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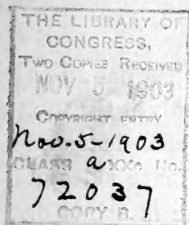
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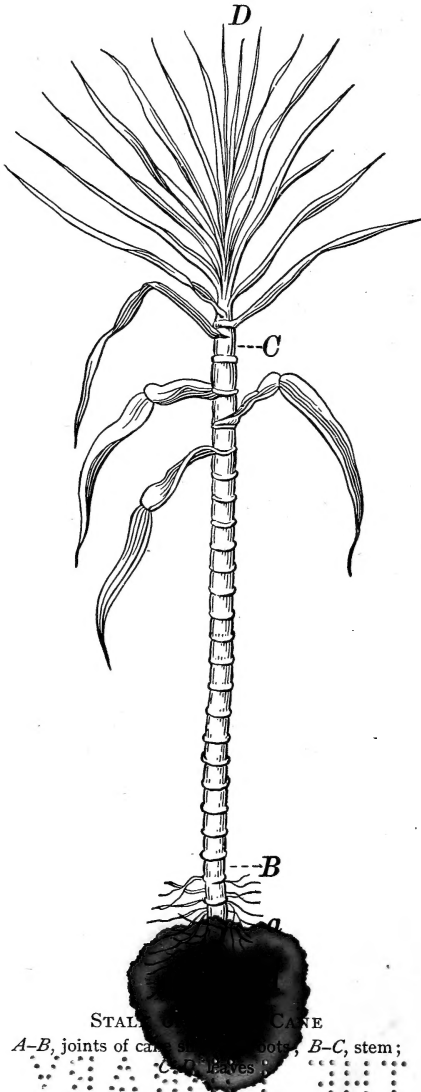
SUGAR CANE

By ^{William} W. C. STUBBS

Director of Louisiana Sugar Experiment Station

Sugar cane was introduced into Louisiana by the Jesuits in 1757, began to be extensively cultivated in 1795, and since that time it has been the chief crop of south Louisiana. It is cultivated along the entire Gulf and South Atlantic coasts. In Mississippi, Alabama, Florida, Georgia, South Carolina, north Louisiana, and north Texas it is manufactured into syrup, while in south Louisiana and south Texas it is converted into sugar and molasses.

Description of Sugar Cane. Sugar cane is a gigantic grass with fibrous roots which reach laterally in every direction. The stalk is a cylinder, varying in diameter from one to two inches, with nodes and internodes (joints), the latter varying in length from two to even six inches. These stalks vary greatly in color, running through white, yellow, green, red, purple, black, and even striped with two or more of these colors. The leaves, grown on alternate sides of the stalk, are clasping at first, but gradually ripen and fall off as the cane matures. In some varieties the lower part of the leaves (sheath) is covered with minute prickles, which sometimes pain the hands of the cane cutters. The joints mature and roots up, and as each ripens it casts its leaf; when ready for

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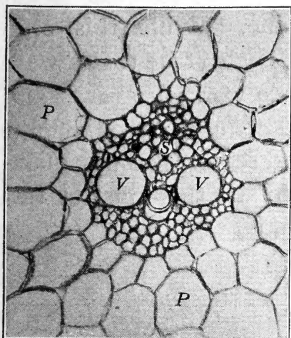
the harvest has a few leaves only at the top. Under each leaf and on alternate sides of the cane is a bud or eye from which the cane is usually propagated. A close examination of the "eye" will reveal rows of "dots," each marking the place from which a root will sprout when the cane is placed in a moist soil.

In tropical countries the sugar cane at maturity sometimes "flowers" or "tassels." These tassels are panicles of silken spikes on large peduncles, resembling very much a plume of pampas grass. Very few of the seeds produced are fertile. This is due doubtless to the fact that the cane

STALK OF SUGAR CANE
A-B, joints of cane showing roots; B-C, stem;
C-D, leaves



has been so long propagated from cuttings ("eyes") that the flowers have lost vigor. The sugar is found in solution in the large pith cells of the cane. At maturity the cane, after being stripped of leaves and topped, is cut at the ground with a cane knife or machete.



