

"Interstate rates to and from New England from and to points in trunk line or central freight association territory, where necessary to preserve established relationships between points or ports in New England and points or ports in trunk line territory, may be increased not to exceed 5 per cent.

"Subject to the maintenance of the established Atlantic port differentials, rates to and from New York may be increased not to exceed 5 per cent. and rates to and from Portland, Boston, Philadelphia and Baltimore may be increased to the extent necessary to maintain said differentials."
W. L. C.

Operations at the Tofo Iron Mines in 1914

The Bethlehem Steel Company's Progress at Its Chilean Property—Electric Railroad from Mines to Dock

Shipments amounting to 63,000 tons have been made from the Bethlehem Steel Company's Chilean iron mines at Tofo in the past year, two-thirds of the amount coming to the United States. Contracts for dock and railroad construction have been let and for the extensive electric plant required for the operation of the railroad.

As has been indicated in previous articles the Tofo mines are located near the coast of Chile, about 30 miles north of Coquimbo. They were originally opened in a small way by a French company, which also operated a steel works at Corral in southern Chile. The

Exploration work by means of tunnels has been carried on, and ore reserves have been materially increased. Much ore has also been put in sight in some cuts made in road construction. Tunnels are now in ore at a point 150 meters, or 490 ft., below the top of South Hill. It was thought that possibly this ore from the lower part of the ore-body might show some increase in sulphur content, but this has not been the case. Thus a sample from the lowest tunnel analyzed as follows:

Iron	67.47 per cent.
Manganese	0.12 per cent.
Phosphorus	0.008 per cent.
Sulphur	trace
Silica	2.00 per cent.

Some exploration tunnels in the mantle of float ore on the eastern edge of the deposit have materially increased the tonnage of float ore in sight.

Shipments of ore have continued during the year as conditions permitted. The ore shipped has been transported to Cruz Grande by aerial tramway, and loaded into vessels by a cantilever loading bridge. This cantilever has now been fitted with a conveying belt 36 in. wide, replacing the buckets as installed by the French company. It is expected that this will greatly reduce the loading time and correspondingly expedite shipments.

SHIPMENTS IN 1915 TO BE 200,000 TONS

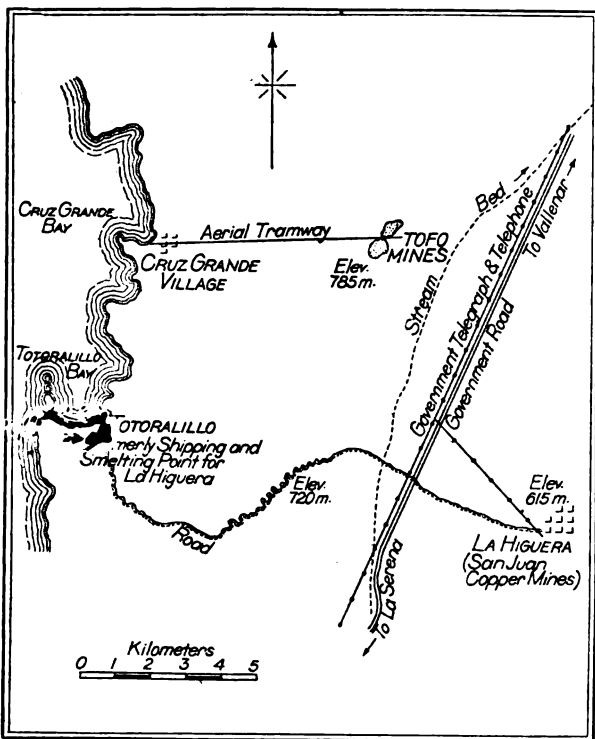
The year's shipments to Philadelphia were six cargoes, aggregating 42,000 tons, and to Europe three cargoes aggregating 21,000 tons, making a total of 63,000 tons. The ore consigned to Europe was to fill some contracts entered into by the French company. Three of the cargoes consigned to the United States came through the Panama Canal, the Oldfield Grange being the first to use the waterway for the purpose of bringing iron ore to the United States.

