be a general law that shales deteriorate with depth. The highest shale in the Scottish series is the richest in crude oil, supplying 130 gal. per ton, but only a few pounds of sulphate of ammonia, while the lowest shale yields only about 80 gal. per ton, but the sulphate of ammonia amounts to 60 lb., or double the amount of ammonia of the highest shales.

The Lead-smelting Works of Port Pirie

The Ores from the Broken Hill Plant Are Smelted and the Bullion Refined and Prepared for the Market

BY GUILLAUME D. DELPRAT*

The lead concentrates from the ore treatment plant at Broken Hill, described in an earlier issue of the JOURNAL, are sent to Port Pirie to the smelters, as also the sintered slimes. Occasionally some carbonate ore is sent down, but the quantity of this is not very large. The concentrates on reaching Port Pirie are discharged into bins and passed through mechanical roasting furnaces of the Ropp type, of which there are five. They are mixed with 14 per cent. of fine shell, 4.5 per cent. of fine iron ore, and 9 per cent. of silicious ore. Each furnace can deal with over 100 tons per day of the mixed material. At the end of each roaster is an iron bin which holds about three tons. The ore is pushed by means of the mechanical rakes into these bins, and from there lowered into 1-ton trucks; these trucks are raised by means of a hydraulic lift to a higher level commanding the Huntington-Heberlein converter pots. The pots are made of cast iron, and can hold about eight tons each; there are 17 of these pots. The ore, when still quite hot, is dumped into the pots in a powdery condition, and a blast turned on at the bottom. An iron hood is lowered on to the pot so as to direct the escaping gas into a large flue. The air blown in oxidizes the remaining sulphur, and the contents of the pot are raised through this to a red heat; the mass fuses together, and after about four hours the pot is tipped, and the partially fused mass falls a hight of 10 ft. on to the floor. On the floor four cast-iron cones are placed; the mass, falling on these cones, breaks up into large sections, and these are further reduced by hand spalling until the pieces are small enough to handle.

On the feed floor we now have: (*a*) the sintered slimes from sintering works, (*b*) the converted material from the "H. H." process, and (*c*) raw concentrates. The ordinary charge fed into the smelting furnaces is made up as follows: Sintered slimes, 1000 lb.; converted concentrates, 2000 lb.; raw concentrates, 200 lb.; old slag, 800 lb.; ironstone, 1050 lb.; limestone, 550 lb.; total ore and flux, 5600 lb.; coke, 840 lb.

It is found that the present style of furnace allows of treating an appreciable quantity of raw lead concentrates, and this is, of course, an advantage, saving on that quantity (about 40 tons per day) the cost of roasting and converting, and the lead and silver loss connected with this.

The charge carries about 17 per cent. of lead; the recovery is about 95 per cent. of lead and 98 per cent. of silver, and practically all the gold.

About 1000 tons of slag are dumped during the 24 hours, of the following composition: SiO_2, 25 per cent.; FeO, 33; MnO, 6; CaO, 12; ZnO, 13; Al_2O_3, 6; S, 3; Pb., 1.5.

The construction of the smelting furnaces differs slightly from the usual type. They are rectangular, measuring 212x62 in. at the tuyeres. The tuyeres, of which there are 11 at each side, instead of having nozzles projecting into the furnace, are flush with the water jackets on the inside. The distance of 62 in. between the sides appeared at first too great for flush tuyeres, but experiments proved that such was not the case, and all the tuyeres are now being gradually replaced with flush tuyeres. Figs. 1 and 2 show a section of a furnace according to the latest construction.

The blast to these furnaces is supplied by eight Green blowers, No. 8, which all discharge into one main pipe 60 in. diameter, from which branches are taken into each furnace. The motive power is supplied by four compound surface-condensing engines, of a total of 1400 h.p. As a rule, only 1150 h.p. of the total available is used, the engine representing the balance being held in reserve in case of accidents or repairs. The total amount of air supplied is approximately 75,000 cu.ft. per min. under a pressure of 30 oz.; this is found sufficient for eight blast furnaces.

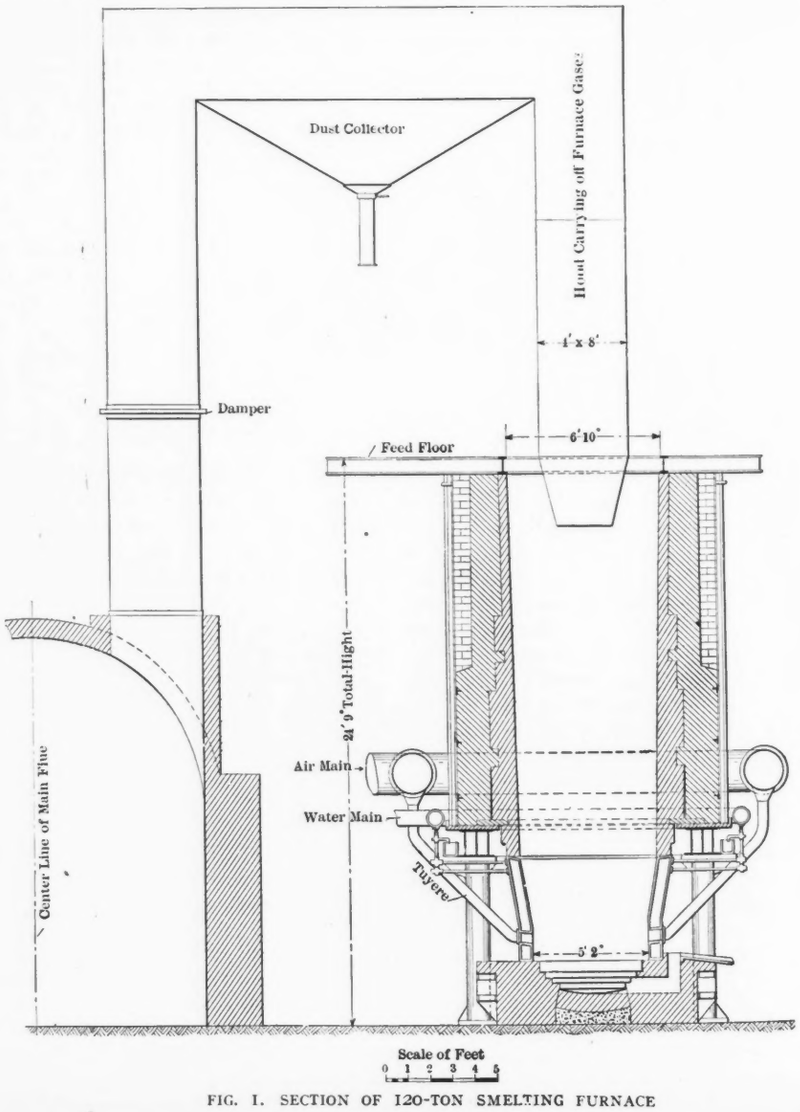


FIG. 1. SECTION OF 120-TON SMELTING FURNACE

Note—Portion of a paper, read as presidential address, befre the Australian Institute of Mining Engineers and published in its *Proceedings* for September, 1906. The first part of the paper describing the ore dressing plant at Broken Hill appeared in the JOURNAL of Feb. 16.

*General manager, Broken Hill Proprietary Company, Broken Hill, N. S. W.

A plate-iron hood is placed over the top of the furnaces, and projects about 3 ft. into the furnaces, and, instead of the down-take being arranged below the feed floor, the smoke goes up into the hood and then along a level iron flue with a pocket to trap the flue-dust, and then down again into the main flue, and on to the chimney. The feed is introduced in the space between the hood and the sides of the furnace; it is found that the advantage of these hoods is that wall accretions are very rare, the central draft causing the gas to travel toward the center through the ore instead of going along the walls of the furnace. Barring-down is thus reduced to a minimum. The loss in flue-dust is also greatly reduced, the greater part of the flue-dust falling down again into the furnace. Another reason why so little flue-dust is lost is the fact that the quantity of gas going from the furnace into the chimney is practically limited to the amount of air blown into the furnace, while with open tops (the usual construction) a large quantity of air is drawn into the furnace through the open top, increasing the volume of air and gas, which carries away more flue-dust. There are many other advantages connected with the use of the hood—the entire absence of lead fumes on the feed floor certainly not being the least important of all.

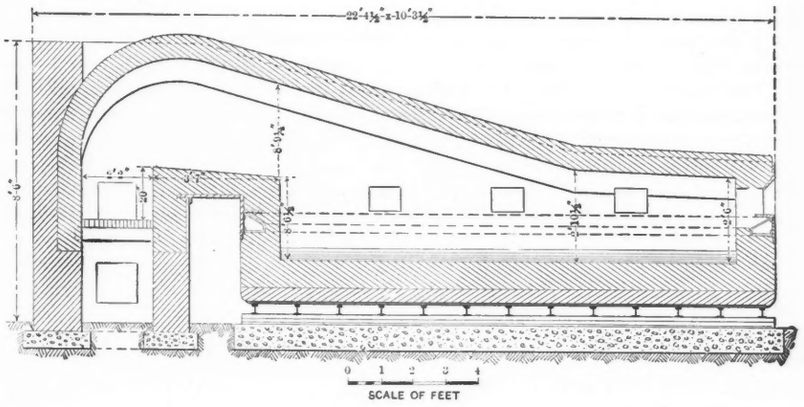


FIG. 3. LONGITUDINAL SECTION OF SOFTENING FURNACE

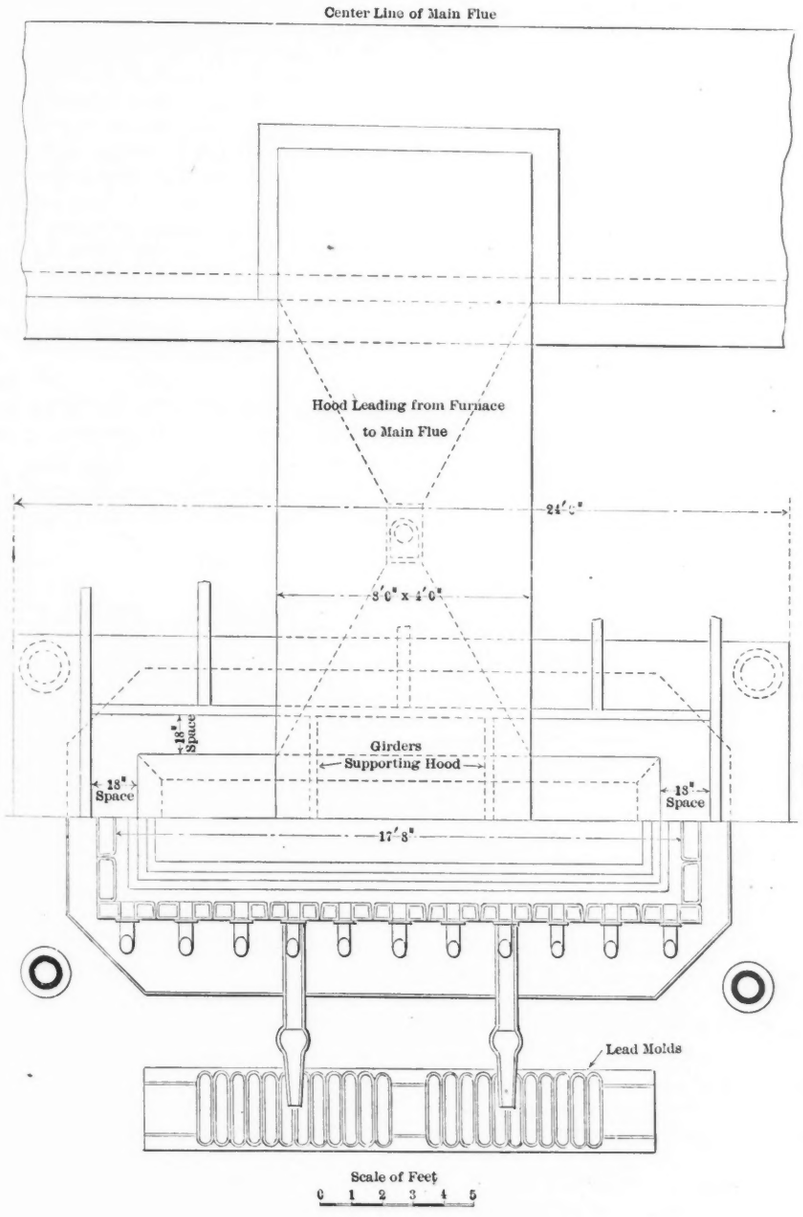


FIG. 2. PLAN OF 120-TON SMELTING FURNACE, SHOWING HALF SECTION THROUGH WATER-JACKETS

At present, out of 13 furnaces, eight are in blast, each producing from 25 to 30 tons of bullion per 24 hours. This bullion is transported to the refinery. In the refinery the first operation is to melt the bullion in a copper-softening furnace of the ordinary construction (see Fig. 3). This furnace holds about 36 tons of bullion. The bullion is melted at a comparatively low temperature, when the dross floats on the surface, containing most of the copper. This scum, or copper dross, is skimmed off. On 36 tons of bullion about 3000 lb. of dross are formed, assaying lead, 77.5 per cent.; copper, 8 per cent.; iron, 1 per cent.; zinc, 1.2 per cent.; sulphur, 4.3 per cent.; arsenic, 0.7 per cent.; antimony, 0.7 per cent.; insoluble, 2.1 per cent.

The operation takes about eight hours. The copper dross is returned to the smelters. The still molten remaining lead is tapped through an iron launder into a second furnace similar to the first, where the temperature is raised, and subsequently cooled, the dross which forms on the surface being skimmed off. This heating and cooling is done twice, and the whole operation takes about 16 hours. This dross assays lead, 74 per cent.; antimony, 10.7 per cent.; arsenic, 1 per cent.

When sufficient quantity of this has accumulated, it is passed into what is called an antimony-dross furnace. This furnace is of similar construction to the two previous furnaces. The dross is mixed with fine coke and fine coal—on every 2800 lb.

of dross, 120 lb. of fine coal and 120 lb. of fine coke; four charges are put in per shift. The oxide of lead is reduced to metallic lead, which is tapped off every shift, and returned to the second softening furnace; the slag is tapped every 24 hours. The slag assays lead, 55.6 per cent.; antimony, 18.65 per cent.; arsenic, 3.7 per cent.

This slag is now sent to a cupola furnace, where 450 lb. of antimonial slag is mixed with 250 lb. of blast-furnace slag and 100 lb. of coke. This produces an antimonial metal containing lead, 78 per cent.; antimony, 20 per cent.; arsenic, 1.5 per cent. This metal is put on the market. The resulting slag from the operation is generally poor enough to be thrown away.

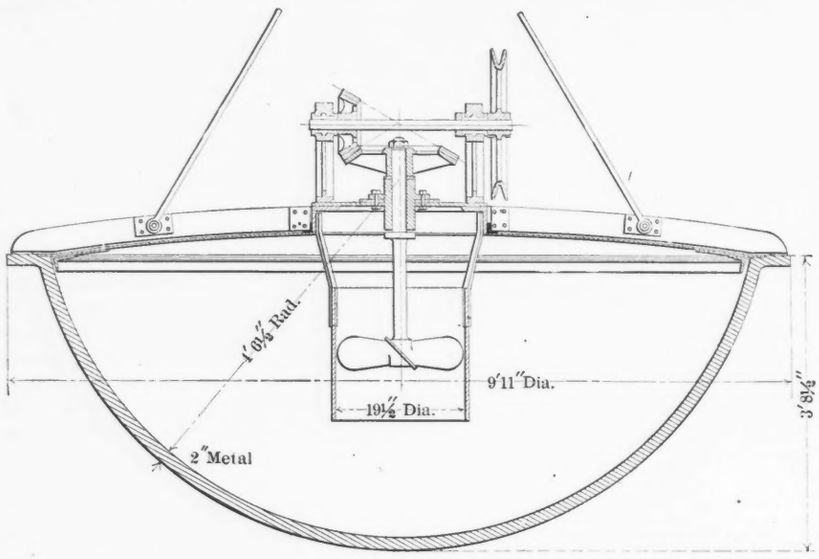


FIG. 4. HOWARD STIRRER

The copper-softening furnace uses about 2 per cent. of coal per ton of bullion; the antimony furnace uses about 3 per cent. of coal per ton of bullion; while the antimony-dross furnace takes about 10 per cent. fuel.

The bullion remaining is now free of copper and antimony, and contains all the silver and gold. These two metals are separated from the lead by means of metallic zinc. For this purpose the now purified lead is run into kettles holding about 40 tons. About 200 lb. of zinc are added, in order to combine with the gold. A Howard stirrer (see Fig. 4) is then gently lowered into the molten lead. The molten mass is thoroughly mixed, and allowed to cool down slowly, and the gold-zinc crust which forms on the top is skimmed off and put on one side; this gold alloy is generally too poor to be treated by itself, and is therefore used in the next kettle on a fresh charge of bullion, just as if it were zinc, for extracting the gold, and ultimately a third kettle. This saves zinc and labor. The resulting alloy, called gold skimmings, after being used three times, contains about 200 oz. silver per ton; 6 oz. gold; 10 per cent. zinc; and 89 per cent. lead.

After removal of the first dross, a second quantity of zinc is added (about 750 lb.) and the stirrer again applied. On cooling down a second time, a new scum forms on the surface, containing the zinc and practically all the silver; this scum is raked into the baskets of a Howard press operated by means of compressed air. The molten lead is squeezed out of the zinc-silver alloy through the perforations in the basket. The resulting zinc-silver-lead alloy weighs about one ton, and assays about 3000 oz. silver per ton, about 20 per cent. zinc, about 70 per cent. lead, and goes to the silver department.

The lead in the kettle still contains a little more silver, which is removed by a further admixture of 700 lb. of zinc, which again is stirred and skimmed off as before and treated in the same way as previously, with this difference, that it is not pressed, as this third scum is too poor for the silver department, but is used over again with more zinc for desilverizing the next kettle of bullion. The separation of the gold and silver from the lead requires about 3.4 per cent. of coal for heating.

The lead has now lost all its silver and gold and is drawn off into a refining furnace, where the last traces of zinc are removed by heating and cooling and skimming the dross twice, as previously, consuming 4 per cent. of coal; the pure lead is then run into the market kettle, from where it is drawn off into molds for the market. The assay shows this lead to be about 99.995 per cent. of metallic lead. The dross resulting from this operation goes back to the smelters.

Every 36 tons of bullion put into the refinery produces about 30 tons of market lead direct and some by-products which are ultimately reduced to metal again.

The gold skimmings from the first zinking are now sent to the retort furnace. The retorts are made of plumbago and heated by means of gas. Each retort holds about 10 cwt. of skimmings. It is heated for four hours, during which time the whole mass is melted and some of the zinc distilled off. What remains in the retort is gold bullion and gold dross. The bullion contains about 225 oz. of silver and 7 oz. of gold. The coal consumed is about 15 per cent. The gold bullion is

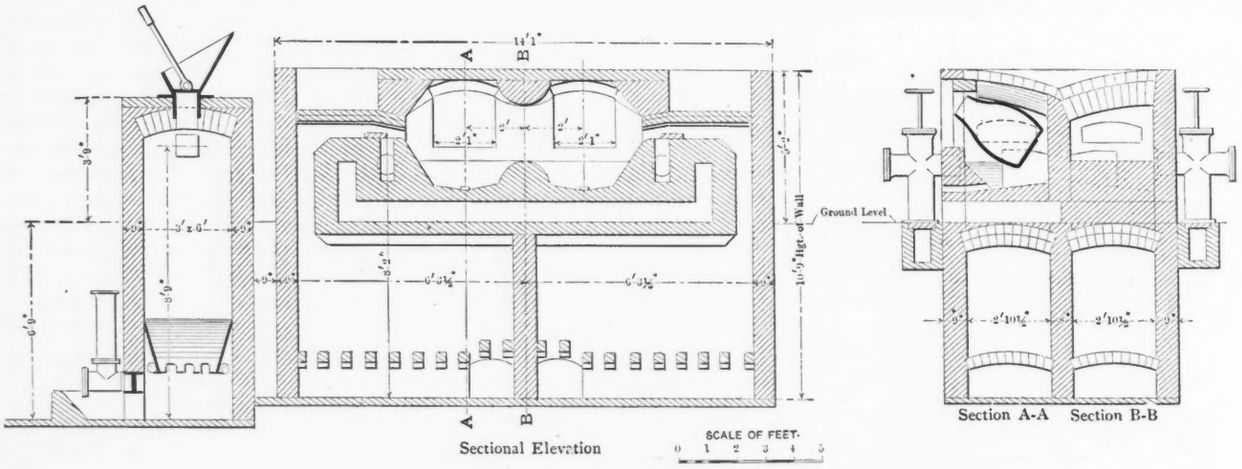


FIG. 5. GAS-FIRED RETORT FURNACE

stacked until about 35 tons have accumulated, when it is put in one of the kettles and melted down and drossed. About 15,000 to 20,000 lb. of dross are obtained, containing lead and some copper.

Treatment of Dross

This dross is squeezed in the filter press in the same way as the ordinary zinc dross, so as to remove the lead mechanically mixed therein. After this the dross is smelted on a cupel. These cupels are made of four parts of cement and one of sand, and take about half a ton as a charge. The materials resulting from the cupel are a gold concentrate, carrying about 17,000 oz. of silver and 550 oz. of gold, and a slag (mostly litharge) carrying 0.1 oz. of gold and 40 to 50 oz. of silver per ton. The concentrates are passed into another cupel, and are run up to doré bullion, which carries about 30 to 35 oz. of gold per 1000 oz. of silver. This doré bullion goes to the parting plant.

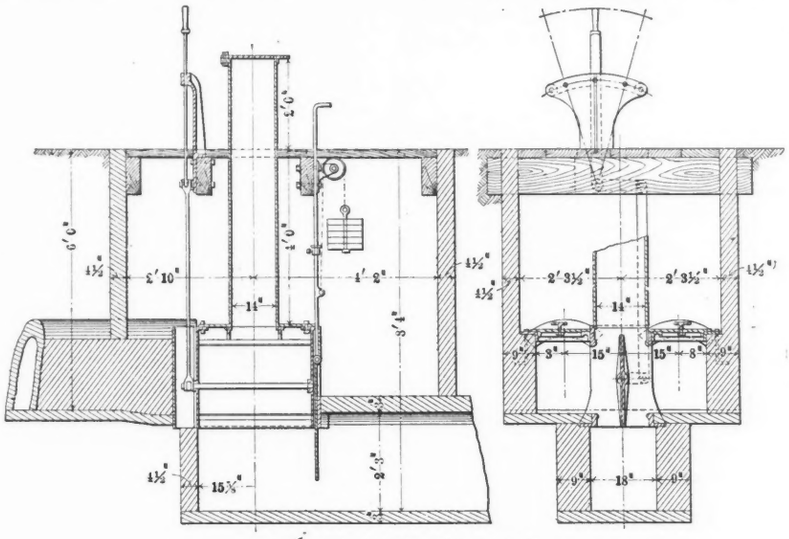


FIG. 6. AIR VALVES AND FLUES

It is necessary now to go back to the kettle from which the dross has been removed as described. After the dross has been removed, 700 lb. of zinc is added to complete the gold extraction, and when this is done, desilverization as usual by means of a further addition of zinc is accomplished. This second gold skimming is treated in the same way as the first scum—that is, pressed in the Howard press, retorted, cupeled, and run up to doré bullion. This completes the treatment of the gold skimmings.

Silver Crusts

Now to follow the silver skimmings (silver crusts). These are heated in plumbago pots in a gas-fired furnace (see Figs. 5 and 6); 12 cwt. constitute one charge, just the same as the gold skimmings. The product from this operation is retort bullion and dross. The retort bullion is about 82 per cent. of the skimmings put in, the dross about 3 per cent., and the balance, which consists of zinc, is distilled over and caught in the form of metallic zinc. The value of this bullion is about 3500 oz. per ton, and this is concentrated on cupels until it contains about 50 per cent. of silver.

After this is done, the rich bullion is brought into the silver yard, an inclosed area where no one is admitted except those working the process. Here the bullion is further concentrated on cupels into crude silver, and this crude silver is remelted with the addition of a little lime, in a perfectly new cupel, which never had any charge before, so as to remove the very last trace of litharge, if there should be any left.

The fineness of the silver now obtained is 998.5. This refined silver is remelted in plumbago pots, 2200 oz. to the charge, and a little copper is added in order to reduce the fineness to 996, which is the fineness of the export bars. The last operation is then to pour the molten contents of the plumbago pots into molds holding about 1020 oz. each. The resulting bars are carefully trimmed, weighed, and marked, and are ready for export. The weekly production is a little over 100,000 oz. of silver. The litharge from all the operations, of course, goes back to the smelters.

Parting Plant

The separation of the gold from the silver is done in the parting plant. Here the doré bullion is dissolved in sulphuric acid in cast-iron kettles placed on a coal fire. Of these kettles there are three in a row. The dissolving takes place in the two outside ones, and the vapors are caught in small lead chambers and condensed back to sulphuric acid. When the silver has been dissolved, the solution of silver sulphate in strong acid is siphoned from the dissolving kettles into cast-iron settling vats, and allowed to remain for a short time to permit any particles of gold which may have been carried over to settle out. The solution is then carefully run off into cast-iron crystallizing tanks placed inside larger tanks so as to allow cold water to be circulated around them. Here the strong liquor is diluted, and the sulphate of silver (although soluble in strong acid, is sparingly soluble in weak) crystallizes out. The crystals are collected on a filter, washed with water, dried, and reduced to metallic silver with coke dust. The mother liquor, weak sulphuric acid, is run into a lead-lined vat, where, by means of a steam coil, it is concentrated, and along with fresh acid is used for dissolving another batch of doré bullion.

The washings from the silver sulphate crystals are run into a vat containing metallic copper, with the result that metallic silver is precipitated, and the copper goes into solution as sulphate. The copper is afterward recovered as metal by the well known reaction with scrap iron. Meanwhile the residue in the two dissolving kettles, consisting of metallic gold with salts of iron and lead, is put into the third kettle and boiled again with fresh sulphuric acid to remove any silver that may have been left undissolved from the previous operation. The residue is then collected and washed with water to remove the silver salt; it is then boiled with hydrochloric acid to take out the iron and lead salts. Finally, it is thoroughly well washed with water, dried, melted, and cast into ingots, which run about 0.992 fine.

Petroleum in Italy

As early as 1893 a French company obtained a concession from the Italian government to explore a certain tract in the Apennines, near Piacenza, and to exploit any deposits of petroleum found there. The success of this company was sufficient to cause the formation of another French syndicate four years ago, and last July these two were absorbed by a Genoese company, with a capital of $3,000,000. The wells already bored are some 95 in number, of which 70 are practically exhausted. The remaining 25 produced about 40,000 bbl. of crude oil in 1905, and with the eight wells now boring it is expected that the total production for 1906 will reach over 65,000 bbl. The concession of the new company comprises about 11,000 acres.

The wells, none of which are gushers, reach a maximum depth of 1300 ft., and the engineers in charge say that those which are exhausted may be made to yield again by deepening. This has not as yet been undertaken, perhaps because by the terms of the grant it is necessary to bore new wells in order to maintain control of the territory. A central motor is used to operate, by cables, the pumps of the various wells.

The British consul at Goa reports that six concerns have commenced mining operations on the manganese deposits of Portuguese India.

The Year 1906 in the Klondike District

The One-man Enterprise is Giving Way to the Large Corporation Plan. In the Mean Time Less Gold is Being Produced

BY J. P. HUTCHINS*

The gold production of Klondike in 1906 was about $5,994,600, or 14.36 per cent. less than that of 1905. This is not surprising, for much ground which would have been worked under normal conditions has been acquired and held during the year for future working when a large corporation and its subsidiary companies shall have completed purchases and installations of machinery for replacing present methods. The year has been one of comparative idleness on the part of many claim owners who expected to be bought out.

Although the snowfall was heavy the thaw was so rapid that the water could not be used so as to produce the best results. There were few winter "lays," or leases, given out, the region being in a buying and selling ferment. A heavy freshet caused considerable damage; one dredge was partly submerged, and a number of cabins and flumes were washed away.

May and parts of August and September had rains, while June and July were very dry. The season was in the main unfavorable for working.

Labor

There was a shortage of labor during the summer when the preparations for future working on a large scale were at their hight. There are no unions in the Klondike, and the only labor difficulty was experienced on work by one who has had many similar troubles elsewhere. Klondike labor is efficient, seemingly as a result of the remarkably stimulating climate. There has been a most pleasant feeling between employer and employee. Wages are still high, 40c. per hour and board in summer; 30c. per hour and board in winter.

The gold production of the Canadian Yukon territory, which includes Klondike and several other districts, is as follows:

GOLD PRODUCTION OF THE CANADIAN YUKON

Year	Amount
1896	$ 300,000
1897	2,500,000
1898	10,000,000
1899	16,000,000
1900	22,250,000
1901	13,000,000
1902	14,500,000
1903	12,250,000
1904	10,350,000
1905	7,000,000
1906	5,994,600

This is all placer gold, for there are no gold vein mines in Yukon territory.

*Mining engineer, 52 Broadway, New York.

The White Channel

No discoveries of new deposits or of rich peneplains on the rims of the channels already worked have been made. There is the likelihood of the occurrence of such deposits as secondary benches or terraces on the "back rims" of the "White channel." This "White channel" is what is left of the ancient creek beds; it has a course approximately parallel to, and an elevation of 150 to 300 ft. above the present creeks. Where it has not been eroded it appears as a bench deposit with one rim completely removed. There is one notable exception to this occurrence, at Lovett gulch, off Bonanza creek, near its confluence with the Klondike river.

There are remains of the "White channel" or of contemporaneous gravels, on Adams gulch, off Bonanza creek, and on Last Chance off Hunker creek; these deposits contain rich gravel, and have yielded well where cheap water is available for hydraulic mining. There is a promising future for these areas.

Dredging

Although there have been no discoveries of importance, there were many stampedes, as they are called colloquially, rushes to known areas which were suddenly considered suitable for exploitation by the dredging method. This was due principally to the success of a 7½-cu.ft. bucket dredge, which operated about 60 days in 1905, and in the open season of 1906 with most gratifying results. The conditions encountered were unusually favorable for Klondike, for there was but little frozen ground to excavate and an easy bedrock and free gravel combined to make the enterprise a successful one. It was due to the success of this one installation that the dredging frenzy began; there have been other successes since.

