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AN ELECTRODE HOLDER FOR DIRECT ENCEPHALOGRAPHY WITH ITS OWN STERILIZING CABINET

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Direct recording from the human brain has been outgrowing purely electrophysiological interest. Several technical problems had, however, to be solved in order to offer the neurosurgeon a reliable and flexible method of rapid investigation of the electrical activity of the brain exposed during operations.

One of the important tools is the holder for the electrodes in corticography. Three types of electrode holder have been described (Jasper, 1951 ; Marshall, 1949 ; Grass, quoted by Schwab, 1951) although it is probable that other models not described in the available literature are also in use.

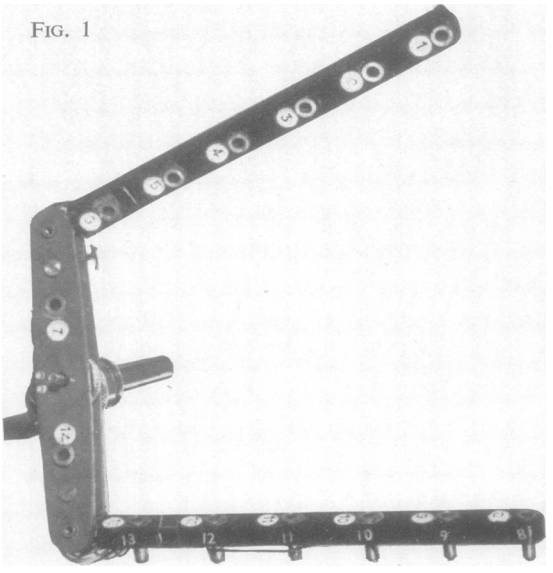
The electrode holder described below has some advantages over previously described models. It was designed to meet the following requirements : (1) Lightness and appropriate mobility ; (2) reliability of contacts ; (3) ease of replacement and interchangeability of various kinds of electrodes ; (4) stable fixation to the skull while allowing immediate removal in case of emergency ; (5) sterilization in formalin vapour ; (6) possibility of stimulating the brain while recording ; (7) possibility of taking photographs of the brain with electrodes in position without obstruction to the view. In collaboration with Mr. M. A. Falconer, the present model, after several trials, has been found satisfactory for routine use since 1953. This model can be built in any small workshop using materials with a fusion point near or below autoclave temperatures. This offers considerable constructional advantages.

The holder (Fig. 1) consists of a central portion or body and two lateral portions or arms. The ball-and-socket connecting base of a de Martel retractor is fixed to the central portion or body, permitting mobility of the holder in various planes and its subsequent fixation at various angles. The base of the de Martel retractor is slipped on to its square peg which has been previously fitted into a drill hole in an appropriate part of the skull. This arrangement is particularly useful as it disposes of the skull clamping device used in all the other models ; should the brain herniate suddenly through the bone flap the peg does not cause interference, while the holder can be immediately lifted or removed. The body of the holder, which is 3 in. long, is made of two parallel plates of " tufnol " ($\frac{1}{8}$ in. thick). At each end these plates clamp a ball ($\frac{7}{16}$ in. diameter). A tension screw allows stability and good friction on each ball on which the arms are fixed.

Each lateral portion or arm can be swivelled to any position about the ball joint which attaches it to the body. This feature proved particularly useful when exploring a large area, for each arm would be adequately and independently orientated. Each arm is made of " bakelite " ($\frac{1}{4}$ in. thick) and is 5 in. long. Six sockets for electrode mounts are placed in each arm and two in the body (a total of 14).

Each electrode mount (Fig. 2 A) is formed by two OZ plugs (A1 and A2). The top of A1 is suitably cross drilled to act as a socket for A2, which is also cross drilled to house (soldered) a short piece of brass tubing (0·052 in. lumen). A small wire spring inside the brass tubing ensures good contact with the rigid part A3 (stainless steel tubing) of the actual electrode. Such an arrangement allows to-and-fro movements of the

FIG. 1



electrode as well as its rotation in both vertical and horizontal planes while the slight friction avoids undesirable looseness.

