SUGAR

A Popular Treatise

By

ALLEN RAY KAHN

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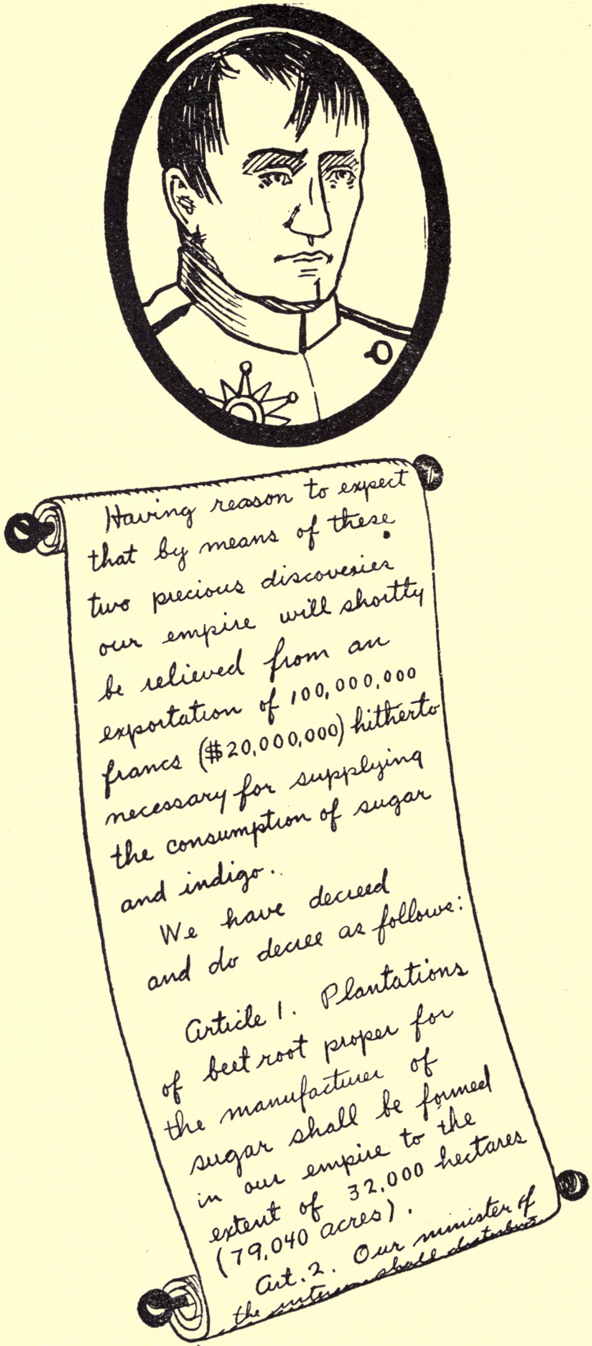

Having reason to expect
that by means of these
two precious discoveries
our empire will shortly
be relieved from an
exportation of 100,000,000
francs ($20,000,000) hitherto
necessary for supplying
the consumption of sugar
and indigo..
We have decreed
and do decree as follows:
Article 1. Plantations
of beet root proper for
the manufacture of
sugar shall be formed
in our empire to the
extent of 32,000 hectares
(79,040 acres).
Art. 2. Our minister of

Preface

The third edition of this book having been practically exhausted and the demand for same appearing to still exist, this fourth edition is now presented to the public. Revisions have been made in line with the original purpose of the book, viz., to explain sugar and sugar manufacture in such simple and brief terms as to enable anyone interested to secure a fairly clear idea of the subject at one reading.

Acknowledgment is made to the following works and authors:

"Beet Sugar Manufacturing and Refining," Lewis S. Ware.

"Beet Sugar Making and Its Chemical Control," Y. Nikaido.

"Zuker Fabrication," Claassen.

"Sugar and the Sugar Cane," Noel Deerr.

"Concerning Sugar," Truman G. Palmer.

And the sugar publications, "Louisiana Planter," New Orleans; "Sugar," New York City; "Facts About Sugar," New York City, and "International Sugar," London, England.

To those seeking a more complete knowledge of the subject, these books are recommended. Same can be purchased through any of above named publications.

Thanks are also due to Dr. Leroy S. Weatherby, of the University of Southern California, for compilation of diagrams of extraction and refining; to Mr. J. J. Armstrong, well known sugar technologist, for valued suggestions, and to the various sugar companies for lists of their executives.

ALLEN RAY KAHN.

Los Angeles, California,
February 26, 1921.

Every man on every station in a sugar factory ought to know why he does the work which he performs. This should follow all the way through from the fireman at the boilers until the sugar is shipped away from the factory.

Louisiana Planter.

I

Sugar Consumption and Production

The past hundred years has seen sugar develop from a luxury of the rich to a common necessity in those countries most advanced.

In the United States, the average yearly per capita consumption amounts to approximately ninety pounds. Only two countries exceed this, one being Canada, the other Australia, which would appear to indicate that the prosperity of the average individual is greater in both these countries than in the United States. England consumes almost as much sugar as the United States per capita, but considerable allowance must be made for the amount of sugar used in jams and preserves annually exported by that country. The per capita consumption in the leading sugar consuming countries of the world before the war was as follows:

Great Britain—93 pounds.
United States—89 pounds.
Germany—45 pounds.
France—43 pounds.
Netherlands—41 pounds.
Belgium—36 pounds.
Austria—29 pounds.
Russia—25 pounds.
India—21 pounds.

There was consumed throughout the world in the year before the war approximately 20,000,000 tons of sugar. Of this amount, a little over one-half was made from sugar beets.

Of the approximately four million tons of sugar annually consumed in the United States, the refineries of the country still handle about two and three-quarter million tons. Louisiana turns out about one-quarter million tons of direct consumption sugar, and the beet factories of the United States about a million.

The value of sugar consumed in the United States is in the neighborhood of $700,000,000 yearly.

A little over 20 per cent of the world's production of sugar is consumed in the United States, but in the ratio of its production to consumption, the United States has been one of the most backward countries. Including all our island possessions, such as Porto Rico, the Hawaiian Islands and the Philippines, the United States manufactures only about one-half of what it consumes. Contrast this with the steel, flour, or cotton business. Moreover, this is a sad reflection upon our country's boasted efficiency, since unlike most other business concerns, the sugar factory, except on very rare occasions, experiences little, if any, difficulty in disposing of its product.

II

The Carbo-Hydrate Sugar

Of all substances produced by nature and transformed by the art of man, none is more interesting than the Carbo-Hydrate sugar.

Nature produces the plant which collects carbonic acid gas, hydrogen and water from air and soil and converts same into food for future use such as production of seed or regrowth. Before the formation of seed or regrowth commences, however, the beet roots or cane stalks are removed to the factory where the transformation of this stored up food to table sugar takes place.

The highest sugar content is reached at the end of the first year and as the production of seed, which occurs during the second year is at the expense of the sugar stored the first year, it naturally follows that sugar is extracted at the factory at the end of first year's growth.

The beet or cane seed (the latter generally consisting of two joints of cane), is planted and after it has secured a firm hold in the ground, water consisting of hydrogen and oxygen, chemically combined, passes upward and the plant commences to grow above the surface with formation of leaves—the leaves, through their green coloring matter (chlorophyl), acted upon by sunlight, attract carbondioxide, which abounds in the air, combines it with other properties absorbed from soil through water and produces starch. This starch, in the cane or beet, is converted, by a process peculiar to sugar plants, into sucrose in which form it can be stored up in beet root or cane stalk for seed or regrowth, but as aforesaid roots or stalks are removed to factory before regrowth starts.

A PRIMITIVE SUGAR PLANT

III

Saccharum Officinarun

(Sugar Cane)

The sugar cane, a tall perennial grass-like plant was first grown, as far as can be determined, in India about 600 B. C. Cane sugar appears to have been first introduced as an article of commerce, in the seventh century A. D., by the Arabs. Columbus was the first to plant cane in the new world. From Santo Domingo, its culture early spread to Brazil, Peru, Argentine, Cuba, Porto Rico and other new world countries.

Cane was first planted in the United States in Louisiana, at a time when Louisiana was foreign territory, the year being 1673. Today in Louisiana, there are over 160 factories, where either sugar or cane syrup is manufactured. There are also a number of large sugar refineries in Louisiana. Other states in our Union in which cane is grown are Georgia, North Carolina, South Carolina, Arkansas, Alabama, Florida and Texas, but with the exception of Texas, which possesses two factories, none of these manufacture sugar unless Georgia with a refinery at Savannah be also excepted.

Most of the cane sugar consumed in the United States is obtained from Cuba, Porto Rico, and the Hawaiian Islands, being shipped to this country in the form of raw sugar and converted to the granulated sugar of the table by large refineries. The yield of cane per acre in the

United States is from 15 to 20 tons. The sugar per ton of cane is from 6½ to 9%. The yield of cane per acre in other parts of the world is 20 to 60 tons and the sugar per ton of cane is from 10 to 13%.

Cane grows, without replanting, from two to forty years depending upon zone in which it is grown. Second and subsequent crops grown from the same roots are called ratoons.

In Cuba the planters are referred to as colonos and the mills they send their cane to are called centrals. In Mexico, the factory is often called an Ingenio.

Some Sugar Trade Names

Glucose, a non-crystalizable sugar made from starch particularly from Indian corn, sorghum, etc., with only 40% of the sweetening power of beet or cane sugar. It is sold in form of a liquid.

Raw sugar is any grade of sugar from which the impurities have not been removed.

Muscovada is a dark, moist sugar, containing molasses and impurities made by boiling to crystals in open kettles from which it is run into hogsheads, the bottom of which are filled with small holes to allow bulk of molasses to drain off.

Panocha is a crude brown cake of sugar, made in Mexico from a non-crystalized thick juice poured into moulds to dry and harden.

Saccharin is not a sugar, but a coal tar product with over 300 times the sweetening power of sugar. One tablespoon full is sufficient to sweeten over 31 gallons of water. It has no food value, however, and the use of same is considered by many physicians to be injurious.

Saccharose is the general name of any crystalline sugar having the formula $C_{12}H_{22}O_{11}$, such as cane, beet and maple sugar.

IV

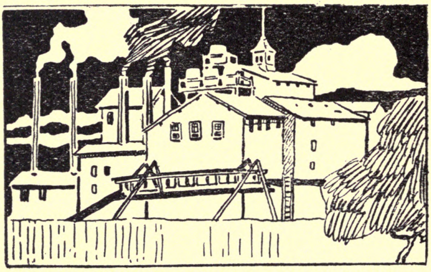
Beta Vulgaris

(The Sugar Beet)

In the year 1747 the great German chemist Margraf, after analyzation of numerous plants, predicted that beet roots of the same species as the common garden variety would ultimately become a great source of sugar. Based on Margraf's investigations, Achard succeeded in converting the carbo-hydrates (carbon, hydrogen and water chemically combined by nature) of the beet to a palatable product. This took place in 1797 and a few years later, factories were established in Germany and France, the industry receiving the especial attention and encouragement of the great Napoleon. At the beginning of the industry, beets averaged 6% sugar. The average today is 16% with an average yield of 260 pounds of refined sugar per short ton (2,000 lbs.) of beets. The yield of beets per acre in the United States is ten to twelve tons.

As recently as 1870 the first really complete beet-root sugar plant was erected in our country, this at Alvarado, California, where it is still in operation. Up to 1879 it remained a failure, when an American, by name Dyer, took hold and made it a financial success. The second successfully operated plant was erected by Claus Spreckels in 1888 at Watsonville, California. The third successful mill was built by the Oxnards in 1890 at Grand Island, Nebraska, and an uncle of the author was one of the first farmers to grow beets for that factory.

Beet sugar is now manufactured in the following states: California, Colorado, Idaho, Illinois, Iowa, Indiana, Kansas, Michigan, Minnesota, Montana, Nebraska, Nevada, Ohio, Utah, Washington, Wyoming and Wisconsin. In all about 100 factories. Prior to the war, there were over 1,200 beet sugar factories in operation throughout the world.



THE FIRST SUCCESSFUL BEET SUGAR FACTORY IN AMERICA.

V

The Difference Between Beet and Cane Sugars

The sucrose content of both beet and cane sugar is transformed at the factory into identically the same substance—sugar. Chemically pure sugar made from either beet or cane analyzes exactly the same. Dr. H. C. P. Geerligs, an international authority on sugar has this to say of the two:

"The largest constituent of the two sugars is the same, viz.: the sucrose, which is the identical chemical body both in cane and in beet sugar, the difference, if there be any, must be found in the very small amount of impurities in or around the crystals.

"Every cane juice contains glucose; sound beet juice, on the contrary, does not contain any glucose. This is the main difference between the two; all the other bodies as gums, mineral matter, etc., are found in both.

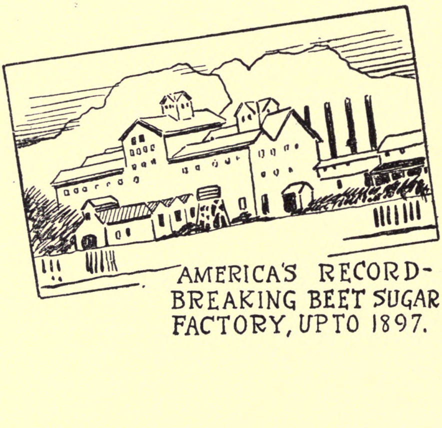
"In the very great majority of cases this small admixture of glucose is perfectly harmless; except in some cases for confectionery, glucose present will not cause any trouble.

"The very best cane sugar will always contain a very small amount of glucose, while granulated pure beet sugar is free from glucose."

The Agricultural Department of the University of California after tests with fruit canned with both beet and cane sugar found at the end of two years that out of 2,000 cans treated there were only six of the beet lot and only seven of the cane spoiled. Their report in part follows:

"Of the 2,000 cans which were thus treated only six cans from the beet sugar lot and seven from the cane sugar lot spoiled during the two years, and these were evidently due to imperfect sealing of the cans, thus showing the utter lack of foundation for the idea that fruits do not keep well when preserved with beet sugar.

"In the jelly trials apples and currants were used as the basis, equal quantities of juice and sugar being used, and the mixture boiled until of the right consistency to jell. The product in each case was as clear as it is possible for jelly to be, and not the slightest difficulty was experienced in the making of it."



AMERICA'S RECORD-BREAKING BEET SUGAR FACTORY, UPTO 1897.

VI

Sugar as an Energy Producer

Sugar produces energy and does its quickly. Its stimulating effect, differing from alcohol, is so natural that its moderate use is beneficial instead of, as in the case of alcohol, detrimental to the bodily system. Half an ounce of sugar will produce heat energy in the body equivalent to raising a kilogram of water 1 degree C. Sugar's attribute of sweetness renders it, especially in combination with other substances, very pleasing to the taste. It excites the salivary glands and digestive apparatus regardless of hunger, and can be eaten without taxing the stomach whilst in the performance of one's duties. Soldiers on the march, for instance, find chocolate candy a great boon.

Dr. Hall says of sugar: "It would be a strange contradiction in the nature of things if sugar and candy in moderation should be hurtful to the human body in any way, for sugar is a constituent of every article of food we can name; there is not a vegetable out of which it cannot be made, not a ripe fruit in our orchards which does not yield it in large proportions, and it is the main constituent of that 'milk' which is provided for the young of animals and men all over the world. Perhaps the child has never lived who did not love sweet things beyond all others; it is an instinct, a passion, not less universal than the love of water. A very little child can be hired to do for a bit of sugar what nothing else would. The reason for this is, that without sugar no civilized child could possibly live, it would freeze to death; it is the sugar in its food which keeps it warm, and warmth is the first necessity for a child."

VII

Popular Sugar Chemistry

(Terms Most Commonly Used)

Acid Juice: Juice that is liable to sour and invert.

Alkaline Juice: A juice that has been rendered neutral to acid by admixture of some alkaline substance, such as lime.

Degree Brix: Indicates the approximate amount of solid substance in a sugar solution, ascertained by immersing what is called a Brix Spindle (a glass tube containing a graduated scale and similar to a hydrometer) in such a solution.

Fructose or Levulose: A form of sugar produced by action of acids on sucrose during the latter's recovery from the beet or cane. One part of the so-called invert sugar produced by fermentation of beet or cane syrup before reaching its final state of purity for use on the table. Invert sugar is composed of two parts, one fructose, the other glucose; glucose plus fructose plus water (H_2O) form sucrose.

Granulated Sugar: A pure sugar which has been crystallized and centrifuged then run through a long horizontal revolving drum called a granulator, where it is dried by heat and screened to desired size of grains.

Invert Sugar: See Fructose.

Magma: A mixture of crystals of sugar, non-crystallized sugar, molasses and impurities. (See Massecuite.)

Massecuite: Product obtained in boiling or graining cane or beet sugar syrups from which final sugars are separated in the centrifugals.

Melada: Crude sugar mixed with molasses.

Polariscope: A beam of light when acted upon by certain optical devices in passing through a sugar solution will be deflected from a straight path to either the right or the left, direction of deflection depending upon the chemical composition of the solution. Light so acted upon is called polarized light. Sucrose will deflect the light to the right—fructose to the left. The degree of deflection, which is read off a graduated scale on the instrument used, indicates the percentage of sugar in a solution. The optical instrument used is called a polariscope.

Purity: The percentage of pure sugar to solid substance (either dry or in solution) contained in either juice, syrup, massecuite, molasses, cane or beets.

Sucrose: Sugars identical in composition with cane or beet sugar, having the formula $C_{12}H_{22}O_{11}$.

Sugar or Per Cent Sugar (See Polariscope): The percentage of sugar contained in either juice, syrup, massecuite, molasses, cane or beets.

Sugar Factors: Sugar is found by multiplying the purity by the Brix. and dividing the result by 100. Brix. is found by dividing the sugar by the purity and multiplying the result by 100. Coefficient of purity is found by multiplying the sugar by 100 and dividing by degrees Brix.

VIII

Cane Sugar Manufacture

The majority of cane sugar factories or centrals, as they are usually called in tropical countries, do not market their product themselves, but ship it to sugar refineries in the form of what is called raw sugar, a brown or yellow sugar, running from 94 to 98% pure. They, therefore, do not have as an elaborate system for purifying the juices in the early stages as American beet sugar factories, where the product is turned out between 99 and 100% pure, ready for the table.

The cane arriving from the fields goes first to the cane crusher (so-called), an arrangement of two horizontal iron or steel rolls with surface corrugations, passing between these rolls the cane is pre-crushed or flattened into a matte of pieces about six inches long, and delivered to the first cane mill, of which there are generally three running in tandem. A metallic carrier is placed between each mill to convey the cane from one mill to another.