The circumstance that the dredge was installed in an area possessing exceptionally fortunate characteristics, not found generally in Klondike, was not kept in mind. There has been much excitement and many abandoned claims have been restaked for dredging. There is talk of installing about 30 dredges in 1907, but only about three are certainties.

New Devices

The Klondike has always been a district where volatility, if not emotionalism, has prevailed to a considerable degree; I attribute it in part to the effects of the remarkably stimulating climate. A result of this tendency is seen in the large number and variety of machines and methods applied to areas of similar characteristics. These experiments have generally been costly. To be sure some excellent devices like the steam thawer, steam scraper, inclined cableway and self-dumper have been evolved. It can be predicted with certainty that if floating dredges are installed on some of the creeks, failure must occur even though a gold tenor of more than 50c. per cu.yd. shall be found. Frozen muck, a mixture of semi-decomposed vegetable matter, silt, sand, and water in varying proportions, usually more than 75c. per cent., as an overburden, and blocky schist bedrock are the most difficult physical conditions, and a short season, high wages, costly fuel and supplies, are adverse economic conditions.

As an example of the same sort of spirit, the Hatfield rain-making expedition in 1906 may be noted. The Hatfield brothers "were imported at great expense" to make rain during the dry summer months when all the conditions except the annual scarcity of water are most favorable. If success were achieved, $10,000, paid share and share alike by the Yukon territorial government and the Klondike miners, was to be the reward. "A cloth-covered cabinet, which no one was permitted to enter," was an essential part of the apparatus. As usual there was a dearth of water.

No doubt there are other areas like the one proved by drilling during the past year, where a minimum of about 40c. and a maximum of over $2 per cu.yd. is said to have been found, which may be worked with success; but the promiscuous placing of dredges in Klondike will mean numerous failures, even though a gold content very much greater than that encountered at Oroville shall be proved. This prospecting has shown that there are wide pay streaks. No discoveries showing other than great vertical concentration have been made.

Methods of Mining

Mining methods have not changed materially during 1906. The year has, however, been one of transition.

When the reservoirs to conserve local water, and the long ditches, are completed, the water will be used in generating power for operating floating dredges and electric machinery, lifts, pumps, etc., in conjunction with modified hydraulic-mining machinery and methods not only to excavate and hoist material to the sluices but also to dispose of tailings. These operations, covering large areas of

creek-bottom claims, make a merger of considerable magnitude and will depart in some cases rather radically from existing methods and the established ideas of the most effective means of working.

There are many reasons why these creeks are unusually amenable to working as "one-man propositions." The total gravel section is usually shallow and solidly frozen and the overburden must be stripped in successive layers as it thaws by exposure. This may best be done by ground sluicing or with steam scrapers, as the material is then removed as it thaws and no attempt is made to handle frozen ground. Ground sluicing is the cheaper when ample water is available, but water will always be comparatively scarce and costly in Klondike.

Now, after most of the creek bottoms have been partially or thoroughly worked, in many cases more than once, and the original superposition of muck has been disturbed, the opportunities for ground sluicing are not so favorable. Steam scraping has been the favorite means of stripping and only in exceptional cases has any other method for removing overburden been used.

Handling Pay Material

The means of excavating and transporting pay material to the sluices, after the overburden has been removed, have been most varied. The following are those employed: Shoveling to platforms, then to sluice; shoveling to wheel-barrows, wheeling to bucket, raising on inclined cableway to sluice; shoveling into cars, hauling on inclined track to sluice; steam-shoveling into cars, hauling on inclined track to sluice; steam-shoveling directly into sluice; shoveling into skips, skidding and hoisting by derrick into sluice; hydraulicking to a sump, hoisting with steel bucket conveyer to sluice; hydraulicking into a sump, hoisting by centrifugal dredging pump into sluice; steam-shoveling into skip, hauling on cableway to sluice; and several other combinations. In a few cases a steam elevator was used to raise the material to the sluice. The means most generally used is shoveling into wheel-barrows, wheeling to bucket, hoisting on inclined cableway to sluice. It is well adapted to the one-man enterprise.

The methods and machines in contemplation will use many of the old features, but will include better means for tailing disposal and will have other advantages. Machinery will replace hand labor and larger capacities will be attained. Areas which have been worked on the one-man plan will be worked on a large scale. In the early days many of the creek claims were grouped and exploited under corporate ownership and management. There were failures in nearly every case, although in several noteworthy instances very rich ground was mined. However, bad management contributed largely to this result. Klondike operations will be watched with more than usual interest after the contemplated changes have been in force for a time.

Cost of Dredging

Two new dredges began operations in 1906, and there are three in course of construction; much of the ground to be mined is frozen, and will need steam thawing, at a cost of 25 to 50c. per cu.yd. One dredge operating in ground but little frozen has excavated material yielding 50c. to $1 per cu.yd. at an operating cost of about 12c. per cu.yd.; a daily average capacity of over 3000 cu.yd. was attained. It is interesting to note that the daily average capacity of a dredge at Oroville, the counterpart of this one, for a year, was about 2900 cu.yd., at a cost of less than 5c. per cu.yd.

Dredging in the Klondike river valley, near the mouth of Bonanza creek, is said to have been very profitable. From operations conducted during 1906 it is thought that, in normal seasons, dredging can be begun about May 1 and continue until about Oct. 20, although operations in the early and late parts of the season must necessarily be at higher cost and with greater difficulty. The design and construction of the dredges must be suited to operations in cold weather. A well designed dredge should be able to operate 30 to 45 days longer in a season than possible in hydraulic mining, and 45 to 60 days longer than open-cut mining may be carried on.

Hydraulic Mining

By hydraulic mining between 2,500,000 and 3,000,000 cu.yd. was washed, about twice as much as in 1905, in spite of a poor water season. This was due to more available sources of supply, and to the construction of storage reservoirs. There were no essential modifications in method and for cost, including amortization, about 20c. per cu.yd. is proper for well managed operation. A dam, 54 ft. high, on Adams creek, and forming a reservoir containing 58,000,000 gal., was completed in 1906. Another, to be 60 ft. high, and to conserve 2,000,000,000 gal., was begun on Bonanza creek.

Two ditches of considerable size with capacities of 10,000 miners' inches and 500 miners' inches, respectively, were partly built. About 5 cu.yd. per miners' inch was hydraulicked per day in mines operating on a scale employing 5 to 7 cu.ft. per sec. Owing to conflicting grants of water rights, there has been considerable difficulty, much of which was aired in the courts. There have been fewer applications for water rights, hydraulicking, as a means of profitable working, having been superseded in popular esteem by dredging. Hydraulicking with pumped water was carried on in but one notable instance. This method is extremely costly and seldom profitable.

Conditions Unfavorable to Water Storage

The physiography of Klondike is extremely unfavorable to getting ample supplies of water without long ditches, pipes, flumes and inverted siphons. Topographic isolation is the cause. Climatic conditions are very unfavorable to the construction and maintenance of water ways. In addition to the high cost of labor, materials and transportation, good dicthing ground is seldom encountered and maintenance expense is large.

Attempts have been made to use steam shovels as ditching machines in gravel, loose rock, and muck. Where the material was thawed, good progress was made, but as this was the exception rather than the rule, much difficulty was experienced. Wooden-stave pipe is being used instead of open flumes for the first time in Klondike. Horse scraping has been used rather generally of late in ditch construction. A cost of 30 to 50c. per cu.yd. was noted for such work.

Fuel and Transportation

The fuel problem was still a difficult one. Wood hauled on runners cost $10 to $16 per cd.; for that delivered on wheels, $14 to $20 per cd. was paid for 16-ft. lengths. Wood tends to become more costly each year as it is necessary to haul greater distances.

Coal from Coal creek, Tantalus and Five Fingers, has been used in a limited way, but not with encouraging results. It possesses low calorific value, and is only used where its cost per ton is less than that of wood per cord.

The transportation problem is still a difficult one. Although the Canadian Government is still pursuing its excellent policy of building and maintaining roads, cost of transportation is high. New roads have been built in Stewart river district and elsewhere. A narrow-gage steam railway is being built out of Dawson to Stewart river. Freight rates from the "outside" are still high; about $60 per ton is the charge. Passenger rates for railway, river steamer and stage travel are about as formerly: 20c., 11c., and 25c. per mile being the respective average charges.

Considerably more drill prospecting has been done in 1906 than in former years. The frozen condition of the gravel makes no essential differences in the manipulation. Prospecting value and dredging value, as determined by drilling with percussion drills and dredging with buckets, respectively, check well.

A new mining code has been adopted and numerous betterments will result. The regulation, passed in 1904, to permit the sale of water, has had no effect for there has been no surplus water to sell. No new concessions were granted, and there is little likelihood of any being given in the future.

Phosphate Mining in Tennessee

The Industry has Suffered Severely from Violent Market Fluctuations. Consolidation is Creating More Stable Conditions

BY H. D. RUHM*

The Tennessee phosphates occur almost entirely in Silurian and Devonian strata, but more particularly in the former, and in the transition strata between the two. The Silurian was essentially the age of shell-fish, the deposits of which formed the immense beds of Silurian limestone. The Devonian was the age of fishes, whose bones are composed of calcium phosphate. Far back in the Silurian age, however, certain species of shell-fish had phosphatic shells, and the commingling of the two formed the "phosphatic limestones" of the Silurian. In some places the phosphate shells were in considerable proportion, and subsequent erosion, proper underground drainage and leaching dissolved out the carbonate to greater or less extent and left the "brown phosphate" of the middle basin. Meantime the transition stage between the two ages had been reached and its deposit spread over the central basin and the highland rim in the form of a thin blanket of the so called blue rock, which is blue, brown, gray and black, according to the coloring matter present. It is composed of a preponderance of microscopic shells composed of phosphate of lime, but mixed with enough carbonate to make the resulting mass vary from 65 per cent. to as high as 80 per cent. calcium phosphate.

Subsequent depression permitted the deposition of Devonian shales and sub-Carboniferous beds, and subsequent pressure hardened all these into rock. At about the middle of the sub-Carboniferous age all these were elevated above the surrounding country and began at once to undergo erosion.

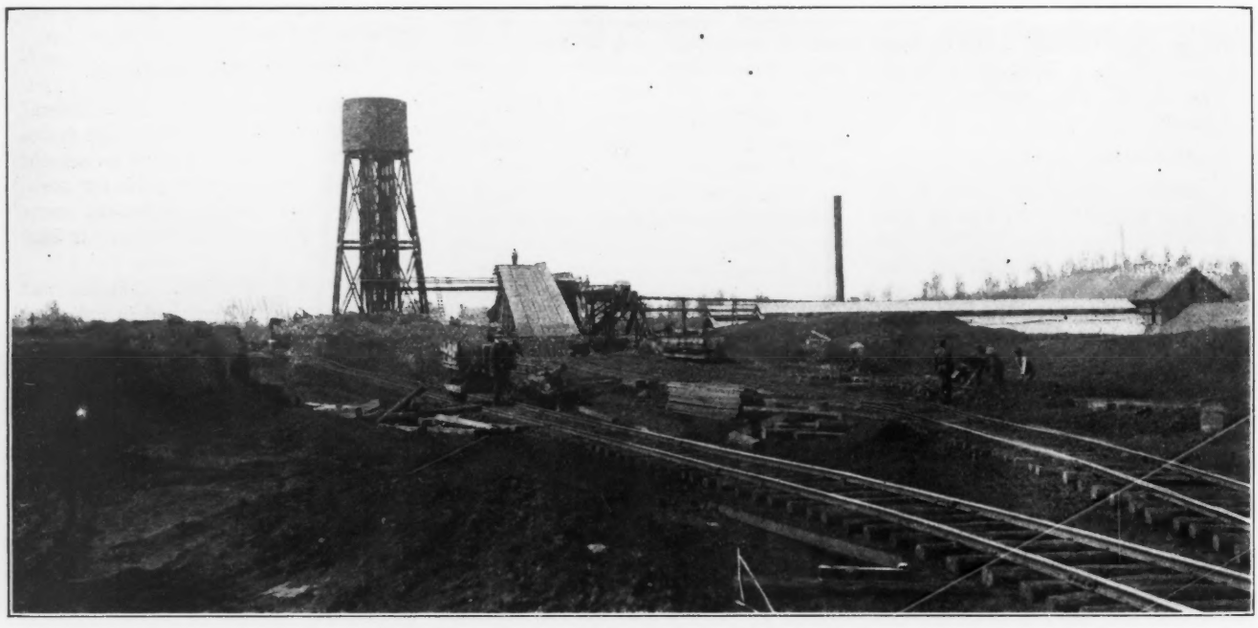
Natural Alterations

In the central basin, where conditions were favorable, the strata intervening between blue and brown phosphatic beds were partly or wholly removed, allowing the blanket of blue rock to subside on to the brown, resting either directly on it or separated from it by only a thin band of clay. If the original phosphatic limestone carried, say, 50 per cent. calcium phosphate, 38 per cent. calcium carbonate and 12 per cent. of insoluble matter, and if leaching took out all the soluble carbonate, the remaining rock would have 80 per cent. of phosphate, which is the usual grade of the bottom rock at Mt. Pleasant, or "export." The top rock varies in analysis from 65 to 80, just as the original blue rock did.

In the highland rim this process took place only on the slopes of the narrow valleys and occasionally in projecting points, instead of over large areas of country as in the central basin. In that portion of the highland rim left intact the blue rock remains in place, as a general thing, with its varying quality and thickness, retaining its original compact form and density. Occasionally, however, the layer of blue rock is found resting immediately on the layer of phosphatic limestone, and where this is the case numerous faults and dips occur.

Again, in the central basin, or brown-rock region, the top erosion first disintegrated and then partially took off the upper layers of shale, sometimes entirely, sometimes leaving it from 1 to 40 ft. thick; this accounts for the varying overburden.

In some places where the limestone layers were entirely soluble, the upper layers of phosphate were dissolved and redeposited in the boulder and stalagmite forms of the "white rock" found in Perry and Decatur counties and near Godwin, in Maury county, and in the "boulder rock," found everywhere to greater or less extent, but in especially heavy deposits on the McGavock place, near Nashville. These redeposits vary in analysis from 50 to as high as 90 per cent. phosphate, but are variable in richness, though individual deposits from one to 20 or 30 acres of very uniform quality are found.



MT. PLEASANT PHOSPHATE FIELD—A TYPICAL PLANT

Early Development

In December, 1893, blue phosphate rock was discovered in Hickman county. The discovery was due largely to the persistence of prospectors for coal, who insisted on hunting in a section of country two geological ages below the coal measures The year 1894, while it brought much ex

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citement, saw a pitifully small output, and comparatively little development of the various facilities necessary for putting on the market a product so widely scattered and so remote from immediately available transportation.

A few companies struggled through 1894, 1895 and the first half of 1896, digging "rabbit burrows" under the hills and stripping back to "face up" their mines. This had the inevitable result of breaking away the main face of the hill, rendering it worse for permanent work than if it had never been touched. Two companies constructed and began to operate narrow-gage railroads, having grades up to 5 per cent. and curves as high as 50 deg. With these facilities, supplemented by all the wagons they could get to work, the several companies managed to get out a really remarkable output of 19,188 tons in 1894, 38,515 tons in 1895 and 17,000 tons for the first half of 1896.

All that time, these blue-rock hunters were walking over and kicking out of the way the brown rock of Indian and Swan creeks and Totty's bend, and prospectors were daily getting off the train at Mt. Pleasant, and driving out to the blue-rock field on Big Bigby creek; they even mined some of this rock, hauling it to Mt. Pleasant and shipping it, never dreaming they were walking and driving every day over the finest deposit of phosphate ever known to the world.

Market Fluctuations

Probably no other commodity has seemed to be so sensitive in its market fluctuations. Prior to the discovery of the blue rock, Florida phosphate of about the same grade was selling in the interior at about $6 per ton for 65 to 70 per cent. on the basis of Centerville freight rates. The first sale of Tennessee phosphate was at $4.65 per ton by the old Southwestern Phosphate Company. In all hunting up the same buyers at once, the mines succeeded in a short time in reducing the price to $2.25 per ton. The hight of folly was accomplished when Louisville and Birmingham parties purchased the Tennessee Phosphate Company holdings on upper Swan creek, expecting to construct a road from the N. & F. division of the Louisville & Nashville Railroad down Swan creek, and thus to cut out the expensive haul of the other mines, which in most instances amounted to 75c. per ton. They also expected, by using machinery, to lessen the cost of production, so they sold 100,000 tons at $1.95 per ton in order to freeze out the small producers. Some of the small producers had in the meantime, however, been holding tight this precious knowledge of the nature of the Mt. Pleasant deposit, and about the time the above action had already put the blue-field companies into bankruptcy or worse, the small producers purchased a few acres of land and calmly went to mining brown rock at Mt. Pleasant at a cost of about 85c. per ton, f.o.b. cars, shipping it on their old contracts at $2.25 for blue rock.

The manufacturers, however, had bought blue phosphate rock guaranteed 65 per cent., and they maintained that they did not want brown phosphate rock even though it ran 75 per cent., unless a deduction was made in the price. The reduction was, of course, promptly forthcoming, for the reason that the parties who had shipped the rock were greatly in need of the 85c. per ton it had cost them to produce and load, and when a compromise of $1.25 per ton was proposed, it was eagerly accepted.

The manufacturers immediately began to stipulate for a 75 per cent. guarantee and for rock containing not more than 5 per cent. of iron oxide and alumina. The people who had invested in the blue-rock region were disgusted with the whole phosphate business, and it was soon found that the field was too extensive to allow concentration of ownership. Some large interests did, however, move into the Mt. Pleasant field, bought one of the best prospects at $100 per acre and began operations by reducing its blue rock 65 per cent. prices to $1.50 and $1.40 for 75 per cent. brown rock. For a long time thereafter $1.10 was the ordinary selling price, and $1.25 the maximum.

Slowly the miners began to find out that it cost more to produce than they had figured on, and prices advanced until in 1898 rock was sold at $2 per ton for 75 per cent. In the meantime the export market had been essayed and the guarantee for this was made 78 per cent. bone phosphate of lime, and 3 to 4 per cent. iron and alumina. The first price at which this grade of rock was shipped was about $1.65 per ton, and in not very many months it had come up to $2.25 per ton. During fall of 1898 and spring of 1899 an era of activity was seen. Property changed hands at a lively rate; laborers flocked to the field, everybody mined all he could get out, regardless of sales and shipments, and still the prices climbed, until in the fall of 1899 and spring of 1900, export rock brought as high as $4 per ton and domestic $3. The fury of production was redoubled and simultaneously the extent of the Maury county field was ascertained to be much greater than had been thought possible.

PHOSPHATE MINE, MT. PLEASANT, TENN.

About this time the Boer war broke out and as three-fourths of the carrying trade for phosphate was done in English vessels, the export business came to a standstill, and the export rock not only of this field, but of Florida, was dumped on the domestic market.

The Fertilizer Industry

In the meantime first the Southern trust and then the Northern trust was formed, the two companies comprising most of the fertilizer factories in the United States. These two concerns partially supplied their wants by purchasing

rock property, but failing to supply their entire requirements, attempted to get them at their own prices later by depreciating the prices of their product.

This depreciation, coupled with the enormous increase in the use of fertilizer, caused the starting up of a large number of independent factories, and consequently an increasing number of buyers of Tennessee phosphate rock. Also the packing-house people being unable to supply the demand for their pure blood and bone fertilizers, and finding that the quality was very much improved by the use of high-grade rock, became large customers of the Mt. Pleasant and other Tennessee fields. Numerous cotton-oil mills having been purchased by the Southern trust, many more were started up, and these all being producers of cotton-seed meal, largely used in the manufacture of fertilizer in the South, they in turn became fertilizer manufacturers and users of Tennessee phosphate rock. Also experiment stations in several States had been making actual experiments with raw ground phosphate rock without acidulation, as a direct fertilizer, and instead of reaching the position taken by the Tennessee station that it was worthless and that its sale should be prohibited they arrived at the directly opposite conclusion. Lastly, with the end of the war, the export trade reached out more strongly than before. The weak condition of the producer was thus changed to one of great strength.

REMOVING OVERBURDEN, PHOSPHATE MINE

Operating Methods

The first thing that impresses itself on any visitor to the phosphate fields is the almost universal dependence on hand labor. This is partially due to the fact that they "just started that way," and hence the most "experienced laborers" have always done that way; and partially to the fact that the varying conditions met with in the deposit make it very difficult to devise appliances suitable for one portion of a mine that will answer the requirements in the closely adjacent portions. For instance, it is possible in the same open face of a mine to find the overburden varying from 2 ft. to 20 and the rock from a few inches thick, sticking tight to the top of a lime boulder, to 15 ft. in the "dip between two boulders," while the rock itself will vary from the shaly, partially disintegrated top rock through various sizes to heavy blocks 6 to 8 in. thick and often 10 or 12 ft. long.

It will therefore be seen how difficult it is to design a machine that will accommodate itself to the handling of this material. The removal of the overburden has been generally accomplished with wheel scrapers. Two companies have used the New Era or Western machine plow, with elevator belt loading the dirt into dump-bottom wagons alongside. Two steam shovels are now in use, being of the traction type, and occasionally these have been used in digging the rock, though apparently with not entire success. Cableways have never been used to transport the material, and this is done largely by wagon and team, though many tram roads, with cars propelled by either mules or dinky engines, are in use.

The bulk of the rock, however, is dug by the miner with pick and fork, loaded into wagons, hauled out and dumped in windrows on the ground, stirred with a potato plow and harrows, allowed to dry in the sun, taken up again into wagons and hauled either direct to cars for shipping or put under sheds for storage. When an extra good quality of rock is wanted, as for export, a few layers of cordwood are put down and the sun-dried rock put on that. Then, when ready to ship, the wood is fired, and after the rock is cool it is broken and loaded with forks, when most of the dirt sloughs off, leaving the rock almost perfectly clean.

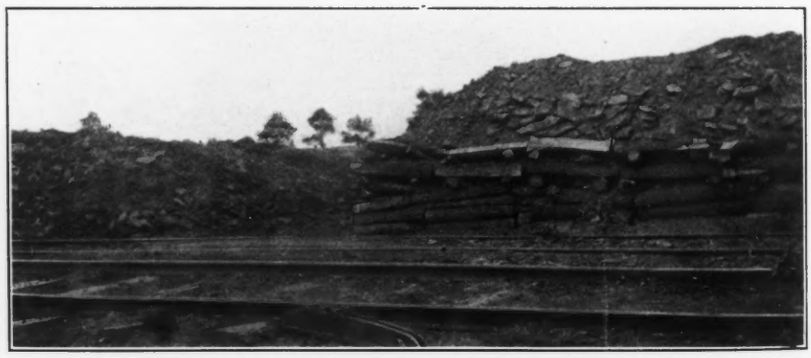
Some rock can be put from the mines immediately on the wood and burned for export, but generally this will only be a safe domestic rock. Some companies who have water accessible pick out the large pieces and send them direct to the dry kilns, and then the small pieces with the dirt, known as "muck," are passed through washers, the rock coming out clean and being deposited on cordwood and burned as above described.

The resulting rock, after being crushed, is passed through screens, which separate it in three sizes: from 1½ in. up going for export, that between 1½ and ¼ in. for domestic, and the dust and ¼-in. pieces being ground up and sold for direct use, or to small factories.

The Century Phosphate Company has installed a system of driers, and does not wash the rock, but dries it thoroughly in mechanical driers, and then screens it as above. Miners are generally turning their attention to labor-saving devices for doing the preliminary operations, and to systems for saving the valuable products that have heretofore gone to waste in large quantities. At least 10 per cent. of the present output is thrown away to prepare the high-grade rock now demanded. I should estimate that this waste rock can be made into acid phosphate at a cost such as to yield an annual net profit of $162,500. This excess fertilizer could profitably be employed in enriching the barren lands whose cordwood has been consumed in drying phosphate rock at Mt. Pleasant.

Situation and Prospects of the Industry

The principal localities in the State where operations are now in progress, are: Mt. Pleasant, Kleburn, Jameson and Century, in Maury county; Lower Swan creek, Twomey and Totty's Bend, in Hickman county; near Gallatin, in Sumner county; Wales station, in Giles county, and near Nashville, in Davidson county.



METHOD OF DRYING PHOSPHATE ROCK—THE PILE ON THE RIGHT IS READY TO FIRE

The principal localities where developments will gradually take place as the demands of the business require are: Southport, Estes bend, Bear creek, Neeley's valley, Little Bigby, West Fork, Baptist Branch and Leiper's creek, in Maury county; Richland creek, in Giles

county; Station Camp creek, in Sumner county; north and west of Franklin, in Williamson county; Brentwood and Bellevue, in Davidson county; Beech river, in Decatur county; Tom's creek, Buffalo river, *Hurricane creek and Cane creek, in Perry county; *Forty-eight Mile creek, in Wayne county; *Upper Swan and *Indian creeks, in Lewis county; *Lower Swan, *Indian creek, Ship's bend, Gray's bend, Persimmon, Haleys and *Leatherwood creeks, in Hickman county.

The total tonnage of phosphate rock of 60 per cent. and better grade now available in the Tennessee field is estimated at 44,800,000 tons, and of this the State may be counted on to produce 35,000,000 tons.

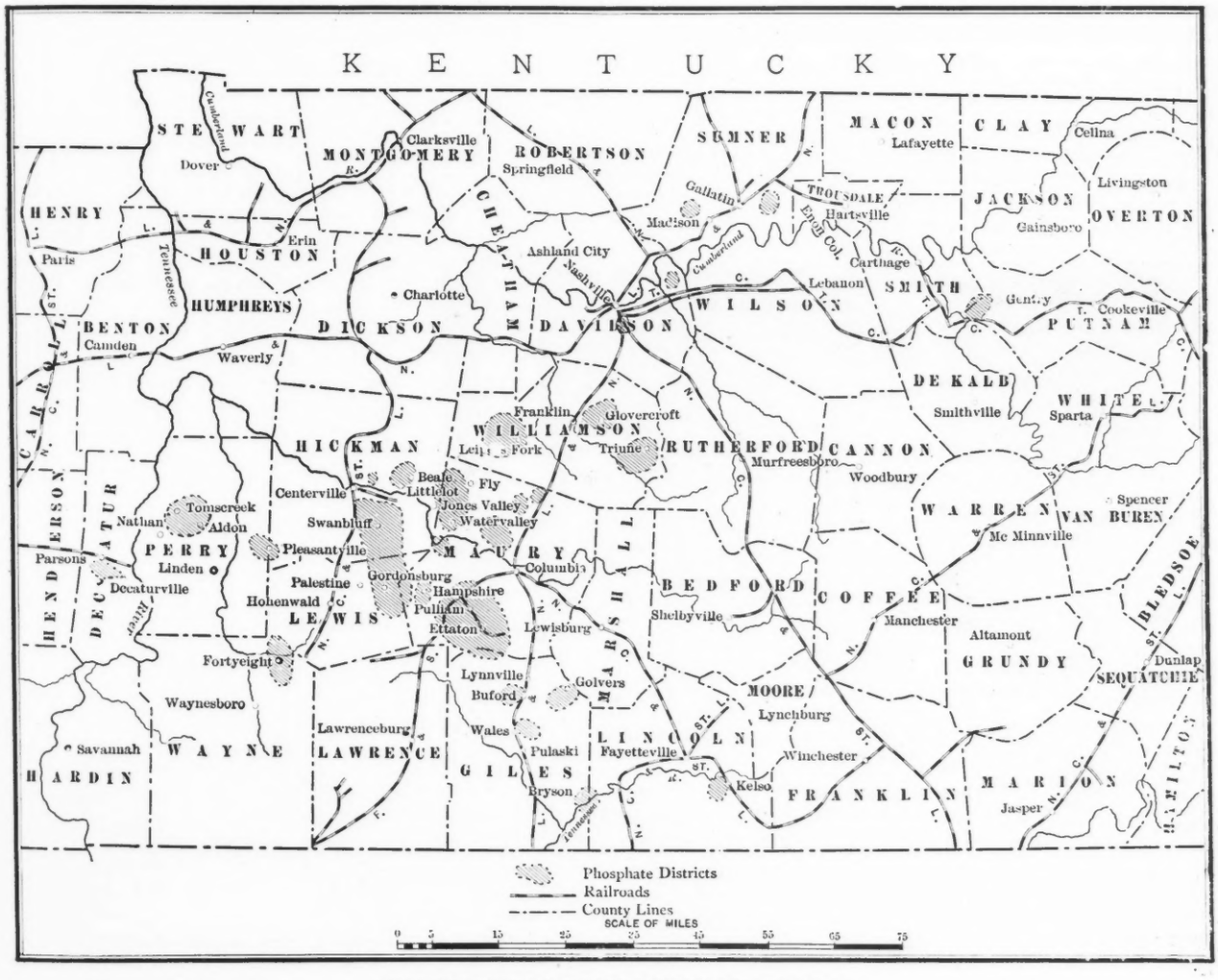
Of the present working localities the principal one is Mt. Pleasant, and while the property owners there are beginning to figure a little on how much they have left, still the prevailing impression that Mt. Pleasant is about through mining is an exceedingly mistaken one. With the present rate of output, the visible supply of the Mt. Pleasant field proper will last for seven years longer, without taking into consideration the Southport field, which is practically part of the Mt. Pleasant field. With the Southport field, mining will last here, at the present rate of output, for 11 years. It is very easy to understand that as work progresses at Mt. Pleasant and the end approaches, some miners drop out by selling, some by working out their small deposits and these naturally go to the other fields. In none of the other fields is found the persistently uniform, high-grade, brown rock of Mt. Pleasant except Southport, Century and Kleburn, in the two latter of which operations are now in progress, and in the former the extension of the Mt. Pleasant Southern Railway will soon cause development work there. As these deposits afford practically the same grade of rock as Mt. Pleasant proper, they will be worked out simultaneously with it and will cater to the same market.

The producers of this character of rock are gradually increasing their prices and reducing their output, thus giving opportunity for the marketing of the lower grades in the other fields, notably the Swan creek and Indian creek deposits in Hickman county. This means that the producers at Mt. Pleasant will make more money from their product, and that it will last a considerably longer time, so that it is safe to say that mining in force will be carried on at Mt. Pleasant and kindred localities for at least 20 years.

During the next decade, to supply the diminution of Mt. Pleasant's output, will come the gradual development of the vast blue-rock field of Maury, Hickman and Lewis counties, and the white rock of Perry and Decatur counties, which form the backbone of the phosphate industry in Tennessee, and whose millions of tons will cause these counties to be considered the phosphate reservoir of the world for the next 75 or 100 years.

