



FIG. 5.—Apparatus for registering the vertical component of earth-waves during the whole of the disturbance.

good type of this class. It consists of plates of carbon and zinc, dipped in dilute sulphuric acid, but with the acid there is dissolved a quantity of potassic bichromate. The hydrogen, liberated by the solution of the zinc, reduces the bichromate, forming water and sesquioxide of chromium, and this and the liberated potash, combine with the sulphuric acid, forming chromalum. The hydrogen, is therefore, never liberated in the free state, but at once employed in reducing chromic acid.

A similar action occurs in the batteries of Grove and Bunsen, only nitric acid is employed for the absorption of the hydrogen, instead of the potassic bichromate. It is obvious, however, that while in the bichromate battery, the potassic bichromate may be mixed with the sulphuric acid, it would not do to allow the nitric acid of the Grove or Bunsen cell to reach the zinc plate. The nitric acid is therefore placed in a separate pot of porous earthenware, which is placed in the sulphuric acid. The nitric and sulphuric acids meet in the pores of the earthenware, but their diffusion is very slow. The amalgamated zinc plate is dipped in the sulphuric acid, while a platinum plate in the case of Bunsen's battery, is

plunged in the nitric acid in the porous pot. The liberated hydrogen in its passage to the platinum or carbon plate meets with the nitric acid, reducing it to nitrogen trioxide (which gives the green colour to the spent acid), or to other lower oxides of nitrogen.

The most constant, as well as the earliest of the "constant batteries," is that of Daniell. In this battery the plates are zinc and copper. The zinc is plunged in dilute sulphuric acid, and the liberated hydrogen is employed in decomposing copper sulphate which surrounds the copper plate. In this way, pure copper is deposited instead of hydrogen on the copper plate, and this does not alter the character of the plate, so that polarisation to any great extent is impossible. The electrical properties of the copper depend, however, to a slight extent, on the rate at which it is deposited, and thus the E.M.F. of the battery is not absolutely constant but the cell is by far the best of its kind. As the copper sulphate would deposit copper on the zinc if it could reach it, a porous pot is employed to separate the sulphuric acid and the copper sulphate.

N. B.—From lectures delivered in connection with the Cambridge (Eng.) University extension scheme.