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BOTANICAL DEPARTMENT

Branches of Sugar Maple and Beech as
Seen in Winter

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This is the fifth of a series of bulletins on elementary science, published at the Agricultural College. While they are prepared especially with the view of helping teachers in the common schools, they should interest every enterprising farmer and horticulturist, or any other wide-awake citizen. Enquiries for bulletins or information regarding this work should be addressed to

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The following bulletins of this series have been published:

- 1. Observing and Comparing Beans and Peas Before and After Sprouting.*
- 2. Study of Wheat and Buckwheat Before and After Sprouting.*
- 3. A Study of the Seeds of Timothy and Red Clover Before and After Sprouting.*
- 4. Observations on the Leaves of Clovers at Different Times of Day.*

BRANCHES OF SUGAR MAPLE AND BEECH AS SEEN IN WINTER.

Some persons think the only way to teach botany in winter is to give out lessons from a book and expect the pupils to learn something from text and pictures. True, we cannot collect roses from a Michigan garden in January, nor maple blossoms in February, but our trees and shrubs in their winter garb furnish excellent lessons to profitably employ pupils for many weeks of winter, and this all comes within the scope of botany, just as much as though we examined flowers in spring or summer.

Let each member of a class be supplied with a branch, a foot or two long, from a sugar maple, and then spend some ten to twenty minutes or more quietly looking at the buds and bark with its scars and specks, and then tell what he has discovered, venturing to explain the object or meaning of some of the things he has seen. In a similar manner let each look over a branch of beech and then point out the difference between the two kinds. After some earnest efforts in this direction and questions have been asked by the teacher, free use may be made of the following illustrations and suggestions.

The upper bud of a branch of maple contains a young stem and leaves ready to continue the main stem, while the buds along the side are the beginning of new branches. The upper or outer portion of each branch is nearly smooth and light brown in color, and scattered over the surface and slightly raised above it are numerous specks (lenticels) of a gray color, each having a little crack in the middle. Some of these specks are circular in outline, but most of them are much longer than broad, and extend up and down the branch. A little distance below the tip of the branch the bark is somewhat cracked, roughened and of a gray color, and the specks are wider, but no longer than those seen on the upper portion.

Opening buds of trees may be obtained at any time during the winter by placing the lower end of the stem in water for a week or two while in the school room. It will be seen in Fig. 45 that most of the bud scales have lengthened considerably; the light portion in the illustration representing the new growth, while the dark tips represent the portion of the scales exposed during winter.

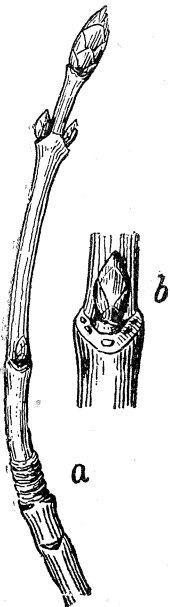


Fig 44. a. Short branch of sugar maple in winter bearing along the sides at certain places, two buds standing opposite each other, and at the end of the branch is a single large bud. b. Bud and leaf scar enlarged.

Three to five scales are in line one above the other, overlapping much like shingles on a roof, and there are four such vertical rows up and down, making the outside of the bud. The scales of any one of these rows break joints or interlock with the adjoining scales in other rows. The central portion of the figure at the top represents the young leaves, while at the base there is a bud on either side. On removing the scales we find the outer or lower ones the shortest, and inside of all are some tiny leaves packed closely together and covered with fine, soft hairs. The dry, firm texture of bud scales enables them to shed water and protect the delicate parts within. These scales, where broken off near each other, leave a number of delicate ridges or scars which we can see to better advantage by looking down the branch a little, until we find them represented as shown in *a*, Fig. 44.



Fig. 45.
An opening bud
as it appeared
early in May.

Each bud at the end of a branch leaves a set of these scars every spring, and by this means we are able to determine the age of the branch from a certain point. These scars left by the bud scales of branches record to a certain extent the life history of the tree. The bark of small, slow-growing branches retains these scars much longer than the bark of thrifty branches, because on those growing rapidly the bark soon breaks and partially destroys the scars.

Two opposite buds appear half way round the stem or nearly so from the next pair above or below. This was found to be the arrangement of the bud scales, in fact, the bud scales are leaves modified for a certain purpose. Every one knows that trees bear leaves in summer and these maples drop theirs in autumn. On searching for the scars where the leaves snapped off, they are sure to be found, each just below a bud, or at least they are found in no other places. The leaf-scars are much the shape of a new moon with the ends turning upward, and slightly projecting, are five little bunches as seen at *b* in Fig. 44.