The change of base will be gradual, and the trade will have ample opportunity to adjust its operations so as to utilize the lower grade blue rock as it becomes advisable and necessary to do so. Its many points of superiority for acidulation and for direct use without acidulation will largely make up for its lower grade.

The blue-rock field proper covers a territory bounded approximately by a trapezoid having as its four corners Centreville, in Hickman county; Kinderhook and Mt. Joy, in Maury county, and Lewis

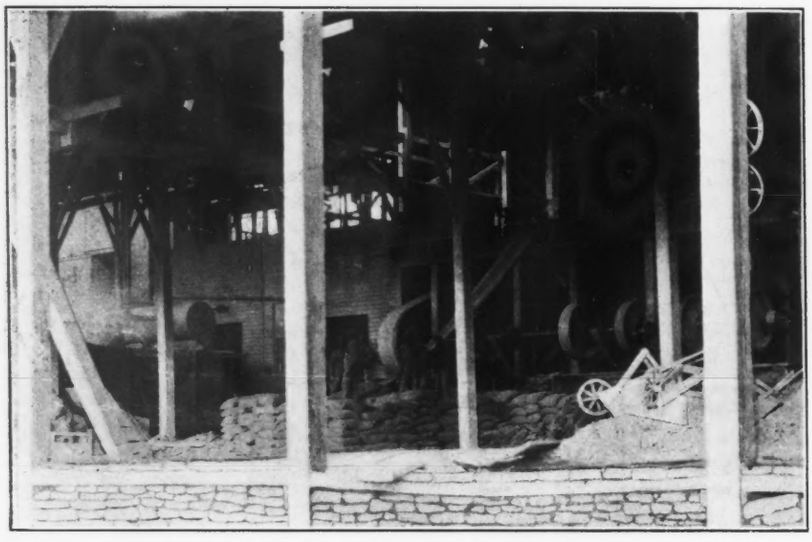


MAP SHOWING PHOSPHATE DEPOSITS OF TENNEESEE

*Blue rock.

Monument in Lewis county. Traversing this territory are Duck river, Indian, Swan, Blue Buck and Cathey's creeks, and their tributaries, and outcropping along these valleys and underlying the ridges between them are deposits of blue rock running in bone phosphate from 60 to 78 per cent., with less than 3 per cent. iron and alumina, that will aggregate in the neighborhood of 40,000,000 tons.

This field will soon be developed by the extension of the Nashville, Chattanooga & St. Louis branch up Swan creek and the Louisville & Nashville branch down Swan creek, with side lines and spurs leading off each, surveys for which have been made, and work on construction will soon be under way. If, however, the Florence Northern Railroad should ever be built from Florence to Nashville it will run through the heart of this territory as well as the magnificent iron deposits of Wayne and Lewis. With the above road and a road from Huntsville on the southeast to Milan on the northwest, all of the phosphate territory would be fully developed, and this section of Maury, Hickman, Lewis, Perry, Giles, Davidson and Williamson counties would be the site of more fertilizer factories than will be found elsewhere in the world in the same space.



INTERIOR, PHOSPHATE PLANT, MT. PLEASANT

Cost of Pipe-line Transportation

The investigations of the Interstate Commerce Commission show that the expense of pumping oil is very much less than the cost of transporting it by rail. It was said that the actual cost of pumping a barrel of oil 100 miles was about 2c., and while this must vary with different conditions the estimate seems to be sufficiently high on the average. The cost to the Standard of transporting a barrel of oil from the Kansas field to the Atlantic seaboard would not be much, if any, above 30 cents.

Standard Screens, Weights and Measures

The Central Standardization committee of the Institution of Mining and Metallurgy recommends the adoption of the following as "The I. M. M. Standard Laboratory Screens":

Mesh, apertur's p'r linear inch.	Diameter of Wire.	Aperture.	Screening Area.
5	0.1 inch.	0.1 inch.	25.00 per ct.
9	0.063 "	0.062 "	24.60 "
10	0.05 "	0.05 "	25.00 "
12	0.0417 "	0.0416 "	24.92 "
16	0.0313 "	0.0312 "	24.92 "
20	0.025 "	0.025 "	25.00 "
25	0.02 "	0.02 "	25.00 "
30	0.0167 "	0.0166 "	24.80 "
35	0.0143 "	0.0142 "	24.70 "
40	0.0125 "	0.0125 "	25.00 "
50	0.01 "	0.01 "	25.00 "
60	0.0083 "	0.0083 "	24.80 "
70	0.0071 "	0.0071 "	24.70 "
80	0.0063 "	0.0062 "	24.60 "
100	0.005 "	0.005 "	25.00 "
150	0.0033 "	0.0033 "	24.50 "
200	0.0025 "	0.0025 "	25.00 "

Owing to difficulties in wire drawing and in the weaving of wire cloth, absolute accuracy to the fourth place of decimals of an inch is unattainable with uniformity of 25 per cent. of screening area; but the above table is so near to theoretical perfection, and the unavoidable irregularities of screening tests themselves are so wide that any inaccuracies in the table would be immaterial in practice. It is not possible to weave the 200-mesh screen except in what is known as "twilled" or double wire.

The advantages of the series are: That a definite ratio and a corresponding arithmetical progression of both aperture and mesh is secured; that by adopting a screening area of 25 per cent. the wires are absolutely "locked" in position, thereby preventing shifting and consequent irregularity in the size of aperture; and that the ratio between wire and aperture in all meshes being constant, the angle of taper of the hole is also constant.

As regards the more exact definition of the word "slimes," the committee suggests: that material coarser than 150 mesh be described as "sand," coarse or fine; that material passing 150 mesh but settling in — seconds in a — inch column of water be described as "meal," and that material settling more slowly in water be described as "slimes."

Mesh per Linear Inch

The mesh committee had issued a printed circular to members of the institution and others. Replies to the questions were received from over 100 engineers. Assuming the adoption of a standard series of screens, which makers of wire cloth could supply, there was a practical unanimity as to the advantages of retaining the description of the various sizes by *mesh per linear inch,* for the following reasons:

Those who objected to the use of the term "mesh" based their objections on the fact that in the past it had not denoted the size of aperture; but as the whole object of establishing a laboratory standard would be to fix definitely a certain aperture for a certain mesh, it would be simply a matter of convenience of terms as to whether a screen was described as a certain "mesh," or with apertures expressed in decimals. There could be little doubt that in practice engineers would continue to use the term "mesh" by choice, because it is shorter, really descriptive, easily remembered, and precisely as accurate as, because interchangeable with, a certain size of aperture. An agreed standard table giving the size of aperture in decimals of an inch, for each standard mesh, would obviate any confusion. The suggestion of one or two engineers that in future aperture should always be specified alone would be unworkable in many cases, and would not necessarily insure accuracy or uniformity. Micrometer measurements of fine wires when once woven and crimped are not always to be relied on, and uneven weaving would in practice vitiate conclusions as to size of aperture much more than in the case of the use of standard screens specially prepared for laboratory use. The dependence on every individual who reports screening tests to verify the measurement of such screens as he happens to have by means of a micrometer, even if advisable or practicable, would produce results of grading that could not easily be made comparable with results obtained elsewhere. The attempt to use a standard of apertures in arithmetical ratio, accurate to two or three places of decimals, is pronounced impracticable by wire-cloth makers; and in any case would only prove to be the introduction of a new arbitrary scale of grading, differing greatly from past practice, and offering no advantage over an agreed standard set of screens such as are now advocated.

As regards the description of screens

in mills, the mesh committee does not propose for the moment to put forward any suggestions. There are difficulties to be considered from the fact that managers of mines are likely to be guided by personal opinions of expediency in connection with the kind of ore, type of crusher, cost of material and subsequent processes of treatment. It is well known that different ores, different quantities of water, wet or dry crushing, and different crushers, all give varying characters of discharge through exactly the same screen. The committee therefore recommends in the first instance the establishment of one uniform standard method of expressing grading analysis of all mill products in the laboratory, which would enable accurate comparisons to be made.

Only comparative accuracy can be attained in the description of *mill* screens made in commercial quantities, owing to the fact that both in the drawing of the wire and in the weaving considerable irregularity always occurs.

Division of Slimes

There seems to be a general opinion that material passing the finest screen of any standard series should be divided into two classes, and not be described under the one heading of "slimes." Various suggestions have been made as to the method of division and as to the terms to be used for describing the three degrees of fineness of particles. The general opinion seems to be that all material coarser than 150 mesh should be described as "sand"—coarse or fine, if preferred; that the portion passing 150 mesh, but readily settling in water, should be described by some such term as "meal;" and that the term "slimes" should be limited to particles which settle slowly in water. It may be difficult to get any general agreement as to the division between "meal" and "slimes;" and even if this be made arbitrarily, it will remain a fact that two materials having the same settling speeds may not be of the same size of particles, character or permeability. Some such rough division of the two classes would, however, tend to greater accuracy and uniformity of description than is usual at present.

Weights and Measures

The weights and measures standardization committee submits the following recommendations for adoption by the central committee:

That the word "ton" shall represent a weight of 2000 lb. avoirdupois (29,166.6 oz. troy); that the use of the terms "cwt." and "qrs." be abandoned, and that fractions of a ton be expressed either in pounds or in decimals of a ton.

That the "miner's inch" be understood to mean a flow of 1.5 cu.ft. of water per minute.

That the word "gallon" be understood to mean the imperial gallon of 10 lb.

That all temperatures be expressed in degrees Centigrade.

That gold and silver returns be expressed in terms of fine gold and silver, and not as "bullion."

That gold contents of ores, etc., be expressed in money values as well as in weights; and that in this connection the standard value be taken at 85s., or $20.67 United States currency, per troy ounce fine gold.

The members also suggest that the following questions be appended to any memorandum that may be issued to the members of the institution embodying the above definitions:

(*a*) Do you consider the general adoption of the metric system of weights and measures to be feasible in mining and metallurgical work, or would this, in your opinion, lead to undue dislocation?

(*b*) Have you any suggestion to make as to weights and measures other than those already dealt with, which require exact definition?

The question of the adoption of metric standards has engaged the attention of the committee, as the present movement in that direction in other branches of industry rendered it, in their opinion, inadvisable to ignore it entirely. The feeling of the committee, however, is that, while the question should be brought to the attention of the members, it would at present be quite inexpedient to advocate the general adoption of the metric system in mining and metallurgical work. On the other hand, an attempt to decimalize existing weights and measures is considered to be a step in the right direction, and as tending to bring about a desirable simplification.

Phosphorus from Wavellite Deposit at Holly Springs, Penn.

Until recently phosphorus, which is used chiefly in the manufacture of matches, was made solely from bones and organic substances. Only since the perfection of the electric furnace have natural phosphates been used to any extent in making phosphorus. The extraction of phosphorus from mineral deposits has been investigated by the United States Geological Survey, and the forthcoming number of the annual "Economic Bulletin" will contain an article by George W. Stose on phosphorus ore at Holly Springs, Penn.

At the foot of the northern slope of South mountain in the vicinity of Mount Holly Springs, about 10 miles southwest of Harrisburg, a deposit of wavellite occurs in the white clay associated with manganese and iron ores. Small quantities of phosphorus had previously been obtained from phosphorite and from apatite, but wavellite, which is aluminum phosphate, has never before been used commercially in the manufacture of phosphorus, as the mineral generally occurs in very limited quantities.

The American Phosphorus Company was organized by Philadelphia capital to develop the deposit and a mill was built nearby. The mine was opened in 1900, the first years being devoted to prospecting and experimenting with the reduction of the ore. During 1905 the mine was in active operation and 400 tons of ore were reported to have been extracted and reduced in the company's furnaces.

The different methods of manufacturing phosphorus are described. The Readman process, patented in 1889, is the one that has come into commercial use in most countries.

The world's production of phosphorus has been variously estimated to be from 1000 to 3000 tons a year. The greater part is made in the Albright & Wilson factory, Wednesfield (Oldbury), England, where the Readman process originated. Other large factories are located at Lyons, France, and at Griesheim and Frankfort, Germany. There is also a plant in Sweden, and there are numerous smaller ones in Russia.

Tonopah & Goldfield Railroad

The report of the Tonopah & Goldfield Railroad deals with the first fiscal year ended June 30, 1906. The total operating expenses amounted to $516,150 and the net earnings totaled $432,726, which, after the deduction of dividends, enabled a balance of $186,633 to be carried forward. A dividend of 7 per cent. was paid on the preferred stock and another of similar amount was declared on the common stock. During the year the company was consolidated with the Tonopah Railroad Company. At the time of the consolidation the Goldfield road was making excellent earnings. The road is broad gage, laid with 65-lb. rails. The company continues to enjoy the monopoly of the immense traffic of the various gold fields in southern Nevada, but has been greatly hampered by a difficulty in securing new rolling stock to meet the demands of the freight offering. Orders for steel ore cars and Pullman passenger cars, under construction in the Eastern States, were not delivered on time.

The company has under construction a spur to the Silver Peak gold field from Tonopah, a distance under 20 miles, and an extension of the main line from Goldfield to Bullfrog.

There is now a through daily train service in conjunction with the Southern Pacific Railroad Company, between Bullfrog, Goldfield and Tonopah, and San Francisco and Ogden, Utah. There is a large passenger traffic and more freight offering than the company's plant can possibly handle. As a consequence the shareholders look forward to a prosperous future.

Electric Power vs. Mules for Mine Haulage

The Electric Installation Described, Besides Increasing the Output, Effects a Saving of 1 Cent per Ton. Plant Pays for Itself in 4 Years

BY M. F. PELTIER*

There is no feature of electric-mining application more successful than electric haulage, and it is the purpose of this article to show by actual results the superiority of this method over mule haulage. The introduction of the system at one of our mines has not only resulted in reducing the cost of production, but has also made practicable the development of more extended operations and has increased the output from 1400 tons to a daily average of 2000 tons. The motors have pulled as much as 2570 tons in 8 hours.

The Electric Equipment

Prior to installing electric haulage there were 16 gathering mules and 17 mules working in spike teams, pulling from the lyes to the bottom, producing 1400 tons of coal per day. Owing to the size of the cars, grade and average haul of 1800 ft. from lyes to bottom of shaft, the output had reached its limit with mule haulage; so, after careful examination of the existing conditions, it was decided to install electrical haulage. Two 15-ton Goodman traction locomotives with double-end control were installed. The frame of these locomotives consists of an upper and lower casting securely bolted together and suspended from the wheel axles. No part of this frame overhangs the rails, an important factor in narrow entries. The trolley pole is of the reversible type and so designed that it accommodates itself readily to the hight of the roof.

Trolley wire No. .0000 is used and securely fastened to the roof with trolley hangers, 8 in. outside of outer rail. The wheels have steel tires, which give them a tractive effort of 20 per cent. above that of the chilled rim. The locomotives are provided with two motors wound for 250 volts and exert a draw-bar pull of 8200 lb. on the level. They have pulled 17 loaded cars up a 2½ per cent. grade 1200 ft. long. These cars weigh when empty 1950 lb. and hold on an average 6600 lb. coal, so the weight of the loaded trip would be over 72 tons.

The Peabody No. 3 Mine Installation

This plant was installed at No. 3 mine of the Peabody Coal Company, Marion, Ill. (Fig. 1), by its manager, T. J. Armstrong. He has made the mine one of the best producing properties in the State. The vein is what is known geologically as the No. 7 seam and dips to the northwest from 2 to 3 per cent. The seam is 9 ft. thick, 2 ft. of which is left for roof, owing to the soft nature of the sandstone immediately over the coal.

The gage of the track is 42 in. The track, which measures 9000 ft. over all, is laid with 40-lb. rails, which are bonded and cross-bonded for return current, and is laid on white-oak ties. The curves on the locomotive-haulage track are from 40 to 60 ft. radius, which gives 16 ft. to 18 ft. from point of frog to point of switch on all cross-overs and turnouts. The curves are elevated on the outer rail to suit a speed of 8 or 10 miles an hour; therefore, when a trip is started, it will not lose speed or coal until it reaches the bottom.

One of the features of the mine is the method in which the coal is handled on the bottom. The loaded cars are all caged on one side and the empty cars are taken off on the other. The bottom proper is 225 ft. long, 18 ft. wide and 8 ft. high, and has a double track laid to a grade of 1 to 1½ per cent. in favor of the loaded cars, which run by gravity to the cages, where they are elevated and brought to the surface and dumped. On the return of the empty car from the top it is bumped off the cage by the loaded car and runs by gravity down a 4 per cent. grade for a distance of 60 ft., then up a 3 per cent. grade for a short distance, and backswitches itself in one of the run-arounds where the empty cars are collected for the motors.

FIG. 1. PLANT AT NO. 3 MINE, PEABODY COAL COMPANY

The Power Equipment

The electrical power for operating the motors in the mine is supplied by a 175-kw. generator belted to a 200-h.p. McEwen high-speed engine, 18x18 in., located in the power-house department of the building containing the hoisting engines. The generator also furnishes light for the underground haulage ways. This generator is designed and built to meet the special requirements of mine service where constant and extreme variations in the load are the rule. From the switchboard in the power-house the current is transmitted over a 400,000-cm. lead cable

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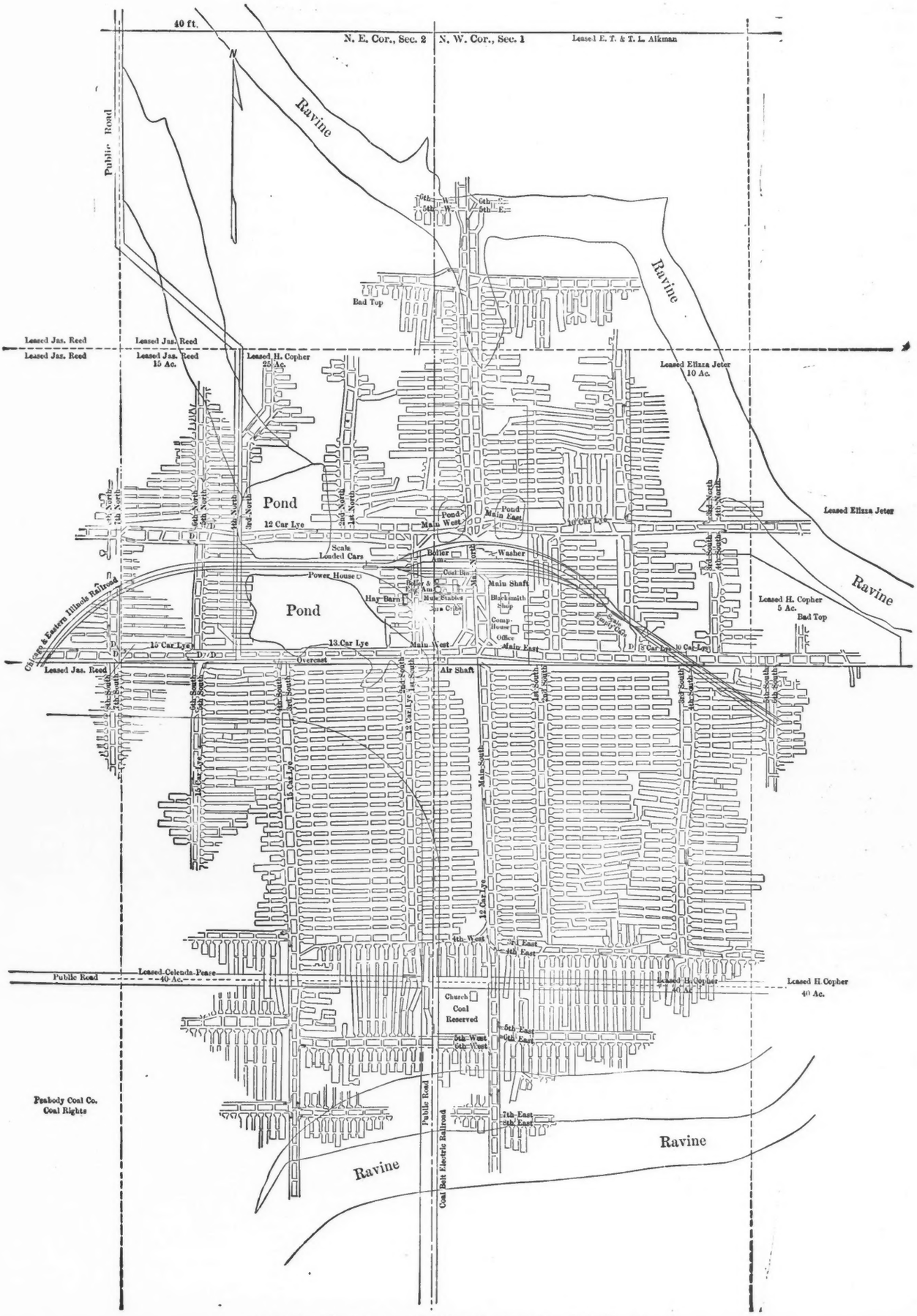

MAP OF MINE NO. 3, PEABODY COAL COMPANY, MARION, ILL.

running down the manway and to the main haulage way of the mine.

Steam to run the electric plant is furnished by a battery of four 150-h.p. tubular boilers, which also furnishes steam for the large hoisting engines; but in order to make the proper comparisons between mule and electric haulage, I will add the cost of two complete power units to the electrical equipment. The machinery making up the electrical installation is as follows:

COST OF GOODMAR ELECTRIC INSTALLATION

2—15-ton locomotives @ $2300..	$4,600.00
1—175-kw. generator and switchboard	2,400.00
1—McEwen engine, 18x18 in., 200 h.p.	2,000.00
Foundations and placing engine and generator	300.00
2—72 in. by 18 ft. tub. boilers, 150 h.p. complete	2,800.00
9000 ft. trolley wire	1,019.90
200 ft. 400,000-cm. lead cable @ $0.55	110.00
665 trolley hangers @ $0.65	432.25
768 bonds @ $0.35	268.80
75 crossbonds @ $0.35	26.25
18 interchangeable trolley frogs @ $2.75	49.50
1 extra 250-volt armature	375.00
2 motor jacks @ $12.80	25.60
Extra fittings for motors	86.24
116¼ tons 40-lb. rail @ $28.25, $3,291.13. Cr. for 25-lb. rails, $2,056.75	1,234.38
6055 white-oak ties @ $0.10	605.50
65 kegs 4½x½-in. spikes @ $3.75	244.50
22 split switches, material and labor @ $17.00	374.00
Fish plates and bolts	280.00
Lumber for trolley supports	76.11
Sundries	3,810.21
Entire labor cost	3,810.21
Total of complete installation	$21,172.79

COST OF MULE HAULAGE

Mules, average cost.....$225.00
Mules, depreciation.....20 per cent.
Mules, interest .....6 per cent.

COST PER MULE, DIVIDED FOR 275 WORK DAYS, PER WORK DAY

Depreciation	$0.163
Interest	0.049
Feed	0.20
Shoeing and stableman..	0.158
Total per day, 275-day basis,	$0.57

TEAM HAULAGE, NO. 3 MINE, DAILY AVERAGE TONNAGE, 1400 TONS.

17 mules @ $0.57..$9.69
9 drivers @ $2.56..24.24 Team drivers, $0.15 extra, or $1.20 extra for 8.
Total.....$33.93
Cost per ton outside mule haulage, $0.024.

COST OF OPERATING ELECTRICALLY, 275 WORK DAYS

2 locomotive runners @ $3.20..	$6.40 per day
2 trip riders @ $2.56	5.12 per day
½ electrician @ $75 per m.	1.08 per day
½ fireman @ $2.02	0.67 per day
Fuel, 5 tons @ $0.75	3.75 per day
Total fixed labor, etc	$17.02 per day
Interest on investment, $21,172.79 @ 6 per cent.	$4.62
Depreciation and repairs @ 8 per cent.	6.16
Oil and waste	0.30
Taxes	0.50
Total others	$11.58
Total daily operating cost electrically	$28.60
Cost per ton based on 2000 tons....	$0.014

It will be seen from the foregoing that the plant, besides increasing the output and saving 1c. per ton, which means $20 per day, practically pays for itself in four years.

Some of the advantages of electric haulage are the simplicity of the entire installation, its flexibility, and the low cost of maintenance, extensions, repairs and changes in the transmission circuits, which are quickly and inexpensively made. Although the plant has been in operation one year, the total expense, excluding operating costs, has been less than $100.

In planning an electric-haulage plant, no set of rules can be rigidly adhered to, as each equipment should be treated as a special problem; but it is my opinion that when grades of over 5 per cent. are encountered, some other means of mechanical haulage must be considered, either the third-rail system or rope haulage.

Coal-mine Hospital Car

Mine Inspector H. D. Johnson, of the fifth anthracite district, has invented a mine-hospital car which was placed in the Seneca colliery at Pittston this week, where it was given a thorough test. This is the first hospital car to be used in any anthracite mine. The trucks are similar to those of the ordinary mine car and upon these are two platforms. The lower platform is of the regulation kind, but between this and the upper deck are four sets of springs to prevent unnecessary shaking of the injured. Two upholstered stretchers are placed side by side on the platform. Between these can be placed an upholstered board, making separate compartments. The sides of the car are also upholstered. The injured are thus kept in firm, yet comfortable, positions. The stretchers are movable, so that the victim need not be moved from the time he is placed on the stretcher at the place of accident until he reaches the hospital or his home.

On either end of the car are two chair-like seats to accommodate four attendants. The car is equipped with rubber and woolen blankets, a medical case containing bandages, ointment and stimulants, oils for burns, various devices for stopping the flow of blood, as well as splints for broken limbs.

The car is kept in an especially arranged barn, near the mine hospital, and can be reached on short notice. In case of accident all haulage on the roads leading to the scene of the accident is stopped and the track made clear for the hospital car, which is hauled to the place required either by electric motors or the mules. It is estimated that an injured person can now be hurried to the foot of the shaft in one-half the time it formerly required, and this is an important feature, as in mine accidents minutes often save lives. Formerly, in case of an accident, workmen would be compelled to travel fully half a mile to get a stretcher, then return to the victim. Once on the stretcher, he was placed on an ordinary coal car and brought to the foot of the shaft.

The officials of the Lehigh Valley Coal Company and the Erie collieries have already inspected the car. The former were so pleased that they gave an order for six cars, and the latter will adopt the car in connection with their first-aid societies.

The Illinois Coal-mining Industry in 1906

The following general summary of the production, developments, prices and other statistics of the coal-mining industry of Illinois during 1906 has been prepared by Secretary Ross, of the Bureau of Labor Statistics of the State of Illinois:

Number of counties producing coal	54
Number of mines and openings of all kinds	1,018
New mines or old mines reopened during the year	151
Mines closed or abandoned since last report	123
Total output of all mines, in tons of 2000 pounds	38,317,581
Number of shipping or commercial mines	419
Total output of shipping mines, tons	37,122,811
Number of mines in local trade only	599
Output of local mines, tons	1,194,770
Total tons of mine-run coal	9,777,905
Total tons of lump coal	16,878,088
Total tons of egg coal	1,850,427
Total tons of nut coal	1,931,988
Total tons of pea coal	6,622,087
Total tons of slack coal	1,257,086
Total tons shipped	33,096,110
Tons supplied to locomotives at the mines	1,035,344
Tons sold to local trade	2,539,678
Tons consumed (or wasted) at the plant	1,646,449
Average days of active operation for shipping mines	189.6
Average days of active operation for all mines	172
Average value per ton all grades at shipping mines	$1.025
Average value per ton of mine-run coal at shipping mines	$0.983
Average value per ton of lump coal at shipping mines	$1.292
Average value per ton of egg coal at shipping mines	$1.224
Average value per ton of nut coal at shipping mines	$0.991
Average value per ton of pea or screenings coal at the mines	$0.504
Average value per ton of slack coal at the mines	$0.319
Aggregate home value of total product	$39,895,802
Number of mines in which mining machines are used	85
Number of mining machines in use	962
Number of tons undercut by machines	9,563,230
Number of tons mined by hand	28,754,351
Average number of miners employed during the year	42.920
Average number of other employees underground	11.605
Average number of boys employed underground	1,499
Average number of employees above ground	6,259
Total employees	62,283
Number of persons at work underground	56,024
Number at work on surface	6,259
Average price paid per gross ton for hand mining, shipping mines	$0.5702
Average price paid per gross ton for machine mining	$0.762
Number of kegs of powder used for blasting coal	1,027,273
Number of kegs of powder used for other purposes	2,749
Number of pounds of dynamite	41,137
Number of men accidentally killed	155
Number killed inside of the mine	147
Number killed outside of the mine	8
Number of wives made widows	105
Number of children left fatherless	333
Number of men injured so as to lose a month or more of time	480
Number of gross tons mines to each life lost	247,210
Number of employees to each life lost	402
Number of deaths per 1000 employed	2.5
Number of gross tons mined to each man injured	79,828
Number of employees to each man injured	130

Delaware, Lackawanna & Western Colleries

The Delaware, Lackawanna & Western Railroad Company, besides its railroad lines, owns a great coal estate in the Wyoming district of the anthracite region. The company operates this coal property directly. The report covers the year ended Dec. 31, 1906.

The total anthracite coal carried by the railroad was 8,582,380 tons. The average haul on this coal was 172 miles. The average receipts per ton were $1.50; per ton-mile, 0.873c. The earnings of the railroad from this coal were $12,902,851, being 39.1 per cent. of its total receipts. In addition to the anthracite tonnage, the road carried last year 983,909 tons bituminous coal; 174,086 tons coke; 298,705 tons ores; 527,014 tons stone, sand, etc., 869,478 tons of iron and steel; 249,238 tons of cement, lime and brick.

The coal-department income account is as follows, averages being calculated on the tonnage opposite each item:

Coal Sales:	Tons.	Amount.	Per Ton.
At mines	113,216	$245,260	$2.17
Company's supply	1,476,334	1,707,950	1.16
Local agencies	5,300,377	19,922,168	3.76
Foreign agencies	2,315,801	14,667,358	6.33
Total sales	9,205,728	$36,542,736	$3.97
Earnings, Co. boats	794,603	207,220	0.26
Total	9,205,728	$36,749,956	$3.99
Coal mined & boug't	9,152,743	$15,521,053	$1.70
Decrease in stocks	52,985	641,387	12.12
Transportation, Co. lines	7,387,840	12,705,897	1.73
Transpo'tion, other	2,510,675	1,972,431	0.78
Hauling and selling	9,205,728	1,442,714	0.16
Vessel expenses	794,603	202,333	0.25
Improvements	9,152,743	609,022	0.07
Total expenses	9,205,728	$33,094,837	$3.59
Net earnings	9,205,728	$3,655,119	$0.40

General expenses are included in handling and selling. As compared with 1905, there was a decrease of $2,021,090, or 5.2 per cent., in gross earnings; but an increase of $359,694, or 10.9 per cent., in net earnings. The expenses last year were 90.1 per cent. of gross earnings.