The juice is extracted from the cane by squeezing it between the rolls of the cane mill. The cane mill consists of three heavy iron or steel horizontal rollers (similar in appearance to a cylinder printing press) usually about 32 inches in diameter by 78 inches long, driven by a steam engine through powerful spur and pinion gearing. The juice falls on to the bed plate of the mill and from there flows to mill juice tanks, from where it is pumped to juice scale tanks and limed therein. Liming consists of mixing about one-half to one pound of lime, in form of milk of lime, to one ton of juice.

The juice is not entirely extracted from the cane by the first set of rolls, but is sent to a second and a third set. On its way to each succeeding set, the juice is moistened to a certain degree with either water or diluted juice, which operation is technically known as maceration.

The small amount of lime used permits of a quick settling of impurities later on in the process. From scale tanks, juice flows to heaters, where temperature is raised to a little over 200 degrees F. From heaters, juice is pumped to settling tanks, where it is allowed to remain for about half an hour. The clear juice is then drawn off and sent to evaporators. The scum that rises to the surface together with settled mud is then filtered through presses, the filtered juice going to evaporators, the mud cake to fields where it is used as fertilizer or otherwise disposed of.

Evaporation: The juice is evaporated at low temperature—first in a number of multi-tubular vessels which run in a series of from three to five (called multiple effect evaporators), in which the vapors given off the juice in the first effect or body goes over to evaporate the juice in another body at a lower pressure. The second, third and fourth bodies operate in a partial vacuum, which permits evaporation at a much lower temperature than when under atmospheric pressure, decreasing the amount of fuel consumed considerably. The juice enters the evaporators with a water content of about 86% and leaves same with a water content of about

40%. The final evaporation is concluded in what are called vacuum or boiling pans.

In the vacuum or boiling pans, the sugar which enters same in solution is crystallized. When the masse content in the pan has reached the proper degree of crystallization, the pan is emptied and contents flow to what is known as a mixer, a long horizontal tank through which a paddle bearing shaft constantly revolves to prevent hardening of the masse. These mixers have a number of spouts below, through which the masse (massecuite) enters centrifugals or sugar separators. A description of centrifugals will be found in an article following, entitled "A Tour of a Complete Sugar Plant." From the centrifugals, the sugar is conveyed to weighing machines where it is automatically sacked and weighed, then transferred to car or warehouse.

Some factories, a number especially in Java, employ instead of crusher and cane rolls, practically the same system of diffusion and carbonation as is used in the beet sugar factory, but the vast majority of cane sugar factories, of course, use the modern cane mill for extracting juice.

The up-to-date cane sugar factory has one great advantage over the beet sugar factory, in that fuel costs practically nothing due to the fact that the stalk of the cane from which the juice is extracted, called bagasse, is used for furnishing the necessary heat and power for the various milling and evaporating operations. The bagasse goes directly from the rolls, in its moist state, to especially designed furnaces which furnaces are a product of American engineering effort and research.

It would be well to follow this article with "The Tour of a Complete Sugar Factory" start-ing with sub-heading "Evaporation" and reading through the sub-heading "Resolving the Sugar." Though the same is a description of beet sugar house work — the operations described under sub-headings mentioned differ but slightly from that of the cane sugar plant.

SUGAR FACTORY EQUIPPED THROGHOUT WITH AMERICAN MADE MACHINERY

IX

Sugar Refineries

With the exception of most of the cane sugar factories in Louisiana, also some of the cane sugar factories in Java, nearly all cane sugar produced is shipped, as stated in a previous article, to sugar refineries in the form of what is called raw sugar, a brown or yellow sugar, running from 94 to 98% pure.

Most of the refineries in the United States are located on the Atlantic Coast. The two exceptions are the California Hawaiian Company and the Western Sugar Refinery in San Francisco, California. These two receive most of their raw sugar from the Hawaiian Islands. The principal source of supply of the Atlantic Coast refineries are Cuba and Porto Rico, almost two and a half million tons coming from these islands alone yearly.

Of the total amount refined in this country, approximately 30% is handled by the American Sugar Refining Company, in their six different plants.

The other principal refineries are the National Sugar Refining Company, The Federal, Arbuckle Bros., Warner, Revere, McCahan, Savannah, Pennsylvania, Henderson, Godchaux and Colonial Sugar Refining companies.

The raw sugar upon arriving at the refinery is first washed then remelted, sent through bone char and other filters for purification, crystallized in vacuum pans, centrifuged, washed, dried, and granulated and packed for shipment in various size packages, boxes and barrels.

Most of the refineries manufacture their own barrels. For instance, the American Sugar Refining Company owns the Brooklyn Cooperage Company, New York, which has factories in Boston, New York Philadelphia and Chalmette, and owns in New York State 50,000 acres of timber land, with stumpage rights on 40,000 more acres. In Arkansas, it owns about 70,000 acres; in Missouri about 80,000 acres, and in other states owns and controls approximately 100,000 acres. It owns and operates seven stave and heading mills, and incidentally operates 135 miles of railroad in order to get its timber to the mills.

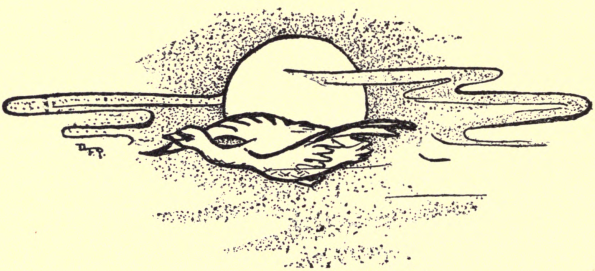
The machines used for forming the sugar into cubed and rectangular shapes and for packing same into paper boxes are marvels of ingenuity, as from the time sugar leaves the granulator until the time it is ready for shipment not a hand touches the sugar.

The public demand for packaged sugar and the great cost of the machinery is one of the reasons why the cane sugar factories themselves do not find it profitable to refine and market their product direct to the consuming public and therefore, use the refineries, with their elaborate equipment and selling organizations to act as intermediaries.

The fact that the refineries handle a million pounds and upward daily, enables them to sell the product at only a slight increase in cost over the raw sugar. In fact, the average central could not refine and market its product as cheaply as the refineries.

The refineries turn out many different grades and forms of refined sugar, including fine, standard, coarse and hard granulated sugars, powdered sugar, cube, and rectangular shape sugar, and special grades for use of candy makers.

The term refiner's margin refers to the difference between the cost of raw sugar, duty and freight paid and the wholesale price of refined granulated sugar. The American Sugar Refining Company states that it takes about 107 pounds of raw sugar to produce 100 pounds of refined sugar, the seven pounds being "lost in refining."



X

The Making of Sugar from Beets Briefly Described

The sliced beets are immersed in warm water, the sugar diffusing through the walls of the cells of the root into the water. This operation is carried out systematically in a series of tanks called a diffusion battery, arranged in a circle and connected together. The juice from one cell passes through the others continuously; the nearly exhausted slices receiving fresh water, which, as it goes from cell to cell, coming in contact with fresher and fresher cuttings, grows accordingly richer in sugar.

The exhausted slices, after being pressed, removing such water as is possible, or after being dried in special ovens, are used as cattle food.

After leaving the diffusion battery the juice is treated with lime, is heated, and is then acted upon by carbon dioxide (commonly known as carbonic acid gas). The object of liming is to neutralize and precipitate the organic acid present. The carbon dioxide removes the excess of lime; the precipitate of calcium carbonate which is formed carries down other organic impurities. As some of the impurities precipitated are soluble in any but alkaline solutions, the first treatment with carbon dioxide is stopped while there is still about 0.1% of caustic lime present.

After leaving the first set of carbonation tanks the mass is filtered and a second carbonation reduces the amount of free lime to about 0.03%. A second filtration follows the second carbonation, often affected in gravity presses which require much less pressure than the ordinary presses.

After further treatment and a third filtration the juice is evaporated at low temperature—first in a series of multi-tubular vessels which run in a series of four or five (called multiple-effect evaporators) in which the vapors from one effect or body go to evaporate the juice in another at a lower pressure; and then after a brief heating at atmospheric pressure, sulphuring and filtering through gravity filters, the evaporation is concluded in steam-heated vacuum pans. (This last evaporation process is termed boiling.)

In the boiling pans crystalization is effected and these crystals are separated from the uncrystallizable syrup in separating devices called centrifugals. From the centrifugals the white sugar, which is practically 100% pure, though still containing a percentage of moisture, is conveyed to the granulators, where it is sifted and dried, then to weighing machines, where it is sacked in 100-pound bags.

The molasses obtained is sold to distilleries for the manufacture of alcohol, or is subjected either to the Osmose or to the Steffens process of sugar recovery.

In the Osmose process the syrup is diffused into water through parchment paper, which allows the salts that hinder crystallization to pass through more rapidly than the sugar and other organic compounds present. After a sufficient treatment the syrup left is re-boiled.

In the Steffen's process, now largely used, the molasses is diluted to contain about 12% solids, then about as much powdered burned lime as there is sugar present is sifted into the solution, the temperature being kept below 18° Centigrade. This precipitates all the sugar into what is called a Tri-calcium saccharate, which is filtered off and used in place of lime in treating the raw beet juice.

XI

A Tour of a Complete Sugar Plant

This section is written with the thought in mind of avoiding, as far as possible, intricate technical description—to explain the process of sugar manufacture in such simple and brief terms as will enable anyone interested to secure a fairly clear idea of this subject.

After reading to Beet Bins, let the reader imagine that he has arrived at a sugar mill and is following the course of the beets throughout the factory, beginning at the point when the beets are stored awaiting their turn to start on their trip of transformation.

THE BEET ROOT

Beet Loading Stations: For receiving beets for shipment by rail, a weighing and carloading platform is generally erected alongside railroad tracks at a point most convenient for farmers of a particular section. In some districts where beet growing is extensive, beet sugar companies will each have their own loading station, in some cases, only a few feet apart. The most modern type of loading stations are those known as the "Ground Level," to distinguish them from the old type, which are built like bridges, necessitating wagons and teams ascending and descending an incline in order to dump the beets into freight cars. With the new type station, the farmer dumps his load into a hopper directly from the roadside. Beets slide from hopper into buckets attached to a wheel or endless belt. On the way from hopper to buckets, most of the adhering dirt is removed. Clean beets fall from the wheel into a scale hopper, the weight being read on recording beam below, which typewrites the weight on cards in triplicate. One of these cards is handed to the farmer. From scale hopper, clean beets fall directly into freight car. The best known of the modern types of beet dumps are the Weller, the Waverly and the SMC.

Beet Bins: Beets, arriving in wagon and carload lots, are dumped herein.

Flumes: At bottom of each bin is a concrete ditch or canal connecting with main flumes. As beets are required, they are pitched into these branches, through which a current of water flows, which conveys the beets to the mill.

Stone Catcher: In the harvesting of beets, many small stones are caught up and conveyed to the mill. These stones, if carried into slicers, break the knives and also seriously interfere with the operation of the slicer. The stone catcher is placed in beet flume to intercept the passage of these stones. It was invented by Messrs. Franklin and Daley. Mr. Franklin is superintendent of one of the Great Western Sugar factories, and Mr. Daley is District General Superintendent of the Holly Sugar Corporation.

Weed Catcher: The swinging paddles comb the weeds and trash out of channel as they try to pass. Paddles are made of sharply notched bar iron, and as they drag through flume, the notches fill up with the objectionable matter and upon ascending, a projecting end of paddle strikes against lateral bars at the top of device, loosening the trash.

Tare-Room: Here samples, as obtained from each load, are tested, and sugar per cent determined by the chemist, as the price of beets is based on the percentage of sugar content. Sample is weighed just as it comes from load, then beets are cleaned, and weighed again in same bag; the proportion that the difference bears to original weight of sample is figured as the per cent of tare for the entire load.

Beet Wheels: Main wheel is located near end of mill and flume. Beets drop into buckets attached to the inner rim and are elevated to floor level and conveyed through short flumes to scrolls.

Scrolls: These monster screws elevate the beets to "washers." Dirty water from flume going to sump to be pumped onto the land.

Beet Washer: The beet washer is a rectangular tank through which runs a paddle bearing shaft, thus beets are carried forward from one end of tank to other and agitated sufficiently to clean off dirt adhering. A "kicker" at end of shaft throws beets onto a set of rolls upon which a stream of water flows, providing an additional cleansing before entering cutters. From rolls beets drop into buckets attached to a long endless chain called a beet elevator which carries the beets to the top floor of factory.

Beet Root Separator: In the harvesting, transporting and washing of beets, many rootlets are broken off. These rootlets average well in sugar content. The boot root separator separates rootlets from the trash, delivering the rootlets direct to beet elevator, thence to cutters. The separator is placed between the beet washer and the beet elevator. Heretofore, the rootlets were mixed up with the trash and went to the sewer. The separator intercepts the passage of the rootlets and, as aforesaid, delivers them to the beet elevator. It is an invention of Mr. Joseph Sailer, General Engineer of the American Beet Sugar Company.

Scale: From top of elevator beets drop into a hopper, from whence they go to automatic scale set to weigh about 800 lbs. When scale hopper is filled to this amount main hopper automatically closes at bottom. From scales beets go to hopper serving beet slicers.

COSSETTES

Beet Slicers: Beets are sliced into long V-shaped slices or strings called "cossettes." Cutting them in this manner exposes the greatest amount of the cell structure of the beet to the action of the sugar-extracting medium, and, at the same time, permits circulation between the slices; thus hastening the process of diffusion. The modern beet slicer is shaped like a big bass drum, about 5 feet in diameter by 18″ wide, having a shaft passing through the center.

A steel ring, slightly smaller in diameter than the outer casing, is bolted to a disc mounted upon the shaft, and revolves inside of this outer casing. The ring, known as the knife block ring or spider, is provided with a number of slots for receiving the knife holders or blocks, either eight or nine of which are furnished, depending upon the type of the cutter—the Binkley Cutter having nine blocks, the Maguin eight, the diameter of ring being the same in both cases.

Each knife block carries three sets of knives, two knives to a set. The knives in each set are bolted opposite to each other in each knife block. The knives themselves are about 6½″ long, 3″ wide, and¼″ thick. Each knife has about 30 blades or divisions, about 3/16 of an inch apart. (See Disston Ad for illustration.) A 9-block ring carries 54 separate knives.

Diffusion: Fourteen cells to a "battery." Water at a temperature of about 175° F. or 80° C., is the diffusing agent. To diffuse a cell takes about an hour. The cells of the battery are so arranged that they may be connected as in a circle. They are also so arranged that any cell may be cut out of the circle while being emptied and refilled without stopping the flow of water in the circuit. The water enters the circuit at the cell containing the cossettes most nearly extracted and travels from one cell to another, absorbing from the cossettes more sugar as it proceeds on its course, until it arrives at the freshest sliced beets. The sugar content of these cossettes being higher, the water becomes more heavily saturated with sugar, so that it will scarcely hold any more. In this state it remains in the final cells for only a short period, during which further extraction continues; after which the liquid—which is now juice—is drawn off and pumped into an automatic weighing tank. Complete extraction of sugar from the slices is not practical, and about 3-10 to 5-10 of one per cent of the sugar content is therefore lost in pulp and water. To keep the loss from this source within reasonable limits requires chemical and mechanical control of the highest order; and in this connection tanks to measure the diffusion juice as it leaves the battery are employed so that the amount of juice drawn off (draft) can be so regulated as to serve in a measure to control loss in question.

Pulp Disposal: After the sugar has been extracted from beet slices, the exhausted cossettes, heavily laden with water, are pumped to drier, where bulk of moisture is evaporated. Wet pulp contains about 85% of water and the dried product about 10%. From drier (an arrangement of revolving drums and hot-air furnaces) the pulp is blown through large galvanized pipes to the warehouse and is there automatically weighed and sacked. Automatic carriers convey sacks to cars directly or to any particular section of the warehouse.

Diffusion Measuring Tanks: For each ton of beets cut, the diffusion juice averages about 1½ tons (about 11% sugar, 2½% of other solid substances and the balance water). Tanks can be adjusted so that upon filling up to a certain point they will be emptied automatically.

Diffusion Juice Reheaters: Here juice is heated to about 190° F. and passes into the carbonation tanks.

EXTRACTION OF IMPURITIES

Liming: Lime is added to the juice in the form of slaked lime, calcium hydroxide [$Ca(OH)_2$], also called milk of lime, or in the form of a "saccharate" of lime, a compound of lime and sugar obtained in recovering the sugar in the final molasses by the Steffens process. The addition of the lime causes the precipitation of the organic acids and their salts which were extracted from the beets along with the sugar, as the lime or calcium salts of these acids. The lime also renders the juice alkaline, which is a necessary factor to prevent the sugar from breaking down into its components, glucose and fructose, during the further process of heating and evaporation.

First Carbonation: The juice is next saturated with carbon dioxide gas, CO_2. This precipitates the excess of lime as calcium carbonate. Not only does this greatly reduce the alkalinity of the juice, but the precipitated calcium carbonate, along with the original precipitate of lime salts, carries down with it much of the remaining organic impurities as albuminoids and gums. The carbondioxide used in this step is obtained from the lime kilns in which limestone, heated by the burning of coke, is calcined to yield both the carbon dioxide for this process, and also the lime for the liming process or to be used in the Steffen's process later in the course of extraction.

Carbonation Presses: Squares of canvas on iron frames. The carbonated juice passing through these presses leaves the lime and insoluble substances deposited on the filter cloths in form of a cake about one inch in thickness. This "lime cake," is burned again to form fresh lime or after being well washed with hot water, is dropped in a trough and conveyed to a tank where water is added until the whole mass becomes of a thick, pasty consistency known as "mud." From here it is pumped into the waste water where it is in turn carried out and used with irrigation water on the land. The juice, which before treatment was dark in color and nearly opaque; on leaving the presses is a thin, transparent straw colored liquid.

Second Carbonations: First carbonation process repeated and soda added to offset lime salts, which form incrustations on evaporator tubes.

Second Carbonation Presses: The juice is again filtered and lime cake and more organic impurities removed.

EVAPORATION

Evaporators: Leaving the bag filters, the "thin juice" enters the first evaporator at a density of about 14° Brix (solid substance, see page 18 for interpretation), and leaves the fourth body at about 60°. The evaporated liquid is termed "thick juice." In process of evaporation the juice goes through a series of four evaporator bodies. The vapor, given off in the first body, in which the steam is utilized, is used to heat the juice in the second body, and so on, thus affording a great saving of fuel. The second, third and fourth bodies operate in a vacuum, which condition permits evaporation at a much lower temperature than when under atmospheric pressure. After evaporation, remelted raw sugar, obtained from the molasses further on in the purification process, is added. This sugar passes through the purification process a second time, along with the fresh juices.

Blow-Ups: The Alkalinity of the juice sometimes becomes increased to such extent through evaporation that it must be reduced before entering vacuum plant. This reduction is accomplished through the "Blow-Ups" which are round iron tanks provided with a perforated steam coil and a chamber for entrance of sulphur gas, sulphur dioxide, SO_2. After heating the thick juice, if it is found too alkaline enough sulphur gas is admitted to correct. This also serves to whiten, or bleach, the juice.

