THE "HOW-TO-DO-IT" BOOKS

CARPENTRY FOR BOYS

in simple language, including
chapters on drawing, laying out
work, designing and architecture

WITH 250 ORIGINAL ILLUSTRATIONS

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CARPENTRY FOR BOYS ELECTRICITY FOR BOYS

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CHAPTER I: TOOLS AND THEIR USES

Knowledge of Tools.—A knowledge of tools and their uses is the first and most important requirement. The saw, the plane, the hatchet and the hammer are well known to all boys; but how to use them, and where to use the different varieties of each kind of tool, must be learned, because each tool grew out of some particular requirement in the art. These uses will now be explained.

A Full Kit of Tools.—A kit of tools necessary for doing any plain work should embrace the following:

1. A Hatchet.
2. A Claw Hammer—two sizes preferred.
3. Cross-cut Saw, 20 inches long.
4. Rip Saw, 24 inches long.
5. Wooden Mallet.
6. Jack Plane.
7. Smoothing Plane.
8. Compass Saw.
9. Brace.
10. Bits for Brace, ranging from ¼ inch to 1 inch diameter.
11. Several small Gimlets.
12. Square.
13. Compass.
14. Draw-knife.
15. Rule.
16. Two Gages.
17. Set of Firmer Chisels.
18. Two Mortising Chisels.
19. Small Back Saw.
20. Saw Clamps.
21. Miter Box.
22. Bevel Square.
23. Small Hand Square.
24. Pliers.
25. Pair of Awls.
26. Hand Clamps.
27. Set Files.
28. Glue Pot.
29. Oil Stone.
30. Grindstone.
31. Trusses.
32. Work Bench.

33. Plumb Bob.
34. Spirit Level.

The Hatchet.—The hatchet should be ground with a bevel on each side, and not on one side only, as is customary with a plasterer's lathing hatchet, because the blade of the hatchet is used for trimming off the edges of boards. Unless ground off with a bevel on both sides it cannot be controlled to cut accurately. A light hatchet is preferable to a heavy one. It should never be used for nailing purposes, except in emergencies. The pole of the hammer—that part which is generally used to strike the nail with—is required in order to properly balance the hatchet when used for trimming material.

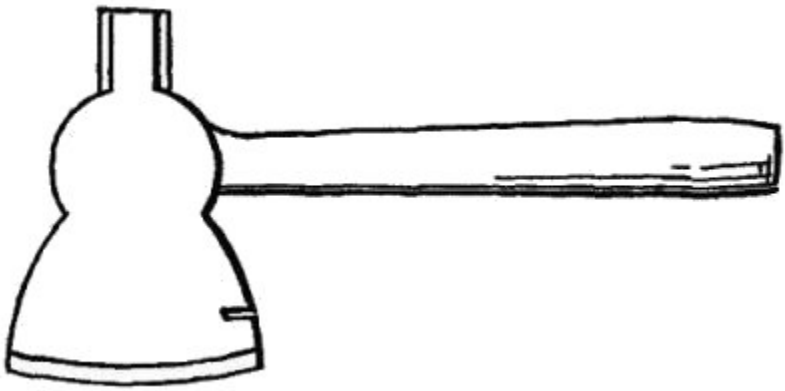


Fig. 2.

The Claw Hammer.—This is the proper tool for driving nails and for drawing them out. Habits should be formed with the beginner, which will be of great service as the education proceeds. One of these habits is to persist in using the tool for the purpose for which it was made. The expert workman (and he becomes expert because of it) makes the hammer do its proper work; and so with every other tool.

Fig. 3.

CHAPTER III: HOW TO HOLD AND HANDLE TOOLS

Observation may form part of each boy's lesson, but when it comes to the handling of tools, practice becomes the only available means of making a workman. Fifty years of observation would never make an observer an archer or a marksman, nor would it enable him to shoe a horse or to build a table.

It sometimes happens that an apprentice will, with little observation, seize a saw in the proper way, or hold a plane in the correct manner, and, in time, the watchful boy will acquire fairly correct habits. But why put in useless time and labor in order to gain that which a few well-directed hints and examples will convey?

Tools are made and are used as short cuts toward a desired end. Before the saw was invented the knife was used laboriously to sever and shape the materials. Before planes were invented a broad, flat sharpened blade was used to smooth off surfaces. Holes were dug out by means of small chisels requiring infinite patience and time. Each succeeding tool proclaimed a shorter and an easier way to do a certain thing. The man or boy who can make a new labor-saving tool is worthy of as much praise as the man who makes two blades of grass grow where one grew before.

Let us now thoroughly understand how to hold and use each tool. That is half the value of the tool itself.

The Saw.—With such a commonplace article as the saw, it might be assumed that the ordinary apprentice would look upon instruction with a smile of derision.

How to Start a Saw.—If the untried apprentice has such an opinion set him to work at the task of cutting off a board accurately on a line. He will generally make a failure of the attempt to start the saw true to the line, to say nothing of following the line so the kerf is true and square with the board.

How to Start on a Line.—The first mistake he makes is to saw *on the line*. This should never be done. The work should be so laid out that the saw kerf is on the discarded side of the material. The saw should cut alongside the line, and *the line should not* be obliterated in the cutting. Material must be left for trimming and finishing.

