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The Electrical Equipment of the Yak Tunnel

The Power Plant Supplies Current for the Operation of the Tunnel, for Mining in Adjoining Properties and for Lighting and Power

BY ROBERT E. RENZ*

The Yak tunnel of the Yak Mining, Milling and Tunnel Company is located in the Leadville mining district and is 1½ miles southeast of the city of Leadville, Colorado. The object of the tunnel is to tap and drain various mines and mineral bodies tributary to the tunnel course. The company mines its own properties and also hauls ores and waste for other mines which the tunnel taps. All power operations are performed by means of electric current, with the exception of a few compressors used in sinking shafts, etc.

pressor. As the work progressed this equipment was found inadequate and plans for enlargement were considered, and after taking into consideration the territory to be supplied with power, it was decided that 6600 volts alternating-current system would be most satisfactory.

Fig. 1 is a photograph of the power house. At the left can be seen an additional boiler house which is being added. In the distance is the Leadville mill of the American Zinc Extraction Company. This mill is driven entirely by electric motors,

POWER EQUIPMENT

Fig. 2 gives a view of the interior of the power house looking from the east end. In the foreground is a compound Norwalk steam compressor of 800 cu. ft. of free air per minute capacity, compressing to 100 lb. pressure. Next is a 75-kw. 250-volt direct-current Goodman generator which formerly supplied current to the trolley system. This generator is seldom used at present, except in case it is found necessary to shut down the motor-generator set located about one mile into the tunnel.

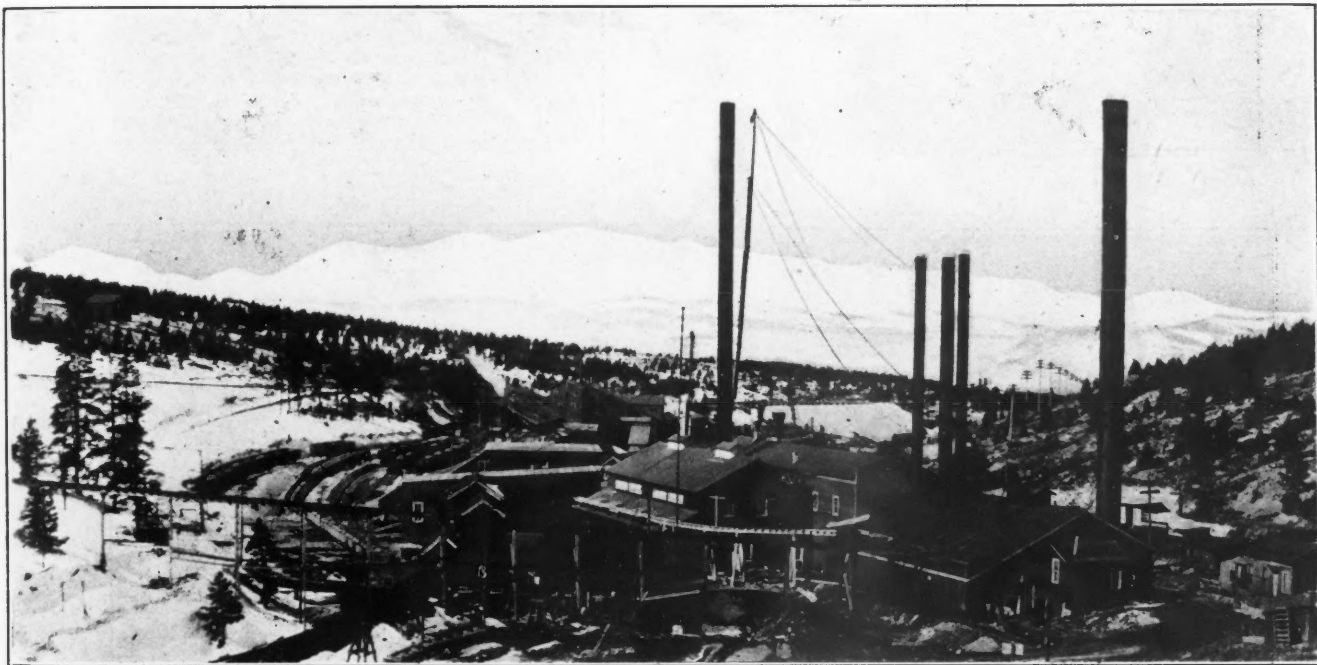


FIG. 1. SURFACE PLANT, POWER HOUSE

When the tunnel was first begun, mules were used to haul the waste, but as the course grew longer it was found that mule haulage was too slow and expensive, and the haulage was changed to electric, which has proved highly satisfactory. The main tunnel is more than 2½ miles long and at present mule haulage would be impracticable and entirely too expensive.

The original power plant consisted merely of one 75-kw. 250-volt generator for supplying current for trolley system and one hoist, and one steam air com-

over 400 h.p. in motors being installed and separation of ores being made with International magnetic separators. The power is furnished by the Yak power house at 6600 volts and transformed at the sub-station to 440 volts.

The general scheme is to transmit the power at 6600 volts to various places where it is needed and then to transform it to 440 volts for use in motors. As the territory covered is large, a considerable saving is made in investment in copper by using a high voltage. A secondary voltage of more than 440 volts is not practicable on account of the power being used underground.

Past the Goodman generator can be seen a Leyner electric compressor. The capacity of this compressor is 800 cu. ft. of free air per minute and is driven by a 150-h.p. 440-volt three-phase motor. Fig. 3 gives a view of the compressor.

At the west end of the power house is located a 6600-volt 60-cycle 425-kw. revolving-field Bullock generator, direct connected to a 600-h.p. cross-compound condensing Allis-Chalmers Corliss engine.

While a 25-cycle current would have been more satisfactory for power work than one of 60 cycles on account of slower speeds, and hence more satisfactory for hoist and pump work, the 60-cycle cur-

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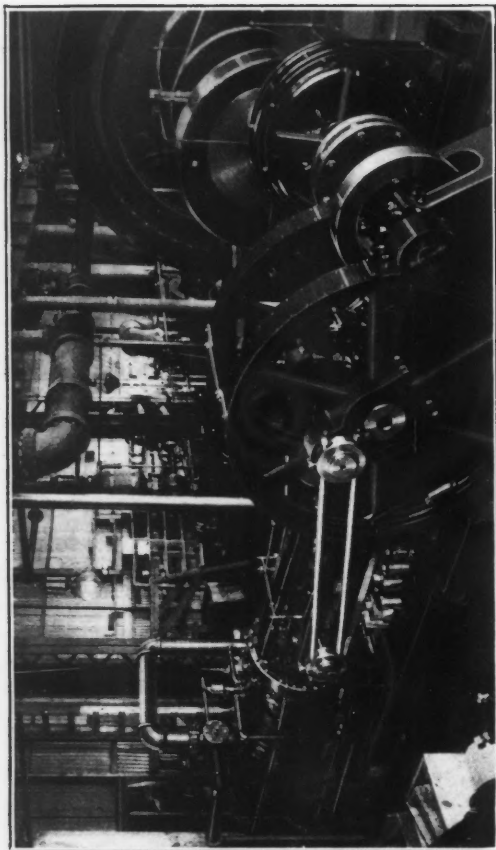


FIG. 3. COMPRESSOR

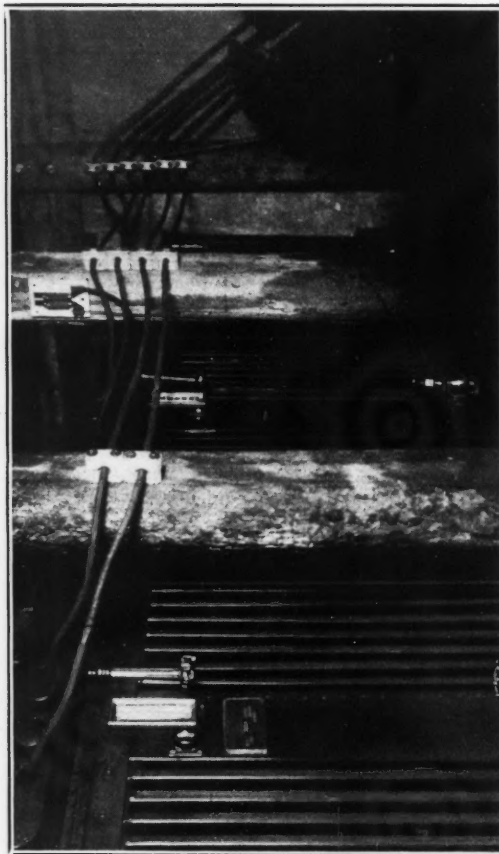


FIG. 8. TRANSFORMER STATION AT TUNNEL LEVEL.

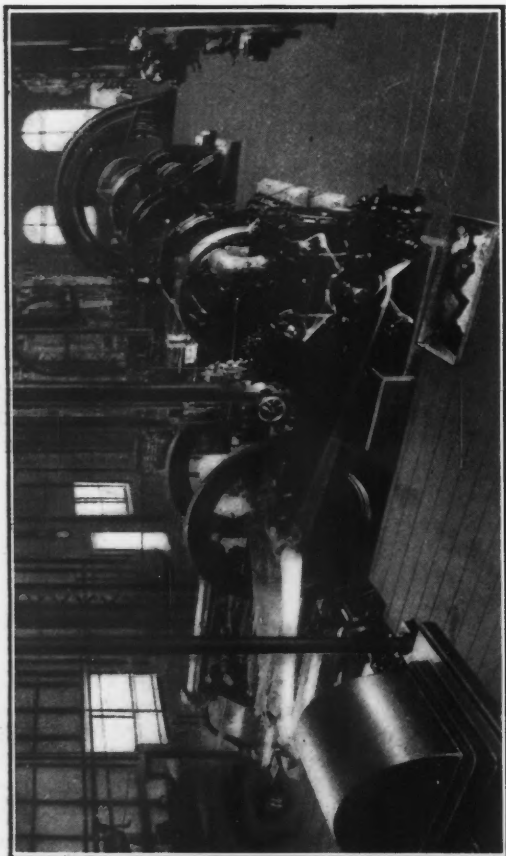


FIG. 2. INTERIOR OF POWER HOUSE

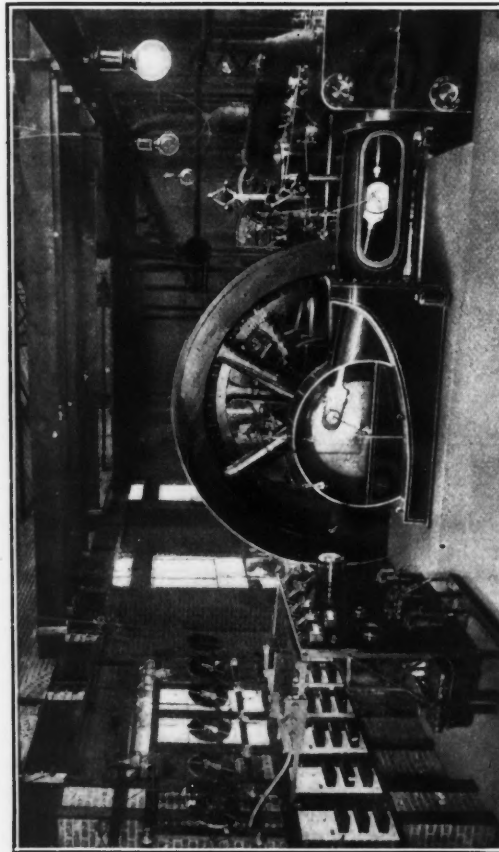


FIG. 4. 425-KW. UNIT AND SWITCHBOARD

rent was decided upon because of a lighting load to be connected on in the future. As the 25-cycle was out of the question for lighting, the 60-cycle was decided upon as a compromise for both lighting and power load. Fig. 4 shows the 425-kw. unit and switchboard.

The condenser used with the alternating-current unit is a Wheeler closed condenser with a capacity of 10,000 lb. of

steam per hour. Drainage water from the tunnel is used for cooling.

A section of the engine room showing the alternating-current unit and condenser is shown in Fig. 5.

Fig. 6 is a plan of the engine room. In the boiler house are two 400-h.p. Cahall water-tube boilers, suitable for 165 lb. steam pressure. In addition there are three 150-h.p. Frost fire-tube boilers, a

part of the original installment. The coal is shoveled directly from cars into the bins. All the firing is done by hand, one man taking care of all the boilers. Feed water is obtained from a reservoir several miles distant in the mountains. This water is pure snow water and there is no trouble with boiler scale.

CONNECTIONS

A diagram of the connections for the entire transmission system is given in Fig. 7. The lines extend from the power house to the Horseshoe station, which supplies power to the tunnel proper. From the Horseshoe station lines extend to Vinnie sub-station, where the voltage is lowered to 440 volts. The station supplies a hoist at the Elk shaft and a hoist at the M. N. shaft. These shafts are at the surface, but are in the vicinity of the tunnel. The tunnel at this point is about 1300 ft. below the surface.

Between the Horseshoe sub-station and Vinnie station power is tapped off for the Hopemore shaft. The 50-h.p. hoist located here is supplied with transformers to lower the tension to 440 volts. From the Vinnie sub-station the line extends to the Fortune sub-station, where power is used for a hoist and compressor.

The Horseshoe sub-station consists of a lightning-arrester station on the surface and a transformer station at the tunnel level. The 6600 volts is transmitted from the arrester station to the transformer station by means of paper insulated lead-covered cable.

Fig. 8 is a view of the transformer station at the tunnel level in a chamber cut out of solid rock and timbered. This sort of station makes a satisfactory place for transformers, for it is cool. The capacity of transformers is 125 kw. each.

This station supplies power to a hoist at the Louisville shaft, a hoist at the Willard winze, a pump at the Cord winze, and a motor-generator set at the Cord station; besides several small diamond drills, pump and blower motors.

The motor-generator station is shown in Fig. 9 and consists of a 100-h.p. three-phase 440-volt induction motor, belted to a 75-kw. 250-volt generator. This generator supplies power for the trolley system and a 75-h.p. direct-current hoist at the Cord winze. This hoist is of the counter-balanced type and is shown in Fig. 10. The depth below the surface at this point is approximately 650 ft. The motor on this hoist is to be changed shortly to a variable-speed alternating-current motor. The reason for changing is to obtain better efficiency by using alternating-current power directly and to reduce the load on the motor-generator set.

HOISTS, PUMPS AND COMPRESSORS

A single-drum hoist located at Louisville shaft is driven by a 50-h.p. variable-

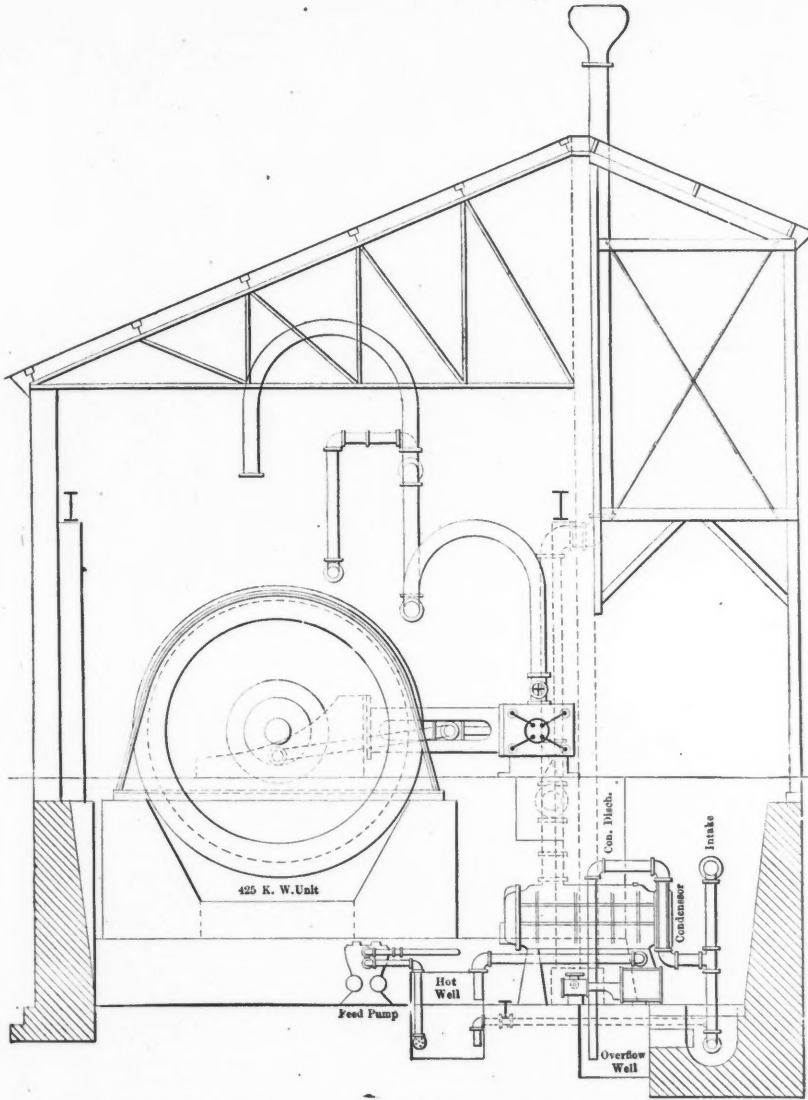


FIG. 5. SECTIONAL ELEVATION, YAK MINING, MILLING AND TUNNEL COMPANY, POWER HOUSE

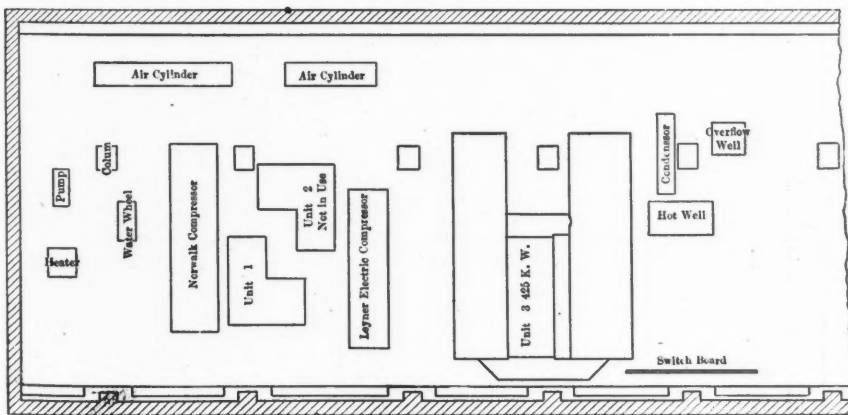


FIG. 6. PLAN OF ENGINE ROOM

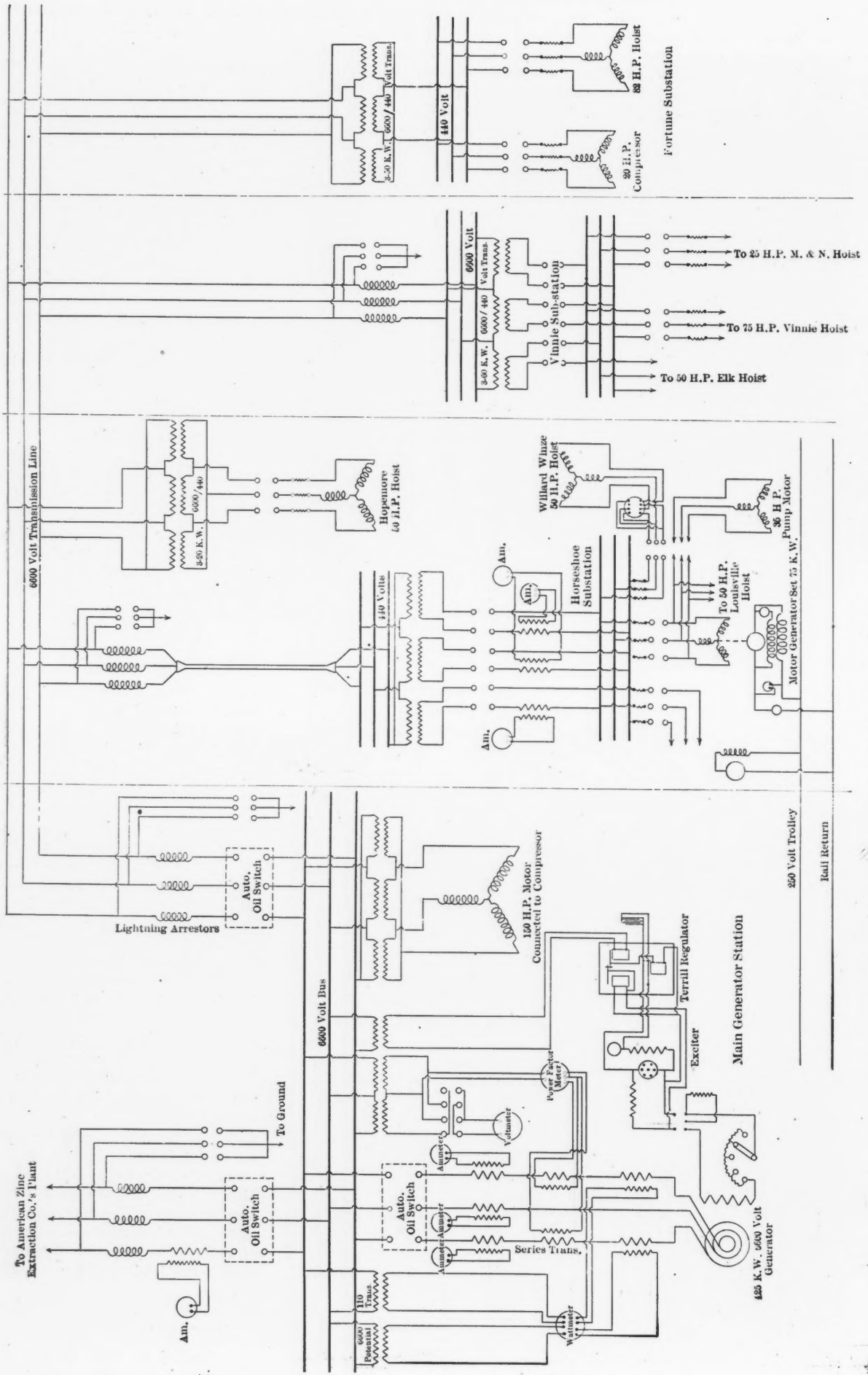


FIG. 7. CONNECTIONS, POWER INSTALLATION, YAK MINING, MILLING AND TUNNEL COMPANY

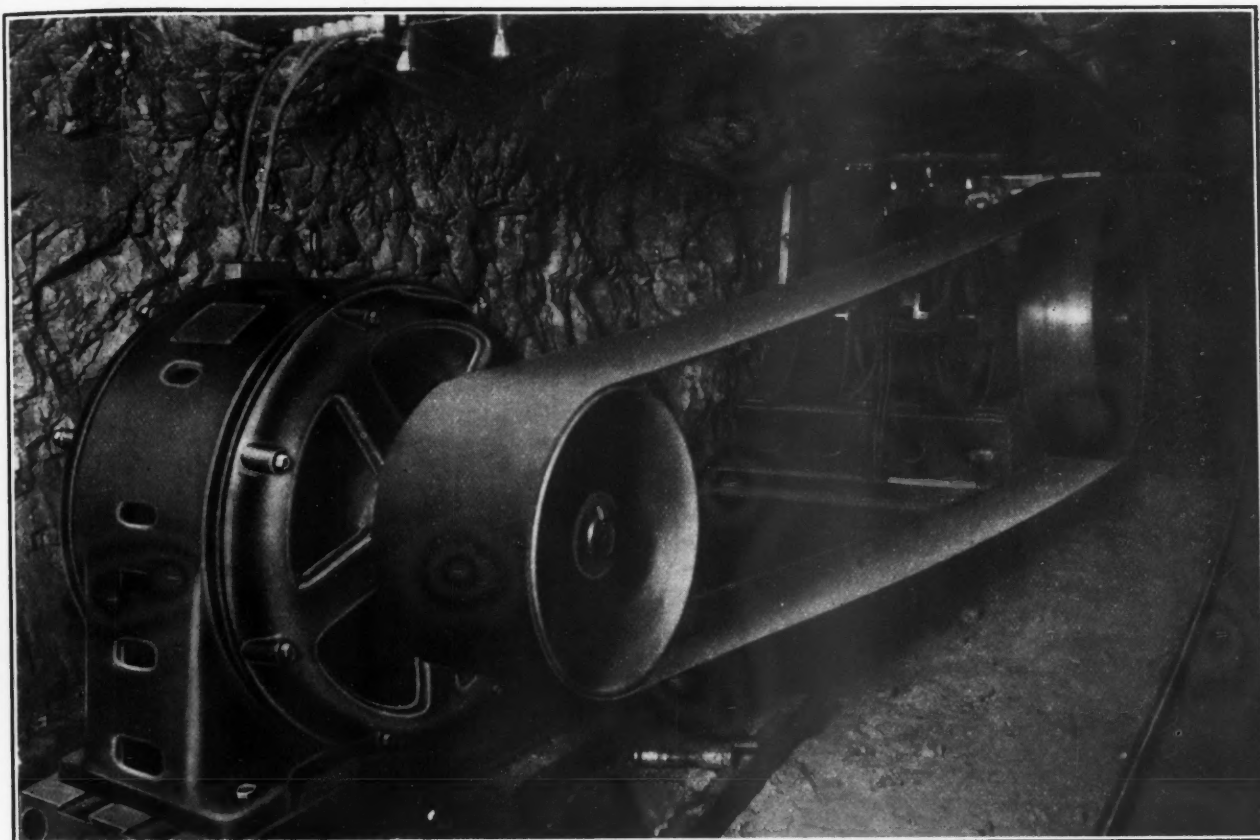


FIG. 9. MOTOR GENERATOR STATION

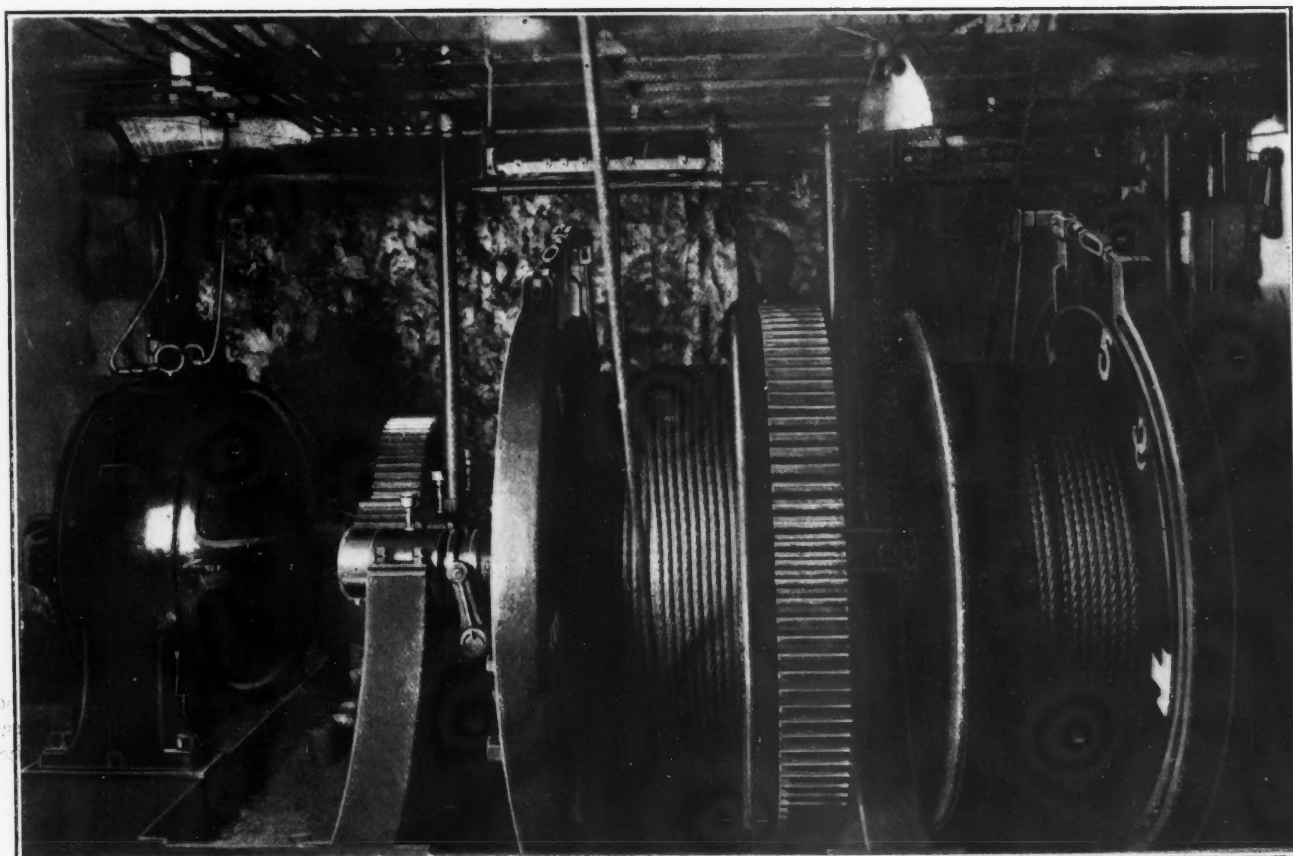


FIG. 10. COUNTERBALANCED HOIST AT CORD WINZE

speed alternating-current motor. A similar hoist is operated at Willard winze.

One object of the tunnel being for drainage, it is obvious that little pumping is necessary. About the only pumping required is at the Cord winze, which is 600 ft. below the tunnel level. Even at this depth it is necessary to pump only 150 gal. of water per minute. This is pumped with an Aldrich triplex electric pump, operating under a head of 600 ft., and so far it has given entire satisfaction.

Electric power is applied to two diamond drills, one direct current and one alternating current. Of the two, the alternating-current drill is the more satisfactory because the motor has no commutator and the control apparatus is more substantial and satisfactory. One advantage of the electric diamond drill is its flexibility and ease of connecting up.

The hoist on the surface at Hopemore shaft is driven by a 50-h.p. variable-speed alternating-current 440-volt motor. At the Vinnie sub-station are three 60-kw. transformers. They are oil cooled and supply 440 volts to a 45-h.p. alternating-current motor connected to the Elk hoist and a 25-h.p. alternating-current motor connected to the M. N. hoist; also to a 30-h.p. electric compressor located at the tunnel level.

transformers supplying 440 volts to a 82-h.p. variable-speed induction motor geared to a single-drum hoist, also power to a 20-h.p. electric-driven compressor.

Wherever it is possible, as on pumps, compressors, etc., induction motors of the squirrel-cage type are used. These motors are essentially constant-speed motors and are more durable and simple than variable-speed motors. Of course hoists require variable-speed wound-rotor motors. Taken as a whole, induction motors at the Yak have given practically perfect per-

formance, have caused very little trouble and need little attention.

general have given very good protection, considering that the lightning is rather serious in this district, due to the large crebodies near the lines. The arresters used are of the well known Westinghouse and General Electric multi-gap types.

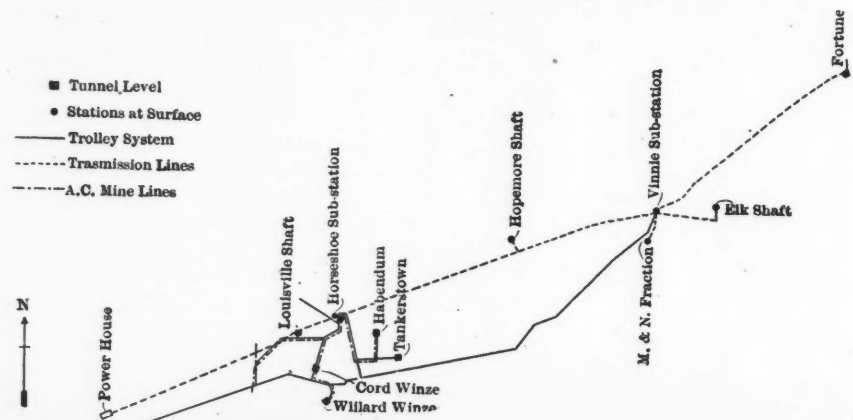


FIG. 11. DISTRIBUTION OF TROLLEY AND TRANSMISSION LINES

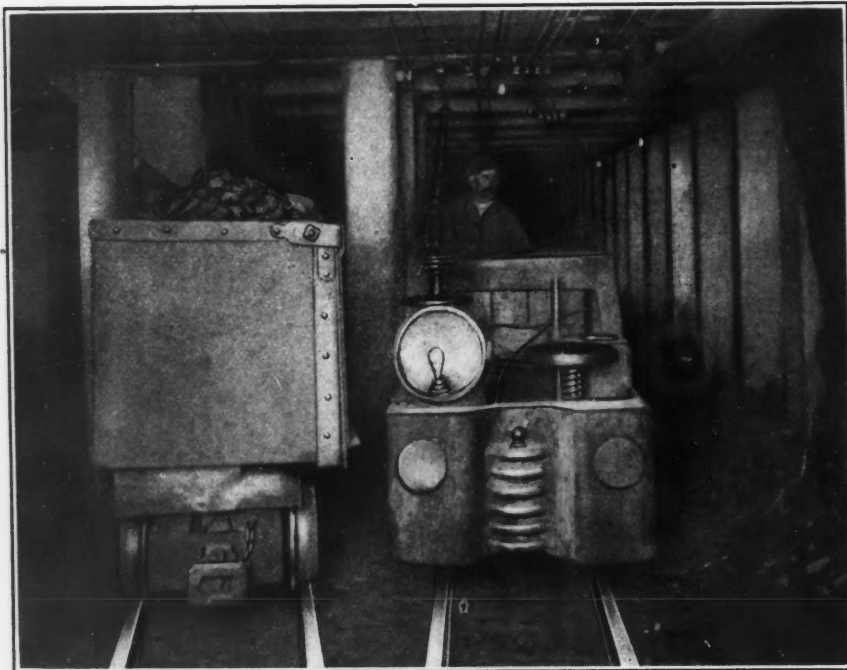


FIG. 12. LOCOMOTIVE AT CORD WINZE. ORE CHUTE ON THE LEFT SHOWS MANNER OF LOADING

The policy of the company in the future in regard to compressed air is to distribute small electric compressors of, say, from one to three drills capacity at the base of operation. This will avoid the necessity of long pipe lines, with their losses, and will give a more flexible and efficient system.

MOTORS AND TRANSFORMERS

At the Fortune station are three 50-kw.

transformers supplying 440 volts to a 82-h.p. variable-speed induction motor geared to a single-drum hoist, also power to a 20-h.p. electric-driven compressor.

Wherever it is possible, as on pumps, compressors, etc., induction motors of the squirrel-cage type are used. These motors are essentially constant-speed motors and are more durable and simple than variable-speed motors. Of course hoists require variable-speed wound-rotor motors. Taken as a whole, induction motors at the Yak have given practically perfect per-

formance, have caused very little trouble and need little attention.

work these locomotives are called upon to do, they have given excellent service. One locomotive can haul 30 cars of 2½ tons capacity, or a load of 75 tons net. The low voltage of 250 was selected in the interest of safety. A higher voltage is too dangerous, the tunnel being rather low in certain places.

The trolley wire is No. 2/0 figure-8 wire, supported by mine hangers. These hangers grip the wire, no soldering being required, and are easy to put up. Fig. 12 shows a locomotive and cars at the Cord loading station. This illustration shows the method of loading from chutes into haulage cars. At the outside ore trestle the cars are dumped directly into railroad cars, thus making the loading and unloading of tunnel cars a simple matter. An automatic block-signal system has been installed in connection with the trolley system. This will save considerable time and reduce the danger of accidents.

Bell telephones are placed at different points throughout the mine and also on various levels at the Cord winze, and are connected with a private exchange at the tunnel mouth.

The spindle of a roller used on a plane or a slope wears out before any other part, and for this reason must be well oiled. If the spindle gets dry it begins to wear, and when such action is once started the roller will do service only a short time, even if oil is then well supplied.

The Tin-stream Works of Red River, Cornwall

The Same Tailings Are Treated by Twelve to Twenty Operators, Simple and Inexpensive Concentrators Extracting a Profit Each Time

BY EDWARD WALKER

Concerning the recovery of tin oxide from slimes at the mines and also in the Red river in Cornwall, I learn by conversation with various engineers that the apparatus in use will survive for a long time to come, and that details of Cornish stream-tin works are quite unknown outside Cornwall. Moreover, fuller study of tin-stream works has revealed to me the explanation of the phenomena, the reason why so much slime is lost at the mines, and why a constant succession of tin-stream works makes profits by treating the slimes over and over again.