CROSS SECTION OF CANE MAGNIFIED ABOUT 200 TIMES

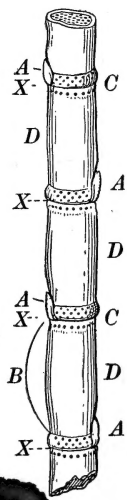
P, pith cells; *V*, vessels; *S*, sieve tubes

tor, where suitable soil and an abundant water supply (either by rainfall or irrigation) can be obtained. Actual cultivation now extends from Spain, 37° north, to New Zealand, 37° south, on both sides of the equator.

Cane requires an enormous amount of water for its best development, and where the rainfall is deficient, irrigation is practiced — often with wonderful

results, as in Hawaii, where on one estate over eleven tons of sugar per acre have been produced. It has been found in practice that from

Where grown. Formerly it was thought that sugar cane could be grown only in tropical islands, but it has now been shown that it will grow anywhere between 30° and 35° north or south of the equator.



SUGAR CANE
A, eyes; *B*, joint; *C*, nodes; *D*, internodes; *X*, semitransparent dots in rows.

seventy-five to one hundred and one gallons of water are required to make a pound of sugar, and that a rainfall of two inches every week during the cane's growth will produce the largest yields of cane. While this crop requires an abundance of water, it is also true that a well-drained soil is absolutely essential to vigorous growth and to large, matured canes. This is easily understood when it is learned that cane, like all grasses, requires a large quantity of nitrogen for perfect growth, and this must be fur-



CUTTING SUGAR CANE

nished usually by the soil. Only well-aërated, moderately moist soils furnish the conditions which render the nitrogen of the soil available ; hence on every estate the lands should be well drained either by open ditches or tiles.

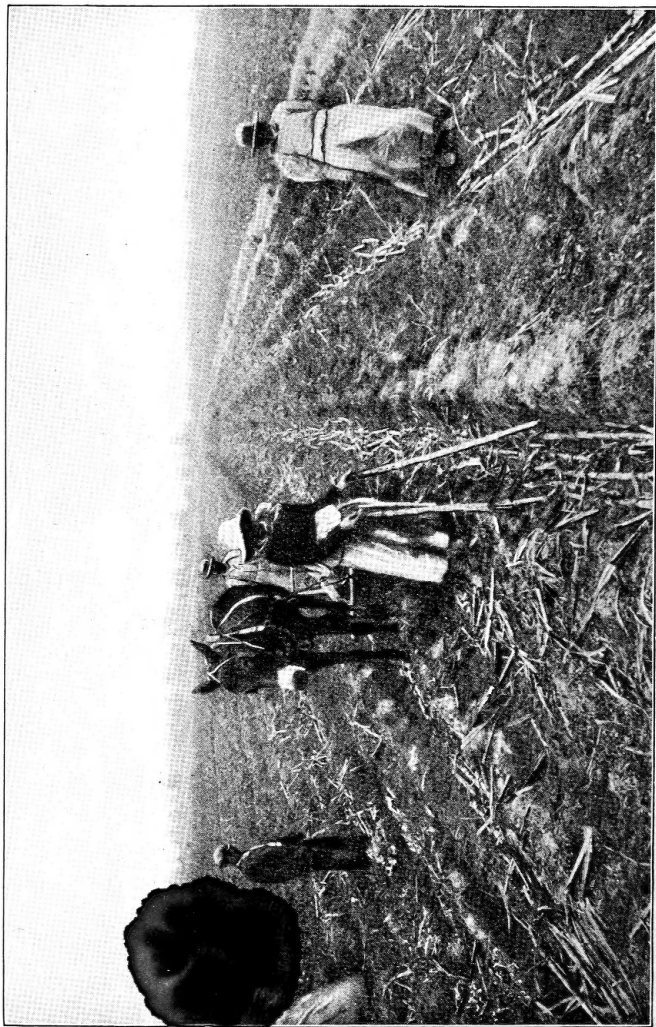
There is a large number of varieties of cane, but the kinds usually raised in the South are the purple, purple-striped or ribbed, and the green. Recently there have been distributed several varieties of "seedlings," which are

