(No Model.)

T. C. WALES, Jr.

OPERATOR'S TELEPHONE CIRCUIT.

No. 522,925. Patented July 10, 1894.

Fig. 1.

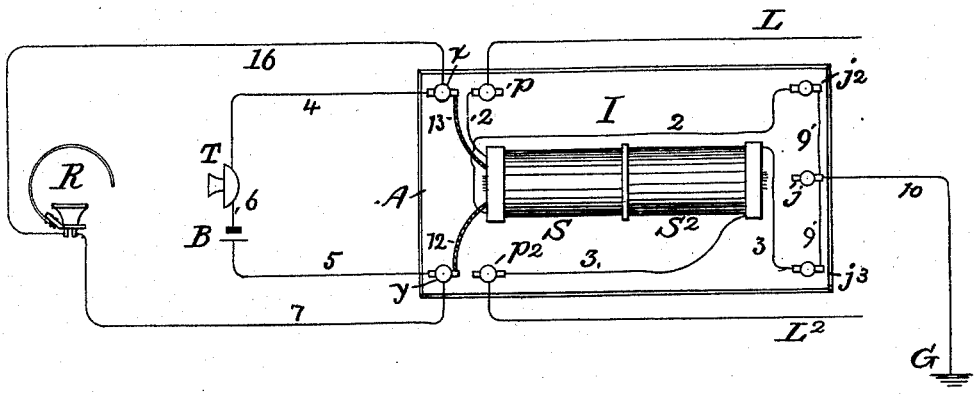
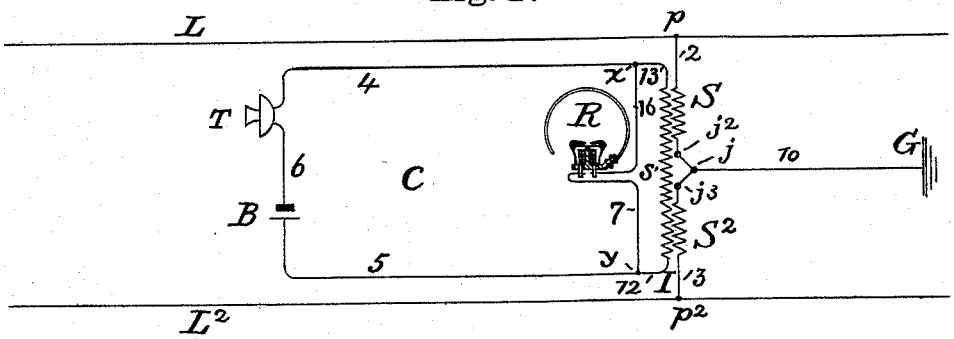


Fig. 2.



Attest.

Thomas D. Lockwood

Seward Pierce

Inventor.

Thomas C. Wales Jr.

UNITED STATES PATENT OFFICE.

THOMAS C. WALES, JR., OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THE AMERICAN BELL TELEPHONE COMPANY, OF SAME PLACE.

OPERATOR'S TELEPHONE-CIRCUIT.

SPECIFICATION forming part of Letters Patent No. 522,925, dated July 10, 1894.

Application filed December 2, 1893. Serial No. 492,633. (No model.)

To all whom it may concern:

Be it known that I, THOMAS C. WALES, Jr., residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Telephony, of which the following is a specification.

This invention relates to the construction and circuit arrangement of the receiving telephones used by the central station operators of exchanges.

Heretofore as is well understood, it has been necessary to construct the operator's head telephones with two coils or with coils made in two parts, each such coil or part containing exactly the same number of turns; and to lead a branch to earth from a point between the said two coils. This construction is relatively very expensive, and the object of my invention is to provide a receiving telephone of equal efficiency, equally well adapted for switchboard work, but of less costly construction.

In carrying out my invention I associate the receiving telephone with the transmitter primary circuit, in a derivation or branch thereof, in parallel with, or as a shunt of the primary helix of the transmitter induction coil; and I so proportion the size and length of the wire which constitutes the said telephone receiver coil, that its impedence properly corresponds to the impedence of the said primary helix of the transmitter induction coil. I have found that by means of the said new circuit arrangement, and definite proportionment of impedence, I am enabled to use a head telephone with but a single and one part helix, essentially similar in construction to standard instruments.

Figure 1 of the drawings which accompany this specification is a diagram of the practical arrangement of the operator's telephone circuits, and their associated transmitter induction coil and receiver; and Fig. 2 is a skeleton diagram of the same organization showing more simply and clearly the electrical connections.

