

wishes to become a mechanical engineer, an architect, draftsman, farmer, etc., while at the same time it embraces real manual training.

In teaching the mechanical side of manual training, Prof. Tadd urges thorough and constant instruction on and discussion of all tools, materials and forms made. Nothing should be taken for granted. Every tool should be explained thoroughly and its use made manifest in as many directions as possible. Lessons should also be given on the various woods, glues, varnishes, nails, etc., and upon the use and applications of the constructions made. "It is of great importance," he adds, "that the course should contain exercises in making the principal typical forms. Don't attempt too many forms, or amateur or freak forms—a weakness in many methods. This error is caused by an undue desire to show finished product and useful articles. While this is an important factor, it should not dominate the desire of obtaining the greatest amount of skill and training. Each pupil should be provided with a note book and sketch book, in which he should write descriptions of the tools and their uses, and also make rough drawings and an isometrical view of each exercise."

After learning the manipulation of the most important tools and appliances, the pupil is ready to construct the simpler forms of joints—first, the plain butt, miter, half and slip joints, later the varieties of these. Another feature of value is the construction of geometric forms, such as cubes, prisms, cylinders, cones, etc. These forms are especially valuable as exercises, because they require logical thinking and render necessary various consecutive steps in their construction, as well as yielding unusual manual skill. After this, pattern-making may be taken up. Beginning with a thorough discussion of the subject, the pupil is then ready to construct some simple pattern, such as wrench, crank, sledge hammer, head, brace, etc. Next in order may be taken the various complex joints, such as the mortise, dovetail, brace joints, the scarfs, and varieties of these. Then advanced geometric forms may be taken—pyramids, cones, grooved cylinders, cone in sections, etc. Advanced patterns come next, such as model for weight, cast-iron bracket, fly wheel, and parts of machinery. The greatest skill is typified in advanced construction. This embraces frames, cabinets, furniture, sashes, doors, roof trusses, etc. Sometimes it is well for an advanced class to combine in constructing some large project, such as a frame house, or a large piece of furniture similar to a vestment case, or case of closets for museums, or book-cases—anything suitable for school purposes. Nearly all the elaborate apparatus in wood used in teaching physics can be made by the boys in a class of this character, and also many useful things required in laboratories.

"The teacher is as yet comparatively rare," says Prof. Tadd, "who is capable of giving this phase of rational manual training, just as the