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PRACTICAL TRAINING FOR YOUNG MECHANICS.



VERY youth in learning his trade should endeavour to become thoroughly acquainted with the nature and capabilities of the materials in which he has to work, and the character and adaptation of the tools used in handling these materials, and the best mode of selecting and using the tools necessary to form the materials into the shape required. It is not necessary to go deeply into the theory of action of these tools, whether they are to be used with the hand or appertain to a machine, but he should first of all study the nature of the materials to be worked and the first

principles of working them; and then the hand or machine tools can be handled to the best advantage, so as to encounter the least resistance, and to produce the most perfect work.

In order for the pupil to become fully acquainted with this subject, it is necessary that he should begin his study and practice upon the most common and easiest worked materials—such as wood, as the basis of operation, or rather as the first subject of instruction. He should study how wood forms, why it has a heart, a longitudinal fibre, circular and concentric rings and radial plates; the influence which each of these elements exerts upon its strength, elasticity, durability, ease of working, &c., and then he will be better prepared to understand the theory of saw teeth, and why a rip saw must be made differently from a cross-cut, a pine saw from one for hard woods.

One great object the student should always have in view in learning a trade is to endeavour to sketch out for himself a system of keeping notes or memoranda, and applying both theory and practice in a reasoning and reasonable manner, so as to best realize the desideratum of "Practical Training."

The action of each tooth should be considered—whether it is a cutting, a tearing, or a rasping action; how durable will be the edge; how wide the "kerf" in

proportion of the net lumber, and how smooth the sides of the cut are. (There is more philosophy in a pine plank and its manipulation than one would at first think for.) Having followed the material through its growth and selections, its felling, seasoning and ripping, we are next ready to consider the question of planing—introducing an entirely new principle (or development) of action. The wonderful principle of the guide is here introduced to aid in the smoothing and planing action. The learner must be taught that a "smooth" surface is often out of plane, and a "plane" surface very often a rough one. The chisel and gouge can be used to groove, chamfer, tenon and mortise. The theory of the saw and plane, chisel and gouge being understood, and their use, and the grain and character and behavior of the wood somewhat familiar, the learner is now ready to comprehend without difficulty the action of lathe tools; the finding also in the lathe the guide principle. He should be taught to *analyse*, to consider the lathe tool as a cutting edge with a convenient handle, and not a handle with a convenient cutting edge. He will then gradually develop into the proper understanding of the action of the lathe, and the angles of lathe and other tools, viewed in the abstract—while at the same time he will be familiar with the practical difficulties and problems attendant upon the grain and nature of the material, and the cause, direction, nature, effect and amount of the strains, &c., upon the various portions of the lathe. Having handled pine wood, he may next be put upon a material having better cutting qualities and less marked grain—saw maple wood—and afterwards develop into the working of walnut, oak and box, and eventually ebony and ironwood.

In each of these stages the learner should be set a definite problem to accomplish—a problem differing from one in constructive geometry, in being solid and tangible instead of plane and representative.

Cylindrical turning and circular facing being mastered, boring, hollowing and under-cutting may be taken up, until the tools and materials are, as it were, mastered, or rendered subservient to the will of the worker. Then may come spherical, oval and eccentric turning, bringing out but little more concerning the nature of the materials, or the action of the cutting-edges, but calling forth observation and analysis of the lathe-action