



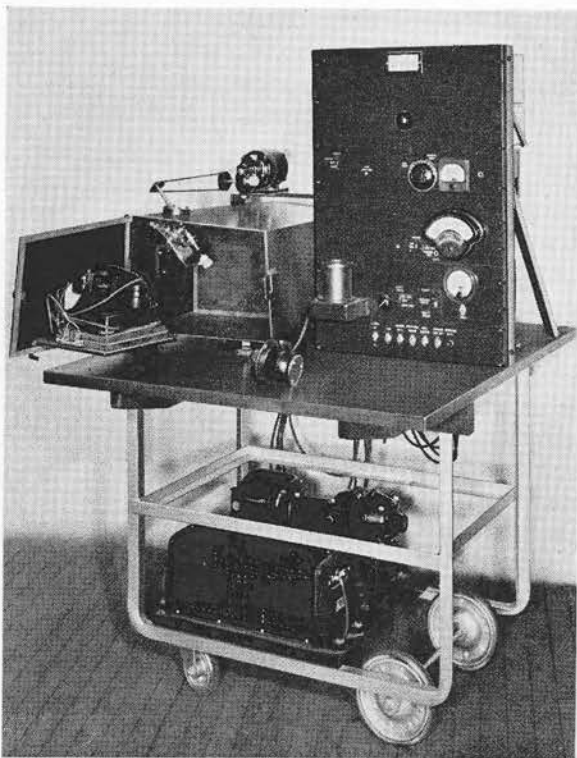
# Sound Tests of Telephone Ringers and Dials

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A TELEPHONE, like a good servant, should always be ready to serve but never intrude; the sound of the ringer ought to be just loud enough to arrest attention and the dial should operate with little noise. These requirements make it desirable to have testing means which are more accurate and reliable than the human ear. The test equipment must measure correctly the total sound energy radiated from the set and the results must not be influenced by noises in the laboratory or factory where the tests are to be made.

To meet these needs the Laboratories has developed an apparatus for testing combined telephone sets. The set is located inside and at one end of an irregularly shaped box, none of whose walls are parallel but which are sound insulating and acoustically hard. At the other end of the box there is a microphone and between them are a group of irregularly shaped vanes on a rotating plate. These vanes and the irregular walls of the box insure many reflections which reduce the effects of variations in the sound radiated by the set from moment to moment. They also tend to equalize the effects of the different frequencies that are obtained with the various ringers.

The microphone output is rectified after amplification and read on a meter. The amplifier with its graduated attenuator measures a wide range of sound levels. It also responds uniformly to frequencies from 1,000 to 10,000 cycles or more, to cover the range of the ringer. A high-pass filter which cuts off at 1,000 cycles is included in the circuit to eliminate



*Fig. 1—The sound of ringers and dials is measured by operating them in a soundproof box which encloses a microphone. To make the sound field more uniform vanes are rotated in the box and the box is so designed that no two of its walls are parallel*

sounds of low frequency not originating in the telephone set. The amplifier operates from alternating-current service mains through a voltage regulator to prevent variation in sensitivity of the measuring equipment.

The telephone set is mounted on a shelf attached to the door of the box, shown in Figure 1, to make it acces-

sible when the door opens. The microphone, shown in the foreground, is mounted at the rear of the box when in use. On the rack at the right is the rest of the measuring apparatus; the oscillator panel with the microphone calibrating chamber is immediately above the switching panel and the amplifier, meters and attenuators are mounted above the oscillator. A motor generator set on the lower shelf supplies ringing current and a voltage regulator to control the alternating voltage supplied to the amplifier and oscillator.

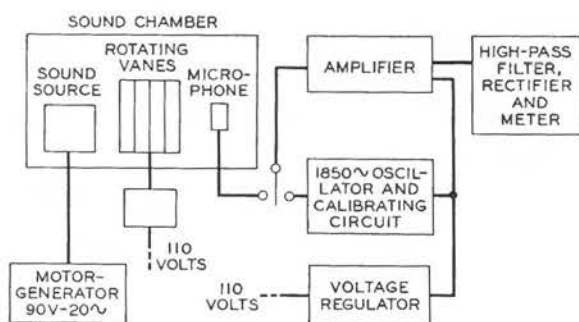


Fig. 2—Diagram of the apparatus used in making sound tests on telephone ringers and dials

sible when the door opens. The microphone, shown in the foreground, is mounted at the rear of the box when in use. On the rack at the right is the rest of the measuring apparatus; the oscillator panel with the microphone calibrating chamber is immediately above the switching panel and the amplifier, meters and attenuators are mounted above the oscillator. A motor generator set on the lower shelf supplies ringing current and a voltage regulator to control the alternating voltage supplied to the amplifier and oscillator.

To measure dial noise the apparatus is equipped with an automatic dial-winding mechanism, shown at the upper left side of the box. This mechanism has a shaft with a rubber ring on the end, which is coaxial with the dial when the door of the box is closed. A cam arrangement presses the rubber ring against the face of the

dial long enough to permit winding; then the shaft retracts and allows the dial to return to normal. This winding and retracting operation is repeated automatically by the motor on top of the box. The operator determines when the dial is being wound and unwound by the sounds in a telephone receiver in the amplifier circuit and thus associates these operations with the noise indicated on the meter. For testing dials whose sounds are considerably lower in intensity than those of ringers, the box is mounted in a sound-attenuating housing to further exclude outside noise.

To check the sensitivity of the microphone, the amplifier, and the meter, a fixed-frequency oscillator operated from the alternating-current mains supplies 1850-cycle current. The apparatus is calibrated by coupling the microphone to a calibrated telephone receiver located at the bottom of the cylindrical box at the left of the oscillator panel.

Test sets like the one described here have been used to measure the performance of telephone dials and ringers in the Western Electric shops as well as in the Laboratories. They have been helpful in arriving at the final design of the combined-set housing and base and in working out modifications of the ringer to insure sufficient sound output. These measuring sets are also used in investigating methods of generating ringer sounds, in improving ringer gongs and ringer motor mechanisms, and as a guide in modifying telephone dials to reduce dial noise. In the factory they have been found useful in locating imperfections of manufacture and in checking the performance of ringers and dials to assure uniformity.