

and so on ; and test their recollection of the forms of all the flowers they have examined. Then you notice the spiral arrangement of leaves on a twig of oak, or thorn, or willow, and the internodes ; and the overlapping of the sepals of the rose and Herb Robert ; the alternance of the parts ; and finally they work out the idea that the floral whorls grow on the stem, and are a sort of depressed spiral of leaves with the internodes suppressed. A few monstrosities and pictures are shown, and the grand generalization is made ; the pistils are re-examined with fresh interest to test the theory ; and all their old knowledge is raked up once more. Then, too, the value of the theory is criticized, and a lesson of caution is learnt.

Then a step forward is made toward classification, by cohesion and adhesion of parts ; and the floral schedule is worked ; and so, step by step, to fruits, and leaves, and stems, and roots, and the wondrous modifications of parts for special uses, as in climbing-plants, and the orchids, which are a grand puzzle till a series of pictures from Darwin step in to explain the use of the parts and plan of the flower. Then some chemistry of the plant is introduced with some experiments, and the functions of all the organs are discussed. And lastly, strict descriptive terms are given, and the rest of the course is occupied by the history and the systems of classification, with constant reference, however, to the other conceptions that the class has gained.

Such a method as this has many advantages. It is thoroughly scientific, however irregular it may seem, and a professor of Botany may smile or shed tears over it for anything I care ; and the knowledge is gained on a sound basis of original observation. Whatever flower a boy sees, after a few lessons, he looks at with interest, as modifying the view of flowers he has attained to. He is tempted by his discoveries : he is on the verge of the unknown, and perpetually transferring to the known : all that he sees finds a place in his theories, and in turn re-acts on them, for his theories are growing. He is fairly committed to the struggle in the vast field of observation, and he learns that the test of a theory is its power of including facts. He learns that he must use his eyes and his reason, and that then he is equipped with all that is necessary for discovering truth. He learns that he is capable of judging of other people's views, and of forming an opinion of his own. He learns that nothing in the plant, however minute, is unimportant ; that he must observe truthfully and carefully ; that he owes only temporary allegiance to the doctrines of his master, and not a perpetual faith. No wonder that Botany, so taught, is interesting : no wonder that M. Demogeot, who visited some English schools last year, at the request of the French Emperor, expressed himself to me as charmed with the vivacity and intelligence of the botanical class of one of my colleagues.

Very possibly a master might make his boys get up a book on Botany, and learn it in the order in which it stands in the book,—cellules and parenchyme, protoplasma and chlorophyll, stems and medullary rays, petioles and phylloides, rhizomes and bulbs, hairs and glands, endosmose and exosmose, secretions and excretions, and so on ; and ultimately come to the flower and fruit ; and possibly a boy of good digestion might survive it and pass a respectable examination in a year's time. But this is not the aim. And even if in this way a greater number of facts could be learned, it would be far inferior to the method of investigation. A master must never forget that his power of teaching facts and principles is far inferior to a willing pupil's power of learning and mastering them. He must inspire his boys, and rely on them : nor will he be disappointed. Those who have in them anything of the naturalist will collect and become acquainted with a large number of species, and follow out the study with care and accuracy ; and the mass, to whom an extensive knowledge of species is a very unimportant matter, but who can appreciate a sound method of investigation and proof, will have gained all that they can gain from botanical teaching. And it must be remembered by those who speak of teaching in science, and yet have never tried it, that a method which would succeed with a few naturalists might utterly fail with the mass.

There is a time in the growth of mind in which there is considerable activity and considerable power of accumulation, but little power of method. And to insist at this stage on rigorous definitions, on sternest formality, is to forget the indications given by nature alike in the growth of the individual and of the world. In a boy's mind is only the dawning twilight of science, which brightens out slowly, if at all, into the perfect day.

A boy leaves the botanical class as a rustic leaves the militia after three months' drill. He has gained something : he is more awake, can listen and learn better, knows what he is about ; in fact, he has been drilled. Year after year I have had new boys and old in my classes, and always have been able to notice that at first the new boys seemed to be at a positive disadvantage in competing with the old, although the subject I was teaching had no reference to Botany.

