J. M. FELL.

TELEGRAPH SYSTEM.

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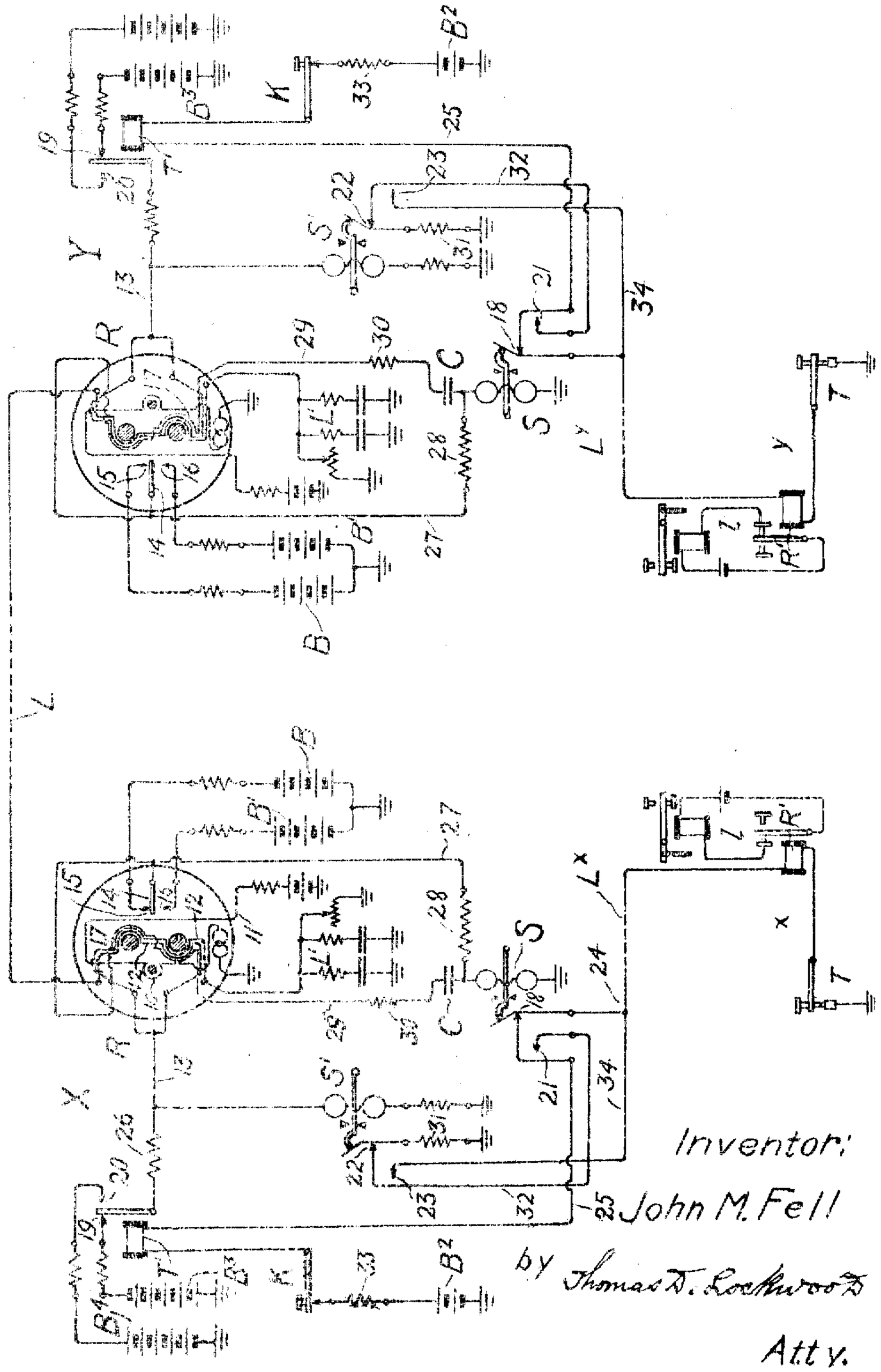
1,238,008. Patented Aug. 21, 1917.



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UNITED STATES PATENT OFFICE.

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TELEGRAPH SYSTEM.

1,238,008. Specification of Letters Patent. Patented Aug. 21, 1917.

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To all whom it may concern:

Be it known that I, JOHN M. FELL, residing at Hackensack, in the county of Bergen and State of New Jersey, have invented certain Improvements in Telegraph Systems, of which the following is a specification.

