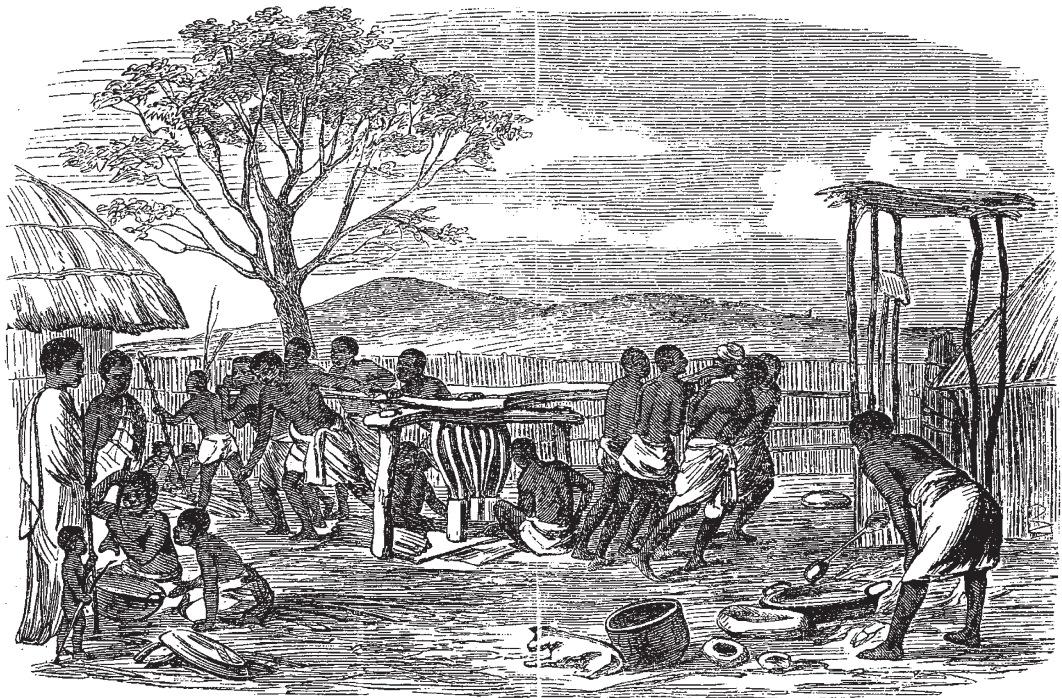


SUGAR

IN considering the subject of sugar, its produce, supply, uses, and adulteration, we enter upon a much wider field of inquiry than in either of our former articles, though the present has an intimate connection with our previous subjects; for neither coffee, tea, nor cocoa is usually considered properly prepared for table without the addition of sugar; it is used more or less in every part of the globe, for in the widest sense of the word, sugar is contained in most vegetable juices, indeed it is the principal food of young plants. In the rising sap of some trees in spring it is very abundant, as well as in the young stems of grasses. The starch stored up in many seeds at the time of germination is converted into sugar. The process of malting consists in forcing the seeds of the barley to germinate, and just at the time when most sugar is found, to stop their growth, so that the sugar is pre-

served for our use and not consumed by the growing plants. Sugar is extracted for the use of man from many distinct plants. Chemically considered, there are two kinds of sugar; one called cane sugar, which is obtained from the sugar-cane, the beet-root, the maple, &c.; the other called grape sugar, or glucose, which is chiefly found in grapes and various fruits. The bulk of the sugar used in this country is the juice of the sugar-cane (*Saccharum officinarum*, and perhaps allied species), a gigantic perennial grass, growing usually ten or twelve feet high, but in some situations attaining fifteen or sixteen feet; it has a jointed stem, somewhat similar to that of the bamboo, the upper part having a series of long, narrow leaves, and the flowers produced in large, feathery panicles. Some doubt exists as to the true native country of the sugar-cane, though it is not at all improbable that it came from Southern China and India. The plant is now very extensively cultivated in the East and West Indies, China, the Mauritius, S. America, and other parts.

