S. S. STOLP.

TELEPHONE SYSTEM.

APPLICATION FILED NOV. 27, 1908.

979,590.

Patented Dec. 27, 1910.

2 SHEETS—SHEET 1.

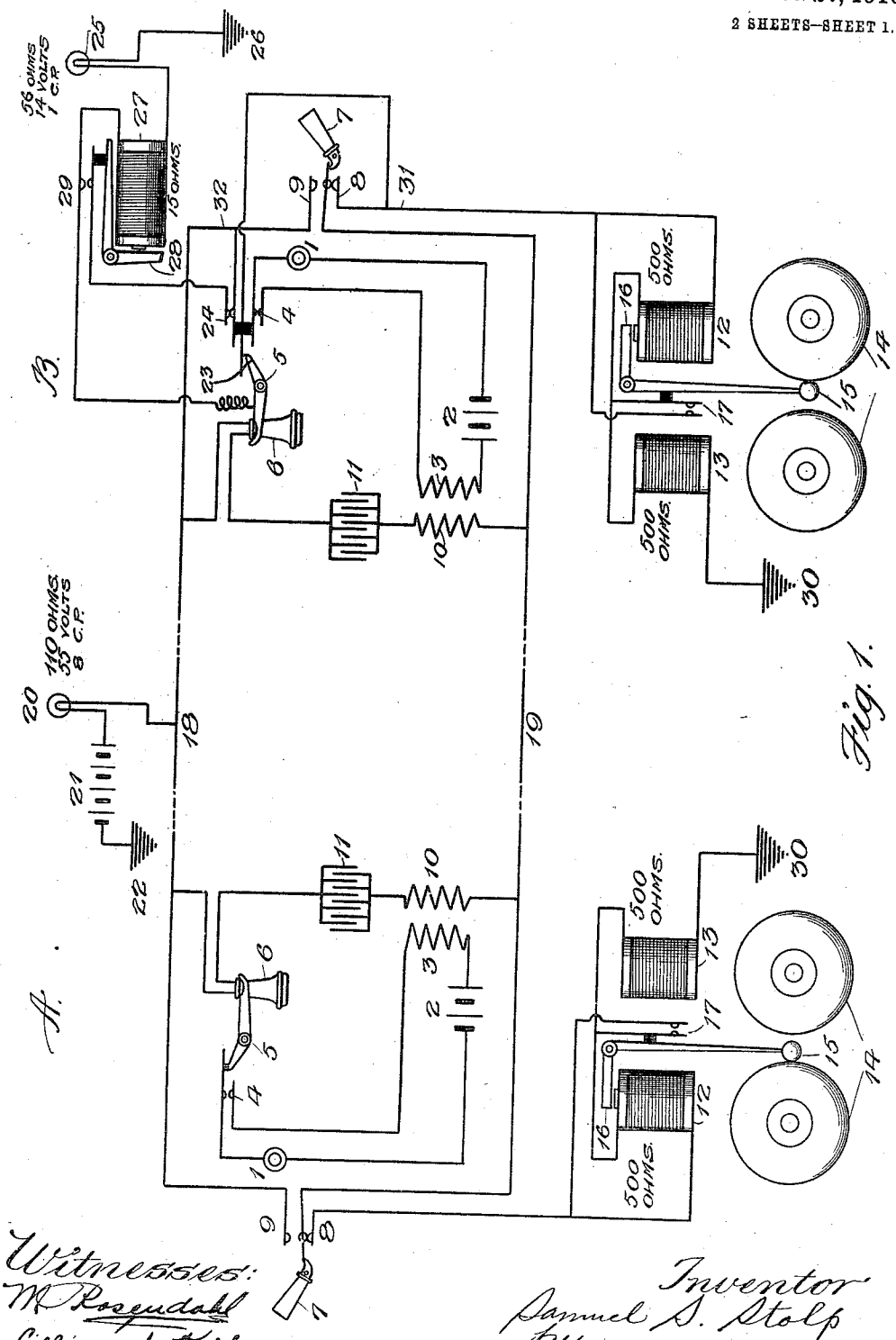

Fig. 1.

Witnesses:
M. Rosendahl
Lillian A. Libby

Inventor
Samuel S. Stolp
by
Sheridan & Wilkinson
Attys.

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2 SHEETS—SHEET 2.

Fig. 2.

