other species showed a much greater percentage of germination in water. For illustration, the numbers given for the following named plants will serve as examples and show the wide variance of certain pollens in this respect. Accordingly it was found that only 4 pollen grains in 100 of *Trillium recurvatum* germinated in water, *Amelanchier candensis* 6, *Mitella diphylla* 11, *Asclepias incarnata* 20, *Lilium tigrinum* 30, *Narcissus Tazetta* 35, *Tradescantia virginica* 50 in the sun and 70 in the shade, *Physocarpus opulifolia* 82, *Melilotus alba* and *Caragana arborescens* 90, and *Staphylea trifolia* 98. The number of germinations per hundred in water, as well as the solutions of sugar used, depend of course on the age and state of maturity of the pollen. This is very important in ascertaining the ability of the pollen to grow since the pollen of many plants is apt to be allowed to remain on, or less rarely, in the anther too long. On the other hand one may easily hesitate to gather what may seem to be pollen that is too young. This in some cases is a mistake since the pollen of some plants, as that of *Vaccinium stamineum*, may even germinate in the anther cavity. These points can, in any case of doubt, be determined with certainty only by careful experimentation. Familiarity with the pollen under investigation is essential in order to avoid mistaking foreign pollen for the one desired. Great differences are also shown by the same pollen in the different per cents of sugar. The very large pollen grains of certain species studied either showed no germination or else only a small percentage of germination as in the case of *Iris Germanica; Iris versicolor; Iris sambucina; Iris Florentina; Mirabilis Jalapa; Canna indica; Oxybaphus nyctagineus; Althaea rosea; Gossipium herbaceum; Ipomoea purpurea;* and *Hibiscus esculentus*. On the other hand certain very small grains as those of *Nelumbo lutea* and others showed a large percentage of germination in some of the sugar solutions. Of the genus Trillium 60 pollen grains in 100 of *Trillium erectum* germinated in 40% cane sugar; while in *Trillium recurvatum* the same number germinated in 15% cane sugar; but only 10 in 40% cane sugar. The next largest number of germinations in this genus was in *Trillium undulatum* where 37 in 100 germinated, followed by *Trillium grandiflorum* and *Trillium nivale* in each of which 30 grains in 100 grew, and then *Trillium cernum; Trillium declinatum* and *Trillium sessile* diminishing in the number of germinations per 100 in the order named. While variation in the percentage of germination of pollen grains is to be expected, the above mentioned figures represent the average of the growth of pollen as shown by many experiments. In some plants the quantity of pollen is very small, since *Mirabilis Jalapa* has only about 32 in each anther cavity, while in other plants the number of grains may be many thousand in a single anther cavity. Honey bearing plants have, comparatively speaking, little pollen, while plants without honey have a large amount of pollen. The large amount of pollen on the terminal cyclindrical spike of flowers of *Typha latifolia* and the catkin like masses of scales bearing the stamens of Pinus are well known. While the various parts of many plants have odor, bees seem to be able to detect odor in pollen.

A PRESSURE CELL

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The purpose of this pressure cell is for the study of entire plants or parts of rather large plants under direct observation and where water pressure of only a few atmospheres are employed. It consists of a base of wood A, 18 cm. long,

14 cm. wide, and 3 cm. thick, which has been boiled in 52°C. paraffin to prevent swelling and warping. Two cm. from each end are grooves B, 9 mm. wide and deep, which traverse the block to side grooves D, E, and F, of the same depth and width and varying in distance from the side C of the block A. All of the grooves above mentioned are on the same side of the block A and serve to hold the lower end of rectangular pieces of thick plate glass G when certain experiments are performed. In some experiments the glass plates may be dispensed with. These plates are held in position at their upper end by an adjustable zinc frame H. In this way glass plates of any length may be used. On the wood block A is placed a strong, clear glass cylinder I, 12 cm. long and 3 cm. inside diameter. This cylinder when in use is closed by a thick 2-holed rubber stopper J, whose lower end is paraffined and through which pass two tubes. One of

"A Pressure Cell"

