

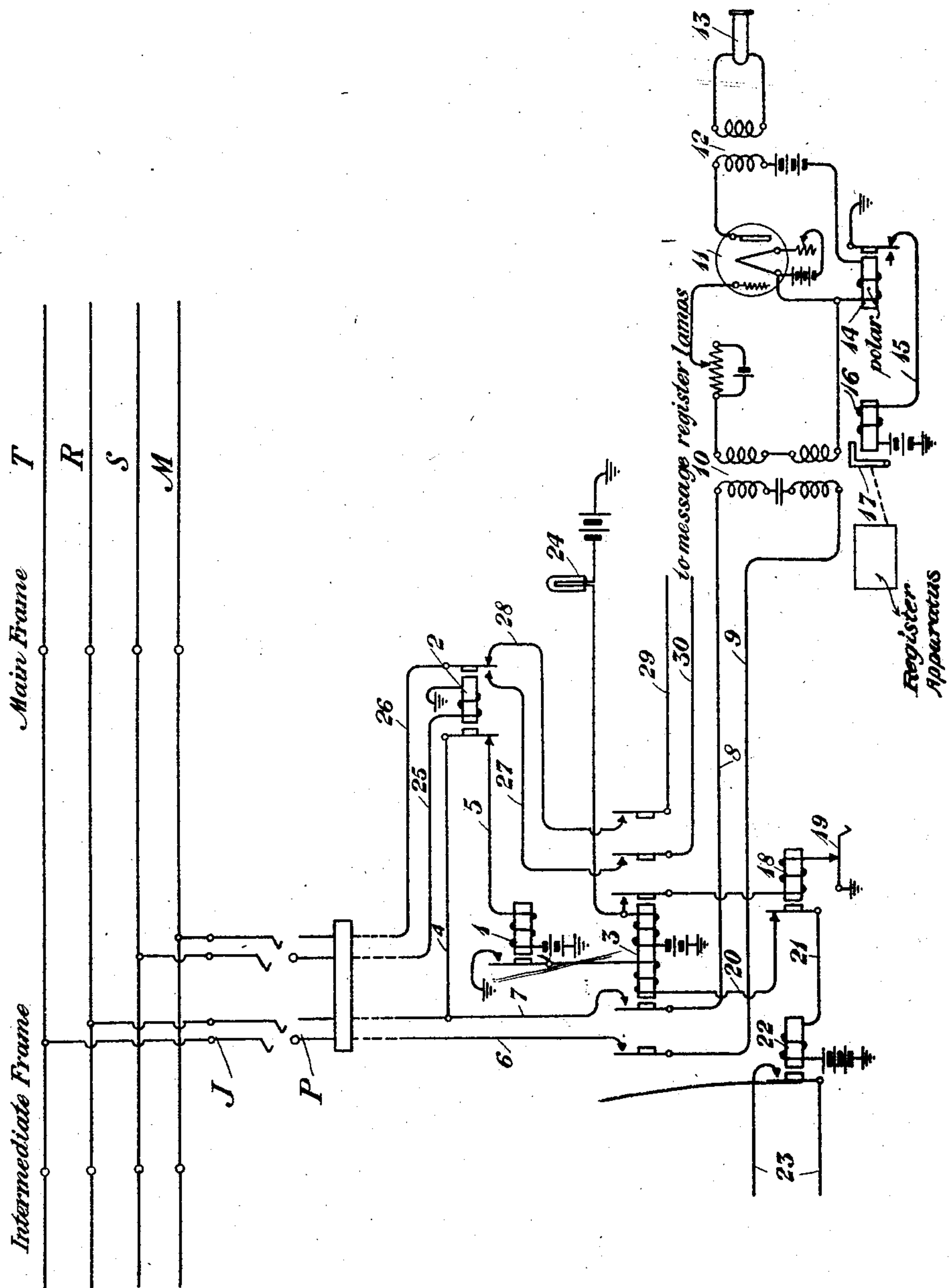
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SERVICE OBSERVING EQUIPMENT FOR AUTOMATIC TELEPHONE SYSTEMS

Filed June 27, 1923



INVENTOR

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BY

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UNITED STATES PATENT OFFICE.

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SERVICE-OBSERVING EQUIPMENT FOR AUTOMATIC TELEPHONE SYSTEMS.

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To all whom it may concern:

Be it known that I, JAMES N. WALTERS, residing at East Orange, in the county of Essex and State of New Jersey, have invented certain Improvements in Service-Observing Equipment for Automatic Telephone Systems, of which the following is a specification.

This invention relates to service observing equipment adapted to be associated with the circuits of an automatic telephone system.

In the service observing equipment heretofore utilized in mechanical or automatic offices it has been the practice to employ a series relay for operating the relay equipment which connects the call to the observing operator's desk and also for repeating the pulses from the calling dial at the subscriber's station. The use of the series relay makes it necessary to open the subscriber's line at some point in the central office in order to place the observing trunk in series with the line. In panel type offices where line finders are used and in step-by-step offices this connection is made at the main frame by removing the heat coils and inserting a plug which connects the observing trunk in series with the subscriber's line. In panel type offices where line switches are used, this connection is made at the intermediate frame and necessitates opening a cross-connection and placing two plugs over the terminal strips in order to get the observing trunk in series with the line. In addition to this in all types of mechanical offices, it is necessary to make a second connection to the sleeve and message register wires. There are many disadvantages in this method of plugging up lines for service observation. One of these is that the number of jack boxes required in order to make the observing trunks accessible to any line is quite large and these boxes take up valuable space on the frames and are so located that they interfere with the work of running cross connections. Another disadvantage lies in the fact that the long patching cords draped down the frames are continuously in the way of the frame man. Furthermore a great amount of time is required to put lines up and the cost of the equipment is relatively large due to the number of jack boxes required, cabling and costly plugs. Another material disadvantage consists in

the fact that the danger of interrupting the service is always increased where subscriber's lines must be opened up.

