

some hours and then withdrawn. The inclination of the hole can easily be read from the glass vessel, as the upper surface of the hydrofluoric acid etches the glass quite distinctly, but the direction of the hole can only be determined by marking the orientation of the top rod while the etching is taking place, marking each joint when the rods are taken apart and finally screwing them together again on the surface in order to compare the orientation marks with the etching on the glass tube. By surveying points at distances of say 300 or even 500 feet, the general course of a bore hole can be determined by the method above described, but the method is laborious and costly and owing to almost unavoidable twisting of the rods the results have seldom proved very satisfactory.

Another method of surveying involves the use of plummets and compasses immersed in a solution of gelatine which slowly hardens after the apparatus has been sent down the hole. This device, although very ingenious, has proved very difficult in use and has not met with much success, especially in deep holes. A very recent form of the apparatus uses paraffine in place of gelatine. The instrument contains an electric resistance and is connected with a dynamo on the surface by double insulated cables. The compass and plummet remain fixed in the solid paraffine while the instrument is lowered to the station in the hole. Current is then sent through the cable and the paraffine melted. The current is then shut off and after sufficient time has elapsed for the paraffine to solidify the instrument is reeled in and its records read. The apparatus should give accurate results, but the long line of insulated cable is costly and liable to injury. (Marriott—Trans. Inst. Min. and Met., Feb., 1905.)

A few months ago an instrument maker in Johannesburg designed a very ingenious apparatus containing compass, plummet, small cameras and electric light, the whole connected with a small adjustable clock so that the light could be turned on for a given period after the apparatus had been lowered into the hole. This apparatus was described by its inventor, Wm. Helme, at a meeting of the Institute of Mining Surveyors of the Transvaal on May 27th, 1905. It has since been used in surveying a number of holes and has proven extremely satisfactory.

A prominent mining engineer of the author's acquaintance states that he has had the machine tested by surveying several holes twice and has found the readings to agree so closely in all cases that he scarcely considers it necessary to take check readings unless the first set show some unusual change of direction in the hole. The apparatus, instead of requiring rods, the use of which involves a great expenditure of time and labor, and the use of a