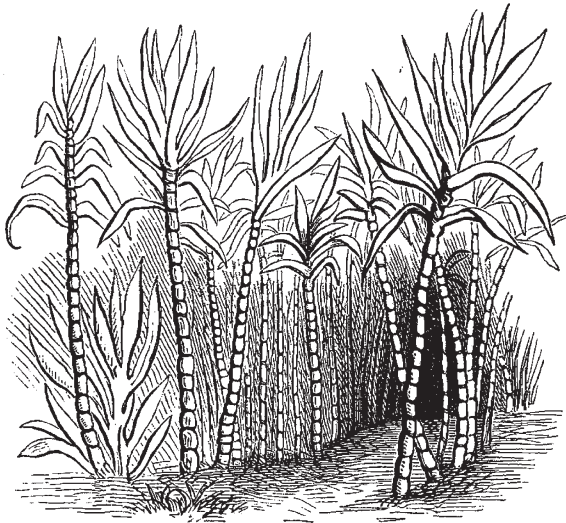


SUGAR MANUFACTURE AT KATIPO, A VILLAGE IN EASTERN TROPICAL AFRICA

The use of sugar dates back to a remote age; its introduction into Europe is said to have taken place in the 9th century, when it was brought from the East into Sicily by the Saracens, and the first European plantations were established about 200 years later in Sicily and Valentia. In the early part of the 15th century its cultivation began in Madeira, the Canary Islands, Granada, &c.; and at the close of the same century Columbus introduced it into one of the West Indian Islands. Barbadoes sent large quantities of sugar into England so long ago as 1646. The sugar-cane does not ripen its seeds, and is, therefore, propagated by cuttings. The canes after planting require, according to the situation and soil in which they are grown, from ten to twelve, or even twenty months before they are ready for cutting; they are taken off near the base, and the stem is then divided into equal lengths, put up into bundles, and carried to the mill. These lengths are submitted to pressure be-

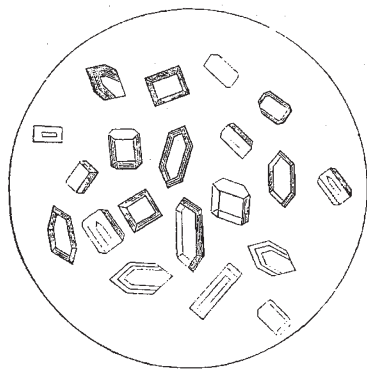
tween heavy rollers, by which the saccharine juice is squeezed out, and is collected in a cistern; it is next filtered and clarified, and the feculent matters separated by lime, a rapid system of boiling now throws off the watery particles by evaporation; and the sugar is brought to such a thickness or consistency that after boiling in one pan, its bulk is so reduced that it is removed to a smaller or medium sized pan, where it is boiled again and skimmed until it is reduced to sufficient bulk and thickness to enable it to undergo a similar operation in the next, or smallest size pan, where it is again boiled till it has assumed the consistency of a thick syrup, which partially granulates upon cooling. It is, however, still in the form of a soft mass, the crystallised portion being imbedded in a thick juice, which is known as molasses. To remove this the whole mass is put into loosely made casks or hogsheads, through which the molasses drains, leaving the crystallised portion more or less dry. After

being kept a few weeks, during which time molasses continues to drain from it, it is packed in bags or hogsheads, and is ready for shipment. In this state it is known as raw, brown, or Muscovado sugar. The process of extracting and preparing the juice for export is not exactly similar in all countries; though the principle is the same, the practice varies according to the amount of intelligence brought to bear upon it.



FIELD OF SUGAR CANE

The drawing on the opposite page, which has been copied by permission of Mr. T. Baines from one of his paintings in the Kew Museum, represents the whole process of sugar making at a village in Eastern Tropical Africa. Under the tree, in the left-hand corner, is a native cutting the cane into lengths, and others collecting them into bundles which are afterwards passed between the rollers of the press, as seen in the centre of the picture. Boiling and crystallisation are shown in the right and left hand corners respectively.



