A Stroboscope for Checking the Speed of Subscribers' Dials

By H. BROADWELL
Telephone Apparatus Development

IN certain parts of the telephone system such as remote step-by-step areas and manual areas having step-by-step P.B.X.'s, it is not always feasible to provide the regular central-office type dial testers* for checking the speed of subscribers' dials. A form of dial tester which can be carried in the maintenance man's tool-kit, and which works on the stroboscopic principle, has therefore been developed for these dials. The device consists of a target (Figure 1) which can be attached to the finger wheel of the dial, and a tuning fork in a case (Figure 2) with an opening through which to view the divisions on the target.

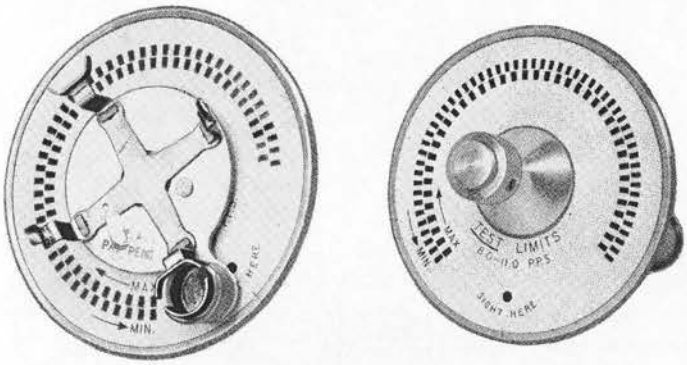

Fig. 1—A target, which can be attached to the finger wheel of a dial, is marked with divisions which are viewed stroboscopically to test the speed of the dial as it unwinds

The manner of using the stroboscope is shown in Figure 3. The maintenance man winds the dial, partly depresses the button in the case so that he can see past the fork, and sights the fork on the reference mark on the target. He then fully depresses the button to start the fork, and releases the dial. If a row of divisions on the target appears to stand still when viewed through the fork, the dial is running at the speed for which that row was figured. If the divisions appear to run in the direction of the arrow located alongside the row, the speed is within the limit which the row represents, and if in the opposite direction, the speed is outside that limit. The velocity of the motion as seen through the fork indicates the extent of the deviation from the speed represented by the row.

The upper and lower limits of speed established for the subscriber's dial as most satisfactory from both circuit and design standpoints are eleven pulses per second, and eight pulses per second, respectively. These limits, known as "test" limits, are represented by two rows of divisions on one side of the removable disc on the

*The 51-type Dial Tester (RECORD, *August*, 1927, *p.* 427), and the 50A Dial Tester.

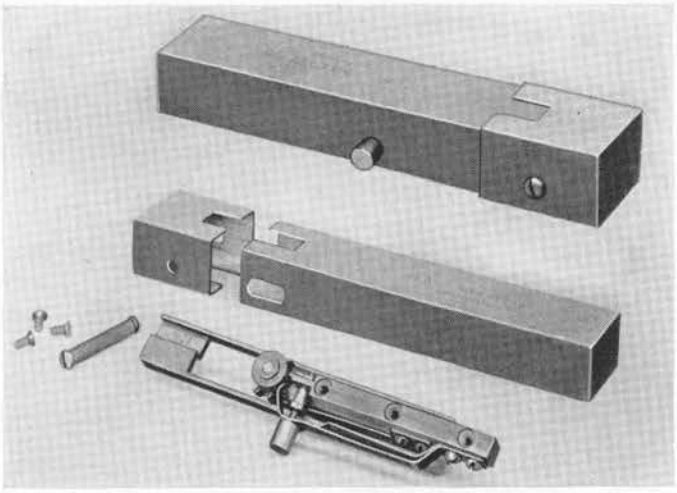

Fig. 2—The divisions on the target (Figure 1) are viewed through the opening in the case, past the prongs of the tuning fork which are set in motion by pressing the button. Each prong bears a shutter, as can be seen at the lower left, and the space between the shutters opens and closes as the fork vibrates

target. If the dial is found to run faster than the maximum or slower than the minimum speed, the dial governor is readjusted to within a closer set of speed limits, 9.5 and 10.5 pulses per second, in order to allow a margin for future changes in speed due to wear and the like. These "readjust" limits are represented by two rows of divisions on the other side of the target disc. The disc is readily reversed for selection of the proper limits by unscrewing the knurled knob which clamps it to the base.

The stroboscope is very sensitive to slight changes in speed, and it was found necessary to employ non-uniformly spaced divisions to compensate for the decrease in the velocity of the dial as it unwinds. The width of each division was determined separately from data obtained by testing a representative lot of dials. The targets were then laid out on a large scale and photographically reduced.

In designing the target mounting, it was necessary to take into account the importance of not marring the finish of the new colored dials. A push button was provided in the knob, which can be depressed to expand the fingers and prevent their marring the finish while the target is being mounted. The flexibility of the fingers also insures a satisfactory grip on dials having the ordinary black finish.

The tuning fork vibrates at fifty cycles per second. Depressing the starting button in the case rotates a ratchet wheel having teeth arranged to lift flat springs which distend the prongs of the fork and then drop back into the space between the teeth. The

Fig. 3—S. J. Stockfleth demonstrates the use of the stroboscope for checking the speed of a subscriber's dial

case for the fork consists of a box and cover which shield the mechanism and exclude dirt when the fork is not in use. Sliding the cover partly off the box provides an opening for viewing the target.

The accuracy of the device depends on a number of factors, such as the extent to which the speed characteristics of the dial under test conform to the average data used for calculating the targets, and the ability of the user to detect slight movements of the divisions when the speed of the dial is close to the upper or lower limit. On most dials tested, an accuracy of 0.1 to 0.2 pulse per second has been obtained, with an occasional instance showing twice this deviation. This accuracy has been found satisfactory.

The Laboratories' Part in the Exposition

In describing the progress of a visitor through the Electrical Building at the Century of Progress Exposition, the Electrical World for May 27 says:

"He comes first on the telephone and telegraph exhibit, a sort of amphitheatre around a well opening to the floor below and whose walls are lined with the infinite complexities and ingenuities which are the means of modern local and long-distance communication. Here are all the wonders of the Bell Telephone Laboratories, scrambled speech, delayed transmission, graphic transmission, all of the related developments of sound and electricity plus, also, some very intriguing possibilities in the field of sight and electricity."

