

the juice of the cane, but not so. It is found also in Sorghum, a plant native to India, and now cultivated in the United States and in the south western counties of Ontario, near Lake Erie; in certain palms, such as the coconut, and the wild-date palm; in some kinds of grasses; in the green stalks of corn; in the Maple; and in quite large quantities in the sugar beet. Maple sugar, on account of its unique and agreeable flavor, is now eaten chiefly as a luxury. This sugar, when freed from the color and flavor derived from the Maple, is identical in composition with that derived from the sugar cane. Most boys and girls in Ontario, especially those who live in the country, are familiar with the Maple, and the process by which sugar is obtained from it; but why the sap runs from the Maple is not so well understood by the majority.

During the summer, the Maple is clothed with green leaves, which, through small openings on their underside, give off the excess of moisture taken up by the roots. Before the water is given off, the food which is held in solution is removed from it. This food goes to form a new growth of wood in the tree. In the autumn, the leaves of the Maple fall; and through the winter, the tree stands bare and does not grow. In spring, if the Maple is bruised or cut in any way, we notice that the tree "bleeds," or, in other words, "the sap runs." We have also noticed that the "bleeding" of the Maple occurs at different times of the year. The sap will run from the Maple before growth has begun, and just as it is beginning. In the two cases, the cause of the run of sap is quite different. We find a good example of both kinds of bleeding in the gathering of sap by the sugar maker. Sap is first gathered when the ground is still frozen, and the roots are therefore almost, or quite, unable to absorb any water; but, at the same time, the air is warmed through the middle of the day by the increased heat of the sun. At this season, the flowing of the sap from holes or cuts made in the trunk of the Maple is due to the expansion by heat of the air inside the smaller branches and twigs of the tree. This sets up at once a pressure upon the sap, and this pressure extends to all parts of the tree. The sap with which the Maple is filled, is thereby forced out as soon as an opening is made for its escape. Later in the season, as the frost disappears, the roots begin to absorb water. This absorption process sets up a pressure within the tree, by reason of which



Fig. 79. Keys of the Maple separate. During germination a radicle is sent out which endeavors to obtain a hold in the soil.

the water is forced out of the same opening. "Bleeding," or the flow of sap, from this last mentioned cause, continues until the leaves are sufficiently expanded to throw off the water absorbed by the roots. The other source from which we in Canada obtain cane-sugar, is the