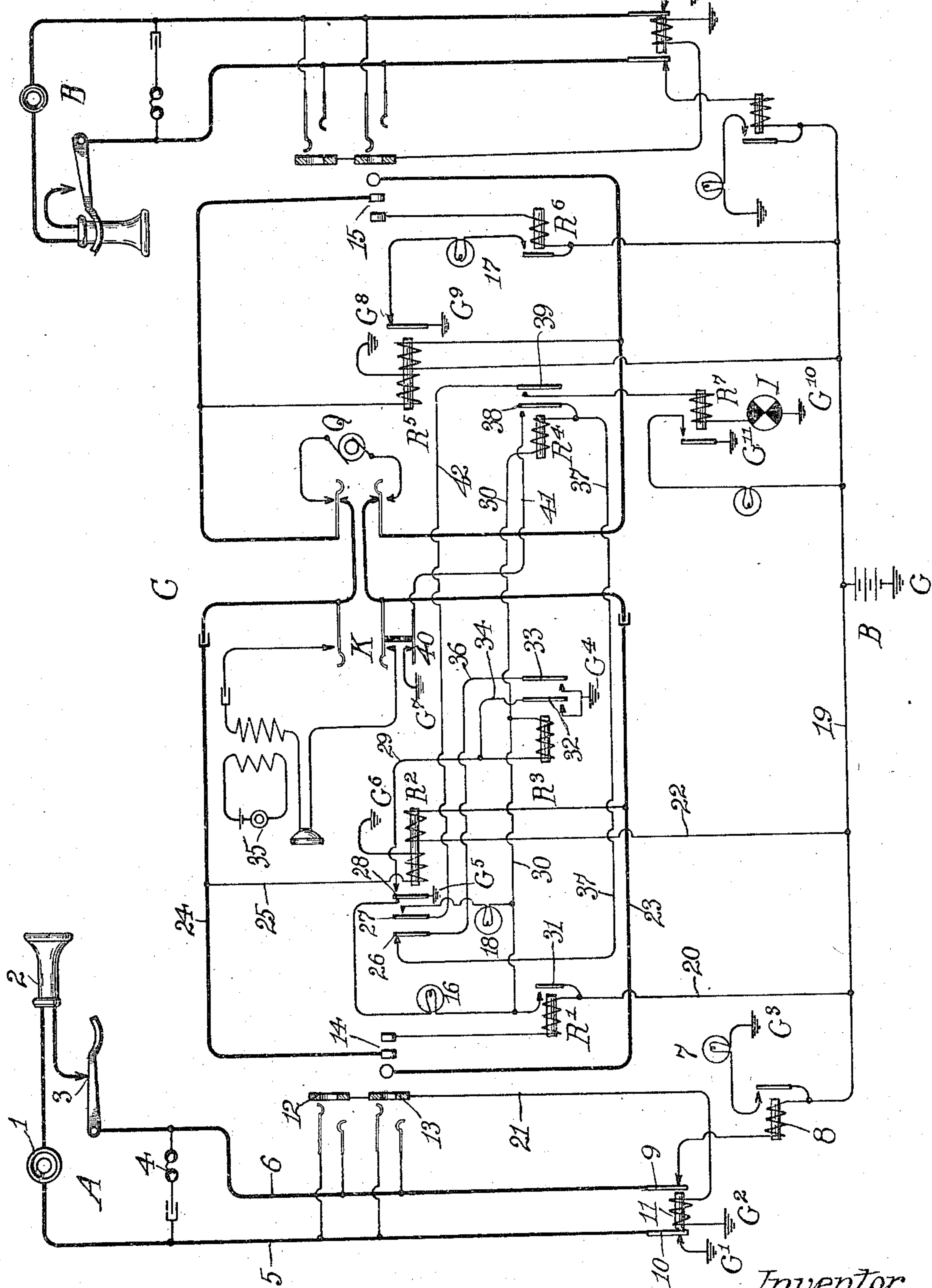


W. W. DEAN.
TELEPHONE SYSTEM.
APPLICATION FILED OCT. 29, 1915.

1,228,537.

Patented June 5, 1917.



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UNITED STATES PATENT OFFICE.

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TELEPHONE SYSTEM.

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Specification of Letters Patent.

Patented June 5, 1917.

Application filed October 29, 1915. Serial No. 58,580.

To all whom it may concern:

Be it known that I, WILLIAM W. DEAN, a citizen of the United States, residing at Rochester, in the county of Monroe and State of New York, 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 more particularly to a central station system with improved supervision and mechanism for giving a distinctive recall signal.