A summary of the coal statement is as follows, in long tons:

	1905.	1906.	Changes.
On hand, Jan. 1	955,400	655,924	D. 299,476
Mined and bought	9,342,662	9,152,743	D. 189,919
Total	10,298,062	9,808,667	D. 489,395
Coal sold	9,642,138	9,205,728	D. 436,410
On hand, Dec. 31	655,924	602,939	D. 52,985

The decrease in coal mined and bought was 4.8 per cent.; in coal sold, 4.5 per cent.

The report says: "Notwithstanding the suspension of mining operations during April and the first half of May last, the net results of the operations of the coal department during the year were highly satisfactory. The total tonnage produced at the company's mines and washeries and purchased from individual operators aggregated 9,152,743 tons, or but 189,919 tons less than in the year 1905. That the total tonnage did not show a greater reduction from the previous year by reason of the six weeks' suspension was due to the ability of the company to run some of its mines and all its washeries during that period. It may be further stated that the collieries of the company were in such condition after the suspension that they were run for the balance of the year to their full capacity, with but little interruption from breakdowns or other causes, and produced during this period an abnormally large tonnage. The average breaker time worked at all the company's collieries for the year was 198.3 days of 10 hours each, as compared with 210.8 days in 1905, or but 12.5 days less. The cost per ton of mining and preparing the coal for market was higher than in the previous year, necessarily so by reason of the fact that certain fixed expenses of managing, protecting and caring for the coal properties must be borne whether they are operated or not, and these were increased substantially during the period the mines were idle, and this cost necessarily had to be charged up against the tonnage produced during the active months. The prices of all classes of materials and supplies used about the mines were higher than in any recent year; notably was this the case as to all kinds of timber used in the mines, also as to steam and water pipe and fittings. The development work in the mines has been prosecuted on a large scale with the view of keeping up the production to the increased requirements of recent years. Special efforts and expense have been directed toward redeeming coal from abandoned workings, and same have been successful and promise better results another year. The management believes that no reasonable effort or cost should be spared to secure from the old workings and from the pillars left in the mines to support the surface of the ground, as large a tonnage as possible without endangering the lives of the miners or the workings of the mines. The policy indicated in previous reports of making liberal annual expenditures for improvement of the company's collieries and breakers was continued, and during the past year the sum of $609,022 was expended or set aside for these purposes.

"The use of electricity in the mining of anthracite coal has been extending rapidly during recent years. This company stands well to the front in the use of electric appliances for lighting its breakers; for handling coal under ground with electric motors and in hoisting same on planes from one level to another by electric hoists, for pumping water with electrically operated centrifugal pumps, and other purposes. It has about 75 miles of trolley wire in use on its underground electric railways, with about 27 miles of feed wire. It has two large central plants for generating electricity for use in different mines contiguous thereto. A large amount of electrical work has been installed during the past year, and more is contemplated for the future.

"After the suspension of mining before referred to, the company's mine employees all returned to work under an understanding that the wages previously paid as established by the Anthracite Strike Commission shall be paid until April 1, 1909. The relations between the company and its mine employees were not seriously disturbed by the suspension and have continued pleasant and cordial since the resumption of work. The accidents in the mines and resulting casualties have been somewhat more numerous than usual during the past year. Experience has always been that increase in accidents follows a period of idleness in the mines. The company and its employees were fortunate, however, in not suffering any serious accidents involving large loss of life or damage to property.

"The demand for anthracite coal has been active throughout the year and this company has had no difficulty in marketing all the coal it could produce at the prices which have prevailed since the strike of 1902. As indicating the activity of the demand, this company at the close of the year had about 60,000 tons of coal less on hand than at the close of 1905. The indications are that the demand during the coming year will equal the tonnage the several companies will be able to produce; indeed, it is generally considered by those qualified to judge that with the growth of the population and business of the country during the past few years the future normal demand for anthracite coal will be so large that the producing companies will not in all probability be able to increase their output above what the market will require from year to year. This condition insures stability in prices and a continuation of prosperity for the industry.

"In the amendment to the Interstate Commerce Act, passed at the last session of Congress, was contained a provision making it unlawful for a common carrier to transport in interstate commerce any commodity, such as coal, mined or purchased by it or in which it has any interest, excepting such coal or other commodity is for its own use, this provision of the law to become effective after May 1, 1908. The avowed purpose of this law was to compel companies such as this to dispose of their coal properties, thus separating the transportation of coal from the mining and merchandizing thereof. The management is advised, by its legal representatives, that this company cannot be required to dispossess itself of its coal properties by the action of Congress under the guise of regulating commerce between the States, especially as by the terms of its charter, one of the early ones granted by Pennsylvania, it has the undoubted right to mine, purchase, transport and merchandize coal."

The Mineral Production of Canada

With its usual commendable promptness, the Mines Branch of the Geological Survey of Canada has issued the preliminary statement of the mineral production of the Dominion for 1906. The figures are given in the following table:

MINERAL PRODUCTION OF CANADA IN 1906

Product.	Quantity. (a)	Value. (a)
METALLIC.		
Copper, lb	57,029,231	$10,994,095
Gold	.....	12,023,932
Iron ore (exports), tons	74,778	149,177
Pig iron from Canadian ore, tons	104,660	1,724,400
Lead, lb	54,200,000	3,066,094
Nickel, lb	21,490,955	8,948,834
Silver, oz	8,568,665	5,723,097
Cobalt, zinc and other metallic products	.....	350,000
Total metallic	.....	$42,979,629
NON-METALLIC.		
Asbestos, short tons	59,283	$1,970,878
Asbestic, short tons	20,127	17,230
Chromite, short tons	8,750	92,100
Coal, short tons	9,916,177	19,945,032
Peat, short tons	250	750
Corundum, short tons	2,274	204,973
Feldspar, short tons	15,873	38,740
Graphite, short tons	447	18,780
Grindstones, short tons	5,545	61,624
Gypsum, short tons	417,755	591,828
Limestone for flux in iron furnaces, short tons	366,015	286,632
Manganese ore (exports), short tons	93	925
Mica (exports), short tons	913	581,919
Mineral pigments—		
Barytes, short tons	4,000	12,000
Ochres, short tons	6,837	36,955
Mineral water	.....	100,000
Natural gas	.....	528,868
Petroleum, bbl	569,753	761,760
Pyrites, tons	39,611	157,438
Salt, tons	76,387	327,150
Talc, tons	1,234	3,030
Total non-metallic	.....	$25,738,612
STRUCTURAL MATERIALS AND CLAY PRODUCTS.		
Cement, natural rock, bbl	8,610	$6,052
Cement, portland, bbl	2,139,164	3,164,807
Sands and gravels (exports) tons	256,550	139,712
Sewer pipe	.....	446,790
Slate	.....	24,446
Building material, including bricks, building stone, lime, etc	.....	7,200,000
Total structural materials and clay products	.....	$10,981,807
Estimated value of mineral products not returned	.....	300,000
Total, 1906	.....	$80,000,048

The tons given are short tons of 2000 lb. The metals are valued at average prices in New York for the year.

The total value of the mineral production of Canada for 20 years past has been as follows:

1905, Total	$69,525,170	1895, Total	$20,505,917
1904, "	60,073,897	1894, "	19,931,158
1903, "	61,740,513	1893, "	20,035,082
1902, "	63,211,634	1892, "	16,623,417
1901, "	65,804,611	1891, "	18,976,616
1900, "	64,420,983	1890, "	16,763,353
1899, "	49,234,005	1889, "	14,013,113
1898, "	38,412,431	1888, "	12,518,894
1897, "	28,485,023	1887, "	11,321,331
1896, "	22,474,256	1886, "	10,211,255

Of the gold reported in 1906, the Yukon furnished $5,600,000, and other parts of the Dominion $6,423,932 in all.

The general comments submitted by Elfric Drew Ingall, chief of the Mines Branch, follow:

Gold

The total output of gold as estimated shows a falling off of over $2,500,000. This is due mainly to the continued shrinkage in the shipments from the Yukon, which district fell short of its last year's output by about $2,750,000. British Columbia showed an increase. For the rest of Canada, which, however, contributed only about 2.5 per cent. to the total, the figures, as far as at present available, show practically a stationary condition of affairs.

All the gold production of the Yukon and about 15 per cent. of that from British Columbia is obtained from placer deposits, the whole from this source amounting to 77 per cent. The remaining 23 per cent. represents the gold contents of the sulphuret and quartz ores worked in British Columbia and in eastern Canada. The placers as a source of the metal have for some years showed a continuous falling off, which, however, is more than neutralized by expansion in the lode-mining branch of the industry. Recent consolidations and the inauguration of extensive enterprises for working the poorer gravels, which, however, exist in large quantities in the Yukon Territory and in British Columbia, are likely in a few years to produce marked results in this line.

Silver

In 1906, Ontario, British Columbia, Yukon Territory and Quebec contributed to make up the total production of silver which reached 8,568,665 oz., valued at $5,723,079. This is an increase, in quantity, of 2,574,373 oz., or 42.95 per cent. over the previous year. The average yearly price of the metal on the New York market was 66.791c. per oz. for 1906, as compared with 60.352c. in 1905. This brings up the increase in value of the Canadian production in 1906, over that for 1905, to 58.20 per cent.

Ontario has assumed first place in Canada as a silver-producing province, owing to the rapid development of the Cobalt camp, which has attracted the attention of the whole mining world. As is well known, the silver occurs mostly in the metallic condition associated with numerous other minerals, the most prominent of which are cobalt and arsenic. The veins are narrow, but the ore is exceedingly rich. Some shipments are reported to have returned $100,000 per car load.

The figures of silver in the ores shipped from Cobalt, Ont., adopted in this report have received corroboration from data kindly furnished by T. W. Gibson, deputy minister of the Ontario Department of Mines, who puts the figure at 5,500,000 oz. of the metal, when complete returns shall be available. This closely agrees with our own estimate of 5,485,000 oz., which, taken at the market price of the metal, would give a value of $3,663,486.

British Columbia, on the other hand, shows a slight decrease in 1906 as compared with 1905, owing to the output of the Slocan district falling off much below expectations; this was offset to a great extent by an increased production from the St. Eugene and the Sullivan mine in the East Kootenay. The falling off of the Slocan, however, is only temporary, and there is every indication of a resumption of activity, more especially if the expected developments take place in the zinc industry. This would permit of mining the large bodies of zinc-lead ores, which are, as a rule, appreciably argentiferous.

Copper

Stimulated by the enhanced price of the metal, the production shows a very large increase in quantity, which expansion, together with the higher values obtained, is shown in the increase of nearly $3,500,000, or nearly 47 per cent.

British Columbia and Ontario are, as formerly, the two main contributors, the former supplying about 79 per cent., the latter about 18.5 per cent.

In British Columbia the mines of the Boundary camp are estimated to have contributed about three-quarters of the output of the province; Rossland being the second in importance, with the mines operated along the Pacific coast making up the balance. The rest of the Dominion output is represented by the copper contents of the nickel-copper mattes shipped from the Sudbury mines, with a small contribution from Quebec, representing the copper contents of the pyrites ores shipped from the mines of the Eastern Townships district.

Cobalt

The production of this metal is represented by the amounts contained in the shipments of ore made from the camp of that name in northern Ontario. It is stated by some operators that in selling the ores value has been received for the cobalt contents; while others have claimed to get no return for this metal. As processes of treatment for these complex ores are perfected, however, it is hoped that this unsatisfactory state of affairs will be remedied.

Nickel

The production of nickel from the ores of the Sudbury district in Ontario has made a very rapid growth during the past two years, the output in 1906 being over twice that of 1904. The ore is smelted at Copper Cliff and Victoria mines to a matte carrying from 78 to 80 per cent. of the combined metals, copper and nickel. The resulting matte is shipped to the United States and Great Britain for refining.

The following were the aggregate results of operations on the nickel-copper deposits of Ontario in 1906, in tons of 2000 pounds:

Ore mined	343,814
Ore smelted	340,059
Matte produced	20,364
Matte shipped	20,310
Copper contents of matte shipped,	5,264.6
Nickel contents of matte shipped,	10,745
Spot value of matte shipped	$4,629,011

According to customs returns, exports of nickel in matte, etc., were for 12 months ending Dec. 31 as follows:

	Pounds.
To Great Britain	2,716,892
To United States	21,252,444
Total	23,969,336

Although nickel is one of the minor constituents of the rich silver ores of the Cobalt district, the buyers of these ores have made no allowance for the nickel contents, and statistics of its output have not been obtained.

Lead

The figures of production of lead show a slight decrease in tonnage this year as compared with 1905; but owing to an increase of 20 per cent. in the average yearly price of this metal on the New York market, the value is very sensibly greater. The total quantity produced in 1906 was 54,200,000 lb., valued at $3,066,094, whereas in 1905 a quantity of 56,580,703 lb. was recorded, valued at $2,676,632.

About 95 per cent. of the above figure of production is to be credited to British Columbia, the great bulk being derived from the East Kootenay district. However, when arrangements are completed which will permit of mining the bodies of zinc-lead ores of the Slocan district, there is no doubt that a much larger production will be recorded.

Zinc

Throughout the year great hopes were entertained that the problem of utilization of the zinc ores of British Columbia was drawing very near to a solution. The Federal Government had appointed a commission to study the question of the sources and of the market for these ores, and a large zinc smelter was being erected at Frank, Alberta, through the enterprise of a group of French capitalists. The conclusion of the commission was that a satisfactory supply of zinc ores could probably be obtained in the Kootenays. The Frank smelter was put in operation and several tons of spelter were turned out from ores derived mainly from the Slocan district, but owing to defective apparatus the plant will require extensive and costly alterations before it can be run on a remunerative basis.

Iron

The total production of pig iron in Canada in 1906 from both Canadian and imported ore amounted to 598,411 short tons, as compared with 525,306 tons in 1905, or an increase of over 13 per cent. in quantity. This production represents the output of nine companies operating fifteen blast furnaces. Of these furnaces, three use charcoal as fuel, and twelve are run on coke.

The ore charged into the blast furnaces totaled 1,204,473 short tons, of which 221,733 tons were Canadian ore, and the balance, or 982,740 tons, was imported. The production of pig iron attributable to Canadian ore amounted to 104,660 tons, which is a marked increase over the previous year, when the production amounted to only 68,170 tons.

Besides the above quantity of Canadian iron ore charged into the furnaces, 74,778 tons were exported, which brings the total of iron ore produced in Canada in 1906 to 296,511 tons.

Asbestos

The production of asbestos from the eastern townships of the province of Quebec, divided into crude and mill stock, was as follows:

	Tons.	Value.
Crude	3,793	$ 626,895
Mill stock	55,490	1,343,983
Total asbestos	59,283	$1,970,878
Asbestic	20,127	17,230
Total products	79,410	$1,988,108

Exports of asbestos, according to customs returns, were 59,864 tons, valued at $1,689,257.

The special features of interest regarding the asbestos-mining industry during the year have been a general increase in output, a marked improvement in plant and machinery in some of the older mines, the opening up of new and promising properties, and a tendency toward the consolidation of a number of mines formerly separately owned, under one management and ownership.

Coal and Coke

The provinces of Nova Scotia, British Columbia, Alberta, Saskatchewan, New Brunswick and the Yukon Territory contributed to the total coal production, their relative outputs being in the order named. Nova Scotia figures in the coal returns for more than 60 per cent. of the whole Canadian production, and British Columbia for slightly over 20 per cent. As far as the figures now available will permit us to compare, the output for 1906 shows an increase of 1,248,229 tons over 1905.

The coal output is growing steadily and for the past 12 years each year has shown an increase over the preceding one. The salient feature of the Canadian coal industry in 1906 is the great development which coal mining has assumed in the western provinces, more particularly in Alberta. In this last province there were in 1901 only two mines which produced over 100,000 tons each per year. In 1906 not less than six collieries had an actual production greater than this figure; and several others, whose output did not quite reach the 100,000 mark are equipped to easily handle this amount.

In Nova Scotia and in British Columbia the increases of the past few years have been due mainly to the development of comparatively old established collieries.

An appreciable proportion of the coal of both eastern and western provinces was converted into coke for metallurgical purposes. At the end of the year there were about 800 coke ovens in operation in Nova Scotia, and somewhat over 1000 in Alberta and British Columbia.

Petroleum and Natural Gas

The production of petroleum is practically all derived from the Ontario peninsula, the only exception being a very small quantity obtained in New Brunswick in the Memramcook field. Besides the old established fields of Lambton and Kent counties some new oil pools were brought in in 1906, the main ones being those of Merlin in Tilbury township and of Moore township.

In the western provinces there has been great activity displayed in search for petroleum and natural gas; large sums have been spent in boring operations both in Alberta and Saskatchewan, but so far we have no production to record from these.

The figures of production of natural gas show a substantial increase over those of 1905, resulting mainly from the development of new gas pools by the Dominion Natural Gas Company in Brant, Haldimand and Norfolk counties. This company and the Provincial Natural Gas and Fuel Company are now the largest Canadian producers. The Medicine Hat field, in Alberta, has also produced very satisfactorily, and shows no perceptible sign of diminution.

Cement

The total quantity of portland cement made in Canada in 1906 was 2,152,562 bbl., as compared with 1,541,568 bbl. in 1905, an increase of 610,994 bbl., or 39.6 per cent. The total sales of portland cement were 2,119,764 bbl., as compared with 1,346,548 bbl. in 1905, an increase of 773,216 bbl., or 57.4 per cent. Additional details will be found tabulated below.

Fifteen companies were operating plants during 1906, with a total daily capacity of about 10,500 bbl., viz.: one in Nova Scotia, two in Quebec, eleven in Ontario, and one in British Columbia. At least four plants were under construction during the year, of which the total initial daily capacity will be about 4700 barrels.

Detailed statistics of production in 1905 and 1906 are as follows:

	1905. Bbl.	1906. Bbl.
Portland cement sold	1,346,548	2,119,764
Portland cement manufac'd.	1,541,568	2,152,562
Stock on hand Jan. 1	111,446	269,558
Stock on hand Dec. 31	806,466	302,356
Value of cement sold	$1,913,740	$3,164,807

The average price per barrel at the works in 1906 was $1.49, as compared with $1.42 in 1905.

The imports of portland cement into Canada in 1906 were 2,430,760 cwt., valued at $778,706. This is equivalent to 694,503 bbl. of 350 lb. each, at an average price per barrel of $1.12. The duty is 12½c. per 100 lb. The imports in 1905 were equivalent to 917,558 bbl., valued at $1,138,548, or an average price per barrel of $1.24. There is very little cement exported from Canada. The consumption is therefore practically represented by the Canadian sales, together with the imports.

THE ENGINEERING AND MINING JOURNAL

Issued Weekly by the

Hill Publishing Company

505 Pearl Street, New York.

London Office: 20 Bucklersbury, London E. C., Eng.

CABLE ADDRESS "ENGMINJOUR, N. Y."

Subscription, payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Canada, Mexico, Cuba, Porto Rico, Hawaii or the Philippines.

To Foreign Countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

Copies are on sale at the news-stands of the following hotels:—Waldorf-Astoria, New York; Brown Palace, Denver; and the leading hotels in the principal cities.

Entered at New York Post Office as mail matter of the second class.

During 1906 THE ENGINEERING AND MINING JOURNAL *printed and circulated* 462,500 *copies, an average of* 8896 *per issue. Of this issue,* 8000 *copies are printed. None sent regularly free. No back numbers beyond current year.*

Contents

Standardization of Measures

The Institution of Mining and Metallurgy is one of the few technical organizations which take positive action in the advancement of the professional interests of its members and of the industry with which they are associated. In the line of this policy it appointed, some time ago, a committee to formulate plans for the standardization of the weights and measures commonly employed in mining and metallurgy. This is an important matter, as we have argued many times, well worthy of the consideration of an organization like the Institution of Mining and Metallurgy. The committee has recently reported its recommendations, a summary of which is published elsewhere in this issue. In general we think that these recommendations will meet with the approval of mining engineers and metallurgists. Certainly they are conservative, which is manifested, moreover, in the decision not to urge the adoption of the metric system.

The abolition of the ton of 2240 lb. and the adoption of that 2000 lb. will eliminate a common and troublesome source of confusion. In accepting the understanding of the miners' inch as a flow of 1.5 cu.ft. of water per minute, the committee conforms to the best engineering practice in America. No exception will be taken to the recommendation that gold and silver returns be expressed in terms of fine gold and silver, and not as "bullion," the former being already the best practice in the world, for which the JOURNAL fought long and earnestly. The recommendation that the gold content of ores be expressed in money value as well as in weight appears to us to be rather unimportant, because so long as it is understood that the returns are being expressed in terms of fine gold, the conversion into money value of any system is easily made, and is without danger of confusion.

The recommendation of the committee that the word "gallon" be understood to mean the imperial gallon of 10 lb., and that all temperatures be expressed in degrees Centigrade, are more open to adverse opinion. As between the gallon of 10 lb., which is the standard in Great Britain, and the gallon of 8.33 lb. (231 cu.in.), which is almost universally employed in the United States, there is no question that, aside from the matter of custom, the former is the simpler for engineering purposes. Considering the matter from the latter standpoint, however, we are of the opinion that the committee would have done better to recommend the discarding of the word "gallon" and the substitution of the common measure of volume, namely the cubic foot, which has already been adopted as the basis for the miners' inch.

We conceive that the true line of progress in simplifying our weights and measures is according to the common methods of thought. It is simple to introduce the custom of measuring liquids by the cubic foot, because everyone is able to picture immediately in his mind how much is represented, which he cannot always do in the case of gallons. Similarly, most English speaking people are accustomed to think of common temperatures, say up to 120 deg. F., by a mental comparison with the Fahrenheit scale, while the same people may think of high temperatures by the Centigrade scale, because they are more generally accustomed to that in connection with furnace work. Consequently, it might be advisable to limit the official adoption of the Centigrade scale to the temperatures higher than the ordinary.

The standard laboratory screens that are recommended by the Institution of Mining and Metallurgy will, we think, meet with general approval, conforming as they do to the ordinary expression of number of meshes per linear inch, and providing a nearly uniform screening area of 25 per cent. The series has certain advantages, which are well pointed out by the committee in its report.

As to the definition of "sand," "meal," and "slime," the committee has evidently had difficulty in coming to a conclusion, and is not yet at all clear in its own mind. It is sufficiently precise to define sand as material coarser than 150 mesh, but to attempt to define meal and slime as material passing 150 mesh but settling in different times in a column of water of certain hight is, we fear, a definition that is so impracticable as to be of comparatively little value.

The Lake Copper Consolidation

In recent issues, we have referred to the aggressive policy adopted by the Calumet & Hecla Company, and the steps which it had taken to secure control of important properties in the Lake Superior

country. In some of the cases—the Allouez and the Centennial—no opposition appeared. At the annual meeting of the Allouez this week a majority of the old board was replaced by Calumet & Hecla men, and it it announced that the same course will be adopted at the coming meeting of Centennial.

For the control of the Osceola, however, it seems that the old Bigelow party was determined to fight. Aware that, by actual purchase and through proxies, shares enough had been secured to control the coming meeting, an unexpected blow was struck. An amendment to the Michigan mining law was sprung on the legislature suddenly and passed with little or no debate. The senator from the copper district was temporarily absent, and apparently most of the members were willing to vote for any measure which seemed to put a limitation on corporate activities. This amendment reads as follows:

"Provided, that if any corporation organized or existing under this act has heretofore purchased or acquired, or shall hereafter purchase or acquire, either directly or indirectly, through its trustees or otherwise, stock in any other such corporation which, at the time of such purchase is operating a producing mine, such stock while owned by such purchasing corporation or held in trust for its benefit, shall not be entitled to any vote at any corporate meeting."

It will be seen that this clause would, in the case of the Osceola, leave the election of the new board practically in the hands of the minority stockholders; that is the representatives of the old Bigelow party. The purpose of the new clause and the fact of its passage became known at once, and prompt measures were taken to prevent, if possible, its approval by the governor of the State.

The course taken to prevent the absorption of the Osceola has met with general condemnation. A snap judgment, secured from legislators, most of whom knew little or nothing about the facts of the case, and were liable to be swayed by the existing feeling against corporations, is not a method which appeals to most men. The purchase of stock, and the securing of proxies for the Calumet & Hecla were openly conducted, and there was no reason to believe that any interests of other stockholders were in danger. Opposition in the open was fair, and might be expected; but the tortuous method adopted did not deserve to succeed.

The latest news is that the Michigan Senate has recalled the bill from the governor; and this probably means its final failure. Whatever opinion may be held of the policy of consolidating Lake interests, there must be general approval of the defeat of an underhand move like this one.

Mining Promotions and the Daily Press

Remarks in three of the leading dailies of New York, which recently came under our attention the same day, were suggestive. In one, a correspondent who is visiting Nevada wrote, "After marveling at a thousand and one fabulous tales of lucky strikes that have suddenly transformed paupers into princes, the light was turned on for me by the chief boomer and one of the cleverest promoters in Goldfield, who, in a moment of inadvertent frankness, remarked, 'At least 97 per cent. of our mining promotion schemes are bubbles.'"

In another paper, a well known advertiser, who does not hide his light under a bushel, remarked in the course of one of his daily outpourings that naturally it would be pleasant just to wave the wand, and thus put up the market price of a stock tenfold, and then "sell out to the man in the moon." If the investors who buy stocks for a rise could appreciate thoroughly that there is safety only when the rise is justified by increase in the intrinsic value of the property represented, and not by the possibility of unloading upon the more unwary public, or the man in the moon, something would be gained.

The third matter of this day was an eight-page supplement of a reputable New York daily, of which about 75 per cent. was devoted to the advertisements of mining enterprises, and a large portion of the remainder to editorial write-ups. It would be conservative to say that upward of 90 per cent. of the advertisements were of enterprises that, to say the least, would be pronounced suspicious by an honest and intelligent mining engineer. It is such prostitution of the press that is largely responsible for the present evil of fraudulent mining promotion.

In this connection it is gratifying to see that the New York *Sun* is turning its satirical guns on some of the dubious promotions. A great deal would be done toward curing this festering sore if all the daily papers would be more circumspect about the advertisements which they accept and publish. There are some honorable journals which put such advertisements under the same ban that they do the advertisements of patent medicines and other discreditable matter, but the majority are utterly conscienceless.

The Butters Treatment for Cyanide Solutions

The spirit that prompted Manager H. P. Garthwaite and his associates of the Butters Salvador Mines, Limited, to give to the readers of the JOURNAL the details of the admirable process devised by the staff metallurgist, Charles P. Richmond, for the separation of gold and copper from cyanide solutions, is the spirit that has made the engineering professions what they are. If everyone capable of adding to the structure of human knowledge were compelled to build his own foundation from the ground up, the edifice would never rise above the first few stories.

This addition to our available stock of information concerning the treatment of cyanide solutions appears elsewhere in the present issue. Here was a problem which has limited the usefulness of the cyanide process in many cases. The slimes produced in the usual way contained so large a bulk of copper that the separation of the gold involved a complicated and costly process which could not conveniently be carried out at the mill. The shipment of the product to the refiners entailed heavy treatment charges and the loss of any returns which the copper in the ore should yield. The method now at the service of every metallurgist not only saves the charges for refining the gold, but also separates the copper in marketable form. Moreover the process is practically continuous.

In many of the industries a process so simple and so profitable would have been closely guarded as a valuable secret. The gates of the plant would have been locked and any visitor showing a suspicious gleam of curiosity would have been turned away by the watchman. Happily the engineers who have to do with mines can still afford to contribute freely to the store of knowledge to which we all owe so much.

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

Depreciation of Smelting Plants

I am sorry that the readers of the JOURNAL have not kept up the discussion, recently inaugurated, on the subject of depreciation of smelting plants, and the allowance that ought to be reckoned for amortization. The importance of the subject has been emphasized in several of the valuable articles that have already been published. However, the discussion has failed to crystallize itself into concrete examples, that might enable generalizations and rules to be deduced, or if that be impossible, to learn the consensus of opinion.

I have recently had before me a case wherein there was a choice between two processes. After studying carefully the items of direct operating expense in each case, the question of first cost of plant naturally arose. By one process, the first cost was about $7 per ton of annual capacity, i.e., the cost of a unit capable of working up 10,000 tons of material per annum was $70,000. In the other case, the first cost was about $10 per ton of annual capacity. Reckoning amortization at 10 per cent. per annum, which has been my usual practice, the fixed charges on that account were $0.70 and $1 per ton, respectively. The process requiring the more costly plant did not show sufficient advantage in direct operating expense to justify the larger expenditure on capital account, but if it were safe to reckon amortization at only 5 per cent., the prospects would have been materially altered, and very likely the decision in this particular case would have been different; on the other hand, if amortization had been reckoned at a higher rate than 10 per cent., the prospects would have been considerably more unfavorable for the more costly plant.

These are very important considerations, especially in the cases of works of high first cost and low operating cost per ton of material treated. If, for example, the first cost is in the neighborhood of $10 per ton of annual capacity, and the operating cost is in the neighborhood of $2.50, an amortization charge of 10 per cent. is 40 per cent. of the direct operating expense, and small variations in the rate are of large influence in determining the commercial result.

It may be that under certain special conditions, 5 per cent. amortization may be safely reckoned, but I am disposed to believe that in the majority of metallurgical constructions the rate which ought to be reckoned for amortization is above 10 per cent., rather than below it. Certainly, 10 per cent. is not an ultra conservative figure.

ROBERT ANSTEE.

New York, Feb. 15, 1907.

Moisture of Coke Shipped in Closed Cars

The question of hydrogen in coke, whether as an occlusion or in the form of carbon compounds, has been gone into quite fully by Parry (*Chemical News*, 25, 98); Dingler's *Pol. J.*, 204, 470; Muck, "Steinkohlen Chemie," p. 153; Summersbach and Anderson "Chemistry of Coke," pp. 79 *et seq.* The weight of evidence appears to be that it occurs in both forms. The question of whether by catalytic action a portion of this hydrogen is oxidized to water may be very readily settled by careful sampling and retention of the sample for a sufficient time in a closed receptacle, unless there is assumed to be some special advantage in a box car and the motion of the train.