now being tried throughout the cane belt. Reference has already been made to the large number of infertile seed in every cane tassel. By extreme care a few of the fertile seeds can be made to germinate. After germination every plant varies greatly from its parents and from the plants grown with it. Therefore each plant is carried to maturity and then tested, and if found of merit is propagated in the usual way by planting the stalk. In this way a number of promising "seedlings" have been given to the world.



A FIELD OF CANE PROSTRATED BY WIND

Soils for Cane. The soils best adapted to canes are, broadly speaking, those which contain the largest amount of fertilizing material and which have a large water-holding capacity. In south Louisiana alluvial loams and loamy clays are cultivated, while in Alabama, and Florida light, sandy soils, when properly fertilized and cultivated, produce fine crops. Soils of low holding water and fertilizers can frequently be profitably cultivated by



PLANTING CANE

artificially supplying these essential factors of heavy cane growing.

Cane is usually planted in five to six foot rows. A trench is opened in the center of the row with a plow, and in this open furrow is deposited a continuous line of stalks, which are carefully covered with plow, cultivator, or hoes. From one to three continuous stalks are placed side by side in the furrow, thus requiring from two to six tons of cane for an acre. In a favorable season this cane soon sprouts and then cultivation begins. Each young sprout, like all grasses, suckers vigorously and soon the entire row is filled with cane.

The cultivation best adapted to corn will meet all the requirements of cane. It should be cultivated at short intervals until "laid by," which should occur when the cane is large enough to shade the soil.

In Louisiana large quantities of tankage, cotton-seed meal, and acid phosphate are used to fertilize the cane crop, the quantity used per acre varying from four hundred to seven hundred pounds.

In Louisiana one planting of cane usually gives two crops, the first is called "plant cane" and the second "first-year stubble" or "ratoon." Sometimes second-year stubbles are grown.

In tropical countries the cane produces crops for many years, sometimes for as many as fifteen or twenty years. It is extremely doubtful, however, whether it pays to carry stubbles so long.

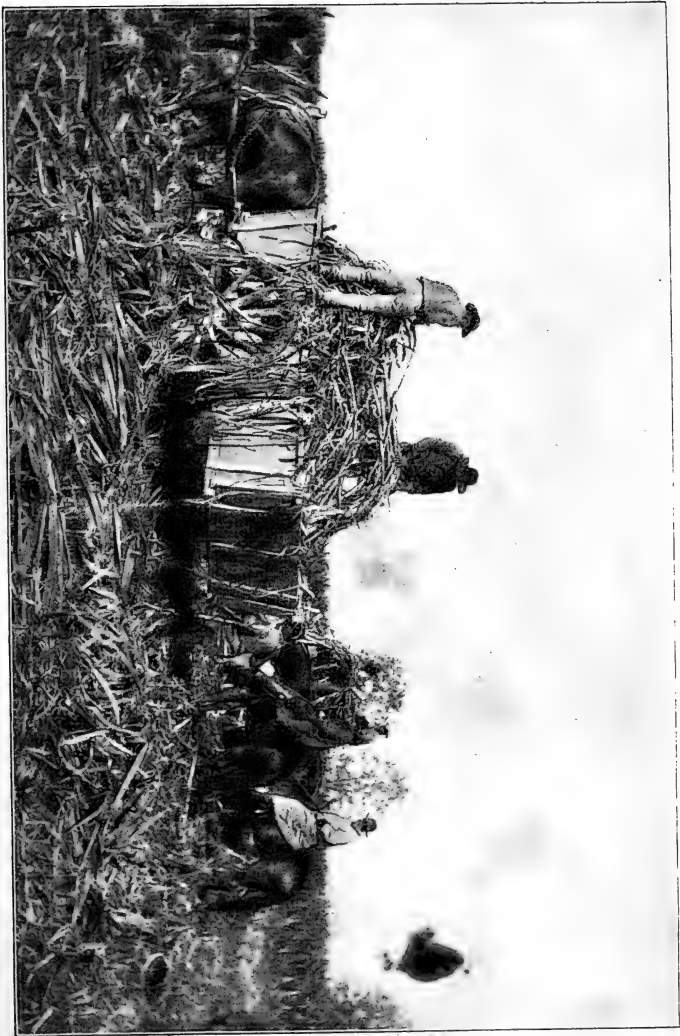
In Louisiana canes are planted from October to April, some preferring fall, others spring planting. Every country has its season for planting and harvesting.