A branch grows rapidly or slowly just in proportion to the number, size and activity of the good leaves carries.

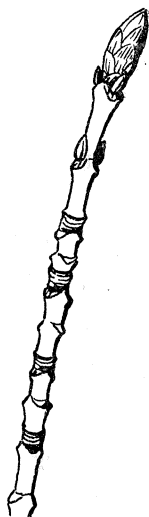


Fig. 46. A part of a very small branch, only seven inches long, carrying a single small bud at the tip. This branch was cut in May, hence the bud is larger than it was in winter.

By counting the sets of scars left by numerous crops of bud scales of the dwarf branch, of which the cut represents the tip, its age was found to be twenty-six years. This was a lower branch taken from the side of a tree much shaded by others of larger growth.

From the leaf-scars seen between each two sets of scale-scars, the dwarf branch appears to have carried each year only two to four small leaves, and those were near the apex.

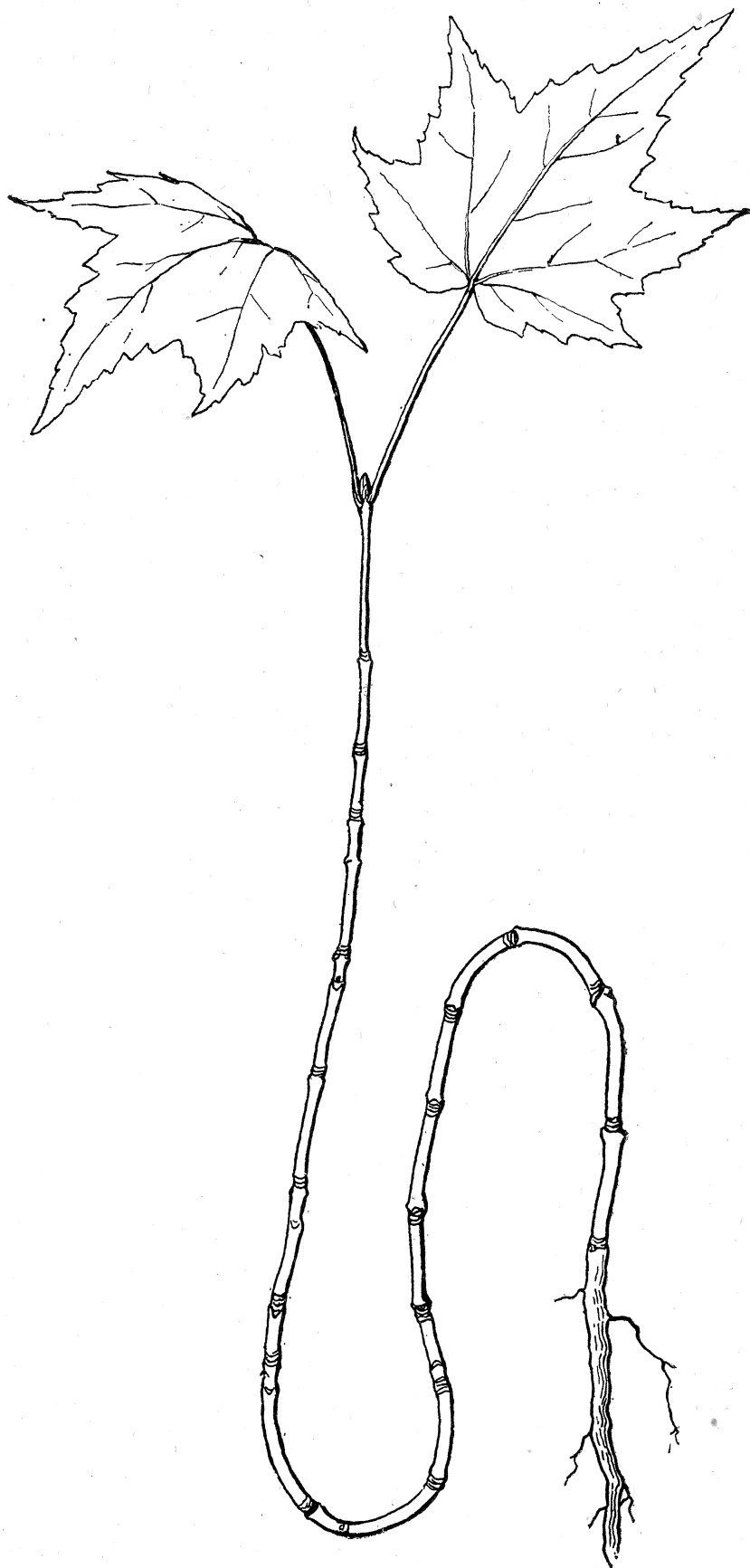


Fig. 47. A small red maple tree that was growing at a great disadvantage in a dense forest, apparently struggling along from year to year, as though hoping for brighter days, which never came.

The figure tells the story of this persevering little tree, always doing its best, regardless of opportunity. With a good chance, the old, dwarfed branch and the little tree would have made a growth of one foot a year, making a branch or tree twenty-six to twenty-seven feet long and two or three inches in diameter. In a certain sense a tree is a community, and each leaf not only works for the branch it helps build up, but turns a portion of its effort toward sustaining the larger branches and the common trunk. This reminds us of the person who gives a portion of his earnings in the form of a tax to support the town in which he lives, the county in which the town is located, and the state of which the county is a portion.

Each member of the class can find a branch which corresponds to his own age or that of some friend, or he may associate the years of growth in the life of a branch or a tree with important events of his neighborhood, state or nation.

Every one of the class must have seen the double winged fruits, often called seeds, that are borne by sugar maples of suitable age and size.

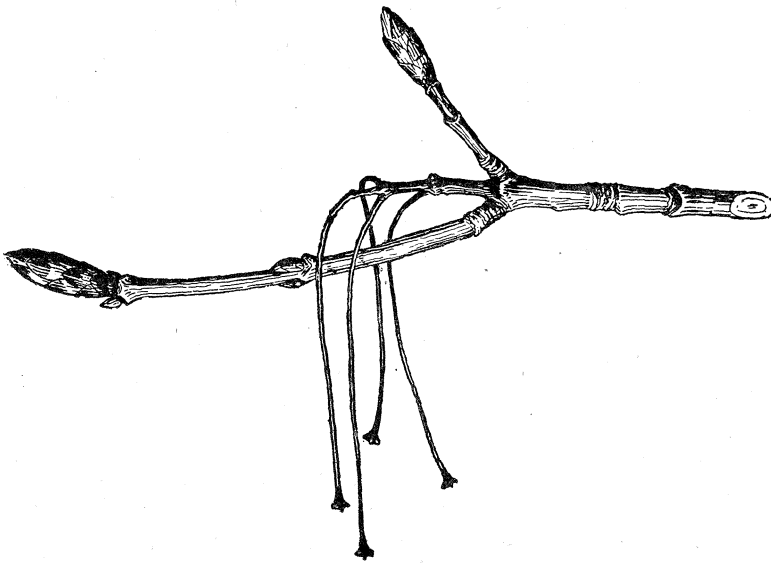


Fig. 48. Branch of a maple tree which still retains the slender fruit stems produced last year.