Syrup Presses: Thick juice and other syrups coming here from blow-ups pass through these presses. The excess of lime is removed as calcium sulphate, along with other impurities.

RESOLVING THE SUGAR

Vacuum Pans: Here thick juice or a mixture termed "standard liquor" is boiled and grained to sugar crystals.

The juice or liquor arrives here with the sugar in solution and through boiling a part of the sugar assumes a crystaline form.

By operating in a vacuum the boiling point of the syrup is lowered, not alone affording a saving in fuel, but preventing burning of the sugar. Pans contain a series of copper coils, through which the steam circulates.

Syrup is admitted to the pan by degrees, and as it boils and crystals form, the sugar boiler by observation determines amount of syrup to admit. When the proper growth of the crystals has reached its limit, he "drops" the pan, and calls or signals, "Strike."

To boil white sugar takes about 3½ hours; to boil "browns" or "raws," from 5 to 14 hours.

Mixers: From both white pans and brown sugar crystallizers, the fillmass or massecuite, as the crystallized syrup is called, enters respective mixer, through which a paddle-bearing shaft constantly revolves to prevent hardening of the mass. These mixers have a number of spouts below, through which the fillmass enters centrifugals or sugar separators.

Centrifugals: The frames of these machines, cylindrical in form, contain a bronze basket of varying diameter according to needs of factory (standard diameters are 30″, 36″ and 40″). The inside height of the basket is usually 24″. This basket, which contains a fine mesh screen, revolves at a speed of from 1,100 to 1,400 revolutions per minute; "green syrup" flies off and white sugar remains. The remaining molasses is then washed out by an automatic spraying device and pure sugar is discharged into a screw conveyor below, thence to granulators (the syrup produced by the sprays is the so-called "wash" syrup). The separation of about 250 pounds of sugar from the fillmass takes from 7 to 10 minutes. Raw fillmass gives a separation of brown or yellow sugar. This yellow sugar goes to melter to be added to thick juice; molasses is pumped to the steffen house to be treated with lime, forming the saccharate with which fresh beet diffusion juice is mixed.

Granulators: White sugar leaving centrifugals contains a certain per cent of moisture; here sugar is dried in a rotary drier. It is then sifted through fine mesh screens into granules, forming granulated sugar. This is the ordinary or **"granulated sugar"** as it is known by all.

The "first" or "white sugar," upon being run through the dryers or "granulators" loses about 3% moisture and comes out a 99.8 or 99.9% sugar ready for sacking. From the granulators it is conveyed by scrolls to the hoppers supplying the sacking machines. These machines are operated by electricity and weigh out very accurately 100 pounds of sugar. The sack of sugar is then set on a conveyor which carries it around to the sewing machine where in a few seconds the sack of sugar is sewed and ready to be carried to the freight car or to the sugar warehouse, in which the surplus sugar is stored awaiting shipment.

Crystallizers: In centrifuging, or spinning, the mass from the vacuum pans (separating the crystals), a proportion of same is thrown off in the form of a syrup, usually running from 70% to 75% sugar, which can be reboiled and about 20% recovered as raw sugar; this residue, called "green syrup," is sent to "blow-ups"; is sulphured, reheated and filtered; then boiled in raw pans, referred to previously, but (unlike fresh "thick juice" or standard liquor) crystals are not as readily formed in the pan, and after boiling for from 5 to 14 hours, the raw product or "fillmass" is transferred to crystallizers in which the mass is agitated from 3 to 5 days, during which time crystals grow, from which brown sugar can be extracted.

EXTRACTION OF SUGAR FROM MOLASSES

Steffen's Process: Molasses, with a sugar content of about 50%, is pumped from main building, weighed, and diluted to a comparatively low density, as compared with original molasses (there also enters at this point a small percentage of milk of lime from hydrate presses). From here solution goes to solution tank to be cooled. After cooling in tank, solution is pumped to "coolers" (about 1,600 pounds of molasses thinned down enters a cooler at one time); here powdered lime is added; an agitator at bottom keeps the cooler mixture in circulation; ice water circulating through coils in bottom of cooler keeps temperature down and prevents lime from slaking. After a certain period, usually about six minutes, cooler is emptied and contents pumped to cold presses.

Steffen's Cold Presses: Saccharate solution, in passing through presses, leaves cold saccharate adhering to cloths. The waste water from cold presses holding a little over 1% sugar is heated and sent through hot presses, where hot saccharate cake adheres to cloth, waste water going to sewer. The saccharate cake is a lime salt of sugar. The composition of this salt is usually expressed as tri-calcium saccharate, or $C_{12}H_{22}O_{11}$-3 CaO-3 H_2O. This ratio varies somewhat, however; the cold saccharate diluted cake contains about 15% sugar, the hot saccharate cake about 12%. From presses, saccharate cake goes by scroll to mixing tank, is diluted with wash water from the first carbonation presses to a brix of between 35° and 40°, forming a cream, and is pumped in this form to first carbonation to be added to fresh beet juice or to hydrate mixer.

It has been found that double-warp jute cloths from Steffens cold presses, if washed in softened water, can be utilized again on Steffens hot presses, as heat reopens the pores of these cloths. This affords a great saving.

Solution Tanks, Etc.: Solution tanks contain an arrangement of coils to cool the molasses solution. In plants, except in the colder regions, an ammonia refrigeration system is used to cool the brine circulating in the coils.

Hydrate Mixer: More lime is used to work up the molasses produced than is needed to purify the fresh beet juice. The compound of lime and sugar (saccharate) coming from the Steffen's presses has a sugar content of about 13%—the lime of this saccharate is what is used to purify the fresh beet juice, for as it is added to the water solution it forms calcium hydroxide and frees the sugar. If any remains unchanged it is decomposed by the carbonation process by which the lime is precipitated out. The part of saccharate not needed for purifying purpose is sent to hydrate mixers. Here, slowly revolved in large tanks, its temperature raised from about 65° to 80° C. (149° to 176° F.), and diluted from 35° to about 20° Brix by an admixture of juice from carbonation filter presses. After a few minutes of mixing the liquid is sent to presses to be filtered, the hydrate, or slakened lime, adhering to cloths is used again in working up the molasses.

LIME KILNS

Kiln and Pulverizer:—

Lime rock and coke are burned together to produce plain unslacked lime and carbon dioxide. $CaCO_3 = CaO + CO_2$. The gas is pumped to the carbonation tanks for use therein, the lime goes to the crusher; is ground up, elevated and distributed to Raymond pulverizing mills; blowers above suck the lime away from the mills as fast as it is powdered and deliver same to conveyors, thence to hoppers serving Steffens coolers.

Rotary Kilns: Waste lime from first carbonation presses is pumped to rotary kilns, of which there are two, each consisting of a long horizontal tube about 6 feet in diameter. The fire, an oil flame, is introduced at one end. About half way back from firing end is superimposed another tube about one-half the diameter and the length of rotary. The diluted lime, entering at one end of this upper tube, is carried backward by a revolving screw and at the same time subjected to a heat which evaporates most of the water. From opposite end to that of entry, lime falls into the kiln tube proper, through which shoots flaming oil; the organic impurities go out through the stack and the almost pure calcium oxide (unslackened lime) in small marble-shaped pieces is carried forward by the rotating movement, drops into wheelbarrows, is then laid out to cool, and when cooled is transferred to main kiln to be ground up with other lime for use in Steffen House.

POWER

Sterling boilers equipped for oil burning and with flue gas economizers are the ones commonly in use. Tests are made of the escape gas, so that the efficiency of all boilers is known at all times. Flue gases are utilized to heat water as it enters boilers.

Both high and low exhaust steam from engines is used whenever possible, especially in first evaporator body and vacuum pans (in conjunction with live steam). Most all reheating is done by vapors from evaporators.

RÉSUMÉ OF PROCESS

After being weighed the beet roots are sent to the cutters, which contain a series of revolving corrugated knives, thence to large iron tanks called diffusion cells, holding about four tons each. Here sugar is removed from slices by hot water. After diffusion, the juice is reheated and receives an addition of lime and is then saturated with carbonic acid gas, which precipitates the lime together with certain impurities. It is then reheated and filtered, relimed, carbonated and treated with soda, reheated and refiltered, is partially evaporated to about 60% of solid substance, bleached with sulphur gas and filtered. After filtration, juice enters "boiling pans" where further concentration takes place and the sugar is resolved to a crystalline form. From the "boiling" or vacuum pans the mass enters sugar separators or centrifugal machines, which revolving at high speed, throw off the molasses and retain the pure sugar, which in a moist form is conveyed to granulators, where it is dried and sifted, then dropped below to automatic scales, where it is sacked ready for shipment.

The sugar remaining in the molasses is precipitated by the addition of lime. This lime-sugar compound is added to the fresh beet juice where the lime is freed to interact in purifying the juice, and the recovered sugar passes a second time through the refining process.

CHEMICAL CONTROL

Sugar manufacture is most effective under chemical control; at each stage of the process small samples of the juice are taken at intervals, dependent on conditions, and these samples are chemically analyzed to determine the per cent of sugar and other content. The density of the juice must be within certain limits at various stages and its purity must be known. This all comes under the jurisdiction of the chemical department. The amount of materials consumed and their relation to the output must be known exactly at any time by the superintendent, and hourly records are therefore made in every department and at each station.

NOTEWORTHY FEATURES

A feature especially noteworthy is the recording of work done by shift machinists and their daily suggestions for further work to be done to anticipate breakdowns; also suggestions for improvements that come to their minds daily and which might be forgotten if left to be suggested at the end of the campaign. A further feature is the advocacy of suggestions from all men regardless of the importance or unimportance of their duties. Unless such co-operation is obtained men are apt to consider that their suggestions will be frowned down upon by their immediate superiors, and thus faults, such as leaky valves, for instance, that permit of a small loss here and there, great in the aggregate, are sometimes not reported promptly.

Again, the comfort of the men should be looked after. In a certain mill where overflows at the sulphur station or blow-ups were quite frequent, there resulted a loss during the campaign of hundreds of dollars, due no doubt to the fact that escaping gas fumes lowered the energy of the men and caused them to relax their alertness. A certain mill in California has provided shower baths and lockers for their men at a cost of over $25,000, and finds that it pays. Every morning a clean suit of white linen, provided and laundered by the company free of cost to the men, is laid in the locker of each man, which he dons, thus presenting a spick-and-span appearance. This mill, one of the oldest in the United States, secures the highest known extraction of any American mill in the business, which result speaks for itself.

KEEPING ABREAST OF PROGRESS

In regard to keeping up with modern methods of sugar recovery, it has been said by Lewis E.

Ware, the well known authority on beet sugar production:

"Beet sugar manufacture from year to year undergoes important changes which result in considerable economy, not only in the modes of extraction, but in the percentage of extraction realized; $50,000 additional expenditure in the machinery furnished frequently means one-half per cent more sugar. If 50,000 tons of beets are worked during the campaign, this additional sugar means 250 tons, the money outcome of which is more than sufficient to pay for the supposed excessive expenditure the first year. Certain contractors of beet sugar machinery whom we could mention, live up to the times, reject all obsolete methods and are consequently at an enormous expense for the construction and designing of new machines and devices. Their prices are high, but are certainly profitable in the long run.

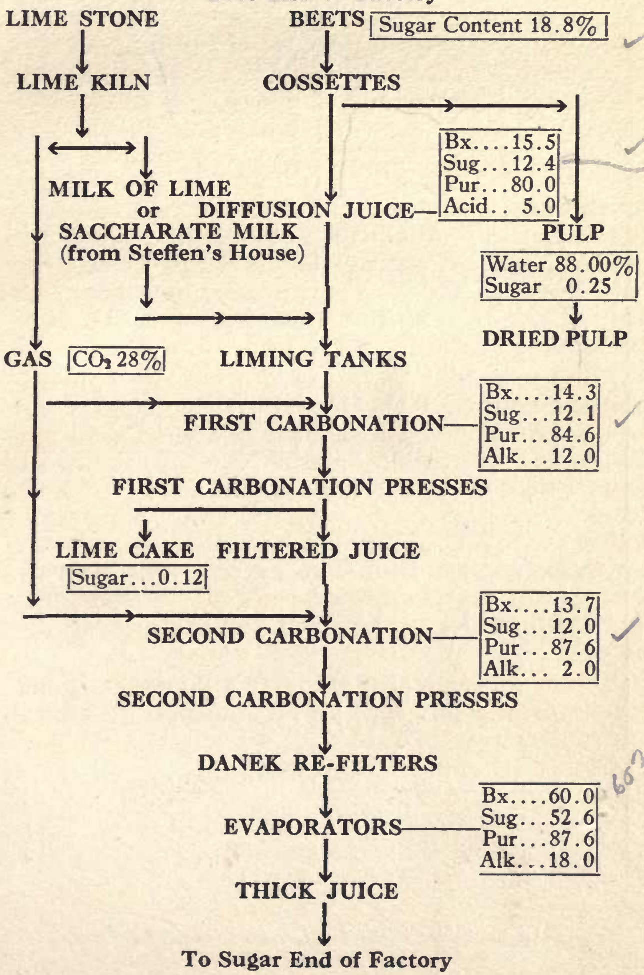
"The practical advice is to give any contemplated change all due consideration, and if all issues have been thoroughly weighed and the advantage of the new device are apparent, **no time should be lost** in making use of it. In most cases it is essential to demand that there shall follow sufficient gain that the device may pay for itself in less than five years. The narrow margin of the manufacturer's profit demands that his plant keep pace with the progress of the times."

A very good idea of many of above mentioned machines and devices can be obtained by glancing at illustrated cut at end of book, contributed by Sugar Machinery Company.

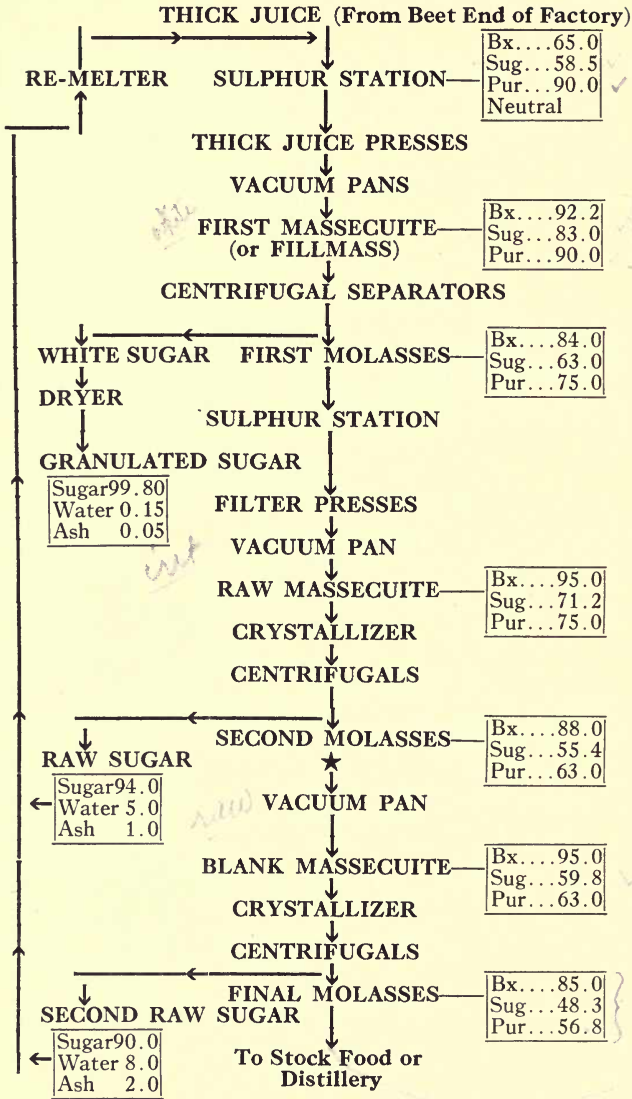
DIAGRAM OF EXTRACTION AND REFINING WITH COMPLETE ANALYSIS AT EACH STEP.

Bx. . . .Degree Brix, or Percent of Total Solids.
Sug. . .Percent Sugar, or Polarization.
Pur. . .Purity, or Ratio of Sugar to Total Solids.
Alk. . .Alkalinity in c.c. of 1/10 N H_2SO_4 per 10 c.c. of Juice.
Acid . .Acidity in c.c. of 1/10 N KOH per 10 c.c. of Juice.

——Beet End of Factory——

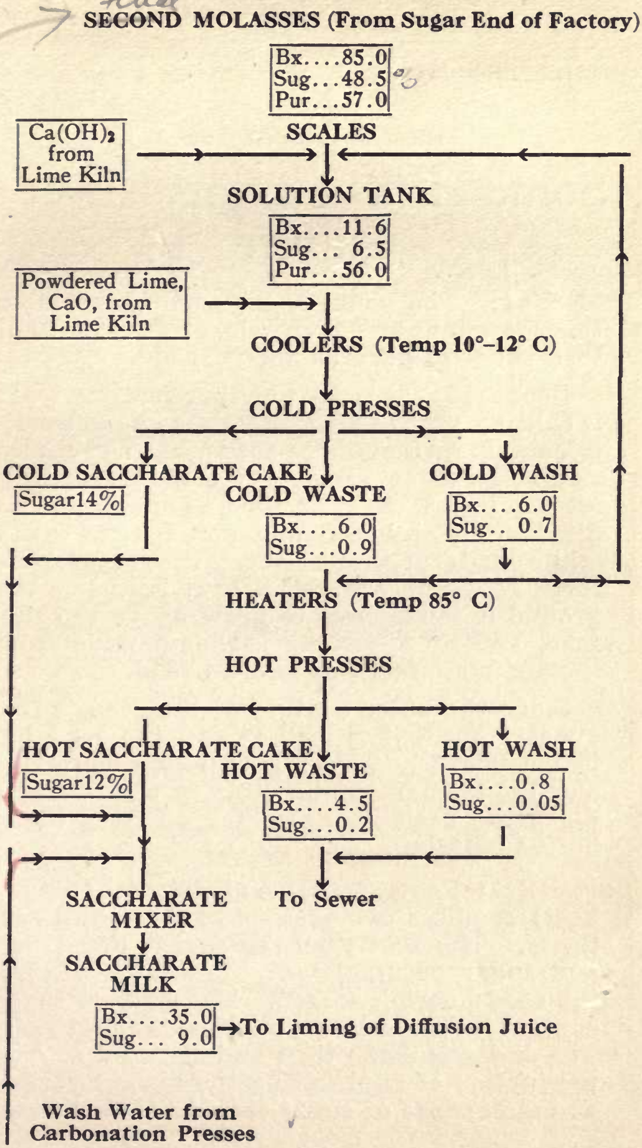


Sugar End of Factory



★In factories having **Steffen's Recovery Process,** more raw sugar is removed and process after SECOND MOLASES is omitted. Pass to next page.

