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SUBSCRIBER'S TELEPHONE CIRCUIT.

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1,221,235.

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Fig. 1.

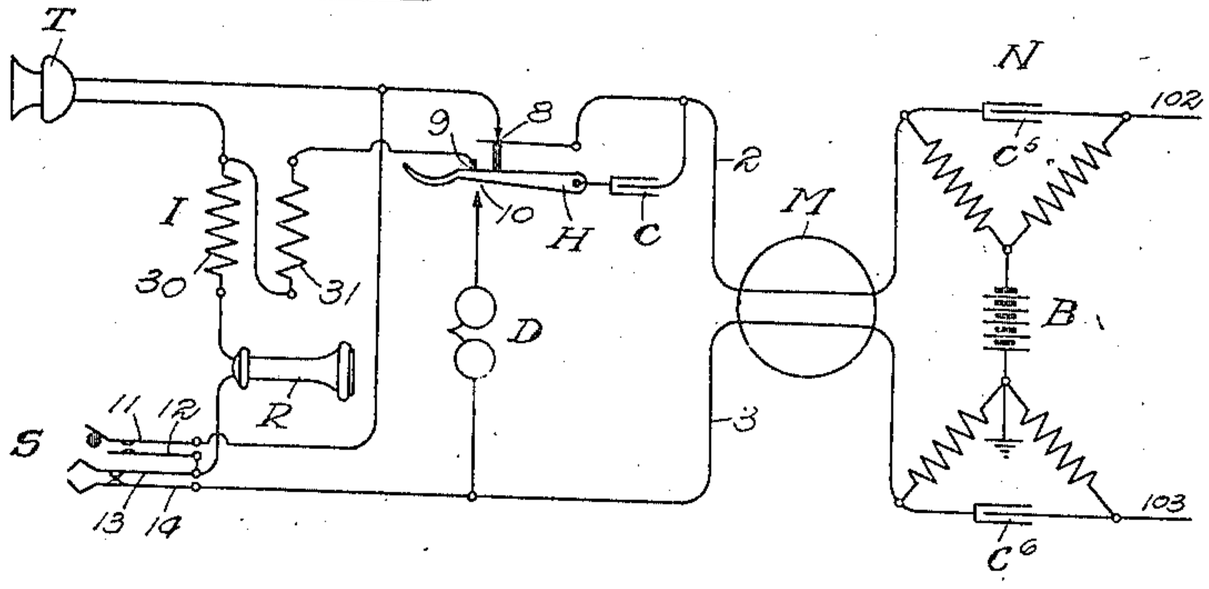


Fig. 2.

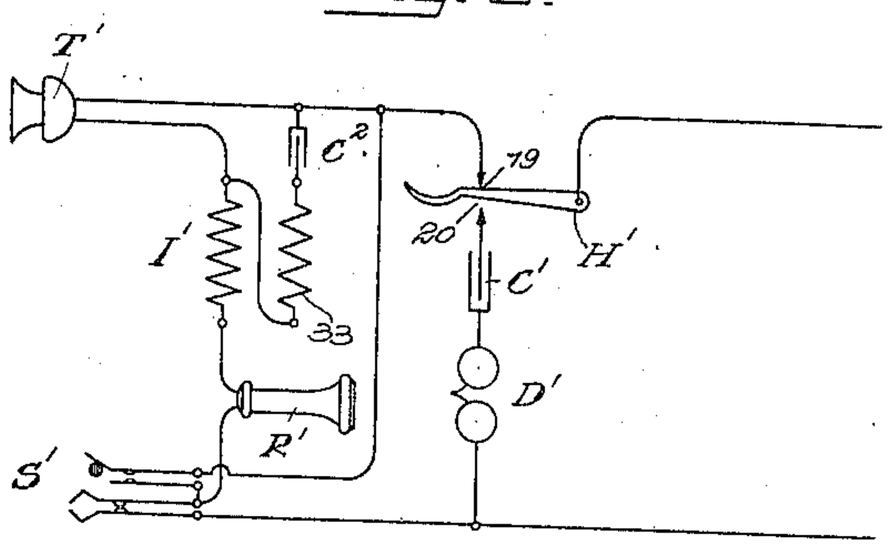
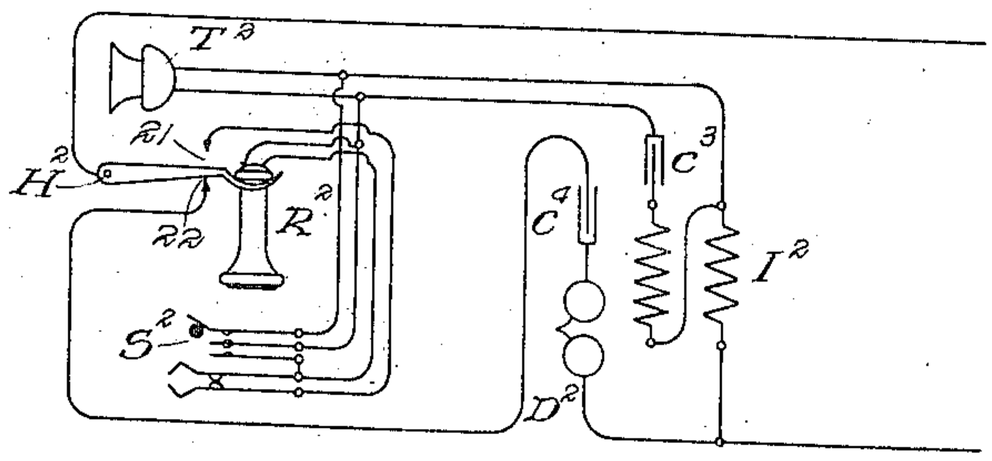