The receiving telephone I employ, is wound with wire of a size much larger than that heretofore ordinarily employed, and the resistance of the instrument is therefore lower.

In the drawings, T is the transmitter, included as usual in the circuit of a battery, or other generator B; I is the transmitter induction coil having a base A, and R is the operator's head telephone.

L and L^2 indicate the main line conductors adapted of course to connect with the conductors of any main telephone circuit, and S and S^2 represent the two halves of the winding of the split secondary helix of the said induction coil, connecting at p and p^2 with the main conductors L and L^2 respectively, and having their remaining terminals joined together and to an earth branch or wire at j. More particularly, the main conductor L is united at the screw p to the coil wire 2, which includes the secondary winding S and which has its remaining terminal attached to the screw j^2. In like manner the other main conductor L^2 is united at the screw p^2 to the coil wire 3, which includes the other half S^2 of the secondary winding or helix, and which at its remaining terminal is attached to the screw j^3.

Continuity of circuit is secured by joining the screws j^2 and j^3 by means of a wire or wires 9, and from a screw j connected with such wire 9, a branch or ground wire 10 leads to the earth G.

Heretofore the double coil receiver has been interposed between the two halves S and S^2 of the secondary winding, and the earth wire 10 (which is necessary for testing and differentiating purposes) has been attached to a point of the circuit between the receiver coils. Not only then under such conditions was it requisite to provide a receiver with two coils, but as the said receiver so placed was in the main circuit, it was necessary to employ fine wire and a great number of convolutions in both coils.

The induction coil I has a single primary helix s which is wound over the whole length of the core or spool.

The complete primary circuit c as clearly indicated in the figures, starting from the positive pole of the generator B may be traced by wire 5, binding screw y, wire 12, primary helix s, wire 13, binding screw x, wire 4, transmitter T, and wire 6 to the negative pole of the generator.

As shown, the two conductors 16 and 7 which connect with the two terminals of the

receiving telephone R respectively, are also united with the primary circuit binding screws *x* and *y;* and so connected, it is evident that the said receiver is in the primary circuit, in parallel with the primary induction coil winding; and that it shunts the said primary winding.

The transmitting telephone may, of course, be of any preferred description.

The receiving telephone may also be of any of the usual forms, but a head telephone generally (with the exception of its winding) of the accepted standard type is preferable, and such a one is shown and described in a patent granted to Wilton L. Richards October 21, 1890, No. 438,828, to which reference may be made.

Referring to the relative proportionment of the impedences of the receiver and induction coil primary helices, whereby the superior operation of the arrangement is secured, it may be stated that either an induction coil or a telephone of the desired dimensions may first be constructed, and that in either case the other instrument can then be proportioned experimentally as required. Since however the induction coil is the more complex and costly instrument of the two, the preferable plan is to employ the standard induction coil, and then to construct the receiver with reference thereto. I have attained most successful results by employing such a standard induction coil having a length of six inches between the spool ends, an ordinary wire core, a single primary winding formed of three hundred and seventy turns of No. 18 wire, and having its two secondary windings, each formed of two thousand five hundred turns of No. 31 wire. The resistance of such a primary measures thirty seven one hundredths of an ohm; and the resistance of each such secondary is eighty five ohms. With this standard coil, having the above described dimensions, I have found that when the receiver coil was formed of three hundred and thirty turns of No. 28 wire, wound on an ordinary telephone spool, the impedence thereof bore that relation to the impedence of the primary required in order to secure the best results in operation. The resistance of the telephone helix so wound, is two and seven tenths ohms. It will be seen therefore that by being enabled to use in the winding of the receiver, wire of considerably larger size, than has heretofore been employed, and by the simplification of the instrument, the cost of the said instrument is materially reduced; while experience has demonstrated that the more economical instrument connected as hereinbefore described, operates most satisfactorily.

It should be stated that the division of the secondary winding of the induction coil is in no sense essential to my present invention, for the purposes of which the two secondaries may be considered as, and practically are one, through which the receiver is brought into inductive relation with the main line circuit.

Having now fully described my invention, I claim—

In a system of switchboard telephone circuits, the combination substantially as hereinbefore described, of a transmitting telephone in the local circuit of a current generator; an induction coil therefor, having a single primary winding, included in said local circuit, and two secondary windings, in circuit serially with main line conductors, together with a branch extending from a point between them to earth; and a receiving telephone in a branch of the local circuit, shunting the said primary winding.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses, this 29th day of November, 1893.

THOMAS C. WALES, JR.

Witnesses:
GEO. WILLIS PIERCE,
FRANK C. LOCKWOOD.