Coke is exceedingly hard to sample on the yard. It is hard to break. The product of a single oven represents a complete manufacture from start to finish, and differs somewhat from every other oven and from other drawings of the same oven. The coke from the top, from the bottom, from the front, and from the back may, and often does, differ widely. As ordinarily sampled the moisture determinations are valueless.

Coke does not readily absorb water, but when hot coke is watered down more or less of a vacuum is formed in each cell and they become practically filled with water. If watered properly the bulk of the water is again driven off in the process of drawing a beehive oven, and nearly all of the balance is gradually evaporated from the still warm coke as it lies on the yard. Mr. Page says he has more trouble in summer. At that season the coke is notoriously over-watered, while we do not realize the amount of moisture which continues to be given off. This is indicated in winter by the cloud of vapor above each pile of coke. If such coke is loaded "warm" in a closed car it will undoubtedly continue to give off moisture which will condense against the cold top, sides and bottom of the car, and also on the comparatively cooler outer surface of the pile of coke. In that event, on opening the car, everything seems to be saturated with moisture and samples from the surface would probably be greatly in excess of the average.

CHAS. CATLETT.

Staunton, Va., March 2.

The Laborer is Worthy of His Hire

"Wanted—An A 1 mine accountant and cashier; thorough knowledge of Spanish and Mexican Stamp Law essential. Salary $200.00 Mexican Silver per month. Apply, etc.:—"

What a travesty of justice is displayed in this advertisement! Anyone at all acquainted with the work and responsibility pertaining to a post such as indicated knows that a competent man would be worth at least double the salary offered.

If the advertiser simply desired an office assistant with prospect of promotion, there would be no call for remark—if so stated; but to expect a capable man to offer his services at such a figure denotes, either crass ignorance or despicable meanness on the part of the advertiser.

A trustworthy official who understands and is interested in his business will save the company the amount of his salary over and over again in ways that would remain undetected or neglected by a less conscientious man.

Granting, that a man possessing the required qualifications accepted the post, it would probably imply that he was "hard up" and looked upon the position as a "makeshift" until something better offered itself, or that his habits were such as to unfit him for a better post.

Other advertisements are constantly appearing for mine superintendents, mill and cyanide men, assayers, chemists, etc.; with such niggardly salaries attached as to preclude the possibility of obtaining good men. The "chief sinners" are mostly those who know little or nothing of the duties belonging to such positions.

All strong, sound companies have realized or are quickly realizing that it is the hight of wisdom to pay competent men good salaries. Many people confuse elements of this subject; in reasoning from cause to effect they argue that prosperous companies can afford to pay good salaries, whereas it should be, good salaries command capable men who make the prosperous companies.

DAVID WALLACE.

Monterey, Mex., March 5, 1907.

Meeting of the Canadian Mining Institute

The Proceedings of the Ninth Annual Convention Included Discussions of Mine Taxation and of the Ores of Cobalt

BY FREDERICK HOBART

The ninth annual meeting of the Canadian Mining Institute began on March 6, at the King Edward Hotel, Toronto. This was the second meeting held in Ontario, the institute having met in Toronto in 1904.

The morning session was devoted chiefly to routine business. President George R. Smith delivered a brief annual address, in which he spoke of the great progress of the mineral industry of Canada in recent years. He called especial attention to the late developments in Ontario, especially in the Cobalt district, and the extraordinary increase in the mineral production of that province. He also referred to recent changes in the mining laws of the provinces, and to the proposed measures for taxation of mining property.

The report of the treasurer showed a balance of about $1300, after paying all claims.

The report of the council showed the work accomplished during the year, and continued as follows: "It is gratifying to be able to record an important increase, of approximately 20 per cent. in the membership during the year, which now, including students, for the first time exceeds 500 names. This may be regarded as indicative of appreciation and recognition on the part of those engaged in the development of our mineral resources, of the useful work this institute is attempting to perform in the interests of mining in the Dominion.

"Pursuant to a resolution unanimously passed at the Quebec meeting, requesting the president to appoint a delegation to wait on the Dominion Government and urge the desirability of the early establishment of a Federal Department of Mines, under the direct supervision of a responsible minister, a deputation consisting of Messrs. Smith, Adams, Porter, Drummond, and Brown, proceeded to Ottawa on April 18, and presented the views of the Institute to Sir Wilfred Laurier and his colleagues, by whom they were most favorably received. Within a few weeks of this interview, the office of director of the Geological Survey of Canada, which had remained vacant since the death of the late Dr. George Dawson, was filled by the appointment of A. P. Low, whose interest in that branch of geological science which deals more particularly with the solution of economic problems, is well known. The work of the Survey during the past year under Mr. Low's direction has been of an eminently useful and practical character; and the appointment of that gentleman to the head of the Survey is a matter for congratulation. Following the appointment of Mr. Low, the Survey was disassociated from the Department of the Interior, and placed under the ministerial charge of Hon. Mr. Templeman. Although, as yet, the bill for the establishment of a Department of Mines has not been introduced into Parliament, it is understood that such a measure is now under contemplation, and it is hoped, therefore, that before another year shall have passed, the wishes of the mining industry in this important respect, will have been realized.

"During the year an addition of some fifty volumes was made to the library, and a number of exchanges, including transactions of technical societies, official reports and periodicals, covering a period of three years, were bound and added to the shelves.

"After receiving the report of the judges, Messrs. Charles B. Going and Frederick Hobart, the council awarded the president's gold medal, for the best paper submitted by a student member during the year, to Frank G. Wickware, of McGill University, for his thesis entitled 'The British Columbia Copper Company's Mine and Smelters.' The council also awarded three cash prizes of $25 each as follows: To Frank B. Wickware for the paper mentioned above; to J. J. Robertson, School of Mining, Kingston, for his paper entitled 'Cyanide Tests on Timiskaming Ores'; and to R. P. Cowen, McGill University, for his paper entitled, 'Number Four Pit, Brayton Domain Collieries, Cumberland, England.'"

The ballots for officers were referred to the scrutineers, Messrs. F. Hobart, R. H. Murray and A. R. Wilson being appointed to that position.

At the afternoon session J. M. Clark read a brief paper on "Royalties on Minerals in Ontario." This was followed by a discussion on the mining tax law pending in the Ontario legislature, at the close of which the following resolution was adopted:

"This institute believes that the bill now before the Ontario legislature providing for the taxation of mines is opposed not only to the mining interests, but also to the manufacturing and agricultural interests of the province, and we, as a body, respectfully ask the Ontario Government to take time, and carefully consider what has been the effect of mining legislation in other countries and in this province."

The members of the institute then proceeded to the Parliament House, where the Minister of Mines, Hon. Frank Cochrane, had arranged for a hearing of the bill. President Smith, Messrs. Hardman, Coste, Hay, Leonard and Clark were spokesmen for the delegation.

At the evening session a number of papers were read by title. Three papers were presented in full: "New Tilbury Oilfield in Ontario," by Eugene Coste; "Status of Mining in Canada," by J. C. Gwillim; "Anthracite Coal Mining," by H. H. Stoek. Mr. Coste's paper was accompanied by maps and diagrams. Mr. Gwillim's paper, which referred to the ethics of the mining profession and the relations between engineers and promoters, was discussed at some length.

The Second Day

The morning session was chiefly devoted to Cobalt. W. G. Miller, provincial geologist of Ontario, opened with a brief address on recent changes and developments in the Cobalt district, which was illustrated by maps and geological sections. He was followed by Prof. C. R. Van Hise in a long and interesting paper on the "Ore Deposits of the Cobalt Region," in which he discussed the probable methods in which the ores were deposited. He considered it probable that the cobalt was the result of deposition by underground waters, the silver being a secondary deposit due to descending waters. He gives his reasons for this belief in a very clear way. In conclusion he expressed the belief that other rich deposits might be found in the neighboring areas. It is impossible to abstract this valuable paper in a brief space. It was followed by a discussion, in which a number of members took part.

In discussing the paper, Eugene Coste said that the Port Arthur district would yet surprise Canadians for silver deposits. It had never been properly explored, and if it were it would show ores of exceptional richness, he thought.

Dr. Robert Bell, of Ottawa, read a technical paper on "The Cobalt Mining District," giving an account of his explorations in regard to mineral areas of the north.

At the afternoon session there was some further discussion on the Ontario tax law, and the following resolution was adopted:

"While freely acknowledging and assenting to the right of the Government to impose such taxation as may be shown to be necessary or expedient for purposes

of revenue, yet it is an axiom of justice that all such measures of taxation should be framed only after such consideration and discussion as may insure a minimum of discomfort and of burden to the industry thus taxed. Therefore, be it resolved, That the mining industry has no objection to taxation imposed of necessity and equitably distributed and collected, and provided, further, that such taxation thus imposed shall not attack rights and titles already vested with the sanction of the Crown; that it does object to the principle of a royalty tax, because it is confiscatory in its nature. Properties have been taken up under legislative enactments abolishing royalties in Ontario. It is impossible of collection except by an intolerable system of inquisition, which is imposed on no other business interests in the province. It will undoubtedly act, as did the bill of 1891, to prevent the investment of capital in Ontario.

"In consideration of these facts we hereby request the appointment of a commission to consider the bill along the following lines, namely: The amount of revenue which your Government deems necessary to procure from the mines of the province; a proper and equitable method of collecting such revenue; the effect of such a tax upon the mining industry and upon those interests which depend thereon; the history and effect of similar legislation in the Dominion of Canada; the following methods of raising such revenue, if necessary: A tax on acreage of mining land; a tax upon the capitalization of mining companies; an increased annual license fee from incorporated mining companies; a tax on dividends declared by mining companies."

P. H. McBennie, Niagara Falls, read a paper prepared by himself and F. A. Fitzgerald on "Magnetic Separation by the Goudal Process," showing that this method was used in Scandinavian countries with success. The crushing mechanical treatment and other incidents were explained.

Dr. Robert Bell, Ottawa, read a paper on "Sir William Logan and the Geological Survey of Canada," giving a selection of the incidents and anecdotes, reminiscences of the man from all points of view.

Hiram W. Hixon, Victoria Mines, read a paper on "Magmatic Waters," which called out a lively discussion.

The Annual Dinner

The annual dinner of the institute, always an important function, was largely attended, and passed off very successfully. Some excellent speeches were made in response to the various toasts. After the usual toasts to the King and the President of the United States, the following were given:

The Dominion and Provincial Governments responded to by Lieutenant-Governor Clark, of Ontario, Hon. Frank Cochrane, minister of mines and Hon. W. J. Hanna, provincial secretary.

The Mining Industry; J. E. Hardman, of Montreal and Prof. J. R. Kemp, of New York.

Sister Societies; Dr. A. R. Ledoux, of New York, for the American Institute of Mining Engineers, R. W. Leonard, for the Canadian Society of Civil Engineers, and H. W. Corbett for the Mining Society of Nova Scotia.

The Guests; Prof. C. R. Van Hise, Prof. Chamberlain, and Bailey Willis, of the United States Geological Survey.

The Press; Frederick Hobart, of New York, R. H. Murray, of Toronto, and H. H. Stoek.

The Transportation Companies; R. C. Steele, of the Toronto Board of Trade.

Retiring President George R. Smith delivered a brief and appropriate valedictory, and introduced the new president, Frederick Keffer, who responded, also briefly.

The Third Day

At the morning session a paper was given by Dr. Wm. Campbell, of Columbia University, New York, on "Microscopic Examinations of Nickeliferous Pyrrhotite." His address was illustrated by lantern slides.

"The Marble Bay Copper Deposit, Texada Island, B. C.," by O. E. Leroy, of Ottawa, was read.

E. Jacobs, of Victoria, dealt with "Progress of British Columbia Mineral Production." He stated that the dividends declared last year by British Columbia mining companies amounted to between $3,000,000 and $4,000,000.

It was announced that the mine-taxation bill of Ontario would probably be considerably modified, or that full opportunity would be given to draft a new bill.

At the afternoon session the scrutineers reported the result of the ballots as follows, the gentlemen named being elected for the ensuing year:

President — Frederick Keffer, Greenwood, B. C.

Vice-presidents—Dr. J. Bonsall Porter, Montreal; W. G. Miller, Toronto; W. Fleet Robertson, Victoria, B. C.

Secretary—H. Mortimer Lamb, Montreal.

Treasurer—J. Stevenson Brown, Montreal.

Council—E. W. Gilman, Montreal; Jas. McEvoy, Fernie, B. C.; Frank B. Smith, Edmonton, Alberta; R. W. Brock, Ottawa; J. C. Gwillim, Kingston; Dr. F. D. Adams, Montreal; H. E. T. Haultain, Craigmont, Ont.; D. H. Brown, Copper Cliff, Ontario.

The following papers were read and briefly discussed: "The Geology of the Franklin District Ore Deposits, B. C.," by R. W. Brock, of Ottawa.

"Some New Points in the Geology of Copper Ores," by Prof. James F. Kemp, New York.

"Iron Possibilities of the Province of Quebec," by F. Cirkel, Montreal.

"History of the Bruce Mines," by H. J. Carnegie Williams, Bruce Mines, Ontario.

A number of papers were read by title. The usual resolutions of thanks, etc., were passed and the meeting finally adjourned.

The Cobalt Excursion

A party of about 60 members of the institute left Toronto at 9:30 p.m. on a trip to Cobalt, a special train being furnished by the Grand Trunk and Timiskaming & Northern Ontario lines. This party spent two days in Cobalt, leaving there March 10 for North Bay, whence the members dispersed to their homes. This closed one of the largest and most successful meetings ever held by the institute.

Zinc Production in Russia

According to the *Financier and Bullionist*, zinc ore is produced in Kieletz, and the metal is smelted and rolled and zinc white produced in the Bendinsk district of Petrokoff, Russia. Statistics for the full year are not yet available, but those for the first nine months of 1906 are compared with corresponding figures for 1905. They are supplied by the Polish Mining Council. The production of zinc ore came from the mines known as the Joseph, the Ullis-Franco-Russian Company, and the Boleslav-Sosenowicz Company, while manufactured zinc and spelter were produced at the three factories, Bendinsk, Paulin and Konstantin. The summary is given in the subjoined table:

Material.	Jan.-Sept. 1905.	Jan.-Sept. 1906.	Changes.
	Lb.	Lb.	Lb.
Calamine.....	163,056,000	104,556,843	D. 58,499,157
Calamine and Galena.....	9,646,382	13,921,573	I. 4,275,191
Spelter.....	13,214,861	15,680,264	I. 2,465,403
Zinc white....	712,345	1,242,903	530,558

On Oct. 14, 1906, the stocks of calamine at the mines amounted to 38,443,932 lb., and there were 561,144 lb. of manufactured zinc held at the factories, and of zinc white the stocks amounted to 145,856 lb. The decrease in the production of ore, the large stocks, and the increases in the quantity of zinc smelted are accounted for by the fact that the year 1905 was one of the most miserable for the production of zinc at the Russian factories and smelters. This accumulated large stocks at the mines, necessitating curtailment in production the following year. It is believed that the total production of metallic zinc for 1906 will fall behind that for the years 1904 and 1903, when the results showed 23,372,264 lb., and 21,812,370 lb., respectively.

Adequate ventilation is one of the best preservatives of timber. A poor and stagnant atmosphere may rot 12-inch Oregon pine in six or eight weeks. Timber with cold water dripping on it will last longer than that which is set up in a dry drift.

Personal

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

Benjamin Sadtler, of Denver, is at present making a professional trip to Sonora, Mexico.

Stanley Unwin, of London, has started on an extended visit to the United States and Canada.

James MacNaughton, general manager Calumet & Hecla Mining Company, has gone to Boston.

Walter Fitch, general manager Utah Copper Company, has been in Calumet, Mich., for the past few days.

H. W. Hardinge left New York on March 4 for Colorado and Arizona. He expects to return about the end of March.

F. Julius Fohs is now at Lexington, Ky., working on several geological reports, and will probably remain there for several months.

W. E. Thorne has left San Jose, Cal., to examine some ancient channels in Placer county, making his headquarters at East Auburn, Cal.

C. Colcock Jones has returned to Los Angeles, Cal., after several weeks passed in eastern San Bernardino county, Cal., on professional business.

H. H. Robinson, general superintendent Michigan State Telephone Company, has been a visitor in the copper country in the interest of extensions contemplated by his company.

W. C. Fitzsimmons, of Cleveland, O., started on March 10 for Mexico, where he will examine a number of gold mining properties for New York and Philadelphia parties.

A. C. de Jongh, a mining engineer from Holland, passed through Denver a few days ago. He is studying mining and metallurgy in the United States, previous to leaving for the Dutch East Indies.

George A. Laird, superintendent of the Copper Queen Consólidated Mining Company's Sierra de Cobre mines, at Cananea, Sonora, Mexico, and formerly manager of La Victoria y Anexas, San Pedro, Mexico, has resigned his position with the Phelps-Dodge Company and will enter into the general engineering business with Franklin W. Smith, of Franklin W. Smith & Co., of Bisbee, Arizona.

Obituary

Homer J. Lindsay, who died in Pittsburg, March 3, aged 48 years, was one of the original Carnegie partners. For some years he had been assistant to the first vice-president of the Carnegie Steel Company.

Lord Penrhyn, who died in London, March 11, aged 71 years, was the owner of large slate quarries in Wales and was best known on account of the most stubborn and protracted labor contest ever known in the mineral industry. He kept all his quarries closed for three years rather than yield to the men's demands, notwithstanding a heavy loss of trade to home and foreign competitors.

Industrial

The Pilling Air Engine Company, Detroit, Michigan, is getting out plans and specifications for a new factory building, which will more than double the present capacity. J. C. Fleming is president and manager.

The Salt Lake City office of the Denver Engineering Works Company has been moved from 416 Dooly Block to 205 Atlas Block. The steadily increasing business under the management of L. G. E. Bignell required roomier quarters.

The Midvale Steel Company, of Philadelphia, Penn., has opened a branch office in the City of Mexico. John E. Strachan, formerly in charge of the Denver office, will be manager of the City of Mexico office. The head office for the Pacific coast, for the Midvale Steel Company, is located in San Francisco, Cal. Jas. C. H. Ferguson is the Pacific coast sales agent.

The Fred. M. Prescott Steam Pump Company, Milwaukee, is again making large extensions, which when completed will more than double the present capacity of the plant, built but four years ago. The additions to the office, drawing rooms and pattern shop are finished; the foundations for the new foundry have been laid, so that the steel work for same will probably be raised within the next month. This building will, be 300 ft. in length, and includes several novel features in the way of handling the pig iron, coke and sand. Paralleling the foundry will be two long machine shops, spanned at the east end by a high erecting shop, 205 ft. in length. The rectangular court between the two shops will be divided by a railroad track and used for the storage of castings. New machinery will be installed in both the foundry and shops, all electrically driven.

The first application in America of the Rateau process for the utilization of exhaust steam from intermittently running engines has been put in operation at the steel works of the International Harvester Company, South Chicago, Ill. The exhaust steam from a reversible blooming mill is utilized in a low-pressure Rateau turbine of 600 kw. capacity, direct-connected to two 250-volt genrators. To regulate the intermittent exhaust of steam, the exhaust of the blooming mill is worked through one of the water-type Rateau steam regenerators, which has a capacity sufficient to take care of intermissions of several minutes' duration in the running of the main engine. The steam then feeds the low-pressure turbine, and is condensed in a barometric condenser. The pressures are atmospheric pressure absolute at the inlet of turbine and 28-in. vacuum at the outlet. The quantity of steam available from the main engine is more than twice the amount needed by the turbine. In case of a shut-down of the main engine for a long period of time an automatic reducing valve allows the steam from the boilers to be directed and utilized in the low-pressure turbine.

Societies and Technical Schools

Western Society of Engineers—The officers of this society for 1907 are: President, W. L. Abbott; vice-presidents, Andrews Allen, E. N. Layfield, A. N. Talbot; treasurer, A. Reichmann; secretary, J. H. Warder. The office of the society is in the Monadnock block, Chicago.

Montana Society of Engineers—At the regular meeting of the society for February, the trustees, to whom was referred the bill for a State Geological Survey, presented by Professor Bowman at the last meeting, made a verbal report. On motion the society voted to indorse said bill, now pending before the legislature of Montana.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Pelton Water Wheel Company, San Francisco, Cal. Pelton Water Wheels. Pp. 108, illustrated, paper, 6x9 in.; 1906.

Joseph Dixon Crucible Company, Jersey City, N. J. Crucibles, Their Care and Use. Pp. 39, illustrated, indexed, paper, 6x9 in. 1907.

Construction News

Birmingham, Ala.—The Kilby Frog and Switch Company has increased its capital stock of $150,000.

The Southern Steel Company has completed the installation of another battery of patent wire-drawing machines at the Ensley plant.

Blue Tent, California—This mine is to be worked on a large scale, and machinery will be needed W. H. Metson and C. L. Canfield, San Francisco, are owners.

Nevada City, California—The Channel Gold Mining Company is preparing to operate on a large scale and will need machinery. Chauncey L. Canfield, Nevada City, Cal., is manager.

Republic, Washington—It is proposed to erect a large mill to treat ores from the Republic and other mines by crushing and cyanidation. Harry L. Rodgers, of Butte, Mont., is managing the project.

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 March 6

Part of the stamps of the Champion mill, and all of the Home mill, at Nevada City, have been started up again after a long period of idleness due to the extended litigation between the two companies. The Champion mill has 70 stamps and the Home 30 stamps. A large quantity of ore had accumulated previous to actual litigation. Some 2500 tons remain uncrushed which was taken by the Home company from the disputed ground, finally adjudged to have been the Champion's. The Champion Company has arranged to connect with the Home water supply to operate the compressors of both plants, which will save considerable expense.

The Tonopah Company (or Brock railroad) has bought out the Bodie Railroad, a wood railroad running 12 miles from Bodie into the great timber belt of Mono county. This deal means much to the Nevada mining country. The problem of an adequate timber supply has long been one to cause anxiety in the Nevada mining section. The Brock syndicate has completed the survey of the right of way upon which it will soon begin the construction of a standard gage from Tonopah junction to connect with the Bodie road by means of which it will tap the great timber belt.

There is a little local excitement in the Honey Lake Valley region, in Lassen county, particularly near Spoonville, the Gibson ranch and Schafer mountain, where considerable prospecting is now being done. Lassen county has for some years had only one producing mine—the old Golden Eagle, owned by the Lassen Mining Company, composed of Louis and Leon Sloss, E. M. Hunt, Curtis Lindley, E. H. Benjamin, and others.

Quite a notable strike has been made in the Mountain Maid mine, Chicago Park district, between Grass Valley and Colfax. The mine is owned by Dr. Charles Puscheco. The ore is rich and much specimen material is being taken out.

In the Fruitvale mine, on the Yuba river side of Chipps ridge, Sierra county, they have come across a pocket of more than $20,000 in specimen ore. They have been driving a tunnel in the mine for several months, under superintendence of Andrew Fitzgerald, of Alleghany. The ledge where found is 6 ft. wide. The discovery is considered important to that part of Alleghany district lying west of the famous Tightner ledge.

The excitement about the Savage mine on the Forest Hill divide, in Placer county, recently bought by George Wingfield, of Goldfield, Nevada, still continues The Forest Hill miners are locating claims in all directions, and as far down as Yankee Jim's. The travel into the mountain section is rapidly increasing and numbers of men from adjoining States have gone into the districts. The Savage mine is in a high mountain locality, 2½ miles from Forest Hill.

The Grizzly Hill drift mine on the South Yuba river, below Blue Tent, Nevada county, is about to be re-opened. Considerable development work has been done and a gravel-mill erected by men who had dissensions among themselves, and then shut down work. W. H. Metson, of San Francisco, and C. L. Canfield, the oil investor, are completing arrangements to open and work the mine on an extensive scale. Only a small part of the gravel channel has heretofore been worked.

Work will soon commence on the 1271 acres of gravel ground owned by El Oro Gold Mining Company, of Nevada City. The claims extend from the Malakoff mine, at North Bloomfield, to the neighborhood of Columbia Hill. Twelve tunnels have been run into the ridge at different times, but all have been too high to bottom the channel, which is believed to be either an extension of the old Bald Mountain channel, which crosses the South Yuba river, from Minnesota, in Sierra county, to Snow Point, in Nevada county, or else the channel which was worked with such rich results by the Blue Banks and other companies in the vicinity of Moore's Flat. As soon as the winter is over the company will start re-opening a 2300-ft. tunnel half a mile above the Pickle ranch, near Columbia Hill, which was driven in from the north side many years ago. An incline will then be put down to reach the bottom of the channel, and the bedrock will be followed for some distance. The company doing this work has for its president Frank T. Smith, and secretary and treasurer, E. L. Bosqui, of Nevada City.

Salt Lake City March 8

A heavy stock interest in the Emma Copper Company, with properties at Alta, has been purchased by Samuel Newhouse, D. C. Jackling and Charles W. Whitley. Recent developments in this mine indicate that it will become a shipper as important as any in the camp.

The Alta Coalition Copper Company has been formed to develop a group of mining claims in the Big Cottonwood district. The officers are: F. R. Snow, president; B. F. Grant, vice-president; N. Y. Stringham, treasurer; all of Salt Lake.

The Daly and Ontario mining companies will probably enter the Salt Lake market with coal, being joint owners of the Weber coal mine at Coalville, Summit county. Heretofore only the camp and mines at Park City have been supplied from this source.

An Ely statistician estimates that during the past year $2,000,000 has been expended in that camp in mine development and improvements. The Nevada Consolidated and Cumberland Ely companies have been the heaviest investors.

Samuel Newhouse, president of the Newhouse Mines and Smelters corporation, has made the statement that a dividend will be declared during the present year. The company owns the Cactus copper mine in Beaver county. It is said the net earnings for this month will be around $225,000.

The mill on the Last Chance property at Bingham, which was recently overhauled thoroughly, is about ready for commission. It is to be operated by electric power.

Shareholders of the Bullock Mining Company, with headquarters at Provo, have elected the following officers: B. H. Bullock, president; J. I. Bullock, vice-president; who, with M. M. Kellog, W. F. Giles and Thomas Boardman are directors.

The owners of the Little Pittsburg and Pioneer mines in the Little Cottonwood and American Fork districts, near Alta, are endeavoring to bring about a consolidation.

It is expected that the smelter of the Utah Smelting Company, located near Ogden, will be in commission not later than March 10. The company has been buying ores for several months and has an accumulation of over 3000 tons on hand.

Denver March 8

Although the past month was a short one, the record of the production of the Cripple Creek district makes a very favorable showing, amounting to 43,100 tons, valued at $1,135,075. In consequence of fine weather conditions, causing the roads to be unusually good for this season of the year, and the starting up of several small metallurgical plants, treat-

ing the lower grades of ores to good advantage, the winter's record is a fine one and the present month promises to show a large increase over the above figures.

It is expected that the Golden Cycle mill at Colorado City, which is almost completed, having been constructed under Philip Argall's personal supervision, will commence operations in a short time on the ores of the Milliken properties. It is understood that the management of the Portland Company is considering the erection of a plant in the immediate vicinity of their properties to treat low-grade ores.

The stockholders of the Yak Mining, Milling and Tunnel Company, operating at Leadville, have declared the regular quarterly dividend of 2c. per share and bendes, an extra dividend of 4c. per share. The tonnage of this mine has been very large lately.

A meeting of the directors of the Calumet Telluride Gold Mining Company was held at Calumet, Mich., a few days ago and a contract for the construction of a 20-stamp mill and electrical plant, was awarded to the Allis-Chalmers Company of Milwaukee, at a cost of $40,000.

There is considerable activity in the Tungsten district of Boulder county and the price for concentrates continues to advance. During the past week $9.20 per unit is understood to have been offered for 60 per cent. concentrates, which is more than double the price of a year ago.

The International Trust Company of Denver has brought suit in the district court against the Campbird Extension Mining Company, this company having borrowed $70,000 on a bond issue about three years ago, the total indebtedness being $86,800, at present. The company owns a property adjoining the famous Campbird mines near Ouray but is in no way connected with them.

Two million ounces of silver will be coined by the Denver mint in 50-centavo pieces for the Mexican Government, as soon as the latter delivers the bullion.

From present appearances the trials of Haywood, Moyer and Pettibone in Idaho will not be held for some time to come. It was expected that they were to commence on March 5, but on that date the defense was granted further time.

Indianapolis March 15

Almost the entire time of the convention of the United Mine Workers of district No. 8 known as the block-coal district, was taken up in considering the trouble at the Progressive Coal Company's mine. It appears that the miners made a contract with the company to mine and load fireclay at 30c. and shale at 25c. a ton. This scale worked satisfactorily as long as there was a good demand for coal, but when the coal business fell off and the company kept the miners busy a part of the time in loading clay and shale, earning from $1.75 to $2 per day, they demanded an increase in price which the company refused to grant. The miners appealed to the district organization. The officers told the miners that it was a private contract made without consulting the district officials and consequently nothing could be done for them. The men were advised that if they did not wish to load the clay by the ton they could load it at regular day wages of $2.56 a day. Thereupon the miners voted to return to work, but trouble is anticipated if they repudiate their contracts and demand the $2.56 per day.

Cobalt, Ont. March 9

The official report of the Timiskaming & Northern Ontario Railway of shipments of Cobalt ore for the week ending Mar. 2 is as follows: Buffalo, 60,000 lb.; Green-Meehan, 68,380; La Rose, 57,480; Nipissing, 148,470; O'Brien, 194,610; Silver Queen, 54,670; total, 583,610 pounds.

Owing to the great demand lately for mining plants, there is much delay in filling orders. The business in Canada is confined to comparatively few companies, the principal trade being done by the Rand-Jenckes, the Allis-Chalmers-Bullock, and Mussens, Ltd., who have agents at Cobalt, and whose machinery is well known. The companies are disposed to be conservative in their orders for plant, and do not care to buy machines of new types with which they are unfamiliar; so that newer rivals in the trade find it difficult to obtain orders. The leading firms have so much business on hand that an order for a large compressor generally takes five or six months to fill.

London March 2

At the Redruth tin ticketings held on Feb. 25, an interesting feature of the function was the sale of a parcel of tin from Swaziland, South Africa. It is not usual for any tin ores or concentrates to be sold by public competition in Cornwall. About 16 tons of Swaziland ore was sold on this occasion, and the price obtained was £135, as compared with £124 obtained by Dolcoath, and Grenville. The ore must therefore have been almost pure tin oxide. It shows that the Swaziland alluvial tin can be dressed very fine.