Steffen's House



XII

Some Hints on Sugar Beet Culture

Beet Seed: The younger the seed the greater the germinating principle. Two-year-old seed is not as good as one-year-old.

Beet seeds are stuck together forming what is called a "seed ball." Beet seed balls usually contain two or three seeds, but sometimes as high as seven. Beet seed contains a plantlet composed of a number of cells, and is filled with starch, albumin, etc., for its growth while underground. After the plant puts forth root and secures a firm hold in the ground it commences to grow above the surface, and by absorbing carbon-dioxide from the air, manufactures its own food.

Since the outer coating of the seed is frequently hard, it is well to roll the seed between boards. This manipulation separates one seed from another. It is also well to place the seed in water for an hour or so before planting.

Sugar Beet Roots: Beta-Vulgaris (the sugar beet) requires two seasons to reach full maturity. The first year the root is developed and sugar accumulated; the second year is the seed bearing season. The highest sugar content is reached at the end of the first year. The sugar is made then and stored up. The production of seed during the second year is at the expense of sugar stored the first year.

It naturally follows that sugar beets are sliced after one season's growth.

Beet roots that have short, small necks are the most desirable, since they contain the most sugar. To produce such a beet ground must be well worked, and not too compact. The more abundant the leaves the more sugar in the beet. Leaves under no circumstances should be stripped. If the ground is not plowed in the proper manner to permit the air to penetrate proper results cannot be obtained. The soil should be of such texture that but little resistance will be offered to the passage of the roots; and where sub-soil is so compact as not to permit the passage of water, it should be improved by drainage. It is advisable to rid the soil of the weeds by hand, rather than with the hoe, the first ten days.

Beet roots when fresh and in good condition contain very little glucose, but if mutilated, glucose will form, causing proportional loss in sucrose.

The well known authority, Lewis S. Ware, in discussing beet culture states: "In Germany, where less weeds exist than in any other country, nevertheless hoeing after thinning is repeated five and even more times. Hoes should not penetrate too deeply. Hoeing has for a general effect the development of the leaves, which development results in a greater formation of sugar, but should be continued only until the root has attained its full growth. If continued after full growth, hoeing would cause the leaves to grow larger, but at this period sugar is increasing in the root and the growth of the leaves at the same time has an opposite effect. Leaves at this time are large and numerous enough anyway to smother the weeds by keeping them from sun and air."

Dr. J. K. Greisenegger, of the Czecho-Slovak republic, has been experimenting with the question of which beets yield the best results, those planted north and south or those east and west. These experiments have been watched with considerable interest and were spread over considerable area in order to ascertain rather definite data on this question. Where air and moisture were at a minimum and where other conditions remained about equal it was ascertained that beets planted in rows running from west to east produced the best sugar content. They produce the largest number of beets, the highest sugar content and also the best leaves. The very opposite results were obtained with rows planted north and south. Then another experiment was made with rows running northwest to southeast and northeast to southwest. These rows again showed a medium output or a lesser content than east and west and a better output than those north and south. It was also ascertained that where the planter was obliged to plant them diagonally to the meridian, preference should be given to rows planted from northeast to southwest.

The fallacy that sugar beets injure the soil has not only been exploded states "Field and Farm," but just the reverse has been found to be the fact. It is true that sugar beets take out of the soil the same elements that are removed by other crops, but in slightly different proportions. But, as has been stated, a large part of these mineral elements is in the top, which, if kept on the farm and fed to livestock, should be returned to the soil in the form of manure, so that in the end but little plant food is permanently removed from the soil by the beet crop. Experience in all sugar beet countries has demonstrated that larger crops of grain can be grown after beets than after any other crop. This seems to be due to the excellent condition in which the soil is left by the beet crop and to the depth of the root bed occupied by the beet roots. It is not apparent that sugar beets add to the soil any fertilizing material, but the fibrous roots left in the ground when the beets are harvested improve its physical condition.

"The Department of Agriculture figures show that beets were the only crop in the United States to show a gain in value in 1920." This remarkable return says the Broderick, Cal., "Independent," was due to the high contract price for beets which was out of all proportion to the selling price of sugar at harvest time. It speaks well for the sugar factories that they would carry out their contracts under conditions prevailing and illustrates in a striking manner the value of a contract crop which protects the farmer against violent fluctuations of the market.

Sugar beets and beet sugar: acreage and production in 1918–1920.

[Figures for 1920 are based upon returns made before the end of the season and are subject to revision.]

State and year.[1]	Factories in operation.	Sugar made.	Average extraction.[2]	Average sugar content.[2]	Beets worked in factories.		Average farm price of beets per ton.	Area of beets planted.
					Area harvested.	Quantity worked.		
	Number.	*Short tons.*[3]	*Per cent.*	*Per cent.*	*Acres.*	*Short tons.*[3]	*Dollars.*	*Acres.*
California:								
1920	11	163,700	15.79	17.90	123,500	1,037,000	13.62	135,700
1919	10	131,172	16.30	17.87	107,174	804,642	14.17	129,500
1918	13	122,795	14.52	17.03	100,684	845,728	9.95	120,900
Colorado:								
1920	17	302,700	12.77	15.83	221,500	2,370,000	11.88	253,600
1919	15	193,890	11.71	13.62	182,616	1,656,113	10.85	236,300
1918	14	191,880	14.07	16.10	125,882	1,363,277	10.02	142,000
Idaho:								
1920	9	64,600	12.97	16.08	55,600	498,000	12.09	57,600
1919	6	26,159	13.29	15.48	30,331	196,847	11.00	53,700
1918	7	44,682	13.66	16.57	32,306	326,979	10.00	37,700
Michigan:								
1920[4]	17	167,500	13.30	16.21	145,200	1,259,000	9.99	173,400
1919[4]	16	130,385	12.63	14.57	123,375	1,032,018	12.52	166,100
1918	16	127,979	14.38	16.61	114,976	890,238	10.08	134,500
Nebraska:								
1920	5	87,500	12.38	15.70	72,000	707,000	11.94	78,900
1919	4	60,870	10.99	13.14	59,113	554,100	10.90	64,800
1918	4	63,494	14.01	16.05	42,746	453,266	9.96	44,600
Ohio:								
1920	5	55,700	12.35	15.66	46,800	451,000	9.22	44,300
1919	5	31,864	10.93	14.15	30,909	291,583	12.75	37,100
1918	5	35,476	12.19	15.74	32,547	291,064	10.03	36,100
Utah:								
1920	18	153,200	11.40	15.41	112,700	1,304,000	11.66	116,100
1919	18	101,025	11.12	13.87	103,247	908,122	10.97	109,700
1918	16	105,794	11.69	15.29	81,717	905,064	10.01	90,100
Wisconsin:								
1920	5	25,100	12.49	15.92	23,200	201,000	10.47	29,000
1919	4	10,636	10.07	13.16	12,100	105,578	12.02	16,200
1918	4	13,358	14.29	16.29	12,400	93,467	10.00	14,900
Other States:								
1920	12	89,600	12.48	15.72	81,500	718,000	11.34	89,900
1919	11	40,450	11.95	14.27	43,590	338,554	11.08	77,000
1918	10	55,492	13.59	15.95	50,752	408,423	9.86	68,900
United States:								
1920[4]	99	1,109,600	12.99	16.06	882,000	8,545,000	11.63	978,500
1919[4]	89	726,451	12.34	14.48	692,455	5,887,557	11 74	890,400
1918	89	760,950	13.64	16.18	594,010	5,577,506	10.00	689,700

[1] Acreage and production of beets are credited to the respective States in which the beets were made into sugar.
[2] Based upon the weight of the beets.
[3] A short ton is 2,000 pounds.
[4] Including beets and sugar from 1,500 acres in Ontario, Canada, 1920, and 850 acres in 1919.

Bureau of Crop Estimates

AMERICAN BEET SUGAR FACTORIES

Their Beet Cutting Capacity, Names of Corporation and Operating Officials

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Alphabetically Arranged by States and According to Factory Location

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CALIFORNIA—

Alameda Sugar Co., ALVARADO: C. H. Crocker, Pt., San Francisco; P. C. Drescher, V.-P., Sacramento; E. R. Lilienthal, V.-P., San Francisco; G. E. Springer, S. & T., San Francisco; F. R. Haas, Purch. Agt., 351 California St., San Francisco; Ray S. Stewart, Supt. Capacity, 800 tons daily. Non-Steffens.

Anaheim Sugar Co., ANAHEIM: A. R. Peck, Pres.; L. H. Multer, Secy.; J. A. Purduyn, Purch. Agt., Sixth and Spring Sts., Los Angeles; D. Jesurun, Supt.; A. C. Berry, Asst. Supt.; B. Lawrence, Chief Chem.; Edward Stark, Agr. Capacity, 1200 tons daily. Non-Steffens.

Union Sugar Co., BETTERAVIA: P. C. Drescher, Pres., Sacramento; E. R. Lilienthal, V.-P., San Francisco; C. H. Crocker, V.-P., San Francisco; G. E. Springer, S. & T., San Francisco; F. R. Haas, Purch. Agt., 351 California St., San Francisco; F. H. Johnson, Mgr.; J. R. Rogers, Supt.; T. McFarland, M. M.; W. Montgomery, Chief Chem.; J. L. Harris, Agr.; A. J. Hebert, Chief Engr.; J. T. Avington, Office Supt. Capacity, 1200 tons daily. Equipped with Steffens.

American Beet Sugar Co., CHINO: H. R. Duval, Pres., N. Y. City; Robert Oxnard, V.-P., San Francisco; H. T. Oxnard, V.-P., N. Y. City; E. C. Howe, V.-P. and Genl. Mgr., Sugar Bldg., Denver; C. C. Duprat, S. and T., 32 Nassau St., N. Y. City; C. R. Hays, Purch. Agt., Sugar Bldg., Denver; J. D. Barry, Local Mgr. (See Oxnard, Cal.). Capacity, 1100 tons. Non-Steffens. Also see Colorado and Nebraska.

Santa Ana Sugar Co., DYER STATION: J. Irvine, Pres.; S. W. Sinsheimer, Genl. Mgr.; E. M. Smiley, Mgr.; F. L. Klentz, Supt. (controlled by Holly Sugar Corp.). Capacity, 1200 tons. Steffens.

Holly Sugar Corporation, HUNTINGTON BEACH: Ex. Offices, Boston Bldg., Denver, Colo.; A. E. Carleton, Pres.; S. W. Sinsheimer, V.-P. and Genl. Mgr.; Remsen McGinnis, Secy.; J. Doheney, Sales Mgr.; M. J. Beausang, Purch. Agt., Boston Bldg., Denver, Colo.; C. A. Johnson, Mgr.; G. J. Daley, Genl. Supt.; C. A. Bullen, Genl. Engr.; G W. Miles, Supt.; R. J. Prescott, Local Purch. Agt. (also see Dyer Station and New Delhi, Cal.). Capacity, 1200 tons. Steffens. Also see Colorado.

Sacramento Valley Sugar Co., HAMILTON CITY: Wm. Lacy, Pres.; Edgar Baruch, V.-P. and Genl. Mgr., Los Angeles, Cal. (Not in operation during 1920, but raising hay, grain and livestock on extensive scale on own land.) A. M. Gelston, Local Mgr. Capacity, 700 tons. Non-Steffens.

Los Alamitos Sugar Co., LOS ALAMITOS: Senator W. A. Clark, Pres., Butte, Mont.; J. Ross Clark, V.-P.; H. C. Lee, V.-P., P. E. Bldg., Los Angeles; E. C. Hamilton, Mgr.; G. Strodholf, Sales Mgr.; K. V. Bennis, Supt.; Wm. C. Poe, Chief Engr.; Frank Norton, Asst. Supt.; Wm. Loranger, M. M.; W. B. Ladd, Chief Chem. Capacity, 900 tons. Steffens.

Spreckels Sugar Co., MANTECA: Executive Office, No. 2 Pine St., San Francisco; J. D. Spreckels, Pres.; A. B. Spreckels, V.-P. and T.; W. H. Hannam, Secy.; H. P. Howard, Sales Mgr.; K. I. Dazey, Purch. Agt.; F. E. Sullivan, Genl. Mgr.; J. F. Taddiken, Chief Engr., No. 2 Pine St., San Francisco; S. E. Miller, Local Mgr. (Same officials for Western Sugar Refinery, San Francisco, Cal.) (Also see Spreckels, Cal.) Capacity, 1200 tons. Non-Steffens.

American Beet Sugar Co., OXNARD: (For Corp. officials see Chino). Fred Noble, Mgr.; H. E. Zitkowski, Genl. Chem.; F. C. Zitkowski, Supt.; Joseph Sailer, Genl. Engr.; A. B. Westfield, M. M.; F. R. Bachler, Chief Chem.; C. H. Weaver, Cashier. Capacity, 3000 tons. Steffens.

Southern California Sugar Co., NEW DELHI: (Suburb of Santa Ana.) (Owned by Holly Sugar Corp.). J. Rose, Supt. (see Huntington Beach). Capacity, 600 tons. Non-Steffens.

Spreckels Sugar Co., SPRECKELS: C. L. Pioda, Res. Mgr.; E. M. Bergh, Supt.; W. B. Adams, M. M.; A. Boyd and J. Dios, Asst. Supts.; L. A. Kemper, Chief Chem.; Geo. Scott, Agr. Capacity, 4500 tons daily (world's largest). Steffens. (See Manteca, Cal.)

Alameda Sugar Co., TRACY: (For Corporation officials see Alvarado, Cal.). Ray S. Stewart, Supt. Capacity, 500 tons. Non-Steffens.

COLORADO—

Great Western Sugar Co., Exec. Offices, Sugar Building, DENVER: C. S. Morey, Chm. Board of Dir.; W. L. Petrikin, Pres.; W. D. Lippitt, V.-P. and Genl. Mgr.; C. W. Luff, Secy.; H. J. Miller, Purch. Agt.; W. L. Baker, Sales Mgr.; R. M. Booraen, Consultor; Edwin Morrison, Genl. Supt.; M. D. Thatcher, Treas. (Pueblo); N. R. McCreery, Dist. Mgr.; Geo. M. Shaffer, Asst. Genl. Supt.; W. A. Mitchell, Asst. Chief Engr.; S. J. Osborn, Genl. Chem.; H. Mendelson, Chief Agri. Factories in Colorado, Montana and Nebraska, which see following:

Great Western Sugar Co., BRIGHTON: C. L. Castleton, Jr., Mgr.; H. A. Harbeck, Supt.; H. A. Johnstone, M. M.; F. W. Cowell, Trav. Engr.; J. F. Hume, Cashier; C. E. Houston, Agr.; W. C. Henry, Chief Chem.; C. S. Scott, Trav. Chem. Capacity, 1000 tons.

Great Western Sugar Co., BRUSH: H. C. Giese, Mgr.; O. M. Cummer, Supt.; J. B. Lackner, M. M.; R. M. Parsons, Trav. Engr.; C. M. Good, Cashier; H. C. Giese, Agri.; L E. Jeffery, M. M.; P. Koller, Trav. Engr. Capacity, 1100 tons.

Holly Sugar Corp., DELTA: S. W. Sinsheimer, Genl. Mgr.; E. M. Drummond, Genl. Supt.; Irvg. Sinsheimer, Supt. (Exec. office, Denver, see Huntington Beach. Cal.).
Great Western Sugar Co., FT. COLLINS: D. J. Roach, Mgr.; F. Klingenberg, Supt.; E. A. Franklin, M. M.; J. F. Rasmussen, Trav. Engr.; Byron Albert, Cashier; H. H. Griffin, Agri.; E. J. Matteson, Chief Chem.; J. A. Bair, Trav. Chem. Capacity, 2150 tons.

Industrial Sugar Co., FT. LUPTON: Chas. Bliss, Pres.; Doctor R. E. Jones, S. and T.; E. F. Ogborn, Genl. Mgr.; R. F. Walker, Genl. Auditor (Exec. offices, Barclay Block, Denver); H. J. Klinge, Supt. Capacity, 600 tons.
Great Western Sugar Co., GREELEY: W. S. Garnsey, Jr., Mgr.; C. H. Criswell, Supt.; H. Howard, M. M.; I. E. Gilbert, Cashier; H. Timothy, Agri.; A. H. Edwards, Chief Chem. Capacity, 1050 tons.

Holly Sugar Corp., GRAND JUNCTION: (See Huntington Beach, Cal.). F. G. Holmes, Mgr.; E. M. Drummond, Genl. Supt.; R. M. White, Supt.; C. M. Phelps and T. E. Gardiner, Asst. Supts.; S. Gourley, M. M.; H. S. Saxton, Chief Chem. Capacity, 700 tons.

American Beet Sugar Co., LAS ANIMAS: (See Chino, Cal.). Frank Noble, Mgr.; W. F. Caton, Supt.; Harvey Morris. M. M.; E. B. Cowan, Chief Chem.; R. G. Dobbins, Asst. Cashier. Capacity, 1000 tons.

Great Western Sugar Co., LONGMONT: F. A. Wilson, Mgr.; F. S. Treadway, Supt.; E. Vosburgh, M. M.; J. F. Rasmussen, Trav. Engr.; J. B. Hitt, Cashier; R. M. Barr, Agri.; E. K. Huleatt, Chief Chem. Capacity, 2350 tons.
Great Western Sugar Co., LOVELAND: H. Scilley, Mgr.; Sam Mooney, Supt.; E. J. Nugent, M. M.; F. W. Cowell, Trav. Engr.; C. L. Atkins, Cashier; H. Scilley, Agri.; V. V. Hartman, Chief Chem Capacity, 1950 tons.

American Beet Sugar Co., LAMAR: Frank Noble, Mgr. Capacity, 500 tons. (Did not operate in 1920.)

American Beet Sugar Co., ROCKY FORD: Frank Noble, Mgr.; E. H. Gerecke, Asst. Mgr.; W. J. Kellogg and C. A. Allen, Supts.; W. A. Park, Chief Engr.; S. J. Kelso, M. M.; I. W. Reed, Chem. Capacity, 1800 tons.

Great Western Sugar Co., STERLING: C. E. Evans, Mgr.; R. C. Welsh, Supt.; George Walters, M. M.; R. M. Parsons, Trav. Engr.; J. C. Rece, Cashier; C. E. Evans, Agri.; G. W. Atkinson, Jr., Chief Chem.; P. Koller, Trav. Chem. Capacity, 1050 tons.

National Sugar Manufacturing Co., SUGAR CITY: F. K. Carey, Pres.; F. J. Carey, V.-P.; E. L. Burke, Secy., Baltimore, Md.; John H. Abel, Genl. Mgr. and Purch. Agt., Sugar City; H. B. Coggeshall, Supt. Capacity, 500 tons.

Holly Sugar Corp., SWINK: E. W. Stevenson, Mgr.; E. M. Drummond, Genl. Supt. Capacity, 1200 tons.