In operating telegraph systems by the half-duplex method, in which duplex apparatus is employed to give one-way transmission between a main line circuit and extension lines or substation loops, it is sometimes difficult for the receiving operator to send promptly a break signal to the sending operator when it is desired to stop transmission. This may occur at a time when the operator is sending a series of rapidly recurring dots, because as the receiving operator opens his key to break, the pole changer which transmits the break signal will be energized by its locking circuit through the contact of the repeating sounder which has been released by the opening of the key of the sending operator. The break signal will thus be delayed until the sending key has been again closed, but in the meantime the breaking operator may have begun to send and the first signaling impulses will be lost. I avoid this difficulty and obtain a prompt break, by providing means for removing the pole changer from the control of the sending operator through the repeating sounder by opening the locking circuit for said pole changer.

It is also possible with a half-duplex arrangement for the operators to lose control of the apparatus by simultaneously opening their keys. Suppose a receiving operator attempts to break just as the sending operator is transmitting a space. This will cause the release of all the receiving and transmitting apparatus at both ends of the line, and, since the circuits including the keys and windings of the pole changers are through the break contacts of the receiving apparatus, in absence of special means for this purpose neither operator can actuate the pole changer to resume transmission. To meet these conditions I furnish a substitute circuit for the normal circuit governing each pole changer, thus preventing such loss of control.

In outlining the invention above and hereinafter describing it, particular systems and apparatus are referred to. It is to be understood, however, that the invention is to be considered as limited in these respects only as defined in the claims.

The drawing shows diagrammatically connected telegraph stations organized in accordance with one embodiment of my invention.

Telegraph central stations appear at X and Y, these being joined by a main line L. These stations are arranged to repeat respectively between the main line and loops or extensions L^x and L^y leading to substations x and y. I have chosen to illustrate this as accomplished by the differential duplex method, there being at each of the stations X and Y a relay R polarized by a winding 10 included in a battery circuit 11 and having differential windings 12, 12 connected to the main line L and artificial line L', and also, in the customary manner, to the common conductor 13 leading to the armature of the pole changer T'. Considering the equipment at one extremity only of the line, that at the opposite end being identical with it, the armature 14 of relay R through its contacts 15 and 16 applies a negative and a positive battery B and B^1 to the polarized repeating sounder S. The line relay and repeating sounder furnish respectively primary and secondary receiving apparatus. An auxiliary controlling winding 17 of the relay R is also connected to the armature and has its opposite extremity grounded through a condenser C and the winding of sounder S.

The substation loop normally passes through a key or primary transmitting apparatus T, the winding of a neutral relay R', associated with the front contact of which is a local sounder circuit l, the contact 18 of sounder S, the winding of the pole changer or secondary transmitting apparatus T' and key K of the central station attendant to battery B^2. Negative and positive batteries B^3 and B^4 are joined to contacts 19 and 20 of the pole changer. From the common wire 13 is connected to ground a polarized sounder S', which actuated by outgoing impulses from the armature of the pole changer permits the attendant to monitor this portion of the service. From the contact 21 of the repeating sounder S connection is made to ground by way of the contact 22 of monitoring sounder S'. The contact 23 of sounder S' is united at 24 to the normal loop circuit between the key

T and contact 18 of the sounder S. The purpose of these connections will be explained in the following detailed statement of operation.

When the operator at x opens his key T in the act of transmitting a message through the apparatus at X and Y to the local receiving apparatus of the operator at y, the pole changer T′ at central station X is deënergized. The loop L^x which is opened for this purpose includes key T, the winding of relay R′, contact 18 of repeating sounder S, conductor 25, the winding of pole changer T′, key K, resistance 33 and battery B^2. A pulse of positive current is thus sent over the line from battery B^4 through contact 20 of the pole changer, resistance 26 in common conductor 13, winding 12 of relay R, conductor L, winding of relay R at central station Y, the greater portion passing by way of common conductor 13 and contact 19 of the distant pole changer to negative battery B^3. Smaller currents find their way through the artificial line L′ and the sounder S′ at station Y, said sounder not being operated thereby. There is the well understood flow of current through the differential windings at both relays R, so affecting them that the distant responds while the home relay remains inert. The monitoring sounder S′ at central station X also receives current, opening contact 22 and closing contact 23, though in normal operation this actuation of the contacts has no function. When the distant relay R is energized, its armature is transferred to contact 16 and current from battery B′ actuates the sounder S by way of conductor 27 and the relatively high resistance 28. Current also charges condenser C through the winding 17 of relay R, conductor 29, resistance 30 and the winding of sounder S. This charging pulse aids the operating current in holding both the relay and sounder armatures against their contacts. Sounder S at central station Y therefore opens contact 18 and closes contact 21. The former breaks the normal loop circuit for operating relay R′, which being deënergized releases the reading sounder in the local circuit l. Contact 21 makes before contact 18 breaks, and a path is furnished for locking the pole changer at station Y against release, which circuit may be traced from ground through resistance 31, contact 22 of sounder S′, conductor 32, contact 21, conductor 25, winding of the pole changer T′, key K and resistance 33 to battery B^2. In this manner transmission may continue under the control of the operator's key at station x, the condenser C at station Y discharging upon the next signaling impulse, which transfers the armature of relay R from contact 16 to contact 15, and by the current pulse produced through the relay R and sounder S accelerating the movement of the armatures toward the opposite contacts.