The First Stroke.—Now, to hold the saw in starting is the difficult task to the beginner. Once mastered it is simple and easy. The only time in which the saw should be firmly held by the hand is during the initial cut or two; afterwards always hold the handle loosely. There is nothing so tiring as a tightly grasped saw. The saw has but one handle, hence it is designed to be used with one hand. Sometimes, with long and tiresome jobs, in ripping, two hands may be used, but one hand can always control a saw better than two hands.

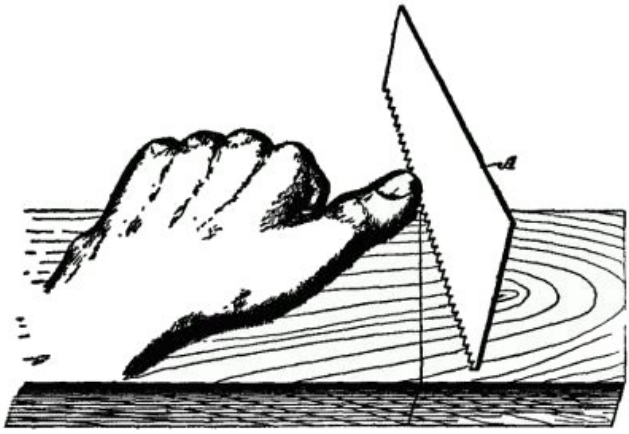


Fig. 20.

The Starting Cut.—In order to make our understanding of the starting cut more explicit, we refer to Fig. 20, in which the thumb of the left hand is shown in the position of a guide—the end of the thumb being held up a sufficient distance to clear the teeth. In this position you need not fear that the teeth of the saw (A) will ride up over the thumb if you have a firm grasp of the saw handle.

The first stroke should be upwardly, not downwardly. While in the act of drawing up the saw you can judge whether the saw blade is held by the thumb gage in the proper position to cut along the mark, and when the saw moves downwardly for the first cut, you may be assured that the cut is accurate, or at the right place, and the thumb should be kept in its position until two or three cuts are made, and the work is then fairly started.

CHAPTER VI: THE USES OF THE COMPASS AND THE SQUARE

The Square.—The square is, probably, the oldest of all tools, and that, together with the compass, or dividers, with which the square is always associated, has constituted the craftsman's emblem from the earliest historical times. So far as we now know, the plain flat form, which has at least one right angle and two or more straight edges, was the only form of square used by the workman. But modern uses, and the development of joinery and cabinet making, as well as the more advanced forms of machinery practice, necessitated new structural forms in the square, so that the bevel square, in which there is an adjustable blade set in a handle, was found necessary.

The Try Square.—In the use of the ordinary large metal square it is necessary to lay the short limb of the square on the face of the work, and the long limb must, therefore, rest against the work side or edge of the timber, so that the scribing edge of the short limb does not rest flat against the work. As such a tool is defective in work requiring accuracy, it brought into existence what is called the try square, which has a rectangular handle, usually of wood, into which is fitted at one end a metal blade, which is at right angles to the edge of the handle. The handle, therefore, always serves as a guide for the blade in scribing work, because it lies flat down on the work.

The T-Square is another modification of the try square, its principal use being for draughting purposes.

The Compass.—The compass is one of the original carpenter's tools. The difference between *compass* and *dividers* is that compasses have adjustable pen or pencil points, whereas dividers are without adjustable points. Modern work has brought refinements in the character of the compass and dividers, so that we now have the bow-compass, which is, usually, a small tool, one leg of which carries a pen or pencil point, the two legs being secured together, usually, by a spring bow, or by a hinged joint with a spring attachment.

Proportional Dividers.—A useful tool is called the proportional dividers, the legs of which are hinged together intermediate the ends, so that the pivotal joint is adjustable. By means of this tool the scale of work may be changed, although its widest field of usefulness is work laid off on a scale which you intend to reduce or enlarge proportionally.

Determining Angles.—Now, in order to lay out work the boy should know quickly and accurately how to determine various angles used or required in

his work. The quickest way in which to learn this is to become familiar with the degree in its various relations.

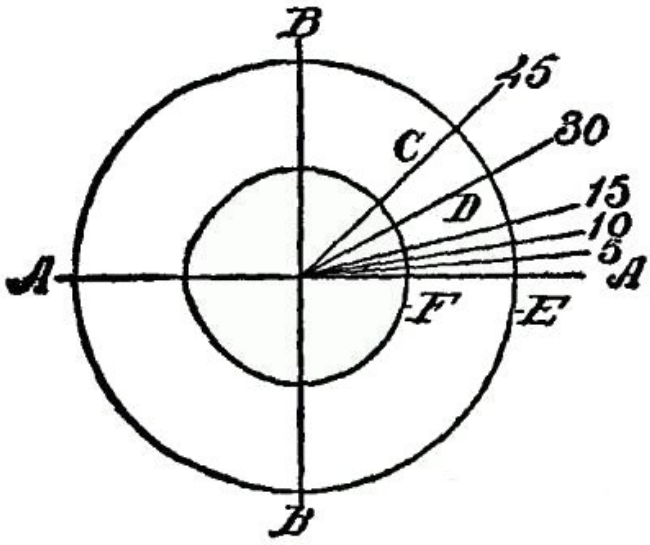


Fig. 51.