Great Western Sugar Co., WINDSOR: J. R. Clark, Mgr.; William Barber, Supt.; E. B. Taylor, M. M.; J. E. Rork, Cashier; E. C. Walter, Agri.; C. B. Millen, Chief Chem. Capacity, 1150 tons.

Great Valleys Sugar Corp., DENVER: S. R. Fitzgerald, Pres.; A. F. Lyster, Chief Engr.; F. F. Gazelle, Genl. Supt. Will erect plants at Ault and Lafayette, Colo.

IDAHO—

Utah Idaho Sugar Co., Executive Offices, SALT LAKE CITY: Heber J. Grant, Pres.; Thos. R. Cutler, V.-P.; W. A. Wattis, Managing Dir.; Merrill Nibley, V.-P. and Asst. G. M.; W. T. Pyper, Secty.-Treas.; W. Bert Robinson, Asst. Secty.-Treas.; T. Geo. Wood, Pur Agt.; B. R. Smoot, Gen. Supt.; J. H. Gardner, Consulting Supt.; M. W. Ingall, Consulting Engr.; W. Y. Cannon, Chief Engr.; H. B. Whitney, Mgr. Indust. Relations Dept.; E. G. Titus, Dir. Agri. Research; Frank Ingalls, Trav. Chem.; S. H. Love, Sales Mgr.

Utah Idaho Sugar Co., BLACKFOOT: B. R. Smoot, Gen. Supt.; C. B. Rackstraw, M. M.; H. Greenwood, Chief Chem. Capacity, 800 tons.

Utah Idaho Sugar Co., IDAHO FALLS: H. A. Major, Supt.; E. J. Whitson, M. M.; L. E. Pearson, Trav. Chem. Capacity, 900 tons.

Utah Idaho Sugar Co., SHELLEY: J. M. Gaddie, Supt.; J. R. Peterson, M. M.; L. E. Pearson, Trav. Chem. Capacity, 750 tons.

Utah Idaho Sugar Co., SUGAR CITY: D. Scalley, Supt.; J. R. Peterson, M. M.; J. C. Keane, Chf. Chem. Capacity, 900 tons.

Amalgamated Sugar Co., Executive Offices, OGDEN, Utah: A. H. Lund, Pres.; D. E. Eccles, V.-P.; J. Quinney, Jr., Secty.; Fred G. Taylor, Gen. Mgr.; H. A. Benning, Asst. Gen. Mgr.; N. A. Lockwood, Consulting Engr.; F. H. Ballou, Chief Engr.; Chas. Giddings, Purch. Agt.

Amalgamated Sugar Co., BURLEY: B. O. McCullock, Supt.; Geo. Hunt, M. M. Capacity, 700 tons.

Amalgamated Sugar Co., PAUL: H. W. Taylor, Supt.; A. Drussell, M. M. Capacity, 600 tons.

Amalgamated Sugar Co., TWIN FALLS: A. Thomas, Supt.; I. Fairbanks, M. M. Capacity, 800 tons.

Beet Growers Sugar Co., RIGBY: J. H. Hawley, Pres.; A. G. Goodwin, V.-P.; Geo. E. Hill, Secty-Treas.; A. W. Gabbey, Asst. Secty-Treas.; J. F. Featherstone, Gen Mgr.; E. C. Caneck, Supt.; T. S. Kanen, Chief Agric. Capacity, 800 tons.

Idaho Co-Op. Beet Sugar Co., TWIN FALLS: Contemplate erection of factories at Filer and Hansen, Idaho.

Preston Sugar Co., WHITNEY: E. A. Nickerson, Pres. In course of construction. (Removed from Corcoran, Calif.)

ILLINOIS—

Chas. Pope, RIVERDALE: E. R. Hatch, Secty.; Chas. Pope, Mgr. Office, 208 North Wabash Ave., Chicago, Ill. Capacity, 500 tons.

IOWA—

Iowa Valley Sugar Co., BELMOND: W. C. Tyrell, Pres.; C. T. Fenton, V.-P. and G. M.; A. L. Luick, Secty.-Treas.; L. L. Putnam, Asst. Gen. Mgr.; W. H. Adams, Supt.; R. E. Stevenson, Chief Engr. Capacity, 600 tons.

Northern Sugar Corporation, MASON CITY: H. A. Douglas, Pres.; S. W. Ladd, V.-P.; S. A. Hill, Secty. Metropolitan Bank Bldg., Minneapolis, Minn. At Mason City: W. H. Baird, Gen. Mgr.; W. E. Groom, Asst. Secty.-Treas.; E. C. Moore, Chief Agric.; A. R. Finley, Supt. Capacity, 1200 tons.

Iowa Sugar Co., WAVERLY: C. G. Edgar, Pres.; Detroit; A. W. Beebe, Mgr.; J. M. Booth, Supt.; J. B. Smith, Agric.; E. F. Cramer, Asst. Capacity, 600 tons.

INDIANA—

Holland St. Louis Sugar Co., DECATUR: See Holland, Mich., for Corporation Officials. B. F. Arendt, Gen Supt.;

J. H. Cormody, Mgr.; F. R. Gordon, Asst. Supt.; James Westveld, Chief Chem.; Walter Beane, M. M. Capacity, 800 tons.

KANSAS—

Garden City Sugar & Land Co., GARDEN CITY: A. E. Carleton, Pres.; J. Stewart, V.-P.; F. A. Gillespie, Secty-Treas.; E. Stoeckley, Gen. Supt. and Purch. Agt.; J. Ortman, M. M.; H. Edminston, Chief Chem. Capacity, 1000 tons.

MICHIGAN—

Michigan Sugar Co., Executive Offices, Union Trust Bldg., DETROIT: Chas. B. Warren, Pres.; Geo. B. Morely, V.-P.; F. R. Hathaway, Secty-Treas. At Saginaw, Mich.: W. H. Wallace, Gen. Mgr.; J. Dooley, Gen. Supt.; C. W. Orton, Purch. Agt.

Michigan Sugar Co., ALMA: Jotham Allen, Mgr.; Guy V. Lockwood, Supt.; E. E. Brown, Asst. Supt.; Wm. Dast, Chief Engr.; H. C. Hines, Chief Chem. Capacity, 1400 tons.

Michigan Sugar Co., BAY CITY: Eugene Fifield, Mgr. Capacity, 1400 tons.

Michigan Sugar Co., CARO: L. R. Stewart, Mgr. Capacity, 1200 tons.

Michigan Sugar Co., CARROLLTON: F. D. Ewen, Mgr. Capacity, 900 tons.

Michigan Sugar Co., CROSSWELL: Fred Harvey, Mgr. Capacity, 750 tons.

Michigan Sugar Co., SEBEWAING: W. M. Smith, Mgr. Capacity, 850 tons.

Columbia Sugar Co., Executive Offices, BAY CITY: John C. Ross, Pres.; N. R. Wentworth, V.-P.; E. W. Cressey, Secty.; Henry A. Vallez, Gen. Supt.

Columbia Sugar Co., BAY CITY: T. C. Carpenter, Supt.; Wm. Large, M. M.; A. J. Laporte, Chief Chem.; L. B. Tompkins, Chief Agric. Capacity, 1500 tons.

Columbia Sugar Co., MT. PLEASANT: O. J. McEwan, Mgr.; E. T. Oberg, Supt. Capacity, 1000 tons. (Also see Paulding, Ohio.)

Continental Sugar Co., BLISSFIELD: See Ohio for Corporation Officials. J. S. Eckart, Supt.; H. A. Tuttle, E. G. Kienbaum, Victor Beebe, Asst. Supts.; Noble Zinser, Chief Engr.; F. C. Mitchell, Chief Chem. Capacity, 1000 tons.

Holland St. Louis Sugar Co., General Offices, HOLLAND: G. J. Diekema, Pres.; C. T. Wright, V.-P.; C. M. McLean, Secty.-Treas.; C. M. McLean, Gen. Mgr.; S. R. McLean, Local Mgr.; C. J. McLean, Supt.; Frank Price, Asst. Supt.; J. S. Van Joren, Chief Chem.; Wm. Burt, M. M. Capacity, 500 tons.

Owosso Sugar Co., General Offices, OWOSSO: Chas. W. Brown, Pres. Pittsburgh; E. Pitcairn, V.-P., Pittsburgh; Daniel E. Crane, Secty-Treas.; Chas. D. Bell, Gen. Mgr.; F. E. McConnell, Purch. Agt.

Owosso Sugar Co., LANSING: Geo. L. Walt, Mgr.; S. Oberg, Supt.; A. Gillis, Chief Engr.; H. Schreiber, Chief Chem. Capacity, 800 tons.

Owosso Sugar Co., OWOSSO: Wm. H. Demuth, Supt. Capacity, 1300 tons.

Independent Sugar Co., MARINE CITY: Thos. L. Handy, Pres.; C. W. Handy, V.-P.; Geo. W. Handy, Treas.; F. S. Handy, Secty.; Ira H. McKinney, Mgr.; D. L. Smith, Supt.; J. Goulette, M. M.; J. E. Kemp, Agric.; Theo. Koenig, Cashier. Capacity, 600 tons.

Menominee River Sugar Co., MENOMINEE: J. W. Wells, Pres.; John Henes, V.-P.; Frank L. Brown, Secty.; G. W. McCormick, Gen. Mgr.; A. Ludwig, Supt.; C. F. Lamb, M. M. Capacity, 1200 tons.

Mt. Clemens Sugar Co., MT. CLEMENS: J. Davidson, Pres.; J. E. Davidson, Secty.-Treas., Bay City; W. M. Streit, Mgr.; O. F. Kaiser, Supt. Capacity, 600 tons.

West Bay City Sugar Co., WEST BAY CITY: M. J. Bialy, Pres. and Treas.; A. D. Bialy, Secty.; F. P. S. Kelton, Supt. Capacity, 900 tons.

MINNESOTA—

Minnesota Sugar Co., CHASKA: H. A. Douglas, Pres.; Geo. A. DuToit, V.-P. and Treas., Metropolitan Bank Bldg., Minneapolis, Minn. Fred C. Hicks, Secty.; Louis E. Flink, Mgr.; R. L. Bowman, Supt. Capacity, 800 tons.

MONTANA—

Great Western Sugar Co., BILLINGS: W. H. Hogarty, Mgr.; H. S. Barringer, Supt.; H. Scherer, M. M.; B. W. Morrison, Chief Engr.; E. L. Gutberlet, Chief Chem.; J. T. Davis, Trav. Chem.; C. F. Ridley, Cashier; John Meyer, Agric. Capacity, 2000 tons.

NEBRASKA—

Great Western Sugar Co., District Office, SCOTTSBLUFF: E. Simmons, Asst. Gen. Mgr.; H. W. Hooper, Asst. Gen. Supt.; N. C. Chatfield, Asst. Chief Engr.; A. M. Gregg, Trav. Engr.; C. C. Crawford, Trav. Chem.; A. H. Heldt, Chief. Agri.

Great Western Sugar Co., BAYARD: C. B. Turner, Mgr.; R. J. Bristol, Supt.; D. L. Kussy, M. M.; J. H.

Zisch, Chief Chem.; H. V. Towner, Cashier. Capacity, 1000 tons.

American Beet Sugar Co., GRAND ISLAND: (See Chino, Calif., for Corporation Officials.) A. J. Denman, Mgr.; F. L. Mehring, Supt.; A. T. Wilson, Chief Chem.; R. R. Mehring, M. M. Capacity, 500 tons.

Great Western Sugar Co., GERING: A. M. Ginn, Mgr.; V. I. Daniels, Supt.; R. P. Gookins, Chief Chem.; W. T. Warren, M. M.; R. McDonald, Cashier. Capacity, 1100 tons.

Great Western Sugar Co., MITCHELL: C. S. Campbell, Mgr.; E. E. Durnin, Supt.; Floyd Powell, M. M.; M. K. Hollowell, Cashier; R. I. Babbitt, Chief Chem. Capacity, 1000 tons.

Great Western Sugar Co., SCOTTSBLUFF: A. M. Ginn, Mgr.; Henry Schmode, Supt.; Stephen Morrison, M. M.; Geo. Goldfain, Chief Chem.; E. H. Clay, Cashier. Capacity, 2000 tons.

NEVADA—

Lahontan Valley Sugar Co., FALLON: B. C. Hubbard, Pres., St. Louis, Mich.; Albert W. Black, V.-P., Bay City, Mich.; Chas. Cave, Treas., Indianapolis; Wm. Kremers, Mgr.; Fred Hinze, Supt. (This factory has been idle for a number of years, but will probably operate with increased capacity, either the season of 1921 or 1922.) Present capacity, 500 tons.

OHIO—

Continental Sugar Co., Executive Offices, TOLEDO: C. S. Edgar, Pres. and Gen. Mgr.; E. H. Cady, V.-P.; F. T. Sholes, Secty.; J. F. Thompson, Purch. Agt.; W. H. Neidig, Chief Engr.; E. Durkee, Chief Chem. (Factories at Findlay and Fremont, Ohio and Blissfield, Mich.)

Continental Sugar Co., FINDLAY: W. E. Weller, Supt.; A. B. Krentel, Chief Chem. Capacity, 900 tons.

Continental Sugar Co., FREMONT: E. McClenathan, Supt.; B. A. Klapka, Chief Chem. Capacity, 600 tons.

Columbia Sugar Co., PAULDING: (See Bay City, Mich., for Corporation Officials.) J. A. Scott, Mgr.; H. C. Pety, Supt.; E. Girard, M. M.; W. M. Krause, Chief Chem. Capacity, 900 tons.

Ohio Sugar Co., OTTAWA: F. H. Hubbard, Secty. and Mgr.; S. O. Kerr, Chief Agri.; E. F. Wolfe, Supt.; Roy Stahl, M. M.; W. A. Deeds, Chief Chem.; S. I. Nepp, J. O. Knutson and D. A. Hebert, Assts. to Supt. Capacity, 600 tons.

Toledo Sugar Co., TOLEDO: (Controlled by Michigan Sugar Co.) F. L. Carroll, Mgr.; M. J. Kirk, Supt.; J. Kelton, Chief Engr. Capacity, 1500 tons.

UTAH—

Utah Idaho Sugar Co., BRIGHAM CITY: (See Idaho for Corporation Officials.) A. C. Pearson, Supt.; Thomas W. Lee, M. M.; J. T. Roberts, Chief Chem. Capacity, 750 tons.

Amalgamated Sugar Co., CORNISH: (See Idaho for Corporation Officials.) S. Christensen, Dist. Mgr.; C. E. Hogge, Supt.; R. B. Lewis, M. M.; J. P. French, Office Supt.; H. E. Hatch, Agri. Supt.; P. Barrett, Chief Chem. Capacity, 600 tons.

Utah Idaho Sugar Co., DELTA: Wm. Varley, Supt.; J. Gardiner, M. M.; E. A. Miller, Chief Chem. Capacity, 1000 tons.

Utah Idaho Sugar Co., ELSINORE: C. R. Wing, Supt.; J. R. Middleton, M. M.; R. O. Daniels, Chief Chem. Capacity, 750 tons.

Utah Idaho Sugar Co., GARLAND: F. W. Hilliard, Supt.; H. C. Hart, M. M.; L. B. Morely, Chief Chem. Capacity, 900 tons.

Gunnison Valley Sugar Co., GUNNISON: (Executive Offices at 532 Clift Bldg., Salt Lake City.) W. Harvey Ross, Pres.; Wm. Wrigley, Jr., Chairman of Board; O. H. Egge, Direc. and Conslt. Engr; L. Holman, Secty.; G. G. Light, Supt.; Frank Clegg, Asst. Supt.; Wm. Conner, M. M.; Walter E. Smith, Chief Chem.; J. O. Anderson, Agri. Capacity, 600 tons.

Pioneer Sugar Co., HOOPER: B. Y. Benson, Pres., Logan, Utah; C. G. Patterson, Secty.; C. D. Adams, Supt. Capacity, 400 tons.

Layton Sugar Co., LAYTON: E. P. Ellison, Pres.; D. O. McKay, V.-P.; R. E. Allen, Secty.-Treas.; James E. Ellison, Mgr.; T. Sass, Supt. Capacity, 600 tons.

Amalgamated Sugar Co., LEWISTON: S. Christensen, Dist. Mgr.; I. J. Clark, Factory Supt.; E. N. Rogers, M. M.; H. G. Spencer, Chem.; H. Ezra Hatch, Agri. Supt. Capacity, 800 tons.

Amalgamated Sugar Co., LOGAN: F. W. Hunter, Supt.; Wm. Laughlin, M. M. Capacity, 700 tons.

Utah Idaho Sugar Co., LEHI: David Hodge, Supt.; L. Taylor, Asst. Supt.; J. Triniman, M. M.; J. P. Bush, Chief Chem. Capacity, 1200 tons.

Peoples Sugar Co., MORONI: G. E. Browning, Pres.; N. G. Stringham, V.-P. and Gen. Mgr.; J. Grant Stringham, Secty.-Treas.; N. P. Sorensen, Supt.; G. E. Kirkham, Asst. Supt.; John Hardy, Foreman; F. Beckstrom, Foreman; K. M. Draper, M. M.; M. H. Jamison, Chief Elec.; F. D. Yearance, Chief Chem. Capacity, 400 tons.

Amalgamated Sugar Co., OGDEN: E. Sebelov, Dist. Mgr.; C. E. Hogge, Supt.; J. F. Yearsley, M. M. Capacity, 1000 tons.

Utah Idaho Sugar Co., PAYSON: E. Brown, Supt.; E. C. Petrie, Chief Chem.; C. E. Drake, M. M. Capacity, 750 tons.

Springville-Mapleton Sugar Co., PROVO: Jesse Knight, Pres.; W. Mangun, V.-P.; C. R. Jones, Mgr. Capacity, 350 tons.

Amalgamated Sugar Co., SMITHFIELD: Wm. Baer, Supt.; Amos Brown, M. M. Capacity, 700 tons.

Utah Idaho Sugar Co., SPANISH FORK: T. E. Edwards, Supt.; C. N. Jacobson, M. M.; E. T. Cluff, Chief Chem. Capacity, 1000 tons.

Utah Idaho Sugar Co., WEST JORDAN: Y. Foote, Supt.; E. A. Miller, Chief Chem.; H. K. Bytheway, M. M. Capacity, 750 tons.

WASHINGTON—

Utah Idaho Sugar Co., NORTH YAKIMA: (Not in operation during 1920.) Capacity, 750 tons.

Utah Idaho Sugar Co., SUNNYSIDE: C. V. Halliday, Supt. Capacity, 750 tons.

Utah Idaho Sugar Co., TOPPENISH: R. L. Howard, Supt.; J. D. Allmondinger, M. M.; E. H. Young, Chief Chem. Capacity, 750 tons.

WYOMING—

Great Western Sugar Co., LOVELL: Chas. F. Johnson, Mgr.; H. Sandman, Supt.; H. Fletter, M. M.; J. W. Kendall, Chief Chem.; C. F. Johnson, Agri.; A. A. Tinn, Cashier. Capacity, 600 tons.