I have referred in this column a number of times during the past few years to the Avino Mines of Mexico, Ltd., a company operating in Durango, Mexico. For the past year Ralph Nichols has been engaged in directing exploring operations with the object of getting an idea of what ore is really to be found. Hitherto various dressing and reduction processes have been recommended and adopted with insufficient data to go on. The cost of Mr. Nichols' operations is necessarily considerable, and the company now finds itself in the position of running short of funds. The exploring work will take all the money on hand, and perhaps more, and there will be none left for reorganizing the plant. The directors have come to the conclusion that reconstruction with a view to assessment is the only possible way of raising any more money, so a scheme of this sort is to be laid before shareholders shortly whereby £60,000 further capital will be provided.

One of the sources of public revenue in the Transvaal is the income derived from the profits of the Premier diamond mines. For the year ended Oct. 30 last the public income from this source amounted to no less than £370,000. At the same time the shareholders in the company receive £260,000 as dividends. This is a practical example of the highest form of socialistic doctrine that mineral deposits should be worked for the benefit of the State. During the year in question, the mining expenses amounted to £286,000, and the sorting and washing to £183,000. Development work cost £42,000, extra equipment, £55,000, and office expenses, marketing expenses, etc., brought the total expenditure of the year up to £660,000. The total income from the sale of diamonds was £1,277,739. The production of diamonds during the year was 899,746 carats, an increase of 54,000 carats over that of the previous year. The water difficulty has now been got over, and by the recent completion of the pumping station on the Wilge river, a water supply of 2,000,000 gal. every 24 hours is assured. Additional pumping plant is to be erected before long by means of which this supply will be doubled. New equipment is also under consideration in order that the output may be increased. It is not probable that this additional expenditure will be embarked on until the famous Cullinan diamond is disposed of. This diamond figures in the assets of the company at a purely nominal sum. Some day it will be realized for a good round sum, which will provide the additional capital required for extending the plant. The company now disposes of its output itself, the original contract with Neumann's having expired.

The affairs of the Ymir mine of British Columbia, and of the English company owning it, are still in suspense. The scheme by which it was hoped to obtain financial assistance from America fell through, and the directors had considerable difficulty in arranging a scheme for providing new capital. It was impossible to raise money by reconstructing and assessing, as many holders would have dropped out, so a scheme for raising money by debentures is now practically complete, and the directors have felt enabled to go forward with the reorganization necessary. It has been decided to appoint a local board of directors, of which S. S. Fowler will be head. The new manager, H. G. Nichols, left London a fortnight ago for the mine.

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

Arizona

Arizona Copper Company—At the recent annual meeting of this company, the chairman announced that with the additional mills recently erected and in course of erection, with the proper complement of men, the company could produce 18,000 long tons of copper per annum, if the ore averaged 2.14 per cent.; and 21,000 tons, if it averaged 2.4 per cent. The production in 1906 was about 13,500 tons.

PIMA COUNTY

Imperial Copper Company—This company, with mines on the branch railroad from Red Rock, on the Southern Pacific, is now erecting a 350-ton smelter, with converters complete, for the treatment of its own and custom ores. Provision is made for a second furnace of equal size, when it shall be required. The construction is under the care of Meade Goodloe, of the Congress mine.

California

AMADOR COUNTY

Argonaut—The new manager of this company is shortly to arrive, and it is expected that this property will before long be operated on a larger scale. A new shaft will be sunk on the Hoffman ground.

EL DORADO COUNTY

Last Chance—A new 10-stamp mill has been placed on this mine at Nashville, Henry Smith superintendent.

Sherman—An electric motor is being installed at this mine, near Placerville, and in a short time the whole plant will be run by electricity.

INYO COUNTY

Southern Belle—This group at Laws is now thoroughly developed, and is equipped for extensive operations. The New Year shaft shows a large body of ore. The mine was a large producer many years ago. W. G. Scott is superintendent of the mine, and A. E. Vandercook, president of the company. Deeper sinking is to be carried on at the property.

New Coso—This company at Darwin is making good progress on the Lucky Jim, and also on the six Thompson claims adjoining. Two new gasolene engines have been installed.

KERN COUNTY

Dredging—Location notices covering some 15,000 acres have been filed for claims in the southeastern part of Kern county, extending into San Bernardino. The project is to dredge in the Mohave desert on the line of an ancient river-bed which crosses it, and the ground has been located along the line of the old river.

MADERA COUNTY

Golden State—These mines, near Raymond, R. D. Morris, superintendent, are about to be worked by a party of Los Angeles men.

MODOC COUNTY

Hoag District—In this new district the following mines are being worked: Turner, Williams and Mason, Wade and Plummer, Kaffader and Bassett, and Seltz, the latter being a copper claim.

MONTEREY COUNTY

Quicksilver—The Esmeralda quicksilver mine has been sold to Cruikshank, Harboldt & Wetzel, and is now being worked by the new owners. A tunnel is being run to open the orebody.

NEVADA COUNTY

Channel Gold Mining Company—This is the name of the new company which has taken hold of the old Blue Tent gravel mine, six miles north of Nevada City. The directors and officers are as follows: J. C. Wilson, president; R. S. Moore, vice-president; George Wilbrand, secretary-treasurer; Chauncey L. Canfield, manager. J. O. Jones, generally known as Oscar Jones, who for many years had charge of the Bald Mountain mine, at Forest City, and the Mayflower mine of Placer county, is the superintendent in charge. The new company is now engaged in getting ready to open a large area of virgin ground, and expects to work the mine extensively.

Champion—The litigation being ended, 20 stamps of the mill of this mine at Nevada City, have started running, for the first time in nearly two years. Ore is being hoisted through both the Champion and Home shafts.

PLACER COUNTY

Bellevue—This mine at Ophir has been sold to W. F. Brice and associates, of Los Angeles. Electric power will be used.

Gold Run Gravels—On this property, Dutch Flat, air compressors and other improvements are being put in.

Savage—This mine at Forest Hill, recently purchased for $100,000 by George Wingfield, of Goldfield, Nevada, will be thoroughly opened and developed at once by its new owner. There are a number of proved mines near this one—notably the Barton, or Herman. The mine is in Volcano cañon.

Hibbe Copper Mine—This mine, on Bear river, three miles above the Dairy Farm mine, has ben sold through C. L. Wilson, and the new owners have commenced to take out ore for shipment.

RIVERSIDE COUNTY

During January 256 mining locations were placed on record in the county recorder's office.

SAN BERNARDINO COUNTY

Desert Mining and Reduction Company—A new mill, pumps, hoist, etc., are about being purchased for this company, whose property is in Bullion district in the New York mountains. Arthur Woods is manager.

SHASTA COUNTY

Treat Consolidated and Little Rover Group—These mines, between Iron Mountain and Shasta, have been re-located by C. Litsch. The orignal owners spent considerable money on development and machinery and applied for patent. The United States land office was not satisfied, and canceled the entries on Nov. 6. Litsch then took up the claims.

Bonanza—For this mine at Harrison Gulch a patent has been issued and it is thought that this will end the long litigation about the Harrison Gulch town-site.

SIERRA COUNTY

Tightner—At this mine, Alleghany, work is to be resumed without delay on the 1000-ft. tunnel from Kanaka creek, a contract to run 500 ft. having been let to Wliliam Kidd and Gabriel Nelson. The tunnel was started last year, but operations on it were delayed.

SISKIYOU COUNTY

Bloomfield—A third interest in this copper mine in the Blue Ledge district, is reported to have been sold to Montana men for $45,000. Six mines of importance have been opened on the same ledge. In the development of the Blue Ledge mine, which gives the name to the district, $200,000 has been expended. Diamond drilling has been done to the extent of 7000 ft. or more.

Champion Group Mines Company—This company has shipped a carload of rich ore and cencentrates from the McKinley

and Old Flag mines, to the Selby smelter. The ledges on these mines are growing wider and richer as they go down, and the indications point toward the development of a valuable property. The company is working two shifts and is in need of ten more miners. A. L. Hays is superintendent.

TUOLUMNE COUNTY

Lion Gold Mining Company—This company has been formed for the purpose of developing and operating the Ida Klein mine, situated near Stent. The property is a comparatively undeveloped one, but bears the marks of a valuable mine, and it is the intention to immediately equip it with all necessary machinery.

Roosevelt—This mine, formerly the Equitable, has been sold by J. H. Adams to W. E. Mitchell, of New York, together with a 5-acre mill site, and the Bourbon group of claims.

Colorado

LAKE COUNTY—LEADVILLE

Buckeye—Work on the recent strike in this mine, Freyer hill, has proved that the sand carbonates found in the north drift, gave place to a large body of iron Upraising in the iron body is now in progress and no doubt when the top is reached the carbonate will be found there; this is the general history of the hill. The drift will be driven ahead to the end of the iron shoot to the north.

Cleveland—The manager of this property, South Evans gulch, was surprised to find during the week that the shaft had passed through the body of lead ore and entered the porphyry; the orebody passed through was 10 ft. thick. When sinking was resumed at the 500-ft. mark the shaft was in hard gold quartz, running $6 per ton; after going down 40 ft. the body of lead ore was caught, and passing through that, the shaft is now in porphyry and going down at the rate of 5 ft. per day. What will be encountered before the shaft reaches the 625-foot is a matter of conjecture.

Helen Gould—Work has been going on all winter driving a tunnel on this claim, East Tennessee section, now in 180 ft. During the week the tunnel ran into a body of ore 4 ft. wide carrying gold, silver and copper.

Breece Hill—The Vinnie is shipping an average of 50 tons daily of a good grade of silicious ore. The large body of zinc opened in the M. N. fraction and running to the end-lines of the Vinnie, will be opened in the latter property. From the lateral run from the Yak tunnel through the Vinnie ground an upraise has been started to make connections with the shaft. When that is completed all the ore mined in the property will go out through the Yak tunnel, which will materially lessen the cost of mining. The Highland Chief employs five four-horse teams steadily, hauling ore from the mine to the switch down the gulch the average shipments being 60 tons daily. From the body of ore recently opened at one of the lower levels of the Elk, 50 tons daily are being hoisted. Hanifen & Reynolds secured a lease on the Black Prince, north of the Little Jonny, sunk the shaft deeper, drifted and have opened up a good body of ore from which they are shipping steadily. The Fanny Rawlins, Big Four, Big Six, Penn, etc., are shipping steadily.

Mammoth—The water in this shaft, Big Evans gulch, has been lowered to 400-ft.; at this point a large station is being cut and when the pumps are installed unwatering the shaft will be resumed.

Monthly Tonnage—The total for the month of February was 75,000 tons of all classes of ore, and considering it was a short month the output is up to the average.

Zinc Mill—The plant belonging to the Boston-Arizona Company has been installed and experimental tests are at present being made; in a few days the mill will be treating 50 tons daily. The process used is magnetic separation.

Swisher Tunnel—This tunnel, driven into Sugar Loaf mountain from the north side, has caught the vein, which is about 3 ft. wide and runs $8 to $10 gold and $16 silver per ton. The new find differs from the typical fissures of the hill, being in blanket form.

Bull's Eye—This mine, Iron hill, under lease to the Bray Brothers, is shipping a good grade of iron from the upper workings. Recently a good vein of carbonates was opened in one of the lower levels, and ore is now being shipped from that part of the mine.

Mammoth—The new machinery and pumps have been installed, and the shaft is being unwatered. To the southwest of the Mammoth lies the Fairmont group, which has been secured under lease to Mayor Johnston, of Boulder; a new shaft will be started about the middle of March.

Elk—The body of low-grade ore recently opened in this property, Breece hill, in one of the lower levels, has improved greatly in value within the last 10 days; today the lessees are sacking ore of high-grade value from a streak several inches wide found in the body of low-grade material.

Hibschle Shaft—This shaft, at the head of East Seventh street, in addition to shipping a good grade of iron, during the week in one of the lower levels opened a good-sized vein of lead carbonates, and this also is being sent to the smelter.

Coronado—This property is shipping at the rate of 400 tons daily of sulphides and lead silicious ores from the ore reserves. Development work is kept well ahead; the water is gradually subsiding until now the pumps are only lifting 1500 gal. of water per min.

Wolftone—Recently this property, Carbonate hill, resumed work, and now 200 men are employed. Ore is being broken at different levels to the amount of 300 tons daily, 200 tons going to the Adams mill and the balance to the smelter.

A. Y. & Minnie—This mine, California gulch, is sending out 200 tons daily, 100 tons being treated at the mill, and the other 100 tons going to the smelter. The concentrate from this mill is a clean product and finds a ready market.

Illinois

VERMILION COUNTY

Kelly Coal Company—The stock of this company, which owns a large coal property near Danville, has changed hands. It was bought outright by R. R. Hammond, J. K. Dering, Hugh Shirkie and Edward Shirkie, all of whom are connected with the Dering Coal Company. The purchase, however, is not by the Dering company, but by the four gentlemen named, and the stock is their individual property. The face of the stock is $3,500,000, but what figure was paid for it has not been made public. The property includes 13,000 acres of land, on which five mines have been opened, which are producing 6000 tons of coal a day. The new officers of the Kelly Coal Company are: President and general manager, R. R. Hammond; vice-president, Hugh Shirkie; secretary and treasurer, J. E. Hitt. The directors are R. R. Hammond, J. K. Dering, Hugh Shirkie, Edward Shirkie and J. E. Hitt.

Indiana

GREENE COUNTY

An eastern company will soon begin the opening of a new mine near Howesville. A year ago a fine vein of coal was found, overlaid with a bed of fireclay. The promoters took options and waited for the building of the New Monon Railroad so as to have shipping facilities. Work is now beginning in earnest.

KNOX COUNTY

Tecumseh Coal Company—The company has sunk a shaft to No. 5 vein, at Bicknell, and is now putting up one of the best tipples in Southern Indiana. All of the machinery will be run by compressed air. Altogether the cost of the mine, with sidetracks, etc., will be $75,000. The shaft is almost 160 ft. deep, and the vein is 6 ft 8 in., of a good bituminous quality. Valentine Martin has been made general manager and O. H. Martin secretary-treasurer.

Missouri

ZINC-LEAD DISTRICT

Atkinson Land—P. W. Atkinson has leased 30 acres of his land to McEntee, Turnidge & Co., of Webb City, who will

drill the ground for mineral. The land is located west of the Howard land at Webb City, on which several good strikes have recently been made.

Garrison Land—The Webb City Mining and Leasing Company has secured a lease on the old workings on this land, which is situated in the southeast edge of Webb City, and is doing much development work. The old 100-ton mill has been overhauled and remodeled into a 200-ton plant, a sludge mill added which is turning out a considerable amount of ore each week, and a new 350-ton modern concentrating plant has been contracted for, to be erected on the west portion of the lease, the old mill being on the east.

Henderson Land—Harley and Charley Wells, of Joplin, who discovered by drill the orebody of the now famous Morning Hour mine on this land, have made another rich strike on a sub-lease adjoining the Morning Hour, the drill showing a 25-ft. face of ore in two different holes. The land is situated just west of Joplin.

Schlessman Land—A strike made by Howard Luke, of Joplin, on this land, which is just west of the Schifferdecker land in the west edge of Joplin, gives promise of opening up a new producing section. This is the first prospecting done on this land and ore was encountered at the 170-ft. level.

Sheperd Land—James Campbell, of the Missouri Lead and Zinc Company, has purchased of the Muncie Mining Company the 200 acres known as the Sheperd farm, lying west of the Rex Mining and Smelting Company's 1000-acre tract and northeast of the Missouri Lead and Zinc Company's large holdings in Joplin.

Thompson Land—A. C. Roper and associates, of Carthage, have leased 400 acres of the Thompson & McFall land, four miles northeast of Carthage, on which they will do some prospect work by drilling. About 12 years ago some drilling was done on this land and showed a body of zinc with a sprinkling of lead ore. This new company has its own drill and will thoroughly test the land.

Madison County

North American Lead Company—The new smelter of this company at Fredericks-town, that cost $250,000, is now operating its shaft furnace and is turning out 5000 lb. of blister copper daily. This contains 4 to 6 per cent. of nickel and cobalt, which will be taken out by the electrolytic process as soon as the refining department is completed. While a little copper occurs with the Southeast Missouri disseminated lead ore, this is the first instance where the amount has been large enough to warrant a special plant for its recovery.

Montana

Butte District

A despatch from Butte, March 11, says: "The striking miners are now willing to enter into a contract to work on a sliding scale, based on the price of copper, with a maximum for underground men of $4 a day when the rate is above 25c. a pound, and a minimum of $3.50 with the price below 18c. Shaftmen will get from $4 to $4.50. It is understood that the companies have agreed to this compromise, and a contract for five years will probably be made."

Nevada

Esmeralda County—Goldfield

Miners' Union—Late telegraphic advices from Goldfield say that the miners have decided to sever connections with the Industrial Workers of the World and form a union of their own. The first shift of miners of the Consolidated Companies was called out March 11 by the old union because the carpenters would not join their order. The shift went on as usual, declaring that they would no longer bear the dictation of agitators.

Mohawk-Jumbo—The shaft at a depth of 350 ft. has encountered a change in the country rock and the miners hope to break into ore within a week or two.

Dixie—Arrangements are nearly completed for resuming development on the Dixie mine which is well located in the eastern portion of the field. In the workings above the 360-ft. level large bodies of milling ore are opened ready for stoping. It is proposed to resume sinking with the view of developing the lower ground.

Amethyst—The shaft has cut ore where the Red Butte and Great Bend veins junction. A new power hoist is being installed with the view of facilitating sinking. The newly formed company has decided to sink the shaft with the greatest possible speed as there are reasons for believing that both the veins will carry milling ore and possibly bonanza shoots will be met with at no great depth.

Combination Extension—The shaft has been sunk to a depth of 200 ft. and the mine has been furnished with a complete pneumatic drilling plant. The bottom of the shaft is in the andesite formation which yields promising assays.

Florence—Plans are completed for the immediate erection of a 10-stamp battery on the Florence. The ore is largely sulphide, and the mill will require a concentrating equipment. It is estimated that the ore already in the dump contains over half a million dollars worth of gold. It has been decided to erect a mill building capable of housing a battery of 30 stamps, as it is believed the requirements of the mine within the next twelve months will necessitate a mill of that capacity.

St. Ives—A rich find has been made in the Codd lease on the St. Ives mine, which gives every indication of developing into a bonanza. Careful samplings across the vein for a width of 3 ft. give assays running up to $2000 per ton. The shaft will be continued to a depth of 200 ft., with the greatest speed so that mining can be started at that level while the shaft is being sunk lower. This find has beneficially influenced the value of shares in a number of mining companies operating in the vicinity of the St. Ives, and there is a large amount of local trading in St. Ives shares at advancing rates.

Simmerone—A new 25-h.p. hoist has been installed by the lessees and a full force of men has been engaged to run the shaft down from the 140-ft. level to the 250-ft. level, with the greatest speed. The shaft will be a large one, and well timbered to enable a large output of ore to be made in as short a time as possible. This mine yielded some bonanza shipments about two years ago, and there are indications that it will be yielding well again within the next few months.

Nighthawk—The main shaft will be continued to a depth of 400 ft. from the 200-ft. level. When pumps are put in place to deal with the water, the manager will put men on to drift on the 200-ft. level.

Nye County—Bullfrog

Skookum—The new tunnel has been advanced for a total distance of 92 ft. The breast is in quartz carrying small values. The manager expects to cut the ore-shoot well within the next 50 ft.

Valley View—A new tunnel has been started in this property, which is located in the Mayflower section of the field. It is proposed to extend the tunnel a distance of 600 ft. with a view of developing a number of low-grade veins which outcrop on the hill.

North Star—Recently the tunnel encountered a promising vein and the management determined to test it by drifts. The results are most promising, and a rich shoot may be discovered at any moment.

Nye County—Fairview

Fairview Eagle—This mine will shortly enter the regular producing and shipping class. At this time there is a large tonnage of rich ore sacked, lying on the dumps and stored in tunnels and drifts about the workings. The Eagle adjoins the Nevada Hills on the north, and is said to have an equally fine showing for relative depth.

Aztec—The power hoist, which was ordered some months ago and which is the second to be installed in the Fairview district has been erected. The Eagle had the distinction of erecting the first power hoist in Fairview.

Nye County—Manhattan

Mammoth—The contract work on the main tunnel has been completed. The last 50 ft. of the tunnel is in ore and the

superintendent is of the opinion that the ledge is wider than it at present appears. Men will be put on in a few days to drift along the vein and stack the ore. The tunnel just finished is the longest on the field and is 608 ft. in length.

Zanzibar—The main tunnel has been driven into the hill for a distance of 450 ft. Numerous drifts have been run from it, and several promising ore-bearing veins have been cut. Prospecting work is being vigorously prosecuted.

Little Grey—Little work has been done on this property during the winter on account of the bad weather. A meeting of the directors was held in Tonopah during the week, and it was decided to resume prospecting work immediately. Orders have been placed in San Francisco for a steam hoist.

Stray Dog—The shaft is down 248 ft., and the rich Stray Dog vein is expected to be cut again within the next 50 ft. The vein at a depth of 136 ft. is over 5 ft. in width, and recent assays have shown an average value of $200 to $250 per ton. The vein runs in a northerly direction, and has a steep dip to the west. In the lower levels sulphide ore is met with, which requires smelting.

Toquima—The shaft has reached a depth of 170 ft., and is still going down in the footwall. The orebody has been found to continue without a break to a depth of 150 ft., and assays from 5 to 16 per cent. copper per ton. If it continues to develop well in the next 200 ft., the owners will erect a smelter on the ground.

NYE COUNTY—OAK SPRINGS

Pomeroy United—This mine is situated 40 miles north of Johnnie Siding, on the Las Vegas & Tonopah Railroad, and only a few miles from the old Emigrant road. The formation is a contact of lime and porphyry with granite. The company has on exhibition at Tonopah several hundred pounds of fine ore that yields average assays of 17 per cent. copper, while picked samples run as high as 21 per cent. The ledge from which the samples were taken is apparently wedge-shaped, and at a depth of 20 ft. has widened out to 5 ft., with well defined walls. Iron gossan traverses the entire length of the property, and can be plainly traced for over a mile and a quarter.

New Mexico

GRANT COUNTY

Santa Rita Camp—The Santa Rita Copper Company has ceased stoping, but is working in the 100-ton concentrator several of the old dumps of oxidized ores, some of which assay as high as 10 per cent. copper, as malachite, cuprite and native copper. Lessees are doing some stoping in the Hearst mine, and are washing several old dumps by means of trommels, hand jigs and strakes. The Santa Rita company has begun a shaft south of town to penetrate the underlying limestone formation at a depth of 1000 ft.

Hanover District—Of the Phelps-Dodge mines the Modoc is shut down and the Old Hanover is leased to Superintendent Kramer, by whom the old stope filling is being shipped, as it can be sorted to assay 6 to 8 per cent. copper. The Hermosa Copper Company, controlled by General Electric interests, is exploring several prospects, of which the Ivanhoe and the Humboldt are the largest. So far the expected copper has not materialized.

Fierro—The two iron deposits, the Union Hill and Jim Fair, are shipping more than 10,000 tons of ore monthly to Pueblo. Of this the first mine is responsible for twice the tonnage of the second, and also contains a much greater preponderance of magnetite over hematite, though both ores have ½ to ¾ per cent. copper, and are within the bessemer limit.

Boggs Mine—This lies on a recently discovered fissure in quartzite, west of the Ivanhoe mine. The ore is galena, which occurs in vertical shoots 5 to 15 ft. long, 1 to 7 ft. thick, and some 10 ft. apart. The lead is poor in silver, but the shoots could produce large quantities of the base metal were it not for the likelihood of a change at a shallow depth to copper.

SIERRA COUNTY

Hillsboro District—The Hillsboro Consolidated Company, which some time ago bought the mines of the Philadelphia Mining and Milling Company, at Andrews, is working 25 men and planning a machinery equipment. In the McKinley group, owned by Conoby & Co., a strike of rich gold ore has been made and shipments will soon be begun. The Empire Company will erect an air compressor to expedite the drilling in its 4000-ft. drainage adit, now started on the fifth level of the Bonanza mine. This mine is controlled by the Miller Bros., of Osage county, Kan. It has a 20-stamp mill.

The Sierra Company, with Ex-Senator Miller, of New York, as president, and J. J. May as superintendent, has been active for three months. It is erecting the steel building for a mill with 30 stamps of 950 lb. and 12 Wilfley tables, and is planning a cyanide-process addition. The power plant consists of two 175-h.p. crude-oil Diesel engines, each direct-connected to a dynamo to furnish electric power for mine and mill. There is a 500-ft. shaft on the Snake and a 600-ft. shaft on the Opportunity, and it is hoped to increase the present force of 70 men to 200, when production is started. There have been several mining revivals at Hillsboro, but so far with little success; perhaps this one will have better luck than its predecessors.

Caballo Mountains—The Victoria Chief Company recently bought up the defunct Black Peak Gold Mining Company, at a sheriff's sale. The Victoria has $500,000 in the treasury, and has started a national bank at Engle to handle this sum that is to be expanded in mine development and in the building of a $250,000 copper smelter on the west side of the range.

Pennsylvania

ANTHRACITE COAL

Gordon-Frackville Coal Company—This company is placing a large pump and set of boilers in the new opening west of Gordon, where a breaker is to be built this year.

Lehigh Valley Coal Company—The new Sayre breaker of this company, at Mt. Carmel, will be placed in operation within two weeks and will have a capacity of 2500 tons daily. It is equipped with many modern improvements, including an electric-alarm system which will stop the machinery in different parts of the breaker by pressing a button.

A disastrous explosion of dynamite occurred at the powder house of the Richards colliery of this company at Mt. Carmel, this week, when 45 were injured and damage done to the extent of $25,000 to the company's property. When the explosion occurred, there were stored in the powder house 5000 lb. of dynamite, 60 kegs of powder and 5000 caps. Fortunately the powder house was located about a mile from the town of Mt. Carmel and some distance from the colliery, otherwise the results would have been more serious.

Philadelphia & Reading Coal and Iron Company—Exceptionally thick veins of coal were recently cut in the Renny tunnel of the North Franklin colliery of this company. In this colliery an electric-haulage system is to be installed.

Delaware, Lackawanna & Western Company—This company broke the hoisting record at the Avondale mine, last week, when 707 cars of coal were hoisted in nine hours. The next best record was 662 cars in ten hours.

Lehigh Navigation Company—This company has plans under discussion for enlarging the business conducted along its canal. During the past few years more than $600,000 of the company's surplus earnings have been expended in rebuilding and repairing the canal.

BITUMINOUS COAL

Pittsburg Coal Company—This company reports its net earnings for January at $374,644, an increase of $36,651, or 10.8 per cent., over January, 1906. Depreciation and interest amounted to $236,277, leaving a surplus of $138,367 for the month.

South Dakota

Custer County

Ideal—Three carloads of machinery have just been delivered, consisting of an air compressor and other necessary equipment. As soon as it is installed, the work of running the long tunnel to tap the ledge will be resumed.

Saginaw—The difficulties of this company have been adjusted, and the work of drifting will be commenced in a few days. The shaft is 400 ft. deep, good ore has been opened up on all the levels and the company plans to build a 100-ton mill.

Clara Belle—This company has now struck the orebody at a depth of 250-ft. The ore is the same as in the old workings, or free milling. The mill will start up at once. The 10-stamp mill is complete and will be worked for the cyanide plant. Tanks are on the ground ready to be erected. Railroads are built for hauling the ore to the mill, a distance of about 3000 ft.

The company has completed a fine shaft, and has all the necessary machinery for mining the ore economically.

Lawrence County

Columbus Group—A cross shoot running nearly north and south is showing up well. The shaft is 38 ft. deep, all in ore, which has widened from 18 in. at the surface to 5 ft. at the bottom of the shaft. The ore assays $9 a ton, free milling. The ledge can be traced a distance of 2000 ft. on the surface, and five other shafts sunk on the vein show the same results.

Safe Investment—This company has put its new mill to work, and 20 stamps are now dropping on ore. The entire 40 will be at work by the end of the week. The company is employing 60 men.

Shamrock—On this group of claims comprising about 170 acres of land, the main ledge has been opened up at two points, showing a strong vein of ore averaging $9 a ton. At a depth of 175 ft. the ledge is 30 ft. wide, and the values lie chiefly in the concentrates. A 155-ft. tunnel has cross cut the vein a distance of 30 ft. and has not yet reached the foot wall. The ore also carries native copper.

Pennington County

Grand View—This company, operating at Silver City, has been running a five-stamp mill for the past eight months on free-milling ore, and is arranging to install machinery to sink the shaft from the 100-ft. level. Antimony ore is also found, and will be developed this spring.

Provident—Operations will begin within the next few weeks on the spodumene property, near Keystone. Preparations have been made to work it on a large scale.

Golden West—Work has been suspended temporarily on account of a break in the machinery. The mill, which has a capacity of 80 tons, will be increased to 150 tons. It is now operated by water power, but an auxiliary steam plant is to be installed so that operations can be continued in winter.

Utah

Juab County

Tintic Ore Shipments last week amounted to 151 carloads, the contributing mines and amounts being: Ajax, 1; Brooklyn, 2; Bullion Beck, 9; Beck Tunnel, 8; Carisa, 2; Centennial Eureka, 57; Eureka Hill, 12; Eagle & Blue Bell, 6; Grand Central, 7; May Day, 5; Mammoth, 17; Scranton, 6; Swansea, 4; Tintic Iron, 6; Uncle Sam, 1; Victoria, 6; Yankee Consolidated, 2 cars.

Lower Mammoth—The electric hoisting plants recently installed are in commission and shipments of ore will be made on the basis of 100 tons a day.

Salt Lake County

Columbus Consolidated—The management of this Alta mine has decided to sink a shaft to the 400-ft. level below the main tunnel.

Ohio Copper—Work is progressing on the excavations for the mill to be erected by this company in Bingham.

Summit County

Park City Shipments last week amounted to 3,290,200 lb., the contributing mines and amounts being: Daly Judge, 1,319,820; Little Bell, 21,200; Daly, 153,500; Daly Judge (zinc middlings), 228,300; Silver King, 1,319,820; Daly West, 1,020,000; Ontario, 196,000 pounds.

Ontario Drain Tunnel—This adit, which was closed a little over two years ago by a series of caves, has been opened as far as Ontario No. 2 shaft, or for a distance of about 3000 feet.

Naildriver—Work at present is being directed in the 200-ft. crosscut from the 950 level.