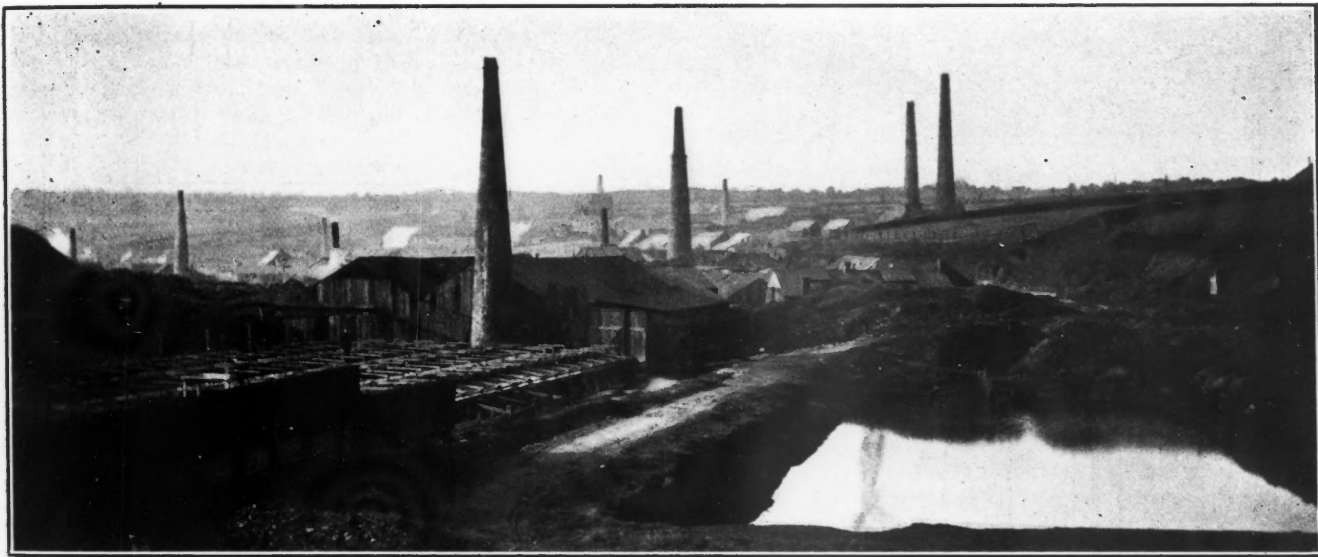
At the dressing works at the various mines the slimes from the stamps and from the calcining furnaces are of such

slimes run out through pipes over distributors and down the frames. During their passage down the frames the heavier particles adhere to the surface, as is the case with buddles, and the lighter portions run over the tailboard *D* into the discharge launder *E*.

During this time water from the launder *C* has been running through the pipes *G* into the V-shaped vessels *F*. These vessels are pivoted at each side of the frames and in normal position are shown by the full lines. They are connected by a series of levers *H* and wire cords *I* with the tailboards *D*. These levers are held up by the pivoted rods *J* running in sockets *K* fixed to the boards. When the ves-

frames. Their efficiency is not very great, for the concentrates obtained in the launders *L* are still of very low grade and have to be sent over a further series of similar frames. The advantage of the frames is their extreme cheapness, durability and automatic action, and for this reason they will continue to be widely used for bringing up poor slimes to a state fit for treatment on the more expensive slime tables.

At Dolcoath and the other mines these frames are used for this purpose, but the fact that they extract a very small proportion of the contents of the slimes is proved by the doings of the tin streamers below.



THE STREAM WORKS AND DRESSING PLANT OF EAST-POOL MINE

low grade, carrying only a few pounds of tin oxide to the ton, that they are not supposed to be worth treating on buddles, tables or other ordinary slime concentrators. They are therefore passed over "rag frames" in order to obtain concentrates that can be treated on buddles or tables.

THE RAG FRAME

I have never seen a working drawing of a rag frame published in any technical publication, so I take this opportunity of giving one. The frames are usually arranged in groups, as shown in the photograph. The plan and elevation show a pair arranged opposite one another. Each frame consists of a sloping board *A* about 6 ft. long by 6 ft. wide. Along the tops of the boards run launders *B* and *C* carrying slimes and water, respectively. The

sels *F* become filled with water they over-balance and discharge their contents on the top of the frames, assuming then the position shown in the dotted lines.

The motion of the vessel and levers tips up the tailboards. The discharged water runs quickly over the frames and washes down such heavy particles as have accumulated into the launders *L*. After the water has been discharged from *F* the vessels and the levers gradually resume their normal position once more. In some cases the resumption of position is assisted by the water from *G* running into the scoops *M* attached to the levers *H*. These scoops are not always used, and in the installation shown in the photograph they are not to be found.

EFFICIENCY OF THE FRAME

This description shows the action of the

The tailings from the mines are discharged into the rivers, which consist really for a large part of the mine waters. The Red river, carrying the waters and tailings from Dolcoath and neighboring mines, contains large quantities of tin oxide that has not been caught at the dressing works. The waters are worked over and over again by a succession of tin-stream works between Dolcoath and the sea, and they all make a very decent living.

In preparing the waters of the river for treatment on the frames the waters are first led to a sluice, where the sands accumulate while the slimes run over into other settling pits. When sufficient sands accumulate the sluice is opened and the sands are washed down into pits, whereby the lighter parts are removed and only the heavier parts remain. These are fed

into a rotating cylinder filled with scrap iron and driven by water wheels, and thus reduced to slimes. For my own part I should call this a tube mill, but the recent inventors and introducers of tube mills object to their attention being called to a machine which has been in operation in Cornwall for more years than they can remember, so I had better say nothing about it.¹

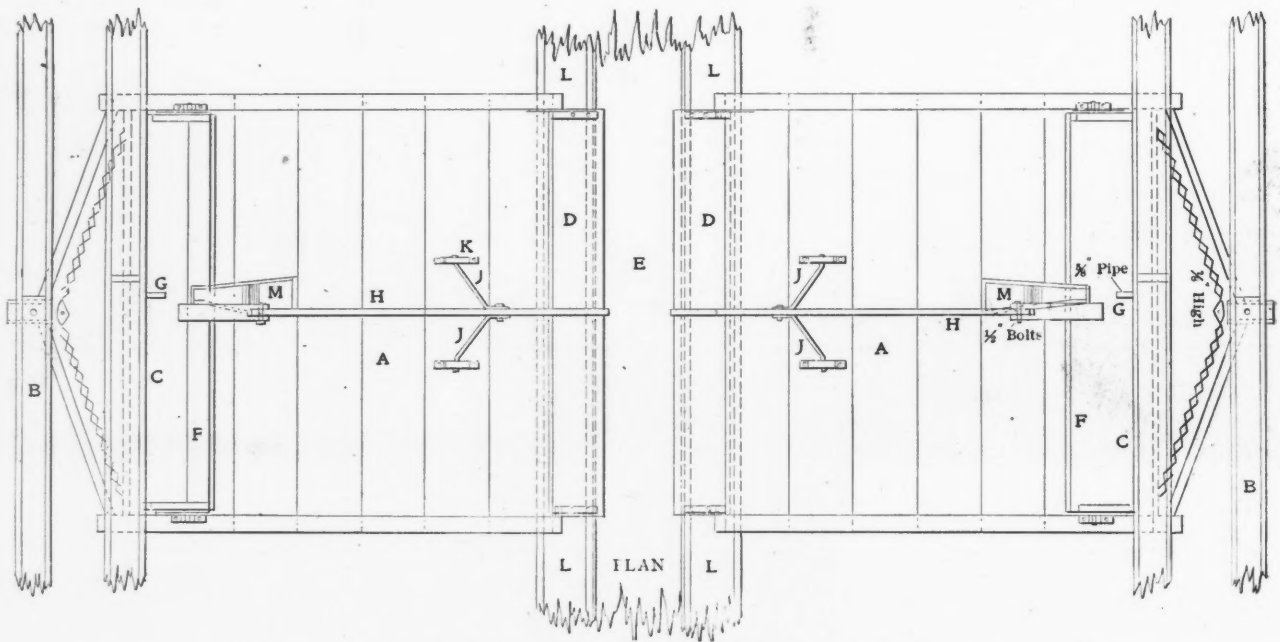
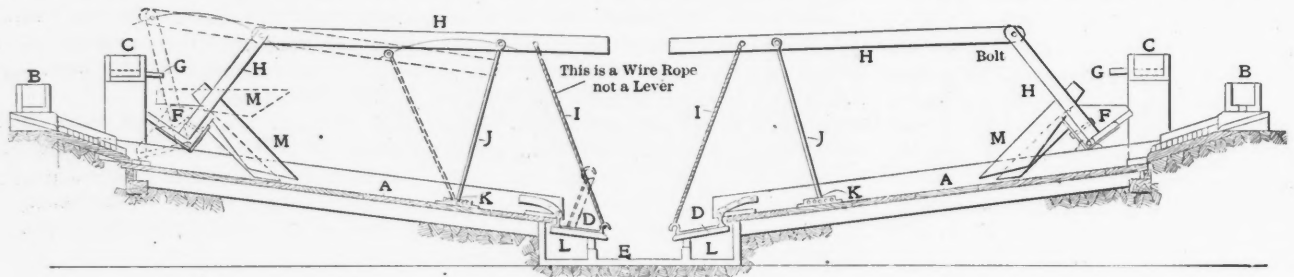
The slimes from this mill and from the settling pits are then passed over rag frames three or four times and afterward buddled. The buddles employed are usually of the concave type, the slimes being fed inward from the circumference. They

owing to their short length of surface and the comparatively steep slope. It is often wondered why the mines do not adopt additional plant for treating their slimes instead of discharging them into the river, but my own observation shows that the mines usually are cramped for room for surface works and could hardly follow such a policy if they desired to do so.

The tin streamers are very reticent in regard to their results and are not willing to give any figures of production or of efficiency of their plant. They confess, however, that the contents of the river are not so great now as they were 10 years ago. This is a considerable admis-

original slimes only once over the rag frame. The succeeding series of rag frames treat the concentrates from the preceding ones. With such a slippery article as tin oxide it is obvious that the settlement of the particles on a surface is a matter of chance, and the passage of the slimes down a mere 6-ft. length is not sufficient to catch 5 per cent. of the contents. From this point of view it is easy to see why constant retreatment of the slimes pays the various tin streamers, and why the last streamers do very nearly as well as the first.

Whether the mines or the first streamers could improve their extraction by



CORNISH RAG FRAME, PLAN AND SECTIONAL ELEVATION

are very wide and their slope is very gentle, so that the fine particles of tin oxide shall have a greater chance of adhering.

THE TIN-STREAM WORKS

At the mines the refinements of sliming are not carried to the extent that is observable at the tin-stream works. The rotating tables and Acme tables used there must lose a great deal of tin oxide

sion for a tin streamer to make and shows that the dressing at the mines is conducted in a more efficient manner than formerly.

One point remains to be discussed. Why is it that a succession of from a dozen to 20 tin-stream works between Dolcoath and the sea can handle the same tailings and all make a profit? I have heard many theories put forward, varying from the natural concentration in river beds to the growth of tin crystals out of nothing.

To me the explanation seems quite simple. Each dressing works at the mines or at the tin-stream works passes the

passing the original slimes over a succession of rag frames, resolves itself into a question as to the space at their disposal. If they cannot expand laterally, they could build rag frames with more than one deck and extend their operations vertically. I give this explanation and suggestion for what it is worth.

The production of gold in the common wealth of Australia in the first quarter of 1907 was 807,354 oz., a decrease of 66,029 oz., as compared with the corresponding period of 1906.

¹A series of letters on the early use of tube mills appeared in the JOURNAL during 1906, p. 1010, May 26; p. 1151, June 16; p. 25, July 7; and p. 167, July 28.

United States Smelting, Refining and Mining Company

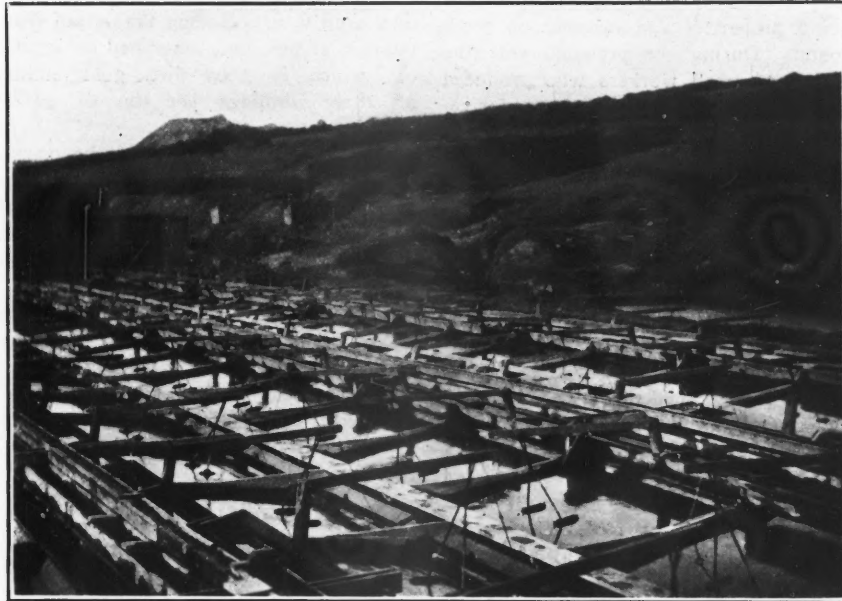
The balance sheet published in the report of the United States Smelting, Refining and Mining Company for the year ending Dec. 31, 1906, shows net earnings of \$3,504,522.47, of which \$5368.20 was paid in dividends on minority stock of subsidiary companies, and \$1,508,581.37 in dividends on the preferred stock of the United States Smelting, Refining and Mining Company, leaving \$1,990,572.90 undistributed surplus.

The total assets at the end of the year were \$46,978,504.84 against a capital liability of \$42,561,537.50. The subsidiary companies of the corporation are: The United States Mining Company which owns either the whole or a majority of the stocks of the United States Smelting Company, Centennial-Eureka Mining Company, Mammoth Copper Mining Company, United States Stores Company, United States Metals Refining Company. The United States Mining Company also owns one-half the stock of the International Metals Selling Company and a majority of the stock and bonds of the Niagara Mining and Smelting Company. The corporation also owns all the preferred stock and a majority of the common stock of the American Exploration

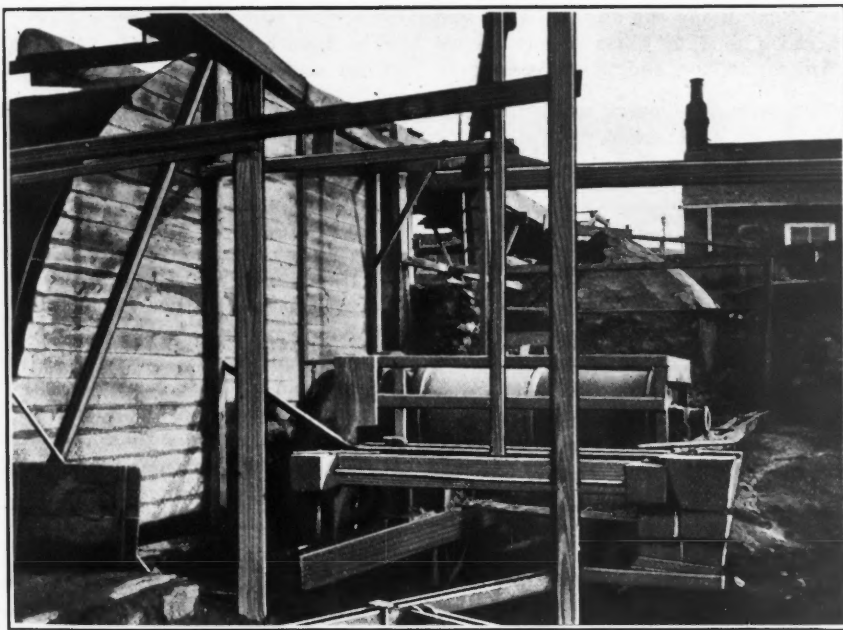
\$1,664,636.87 was charged to capital account. This item includes \$798,192.60 for real estate and refineries at Chrome and Grasselli, and \$679,663.61 for smelting buildings and plant at Bingham Junction, Mammoth and Chrome.

During the year the directors authorized, in California, an enlargement of the Mammoth smeltery; the construction of a

of avoiding the smoke troubles to which the farmers have objected; and the acquisition of several mining claims adjoining the various properties; they caused the construction of a lead refinery at Grasselli, near Chicago; authorized the purchase of additional land adjoining the copper refinery, at Chrome, N. J., a 50 per cent. enlargement of that plant and the



RAG FRAMES AT STREAM TIN WORKS, RED RIVER, CORNWALL



TUBE MILL FOR GRINDING SANDS, RED RIVER, CORNWALL

Company and substantial holdings in the Richmond-Eureka Mining Company; also nine-tenths of the stock of the Real del Monte Mining Company. It also purchased during the year 50,000 shares and \$50,000, 7 per cent. gold bonds of the Peruvian Mining, Smelting and Refining Company. For construction and other additions to property in 1906 the sum of

converting plant; the acquisition of additional mining claims adjoining the Mammoth mine; the construction of a railroad to connect the mine and the smeltery; the lease of the Quartz Hill mines and the construction of a railroad to connect these mines with the Southern Pacific Railroad. They authorized, in Utah, many additions to the smeltery, especially with the hope

construction of a complete smelting and converting plant at Chrome.

The company decided not to extend its operations into South America, to the extent of becoming responsible for the operations of properties there, but joined to a limited amount in subscribing to the stock of the Peruvian Mining, Smelting and Refining Company which was formed to acquire the Churrucca mines in Peru. This subscription, together with its share of profits in the Exploration Company, gives the ownership of one-fourth the outstanding stock of the Peruvian Company.

It is reported that the Chilean Government will soon begin the preliminary work on a railway running north and south, which will be of great importance in the development of mines, especially in the north of the Republic.

It is reported that extensive operations have been begun in the development of newly discovered manganese deposits near the line of the Kars railway in Russia.

The copper-smelting works at Guayaacan, Chile, manufacture sulphuric acid as a by-product, but at present its output is greater than the country can take care of. Consequently, to utilize the surplus, a plant for the leaching of copper ore with sulphuric acid is being erected in connection with the smeltery.

Mining in Rhodesia, South Africa

In the annual report of the British South Africa Company for the year ending March 31, 1906, Sir William Milton, administrator of Southern Rhodesia, states that great activity has been displayed in every mining district, resulting in an increase in the number of gold-producing properties and opening up fresh ground. During the previous year the number of small workers who produced gold reached 72, but in the year under review the total increased to 164. In some cases local syndicates have been formed to finance such workers, and the British South Africa Company has helped a number of this class of producer to erect mills by advancing money on easy terms of repayment.

Diamonds were discovered during the year about 12 miles west of Gwelo township, which led to a good deal of excitement, as it is contended that they occur in alluvial, and that a profitable industry will arise for alluvial diggers. Prospecting work was carried out on areas granted for the purpose and 1161 carats were declared up to March 31, 1906. The deposit from which they were won also contains other precious stones of value. Washing machinery is now being erected to deal with large quantities of the soil.

PRODUCTION OF GOLD

The highest point reached in the gold production of the previous year was 35,000 oz., as declared in March, 1905; but this total was soon left behind, and 40,000 oz. were declared, to be followed again by 45,000 oz., in March, 1906. The silver, lead and coal productions were not only maintained but showed an increase, and diamonds, as above mentioned, have been declared for the first time.

The reef claims current at the end of the year were 61,548 as compared with 54,730 current on March 31, 1905. The gold produced shows an increase of 125,503 oz., as compared with the previous year's output. The total production from April 1, 1905, to March 31, 1906, reached 435,019 oz., as against 309,516 oz. for the year ended March 31, 1905. The value of the production amounted to £1,556,741, as against £1,113,068, so that an increase occurred on the previous year's figures of £443,673, which may be considered very satisfactory.

Of the above gold totals the discharged companies and tributors of discharged claims produced 330,250 oz., valued at £1,206,237, and the small workers accounted for the balance, viz., 104,769 oz., valued at £350,504.

THE MINERAL PRODUCTION, 1906

	Value.
Gold, 435,019 oz.	£1,556,741
Silver, 83,996 oz.	9,958
Lead, 551 tons.	6,858
Coal, 111,105 tons, of which 82,014 tons were sold.	62,289
Diamonds, 1161 carats.	4,028
Total	£1,639,874

The previous year's value amounted to £1,166,878.

The total crushing power in the country on March 31, 1906, was equivalent to 1150 stamps and 4 tube mills, an increase in comparison with last year of 250 stamps and 3 tube mills.

The number of tons of quartz crushed for gold was 1,100,609 tons, as against 787,936 tons of the previous year. The total gold won, including the output from tailings, slimes, etc., amounted to 435,019 oz., which is 7.905 dwt. gold bullion or 28.288 shillings per ton of quartz milled.

There was no output from the copper claims, but work was continued on areas in the Victoria and Umtali districts. The copper claims current on March 31, 1906, numbered 3133, as against 3943 of the previous year.

Shipments of chrome-iron ore from claims situated on the Selukwe Commonage were made during the year, and it is hoped, if cheap railway rates can be secured, to continue such consignments. The number of claims pegged on the deposit reached 800.

SINCE MARCH, 1906

The progress of the industry since the year ended March 31, 1906, with which the report of Sir William Milton is solely concerned, has been remarkable. In the gold industry in particular a series of new records has been established, the highest production in any one month having now reached a total of 50,127 oz., as against 37,116 oz. in 1905, and 28,100 oz. in 1904.

THE MINERAL OUTPUT OF SOUTHERN RHODESIA

	Gold, Oz.	Silver, Oz.	Lead, Tons.	Coal, Tons.
1890-1898.	22,911	....	....	....
1899.	56,742	112	....	....
1900.	85,367	951	....	....
1901.	172,035	3,132	....	....
1902.	194,170	3,445	....	....
1903.	231,872	20,715	128	46,870
1904.	267,737	70,146	455	59,678
1905.	407,048	89,278	570	97,191
1906.	551,895	110,575	652	103,803

During last year 1849 carats of diamonds, 3400 tons of chrome-iron ore and 17 tons of wolframite ore were also produced.

With regard to chrome-iron ore, the deposits in the Selukwe district are reported to be of practically unlimited extent, and of uniform and high quality. The market for this ore is at present of comparatively small dimensions, but endeavors are being made to foster a larger trade, which may hereafter have an important bearing on railway receipts.

The output of minerals from Northern Rhodesia has also commenced. Mr. Ackermann visited the Rhodesia Broken Hill mine, the Bwana M'Kubwa mine of the Rhodesia Copper Company, Ltd., and the Kansanshi mine of the Tanganyika Concessions, Ltd. It was impossible until the railway had reached the Rhodesia Broken Hill mine to ship the large tonnage of mixed lead and zinc ore required to carry out on an adequate scale the metallurgical

tests, the results of which are needed to determine the nature of the plant required for the separation and treatment of the various classes of ore. When these tests have been completed, work can be prosecuted vigorously. Meantime upward of 10,000 tons of calcined zinc ore have been despatched during the past six months from the Rhodesia Broken Hill mine to Beira. Shipments of this ore will continue to be made, but the tonnage handled cannot reach its full dimensions until the plant required to deal with the medium-grade ores and to produce metallic lead has been erected. A small tonnage of rich copper ore is also on its way to Beira from the mines of the Kafue district.

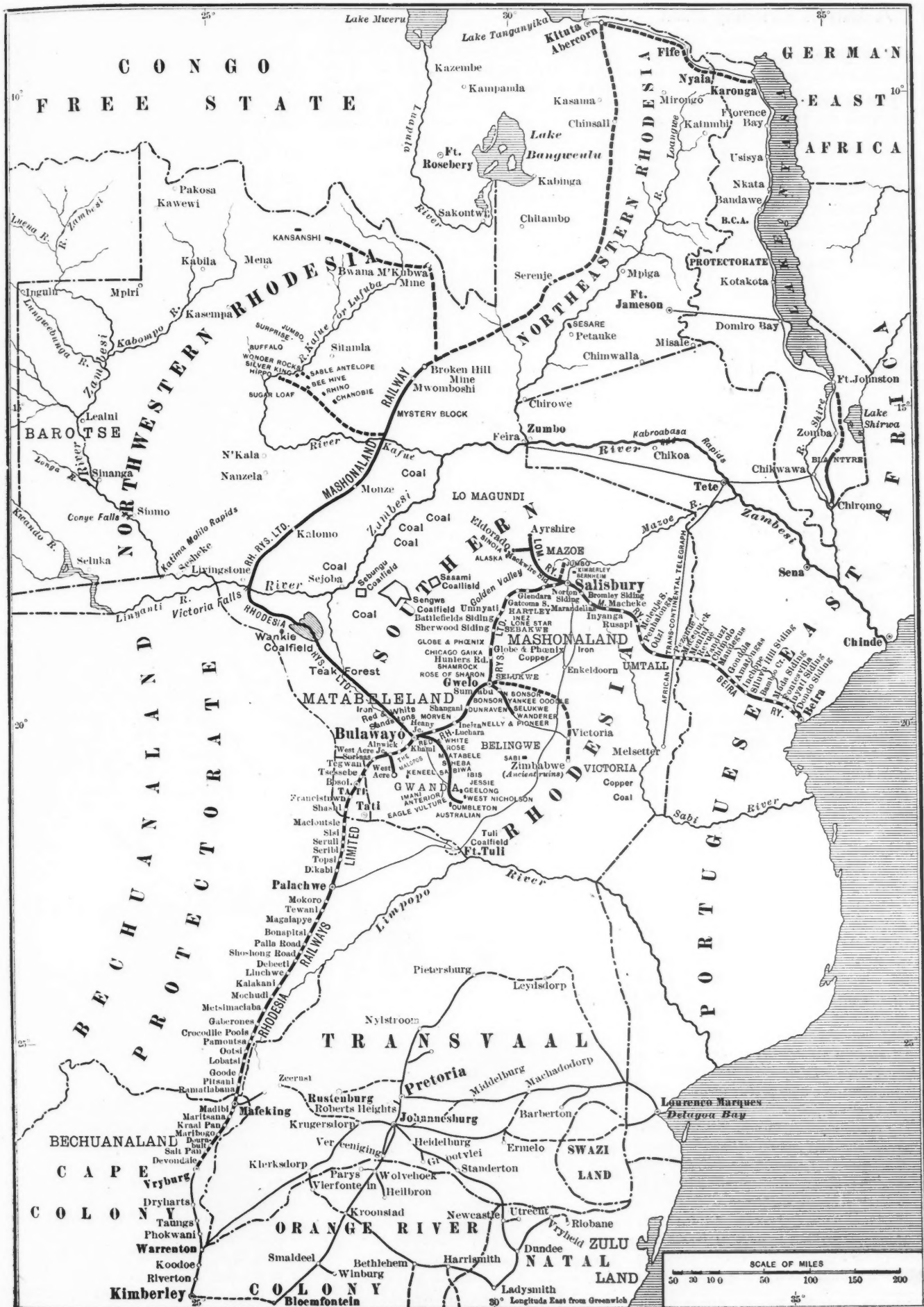
The total production of diamonds up to the end of December last was 1849 carats, the stones being of fine quality and commanding high prices. Outside the areas controlled by the Willoughby group a number of prospectors have been at work, but so far as is known at present no important finds have been made. Certain alterations have recently been made in the terms given to diggers in the districts which are now engaging attention, and special inducements have also been ordered to discoverers of any new fields situated at least 100 miles from any previously known deposit.

The French Mint

The French mint, in 1906, coined 46,486,029 pieces, of which 34,288,854 were for France, 12,194,060 for Indo-China, and 2115 for Tunis. The total weight of metal of all kinds used was 485,600 kg. The French pieces coined included 18,310,600 of gold—30,247 of 100 fr., 14,613,010 of 20 fr. and 3,665,353 of 10 fr. The silver pieces were 4,587,244 in number; 1,908,100 of 1 fr. and 2,679,144 of 50 centimes. The bronze coins were 11,394,000 in number, 3,000,000 being 10c. and 8,394,000 of 5c. The five-centime piece, or "sou," is the smallest coin made in value. For Indo-China there were coined 10,194,060 silver piasters, and 2,000,000 small copper coins. The coinage for Tunis was only 106 gold pieces and 2006 silver pieces.

The production of gold in the commonwealth of Australia in the first quarter of 1907 was 807,354 oz., a decrease of 66,029 oz., as compared with the corresponding period of 1906.

Phosphate rock is acidulated by the Wallaroo Phosphate Company, at Wallaroo, South Australia, the output of which is about 10,000 tons of acid phosphate per annum. This is consumed principally in Yorke's peninsula. The demand is greater than the local works can supply, wherefore about 30,000 tons of acid phosphate per annum has to be imported.



MAP OF RHODESIA AND THE TRANSVAAL

A Barytes Grinding Plant

By EDWARD K. JUDD*

There are two plants in the vicinity of New York for pulverizing barytes, both of them treating only imported crude mineral. That of Hammill & Gillespie, at Stamford, Conn., grinds other materials as well, but that of the Ainslie Mining and Railway Company, Ltd., in Long Island City, treats barytes alone. The latter plant is modeled closely after the pattern of those in Missouri and the

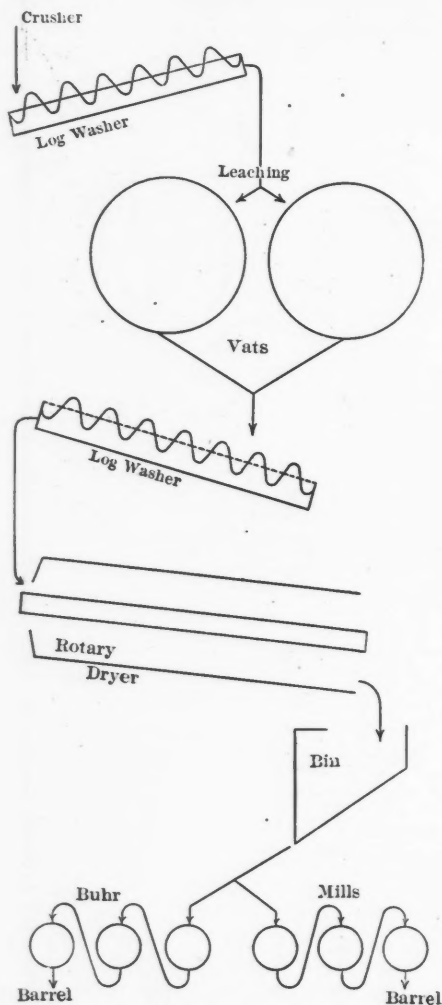
which carries it across the lake, delivering it into railroad cars. These travel over the tracks of the Inverness Railway and Coal Company, to Port Hastings, whence the ore is shipped by steamer to Montreal and New York, and by rail to Dartmouth, N. S., in each of which cities the company maintains a grinding plant.

ARRANGEMENT OF THE PLANT

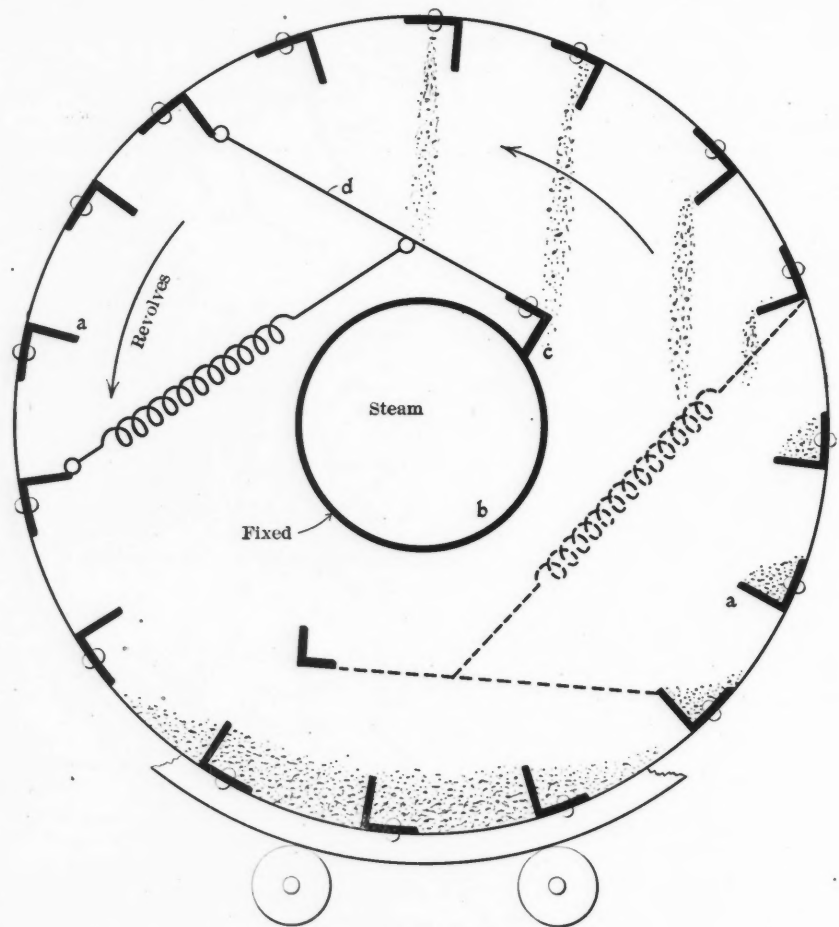
The plant in Long Island City (Greater New York) is situated on the east side of Newtown creek; the sea-going carrier is able to proceed directly to the works, and to unload at the door. The cargo is unloaded into horse dump-carts, which pass over weighing scales, for the purpose of levying the import duty, before dumping

a small gyratory crusher, the discharge from which is elevated to a log-washer. This completely separates the clay and dirt adhering to the barytes.

The discharge from the log-washer, the maximum size of which is about 1/2 in., falls through a chute into one of two bleaching tanks, for the removal of all soluble impurities. The bleaching tanks are ordinary wood-stave, circular vats, 3 1/4 ft. high and 12 ft. in diameter, lined with sheet lead. At opposite points of the circumference two 2-in. lead pipes enter each vat, and are coiled into parallel spirals on the bottom; this coiled part of the piping is punctured with small holes. The pipes are arranged to admit either steam or water; in other plants com-



BARYTES MILLING PROCESS



SECTION OF DRYER

South, but has enough features of unusual interest to deserve a short description. To the manager, H. R. Harrison, I am indebted for the privilege of visiting the works.

The crude material is mined by the company on the east shore of Lake Ainslie, on Cape Breton Island, Nova Scotia. The mineral deposit and the operating methods have been recently described.

Briefly, the mineral is carried from the working place by a system of trams and chutes to a wharf on the edge of the lake; thence it is discharged into a steam lighter

*Mining engineer, No. 55 Fulton street, New York.

under a shed. As the crude material is needed for supplying the mill, it is brought in by wheelbarrow and put on the floor beside the crusher. A ship-load is generally sufficient to keep the mill going until the next arrival, although during the winter shipments are suspended for several months.

The general plan of the process is indicated in the accompanying diagram, from which the elevators are omitted. The elevators are all of the common belt-and-bucket type, and as the building was not designed for the operations now conducted in it, a great number of these is required. The mineral is shoveled into the hopper of

pressed air also is occasionally admitted as the stirring agent, to avoid undue dilution of the acid bath.

WASHING AND DRYING

When a vat is conveniently full, an ordinary charge weighing 10 tons or more, sulphuric acid is poured in and sufficient water is added to submerge the charge. Steam is then admitted through the lead pipes, and the agitation is continued for 12 hours, or more. The acid bath is run to waste, and, in summer, is then replaced by cold water, to cool the charge; in winter this detail is not observed. In either case, the bleached material is shoveled out

of the vats upon a platform, and from this into a log-washer similar to that used in the first treatment. This washing removes the soluble sulphates formed in the vats, as well as traces of acid. The strength of the acid bath, and the duration of the bleaching process are both subject to considerable variation, according to the nature and amount of the impurities in the ore.

From the discharge end of the second log-washer, the cleaned barytes is elevated to a rotary dryer, heated by steam. This dryer is a simple, cylindrical shell 20 ft. long and 4 ft. in diameter; it rolls on two tires, one near each end, each resting on a pair of supporting wheels, and is driven by a cog and pinion near one end. It is inclined $\frac{3}{4}$ in. to the foot. To the interior surface of the shell are riveted parallel angle irons *a*, 6 in. apart, of each of which one leg extends 3 in. inward from the circumference. These are designed to lift the ore on the upgoing side, and to let it fall, from near the top, upon a central, stationary tube *b*, 1 ft. in diameter, containing steam. Another section of angle iron *c*, the length of the dryer, is hinged to the outer shell at three points by swinging arms *d*. As the shell revolves, this swinging arrangement scrapes off the material collected on the top of the steam tube; the spring supports serve only to cushion the oscillations of the scraper. The dotted lines indicate the position taken by the scraper during the lower part of its rotation. The dryer revolves 12 times per minute. From the dryer the barytes falls into a hopper which stores the supply for the grinders.

The product is pulverized in buhr mills, arranged in two independent series of three each, the ore passing from one to the next until it has passed through the three mills. The stones have a diameter of 4 ft. The flow from the last mill is caught in ordinary flour barrels, holding 550 to 600 lb. each, in which it is shipped.

The Revised Nevada Mining Law

The State mining regulations have been revised by the Nevada legislature and the new law will be come effective on July 1 next. The changes made are chiefly in minor details, the most important modification being a clause reducing the period allowed for recording the location and boundary notices from 90 to 20 days.

The amended act is as follows:

Sec. 1. Any person, a citizen of the United States, or who has declared his intention to become such, who discovers a vein or lode may locate a claim upon such vein or lode by defining the boundaries of the claim in the manner hereinafter described and posting notice of such location at the time and point of discovery, which notice must be posted upon one of the several monuments prescribed in Sec-

tion 2 of this act, and such notice must contain: First, the name of the lode or claim; second, the name of the locator or locators; third, the date of location; fourth, the number of linear feet claimed in length along the course of the vein each way from the point of discovery, with the width on each side of the center of the claim and the general course of the vein or lode as near as may be.