In the United States the cane is harvested annually, because of the frost of our winters, while in tropical countries it is permitted to grow from fifteen to twenty-four months before harvest.

It is necessary in the United States to save seed from the fall harvest for the next crop. Sometimes the cane is planted in the fall as soon as it is cut, and covered deep to exclude the frost. Oftener, however, it has to be preserved through the winter for spring planting. This is done either in horizontal or vertical mats, or by throwing the cane into the middles between the rows and covering with dirt by means of large plows.

The juice of the cane varies in different countries, and even upon different soils and in different seasons. In some countries it may contain as high as twenty per cent of sugar and with very little other matter present, making it easy to work. In Louisiana the juice varies from eleven per cent to fourteen per cent, with two per cent to three per cent of impurities present. Upon the sandy soils of Georgia, Florida, and Alabama the sugar content is higher, often reaching sixteen per cent, with of course a diminution of impurities. The yield of cane per acre in tons is also a variable quantity, depending upon country, season, and soil. Over one hundred tons per acre have been grown in Hawaii, and sixty tons in Louisiana, but the average is much below these figures. In Louisiana an average of twenty to thirty tons per acre on a large estate is considered a fair yield. Upon the sandy lands of the coasts fifteen to twenty tons per acre are good yields.

Making of Syrup, Sugar, and Molasses. A small mill, propelled by horses, for crushing the cane, and a kettle or



LOADING CANE

pan for evaporating the juice, constitute the outfit for making syrup. This equipment is very cheap and can be easily operated by a small family. While these small mills rarely extract more than one half of the juice in the cane, the syrup made by them is exceedingly palatable and usually commands a good price in our markets.

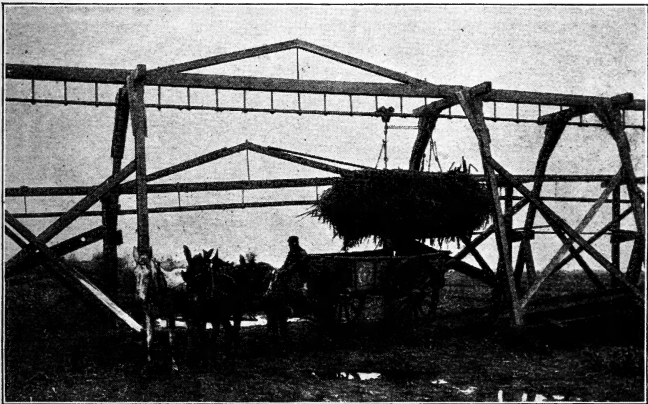
In our large sugar houses nine-roller mills, with a crusher in front, clarifiers, evaporators, multiple effects, vacuum pans, centrifugals, pumps, filter presses, boilers