The object of the invention is to provide an improved supervisory system in which a distinctive recall signal is given by a signaling device additional to the usual supervisory signals.

In the accompanying drawing, I have illustrated diagrammatically a telephone system embodying my invention.

A number of telephone lines connect the various substations such as A and B, illustrated in the drawing, to the central station at C. The substation A is provided with the usual transmitter 1, receiver 2, switch-hook 3, and call device 4,—these pieces of apparatus being connected in a well known manner to the line wires 5 and 6, which lead to the central station at C. The line 5, 6 is provided with a line signal 7, controlled by the line relay 8, which is normally in series with the line 5, 6 by way of the back contact and armature 9 of the cut-off relay 11. The line 5, 6 is provided at the central station with the multiple jacks 12, 13, one of which may be employed as the answering jack.

The cord circuit, diagrammatically illustrated in the drawing, is provided with the answering plug 14 and the ringing or calling plug 15. The cord circuit is a three wire circuit and each cord is provided with a supervisory relay and a third wire relay. The supervisory relay R^2 supplies battery to the answering end of the cord circuit and the supervisory relay R^5 is similarly connected to the calling end of the cord circuit. The sleeve relay R^1 is connected in the third wire of the answering cord, and the sleeve relay R^6 is connected in the third wire of

the calling cord. The answering end of the cord circuit is provided with a supervisory lamp 16 for indicating the condition of the calling line and the supervisory lamp 17 is provided in connection with the calling end of the cord circuit for indicating the condition of the called line. In addition, the recall signal lamp 18 is provided in connection with the answering end of the cord circuit to indicate when the calling subscriber wishes to make a recall. A pair of locking relays, R^3 and R^4 are provided for controlling the display of the separate recall signal. An interrupter I is switched into series with the lamp 18 to give a characteristic signal on the same.

I shall now describe my invention in detail in connection with the various operations required to make a connection between one subscriber's line and another subscriber's line, and in making a recall from the calling subscriber's line. As soon as the subscriber at the substation A lifts his receiver from the switch hook, preparatory to making a call, it can be seen that the line lamp 7 will be illuminated upon energization of the line relay 8 over the following circuit:

Battery B, bus wire 19, line relay 8, back contact and armature 9 of the cut-off relay 11, line wire 6, switch hook 3, receiver 2, transmitter 1 and back over the line wire 5 through the contact 10 of the cut-off relay to ground at G^1 .

The operator observing the display of the line signal inserts the answering plug 14 in one of the jacks and in doing so connects the third wire of the cord to the cut-off relay 11 thereby operating the same to extinguish the line signal. The circuit of the cut-off relay 11 may be traced as follows:

From the battery B over bus bar 19, third wire of the cord 20, sleeve relay R^1 , to the corresponding plug and jack contact, wire 21, cut-off relay 11, and ground at G^2 .

Battery is now fed out over the tip and sleeve strands of the cord to the substation instrument over the following circuit:

Battery B, bus bar 19, battery feed wire 22, winding of the relay R^2 , tip strand of the cord 23, through the cooperating plug and jack contact over the tip side of the line 6, through the substation instrument, back

over the sleeve side of the line 5, through the cooperating jack and plug contact to the sleeve strand 24 of the cord, wire 25, winding of the supervisory relay R^2 and to ground at G^6 .

The substation bridge being closed at this time, the supervisory relay R^2 will be energized and will attract its armatures 26, 27 and 28. The armature 28 breaks the circuit of the supervisory lamp 16, and closes the circuit of the locking relay R^3 over the following circuit:

Ground at G^5 , armature 28, front contact, wire 29, winding of the relay R^3 , wire 30, armature 31 and front contact of the relay R^1 , third wire 20, battery bus 19, and to battery at B.

The relay R^3 is energized and attracts its armatures 32 and 33 and closes a holding circuit for itself as follows:

Ground at G^4 , front contact and armature 32, wire 34, winding of the relay R^3 , wire 30, armature 31 of the sleeve relay, R^1 , wire 20, bus 19, and battery at B.

The armature 33, which is closed against its front contact at this time, prepares a circuit which is open at this time at the armature 26 of the supervisory relay R^2 , to energize the recall relay R^4 .

The operator connects her telephone set 35 to the cord circuit by means of the key K and after ascertaining the number of the line with which the subscriber at the substation A desires to be connected, she inserts the calling plug 15 in the jack of the desired line, which in this case is assumed to be the line of the subscriber at the substation B. The supervisory lamp 17 is lighted in the usual manner until the called subscriber responds to the signal which is given by ringing current from the generator at Q. After the subscribers have finished their conversation, they replace the receivers upon the respective switch hooks and the supervisory lamps 16 and 17 will be lighted in the usual manner to give the disconnect signal.