Sec. 2. The locator of a lode mining claim must sink a shaft upon the claim located 4x6 ft. to the depth of at least 10 ft. from the lowest part of the vein of such shaft at the surface, or deeper if necessary, to show by such work a lode deposit of mineral in place; a cut or cross-cut or tunnel which cuts the lode at a depth of 10 ft., or an open cut along the said ledge or lode equivalent in size to a shaft 4x6x10 ft. deep, is equivalent to a discovery shaft. The locator must define the boundaries of his claim by removing the top of a tree, having a diameter of not less than 4 in., not less than 3 ft. above the ground, and blazing and marking the same; or by a rock in place, capping such rock with smaller stones, such rock and stones to have a height of not less than 3 ft.; or by setting a post or stone, one at each corner and one at the center of each sideline. When a post is used, it must be at least 4 in. in diameter by $4\frac{1}{2}$ ft. in length, and set 1 ft. in the ground. When it is practically impossible on account of bedrock or precipitous ground to sink such posts, they may be placed in a mound of earth or stones, or where the proper placing of such posts or other monuments is impracticable or dangerous to life or limb, it shall be lawful to place such posts or monuments at the nearest point properly marked to designate the right place. When a stone is used, not a rock in place, it must be not less than 6 in. in diameter and 18 in. in length and set two-thirds of its length in the top of a mound of earth or stones, 4 ft. in diameter and $2\frac{1}{2}$ ft. in height. All trees, posts or rocks used as monuments, when not 4 ft. in diameter at the base, shall be surrounded by a mound of earth or stones 4 ft. in diameter by 2 ft. in height, which trees, post, stones or rock monuments must be so marked as to designate the corner of the claim located; provided, however, that the locator of a mining claim shall within 20 days from the date of posting the notice of location define the boundaries of said claim by placing at each corner and the center of each sideline one of the hereinbefore described monuments, and shall within 90 days from the date of posting of said location notice perform the location work hereinbefore described.

Sec. 3. Any locator or locators of a mining claim, after having established the boundaries of said claim, and after complying with the provisions of this act, with reference to the establishment of such boundaries, may file with the dis-

trict mining recorder a notice of location, setting forth the name given to the lode or vein, the number of linear feet claimed in length along the course of the vein, the date of location, the date on which the boundaries of the claim were completed, and the name of the locator or locators. Should any claim be located in any section or territory where no district has yet been formed, or where there is no district recorder, the locator or locators of such claim or claims may file with the county recorder notice of locations as set forth above, and said notice of locations will be *prima facie* evidence in all courts of justice of the first location of said lode or vein. Within 90 days of the date of posting the location notice upon the claim the locator shall record his claim with the mining district recorder and the county recorder of the mining district or county in which such claim is situated by a location certificate which must contain:

First. The name of the lode or vein.

Second: The name of the locator or locators.

Third. The date of the location and such description of the location of said claim, with reference to some natural object or permanent monument, as will identify the claim.

Fourth. The number of linear feet claimed in length along the course of the vein each way from the point of discovery, with a width on each side of the center of the vein, and the general course of the lode or vein as near as may be.

Fifth. The dimensions and location of the discovery shaft, or its equivalent, sunk upon the claim.

Sixth. The location and description of each corner, with the markings thereon.

Any record of the location of a lode mining claim which shall not contain all the requirements named in this section shall be void. All records of lode or placer mining claims, millsites, or tunnel rights heretofore made by any recorder of any mining district or any county recorder are hereby declared to be valid and to have the same force and effect as records made in pursuance of the provisions of this act. And any such record, or a copy thereof, duly verified by the mining recorder or duly certified by a county recorder, shall be *prima facie* evidence of the facts therein stated.

According to the *Bd. of Trade Journ.*, Feb. 7, 1907, a company has been formed to work the iron sand found in extensive deposits on the Japanese coast. The iron sand contains no sulphur nor phosphorus. The deposit to be worked lies between Muroran and Hakodate; in some places it is 45 miles in length, 1800 ft. wide, and 4 to 10 ft. deep.

An enormous deposit of pure salt is reported to have been found on the west side of the Utah desert, not far from the Nevada State line.

Portland Cement Resources of West Virginia

By G. P. GRIMSLEY*

West Virginia, with its valuable deposits of coal and natural-gas fuel, its 4000 miles of railroad and over 500 miles of navigable waterways, nearness to large markets, and almost inexhaustible deposits of materials for the manufacture of portland cement, deserves careful attention on the part of capitalists in search of profitable investments. At present there is a single mill, that of the Buckhorn Portland Cement Company, located on the Cheat river, near Rowlesburg, which is in successful operation with a daily output of 1200 barrels. The State Geological Survey has recently issued a report on clays, limestone, and cement in West Virginia. In my work in the preparation of this report, as well as in reports on these resources for private companies during the past two years, I have been surprised at the natural advantages for the growth of the cement industry in this State, and the fact that many of these valuable properties remain undeveloped.

ADVANTAGES OF MARTINSBURG

In the eastern part of the State is the city of Martinsburg, reached by two railroads, the Baltimore & Ohio, and the Cumberland Valley. It is only 75 miles from Washington, 100 miles from Baltimore, 196 miles from Philadelphia and 228 miles from Pittsburg. These cities can be reached with a very low freight rate. In this region the Shenandoah limestone of Cambro-Silurian age covers a wide area and consists of belts of rock of marked uniformity of composition in the same belt, but varying from one belt to another. Near Martinsburg there are several belts of high-grade rock, light in color and smooth in fracture, which average in composition 96 to 99 per cent. carbonate of lime, and less than one per cent. of silica. These belts can be traced in a few cases eight to ten miles in length and in width, 25 to 600 ft.

On account of the high degree of purity the rock is in demand for furnace flux and has been extensively quarried for this purpose. From 50,000 to 70,000 tons have been shipped in one month from the Martinsburg quarries mostly to Pittsburg. The impression has been that this grade of rock is reaching exhaustion in this area, but a recent examination has shown that there are very large deposits not yet opened.

Dolomites and magnesian limestones of almost theoretical purity occur in elongated lenses in this field, and have been worked on a small scale to furnish rock for open-hearth steel furnaces. While the

high-grade limestone could be used in the manufacture of portland cement, there are a number of belts of a lower grade of stone adapted to this work. They average in carbonate of lime about 90 to 92 per cent. with a higher percentage of alumina and silica than in the pure rock. All of these belts trend north 25 deg. east, with very little soil cover, the rock over much of the area coming to the surface. Diamond drill holes to a depth of 200 ft. were stopped in limestone of the same grade as that at the surface.

In direct contact with the limestone are belts of shale in which the percentage of silica and alumina is 72 to 80 per cent. and the ratio of these elements within the proper proportion for economical manufacture. Cement made from a proper mixture of this limestone and shale shows a high degree of strength. Neat briquets after 28 days broke at 850 lb. and at over 500 lb. with three parts sand.

FAVORABLE CONDITIONS

The direct association of these materials will result in economy in quarrying and handling the materials. In many places it would be possible to build a mill which would stand half on shale and half on limestone. The quantity of materials available with low quarry cost would be almost unlimited even with a very large mill. The total quantity would last a number of plants for centuries. Water supply is constant and abundant in the Opequon creek which flows part of its course along the contact of a wide belt of limestone and shale. The Potomac river has high limestone bluffs in part of this area and is only eight to ten miles distant from Martinsburg. On this river is a large electric power plant using the water power of the river. This plant now supplies light and power to Martinsburg, and a second plant is in process of construction, thus introducing cheap light and power for mills.

The topography is rolling and suitable for building sites of any size. Coal for fuel can be secured from the Cumberland region, 75 miles distant, and there is active coal development in the mountains near Cherry Run, 15 miles distant. These coals are all probably too low in volatile matter for use in the rotary kilns. The best grade of cement coal used throughout the United States east of the Mississippi river is the Pittsburg coal from the Fairmont, West Virginia, mines. This coal can be shipped to Martinsburg for \$2.60 a ton.

In addition to the cement manufacture, a comparatively small additional expense would add the equipment for crushing rock for ballast and for crushing the high-grade rock for use as flux in the steel works at Baltimore and Pittsburg. The screenings would be available for concrete work. The high-grade rock as well as the beds of dolomite near at hand could be burned into lime which would

reach a wide market. With these natural advantages, the Martinsburg area is destined to be one of the very important cement centers of the country, and at the present time much attention is being paid to it and several tracts are under option. The prices for the land are at present reasonable, and the people are interested in securing new enterprises.

SHEPHERDSTOWN AND THE SHENANDOAH

Northeast of Martinsburg, at Shepherdstown this same belt of limestone forms a vertical bluff along the Potomac river, for over a mile. The strata as at the other localities, are steeply inclined. Much of this rock is highly magnesian, but pure strata are to be found, and shales and clay at no great distance away.

The dam in the Potomac, which is at present out of repair, furnished water power for the old natural cement mill at this place, and was estimated to give 1000 h.p. The water was backed for five miles giving connection with the Chesapeake and Ohio canal, and through this waterway the cement was shipped to Washington, at a cost of 8c. a barrel. The area is also reached by the Norfolk & Western Railroad.

The rock along the river forms a vertical bluff with a height of 125 ft., with practically no cover, so that it could be worked with a high face in an open quarry. The Fairmont coal for the kilns could be shipped part of the way by water and thus reduce its cost. Good building sites are available within a mile of the town.

Further south, in Jefferson county, near Charlestown and Millville, this limestone is found suitable for Portland cement, and the shales near at hand. Near the latter place is an extensive deposit of marl of good thickness. A large electrical power plant is being constructed on the Shenandoah river, within a mile of the marl deposit. The area is reached by the Baltimore & Ohio road. Other locations with similar deposits of limestone and shale are to be found in these counties.

Near Keyser, in Mineral county, the lower Helderberg limestone contains 93 to 98 per cent. carbonate of lime with shales near. This location is near the Baltimore & Ohio and the Western Maryland railroads, and not far distant from large coal-fields.

Near Hendricks, in Tucker county, is a tract of land of nearly 500 acres, which is almost ideal in its arrangement of materials for cement work. At the base of the mountain is the railroad and river with water supply. On the hill above is the deposit of Greenbrier limestone at least 400 ft. thick, and over the limestone is the deposit of red shales at least 200 ft. thick. In places these have slipped and formed 6 or 8 ft. of cover over the limestone. The silica-alumina ratio in this shale is 3.6. These materials have been

*Assistant State geologist, Morgantown, W. Va.

tested in one of the large testing laboratories, and have yielded a high-grade portland cement.

THE GREENBRIER LIMESTONE

This locality is near some of the large coal mining centers, and coal could be obtained from these mines at a very low cost. It is not necessary to go away from the limestone tract for fuel, a condition which adds still more to the value of the location. Above the limestone 655 ft., or 1050 ft. above the railroad track, is a vein of coal $4\frac{1}{2}$ ft. thick. The entry has been driven a couple of hundred feet to the northeast, and shows a bright glistening coal with 25 per cent. of volatile matter and 68 per cent. of fixed carbon. The coal is probably the Nuttall (Sewell) seam, although the identification is not certain, but it belongs in the Pottsville series.

A timber chute lined with steel plates and 1200 ft. long, leads from the mines to the inclined track, 1500 ft. long, to the mill site. Natural gas has been piped to the town a mile distant. The limestone quarry was opened a few years ago for lime, which is burned in two nine-foot steel-clad kilns, and there is a good market for the lime in the tanneries and pulp mills of this section.

In the southern part of the State, along the Chesapeake & Ohio Railroad, the Greenbrier limestone reaches a thickness of 1000 ft. While this rock varies in composition over the area, there are large deposits that are high grade limerock and near clays and shales that might be utilized for cement manufacture. The area is not far removed from the New River coalfields, and has abundant water supply, in places available for water power. The product would reach the eastern markets over a trunk line railroad.

Near Morgantown, in the northern part of the State, this same limestone is found with the shales over it. The limestone is, at least, 100 ft. thick, and is near the railroad. At Morgantown the product could be shipped to Pittsburg and the cities along the Ohio river by boat or barge, affording cheap transportation. Deckers creek, flowing along the outcrop of the rock, would furnish an abundant water supply. The area is three to four miles from two large coal mining centers, and seven miles from the natural gas pipe lines with gas at 5c. per 1000 cu.ft. Pittsburg coal would cost at the plant one dollar a ton. The materials have been carefully tested in two laboratories and have proved suitable for the manufacture of a high quality of cement. Across the river from Morgantown is a good deposit of limestone and shale with the Pittsburg coal on the same tract, and the area is crossed by two natural-gas pipe lines. This area is near the Baltimore & Ohio Railroad, and on the river.

As a result of the work of the State Survey attention has been called to these

opportunities for portland-cement development, and much interest is now being taken in this field. Three companies are now carefully investigating some of the areas described, and the summer of 1907 will probably see work started on new plants. When the development is fully started the growth of the cement industry in this State will be rapid. These tracts, with their natural advantages, justify the prediction that West Virginia will before long become a prominent cement-producing State.

Treatment for Electrical Shocks

BY RICHARD LEE

The common use of electricity in coal mines, and the conduction of current along gangways and entries through exposed wires, has resulted in numerous accidents due to miners coming in contact with two conductors at different potentials. The electric shock that results depends mainly on the strength of current passing through the body, the time for which it is maintained, and the physical condition and peculiarities of the victim. There is a difference of opinion as to whether alternating-current or continuous-current shocks under certain conditions are the more dangerous. It is well to remember, however, that a high-potential alternating circuit should not be regarded as safe to handle, even when the current has been shifted off, until it has been connected to earth and so practically discharged.

A live wire may often be handled without inconvenience when standing on an india-rubber mat or on a dry-wood floor, but it is a safe rule to avoid contact with any part of an electrical apparatus without thoroughly understanding what one is doing. The symptoms of an electric shock are as follows: (1) Stoppage or weakening of the action of the nerves; (2) contraction and stiffening of the muscles; (3) stoppage or weakening of the action of the heart. The contraction of the muscles is what prevents the victim from letting go after grasping a live wire.

A person who has received a severe shock may become unconscious and seemingly cease to breathe. None of these symptoms necessarily indicates death, and under no circumstances should remedial measures be abandoned until a physician has pronounced life extinct. It is most likely that many victims have been given up for dead after an electric shock, when the continuous application of further remedies might have restored them. A number of cases are on record where subjects who have received severe shocks have been unconscious for more than 30 min. without the slightest discernible heart action, and still have recovered because of the artificial respiration applied.

In treating a victim, it is advisable to elevate the body and legs so as to send the blood to the brain, which action may prove a remedy for syncope, a condition often resulting from such a shock. If the heart has stopped beating, it is sometimes possible to start that organ again by applying a series of smart taps over the chest. The treatment should also be accompanied by drawing the arms in and out so as to aid or rather force artificial respiration. A number of authorities also advocate hypodermic injections of ether and alcohol beneath the skin, so as to distend the arteries and help the heart action. In trying to disengage a man who is in contact with live metals, it is well to remember that dry clothing is a good insulator, and the best plan is to seize the victim's arm on the clothing and try to pull him away. Under no circumstances should the rescuer touch the bare skin or take hold under the armpits where the clothing is apt to be damp.

The Lake Fork District, Colorado

On the western side of the Continental Divide, near the head of Lake Fork of Gunnison river in southwestern Colorado, about 14 miles by road northeast of Silverton and nearly the same distance southwest of Lake City, is a mining region that may be considered a geologic extension of the famous Silverton district. The Silverton district has been worked for many years. In the summer of 1906 a party under Mr. Cross, engaged in reconnaissance work in the San Cristobal quadrangle, made a somewhat hurried survey of the Lake Fork region. The discussion is published by the Geological Survey in its annual economic bulletin, No. 315.

The region was prospected many years ago and has been the scene of more or less activity ever since, but developments have been greatly retarded by lack of transportation facilities. To reach the nearest railroad, at Animas Forks, 5 miles west of Whitecross, one must cross a divide requiring a 1500-ft. climb, and the railroad at Lake City is nearly 15 miles distant. Nevertheless considerable ore has been shipped from the various mines of the region, and active development is progressing as rapidly as the conditions warrant. Many prospects have workings of several hundred feet.

At the time of the visit the Ohio mine, on the east side of Lake Fork between Copper and Silver creeks, was being more actively developed than any other in the vicinity. About 70 tons of ore had been shipped, and nearly as much more lay in the bins ready to be moved. The ore in the bins was estimated to carry 12 to 15 per cent. copper, \$10 to \$12 in gold, 50 to 60 ounces in silver, and 10 per cent. zinc.

Charles Haynes Haswell

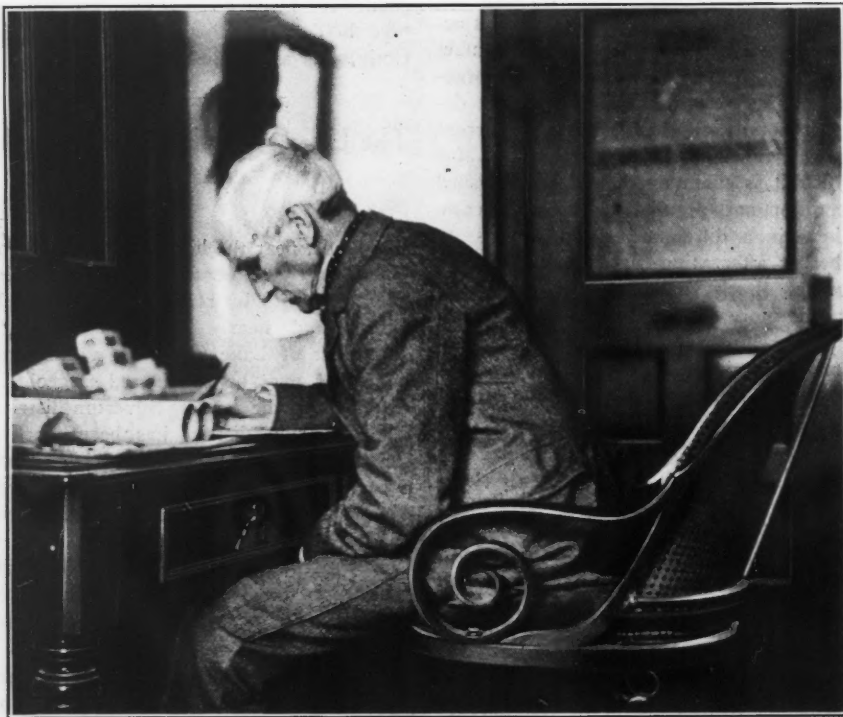
Charles Haynes Haswell, the oldest civil engineer of note in the world and one of the most distinguished marine engineering experts, died at his home in New York City, May 12, in his ninety-eighth year, his death being due to a shock attending a dislocation of the shoulder. Up to the time of the accident he had been in good health and was regularly at his work in charge of important construction operations for New York City.

Mr. Haswell was born of English parents in this city, May 22, 1809. At the age of 19 he secured employment in the engine works of the pioneer establishment of James P. Allaire. While with this firm he was selected by the United States Navy Commissioners to

reanean, a proposal was submitted to the Secretary of the Navy that the funnels then in use be replaced by two horizontal pipes leading into the wheel house, the idea of the inventor of the scheme being that the smoke from the fires would be concealed from the enemy by being drawn from the furnaces by the suction of the paddle wheels. The proposal was indorsed by the secretary; and Mr. Haswell, who fought the project as an impracticable idea, was suspended from the service. The arrangement was given a trial, which was witnessed by many prominent government officials, and upon its proving a complete failure, Mr. Haswell was notified that if he would apologize for his action he would be reinstated. This he refused to do, and as a result was detached from the service.

Mr. Haswell built several merchant steamships and then engaged in engineering practice in New York. For over 40 years he was surveyor of steamships for the marine underwriters of New York. He designed and located the buildings on Hoffman island in the lower bay and built the crib bulkhead at Hart's island. He constructed what at the time were the most extensive and difficult building foundations in the city. For several years past he had supervised extensive work of construction and improvement at Riker's island. From 1855 to 1858 he was a member of the board of councilmen of New York City, and during the latter year was its president. Later he entered the employ of the city, and during his many years of service acted as chief engineer of the dock department, superintending engineer to the department of charities and correction and the board of health, and consulting engineer to the board of public improvements. He was appointed by the latter body in 1898 to design and supervise the extension of Riker's island, and in 1902 was appointed consulting engineer to the board of estimate and apportionment, which position he held at the time of his death.

Mr. Haswell first brought out his pocket-book, which is now in its seventy-second edition, in 1843, the volume at that time containing 284 pages. He was also the author of "Reminiscences of an Octogenarian," a book of memoirs covering the old New York from 1816 to 1860. He was a member of the Engineers' Club of New York and Philadelphia, and belonged to many engineering and scientific organizations, among these being the American Society of Mechanical Engineers, the American Society of Civil Engineers, American Society of Naval Engineers, the Institution of Civil Engineers and the Institution of Naval Architects of Great Britain.



CHARLES HAYNES HASWELL

take charge of the building of a steam war vessel for the Government and in 1836 joined the United States Navy as chief engineer, receiving his commission as engineer-in-chief in 1845. Some years prior to this date he conceived the idea of building a steam launch and in 1837 constructed the "Sweetheart," which was the first private steam yacht launched. He held the rank of engineer-in-chief of the navy until 1851, and during that period designed the machinery for ten war vessels and introduced numerous mechanical improvements for increasing the early steam navy's efficiency.

His aggressiveness as a practical engineer and his ideas due to his mechanical training involved him in frequent controversies with the naval authorities. When the old "Missouri" some fifty years ago was about to start for the Mediter-

He was, however, shortly after reinstated and later was chosen to design and superintend the building of the machinery for several revenue cutters. In 1843 he was ordered to Washington to discharge the duties devolving upon the engineer-in-chief, and in 1845 he was promoted to that position, which he held until 1851, when President Fillmore appointed a civilian to supersede him, later, however, restoring to him his rank as senior chief engineer.

In 1847-48 he designed the entire boiler and engine equipment of the steam frigate "Powhatan." Owing to a lack of professional aid, and the urgent requirements of the service and the contractors, he was compelled personally to design every detail and made the working drawings himself.

After retiring from the navy in 1851

Centennial Copper Mining Company

The treasurer's statement in the annual report of the Centennial Copper Mining Company for the year ending Dec. 31, 1906, gives a balance of \$340,310.30 for the end of that period as compared with \$331,779.16 of the year before. Energies were directed chiefly toward the development of the property. The sale of 2,253,015 lb. of copper brought \$439,155.50 or an average of 19.5078c. per pound.

Operations of the year included 2437½ ft. of sinking, raising and drifting, and 12,741 fathoms of stoping. Of the 192,866 tons of rock broken 166,000 tons were treated yielding 13.58 lb. of refined copper per ton. The cost of sinking was \$19.28 per foot, raising \$10, and drifting \$6.223 per foot. The cost of stoping was \$7.997 per fathom.

The total assets at the end of the year were \$2,091,233.11.

Chrome Plant of U. S. Metals Refining Company

A New Copper-smelting Plant Now in Course of Construction
and Description of an Important Electrolytic Refinery

BY LAWRENCE ADDICKS*

The property at Chrome, N. J., formerly known as the DeLamar Refinery, is now owned by the United States Metals Refining Company, which is a subsidiary company controlled by the United States Smelting, Refining and Mining Company. It forms the copper-refining link in the metallurgical chain operated by the parent company. Since the change of control two years ago the refinery has been brought up to 200 tons a day capacity, and a complete copper-smelting plant with blast furnaces and converters has been added, arranged for rapid expansion into

as possible a self-fluxing mixture, it being the intention to bed the ores as is commonly done in lead practice.

ORE SAMPLING

At the head of the trestle is a well equipped sampling mill, designed to make the least fines consistent with accurate sampling. Ore is dumped from the car on a 5-in. grizzly and any lumps retained are broken by hand with a sledge. The grizzly delivers directly to a Brunton oscillating sampler, which cuts out one-fifth which passes successively through three other samplers and appropriate crushing

the scales to a Reedy electric elevator, installed in duplicate, and are raised with the motorman to the furnace charging door and dumped directly into the furnace, which is charged alternately from either side.

BLAST FURNACES AND CONVERTERS

The blast furnaces are of the usual water-jacketed type, the jacket sections being vertical. It is intended to install two large furnaces, but the plant is being started with a small 38x60-in. Traylor furnace, formerly in use at the refinery and one large furnace. The building and



GENERAL VIEW OF SMELTING PLANT, U. S. METALS REFINING COMPANY, CHROME, N. J.

a still larger unit, if found desirable. The entire plant as it stands today represents the most modern practice.

Shipments can be received by rail, by lighter or directly by steamer, a large steamship dock having been erected in connection with the smelter. Cupriferous material of every nature from lean ore to bullion is received. A three-track trestle with an ore-bin capacity of about 8000 tons affords ample storage for properly distributing the different ores to as nearly

machinery, so that $1/625$ of the original carload is delivered in $1/4$ -in. size upon the floor of the final sampling room, and $624/625$ is returned as reject to the car from which it was taken and sent on to the bins. The first Brunton sampler which takes 5-in. lumps is the largest of the type that has been built. The capacity of the mill is conservatively rated at 100,000 lb. an hour.

From the ore beds the ore is transferred to an electric-driven charging-car carrying one trailer which runs on tracks at a lower level. The car and trailer extend just the width of the charging doors of the blast furnaces. The pair pass on over

equipment is all on the larger scale. Air is furnished at 32 oz. to the furnaces and jacket water is taken from the 5000-gal. circulating system in the refinery. The jackets were made by the Marine Boiler Works Company.

The blast furnaces produce matte assaying 50 per cent. copper, and a highly silicious slag. The latter is withdrawn in sectional cast-steel cars handled by electric locomotives. The matte is collected in 14-ft. settlers in the customary way and tapped out into ladles handled by a 40-ton crane and poured directly into the converters, of which there are at present two stands and six shells.

Note—From advance sheets of *The Mineral Industry*, Vol. XV.

*Superintendent, Chrome Plant, United States Metals Refining Company, Chrome, N. J.

The converters are of the trough type 84x126-in., Allis-Chalmers, motor governed and supplied with air at 12 lb. The blister copper is cast into bars and sent to the refinery, where it is treated just as outside bullion, a complete interaccounting of metals being made between the two plants.

CHIMNEY AND FLUE

Gases from the various units enter a long flue 12x13 ft. equipped with self-discharging hoppers throughout, and finally pass into a 200x12-ft. Kellogg brick stack. No dust chamber has been erected, as the size of the flue is ample at present. The stack will easily handle four furnaces, and should these be erected later there is ample ground space for a dust chamber. The stack is furnished with a self-sealing discharge for flue dust and is built without a lining.

POWER PLANT

Power for the smelter is supplied from a separate plant on account of lack of space for additional engines in the refinery power house. Steam and electric power, however, are taken from the refinery power house. Air for the blast furnaces is taken from a No. 9 Root blower, driven by a 11x24x36-in. Hamilton-Corliss tandem engine. The converters are supplied by a 13x28 in. and 30x30x42-in. Nordberg blowing engine. This power house also contains a 13x27-in. and 23x15x30-in. Ingersoll-Rand cross-compound two-stage Corliss air compressor, furnishing air at 80-lb. pressure for general use, reserve units for this service being installed in the other power house.

SAMPLING PIG COPPER

Following now the course of the converter bars into the refinery, they are taken on narrow-gage cars by an electric locomotive to the pig-copper scales. Cars of five tons capacity are used. This gives a gage which will take a curve of 25-ft. radius and also gives a car which can be pushed by hand, when desired, as all the cars are equipped with roller bearings. The scales are in duplicate, all material being weighed first on one, then on the other, one scale being used by the representative of the seller in the case of custom material.

From the scales the pig is taken directly to the sampling room, which is equipped with three high-speed drills and apparatus for rapidly handling the material, the capacity of each drill being 100 pigs an hour. As an average pig weighs 300 lb. this gives a total capacity of 45 tons an hour.

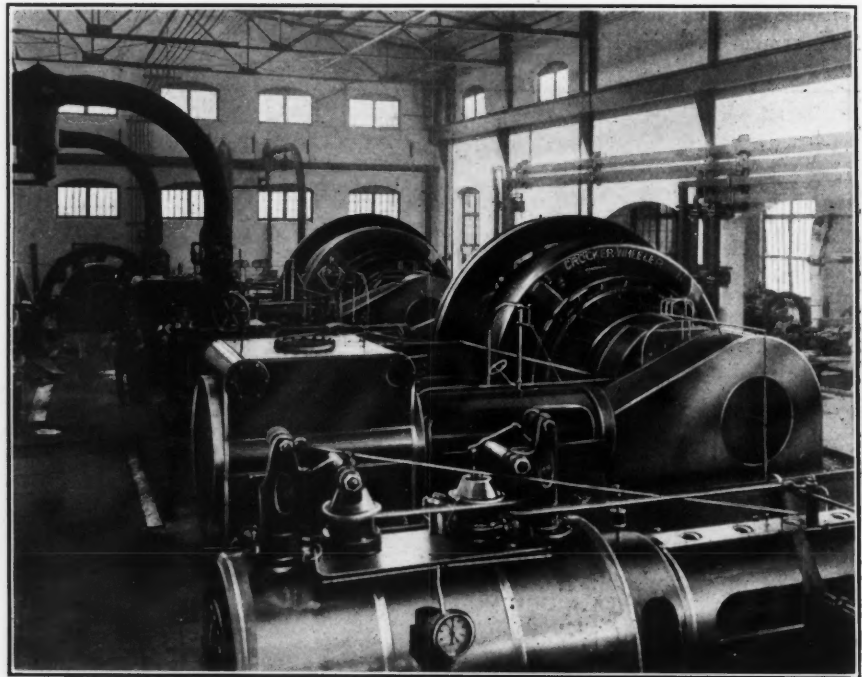
ANODE FURNACES

From the sampling room the tracks lead directly to the anode furnaces, which are three in number. Two of them have a capacity of 100 tons in 24 hours, and the

third 150 tons. Just short of 200 tons has been drawn from the large furnace in a single charge. This very large increase in size over the customary unit has been entirely successful. The furnace was built to be equipped with waste heat boiler and charging crane, but the arrangement is being tried out first on the wirebar furnace, which is an exact duplicate, and will be described in that connection. The two smaller furnaces are equipped with B. & W. type boilers. The anode copper is ladled into molds carried by a Walker casting wheel, each anode being 3 ft. square and weighing 600 lb. As far as I know this is the largest anode that has ever been used. The old plant had a capacity of about 115 tons a day, and when this was to be brought up to 200 tons, it was decided to build no new tanks

ical relations will probably be 30 days for anodes and two days for cathodes, as the present cathodes are exceedingly heavy, weighing about 300 lb. apiece. The current density is about 21 amperes per square foot, which is higher than any other plant with the exception of the Boston & Montana. The normal current is 9500 to 10,000 amperes. The tank room is divided into three circuits of 272 tanks each. A current density of 500 amperes per square inch has been adopted for all bus bars on electrolytic work.

The slimes are sluiced through launders to a screen and sump from which they are pumped with a steam siphon to the top of the silver building. The circulation of electrolyte is accomplished by means of hard-lead centrifugal pumps in a pump house outside of the main build-



REFINERY POWER PLANT, U. S. METALS REFINING COMPANY

but to increase the depth of the tanks 12 in. changing from electrodes 2x3 ft. to 3x3 ft. and increasing the current density about 20 per cent.

The anodes are cooled in a bosh of the same dimensions as a tank in the tank house and are kept in this space relation upon a special car and upon storage racks under the yard crane if not required at once in the tanks, so that all handling of anodes is mechanical and rapid.

TANK HOUSE

The tank house contains 816 tanks in 24 groups of 34 tanks each, arranged in accordance with the Walker patent. The building is in three bays with two cranes in each bay. Twenty-six pairs of electrodes are used to a tank. At present anodes are left in 28 days and the cathodes fourteen. Experiments now being carried out indicate that the most econom-

ing. The tanks are two in cascade and a circulation of about 4 gal. per minute per tank is maintained.

WIRE-BAR FURNACES

The cathodes when unloaded are placed by a mechanical device in horizontal piles of 5000 lb. each and sent to the wire-bar furnaces, where they are picked directly from the car by the charging crane and put into the furnaces. Charging cranes have been used for many years in connection with open-hearth steel furnaces, but this is the first successful application to a copper-refining furnace. The design has been modified from the steel type, the load being pushed off the peel instead of being dumped from a shovel, and the furnace can be packed as tightly with cathodes as by hand. In view of the success of this experiment, it is intended to extend the use of the crane to all the

furnaces. Patents on the arrangement have been applied for.

In order to accommodate the charging crane, it was necessary to build a furnace with one side practically all doors. Three doors 3 ft. 6 in. by 6 ft. 11 in., have been provided with only sufficient space between to afford room for a powerful buckstay. The hearth of the furnace is 14 ft. 5 in. x 34 ft. 3 in., and the walls are lined with magnesite brick to a point about two courses above the metal line, where a single course of chrome brick is laid and the wall continued with silica brick, the object of the chrome brick being to interpose a neutral layer between the basic and the acid brick. The bottom of the furnace consists of 9 in. of sand upon 9 in. of brick resting upon iron plates which are supported by brick piers.

The gases pass up a 6-ft. brick-lined iron stack placed directly over the poling

Engineering Works, and is equipped with four motions, motor driven. It travels on overhead runways, passing the various furnaces. By recharging at night, which can be very rapidly done with the crane, 400,000 lb. can be brought round in one charge. In addition to the large furnace there are two 75-ton units which will probably be replaced by larger ones at an early date.

POWER PLANT

The furnace-coal and ash-handling system is not yet completed at this writing. It is intended to handle all the coal through the roof trusses in electric larries; the ashes are to drop directly into cars which run outside the building through a tunnel to a shaft where they will be picked up by a yard crane and transferred to the narrow-gage railroad system.

Anthracite buckwheat is burned under

the Middlesex Water Company and softened in a We-Fu-Go plant, which delivers it to a suction well. Three outside-packed plunger pumps force it through primary and secondary closed heaters furnished by the Goubert Manufacturing Company, and then by way of the Green economizer to the boilers. Complete duplicate feed mains are installed and in addition there is a test service, feeding certain boilers next the superheaters. Large measuring tanks are provided and all piping and valves are arranged for frequent steam-consumption tests on the various engines.

The steam is superheated in a separately fired Schmidt superheater to 475-500 deg. F., which has been found economical after experiments ranging from the saturated temperature of 366 deg. F. to 750 deg. F. A duplicate system of headers is installed, arranged so that any engine or engines can run on either superheated or saturated steam and virtually forming a ring main. Cochrane separators are used to take care of priming, and all high-pressure grips are handled by a Holly return system. Locke engine stops are used on all the larger units.

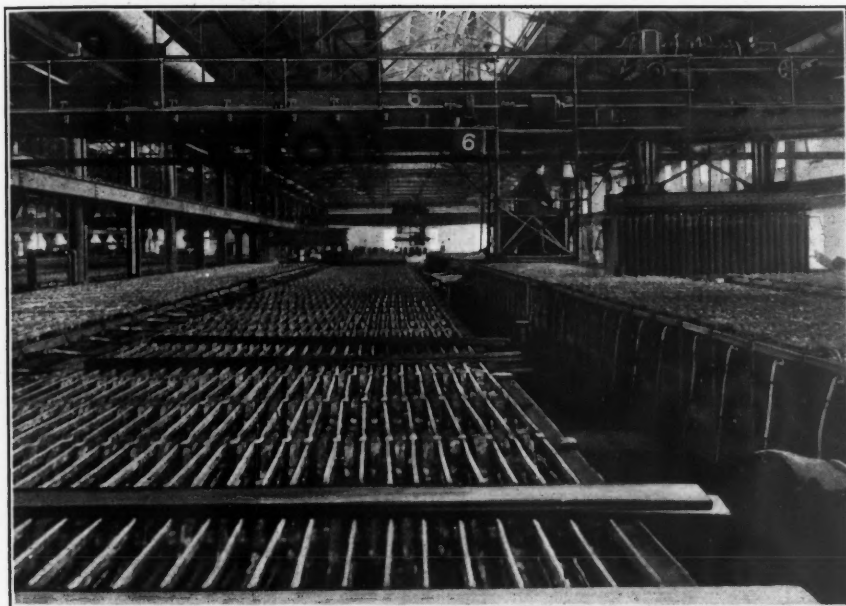
There are four electrolytic generating units, two 1500-h.p. Nordberg engines driving 1050-kw. Crocker-Wheeler generators, one 1125-h.p. Rice & Sergeant engine driving a 750-kw. Crocker-Wheeler generator and a 775-h.p. Hamilton-Corliss engine driving a 520-kw. Crocker-Wheeler unit. These are all horizontal, 100 r.p.m., full Corliss gear and valves, except the Rice & Sergeant, which has poppet valves on the high-pressure cylinder, and the Hamilton-Corliss, which runs at 105 r.p.m. Normally three out of the four engines are in service and the 520-kw. unit is arranged to run in the place of any of the others.

The switches are of the multi-blade knife type, furnished by the Walker Electric Company, three 5000-ampere units being placed in parallel to give the full 15,000-ampere overload capacity of the largest generators. Instead of circuit breakers, Eppensteiner engine-stop relays are used. This is a relay attached to the ammeter shunt which operates the engine stops and shuts the engine down in case of a current overload. It was developed at this plant and has recently been put upon the market under the above stated name by the Western Electrical Instrument Company. The bus-bars consist of two bars in parallel with a total cross-section of 20 square inches.

Light and power are furnished by three 300-h.p. Nordberg-Corliss engines driving 200-kw. Westinghouse generators and a 100-kw. high-speed unit, all operating in parallel at 240 volts direct current.

HYDRAULIC SYSTEM

The hydraulic system is quite elaborate. The condensing system consists of two, 5000-gal. centrifugals, motor driven,



TANK HOUSE, U. S. METALS REFINING CO.

door without the usual connecting flue. The result is a marked improvement in the draft. The stack is carried by a tower of structural steel which straddles the end of the furnace. The staying is all direct, a yoke being passed around the stack to avoid the customary oblique stays. The fire box is stayed as a separate unit. The conker plate is water-cooled but all other parts are air-cooled.

