

St. Louis. The steel structural work of the mill, including the self supporting smoke-stack, and other buildings was erected by Milliken Bros. of New York, the mill buildings being so arranged that duplicates of the whole plant can be installed when deemed necessary.

The mill has a capacity for turning out from 125 to 150 tons of raw sugar in a day of 24 hours, while the hydraulic pressure on mill crusher is 1200 tons. Mill No. 1, 390 tons; Mill No. 2, 400 tons, and Mill No. 3, 410 tons.

The principal sugar making appliances consist of the Deming system of clarification, Lillie quadruple effects, 3 vacuum pans, capacity 25 tons each; 16 crystallizers and 8 filter presses from the Kilby Manufacturing Co. of Cleveland, O.; 18 water driven centrifugals from the American Tool & Machine Co. of Boston, and much other modern sugar machinery.

Power to drive the machinery is generated by a set of Babcock & Wilcox water tube boilers of 1600 h. p., the steam from which is transmitted to a St. Louis Corliss engine of 450 h. p. The residue from the bulk of cane trash is used for fuel, and is conveyed direct to the furnaces by the aid of an automatic trash carrier and stokers supplied by the Link Belt Machinery Co. of Chicago. In connection with the steam outfit the Green Economizer has been introduced. The mill extraction of the sucrose content of the cane product with maceration is from 93 to 94 per cent, while the loss in the mud from the filter presses is about 1 per cent of the total sucrose. Water for the mill and sugar boiling house is obtained from artesian wells in the mill, sunk to a depth of 320 feet. The manufacture of the sugar is under complete chemical control, there being maintained a chemist's department, where numerous daily tests are made. The first crop of cane was ground in the mill during the season of 1900. In order to expedite the handling of the sacked sugar from the mill, the tracks of the O. R. & L. Co.'s railway system are laid directly into the sugar room and conveyed without additional handling to Honolulu for shipment.

In the conduct of the property the company operates its own stores as a matter of convenience to its army of employees, and carries a large stock.

The foregoing report sets forth the main points regarding the present status of the plantation, of which William W. Goodale is the general manager, who for twenty-three years has been identified with the sugar industry of Hawaii. For thirteen years he managed the Onomea properties on Hawaii, and for the past three years has filled that position on the Waialua.

Officers of the Waialua Agricultural Company, Ltd., 1900-1901, are as follows: President, J. B. Atherton; Vice-President, C. M. Cooke; Secretary, E. D. Tenney; Treasurer, W. A. Bowen; Auditor, H. Waterhouse; Manager, Wm. W. Goodale. Castle & Cooke, Ltd., of Honolulu, are agents for the above plantation.

Oahu Sugar Company.

The wonderful success of the Ewa and Honolulu Plantations on the Island of Oahu is repeated in the estates of the Oahu Sugar Company, more particularly as to soils, methods of irrigation and the sugar yield per acre of cane. The lands in question lie on the lower slopes of the Waianae and Koolau mountains, extending from sea level up to 650 feet above, and in almost the entire region the soil, composed of decomposed volcanic rock, is generally deep and contains much iron.

The early history of these lands prior to being utilized for the growing of sugar cane is identical with that of adjoining plantations, they being devoted at one time to ranges for cattle. The company was duly incorporated in 1897, and it holds a total area of 13,000 acres, mostly leased lands

from the O. R. & L. Co., II Estate and the Robinson Estate.

The entire area is considered well adapted for the successful growth of sugar cane, and at the present time there is approximately 6500 acres under cultivation and in various stages of growth, the Lahaina variety being planted exclusively.

The area under cultivation is about one-half plant cane and one-half long ratoons.

The greatest elevation that cane is planted at the present time is 550 feet above sea level. The operation of plowing is performed by using three sets of Fowler's English plows, and turning the soil over to an average depth of from fifteen to eighteen inches. The system of cultivation is identical with that of the Ewa, Waialua and Honolulu plantations, which consists of irrigation and fertilization, and using about 800 pounds of Hackfeld high-grade fertilizers to the acre. The cane matures in from sixteen to twenty months, and the average return of sugar to the acre of plant cane is from ten to eleven tons, while from the long ratoons the returns will average ten tons to the acre. The sugar yield for 1901 from 2300 acres was 21,500 tons, there being an excess of 1500 tons over and beyond the estimate made by the manager in his report for the year 1900. The estimated crop for 1902, to be derived from 3100 acres, which includes 400 acres of short ratoons, is 27,000 tons, while the crop of 1903 will come also from 3100 acres, the yield being estimated as the same as the 1902 crop. These estimates are considered very conservative.