Sheridan Sugar Co., SHERIDAN: (Controlled by Holly Sugar Co.) S. W. Sinsheimer, V.-P.; and G. M.; J. D. McIntyre, Supt.; O. V. Mumaugh, M. M. Capacity, 900 tons.

Wyoming Sugar Co., WORLAND: J. M. Eccles, Pres. and Gen. Mgr.; C. E. Kaiser, V.-P.; M. Browning, Treas.; A. C. Lighthall, Secty.; Frank Kaspar, Supt. (Executive offices, Eccles Bldg., Ogden, Utah.) Capacity, 600 tons.

WISCONSIN—

Chippewa Sugar Refining Co., CHIPPEWA FALLS: M. Hottolet, Pres.; A. P. Mann, V.-P.; J. S. Lawson, Secty.-Gen. Mgr., 428 Grand Ave., Milwaukee, Wis.; J. A. Brooks, Mgr.; R. E. Pospisil, Supt. Capacity, 600 tons.

Green Bay Sugar Co., GREEN BAY: J. H. Taylor, Pres.; A. J. Tippler, V.-P.; J. Kittel, Secty.; W. B. Rosevear, Gen. Mgr.; C. H. Hine, Factory Mgr. Capacity, 600 tons.

Rock County Sugar Co., JANESVILLE: James Davidson, Pres.; J. E. Davidson, Secty.-Treas., Bay City, Mich.; W. B. Davis, Gen. Mgr.; A. W. Robbell, Supt. Capacity, 700 tons.

U. S. Sugar Co., MADISON: J. S. Lawson, Pres.; J. G. Kremers, V.-P.; J. A. Schulte, Secty., 428 Grand Ave., Milwaukee, Wis.; A. E. Johnson, Factory Mgr. Capacity, 600 tons.

Wisconsin Sugar Co., MENOMINEE FALLS: J. K. Farley, Sr., Pres., Chicago, Ill.; Dean Farley, V.-P. and Gen. Mgr.; E. O. Eckland, Secty. and Gen Supt. Capacity, 600 tons.

For a complete list of Louisiana sugar factories including names of officials and data covering amount of cane ground and sugar made, etc., the reader is referred to the "Year Book of the Louisiana Planters' Association," 407 Carondelet St., New Orleans, La.

For a complete list of the sugar factories of the world, the reader is referred to the "Sugar Annual," published by the "Journal des Fabricants de Sucre," 3, Rue de Richelieu, Paris, France.

SUGAR REFINERIES OF THE UNITED STATES

American Sugar Refining Co.—Earl D. Babst, Pres.; S. Stubbs, V.-P.; A. B. Wollam, Treas.; E. T. Gibson, Secty.; H. A. Niese, Consultg Refiner; Howard Dalton Consultg. Engr.; E. C. Grether, Eqpt. Engr., 117 Wall St., New York. Refineries at Boston. Capacity, 2,000,000 lbs. daily; (2, "Reserve" 3,000,000 lbs., and "Spreckels," 2,000,000 lbs); Jersey City, 2,000,000 lbs., Brooklyn, 4,500-000 lbs., Chalmette, La., 3,000,000 lbs. and Baltimore, which is under Const.

Arbuckle Bros.—W. A. Jamison, Managing Dir., 71 Water St., New York City. Refinery at Brooklyn, New York, John W. Scott, Gen. Supt. Capacity, 2¼ million lbs. daily.

California Hawaiian Sugar Refining Co.—W. M. Alexander, Pres.; P. Welch, V.-P.; W. H. McBryde, Secty.; Geo. M. Rolph, Gen. Mgr.; D. B. Gray, Pur Agt., 230 California St., San Francisco, Calif. Refinery at Crockett, Calif. A. M. Duperu, Mgr.; Paul Caster, Asst Mgr.; Martin Tost, Supt.; Uno Hartman, Consultant; L. L. Edmunds, Chief Engr.; H. C. Welle, Chief Chem. Capacity, 4½ million lbs. daily.

Colonial Sugars Co.—John Farr, Pres.; James H. Post, Treas.; T. A. Howell, V.-P.; W. J. Vreeland, Secty., 129 Front St., New York City. Refinery at Grammercy, La.; Chas. N. Wogan, Gen. Mgr.; D. G. Jackson, Gen. Supt.; T. R. Wilson, Pur. Agt. Capacity, 1½ million lbs. daily.

Federal Sugar Refining Co.—C. H. Spreckels, Pres.; L. L. Clarke, V.-P.; A. H. Platt, Secty.; P. J. Smith, Treas.; P. L. Wooster, Purch. Agt., 91 Wall St., New York City. Refinery at Yonkers, New York. Louis Spreckels, Mgr.; Walter Spreckels, Asst. Mgr.; Chas. Graham, Chief Engr. Capacity, 4¼ million lbs. daily.

Godchaux Sugars, Inc.—Chas. Godchaux, Pres.; Ed. Godchaux, V.-P.; Jules Godchaux, V.-P.; Paul L. Godchaux, Treas.; Emile Godchaux, Secty., 221 Godchaux Bldg., New Orleans, La. Refineries at Reserve and Napoleonville, La. Capacity, 800,000 lbs. daily.

Henderson Sugar Refining Co.—Wm. Henderson, Mgr. Dir.; Adam Gambel, Mgr.; B. E. Michel, Sales Mgr., 749 South Peters St., New Orleans. Refinery at New Orleans, C. J. Gambel, Supt.; R. Caster, Chief Engr. Capacity, 600,000 lbs. daily.

Imperial Sugar Co.—I. H. Kempner, Pres.; G. D. Ulrich, V.-P. and Gen. Mgr.; J. Vickerman, Secty.; E. O. Gunther, Treas., Sugarlands, Texas. Refinery at Sugarlands, Texas. B. H. Varnau, Supt.; R. L. Lavender, Chief Engr. Capacity, 800,000 lbs. daily.

McCahan Sugar Refining Co.—Manuel Rionda, Pres.; B. B. Rionda, V.-P.; H. B. Young, Secty.; W. J. Craig, Treas., 101 South Front St., Philadelphia. Refinery at Philadelphia, Pa. Thomas Kavanaugh, Gen. Mgr. 1¼ million lbs. daily.

National Sugar Refining Co.—James H. Post, Pres.; Thomas A. Howell, V.-P.; G. A. Bunker, Secty.; H. F. Mollenhauer, Treas. Refinery at Long Island City, New York. J. Henry Leinau, Supt, Yonkers, New York; Warren H. Kipp, Supt. Capacity, 3,000,000 lbs. daily for Long Island City. Capacity, 2,000,000 lbs. daily for Yonkers.

Pennsylvania Sugar Co.—G. H. Earl, Jr., Pres.; S. F. Houston, V.-P.; J. A. McCarthy, Secty-Treas. Refinery at Philadelphia. V. H. Hoodless, Supt.; F. McGuire, Pur. Agt. Capacity, 2,000,000 lbs. daily.

Revere Sugar Refining Co.—A. W. Preston, Pres.; D. P. Thomas, V.-P.; F. J. Tilden, Secty.; J. W. Damon, Treas., 15 Broad St., Boston, Mass. Refinery at Charleston, Mass. H. E. Worcester, Supt.; E. Lowe, Asst. Supt.; C. W. Febbetts, Chief Engr. Capacity, 1,500,000 lbs. daily.

Savannah Sugar Refining Co.—B. A. Oxnard, Pres.; N. B. Lane, V.-P.; W. S. Pardonner, Secty-Treas. Refinery at Port Wentworth, Savannah, Ga. B. O. Sprague, Mgr.; Alex Ormond, Engr. Capacity, 1,500,000 lbs. daily.

Warner Sugar Refining Co.—C. M. Warner, Pres.; G. E. Warner, V.-P.; C. B. Warner, Treas.; A. L. D. Warner, Asst. Treas.; R. M. Bell, Secty.; J. R. Pels, Purch. Agt. Refinery at Edgewater, N. J. E. W. Gerbracht, Mgr.; Arthur Gerbracht, Supt.; A. Claus, Chief Engr. Capacity, 3,000,000 lbs. daily.

Western Sugar Refinery—John D. Spreckels, Pres.; A. D. Spreckels, V.-P.; W. D. K. Gibson, Secty.; W. H. Hannam, Mang. Direc.; F. E. Sullivan, Gen. Mgr.; K. I. Dazey, Purch. Agt., 2 Pine St., San Francisco. Refinery at San Francisco, Calif. C. J. Moroney, Mgr.; N. E. Dole, Supt.; J. F. Taddiken, Chief Engr. Capacity, 2,000,000 lbs. daily.

HAWAIIAN SUGAR FACTORIES

Manager's Name.	Name of the Factory.	Name of Island	Post Office Address.
J. M. Ross	Hakalau Plantation	HAWAII	Haklao
W. H. Campbell.	Hawaii Mill Co	..	Hilo
J. A Scott	Hilo Sugar Co.	..	Hilo
C. C. Kennendy.	Waiakea Mill Co.	..	Hilo
K. S. Gjendrum.	Honokaa Sugar Co.	..	Honokaa
Wm. Pullar.	Honomu Sugar Co.	..	Honomu
E. E. Conant	Kona Development Co.	..	Kelakekua
J. Atkins Wight.	Halawa Plantation Co.	..	Kohala
Jhon Hind	Hawaii Mill & Plant Co	..	Kohala
Geo C. Watt	Kohala Sugar Co.	..	Kohala
Robt Hall	Niuli Mill Plantation.	..	Kohala
R. H. Bryant.	Puakea Plant Co.	..	Kohala
J. C. Searle	Puako Plantation	..	Kohala
H. H. Renton	Union Mill Co	..	Kohala
E. Madden	Kukaiau Mill Co.	..	Kukaiau
A. Horner	Kukaiau Plantation.	..	Kukaiau
A. Ahrens	Pacific Sugar Mill	..	Kukuihaele
Carl Wolters	Hutchinson Sug. Plant, Co.	..	Naalehu
J. Watt	Olaa Sugar Co. Ltd	..	Olaa
J. T. Moir	Onomea Sugar Co	..	Onomea
Geo McCubbin	Kaiwiki Sugar Co	..	Ookaa
A. Lidgate	Hamakua Mill Co	..	Paauilo
A. Smith	Paauhau Sug. Plant. Co	..	Paauhau
W. G Ogg	Hawaiian Agr. Co	..	Pahala
C. McLennan	Laupahoehoe Sugar Co.	..	Papala
Jas Wesbter	Pepeekeo Sugar Co.	..	Pepeke
W. Stordat	McBryde Sugar Co	KAUAI	Eleele
G. H. Fairchild	Makee Sugar Co	..	Kealia
J. Fasot	Waimea Sugar Mill Co.	..	Kekaha
J. R Meyers	Kilauea Sugar Plant. Co	..	Kilauea
C. R. Wilcox	Koloa Sugar Co	..	Koloa
Ed. Broadbent	Grove Farm Plantation	..	Lihue
F. Weber	Lihue Plantation Co.	..	Lihue
G. R. Ewardt, jr.	Gay & Robinson	..	Makaweli
B. D. Baldwin.	Hawaiian Sugar Co.	..	Makaweli
H. P. Faye	Kekaha Sugar Co	..	Waimea
Jhon Chalmers	Kaeleku Plant. Co., Ltd.	MAUI	Kaeleku
Ah Ping	Kipahulu Sugar Co	..	Kipahulu
Geo. Gibb.	Olowalu Co	..	Lahina
L. Weinzheimer.	Pioneer Mill Co., Ltd.	..	Lahina
H. A. Baldwin.	Maiu Agricultural Co	..	Paia
F. F. Baldwin.	Hawaiian Com. & Sugar Co.	..	Puunene
H. P. Penhallan	Wailuku Sugar Co.	..	Wailuku
James Gibb	Honololu Plantation Co.	OHAU	Aiea
G. F. Renton.	Apokaa Sugar Co., Ltd	..	Ewa
G. F. Renton.	Ewa Plantation	..	Ewa
J. J. Dowling	Koolau Agricultural Co	..	Hauula
Andrew Adame.	Kohuku Plantation Co.	..	Kahuku
S. E. Wooley	Laie Plantation	..	Laie
U. W. Goodale.	Waialua Agricultural Co.	..	Waialua
Fred Meyre	Waianae Co	..	Waianae
G. Chalmers.	Waimanalo Sugar Co.	..	Waimanalo
E. K, Bull	Ohau Sugar Co	..	Waipahu

LOUISIANA SUGAR FACTORIES

NAME	P. O. ADDRESS
Barton, Mrs. E. H.	Barton
Belle Helene Co-Operative Sugar Co.	Belle Helene
Evan Belle Co., Inc.	Belle Alliance
Miles Planting & Mfg. Co.	McCall
Noel, R. E.	McCall
Barton, C. C.	Albemarle
Blanchard Planting Co.	Tallieu
Dugas & LeBlanc, Ltd.	Paincourtville
Glenwood Planting Co., Ltd.	Napoleonville
Godchaux Co., Ltd., The Leon	Napoleonville
Himalaya, Inc.	Tallieu
Kessler & Folse	Klotzville
Lula Company, Inc.	Belle Rose
Oakley Mfg. Co., Inc.	Avoca
Prejean, S.	Belle Alliance
Robichaux Co., The E. G.	Tallieu
Aleman Pltg. & Mfg. Co.	Belle Alliance
Elfert, Robert	Labadieville
Martin Sons, Inc., R. C.	Albemarle
Simoneaux, Aurelien	Plattenville
Jefferson Syrup Co.	Cottonport
Chatsworth Pltg. & Mfg. Co.	Burtville
Gianelloni, S. J.	Burtville
Catherine Pltg. & Mfg. Co., Ltd.	Lobdell
Devall Pltg. Co., Inc.	Chamberline
Hill, George	Port Allen
Kahao, M. J.	Kahns
Laws, Harry L.	Cinclare
Levert Pltg. Co., The Auguste	Mark
McWilliams Pltg. Co., The J.	Plaquemine
Milliken, Estate Mrs. D. A.	Chamberlin
Poplar Grove Mfg. & Ref. Co.	Port Allen
Westover Pltg. Co., Ltd.	Kahns
Glynn Planting Co., Ltd.	Glynn
Board of Control (State Penitentiary)	Jeanerette
Loisel Sugar Co., Ltd.	Jeanerette
New Iberia Sugar Co., Ltd.	Morbihan
Pharr & Sons, Ltd., J. N.	Olivier
Teche Syrup & Canning Co., Inc.	Jeanerette
Vida Sugar Company	Loreauville
Lewis, John B.	Jeanerette
Roger Co., Ltd., The Ernest	Thibodaux
Waverly Sugar Mfg. Co.	Thibodaux
Roth & Lagarde	Thibodaux
Deer Range Pltg. Co., Inc.	Myrtle Grove
Plaquemines Sugar Co., Inc.	Dalcour
Alma Plantation, Ltd.	Lakeland
Central Louisiana Sugar Factory, Inc.	Valverda
Ingleside Sugar Co., Inc.	Lakeland
McCrea Planting & Mfg. Co.	McCrea
Meeker Sugar Refining Co.	Meeker
Shirley Company, Inc.	Bunkie
Bloaim Co., Ltd., The L. A.	Luling
Hymel, Stanislas	Luling
Landeche Co., Ltd.	Killona
Milliken, Estate Mrs. D. A.	Killona
Dubourg, J. B. (Lessee)	Welcome
Hymel Bros. P. & M. Co.	Central
Keller & Co., L.	Hester
Laurel Ridge P. & M. Co.	Lagan
Longview Sugar Co.	Remy
Miles Pltg. & Mfg. Co.	St. Patrick
Salsburg Refining Co., Ltd.	Lauderdale
St. Joseph P. & M. Co.	Feitel
Uncle Sam P. & M. Co.	Convent
Union P. & M. Co.	Union
Waguespack, Felicien	Mt. Airy
Waguespack & Haydel	St. Patrick
Waguespack P. & M. Co.	Oubre
Webre-Steib Co., Ltd.	St. Patrick
Roussel, Octave	St. Amelia
Caire & Graugnard	Edgard
Champagne, A. & J. E.	Edgard
Godchaux Co., Ltd., The Leon	Reserve
Graugnard & Reynaud	Lions
Golden Star P. & M. Co., Ltd.	St. Patrick
San Francisco P. & M. Co.	Lions
Songy Pltg. Co., Ltd.	Wallace
Burch, Mrs. E.	Lucy
Haas, W. D.	Barbeck
Crockett & Weil	Opelousas
Devilliers, Mentor	Opelousas

NAME	P. O. ADDRESS
Barton, Jr., C. C.	Sunshine
Clover Ridge P. & M. Co.	Rosedale
Folse, L. N.	Whitecastle
Gay Planting Co., Inc., A. H.	Plaquemine
Gay P. & M. Co., The E. J.	Plaquemine
Greenfield P. & M. Co., Inc.	Plaquemine
Murrell P. & M. Co., The G. M.	Bayou Goula
Old Hickory P. & M. Co.	Hohen Solms
Soniat, L. M.	Dorcyville
Supples' Sons Pltg. Co., The J.	Bayou Goula
Slack Bros.	Rosedale
Spillet Sugar Co.	Bayou Goula
Strange, W. G.	Whitecastle
St. Gabriel Sugar Co., Inc.	St. Gabriel
Wilberts Myrtle Grove P. & M. Co.	Plaquemine
Adams & Sons, G. G.	Whitecastle
Anzelmo, Tony	Plaquemine
Desobry, L. H.	Plaquemine
Landry, Stephen	Sunshine
Richard, Oscar	Sunshine
Songy, Edouard	Plaquemine
Sitman, Geo. W. (Receiver)	Burtville
Jefferson P. & M. Co.	Waggaman
Billeaud Sugar Factory	Broussard
Lafayette Sugar Ref. Co.	Lafayette
Youngville Sugar Factory	Youngville
Beadle & Bros., Wm.	Broussard
Conque Bros.	Carencro
Lariviere, L.	Broussard
Barker & Lepine	Lafourche Cng.
Godchaux Co., Ltd., The Leon	Raceland
Gheens Realty Co.	Gheens
Lafourche Sugar Ref. Co.	Thibodaux
Lagarde Co., Ltd., The C.	Thibodaux
Laurel Grove Company	Thibodaux
Levert-Morvant Pltg. Co.	Thibodaux
Libby & Blouin, Ltd.	Lafourche Cng.
Lockport Central Sugar Ref. Co.	Lockport
Lower Lafourche P. & M. Co.	Lockport
Mathews, C. S.	Mathews
Price, Mrs. Andrew	Thibodaux
Mary & Tuma	Washington
Richard & Voltz	Rosa
Roy, Henry	Leonville
St. Cyr, J. T.	Opelousas
Singleton, Geo. L.	Arnaudville
Chauffe & Bros., R.	St. Martinville
Levert-St. John, Inc.	Levert
Smedes Bros., Inc.	Cade
Belleview Plantation Co.	Franklin
Berwick P. & M. Co., The O. D.	Foster
Burguieres Co., Ltd. The J. M.	Louisa
Centreville Company	Centreville
Columbia Sugar Company	Franklin
Clausen, Estate Jacob	Foster
Danos & Sons, L.	Patterson
Delgado, Succession of Isaac	Jeanerette
Forsyth, Jr., L.	Baldwin
Franklin Sugar Ref. Co.	Franklin
Home Place P. & M. Co.	Glencoe
Foster, J. W.	Franklin
Laws, Harry L.	Baldwin
Lyon Company	Berwick
Moreira, Schwan & Moreira	Centreville
Oak Bluff P. & M. Co.	Franklin
Oaklawn Sugar Co.	Franklin
Argyle-Crescent Co., Inc.	Houma
Ashland P. & M. Co., Ltd.	Houma
Barrow & Duplantis	Houma
Cocke, R. W.	Ellendale
Crescent-Magnolia P. & M. Co.	Minerva
Marmande, Ltd., Estate of B.	Theriot
McBride & Chauvin (Lessees)	Ellendale
McCollam, Edmond	Ellendale
McCollam & Cocke	Ellendale
Minor, Estate H. C.	Houma
Moore Pltg. Co., Ltd., The J. T.	Shriever
Shaffer, John D.	Ellendale
Terrebonne Sugar Co.	Montegut
Erath Sugar Co.	Erath
Rose Hill Co., Inc.	Abbeville
Vermillion Sugar Co.	Abbeville
Board of Control (State Penitentiary)	Angola