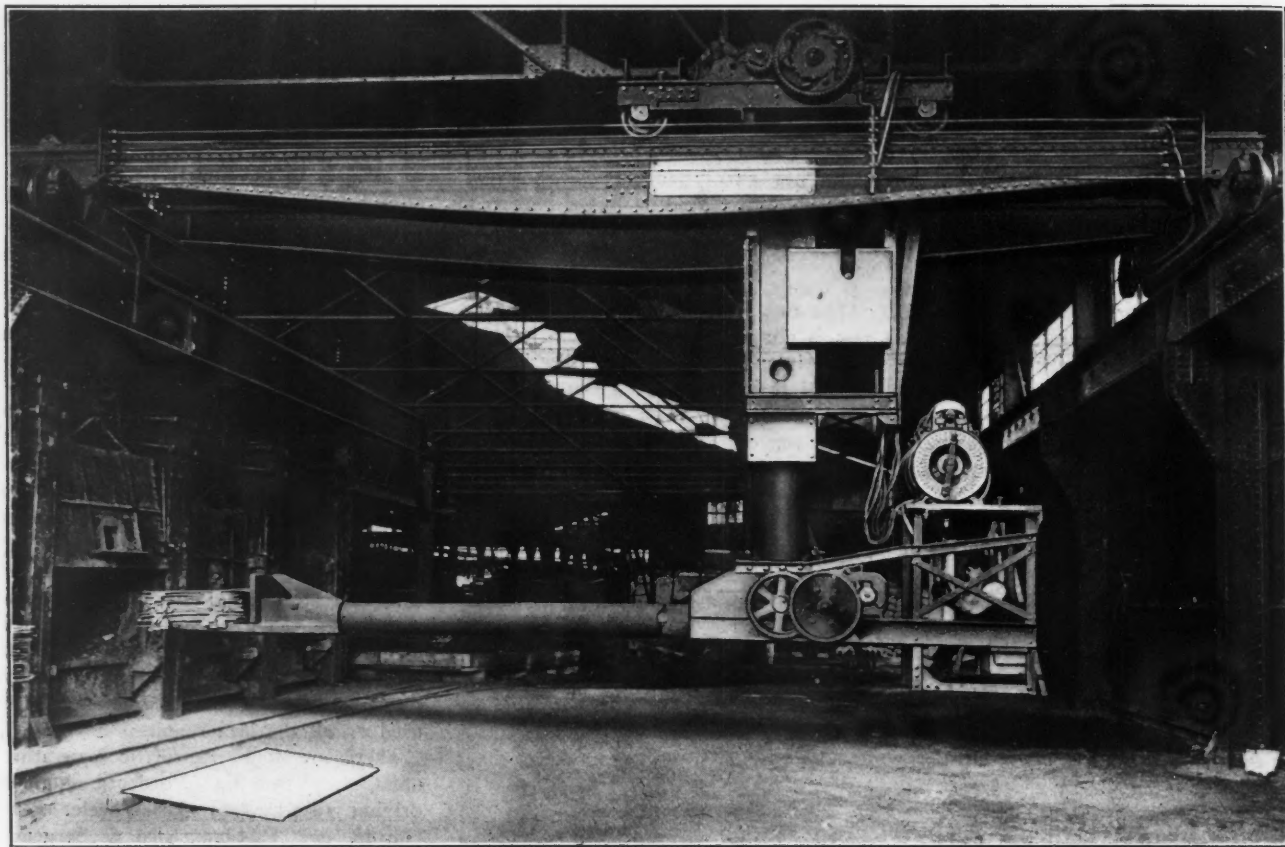
The stack is capped by a damper, and in this way closed off when the waste heat boiler equipment is in use. Then the gases are drawn from a point between the throat of the furnace and the bottom of the iron stack through a very short flue to a 515-h.p. Worthington boiler. Draft is produced by a motor-driven fan. Evaporation tests have not yet been made on this unit but it is hoped to reach 6 lb. of water from and at 212 deg. F. per lb. of coal burned by the furnace.

The crane was built by the Morgan

the boilers, run-of-mine bituminous in the refining furnaces, and fuel oil in the silver refinery. Coal is stored in heaps by a locomotive crane, a method which has been found simple and economical. The loop tracks at the west side of the property give a storage of about 15,000 tons.

The buckwheat coal is unloaded at the power house from hopper-bottom cars into an elevating and conveying system which delivers it to overhead bunkers in the boiler room carrying a day's supply from which it is spouted directly to the boiler-room floor. The boilers are hand-fired, with forced draft supplied by fans. They are of the B. & W. horizontal type, furnished with McClave grates and carrying 150 lb. per sq. in. pressure. The flue gases are carried off by the natural draft of a 175-ft. brick stack 12 ft. in diameter. One economizer is installed and space is left for two more units.

Feed water is taken from the mains of



CHARGING CRANE FOR CATHODE MELTING FURNACES



ELECTROLYTIC PARTING PLANT

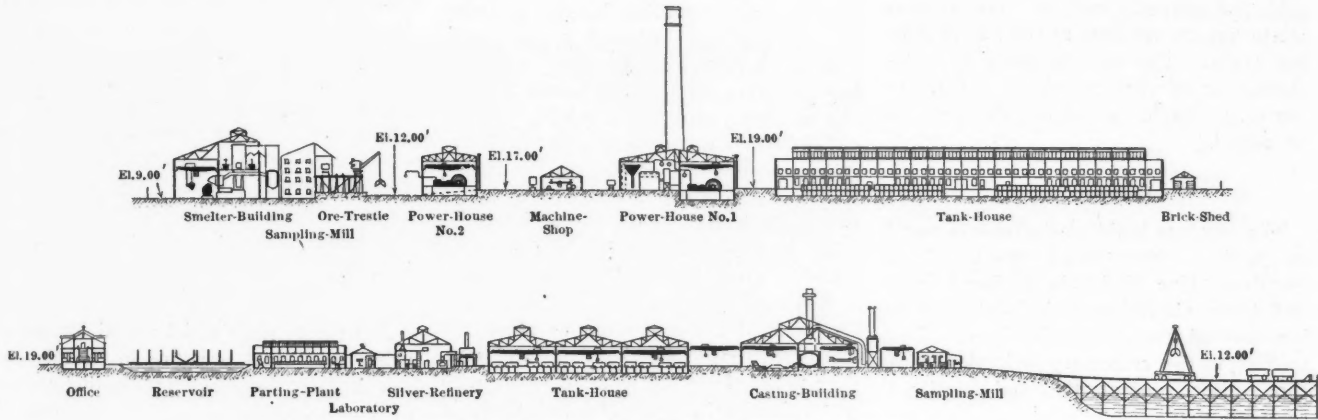
supplying three Worthington and one Alberger barometric heads with salt water. Two engine-driven 5000-gal. centrifugals handle the bosh system, circulating fresh water from reservoirs through the boshes and jackets and then through cooling sprays back to the reservoirs. A 50-lb. cold water, 100-lb. hot water and 180-lb. hydraulic service are also maintained. The

pressors furnish air at 80 lb. per sq. in. and air lifts and air-driven tools are quite generally used around the plant.

As an illustration of the varied service the modern works power plant is required to perform, it is interesting to note in tabular form the various pressures of air, steam and water actually carried. (See table on page 1006.)

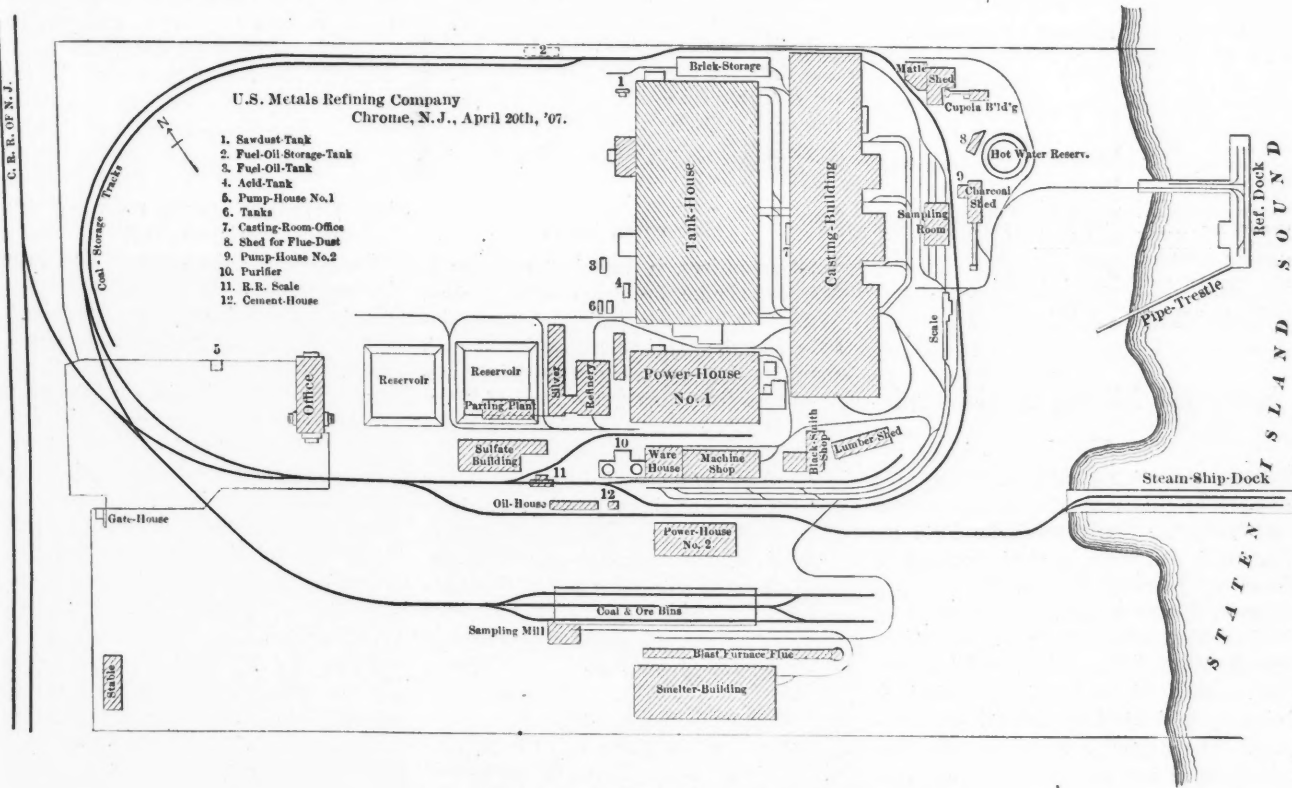
reduced to almost a trace and in this way the slag returns to the anode furnaces from the silver refinery kept down to a minimum. The filter press is made of hard lead plates on an iron frame and a lead-lined cast-iron egg is used.

In the furnace room are two 6 ft. 6 in. by 8 ft. reverberatories, with a capacity of 100,000 oz. of doré each per charge.



CHROME PLANT, U. S. METALS REFINING COMPANY

Upper drawing. Section from North to South. Lower drawing, Section from East to West.



GROUND PLAN OF PLANT, U. S. METALS REFINING CO.

50-lb. is for miscellaneous general service; the hot water is from the condensation from the tank-house heating coils; the hydraulic service is used in hydraulic cylinders. There is also a fire-pump service. A number of the steam auxiliaries are arranged to operate either condensing or on back pressure, and a complete network of exhaust steam pipes is carried around the plant, live steam being replaced by exhaust wherever possible. Three air com-

GOLD AND SILVER REFINING

The silver refinery has three departments, viz., the slimes, the furnace, and the parting. The slimes are delivered by the steam siphon pump in the tank-house cellar to a receiving tank at the top of the slimes room. The usual process of boiling with sulphuric acid and niter and then filter-pressing is employed. No agitating paddles are used, thereby keeping all machinery out of this room. The copper is

They cast one charge a week. The copper slimes are melted and the impurities oxidized and slagged. It is an interesting commentary on the growth of copper refining to note that these furnaces, used for smelting by-product silver, are just about the size of copper-refining furnaces in use 25 years ago.

The doré is parted electrolytically in cells of the Thum type. A current density of about 50 amperes per square foot on 5

sq.ft. of anode surface per cell is used. The electrolyte is the usual silver-copper nitrate with small quantities of free nitric acid present. Power is taken from one of the tank-house circuits. The silver crystals are scooped up from the horizontal carbon cathodes, washed and melted in an oil-fired crucible furnace. The gold mud which is collected in canvas bags is boiled first with nitric and then with sulphuric acid and similarly melted. The various waste liquors are sent to the slimes boiling tanks. The parting plant was designed for an ultimate capacity of 1,000,000 oz. a month, so that outside doré can be parted.

BLUESTONE

The sulphate building demands a word in passing. Here about 200,000 lb. a month of blue vitriol is produced from tank-house electrolyte and nickel sulphate is recovered from the mother liquors. The process is the customary oxidation with shot copper, concentration and fractional crystallization.

AIR, STEAM AND WATER PRESSURES

Service.	Medium.	Pressure.
Dry vacuum.....	Air.....	28 in. vacuum.
Induced draft.....	Gases.....	1 in. vacuum.
Forced draft.....	Air.....	1 in.
Blast furnaces.....	Air.....	2 lb.
Converters.....	Air.....	12 lb.
Condensing.....	Steam.....	28 in. vacuum.
Back pressure.....	Steam.....	5 lb.
Live steam.....	Steam.....	150 lb.
Superheated.....	Steam.....	150 lb.
Condenser.....	Water.....	10 lb.
Bosh.....	Water.....	20 lb.
General service.....	Water.....	50 lb.
Hot.....	Water.....	100 lb.
Fire.....	Water.....	150 lb.
Feed.....	Water.....	170 lb.
Hydraulic.....	Water.....	180 lb.

River-bed Mining in California

River-bed mining still continues at a number of points on the American river and its forks. On the Middle Fork the Mammoth bar was worked successfully for many years by Col. W. S. Davis, of Auburn, Placer county. The deepest pit sunk at that point was 63 ft. He subsequently worked Texas bar, and last season commenced on Quail bar, which is being again worked by Colonel Davis this year. The gravel is raised by elevators and dumped into the boxes. A car running at the rate of 500 ft. a minute, suspended from a cable between two towers, carries the boulders away from the pit. The car and elevator are run by electricity, which is generated by water taken from the California ditch, in El Dorado county, and conveyed to the dynamo through a pipe line having a height or pressure of 1000 ft. The method of mining these bars adopted by Colonel Davis has been very successful and the results profitable.

Colliery Investigations by the Geological Survey

The United States Geological Survey, within a few weeks, will establish in the Pittsburg district, an experiment station for the purpose of testing explosives used in coal mining, the ultimate object being, if possible, a reduction in the number of mine disasters resulting from gas and coal-dust explosions. Miners' safety lamps will also be tested at this station, and the investigations will be conducted both in the laboratory and in the mines.

The station will consist of an explosive gallery, rescue room, observation house, lamp-testing rooms, and explosives laboratory. This gallery is to be made of boiler-plate and will be in the form of a cylinder, 100 ft. long and 6 ft. in diameter. A series of safety valves on hinges will be arranged along the top to allow the escape of gas following an explosion. Port holes along the sides, covered with half-inch plate glass, will allow those in the observation house to see whether an explosion has taken place in the gallery during the tests. The cylinder will be filled with fire-damp and air, or coal dust and air, and the explosives will be hurled into the gallery by means of a steel mortar fired by electricity from an observation house 60 ft. away. The fire-damp and air will be thoroughly mixed by an electrical fan.

EXPLOSIVES TESTS

All explosives, if used in large quantities, will ignite fire-damp or coal dust. Tests will be made with various explosives and the maximum quantity of each explosive that can safely be used in mines will be published under the head of "Permissible Explosives." Explosives known as safety explosives in which the temperature at the point of detonation is low and the flame of short duration, will have a higher limit charge than the less safe explosives. The rescue room will resemble the interior of a mine and during tests will be filled with smoke. The efficiency of all apparatus for sustaining life will be determined by a series of tests. Miners will be shown how to rescue their fellow miners.

The observation house will run parallel with the explosive gallery 60 ft. away and will give opportunity for a number of persons to witness the tests in safety.

All safety lamps that are now used in this country will be tested, not only for their candle power but also for their relative safety in the presence of fire-damp. The lamps, which will be tested in a separate room, will be subject to different velocities of explosive mixtures of gas and at various angles.

All explosives will be first tested by the pendulum test and the Trauzl test, to arrive at the quantity to be used in making

experiments in order to get the same disruptive force. The Pendulum test, or the English test, consists of a large pendulum weighing several tons which swings backward when the force of an explosive is exerted upon its face and the distance of the swing is indicated by a delicate sliding rule. The explosive is fired from a mortar and the force of the explosion is played against the face of the pendulum. The Trauzl test consists of a cylindrical lead-block 20 cm. high and 20 cm. in diameter. The weighed explosive with the electrical detonator is placed in this central cavity and tamped with a known quantity of sand and moist clay. After the charge has been exploded the pear-shaped expansion of the bore is measured by filling it with distilled water at 16 deg. Centigrade.

RESULTS OF EXPLOSIONS

A pressure gage will be used for measuring the actual pressure in pounds per square inch developed by the detonation of various explosives. The analysis of the products of combustion will also be made. The heat of decomposition of all explosives in terms of calories will be ascertained by detonating large quantities in a bomb. The explosives will be fired from the mortar at night and the length of the flame will be determined by photography. The time of the flame will also be determined by an electrical apparatus. The rate of detonation will be ascertained by an electrical rotary recording drum.

Actual experiments will be made in mines to lessen the waste of fuel in mining operations. Several of the best explosives which have been determined by the results at the testing station will be used in different mines and the amounts of lump and slack coal produced will be carefully screened and weighed. A classification of these explosives will be made in reference to the cost of explosive per ton of coal produced. Different methods of using explosives in mines will be investigated with special reference to increasing safety and efficiency.

The experiments will be under the direction of Dr. Joseph A. Holmes, chief of the Technologic branch of the Geological Survey. Dr. Charles E. Munroe has technical supervision of the tests which will be conducted at the station. Clarence Hall, explosives expert for the Geological Survey, assisted by W. O. Snelling, will have immediate charge of the experiments. Mr. Hall has recently returned from Europe where he made a study of the foreign government testing stations.

The Russian minister of commerce has appointed a commission to devise methods for the development of the Russian half of Sakhalin, especially the mining industry.

The Cassiar Coalfields in British Columbia

By J. J. BELL*

One of the most promising of the hitherto unworked coalfields of British Columbia is to be found in the Telkwa valley, Cassiar district. When prospecting for gold and copper, in 1901, William Limin discovered valuable beds of coal.

that the coal is of good bituminous quality, burning well and satisfactorily standing exposure. The seams are apparently of the same age and general character as the best coals mined on the Pacific slope and vary in thickness from 3 to 15 feet.

EXTENT OF THE DEPOSIT

In 1904 A. Webster, formerly of the Geological Survey, visited the locality. He considers the deposits to be of the very

ness of coal of over 50 ft. Allowing one million tons for each foot to the square mile the amount of coal would be 25,100,000,000 tons. The present holders expect to mine 3,000,000 tons a year, at which rate the deposit would not be exhausted for nearly 1000 years.

Tests with the diamond drill show that the seams dip toward the north and east, and that there is considerable faulting. A hole near the northern boundary penetrated 130 ft. into the sandstone without reaching the coal; at this point drilling operations had to be suspended on account of the breaking of the drill. The deposit is underlaid by conglomerate. An interesting feature is the ash beds. In some places fire has eaten its way into the seams, probably from Indian camp fires, and having burned the coal, the overlying rock has fallen down, smothering the fire and leaving the ash beds.

The only coal so far mined was for the use of the prospectors. They burned it for three months in a stove without having a clinker. Tests show that it is low in ash and sulphur. It is very solid and can be mined with little waste.

LOCATION AND TRANSPORTATION

The seams crop out on Goat and Mud creeks, which are tributaries of the Telkwa. The latter flows into the Buckley, which in turn empties into the Skeena, near Hazelton, up to which point steamers ascend. From this point supplies can be taken in by pack train. The Telkwa and Buckley valleys are fertile and a number of claims have been taken up; however, settlement will be slow until railway communication is established. Wheat, oats, potatoes, etc., can be raised with little difficulty, so that supplies for the miners can be readily obtained. The elevation is about 2000 ft. above the sea.

The Cassiar Coal Development Company, composed principally of Toronto and Hamilton men, has a government lease for 52 square miles, and is negotiating with English capitalists to take a large interest. The Grand Trunk Pacific Railway is expected to pass through or near the property, while a charter controlled by the same company exists for a road to Kitamaat arm, which lies 80 miles distant, and has a land-locked harbor connecting with the Pacific ocean.

Boiler cinder is a valuable substitute for crushed stone or gravel in making a cinder concrete. It should be screened to remove the fine ash particles, and when made into a mixture of one part cement, two parts sand and four parts cinder, it forms a good concrete which is light in weight and which takes up considerable shock without being too rigid. Cinder concrete is suitable for machine-shop and engine-room floors which are subject to considerable vibration from machinery.



OUTCROP OF SEAM NO. 5, 14 FT. THICK



NO. 1 SEAM, THE THICKEST COAL BED IN THE CASSIAR DISTRICT



SEAM NO. 2, WHICH AT SOME POINTS IS 15 FT. THICK

In 1902 a party, equipped with a diamond drill and other tools, made a thorough examination, which revealed the extent and richness of the deposit. The same year Professor Coleman, of the School of Practical Science, Toronto, was sent out, and his report fully confirmed the results arrived at by the first explorers. He states

*29 Prince Arthur avenue, Toronto, Canada.

first quality, both as a coking and a steam coal.

A section of the strata in descending order is as follows: Ash, rock, drift, etc., 100 feet; coal seam No. 1, 20; clay shale, 25; coal seam No. 2, 15; clay shale, 4; coal seam No. 3, 2½; clay shale, 40; coal seam No. 4, 4; clay shale, 35; coal seam No. 5, 14 feet. This gives a total thick-

Four Tests of a Capell Mine Ventilating Fan

Measuring the Quantity of Air in a Fan-drift Seems to Give Incorrect Results Because of the Proximity of the Fan

BY JOHN B. THOMSON

The following tests were made on a Capell fan for the purpose of ascertaining whether the combined mechanical efficiency of the fan and of the engine attained 60 per cent. The results of the actual experiments afford a good opportunity of elucidating what seemed to be a mystery or inaccuracy, which will subsequently be referred to.

The Capell fan is 8½ ft. in diameter and 3½ ft. broad, getting air at one side and exhausting out of the mine. The diameter of the ear is 5 ft. 9 in., equal to an area of 26 sq.ft. The fan is driven by a steam engine with a single cylinder, 9 in. in diameter and 16 in. stroke, having a piston-rod at one end, 1½ in. in diameter. The fan is belt driven, the ratio of the pulleys being 2½ to 1. One of the pulleys, however, was altered between the first and second tests, making the ratio 5 to 3. The rectangular upcast shaft, 7 ft. long and 5 ft. wide, is used exclusively as an airshaft. The ear of the fan is 18 ft. from the edge of the upcast pit, and the fan drift is built of brick, with a cement-concrete roof and floor.

All the tests were made when the pit was entirely clear of workmen.

The first test was made on Sept. 23, 1905. When the engine was running at 90 revolutions and the fan at 225 r.p.m., four indicator diagrams were taken from each end of the cylinder, showing a mean pressure of 54.895 lb. per sq.in., and 24.98 h.p.

The air was measured in the fan-drift, about midway between the upcast shaft and the fan. The drift was divided into nine spaces (Fig. 1), and shelves were placed in the centers of the spaces to support the three anemometers, which were used, after being calibrated at Kew. The anemometers were allowed to run for 5 min. in each space, so as to get a fair average. The results of these tests are recorded in Table I. It will be noticed that the quantities of air in Nos. 1 to 6 spaces were positive, and that they were negative in Nos. 7, 8 and 9 spaces. The average speed of the engine, when the air was being tested, was 92 revolutions and of the fan 230 r.p.m., so that the power in the air at 90 r.p.m. should be $(22.42 \times 90 \div 92)$ or 21.93 h.p. The mechanical efficiency was $(21.93 \times 100 \div 24.98)$ or 87.8 per cent. When these figures were worked out the result seemed to be absurd, and it was decided to make another test.

Note—From the *Transactions of the Mining Institute of Scotland*, Vol. XXIX, Part 2.

TEST No. 2

The second test was made on Oct. 14, 1905, and, as already mentioned, the ratio of the pulleys had been altered since the first test. In this case, the speed of the steam engine was 120 revolutions, and of the fan 200 r.p.m. The average of ten indicator diagrams showed a mean pressure of 35.06 lb. per sq.in., and 21.27 h.p.

The air was measured in the fan drift

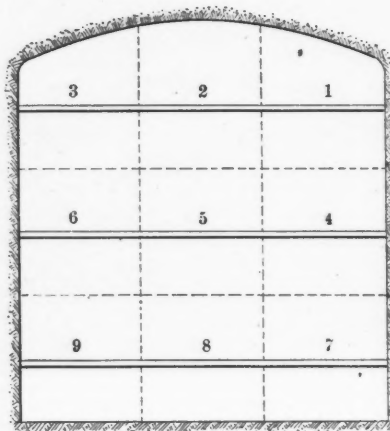


FIG. 1. FAN DRIFT

as in the first test. The top shelf having been broken, a new one, a little thicker, was substituted and made a slight difference in the area of the spaces. Table II shows the results of this air test, and it will be again noticed that the readings are positive in the first six spaces and negative in the last three spaces. The horsepower in the air being 18.38, and that of the engine 21.27, the mechanical efficiency was 86.4 per cent.

The results of the two tests, being so near one another, pointed to some other reason for the high efficiencies shown than inaccurate testing; and, seeing that there was such an eddy in the fan drift, it was decided to make another test and measure the air at the bottom of the upcast shaft. A rather unusual circumstance at the colliery allowed this to be done with very little trouble. The upcast shaft is sunk to the Ell coal seam a depth of 324 ft. This seam is not being worked at present, and a short drift, 120 ft. long, leads from the bottom of the upcast shaft to the top of a blind pit, sunk to the lower seams now being worked and ventilated, so that all the air that goes to the fan passes through this drift on its way to the upcast shaft.

TABLE I. RESULTS OF EXPERIMENTS UPON A CAPELL FAN.

No. of Space.	Area of Space.	Velocity of Air Per Minute.	Quantity of Air Per Minute.		Watergauge.	Horsepower in the Air.	
			Cubic Feet.	Cubic Feet.		Horsepower.	Horsepower.
1	4.030	3,618	14,580		2.42	5.56	
2	4.030	4,361	20,060		2.43	7.68	
3	4.030	2,641	10,643		2.43	4.07	
4	3,725	2,225	8,288		2.18	2.84	
5	3,725	1,910	7,114		2.18	2.44	
6	3,725	2,268	8,448		2.22	2.96	
7	3,725	732	2,726	69,133	2.15	0.92	25.55
8	3,725	1,043	3,885		2.11	1.29	
9	3,725	740	2,756		2.11	0.92	
Totals.	35.010			9,367	2.25		22.42

TABLE II. RESULTS OF EXPERIMENTS UPON A CAPELL FAN.

No. of Space.	Area of Space.	Velocity of Air Per Minute.	Quantity of Air Per Minute.		Watergauge.	Horsepower in the Air.	
			Cubic Feet.	Cubic Feet.		Horsepower.	Horsepower.
1	3,930	3,981	15,645		1.93	4.76	
2	4,500	3,565	16,042		2.11	5.33	
3	3,930	3,225	12,674		2.09	4.17	
4	3,725	2,531	9,428		1.90	2.82	
5	3,725	1,541	5,740		1.86	1.68	
6	3,725	1,653	6,157		1.86	1.80	
7	3,725	506	1,885	65,686	1.80	0.54	20.56
8	3,725	1,009	3,758		1.81	1.07	
9	3,725	545	2,030		1.78	0.57	
Totals.	34.710			7,673	1.90		18.38

TEST No. 3

The third test was made on November 11, 1905. The steam engine was running at a speed of 120 revolutions and the fan at 200 r.p.m. The mean indicated pressure taken from 12 diagrams was 3389 lb. per sq.in., and the engine produced 2056 h.p. The quantity of air passing through the drift in the Ell coal seam was 43,035 cu.ft. per min., and the observations recorded in Table III were taken in order to

TABLE III. OBSERVATIONS IN THE ELL COAL-SEAM.

Barometer, at surface.....	29.08 in.
Barometer, at Ell coal-seam, downcast side.....	29.44 in.
Thermometer, at surface, in atmosphere.....	52° Fahr.
Thermometer, in fan-drift.....	62° Fahr.
Water-gage, in fan-drift.....	2.03 in.
Water-gage, in Ell coal-seam.....	1.16 in.

calculate what the volume should be in the fan drift. The difference of (2.03—1.16 in. or) 0.87 in. in the readings of the water gages is equal to 0.06 in. of mercury; and consequently, the actual barometric pressure in the Ell coal seam would be equal to (29.44 + 0.06 or) 29.50 in. of mercury. The volume of air, calculated at the pressure in the fan drift, would consequently be (43,035 × 29.50 ÷ 29.08 or) 43,656 cu.ft. per min. The water gage due to the differences of temperature, calculated on the depth of the Main coal seam, 393 ft., was 0.11 in., and the actual water gage due to the fan was (2.03—0.11 or) 1.92 in. The horse-power of the ventilation is (43,656 × 1.92 × 5.2 ÷ 33,000 or) 13.20. The mechanical efficiency was (13.20 × 100 ÷ 20.56 or) 64.2 per cent.

This result seems to be a nearer approach to the real efficiency than that obtained in the two former tests, and the question arises as to why the anemometers should register a greater velocity in the fan-drift than is due to the quantity of air actually passing.

TEST No. 4

To satisfy myself that it was not due to a misconception in regard to the negative and positive readings in the fan-drift, I had a false floor of wood and brattice-cloth put in the fan-drift, so as to reduce its area and to avoid any negative readings. On November 14, 1905, 3 days after the third test, the air was measured in the fan-drift and in the drift in the Ell coal seam, at precisely the same time, and the following results were obtained: Quantity of air in fan drift, 56,033 cu.ft. per min.; quantity of air in drift in Ell coal seam, 40,964 cu.ft. per min.; a difference of 15,069 cu.ft. per minute.

Calculating proportionately, the quantity of air that would have been measured in the fan drift had it been made during the third test, would have been (40,964 : 43,035 : 56,033 : 58,865) cu.ft. per min.; the horse-power of the ventilation would have been (58,865 × 1.92 × 5.2 ÷ 33,000 or) 17.8; and the mechanical efficiency would have been (17.8 × 100 ÷ 20.56 or) 86.5 per cent.

From the results of these tests, it seems

to be incorrect, when testing a fan for its mechanical efficiency, to measure the quantity of air in the fan drift, as the velocity of the air, taken so near the fan, is influenced by it in the same way as air rushing through a regulator, when a factor has to be introduced to allow for vena contracta.

A New Safety Mine Cage

SPECIAL CORRESPONDENCE

A patent has been granted to George Killian, of Scranton, Pennsylvania, for a safety mine carriage and a detachable cone for mine cages, and all kinds of elevators. The object of the device is to promote a simple safety appliance whereby the mine cage cannot be carried over the head wheel, in the event of the engineer losing control of the engine or being unable to shut off steam as is sometimes the case. The hoisting rope on the lower end is connected in the usual manner to the cone. A pair of jaws swinging freely and fastened pivotally to the cone, are grooved on their inner or adjacent faces for the reception of the hook or link of the cage. These jaws are held together and connected to the hook by means of a ring which is riveted in the depending parts of the jaws by soft metal pins. A stationary ring is supported by suitable framework at a point below the head wheel through which ring the hoisting rope passes. This ring is large enough to permit the cone to pass through it, but engages the stationary ring in case the cage or elevator is raised to an abnormal height.

Should the cage be drawn up far enough to cause the ring or cone to strike against the stationary ring, the impact will sever the soft metal pins, thereby stripping off the ring and releasing the jaws. Upon the jaws being released they will swing outward and free the cage loop, thereby releasing the cage and preventing its being carried up over the head wheel, or causing any damage to the shaft or anyone who might be on the cage. The mine cage is made entirely of steel and is equipped with double independent springs which release automatically when the ring is stripped from the cone. Instantly eight bull-nosed safety dogs imbed themselves in the guides making it impossible for the cage to drop more than one inch, and the heavier the weight on the cage, the quicker the jaws will act. Another feature is the simplicity in attaching the hoisting rope to the cone. The jaws can be swung out of the way, making it a very simple matter to secure the rope to the cone as the jaws are hung from the lower sides of the cone, and on opposite sides of a vertical hole in the latter, for the reception of the rope. The invention has been given a thorough test and has shown no defect.

The Girard Estate Collieries

The carefully prepared reports of Heber S. Thompson, chief engineer of the coal properties of the Girard Estate, always give some interesting data relating to the anthracite trades. The Girard collieries in 1906 furnished 3 per cent. of the total anthracite shipments; but the collieries are operated by different companies, and represent a variety of practice. The Girard Estate includes 13 collieries, leased to six different companies, and two washeries, each leased to a separate company.

The production for two years has been as follows:

	1905		1906	
	Tons.	Per Ct.	Tons.	Per Ct.
Fresh-mined coal.....	1,673,993	83.2	1,508,067	79.6
Washery coal.....	148,906	7.4	202,204	10.6
Total shipments.....	1,822,899	90.6	1,710,271	90.2
Used at mines.....	187,909	9.4	184,797	9.8
Total.....	2,010,808	100.0	1,895,068	100.0

The total decrease of 115,740 tons, or 5.8 per cent., in 1906 was due to the stoppage of mining in April, when the discussions between operators and miners were in progress. To this also must be attributed the increased proportion of coal consumed in operating, on which the time idle has a considerable influence. The pumping and other similar work must be continued, whether coal is produced, or not.

The average royalty received by the Girard Estate in 1906 was 34.21c. on fresh-mined coal, 19.49c. on washery coal; an average of 29.30c. per ton on all coal mined, against 29.98c. in the preceding year. The average royalty on all coal shipped was 33.07c. per ton in 1905, decreasing to 32.47c., in 1906, owing to the larger proportion of small coal.

An interesting statement, given below, shows the production of the different sizes of coal in 1906; the first column giving the sizes made of fresh-mined coal, the second that of all coal shipped, including washery coal, or coal recovered from old culm banks:

	Fresh-m'd Coal		All Coal	
	Tons.	Per Ct.	Tons.	Per Ct.
Lump.....	6,800	0.45	6,800	0.40
Steamboat.....	97,831	6.49	97,831	5.72
Broken.....	130,753	8.67	130,753	7.64
Egg.....	200,948	13.33	200,948	11.75
Stove.....	241,779	16.03	241,779	14.14
Chestnut.....	278,559	18.47	298,956	17.48
Total large....	956,670	63.44	977,067	57.13
Pea.....	194,061	12.87	219,127	12.81
Buckwheat.....	235,469	15.61	305,433	17.87
Rice.....	100,049	6.63	165,511	9.68
Barley.....	21,818	1.45	42,933	2.51
Total small...	551,397	36.56	733,204	42.87
Total.....	1,508,067	100.00	1,710,271	100.00

The proportion of small in the washery coal is naturally very much greater than in freshly prepared coal. Thus; at the Raven Run washery, the largest on the estate, the proportion of small or steam sizes was 85.5 per cent. last year; the remaining 14.5 per cent. being all chestnut, the smallest of the large sizes. The coal used in operating collieries is not sized, but it is all small sizes or culm, practically. Adding this, there would be, for the total mined, 51.6 per cent. large, and 48.4 small sizes.

The Washington Coal Situation

By R. P. TARR*

Washington, the State destined soon to rank according to population well up in the list of States, contains the measures which must furnish fuel for not only its own demands, but also for those of western Montana, Idaho and Oregon. Within this State are the undeveloped beds, and the only coal areas of importance in northwestern United States. During the past winter the State was in the throes of a fuel famine, and this has caused a unique situation. There are undeveloped and almost unknown deposits in Whatcom, Skagit, Snohomish, Chehalis, Pacific, Lewis, Cowlitz, Clarke and Skamania counties, and other parts of Kittitas than those to which operations are now confined.

EARLY OPERATIONS

It was when the earlier efforts were being made to open the coal deposits of Washington that the most serious mistakes occurred, producing adverse conditions now. Besides the knowledge of the existence of coal in certain parts of the State, little was known concerning any area until after the investigations and reports of Bailey Willis, Geologist U. S. Geological Survey (Vol. 15, tenth census). This admirable report, practically confined to the Palmer-Wilkeson fields, directed attention to this region. Into these sections the pioneer of the early 80's made his entrance, wholly unprepared and entirely ignorant of mining methods, eager only to file his claim.

Soon many mines were opened, to be operated only temporarily. Of these there are nearly a score, abandoned monuments of the errors of those who were unacquainted either with coal-mining problems, the demands of the time, or with financial requirements of big projects. These failures produced a reaction which placed a discount on the merits of the coalfields in general, and put a quietus to future development by driving away both capital and interest.

When the railroad and steamship companies attacked the problem of mining systematically these difficulties disappeared. The railroads which now contemplate entering the Sound country will probably also achieve success. But there is another problem confronting the State. Along with the railroad development comes increase in population and additional industries. The commercial side of coal development must therefore be considered immediately. The railroads cannot take care of this; outside capital must.

At the present time 30 mines are in operation, about half of which may take

ranking importance. The remainder have small outputs and are undergoing every sort of struggle to stagger on. Several of them are reopenings of abandoned properties and owing to former mistakes in mining methods cannot be operated with advantage.

