W. G. BLAUVELT.

SUPERVISORY SIGNALING SYSTEM.

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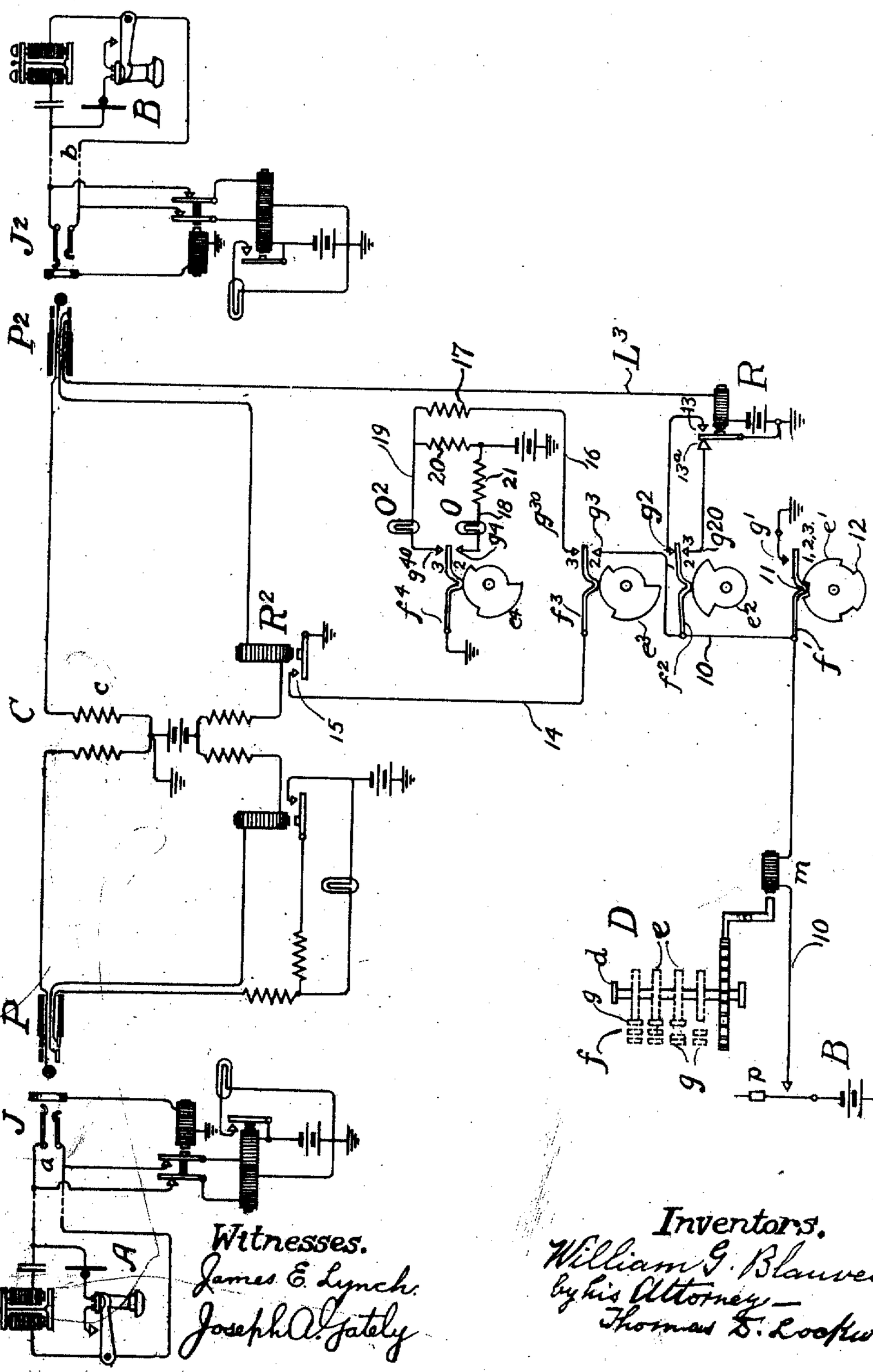
990,219.

Patented Apr. 25, 1911.



Witnesses.

James E. Lynch.

Joseph A. Gately

Inventors.

William G. Blauvelt

by his Attorney—

Thomas D. Lockwood

UNITED STATES PATENT OFFICE.

WILLIAM G. BLAUVELT, OF NEW YORK, N. Y., ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK.

SUPERVISORY SIGNALING SYSTEM.

990,219. Specification of Letters Patent. **Patented Apr. 25, 1911.**

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To all whom it may concern:

Be it known that I, WILLIAM G. BLAUVELT, residing at New York, borough of Manhattan, in the county of New York and State of New York, have invented certain Improvements in Supervisory Signaling Systems, of which the following is a specification.

