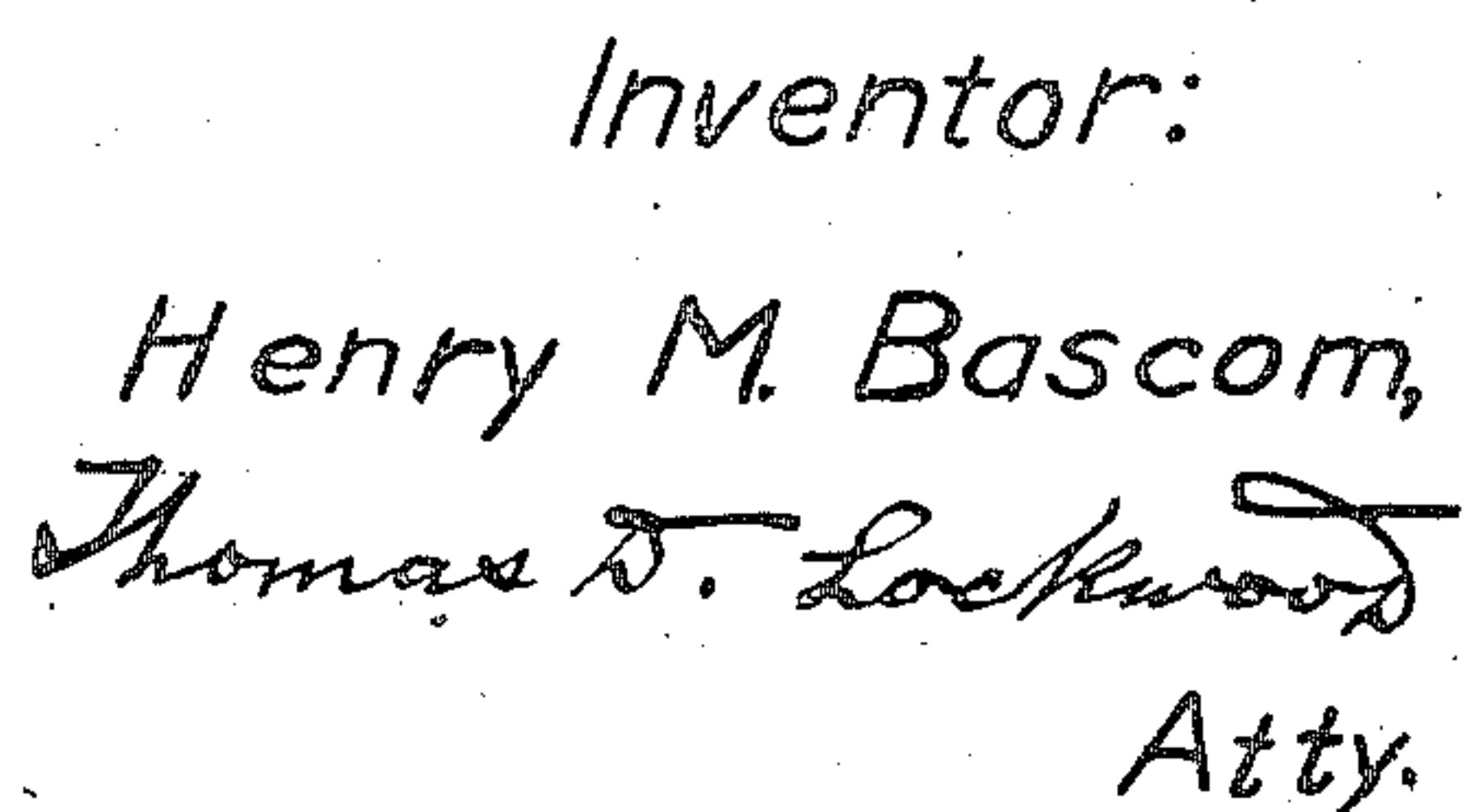


1,232,183.

Patented July 3, 1917.



UNITED STATES PATENT OFFICE.

HENRY M. BASCOM, OF BROOKLYN, NEW YORK, ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK.

CONTROLLING SYSTEM.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, HENRY M. BASCOM, residing at Brooklyn, in the county of Kings and State of New York, have invented certain Improvements in Controlling Systems, of which the following is a specification.

In telephonic, telegraphic or other signaling systems, the operation in the ordinary manner of certain indicating or signaling apparatus may introduce difficulties through complication of the circuits, presence of earth potentials or the lack of sufficient current margins. The present invention takes advantage of changes of resistance to disturb a potential balance normally maintained in a controlling apparatus, which leads to its functioning, and there is thereby obtained a sensitive and generally effective controlling system.