Fig. 3.



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UNITED STATES PATENT OFFICE.

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SUBSCRIBER'S TELEPHONE-CIRCUIT.

1,221,235. Specification of Letters Patent. Patented Apr. 3, 1917.

Application filed July 19, 1915. Serial No. 40,716.

To all whom it may concern:

Be it known that I, ARTHUR BESSEY SMITH, a citizen of the United States of America, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Subscribers' Telephone-Circuits, of which the following is a specification.

My invention relates to subscribers' telephone circuits and has for its principal object the improvement of the transmission.

A further object is the rearrangement of telephone circuits embodying my improved transmission schema, in such a manner that my invention may be readily practiced in connection with standard types of telephone equipment now in use, without, however, departing in any way from the principles of my invention.

To accomplish these and other useful ends my invention comprises the means hereinafter set forth and claimed.

In the drawings, Figure 1 represents diagrammatically an individual line wall type of telephone embodying the principles of my invention. Fig. 2, shows a modification which is better adapted to party line service. Fig. 3, shows a further modification or rearrangement of the circuit which is well adapted for use in connection with a desk telephone.

Referring to Fig. 1, I have shown at T a microphone transmitter which may be of any suitable type or construction. At I is shown an induction coil having the windings 30 and 31 connected in a manner which will be described. At R is shown a telephone receiver which is preferably of the non-polarized direct current type. At S is shown a calling device, which may be of the general type of calling device disclosed in British patent to S. G. S. Dicker, No. 29654 of 1910. It comprises, among other details, a pair of impulse springs 13 and 14 which may be separated a predetermined number of times through the medium of a finger hole dial (not shown), and a pair of shunt springs 11 and 12 which are closed whenever the finger hole dial is out of its normal position. At D is shown a ringer which may be of any suitable type and at C is shown a condenser. At H is shown a hook switch so constructed that when the receiver R is placed upon the hook the contact 10 will be closed, and when the receiver is removed the contact 8 and the contact 9 will be closed and the contact 10 will be broken. It is evident that when the receiver is off the hook the transmitter T will be connected to the wire 2 by means of the contact 8 and the condenser C will be connected to the winding 31 by means of the contact 9. When the receiver is hung up these connections are broken and the condenser C is connected to the ringer D by the contact 10, the ringer being bridged across the line wires 2 and 3 in series with the condenser.

The line wires 2 and 3 serve to connect the substation shown herein to the individual line apparatus located at the central exchange. This apparatus may be of any approved central energy type, either manual or automatic, although the substation circuits shown herein are intended to be used in conjunction with automatic central office equipment, of which I have indicated at M an individual line switch and at N the relay windings of a connector switch through which talking battery is supplied from the battery B.

The substation circuit shown in Fig. 2 is similar to the one described above except that separate condensers are provided for the ringer circuit and for the circuit of the winding 33 of the induction coil. This is done because it is necessary in party line service to adjust the capacity of the condenser C′ in accordance with the frequency of ringing current to which it is intended that the ringer D′ shall respond. It follows therefore that the capacity best suited to the ringer D′ will not in all cases be the most efficient for use in the talking circuit, hence the use of separate condensers is advisable.

In Fig. 3, I have shown a circuit arrangement especially convenient for use with desk telephones. The ringer D^2, the induction coil I^2 and the condensers C^3 and C^4 are intended to be installed together in a suitable manner and connected with the instrument, which comprises the rest of the apparatus, by means of a portable four conductor cord.

Having given a brief description of the apparatus I will now explain in detail how my invention operates to improve and increase the range of telephonic transmission. Referring to Fig. 1, the transmitter T is supplied with talking battery from the bat-

tery B over the following path: positive pole of battery, wire 3, impulse springs 13 and 14, receiver R, winding 30 of induction coil I, transmitter T, contact 8 of hook switch H and wire 2 to the negative pole of battery B. The receiver R being included in the above circuit, it has its electromagnet energized and is thereby made sensitive to the alternating or fluctuating voice currents superimposed on the battery supply circuit by the charging and discharging of the condensers C^5 and C^6 during conversation. It is understood, of course, that the conductors 102 and 103 extend to another substation equipped with a microphone transmitter which, by varying its resistance, can produce the changing currents above mentioned.