SUGAR CRYSTALS MAGNIFIED

The quantity of saccharine matter contained in the cane varies according to the nature of the soil, climate, or other conditions under which the plants are grown. An acre of land under sugar cultivation may yield from one up to four tons of sugar, and from each ton of sugar after the first process of crystallisation somewhere about seventy gallons of molasses will drain; so that when we consider the labour required to keep a sugar plantation in full working order, such as tending the plants, expressing the juice, evaporation, crystallisation, and the subsequent waste both of sugar and molasses, as well in the draining

on the voyage home, as during the time of its storage in the docks, and above all, the duty demanded upon sugar by the British Government, it does seem rather surprising that the article can be retailed at the price it is, though many are apt to call out that it is not so cheap as it ought to be. Sugar in its most common use cannot now be considered a luxury; to rich and poor alike it has become a necessity, indeed, amongst the lower classes a larger proportion is consumed than amongst the middle and upper section of the community, the average annual consumption per head of the whole population of the United Kingdom being about forty pounds. The East and West Indies, Mauritius, and Brazil now supply the bulk of the sugar brought into the English Market. It is imported in hogsheads and bags, the latter vary much in size and the sugar is also of various qualities, some of it indeed as it arrives has much the appearance of black muddy gravel or sand; most of this undergoes a further process of purification and recrystallisation in our own sugar refineries, which abound at the East end of London, as well as at Greenock, Glasgow, Liverpool, and Manchester. From these refineries the sugar comes out in the forms known in trade as lump or loaf sugar, crushed lump, pieces, and bastards.

The quantity of unrefined sugar entered for home consumption during the year 1869 was 11,188,081 cwts., and this exclusive of 1,025,929 cwts. of refined sugar and sugar candy, and 741,771 cwts. of molasses. The sugars best known in the British grocery trade are Demerara, Berbice, Barbadoes, Porto Rico, and Mauritius. These are sufficiently refined and crystallised in the colonies producing them as to suit the requirements of the retail trade. Those from Antigua, Cuba, Madras, Penang, &c., usually find their way into the hands of the refiners, brewers, and confectioners. Molasses is, as we have before said, the drainings from raw cane sugar. It is used for many purposes; large quantities of rum are distilled from it, often on the plantation where the sugar is produced; and where it is not so used it is exported, the sugar refiners in England buy it up largely, and produce a quantity of crystallised sugar from it. Rum, however, is usually made from the skimmings taken from the last boiling of sugar, which are mixed with proportionate quantities of molasses and water. Though molasses and treacle are often spoken of as identical, they appear to be different in their origin, for while the former is the drainings of raw sugar, the latter is the drainings of refined sugar. We have hitherto spoken only of cane sugar, or, to speak more correctly, of that obtained from the sugar-cane, but a large portion, indeed the bulk, of the sugar used on the Continent, is obtained from the beet-root (*Beta vulgaris*), the manufacture of which forms a separate article of industry.

JOHN R. JACKSON

NOTES

INTELLIGENCE has been received of an accident which occurred to H.M.S. *Psyche*, carrying the Sicilian section of the Eclipse Expedition from Naples to Catania; but, we are happy to announce, without injury to any of the passengers or crew, or loss of any of the instruments. The following are all the telegrams to hand at the moment of going to press:—“The *Psyche*, with the Eclipse Expedition on board, has struck on a sunken rock near Catania. All hands have been saved, and also the scientific instruments. The captain, who has behaved most nobly, is still on board, and, with a view to save the ship, has telegraphed to Malta for assistance.” The following telegram has been received at the Admiralty:—“*Psyche* has struck, while running by chart, on a sunken rock near Catania. All saved. Instruments sent into Catania. Commander Fellowes has acted nobly, and hopes to save ship, if assistance comes at once from Malta, where he has telegraphed. *Royal Oak* sent for.” We may congratulate ourselves that the