Tooele County

Ingot—The development of this property at Mercur has been resumed after several years of inactivity. It adjoins Consolidated Mercur and is controlled by practically the same interests.

Gold Hill—This property is owned by the Western Utah Copper Company and is being developed upon an extensive scale. It is to this mine that a branch line of the Western Pacific Railroad will be built this year.

Washington

Ferry County

Republic Mine—Some time ago this mine was sold by the Ferry county treasurer for taxes. Harry L. Rodgers, of Butte, Mont., met the county commissioners, Feb. 25, and secured a lease of and option for the purchase of the Republic and Cecelia Fraction in five years, the consideration being $50,000. In order to exercise his right, he must erect a mill at or near the city of Republic, to be of at least 100 tons daily capacity and be in operation by March 1, 1908. He must operate the mine, produce from it at least 1000 tons of ore per month, pay the county a royalty of 10 per cent. on all ore having a gross value up to $10 per ton and of 50 per cent. on all ore having a value of $10 or more per ton, the royalties to apply on account of the purchase price of the mine. Mr. Rodgers, who represents a New York syndicate, was at Republic last December and procured samples from the leading mines of the camp. Some of the principal shareholders in the Republic Consolidated Mining Company are said to be members of the syndicate. In connection with this deal Mr. Rodgers proposes to arrange for a consolidation of the Republic, Pearl Consolidated, Quilp, Trade Dollar, Ben Hur and Tom Thumb mines, and is now negotiating with the companies owning them. Mr. Rodgers stated that he expected to establish a new mill in the camp, at a cost of $250,000, to treat 500 tons of ore daily. The ore is to be treated by cyanidation.

Hitherto great difficulty has been experienced in mining and marketing the ores of the camp, owing to the irregularity of their deposition in the various veins. The higher grades of ore have always been found in streaks and bunches, separated by others of lower grades, which would not pay to break and remove. The cost of mining ore in the camp has run up to $5 or $6 per ton, and the transportation to and treatment at the smelters has cost from $5 to $7.50 per ton. Any ore having a value of less than $10 or $11 per ton would not pay to handle under the past conditions. Not only that, the demand for Republic ores at the smelters was spasmodic, and the market for them was unsteady and unreliable. Under the proposed new conditions, if they can be carried out and the ore treated at a low cost, the ores of different values, instead of the higher-grade bunches being separately gouged, may be broken clear across the vein, from wall to wall, and sent to the mill without grading or sorting, the cost of breaking in that case probably not exceeding $1.25 per ton.

Pearl Consolidated—The annual stockholders' meeting is announced to take place at 609 Jamieson building, Spokane, Wash., March 19. The board of directors has sent out a circular setting forth that the directors have entered into a contract with Harry L. Rodgers, representing New York capital, for a lease and bond on the company's property on the following lines: "Price, $156,000. Time, three years from completion of the mill 120 days from Feb. 27. Mill to be completed not later than March 1, 1908. Must

commence sinking the main shaft on or before Aug. 27, and work continuously until an additional depth of 100 ft. has been attained. Must cut a station at that depth and drive a crosscut to the vein. Must mill a minimum tonnage of 1000 tons per month, keep development sufficiently in advance of ore extraction (if the ore is to be had), and pay a royalty of 10 per cent. of the gross assay value of $8 on ore milled and an additional 50 per cent. on all ores having a value in excess of $8 per ton. Royalty applies on purchase. Must pay all taxes during life of lease, beginning with 1907, and pay interest on the mortgage quarterly."

Mine Consolidation—Tue Quilp, Ben Hur and Pearl Consolidated mining companies have entered into contracts with H. L. Rodgers, of Butte, Mont., for leasing and bonding their mines to him, with a view to consolidating them with the Republic mine under one management. Other companies remain to be heard from.

Canada

ONTARIO—COBALT DISTRICT

Brooks-Hudson — Fourteen men are at work on this property, Hudson township, which lies several miles northwest of Cobalt. A vein 5 in. in width has been struck a short distance below the surface.

Gordon-Cobalt — A vein of calcite on this propery, Cobalt, about half a mile south of Clear lake on the contact of diabase and Keewatin, on being followed down 45 ft. gradually gave place to quartz carrying gold. But little development has been done on the property.

Irwin-Gordon — Good surface samples have been found on this property, located up the Montreal river, some 15 miles from Latchford. Ten men are at work, with A. Chenette as foreman.

Larder Lake Proprietary Mines — This company has ordered a plant, comprising a five-stamp mill, a 20-h.p. engine and a 25-h.p. boiler.

McKinley-Darragh — A new vein has been struck in this mine, Cobalt, while crosscutting on the 150-ft. level to connect shafts Nos. 1 and 2. It is a blind lead about 153 ft. distant from shaft No. 1, from 3 to 6 in. wide, with native silver and argentite, and will run at least 1000 oz. to the ton.

Nancy Helen — Superintendent J. F. Black reports the discovery of a 4-in. silver-calcite vein at a depth of 18 ft. in the shaft. A small steam plant and hoist have been ordered.

Right of Way—The shaft on the Timmins vein is down 40 ft. and No. 2 shaft 50 ft. At the 100-ft. level they will crosscut to the vein beneath the railroad track.

Rothschild — Three shafts have been sunk, one being down 50 ft., and there is a large open cut 30 ft. long by 20 deep. A four-drill compressor, 60-h.p. boiler and steam hoist have been installed. Stripping to the extent of 6000 ft. has been done. Twelve men are at work under Superintendent J. A. Herman.

Trethewey—A circular issued, announcing the payment of a 4 per cent. dividend to shareholders on March 30, states that the policy of the management has been to put more ore in sight by development work than is removed by stoping. The new ore-sorting plant has been installed and is in working order, with a capacity sufficient to handle a larger quantity of ore than is now being mined. Existing facilities for carying on operations will be sufficient until an increased output has to be dealt with.

Lake George Mining Company—An additional shaft is to be sunk on this company's location adjoining in Cobalt the Cleveland Cobalt property, with the object of tapping a rich vein containing native silver which was struck by diamond drilling in the bed of Clear lake.

Rochester—A rich strike has been made at this mine, Cobalt, a vein 4 ft. wide having been found 2 ft. below the surface. Large quantities of native silver have been taken out. The rich paying streak in the vein is about 5 in. wide, carrying calcite galena, smaltite bloom and silver. It has been stripped for 250 ft. At 18 ft. below the surface it assays 916 oz. to the ton. Another good vein has been discovered 50 ft. from the main vein. A first-class plant is being installed.

ONTARIO—STURGEON LAKE

St. Anthony Reef—From Sturgeon lake Manager A. L. McEwan, has brought to Port Arthur gold bullion of the value of $2500, the result of what is practically the last clean-up under the present management, the mine having changed hands. The principal promoter of the new company is Mr. Wendock, of Saginaw, Mich.

NOVA SCOTIA

Dominion Coal Company—The report of the directors for the year 1906 states that the output was 3,552,746 tons, as compared with 3,189,657 tons for 1905. There was, however, a decrease in net earnings. This was partly due to the increasing demands of the Dominion Iron and Steel and the New England Gas and Coke companies, the contracts with which were filled at a loss. Owing to the rapid depletion of the older mines, arrangements had to be made years ahead for new mines, and an abnormal amount of development work, renewals and repairs was required. Large expenditures had been made and an extensive program mapped out, entailing the sinking of a new shaft to the Emery seam at No. 5; a new mine at No. 8 International; the opening up of two new mines in the Lingan district, and the construction of a new branch railway to these mines. The profit and loss account showed net proceeds from sale of coal and other sources, $1,137,370, as compared with $2,573,832 in 1905. The balance after deducting interest and other fixed charges was $631,815, as against $1,023,671 in the previous year.

Spain

Rio Tinto—This company has put some new furnaces into operation at the mine to treat a portion of the poorer sulphide ore by the bessemer process, instead of by leaching as heretofore. The leaching method would not have released the copper for two to three years, and inasmuch as it is anticipated that 1000 tons of ore will be smelted daily, the quantity produced is likely to be from 4000 to 5000 tons of copper per annum. Unless, however, the output of ore is raised, this is merely an anticipation of the production. The move is considered to be a wise one. inasmuch as the water problem becomes more and more difficult every year; on the other hand, the sulphur content of the ore will be lost by the bessemer process.

Australia

VICTORIA

The question of utilizing the extensive deposits of brown coal in this State is again receiving consideration. At present the output is inconsiderable, and no attempt has been made to utilize the fuel save in the form of briquets, for which there is practically no demand, by reason of the abundance and cheapness of firewood. It is now suggested that the Victorian brown coal should be gasified, and the by-products utilized. Two of the best known Victorian brown-coal fields, Morwell and Laverton, are situated 89 and 13 miles, respectively, from the Victorian metropolis, and within the range of distances over which electrical power can be distributed at a profit. It is doubtful, however, whether under existing industrial conditions the conversion of the deposits into sources of electric power supply will become a readily accomplished fact.

NEW SOUTH WALES

The report of the Sulphide Corporation, Limited, for the year ending June 30, 1906, shows that the gross profits amounted to £157,895, after debiting £14,116 to working costs for amortization and providing £16,275 to cover the special expenses incurred at the company's mine at Broken Hill, N. S. W., on account of the creep and fire in the workings. The net profit was £94,460, which, together with the sum of £94,005 brought forward from the previous year, gave a total of £188,465. From this amount the directors distributed a 10 per cent. dividend on the preference shares and carried the balance of £133,465 forward to the next year's profit and loss account. No dividend was declared on the ordinary shares.

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, March 13

Coal trade in the West shows a slight improvement in the matter of car service. This is partly due to a decreasing pressure of shipments as spring approaches. The trade is much disturbed by reports of increases in railroad rates. In some cases such advances have already been made, and operators are protesting.

In the East the trade is quiet, the demand for domestic fuel falling off. The steam-coal consumers, however, show no disposition to reduce their demands, and consumption remains steady.

COAL-TRAFFIC NOTES

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to March 2 were as follows, in short tons:

	1906.	1907.	Changes.
Anthracite	879,205	857,532 D.	21,673
Bituminous	6,355,355	6,233,010 D.	122,345
Coke	2,159,240	2,326,334 I.	167,094
Total	9,393,800	9,416,876 I.	23,076

The coal production of the Cumberland region in Maryland and West Virginia for the year 1906 is reported as follows:

	Tons.	Per Ct.
Shipped by Baltimore & Ohio	3,651,390	50.8
Shipped by Pennsylvania R. R.	1,019,272	14.2
Shipped by Western Maryland.	973,381	13.5
Shipped by Ches. & Ohio Canal.	198,505	2 8
Total shipments	5,842.548	81.3
Used at mines and local sales	1,345,489	18.7
Total	7,188,037	100.0

The total reported in 1905 was 6,226,684 tons; showing an increase last year of 961,353 tons, or 15.4 per cent.

New York March 12

ANTHRACITE

The hard-coal market shows as much strength as during most previous months of March. It is usual for business to fall off heavily in anticipation of the reduction in prices which, it is believed, will occur April 1. Contracts have been canceled in some instances but as a whole March business is fairly active. Car supply is still poor but there is sufficient coal being moved to meet present requirements. There is nothing authentic known with regard to the actual time at which the reduced prices will go into effect, but it has been the custom heretofore and it is expected now that the new schedule will take effect April 1. Prices remain unchanged at $4.75 for broken, $5 for egg, stove and chestnut. Small steam sizes are still very scarce and are quoted nominally at $3 for pea, $2.25@2.50 for buckwheat, $1.50 for rice, $1.40 for barley, all f.o.b. New York harbor shipping points.

BITUMINOUS

The Atlantic Seaboard soft-coal trade is fairly strong; there seems to be a plentiful demand for coal and prices are firm. The season's prices are being made and contacts closed for the coming year. Contract figures are generally at an advance from 5 to 10c. per ton, and of this increase 5c. is due to the advance in through railroad rates.

Trade in the far East is calling for considerable coal consisting of balances on old contracts and orders from shoalwater ports that heretofore have been frozen and whose supply has become short. Trade along the Sound is calling for a large amount of coal and some of the larger companies, dealing in the better grades, are unable to supply the demand.

New York harbor trade is absorbing a large amount of coal; prices range around $2.70 per ton f.o.b. New York harbor shipping ports for fair grades of steam coal. All-rail trade shows good demand at fairly good prices. Transportation is reasonably good, but car supply for any particular mine is still dependent upon the main line on which the mine is located. On the railroads offending the least in this respect the supply ranges from 50 to 75 per cent. of the demand; other roads are very much behind with their cars and it is reported that some mines have been without cars for five or six consecutive days.

In the Coastwise vessel market there seems to be a sufficient supply of vessels and from the way they are accepting freight it would indicate that they are looking for lower figures before long. We quote freight rates from Philadelphia on large vessels to Boston, Salem and Portland at $1 and discharge; to the Sound 85c.; in both cases the loading and discharging clause is included.

Birmingham March 11

There is a steady production and every ton of coal is finding a ready demand. Operators of mines are well supplied with orders for the product and, as far as can be seen ahead now, there will be need for steady operation through the entire year. The effort being made by the railroads to give better service is having some effect and a larger tonnage of coal is being moved.

The legislature of Alabama has taken a recess until July and the proposed mining law goes over until that time. Members of the mining and manufacturing committees of the House and Senate will visit this district during the recess and investigate conditions and the desires of the miners and operators in the hope of arranging a bill that will be satisfactory all around. The disagreement between the interests mentioned heretofore in regard to the bill are still as wide as they were when the committees gave the two sides a hearing.

The report of the mine inspector for the first two months in the year shows nine lives to have been lost in coal mines in this State. Falling roof is given in the majority of cases as the cause of accident.

Chicago March 11

The local trade is still inactive. The receipts of Western coals—those chiefly in demand in the local market—are large, but consumption, owing to the mild weather and other causes, is not active. Consequently there is much coal on track, though not so much as a week ago, and a determination on the part of dealers to keep back consignments from the mines as much as possible.

Eastern supplies are afflicted with the difficulty of transporting to market coal that is ready for the consumer. Smokeless run-of-mine is the best selling variety. The price of smokeless continues $3.40, with prepared sizes selling for $4.30 firmly, and the market apparently tight against a reduction. The demand for smokeless run-of-mine continues unabated, but other grades are in large supply compared with the demand.

Illinois and Indiana sell for practically the same prices as last week—$1.75@2.50 for lump and egg, $1.65@2.15 for run-of-mine and $1.20@1.50 for screenings.

Hocking Valley is dull. Youghiogheny is selling at $3.20 list price, with the discount 10 to 20c. on certain shipments, most of the supply being kept up to the circular price closely. Pittsburg No. 8 is $2.90 for ¾-in., with the supply not too great for the demand.

Cleveland March 12

Spot coal is selling at easier prices. Ohio mine-run on Cleveland track is bringing 95c. This decline is caused by a lessened demand among local consumers and heavy receipts locally during the week. On this account considerable coal has ac-

cumulated. Quotations on ¾-in. coal are 10c. higher. General prices at the mines are $1 for run-of-mine and $1.10 for ¾-in. Coal rates to lake ports were advanced 5c. a ton on Wednesday. This applies to Ohio, West Virginia and Pennsylvania coal and will go into effect as soon as navigation opens, probably about April 1. Several boats are now being loaded on the river and a number of vessels already have their full cargoes.

The retail prices of coal and coke will be affected by the advance in freight rates. The wholesale trade will not be affected, as the purchaser must necessarily pay the freight on the mine price. Connellsville coke sold last week around $5.20 a ton. The present freight rate is $1.60 and the advance will make it $1.65. Coke dealers state that it is hard to furnish the product in sufficient amount to meet the demand and it is very probable that the price will be advanced to meet the situation.

Indianapolis March 11

The coal carrying roads of Illinois have decided to advance the rate on Indiana coal to Chicago 10c. per ton. Indiana operators say this will result in closing permanently half of the mines in the State. They complain because the advance for hauling coal from the East has been placed at 5c. a ton, which is not a proportionate advance. The Indiana operators say with the Indianapolis and gas belt markets almost entirely lost to them and the Chicago rate increased to 80 and 90c. per ton, not more than one-third of the 17,000 miners in Indiana will be able to make a living this summer.

The shippers' bill has been enacted into law by the Legislature. The reciprocal demurrage clause was cut out, but the section requiring freight to be moved at least 50 miles per each 24 hours remained in the act. This will, if enforced, prevent blockades of coal cars. Railroad companies are also prohibited from confiscating coal without first notifying the consignor and consignee. In case of any omission to so notify the consignor or consignee the owner may legally exact 50c. a ton in excess of the contract price of the coal confiscated.

Pittsburg March 12

Coal—The demand continues good and prices are firm, quotations of mine-run coal ranging from $1.15 to $1.25, f.o.b. mine. All the mines are being operated as fully as the supply of cars will permit. While there is no decided scarcity, more cars could have been used during the week. The river mines are running full and there is an unusual number of empty coal boats and barges. Another big shipment to Southern ports is expected before April 1. The railroads have made a concession in freight rates in this district that is satisfactory to independent operators, but not to the large producing interests. The freight rate from the mines to Pittsburg is 43c. a ton, and to owners of individual cars the rate averages about 33c. On April 1 there will be a uniform rate of 38c., and owners of private cars will not have any advantage over the smaller operator in the matter of freight rates.

Connellsville Coke—There was a slump in coke prices during the past week which will be only temporary. It was due to the closing of several blast furnaces and the suspension of coke shipments. Some sales of furnace coke were made as low as $3 a ton, but the tonnages were not large. Quotations on spot furnace coke range from $3.25 to $3.40. Foundry coke for prompt shipment is quoted at $3.60@3.85.

The production of coke for the week, according to the *Courier*, amounted to 282,898 tons in the Connellsville region and 128,350 tons in the Lower Connellsville region. The shipments aggregated 15,638 cars, distributed as follows: To Pittsburg, 5530 cars; to points west of Connellsville, 9194 cars; to points east of Connellsville, 914 cars.

Foreign Coal Trade

Imports of coal and coke into the United States for January are reported as follows, in tons:

	1906.	1907.	Changes
Great Britain	30,641	4,607	D. 26,034
Canada	155,996	119,479	D. 36,517
Japan	4,959	1,933	D. 3,026
Australia	22,749	19,914	D. 2,835
Other countries	97	48	D. 49
Total coal	214,442	145,981	D. 68,467
Coke	19,651	19,868	I. 217
Total	234,093	165,849	D. 68,244

Some Nova Scotia coal comes to New England ports, but the bulk of the imports of coal is on the Pacific coast. The coke is chiefly from British Columbia, though a little comes from Germany.

Exports of coal and coke from the United States for January are reported by the Bureau of Statistics as follows:

	1906.	1907.	Changes.
Anthracite	164,139	169,680	I. 5,511
Bituminous	546,903	591,690	I. 44,787
Total coal	711,042	761,370	I. 50,328
Coke	62,049	59,569	D. 2,480
Total	773,091	820,939	I. 47,848

The exports 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	494,834	521,346	I. 26,512
Mexico	94,009	88,341	D. 5,668
Cuba	71,429	62,471	D. 8,958
Other W. Indies	31,586	50,438	I. 18,852
Europe	5,339	4,360	D. 979
Other countries	13,845	34,414	I. 20,569
Total	711,042	761,370	I. 50,328

The exports to Europe were chiefly to Italy; those to other countries, to South America. The exports to Canada—68.5 per cent. of the total in 1907—were, in detail, as follows:

	1906.	1907.	Changes.
Anthracite	158,384	164,158	I. 5,774
Bituminous	336,450	357,188	I. 20,738
Total	494,834	521,346	I. 26,512

There was an increase this year in both anthracite and bituminous coal.

Iron Trade Review

NEW YORK, March 13

There is no special change to be recorded in the iron and steel markets this week. Pig-iron buying has been rather quiet, but prices are stationary, makers not being inclined to grant concessions. Finished material is more active, and new orders for structural steel and rails are coming forward. The mills continue to be pressed with work, specifications on contracts coming in freely.

Bessemer Steel Production—The total production of bessemer steel ingots and castings in the United States in 1906 is reported by the American Iron and Steel Association at 12,275,253 long tons, against 10,941,375 tons in 1905; showing an increase of 1,333,878 tons, or 12.2 per cent. Some comment on these figures will be found on another page.

Birmingham March 11

Spot pig iron, delivery within the month, is being sold by Alabama manufacturers at $24 per ton, though it is admitted that only small lots can be handled. Sales are being recorded right along for iron to be delivered during the last half of the year at $18.50@19 per ton for No. 2 foundry. By April 10 three furnaces will either be blown in or be ready to go into operation, one at Anniston, one at Rising Fawn, Ga, and one at Florence, Ala. Two other furnaces will be ready for the torch the latter part of the coming month.

The accumulated stocks of iron and pipe in this district are being reduced slowly. The railroads are doing a little better in the way of furnishing cars. The fact that the advance in freight rates on iron and kindred products is staved off until April gives encouragement.

G. H. Schuler, treasurer of the Southern Steel Company, will retire at the end of this month as treasurer and will be succeeded by A. R. Forsythe, assistant cashier of the Birmingham First National bank. Mr. Schuler will remain a director of the company and together with his brother, E. T. Schuler, and their friends will hold the control of the Southern Steel Company. The company is capitalized at $25,000,000 and has four blast furnaces, a steel plant, steel rod, wire and nail mills, coal mines, ore mines, limestone quarries, coke ovens and other properties. Several hundred thousand dollars are be-

ing expended in improvements about the various plants, especially at the steel works.

Baltimore March 12

Imports of spiegeleisen for the week were 986 tons; of ferromanganese, 500 tons. Imports of iron ore were 8100 tons from Cuba and 5900 tons from Greece; 14,000 tons in all. There were 950 tons of manganese ore received from Cuba. Among the other imports were one cargo, 3792 tons, iron pyrites from Huelva, Spain.

Chicago March 11

The local iron market continues to be a waiting market. Consumers are not yet convinced that prices will not decline, and consequently are placing as small orders as possible. Furnace agents, on the other hand, are asserting confidently that prices will remain as they are or strengthen. To the impartial critic of the situation it would seem that the market is weakening somewhat.

Quotations remain practically the same as last week. Northern being sold at about $23.50 and Southern at $18@18.50, Birmingham, for second-half deliveries. The demand for quick-delivery lots continues unabated.

Coke is somewhat easier, with the best Connellsville selling at $6.65 for quick deliveries and about $6.40 for contracts on second-half delivery.

Cleveland March 12

Iron Ore—The lake-ore business this year is expected to be large, as there are many local furnaces in the market heavily at this time, and it is expected that their requirements will increase.

Pig Iron—Inquiries for pig iron for delivery during the second quarter continue to come out and those furnaces having metal to offer are getting good prices for it. Quotations f.o.b. Cleveland are as follows: No. 1 Northern, $26.25; No. 2, $25.75; No. 3, $25.25; bessemer, $23.50; No. 1 Southern, $28.10; No. 2, $27.60; No. 3, $27.10; 8 per cent. silvery, $31.95.

Lake package-freight lines are increasing their warehouse capacity to handle increased business. The Anchor line is erecting a new warehouse on the old Pittsburg coal company dock.

Philadelphia March 13

Pig Iron—The market, compared with a week ago, presents no decided change. The smaller consumers are drifting along and occasionally buying, but as a rule are satisfied. They are awaiting developments and have the impression that things will work in their favor. The larger consumers are buying in a quiet way, but every move made is known. Pig-iron makers received a shock not long ago and it has not been without its good effects, as they know the market will gradually take every ton of iron they can make. Forge iron is strong, there being quite a few sales of No. 2 foundry merely to fill up.

Steel Billets—The report is nothing more than a repetition of weeks and months past; the capacity is strained and prices strong.

Bars—There has been some run on steel bars and the demand was fully met. The mills are sold far ahead.

Sheets—Our sheet people say everything is working into their hands. They are managing to keep customers supplied, though not always at contract dates.

Pipes and Tubes—The tube market is apparently quiet and consumers have large stocks on hand. The mills are oversold and trying to catch up.

Plates—The plate-mill situation is about as it has been for some time past. A trifling restriction of output has occurred, but this is being remedied. Boiler plate is in good demand. Inquiries for tank for early summer deliveries are beginning to come in.

Structural Material—Our structural people say that from correspondence and general knowledge they anticipate a very large demand in the near future. It is certain that a number of new enterprises will appear in the market and place orders.

Steel Rails—While there is no great activity, there is a profound interest in the situation; there are big orders looming up and the question is what will people do with them.

Scrap—Scrap iron of all kinds is in active demand and there is a scramble to get every ton that can be had. Prices are stronger and needs urgent. Melting scrap is particularly hard to get.

Pittsburg March 12

Energetic efforts are being made by all mills to catch up on deliveries, and more attention is being paid to increasing production than to booking new business. The first week of the month showed a decided gain at the plants of the Carnegie Steel Company in every finished line over the record month of October. Every finishing mill is being operated to capacity, and provision has been made for a full supply of material. In addition to the output of steel-making pig iron from its 53 blast furnaces the company will have 5000 tons of outside pig iron, and 10,000 tons of heavy melting scrap. The Ohio works, which have been on sheet and tin bars for the past two weeks, went back on standard steel rails yesterday. All of the steel bars were shipped to plants of the American Sheet and Tin Plate Company, and that company is operating 100 per cent. of its sheet mills, and a fraction more than 90 per cent. of its tin-plate mills. All are being run to full capacity and it is expected to keep this pace up through the month. The National Tube Company and the American Steel and Wire Company, the other subsidiary interests of the United States Steel Corporation in this district, also are in the record-breaking contest. The tin-plate mills have more actual specifications than ever before, and it is almost impossible to place an order for delivery this side of July. There is likely to be a tin-plate famine this spring, although production is heavier than ever before. This is accounted for by the absence of mill stocks at the opening of the year, when usually there are fully 1,000,000 boxes on hand for the spring rush. New business in structural material, plates, bars and wire products has been booked this week. Despite reports to the contrary, no steel contracts of importance have been canceled and the mills will be under great pressure to take care of the orders on the books before the opening of the fourth quarter. The steel-bar producers, it is believed, will decline to make the usual concession to the agricultural-implement makers, and will positively refuse to accept any business for delivery this year at less than the established price of 1.60c.

The bi-monthly adjustment of wages under the sliding scale of the Amalgamated Association of Iron, Steel and Tin Workers was made today. Sales of tin plate in January and February averaged $3.60 a box, and the workers will receive an advance of 2 per cent. The base of the scale is $3.40 a box, and a 2 per cent. increase was granted at the January settlement. The examination of the sales sheets for bar iron and sheets also was made, but there will be no advance.

Pig Iron—The market is quiet although there were a number of small sales of foundry iron, but prices have dropped about 50c. a ton. Lots of 100 and 200 tons of No. 2 foundry for prompt shipment, aggregating about 1000 tons, were sold at prices ranging from $24 to $24.50, Valley furnaces. About 1000 tons for delivery in the last half were sold at $21.50. The sale of 5000 tons of bessemer iron to the Carnegie Steel Company by the Bessemer Pig Iron Association took all the available bessemer out of the market for March delivery. Bessemer is nominally quoted at $22@22.50 for prompt, No. 2 foundry at $24@24.50, and gray forge at $21, all f.o.b. Valley furnaces.

Steel—Prices of billets are purely nominal, quotations of bessemer billets continuing at $29.50, and open hearth at $32. No billets are being offered by the Pittsburg mills. Plates continue strong at 1.70c., and merchant steel bars at 1.60c.

Sheets—All the mills are away behind on deliveries and premiums are still being offered for both black and galvanized sheets for prompt shipment. The estab-

lished price remains at 2.60c. for black and 3.75c. for galvanized for No. 28 gage.

Ferro-Manganese—The market continues strong and prompt ferro is quoted at $75 to $76 per ton.

Cartagena, Spain Feb. 23

Iron and Manganiferous Ores—Messrs. Barrington & Holt report for the week: Shipments were five cargoes, 10,125 tons, to Great Britain; two cargoes, 8450 tons, to Rotterdam; 18,575 tons in all. Prices continue firm.

Quotations are, f.o.b. shipping port: Ordinary 50 per cent. ore, 9s. 9d.@10s. 3d.; special low phosphorus ores, 10s. 9d.; specular ore, 55 per cent. iron, 12s. 6d. Manganiferous ore, 35 per cent. iron and 12 per cent. manganese, is 14s. 6d., same terms; no higher grades offered.

Iron Pyrites—Pyrites, 40 per cent. iron and 43 sulphur, are 11s. 9d. per ton, f.o.b. Cartagena.

Philadelphia March 13

The completed figures collected by the American Iron and Steel Association show that the production of bessemer-steel ingots in the United States last year showed a ratio of increase somewhat higher than that of pig iron. The total output of ingots and direct castings in 1906 was 12,275,253 tons; an increase over 1905 of 1,333,878 tons, or 12.1 per cent., the gain in pig iron having been 10.1 per cent. The production for six years past has been, in long tons:

1901.....	8,713,302	1904.....	7,859,140
1902.....	9,138,363	1905.....	10,941,375
1903.....	8,592,829	1906.....	12,275,253

There has been no intermission in the increasing tendency to convert our pig iron into steel, and this will be even more apparent when the figures for open-hearth steel are added to those for converter steel as given above. It may be mentioned that the total for last year is slightly in excess of our estimate given in the JOURNAL of Jan. 5 last; but the difference is only 0.75 per cent.

Bessemer steel continues to be the material chiefly used for rails, though open-hearth rails are beginning to be strongly in evidence. The total make of bessemer-steel rail in 1906 is given as follows, in long tons:

Sections:	Tons	Per ct.
Under 45 lb.....	223,358	6.0
Between 45 and 85 lb.....	1,608,793	43.5
Over 85 lb.....	1,873,491	50.5
Total	3,705,642	100.0

The total in 1905 was 3,135,729 tons, the gain last year being 569,913 tons, or 18.2 per cent. The use of the heavier sections, 85 lb. and over, steadily increases, notwithstanding the fact that there was last year an unusually large demand for light rails for industrial and mining purposes.

Pennsylvania, as usual, led in the production of bessemer steel last year, having made over 40 per cent. of the total; Ohio following, with about 30 per cent. The Middle West is, and is likely to remain, the chief seat of the converter-steel industry.

Metal Market

NEW YORK, March 13

Gold and Silver Exports and Imports.