It needs but little study to discover that each cluster of flowers must have come from a bud at the end, and after bearing fruit, no other bud continued the stem, but instead, a bud on each side became vigorous leaders for two branches.

The following illustrations of limbs of beech were made from specimens cut early in May, when the buds had made some growth. The beech bears buds singly and not in pairs, with one bud at the end of the branch.

The upper or outer portions of the branches are light brown in color, much like those of the maple, excepting they are more slender and the specks smaller and less pointed. The buds are mostly long, slender and sharp pointed, and the scales are not arranged exactly in rows extending up and down. At intervals a series of scars can be seen, considerably like those observed on the maple.

As we look at the branch, held right side up as it grew on the tree, the scar on the right side of the stem is a little to the left of its bud, while a scar or a bud on the left side is at the right of a bud, that is, one leaf scar is at the left of its bud, while the scar above is at the right of its bud, and this rule holds good throughout the tree, whether the branches are more or less spread out on the tree or whether they are near the top and erect. Near some of the leaf scars there may be seen for each a tiny round bud which commonly amounts to nothing. Extending nearly around the stem from each leaf scar, may be seen a slight ridge or single scar. If the pupil carefully dissected an enlarged bud of the beech he would find that these scars mark the place from which a pair of brown bud scales had fallen. Some of the older pupils may learn to think of a pair of such scales as *stipules*, and forming a part of the leaf which grew between them. In this case the stipules were the bud scales which in some other plants look much like small green leaves. Each bud on the side of a branch is planned to produce a side branch. This is illustrated by Fig. 49, where three side buds for last year are represented as without stems, while the bud on the growth of the previous year shows a short stem bearing a bud at the end.

