

Machine Construction & Drawing.

(From Collin's Elementary Science Series.)

CHAPTER I.

1. A **DRAWING**, as the representation of a machine, to be intelligible, should convey a correct idea of the size and proportion of the object represented, and, in most cases, of its several parts; also the various motions which the movable parts are capable of producing.

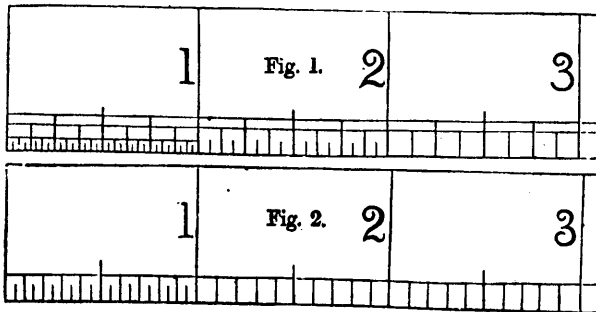
To make such a drawing of the same size as the machine, it is clear, in many cases, would be almost impossible; we therefore generally make our drawings to a reduced size, or, as it is termed, "*to Scale*," that is, the drawing may be one-fourth of the size of the object, in which case we say, the drawing is to a scale of one-fourth, or 3 inches = 1 foot. However, to make this point clear, the subject of scales will be treated more fully further on.

2. In drawings of machinery, approximations to the true form of some portions are often employed, and unfortunately too often by those unable to form a just approximation, owing to the want of a knowledge of those principles which are essential for the correct representation of objects. We therefore strongly advise all students to learn first how to draw correctly, so that they may be able to adopt approximations when necessary or advisable.

3. The standard of measurement used in this country is the *foot*, the one-third of the standard *yard*; this is divided into twelve equal parts, called *inches*; these are subdivided into 8, 16, 32, 64, &c., parts, and termed respectively *eighths*, *sixteenths*, *thirty-seconds*, *sixty-fourths*, &c., denoted by $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{32}$, $\frac{1}{64}$, &c., each subdivision being one-half of the preceding. It is usual to denote the size of an object by so many *feet*, *inches*, *eighths*, &c., as the case may be; this will be considered in the articles on *scales*.

In some engineering establishments the *decimal rule* is used, wherein the inch is taken as the standard, of which there are ten in each half of the rule, instead of twelve as in the *two-foot rule*; each inch in the decimal rule is divided into ten equal parts, these are again subdivided.

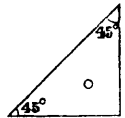
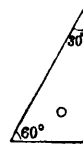
The common *two-foot* being the most used, we shall take our dimensions by means of it. Fig. 1 represents a portion of this rule; and fig. 2 the decimal rule.



CHAPTER II.

4. We will now give the student a few hints on the use of the necessary instruments required for mechanical drawing, assuming that he possesses a drawing-board, a T-square, two set-squares, drawing-paper, a box of instruments, a scale, india-rubber, and pencils. One of the following sizes of board will be sufficient

for present use,—2 ft. 4 in. × 1 ft. 9 in., or 2 ft. × 1 ft. 6 in. The two set-squares should have angles 90°, 60°, and 30°, and 90°, 45°, and 45°, respectively (see figs. 3 and 4).



5. The drawing-paper for present use may be of a common kind, and fastened down by pins; convenient sizes of sheets are—*Royal*, 25 in. × 20 in., *Imperial*, 30 in. × 21 in. (using half-sheets). When the nature of the drawing demands it, a better kind of paper should be used, the most common being *Double Elephant*, 40 in. × 26 in.; the smooth is best suited for fine-lining and shading.* The box of instruments should contain at least—dividers, a set of large compasses with lengthening-bar, pen and pencil legs, small pen and pencil bows, a drawing-pen, and a protractor, also a few drawing-pins.

6. The drawing pencils best for ordinary use are, H, HH for fine work, and HB for sketching. Figs. 5 and 6 show how to cut the pencil for using with the squares and bow-pencil (this flat chisel-point will last a considerable time compared with the round point). A small smooth file or sand-paper is useful to rub the pencil upon.



Fig. 5. Fig. 6.

As our drawings are to be *inked-in*, the pencil lines should be fine, and made with as little pressure as possible; all lines should be drawn sufficiently long at first, so as not to require producing.

7. Lines parallel to the long edges of the drawing-board should be drawn with the T-square, as also lines at right angles to these, if longer than an edge of the set-square (see figs. 7 and 8).

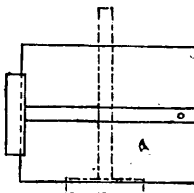


Fig. 7.

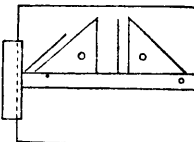


Fig. 8.

Lines not parallel to the sides of the board are best drawn by using the set-squares (see fig. 9), or T and set-squares; and lines at right angles to the one already drawn (whatever may be the position of that line) by reversing the set-square; in fig. 10 *ab* is the line first drawn, *cd* a line at right angles to *ab*.

Use the india-rubber as little as possible.

8. The following distinguishing lines will be used in this book,—Un-

broken lines represent the form of objects, as *ab*, *bc*, &c., in fig 15; if these lines cannot be seen from the fixed position in which we view them, they are shown by dotted lines, thus,, as in figs. 15 and 16; these dotted lines are of the same thickness as the other lines of the object. Lines used to determine the form, or construction lines, are shown as dotted lines, — — — — —, but not as thick as the former; * centre lines are shown thus, — . . . —; radius lines are shown thus, < — — — — —; dimension lines are shown thus, < — — — — —.

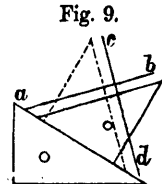


Fig. 9.

* If the drawing is to be coloured or shaded, it should be stretched and fixed with glue or gum and not with pins.