From the sockets the leads (7·009 PVC covered) recess in the underside of each arm and join with the leads from the other arm and from the body to form a cable. The cable is shielded all its length with braiding (insulated from the metallic parts of the holder). An additional rubber tubing covers the whole cable form. Each lead at the end of the cable (8 ft. long) is connected by means of individually numbered plugs to the input box extension (clamped under the operating table) of the E.E.G. apparatus.

Each electrode (Fig. 2, A3) is a silver-silver chloride bare ball on a silver lead soldered to a length of stainless steel tube (0·048 in. diameter, 2½ in. long) which slides in the electrode mount. The silver lead (32 S.W.G. four lengths 5-8-10-12 cm.) has sufficient spring in it to maintain contact on the brain. In addition flexible insulated silver leads for recording from non-exposed surfaces or cavities and light needle electrodes for depth recording are included in the equipment. At the distal end of the patient these special electrodes are soldered to single plugs (Fig. 2B) which fit in the sockets. All the electrodes therefore are interchangeable.

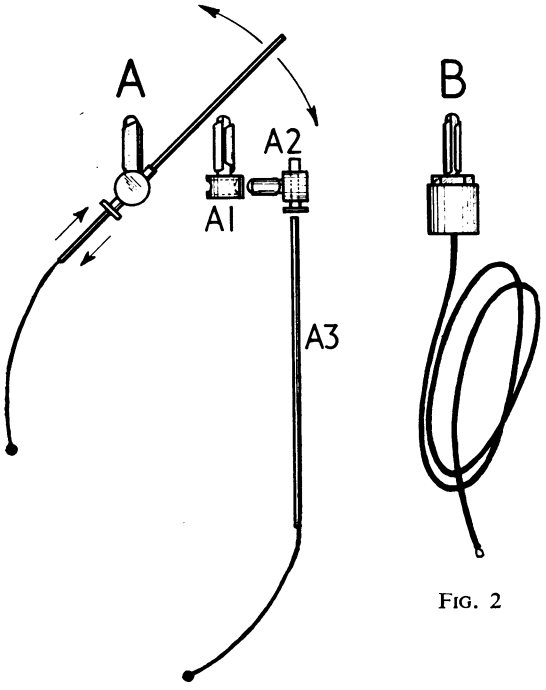


FIG. 2

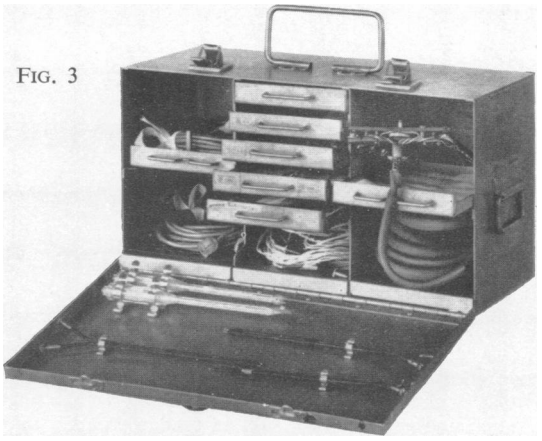


FIG. 3

Stimulation of the brain may be performed either directly or through the recording electrodes by applying the terminals to appropriate contacts near the sockets.

A special cabinet (Fig. 3) was built for keeping and sterilizing two electrode holders, the various electrodes, and the stimulating electrodes and their cables. The five drawers in the central portion contain electrodes of various lengths and types. One electrode holder is placed in each side drawer, the right hand one of Fig. 3 being that described above. Each cable is rolled in the recess below each lateral drawer and in the middle there is a cable for the stimulator electrodes. All drawers are perforated to permit the circulation of vapour from formalin tablets scattered around under gauze and at the bottom of the cabinet. The cabinet is closed and sealed with adhesive tape. After a minimum of 24 hours the apparatus is sterilized and ready thereafter for use in the operating theatre. Following each operation the holder, all the electrodes, and the cables and terminal plugs are carefully checked before going back into the sterilizing cabinet.

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