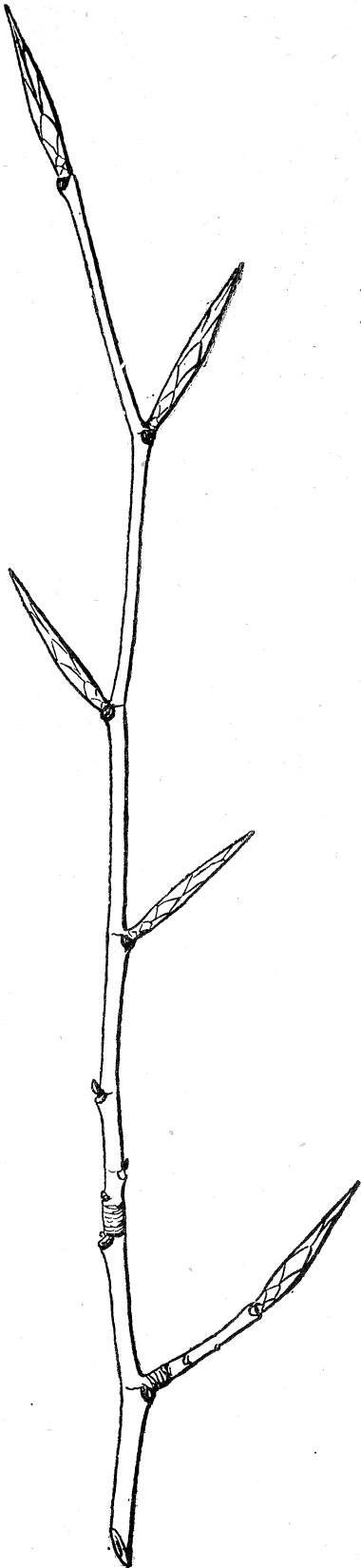


Fig. 49. Leaf scars of beech approaching a circle in shape, situated a little to one side and below each bud.

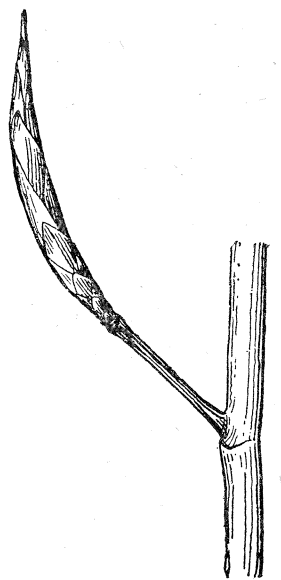


Fig. 50. A thrifty branch sometimes pushes a short growth the first year instead of the second year, and places a bud on the outer end as here illustrated.