This invention is directed to the signals employed for supervising telephone calls. Ordinarily in manual systems, the cord circuit by which the lines are united at the central station has in both the answering and calling ends a single signal device, as an incandescent lamp, which is caused to glow when the receiver of the corresponding substation is upon its hook, and to be extinguished when said receiver is removed. This gives the operator an indication of the conditions at the substations, which is in many instances sufficient, but in others puts upon her an undue burden in noting and remembering the times of appearance and disappearance of the signals. For example, the calling subscriber after the completion of a particular conversation, or because there was an error in the connection, will keep the receiver off the switchhook when he desires to speak with the operator. Unless the latter observed the lighting and extinguishing of the called supervisory lamp, this leads her to again ring over the called line, or to wait for the called subscriber to answer. Drag upon the operator's work, and delay and annoyance of the subscriber results. A further difficulty arises from the fact that in measured service the operator has no direct means of knowing when the calls have reached a stage at which they should be charged, unless, as before pointed out, she has seen the changes in the called line supervisory.

The present invention provides plural signals for the called line, by which, for each connection, separate indications are given when the subscriber responds to the ring of the bell and when he terminates the conversation.

In the accompanying diagrammatic drawing my invention is illustrated in connection with a manual cord circuit, though it is to be understood that it is applicable to all systems where similar supervision is useful.

The letters A and B designate telephone substations, the lines *a* and *b* of which unite them to jacks J and J^2, respectively, at a central station C. At the central station are circuits for connecting the lines, in the present instance an operator's cord circuit *c* being shown, this having an answering plug P and a calling plug P^2. These appear adjacent to the jacks J and J^2, and therefore A may be considered as the calling and B as the called substation. In every respect, save as it relates to supervision of the called line, the cord circuit *c* may be as usual, and only the novel portions will be particularly described.

Associated with the cord circuit is an automatic switching mechanism D, the arrangement and functions of which will depend upon the character of the system of which it is a part, but which, in any event, is adapted to assume successive controlling positions in regular sequence. In the present instance, it is employed solely as a means for governing the supervisory signals of the called subscriber, and for this purpose it consists of a shaft *d* upon which is fixed a series of cams *e*, the peripheries of which coöperate with springs *f* to force them against or permit them to separate from contacts *g*. These cams, springs and contacts all appear in two places in the drawing, in dotted lines in their actual relation to the shaft *d* and in full lines at points most clearly developing the circuit organization. In the latter case, they are distinguished from one another by numerals affixed to their reference letters. The switch shaft with its cams may be moved from position to position by a motor magnet *m* actuating ratchet mechanism. A pulsator *p* supplies intermittent current from battery B through conductor 10 to the motor magnet *m*, and thus rotates the shaft whenever its circuit is completed at one of the contacts of the sequence switch D to ground or other return conductor. This ground connection may be at some external point or local to the switching mechanism itself, the cam *e'* controlling the latter condition and determining the correct stopping points of the switch shaft. When the spring *f'* coöperating with this cam is separated from the contact *g'*, this being in the positions indicated by the numerals placed at the opposite side of the spring from the contact, the projection 11 upon said spring lies in a depression 12 in the periphery of the cam, and the shaft with

the associated cams is properly positioned. Upon the completion of the circuit of the motor magnet m at some point in the system the projection rides out of the depression, and when resting upon elevations of the cam e' closes a local circuit for the motor magnet which insures rotation of the shaft to the next position at which the cams are to stop, regardless of external conditions. The numerals applied to the contacts of the remaining cams show the positions in which said contacts are closed. Of the other cams, e^2 has its spring f^2 normally resting upon a contact g^2, which is joined to the front contact 13 of a relay R in the third conductor L^3 of the cord between the central station battery and the sleeve contact of the calling plug P^2.

The normal contact 13^a of relay R is joined to the contact g^{20} of cam e^2. The spring f^2 of this cam and contact g^3 of cam e^3 are included in the conductor 10 of the motor magnet. From spring f^3 of cam e^3 a conductor 14 leads to the front contact 15 of the called line supervisory relay R^2, situated in the cord conductor L^2 and energized only when the receiver at the substation is off its switchhook. The alternate contact g^{30} is united by a conductor 16 through a resistance 17 with parallel branches 18 and 19, in which are a ringing signal O and a disconnecting signal O^2, respectively, both of these preferably being incandescent lamps. Resistances 20 and 21 are interposed between the conductor 16 and the lamp O, and the juncture of these resistances is connected to battery. The conductors 18 and 19 terminate, respectively, in contacts g^4 and g^{40} of cam e^4, the spring f^4 of which is joined to ground. As thus described and illustrated both signal lamps O and O^2 may be said to be directly associated with one and the same cord circuit C, and particularly with the calling end of said cord circuit, and both positioned and adapted to signal one and the same central station operator.