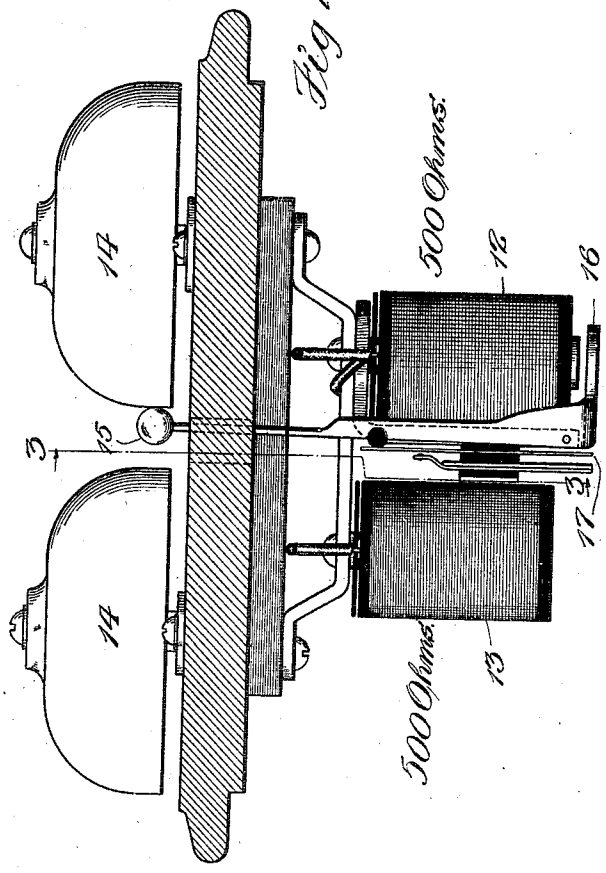
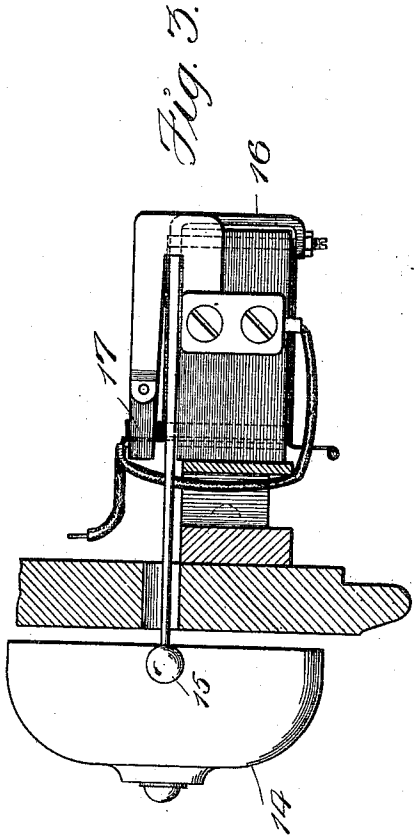


Fig. 3.



Witnesses:
M. Rosendahl
Lillian A. Tibby

Inventor:
Samuel S. Stolp
by
Sheridan & Wilkinson.
Attys.

UNITED STATES PATENT OFFICE.

SAMUEL S. STOLP, OF CHICAGO, ILLINOIS, ASSIGNOR TO WILLIAM J. C. KENYON, OF CHICAGO, ILLINOIS.

TELEPHONE SYSTEM.

979,590. Specification of Letters Patent. **Patented Dec. 27, 1910.**

Application filed November 27, 1908. Serial No. 464,740.

To all whom it may concern:

Be it known that I, SAMUEL S. STOLP, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Telephone Systems, of which the following is a specification.

The principal object of my invention is to provide a new and improved telephone system adapted for successful signaling.

Another object is to provide a telephone system that shall have an extra signal to be employed in certain cases when the primary signal may be inoperative.

Still another object is to provide an extra signal that may be employed in case the primary signal fails to act properly.

A further object is to provide a telephone system that shall be adapted for signaling at all times, whether or not the apparatus is connected up for talking.

All these objects, and others, will be made apparent in the following specification and claims, when taken in connection with the accompanying sheet of drawings, in which—

Figure 1 is a diagrammatic representation of a telephone system which embodies my invention. Fig. 2 is a top plan view of a bell which forms a part of the system, and Fig. 3 is a vertical section taken on the line 3 in Fig. 2.

While my invention is capable of embodiment in a wide variety of forms and may be applied and employed under widely varying circumstances, I have chosen to illustrate it in a single specific form, which I will now proceed to describe.

