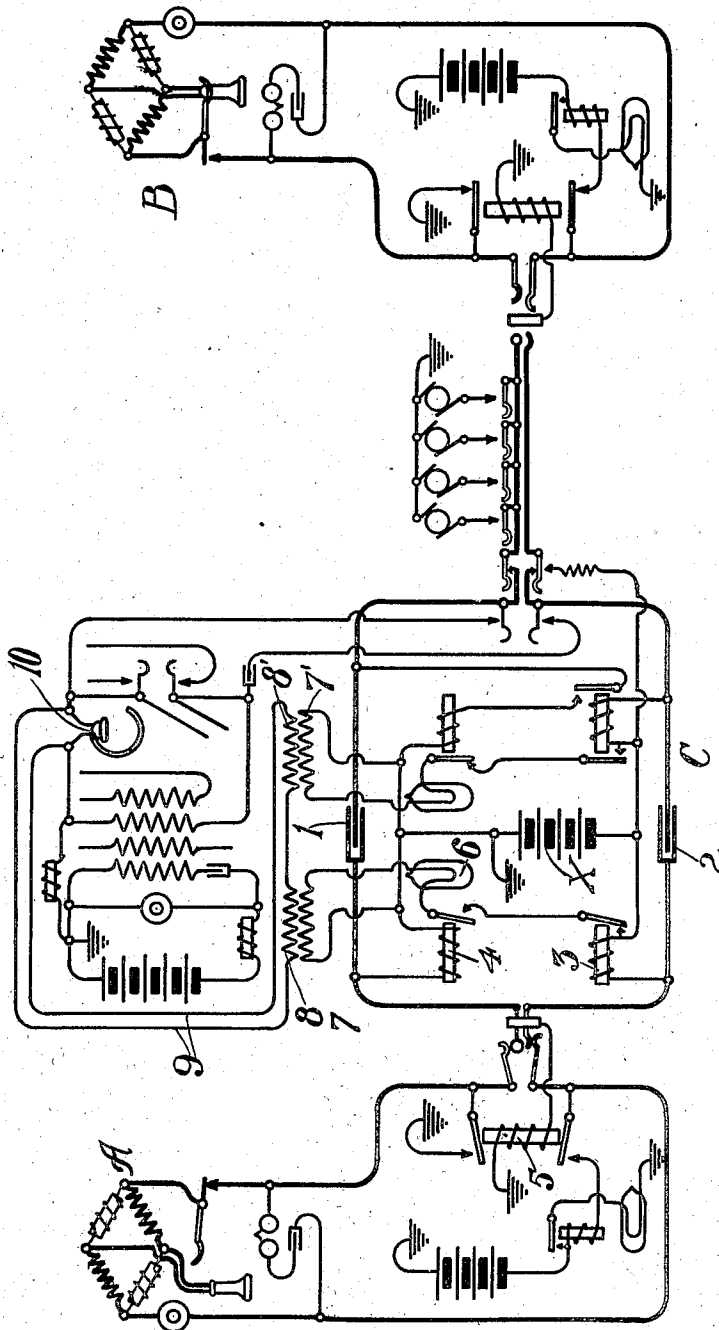


W. S. PACA.
TELEPHONE SUPERVISORY SYSTEM.
APPLICATION FILED NOV. 13, 1908.

933,335.

Patented Sept. 7, 1909.



Witnesses

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UNITED STATES PATENT OFFICE.

WILLIAM S. PACA, OF OIL CITY, PENNSYLVANIA.

TELEPHONE SUPERVISORY SYSTEM.

933,335.

Specification of Letters Patent.

Patented Sept. 7, 1909.

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To all whom it may concern:

Be it known that I, WILLIAM S. PACA, a citizen of the United States of America, and a resident of Oil City, county of Venango, and State of Pennsylvania, have invented a new and useful Improvement in Telephone Supervisory Systems, of which the following is a specification.

My invention pertains to supervisory systems for operators at switchboards in telephone exchanges, and it has as its object the provision of an audible signal whereby a connected subscriber may obtain the attention of the operator, the audible signal being operated preferably in conjunction with the usual visual signals of a common battery switchboard.