The accompanying drawing illustrates a single embodiment of the invention, Figure 1 showing diagrammatically my improved system applied to the control of a subscriber's signal associated with a telephone service observing circuit, while Fig. 2 is a schema illustrating the principle of the invention.

Circuits for observing the character of service rendered telephone subscribers are ordinarily provided with a lamp signal at the observer's desk, governed by a relay so connected that it follows in its energization and deenergization the opening and closing of the substation hookswitch contacts. It is possible to join this relay in series with the substation line or to connect it to ground in parallel with one winding of the repeating coil in the A operator's cord circuit. In the first instance, the opening of the subscriber's line and the introduction of a connection may cause trouble, while in the second, the evil effect of earth potentials may be encountered and machine ringing is interfered with. In this particular application of my invention, I control the subscriber's signal through the change of resistance in the sleeve conductor of the connected cord circuit, due to the placing of a shunt upon a supervisory lamp when the subscriber takes down the receiver. This affects a Wheatstone-balance including in its bridge a signal controlling relay.

Referring to Fig. 1 of the drawing, the line L is shown uniting the usual substation set A with the answering jack J at a central sta-

tion. To the sleeve conductor of the line is joined its cut-off relay R. Coöperating with the jack J is the plug P of a cord or connecting circuit, the answering end of which appears at C. This cord circuit includes the customary battery B, answering supervisory relay R' with its supervisory lamp O in series with an 83 ohm resistance r , said lamp being extinguished by the application of a 40 ohm shunt r' through the front contact of relay R'.

To the substation line L is connected the service observing line L'. The observer's head telephone T is associated with the talking conductors, and at the position of said observer is a subscriber's signal lamp O', the other equipment of the position not appearing. The lamp O' is in a local circuit controlled in the contacts of a sensitive relay R², conveniently furnished by substituting for the needle of a voltmeter having an oscillating coil 10, a contact arm 11. This arm is normally held against a stop 13 by a light spring 14 and moves into the contact with a stop 15 when current passes through the coil 10 in the proper direction. One terminal of the coil of this relay is connected to the third, or sleeve, conductor of the observed line through a conductor 12 of the service observing line, while the other terminal is joined to the opposite poles of the battery through resistances r^2 and r^3 of 5000 and 29,750 ohms, respectively. From Fig. 2 it will be clear that the circuit of Fig. 1 forms a Wheatstone-balance circuit, in which the side a contains the windings of the cut-off relay R, the resistance of which is 30 ohms, the side b , the resistance r normally in series with the lamp O, but with this shunted by the resistance r' when relay R' is energized, the sides c and d , the fixed and predetermined resistances r^2 and r^3 and the bridge conductor e , the winding of relay R². With the receiver at substation A upon its hook and therefore with the relay R' deenergized, the values of the resistances are such that there is at least an approximate balance of potentials at the terminals of the relay R² and the arm 11 is held against the normal stop by its spring. On account of the variation in commercial resistance coils, it is impracticable to provide for an accurate balance under all conditions. Therefore the resistances r^2 and r^3 are preferably

so chosen that the potentials at the terminals of relay R^2 are substantially equal for extreme conditions of service, and that any departure from this shall be such as to cause
 5 a flow of current in the bridge e which will tend to maintain the arm 11 against its normal contact 13. When the subscriber takes down the receiver, relay R' operates as usual, placing the shunt r' in parallel with
 10 the supervisory lamp O . The resistance of the side b of the Wheatstone-balance is consequently lowered and the balance of potential at the terminals of the bridge e disturbed, causing current to so flow through
 15 the winding 10 of relay R^2 . This compels the arm 11 to swing into contact with stop 15, closing the local circuit of the lamp O' at the observing position, so that said lamp is illuminated to indicate to the observer
 20 the act of the subscriber. Upon the return of the receiver to its hook the normal condition of potential at the bridge terminals is restored, permitting the spring 14 to return the arm 11 of relay R^2 to its stop 13,
 25 opening the local circuit to extinguish the lamp O' .

While the invention is here discussed in connection with a particular portion of one type of signaling system, it is to be understood that its field is by no means thus limited, but may cover many instances in which it is desired that changes in resistance shall produce circuit controlling operations.

I claim as my invention:

35 1. In a service observing system, a telephone line, a connecting circuit therefor, a signal associated with the circuit and controlled by conditions in the line, a relay and a service observing signal controlled
 40 thereby, and means for maintaining a balance of potential at the terminals of the relay, said balance being disturbed to operate the relay and display the service observing signal upon a changed condition of
 45 the first-named signal.