III. INTERIOR OF SCHOOL HOUSE, HEATING AND VENTILATING, &c.

(Continued from our Last.)

So important has the subject of ventilation in School-houses become that in England and other countries specific regulations have been adopted by the Government on the subject, which are rigidly enforced. In this brief article we can only just give a few hints (with illustrations) on the subject, and Trustees will in no case omit to provide for this most essential necessity in every schoolhouse. Previously to doing so, we desire to quote from pages 62 to 68, to make some remarks on the construction and arrangements of the School-house.

1. **SIZE.**—Each School house should be sufficiently large to allow every pupil : 1. To sit comfortably at his desk ; 2. To leave it without disturbing any one else ; 3. To see explanations on his lessons, and to recite, without being incommoded or incommoding others ; 4. To breathe a wholesome atmosphere. For the accomplishment of this last, not less than 150 cubic feet of air should be allowed for every pupil.

2. **PLATFORM AND SHELVES.**—The master's platform may be raised about eight inches ; and the end of the room occupied by him should be filled with shelves for a library, and for philosophical apparatus, and any collection of natural curiosities (such as rocks, minerals, plants, shells, &c.) which may be made in the neighbourhood, or obtained from abroad. The books, apparatus and collections should be protected by doors, which may be made perfectly plain and without pannels, so as to be painted black, and serve as black-boards, if necessary. They may be conveniently divided by pilasters into three portions—the middle one for books, the other for apparatus and collections. On one of the pilasters may be a clock ; on the other a barometer and thermometer ; on shelves in the corners, the globes ; and over the library, in the centre, may be the time table. One of the pilasters may form part of the ventilating tube. The space for the platform, shelves, &c., between the front range of desks and the north wall, should be from seven to ten or twelve feet according to the size of the room and the number of pupils contemplated. The sides and front of this space should be furnished with seats, ten or eleven inches wide, for very young pupils when the school is large, and sometimes for classes reciting. By means of a large moveable black-board, this space may be in case of need, divided into two, so that two classes may recite at a time.

3. **ENTRY, &c.**—The entry should be lighted by a window, and furnished with hooks or pins, for the accommodation of hats, bonnets, and cloaks ; and a wood-closet, large enough to contain one or two cords of wood. By making the ceiling of the entry and wood-closet only seven feet high, two commodious rooms for recitation may be formed above them, lighted from the windows over the front door, and accessible by stairs from within the school-room.

4. **LIGHT.**—The windows should be on the east and west sides of the room, and on the right and left of the pupils. Windows on the north, although they admit too much cold in winter, give an agreeable light. From the south the light is too intense. The eye is often materially and permanently injured by being directly exposed to strong light ; and if the light come from behind, the head and body of the pupil, interposed, throw the book into their shadow. The windows should be set high enough to give an uninterrupted light, and prevent pupils sitting at their desks from seeing persons or objects on the ground without. The windows should be furnished with blinds or curtains, and should be made to open from the top as well as from the bottom ; so that in the summer season when the ventilator will not act, they may supply its place.

5. **HEATING.***—There are two common modes of warming School-houses in this country—by means of open fire-place and stove. The former is preferable with reference to health, and by a little pains in the construction, may almost equal the stove in economy of fuel—furnishing the room at the same time with an ample supply of fresh, warm air from abroad. In a suitable position, near the door, let a common brick fireplace be built. Let this be enclosed on the back and on each side by a casing of brick, leaving between the fireplace and the casing a space of four or five inches, which will be heated through the back and jambs. Into this place let air be admitted from beneath by a box 24 inches wide by 6 or 8 deep, leading from the external atmosphere by an opening beneath the front door, or at some other convenient place. The brick casing should be continued as high as six or eight inches above the top of the fireplace, where it may open into the room by lateral orifices, to be commanded by iron doors, through which the heated air will enter

* In regard to heating a School-house, we desire to call attention to Mr. Boxall's advertisement on the subject in the *Journal of Education*, for May and November of last year.—Ed. J. of Ed