

preceptions of the various forms brought under his notice, proceeded to construct them of such suitable material as can be conveniently had. The ball, cube, cone and cylinder may be formed of clean, moist or moulding sand, or suitable clay. They should be made as accurately as a child can be taught to make them, and considerable pains should be taken to give him the necessary facility of manual movement. During the second year the material should be of a more resisting nature than sand, perhaps pasteboard. As a sample of an exercise, suppose he is required to construct a square whose side is three inches, or any convenient length. Require him to place his ruler upon the piece of pasteboard and mark with his knife along the outer edge. This operation is not so easily done as one might suppose. The ruler has to be correctly applied and firmly held with the left hand, so that it cannot slip and produce a crooked line instead of a straight one. He should also be required to do it with the least amount of waste. He will have to be shown, in the first instance, how to move the ruler as far as possible towards the edge, so that none but the waste parts may be marked off. When this is done he proceeds to cut. His first attempts will be awkward and the line will be imperfectly cut; it will be ragged and probably uneven. He will require to be shown how to steady the pasteboard and how to hold the knife when he cuts. Let him test the accuracy by applying his ruler to the cut. Let it be done again and again, if necessary, but not so often as to discourage him. Let us suppose one side completed.

The second adjacent side is ruled off and completed in the same way. Let him now apply the carpenter's square to test the work (small carpenter's squares can be had for the purpose). He will not only learn the use

of this tool, but he will become practically acquainted with a right angle, and his eye will soon detect the slightest deviation from it. The two remaining sides will be constructed in a similar manner, and the square completed. There will, no doubt, be many trials and repeated corrections before a fairly accurate square has been made, but the pupil has made substantial gain. He has learned to use a ruler and knife properly, and acquired some manual neatness and dexterity. Exercises may be proposed on the square, by means of which its geometrical properties may be practically understood. They may be further led to find out that the diagonals of a square are not only equal to each other, but bisect each other—truths they will never forget when taught in this way. If each form is similarly dealt with, the drawings which the pupil makes in his subsequent course will be not only much better executed, but of far deeper interest.

When he has entered upon his course in industrial drawing, the pupil should frequently cut out forms before drawing them, sometimes with scissors as well as with a knife. While studying the elements of geometrical drawing, such as bisecting lines, angles, erecting perpendiculars, etc., he will acquire facility in using the compass. In drawing plans of the school-house, play-ground, etc., of given dimensions, he will become accurate in measuring and accurate in representing measurement.

Arrived at the study of formal geometry, the pupil should, previous to drawing his figures on the blackboard for demonstration, construct them of pasteboard or paper, etc., whenever practicable, and find out the geometrical truths which he is to establish by demonstration. Industrial tools, whose principles depend upon his geometrical truths, should be explained.