Compiled By "Facts About Sugar"

PHILIPPINE SUGAR FACTORIES

Compiled By "Facts About Sugar"

COMPANY	MUNICIPALITY	PROVINCE	MANAGER
Bacolod-Murcia Milling Co.	Bacolod	Negros Occidental	Emiliano Lizares / Mr. Aluman
Binalbagan Estate	Binalbagan	" "	Carlos A. Ferrandez
Compañia Azucarera De Bais	Bais	Negros Oriental	Wm. M. McQuaid
Canlaon Central	La Castillana	Negros Occidental	José Gomez
Calamba Sugar Estate	Canlubang	Laguna	John Dumas
Carmen Central	Calatagan	Batangas	J. M. Genato / J. Z. Zabarte
Capiz Central	Capiz	Negros Occidental	F. Jagastazola
Central Bearen	Kabankalan	Negros Occidental	Lizarraga Hermanos
Cia. Azucarera de la Carlota	La Carlota	Negros Occidental	C. T. Lewis
De la Rama Central / Lumanqub	Bago	Negros Occidental	R. de la Rama
Guanco Central / Magdalena	Hinigaran	Negros Occidental	S. Ortega
Dinalupihan Central	Dinalupihan	Bataan	
Hawaiian-Philippine Sugar Co.	Silay	Negros Occidental	A. M. McKeever
Isabela Sugar Co., Inc.	Isabela	Negros Occidental	Mr. Infante
Camancy Sugar Factory	Isabela	Negros Occidental	F. W. Cannaday / Salvador Serra
Ma-ao Sugar Central Co., Inc.	Pulupandan	Negros Occidental	Hamilton McCubbin
Mindoro Sugar Co.	San José	Mindoro	R. E. Wright
Muntinlupa Sugar Factory	Muntinlupa	Rizal	Carlos Young
North Negros Sugar Factory	Manapla	Negros Occidental	F. E. Greenfield
Nueva Apolonia Sugar Factory	Vallehermoso	Negros Oriental	Jose de la Viña y Cruz
Pampanga Sugar Development Co.	San Fernando	Pampanga	Jose Escaler
Palma Central	Ilog	Negros Occidental	Salvador Serra
Pampanga Sugar Mills	Del Carmen	Pampanga	R. Renton Hind
Philippine Sugar Development	San Fernando		Carlo Adriozola
Saint Louis Oriental Sugar Factory	Manaoag	Pangasinan	Thomas Rous, Prop.
San Antonio Central	La Carlota	Negros Occidental	Antonio Urquijo
San Carlos Milling Co.	San Carlos	Negros Occidental	J. N. Kruseman
San Isidro Central	Kabankalan	Negros Occidental	Juan Vidaurrazaga
Talisay-Silay Milling Co.	Talisay	Negros Occidental	Emilio Gaston
Talisay Central	Talisay	Negros Occidental	R. de la Rama
Victorias Milling Co	Victorias		No. Negros Sugar Co

PORTO RICAN SUGAR FACTORIES

NAME	LOCATION	OWNER
Aguirre	Salinas	Central Aguirre Co.
Alianza	Camuy	Central Alianza, Inc.
Ana Maria	Anasco	Ana Maria Sugar Co.
Bayaney	Arecibo	Central Bayaney, Inc.
Belvedere	Cabo Rojo	Sucesores de Bianchi
Bocachica	Juana Diaz	S. V. Hennay G. Cabrera
Cambalache	Arecibo	Central Cambalache Co.
Canovanas	Loiza	Loiza Sugar Company
Carmen	Vega Alta	Carmen Centrale
Cayey	Cayey	Cayey Sugar Company
Coloso	Aguada	Sucesores de Bianchi
Columbia	Maunabo	Fantauzzi, Verges & Riefkohl
Constancia	Toa Baja	Comp. Azucarera del Toa
Constancia	Ponce	Sauri y Subira
Corsica	Rincon	New Corsica Centrale, Inc.
Cortada	Santa Isabel	Santa Isabel Sugar Company
Ejemplo	Humacao	Comp. Azucarera El Ejemplo
Eureka	Hormigueros	Central Eureka, Inc.
Fajardo	Fajardo	Fajardo Sugar Company
Fortuna	Ponce	South Porto Rico Sugar Co.
Guanica	Guanica	South Porto Rico Sugar Co.
Juanita	Bayamon	Central Juanita, Inc.
Juncos	Juncos	The Juncos Central Co.
Lafayette	Arroyo	Sucrs. C. y J. Fantauzzi
Los Canos	Arecibo	Central Vannina
Machete	Guayama	Comp. Azucerara Central Machete
Mercedita	Ponce	Sucesion de J. Serralles
Mercedita	Yubucoa	Yubucao Sugar Co.
Monserrate	Manati	Federico Calaf
Pasto Viejo	Humacao	Central Pasto Viejo, Inc.
Pellejas	Adjuntas	Pellejas Sugar & Coffee Co.
Plata	San Sebastian	Plata Sugar Company
Playa Grande	Vieques	Benitez Sugar Company
Plazuela	Barceloneta	Plazuela Sugar Co.
Progreso	Carolina	Central Victoria, Inc.
Puerto Real	Vieques	Succession de Enrique Bird
Rochelaise	Mayaguez	Mayaguez Sugar Company, Inc.
Rufina	Guayanilla	Maria Mercado e Hijos
San Francisco	Guayanilla	Lluberas Hermanos
San Vicente	Vega Baja	Rubert Hermanos
Santa Barbara	Jayuya	Juyuya Development Co.
Santa Juana	Caguas	S. A. de Sucreries de St. Jean
Santa Maria	Vieques	Ch. Le Brun
Soller	Camuy	Soller Sugar Company
Triunfo	Naguabo	Garzot & Fuertes, Inc.
Vannina	Rio Piedras	Central Vannina

CUBAN SUGAR MILLS

Compiled By "Facts About Sugar"

NAME	LOCATION	OWNER	ADDRESS	MANAGER
		Oriente Province		
Bio	Bio	Blanco Homenos	Santiago	
Almeida, Hatillo	San Luis	Federico Almeida	Lorraine (b) 4, Stgo	Federico Almeida
Alto Cedra	Macarné	West Ind. M. S. Co.	Obrapia 19, Havana	J. Hanselman
América	Contramaestre	Federico Almeida	Lorraine (b) 4, Stgo.	Federico F. Rosillo
Atlantic	Tanamo Bay	Atlantic Fruit Co.	Sama, Oriente	
Baguanos	Cueto	C. A. Cen. Baguanos	Holguin	Gabriel Maurioo.
Belona	Marimon	Cía. Az. Cen. Belona	Banco Español Havana	José Marimon
Borjita	Dos Caminos	S. A. Ing. Cen. Borjita	Marina 1, Santiago	L. de Hechavarria
Boston	Banes	United Fruit Co.	131 State St., Boston	H. Harty.
Cacocum	Cacocum	Cía. Az. Cen. Cacocum	O'Reilly 11, Havana	Juan de Larrea.
Canarias (Bayat)	San German	Miranda Sugar Co.	Bayate	L. M. A. Evans
Cape Cruz	Ensenada de Mora	Cape Cruz Co.	138 Front St., N. Y.	G. R. Buchanan
Carmen	Julia	C. A. Cen. Carmen	Banco Nac. 518, Hav.	José G. Menocal
Chaparra	Puerto Padre	Cuban Amer. S. Co.	Robins Bldg., Havana	Ralph B. Wood
Colorados	Omaja	Colorado Sugar Co.	449 Federal St., Boston	
Confluente	Guantánamo	Confluente Sugar Co.	Madrid, Spain	Manuel Orta
Cupey	Cupey	West Ind. M. & S. Co.	Obrapia 19, Havana	M. R. Abbey
Delicias	Puerto Padre	Cuban Amer. S. Co.	Robins Bldg., Havana	Ernesto Brooks
Dos Amigos	Campechuela	Nicolas Castaño	Cienfuegos	M. Gonzalez
Ermita	Ermita	Ermita Sugar Corp.	Ermita	F. S. A. Chateauviex
Esperanza	Guantánamo	C. A. Oriental Cubana	Marina (b) 38, Stgo.	Antonio Arias
Isabel	Guantánamo	Guantánamo Sugar Co.	Guantánamo	Wm. Robertson
Isabel	Media Luna	Beattie & Co.	Manzanillo	R. H. Beattie
*Jobabo	Jobabo	Compañía Cubana	52 William St., N. Y	C. R. Stuntz
Los Caños	Guantánamo	Guantámo Sugar Co.	Guantánamo	H. R. Muschell
Madrazo Jibacoa	Manzanillo	Cía. Az. Jibacoa	O'Reilly 11, Havana	M. B. de Marchena
Manatí	Manatí	Manatí Sugar Co.	Marraqué Bldg., Hav.	Regino Truffin
Marimon	Macurijes	C. A. Oriental Cubana	Marina, baja, 38, Stgo.	Antonio Arias
Miranda	Miranda	Miranda Sugar Co.	Bayate	L. M. A. Evans
Monona	Guantánamo	Luis E. Simon	Guantánamo	Luis F. Simon
New Niquero	Niquero	New Niquero Sugar Co.	100 Broadway, N. Y.	Ricardo Narganes
Oriente	Xavier	Cía. Az. Oriente S. A.	Hartmann (b) 10 Stg.	Elmo J. Miller
Palma	Palma Soriano	Palma Sugar Corporation	Palma Soriano	Rafael Aguirre
Palmarito	Miranda	Miranda Sugar Co.	Bayate	L. M. A. Evans
Preston	Preston	Nipe Bay Co. (U. F. Co.)	131 State St., Boston	F. W. B. Hogge
Rey	Rey	C. A. Cen. Rey, S. A.	Royal Bank 314, Hav.	Juan Rimblas
Rio Cauto	Rio Cauto	Cuban-Can. Sug. Co.	Rio Cauto	George T. Walker
Romelie	Guantánamo	Sucs. Mackinlay Brooks	Guantánamo	Francisco de Pando
Salvador, El	Manzanillo	Godwall, Maceo y Ca.	Manzanillo	Ramón D. Escobar
San Antonio	Guantánamo	Sucrs. Luis Redor	St. E. Montluc, Fr.	M. A. Labarraque
San Ramón	San Ramón	Fdez. Vásquez y Ca.	Manzanillo	Genaro Fernandez
Santa Ana	Auza	Sucn. Auza y Escoriaza	Lorraine (b) 4, Stgo.	Francisco Auza
Santa Cecelia	Guantánamo	Columbia Trust Co.	New York City	Héctor Haget
Santa Lucía	Santa Lucía	Santa Lucia Co.	Tte. Rey 11, Havana	W. Dunn
Santa María	Guantánamo	Santa María Sugar Co.	71 Broadway, N. Y.	G. Nasi
Holguin	Holguin	C. A. Cen. Holguin	Holguin	
Margarita	Jiguani	C. A. Cubana	Jiguani	
Sofia	Bayamo	Sucrs. J. Alsina	Ap. 76, Manzanillo	Juan Alsina
Soledad	Guantánamo	Guantánamo Sugar Co.	Guantánamo	Jos. McCracken
Tacajó	Tacajó nr. Antilla	Tacajó Sugar Corp.	112 Wall St., N. Y.	G. G. Trowbridge
Teresa	Ceiba Hueca	Cen. Teresa Sugar Co.	Obrapia 23-A, Havana	James R. Biggar
Unión	San Luis	Cía. Az. Santiago	Ap. 151, Santiago	Jose Rousseau
Yaguanabos	Omaja	Cía. Az. Yaguanabos	Holguin	Eugenio Barbero
Yara	Yara	Yara Sugar Co.	Carlos Mendieta	Martinez Lufriu
Tanamo	Cayo Mambi	Atlantic Fruit Co.	61 Bdwy. N.Y.	
		Camaguey Province		
Adelaida	Morón	Cía. Az. Adelaida	Oficios 22, Havana	L. Falla Gutiérrez
Agramonte	Florida	Cía. Az. Vertientes	S. Bernardo 127, Cfgs.	Carlos Alvarez
Algodones	Guayacanes	Cen. Algodones, S. A.	Royal Bank, Havana	Isaías Cartaya
Baraguá	Baragua	Jules Godchaux	M. Gomez 444, Hav.	E. P. Cobb
Camagüey	Piedrecitas	Cía. Az. Camagüey	O'Reilly 11, Havana	Ramón L. Quiñones
Céspedes	Céspedes	Pérez y González	Céspedes	Vicente González
Ciego de Avila	Ciego de Avila	Cía. Az. C. de Avila	Aguiar 71, Havana	L. Octavo Diviño.
Cunagua	Morón	Am. Sugar Refin. Co.	Amargura 23, Hav.	Antonio G. Mendoza
Elía	Elía	Elía Sugar Co.	Cuban Tdg. Co., Hav.	M. J. Amezaga
Estrella	Sierra Morena	Cía. Central Azucarera	M. Gómez 518, Hav.	Domingo León.
Florida	Florida	P. A. Sug. Co. (Atkins)	Obrapia 19, Havana	H. J. B. Baird
Francisco	Sta. Cruz del Sur.	Francisco Sugar Co.	112 Wall St., N. Y.	Leandro J. Rionda
Jagüeyal	Ciego de Avila	Cuba C. S. Corporation	Bárraque Bldg., Hav.	Blas M. España
Jaronu		Am. Sugar Refin. Co.	Amargura 23, Hav.	Antonio G. Mendoza
Jatibonico	Jatibonico	La Compañía Cubana	52 William St., N. Y	C. L. Merriam
Lugareño	Lugareño	Cuba C. S. Corporation	Barraque Bldg., Hav.	José F. Ponce
Morón	Morón	Cuba C. S. Corporation	Barraque Bldg., Hav.	A. Betancourt
Najása	Hatuey	Cía. Az. Najasa	Prado 94, Havana	M. B. de Marchena.
Patria	Morón	C. A. Cen. Patria	Oficios 22, Havana	H. Sanjustiz
Pilar	Gaspar	Cía. Central Azucarera	M. Gómez 518, Hav.	Domingo León.
Punta Alegre	Punta San Juan	P. A. Sug. Co. (Atkins)	Obrapia 19, Havana	L. B. Caldwell
Redencion	Minas	Cía Az. Redencion	Cuba Trading Co., Hav.	J. Mnez. Delmau
Santo Tomás	Ciego de Avila	B. Romanach	Martí 8, Caibarién	Victor Zevallos
Senado, El	Nuevitas	B. Sánchez Adán	Nuevitas	P. Sánchez Batista
Sito	Ca. Az. Cen. Sito	Kil 115 N. C. Ry.	O'Reilly 11, Hav.	Francisco de Sola
Stewart	Stewart	Cuba C. S. Corporation	Barraque Bldg., Hav.	Juan Pérez Ayuela
Violeta	Cerca de Morón	Cuban C. S. Corporation	Barraqué Bldg., Hav.	José G. Rios
Nauyu	Punta Alegre	C. A. Nauyu	Havana	G. Menocal
Santa Cruz	Sta. Cruz del Sur	C. A. Santa Cruz	"	R. Rodriguez
Vertientes	Camaguey	C. A. Vertientes	Cienfuegos	

CUBAN SUGAR MILLS (continued)

