PRACTICAL HINTS ON WATCH REPAIRING.

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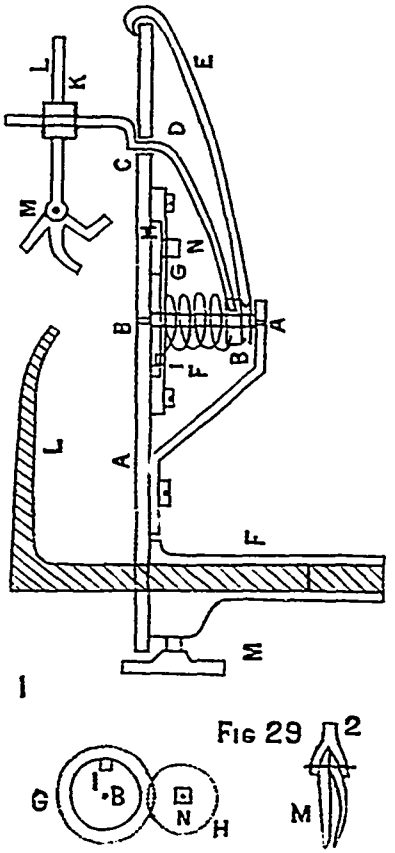
THE ANGLE-METER.—CONTINUED.

(442) Fig. 27 merely gave the external appearance of the tool. The mechanism is underneath the plate, *A*, and is shown in Fig.

Fig. 28.



28, in which *a* is a sort of staff, whose upper pivot fits in the lower half of the hole, *B*, and the lower one is supported in a suitable bridge, screwed to the under surface of the plate, *A*. At the lower end of the staff a brass hub, or collar, *b*, is driven on. In it are fastened the wire lever, *d*, and the lower end of the spiral spring, *f*, in the same way as hair-springs are usually secured. The steel wire pointer, *e*, is attached to the same hub, having its end bent into a ring, and sprung into a circular groove turned in the hub, nearly as the regulators in American watches are fastened. Or a plate may be fitted underneath and bearing on the ring, which is tightened up by two small screws, to give any desired pressure to the ring. The object is to make the pointer tight enough to stay as it is placed, and to move with the lever, *d*, but allow it to be turned around on the hub, if desired, without using much force. The arm of the lever is so placed that its claw, *m*, will bear against any convenient part of the piece being tested, then the pointer is moved so that it will come at the *O* on the scale, *D*, Fig. 27, when the measurement begins. At the end of the movement, the pointer will show its amount in degrees without calculation.

(443) The spring, *f*, is provided for keeping the claw of the lever in contact with the piece on trial. It may be made to press the lever in either direction, or to bring it to the centre of the scale, by moving the upper end as required. Fig. 29 shows a stud, *i*, to which the spring is attached, and which is carried by a circular ring, *g*, placed concentrically with the hole, *B*. This ring has teeth on its exterior edge, and is revolved as desired by the toothed wheel, *h*, working into it, by means of a bench key applied to its squared post, *n*. The whole thing, together with the grooved plate in which *g* and *h* turn, can be taken out of some old verge watch, and screwed to the under surface of the plate, *A*. But instead of the regulator pins, as used in the watch, the stud, *i*, must be soldered on the spur which projects out inside of the ring, *g*. The spring, *f*, can be made of unannealed and springy fine iron binding wire. It should not be too stiff, else it might cause the lever to exert too much pressure on the part being tested. It should, therefore, be closely coiled and somewhat long. The figure shows open coils in order to expose the staff within. All that is necessary is to turn the wheel, *h*, enough to give the spring merely sufficient tension to insure the arm, *l*, remaining in contact with the part, and following its motion.

(444) The lever, *d*, curves upward to the slot, *C*, through which it passes to the upper side of plate, *A*, then makes a bend outward, and again rises vertically. In fitting arms into the hub, *k*, the bend or elbow rests on the plate when pressed down, and protects the staff, *a*, from strain. But ordinarily the wire, *d*, should not rub either in the slot, *C*, or on the surface of the plate. Nor should the pointer, *e*, rub on the plate, but play freely just above and close to the scale, *D*. The hub, *k*, slides on the vertical part of *d*, and is fastened by a set screw. The side of *d*, facing the screw, is filed flat, by which means the arm, *l*, is caused to always point to the centre, *B*, (Fig. 27.) The side of *l* is also flatted, to prevent it turning over in its hole, and when its end has been properly adjusted, it is fastened by a set screw.

(445) At the inner end the wire, *l*, is split, and takes in a small piece or claw, *m*, which may turn up or down on the rivet through the joint, to adapt itself to the piece being tested. Different arms, *l*, should be provided, each having a differently shaped claw, *m*. Three are shown in the figure, (although only one is attached to any one arm,)—one straight with a broad end, to insert between the plates of a movement and rest against the side of a lever fork or any similar part; one is curved to suit other cases; and the lowest one has a piece of spring on its end, curved directly downwards. Its breadth is transverse to the arm, *l*, so that it will not yield sideways, although free to spring in the direction of the length of the arm. This spring is used when there is no arm of a balance in a convenient position for one of the other claws to rest against it, as represented in Fig. 27. In such case, this spring can bear on the inside of the balance rim, and, by drawing out the arm, *l*, any amount of adhesion can be given to prevent the spring slipping on the rim. The balance is moved, during this test, by placing the finger on the upright end of the lever, *d*, not on the balance itself. Other shapes for the claws will occur to the workman, as adapted to particular circumstances.

(446) *F*, *F*, *F*, Fig. 28, are the legs of the plate, A, made hollow, like those of the ordinary upright drilling tool; each one carries a clamp, *L*, which is caused to bear on the pillar plate of the watch movement, supported on a ring as already