

Ellis, (F. W.)

Description of a simplified
Clock-work apparatus for
graphic experiments



[Reprinted from the Boston Medical and Surgical Journal of July 21, 1887.]

DESCRIPTION OF A SIMPLIFIED CLOCK-WORK APPARATUS FOR GRAPHIC EXPERIMENTS.

BY F. W. ELLIS, M.D., SPRINGFIELD, MASS.

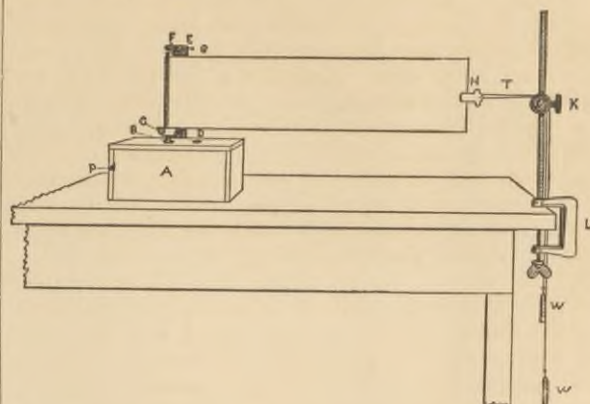
THREE kinds of apparatus are required in graphic experiments: first, a contrivance for imparting a uniform motion to the recording surface; secondly, an arrangement for writing upon the moving surface; and thirdly, a mechanism for transmitting the movement to be recorded to the second form of apparatus. These three forms of apparatus are all required in ordinary physiological and clinical experiments in which the graphic method is employed, and together form the complete recording apparatus.

We have no good name for the first class of instruments—perhaps graphic-motor would be as good as any. The word kymograph or kymographion, is sometimes employed to designate this species of apparatus, but, as the word is also used to denote instruments belonging to the second class, as the original kymograph of Ludwig, Fick's spring kymograph, etc., it only tends to confusion to employ it in this connection.

In the ordinary forms of graphic motors some kind of clock-work is usually employed. In large laboratories, gas-engines, electric, hot-air, and water motors have been used to impart the required motion to the apparatus, but, ordinarily, clock-work driven by a weight or spring is resorted to for this purpose. Experience has taught the writer that even large laboratories are apt to be inadequately supplied with instruments of this kind. The cost of the instruments constructed after the models of Ludwig and Marey is so great that well-equipped laboratories cannot afford more than one or two of them. Several experimenters, working together, are liable to be embarrassed for want of a sufficient number of recording instruments. To many clinical investigators these instruments are inaccessible. There are also enthusiasts, carrying on experimental researches in private, who are indisposed to make the large outlay required to procure the complicated Ludwig or Marey apparatus. There are, moreover, certain requirements for particular purposes which the instruments mentioned do not possess; these are portability, compactness, and easy adaptability to special conditions.

Reichert¹ described two ingenious arrangements of simple construction to take the place of the complicated graphic motors. The apparatus was, however, bulky and could not be conveniently transported. The apparatus to be described is exceedingly simple, is easy to construct, costs very little, and is quite efficient. It is amply sufficient for most graphic purposes, and is particularly well adapted for clinical work. It can be easily modified for special purposes, and very long tracing can be taken with it when required.

The figure gives an outline sketch of the apparatus. The clock work is enclosed in a small covered box A. The axle for the minute-hand projects through a small hole in the cover, and is represented at B. A wooden spool C, about 12 centimetres long, and having a hole in the centre of its lower end, is fitted to the axle, and is retained in a perpendicular position by means of the



wooden upright D having a projection E at right angles to it. A pin F, in the centre of the upper end of the spool is held in a notch in the piece E by a pin G. A clamp L, to which is fastened a brass rod, can be fastened to one end of a table. A short piece of brass K has a hole in its centre through which the rod passes and upon which it can be clamped at any height by means of a binding-screw. Two small pulleys are affixed to the ends of this piece. Two strings pass over these pulleys. One end of each string is fastened to a garter-clamp H, and the other to a small weight W. The clamps are fastened to each end of the paper for the tracing. One end of the paper is passed around the wooden roller, and the strings are placed upon the pulleys. The paper is then retained in its position by the traction of the weights. The clock-work is an ordinary eight-day movement. The pendulum and escapement are removed. A piece of sheet brass is fastened to the axle of the scape-wheel to serve as a regulator. A steel spring, one end of which, P, projects through the front of the box, is fastened inside the case in such a way that it serves as a lever which can be pressed against one of the wheels and so stop the apparatus. By employing spools of different diameters the rate of movement of the paper can be varied as desired. When a very slow rate is required, as is necessary in some protracted experiments, extending over hours, or even days, a marine clock-work can be substituted for the ordinary pendulum movement.

It is evident that tracings of great length can be taken with this apparatus. By turning the box upon its back, horizontal tracings can be obtained.

A very efficient method for smoking the strips of paper is the following: A circular piece of wood, an inch or more in thickness, is sawn from a board. A short brass or iron rod is driven through the centre of the wooden disc. The paper is made to envelop the disc and is fastened with a tack. By revolving the wheel over the naked flame of an oil lamp the paper can be very evenly covered with a coating of carbon.

Ordinarily very light weights are sufficient to keep the paper smooth. When larger weights are used, it will be necessary to fasten the box to the table by means of a clamp or some other simple device.

¹Two new Kymographions and a Time-Recorder, Philadelphia Medical Times, Vol. XII, p. 267.