A and B are two stations connected together by the pair of conductors 18 and 19. In the drawing this constitutes a private line system, but after the arrangement and operation of this particular system has been stated it will at once be apparent that A might represent a central station and B a subscriber's station, and that other modifications might be made. Bridged across the line at station A in series are the receiver 6, condenser 11 and secondary 10 of an induction coil 3—10. The local primary circuit includes a transmitter 1, battery 2, primary 3 of the induction coil 3—10 and a pair of contacts 4 which are kept open by the weight of the receiver 6 when it is on the hook 5. The branch 19 of the line is normally connected to the bell at the pair of contacts 8; but the little hand operated lever 7 is adapted to open the contacts 8 and close the contacts 9, thus directly closing the two sides of the line 18 and 19 at the station A. From the contacts 8 a single conductor leads through the magnet coils 12 and 13 in series to ground 30. But the contacts 17 are arranged so that when closed they cut out or shunt the coil 12. This action takes place by the attraction of the magnet 12 on the armature 16, which also vibrates the clapper 15 against the gongs 14. It will be seen that there is always a closed conductor path from the contacts 8 to the ground 30, through the coil 13, and that the coil 12 will be cut out intermittently, thus ringing the bell when a sufficient electromotive force is applied across the points 8 and 30.

At some point on the line 18 a single conductor is tapped in, leading from ground 22 through the storage battery 21 and the lamp 20. At the opposite end of the line the station B has an equipment, which is precisely the same as that just described for station A, but with certain added features which will be described presently. So far as the parts at B correspond to those of A, they have been designated with like reference characters. From the hook 5 at B a conductor leads through the relay coil 27 and lamp 25 to ground 26. Another conductor leads from the point 31, adjacent to the contacts 8 on the side toward the bell, to the contact point 23 where it is engaged by the receiver hook 5 when the receiver 6 is hung thereon, but not otherwise. A branch conductor from the point 32 on the main line wire 18 leads to the contacts 24, which are closed when the receiver 6 is on the hook, but not otherwise. From the contacts 24, a conductor leads to a pair of contacts 29, which when closed are adapted to shunt part of the circuit leading through the relay 27 and lamp 25. The bell at station B is exactly like that at station A.

The coils 12 and 13, in the special installation which I am now describing, each have a resistance of five hundred ohms. The lamp 25 is of one candle power and is designed for fourteen volts and has a resistance of fifty-

six ohms. The relay coil 27 has a resistance of fifteen ohms. The lamp 20 has a resistance of one hundred and ten ohms and is designed for fifty-five volts, and is of eight candle power.

In the drawings the parts have been shown in normal position as they would appear when not in use for signaling or talking. Assuming that an operator at A desires to call a party at B, he will press down on the lever 7, thus disconnecting the A bell from the line at 8, and directly connecting the two branches 18 and 19 of the line at 9. Previously to this, the battery 21 is on open circuit, as will readily be observed by tracing the branching conductors therefrom to the contacts 9, condensers 11 and contacts 29; but when the contacts 9 at A are closed, a circuit is completed as follows: ground 22, battery 21, lamp 20, line 18, contacts 9, line 19, contacts 8, and thence through the two branches in parallel as follows; (1) from intersection point 31 through the B bell to ground 30 (2) from the intersection point 31 through contacts 23, hook 5, relay coil 27, lamp 25 to ground 26. Inasmuch as the bell has an aggregate resistance of one thousand ohms and the lamp 25 and coil 27 have an aggregate resistance of only sixty ohms, it is evident that substantially all the current will flow through the lamp 25 and the B bell will not be actuated. Furthermore, the effect of the current flowing through the relay coil 27 will be to attract the armature 28, which will close the contacts 29, thus establishing the following circuit: from ground 22, through battery 21, lamp 20, line 18, contacts 24, contacts 29, relay coil 27, lamp 25 to ground 26. It will be observed that this circuit shunts a large part of the circuit previously traced, and that it will be held closed at 29 by the current flowing through the relay 27, even though the A operator may open the contact 9. Thus it is evident that a momentary pressure on the A lever 7 will start the lamp 25 to burn and that it will burn continuously until its circuit is interrupted at either 24 or 29. This lamp 25 is a signal to the party at B to answer. At this point I will call attention to the fact that he cannot affect the system in any way unless he removes his receiver 6 from the hook. If while the lamp 25 is burning the B party simply presses down on the lever 7 while the receiver is on the hook, he will throw the A bell and the B bell in parallel with the lamp 25, but inasmuch as each of these bells has a far higher resistance than the lamp, neither of them will ring. Assuming that the contacts 9 are closed as just suggested, the circuit with the three parallel branches is traced as follows: from ground 22 to the point 32 and thence (1) through the relay coil 27 and lamp 25 as previously stated, (2) from the point 32 through contacts 9 over line 19, through contacts 8 and A bell to ground 30, (3) from the point 32 through the contacts 24 and 29, hook 5, contacts 23, point 31, through B bell to ground 30. It is therefore clear that the party at B can only signal back by removing his receiver from the hook. The removal of the receiver 6 from the hook 5 at B produces three changes (1) it closes the local circuit at 4, (2) it opens the contact 23, and (3) it opens the contact 24. It will readily be observed that by the opening of the contacts 23 and 24 the relay coil 27 and lamp 25 are entirely disconnected, and thus the low resistance path through the lamp 25 is disconnected from the battery 21. After having removed the B receiver 6 from the hook, the party presses down on the lever 7, thus ringing the A bell, the circuit being the second of the three branch circuits traced in the preceding paragraph, but this time constituting a single branch as follows: from ground 22, through battery 21, lamp 20, conductor 18, contacts 9 at B, conductor 19, contacts 8, through the A bell to ground 30. The ringing of the A bell calls the A operator, and conversation may proceed between the two stations. All the talking current is furnished by the local batteries 2. The condensers 11 permit the flow of the alternating voice currents to the line 18—19, but prevent any flow of direct current from battery 21.

