A NEW COMPOUND MICROTOME. By GEO. C. HUBBARD.

Wishing to prepare some slides exhibiting the structure of various animal tissues and organs, but having no microtome, I made one of wood chiefly, at a cost of thirty cents and two or three days' labor.

The principle of the machine is to prepare sections by quickly forcing the tissue, supported on a carrier attached to the circumference of a 12-inch wheel, across the edge of a razor, which is brought automatically a slight distance nearer the tissue at each rotation of the wheel.

The base of the machine is a heavy board about thirteen inches long by eight in width. At the middle of each side inflexible standards are erected and adjustable bearings provided, the centre of the opening in each being six and one half inches above the board. In these bearings rests the axis of the 12-inch wheel, which is turned by means of a crank.

The support for the tissue consists of a round brass disc of any convenient size attached at its centre to one end of a short cylindrical rod. This rod fits into a corresponding orifice extending through the middle of a half-cleft sphere, which fits loosely in a corresponding socket in the circumference of the wheel. One side (the one opposite to the automatic feeder) of this socket is made adjustable by removing a round bit of wood and inserting in its stead a concave disc, which is attached to the short end of a straight lever extending down the side of the wheel to near the axis. A screw passing loosely through the lever about an inch from the center of the disc into the wheel serves as a fulcrum. Let this lever be called A. The long arm of A is moved by means of a circular wedge turning upon the round end of the wheel's axis. The thick part of the wedge is allowed to project four or five inches beyond the line of the circumference of the circle, and provided with a knob, thus forming a second lever, B, to which the power is applied. Instead of B and the wedge, a thumb-screw may be screwed through the long end of A, its end turning against the side of the wheel.

When the tissue has been fastened to the brass disc in the usual way, its round support is thrust into the opening of the ball. The carrier is turned and bent in any direction and pushed out or in until the tissue is in the right position with regard to the razor. A slight force exerted on the knob of B moves B forward thus causing a thicker part of the circular wedge to pass between the wheel and the long arm of A, which forces the concave disc at the other arm against the half-cleft ball, thus causing it to grip firmly the tissue support. If a thumb-screw be used, it must be turned three or four times to produce the same effect.

At one end of the board forming the base of the machine is fastened, by means of two hinges, a perpendicular piece of wood six and one-half inches long, cut so that there are three arms above. Each of two of these has an opening at its upper extremity suitable for receiving the razor, and is provided with a set-screw for clamping the razor.

To the third arm is attached a nut in which work the threads of a bolt, which extends horizontally to near the axis. The head of the bolt is attached to the centre of a wheel some four or five inches in diameter. The bolt now forms the axis of this wheel and must be supported at the wheel by an unyielding bearing. Turning this wheel once in the right direction pulls the razor forward a distance equal to that between the threads, which we shall suppose to be one-sixteenth of an inch.

On the face farthest from the razor of the small wheel, about twenty round brads are inserted near the circumference *at equal distances apart*, and *all the same distance from the centre of the bolt.* If the wheel be rotated the distance between two brads, the razor is drawn forward one three hundred and twentieth of an inch.

A small rectangle of tin or brass about three-fourths of an inch long is bent at right angles, and one edge is cut to form a slightly concave set of twelve vertical teeth of equal size, to turn the 4-inch wheel by pushing against the brads. If ten of the teeth are used, one tooth will move the razor forward one thirty-two hundredth of an inch.

This ratchet is now fastened to the side of a long horizontal lever, which is secured at one end to an upright support. The other arm rests upon an eccentric on the square end of the axis of the 12-inch wheel. Turning this wheel causes an up-and-down motion of the ratchet. The eccentric has a rectangular opening so that it may be slipped upon the axis and made more or less eccentric. It is held in any desired position by a set-screw. A peg, or better a screw with the head removed, projects from the under side of the lever just mentioned into a groove made in the circumference of the eccentric. This groove must be so arranged, that when the ratchet is rising, a tooth catches under a brad; but when it ceases to rise, a short oblique portion of the groove moves the tooth from under the brad. The groove now resumes its straight course so as to prevent the next tooth above from coming in contact with the brad as the ratchet descends. Another short oblique portion of the groove brings this tooth under the brad. As one brad escapes from the top of the ratchet, another enters at the bottom.

To prevent any lost motion, and to push back the razor support when the 4-inch wheel is turned backward, a strong spiral spring may be placed on the bolt so as to extend from the bearing to the nut.

With the above described arrangement of parts, sections can be cut one thirty-two hundredth of an inch thick. By shifting the eccentric so that alternate teeth work, the sections are of double the thickness, etc. But little eccentricity is needed, about one-sixteenth of an inch being sufficient when each tooth of the ratchet is employed.

On the organogeny of Compositæ. By G. W. Martin.

On the development of the archegonium and apical growth in the stem of Tsuga Canadensis and Pinus sylvestris. By D. M. Mottier.

[ABSTRACT.]

This work consisted in a study of the development of the archegonium and the meristems of the stem. The results obtained in reference to the archegonium differ from those of Strasburger in that the neck of that organ in Tsuga consisted of two cells in as many cases as where one only was found, and very rarely three. In Pinus the neck of the archegonium was found to be made of two layers of cells, four in each layer, lying one above the other, instead of one layer.

As regards the growth of the stem it is argued that we can not say with certainty that growth proceeds from a single initial cell, as claimed by Duliot for the Gymnosperms.

Preliminary notes on the genus Hoffmanseggia. By E. M. Fisher.

Development of the sporangium and apical growth of stem of Botrychium Virginianum. By C. L. Holtzman.