

Shops of Honolulu Iron Works Photo by Williams, Honolulu

2000 acres, which is about equally divided between plant and ratoon canes of Rose Bamboo and Lahaina varieties.

As to the time of canes maturing it is from fifteen to eighteen months, while the character and depth of soil are from good to fair. In the plowing of the soil one set of Fowler's English plows is made use of, while the elevation that cane is planted is from practically sea level up to 150 feet. Water for irrigation purposes and mill use is obtained from springs in the adjacent mountains and also from a lagoon, which is pumped up, the daily supply in twenty-four hours, averaging about 3,000,000 gallons. The labor necessary on the plantation is about 250 hands, one-third of the work being performed by day labor and the remaining two-thirds by contracting gangs or company men.

To transport the cane to the mill and to expedite the moving of men and material there is about ten miles of main and portable tracks, the rolling stock of which consists of seventy cane cars with average capacity of four tons, ten closed cars for conveying sacked sugar to the shipping point and one engine.

In the cultivation of the soil the company expends from \$10,000 to \$12,000 every year for fertilizers. The average yield of all plant canes in a favorable season is five tons of sugar to the acre, or one ton to eight tons of cane, while the ratoon canes not receiving any irrigation average two tons of sugar to the acre.

The machinery adopted for the manufacture of sugar consists of two three-roller and one two-roller mills, 26 x 54, made in Glasgow; an open clarification system, two vacuum pans, triple effect, open settlers, three filter presses, six 36-inch centrifugals driven by separate power, etc. All three mills are driven by separate engines, having combined 150 horsepower. The mill is operated ten hours a day and turns out an average of twenty tons of raw sugar in that period, there being three grades manufactured and known as A, B and C. The gross weight of the sacks is 125 pounds each.

The annual output of the mill is from 3000 to 3500 tons, which is conveyed to Honolulu for shipment by the steamer J. A. Cummins, owned by the plantation company. George E. Chalmers is the manager of the Waimanalo Sugar Company, and has been connected with the sugar industry of the islands for eighteen years, while A. Irvine is the accountant at plantation.

Following is the list of officers of the company:

- W. G. Irwin, President.
- W. L. Hopper, Vice President.
- W. M. Giffard, Treasurer.
- H. Whitney, Secretary.

Honolulu Iron Works.

The Honolulu Iron Works was established in 1853, and since then has been in uninterrupted operation, with a gradually increasing capacity. It is now a stock company, having been incorporated about thirty years ago, under the Hawaiian laws. The stock of the Honolulu Iron Works Company is owned by a number of prominent business men, sugar planters and steamship owners in the Hawaiian Islands.

In 1900 the old works were discontinued, and new and extensive shops were built on the south side of the harbor (see Plate No. 1). The new site covers six and one-half acres, and is located with the United States Government reservation on two sides, facing the harbor front. All of the buildings are made entirely fire-proof, of steel structural work and bricks, and are airy and modern in every respect. In these buildings are installed the most modern and efficient machinery and machine tools that can be obtained in the United States, as will be specified later.

The scope of the work executed by the Honolulu Iron Works Company extends from the repairing of all kinds of machinery and iron ship-work to the building of complete sugar houses of the largest description. They are now finishing the last two of five such factories. The Honolulu Iron Works Company has also executed repairs to nearly all the United States war vessels and transports which have come to Honolulu, and is almost always engaged in such work, for which special facilities are on hand. They are also at present engaged in building a small iron steamer, for which the material has been imported. It will be about 100 feet long, and the company hopes in time to be able to take up this branch of manufacture to a greater extent. There have also been lately completed in their works two 3,000,000-gallon pumping engines, and more of this class of work is expected.

The skilled mechanics employed are pro-

cured mostly from the United States and the unskilled laborers are almost exclusively native Hawaiians, no Asiatic labor of any kind being used. The number of men employed varies greatly according to the season and requirements. At times, as many as 600 mechanics have been employed, but from 450 to 550 have been the average number of men at work during the last three or four years.