PRESENT OUTPUT

During 1906 the total coal output in the State was 3,290,534 tons. This was an increase of 443,633 tons above that of 1905. Of these thirty mines, five are operated by the Northern Pacific Railway Company and produce 44 per cent. of the entire output, eight are operated by the Pacific Coast Steamship Company and produce 37 per cent. of all coal mined. The remaining seventeen mines produce but 19 per cent. of the entire tonnage.

The following analyses show the values of the best types of coal mined for various uses:

	Roslyn, Steam, etc.	Burnett, Gas.	Wilkeson, Blacksmith.	Fairfax, Coke.
Moisture.....	1.91	1.44	1.38	1.30
Volatile matter.....	34.30	40.90	21.69	19.22
Fixed carbon.....	51.11	49.24	66.96	64.22
Ash.....	12.63	8.42	9.97	15.26

The coal is mined from three principal fields:

Palmer (King County) producing 52 per cent.
Roslyn (Kittitas County)..... 41 per cent.
Wilkeson (Pierce County)..... 7 per cent.

Of the entire output, 65 per cent. is consumed by railroad and steamship companies. The remaining 34 per cent. is used commercially in Washington and tributary territory having a population of 1,250,000 inhabitants.

CHARACTER OF THE DEPOSITS

The Cascade uplift was very intense, but not to the degree that much metamorphism of the coal measures has taken place. During the uplift four active volcanoes were formed, namely Baker, Rainier, Adams and St. Helens. Dikes from these have considerably broken the measures and aided in the production of faults. Near some of these a slight metamorphism produced coked portions. This is graphitic coke and not anthracite as some assert. The seams are in many localities in a tilted condition and are worked at dips varying from 15 to 90 deg. In those portions where the dip is less steep the amount of moisture runs from 10 to 15 per cent. Most of the coals belong under the characterization of lignites. While far superior to the brown lignites of Dakota and Montana, these moist Washington coals do not stand transportation well and cannot be stored at all.

All Washington coals contain more ash and have a duller luster and lighter texture than eastern coals. Having been deposited during Cretaceous-Tertiary times when the amount of carbon dioxide was greatly diminished, there is thus good

reason for these different and inferior characteristics. While many seams are of extreme thickness, there are few more than 6 ft. that are not streaked and exceedingly dirty.

The containing walls of the coal seams are generally of shale and poor, but in a country plentiful in timber, this is not so serious a matter as elsewhere. Cleaning by the dry process will do much to benefit the quality of the coal. The coal is here and must be mined. The glacial deposits and forest coverings have done much to render prospecting difficult. We have, as yet, only a scant knowledge of the coal resources of the State.

Iron and Steel Bounties in Canada

The new bounty bill has passed the Canadian Parliament and become law. The bounties provided for iron and steel production are as follows:

a. In respect of pig iron manufactured from ore, on the proportion from Canadian ore produced during the calendar years—1907, \$2.10 per ton; 1908, \$2.10 per ton; 1909, \$1.70 per ton, and 1910, 90c. per ton.

b. In respect of pig iron manufactured from ore, on the proportion from foreign ore produced the calendar years—1907, \$1.10 per ton; 1908, \$1.10 per ton; 1909, 70c. per ton, and 1910, 40c. per ton.

c. On puddled iron bars manufactured from pig iron made in Canada during the calendar years—1907, \$1.65 per ton; 1908, \$1.65 per ton; 1909, \$1.05 per ton, and 1910, 60c. per ton.

d. In respect of rolled, round wire rods not over $\frac{3}{8}$ in. in diameter, manufactured in Canada from steel produced in Canada from ingredients of which not less than 50 per cent. of the weight thereof consists of pig iron made in Canada, when sold to wire manufacturers for use or when used in making wire in their own factories in Canada, on such wire rods made after December 31, 1906, \$6 per ton.

e. In respect of steel ingots manufactured from ingredients of which not less than 50 per cent. of the weight thereof consists of pig iron made in Canada, on such ingots made during the calendar years—1907, \$1.65 per ton; 1908, \$1.65 per ton; 1909, \$1.05 per ton, and 1910, 60c. per ton.

f. On pig iron manufactured from Canadian ore by the process of electric smelting during the calendar years—1909, \$2.10 per ton; 1910, \$2.10 per ton; 1911, \$1.70 per ton, and 1912, 90c. per ton.

g. On steel ingots manufactured by electric process directly from Canadian ore, and on steel ingots manufactured by electric process from pig iron smelted in Canada by electricity from Canadian ore during the calendar years—1909, \$1.65 per ton; 1910, \$1.65 per ton; 1911, \$1.05 per ton, and 1912, 60c. per ton.

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The Sulphur Industry

The United States used to be a large importer of brimstone; in 1903 the imports amounted to 190,931 long tons. In 1904 the American production of brimstone was in excess of 190,000 tons, and in 1906 it was considerably upward of 200,000 tons, while the imports had dwindled to about 73,000 tons. We have many times remarked how this great industrial change was brought about by the success of the Frasch process in exploiting the sulphur deposit of Louisiana, not only excluding the Sicilian sulphur to a large extent from the United States, but also threatening the European market, and causing directly the winding up of the old sulphur trust (the Anglo-Sicilian Sulphur Company) and the practical assumption of the management of the sulphur industry of Sicily by the Italian Government, the latter operating through an organization known as the Consorzio. At the time of the organization of the latter, we spoke of the strange and hazardous character of the undertaking. Our anticipations have been fully borne out. The Sicilian sulphur producers have been dissatisfied (leading to strikes and riots last year) and the definite policy of the Consorzio has not yet been settled.

In commenting upon the above situation, Messrs. Emil Fog & Sons, of Messina, in a recent commercial report, said: "The election of the definite board (of the Consorzio) has not yet taken place; and until it has, it will be impossible to report on the future tendency of the brimstone market. Everything depends on the men that will be elected, their capacities and intentions. The provisional board so far has pursued absolutely passive tactics; the definite board may show more enterprise and adopt more energetic measures, especially with respect to America." They go on to say that the constant rumors of American exports to the Continent are creating ill feeling among the Sicilian producers, who recently held a meeting at which it was proposed that retaliative measures be taken, meaning, of course, the dumping on the American market, at cost price, of the stocks inherited from the Anglo-Sicilian company.

With singular fatuity, the Sicilians appear to be unable to appreciate the strength of the position of the Union Sulphur Company, in spite of the elaborate reports made upon its prospects by en-

gineers sent to Louisiana by the Italian Government. Even now they consider the brilliant reports of the Louisiana production to be exaggerated, especially with respect to the future prospects, and insist that the Union Sulphur Company should purchase a certain quantity of brimstone annually from Sicily!

An actual competition between the Union Sulphur Company and the Sicilian producers would inevitably lead to disaster, especially to the latter. There is a large and turbulent population in Sicily which is dependent upon the exploitation of its mines. The earnings are small and the social condition is unsatisfactory. The strikes and riots which occurred last year are illustrative of what would be likely to happen under the stress of severe competition. It is that which the Italian Government has aimed to prevent. On the other hand, the Union Sulphur Company has evidently preferred to uphold prices, rather than to engage in an industrial war. Negotiations for an agreement have been under consideration for nearly two years, but no conclusion has been reached, although there has evidently been a provisional understanding, as to which profound secrecy has been preserved. Naturally the latter has been a subject of discussion and discontent among the Sicilian producers, none of whom knows apparently just where he stands. There is a general demand that the full details of the situation should be made public. We believe the reason why they have not been made public is simply that no final agreement has yet been made, but it is probable that it soon will be. It certainly is desirable to come quickly to an understanding as to this matter, which at present is creating so much uncertainty and distress in Sicily.

The Geological Survey

The new director of the Geological Survey is losing no time in the inauguration of plans looking toward the improvement of his organization. The most important has been a conference with the State geologists, which was held at Washington, May 20, to discuss coöperative work in various States by the Federal and State surveys. The directors of many of the State surveys were present at this conference. It is evident without argument that a great advance in the perform-

ance of the immense volume of geological work that remains to be done can be secured, and the general efficiency of not only the State surveys, but also of the Federal survey, can be improved by the development of a good plan of coöperation. It is gratifying that the director of the U. S. Geological Survey has so early taken up this important question.

He has also inaugurated other changes, which are interesting, although of less importance. The work and status of the topographical engineers connected with the survey have been more clearly defined. Various changes have been made in the internal organization of the geological branch. Among others, Mr. Lindgren has been promoted to the headship of a division, a promotion which it is gratifying to note, in view of the sterling character of his work and his high attainments as a scientist in the field of economic geology. Dr. Hayes has lost his previous strange title of "Geologist in Charge of Geology" (what else than geology should a geologist be in charge of?) and now has the rational title of "Chief Geologist," continuing the direction of the geologists in the field, in which work he has achieved signal success, filling a difficult position with an ability which has commanded the sincere respect of his associates.

"High Grading"

One of the old problems of mining, which has never been satisfactorily settled, is the prevention of thefts of high-grade ore. The question has become a particularly important one in recent years, because of the discovery of many mining districts where the ore is of singularly high grade. At Kalgoorlie, Western Australia, the situation became so bad that recently the government had to appoint a commission to investigate the evil. However, this commission does not appear to have come to any satisfactory conclusion. In a recent interview Mr. Hoover, of Bewick, Moreing & Co., who is now visiting in Australia, remarked that, after the appalling state of affairs disclosed by the report of the commission, it was a great pity that no more effective remedies were proposed. In Mr. Hoover's opinion the suppression of gold stealing from the mines rests with the police, and it would be advisable to introduce the system which exists in London, where

anyone who can show that the purpose is in the interests of public order and for the public good can hire a policeman from the regular force, the policeman remaining entirely under the control and direction of the regular police officials, and the police administration being reimbursed the cost. That is undoubtedly a practicable recommendation and one which, if put into effect, would greatly tend to reduce the evil of "high grading."

We have in the United States the same trouble which exists in Western Australia. Everyone remembers the serious extent to which the stealing of ore was carried on at Cripple Creek, Colo., and how the practice was partially broken up by destroying the "assay offices" where the stolen ore was bought. At Goldfield, Nev., conditions are worse than they ever were at Cripple Creek. "High grading" is regarded by many miners as a legitimate perquisite, analogous to secret commissions. Mine operators so unlucky as not to possess a "rich streak" have found it difficult to keep miners, who constantly try new employers until they find work near the rich ore. This scandal was so open that premiums were offered for work in the Hayes-Monnette lease on the Mohawk mine, where the ore was so rich that a miner could easily carry away one thousand dollars' worth in his coat pocket. An amusing incident occurred in the case of one of these gentry, who was too greedy and loaded himself so heavily that he could not get out of the bucket upon reaching the surface. Not less scandalous has been the way in which this stolen ore has been collected by the wagons of reputable concerns and shipped openly to the smelters.

Last January a strike of the miners at Goldfield was feared, because the mine owners proposed to establish "change houses," in which the men were to be required to change their digging clothes for ordinary clothes, under supervision. Of course it has been well recognized that American miners would not permit that rule, which is enforced in the diamond field of South Africa, and the operators of Goldfield were over venturesome in suggesting it. In a way they paid a penalty for their temerity, because the miners, having taken the proposal as a reflection on their honesty and threatened a strike, the dispute was finally settled by the miners allowing change houses in a modified form, while as a compensation they

exactd an increase of wages to the minimum of \$5 per eight-hour shift.

Obviously the prevention of stealing from mines is distinctly a police duty. Under the conditions which exist in such parts of the world as Western Australia, Nevada and other remote districts, where society and government are not highly organized, it is too much to expect of the State and county governments that they shall control every mine. However, Mr. Hoover suggests an expedient whereby anyone to whom it would be worth while could secure the desired protection. A similar practice, although not particularly for the prevention of ore stealing, actually exists at many of the remote mining camps of Mexico and has been found to work well.

Wash-houses at Collieries

It is unfortunate that so many colliery operators have assumed an antagonistic attitude toward the legislation proposed in several States, compelling the establishment of a wash-house at each colliery. There is no good reason for such an attitude except the objection to the cost entailed, which after all is insignificant and consequently is not a good reason. On the other hand, there are positive benefits to be derived. The improved hygienic conditions inaugurated in such a way would lead to better health, greater strength, and more cheerfulness on the part of the miners, who would do better work, and the operator would be the gainer. A further tendency toward such increased efficiency would result from the greater self respect that the men would have if they were able to go home clean from their work, instead of in the disreputable condition at present. If the operators think that unclean, dirty men, who are so because they lack the facilities to preserve their self-respect, make the best miners, then their objections to the proposed legislation are well founded. However, we do not think so. The States where such proposed laws have been introduced should enact them.

IN 1906 ANTHRACITE mining was a slightly more hazardous occupation than mining bituminous coal in Pennsylvania. According to the State department of mines, of 166,175 anthracite miners 557 were killed in accidents, and of the 172,928 bituminous coal miners 477 were fatally injured.

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

Silver-Cobalt Deposits

A pessimistic and somewhat superstitious friend asked me the other day: "Are there any silver-cobalt mines that have proved lasting?" This is a question naturally suggested by the records of old mines in which these elements were associated. The German miners gave the name Cobalt (Kobold) to the substance which seemed to drive away the riches of a mine. Kobold was a gnome or evil spirit of the mine. Cobalt seems to have earned its evil name and deserved it in some of the mines of the Harz mountains. Chile is another country where rich showings of silver and cobalt failed to make good. In Percy's "Metallurgy of Silver," there is an analysis of a Chilean ore containing: Silver, 12.56 per cent.; metallic arsenic, 66.17; arsenious oxide, 17.22; and cobalt, 3.24 per cent. The silver was in the metallic state. In other places in Chile the cobalt is in much higher proportion, but the mines are not worked.

In the beginning of the nineteenth century, rich silver-cobalt ores were discovered in the county of Stirling, Scotland, and \$250,000 were taken out of the mine. After that there was nothing. This mineral seems to have been similar to the Canadian cobalt ores consisting of native silver, sulphides and cobalt in calcite. Nobody hears of silver-mining in Scotland now.

But if cobalt augurs badly for the staying powers of a mine, nickel may be said to do the same, if we take Silver Islet for an example. This mine was situated on an island near the Canadian shore of Lake Superior. The mineral contained: Silver, 78.34 per cent.; arsenic, 5.98; nickel, 12.93; and cobalt, 2.75 per cent. Some records of this mine may be found in the Transactions of the American Institute of Mining Engineers, 1877. My information is obtained from Percy, who quotes Mr. Courtis's paper read before the Institute in February, 1877, as follows:

"Mr. Macfarlane, unable to get the Canadians to raise the necessary money to carry on the work, in spite of the fact that many thousands of dollars worth of ore had been taken out, succeeded in interesting parties from the States. These parties bought all the lands of the Montreal Mining Company, and a capital of \$73,000 paid a dividend of \$160,000 the first year, besides paying about \$200,000 toward settlement with the Montreal Mining Company, and expending also a large amount of money to establish the plant.

"In the report for this year we find the total amount of dividends has been \$622,666.66, and the total production \$2,237,479.84. The great outlay was needed at the mine to establish a town on a barren rocky shore; to maintain a foothold on a little rock not 80 ft. square against the mighty storms of Lake Superior; to furnish steam tugs, engines, pumps, and build a mill capable of concentrating over 75 tons of rock per day.

"Silver Islet stands today perfectly equipped for mining concentrating, and smelting 50 to 100 tons of ore a day. It has immense tracts of land in a mineral district, which has hardly been explored as yet. It has \$700,000 worth of property on hand, and only \$400,000 indebtedness, and its own vein has been exposed only about 800 ft. deep and 600 ft. horizontally yet today its stock is almost valueless. The failure of Silver Islet to produce even expenses for the last two years has dampened the ardor of other mining companies so that with the exception of very feeble efforts at other points, except Duncan, the results of whose development all interested are watching, there is no extensive mining being done.

"The average assay of all ore smelted from Silver Islet during the first three years was above 900 oz. per ton."

Then there is a note from Dr. Sterry Hunt dated Montreal, Nov. 18, 1879, announcing that "drifts a few fathoms from the old shaft have disclosed a parallel lode which has enabled them to pay off in the last six months a debt of \$400,000, and the weekly yield is now from \$50,000 to \$70,000. On Nov. 1 the estimated value of the ore in sight was \$1,000,000.

"The country rock of Silver Islet is diorite in clay-slate. The native silver is disseminated through the ore in dendritic masses. Associated minerals are native silver filiform and massive cerargyrite, argentite, pyrargyrite, niccolite containing cobalt, annabergite galena, zinc blende, copper pyrites, iron pyrites, marcasite, gypsum, calcite, dolomite, rhodocroisite, quartz and graphite."

The ore was smelted with galena from Colorado and Utah, limestone and iron cinders from rolling mills, in small rectangular one-tuyered blast furnaces smelting about 6 tons a day. The base bullion contained 2000 oz. silver to the ton, which was cupelled directly Regulus and Speiss were obtained, which was roasted and used over again until concentrated enough to be worked for nickel. The slags contained from 1 to 5 oz. silver and less than 1 per cent. lead.

An analysis of the slag is also given, as follows: Lime, 10.77 per cent.; magnesia, 1.97; alumina, 12.25; ferrous oxide, 41.11; and silica, 33.77 per cent.

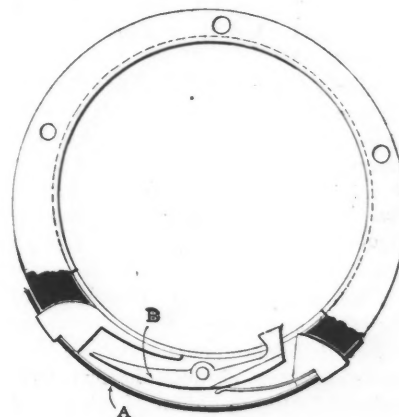
Whether cobalt in Canada will last for many years or not remains to be seen. It would be interesting if those readers who have had experience with cobalt silver mines would give some account of them. The literature of the subject is scanty.

HENRY WATSON.

Chicago, Ill., May 15, 1907.

Tampering with Safety Lamps

I recently visited a mine, where much gas was present, in which the Wolf safety lamp is in use. Some "smart" miner, disobeying orders and risking the lives of everyone underground, had tampered with the safety lamp, nearly everyone in use at the mine showing evidence of having been opened.



PLAN OF LAMP FRAME—PIN HOLE AT A

The magnetic lock on the Wolf lamp is an ingenious device. However, it has been found that without injuring the mechanism of this excellent lamp, it is possible to open it by drilling a hole at the point marked A in the accompanying engraving. By inserting a needle, the lever B can be moved, and the bottom of the lamp can be unscrewed without the use of a magnet. To conceal this deviltry the little hole at A was filled with grease, so as to be almost invisible.

This is a danger which ought to be called to the attention of mine managers, and the manufacturers of the Wolf lamp. Of course, it can be easily eliminated by a little modification in the design of the locking mechanism of the lamp.

RICHARD LEE.

New York, April 30, 1907.

Anaconda Copper Mining Company

This company owns mines and works in the Butte district in Montana, besides coal mines and other subsidiary property. It is controlled by the Amalgamated Copper Company. The report covers the year 1906. The capital stock is \$30,000,000. The surplus, or undivided profit, amounted to \$9,183,242 at the close of the year.

The mines of the company produced 1,450,601 net tons of ore during 1906. The reduction works treated for all companies 3,006,910 dry tons of ore and other cupreous material. From the ore treated for the Anaconda company there was produced 94,963,835 lb. of copper, 2,979,908 oz. of silver and 15,985 oz. of gold.

The earnings and expenses for two years past were as follows:

	1905.	1906.	Changes.
Gross earnings	\$23,734,203	\$26,968,871	I. \$3,234,668
Expenses	18,146,481	18,384,702	I. 238,221
Net earnings	\$ 5,587,722	\$ 8,584,169	I. \$2,996,447
Other income	131,106	258,500	I. 127,394
Total net	\$ 5,718,828	\$ 8,842,669	I. \$3,123,841

From the net income in 1906 dividends amounting to \$6,900,000, or 23 per cent., were paid, leaving a surplus of \$1,942,969. Adding the balance from 1905, made a total surplus of \$9,183,241. The net income last year was equal to 29.5 per cent. on the stock.

President John D. Ryan states that all departments of the company were in continuous operation during the year. The company treated at the reduction works an increased amount of ore for other companies, thus reducing the cost of treating the product of its own mines. On account of the higher prices for copper received there has been a greater proportion of lower-grade ores mined, although the reserves of the higher-grade ores have been increased largely. Through the economies introduced in the operation of mines and works and the higher price for copper, it was possible during the year to mine at a profit on as much as 1 per cent. lower in copper value than the lowest grade considered profitable during the last few years.

It has been determined that the workings of the tailings in the dump of the old works by leaching and precipitation can be done at a good profit during the months when water will not freeze, and other arrangements will make the leaching and precipitation of these tailings profitable during all of the year. With any reasonable price for copper, the yield from working the tailings should be large for many years to come.

The subsidiary departments made profits of \$387,615 for the year. The saw mills are expected to furnish a considerable supply of timber and lumber for commer-

cial uses outside of the company's needs. The Butte-Anaconda & Pacific Railroad yielded net profits of \$342,193. After paying a dividend of 6 per cent. on the capital stock a surplus was left of \$282,193. Additional equipment has been ordered to be delivered before next winter.

A detailed analysis of earnings and expenses for 1906 is as follows:

Sales copper, silver and gold	\$20,955,532
Royalties, dividends and rentals	146,731
Miscellaneous	172,989
Net profits, subsidiary dep'ts	387,615
Total receipts	\$21,662,867
Decrease in copper, silver and gold on hand	\$455,102
Mining expenses	5,870,439
Ore, matte and copper bought	315,091
Transportation of ore to mill	234,150
Reduction expenses at Anaconda	4,424,278
Transporting, refining and selling metal	1,721,966
Administration expenses	57,872
Total expenses	\$13,078,698
Net balance	\$8,584,169

The total quantity of cupreous material treated in the reduction works, was 3,006,910 dry tons. The material treated for the Anaconda was 1,494,828 tons ore; 18,496 tons of slimes; 3324 tons flue-dust; 166,516 tons slag; 654 tons miscellaneous cleanings from old works; a total of 1,683,818 tons. The yield, as stated above, was 94,963,835 lb. copper, 2,979,908 oz. of silver, and 15,885 oz. of gold; giving averages per ton of ore only of 63.5 lb. copper, 1.99 oz. silver, and 0.011 oz. gold per ton. An increased product of arsenic has been recovered from flue dust, and a good price is being received for it on contract for the entire output of the plant.

The electrical equipment of the concentrator has been completed, and the power costs at that plant will show a large reduction during the coming year.

An experimental plant to leach the tailings in the dumps at the old works was in operation during part of the year with gratifying results. It has been determined that the working of these tailings by leaching and precipitation can be done at a good profit. With any reasonable price for copper, the yield from working the tailings should be larger for many years to come.

The yield of copper from the precipitating plants treating the water taken from the mines through the High Ore pumping plant, was larger than in any previous year and netted the company a very good profit after deducting all costs of draining.

The coal mine at Belt produced 291,851 tons of coal, of which 152,304 tons were shipped to the other departments of the company, 116,469 tons were sold and 23,076 tons were used by the coal department.

The brick department at Anaconda has much improved its product and business, the silica and fire brick manufactured by the company now finding ready market at all smelting centers in the Intermountain and Pacific coast territory.

Electric Smelting of Iron Ore

The results of the experiments in electric smelting, undertaken to demonstrate the commercial feasibility of the process as applied to Canadian iron ores, were given in a preliminary report by Dr. Eugene Haanel, published last year, and have received extensive publicity. The final report just issued* is of a more elaborate character and comprises a detailed statement of the work done and its results, with analyses of the raw material used and the pig iron and slag produced and many other data of practical value to metallurgists. It contains numerous illustrations of the plant and machinery, showing the changes it was found necessary to make in construction, and plans are also given of two recently patented electric furnaces. The appendix comprises much recent information on the subject, including a description of Swedish improvements in the process, and the results of German and French experiments.

The report states that the first electric smelting plant in Canada for the production of pig iron and later of high-grade steel and steel castings is at present under construction at Welland, Ont., by R. Turnbull, Canadian representative of the Heroult process and furnaces, and R. H. Wolff, American representative of the same, and their associates. The first installation consists of one 3000-h.p. furnace of the latest Heroult type, which is expected to produce 35 tons of pig iron per day, when not utilizing the gases produced by the reduction and 40 tons when the gases are used. Power will be furnished by the Ontario Power Company, of Niagara Falls, at 12,000 volts and transformed to the required voltage by transformers furnished by the Packard Company of St. Catharines, Ont. These will be of the oil- and water-cooled type, of 750 kw. each, and arranged with taps on the secondary side to allow a range from 30 to 40 volts on the secondary. The furnace is so arranged that a three-phase current can be employed. The furnace will be used to demonstrate that pig iron can be commercially produced at a site where the price of power is high and the nearest ore supply 150 miles distant. Some of the ore used will be brought from Port Arthur, containing as high as 1½ per cent. sulphur, and other Canadian ores will be employed. The first furnace will be followed by a second one, probably of larger capacity, and a Heroult steel furnace will also be installed for the manufacture of high-grade steel castings, at present not made in Canada.

*"Report on the Experiments made at Sault Ste. Marie, Ont., under Government auspices in the Smelting of Canadian Iron Ores by the Electro-thermic Process." By Eugene Haanel, Ph. D. Ottawa; Government Printing Office.

Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

UNITED STATES AND BRITISH PATENTS

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

CEMENT

CEMENT KILN. Thomas M. Morgan, Longue Pointe, Quebec, Canada. (U. S. No. 851,765; April 30, 1907.)

COAL AND COKE

BRIQUETTING. A. W. H. Vivian, London, England. Briquetting small coal by means of a mixture of water, magnesite cement and oil that has been treated with chloride of sulphur. (Brit. pat. 7357 of 1906; April 27, 1907.)

CHARCOAL AND COKE MAKING. W. S. Simpson, London, England. A retort for making charcoal and coke from peat, brown coal, etc. (Brit. No. 7732 of 1906; April 13, 1907.)

COAL CRUSHER. Milton F. Williams, St. Louis, Mo., assignor to Williams Patent Crusher and Pulverizer Co., St. Louis, Mo., a corporation of Missouri. (U. S. No. 850,988; April 23, 1907.)

COAL CUTTERS. H. Hird, Dewsbury, England. Improvements in the coal cutters, consisting of rotating drills mounted on a traveling carriage. (Brit. No. 11,525 of 1906; April 20, 1907.)

COAL-CUTTING MACHINES. H. Hurst, Dewsbury, England. Method of securing cutters to the cutter wheels of coal-cutting machines. (Brit. No. 11,524 of 1906; April 27, 1907.)

COAL-MINING DEVICE. H. Haughton, Ormskirk, Lancashire. A split steel rod for use in breaking down coal without the use of explosives. (Brit. No. 25,371 of 1906; April 20, 1907.)

COKE MANUFACTURE. G. de Velna, Paris, France. Method of utilizing small coal for the manufacture of coke suitable for use in metallurgical operations. (Brit. No. 19,780 of 1906; April 13, 1907.)

COKE OVEN. Andrew Kerschgens, Charleroi, Penn., administrator of Joseph Kerschgens, deceased. (U. S. No. 850,939; April 23, 1907.)

DISTILLATION OF COAL—Method of Distilling Coal. Olivier A. Gobbe, Jumet, Belgium. (U. S. No. 852,268; April 30, 1907.)

PEAT-WORKING MACHINE. Geo. Matthews, Ilga, Mich. (U. S. No. 852,609; May 7, 1907.)

COPPER

CONVERTING COPPER MATTE—Art of Converting Metals. Richard L. Lloyd, Cananea, Mexico. (U. S. No. 851,816; April 30, 1907.)

ELECTROLYTIC COPPER. M. Perreul-Lloyd and A. M. Gardner, Paris, France. In electrolytic methods for producing copper from solutions of copper and iron sulphates, methods of dealing with the sulphuric acid so as to use it over and over again. (Brit. No. 25,489 of 1906; April 27, 1907.)

MATTE SMELTING. J. Savelsberg, Papenburg, Germany. A method of treatment of copper and other mattes for the purpose of removing the iron by mixing the ground matte with silica and iron and distributing it over a layer of incandescent fuel, through which an air blast is forced from below. The iron slags off and the remaining sulphides and sulphates of copper, etc., become sintered. (Brit. No. 10,329 of 1906; April 20, 1907.)

ORE TREATMENT—Method of Treating Ores. James W. Bolleau, Denver, Colo., assignor of one-half to James B. Knoblock, Denver, Colo. (U. S. No. 853,575; May 14, 1907.)

GOLD AND SILVER

HYDRAULIC MINING—Regulating Means for Hydraulic Nozzles. George J. Henry, Jr., San Francisco, Cal. (U. S. No. 853,786; May 14, 1907.)

STAMP MILLING PRACTICE. C. E. Holland, New York, N. Y. Electrolytic apparatus for setting float gold coming from stamp

batteries, or floating ore coming from concentrating plant. (Brit. No. 6937 of 1906; April 27, 1907.)

IRON AND STEEL

BLAST-FURNACE TOP. John W. Gocher, Johnstown, Penn. (U. S. No. 851,128; April 23, 1907.)

BLAST FURNACES—Skimmer for Blast Furnaces. Charles D. Irvin, Pittsburg, Penn. (U. S. No. 851,596; April 23, 1907.)

FERRO-MOLYBDENUM. H. W. C. Annable and the Ferro-Alloys Syndicate, London. Obtaining ferro-molybdenum from molybdenite by heating the latter with alkali in the presence of oxygen, and preparing from the product a solution containing molybdate of the alkali; precipitating this by means of a salt of iron, so obtaining molybdate of iron, which can be reduced to ferro-molybdenum. (Brit. No. 5031 of 1906; March 30, 1907.)

FERRO-MOLYBDENUM—Manufacture of Ferro-Molybdenum. Henry W. C. Annable, London, England, assignor to the Ferro-Alloys Syndicate, Ltd., London, England. (U. S. No. 852,920; May 7, 1907.)

MOLD for Casting Chilled Rolls. Ralph H. West, Cleveland, O. (U. S. No. 853,490; May 14, 1907.)

MOLD—Metal Mold for Casting Iron and Steel. Alonzo W. McArthur, Swampscott, and Jesse M. Darke, Lynn, Mass., assignors to General Electric Co., a corporation of New York. (U. S. No. 852,671; May 7, 1907.)

OPEN-HEARTH FURNACES. J. A. Drain, Pittsburg, Penn. In open-hearth furnaces, arrangements for discharging the contents into more than one ladle. (Brit. No. 19,633 of 1906; April 13, 1907.)

TEMPERING BATH. J. Churchward, New York, N. Y. Improved tempering bath for steel castings, composed of two superimposed baths, one of carbolic and linseed oil and the other of a mixture of mercury and fat. (Brit. No. 19,170 of 1906; April 27, 1907.)

LEAD

LEAD OXIDE—Process of Making Lead Oxide. Clarence A. Hall, Philadelphia, Penn. (U. S. No. 852,325; April 30, 1907.)

PETROLEUM

PUMPING—Deep Oil Well Pumping. Ross J. Hoffman, Bradford, Penn. (U. S. No. 852,061; April 30, 1907.)

QUICKSILVER

MERCURY OR QUICKSILVER STILL. Raymond A. Lackmann, Portland, Ore. (U. S. No. 853,701; May 14, 1907.)

ZINC

ALLOY. J. H. W. Rolason, Birmingham, England. The use of zinc as an alloy for standard silver, such silver containing 925 parts of fine silver and 75 parts of zinc, the metal thus formed being more ductile and more easily annealed. (Brit. No. 7195 of 1906; April 27, 1907.)

LOW GRADE CALAMINE. F. S. Moyano, Agullas, Spain. A process for utilizing low-grade calamine by first calcining and then treating with a solution of calcium chloride, the zinc chloride thus produced being precipitated as oxide by the admixture of carbonate of magnesium. (Brit. No. 24,526 of 1906; April 27, 1907.)

METALLURGICAL CONDENSER. Woolsey M. Johnson, Iola, Kan. (U. S. No. 851,520; April 23, 1907.)

ORE REDUCTION—Process of Reducing Zinc Ores. Carl G. P. de Laval, Stockholm, Sweden, assignor to Société Anonyme Métallurgique Procédés de Laval, Frankfurt-on-the-Main, Germany, a corporation of Belgium. (U. S. No. 852,440; May 7, 1907.)

RETORTS—Process of Filing Zinc Retorts. John D. James, Pulaski, Va. (U. S. No. 851,668; April 30, 1907.)

ZINC OXIDE. H. A. Leaver and C. Buch, London. Improved process for recovering zinc oxide and ammonia from flux skimmings of zinc by means of lime. (Brit. No. 5655 of 1906; March 30, 1907.)

ZINC SULPHATE—Process of Reducing Zinc Sulphate Directly from the Ore. George O. Angell, Philadelphia, Penn. (U. S. No. 851,639; April 30, 1907.)

ORE DRESSING

BALL MILL. Hermann Löhnert, Bromberg, Germany. (U. S. No. 851,013; April 23, 1907.)

CONCENTRATING TABLES. G. Green, Lanark, England. Method of mounting concentrating tables having a vanning motion, the tables being mounted by means of brackets on pivots which oscillate round a center above, the motion thus obtained moving the table through an arc and imitating the motion of the vanning shovel. (Brit. No. 14,721 of 1906; April 20, 1907.)

CONCENTRATOR. Henry L. Lightner, San Francisco, Cal., assignor of one-third to William Priest and one-third to Henry Felge, San Francisco, Cal. (U. S. No. 851,426; April 23, 1907.)

CONCENTRATOR. John F. Isbell, Denver, Colo. (U. S. No. 853,459; May 14, 1907.)

CONCENTRATOR—Centrifugal Concentrator. Charles T. Heisel, Cleveland, Ohio. (U. S. No. 852,558; May 7, 1907.)

CONCENTRATOR—Electromagnetic Machine or Concentrator. John H. Ryan, Portland, Ore., assignor of one-third to O. B. Stubbs and one-third to Charles N. Ryan, Portland, Ore. (U. S. No. 853,475; May 14, 1907.)

CRUSHER. Milton F. Williams, St. Louis, Mo., assignor to Williams Patent Crusher and Pulverizer Co., St. Louis, Mo., a corporation of Missouri. (U. S. No. 851,390; April 23, 1907.)

CRUSHER—Dry-pan Crusher. Jacob W. Boltz, Topeka, Kan. (U. S. No. 852,160; April 30, 1907.)

CRUSHING MACHINE. Thomas L. Sturtevant, Quincy, and Thomas J. Sturtevant, Wellesley, Mass., assignors to Sturtevant Mill Co., Portland, Me., a corporation of Maine. (U. S. No. 853,656; May 14, 1907.)

CRUSHING ROLLS. Frank P. Snow, Los Angeles, Cal. (U. S. No. 853,481; May 14, 1907.)

ORE FEEDER. Henry Eggers, Denver, Colo. (U. S. No. 853,346; May 14, 1907.)

ORE MILL. Julius Johnson, Mesa, Ariz. (U. S. No. 851,757; April 30, 1907.)

ORE PULVERIZER. George J. Beistner, Chicago, Ill., assignor of one-half to Walter H. Stone, Chicago, Ill. (U. S. No. 852,096; April 30, 1907.)

ORE PULVERIZER and Concentrator. Obadiah K. McCutcheon, Pittsburg, Penn. (U. S. No. 850,952; April 23, 1907.)

ORE PULVERIZING OR GRINDING MILL. James W. Fuller, Jr., Catawauqua, Penn. (U. S. No. 852,173; April 30, 1907.)

ORE SEPARATING AND CONCENTRATING MACHINE. William P. Clifford, Iconium, and William W. Rankin, Ottumwa, Iowa. (U. S. No. 853,917; May 14, 1907.)

ORE SEPARATOR. Lon D. Hall and Samuel P. Hall, Prescott, Ariz. (U. S. No. 853,782; May 14, 1907.)

ORE SEPARATOR—Centrifugal Machine. Birger Ljungström, Stockholm, Sweden, assignor to Aktiebolaget Separator, Stockholm, Sweden. (U. S. No. 852,666; May 7, 1907.)

ORE SEPARATOR—Electromagnetic Separator. William Blackmore, London, England. (U. S. No. 851,979; April 30, 1907.)

ORE SEPARATOR—Magnetic Ore Separator. Henry H. Wait, Chicago, Ill., assignor to International Separator Co., Chicago, Ill., a corporation of New Jersey. (U. S. No. 851,046; April 23, 1907.)

PEBBLE MILLS—Lining for Pebble Mills. Max F. Abbé, New York, N. Y. (U. S. No. 851,637; April 30, 1907.)

SEPARATION OF MINERALS—Apparatus for Separating Minerals. James F. Latimer, Toronto, Ontario, Canada. (U. S. No. 851,599; April 23, 1907.)

SEPARATION OF MINERALS—Process for Separating Minerals. James F. Latimer, Toronto, Ontario, Canada. (U. S. No. 851,600; April 23, 1907.)

SEPARATOR—Mineral Separator. Chas. U. Shepard, Summerville, S. C. (U. S. No. 853,603; May 14, 1907.)

METALLURGY—GENERAL

BRIQUETTING—Method of Forming

Blocks of Ores for Metallurgical Purposes. Arpad Ronay, Budapest, Austria-Hungary. (U. S. No. 12,643, reissue; April 30, 1907.)

BRIQUETTING—Process of Agglomerating Minerals. Walter G. Perkins and Thomas Cox, Jr., San Francisco, Cal. (U. S. No. 852,611; May 7, 1907.)

DESULPHURIZING—Process of Desulphurizing and Subsequent Smelting. Walter G. Perkins, San Francisco, Cal. (U. S. No. 852,612; May 7, 1907.)