In the operation of telephone switchboards it has been found that a weak point in the operators' supervisory signal systems is that the supervisory signals are of such character as to be operated, but not to be noticed by the operator instantly, thus possibly causing a delay where a telephone subscriber desires to attract the operator's attention for the purpose of securing quickly a second connection, or for the purpose of getting information from the operator. In common battery or central energy systems, small electric lights are used in connection with the operator's connecting cord circuit, said lights being operated from the subscriber's telephone by the act of removing or replacing the telephone receiver from or on the switch-hook. It is the general practice that where a subscriber has been connected with one party, and wishes to attract at once the operator's attention so as to secure a second connection, the subscriber works his switch-hook up and down several times for the purpose of signaling the operator by lighting and extinguishing the supervisory lamp. It has been demonstrated in practice that the act of lighting and extinguishing the supervisory lamp does not always attract the operator's attention quickly, for the reason that the operator's eye may be directed to some other part of the switchboard at the exact instant that the supervisory lamp may flash several times and go out, and further, that if the subscriber works his switch-hook very rapidly, the supervisory lamp does not receive current for a long enough period to light the lamp up fully, and consequently it is not noticed by the operator, the result being that the subscriber then waits at his tele-

phone for a period of greater or less duration, according to the amount of patience possessed by the subscriber, and then proceeds again to work the switch-hook. It has been shown in systems where the general service is good, that there is complaint from subscribers of delay in securing the operator's attention for a second connection as above stated.

The object of my invention is to reduce delay in securing the operator's attention for a second connection to the minimum, and for this purpose I have invented a circuit which is adapted to any central energy or common battery cord circuit, and can be adapted to magneto system cord circuits, whereby the act of working the switch-hook up and down will not only operate the supervisory lamp if a subscriber is already connected with a cord circuit, but will signal directly into the operator's receiving telephone, thereby instantly attracting the operator's attention to the supervisory lamp signals, and securing to the subscriber immediate attention.

In supervisory systems embodying my invention, the operation of the switch-hook by the subscriber produces a clicking sound in the operator's receiving telephone. The operator, hearing this clicking sound, will at once cast her eye on the supervisory lamps and instantly detect the one which is flashing, or if the subscriber had worked his switch-hook so rapidly that the supervisory lamp has not lighted up sufficiently to be detected, the operator will have been warned by the "clicking" sound in her receiving telephone that some subscriber is endeavoring to attract her attention, and can ascertain on what cord circuit such subscriber is connected by running over or listening in on the cord connections that may be set up.

In the figure which accompanies this description, I show a cord equipment and two subscribers' lines of a well known type, which may be cited as a standard type of common battery telephone system. In connection with this circuit I show the modification which constitutes my invention.

The type of telephone system shown is selected for illustration only, the modification constituting my invention being readily adapted to any type of common battery central office equipment and to many types of magneto central office equipment.

In the figure, station A is represented as

calling and station B as about to be called. The cord pair at C is of a type having four relays per cord pair. The cords are separated conductively by condensers 1 and 2.

On the answering cord supervisory relays 3 and 4 are energized by current flowing through the substation bridge and through the cut-off relay 5; relay 3 closes the circuit of lamp 6 and relay 4 opens the circuit of lamp 6. Upon cessation of current through the substation bridge at A, relay 4 will release its armature and close the circuit of lamp 6. In series with lamp 6 I introduce the induction coil having primary windings 7 and secondary winding 8. An audible signal circuit includes secondary winding 8, conductors 9 and operator's receiving telephone 10.

It is obvious that when the circuit of lamp 6, containing also battery X and induction coil winding 7, is either closed or opened by relay 3 or 4, the starting or stopping of current in winding 7 will cause an inductive pulsation in secondary winding 8; the relation of the windings 7 and 8, the conductors 9, and the receiving telephone 10 shall be such that the resultant current through the receiver 10 shall produce an audible but not objectionably loud click. It is obvious therefore that the working of the switch-hook up and down at substation A and thus breaking and making repeatedly the contact of the hook switch will, by controlling relay 4 thus controlling the circuit of lamp 6 and primary winding 7, produce a series of clicks in the operator's telephone 10 characteristically different from the isolated and intermittent clicks caused by the regular acts of subscribers in answering calls and in hanging up receivers permanently for disconnection. Induction coil having winding 7' 8' is related to the other plug of the cord pair in the same manner, and transmits to the telephone 10 audible signals from the station B. As many as desired of the operator's plugs may be connected by an inductive link to the operator's receiving telephone. The diagram of the figure accompanying contemplates that all of her plugs and supervisory lamps shall be so connected; the secondaries 8 8', etc. of the induction coils may be grouped in any desired manner, series, multiple, or multiple arc, in association with the conductors 9 which lead to the telephone 10.

In large exchanges, particularly in exchanges where trunking is used extensively and in exchanges where measured rates are used, it is customary to have an operator ignore a signal for attention from her ringing plug, the action of an operator upon such a signal being merely to disconnect the plugs, thus permitting the signaling subscriber to call in upon his proper A-operator. Under such operating rules it may be deemed advis-

able to omit the audible relation between the ringing plug and the operator's receiving telephone; this will reduce the total number of clicks to be received by the operator, yet leave her easily attracted to the flashing of a lamp by one of her own subscribers connected upon any answering plug. I call attention to the fact, however, that the operator's attention should be attracted for prompt disconnection of her ringing plug so that the subscriber signaling her may be enabled to signal his own operator more promptly.