2. In a service observing system, a telephone line, a connecting circuit therefor provided with a supervisory signal, a service observing line, a signal circuit controlling relay having its winding in said line,
 50 means including the supervisory signal for maintaining a balance of potential at two points on opposite sides of said relay winding, and a supervisory relay in the connecting circuit for controlling said supervisory
 55 signal and through the signal the balance of said potentials to operate said circuit controlling relay.

3. In a service observing system, a telephone line, a connecting circuit therefor provided with a supervisory signal, a service observing line including a circuit controlling relay, means including said signal
 60 for normally maintaining two points on opposite sides of said relay at the same po-

tential, and a supervisory relay in the connecting circuit adapted on energization to withdraw said signal and unbalance said potentials to operate the circuit-controlling relay.

4. In a service observing system, a telephone line, a connecting circuit therefor provided with a supervisory signal, a shunt for the signal and a supervisory relay governing
 70 said shunt, a Wheatstone-balance one side of which includes said signal and shunt, circuit-controlling means in the bridge of the balance, and a service observing signal circuit controlled thereby, said means becoming
 75 operative on change of resistance in the balance by operation of the supervisory relay.

5. In a service observing system, a telephone line, a connecting circuit therefor, a supervisory signal associated with the circuit and provided with a shunt circuit, a
 85 Wheatstone-balance two sides of which include a cut-off relay and said signal and shunt, the companion sides including predetermined resistances, circuit-controlling means in the bridge of the balance, and a
 90 service observing signal under control of said means and being effective on closing the shunt by operation of the supervisory relay.

6. In a telephone system, a telephone line, a connecting circuit therefor, a Wheatstone-balance, comprising; in two sides, a cut-off relay and a supervisory signal included in
 95 the connecting circuit, and in the companion sides, predetermined resistances; circuit-controlling apparatus in the bridge of the balance, a service observing signal circuit controlled thereby, and a supervisory relay responsive to the conditions in the line adapted
 100 to alter the side resistance containing the first-named signal and thereby operate the service observing signal.

7. In a service observing system, a telephone line, a connecting circuit therefor provided with a supervisory signal in its sleeve conductor, a service observing line
 110 having a conductor joined to the sleeve conductor of the telephone line and connecting circuit, a relay with its winding included in said service observing conductor, and means for maintaining a balance of potential at the terminals of the relay during the display
 115 of the supervisory signal, said balance being disturbed upon the withdrawal of the signal to cause the operation of the relay.

8. In a service observing system, a telephone line and its cut-off relay, a connecting circuit therefor provided with a supervisory signal in its sleeve conductor, a shunt for the signal and a supervisory relay governing
 125 said shunt, a service observing line having a conductor joined to the sleeve conductor of the telephone line and connecting circuit, a sensitive relay with its winding included in said service observing conductor, a Wheat-
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stone-balance having the service observing line conductor and the winding of the sensitive relay furnishing the bridge conductor, one of the sides of the balance including the supervisory signal and its shunt, the side of the balance upon the opposite side of the bridge including the winding of the cut-off relay and the other two sides being of predetermined resistance, and an observer's signal controlled by the sensitive relay.

9. In a telephone system, line sleeve and connecting circuit sleeve contacts, line connections associated therewith including a cut-off relay and a variable resistance, a Wheatstone-balance one branch of which includes said relay and variable resistance, and circuit controlling apparatus in the bridge of the balance adapted to operate when said resistance is altered.

10. In a telephone system, line sleeve and connecting circuit sleeve contacts, line connections associated therewith, the resistance of one of said connections being adapted to be altered in the operation of the system, a Wheatstone-balance one side of which includes said variable resistance, and circuit controlling apparatus in the bridge of the balance adapted to operate when said resistance is altered.

11. The combination with a telephone line and its cut-off relay, of a variable resistance, a Wheatstone-balance one side of which includes the relay and variable resistance, and a circuit controlling apparatus included in

the bridge of the balance and being adapted to operate upon a variation in said resistance.

12. In a telephone system, the combination with a central station and a telephone line extending to the central station and being provided with a local circuit thereat, of a variable resistance connected with said local circuit, a Wheatstone-balance one side of which includes the variable resistance, and a circuit controlling apparatus included in the bridge of the balance and being adapted to operate upon a variation in said resistance.

13. In a telephone system, the combination with a central station and a telephone line extending to the central station and being provided with a local conductor thereat, of a connecting circuit having a local conductor coöperating with that of the line, a variable resistance in the local conductor, a Wheatstone-balance one side of which includes the variable resistance, and a circuit controlling apparatus included in the bridge of the balance and being adapted to operate upon a variation in said resistance.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses, this seventeenth day of July, 1916.

HENRY M. BASCOM.

Witnesses:

ALFRED KAUFMANN,
CLIFFORD C. ELLIS.