DESCRIPTION OF SHOPS.

Machine Shop.—Referring to Plate No. 2, the machine shop is 90 feet wide and 300 feet long, and in it are installed the following tools, viz:

- 1 57" double carriage Dettrick & Harvey lathe.
- 18 lathes from 12" to 60" swing.
- 1 Jones & Lamson turret lathe.
- 1 open-side planer, 16 feet travel.
- 5 shapers.
- 2 horizontal boring mills.
- 2 vertical boring mills, 8 feet and 16 feet swing.
- 3 slotters, 12", 20" and 24".
- 1 portable slotter for key-ways.
- 4 planers, 3 feet, 6 feet and 10 feet.
- 2 milling machines.
- 6 drill presses.
- 4 portable drills.
- 1 air drill.
- 2 radial drills, 6 feet and 8 feet.
- 1 Newton cold saw.
- 2 pipe-threading machines, up to 8" pipe.
- 5 bolt cutters, up to 6" in diameter.
- 2 hydraulic presses, 300 tons and 50 tons.

The machine shops are served by:

- 1 15-ton electric traveling crane.
- 1 10-ton electric traveling crane.
- 1 8-ton electric traveling crane.
- 1 15-ton hand crane.
- 5 air hoist jib cranes.

There is also a well-equipped tool-room, with universal milling machines, three lathes, shaper, drill press, emery wheels, etc., etc.

Foundry.—This building is 88 feet wide and 265 feet long and contains the following machinery, viz:

- 1 cupola, capacity 12 tons per hour.
 - 1 cupola, capacity 8 tons per hour.
 - 3 core ovens, 16 feet by 18 feet by 22 feet.
 - 1 brass foundry with 3 pot furnaces.
 - 1 pneumatic elevator for cupola.
- Served by:
- 1 15-ton electric traveling crane.
 - Overhead hand crane with air hoist.
 - Cleaning shed, tumbler, emery wheel, etc.
 - Clay mill and sand mixer, etc.
- The necessary power is supplied by a 5-horsepower Westinghouse motor.

Boiler Shop.—This building is 85 feet wide and 330 feet long, including a pipe shop

which is 60 feet wide and 150 feet long. In this shop are installed the following tools, viz:

- 50-horsepower Westinghouse motor.
- 1 10-ton electric traveling crane.
- 2 overhead hydraulic cranes.
- 4 shears, capacity 1" plate down.
- 8 punches, capacity 4" hole in 1/2" plate down.
- 1 angle iron shears, 1" by 5" by 5" down.
- 3 sets horizontal rolls.
- 1 set vertical rolls.
- 1 plate planer.
- 1 radial and 2 drill presses.
- 2 horizontal punches, 1 3-16" hole in 1/2" plate.
- 1 100-ton hydraulic riveter, 9 feet gap.
- 4 50-ton hydraulic riveters, 5 1/2 feet gap.
- Pneumatic caulking plant.
- Dipping tank for coating pipe.

Pattern Shop and Storage for Patterns.—This is a two-story building, 60 feet wide by 200 feet long. The upper floor in the half of the building is arranged for a pattern shop, and the lower floor for a carpenter shop. The other half of the building is entirely used for the storage of patterns. This building is built of brick and iron and is practically fire-proof.

In the pattern shop and carpenter shop are the following tools, viz:

- 30-horsepower Westinghouse motor.
- 1 large and 3 small turning lathes.
- 2 band saws.
- 1 circular saw.
- 1 combination saw.
- 1 planer.
- 1 jointer.
- Grindstone, etc.