The method of transporting cane from field to mill is over thirty-two miles of main railroad connected with which there are ten miles of portable or field track, the rolling stock consisting of from 450 to 500 cane cars, average capacity five tons, and four Baldwin engines.

The necessity for the above length of main trackage can be more fully understood when it is known that the plantation lands

extend for a length of twelve miles with an average width of eight miles.

As the average annual rainfall is only from eighteen to twenty inches, no dependence is placed upon moisture from that source, but from a system of artesian wells and a limited amount of tunnel work in the mountains. The company has constructed a system of reservoirs having a total storage capacity of 600,000,000 gallons, there being thirty-two in all, twenty-nine of which are completed and the remainder in course of completion.

The main object of this extensive reservoir system is for the conservation of the storm waters emanating at higher altitudes in the mountains which would otherwise largely flow to the sea.

At the present time there are fifty-five artesian wells upon the plantation, and in order to utilize this supply of water for the purposes of irrigation a number of extensive pumping plants have been erected in several gulches, from whence the water is lifted and conveyed by gravitation to point of use. There are six pumping stations in all and equipped in the following manner:

Waialua Gulch Station—Reidler duplex, triple expansion, quadruple acting pump raises 12,000,000 gallons of water in a single lift 750 feet. This is said to be the most powerful pump for its size in the Hawaiian Islands, or, in fact, in the world.

No. 1 Station, Waipahu Gulch—Reidler triple expansion, triple acting, 12,000,000-gallon capacity, lift 350 feet.

No. 2 Station, Waipahu Gulch—This pumping system is identical with No. 1.

No. 3 Station—Reidler triple expansion, double-acting, 8,000,000-gallon pump, lift 200 feet.

No. 4 Station—Worthington high duty 8,000,000-gallon pump, 550-foot lift.

Honolulu—Shaft 280 feet in depth, two Reidler pumps, 6,000,000 gallons each, arranged tandem, 650-foot lift.

At the mill is a 5,000,000-gallon plant for pumping for the II Estate peninsula be-

tween crops, and during the operation of the mill the water supply is used for the vacuum pans, pumps and general use about the mill.

In connection with the irrigation system there has been installed about 40,000 feet of from 24 to 30-inch steel riveted pipe, while the length of main ditches is some sixty miles, connecting or leading water from the mountains, pumping stations, etc., and uniting the entire reservoir system.

On Ford's Island, which is a part of the holdings of the Oahu Sugar Company, and situated in a part of Pearl Harbor, are 320 acres of Lahaina cane which is irrigated by gravity from six flowing wells having a joint capacity of 5,000,000 gallons and containing about twenty grains of salt to an imperial gallon. As the highest average elevation is only from seventeen to eighteen feet, the problem of irrigation by gravity becomes a simple proposition.

From the above 320 acres the company expects beyond a doubt that the yield will be 4000 tons of cane, or an average of 12 1/2 tons of sugar to the acre, or 100 tons of cane to the same area.

In some fields on the Oahu Plantation, according to the statement of the manager, the yield has been as high as 110 tons of cane to the acre, and it is fully expected that, as soon as everything in connection with the pumping system is installed and working to full capacity, the average yield of sugar should be twelve tons to the acre.

At the present time there are about 1500 skilled and unskilled laborers upon the plantation, the average pay of skilled labor being \$85 per month, while the average pay for unskilled labor, which includes field hands, is \$20 per month.

In the working and development of the plantation about two-thirds of the employees are working under the co-operative or profit-sharing system, the remaining one-third being day-laborers.

The co-operative contracts entered into with the different laborers is the same as adopted by all the plantations on the Island of Oahu. After the cane is harvested, and all advances made during the period of cultivation and maturing of the cane have been deducted, the individual planters receive sums ranging from \$170 to \$330 clear. The laborer, as on other plantations, is given house room, water, fuel, hospital and medical attendance free.