If the calling subscriber desires a connection with another subscriber while the connecting plugs are still in place, instead of permanently replacing his receiver upon the switch hook, he replaces the receiver on the switch hook for only a short time to open the line and then removes it again to give the recall signal.

When the receiver 2 is replaced upon the switch hook 3 at the substation A, the supervisory relay R^2 will be deenergized and the armatures 26, 27 and 28 will drop back against their back contacts. The armature 28 closes the circuit of the answering supervisory lamp 16 in the well known manner. The armature 27 opens the circuit of the special recall signal 18. The armature 26 closes the energizing circuit of the locking recall relay R^4 as follows. It will be remem-

bered that the relay R^3 was energized and locked upon the prior energization of the supervisory relay R^2 . The circuit of the relay R^4 may be traced from ground at G^4 through the front contact and the armature 33 of the relay R^3 over the wire 36, armature 26, back contact, wire 37, winding of the relay R^4 , wire 30 through the front contact and armature 31 of the relay R^1 to battery at B over the wire 20 and the bus bar 19. The relay R^4 is energized and in attracting its armature 38, it closes a locking circuit for itself as follows:

Ground at G^7 , contact 40 of the key K, wire 41, front contact and armature 38 of the relay R^4 , winding of the relay R^4 , wire 30, front contact and armature 31 of the relay R^1 to battery at B over the wire 20 and the bus 19.

The armatures 38 and 39 of the relay R^4 are thus held against their front contact. The armature 39 prepares the circuit for the special recall lamp 18 which is now held open at the armature contact 27 of the relay R^2 .

When the subscriber again raises the receiver 2 from the switch hook 3, the relay R^2 is energized and attracts its armatures 26, 27 and 28. The armature 28 breaks the circuit of the supervisory lamp 16. The armature 26 causes no change and the armature 27 closes the circuit of the special recall signal 18 as follows:

From ground at G^{10} through the interrupter I, pilot relay R^7 , front contact and armature 39 of the recall relay R^4 , wire 42, armature 27, front contact of the relay R^2 , through the special recall lamp 18, wire 30, front contact and armature 31 of the sleeve relay R^1 to battery B over the wire 20 and the bus bar 19. The lamp 18 will thus be intermittently lighted and will give a separate and distinct recall signal upon a separate and distinct signaling device not connected with the usual supervisory signal. The lamp 18 is preferably so placed as to be readily noted by the operator in charge of the connecting cord.

Instead of employing a lamp, some other form of signal may be employed, and in fact, a drop or semaphore comprising a separate and distinct signaling device comes within the spirit of my invention.

What I claim as new and desire to protect by Letters Patent of the United States is the following:

1. In combination a telephone line having line terminals, a cord circuit for connecting said line with other lines, a supervisory relay in said cord circuit, a supervisory signal device, a locking relay and a separate recall signal device controlled by said supervisory relay and said locking relay, said recall signal device being individual to said cord circuit.

2. In combination a plurality of telephone lines to be interconnected, a cord circuit for connecting said lines in conversation, a supervisory relay in said cord circuit, a supervisory signal controlled by said relay, a locking relay controlled by energization of said supervisory relay, a separate recall signal, a recall relay, said recall relay being controlled by energization of said locking relay and deenergization of said supervisory relay, said recall signal being displayed by energization of said supervisory relay and said recall relay.

3. In combination a plurality of telephone lines to be interconnected, a cord circuit for interconnecting the same, a sleeve relay for said cord circuit, a supervisory relay for said cord circuit, a supervisory signal device and a separate recall signal device, said devices being individual to said cord circuit, said supervisory signal device being controlled by said sleeve relay and said supervisory relay, and a locking relay, said recall signal device being controlled by

said sleeve relay, said supervisory relay and said locking relay. 25

4. In combination a plurality of telephone lines to be interconnected, a cord circuit for interconnecting the same, a supervisory signal device and a separate recall signal device, said signaling devices being individual to said cord circuit, and a supervisory relay controlling both of said signals. 30

5. In combination, a plurality of telephone lines to be interconnected, a cord circuit for interconnecting the same, a supervisory signal lamp and a recall signaling lamp, said lamps being individual to said cord circuit, a circuit for said supervisory signaling lamp to energize the same for steady illumination, a circuit for said recall signaling lamp to illuminate the same intermittently, and a supervisory relay controlling both of said circuits in due order. 35 40 45

In witness whereof, I hereunto subscribe my name this 26 day of Oct. A. D. 1915.

WILLIAM W. DEAN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."