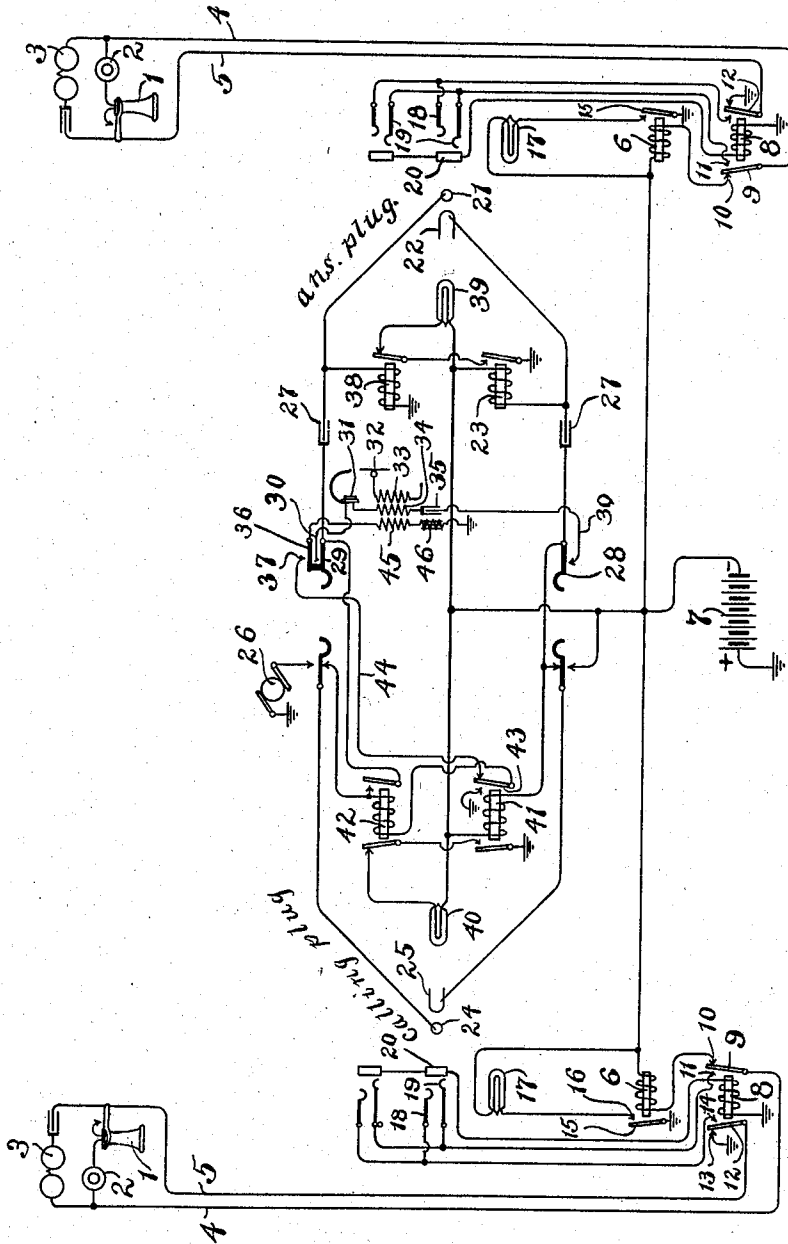


H. P. CLAUSEN.  
TELEPHONE SYSTEM.  
APPLICATION FILED JUNE 4, 1908.

937,050.

Patented Oct. 19, 1909.



WITNESSES :

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# UNITED STATES PATENT OFFICE.

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## TELEPHONE SYSTEM.

937,050

Specification of Letters Patent.

Patented Oct. 19, 1909.

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*To all whom it may concern:*

Be it known that I, HENRY P. CLAUSEN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Telephone Systems, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to telephone systems, and has for its object the provision of a new and novel central energy switchboard circuit, features of the invention being more particularly in the nature of test circuits for such central energy systems, in connection with instrumentalities necessary for the adaptation of such test circuits to the general central energy switchboard circuits.

I will describe my invention more in detail by reference to the accompanying drawing, illustrating diagrammatically the circuit arrangements.

A subscriber's station, comprising a receiver, 1, transmitter, 2, in connection with the signaling ringer, 3, are shown as connected by means of line wires, 4 and 5, to a central station. The subscriber's circuits are shown in duplicate more clearly to reveal the interconnections. Each subscriber's sub-station circuit is united to the same line instrumentalities at the central station. This is true for the normal subscriber's lines. This central station equipment associated with each normal subscriber's line, consists of a line relay 6, one of its terminals being connected to a battery 7, which battery has its positive terminal grounded. An additional instrumentality for each subscriber's line circuit is the cut-off relay 8, which is provided with an armature 9, and having a back-contact, 10. The armature 9 is likewise provided with a front contact 11. A further armature 12 is under the influence or control of relay 8, having a back-contact 13, and a front contact, 14. The line relay 6 has an armature 15, which has a front contact 16. A lamp 17 is controlled by the armature 15, and front contact 16. An answering jack, having a tip-spring 18, and a sleeve spring 19, and a thimble 20, is shown in connection with each subscriber's line circuit, and the same answering jack springs and thimble are multiplied through to various multiple jacks, as shown. When the