METAL REFINING—Process of Purifying Metals. Paul L. T. Héroult, La Praz, France, assignor to Société Electro-Metallurgique Française, Froges, Isère, France. (U. S. No. 851,167; April 23, 1907.)

ORE TREATMENT—Process of Treating Zinc and Lead Ores. John Theilberg, New York, N. Y. (U. S. No. 851,187; April 23, 1907.)

SINTERING—Apparatus for Sintering Fine Ore. John G. Bergquist, Chicago, Ill., assignor to American Sintering Co., Chicago, Ill., a corporation of Illinois. (U. S. No. 853,433; May 14, 1907.)

MINING MACHINERY AND APPARATUS

AERIAL TRAMWAY BUCKETS—Automatic dumping mechanism for aerial-tramway buckets. Hiram G. Ferris, Leavenworth, Kan. (U. S. No. 852,546; May 7, 1907.)

BLASTING—Miner's Blast-charger. William G. Peay and George W. Ham, Willard, Ky. (U. S. No. 852,900; May 7, 1907.)

CAR-DUMPING APPARATUS. Truman H. Aldrich, Jr., Birmingham, Ala. (U. S. No. 852,643; May 7, 1907.)

COMPRESSED AIR—Apparatus for Extracting Moisture from Compressed Air. James R. Duncan, New York, N. Y. (U. S. No. 853,345; May 14, 1907.)

CONVEYING MACHINERY—Machinery for Conveying Earth, etc. Samuel Lloyd, Birmingham, and Alfred R. Grossmith, Corby, near Kettering, England. (U. S. No. 852,885; May 7, 1907.)

DEEP BORING APPARATUS. H. M. Smit, Utrecht, Holland. An apparatus for determining the dip of strata, for use in connection with deep boring apparatus. (Brit. No. 10,764 of 1906; April 20, 1907.)

DREDGER and Excavator. Marx P. Schetzel, Oakland, Cal. (U. S. No. 851,628; April 23, 1907.)

DREDGING and Excavating Machine. John Kennedy, Montreal, Quebec, Canada. (U. S. No. 851,093; April 23, 1907.)

DUST-PREVENTION APPARATUS. H. D. Griffiths and G. H. Colwill, Swansea, Wales. An exhaust apparatus for preventing dust in mines, by means of which the dust from the drills is drawn through a tank of water. (Brit. No. 7355 of 1906; April 27, 1907.)

EXCAVATING BUCKETS—Scraper for Orange-Peel Buckets. Louis A. Désy, Montreal, Quebec, Canada, assignor to Joseph William Harris, Montreal, Canada. (U. S. No. 851,733; April 30, 1907.)

EXCAVATING SCOOP. Russell Wiles, Chicago, Ill., assignor to John W. Page, Chicago, Ill. (U. S. No. 852,863; May 7, 1907.)

LOCOMOTIVES—Cable-Reel Apparatus for Mining Locomotives. Harry W. Shaver, Pochontas, Va., assignor to General Electric Co., a corporation of New York. (U. S. No. 853,522; May 14, 1907.)

MINE CAGES. S. Henrard, Liege, Belgium. Improved method of suspending mine cages in case of accident to the winding rope. (Brit. No. 1964 of 1907; April 27, 1907.)

MINE CAR. Franklin C. Hockensmith, Pittsburg, Penn., assignor to Hockensmith Wheel and Mine Car Co., Penns Station, Penn., a corporation of Pennsylvania. (U. S. No. 852,879; May 7, 1907.)

MINE GASES—Apparatus for Detecting the Presence and Volume of Fire-damp and Other Light Gas in Mines, etc. James McCutcheon, Edinburgh, Scotland. (U. S. No. 852,895; May 7, 1907.)

MINER'S LAMP. Ralph L. Graves, Sumpster, Ore. (U. S. No. 853,078; May 1, 1907.)

PICK FOR MINING OR CUTTING MACHINES. Thomas N. Wallace, Centerville, Iowa, assignor of fifteen one-hundredths to John R. Needham, Centerville, Iowa. (U. S. No. 851,970; April 30, 1907.)

ROCK DRILL. Edward Leichter, Nevada City, Cal., assignor of one-half to James C. Campbell, Nevada City, Cal. (U. S. No. 853,555; May 14 1907.)

ROCK DRILL. Her Rock Drill Co., Denver, Colo. An improved pneumatic hammer rock drill. (Brit. No. 18,882 of 1906; April 13, 1907.)

ROCK DRILL—Electric Rock Drill. John Riddell and George B. Painter, Schenectady, N. Y., assignors to General Electric Co., a corporation of New York. (U. S. No. 852,680; May 7, 1907.)

ROCK DRILLING MACHINES. C. R. Newton, Johannesburg, S. A. An improved tool holder for holding drills in percussive rock-drilling machines. (Brit. No. 20,721 of 1906; April 20, 1907.)

METALLURGICAL MACHINERY AND APPARATUS

BRIQUET PRESS. Ely C. Hutchinson, San Francisco, Cal., assignor to Charles R. Allen, San Francisco, Cal. (U. S. No. 851,007; April 23, 1907.)

BRIQUET PRESS. Oscar Busse, Melderich, Dulsburg, Germany. (U. S. No. 850,905; April 23, 1907.)

BRIQUETTING—Apparatus for Preparing Pulverulent Materials for Molding or Briquetting. George J. Mashek, Newark, N. J. (U. S. Nos. 852,024 and 852,025; April 30, 1907.)

BRIQUETTING APPARATUS. Société de Sacre Madame de Dampreny, Charleroi, Belgium. In briquetting apparatus in which plastic material is extruded, improved means for cutting up the extruded mass into bricks. (Brit. No. 14,254 of 1906; April 13, 1907.)

BRIQUETTING MACHINE. Robt. Schorr, San Francisco, Cal. (U. S. No. 852,457; May 7, 1907.)

INGOT-CHARGING CRANE. Clarence L. Taylor, Alliance, Ohio, assignor to Morgan Engineering Co., Alliance, O. (U. S. No. 853,482; May 14, 1907.)

ORE TREATMENT—Apparatus for the Treatment of Sulphides and Other Ores. Geo. E. Kingsley, Toronto, Ontario, Canada. (U. S. No. 852,510; May 7, 1907.)

REFINING METALS—Apparatus for Converting Metals. Richard L. Lloyd, Cananea, Mexico. (U. S. No. 851,817; April 30, 1907.)

STAMP-MILL MACHINERY. James C. Anderson, Highland Park, Ill. (U. S. No. 852,756; May 7, 1907.)

FURNACES

ANNEALING FURNACE. T. V. Hughes, Birmingham, England. In annealing furnaces for toughening metals, in which a gaseous non-oxidizing atmosphere is used, methods of arrangement to prevent air entering with the articles to be treated. (Brit. No. 729 of 1906; April 13, 1907.)

BLAST-FURNACE CHARGING APPARATUS. Guy R. Johnson, Clarksville, Tenn. (U. S. No. 853,016; May 7, 1907.)

CHARGING DEVICE—Device for Charging Furnaces. Gas Generators, etc. Hugo Rehmann, Mülheim-on-the-Ruhr, Germany. (U. S. No. 853,420; May 14, 1907.)

CHARGING TRUCK for Annealing Furnaces. John G. Blum, Toledo, Ohio. (U. S. No. 852,012; April 30, 1907.)

CRUCIBLE FURNACE. Julius Borbeck, Aitena, Germany. (U. S. No. 852,867; May 7, 1907.)

ELECTRIC FURNACE. Henry N. Potter, New Rochelle, N. Y., assignor to Geo. Westinghouse, Pittsburg, Penn. (U. S. No. 851,961; April 30, 1907.)

ELECTRIC FURNACE PRACTICE. H. Rochling and W. Rodenhauser, Volkingen, Germany. In electric furnaces a method of preserving the covering of slag in as hot and liquid a state as possible. (Brit. No. 17,615 of 1906; April 20, 1907.)

ELECTRIC MELTING FURNACE. P. R. Kuhnrich, Sheffield, England. An electric melting furnace for metals, mounted on trunnions so as to be rotatable around a horizontal axis, and provided with discharge openings of such construction that a casting ladle is dispensed with. (Brit. No. 6283 of 1906; April 20, 1907.)

ELECTRIC RESISTANCE FURNACES. F. A. Kjellin, Stockholm, Sweden. Construction of electric resistance furnaces which will allow of the treatment of large charges. (Brit. No. 21,416 of 1906; April 27, 1907.)

FURNACE CHARGING—Charging Bar for Open-hearth Charging Machines. Clarence L. Taylor, Alliance, Ohio, assignor to Morgan Engineering Co., Alliance, Ohio. (U. S. No. 853,483; May 14, 1907.)

MUFFLE FURNACE—Recuperative Muffle Furnace. Lazrby C. Hamlink, St. Louis, Mo., assignor to Gas Bench Construction Co., St. Louis, Mo., a corporation of Missouri. (U. S. No. 852,506; May 7, 1907.)

OPEN-HEARTH FURNACE PRACTICE. E. Bosshardt and H. Garda, Cologne, Germany. In open-hearth furnaces for smelting, melting and producing alloys, improved methods of preheating the air employed. (Brit. No. 15,075 of 1906; April 27, 1907.)

ROASTING FURNACE. W. B. Dennis, Black Butte, Oregon. A roasting furnace, consisting of a series of chambers arranged vertically over each other, through which the ore descends gradually. (Brit. No. 12,523 of 1906; April 20, 1907.)

SMELTING FURNACE. Walter G. Perkins, San Francisco, Cal. (U. S. No. 852,613; May 7, 1907.)

STACK-FURNACE CONSTRUCTION. Joseph L. Hunter, Roanoke, Va. (U. S. No. 853,698; May 14, 1907.)

TURBO BLOWER. Hans Holzwarth, Hamilton, O., assignor to Hooven, Owen, Rentschler Co., Hamilton, Ohio. (U. S. No. 853,363; May 14, 1907.)

TUYERE VALVE—Hot-blast Valve. Jacob B. McKennan, Pueblo, Colo. (U. S. No. 853,722; May 14, 1907.)

INDUSTRIAL CHEMISTRY

ACID COOLING and Generating Chamber. Iens P. Lihme, Cleveland, O., assignor to the Grasseil Chemical Co., Cleveland, O., a corporation of Ohio. (U. S. No. 852,390; April 30, 1907.)

ALUMINUM PROCESS. A. Klemm, Mannheim, Germany. Producing alumina and alkali thiosulphate by mixing alkali sulphate, carbon and bauxite, calcining, lixiviating and treating with sulphurous acid or sulphuretted hydrogen. (Brit. No. 5478 of 1906; Apr. 6, 1907.)

ARSENIC REMOVAL. Peter Spence & Sons, Manchester, England. In clarifying solutions which have been obtained by acting on aluminum compounds by means of sulphuric acid containing arsenic, precipitating the arsenic as sulphide by adding calcium sulphide, the precipitated sulphide on falling acting to clear the solution generally. (Brit. No. 6529 of 1906; April 13, 1907.)

ARTIFICIAL FUEL—Composition of Matter to be Used as Fuel and Process of Making Same. Edgar L. Culver, South Omaha, Nebr. (U. S. No. 851,407; April 23, 1907.)

ATMOSPHERIC NITROGEN—Process of Oxidizing Atmospheric Nitrogen. Albert Neuburger, Berlin, Germany. (U. S. No. 850,392; Apr. 13, 1907.)

CALCIUM PHOSPHATE—Method of Producing Dicalcium Phosphate. Eugen Bergmann, Ohlau, Germany. (U. S. Nos. 852,371 and 852,372; April 30, 1907.)

EXPLOSIVE. Fin Sparre, Wilmington, Del., assignor to The E. I. du Pont de Nemours Powder Company, Wilmington, Del., a Corporation of New Jersey. (U. S. No. 850,268; Apr. 13, 1907.)

EXPLOSIVE. Fin Sparre, Wilmington, Del., assignor to The E. I. du Pont de Nemours Powder Company, Wilmington, Del., a Corporation of New Jersey. (U. S. No. 850,502; Apr. 13, 1907.)

EXPLOSIVE—Ammonium-nitrate Explosive. Fin Sparre, Wilmington, Del., assignor to The E. I. du Pont de Nemours Powder Company, Wilmington, Del., a Corporation of New Jersey. (U. S. No. 850,325; Apr. 13, 1907.)

EXPLOSIVE—Ammonium-nitrate Metallic Explosive and Process of Making Same. Fin Sparre, Wilmington, Del., assignor to The E. I. du Pont de Nemours Powder Company, Wilmington, Del., a Corporation of New Jersey. (U. S. No. 850,267; Apr. 13, 1907.)

EXPLOSIVE and Process of Making Same. Fin Sparre, Wilmington, Del., assignor to The E. I. du Pont de Nemours Powder Co., Wilmington, Del., a Corporation of New Jersey. (U. S. No. 850,326; Apr. 13, 1907.)

EXPLOSIVES—Manufacture of Explosives. Hugh C. L. Bloxam, Cape Town, Cape Colony, assignor to South African Maganite Explosives Syndicate, Ltd., Cape Town, Cape Colony. (U. S. No. 853,056; May 7, 1907.)

EXPLOSIVES—Waterproof Composition for Explosives. Fin Sparre, Wilmington, Del., assignor to The E. I. du Pont de Nemours Powder Company, Wilmington, Del., a Corporation of New Jersey. (U. S. No. 850,266; Apr. 13, 1907.)

POTASH EXTRACTION—Method of Extracting Potash from Feldspathic or Other Potash-bearing Rock. Allerton S. Cushman, Connecticut. (U. S. No. 851,922; April 30, 1907.)

SULPHURIC ACID. J. Raschen, A. E. Waring and the United Alkali Company, Liverpool. An improvement to the inventors' process for removing arsenic from sulphuric acid by means of hydrochloric acid gas. (Brit. No. 5151 of 1906; Mar. 30, 1907.)

SULPHURIC ACID—Tower for Sulphuric-acid Plants. Richard Cellarius, Sergievskoi Posad, Russia. (U. S. No. 848,631; April 2, 1907.)

ZINC SULPHIDE—Apparatus for Producing Alkali Hydrates and Zinc Sulphide. Charles Ranson, Brussels, Belgium, assignor to Henry William De Stuckle, Dieuze, Germany. (U. S. No. 850,965; April 23, 1907.)

ANALYTICAL CHEMISTRY

ASSAYING—Assayer's Pouring-mold. John J. Bailey, Victor, Colo. (U. S. No. 850,811; Apr. 13, 1907.)

Personal

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

Hon. Frank Cochrane, minister of mines for Ontario, has returned from a trip to England.

C. I. Burt, an operator of the Georgetown, Colo., district, is making a business visit to eastern points.

W. A. Clark has returned to Butte, Mont., to look after his extensive mining and smelting interests there.

G. G. S. Lindsey, general manager of the Crow's Nest Pass Coal Company, Fernie, B. C., has been in Toronto.

Arthur Pierce, mining engineer, of London, England, spent several days in Butte, Mont., recently, on mining business.

Dr. Regis Chauvenet, of Denver, has been examining mines in Gilpin county, Colo., in the interests of Eastern capitalists.

George E. McClelland, manager of the Freeland mines at Idaho Springs, Colo., has returned from a business visit to the East.

Col. George G. Vivian, of Denver, has been making examination of mining properties in Gilpin and Clear Creek counties, Colorado.

Clifford Willey has been appointed engineer for the Virginia & Mexico Mine and Smelter Corporation, at Hostotipaquillo, Mexico.

Herman Wendler, of Ures, Sonora, Mexico, sailed from New York, May 21, on a business trip to Europe. He will return in the fall.

E. G. Biddison has been appointed superintendent of the mines of the Ohio Coal Company, in Coshocton and Guernsey counties, Ohio.

Christ Miller, formerly foreman for the Lehigh Valley Coal Company at Oneida, Penn., has succeeded the late William Jones as foreman of the Tomhicken mine.

Burt Adams Tower, mining engineer, of Butte, Mont., is visiting Idaho in the interest of the Mines Exploration and Development Company, a Butte corporation.

E. C. Frisbee, H. R. Mandell and William E. Bright, of Massachusetts, attended the meeting of stockholders of the Raven Mining Company, in Butte, Mont., May 15.

John E. Pettit has been appointed State mine inspector of Utah, in place of Gomer Thomas, who has resigned in order to take charge of a large coal-mining operation.

Alexander Agassiz, president, and Rudolph Agassiz, second vice-president of the Calumet & Hecla Company, are in the Lake Superior country on the usual semi-annual visit to the properties.

W. A. Carlyle has resigned the position of general manager of the Rio Tinto copper mines in Spain, which he has held during the past seven years. He has begun consulting practice in London.

Thomas H. Williams, general superintendent of the Kingston Coal Company, was severely burned recently by an explosion of gas in that company's No. 4 colliery near Kingston, Pennsylvania.

F. P. Vandenberg, who resigned a year ago as chief chemist to the Belen mines at Cumpas, Sonora, Mexico, has recovered his health and is now developing personal interests at Santa Rosa, New Mexico.

H. E. T. Haultain, who for the past year and a half has been manager of the production end of the Canada Corundum Company, has been appointed general manager, with headquarters at Craigmont, Ontario.

C. S. Durell, late at Searchlight, Nev., has taken over the management of the Death Valley Gold Mining Company at Cima, California. He will also act as consulting engineer for the Arcalvada Mining Company, in the same district.

Eli T. Connor, formerly superintendent of the Wyoming division collieries of the Lehigh Valley Coal Company, has been selected by the Guggenheim interests to take charge of the operations of the New River Collieries Company in West Virginia.

Norman R. Fisher, of New York, having taken over the general management of a number of properties in Cobalt, Ont., and the surrounding districts, has opened offices in Haileybury, Ont., which he is for the present making the headquarters of his consulting practice.

Prof. Frederick H. Sexton, who resigned the chair of mining in Dalhousie University, Nova Scotia, to accept the metallurgical professorship in the University of Missouri, has been appointed director of technical education for Nova Scotia and principal of the school of technology to be established in Halifax.

Eugene Coste, of Toronto, Ont., has just returned from South America. He has obtained an option on a large area of land in Columbia. Natural gas is burning on the surface of the property, which is located near the towns of Barranquilla and Porte Colombia. Development work will shortly be undertaken.

William H. Smith, Jr., for the past 14 years general superintendent of the Jeddo mines of G. B. Markle & Co. at Jeddo, Penn., has resigned his position, and is succeeded by John T. Keith. Arthur P. Goedecke has been appointed assistant superintendent. Joseph R. Crague, mining engineer, has been promoted to be assistant to the general superintendent.

Simonds & Burns, of New York, have established headquarters at Haileybury, Ontario, for work in the Cobalt and ad-

jacent districts. At least one member of the firm, assisted by C. E. Beckwith, will remain there practically all the time. They are at present representing the interests of New York people in the development of quite a large property and are making a specialty of examination work in the district.

J. C. Evans, of Youngstown, Ohio, has just returned from Zaragoza, South America, where he has been operating Cyclone drills, prospecting a placer property for the South American Development Company. The results were highly satisfactory. It is rumored that a dredge will be put on the ground immediately. Mr. Evans expects to return to South America the latter part of the year to take charge of drills for developing a new territory.

In the Star-White suit in the Supreme Court of British Columbia, recently, a number of mining engineers appeared as witnesses. The list included Frank L. Sizer, of Helena, Mon.; S. S. Fowler, of Nelson, B. C., and J. M. Harris, for the plaintiff; Max Boehmer, of Denver, Colo., W. J. Elmendorf, of Spokane, Wash., and Byron N. White for the defendant; W. E. Zwicky, of Kaslo, B. C., who was appointed by the court to make surveys of the property in dispute.

Obituary

Frank H. Goodyear died in Buffalo, N. Y., May 13, aged 58 years. He was connected with the iron trade for a number of years, and was the leader in the organization of the Buffalo & Susquehanna Iron Company, and the successful development of its business.

Col. S. B. Dick, who died in Meadville, Penn., May 10, aged 71 years, was for many years prominent in the iron industry of the western part of Pennsylvania. He was stockholder, director and president in several iron companies. He was also largely interested in railroad and mining enterprises in Colorado.

Societies and Technical Schools

Massachusetts Institute of Technology—The presidency has been offered to Benjamin Ide Wheeler, now president of the University of California, and widely known as an organizer and educator.

American Society of Mechanical Engineers—The semi-annual meeting of this society, to be held in Indianapolis, Ind., May 28 to 31, promises to be of especial interest. A wide range of subjects will be taken up and discussed, among which will be reports of committees on standard proportions for machine screws; standard tonnage basis for refrigeration; papers on pumping engines, the heating of storehouses, and kilns for portland cement.

Special sessions will be held for papers and discussions of superheated steam, including papers on its specific heat, its flow, furnace and superheat relations, the determination of entropy lines for superheated steam, the performance of Cole superheaters, superheated steam in an injector; the use of superheated steam on locomotives in America, analysis of locomotive tests, and material for the control of superheated steam. An automobile symposium has been planned for the evening session, May 30, at which papers, illustrated by lantern slides, will be read and discussed. Several excursions have been arranged to different plants and points of interest in and around Indianapolis. One of the professional sessions devoted to superheated steam, will be held at Purdue University.

Mining Society of Nova Scotia—The fifteenth annual meeting was held in Halifax, March 27 and 28. The reports showed the affairs of the society to be in good condition. A. A. Hayward, the retiring president, delivered the annual address, and the following papers were read:

"Mine Pumping with Direct Connected Turbine Pumps," by P. H. Moore.

"Sinking and Timbering of the Allen Shaft," by H. E. Call.

"History of the Mining Society of Nova Scotia," by G. W. Stuart.

"Notes on the Property of the Seal Harbor Mining Company," by T. G. MacKenzie.

"Classification of Coal," by A. L. MacCallum.

"Coal Shipping Piers," by Hiram Donkin.

"Geological Conditions of the Iron Ores of Nova Scotia," by Professor Woodman.

"Londonderry Furnace Practice," by H. S. Badger.

"Sibley Mine, North Brookfield," by E. Percy Brown.

The new officers elected are: President, C. J. Coll, Stellarton; first vice-president, Dr. J. E. Woodman, Halifax; second vice-president, T. J. Brown, Sydney Mines; secretary-treasurer, H. M. Wylde, Halifax. Council: J. A. Johnson, H. S. Poole, F. H. Sexton, G. W. Stuart, R. H. Brown, B. F. Pearson.

Industrial

The Abner Doble Company, San Francisco, has appointed Mitsui & Company to act as sole agents in Japan and its territories, Korea, China and Manchuria, for the sale of Doble tangential water wheels and hydraulic apparatus. Mitsui & Company is the largest engineering house in the Far East, with its 35 branch offices.

The Duff Manufacturing Company, Pittsburg, Penn., the sole manufacturers of Barrett ratchet jacks, is placing on the market a new ball-bearing lifting jack

which embodies many new ideas and improvements, and which will be manufactured in connection with the Duff roller bearing screw jacks.

The New York Engineering Company is now in its new offices in the United States Express Building, No. 2 Rector street, New York. The company devotes its attention exclusively to the designing and building of gold dredges, under the management of Vice President A. C. Ludlum, and has obtained many contracts.

It is announced that the Mississippi Glass Company has purchased the Sergeant Glass Company's plant, at Kane, Penn., and will operate it in manufacturing rolled, figured, polished plate and wire glass. With this new plant and its facilities added to its Latrobe, Port Allegany, Morgantown, and St. Louis factories, the Mississippi company becomes the world's largest producer of flat glass, having a capacity of 30,000,000 sq. ft. per annum.

The American Electric Furnace Company, No. 45 Wall street, New York, gives notice that it has taken over all the business pertaining to electric furnaces heretofore carried on by the American Gröndal Kjellin Company, of New York, and the Induction Furnace Company, of Newark, and has acquired all patents relating to electric furnaces taken out by F. A. Kjellin and E. A. Colby, which were owned by these companies. The company is prepared to furnish furnaces for the treatment of various metals and alloys and full information in regard to their application.

The Tennessee Coal, Iron and Railroad Company, in order to handle its increased business at the Ensley works, has just placed an order with the Crocker-Wheeler Company, Ampere, N. J., for the complete electric-motor equipment of its new steel-rail mill at Birmingham, Ala. The order includes 15 Crocker-Wheeler Form W rolling-mill motors, designed for the arduous service of rolling mills. The order aggregates about 575 h.p. Among other purchasers and users of the Form W rolling-mill motor are the Alliance Machine Company, Bethlehem Steel, Carnegie Steel, Illinois Steel, Lorain Steel, Mineral Point Zinc, Morgan Engineering, National Tube, Pennsylvania Steel, Shelby Steel Tube, and the Youngstown Sheet and Tube companies.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Du Bois Iron Works, Du Bois, Penn. Gas and Gasolene Engines. Pp. 35, illustrated; paper, 6x9 inches.

C. O. Bartlett & Snow Company, Cleveland, Ohio. Catalog No. 16. Mechanical Dryers. Pp. 60, illustrated; paper, 6x9 in.; 1907.

D. T. Williams Valve Company, Cin-

cinnati, O. Williams Oil and Grease Cups. Pp. 20, illustrated, paper, 3½x6 in.; May, 1907.

Buffalo Forge Company, Buffalo, N. Y. Buffalo Steel Plate Planing Mill Exhausters and Dust Separators. Pp. 4, illustrated; paper, 3½x6½ inches.

C. W. Hunt Company, West New Brighton, New York. Catalog No. 072. "Hunt" Coal Handling Machinery. Pp. 63, illustrated; paper, 7x9 inches.

Monongahela Manufacturing Company, Monongahela, Penn. General Miscellaneous Coal Handling Machinery. Pp. 120, illustrated; paper, 9x12 inches.

Jeffrey Manufacturing Company, Columbus, Ohio. No. 57 B. Jeffrey Conveying Machinery for Saw Mills, etc. Pp. 72, illustrated, paper, 6x9 in.; March, 1907.

B. F. Sturtevant Company, Hyde Park, Mass. Bulletin 143. Generating Sets with Horizontal Engines, Class HC1. Pp. 7, illustrated, paper, 6½x9 in.; March, 1907.

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Allentown Rolling Mills, Allentown, Penn. Pump Data No. 11. The Aldrich Electric Boiler Feed Pump. Pump Data No. 12. The Aldrich Electric Sinking and Recovery Pump. Pp. 8, illustrated, paper, 6x9 in.

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Construction News

Silver Creek, South Dakota—It is proposed to enlarge the stamp mill at the Gordia mine. L. M. Kearney, Rochford, South Dakota, is owner.

Nelson, Kentucky—The Nelson Creek Coal Company is preparing to open mines and install machinery. John W. Bastin, Nelson, Ky., is general manager.

Horse Branch, Kentucky—The Lillian Coal Company is preparing to open a coal mine and will need machinery. Frederic Ackart, Central City, Ky., is secretary.

Christiansburg, Virginia—The Rorer Anthracite Coal Company is preparing to open coal mines and build a breaker, and will need machinery. M. H. Corgan, Nanticoke, Penn., is president and general manager.

Special Correspondence from Mining Centers

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

REVIEWS OF IMPORTANT EVENTS

San Francisco

May 15—The office of State débris commissioner of California was abolished at the last session of the legislature, so that W. W. Waggoner is now out of office. Last week the State Department of Engineering came into existence under the new law and will perform the functions before belonging to the Department of Highways, Public Works Commission, Débris Commission and Lake Tahoe Débris Commission. Nathaniel Ellery is the new State engineer. The State débris commissioner was a useless official at best, as all the work in that connection was done by the California Débris Commission, a Federal board composed of officers of the Engineer Corps, United States Army, and still in existence. Whatever business in the subject of mining débris is necessary to be done, can be carried out by the California Débris Commission, empowered by act of Congress, and the new State engineer can consult with them when State interests are in any way affected.

The opening of spring has renewed the interest of the new mining camps in the mountain county of Modoc where mineral discoveries were made at several points last year. Miners, prospectors, and promoters are now going to the Hoag, Bidwell, New Pine Creek and Windy Hollow mines. Indications are that all of that country will be prospected much more closely than it ever has been before. Many of these people represent capital, not merely of the promoter kind, but that which is able to make sound investments. Numbers of these come from Goldfield and other newer Nevada mining camps, and are pleased with the prospects and what developments have already uncovered. The main drawback at present is the quantity of snow still lingering on the mountains. This is not melting very fast, at present, because of the cool weather.

In another county not generally considered as a mining one—Tehama—considerable interest is being shown in copper deposits. The Tom-Head mountain copper belt is 30 miles due west from Red Bluff, or 42 miles by the wagon road which passes by the Blossom, Burrill, Pettyjohn and Stevenson ranches. The road is practically level for a distance of 32 miles to Stevenson's. From this point the elevation increases rapidly for the next 10 miles, until the camp of the California & Massachusetts Copper Mines Company is reached at an altitude of 4300 ft., and 42 miles from Red Bluff. The great mines in

Shasta county, only a few miles north, have been largely developed in the past six years in spite of many obstacles which are not encountered in the Tom-Head district, where topographical conditions, etc., favor cheap mining. It is true that at present no railroad has penetrated this region, but the old Humboldt trail passes directly over the property now being operated by the California, and this great natural highway to the port of Eureka will unquestionably some day be paralleled by a railroad to the coast. The supervisors of the county are building roads and bridges, and on their completion mining will be greatly facilitated, and it will be practicable to haul freight both ways at all times during the year, as the road is of such a character that for seven months in each year an automobile can be driven from Red Bluff to within 60 ft. of the company's principal works.

For a year or more mining affairs at Nevada City have been rather dull, which was due mainly to the Champion-Home litigation. Now several of the mines are again active and miners are employed in the following number: Champion, 100; Murchie, 40; other Willow Valley mines, 40; Union, 12; Blue Tent, 12; Mountaineer, 20; Oustomah, 14; Union Hill, 12; Charronat, 10; Indian Flat, 10; miscellaneous, 140; total, 511. This is an enumeration of miners only, although men otherwise employed about the mines will swell these figures. The pay roll is increasing, too, and can be added to by those employed in the many mines that draw supplies and put money in circulation for living expenses directly to the business of Nevada City. There are other mines being constantly opened, and considerable capital is being interested in developing claims in the Willow Valley district.

The Mount Shasta Mines Corporation was sold this month for over \$50,000. The property was bought for the benefit of the bond-holders. The sale was made under a trust deed. The company was in a tight hole three or four years ago, being heavily in debt to local creditors and others. The company paid its debts by a bond issue—100 bonds of \$500 each, secured by a trust deed. The bonds were not to be paid until 1911, but the company defaulted on interest and the property was sold under the trust deed. The transaction involves the transfer of the Mount Shasta, Lucky Boy, and Monitor Mining claims, together with all improvements,

including mill, hoisting works, bunkhouses and office building.

The Keystone mine at Amador City, owned by J. M. McDonald, is reported sold to Nevada men. This mine has been worked for more years than any other in the State and it is estimated has yielded over \$9,000,000 since it was opened in the fifties.

The plant of the Hercules Powder Company at Pinole has been tied up through the refusal of the union men to work at the side of 11 non-union machinists who struck for an eight-hour day. Nearly 1000 men are affected by the strike.

Salt Lake City

May 17—The deal, which had been pending for some time, for the sale of the properties of the Bingham Amalgamated Copper Company, in Bingham, has been declared off and the company will continue to operate its property as heretofore.

Negotiations have begun looking toward the sale of the Conger mine in Bingham. It is planned to effect a coalition with several adjoining properties.

Notice has been received from the headquarters of the Boston Consolidated Mining Company, to holders of the debenture bonds of the company that they will be retired Nov. 1 next at \$105 for each \$100 bond. About one-half of the issue has already been converted into stock.

The Utah Copper Prince Mining Company has filed articles of incorporation to develop a mining property in Utah county. William Snell is president and L. A. Watson, of Salt Lake, secretary.

A contract has been let to the General Electric Company, to equip the Copperton mill of the Utah Copper Company, with additional electrical machinery. The plant will be operated in the future by electric power generated from the Garfield plant now nearing completion.

It is believed that something definite regarding the proposed coalition of the Silver King, Keith-Kearns and other Park City mines will be released within the next 30 days. The matter of titles is being looked into, and as soon as the examination is concluded, the proposed Silver King Amalgamated Mines Company, will be organized. F. Augustus Heinze is interested in this enterprise.

Dividends for May payment have been declared by several mining companies operating in Juab county, as follows: Beck Tunnel Consolidated, \$40,000; Grand Central, \$10,000; Utah (Fish Springs)

\$3,000; Lower Mammoth, \$9,500; Colorado, \$40,000. The two last named mines are represented in the dividend column for the first time.

The Scranton Extension Mining Company has been organized to develop property near the Scranton mine in the North Tintic district. George Beck, of Lehi, is president.

The directors of both the Uncle Sam Consolidated and May Day Mining companies have decided upon a plan of consolidation, which now awaits ratification by share holders. It is proposed to form a new company, to take over the assets of the older organizations, without reference to the Humbug ground and the four-fifths interest in the Richmond & Anacanda mine, owned by the Uncle Sam Consolidated Company. Shareholders of the Uncle Sam and May Day will share equally in the stock of the new organization.

The Newhouse Mines and Smelters corporation produced over 1,000,000 lb. of copper during April. A total of 26,000 tons of ore were mined and the recovery of gold and silver amounted to about \$2.50 a ton.

The Murray smelter of the American Smelting and Refining Company, was forced into idleness last week on account of a strike of laborers—mostly foreigners. The company has granted a slightly increased scale of wages and some of the furnaces have been started again.

At the annual meeting of shareholders of the Nevada Douglas Copper Company, operating at Yerington, Nev., the following officers were elected: President, J. D. Wood; vice-president, F. J. Hagenbarth; secretary and manager, Walter C. Orem; treasurer, W. V. Rice, of Salt Lake; who, with Henry P. Henderson, of Salt Lake; A. J. Orem, C. H. Hastings, F. A. Schirmer, of Boston and A. L. Pearse, of London, Eng., are directors. The financial statement showed a cash balance on hand May 11 of about \$44,000. The installation of an air compressor and other large equipment is in progress. Facilities for ore treatment will probably be provided during the year.

Denver

May 17—Amid the cheers of thousands, the blowing of whistles, and the ringing of bells, Lieutenant Governor Harper, of Colorado, pressing an electric button, on May 11, started the work on the new drainage tunnel, in the Cripple Creek district. A number of special trains brought a large number of visitors, to whom a hearty greeting was extended by Mayor Van Tilborg, of Cripple Creek. The mayors of the leading towns of the district made short addresses, which were responded to by prominent citizens of Denver, Colorado Springs, and other points, after which President Alderson, of the School of Mines, made the address of

the day on the "Opening of the Cripple Creek Drainage Tunnel—Its Significance in Scientific Mining."

A mining deal of considerable importance, involving two large properties located in the Black Hills, has just been closed in this city, when the Hidden Fortune and the Columbus Consolidated properties were consolidated under one management, the headquarters of which will be in New York.

It is reported on good authority that the Carpenter smelter, at Golden, has been sold by Berry Brothers, of Detroit, to a syndicate, which intends to start operations before long.

The Federal grand jury, impanelled in the United States Court will investigate land frauds, including coal and timber lands, which have been committed in this State, and interesting developments may be expected. Action is taken on the reports of the special corps of investigators, which has been at work for some time past. Judge Lewis, in his instructions to the jury, laid special stress on the matter of showing favors to anyone, on account of good reputation or influence in the community.

Naturally the great trial at Boise, Idaho, of the leaders of the Western Federation of Miners is being watched here with great interest, all three being residents of this city.

During the month of April the output of the tungsten district in Boulder county, was 120 tons of concentrates, valued at about \$75,000. During this year tungsten concentrates to a value of about \$235,000, have been shipped.

Scranton

May 21—The Delaware & Hudson Company is building a large pumping station on its property in Plymouth Junction, to be located at No. 1 shaft. A tunnel is being built to the Susquehanna river, from which the water will be pumped to the new washeries to be built at No. 3, No. 5 and Boston collieries. The station will be one of the largest in the anthracite region.

Extensive improvements are being made by the Delaware & Hudson in the neighborhood of Wilkes-Barre for the purpose of tapping the collieries of the Kingston Coal Company. At present all the coal of the Kingston company is shipped to market over the Lackawanna Railroad and these collieries are among the most productive in the region. Last year the company shipped 1,195,581 tons over the Lackawanna road. A new market for the coal will be found by the Delaware & Hudson.

Fred E. Zerby, of Wilkes-Barre, has been appointed general manager of the Kingston Coal Company to succeed the late Robert S. Mercur. For the past five years Mr. Zerby has been superintendent of the Wyoming division of the Lehigh Valley Coal Company.

Toronto, Ont.

May 20—The buildings of the reduction plant of the North Ontario Reduction and Refining Company, at Sturgeon Falls, Ont., the construction of which was commenced in October last, are now completed, in readiness for the installation of the machinery. The main structure is 126 x 80 ft., the central portion of the building being 60 ft. in height. It is erected upon a foundation of solid masonry. The plant is not a smelter, as the term is usually understood, but will be operated by the "hydro-electric" process for treating ores. It was erected by W. B. Holman, of Grand Rapids, Mich., and O. L. Young, manager of the Idaho Reduction Works, who are both directors of the company. In addition to the main building there is a sampling plant or laboratory, a two-story building, 35x75 ft.

The machinery is all under contract. The boilers and engines, built at the Scannel Boiler Works, Lowell, Mass., have been shipped. The crushing plant and electrical machinery are furnished by Allis-Chalmers-Bullock, Montreal, and it is hoped to have the plant installed and ready for operation by July. It will have a capacity of 300 tons per day. The capacity of the sampling plant is three tons per hour, and as soon as it is finished it is intended to treat Cobalt ores in small quantities until the large plant is ready. A rough estimate of the total cost is \$75,000.