Suppose the operator at y wishes to stop transmission by the operator at x and opens his key T for this purpose. If the operator at x at this moment has his key closed, the armature of relay R at central station Y will be on the contact 15 and the repeating sounder S will be as illustrated, with its contact 18 made. The normal loop circuit L^y will be open and the pole changer at Y deënergized to send out a break impulse from its contact 20. If, on the other hand, the operator at y breaks as the key of the operator at x is open as in the sending of dots, the armature of relay R at Y will leave contact 15 and strike contact 16, which will result in the loop L^y being opened at contact 18 of sounder S after the operator at y has endeavored to break. Thereupon the locking circuit for the pole changer at Y will be closed at 21 and this apparatus may be reënergized before an effective impulse can flow over the line L from station Y to X. Yet there will usually be a sufficiently strong impulse of operating current from contact 20 to release the sounder S′ at station Y. This severs the locking circuit of the pole changer at contact 22 preventing its reënergization, and a full break impulse reaches the operator at x.

It may be that the effort of the operator at y to break comes at such time, as during the making of a space by the operator at x, that all the apparatus will be released. That is, both keys will be opened, the pole changers will both be deënergized, causing the monitoring sounders S′ to release and the relays R to operate, thus releasing the repeating sounders S. This opens the pole changer circuits for both loops at contacts 18 and 22. As the operators can only control the relays through the pole changers, they would be locked out from the circuit unless substitute paths for the pole changers be furnished. These are provided for in the present instance through the contacts 23 of the monitoring sounders S′. Under the conditions assumed there will be at each central station a circuit from ground through the loop apparatus, conductor 34, contact 23, conductor 32, contact 21 of the repeating sounder, conductor 25, winding of the pole changer T′, key K and resistance 33 to battery B^2. Over such path either operator may actuate the pole changer to restore normal conditions.

I claim:

1. In a telegraph system, receiving apparatus, local transmitting apparatus normally controlled by the receiving apparatus, and means governed by operating currents for removing the transmitting apparatus from the control of the receiving apparatus.

2. In a telegraph system, receiving apparatus, local transmitting apparatus normally controlled by the receiving apparatus, and an electro-mechanism governed by operating currents from said transmitting apparatus for removing the latter appuratus from the control of the receiving apparatus.

3. In a telegraph system, a line circuit, receiving apparatus associated therewith, transmitting apparatus normally controlled by the receiving apparatus, and electromagnetic means joined to the line circuit for removing the transmitting apparatus from the control of said receiving apparatus.

4. In a telegraph system, receiving apparatus, transmitting apparatus, a circuit for the transmitting apparatus passing through contacts of the receiving apparatus, other contacts in said circuit, and means responsive to operating current from the transmitting apparatus for opening the circuit at the last-named contacts.

5. In a half-duplex telegraph system, a line circuit, a receiving apparatus and a transmitting apparatus associated therewith, a secondary receiving apparatus controlled by the line receiving apparatus, an extension circuit passing through the secondary receiving apparatus and the transmitting apparatus, and an electro-mechanism energized by current from the line circuit and governing the extension circuit.

6. In a half-duplex telegraph system, a line circuit, a receiving apparatus and a transmitting apparatus associated therewith, a secondary receiving apparatus controlled by the line receiving apparatus, an extension circuit passing through the secondary receiving apparatus and the transmitting apparatus, and an electro-mechanism joined to the line circuit between the receiving apparatus and transmitting apparatus and governing the extension circuit.

7. In a half-duplex telegraph system, a line relay, a pole changer, a common conductor joining the line relay and pole changer, a repeating sounder under the influence of the line relay, an extension circuit passing through a contact of the repeating sounder and the winding of the pole changer, a locking circuit for the pole changer controlled by the repeating sounder, and a monitoring sounder connected to the common conductor and also controlling the locking circuit.

