The Subscriber's Amplifier.

SUCCESSIVE improvements in the design of telephone circuits and equipment have resulted in the attainment of such a high standard of efficiency in speech transmission that subscribers using modern instruments rarely experience difficulty in reception. Exceptional conditions nevertheless present an occasional problem and circumstances may arise in which the volume of sound produced in the receiver is insufficient. Such cases fall naturally into two categories, those in which the received speech is definitely faint, and those in which, for special reasons, it is necessary to provide greater volume than that normally obtained.

The former condition is usually encountered in instruments connected to lines which, owing to their length and high loop resistance or poor insulation, cause undue attenuation of the speech currents. The second case arises when the user of the telephone is partially deaf or when the instrument is installed in a place where local noise may render hearing difficult. In each instance the obvious remedy is to amplify the incoming speech current and it is with this object in view that The General Electric Company has developed the subscriber's amplifier

The introduction of this instrument marks still another application of the thermionic valve in the transmission of speech, for in principle the amplifier operates in a similar manner to the repeater employed on trunk telephone lines, or more closely to the audio "stages" of a radio receiver The type of valve used is, in fact, a standard component of most wireless sets.

For reasons of convenience and economy the amplifier is combined with an ordinary telephone and is supplied as a complete set. For C.B. systems the outfit consists of a desk pedestal and special bell box which accommodates the amplifier apparatus in addition to the usual ringer, condenser and induction coil. Similar equipment is provided for magneto systems, the generator being fitted in a separate teak box. In each case the desk pedestal is of standard design but equipped with an extra pair of switch-hook contacts and a transmitter cut-out key The former

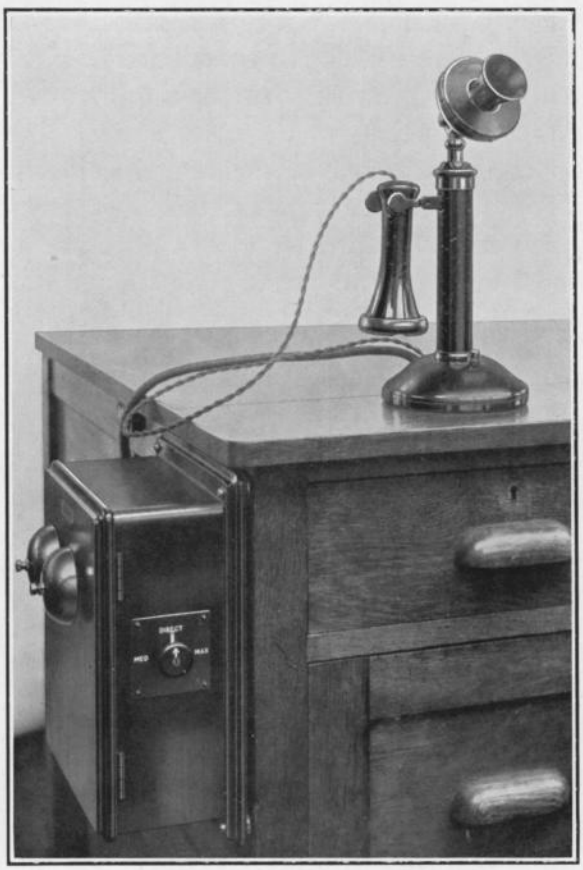

Fig. 1.—Amplifier combined with C.B. telephone.

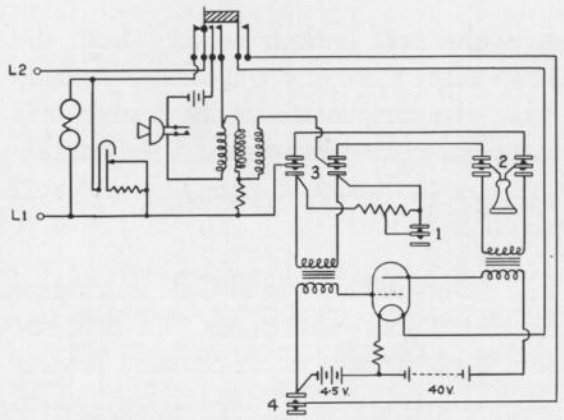

Fig. 2.—Circuit for magneto telephone combined with battery-operated amplifier.

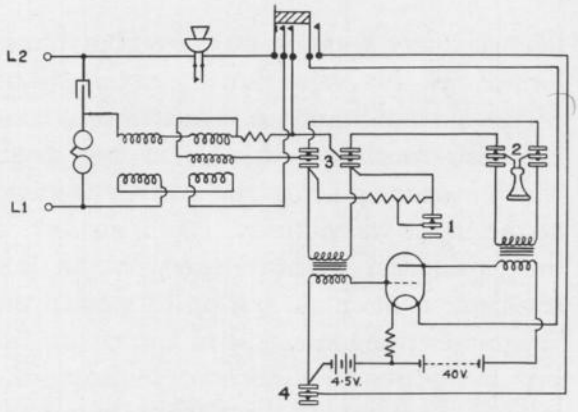

Fig. 3.—Circuit for C.B. telephone combined with battery-operated amplifier.