It is claimed that by this process all the metallic contents of the Cobalt ores, in addition to silver, can be saved. The transportation facilities are good, as the site faces on the river, and a railway siding connects it with the Canadian Pacific main line. The town of Sturgeon Falls has given the company a bonus of \$8000 and exemption from local taxation for 10 years.

London

A short time ago, in writing of the organization of a new company to manufacture aluminum, I referred to the prosperous state of the British Aluminum Company. The results of the working of this company during 1906 are now to hand and show a profit of no less than £155,023. This result, for a company which struggled for many years through financial and technical difficulties of an almost overwhelming character, is particularly gratifying. In the early part of this year the capital of the company was increased from £700,000 to £1,300,000, in order to cope with the demand for the metal. The company originally started at the Fall of Foyers on the Caledonian canal in Scotland, but the water capacity there has proved to be ridiculously small, besides which the dues on vessels passing up the canal added seriously to expenses. The intention is to abandon Foyers eventually and to concentrate operations at Ballachulish.

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

Alabama

TALLADEGA COUNTY

Entiachopeo Graphite Company—This company has been organized to develop some promising graphite deposits. It will have its main office at Talladega and its plant at Ashland, Ala. The plant has already been installed, and its product will be refined graphite for commercial purposes. Officers of the company are: President, A. A. Allen; vice-president, J. E. Michael; secretary and treasurer, C. H. Michael.

Alaska

KETCHIKAN DISTRICT

Copper mining on a larger scale than heretofore will be the record for this season in southeastern Alaska. The outlook is especially bright for that district which draws its mining supplies from Ketchikan, the Ketchikan mining district. Practically all the mines or prospects that have ever shipped ore are working a large and an increasing force of miners. Prince of Wales Island continues to be the center of production, almost all the present producing mines being located upon that island. Prospectors report much snow upon the mountain slopes, making moving very difficult. Heavy rains would melt the snow, aiding the prospector greatly.

The matte smelter at Hadley, Prince of Wales Island, is again working to its full capacity. The furnaces were blown in about May 1. It is to be hoped that a sufficient supply of coke can be obtained to permit the continuous operation of this plant. Labor troubles at the coal mines of British Columbia have, this past year, produced a shortage of fuel for this district. At present a full fuel supply cannot be obtained, and a little uneasiness is felt for the coming season. Several thousand tons of ore are now contracted for by the smelter, and the expectation is that the shipments to British Columbia and Tacoma smelters will also be large.

Colorado

GILPIN COUNTY

Barnes—This group of three claims on Quartz hill, owned by Byron S. Lake, of Denver, has been sold to New York people, who will organize a company. The purchase price was \$25,000. The main shaft is down 750 ft. and the production to date is \$75,000. H. A. Hicks, Central City, Colo., is agent.

Eldorado—Pennsylvania people have

purchased the lease and option of E. S. Moulton on this property in Spring gulch and have organized the Gilpin & Eldorado Mining and Milling Company. H. Earhardt, Central City, Colo., will be manager. The company proposes installation of a heavier plant of machinery and will erect its own stamp mill in the future.

King Bee Gold Mining and Milling Company—Eastern and Colorado people are interested in this incorporation and will arrange for heavy operations at an early date, with B. L. Martin, Central City, Colo., as manager.

Old Kentucky—Thomas F. Daly, of Denver, has acquired by sheriff's deed this group in Hawkeye district, together with machinery, buildings, and improvements formerly owned by the Old Kentucky Gold Mining Company. Arrangements will be completed for the resumption of operations at an early date.

Plateau Mining, Milling and Development Company—This company has absorbed all of the interests of the Bullion company in the Pine Creek district, Omaha, Neb., people are interested and they will arrange for operations on the consolidated group. E. J. Adams, Apex, Colo., is manager.

LAKE COUNTY—LEADVILLE

With the resumption of work on a number of old properties, and the starting of new shafts the Arkansas Valley smelter finds itself overstocked with sulphide ores, and has placed a restriction on this class of ore. All of the large producers are cut down about half, and but little of this class of ore is being taken from the smaller men. There is a movement on foot by Denver, Pueblo and Eastern capital to start up the old Elgin smelter, to relieve the congestion of the ore market. This plant was especially equipped a few years ago for the treatment of sulphide ores. In the present condition of the market the American Smelting and Refining Company, no doubt, would willingly take the matte which would assist materially in smelting the refractory ores daily received at the Arkansas Valley plant.

The two new mills that have been in course of construction during the spring will start work before the end of May. The Leadville District Milling Company will treat the dumps of the Ibez Company; a conservative estimate places the dumps at 1,000,000 tons. The other mill on Carbonate hill, to treat the ores found in the dumps of the Morning and Evening Stars,

will probably start operations soon. It is expected that the lead concentrates received from the two mills will greatly assist the local smelter in getting rid of some of the extra tonnage piled on the dump, and enable it to run at full capacity. The closing down of the smelter at Murray, Utah, should help the local plant as the lead ore will probably be diverted here.

Bessie Wilgus—This shaft, Rock hill, has now reached a depth of 700 ft., and drifting has been started north and south. The ground at this depth will be thoroughly prospected to locate the main ore-shoot that trends from the Reindeer through this territory.

Rock Hill—With the drying up of the roads the properties on this hill are able to resume shipping. The Reindeer is outputting in the neighborhood of 75 tons daily; from the Rock and Dome 30 tons are going out; from the Casey lease 100 tons of good iron are being shipped daily, and the President is shipping 30 tons of low-grade sulphides. Sinking the new shaft on the Delaware has been started. Still farther west the new shaft on the Alhambra placer, has reached a depth of 500 ft., and is in the porphyry; it will be sunk 150 ft. deeper when drifting in different directions will be started. At the Nil Desperandum a body of low-grade sulphide has been caught in the lower south drift.

R. A. M.—The lessees working this property, Iron hill, are at present driving a drift to connect with the Pyrenees shaft from the 1000-ft. level, and when the connections are made all of the pumping will be done from the latter shaft. An attempt was made to reach the orebody below the lower level from the Pyrenees shaft, but it was found to be so hot that it was impossible for men to work. When the connection is made it will supply plenty of good air.

Yak Tunnel—In addition to the regular monthly output of ore the company is doing a large amount of development work on different claims. The Louisville, which is being worked from the tunnel level, is shipping 30 tons daily of a good grade of sulphide. An upraise is being carried in the M. N. ground, Breece hill, to connect with the shaft from the surface. When this work is completed the opening of the large body of zinc ore in the property will be commenced.

Elgin Smelter—The increase in the output of low-grade sulphide ores, and

the lack of smelting facilities has brought to the attention of several capitalists the advisability of starting this plant. Although it has been idle for several years the machinery is in good order, and all of the furnaces are adapted for the treatment of sulphide ores. Arrangements for the purchase of the plant are now going on and should be settled definitely within a short time.

Leo Shaft—A drift is being run from the bottom of the shaft, head of California gulch, following a small streak of zinc ore, and the impression prevails that it is a stringer from the main North Moyer ore-shoot.

Sunday—This property, Ball mountain, has resumed shipping and the grade of ore is higher than the average hitherto sent from the property. The main shaft is still being sunk and will reach the objective point about the middle of the month, when it will be 450 ft. deep. Drifting from the bottom to the vein will then be started.

SAN JUAN COUNTY

Work in the San Juan is opening up well as the heavy snows of the past winter are going off.

Peerless San Juan—This company has found some good ore in its mine near Silverton. Orders have been placed with the John A. Traylor Machinery Company, of Denver, for a 420-cu.ft. cross-compound belt-driven air compressor, with 75-h.p. A. C. motor; also for Hardsocg wonder air-hammer drills and piston drills.

Michigan

HOUGHTON COUNTY—COPPER

Osceola—The Calumet & Hecla Company has filed its answer in the United States circuit court for the western district of Michigan in the equity suit brought by A. S. Bigelow to restrain the defendant corporation from acquiring control of Osceola. The Calumet & Hecla charges that the plaintiff has perpetrated a fraud upon the court by acquiring "an ostensible legal title" to 23 shares of Calumet & Hecla stock for the sole purpose of instituting proceedings against the defendant, his object being not to protect the interests of the stockholders, but to maintain control of the Osceola corporation. Calumet & Hecla admits it has brought 46,080 of a total of 90,000 shares of Centennial, 42,828 shares of a total issue of 100,000 shares of Allouez, and 22,671 shares of Osceola out of 96,150 shares issued, and that it has proxies representing over 25,000 shares more. The defendant denies that it has or could have any purpose to secure a monopoly of the production of Lake copper. It admits that it has expended for the purchase of Allouez, Centennial and Osceola not less than \$6,000,000 but denies that these companies are competing companies. The defendant denies that it has ever had any intention

to acquire any interest in Tamarack or Isle Royale, or that it ever intended to alter the legal status of the Ahmeek, Laurium or Seneca companies as independent corporations in any degree whatever, and charges that Mr. Bigelow and his associates own a controlling interest in each of the latter companies. Calumet denies that it ever intended to acquire or combine with the Quincy Company, and says that Mr. Bigelow's alleged apprehensions and charges in that behalf are without any foundation in fact whatsoever.

The defendant says its acts and purposes will tend to increase competition of Lake copper with the production of the world. It further avers that "the relations now and heretofore existing between the companies controlled by the Bigelow syndicate, and also the relations between the Osceola and the other 'Bigelow mines' have resulted in loss and damage to the stockholders of the Osceola;" that stockholders have become dissatisfied with the management, and desire a change.

KEWEENAW COUNTY—COPPER

Cliff—The Keweenaw Central Railroad is building a spur into this property, and as soon as completed rock shipments will be made from openings and stock-pile. The new shaft-house on this property is nearly completed.

Keweenaw—This company is considering putting in an electric plant at the Mandan property to furnish light and power.

Mohawk—The management at the mine is considering the advisability of adapting electrical power for mining purposes. T. A. Chatman, of Chicago, is consulting engineer and is at the mine going over the ground. The third head at the stamp mill has been compounded and will go into commission in a few days; as soon as this head is in operation the fourth will be altered. With these improvements made the production from then on should show marked increase over the first quarter of the year.

Missouri

ZINC-LEAD DISTRICT

Alpha—The lead strike of this company in No. 2 shaft on the 135-ft. level, is more than bearing out the drill indications, and is especially rich. This is the same company that located a channel deposit last year and has been making large turn-ins for several months. Developments have proved it a double channel, with a 10-ft. rib intervening. These two channels have been driven, side by side, for several months, with here and there a door cut through the bar. Drilling and cross-cut drifting have proved the existence of open ground and no ore each way from these parallel channels. Other channels have been located in the same vicinity by the Argosy Mining Company, Stevens & Co., and Adams & Co.

Lewis Land—This land at Alba is coming into prominence along with other property in the Alba-Neck City district. On the 220-ft. level a 16-ft. vein of ore has been penetrated by drilling. The second hole has been started in an effort to locate the extension of the orebody. Drilling will be continued until the full extent of the vein is determined. A shaft will be started immediately on the first drill-hole. This land is two miles east of Alba.

Lyon-Dougherty Land—In the fifth drill hole put down on their 10-acre lease of this land southeast of Prosperity, Lon Hatcher and associates have penetrated a 25-foot vein of sheet ore on the 190-foot level. This promises to be a big producing property when fully developed.

Rohrer Land—The drill on the Henry Rohrer land, near Sarcocix, which a few days ago encountered silicate and lead ore on the 50-ft. level has since encountered zinc at the 98-ft. level in another hole. This is the third hole put down on this land and a shaft has been started on the second. The Optimo and the O. K. mines in the same locality are doing well at present.

LAWRENCE COUNTY

It is claimed at Aurora that geologists have pronounced a section south of Aurora, in Lawrence county, an undeveloped ore area, and the owners of a 160-acre tract have contracted for an extensive amount of drilling.

Montana

BUTTE DISTRICT

Anaconda—The shaft on the High Ore mine of the company is 2780 ft. deep, and will be continued to 2800 ft. The veins will be crosscut at the 2600 and bottom. The Neversweat has been closed down a few days on account of a break in the hoisting engine, but will be in operation soon. The work of re-timbering the shaft of the Belmont is under way and will consume some time, as the opening will be enlarged to three compartments.

Boston & Montana—All mines of the company are in operation, and are yielding an average of 3300 tons of ore a day. The shaft of the West Colusa has reached 1700 ft. An immense tonnage has been blocked out in this mine, the Leonard and the Mountain View. The shaft on the Badger State has passed the 200-ft. mark, and is to be sunk to the 1800-ft. level.

Butte & London—The shaft reached 1000 ft. May 20. The new 1000-gal. pump has arrived, and is going into the 800-ft. station.

Coalition—The Rarus shaft is 2100 ft. deep, and is to be sunk to the level of the West Colusa, in order that the water may drain into the latter, and thence to the Leonard. The air-shaft, now two compartments, and 1400 ft. deep, is being en-

larged to four compartments. Raising is in progress from below. The lower workings are well aired, but the air is warm. In driving for waste for filling purposes several new bodies of ore have been struck recently in the lower workings, but their extent is not yet known. The shaft on the Minnie Healey is finished to the 1400, but not entirely timbered.

Davis-Daly Estates—Crosscutting north of the 400- and 600-ft. stations in the Mt. Moriah continues without the interception of veins so far. The shaft is sunk in a mineralized vein. Drifting east and west at the 500 of the Smokehouse has not shown bodies of commercial ore. The vein struck in the crosscut south of the 1800-ft. station of the Original, has not been crosscut, and its width or character is not known. The flow of water from it is still heavy, though greatly diminished. The shaft on the Colorado will reach 1000 ft in a short time, and after a station is cut and pump installed a crosscut will be driven north from the station to tap the Baltic vein, supposed to be a continuation of the Moonlight and Blue Jay.

North Butte—The face of the crosscut heading, north from the 1600-ft. level of the Jessie has entered Berlin ground, and will have to be driven between 300 and 400 ft. before it strikes the Berlin vein. Legal complications over the sale of the Berlin group to the company have caused delay in the beginning of work in the shaft on that property. The company is cutting skip pockets at the 1800 level of its main shaft and mining about 1200 tons of ore a day. It expects to resume sinking when this work is finished.

FERGUS COUNTY

North Moccasin—The controlling interest in this property, near Lewiston, has been sold to the Barnes-King Development Company. The stock was held by John A. Drake.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Combination Fraction—The Morton-Beesley lease on this mine has a 7-ft. body of ore averaging between \$500 and \$600 per ton. The lessees have but 40 days to continue their operations before the property reverts to the company. Consequently every effort will be made to run the ore out as rapidly as possible. The average daily output now is valued at \$50,000 but within the next 10 days this will probably be doubled.

Little Florence—A shipment of 75 tons of high-grade ore has been made to the Salt Lake smelters. Some of this ore averaged over \$1000 per ton. The vein still holds its strength and has every appearance of being permanent.

Great Bend—A new electric power plant has been installed, and within a few days

sinking operations will be resumed. The shaft will be run straight down to the 600-ft. level.

EUREKA COUNTY

Richmond-Eureka—During the week ending May 6, the ore shipments of this company amounted to 1000 tons, which is the best for the year so far, and shows that the railway is giving better service.

LYON COUNTY

The new mining town of Alberta is situated on the eastern slope of the Mason Valley range, in which the Yerington copper mines are located, and on the west bank of Walker river. The preliminary survey of the proposed branch of the Oregon Short Line crosses the southern corner of the townsite. The eastern portion of the town lies 20 ft. above the river and gradually rises about 25 ft. at its western limit, thus assuring drainage. Alberta overlooks the entire Mason valley, which is the largest fertile valley in the State. The Bluestone mine is in the range just above the town, and the reduction works of this mine, now being built to reduce 1000 tons of ore daily, are between the mine and Alberta.

NYE COUNTY—BULLFROG

Eagle—Work on this property has hitherto been confined to surface trenching chiefly. At present the sinking of a shaft and the running of a long crosscut tunnel are being undertaken, the surface indications having warranted the management in launching out into substantial development work.

North Star—The main tunnel has been run in 400 ft., and there are good indications that it is rapidly approaching the main ledge.

Oasis—The shaft has been sunk to a depth of 70 ft. on the ledge, which on this surface outcrops for a distance of 3000 ft. The ledge is over 40 ft. wide on the surface. Sinking will be continued to the 200-ft. level before driving is started.

Pioneer—Active prospecting work is being done on the surface of this property, which is well located in the Mayflower section of the field. A vein-bearing formation 48 ft. in width has been uncovered assaying up to \$10 per ton. It is proposed to commence sinking a deep shaft on this formation within the next fortnight.

Shoshone—The main shaft has reached a depth of 440 ft., and is in the lode which at the bottom shows free gold, and assays well. This is the deepest orebody yet opened on the field. The management is shipping a carload of rich ore daily to the Salt Lake smelters from the Shoshone, and, beginning the present week, similar shipments will be made from the company's Polaris mine. In this mine a large body of shipping ore has been cut in the 300-ft. level.

NYE COUNTY—MANHATTAN

Gold Crater—Preparations are being made to start the sinking of a new vertical working shaft to a depth of 350 ft. A new hoist has been installed, and it is expected that men will be put to work soon sinking. The preliminary prospecting operations proved the mine to be valuable.

Otero—The shaft is being sunk to the 100-ft. level as rapidly as possible. It is in good ore at present, and the management is sanguine.

Thanksgiving—Drifting has been started from the 236-ft. level along the vein, and a crosscut is being run to the hanging wall. For a distance of 9 ft. across the vein assays return values up to \$300 per ton. The vein is almost vertical, and is mineral-bearing from the surface to the bottom level.

NYE COUNTY—TONOPAH

Ore Shipments—Shipments of ore over the Tonopah Railroad for the week ending May 9 were: Tonopah Company, 1568 tons; Belmont, 435; Montana-Tonopah, 125; Tonopah Extension, 220; Midway, 80; total 2428 tons. In addition the Tonopah Company shipped 3305 tons to its mills.

Midway—Development work continues to be carried out systematically. The workings are looking well. Large and valuable orebodies have been opened up, and shipments of high-grade ore are being made whenever the management can secure railroad accommodation.

Rescue—Rumors have been prevalent in Tonopah lately of a rich strike in this mine. The manager, however, denies that a valuable strike has been made, but he hopes to make an important announcement shortly. The north and south crosscuts on the 650-ft. level are each out 140 ft. They are in a formation carrying numerous quartz stringers showing assay values, which indicate close proximity to an orebody. It is possible, however, that it will be necessary to sink the shaft a farther distance before a permanent orebody is discovered.

Tonopah Extension—The shaft has now reached a depth of 980 ft., and when the 1050-ft. level is reached preparations will be made to crosscut to cut the vein at that depth. Stopping is being done in all the Western levels from 270 to 600 ft. The vein varies from 30 to 40 ft. in width with an average value of \$100 per ton. There is sufficient amount of ore already developed in the mine to keep a 100-stamp mill running steadily for a number of years, and consequently, the company has decided to erect such a mill in the Tonopah district. The company's engineering staff is now engaged in drawing plans and estimates for the mill, and it is probable that steps will be taken to commence its erection within the next three months.

North Carolina

ROWAN COUNTY

Union Copper Mining Company—The stockholders' committee recently issued the following notice to stockholders: "The Union Copper Mines Company, with capital of \$2,500,000, full-paid and non-assessable, divided into 500,000 shares of par value of \$5 each, has been incorporated under the laws of Maine, and has purchased the property of the Union Copper Mining Company, which was sold by order of the court in the receivership proceedings. The committee has been successful in completing the arrangement which it undertook to secure between stockholders and creditors of the Union Copper Mining Company and shares of the old company may be deposited at any time before June 1, 1907, with T. C. Buck & Co., 42 Broadway, New York, and for two shares of the old company so deposited one share of the new company will be given.

Oregon

BAKER COUNTY

Dredging—Eugene Pearson, of Portland, and associates, have incorporated the Burnt River Consolidated Mining and Dredging Company capitalized at \$1,500,000, and have purchased 1200 acres of placer grounds 28 miles south of Baker City, over Dooley mountain, on Burnt river, the land including 500 acres fit for dredging, from the Merchant's Mining Company, W. J. Patterson, of Baker City.

The ground is covered with several reservoirs and ditches and has plenty of water. The gravel is 22 ft. to bed rock. Two giants are working now and there is water sufficient for six; it is expected to put in several more immediately. A large dredge will be put on the land in another year.

Poorman—Engineer John Arthur, of this copper group, Goose Creek, reports his men are now crosscutting the vein and are in 30 ft. on ore. The ores are iron and copper sulphide. The group is 28 miles east of Baker City.

Indiana—This mine, J. W. Messner, manager, is now down 400 ft. Manager Messner will sink to the 600-ft. level and continue development work before beginning the shipment of ore or the erection of his own smelter. The Indiana is 28 miles northeast of Baker City.

Pennsylvania

ANTHRACITE COAL

A new coal company has been organized in Philadelphia to work some coal lands in Luzerne county. The officials are Charles C. Burchill, of Mahanoy City, president; Louis McCaffrey, of Philadelphia, vice-president; William Nicewenter, of Shenandoah, treasurer, and Henry Keiper, of Shenandoah, secretary.

Delaware & Hudson—This company is installing two new Hamilton-Corliss engines at the fan-house of No. 2 colliery, near Plymouth.

COKE

Dunlap-Connellsville Coke Company—This new company has acquired a tract of 155 acres of coking coal in Redstone township, Fayette county. William A. Bishop, Connellsville, Penn., is president.

Unity-Connellsville Coke Company—This company has bought land in Unity township, Westmoreland county, and is preparing to open mines and to build 150 coke ovens.

South Dakota

CUSTER COUNTY

Hartwell—The tunnel is now in 67 ft. from the first set of timbers, and the mine is showing up better. Rails for the tunnel track, a car, and other machinery, have been purchased, and the force of men will be increased in June.

Saginaw—A new 100-ton mill is being installed at this mine, seven miles northwest of Custer. The mill will be arranged so as to treat all the different kinds of ore on the ground. Machinery for crushing, concentrating, amalgamating and cyaniding will be installed. A new hoist is also going in, and a safety cage.

LAWRENCE COUNTY

Columbus—The deal whereby the Hidden Fortune holdings were to be incorporated with those of the Columbus has been consummated. The property of the former company was bid in at public auction by E. Nesmith, of the Colorado Iron Works, on a judgment of \$239,000. This judgment was immediately made over to the Columbus. This company has increased its capitalization to \$7,000,000, and has issued bonds to the amount of \$400,000. It is the intention of the company to commence work on both properties at an early date, to put the Hidden Fortune mill into running order, and to build an aerial tramway to bring the ores from the mine to the mill. The company now has nearly 1000 acres, and a supply of ore running from \$3 to \$5 a ton, together with some of high grade.

Globe—Continuous operations on this property have resulted in opening up a vein 30 ft. wide and averaging \$12 a ton. This is in addition to the bodies of low-grade ore. Work at the mill goes on rapidly. Practically all the machinery has arrived, and it is expected to have the works in operation by July.

Gilt Edge Maid—At a special meeting of the stockholders held in Deadwood the directors were authorized to issue bonds to the amount of \$200,000. With this amount the company's debts will be paid, and funds supplied to carry on development work.

Homestake—Flooding of the mine is

progressing rapidly, and will be accomplished by the end of this month. A new high-pressure compressed-air motor has arrived, and as soon as work recommences, will supersede the small steam engine which has been used for transporting ore between Lead and Terraville. The new motor weighs 8½ tons, and is similar to the one which has been in use on the Lead side for a number of years.

Utah

IRON COUNTY

Jennie Extension—In a shaft on this property, near Gold Springs, 4 ft. of ore averaging \$13 a ton has been encountered. C. A. Short, of Gold Springs, is manager.

Jennie Gold—The new mill at this property continues in successful operation. A large compressor plant is to be installed soon.

JUAB COUNTY

Beck Tunnel Consolidated—This company has decided to sink a new double compartment shaft. It will be located near the center of the property, and will be the main working shaft. Superintendent John Roundy expects to encounter the orebody at 300 ft. depth.

SALT LAKE COUNTY

Bingham Copper—This company has broken ground preparatory to the installation of a compressor plant. The management has planned a broad campaign of development. E. W. Clark, Ophir, Utah, is president.

Columbus Consolidated—At Alta, this company is sinking four shafts. Ore will soon be moved over the aerial tramway operated out of the district.

New England Gold and Copper—Manager H. M. Adkinson states that the output of concentrate from the mill hereafter, or until the plant is again enlarged, will be on the basis of one carload every two days. In the mine, which is situated in Bingham, conditions are satisfactory.

South Columbus—Four drifts are being run in ore in this Alta property, which will soon become a regular shipper.

Utah Apex—The April earnings of this company amounted to about \$24,000 net. About 100 tons of high-grade and 300 tons of mill ore are being mined daily. The Markham Gulch mill, owned jointly by the Utah Apex and Utah Development companies, will be in commission within a week.

Tom Moore—A contract has been let to drive the main tunnel in this Bingham property 100 ft. farther.

WASHINGTON COUNTY

Utah & Eastern—The smelter of this company at Shem City is in operation again, the April output being about 93,000 lb. The plant was running only a portion of the month, however. The company op-

erates a traction engine between the smelter and nearest railroad point, a distance of about 40 miles.

Canada
ALBERTA

The Canadian Rand Company, Ltd., is supplying three complete haulage plants to as many collieries in western Alberta—one each to the McNeill Company's anthracite mine at Canmore; the Lille colliery of the West Canadian Collieries, Ltd., of Blairmore; and the Hilcrest Company's mine, near Frank. Each system includes a four-stage air compressor, locomotive, and pipe-line storage. Each train will have a capacity of 40 cars of coal up a 1½ per cent. grade. A similar plant has been installed at the International Coal and Coke Company's colliery, at Coleman, Alberta, and as well at one of the Crow's Nest Pass Coal Company's mines, at Michel, British Columbia.

BRITISH COLUMBIA

Centre Star—The Consolidated Mining and Smelting Company, of Canada, is installing at its Centre Star mine, Rosslund, an 1150-h.p. Nordberg hoisting engine having cylinders 28x60 in., drums 10 ft. diameter by 5 ft. face, and capacity 1350 tons in 10 hours from a depth of 3000 ft., using 4½-ton skips, in balance. Ordinary speed when hoisting is 2500 ft. per min. Brakes, reversing gear and clutches are operated by auxiliary engines. Corliss valve is controlled by a governor. Hoisting cable is of 1¼-in. steel. The engine is set on massive cement-concrete foundations and housed in a frame building 52x56 ft., erected for the purpose.

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments from Cobalt continued comparatively light, the total for the week ending May 11 being: Coniagas, 124,000 lb.; Right of Way, 1400; Trethewey, 43,360; O'Brien, 65,210; total, 233,970 pounds.

Green Meehan—At this mine, Cobalt, operations have been considerably delayed by the non-delivery of a compressor which was due Feb. 15. A force of 70 men and three steam drills are at work. The large open cut, which has yielded a quantity of high-grade ore, is down about 40 ft. The main shaft is down over 50 ft., and is yielding a good quality of ore. No. 2 shaft is on a 5-in. vein, carrying high values at 25 ft., and No. 4 shaft has reached at 20 ft. ore carrying a good showing of native silver. A large quantity of low-grade ore is on hand, for the treatment of which a concentrator is to be installed this summer.

Silver Bar—The vein on this property, Cobalt, on which a shaft was sunk for 150 ft., and drifting started, disappeared some time since. Interest has now been revived by the discovery of another small vein of

native silver, which has been uncovered for 150 ft. or more.

Timiskaming—In this mine, Cobalt, 27 tons of ore taken from the 75-ft. level of the rich vein, and running from 9000 to 18,000 oz. per ton in silver content, were shipped to the smelter May 15. Another important find of silver calcite ore has been made in drifting at the 50-ft. level.

Big Ben—Twenty-two men are at work on this mine at Cobalt under Superintendent F. L. Cole, who has had experience in Brazil and South Africa. Five veins have been uncovered. Vein No. 5 at a depth of 6 ft. carries niccolite and a good showing of native silver. Two other veins show calcite and smaltite on the surface. A shaft is down 25 ft. on a 7-inch vein of crystallized calcite.

Cobalt Lakes—E. L. Fraleck, superintendent of this company at Cobalt, reports that No. 5 vein at 41 ft. is showing solid smaltite with a quantity of leaf silver. The shaft is down 20 ft. on No. 6 vein and native silver is showing. The compressor will be installed early in May.

Foster—In this mine, at Cobalt, a drift from No. 5 shaft at the 70-ft. level has encountered at a distance of 94 ft. one of the surface veins. It is 8 in. wide of smaltite and carrying native silver.

Timiskaming & Hudson Bay—In this mine, at Cobalt, a fissure from 4 to 5 ft. wide has been uncovered, containing from 4 to 12 in. of solid ore and extending 400 ft. to the boundary of the Nipissing property north of Cobalt town.

Nipissing—The work at Cobalt is now under the direction of T. R. Drummond, the new superintendent. The force of 250 men at present employed will be increased to 600 on the completion of camp buildings for their accommodation. No shipments of ore have been made for some weeks and there are about 10 carloads on hand, including three carloads taken in the course of development work from vein 49, drifting on which has been started at 110 ft. The shaft on vein 26 has reached a depth of 60 ft., but the vein has been struck at 110 ft. by cross-cutting from another shaft and found to be 9 in. wide at that depth, and to maintain its value. Vein 27, which hitherto has yielded the greater part of the output in bulk, from open-cutting, is being worked by drifting at the 60-ft. level and a cross-cut is also being run at the same depth for exploration. The building for the new sampling works is completed; rolls, crushers, etc., supplied by Allis-Chalmers-Bullock, are being installed. It will be the first sampling plant of the camp.

Temagami Silver Mining Company—This company is conducting active development in the Temagami forest reserve. The property comprises three islands on the Cross lake arm of Lake Temagami and the adjacent bed of the lake. On Island A, seven acres in extent, the work

has uncovered several veins, one being a strong silver-lead 2 ft. wide on the surface. A shaft has been sunk 60 ft., at the bottom of which the vein had widened to 3 ft. A second vein, 40 ft. distant, has been unearthened, yielding high-grade ore. A copper vein with a surface width of 3 ft. has also been discovered. A small plant has been put in. Superintendent R. E. Patterson, formerly with the Clergue Copper Company, Lake Superior, is in charge.

ONTARIO—RENFREW COUNTY

The Ontario government has cancelled leases covering about 1000 acres of mining lands in Raglan township, Renfrew county, held by the Corundum Refiners, Ltd., of Toronto. These leases were granted on condition that the company would establish a corundum industry and expend \$150,000, which it has failed to do.

Africa

TRANSVAAL

The gold production reported for April and the four months ended April 30 is as follows, in ounces fine gold:

	1906.	1907.	Changes.
April.....	439,243	537,019	I. 97,776
Four months.....	1,719,272	2,106,696	I. 387,424

The increase for the four months this year was 22.5 per cent.

The Chamber of Mines reports in regard to native labor that 8318 natives were distributed to the mines during April, while 7335 left through time expiry and other causes, giving a net gain during the month of 983 natives. The number employed at the end of April, excluding those engaged at the Robinson group of mines, was 91,824.

Australia

WESTERN AUSTRALIA

Gold production in April is reported at 130,086 oz.; being 360 oz. more than in March, but 22,130 oz. less than in April, 1906. For the four months ended April 30 the total gold production reported was 604,583 oz. in 1906, and 556,243 oz. in 1907; a decrease of 48,340 oz. this year.

New Zealand

The Mines Department reports the exports of gold for February and the two months ended Feb. 28, as follows, in bullion ounces:

	1906.	1907.	Changes.
February.....	32,708	40,036	I. 7,328
Two months.....	94,412	67,546	D. 26,866

The bullion reported for the two months in 1907 was equal to 63,523 oz. fine gold, or \$1,313,022. Exports of silver for the same periods were, in ounces:

	1906.	1907.	Changes.
February.....	168,765	82,139	D. 86,626
Two months.....	254,317	271,691	I. 17,374

January exports this year were large, but there was a heavy decrease in February.

Metal, Mineral, Coal and Stock Markets

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

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, May 22—The coal trade in the East shows little change, either in anthracite or in bituminous. Contracts for bituminous supplies for the season are generally closed, and have been about up to the average. There are, as usual, some large consumers who think that they can do better by trusting to the open market; but the great majority prefer to cover their requirements by contract. Steam coal is in good demand, and steam sizes of anthracite are in better supply than they have been.

In the West, warmer weather seems to have come at last, with a corresponding decrease in demand. As in the East, there is a steady demand for steam coal, which helps to equalize matters. Car service is generally fair, and many mines have had to cut down their time, in order to prevent over-supply and congestion in the larger markets.

The reports of coal tonnage furnished by leading carriers show decreases, for the most part, for the four months ended April 30. The Pennsylvania Railroad lines are almost the only exception. How much of this decrease was due to railroad congestion and how much to a decrease in demand, is not easy to determine. The railroad troubles, however, undoubtedly had considerable effect.

COAL-TRAFFIC NOTES

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to May 11 were as follows, in short tons:

	1906.	1907.	Changes.
Anthracite.....	1,427,778	1,981,516	I. 553,738
Bituminous.....	11,845,990	13,462,972	I. 1,616,982
Coke.....	4,632,419	5,072,536	I. 440,117
Total.....	17,906,187	20,517,024	I. 2,610,837

The total increase thus far this year has been 14.6 per cent.

Washery coal—that is, coal saved from old culm banks—in the anthracite region in 1906 amounted to 3,846,501 long tons, or 6.9 per cent. of the total anthracite shipments. This is the largest quantity ever reported in one year, and was an increase of 1,202,456 tons over the previous year. In addition to the shipments, 259,807 tons were used at mines or sold locally, making a total of 4,106,308 tons saved in this way.

Shipments of bituminous coal and coke over various railroads in western Pennsylvania and West Virginia are reported as below for the three months ended March 31:

	Coal		Coke	
	1906.	1907.	1906.	1907.
Balt. & Ohio	6,689,768	6,064,110	1,533,840	1,431,196
Buff., Roch. & Pitts....	1,792,346	1,627,728	170,508	156,929
Be'h C. Div., N. Y. Cent.	2,470,605	1,832,250	25,956	20,829
Norfolk & W. Pitts. & L. Erie.....	2,907,794	2,786,785	667,456	657,534
	3,021,412	2,358,007	1,213,955	1,353,336
Total.....	16,881,925	14,668,880	3,611,715	3,619,824

In addition to the coal and coke given above the Baltimore and Ohio carried 249,381 tons of anthracite in 1906, and 273,605 in 1907; an increase of 24,224 tons this year. The tonnages given in the table show an increase of 8109 tons, or 0.2 per cent., in coke, but a decrease of 2,213,045 tons, or 13.1 per cent. in coal.

The railroads in the Ohio Coal Traffic Association report the coal originating on their lines for the three months ending March 31, as follows, in short tons:

	1906.	1907.	Changes.
Hocking Valley.....	1,120,334	801,037	D. 319,297
Toledo & Ohio Cent..	534,826	412,019	D. 122,807
Baltimore & Ohio....	539,502	505,760	D. 33,742
Wheeling & L. Erie..	913,507	821,284	D. 92,223
Cleve., Lorain & Wh.	680,646	595,005	D. 85,641
Zanesville & Western	366,802	358,072	D. 8,730
Toledo Div., Pen. Co.	740,046	647,563	D. 92,483
L. Erie, Alliance & Wh.	296,719	292,636	D. 4,083
Marietta, Col. & Clev.	.....	3,982	I. 3,982
Total.....	5,191,382	4,437,358	D. 754,024

The decrease in the total tonnage this year was 14.5 per cent.

Receipts and shipments of coal at Chicago for the three months ended March 31, are reported as follows by the Chicago Bureau of Coal Statistics:

	Received.	Shipm'ts.	Balance.
Anthracite.....	392,249	300,639	91,610
Bituminous.....	4,479,961	1,240,989	3,238,972
Coke.....	99,233	79,194	20,039
Total.....	4,971,443	1,620,822	3,350,621
Total, 1906.....	4,039,676	1,269,810	2,769,866

The balance represents, approximately, the city consumption of fuel. Receipts of bituminous coal this year were: Pennsylvania, 288,098; Ohio, 250,996; West Virginia, 177,054; Indiana, 868,099; Illinois, 2,895,714 tons.

Coal receipts at St. Louis for the three months ended March 31, were 2,461,640 tons in 1906, and 1,994,458 tons in 1907; a decrease of 467,182 tons this year.

Coastwise coal shipments from the leading Atlantic ports for the three months ending March 31, are reported as follows:

	Anthracite.	Bituminous.	Total.
New York.....	3,762,245	3,203,340	6,965,585
Philadelphia....	509,490	1,101,143	1,610,633
Baltimore.....	43,827	834,575	878,402
Newport News..	.....	572,188	572,188
Norfolk.....	.....	336,884	336,884
Total.....	4,315,562	6,048,130	10,363,692
Total, 1906....	4,394,669	5,726,443	10,121,112

The total shipments show an increase this year of 242,580 tons, or 2.4 per cent.

New York

ANTHRACITE

May 22—No special features are noted in the anthracite-coal trade during the past week. The demand continues fairly strong, especially marked for small sizes. Car supply is fair and movements are somewhat better than in the past. Coastwise trade is good, all the barges offered being loaded at once.

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

BITUMINOUS

The Atlantic Seaboard soft-coal trade is affected largely by short vessel supply which is bringing about an accumulation of orders in shippers' hands and is detaining coal from reaching consumers as quickly as expected. The high outside freight rates have attracted many vessels, leaving but a small supply for the usual trade.