subscriber removes his receiver from the switch-hook, a closed circuit is effected at the sub-station of the line wires 4 and 5. A current now passes from the negative terminal of the battery 7 to the line relay 6, back-contact 10, armature 9, line conductors 4 and 5, through the sub-station set, through the armature 12, through back-contact 13, to ground, which is connected to said positive battery terminal 7, thus pulling up relay 6, which energizes the lamp 17, and gives the line signal. The answering plug, comprising a tip contact 21, and a sleeve contact 22, is then inserted into the jack, and this immediately causes an energizing of the cut-off relay 8, by reason of the fact that current from the negative terminal of the battery 7 flows through the supervisory relay 23, through the sleeve contact of the answering plug, through the thimble 20, thence through the cut-off relay 8, back to the positive terminal of the battery, as here shown, through the ground connection. This immediately disconnects the line relay 6, and causes the lamp 17 to be extinguished.

It will thus be seen that negative battery is connected to thimble 20 of a talking subscriber's line. The reason for this will be more apparent hereafter when it is explained that in order to get a busy test, it is necessary for the calling plug to come in contact with negative battery at the thimble. A calling plug having a tip contact 24, and a sleeve contact 25, is associated in the same cord circuit with the answering plug having contacts 21 and 22 respectively. A ringing key connected to a generator 26, as well understood, is shown. The cord circuit between the answering and calling plug is broken by condensers 27, 27, so far as direct currents are concerned, however, these condensers offer practically no opposition to the talking current.

A listening key, having springs 28, 29, connected to the answering plug, is shown, and this key, by means of springs 30, 30 effects connection with the operator's talking set, comprising the head receiver, 31, transmitter, 32, primary of the induction coil, 33, secondary of induction coil, 34, and condenser, 35. The primary 33 of the induction coil, and the transmitter 32, must be connected to some suitable source of current, not here shown. The ringing spring 29 is further secured by an insulating bushing to a

spring 36, having a back contact 37, to be used for busy test purposes, as will be more clearly set forth hereinafter.

Battery current from the negative pole of the battery 7 is furnished to the line conductor 4, through the sleeve spring 19, the sleeve of the plug 22, and the supervisory relay 23. Positive battery current is furnished from the positive pole of the battery, through the supervisory relay 38, to the tip current conductor, from there through the tip 21 of the answering plug, to the tip spring 18, and from there to the conductor 5. Thus the battery is bridged particularly across the conductors 4 and 5, with relays 23 and 28 in the bridge on opposite sides of the battery. A lamp 39 is under the control of relays 23 and 28. On the calling side of cord circuit, I provide a lamp 40 under the control of relays 41 and 42. The relays 41 and 42 respectively furnish negative and positive battery current to line conductors when the calling plug is inserted in the jack.

I have previously stated that when any subscriber is busy, the thimbles 20 are connected to negative battery. It will thus be seen that should the calling plug tip 24 come in contact, for instance, with thimble 20, which is connected with negative battery, a circuit will be established from said thimble 20, through tip 24, through the ringing key springs, through the relay 42, the armature 43, through the wire 44, the back contact spring 37, the spring 36, tertiary coil 45 and impedance coil 46 to ground or storage battery. A flow of current will therefore take place between the positive and negative terminals of the battery 7, through my new and novel coil 45.

The coil 45 is in inductive relation with the coils 34 and 33, so that the flow of current in said coil 45 will cause a click in the operator's receiver 31, apprising the operator that the called-for line is busy. The great advantages of arranging the busy test circuit in this way are due to the dampening effect of the click as secured by the interposition of the impedance coil 46, and the winding of the relay 42, which winding thus serves a double purpose. It is, of course, understood that in making the busy test, the listening key, comprising the springs 28 and 29, is to be actuated outwardly to effect the connections necessary.

Having thus described my improved circuit, what I claim as new, and desire to secure by Letters Patent is:

1. A telephone system, comprising line circuits and a cord circuit, a supervisory relay in said cord circuit, an operator's talking circuit in said cord circuit, and means for establishing a "busy test" circuit through said operator's talking circuit, and said supervisory relay.

2. A telephone system, comprising line circuits and a cord circuit, a supervisory relay in said cord circuit, an operator's talking circuit, having an induction coil provided with a tertiary winding, and means for establishing a "busy test" circuit through said relay and said tertiary winding.

In witness whereof, I hereunto subscribe my name this second day of June A. D., 1908.

HENRY P. CLAUSEN.

Witnesses:

E. B. CAMPBELL,  
O. M. NENNICK.