For ordinary field work, such as the plowing of certain fields and the trenching, furrowing and checking up of land prior to planting, some 175 mules are found necessary.

The general headquarters and mill are situated at Waipahu, where has been erected one of the most complete mills on the Island planned for a capacity of 150 tons of raw sugar, but in reality 190 tons has been the output, under very favorable conditions, in twenty-four hours.

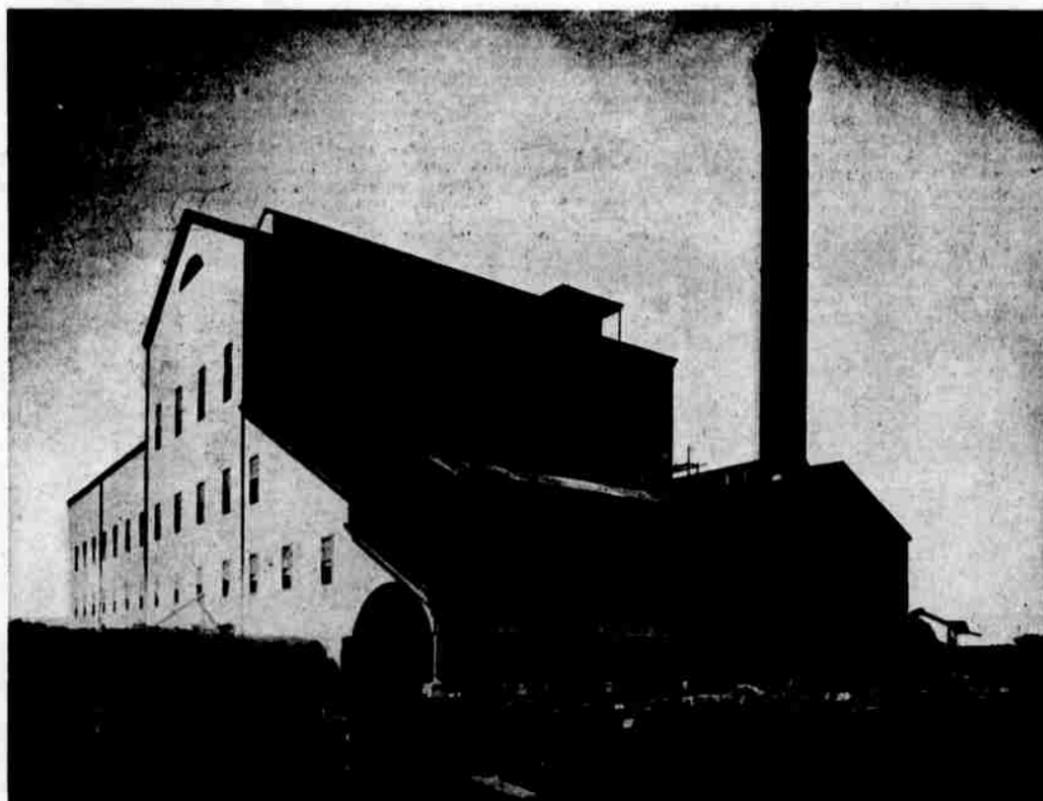
The buildings are of skeleton steel structural work with corrugated galvanized iron sides and roofs and iron floors, and were the first contract taken and completed on the Island of Oahu by the house of Milliken Brothers of New York.

Within this building have been installed complete mechanical appliances, the special feature for the manufacturing of sugar being crystallization in motion, securing, it is claimed, the largest possible percentage of sugar from the molasses in the shortest possible period.

The machinery so installed consists primarily of a Deming super-heating system, settling tanks, eight patent sand filters taking up a very limited space, twelve Kroogs large-size filter presses, sixteen water-driven Watson & Laidlaw centrifugals, Deming system of clarification, one 55 and one 30-ton vacuum pans, connected with which are the vacuum pumps, of German make.



Three of the Power Plants on Honolulu Plantation, two in Foreground Pumping Plants, the other Sugar Factory; representing Total Investment of \$1,500,000



EXTERIOR VIEW NINE-ROLLER MILL, OAHU SUGAR COMPANY