A COMMON TYPE OF SYRUP FACTORY

and engines, tanks and cars, are found. A modern, up-to-date sugar house, capable of handling from five hundred to one thousand tons of sugar cane, will cost from one

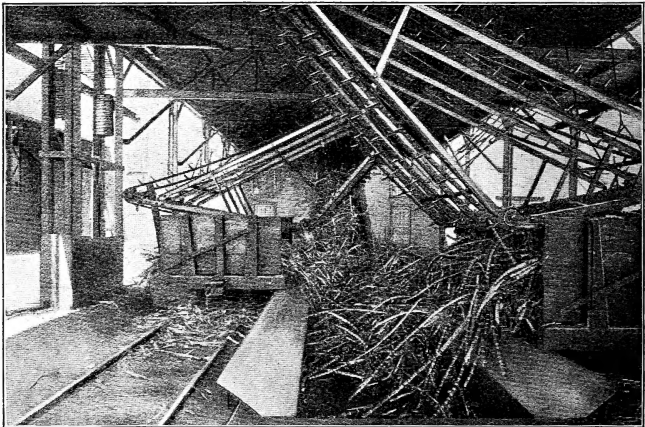
hundred thousand to two hundred and fifty thousand dollars, and a large number of both skilled and unskilled laborers is required to operate it. Such a mill as the above will extract from seventy-five to eighty pounds of juice from every one hundred pounds of cane. The refuse left after the juice is extracted is called "bagasse"



TRANSFERRING CANE FROM WAGON TO TROLLEY

or "megass," and can be used as fuel under the boilers, or made into wrapping paper. The juice is usually treated with sulphur and lime, and then boiled. This treatment brings to the surface a heavy blanket of scums, which is removed and, with the settlings, sent through the filter press, where the juice is extracted and the solid matter (cake) retained in the press. This clarified juice is now evaporated into syrup, either in open vessels or in multiple effects. The syrup is now drawn into the vacuum pan, where it is cooked to grain at a high vacuum and a low

temperature. This mixture of sugar and molasses (called *masse cuite*) is drawn into a centrifugal machine with perforated wire gauze sides placed within a solid iron vessel. By a rapid rotation of this machine, the liquid molasses is thrown through the wire gauze into the outer vessel, while the sugar is retained in the centrifugal. By using water or other washes, any grade of sugar may be



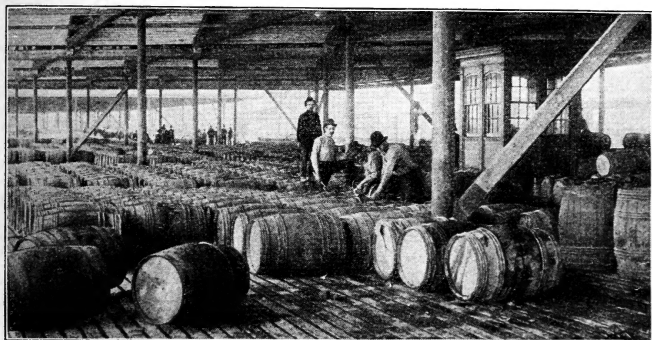
MACHINE FOR TRANSFERRING CANE FROM CARS TO CARRIER

made. By again cooking the molasses separated from the first sugar, second sugar, usually termed "seconds," may be obtained. The molasses from the second sugar may be made to yield third sugar, or "thirds."

There are a few open-kettle sugar houses left in Louisiana. These differ from the above in that the syrup is cooked directly in open pans or kettles to a heavy density and placed in vessels (called coolers) to crystallize. In a few days this crystallized mass may be either potted

in hogsheads or run through a centrifugal machine as described above. Open-kettle sugar and molasses are thus obtained, the latter fetching a high price on account of its delicious flavor and agreeable aroma.

Write to the Louisiana Sugar Experiment Station, Audubon Park, New Orleans, Louisiana, for bulletins on sugar cane.



SUGAR SHED IN NEW ORLEANS

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