NAME	LOCATION	OWNER	ADDRESS	MANAGER
		Pinar del Rio Province		
Francia, La	Los Palacios	Cuban Sug. Mills Corp.	Obispo 59, Havana	J. Adams
Galdo		Manuel Galdo	Galdo Co., Cardenas	Manuel Galdo.
Galope	S. Juan y Martinez	Central Galope S. A.	Cuba 120, Havana	José Maria Herrera
Gerardo	Bahía Honda	Peterson, Barker & Hill	Manz. Góm. 514, Havana	Emilio Núñez.
Lincoln	Artemisa	C. A. Central Lincoln	Aguiar 71, Havana	Manuel Casanova
Mercedes	Mariel	Humberto Balsinde	Aguiar 116, Havana	
Mercedita	Cabañas	Cuban-Amer. S. Co.	Robins Bldg., Havana	E. A. Longa
Orozco	Cabañas	Cía. Az. Nacional	Banco Nac. 403, Hav.	Jose Rodriguez
Pilar, El	Artemisa	Mario G. Menocal	Mercaderes 21, Hav.	Manuel Aspuru
San Ramón	Mariel	Frank J. Peterson	Manz. Gómez 514, Hav.	Manuel Balsinde
Caribe	Taco Taco	C. A. Cen. Caribe		
San Cristobal	San Cristobal	C. A. Cen San Cristobal		
		Havana Province		
Amistad	Güines	C. A. A. Gómez Mena	Manz. Gómez, Havana	Alfonso Gómez Mena
Baby	Arroyo Naranjo	Cuervo & Martiate	Arroyo Naranjo	Cuervo & Martiate
Fajardo	Gabriel	Benito Arxer	B. N. 405, Havana	Benito Arxer
Fortuna	Alquizar	Ferrar, Palmer	Obispo 7, Havana	G. Hernández
Gómez Mena	San Nicolás	Ciá A. Gómez Mena	Manz. Gómez, Havana	José Gómez Mena
Güira Melena	Guira de Melena	Cía. Az. G. de Melena	Empedrado 30, Hav.	José N. Espinosa
Habana	Hoyo Colorado	C. A. Central Havana	Aguiar 74, Havana	R. Montalvo
Hershey	Sta. Cruz del Norte	Hershey Corporation	Manz. Gom 364, Hav.	E. E. Olding
Jobo				
Josefita	Los Palos	S. Calcavecchia.	S. J. de D. 3, Havana	Luis E. Quirós
Julia, La	Durán	Cuba C. S. Corporation	Barraque Bldg., Hav.	Jerónimo Martinto
Mercedita	Melena del Sur	Enrique Pascual	Obrapia 38, Havana	Lesmes Pascual
Nombre de Dios	Güines	C. A. Cen. N. de Dios	Royal Bank 519, Hav.	S. Izquierdo
N. S. del Carmen	Jaruco	Ciá. Az. P. F. Castro	Mercaderes 36, Hav.	P. C. Andreu
Nueva Pax	Los Palos			
Occidente	Quivicán	C. A. Central Occident	B. N. 316, Havana	
Portugalete	San José Lajas	Manuel Otaduy	San Ignacio 72, Hav.	Vicente Goicoechea
Providencia	Güines	Ciá. Az. de Güines	Cuba 76, Havana	A. R. de Blanck
Rosario	Aguacate	**Hershey Corporation**	**Manz. Gom. 364, Havana**	Ramon Pelayo
San Augustin	Quivicán			
San Antonio	Madruga	C. A. A. Gómez Mena	Manz. Gómez, Havana	Manuel Gómez Mena
Toledo	Marianao	Cía. Az. Central Toledo	Mercaderes 21, Hav.	Manuel Aspuru
		Matanzas Province		
Alava	Banagüises	Cuba C. S. Corporation	Barraque Bldg., Hav	Antonio Zubillaga
Araujo	Manguito	Ciá. Az. Cen. Araujo	B. N. 316, Havana	Félix Risech
Armonía	Bolondrón	Central Armonía Co.	Marina 22, Havana	Juan S. Olano
Australia	Jagüey Grande	C. A. Ing. Australia	O'Reilly 11, Havana	Mario Paez
Buenaventura	**Jaguey Grande**	**Cia. Az. Buenaventura**	**Jaguey Grande**	
Carolina	Coliseo	M. Flores Pedroso	Coliseo	F. Fernández
Conchita	Unión de Reyes	Cuba C. S. Corporation	Barraque Bldg., Hav.	Alonso Alzugaray
Cuba	Pedro Betancourt	Cen. Cuba Sugar Co.	Aguacate 110, Hav.	Arturo Bernal
Dolores	Jovellanos	Melchor Gastón	G. y Calzada, Vedado	Aurelio Martinez
Dos Rosas	Cárdenas	Hires Sugar Co.	New York	E. L. Poole
Elena	Ceiba Mocha	Jaen, Oteiza y Hnos	Independencia 80, Mat.	A. Oteiza
España	Perico	José López Rodriguez	Obispo 135, Havana	Alfredo Aldereguía
Esperanza	Calimete	C. A. Cen. Esperanza	Mercaderes 36, Hav.	C. de la Rosa
Feliz	Feliz	Cuba C. S. Corporation	Barraque Bldg., Hav.	Abelardo Padrón
Flora	Guira de Macuriges	Cen. Cuba Sugar Co.	Aguacate 110, Hav.	Antonio M. Ronco
Guipúscoa	Hato Nuevo	Sobrinos de Arocena	Hato Nuevo, Marti	Ramón G. Arocena
Jesús María	Benavides	Mat.-Amer. Sugar Co.	Obispo 7, Havana	Bauduy Laine
Limones	Limonar	José I. Lezama	Empedrado 6, Havana	Socorro Garbayo
Loft	Macagua	George W. Loft	New York	
Luisa	Limonar			
Mercedes	Mercedes	Cuba C. S. Corporation	Barraque Bldg., Hav.	Antonio Carrillo
Por Fuerza	Calimete	La Paz Sugar Co	Reina 105, Havana	Juan Pademonte, Pr.
Porvenir	Cidra	Wenceslao Xagundo	Calimete	Wenceslao Xagundo
Progreso	Cárdenas	Laurentino García	Ap. 42, Cárdenas	M. Bardiales
Puerto	Arcos de Canasí	José Avendaño	Inquisidor 22, Havana	José F. Cartava
Reglita	Perico	José López Rodréguez	Obispo 135, Havana	Séptimo Sardinas
San Cayetano	Cidra			
San Ignacio	Agramonte	**Cia. Az. San Ignacio S.A.**	**Agramonte**	**Victor Mujica**
S. J. Bautista	Arcos de Canasí			
San Vicente	Jovellanos	Cuban Com. &. Ind. Co.	B. N., Havana	Plácido Alonso
Santa Amalia	Coliseo	García, Mdez. Co., L.	Coliseo	Laurentino García
Santa Gertrudis	Banagüises	Cuba C. S. Corporation	Barraque Bldg., Hav.	Francisco Bernal
Santa Rita	Baró	Ciá Az. Caobillas	B. Nac. 405, Havana	Joaquín G. Gumá
Santo Domingo	Unión de Reyes	Cen. Cuba Sugar Co.	Aguacate 110, Havana	Gerardo Gutiérrez
Saratoga	Limonar	Cen. Cuba Sugar Co.	Aguacate 110, Havana	J. Magin Tarafa
Socorro	Pedroso	Cuba C. S. Corporation	Barrague Bldg., Hav.	G. B. Symes
Soledad	Jovellanos	Cuba C. S. Corporation	Barrague Bldg., Hav.	Alfredo Fernández
Tinguaro	Perico	Cuban Amer. Sugar Co.	Robins Bldg., Havana	J. W. Caldwell
Triunfo	Limonar	Hdos. Vda. F. Sotero	Limonar	A. Mesa Prieto
Triunvirato	Cidra			
Unión	Agramonte	Frank J. Peterson	Manz. Gómez 514, Hav.	Ramón Orrantia
		Santa Clara Province		
Adela	Remedios	Zarraga y Ca.	Royal Bank, Havana	Enrique Alvarez
Altamira	Zulueta	Espinosa & Arango	Remedios	José María Espinosa
Andreita	Cruces	Ciá. Az. Andreita	Oficios 22, Havana	
Cabaiguán	Cabaiguán	Ciá. Az. Cabaiguán	Apar. 26, Cabaiguán	C. Rguez. Morini

NAME	LOCATION	OWNER	ADDRESS	MANAGER
		Santa Clara Province (*continued*)		
Caracas	Caracas	A.-C. Estates Corp.	Aguiar 106, Havana	Theodore Brooks
Caridad				
Carmita	Vega Alta	Gerardo Machado	Ap. 2446, Sta. Clara	Angel Pérez López
Cieneguita	Abreus	Cía. Az. Cieneguita	Oficios 22, Havana	Juan Román
Constancia	Constancia	Cuban-Amer. Sugar Co.	Robins Bldg., Havana	Alan B. Bailey
Constancia	Encrucijada	Constancia Sugar Co.	B. Nac. 209, Havana	J. Escobar
Corazón de Jesús	Sagua la Grande	Juan Amezaga y Cía.	Ap. 8, Sagua la Gde.	Ignacio Aguirre
Covadonga	Carreño	S. A. Cen. Covadonga	Mercaderes 36, Hav.	Alejo A. Carreño
Dos Hermanos	Cruces	Dos Hnas. Sugar Co.	Obispo 7, Havana	A. E. Martí
Dos Hermanos	Palmira	Casar Rodrignez Mormi	Acea 95, Cienfuegos	Oscar Berrayarza
El Salvador				
Fe	Salamanca	Central Sugar Corp.	Horter Bldg., Havana	H. A. Herbert
Fidencia	Placetas	C. A. Cen. Fid. D. Leon	M. Gómez 514, Hav.	Francisco Quiñones
Hormiguero	Hormiguero	Hormiguero Sugar Co.	Hormiguero	Elie L. Ponvert
Juraguá	Cienfuegos	Sta. C. Sugar Co., L.	Obispo 5, Havana	S. C. Murray
Julia, La	Taguayabón	Hdos. Hnas. Pester	Taguayabón	R. de Biscuccia
Lequeitio	Lequeitio	Cuba C. S. Corporation	Barraque Bldg., Hav.	A. Gou
Lutgardita	Sagua la Grande	Cía. Az. de Sagua	Royal Bank 408, Hav.	Marcelina García
Macagua	Mata	Hdos. de D. Bethart	Apartado 204, Mata.	Domingo Bethart
Manuelita	Palmira	L. Falla Gutiérrez	Oficios 22, Havana	César Rodríguez
Mapos	Guasimal	Mapos Cen. Sugar Co.	Philadelphia	A. C. Hope
María Antonia	Santo Domingo	Alba y González	Ap. 43, Sagua la Gde.	Ramón Alba
María Victoria	A. de Pasajeros	Cuba C. S. Corporation	Barraque Bldg., Hav.	Mariano Martínez
Naranjal	Fomento	Cía. Az. Naranjal	Fomento	José B. Labrador
Narcisa	Yaguajay	North Amer. Sugar Co.	B. N. 209, Havana	Ricardo Berrayarza
Natividad	Sancti-Spiritus	Sucrs. F. L. del Valle	O'Reilly 11, Havana	Francisco Gómez
Parque Alto	Parque Alto	Parque Alto Sugar Co.	B. N. 209, Havana	A. Suàrez Villar
Pastora	S. J. de los Yeras	Cen Pastora S.A.	Compostela 65, Hav.	Julio Martinello
Patricio	Encrucijada	C. A. Cen. Patricio	Ap. 582, Cienfuegos	Domingo Nazabal
Perseverancia	Perseverancia	Cuba C. S. Corporation	Barraque Bldg., Hav.	Edgar Garnett
Portugalete	Palmira	Hdos. de Escarsa	Ap. 210, Cienfuegos	Sotera F. Escarza
Purio	Calabazar	Hdos. de Oña	Sagua la Grande	Rogelio Tomasino
Ramona	Rancho Velóz	Domingo León	M. Gómez 514, Hav.	José Galbán
Reforma	Caibarién	C. A. Cen Reforma	M. Gómez 401, Hav.	José H. Martínez
Resolución	Carahatas	Rodda y Molina	Sagua la Grande	José Rodda
Resulta	Sagua la Grande	Juan de Dios Oña	Ap. 65, Sagua La Gde	P. Reyes
Rosalía	Taguayabón	Central Rosalia, S. A.	Ariosa 23, Caibarien	S. E. García
Rosa María	Mayajigua	P. A. Suárez Cordoves	Mayajigua	P. A. Sufirez Córdove
San Agústín	Lajas	Nicolás Castaño	Cienfuegos	Dr. Betancourt
San Agústín	Remedios	Atkins & Co..	Obrapia 19, Havana	Gabriel Montaner
San Antonio	Santa Clara	Vicente G. Abreu	Ap. 2489, Sta. Clara	Vicente G. Abreu
San Cristóbal	Seibabo	Salvador Calcavechia	S. J. de Dios 3, Hav.	E. Cardoso
San Francisco	Cruces	Cia. Az. de Sagua	San Ignacio 50, Hav.	Rafael F. Guardado
San Isidro	Quem. de Güines	C. A. de Sagua.	Royal Bank 408, Hav.	Mario de la Vega
San José	Placetas	Hnos. Goicoechea	O'Reilly 11, Hav.	Ezequiel Zubillaga
San Lino	Rodas	Domingo Ramirez Pardon	Cienfuegos	Leopoldo Suero
San Pablo	Zulueta	Compañia Cubana	Zulueta	José Iglesias
San Pedro				
Santa Catalina	Cruces	Artime Díaz & Co.	Cienfuegos	Ricardo Díaz
Santa Lutgarda	Mata	José M. López	Mata	Antonio G. Solís
Santa María	Ranchuelo	Esteban Cacicedo	Cienfuegos	Esteban Cacicedo
Santa Rosa	Ranchuelo	Cia. Az. de Sagua	Ranchuelo	Marcelino Garcia
Santa Teresa	Sitiecito	Cia. Az. Santa Teresa	Sagua la Grande	M. J. Mola
~~Stma. Trinidad~~	Ajuria			
Soledad	Cienfuegos	Sol. Sug. Co. (Atkins)	Obrapia 19, Havana	F. L. Hughes
Trinidad	Trinidad	P. A. Sug. Co. (Atkins)	Obrapia 19, Havana	Wm. G. Pullum
Tuinicú	Tuinicú	Tuinicú Sugar Co.	112 Wall St. N. Y.	José V. Rionda
Ulacia	Rodrigo	Ulacia Hnos.	Rodrigo	Juan Ulacia
Unidad	Cifuentes	Cuban-Amer. Sugar Co.	Robins Bldg., Havana	R. McCulloch
Vega, La	Guayos	La Vega Sugar Co.	Royal Bank, Havana	Isaías Cartaya
Vitoria	Yaguajay	Vda. Ruiz de Gámiz	Cuba 138, Havana	Marcos Larralde
Washington	Hatuey	Washington Sugar Co.	112 Wall St., N. Y.	Carlos Arche
Zaza	Placetas	Viuda Zulueta y Gámiz	Cuba 20, Havana	Martín Ormaeche
Santa Isabel	Formento	Martinez, Lopez y Co.	Formento	

Principal Manufacturers of Equipment Used in Sugar Houses

Belting, Leather
Cook, H. N., Belting Co., San Francisco.

Belting, Centrifugal
Cook, H. N., Belting Co., San Francisco.

Beet Knives
Du Vivier, E. H., New York City.
Disston & Sons, Philadelphia.

Beet Root Separators
Sugar Machinery Co., Los Angeles.

Beet Seeds
Freeman, Allen G., San Francisco.
Pettit, Marshall & Co.,Inc., New York City.

Beet Slicers
Du Vivier, E. H., New York City.
Sugar Machinery Co., Los Angeles.

Beet Sugar Machinery
Dyer Co., Cleveland, Ohio.
Kilby Mfg. Co., Cleveland, Ohio.
Sugar Machinery Co., Los Angeles.

Centrifugals
American Tool & M. Co., Boston, Mass.
Cresson-Morris Co., Philadelphia, Pa.
Hepworth, S. S. Co., New York City.
Wayte, J. J., Inc., New York City (Agents).

Centrifugal Dischargers
American Tool & Mach. Co., Boston, Mass.
Hepworth, S. S. Co., New York City.
Sugar Machinery Co., Los Angeles

Conveyors
Hill Clutch Co., Cleveland, O.

Equipment for Sugar Mills
Dyer Co., Cleveland, Ohio.
Kilby Mfg. Co., Cleveland, Ohio.
Sugar Machinery Co., Los Angeles.
Von Phul, Gilbert D., New Orleans, La.

Engineering Companies
Dyer & Co., Cleveland, Ohio.
Cannon & Swenson Co., Chicago, Ill.
Kilby Mfg. Co., Cleveland, Ohio
Schwarz Engineering Co., Denver, Colo.
Stewart, Jas., & Co., Salt Lake City, Utah.
Sugar Machinery Co., Los Angeles.

Evaporators
Baeuerle & Morris, Philadelphia, Pa.
Dyer Co., Cleveland, Ohio.
Oat, Jos. & Sons, Philadelphia, Pa.
Sugar Machinery Co., Los Angeles, Cal.
U. S. C. I. Pipe & Fdy. Co., Philadelphia, Pa.

Fraising Machines
Kilby Mfg. Co., Cleveland, Ohio
Sugar Machinery Co., Los Angeles, Cal.

Juice Heaters
Baeuerle & Morris, Philadelphia, Pa.
Kilby Mfg. Co., Cleveland, Ohio
Ogden Iron Works, Ogden, Utah
Sugar Machinery Co., Los Angeles.
Stearns-Roger Mfg. Co., Denver, Colo.

Packing
N. Y. Bltg. & Pkg. Co., New York City.
Squires & Co., San Francisco, Cal.
Cook, H. N., Belting Co., San Francisco.
U. S. Cast Iron Pipe & Fdy. Co Philadelphia.

Pipe
Crane Co., Chicago, Ill.
U. S. Cast Iron Pipe & Fdy. Co Philadelphia.

Pulverizing Machinery
Raymond Bros. Co., Chicago, Ill
U. S. Cast Iron Pipe & Fdy. Co., Philadelphia.

Pumps
Ingersoll-Rand Co., New York, N. Y.

Pulp Dryers
Stearns-Roger Mfg. Co., Denver, Colo.

Roller Mills
Raymond Bros. Co., Chicago, Ill.

Screens
Mundt & Sons, Jersey City, N. J.
Tyler Co., Cleveland, Ohio.

Steffens House Machinery
Dyer Co., Cleveland, Ohio.
Raymond Bros. Co., Chicago, Ill.
Faget Engineering Co., San Francisco.
Sugar Machinery Co., Los Angeles.

Sugar Sprays
Stearns Roger Co., Denver, Colo.
American Tool & Mach. Co., Boston.
Sugar Machinery Co., Los Angeles.

Tanks, Carbonation, Beet Washers, Etc.
Baeuerle & Morris, Philadelphia, Pa.
Bay City Iron Works, Bay City, Mich.
Stearns-Roger Co., Denver, Colo.
Sugar Machinery Co., Los Angeles.

Thermometers
Taylor Instruments Co., Rochester, N. Y.

Vacuum Pans
Baeuerle & Morris, Philadelphia, Pa.
Oat, Jos. & Sons, Philadelphia, Pa.
Sugar Machinery Co., Los Angeles.

Washing Machines, Filter Cloth
Clenzall Machines Co., St. Louis, Mo.

Wheels, Beet Lifting
Dyer Co., Cleveland, Ohio.
Sugar Machinery Co., Los Angeles.

NOTE

Catalogues issued free by the above mentioned concerns give very interesting illustrated descriptions of machinery and equipment used in sugar manufacture, and are accordingly very helpful to the sugar student.

FACTS ABOUT SUGAR

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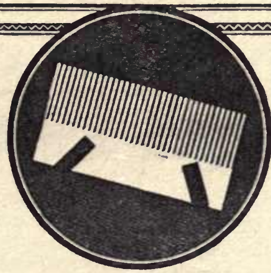
ALL THE NEWS OF THE SUGAR WORLD

PUBLISHED WEEKLY



THE DISSTON FACTORY—SIXTY-ONE ACRES—SIXTY-EIGHT BUILDINGS

MODERN BEET SUGAR FACTORY
S M C JUICE HEATER
MODERN CANE SUGAR FACTORY
S M C BEET LOADING STATION
S M C CANE HOIST
S M C TRASH CATCHER
S M C CANE MILL
CABLE SUMCOLA
SAILER BEET ROOT SEPARATOR
S M C EVAPORATORS
Sugar Machinery Company
Engineers and Manufacturers
Los Angeles, California
U·S·A
S M C FRAISING MACHINE
S M C VACUUM PAN
BINKLEY SLICER
S M C AUTOMATIC SPRAY
CENTRIFUGALS AND S M C DISCHARGERS