A typical cargo analysis (natural) of the ore is as follows, the cargo selected being that of the steamship Twickenham:

Moisture	0.10 per cent.
Iron	67.60 per cent.
Phosphorus	0.043 per cent.
Silica	2.21 per cent.
Copper	0.009 per cent.

It is now hoped to ship 200,000 tons in 1915, and to gradually increase this amount until the permanent installation is completed, when a production of 1,500,000 or 2,000,000 tons annually is expected.

A very important feature of the year was the development of a water supply. In 1913 water rights were acquired of the San Juan group of copper mines at La Higuera, and an abundant source of water has been developed. From old records it is expected that ultimately there will be available about 300,000 gal. per day. An electric pump has been installed, a pipe line laid to Tofo, concrete storage tanks erected, and the water is now in use. It has been found to be of a satisfactory character, though containing a rather high



Map Showing Location of Tofo Iron Mines and Cruz Grande Bay Where Docks Will Be Built

Bethlehem Steel Company, through its subsidiary, the Bethlehem-Chile Iron Mines Company, took over the property in 1913. Hubert Merryweather, formerly with the Juragua Iron Mines Company, a Cuban operation also owned by the Bethlehem Steel Company, is vice-president and general manager.

The surroundings of Tofo are shown on the accompanying map. A general description of the mines was published in *The Iron Age* of May 11, 1914. Operations have proceeded steadily at these mines during the year, the handicap due to the general disturbance caused by the European war being to a great extent neutralized by the abundance of labor now available in Chile. Ordinarily the labor question there is a serious one, but due to the closing of many nitrate operations, labor in all parts of Chile is now very plentiful.

percentage of calcium sulphate. A water treatment plant will shortly be installed to insure a quality for boilers and drinking purposes. It was found that the water that had stood in the San Juan workings for years contained practically no copper.

DOCK AND RAILROAD CONSTRUCTION

A contract has been let to the Snare & Triest Company, New York, for installing a basin dock in the bay of Cruz Grande. The basin will be excavated approximately 40 ft. deep, 200 ft. wide and 900 ft. long. It is in the form of a slip, where the boats can enter for the loading of iron ore. At one side will be erected a steel dock 340 ft. long. This will have pockets holding 30,000 tons of iron ore, and loading will be through chutes by gravity, permitting the loading of a boat in a very short time. The dock will be similar in construction to many of the ore docks in service on the Great Lakes. The railroad tracks on top of the dock are at an elevation of 123 ft. above low tidewater, and the railroad running from the mines will approach this dock from a higher elevation, and will not require any up-grade hauling of the ore.

A contract has been made with Slaughter & Ross, of Chile, for the construction of a railroad which will transport the ore from the mine to the dock. The main line will be about 15 miles long, of which 13 miles will be of a uniform 3 per cent. grade, the remaining 2 miles varying from level track to a 2 per cent. grade. A 3 per cent. grade was considered the maximum grade that should be used, in view of the heavy trains that will be operated. The mine has an elevation of about 2300 ft. above sea level, and is on a direct line about 4 miles from the dock at the Bay of Cruz Grande. It is necessary to make a railroad of the above length in order not to get a grade of over 3 per cent. The railroad will be standard gauge, 4 ft. 8½ in., with 100-lb. rails, tie plates, oak ties, rock ballast, etc. It will be single track, and have four passing sidings, each 1050 ft. in length. The country through which it is built is rough, mountainous, and principally rock. Approximately 50 per cent. of the road will consist of curves, the sharpest being about 350 ft. in radius. There will be no tunnels or bridges, but a steel double track trestle will be built for an approach to the dock.

ELECTRIC PLANT FOR THE RAILROAD

The railroad will be electrically operated, having a catenary overhead trolley system which will furnish direct current at 2400 volts to 110-ton electric locomotives. The total weight of the locomotives will be on the drivers. The locomotives will have a continuous tractive effort of about 37,000 lb. at 11 miles per hour, which will permit of hauling a train of 21 ore cars of 420 tons total weight up the 3 per cent. grade in continuous service. The most interesting feature of the electric locomotives is the regeneration of power when they are descending the grade with loaded trains. The power thus generated will be sent back into the lines to assist in hauling the empty cars up the 3 per cent. grade. This regeneration also reduces the duties on the air brake system in retarding the descending trains.