The induction coils used may be of any desired characteristics, depending upon the strength preferred for the click in the operator's receiver and depending upon the mode of connecting the secondaries before attaching to the circuit wires 9. I have found that with connections shown in the figure resistance for the winding 7 of .25 to .5 ohms and for the winding 8 of 200 ohms give very satisfactory results. It is found by experience also that the circuit is useful in warning an operator of the fact that some other operator may have plugged in and rung on a line that the first operator may have had connected, as the act of the second operator plugging in and ringing on a busy line will cause the cord relay of the first connected cord to be chattered or rattled, and will thereby cause an interrupted current to flow through the primary of one of the induction coils, thus giving a very decided signal in the operator's receiving telephone who may have had the original connection.

The desideratum in the system of my invention is that a signaling link be provided at all times between the supervisory circuits associated with the operator's keyboard equipment and the operator's telephone. It is obvious that many forms of combining the elements to produce the result are possible, and also that divers elements may be combined to the same result. Combinations of condensers or impedances or both may replace the induction coils whose windings are 7 and 8. Also the winding 7, instead of being individual to a single lamp, may be common to both lamps of a pair or may be common to all the lamps of the operator's equipment, there being but a single such winding per operator and that winding being included in the lamp signal bus wire of her position. In this case, a click in the receiver will be heard for each change in current value, the current increasing or decreasing slightly as any lamp is lighted or extinguished; the characteristics and limitations of existing supervisory circuits in an exchange where it is desired to install my invention to supplement an existing supervisory system, may in some instances be such as to render this method the most desirable.

In the system of my invention, the sub-

scriber's hook is enabled to operate as a telegraph key to produce audible telegraphic signals in the operator's telephone receiver. This interpretation of the figure describes the relay 4 as the telegraph line relay, the receiver 10 in conjunction with the repeating coil 7—8 forming an audible telegraphic sounder.

Having thus described my invention, what I claim as new and desire to secure by United States Letters Patent is:

1. In a telephone system, a subscriber's line; a relay controlled over said line; a local circuit controlled by said relay; an operator's receiving telephone; and an induction coil having its primary winding included in said circuit and its secondary winding connected to said telephone, substantially as described.

2. In a telephone system, a subscriber's line; a relay controlled over said line; a local circuit controlled by said relay; an operator's receiving telephone; and an inductive link connecting said circuit and said telephone, substantially as described.

3. In a telephone system, a subscriber's line; a relay controlled at all times over said line; a local circuit controlled by said relay; an operator's receiving telephone; and means for producing at any time an audible signal in said telephone when said relay is operated, substantially as described.

4. In a telephone system, a circuit adapted to be opened and closed and adapted to be so controlled by a subscriber's hookswitch; an operator's receiving telephone; and means operative at all times for producing a current through said telephone when said circuit is opened or closed, substantially as described.

5. In a telephone system, a circuit adapted to be opened and closed and adapted to be so controlled by a subscriber's hookswitch; an operator's receiving telephone; and means operative at all times for producing a clicking sound in said telephone when said circuit is so controlled, substantially as described.

6. In a telephone system, a visual super-

visory signal; a controlling circuit therefor; an operator's receiving telephone; and an inductive link connecting said circuit and said telephone, substantially as described.

7. In a telephone system, a visual supervisory signal; a controlling circuit therefor; an operator's receiving telephone; and an induction coil having its primary winding included in said circuit and its secondary winding connected to said telephone, substantially as described.

8. In a telephone system, a visual supervisory signal; a controlling circuit therefor; an operator's receiving telephone; and means for producing an audible signal in said telephone at all times upon energization or de-energization of said signal, substantially as described.

9. In a telephone system, a visual supervisory signal; a controlling circuit therefor; an operator's receiving telephone; and means operative at all times for producing an audible signal in said telephone upon the breaking of said circuit, substantially as described.

10. In a telephone system, a telegraph circuit extending from an operator's connecting apparatus to a substation, said circuit being operative at all times during the connection of the operator's connecting apparatus with the said station, and producing an audible signal in the operator's telephone in response to current changes in the said circuit, substantially as described.

11. In a telephone system, a supervisory relay; a visual signal controlled thereby; and an auxiliary supervisory signal circuit controlled exclusively by said relay at all times during the continuance of connection and including the operator's receiver as an audible signal device.

Signed by me at Oil City, county of Venango and State of Pennsylvania, in the presence of two witnesses.

WILLIAM S. PACA.

Witnesses:

J. S. MASON,
T. P. CADIGAN.