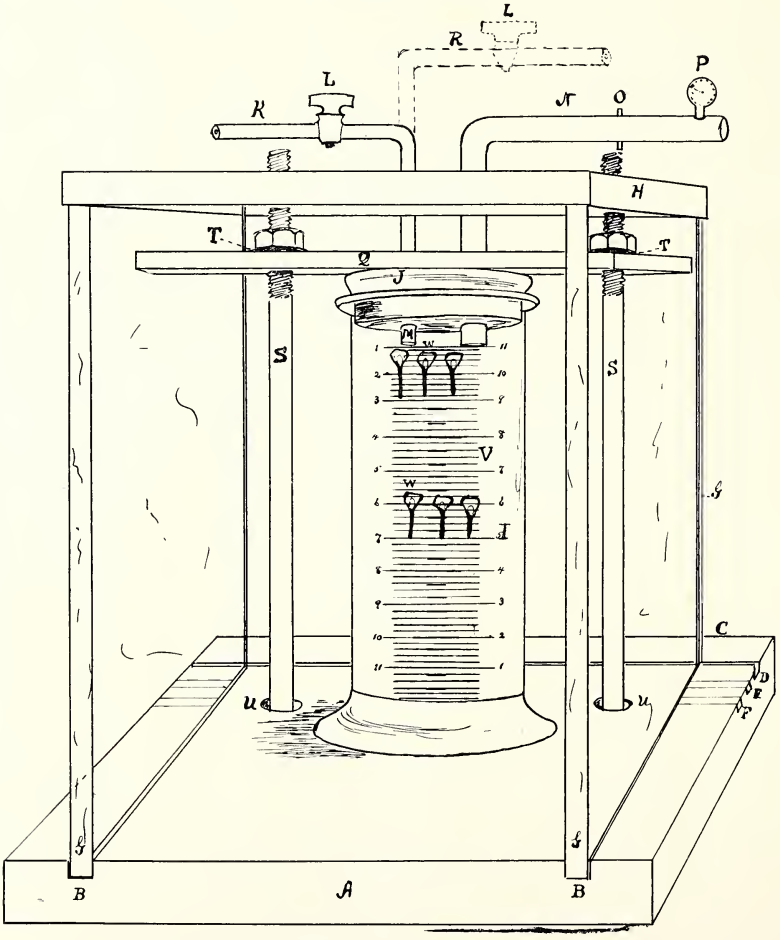

Fig. 1—A Pressure Cell.

these tubes K serves as an overflow and is controlled by the glass stop cock L. A filter is provided at M. The water under pressure enters N, which contains a filter at O and a pressure gauge at P. The rubber stopper J is held firmly in I by means of a plate Q, 120 mm. long, 65 mm. wide, and 5 mm. thick, through the center of which passes a circular opening 25 mm. in diameter to allow the passage of K and N. At the same time it allows I to be opened by removing the rubber stopper J when the brass plate Q is turned back over K and N, by turning K in the same direction as is shown for N, as is indicated by the dotted line R. Through the ends of Q pass thick brass bolts S, threaded at each end and carrying heavy brass nuts which rest on brass washers T. The lower ends of S are threaded for only one cm. from the end and are counter sunk on the lower side into A at U, while the upper ends of S are threaded back 6 cm. from the end. This arrangement affords a quick and secure method of forcing and holding, water or air tight, J. into I or the removal of J from I. The apparatus may be lengthened by the use of a longer glass cylinder, bolts and glass plates than those shown in Figure I. This is desirable in certain experiments with long plants. Water pressure is not dangerous with an apparatus of this sort, but when even slightly compressed air or gasses of any kind are used, extreme care must be exercised. Danger in this latter respect, however, is obviated in the case of low gas pressure by the use of the heavy glass plates, G. Brass has been used for Q and S, instead of iron, due to the rusting of the latter, especially in long continued experiments. For holding seedlings and various specimens, a glass slide, V, which exactly fitted I was used. This slide was finely ruled, as indicated, by means of a dividing engine. A rubber band or a cap of gypsum was used to hold the seedlings, W, on the slide, V. In some instances graduated, clear glass tubes were used to hold the seedlings. In case V is a long slide and equals the interior length of the cylinder I, and the experiment is of short duration, more than one row of seedlings, W, can be used. By means of the graduated slides and tubes used in I, the effect of pressure can be directly observed during the experiment. Exact readings may also be made with the horizontal microscope. This apparatus is being used, at present, for an extensive study of water pressure on plants.