The arrangements of the invention obviate the above mentioned difficulties and disadvantages by providing arrangements which will allow connections to be made with the subscriber's line by means of a bridged connection. The principal difficulty encountered heretofore in attempting to provide a bridged connection for service observing equipment in machine switching offices has been in so designing a circuit that it will accurately repeat dial pulses and will at the same time present sufficient impedance so that it will have little or no effect on and will not interfere with the operation of the central office apparatus. Accordingly the invention provides a bridged connection, or circuit, having included therein a vacuum tube amplifier. In the plate circuit of the amplifier would be included a relay which would respond to the dial pulses and which might in turn operate a register apparatus. Operators' listening apparatus might also be associated with the plate circuit of the tube. The impedance presented by the input circuit of the vacuum tube would be sufficiently great so that the service observing equipment would not interfere with the line or central office equipment and the arrangements at the same time would be sufficiently sensitive to accurately repeat the dial pulses. Other features and advantages of the invention will be clear from the detailed description hereinafter given.

The invention may be more fully understood from the following description together with the accompanying drawing in which is illustrated a circuit diagram embodying the invention.

In the drawing is shown the tip, ring, sleeve, and message register conductors of a subscriber's line terminating at a mechanical office. Conductors are bridged across these conductors at a suitable point in the central office and terminate in the jack J. Adapted to cooperate with jack J is the plug P. When the plug P is connected with jack J the conductors 6 and 7 are bridged across the tip and ring conductors of the line and conductors 25 and 26 are bridged across the sleeve and message register conductors of the line respectively. The conductors 6 and 7 are associated over the

contacts of relay 3 with conductors 8 and 9 which terminate in the winding of transformer 10. The other winding of transformer 10 is included in the input circuit of the vacuum tube amplifier 11. The output, or plate circuit of amplifier 11 includes a winding of the transformer 12, the other winding of which is included in a circuit with a telephone receiver 13. The plate circuit of the tube also includes the winding of the polar relay 14, which relay will control a circuit 15 including register apparatus 16 and 17.

The arrangements operate in the following manner: When plug P is connected with jack J the relay 1 will operate in parallel with the line relay of the subscriber's line over a circuit including conductor 4, armature and contact of relay 2, conductor 5, winding of relay 1, battery and ground. The operation of relay 1 will close the following circuit: from ground, contact and armature of relay 1, left hand winding of relay 3, conductor 20, contact and armature of relay 18, conductor 21, winding of relay 22, to battery and ground. This will operate relay 3 which will lock up over the following circuit: from ground and battery, right hand winding of relay 3, contact and armature of relay 3, winding of relay 18, and over the contact of release key 19 to ground. This will operate relay 18 which will open at its left hand contact the previously traced circuit through relay 22. The relay 22 controls a circuit 23 which may control cycle counter apparatus if desired. The operation of relay 3 will connect conductors 8 and 9 to conductors 6 and 7 and bridge the primary winding of transformer 10 across the tip and ring conductors of the line. The polar relay 14 in the plate circuit of the tube is normally energized. At each interruption of the subscriber's dial the polarized relay 14 releases due to the relay action of the tube which interrupts the current in the plate circuit. At each release of the polarized relay 14 the pen register apparatus 16 and 17 will be operated over circuit 15. The operation of relay 3 will light the signal lamp 24 and will connect conductors 29 and 30, which lead to message register lamps, to conductors 27 and 28 which may be selectively connected to conductor 26 and thence to the message register conductor M of the line depending upon the actuation of relay 2. The actuation of relay 2 depends on the condition of the sleeve of the line. By opening the release key 19 the apparatus may be restored to normal.

While the arrangements of the invention have been disclosed in certain specific ar-

rangements which are deemed desirable it is understood that they are capable of embodiment in many and widely varied forms without departing from the spirit of the invention as defined by the appended claims.

What is claimed is:

1. In an automatic telephone system, a subscriber's line terminating at a central office, a service observing circuit, switching means at said central office for bridging said observing circuit across said line, said observing circuit including a vacuum tube amplifier and a polarized relay in the plate circuit of said tube.

2. In an automatic telephone system, a subscriber's line terminating at a central office and comprising tip and ring conductors, a pair of conductors associated with said tip and ring conductors and terminating in switching means, service observing equipment adapted to be associated with said switching means, said equipment comprising a circuit including a vacuum tube amplifier, a polarized relay in the plate circuit of said tube, register apparatus controlled by said relay, and means in said equipment responsive to the closing of the subscriber's line circuit for operatively associating said vacuum tube circuit with said pair of conductors through said switching means.

3. In an automatic telephone system, a subscriber's line terminating at a central office, a service observing circuit, switching means at said central office for bridging said observing circuit across said line, said observing circuit comprising a vacuum tube amplifier, a normally energized polar relay in the plate circuit of said tube, register means controlled by said relay, and signal receiving apparatus associated with the plate circuit of said tube.

4. In an automatic telephone system, a subscriber's line terminating at a central office and comprising tip and ring conductors, a pair of conductors associated with said tip and ring conductors and terminating in switching means, service observing equipment adapted to be associated with said switching means, said equipment comprising a circuit including a vacuum tube amplifier, a polarized relay in the plate circuit of said tube, register apparatus controlled by said relay, means in said equipment responsive to the closing of the subscriber's line circuit for operatively associating said vacuum tube circuit with said pair of conductors through said switching means, and signal means controlled by said last mentioned means.

In testimony whereof, I have signed my name to this specification this 26th day of June, 1923.

JAMES N. WALTERS.