The G.E.C. Anti-Side Tone Circuit.

SINCE the introduction of central battery telephone systems a number of different instrument circuits have been suggested, but in the majority of these no attempt had been made to reduce the volume of the side tone in the subscriber's receiver during transmission. The advent of the modern high efficiency immersed electrode transmitter has made the use of an anti-side tone circuit absolutely necessary, and several schemes for the reduction of side tone have been evolved, some depending for their action on a separate transformer and some, as for instance that used in the GECOPHONE telephones, on an induction coil of special design.

In describing the operation of the G.E.C. anti-side tone circuit, one of the principal features of the new manual and automatic C.B. instruments, reference will be made to Fig. 1 which shows, in schematic form, the conditions during conversation. In this diagram, IC represents a special induction coil having three inductive windings, A, B and C, and a non-inductive winding X, wound on a common core. T, R and K represent the transmitter, receiver and condenser respectivley, and PR a polarised ringer The impedance of this latter is so high at speech frequencies that its effect may be neglected when considering the transmission and reception of speech.

During transmission sound waves constituting the speech impinge on the transmitter diaphragm, producing variations in the resistance of the transmitter and thereby varying the line current flowing through winding A of the induction coil and the transmitter The fluctuation of the line current gives rise to corresponding changes of potential difference across the transmitter and this varying potential difference, being applied to the condenser K, produces charging and discharging currents which flow through winding B of the induction coil. The windings A and B are so connected that these currents in winding B induce electromotive forces in A which augment the variation in the line current produced directly by the transmitter This boosting effect on transmission is thus obtained in exactly the same manner as in earlier forms of central battery instrument circuits employing an induction coil with two windings only (A and B), and in which the the receiver alone replaces the closed circuit made up of C, X and R. With such an arrangement the transmitted speech is, of course, reproduced in the receiver

In the new circuit, excessive side tone is effectively suppressed by the introduction of the third winding C on the induction coil, which is connected in series with the receiver, the two being shunted across the resistance X. The windings of the induction coil are so

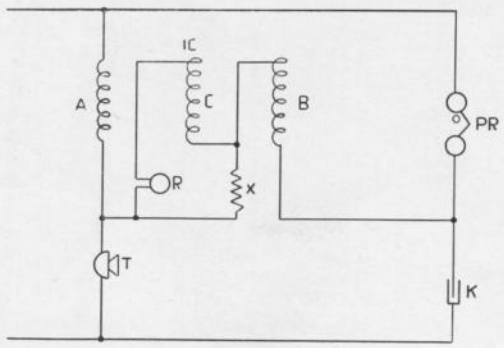

Fig. 1.

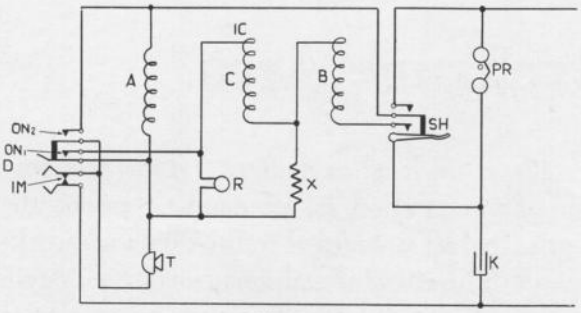

Fig. 2.

proportioned and connected that, during transmission, the electromotive force induced in C is substantially equal and opposite to the fall in potential across the resistance X, due to the passage of the condenser currents, and in consequence, the current through the receiver and winding C is practically zero. The receiver does not, therefore, respond appreciably to the current variations caused by the transmitter

During reception, voice currents received over the line flow through winding A and the transmitter, and corresponding currents are induced in the local circuit comprising resistance X in parallel with the receiver and winding C, and winding B and the condenser The direction of the electromotive forces induced in winding C is now such that they assist those due to the fall in potential in resistance X. The current variations in the receiver are therefore augmented and the receiving efficiency of the circuit is increased.

Fig. 2 shows the complete circuit of the GE@oPHONE Handcombination Telephone for use on automatic systems and includes a gravity switch SH and a dial D, having impulsing contacts IM and off-normal contacts ON_1 and ON_2. Under conversation conditions, i.e., when the handcombination is removed and the gravity switch operated, with the dial normal, the circuit corresponds to Fig. 1

The presence of the condenser K across the impulsing contacts prevents an undue rise of voltage on the line when the circuit is broken. During impulsing, the off-normal contacts ON_1 short-circuit the receiver and prevent it from responding to currents induced in the induction coil or flowing to or from the condenser An impedance, consisting of winding B of the induction coil in series with winding C shunted by resistance X, is in series with the condenser and tends to prevent pitting of the impulsing contacts. Off-normal contacts ON_2 short-circuit the transmitter and winding A of the induction coil, thus removing their impedance from the dialling circuit. The shunting of the ringer PR by the comparatively low impedance of the induction coil windings, prevents it from tinkling owing to transient currents during dialling.