At all United States Ports in January and year

Metal.	Exports.	Imports.	Excess.
Gold:			
Jan. 1907...	$2,443,441	$ 3,204,457	Imp. $ 761,016
" 1906 ..	5,741 665	2,605,709	Exp. 3,135,956
Year 1907..	2 443 441	3,204,457	Imp. 761,016
" 1906..	5 741 665	2,605,709	Exp. 3,135,956
Silver:			
Jan. 1907...	4.766,874	3,620,888	Exp. 1,145,986
" 1906 ..	7,516,668	4,686,711	" 2,829,957
" 1907 ..	4.766,874	3,620,888	" 1,145,986
1906 ..	7.516,668	4,686,711	" 2,829,957

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 Mar. 9 and years from Jan. 1

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	$ 303,915	$ 44,697	$1,065,465	$ 51,304
1907.....	1,717,226	1,618,843	6,881,083	462,472
1906.....	3,027,379	459,157	15,685,231	367,331
1905.....	29,457,196	831,827	7,474,154	398,877

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

The joint statement of all the banks in the New York Clearing House for the week ending March 9 shows loans $1,066,956,900, a decrease of $12,228,700; deposits, $1,019,889,100, a decrease of $18,542,700, as compared with the preceding week. Reserve accounts show:

	1906.	1907.
Specie.....	$178,668,600	$185,456,700
Legal tenders.....	78,278,100	71,567,300
Total.....	$256,946,700	$257,024,000
Surplus.....	$9,278,150	$2,051,725

The surplus over legal requirements shows a decrease of $1,806,925, as compared with the previous week.

Specie holdings of the leading banks of the world March 9 are reported as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York	.....	.....	$185,456,700
England.....	$180,443,440	.....	180,443,440
France.....	525,316,665	$196,440,325	721,756,990
Germany	166,910,000	55.635,000	222,545,000
Spain..	77,095,000	123,890,000	200,985,000
Netherlands....	27,723,000	29.065,000	56,788,000
Belgium.....	16,046,665	8,023,335	24,070,000
Italy.....	161,790,000	24,718,000	186,508,000
Russia	595,420,000	27,045,000	622,465,000
Aust.-Hungary.	231,490,000	61,300,000	292,790,000
Sweden.....	20,535,000	.....	20,535,000

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports.

On March 11 the director of the Mint bought 100,000 oz. of silver for delivery at the New Orleans mint at 69.43c. per ounce.

Shipments of silver from London to the East are reported by Pixley & Abell as follows, for the year to Feb. 28:

	1905.	1906.	Changes.
India.....	£ 3,794,910	£2,346,210	D. £ 1,448,700
China.....	.....	.....	.....
Straits..	.....	85,050	I. 85,050
Total.....	£ 3,794 910	£2,431,260	D. £ 1,363 650

Receipts for the week were £150,000 from New York. Exports were £8750 in coin to the Straits; £215,600 in bars and £90,000 in Mexican dollars to India; £314,350 in all.

Indian exchange continues strong, and the Council bills offered in London were all taken at 16.09d. per rupee. Purchases of silver for coinage by the Indian government are still being made.

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars.....	$0.52¾	$0.54¼
Peruvian soles and Chilean	0.484	0.51
Victoria sovereigns.....	4.854	4.87
Twenty francs.	3.86	3.89
Spanish 25 pesetas...	4.78	4.80

SILVER AND STERLING EXCHANGE.

March.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	March.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
7	4.84½	68½	31 11/16	11	4.84⅛	69	31 11/16
8	4.84⅛	68⅝	31¾	12	4.84⅛	68⅝	31 11/16
9	4.84⅛	68¾	31 11/16	13	4.84	68¾	31 11/16

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

Other Metals

Daily Prices of Metals in New York.

March.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
7	25⅜ @26	25 @25¼	109 11/16	42	6.00	6.85 @6.90	6.70 @6.75
8	25⅜ @26	25 @25¼	109 7/16	42	6.00	6.85 @6.90	6.70 @6.75
9	25⅜ @26	25⅛ @25⅜	.....	42	6.00	6.85 @6.90	6.70 @6.75
11	25⅜ @26	25¼ @25⅜	110⅜	42	6.00	6.85 @6.90	6.70 @6.75
12	25½ @26	25¼ @25½	110½	42½	6.00	6.85 @6.90	6.70 @6.75
13	25½ @26	25¼ @25½	110¼	42¼	6.00	6.85 @6.90	6.70 @6.75

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions as made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting and Refining Company for near-by shipments of desilverized lead in 50-ton lots, or larger. The quotation on spelter are for ordinary western brands: special brands command a premium.

Silver prices have been irregular this week, advancing to 31 15/16d. on March 11, on speculative buying, and reacting to 31 11/16d. on March 13. Lower prices have been caused by withdrawal of the Indian Government as a buyer, and selling for China account.

Copper—While domestic business has been very quiet, the revival in activity abroad has made further progress, and good-sized business is reported for shipment to Europe at advancing prices. The close is firm and higher at 25½@26c. for Lake copper; 25¼@25½c. for electrolytic in ingots, cakes and wirebars. Casting copper is quoted at 24⅝@24⅞c.

The standard market has reflected the better feeling, and active speculation took place from day to day. The close is cabled at £110 5s. for spot, £111 10s. for three months'.

Refined and manufactured sorts we quote: English tough, £114@115; best selected, £117@118; strong sheets, £125@126.

Exports of copper from New York for the week were 1904 long tons. Our special correspondent reports the exports from Baltimore at 1287 long tons copper. From Baltimore there was also exported 22,695 lb. copper sulphate.

The average price received by the Mass Consolidated Mining Company for its 2,106,739 lb. of copper sold in 1906 was 19.52c. The Quincy received 19.259c. as the average for 16,194,838 lb. The Osceola received 18.89c. as the average for 18,588,451 lb. The Allouez reports 19.145c. as the average on 3,486,900 lb. sold.

Imports of copper into Germany for the year 1906, according to Aron Hirsch & Sohn, of Halberstadt, were 130,770 tons. Exports were 11,215 tons, showing net imports of 119,555 metric tons for the year.

The total production of copper in Canada for the year 1906 is reported at 57,029,231 lb., of which the greater part came from the British Columbia mines, chiefly those in the Boundary district.

Copper Sheets—The base price of copper sheets is 32c. per pound.

Copper Wire—The base price of copper wire, No. 0000 to No. 8, is 27¼@27½c. per pound.

Tin—The market has been steady throughout the week, and a better demand is reported from consumers. The London speculative market has displayed a strong undertone, but closes easy at £192 5s. for spot, £190 15s. for three months', while business in this market has been done at 42¼ cents.

Lead—The quotation remains unchanged at 6c. New York.

The advance in the London market has made further progress and quotations at the close are firm at £20 for Spanish lead, £20 2s. 6d. for English.

Spanish Lead Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of Feb. 23: The price of pig lead has been 89.75 reales per quintal, silver being paid at 14 reales per ounce; exchange, 27.46 pesetas to £1. The price of lead, on current exchange, is equal to £18 6s. per long ton, f.o.b. Cartagena. Shipments for the week were 515 tons argentiferous and 500 tons desilverized to Great Britain; 248 tons desilverized lead to Marseilles; 1263 tons in all.

Spelter—The market is unchanged and steady at 6.85@6.90 New York, 6.70@6.75c. St. Louis.

The London market, in sympathy with all other metals, has improved and closes at £26 10s. for good ordinaries, £26 15s. for specials.

Zinc Sheets—The base price is now $8.50 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

Spanish Zinc Ore Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of Feb. 23, that shipments of zinc ore for the week were 2580 tons blende to Antwerp, and 1300 tons blende to Stettin. No change in the market.

Antimony—The market is unchanged. Ordinaries, 23@23½c.; Hallett's, 23½@24¼c.; Cookson's, 24½@25½c.

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

The Canadian official report gives the following figures for nickel in Ontario for the year 1906: Ore mined, 343,814 short tons; ore smelted, 340,059; matte produced, 20,364; matte shipped, 20,310; copper contents of matte, 5265; nickel contents, 10,745 tons. Exports of nickel in matte were 11,985 short tons.

Platinum—Demand continues strong and prices high. Unmanufactured platinum is quoted at $38 per oz. for ordinary and $41 per oz. for hard. For good scrap $31.50@32 is paid.

Quicksilver—Current prices in New York are $41 per flask of 75 lb. for large quantities, and $42 for smaller orders. San Francisco orders are $38@39 per flask, according to quantities, for domestic orders, and $37@37.50 for export. The London price is £7 per flask, but £6 16s. 3d. is quoted by jobbers.

Aluminum—Prices are steady and demand good. Prices for ton lots, or over, are: No. 1, over 99 per cent. pure metal, 36c. per lb.; No. 2, over 90 per cent., 34c. Small lots are 1 to 3c. higher, according to size. Rods, according to size, are 1c. per lb. up over the price of ingots. Granulated metal is 2c. per lb. over ingots.

Imports and Exports of Metals

Tin—Imports of tin into the United States for January were as follows, in long tons:

	1906.	1907.	Changes.	
Straits	1,376	1,887	I.	511
Australia	5	26	I.	21
London	2,769	1,750	D.	1,019
Holland	53	45	D.	8
Other Europe	121	86	D.	35
Other countries	....	1	I.	1
Total	4,324	3,795	D.	529

The decrease this year in the totals was 12.2 per cent. Most of the tin received from Great Britain was Straits tin.

Antimony Imports—Imports of antimony into the United States for January were as follows, in pounds:

	1906.	1907.	Changes.	
Metal and regulus.	898,675	940,295	I.	41,620
Antimony ore	82,777	305,511	I.	222,734

There was a large increase in the receipts of antimony ore this year.

Missouri Ore Market

JOPLIN, March 9

The highest price paid for zinc ore was $53.50 per ton, the assay basis $48 to $51 per ton of 60 per cent. zinc, and the average price $49.68.

The highest price paid for lead was $85.50 per ton, with medium grades selling at $80@83, and the general average, all grades, $82.92.

The several smelting companies purchasing ore in the district have, it is estimated, approximately $350,000 advanced on ore in the bins which they have been unable to move on account of the lack of cars. By using open coal cars they are enabled to keep the output moved each week, but sufficient cars to move the large amount on which money has been advanced are not forthcoming. Lighter buying at the close of the week indicates a desire to move ore already owned rather than make further advances, but the demand is so strong, with the new smelters in the market, that few of them care to drop out of the market. Never before in the history of the district was so much ore purchased ahead and left in the bins for so long a period. A rumor gained currency among some of the producers that spelter was likely to fall, and ore was freely offered on advances where the past two or three weeks no advance would be taken.

The lead market is notably weaker, there seems to be a concerted action on the part of lead smelters to move ore purchased in previous weeks before tying up money in additional supplies that cannot be shipped until the car situation shows some measure of relief.

Following are the shipments of zinc and lead from the various camps of the district for the week ending March 9:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,279,430	606,950	$107,174
Joplin	2,542,130	451,260	84,822
Galena-Empire	1,616,460	218,040	49,460
Alba-Neck City	1,498,250	.....	38,205
Duenweg	679,100	363,300	32,053
Badger	477,160	11,330	12,875
Granby	400,000	70,000	9,992
Spurgeon	308,300	93,550	9,219
Aurora	352,520	.....	8,876
Prosperity	258,370	51,940	8,614
Oronogo	282,650	10,460	7,299
Baxter Springs	216 930	.. ....	5,100
Carl Junction	131,160	3,340	3,419
Sherwood	51,720	16,240	1,959
Carthage	66,000	.....	1,683
Cave Springs	52,950	1,950	1,405
Stott City	54,590	.....	1,296
Zincite	29,280	13,670	1,292
Totals	12,297,000	1,912.030	$384,743

Ten weeks.....116,610,670 16,582,380 $3,434,154
Zinc value, the week, $305,463; 10 weeks, $2,737,591
Lead value, the week, 79,280; 10 weeks, 696,563

Average prices for ores 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	83.58
February	47.37	47.11	February	72.83	84.53
March	42.68	.....	March	73.73	.....
April	44.63	.....	April	75.13	.....
May	40.51	.....	May	78.40	.....
June	43.83	.....	June	80.96	.....
July	43.25	.....	July	74.31	.....
August	43.56	.....	August	75.36	.....
September	42.58	.....	September	79.64	.....
October	41.55	.....	October	79.84	.....
November	44.13	.....	November	81.98	.....
December	43.68	.....	December	81.89	.....
Year	43.24	.....	Year	77.40	.....

Wisconsin Ore Market

PLATTEVILLE, March 9

The market opened strong, with last week's prices prevailing. It is reported that one of the principal buyers paid $52 for 60 per cent. ore the latter part of the week, and active business was in evidence throughout the week. It is expected that the present satisfactory prices will continue, but a much higher market is not looked for. The majority of the buyers of 45 per cent. ore report at least 10 weeks' supply on hand at the smelters.

The entire output of the Dall, which is equipped wih a magnetic separating plant, was sold at $54.50 per ton, the Empire output showing at $54. There was a change in the disposition of the different ores from the usual procedure. many of the different lots going to new buyers.

The camps of the district loaded ore for the week ending March 9 as follows:

Camps.	Zinc, Lb.	Lead, Lb.	Sulphur, Lb.
Platteville	339,260	.....	...
Buncombe-Hazel Green	808,120	.....	.....
Linden	395,090	.....	.....
Cuba City	290,960	.....	.....
Potosi	208,015	36,550	.....
Galena	152,000	.....	.....
Rewey	114,400	.....	.....
Benton	107,230	.....	.....
Livingston	96,000	.....	.....
Elmo	69,200	.....	.....
Highland	66,000	.....	.....
Total for week	2,646,275	36,550	.....
Year to Mar. 9	16,523,994	685,020	96,480

The loading for the week reached somewhat over the average, showing that the output is increasing.

Chemicals

NEW YORK, March 13

Copper Sulphate—The demand continues strong and orders are coming in freely. Prices are unchanged, at $7.35 per 100 lb. in carload lots, or over; and $7.60 per 100 lb. for smaller parcels.

Nitrate of Soda—Spot supplies are still scarce and the market is strong, with an upward tendency. Quotations are unchanged, 95 per cent. for 1907 delivery, all positions, commanding $2.45@2.47½ per 100 lb., and 96 per cent. $2.50@2.52½. For 1908 delivery quotations are $2.42½ and $2.47½, respectively.

Mining Stocks

NEW YORK, March 13

The stock markets generally continue irregular, with obvious signs of manipulation and business largely professional. Today there have been heavy falls in prices, almost a small panic.

In the New York curb market the business has been limited chiefly to the coppers, with no special activity. Nevada-Utah, which has been a feature, has fallen off, both in activity and price. This is a striking instance of the impression which certain kinds of advertising make.

Boston March 12

Saturday last was the low day for mining shares in this market and liquidation seems to be almost complete. The effort to block by legislation in the Michigan legislature control of the Osceola and other properties by the Calumet & Hecla interest receives nothing but the severest condemnation, and well it might be so. However, the matter has been rectified and matters will be allowed to go as they were originally intended. In the meantime the Lake properties suffered severe declines. Allouez broke $6 to $59, with recovery to $63.50 today. Atlantic $2.25 to $16, recovering to $17.37½; Centennial, $4 to $36, rallying to $41; Copper Range, $5 to $84, rallying to $88 again.

Trinity has been quiet and fairly well supported. It ran off $1.50 to $25.50, recovering to $26.50 today. Quite a slice was taken off North Butte. It broke almost $10 to $97.50, but stiffened to $105 again. Utah Consolidated rose $3 to $69, on excellent buying, but reacted to $65, recovering to $66.75 today. U. S. Smelting fell $3.25 to $56.50, recovering to $58.75 today. Amalgamated dipped from $105.12½ a week back to $101.50, but rallied and touched $105.75 today. Bingham was a weak spot, falling $5 to $22, closing at $24.50 tonight, and Boston Consolidated fell $1.50 to $26.50. Butte Coalition fell $4 to $30, recovering to $33, and Calumet & Arizona, after falling $5 to $174, has recovered to $180. Calumet & Hecla went off $35 to $915 on slight dealings. Old Dominion, after touching $51, rallied to $57, and Shannon fell $1.50 to $18.50, recovering most of the decline. At today's annual meeting of the Allouez Mining Company, Calumet & Hecla people placed six of their members on the board, retaining three of the original, including President Harry F. Fay, who will continue as the chief executive officer. Calumet owns considerably over 35,000 shares of Allouez. The Osceola meeting occurs Thursday next, March 14, and the Centennial annual meeting comes April 2. Like changes will undoubtedly be made in these two companies.

Nevada-Utah furnished the curb feature. Lawson's announcement that he could not stand sponsor for this property, in keeping with his advertisements, caused the stock to break to $3.37½, with recovery to $4.50. It rose to above $9 a week or so ago. The curb did not entirely sympathize with the exchange prices as a rule, although Superior & Pittsburg fell over $4 to $21.50, with recovery to $23.75 today.

San Francisco March 6

Some time since a movement was commenced to effect a fusion between the San Francisco Stock and Exchange Board and the San Francisco Stock and Bond Board, the latter of which mainly deals in bonds, etc., and the former almost entirely in mining shares. Many meetings were held by a joint committee representing both, and the plan seemed to be about on the point of success when eight members of the Stock and Bond Board who had been counted upon to vote in favor, opposed and that ended the proposition. Now the Stock and Bond Exchange members have started on entirely independent organization known as the San Francisco Mining Exchange, to deal in mining shares, and there is already talk of a fusion with the San Francisco & Tonopah Exchange, which started up again last week for the first time since the great fire of April 18. This fusion would make an exchange which would bring a strong competition against the "old board" as it is called—the San Francisco Stock and Exchange Board. The new San Francisco Mining Exchange, while constituted principally of the members of the San Francisco Stock and Bond Board, is an entirely independent organization. The officers are: Walter Turnbull, president; A. W. Blow, vice-president; Mathias Meyer, treasurer; D. R. Wilson, secretary. Those who were present at the meeting of organization were Worthington Ames, Edward Barry, Jacob Barth, H. Beri, A. W. Blow, Robert C. Bolton, Milton A. Bremer, George Buckingham, Bert. F. Hecht, A. Heilbronner, A. C. Hellman, Fred S. Knight, Henry S. Mannheim, Mathias Meyer, J. R. K. Nuttall, Sol. E. Scheeline, Gustave Sutro, Walter Turnbull, D. R. Wilson. The new exchange also has as banking members the Ameri-

can National Bank, the California Safe Deposit and Trust Company, the Canadian Bank of Commerce, the Central Trust Company of California, the Crocker National Bank and the London, Paris and American Bank.

Colorado Springs March 9

The local mining market has been decidedly slumpy this week. There has been a decline in nearly the entire list; some of the stocks recovering a few points the latter end of the week. El Paso was the feature of the market, dropping from 57 to 44 without any apparent reason. The low prices have brought out buyers and the volume of trading has been heavier than for several weeks.

STOCK QUOTATIONS

NEW YORK Mar. 12	
Name of Comp.	Clg.
Alaska Mine	1⅜
Am.Nev.M.&P.Co.	3½
Amalgamated	105⅝
Anaconda	69¾
Balaklala	11
British Col. Cop.	8
Buffalo Cobalt	2½
Butte & London	2⅜
Butte Coalition*	33
Butte Cop. & Zinc	5¾
Cobalt Contact	9/16
Colonial Silver	3⅝
Cum. Ely Mining	10
Davis Daly	16¼
Dominion Cop	6⅛
El Rayo	5½
Foster Cobalt	2⅛
Furnace Creek	1½
Giroux Mine	9
Gold Hill	37/16
Greene Gold	1¼
Greene G. & S	2
Greenw'r & D.Val.	1⅝
Guanajuato	4⅜
Guggen. Exp	265
Hanapah	⅜
McKinley Dar	1⅜
Micmac	5⅛
Mines Co. of Am	2
Mitchell Mining	5
Mont.Sho.C.(New)	11⅛
Nev. Utah M. & S.	4⅜
Newhouse M. & S.	21⅜
Nipissing Mines	13½
Old Hundred	3⅛
Silver Queen	2⅛
Stewart	3¼
Tennessee Copper	
Union Copper	¾
Utah Apex	7¼
West Columbus	17

N. Y. INDUSTRIAL	
Am. Agri. Chem	22
Am. Smelt. & Ref.	135¼
Am.Sm. & Ref., pf.	112¾
Bethlehem Steel	
Colo. Fuel & Iron	39
Federal M.& S.,pf.	89½
Inter. Salt	15
National Lead	67¼
National Lead, pf.	100
Pittsburg Coal	
Republic I. & S.	27¼
Republic I. & S.,pf.	90¼
Sloss-Sheffield	59
Standard Oil	511
Tenn. C. & I.	
U. S. Red. & Ref.	
U. S. Steel	40⅜
U. S. Steel, pf.	101⅝
Va. Car. Chem	30
Va. I. Coal & Coke	

ST. LOUIS Mar. 9		
N. of Com.	High.	Low.
Adams	.40	.25
Am. Nettie	.08	.06
Center Cr'k	2.40	2.25
Cent. C. & C.	65.00	64.50
C.C. & C. pd.	80.00	78.25
Cent. Oil	70.00	60.00
Columbia	5.00	4.50
Con. Coal	29.00	27.00
Doe Run	170.00	160.00
Gra. Bimet.	.35	.25
St. Joe	18.00	16.00

BOSTON Mar. 12	
Name of Comp.	Clg.
Adventure	4¾
Allouez	63¾
Am. Zinc	42
Arcadian	9
Atlantic	17⅛
Bingham	25
Boston Con.	28⅛
Calumet & Ariz.*	180
Calumet & Hecla*	920
Centennial	40¼
Con. Mercur	.45
Copper Range	87¼
Daly-West	17½
Franklin	23¾
Granby, New	140
Greene Con*	27½
Isle Royal	26¼
La Salle	19¾
Mass	7
Michigan	17½
Mohawk	87
Mont. C. & C.(new)	
Nevada	16
North Butte	103¼
Old Colony	
Old Dominion	54¾
Osceola	156
Parrot	26¾
Phoenix	
Quincy*	127
Rhode Island	8⅜
Santa Fe	4½
Shannon	20¼
Tamarack*	136
Trinity	26
United Cop., com.	74½
U. S. Oil	10⅜
U. S. Smg. & Ref.	58¾
U.S.Sm.& Re.,pd.*	44½
Utah Copper	66⅛
Victoria	9
Washington	
Winona	10¼
Wolverine	190
Wyandotte	

*Ex. Div. †Ex. Rights.

BOSTON CURB	
Ahmeek	100
Ariz. Com	25
Black Mt.	6⅞
Cananea Cent	28½
East Butte	13
Hancock Con	13
Keweenaw	9½
Majestic	3¼
Raven	2⅞
Shawmut	1
Superior	19
Superior & Pitts.	23½
Troy Man	2⅜

LONDON Mar. 13			
Name of Com.	Clg.		
Dolores	£1	16s	3d
Stratton'sInd.	0	2	9
Camp Bird	1	6	0
Esperanza	2	3	9
Tomboy	1	7	6
El Oro	1	9	4½
Oroville	0	18	9
Somera	0	7	6
Utah Apex	1	6	10½
Ariz.Cop.,pfd.	3	15	0
Ariz.Cop.,def.	3	12	6

Cabled through Hayden, Stone & Co., N. Y.

S. FRANCISCO Mar. 6	
Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.59
Best & Belcher	1.50
Caledonia	.47
Challar	.13
Con. Cal. & Va	.95
Crown Point	.31
Exchequer	.81
Gould & Curry	.36
Hale & Norcross	.71
Mexican	.85
Ophir	2.70
Overman	.17
Potosi	.16
Savage	.79
Sierra Nevada	.82
Union	.80
Utah	.05
Yellow Jacket	1.00
TONOPAH STOCKS	
Golden Anchor	.30
McNamara	.58
Montana-Pitts.ex.	.25
North Star	.35
Rescue	.20
GOLDFI'D STOCKS	
Black Ants	.11
Blue Bull	.47
Columbia Mt.	1.02
Comb. Frac.	4.52
Conquerer	.21
Daisy	2.50
Florence	3.10
Frances-Mohawk	1.00
Goldfield Con.	9.50
Grandma	.30
Great Bend	1.07
Red Hills	.25
St. Ives	1.85
BULLFROG STOCKS	
Amethyst	.45
Bonnie Claire	.40
Mayflower Con.	.39
Montgomery Mt.	.33
Original	.20
MANHAT'N STOCKS	
Gold Wedge	.13
Manhattan Mg.	.12
Pine Nut	.21
Ruby Wonder	
Stray Dog	.39
Yellow Horse	.07

NEVADA Mar. 13 (Weir Bros. & Co., New York)	
TONOPAH STOCKS	Clg.
Tono'h Mine of N.	15.50
Tonopah Exten	3.87½
Montana Tonop'h	3.60
Belmont	5.00
Tonopah Midway	1.97
West End Con	1.45
Jim Butler	.98
GOLDFI'D STOCKS	
Sandstorm	.59
Kendall	.40
Red Top	4.12½
Jumbo	4.12½
Goldfield Mining	1.45
Dia'dfield B. B. C.	.40
Atlanta	.65
Mohawk	18 00
Silver Pick	1.28
Laguna	1.67
BULLFROG STOCKS	
Mont. Shoshone C.	11 50
Tramps Con	1.16
Gold Bar	1 15
Bullfrog Mining	.28
Bullfrog Nat. B.	.40
Homestake Con	1.20
MANHAT'N STOCKS	
Manhattan Con	.69
Manhat'n Dexter	.28
Jumping Jack	.22
Stray Dog	.37
Indian Camp	.25

COLO. SPRINGS Mar. 9	
Name of Comp.	Clg.
Acacia	10
Black Bell	3
C. C. Con	4⅞
Dante	5
Doctor Jack Pot	7
Elkton	60
El Paso	47
Findley	67
Gold Dollar	
Gold Sovereign	6
Isabella	20½
Index	6¾
Jennie Sample	7
Jerry Johnson	
Mary McKinney	64
Pharmacist	6½
Portland	1.17
Un. Gold Mines	9½
Vindicator	
Work	19¾

New Dividends

Company.	Payable.	Rate.	Amt.
Am. Smg. & Ref., com	Apr. 15	$1.75	$875,000
Am. Smg. & Ref., pfd	Apr. 1	1.75	875,000
Bunker Hill & Sullivan	Mar. 4	0.60	180,000
Daly-West	Mar. 15	0.60	108,000
Dominion Coal	Apr.	1.00	150,000
Granby Con	Mar. 30	0.30	405,000
Gugg. Exp. Co	Apr. 1	2.50	262,500
Hecla	Mar.	0.02	20,000
Homestake, S. Dak	Mar. 25	0.50	109,200
Horn Silver	Mar. 30	0.05	20,000
Kendall	Mar. 20	0.03	15,000
Le Roi No. 2	Feb.	0.24	28,800
New Century	Feb. 15	0.01	1,500
Nova Scotia Steel & Coal	Apr. 15	1.50	74,555
Quartette Mg	Mar. 30	0.01½	15,000
Standard Con	Mar. 26	0.10	17,839
Teziutlan	Apr. 1	2.00	20,000
Trethewey	Mar. 31	0.04	40,000
U. S. Gypsum	Mar. 1	1.25	56,250
U. S. Red. & Ref., com	Apr. 15	0.87½	656,250
U. S. Red. & Ref., pfd	Apr. 15	0.87½	656,250
United Verde	Mar.	0.75	225,000
Utah Con	Apr. 15	1.50	450,000
Work	Apr. 1	0.01	15,000

Assessments

Company.	Delinq.	Sale.	Amt.
Arizona Prince, Cal.	Mar. 25	Apr. 20	$0.04
Bullion, Nev	Feb. 3	Mar. 6	0.05
Butler-Liberal, Utah	Mar. 14	Apr. 1	0.01
Clark-Virginia, Utah	Mar. 5	Mar. 12	0.00½
Con. Cal. & Va., Nev.	Mar. 21	Apr. 11	0.25
Etna-King, Cal	Mar. 10	Apr. 3	0.01½
Exchequer, Nev	Mar. 4	Mar. 25	0.05
Ingot, Utah	Mar. 15	Apr. 1	0.02
Julia, Nev		Apr. 14	0.03
Oro Blanco, Cal	Feb. 25	Apr. 22	0.03
Quincy, Jr., Idaho			0.10
Savage, Nev	Mar. 13	Apr. 3	0.10
Sierra Nevada	Feb. 25	Mar. 18	0.10
St. George, Utah	Mar. 4	Mar. 25	0.01
St. Joe, Utah	Mar. 28	Apr. 16	0.02
Wabash, Utah	Mar. 12	Apr. 3	0.05
West Century, Utah	Mar. 6	Mar. 23	0.00½

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		29.854	
April	64.765		29.984	
May	66.976		30.968	
June	65.394		30.185	
July	65.105		30.113	
August	65.949		30.529	
September	67.927		31.483	
October	69.523		32.148	
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

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1906.	1907.	1906.	1907.	1906.	1907.
January	18.310	24.404	18.419	24.825	78.869	106.739
February	17.869	24.869	18.116	25.236	78.147	107.356
March	18.361		18.641		81.111	
April	18.375		18.688		84.793	
May	18.475		18.724		84.867	
June	18.442		18.719		83.994	
July	18.190		18.585		81.167	
August	18.380		18.706		83.864	
September	19.033		19.328		87.831	
October	21.203		21.722		97.269	
November	21.833		22.398		100.270	
December	22.885		23.350		105.226	
Year	19.278		19.616		87.282	

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	
February	36.403	42.102	August	40.606	
March	36.662		September	40.516	
April	38.900		October	42.852	
May	43.313		November	42.906	
June	39.260		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		15.922	
April	5.404		15.959	
May	5.685		16.725	
June	5.750		16.813	
July	5.750		16.525	
August	5.750		17.109	
September	5.750		18.266	
October	5.750		19.350	
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.		St. Louis.		London.	
	1906.	1907.	1906.	1907.	1906.	1907.
January	6.487	6.732	6.337	6.582	28.225	27.125
February	6.075	6.814	5.924	6.664	25.844	25.938
March	6.209		6.056		24.563	
April	6.078		5.931		25.781	
May	5.997		5.846		27.000	
June	6.096		5.948		27.728	
July	6.006		5.856		26.800	
August	6.027		5.878		26.938	
September	6.216		6.056		27.563	
October	6.222		6.070		28.075	
November	6.375		6.225		27.781	
December	6.593		6.443		27.938	
Year	6.198		6.048		27.020	

New York and St. Louis, cents per pound. London in pounds sterling per long ton.