Smith Shop.—This building is 50 feet wide

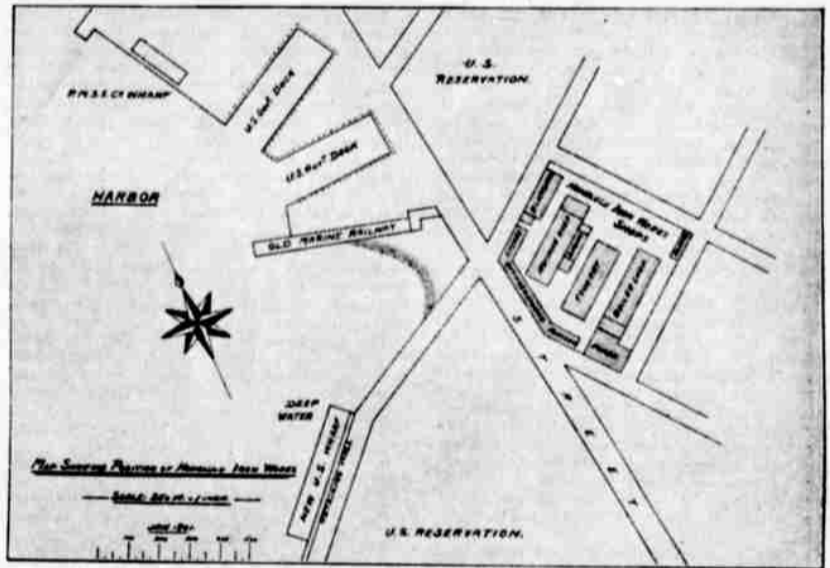
two Cahall vertical water-tube boilers and one horizontal combination fire and tubular boiler, which furnish the necessary steam for the whole plant.

Store Building.—The store building is 38 feet wide and 322 feet long, and contains a large stock of all kinds of iron pipes, plates, boiler tubes, copper material, etc., used in manufacture, and a large stock of heavy shafting is always kept on hand, up to 12" and 16" in diameter.

Drawing Office.—The drawing office is large and roomy, and this department gives employment at present to about seven mechanical draughtsmen.

The general office for the works is situated in the front building. It is large and well equipped, giving ample accommodation and facilities to the clerical staff employed in connection with the works.

The second main division of the Honolulu Iron Works is the Store and Merchandise Department. This is located on the northern side of the harbor, at the place where the old warehouses were formerly in operation. These warehouses cover about two acres and contain a large assortment of iron pipes, tubes, packing, oil, fittings, brass and iron valves, etc., of all descriptions, and a full equipment of plumbing goods, also a full stock of engineers' general supplies. There is also a large variety of small engines, from two to twenty horsepower, small boilers, hoisting engines, gasoline engines, machine tools, such as lathes, drill presses, shapers, planing machines, etc. This part of the company's business is a very important one, as it makes it possible for the plantations and for vessels calling at Honolulu to get supplies of almost everything they might require, including blacksmith's coal and coke.



Map Showing Position of Honolulu Iron Works in Relation to Government Docks [PHOTO BY WILLIAMS, HONOLULU]

by 110 feet long, and is equipped as follows, viz:

- Arranged for 11 fires.
- 1 bolt machine.
- 3 steam hammers, 8, 5 and 1 1/2 tons.
- 5 hand cranes.

Coppersmith Shop.—This building is 25 feet by 50 feet, and is fully supplied with the usual tools for making copper pipes and doing copper work in general.

Engine and Dynamo Room.—This building is 35 feet by 120 feet, and in it is installed one 350-horsepower Compound Corliss Condensing Engine and one generator.

The power for the entire works emanates from this building, there being no steam engine located anywhere else.

Boiler House.—In the boiler house are

A new, commodious and modernly equipped office building is now in course of construction, in connection with the stores, and there is a clerical staff of about fourteen at present employed in these departments.

The views of the general plans of the buildings, as well as the interior of these vast shops will be found interesting.

Following are the officers of the above important industry:

- F. M. Swanzo, President.
- J. B. Atherton, Vice President.
- T. Clive Davies, Treasurer.
- W. H. Baird, Secretary.
- T. R. Keyworth, Auditor.
- C. Hedeman, Manager.
- J. Dyer, Superintendent.
- J. A. Kennedy, Chief Accountant.



Interior View Machine Shops, Honolulu Iron Works, Showing Three Nine-Roller Mills in Process of Erection [PHOTO BY WILLIAMS, HONOLULU]