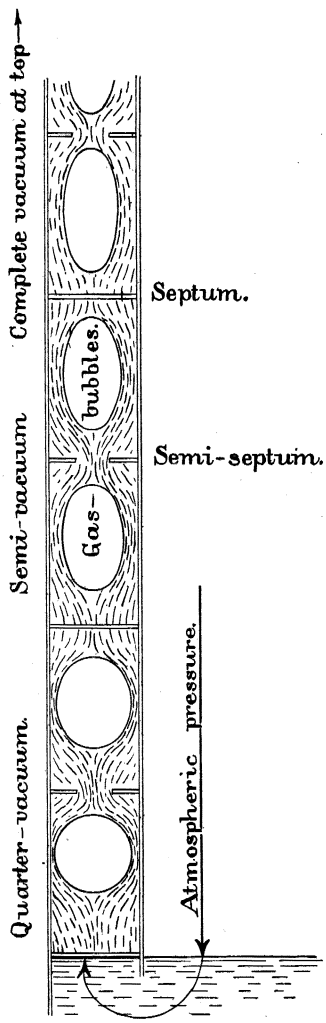
The second diagram represents the air-bubbles as gradually narrowing upwards. This accords with the theorem of Schwendener and Steinbrink, who held that the ducts are exceedingly narrow at their tips. The same result is given from observations on the red beech by Hartig and Weber. Strasburger had previously shown that narrow ducts contain very little air, and have streaming water; whilst large ducts in tall stems have much air and usually little water. If we accept these data we find an extraordinary correlation. Through the length of a lofty stem are wide tubes, whose contents are a column of froth of the lightest kind, having a maximum of air in a very thin shell of water. In the region of the leafy spray the conditions are reversed, narrow ducts and a relatively heavy load; and hence the need of a high vacuum, which is secured by the curious structure and the proximity of the leaves.



Xylem-duct.
(diagrammatic)

I am obliged to Professor MacDougal for referring me to Steinbrink's paper, and to Mr. Earle Anderson for drawing the diagrams.

George Macloskie.
Princeton University,
June 25, 1904.

BOTANICAL NOTES.

THE NUMBER AND WEIGHT OF COTTONWOOD SEEDS.

At my suggestion, one of my students, Mr. B. R. H. d'Allemand, made careful counts and estimates as to the number and weight of the seeds of the cottonwood (*Populus deltoides*). Selecting a well-grown pistillate tree about forty feet in height with a trunk two feet in diameter, and a spreading top fully forty-five feet from side to side, he carefully divided it by an imaginary vertical plane into two equal parts. One of these halves he divided again in the same manner, and continued the process until he reached a branch small enough to enable him to count the number of catkins which it bore. It was found in this way that the tree bore about 32,400 catkins. Then a number of careful counts were made of the seed pods in the catkins, by which it was found that the average number is about twenty-seven. The average number of seeds in the pods was easily determined by a series of counts to be thirty-two. From this it appears that this particular tree produced the enormous number of nearly twenty-eight millions of seeds.

One hundred seeds with their cottony fibers attached were then weighed upon a chemical balance. The result was .065 gram. So the weight of a single seed is .00065 gram, and the total weight of all the seeds on the tree 18.2 kilograms, or almost exactly forty pounds.

WEIGHT OF DANDELION-DOWN.

How heavy is a dandelion-down with its achene as it floats away on the breeze? The tiny parachute is so constructed that the weight of the achene brings the spreading rays at the summit of the slender rod (*rostrum*) into the proper position for floating in the air, as any one may readily see for himself by 'blowing' a seeding dandelion head in a quiet place. It makes no difference what the position of the parachute may be, as soon as it is free in the air the weight of the achene rights it at once. One who has not closely observed dandelions will be much interested in watching the quick 'righting' of every little parachute under the action of the tiny achene weight. Recently it occurred to me to find out how heavy dandelion-downs are, and at my suggestion Mr. d'Allemand undertook the delicate task of weighing them. He found that there are about one hundred and ninety achenes in each dandelion head, and, carefully counting this number, he determined their aggregate weight to be .085 gram. From this it was easy to calculate the weight of a single achene to be .00044 gram. It takes more than two and a quarter millions of dandelion-downs to weigh a kilogram, and somewhat more than one million to weigh a pound. In other words each parachute weighs about one millionth of a pound!

TENDRILS OF VIRGINIA CREEPER.

IT is pretty generally known nowadays that some Virginia creepers cling to walls by discoid expansions of their tendril tips, while others produce twining tendrils without such expansions. Among gardeners there is a pretty general notion that there are two quite distinct kinds, distinguished mainly by the presence or absence of disks. This distinction has even been admitted into recent descriptive manuals, as in Britton's 'Manual,' where the disk bearing form is called *Parthenocissus quinquefolia,* and a form with 'tendrils mostly without terminal adhering disks' is set off as the variety *laciniata.*

In a recent popular article Professor Pammel gives his opinion that this difference as to the formation of disks is not constant with any particular plant, and in a subsequent letter cites the case of the planting of a disk-bearing Virginia creeper which later formed ordinary twining tendrils only. On smooth surfaces the disks are not produced. This agrees with the statement made by Goebel in his 'Organography of Plants' (page 268, English edition) as follows: "Mohl was the first to show that the adhesive disks on the tendrils of certain species of *Ampelopsis* appear in consequence of contact with a firm body. We have here to do with a contact stimulus. Different species of *Ampelopsis* behave differently. Some, like *A. hederacea,* possess ordinary tendrils which twine round a support and eventually become firm, woody structures, but if they do not happen to find a support they die off at an early period. *Ampelopsis quinquefolia,* on the other hand, fixes itself to walls and tree trunks by means of adhesive disks on its tendrils, but these can also act like ordinary tendrils. In tendrils which do not come in contact with a firm body no viscid disks appear." Making allowance for some confusion as to the identity of the species, it appears that Goebel regards the formation of disks as a result of a mechanical stimulus. There is need of a number of careful observations on this point in connection with one of the most widely grown of all ornamental climbing plants.

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FIELD WORK FOR 1904 OF THE DIVISION OF GEOLOGY AND PALEONTOLOGY OF THE UNITED STATES GEOLOGICAL SURVEY.

THE field work of the division of geology and paleontology, United States Geological Survey, for the season of 1904 will cover investigations in many states. Dr. C. Willard Hayes, geologist in charge of geology, has general supervision of this work. Some of the most important of the numerous parties in the field are here mentioned.

General Investigations.—Besides investigations confined to the limits of one or two states, several lines of work will be taken up that will cover wide general areas. The gla-