In case the lamp 25 is burned out or the circuit thereof is interruped from any cause, this will remove the low resistance branch circuit to ground when the contact 9 is closed by the A operator, and the current will pass from the point 31 through the B bell to ground 30, ringing the bell as long as the contact 9 at A is kept closed. Thus, it will be seen, that whenever the lamp signal fails, the bell comes into action.

If the party at B fails to put his receiver 6 on the hook 5, then a closure on the contact 9 at A will ring the B bell, because the low resistance path through the lamp 25 will be broken at 23 and 24. If the operator A, expecting the lamp 25 to work normally, should give only a momentary push on the lever 7, this will of course ring the B bell for only a moment. If this short ring was not heard by the party at B, then the A operator would get no answering signal and very naturally he would return to the lever 7 and depress it, repeatedly and continuously, thus ringing the B bell noticeably. The operation would be the same whether the failure of the lamp was due to an interruption of its branch circuit or to leaving the B receiver 6 off the hook.

This particular installation that has been described connects a broker's office A with the instrument B of his representative at a stock exchange. The representative on the floor of the exchange will be attracted sooner

or later by his lamp 25 which burns continuously (under normal conditions) after a momentary depression of the lever 7 at the broker's office. The arrangement is designed to give the representative at the exchange considerable time before requiring him to answer, and therefore, the broker at A does not necessarily stay at his instrument waiting for his answer, but depends on being signaled back by the representative at the exchange. In case the lamp 25 burns out or the B receiver 6 is left off the hook, the B party can be reached by the ringing of the bell. Whether the A receiver is on or off the hook, the A bell will ring when the B lever 7 is depressed. Inasmuch as the lamp 25 consumes the battery 21 while it is burning it is desirable that the apparatus should be arranged to shut the lamp off as promptly as practicable. As has been explained, the party at B cannot signal back to A until he removes his receiver from the hook, and thus extinguishes the lamp 25.

The battery 21 and the lamp 20 for each line like that illustrated are preferably installed at a central station. The lamp 20 serves in part as an indicator being normally dark, but having a dull glow when one of the signals is being actuated. If the side of the line designated 18 becomes grounded, the lamp 20 will glow brightly. If the branches 18 and 19 of the line become short-circuited, the lamp 20 will have a dull glow continuously without interruption. If such a short circuit is reported to the central station by the B subscriber who notes the continuous glow of his own lamp 25, then the lamp 20 affords ready means for identifying the faulty branch. The lamp 20 cannot burn out, because even on a ground it is subjected to no excessive voltage. It will readily be seen that the lamp 25 cannot burn out because any possible applied voltage is safely below the limit.

The bell disclosed in this specification has the advantage of a wide sweep of the clapper, the same as a common alternating current bell. The contacts are very easy to adjust whereas in the old direct current bell with break contacts, the adjustment is fine and difficult. Even on heavy currents there is practically no sparking or arcing across the contact terminals 17. It may be desirable to substitute the bell for the lamp 25. In this case it will be necessary to have a continuous current bell in order to hold the relay 27. It will be seen that my bell satisfies this condition although a break contact bell would not do so.

If any one tried to steal in on the line, that is tried to bridge a receiver across the conductors 18 and 19 to listen to conversation, this action would light the lamp 25 giving a warning to the party at B. Of course this effect might be avoided if the stealthy party understood the necessity for a condenser similar to 11, but this would be extremely unlikely.