8. In a half-duplex telegraph system, a line relay, a pole changer, a common conductor joining the line relay and pole changer, a repeating sounder under the influence of the line relay, an extension circuit passing through a contact of the repeating sounder and the winding of the pole changer, a locking circuit for the pole changer controlled by the repeating sounder, and a monitoring sounder connected to the common conductor and acting to open the locking circuit.

9. In a telegraph system, receiving apparatus, primary transmitting apparatus, secondary transmitting apparatus controlled thereby, a circuit connecting the primary and secondary transmitting apparatus through a contact of the receiving apparatus, and means for establishing another circuit between the transmitting apparatus when the first-named circuit is broken.

10. In a telegraph system, receiving apparatus, primary transmitting apparatus, secondary transmitting apparatus controlled thereby, a circuit connecting the primary and secondary transmitting apparatus through a contact of the receiving apparatus, and means under the control of the transmitting apparatus for establishing another circuit between the transmitting apparatus when the first-named circuit is broken.

11. In a telegraph system, receiving apparatus, primary transmitting apparatus, secondary transmitting apparatus controlled thereby, a circuit connecting the primary and secondary transmitting apparatus through a contact of the receiving apparatus, and means under the control of the transmitting apparatus for establishing another circuit between the transmitting apparatus through another contact of the receiving apparatus when the first-named circuit is broken.

12. In a telegraph system, receiving apparatus, primary transmitting apparatus, secondary transmitting apparatus controlled thereby, a circuit connecting the primary and secondary transmitting apparatus through a contact of the receiving apparatus, and an electro-mechanism controlled by the transmitting apparatus for establishing another circuit between the transmitting apparatus when the first-named circuit is broken.

13. The combination with a line circuit and an extension circuit, of receiving apparatus connecting said circuits, plural transmitting apparatus in the extension circuit, an electro-mechanism joined to the line circuit, and a circuit through one of the transmitting apparatus substituted for the normal extension circuit and controlled by said electro-mechanism.

14. The combination with a line circuit and an extension circuit, of receiving apparatus connecting said circuits, plural transmitting apparatus in the extension circuit, an electro-mechanism under the influence of the transmitting apparatus, and a circuit through one of the transmitting apparatus substituted for a normal extension circuit and closed by said electro-mechanism upon the release of the transmitting apparatus.

15. The combination with a line circuit and an extension circuit, of receiving apparatus connecting said circuits, plural trans-

mitting apparatus in the extension circuit, an electro-mechanism under the influence of the transmitting apparatus, and a circuit through one of the transmitting apparatus substituted for a normal extension circuit and closed by said electro-mechanism upon the release of the transmitting apparatus and receiving apparatus.

16. In a half-duplex telegraph system, a line circuit, primary receiving apparatus associated therewith, secondary receiving apparatus controlled by the line receiving apparatus, an extension circuit passing through the secondary receiving apparatus, primary transmitting apparatus in the extension circuit, secondary transmitting apparatus associating the extension and line circuits, and a path between the primary and secondary transmitting apparatus substituted for the normal circuit upon the release of the receiving and transmitting apparatus.

17. In a half-duplex telegraph system, a line circuit, primary receiving apparatus associated therewith, secondary receiving apparatus controlled by the line receiving apparatus, an extension circuit passing through the secondary receiving apparatus, primary transmitting apparatus in the extension circuit, secondary transmitting apparatus associating the extension and line circuits, a path between the primary and secondary transmitting apparatus substituted for the normal circuit upon the release of the receiving and transmitting apparatus, and means connected to the line circuit for controlling said path.

18. In a half-duplex telegraph system, a line circuit, a relay associated therewith, a repeating sounder controlled by the line relay, an extension circuit passing through contacts of the repeating sounder, an operator's key in the extension circuit, a pole changer having its winding in the extension circuit and its contacts connected to the line circuit, a monitoring sounder connected to the line circuit, and a substitute circuit for the key and pole changer controlled by contacts of the monitoring sounder.

19. In a half-duplex telegraph system, a line circuit, a relay associated therewith, a repeating sounder controlled by the line relay, an extension circuit passing through contacts of the repeating sounder, an operator's key in the extension circuit, a pole changer having its winding in the extension circuit and its contacts connected to the line circuit, a monitoring sounder connected to the line circuit, and a substitute circuit for the key and pole changer controlled by contacts of the monitoring and repeating sounders.

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

JOHN M. FELL.

Witnesses:
EDW. F. WATSON,
B. PERRY HAMILTON.