Definition of Degree.—A degree is not a measure, as we would designate a foot or a pound to determine distance or quantity. It is used to denote a division, space, interval or position. To illustrate, look at the circle, Fig. 51. The four cardinal points are formed by the cross lines (A, B), and in each one of the quadrants thus formed the circle is divided into 90 degrees. Look at the radial lines (C, D), and you will find that the distance between these lines is different along the curved line (E) than along the curved line (F). The degree is, therefore, to indicate only the space, division or interval in the circle.

The Most Important Angle.—Most important for one to know at a glance is that of 45 degrees, because the one can the more readily calculate the other degrees, approximately, by having 45 degrees once fixed in the mind, and impressed on the visual image. With a square and a compass it is a comparatively easy matter accurately to step off 45 degrees, as it is the line C, midway between A and B, and the other degrees may be calculated from the line C and the cardinal lines A or B.

CHAPTER VII: HOW THE DIFFERENT STRUCTURAL PARTS ARE DESIGNATED

The Right Name for Everything.—Always make it a point to apply the right term to each article or portion of a structure. Your explanation, to those who do know the proper technical terms, will render much easier a thorough understanding; and to those who do not know, your language will be in the nature of an education.

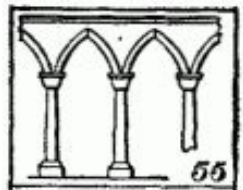
Proper Designations.—Every part in mechanism, every point, curve and angle has its peculiar designation. A knowledge of terms is an indication of thoroughness in education, and, as heretofore stated, becomes really the basis of art, as well as of the sciences. When you wish to impart information to another you must do it in terms understood by both.

Furthermore, and for this very reason, you should study to find out how to explain or to define the terms. You may have a mental picture of the structure in your mind, but when asked to explain it you are lost.

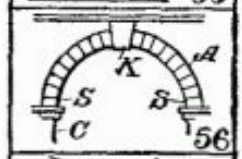
Learning Mechanical Forms.—Suppose, for example, we take the words *segment* and *sector*. Without a thorough understanding in your own mind you are likely to confuse these terms by taking one for the other. But let us assume you are to be called upon to explain a sector to some one who has no idea of terms and their definitions. How would you describe it? While it is true it is wedge-shaped, you will see by examining the drawing that it is not like a wedge. The sector has two sides running from a point like a wedge, but the large end of the sector is curved.

If you were called upon to define a segment you might say it had one straight line and one curve, but this would not define it very lucidly. Therefore, in going over the designations given, not only fix in your mind the particular form, but try to remember some particular manner in which you can clearly express the form, the shape or the relation of the parts.

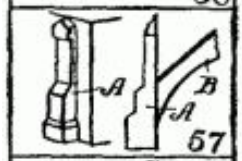
For your guidance, therefore, I have given, as far as possible, simple figures to aid you in becoming acquainted with structures and their designations, without repeating the more simple forms which I have used in the preceding chapters.



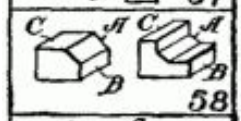
55. *Arcade.*—A series of arches with the columns or piers which support them, the spandrels above, and other parts.



56. *Arch.*—A curved member made up, usually, of separate wedge-shaped solids, A. K, Keystone; S, Springers; C, Chord, or span.

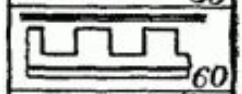


57. *Buttress.*—A projecting mass of masonry. A, used for resisting the thrust of an arch, or for ornamentation; B, a flying buttress.

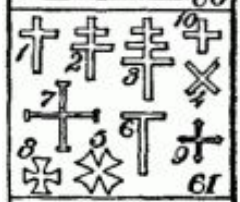


58. *Chamfer.*—The surface A formed by cutting away the arris or angle formed by two faces, B, C, of material.

59. *Cotter or Cotter Pin.*—A pin, A, either flat, square or round, driven through a projecting tongue to hold it in position.

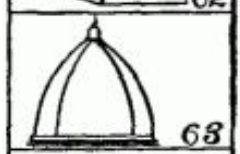


60. *Crenelated.*—A form of molding indented or notched, either regularly or irregularly.



61. *Crosses.*—1. Latin cross, in the Church of Rome carried before Bishops. 2. Double cross, carried before Cardinals and Bishops. 3. Triple or Papal cross. 4. St. Andrew's and St. Peter's cross. 5. Maltese cross. 6. St. Anthony or Egyptian cross. 7. Cross of Jerusalem. 8. A cross patté or fermé (head or first). 9. A cross patonce (that is, growing larger at the ends). 10. Greek cross.

62. *Curb Roof.*—A roof having a double slope, or composed on each side of two parts which have unequal inclinations; a gambrel roof.



63. *Cupola.*—So called on account of its resemblance to a cup. A roof having a rounded form. When on a