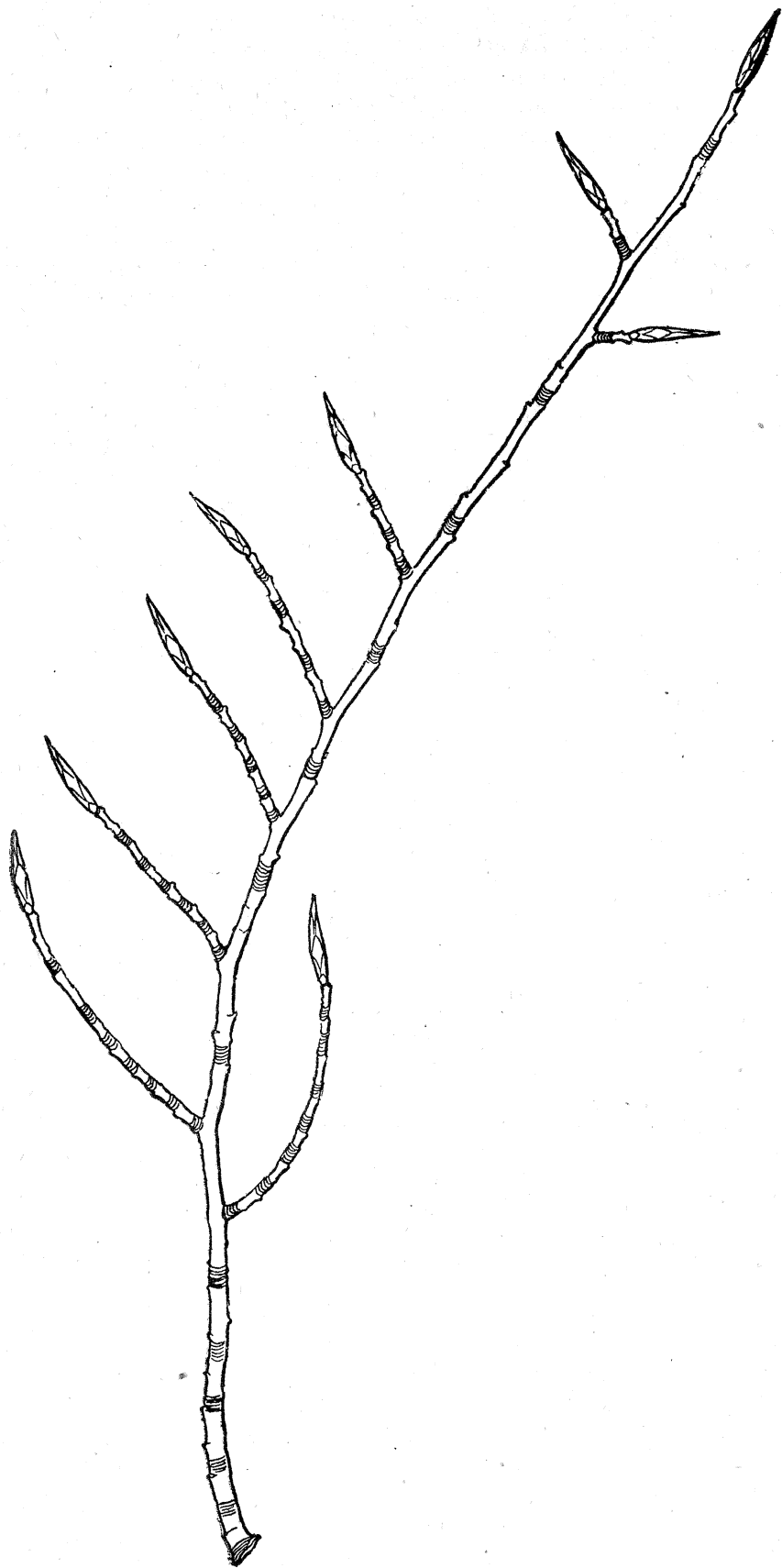


Fig. 51. Showing the life history of an old branch of beech.

Most of the tiny branches of the beech shown in Fig. 5 are on one side of this main branch, probably because the light was most favorable on that side. This was cut in May, and represents the buds somewhat enlarged. They are small, however, indicating a feeble growth for the summer, and along their sides are small leaf scars between sets of bud scars, indicating that only one, two or possibly three small leaves were carried thereon in a single season. The drawing shows on the main branch twelve sets of bud-scale scars, and one to be left for the present bud at the top, making the whole the growth of thirteen years. Some of the leaf scars are not well represented, as the leaves were very small and a portion are turned away from the observer, but with such a branch in hand, no one should have any difficulty in counting the scars where each leaf had fallen, thus numbering all the leaves that were required to build up the branch during these thirteen years. The tree toils all the growing year, gathering in from the soil, water and other materials which the water dissolves, and from the air carbonic acid enters the leaves, and out of these substances, through the aid of sunlight, the stems are lengthened and perfected early in the season, and for a considerable portion of the year buds are preparing for an early start the succeeding spring.

Most likely, every member of the class knows that a cross section of a stem of maple or beech shows pith in the middle surrounded by wood, outside of which is the bark. Furthermore, he knows that trees grown in Michigan in the open air usually indicate by rings or layers of wood the age of the tree. This rule generally holds good, though in some cases there may be exceptions.

Many other points concerning branches of maple and beech could be enumerated and recorded, but these are enough for our present purpose. The forests of the State contain about seventy species of trees and one hundred and fifty species of shrubs, any two of which would make as good a lesson for study as the branches of maple and beech. There is no lack of an abundance of materials right at hand to profitably occupy young persons during the bleakest months of the year.

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