

LECTURES TO LITTLE FOLKS.

THE PHANTASMASCOPE. — (See page 77.)

Before quitting the subject of our last lecture, we have yet another toy in store for your amusement, it is founded upon the same optical principle which we hope you now thoroughly understand. In the illustration Fig. 1, is shown a disk with figures drawn therein in different attitudes of dancing; near the edges are cut out a series of notches corresponding with the figures delineated on their margins. To exhibit the magical effects of this toy, it must be attached to a spindle and made to revolve rapidly before a looking-glass, and the reflections viewed through the openings, when to your astonishment you will observe the figures in constant motion and exhibiting the most grotesque attitudes; now attend to the explanation. Each figure is seen through the aperture, and as it passes and is succeeded in rapid succession by another and another, differing from the former only in attitude, the eye is cheated into the belief of its being the same object successively changing the position of its body. Consider what takes place in an image on the retina when we actually witness a man in motion; for instance, a man jumping over a gate: in the first moment he appears on the ground, in the next his legs are a few inches above it, in the third they are nearly on the level with the rail, in the fourth he is above it, and then in the successive movements he is seen descending as he had previously risen. A precisely similar effect is produced on the retina by the successive substitution of figures in corresponding attitudes, as seen through the orifices of the revolving disk, each figure remaining on the retina long enough to allow its successor to take its place without an interval that would destroy the illusion. Fig. 2, is an improvement upon its construction in as much as we get rid of the mirror, and enable two persons to witness the deception at the same time: at each end of the spindle a disk is placed and by revolving the spindle you will then perceive that both cards are made to turn with equal velocity, figures will be all dancing or horses prancing, according to the style of figure you choose to delineate upon the card. It is scarcely necessary to observe that the appearances thus produced, may be infinitely varied; heads opening their mouths, and distorting their countenances; creeping serpents, and machinery in active operation are among the subjects that have excited the greatest admiration.

MECHANICAL DRAWING.

For some months past we have given diagrams in Mechanical Drawing taken from the DRAWING BOOKS adopted by the COMMISSIONERS OF NATIONAL EDUCATION IN IRELAND, but as in every number that we issue there are examples of machinery which if copied accurately by the student will afford him excellent practice, we shall for the future give illustrations of a more varied kind, but on a reduced scale, in order to embrace in each volume as much instruction in this most useful art as possible.

The ability to draw neatly and correctly cannot be too highly estimated by the mechanic, in fact it is an absolute necessity to progress in his trade. The carpenter, the cabinet-maker, the founder, the smith, in fact

every artizan who wishes to become master of his craft should have some knowledge of mechanical drawing so as to be able to delineate correctly his ideas upon paper. The frivolous excuses so frequently made of not having taste for drawing, or time to do so, is unworthy of any young mechanic who is in the least desirous of improving his position. Any one can be taught to become sufficiently skilful with his pen and pencil to make good mechanical drawings. This is no gift of nature, it is simply acquired by practice and proper attention to the rules and principles which govern the art, nor is any costly box of mathematical instruments necessary. With a drawing board, square, jointed compasses fitted with pen, pencil, and extension joints; a small pair of compasses with needle points for describing very small circles; a *good ruling pen* parallel ruler, and sliding square, with a few cakes of water colours, such as india ink, sepia, umber, lake, blue, and yellow, he can make almost any kind of mechanical drawing. His instruments, however, should be always good and can be obtained separately of a much superior quality to those sold in boxes, in fact the cheap instruments sold in boxes are absolute trash with which no draftsman, however proficient he may be, can make good work.

The ability to make a good drawing is always a source of pleasure and amusement, and when once the young student acquires the art he begins to feel resources of profitable pleasure within himself, and no longer seeks for frivolous amusements and spending time unprofitably. As regards want of time or want of recreation after the day's work is over, an excuse which is so often made by young men, we can only say, that it is not necessary every evening should be spent in study, other recreations of an enlivening kind, if harmless, are essential to health and happiness, but a few evenings in every month can always be spared for the study of drawing, "where there is a will there is a way."

As a source of pleasure and as an accomplishment, the study of drawing has frequently a great influence over the mind and tends to elevate and refine our ideas; a good picture often conveys more instruction and reaches the heart quicker by the moral which it portrays than even a well written book.

Although a knowledge of geometry and perspective is very essential to be a good mechanical draughtsman, yet any one may arrive to great skill in delineating figures and machinery, without having studied the rudiments of either. We shall therefore from time to time furnish such subjects as we hope will prove of value to every one desirous of acquiring the art, whether young or old.

AN OLD INVENTION.

From a paper on the locomotive engine, by Joseph Harrison, Jr., read before the members of the Franklin Institute of Pennsylvania, February 21, 1872, is taken the following paragraph:

"The engineer, noting the curious things in bronze and in copper exhumed at Pompeii and gathered together in the Museum Borbonico at Naples, will linger near a small vessel for heating water, little more than a foot high, in which are combined nearly all the principles involved in the modern vertical steam boiler—fire-box, smoke-box, smoke-flue through the top, and fire-door at the side, all complete; and strange to say, this little thing has a *water-grate* made of small tubes crossing the fire-box at the bottom, an idea that has been patented twenty times over, in one shape or another, within the period of the history of the steam engine."