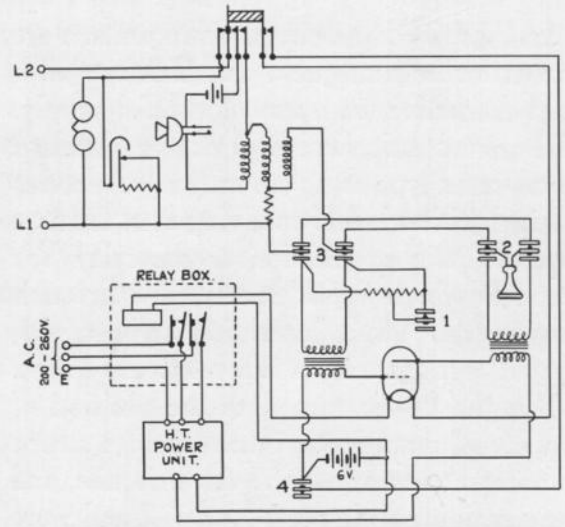

Fig. 4.—Circuit for combined amplifier and magneto telephone with power unit.

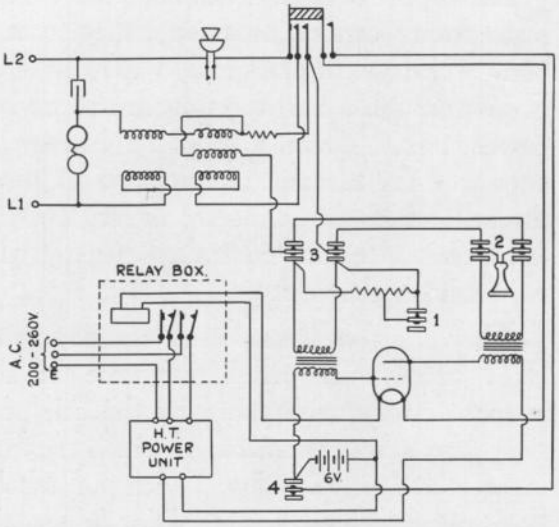

Fig. 5.—Circuit for combined amplifier and C.B. telephone with power unit.

controls the supply of current to the amplifier, while the latter enables the user to place a temporary short-circuit across the transmitter and so effectively cut out all extraneous noise when listening under exceptionally bad conditions. The telephone circuit also includes a special induction coil for suppressing side tone which, in view of the amplification of the current in the receiver, may become undesirably loud during transmission.

The amplifier consists of a single three-electrode valve with its associated input and output transformers which can be connected between the telephone circuit and the receiver by the operation of a three-position key When this key is in the normal or "direct" position the amplifier is entirely disconnected and the filament battery cut off. The instrument then functions as an ordinary telephone. When the key is turned to the position of "medium" or "maximum" amplification the receiver is replaced in the telephone circuit by the primary winding of the input transformer and connected across

the secondary winding of the output transformer in the valve anode circuit. The degree of amplification is regulated by a non-inductive resistance, variable in two steps, which is shunted across the primary winding of the input transformer With the key in the "maximum" position the whole of this resistance is in circuit but on turning to the "medium" position a pair of springs on the key short-circuits a portion, reducing the value of the shunt and therefore of the current passing through the transformer

The supply of high tension current for the plate circuit can be obtained either from a battery of dry cells or from 200-260 volt A.C. mains through a transforming and rectifying power unit. When a primary battery is employed the filament circuit requires three dry cells which are connected in series with a fixed resistance and controlled through the switch-hook contacts.

When a power unit is used as a source of H.T supply, the fixed resistance in the filament circuit is replaced by the coil of a relay, through the contacts of which the unit is connected to the mains. With the switch-hook operated and the amplifier in circuit, the filament current energises the relay and so connects the power unit to the mains. The unit is therefore entirely isolated from the mains except when the amplifier is actually in use. To compensate for the greater drop of potential in the relay winding, the number of cells in the filament battery is increased from three to four

Fig. 1 illustrates a typical C.B. instrument with the associated amplifier and bell box mounted at the side of an ordinary writing desk. The transmitter cut-out key, which can be depressed and released by the finger, will be seen at the base of the pedestal.

In Figs. 2—5 the circuit arrangements are shown for both magneto and C.B. sets with the alternative sources of H.T. supply. The power unit, which is of the standard metal-cased type complete with valve rectifier as used with wireless receiving sets, forms a separate item in addition to the relay box through which it is controlled. In each diagram the "direct" condition is given, with contact springs No. 4 operated as shown. When the key is turned to the position of "medium" amplification these springs return to normal to complete the valve circuits, and the remaining spring sets Nos. 1, 2 and 3 are operated. In the "maximum" position the key operates springs Nos. 2 and 3 only