The operator, having received a call for substation B and found its line b not in use, inserts the plug P^2 of the cord circuit with which she has answered into the jack J^2. This causes the energization of relay R in circuit with the cutoff relay of the called line. The closure of contact 13, together with normal contact g^2 of the sequence switch, gives a ground for conductor 10, and impulses of current are applied by the pulsator p to the motor magnet of the switch, which is driven to its second position. Grounded spring f^4 now resting upon contact g^4, there is a local circuit for the lamp O through conductor 18 and resistance 21, lighting this lamp and thus preparing it to indicate the subscriber's response to the ringing of his bell. The signal has therefore been rendered effective by the association of the jack and plug. The subsequent taking down of the receiver energizes supervisory relay R^2 and gives a circuit through its front contact 15, conductor 14, spring f^3, contact g^3 and conductor 10 for the motor magnet. The switch D thereupon takes its third position, opening contact g^4, and thus extinguishing the lamp O to inform the operator that the called subscriber has answered. Upon its alternate contact g^{40} the spring f^4 closes the local circuit 19 for the disconnecting lamp O^2, but this is shunted by a circuit from battery to ground through resistance 17, conductor 16, switch contact g^{30}, conductor 14 and contact 15 of relay R^2. It does not receive sufficient current to cause it to glow, but has been prepared for signaling by the removal of the receiver. When, however, the called subscriber hangs up the receiver, the armature of relay R^2 falls off, breaking the shunt circuit and lamp O^2 lights. This gives to the operator positive knowledge that there has been communication between the calling and called substations, and that, if the supervisory lamp of the calling line also lights, she may withdraw the plug P^2 and, in measured service, record the call. If the calling line supervisory remains out, it at once indicates to the operator, without effort to recall previous conditions, that she should again connect her set with the cord to inquire what is desired. When the operator pulled out the calling plug, the relay R, being released, completed at its back contact 13^a a circuit for the motor magnet by way of switch contact g^{20} and conductor 10. The switch D advanced to its normal position and was stopped by the opening of the contact g^{20}. If the called subscriber had failed to answer, the same circuit would have resulted upon the deënergization of relay R in the second position, and contact g^{20} would still be closed in the third position, causing the complete restoration of the switch.

Having thus described my invention, I claim:

1. In a telephone system, a central station and a substation, a plurality of supervisory signal devices at the central station, all positioned and adapted to signal one and the same central station operator and means for successively bringing said signal devices under the control of the substation.

2. In a telephone system, a central station and a substation, a plurality of signal devices at the central station, all positioned and adapted to signal one and the same central station operator and automatic mechanism at the central station for successively bringing said signal devices under the control of the substation.

3. In a telephone system, a central station and a substation, two supervisory signals, both positioned and adapted to signal one and the same central station operator and

means controllable by central station apparatus for rendering one signal effective and by substation apparatus for rendering the other signal effective.

4. In a telephone system, a central station and a called substation, and two supervisory signals both positioned and adapted to signal one and the same central station operator and controllable by the substation apparatus at different stages of a call.

5. The combination with telephone lines, of a connecting circuit therefor, and a plurality of signal devices associated with the connecting circuit, all of said signal devices being positioned and adapted to signal one and the same operator and controllable during a single connection by the condition of one of the substation lines.

6. The combination with telephone lines, of a connecting circuit therefor, and a plurality of supervisory signal devices directly associated with the calling end of the connecting circuit and controlled by a called telephone line.

7. The combination with telepho e lines, of a connecting circuit therefor, and a ringing supervisory signal and a disconnecting signal directly associated with the connecting circuit and both controllable from one of two telephone lines when such lines are c nnected by the connecting circuit.

8. The combination with a telephone circuit including substation apparatus, of a plurality of signal devices, switching means for actively associating one and then another of the signal devices with the circuit, and means controlled by the condition of the substation apparatus for actuating the switching means.

9. The combination with telephone lines and a connecting circuit, of a sequence switch provided with a plurality of contacts, called line supervisory signals connected with said contacts and effective in different positions of the sequence switch, and means for actuating the sequence switch to said different positions.

10. Telephone lines, a connecting circuit therefor, a relay associated with the connecting circuit, switching mechanism provided with motor means and with a plurality of contacts, said motor means being controlled by the relay, and called line supervisory signals joined to different contacts of the switching mechanism.

11. Telephone lines, a connecting circuit therefor, switching mechanism associated with the connecting circuit and having a plurality of contacts, a ringing signal connected to one contact of the switching mechanism, a disconnecting signal connected to another contact thereof, means controlled by uniting the connecting circuit with a called line for closing the contact to the ringing signal, and means operating upon the response of the called subscriber for closing the contact to the disconnecting signal.

12. Telephone lines, a connecting circuit therefor, switching mechanism associated with the connecting circuit and having motor means and a plurality of contacts, a ringing signal connected to one contact of the switching mechanism, a disconnecting signal connected to another contact thereof, a relay controlled by uniting the connecting circuit with the called line for actuating the motor means to close the contact to the ringing signal, and a supervisory relay thereafter controlling the motor means to close the contact to the disconnecting signal.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses, this 18th day of October 1910.

WILLIAM G. BLAUVELT.

Witnesses:

PHILIP WOOLLCOTT,

WILBUR L. VATTER.