Trade in the far East shows a strong demand, it being impossible to fill orders on account of short vessel supply; so that stocks are accumulating in the hands of shippers. Some small shortages in the East have been bridged over by purchases of outside coal.

The trade along the Sound has been ordering a little more coal, and in the last few weeks the Sound barge business has been in better condition and the trade is being moved more promptly.

New York harbor trade is slightly improved and better prices prevail, in a small way; from \$2.70@2.75 is being received for better grades of steam coal. All-rail trade is inclined to be slow, as everyone is pretty well supplied. Car supply is up to all demands.

Rates on coastwise shipments are unchanged from last week and are quoted as follows: Philadelphia to Boston, Salem and Portland, \$1@1.05; to Providence, New Bedford and the Sound, 90c.; to Lynn and Bangor, \$1.25; to Portsmouth, Gardiner and Saco, \$1.15; to Bath, \$1.10; with towages where usual.

Birmingham

May 20—Coal-mine operators in Alabama assert that there has been no falling off in the demand for coal, and so far there is no reason for any curtailment of the production. Good prices prevail and the large consumers in the district are

not giving any intimation that there is soon to be any countermanding of orders or hesitation in accepting coal as fast as it can be delivered. Some of the operators in this section are still making efforts to get men, in fact, in some quarters it is reported there is room for a number of good miners.

Nothing is heard as to union or non-union coal miners. The union miners in this district are to hold their annual meeting in June, but no apprehension is felt by the commercial companies who give employment to this class of labor that there is to be any trouble. With the exception of the two weeks' pay day there is but little difference from conditions in this district two years ago and the present state of affairs.

A little better condition prevails as to coke. The demand is better; prices are firm again. Several hundred coke ovens are either under construction or in contemplation for construction during the summer.

Chicago

May 20—The feature of the coal market continues to be large sales of domestic coals, both anthracite and bituminous. The continued cold weather accounts for this in large measure. In bituminous steam coals the tendency is toward strengthening run-of-mine and fine coals, prepared sizes gradually weakening. Contracts are strengthening, despite the general tendency of users of large amounts of coal to hold off because of favorable conditions in the open markets for the last two years.

Western bituminous—Illinois and Indiana—sells for \$1.90@2.65; \$1.70@2.50 for run-of-mine, and \$1.25@1.75 for screenings. The tendency in Western coals is toward the fine sizes, on account of the anti-smoke prosecutions in Chicago and the growth of mechanical devices for burning fine coal.

Eastern coals are quiet; the demand is not large and supplies are not too great in the case of any well-known coal. Smokeless is firm, with supplies somewhat scant, at \$3.35 for run-of-mine and \$3.65 for lump and egg. Hocking is quiet and firm at \$3.15 for lump, and Youghiogeny is somewhat scarce at \$3.15 for ¾-inch.

The strict enforcement of demurrage and re-consignment rules has resulted in a general strengthening of the market, by prohibiting the usual accumulation of coal on tracks in Chicago.

Cleveland

May 21—The coal market carries little change from last week. Pittsburg slack is easier at \$1.60@1.75 for No. 7. Run-of-mine sells at \$1.85 and ¾-in. lump at \$1.60. The Lake trade is quiet. Coal shippers are getting wild tonnage at regular, or contract rates.

Indianapolis

The local coal trade, which began in the middle of October last year and continued until the middle of May, has at last shown signs of depression. The unprecedentedly cold April made as good a market as some of the winter months, according to statements made by dealers.

The Big Four Railroad is now bringing large quantities of coal to this and eastern Indiana markets. This is a result of amicable arrangements recently made by this road with the Evansville & Terre Haute and the Southern Indiana, whereby the latter companies are delivering more than 200 loaded cars to the Big Four daily and at a division of rates satisfactory to all the companies.

C. D. Trobridge, president of the recently incorporated Traction Coal Company, of Indianapolis, denies that the company is to be a merger company to include all the prominent local dealers in the city. The object is only to organize and incorporate a company sufficiently strong financially to buy the Sullivan County Coal Company mines and have four or five yards to distribute the coal to consumers.

Pittsburg

May 21—The market continues strong, but production is falling off on account of a shortage of railroad cars, and a serious scarcity is expected later on. Not more than 85 per cent. of the railroad mines were in operation at the opening of the week and a number will be closed tomorrow, as there are not enough cars. All the river mines are running and the supply of empty coal boats and barges is sufficient to keep them going for some time. The rivers are navigable today and preparations are being made to send out a large tonnage of coal tonight and tomorrow.

Connellsville Coke—Spot coke continues weak, and sales of furnace coke have been made during the past few days at \$2.15 and foundry as low as \$3. Some transactions, however, were at higher prices. For second-half delivery furnace coke is quoted at \$2.75@2.85 and foundry at \$3.25@3.50. The *Courier* in its summary for the week gives the production in both regions at 416,971 tons. The shipments aggregated 14,598 cars distributed as follows: To Pittsburg, 4960 cars; to points west of Connellsville, 8877 cars; to points east of Connellsville, 761 cars.

Foreign Coal Trade

The coal bunkered, or supplied to steamships engaged in foreign trade, at United States ports for the three months ended March 31 was 1,411,580 tons. Adding this to the exports, previously reported, makes a total of 3,665,696 tons coal

sold for consumption beyond the limits of the United States.

The total exports of fuel from Great Britain, with coal shipped for the use of steamers in foreign trade, for the four month ending April 30, are reported as follows, in long tons:

	1906.	1907.	Changes.
Coal.....	16,934,250	18,859,218	I. 1,924,968
Coke.....	224,824	289,545	I. 64,721
Briquets.....	467,051	447,823	D. 19,228
Total exports..	17,626,125	19,596,586	I. 1,970,461
Steamer coal.....	5,932,517	5,947,394	I. 14,877
Total.....	23,558,642	25,543,980	I. 1,985,338

The total increase was 8.4 per cent. The shipments of coal to the United States for the four months were as follows:

	1906.	1907.	Changes.
Atlantic ports.....	20,174	7,821	D. 12,353
Pacific ports.....	8,536	8,974	I. 438
Total.....	28,710	16,795	D. 11,915

Among the larger exports this year were 3,652,917 tons to France; 2,647,613 tons to Italy; 2,496,657 tons to Germany.

Imports and exports of fuel in Austria-Hungary for the two months ended Feb. 28 were, in metric tons:

	Imports	Exports
Coal.....	1,629,352	124,318
Brown coal.....	2,327	1,279,508
Coke.....	86,472	51,152
Briquets.....	8,761	12,573
Total.....	1,726,912	1,467,551

There was also imported 625 tons of peat and 326 tons charcoal; exported 1543 tons peat and 4884 tons charcoal.

Shipments of Nova Scotia coal for the four months ended April 30 were as follows, by companies:

	1906.	1907.	Changes.
Dominion.....	738,470	720,961	D. 18,209
N. S. Steel.....	122,761	120,276	D. 2,485
Cumberland.....	156,905	105,658	D. 50,647
Acadia.....	75,997	88,208	I. 12,211
Intercolonial.....	87,430	84,710	D. 2,720
Inverness.....	32,334	53,980	I. 21,596
Total.....	1,213,397	1,173,143	D. 40,254

The total shipments show a decrease of 3.3 per cent. this year.

Iron Trade Review

New York, May 22—The rush to buy pig iron is not so much in evidence this week, probably because many have satisfied their requirements. Present demand is chiefly of smaller lots for early delivery, and these are hard to get. Parallel conditions are found in finished material, though not quite to the same extent. Rails and structural material show a good deal of new business, and there is also considerable activity in bars and plates.

Charcoal Furnace Combination—The Lake Superior Iron and Chemical Company is the title of a new company which has acquired possession of a number of the charcoal blast furnaces in the Lake Superior country, all of them in Michigan. The furnaces included in the merger are the Newberry, Marquette, Manistique, Gladstone, Elk Rapids, Boyne City, Antrim and Hinkle.

Baltimore

May 21—Exports for the week include 1272 tons steel rails to Buenos Aires. Imports include 748 tons ferromanganese. Receipts of iron ore were 5300 tons from Cuba; 6400 tons from Nicolaieff, Russia; 3650 tons from Beni-saf, Algeria; 15,350 tons in all. Other receipts included 6870 tons of iron pyrites from Spain; 4500 tons copper ore from Santiago, Cuba; 294 tons chrome ore from Liverpool.

Birmingham

May 20—When intimation is given that some of the manufacturers are about to withdraw from the market, it cannot be denied that the iron market is in a strong condition. No. 2 foundry iron for delivery during the fourth quarter is selling easily at \$20 per ton. Third-quarter iron is becoming almost as scarce as spot iron. Iron for delivery within the month brings something like \$24 per ton, No. 2 foundry. The production is a little improved, the Tennessee Coal, Iron and Railroad Company having three furnaces in blast now at Bessemer. Sales for delivery during the coming year are still being made and at prices that are satisfactory.

Steel, cast-iron pipe, machine and foundry work are in strong demand. John A. Topping, president of the Republic company and chairman of the executive committee of the Tennessee company, is in the Birmingham district looking over conditions.

Chicago

May 20—The pig-iron market locally is still strong. The demand for all grades of iron, for both quick and future delivery, is strong and promises to continue. The tone of the market is decidedly bullish. Prices continue firm. For deliveries in the second half, Southern No. 2 brings \$20.50@21.50, with quick deliveries within the next month and a half at about \$23, Birmingham. These quotations make the price of Southern in Chicago \$24.85@25.85 for the second half and about \$27.35, Chicago, for quick delivery.

Northern furnaces are reported to be largely sold out for the rest of the year. Shipments of Southern are delayed greatly owing to lack of iron. The probabilities for the year seem to justify faith in the continuance of high prices and comparatively scant supplies. Northern No. 2 is quoted at \$25@25.50 for the last half, and \$27@27.50 for quick delivery.

Coke is fairly strong, with supplies well regulated to demand. Connellsville 72-hour is selling at \$6 and Southern coke of the best grade at about 25c. lower.

Cleveland

May 21—Interest has been transferred from the pig-iron market to finished lines, and heavy sales are reported in structural material. A strong demand for crude

steel has advanced prices. Merchant pipe is up \$4 a ton. Pig iron is strong with no quotations on No. 2 foundry below \$24 for last-half delivery. Demand from real estate quarters has put up the price of structural steel, and it is reported that steel bars are to be advanced. Trade on the lakes is quiet, no ore cargoes of any size having yet reached Cleveland from upper lake ports.

Local iron dealers report the following prices for last-half delivery: Bessemer, \$23.90; No. 1 foundry \$24.50; No. 2 foundry, \$24; No. 3 foundry, \$23.50; No. 2 southern, \$24.35; gray forge \$22.50. It is expected that prices will show further strength.

Philadelphia

May 22—The demand for basic pig in eastern territory overshadows everything else in the crude-iron market. The worst feature is that it partakes of speculation though not to such a degree as some published statements assert. The extraordinary demand for material into which basic pig enters warrants the action that has been taken, resulting in an advance in price of several dollars per ton within a few months. Foundry, forge and malleable are all higher by a dollar or two under an active spring demand. The requirements represent actual business recently taken by mills, foundries and engineering plants. Our furnace people speak in glowing terms of the pig-iron situation and predict that the present conditions will continue. Brokers report some moderate business in English and Scotch pig. Southern furnaces have been called upon within a week to take care of some urgent buyers who paid premiums for early delivery. In some quarters a subsidence of the present buying activity is predicted and the prediction appears reasonable—but reasonable predictions are dangerous. For No. 2 Foundry, prices range all the way from \$24 to \$26.50, according to delivery; gray forge, from \$23.75 to \$25.50. Basic, \$23.50 to \$25.50. low phosphorus is \$27.50.

Billets—Billets have sold at \$32.50 with \$33 as a fair asking price. Large orders will be placed before Saturday. Forging steel has been booming in a quiet way in moderate lots at \$37.50.

Bars—Premium prices are the rule for early deliveries. Consumers are on the war-path and a good many stores were pretty well cleaned out last week.

Sheets—The bulk of business of the past week is in small lots which went at prices a little above the card.

Pipes and Tubes—A large business has been done within a week at the recent discounts. The demand is still heavy.

Plates—The many small buyers of iron and steel plate throughout this territory are badly handicapped by the fact that the plate mills are swamped with big orders and will be worse swamped before long.

Pittsburg

There is but little change in the market for finished steel products. New business is still being placed in all lines, and the mills are unable to catch up on deliveries. It seems certain now that the year will close with many unfilled orders on the books of the large interests. No promises are made for delivery. Premiums for reasonably prompt deliveries in most of the important lines are offered and range from \$1 to \$4 a ton over the established prices. In merchant steel bars there is a particularly heavy demand. The agricultural implement makers have entered the market, having given up hopes of obtaining the usual concession of \$2 a ton. Orders are being placed ranging from 500 to 5000 tons for the year beginning July 1, and all are at the ruling rate of 1.60c. Pittsburg.

Crude steel continues scarce, and prices are higher. While the rate for sheet-bars for third quarter has been fixed at \$30, it is practically impossible to place a large order even at that price. Yesterday the leading producer announced the price of sheet-bars for June delivery at \$31, but a Youngstown concern has refused an order for 2000 tons at that figure. The high price of sheet-bars and tin-bars is seriously affecting independent sheet and tin-plate interests who have not covered for their requirements. But for the fact that the mills are sold for more than six months ahead, prices for sheets and tin-plate would be advanced. A further complication in the situation may arise when the demands of the Amalgamated Association of Iron, Steel and Tin Workers are presented for the new scale to become effective when the present agreement expires on June 30. The annual convention in session in Toledo has decided to ask for an advance of 6 per cent. for the roller and doubler in the tin-plate mills, and about 2 per cent. for other tonnage men. No important change that will be objected to by manufacturers is proposed in the sheet scale. It is understood that the convention decided to put the sheet-mill hands on a tonnage basis. The leading interest, which usually arranges the wage scale for all union sheet and tin-plate mills, is preparing for a conference with the committee of the Amalgamated Association, and efforts are being made to hold it early next week.

The most important wage change contemplated by the workers' organization is in the iron scale, and the demands are likely to meet with serious opposition from the manufacturers. It is proposed to continue the base of the scale at \$5 a ton when bar iron is selling at 1c. a pound. The pay of the puddlers is to advance 12½c. with every increase in the selling price of 0.05c. above the base. The examination of the sales sheets of bar iron for March and April disclosed an average of 1.6c. a pound which, under the existing scale, gives the puddlers a rate

of \$6 a ton, or an increase of 25c. over the old rate. Under the proposed scale this average would give the puddlers a rate of \$6.50 a ton.

Pig Iron—Sales for the week for this year's delivery were confined to three lots of bessemer and malleable bessemer aggregating 2000 tons for May and June at \$23.50, Valley furnaces. No. 2 foundry iron in small lots for early delivery brought \$25 and as high as \$26, Valley. A number of inquiries are in for second half, but it is not likely that any large tonnage can be placed at any price. A feature of the pig-iron market was the placing of an order for 25,000 tons of malleable bessemer for delivery in the first quarter of 1908 at \$22, Valley furnaces. As there is practically no bessemer iron for this year it is believed the market for 1908 will open in a short time. Gray forge is stronger this week, and the minimum quotation for second and third quarter is \$22.90, Pittsburg.

Steel—The supply of crude steel is not sufficient to meet the demand. A number of mills have withdrawn from the market, having completely sold up for the year. Bessemer billets are quoted nominally at \$31.50, and open-hearth at \$33, Pittsburg. Plates remain at 1.70c., and merchant steel bars at 1.60c.

Sheets—New business in sheets is being booked daily, and the mills do not appear to be catching up on deliveries. Prices are unchanged, black sheets being quoted at 2.60c., and galvanized at 3.75c. for No. 28 gage.

Metal Market

NEW YORK, May 22.

Gold and Silver Exports and Imports

At all United States Ports In April and year

Metal.	Exports.	Imports.	Excess.
Gold:			
Apr. 1907..	\$ 2,201,659	\$ 4,928,490	Imp. \$ 2,726,831
" 1906..	2,485,352	14,941,583	Imp. 12,456,031
Year 1907..	7,904,963	16,575,105	Imp. 8,670,142
" 1906..	22,632,174	25,257,670	Imp. 2,625,496
Silver:			
Apr. 1907..	4,862,998	3,921,484	Exp. 941,514
" 1906..	4,213,687	2,833,859	" 1,379,828
Year 1907..	19,532,394	15,307,010	" 4,225,384
" 1906..	23,379,295	15,510,857	" 7,868,438

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York

For week ending May 18 and years from Jan. 1

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	\$ 1,000	\$ 112,195	\$ 596,012	\$ 9,410
1907.....	1,878,446	5,509,574	14,303,570	712,553
1906.....	4,968,621	41,378,528	24,685,712	776,429
1905.....	32,914,546	5,038,542	12,068,639	1,459,809

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

The foreign commerce of the United States for the four months ended April 30 is valued as follows by the Bureau of Statistics of the Department of Commerce and Labor:

	1906.	1907.
Exports, merch'dise..	\$602,260,358	\$667,954,324
Imports.....	431,670,062	511,982,259
Excess, exports....	\$170,590,296	\$155,972,065
Add excess of exports, silver.....		4,225,384
Total.....	\$160,197,449	\$160,197,449
Deduct excess of imports, gold.....		8,670,142
Net export balance.....	\$151,527,307	

The gold and silver movement in detail will be found in the table at the head of this column.

The joint statement of all the banks in the New York Clearing House for the week ending May 18 shows loans \$1,124,808,700, a decrease of \$1,414,900; deposits, \$1,106,100,900, an increase of \$1,681,800, as compared with the previous week. Reserve accounts show:

	1906.	1907.
Specie.....	\$185,441,600	\$215,060,200
Legal tenders.....	81,395,900	72,937,700
Total cash.....	\$266,837,500	\$287,997,900
Surplus.....	\$10,129,275	\$ 11,472,676

The surplus over legal requirements shows an increase of \$2,986,450, as compared with the previous week this year.

Specie holdings of the leading banks of the world, May 18, are reported as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York.....			\$215,060,200
England.....	\$174,744,455		174,744,455
France.....	522,575,160	\$196,050,015	718,625,175
Germany.....	175,390,000	68,465,000	243,855,000
Spain.....	77,635,000	126,015,000	203,650,000
Netherlands.....	26,334,500	27,524,000	53,858,500
Belgium.....	16,313,335	8,156,665	24,470,000
Italy.....	162,015,000	24,962,000	186,977,000
Russia.....	579,915,000	28,800,000	608,715,000
Aust.-Hungary.....	226,985,000	63,365,000	290,350,000
Sweden.....	20,800,000		20,800,000

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports. The European statements are from the cables to the *Commercial and Financial Chronicle* of New York.

Shipments of silver from London to the East are reported by Messrs. Pixley & Abell as follows, for the year to May 9:

	1906.	1907.	Changes.
India.....	£ 6,606,603	£ 4,610,334	D. £ 1,996,269
China.....			I.
Straits.....	1,750	321,500	I. 319,750
Total.....	£ 6,608,353	£ 4,931,834	D. £ 1,676,519

Receipts for the week were £11,000 from Australia, and £152,000 from New York; a total of £163,000. Exports were £145,000, all to India.

SILVER AND STERLING EXCHANGE.

May.	Sterling Exchange.	Silver.		May.	Sterling Exchange.	Silver.	
		New York, Cents.	London, Pence.			New York, Cents.	London, Pence.
16	4.8640	65½	30½	20	4.8685	65½	...
17	4.8690	65½	30½	21	4.8680	66½	30½
18	4.8690	65½	30½	22	4.8675	66½	30½

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

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars.....	\$0.51½	\$0.53½
Peruvian soles and Chilean.....	0.46½	0.49½
Victoria sovereigns.....	4.85	4.87
Twenty francs.....	3.85	3.89
Spanish 25 pesetas.....	4.78½	4.80

Other Metals

May.	Copper.			Tin.	Lead.	Spelter.	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.			Cts. per lb.	Cts. per lb.
16	24½ @25½	24 @24½	103	44½	6.00	6.35 @6.40	6.20 @6.25
17	24½ @25½	24 @24½	102½	44	6.00	6.35 @6.40	6.20 @6.25
18	24½ @25½	24 @24½	.....	44	6.00	6.35 @6.40	6.20 @6.25
20	24½ @25½	23½ @24	.....	43½	6.00	6.35 @6.40	6.20 @6.25
21	24½ @25½	23½ @24	101½	43½	6.00	6.35 @6.40	6.20 @6.25
22	24½ @25½	23½ @24	101½	43½ @44	6.00	6.35 @6.40	6.20 @6.25

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

Copper—There has been no change in the situation. Consumers, both in this country, as well as abroad, are persistently holding aloof and sellers have so far been unable to stimulate any interest, in spite of the lower prices which are being asked. A feature of the week has been some offerings of copper by consumers for resale. The market closes nominal at 24½ @25½ for Lake copper; 23½@24c. for electrolytic in cakes, wirebars or ingots; and 22½ to 23½ for casting copper.

The scarcity of near-by options has sustained the spot quotation for standard, but there has been a considerable amount of forward selling on the part of the bear contingent, under which the three months' option has yielded, causing important backwardation. The close is weak at £101 7s. 6d. for spot, and £98 12s. 6d. for three months'.

For refined and manufactured sorts, we quote: English tough, £107@108; best selected, £111@112; strong sheets, £119@120.

Exports of copper from New York for the week were 470 long tons. Our special correspondent reports exports for the week from Baltimore at 526 long tons copper.

Imports and exports of copper in Germany for the three months ended March 31 were, in metric tons:

	1906.	1907.	Changes.
Imports.....	37,125	26,506	D. 5,619
Exports.....	3,425	2,113	D. 1,312
Balance, imports....	28,750	24,393	D. 4,307

The increase shown in 1906 was chiefly from Spain and Italy.

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—Consumers have allowed their supplies to run down to a minimum, and as a result there has been a steady inquiry for spot delivery. The premium, however, has been materially cut down, as the improvement in the strike situation has made it possible to effect better deliveries. The market is steady at 43¾ to 44c.

The foreign market has held its own throughout the week, and closes practically unchanged at £189 10s. for spot, and £185 for three months'.

Exports of tin from the Straits for the first half of May are cabled as follows: United States, 665; London, 1701; European continent, 462; total, 2828 long tons, an increase of 95 tons over the corresponding period last year.

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

The reports from Europe indicate a very strong position in the lead market, and premiums are being paid for near-by delivery. The close is firm at £19 17s. 6d. for Spanish lead and £20 for English.

The movement of foreign lead in the United States for the three months ended March 30 is reported by the Bureau of Statistics as below, in short tons:

	1906	1907	Changes
In bond, Jan 1....	8,148	5,691	D. 2,457
Imports, three mos.	23,303	19,490	D. 3,813
Total supplies...	31,451	25,181	D. 6,270
Re-exports	10,955	5,299	D. 5,656
In bond, Mar. 31..	11,556	4,617	D. 6,939
Total deductions	22,511	9,916	D. 12,595
Balance	8,940	15,265	I. 6,325

The balance has presumably entered into consumption in the United States.

Spanish Lead Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of May 4, that the price of pig lead has been 92.50 reales per quintal; silver, 13.25 reales per ounce; exchange, 27.82 pesetas to £1. The price of lead, on current exchange, is equal to £18 12s. 3d. per long ton, f.o.b. Cartagena. Exports for the week were 600 tons desilverized to London; 66 tons desilverized, and 813 tons argentiferous to Marseilles; 100 tons desilverized to Hamburg; 25 tons antimonial lead to Rotterdam; a total of 1604 tons.

Spelter—Nothing of particular interest has developed in the market during the past week, and the close is steady at 6.35@6.40 New York, and 6.20@6.25 St. Louis.

London cables a weak market, and the quotation has declined to £25 1s. 6d. for good ordinaries and £25 17s. 6d. for specials.

Zinc Sheets—The base price is now \$8.60 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

Spanish Zinc Ore Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of May 4, that the market is dull and quiet. No shipments reported for the week. Nearly all the ore mined is covered by contract.

Antimony—On free offerings of metal, with a demand that is only fair, the market is weaker. At the close quotations are about 22c. for Cookson's, 17½c. for Hallett's, and 16½@17½ for ordinaries.

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

Platinum—The market has fluctuated rather sharply and prices are a little uncertain. The latest quotation is \$28 per ounce for ordinary metal, and \$31 for hard. Scrap is quoted at \$20 per ounce, with light demand.

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.

Vincenzo Spirek estimates the quicksilver output of the leading districts of the world as follows, in metric tons:

	1906	1907	Changes
Idria, Austria.....	519	526	I. 7
Mt. Amiata, Italy.....	369	318	I. 49
Almaden, Spain.....	800	1,242	I. 442
Nikitovka, Russia.....	319	210	D. 109
California, U. S.	1,049	941	D. 102
Total.	3,056	3,337	I. 287

British Metal Imports and Exports

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

	1906	1907	Changes
Copper ore.....	31,543	32,318	I. 775
Matte and precipitate..	25,343	22,497	D. 2,846
Fine copper.....	24,650	23,803	D. 847
Total imp. fine copper..	40,426	38,284	D. 2,142
Exports.....	14,672	17,720	I. 3,048
Re-exports	7,662	8,299	I. 637
Total exports.....	22,334	26,019	I. 3,685
Balance, imports ..	18,092	12,265	D. 5,827

Of the imports this year the United States furnished 92 tons of matte and 8030 tons fine copper; against 1611 and 7409 tons, respectively, last year.

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

	1906	1907	Changes
Straits.....	11,302	11,719	I. 417
Australia.....	1,527	1,905	I. 378
Other countries....	945	1,236	I. 291
Total imports..	13,774	14,860	I. 1,086
Exports.....	2,436	3,142	I. 706
Re-exports.....	10,493	9,546	D. 947
Total exports ...	12,929	12,688	D. 241
Balance, imp....	845	2,172	I. 1,327

Imports of tin ore were 6237 tons in 1906, and 6357 tons in 1907; an increase of 120 tons. Of the imports this year 5180 tons were from Bolivia.

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

	1906	1907	Changes
United States.....	7,161	4,665	D. 2,496
Spain.....	34,462	36,604	I. 2,142
Australia.....	17,028	17,406	I. 378
Germany.....	6,616	2,722	D. 3,894
Other countries.....	1,657	3,288	I. 1,631
Total imports.....	66,924	64,685	D. 2,239
Exports.....	14,286	17,596	I. 3,310
Balance, imports ...	52,638	47,089	D. 5,549

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

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

	1906	1907	Changes
Spelter.....	29,508	30,905	I. 1,397
Zinc sheets, etc.....	5,931	7,277	I. 1,346
Total imports ...	35,439	38,182	I. 2,743
Exports.....	2,394	1,777	D. 617
Balance, imports..	33,045	36,405	I. 3,360

Imports of zinc ore are not reported separately.

Quicksilver—Imports of quicksilver into Great Britain for the four months ended April 30 were 809,382 lb. in 1906, and 1,612,956 lb. in 1907; an increase of 803,574 lb. Re-exports for the same period were 736,923 lb. in 1906, and 910,131 lb. in 1907; an increase of 173,208 lb. this year.

Missouri Ore Market

Joplin, Mo., May 18—The highest price paid for zinc ore was \$50 per ton, on an assay base price of \$45 to \$47 per ton of 60 per cent. zinc—the same price as ruled a week ago. Floods restricted the output approximately 1500 tons, filling all the Badger mines to the surface, cutting off about 400 tons here alone, and putting many other mines of the district temporarily out of business; at most of them resumption will be possible during the coming week. A protracted restriction of 600 tons per week will be partially overcome by six new mills that will output about 200 tons per week. The average price was \$45.34. The highest price for lead ore was \$82, with medium grades ranging from \$78 to \$80 per ton, and an average of \$78.68 per ton.

Following are the shipments of zinc and lead from the various camps of the district for the week ending May 18:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville.	3,138,540	476,590	\$92,580
Joplin.....	2,521,020	387,470	75,709
Galena-Empire	1,396,320	171,890	38,904
Alba-Neck City.....	1,260,210	11,760	31,339
Duenweg.....	834,550	170,750	26,355
Oronogo.....	619,100	96,760	16,871
Prosperity.....	383,320	193,580	16,654
Spurgeon.....	547,370	84,790	14,048
Aurora.....	642,090	11,730	10,144
Badger.....	283,280	.....	6,940
Carthage.....	253,960	.....	6,222
Granby.....	350,000	35,000	6,100
Baxter Springs.....	176,830	.....	4,067
Zincite.....	62,860	11,660	1,943
Stott City.....	59,630	.....	1,371
Playter.....	43,790	7,460	1,298
Reeds.....	42,760	.....	938
Totals.....	12,615,630	1,659,440	\$351,484

20 weeks.....242,033,580 37,736,910 \$7,253,158
 Zinc value, the week, \$286,115; 20 weeks, \$5,705,461
 Lead value, the week, 65,369; 20 weeks, 1,547,697

Average prices for ore in the district, by months, are shown in the following table:

ZINC ORE AT JOPLIN			LEAD ORE AT JOPLIN.		
Month.	1906.	1907.	Month.	1906.	1907.
January...	47.38	45.84	January...	75.20	83.53
February...	47.37	47.11	February...	72.83	84.58
March.....	42.68	48.66	March.....	73.73	82.75
April.....	44.63	48.24	April.....	75.13	79.76
May.....	40.51	.....	May.....	78.40	.....
June.....	43.83	.....	June.....	80.96	.....
July.....	43.25	.....	July.....	74.31	.....
August.....	43.56	.....	August.....	75.36	.....
September.....	42.58	.....	September.....	79.64	.....
October.....	41.55	.....	October.....	79.84	.....
November.....	44.13	.....	November.....	81.98	.....
December.....	43.68	.....	December.....	81.89	.....
Year.....	43.24	.....	Year.....	77.40	.....

Wisconsin Ore Market

Platteville, Wis., May 18—The week shows a net gain in the zinc production. The pyritic ore shipped, which formerly constituted all of the tonnage reported, decreases monthly; today the ore shipped is largely 60 per cent. ore, although there is considerable pyritic ore represented in the tonnage as shown in the report below. The consensus of opinion among local mining men is that it will not be long before nearly all of the ore from the Wisconsin district will be high grade. Development and improvements tend to this conclusion. The deciding point to this end is that the ore generally admits of magnetic separation. Present indications are toward heavier production and in spite of the general cry of over-production there is no surplus to be found at the mines.

The price of 60 per cent. ore held the same as last week \$47@48 per ton. The market was strong; buyers were active. Authorities have it that Platteville camp will be producing, within a year, as much as the entire district put together is now turning out. At the present time every pound of ore shipped from Platteville runs 60 per cent. or over, with the exception of that shipped from the St. Rose. Unfavorable road conditions prevailed and prevented the hauling of all ore to the shipping points.

Lead remains steady at \$41 per 1000 lb.; production normal. The new lead mill is expected to start before the first of the month.

The shipment for the district, by camps, for the week ending May 18, is as follows:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville.....	197,821	.....	.....
Linden.....	184,940	56,900	.....
Galena.....	171,800	.....	.....
Benton.....	165,310	.....	.....
Livingston.....	111,000	.....	.....
Mineral Point.....	97,710	.....	.....
Rewey.....	61,000	.....	.....
Cuba City.....	39,500	55,220	.....
Total for week.....	1,029,081	112,120	.....
Year to May 18.....	34,651,960	1,563,440	189,160

As the wires were down no report was received from Hazel Green and Buncombe camps. There were several of the camps unable to ship all the ore produced, on account of the shortage of cars.

Chemicals

New York, May 22—The general market continues active, almost all heavy chemicals being in strong demand.

Copper Sulphate—There is no change in demand, and supplies are not increasing. The quotations remain unchanged, at \$7.50 per 100 lb. for carloads or over, and \$7.75 per 100 lb. for smaller lots.

Nitrate of Soda—There is no change in the market. The demand continues good and prices remain for spot \$2.70 per 100 lb. with 96 per cent. for all positions of 1907 at \$2.50. The price for 95 per cent. is \$2.45 for both 1907 and 1908. Stocks are extremely low, and spot nitrate is not to be had just now.

Phosphates—Exports of phosphate rock through the port of Savannah during the month of April are reported by J. M. Lang & Co. as follows, in long tons: Germany, 9708; Holland, 3687; Italy, 2269; Great Britain, 1521; total, 17,185 tons.

British Chemical Trade — Exports of chemicals from Great Britain for the four months ended April 30 were as follows, in cwt of 112 lb. each:

	1906.	1907.	Changes.
Bleaching powder....	324,432	361,347	I. 36,915
Muriate of ammonia,	35,649	58,042	I. 22,393
Soda ash.....	511,893	715,197	I. 203,304
Bicarbonate of soda.	101,899	142,715	I. 40,816
Caustic soda.....	473,381	498,451	I. 15,070
Soda crystals.....	55,691	46,762	D. 8,929
Soda sulphate.....	266,462	285,762	I. 19,300
Sulphuric acid.....	33,193	27,333	D. 5,860

Exports of copper sulphate were 25,721 long tons in 1906 and 29,123 tons in 1907, an increase of 3402 tons this year.

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

	1906.	1907.	Changes.
Nitrate of potash.....	3,344	4,086	I. 742
Nitrate of soda.....	35,348	54,693	I. 19,345
Phosphates.....	169,506	201,509	I. 32,003
Sulphur.....	7,209	6,493	D. 716
Pyrites.....	266,751	269,160	I. 2,409

Estimating sulphur contents of pyrites, the total sulphur imports were 113,909 tons in 1906 and 114,157 tons in 1907, an increase of 248 tons this year.

Mining Stocks

New York, May 22—No improvement can be found in the general stock markets, and several days of the week were covered by a bear raid, which was rather successful. The markets continue professional mainly, and the present conditions are not tempting to outsiders. At the close there is a steady pressure to sell, which is not favorable to any improvement in quotations.

Amalgamated Copper sold down to \$91 and American Smelting and Refining common to \$122¼. United States Steel closed at \$34½, with \$98½ for the preferred. Utah Copper closed at \$27½, a loss.

The curb market was dull, with selling orders in evidence, and prices inclined to yield. The copper shares were comparatively quiet; the larger dealings being in Nevada stocks and those of the Cobalt companies.

Boston

May 21—Copper shares wound up today with a smash in sympathy with the break in the New York list. The market has been passive the past week, until today, with slight fluctuations. Copper Range had a period of strength, stiffening \$1.50 to \$84.37½, on renewed reports that the Cole-Ryan interests were still looking for control. The price tonight, however, was off to \$79.75. Amalgamated is off \$6.75 net and \$8 gross for the week, closing at \$88.62½. Calumet & Hecla is off \$35 to \$835 on light trading. Dividend action will come within the next 10 days. Three months ago \$20 was declared.

North Butte is off \$6.25 to \$85.75. The usual quarterly dividend of \$2 has been declared. Old Dominion, broke \$5.50 to \$49; Butte Coalition \$2, to \$25; Calumet & Arizona \$9, to \$166; Boston Consolidated, \$4.12½, to \$25.87½; Franklin \$2.75, to \$14.75; Isle Royale \$2.25, to \$16.75. Mohawk moved up \$2.50 to \$89, but is back to \$83.

Shannon has maintained a firm tone, closing a trifle above a week ago, at \$18.12½. Dividend action will be taken in the next fortnight. Arizona Copper people are to build a railroad which will obviate interruptions during the flood season. The Shannon will benefit in concessions in freight charges.

The Mass Mining Company will commence prospecting with diamond drill on the Riddle farm, with a hope of striking the Baltic lode. A circular to Adventure mining stockholders is rather discouraging, showing a loss of \$21,034 in mining operations for the first four months of this year. Stockholders will have to decide the expediency of further operations at the coming annual meeting. Raven mining stockholders have voted to increase the capital 500,000 shares more. Of this 400,000 shares will be retained in the treasury and 100,000 shares imme-

diately sold at \$1 per share, for which stockholders can subscribe at the rate of one new share for five held. The rights have sold from 14 to 9c. Nipissing is off to \$11 on the curb.

Colorado Springs

May 18—The trading on the local mining exchange has been dull the past week, but prices have held quite firm. On both sides of the market there seems to be a disposition to wait for development in the drainage-tunnel project. The desultory tactics of the management of the tunnel scheme is having a damaging effect on Cripple Creek stocks which it will take several months of active and continuous tunnel work to overcome.

STOCK QUOTATIONS

Table with columns for NEW YORK and BOSTON, listing various stock names and their prices. Includes sub-sections for NEW YORK and BOSTON.

N. Y. INDUSTRIAL

Table listing industrial stocks in New York with columns for company name and price.

ST. LOUIS

Table listing stock prices in St. Louis with columns for company name and price.

Table listing various stock names and their prices, continuing from the main Stock Quotations section.

BOSTON CURB

Table listing stock prices on the Boston curb with columns for company name and price.

LONDON

Table listing stock prices in London with columns for company name and price.

S. FRANCISCO May 15

Table listing stock prices in San Francisco with columns for company name and price.

NEVADA May 22

Table listing stock prices in Nevada with columns for company name and price.

New Dividends

Table listing new dividends for various companies with columns for company name, payable date, rate, and amount.

Assessments

Table listing assessments for various companies with columns for company name, delinquent date, sale date, and amount.

Monthly Average Prices of Metals AVERAGE PRICE OF SILVER

Table showing monthly average prices of silver in New York and London from 1906 to 1907.

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

AVERAGE PRICES OF COPPER

Table showing average prices of copper in New York and London from 1906 to 1907.

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

Table showing average prices of tin in New York from 1906 to 1907.

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Table showing average prices of lead in New York and London from 1906 to 1907.

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

AVERAGE PRICE OF SVELTER

Table showing average prices of svelter in New York, St. Louis, and London from 1906 to 1907.

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