For the sake of clearness I have made my disclosure very specific with respect to a particular embodiment of my invention. But I desire to have it understood that the invention in the various aspects defined in the following claims is capable of widely different application from that here disclosed.

I claim:

1. In a telephone system, a line comprising two metallic conductors, a grounded battery connected to one of them, grounded signaling devices normally connected to the other conductor, one at each end of the line, and means to disconnect the signaling device and simultaneously connect the conductors at either end of the line and thereby actuate the signaling device at the opposite end of the line.

2. In a telephone system, a line comprising two metallic conductors, a grounded battery connected to one of them, a grounded signaling device normally connected to the other conductor at one end of the line, means to connect the conductors at the opposite end of the line and thereby actuate the signaling device, and talking apparatus bridged across the line at the ends with respective condensers in series therewith.

3. In a telephone system, a line comprising two metallic conductors, a grounded battery connected to one of them, grounded signaling devices normally connected to the other conductor at the ends of the line, and means to connect the conductors at either end of the line and thereby actuate the signaling device at the opposite end thereof.

4. In a telephone system, a line comprising two metallic conductors, a grounded battery connected to one of them, grounded signaling devices normally connected to the other conductor at both ends of the line, and means at both ends of the line to disconnect the signaling device at the respective end therewith and to connect the conductors at that end and thereby actuate the signaling device at the opposite end.

5. In a telephone system, a line comprising two metallic conductors, a grounded battery connected to one of them, talking apparatus in series with a condenser bridged across the line, a local transmitter circuit and a local battery associated therewith, a grounded signaling device normally connected to the conductor, which does not have the battery attached thereto, said talking apparatus and signaling device being associated together at one point on the line, and means to connect the conductors at another point of the line and thereby actuate the signaling device.

6. In a telephone system, a line compris-

ing two metallic conductors, a grounded battery connected to one of them, a grounded signaling device normally connected to the other conductor at one end of the line, and means to connect the conductors at the opposite end of the line and thereby actuate the signaling device, said signaling device being constructed to have a closed circuit between its terminals at all times.

7. In a telephone system, a line comprising two metallic conductors, a grounded battery connected to one of them, a grounded signaling device normally connected to the other conductor at one end of the line, means to connect the conductors at the opposite end of the line and thereby actuate the signaling device, talking apparatus and a condenser in series bridged across the line, an electro-magnet in series with said signaling device, a shunt around the circuit closing means at the opposite end of the line adapted to be closed by said electro-magnet, and means to automatically break said shunt by changing the talking apparatus from inoperative to operative condition.

8. In a telephone system, a line comprising two metallic conductors, a grounded battery connected to one of them, a grounded signaling device normally connected to the other conductor at one end of the line, a circuit closer for the two conductors at the opposite end of the line, a receiver and a condenser in series bridged across the line, a supporting hook for said receiver, an electromagnetic switch in series with the signaling device adapted to close a shunt around the said circuit closer, and means to break both branches of the circuit to the signaling device when the receiver is removed from the hook.

9. In a telephone system, a line comprising two metallic conductors, a grounded battery connected to one of them, two grounded signaling devices having different resistances normally connected to the other conductor at one end of the line, a circuit closer to connect the conductors at the opposite end of the line, and means in series with the signaling device of less resistance to close and hold a shunt around the said circuit closer.

10. In a telephone system, a line having two signaling devices in multiple at one end thereof, a hold device associated with one signaling device, means at the opposite end of the line to actuate said signaling device having the hold device or to actuate the other signaling device in case the first is inoperative.

11. In a telephone system, a line having two signaling devices of different resistances at one end, a hold device associated with the signaling device of less resistance, and means at the opposite end of the line to send an electric current through said signaling devices in parallel.

12. In a telephone system, a line having a signaling device at one end thereof, a hold device associated with said signaling device, a telephone receiver, a hook therefor, a circuit closer at the opposite end of the line to actuate said signaling device, and means to break the circuit of the signaling device when the receiver is moved from the hook.

13. In a telephone system, a line having two signaling devices of different resistances at one end thereof, a circuit closer to send current through said devices in parallel, a hold device associated with the signal device of less resistance, a receiver, a hook for the receiver, and means to break the branch circuit leading to the circuit device of less resistance when the receiver is off the hook, thus leaving a single path through the other signaling device for signaling current.

In testimony whereof, I have subscribed my name.

SAMUEL S. STOLP.

Witnesses:

LILLIAN A. KIBBY,

ANNA L. WALTON.