Since the action of a transmitter in varying its resistance to produce changes in the line current is well understood we may proceed without further explanation to consider in what manner my invention modifies this action.

A shunt path may be traced around the transmitter T which path extends from the upper terminal of transmitter T by way of contact 8, condenser C, contact 9, and winding 31 of induction coil I to the lower terminal of transmitter T. Considering now the transmitter T, at any given instant it will have a certain resistance resulting in a difference of potential across its terminals. It follows then that the condenser C will be charged, the amount of charge depending on the voltage across the terminals of the transmitter. Assuming now that the resistance of the transmitter is increased the flow of current in the line will be reduced. Also, owing to the increased resistance, the voltage across the transmitter terminals will be increased resulting in an increased charge of the condenser C. The charging current flows through the winding 31 of the induction coil I and this winding is so connected that the charging current induces in the winding 30 of the induction coil a current which is in opposition to the main line current, thereby still further reducing it.

Taking now the case where the resistance of the transmitter is reduced, such reduction of resistance of course results in an increased flow of current in the line. Also, owing to the reduced resistance, the voltage across the transmitter terminals will be reduced resulting in a discharge of the condenser C. The condenser C discharges through the winding 31 of the induction coil I as before but since the discharging and charging currents are in opposite directions, the induced current in the winding 30 of the induction coil I is, in this case, in the proper direction to augment the current in the main line.

I am aware that this interaction between the two windings of an induction coil has been used before but I believe it to be new to connect the receiver serially in the line with the transmitter and a winding of the induction coil as shown, with the other winding of the induction coil and a condenser forming a direct shunt circuit around the transmitter.

In Figs. 2 and 3 the operation, so far as the talking circuit and the application of the principles of my invention are concerned, is the same as in Fig. 1 and, it is believed, will be sufficiently clear from the foregoing explanation.

To sum up, it will be seen that I have provided an efficient circuit arrangement for a substation telephone set embracing a transmitter, a winding of an induction coil and a receiver connected in series with the main circuit, and a shunt circuit around the transmitter comprising a condenser and a second winding of the induction coil, the said shunt circuit being provided for the purpose of amplifying the variations in the current flow in the main circuit caused by variations in the resistance of the transmitter.

While I have shown several embodiments of the principles of my invention it is probable that other modifications will suggest themselves to those skilled in the art. I do not, therefore, wish to be held strictly to the forms shown herein, but desire rather to include all modifications which may come within the scope of the appended claims.

What I claim as my invention is:

1. In a telephone system, a subscriber's telephone station, a line for said station, a direct current bridge across said line at said station, said bridge containing a receiver and a transmitter, a reactive circuit for shunting said transmitter, a coil in said reactive circuit, a second coil inductively related thereto in the bridge, a condenser in said reactive circuit, another bridge circuit for said line at said station, means for substituting one bridge for the other across the line and for changing the condenser from said reactive circuit to said other bridge.

2. In a telephone system, a subscriber's telephone station, a line for said station, a direct current bridge across said line at said station, said bridge containing a receiver and a transmitter, a reactive circuit for shunting said transmitter, a coil in said reactive circuit, a second coil inductively related thereto in the bridge, a condenser in series with said first coil, another bridge circuit for said line at said station, means for substituting one bridge for the other across the line and for changing the condenser from said reactive circuit to said other bridge.

3. In a telephone system, a subscriber's telephone station, a line for said station, a direct current bridge across said line at said station, said bridge containing a receiver and a transmitter, a reactive circuit for shunting

said transmitter, a coil in said reactive circuit, a second coil inductively related thereto in the bridge, a condenser in said reactive circuit, another bridge circuit for said line at said station, means for substituting one bridge for the other across the line and for changing the condenser from said reactive circuit to said other bridge, an automatic switch associated with said line, an impulse sender in series with said transmitter for operating the switch, and a source of current controlled through the medium of said switch for supplying said transmitter with talking current.

4. In a telephone system, a subscriber's telephone station, a line for said station, a direct current bridge across said line at said station, said bridge containing a receiver and a transmitter, a reactive circuit for shunting said transmitter, a coil in said reactive circuit, a second coil inductively related thereto in the bridge, a condenser in series with said first coil, another bridge circuit for said line at said station, means for substituting one bridge for the other across the line and for changing the condenser from said reactive circuit to said other bridge, an automatic switch associated with said line, an impulse sender in series with said transmitter for operating the switch, and a source of current controlled through the medium of said switch for supplying said transmitter with talking current.

Signed by me at Chicago, Cook county, Illinois, this 12th day of July, 1915.

ARTHUR BESSEY SMITH.

Witnesses:
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W. W. OWEN.