At the Bay of Cruz Grande, a modern steam turbine electric power plant will be built. The General Electric Company, Schenectady, N. Y., has the contract for the installation of the apparatus for this plant, as well as the electrification of the railroad. There will be two steam turbines, each of 3500 kw. capacity, which will generate power at 2300 volts, 3-phase, 60-cycles alternating current. The auxiliaries of the steam turbines will be motor driven—circulating water pumps, vacuum pumps, hot well pumps, and boiler feed pumps. The boiler equipment will consist of four boilers of 440 hp. each. They will generate steam at 200 lb. pressure and 100 deg. F. superheat. Oil will be used for fuel, although the boilers will be constructed so that coal can be used if desirable. A 300-kw., 600-volt, 60-cycle, 3-phase alternating current turbine will be used to provide power for the station auxiliaries, and to supply power for the load at night, which will be principally lighting and of small capacity. Power will be transmitted to the mine from the power house by a 22,000-volt transmission system, which will consist of

two duplicate transmission lines on the same poles. Two banks of transformers, consisting of three single-phase transformers per bank, will be used in the power house and also at the mines for changing the voltage from 2300 to 22,000. Each bank of transformers will be connected in delta on the primary and secondary windings; each will have a capacity of 2000 kva. Power will be furnished the railroad by two motor generator sets located in the power house. Each set consists of a 1400 kva., 2300-volt synchronous motor, direct connected to two 500-kw., 1200-volt d.c. generators connected in series, so as to give 2400 volts d.c. with a capacity of 1000 kw. normal load.

ELECTRICITY FOR SHOPS AND MINES

The machinery in the machine and blacksmith shops will be motor operated. The large ore crushers at the mines will be driven by electric motors. The crushing plant will consist of a large 5 x 7-ft. jaw crusher, working in conjunction with two No. 9 gyratory crushers. The drills for mining purposes will be electrically operated.

On account of the comparatively high cost of fuel in Chile it is more economical to produce power in the main central station, and to use electrically operated apparatus wherever possible, instead of having apparatus operated by steam from small isolated boiler plants which have a poor fuel economy. For this reason the mining and transporting of the ore will be done by electrical apparatus wherever it is possible.

German Iron and Metal Trades

The following data from European journals cover various phases of war conditions in German industries:

Steel works in Upper Silesia are operating at about 60 per cent. of capacity. Little demand for bars and plates is reported, but light sheets are brisker. Makers of tubes are busier, though there is keen competition there from Westphalian plants. The pig-iron production in Upper Silesia in October was 60,736 metric tons, an increase of 11,414 tons over September, and the total output to November 1, 1914, was 737,254 tons, or 97,275 less than for the same period last year.

New construction reported: The Thyssen Steel Works are erecting a new rail mill at Hagendingen. The Rombach Works are completing their eighth blast furnace and are about to extend their rolling mills. The Aumetz-Friede Works at Kneutingen plan the erection of a cement plant, while the De Wendel Works are said to be building a new steel plant at Hayingen. A new plant is contemplated by the Dillingen Iron & Steel Works.

The Wurtemberg group of the Association of Iron Foundries has raised the price of castings 10s. (\$2.43) per ton.

At the last meeting of the Pig Iron Syndicate, November 23, it was decided to continue present quotations for the first quarter of 1915 with the exception of hematite, which is raised 10s. (\$2.43) per ton, because of the advance in hematite ores. Two or three days later it was announced unofficially that it had been decided to again introduce a bounty of 5s. 6d. (\$1.34) per ton on pig iron used in export manufacture. The output in November was expected to reach that of the two previous months.

An advance of about 70 per cent. in the prices of old metals has taken place and maximum selling prices are proposed by the Government for these as well as for new metals, including tin.

As a result of the dissolution of the International Spelter Syndicate, it is contended by certain members that the German Association is to be regarded as dissolved. Other members contend that contracts are not rendered void by the war but merely suspended. The matter may be contested at law. Efforts are being made to reorganize the German Spelter Syndicate on a different basis.

The Austrian Steel Syndicate's domestic sales in October decreased 8641 metric tons or 23 per cent., compared with those of October, 1913.