No. 647,307. Patented Apr. 10, 1900.

J. M. LATIMER.

COMBINED TELEPHONE EXCHANGE AND FIRE ALARM SYSTEM.

(No Model.) (Application filed July 3, 1899.)

3 Sheets—Sheet 1.

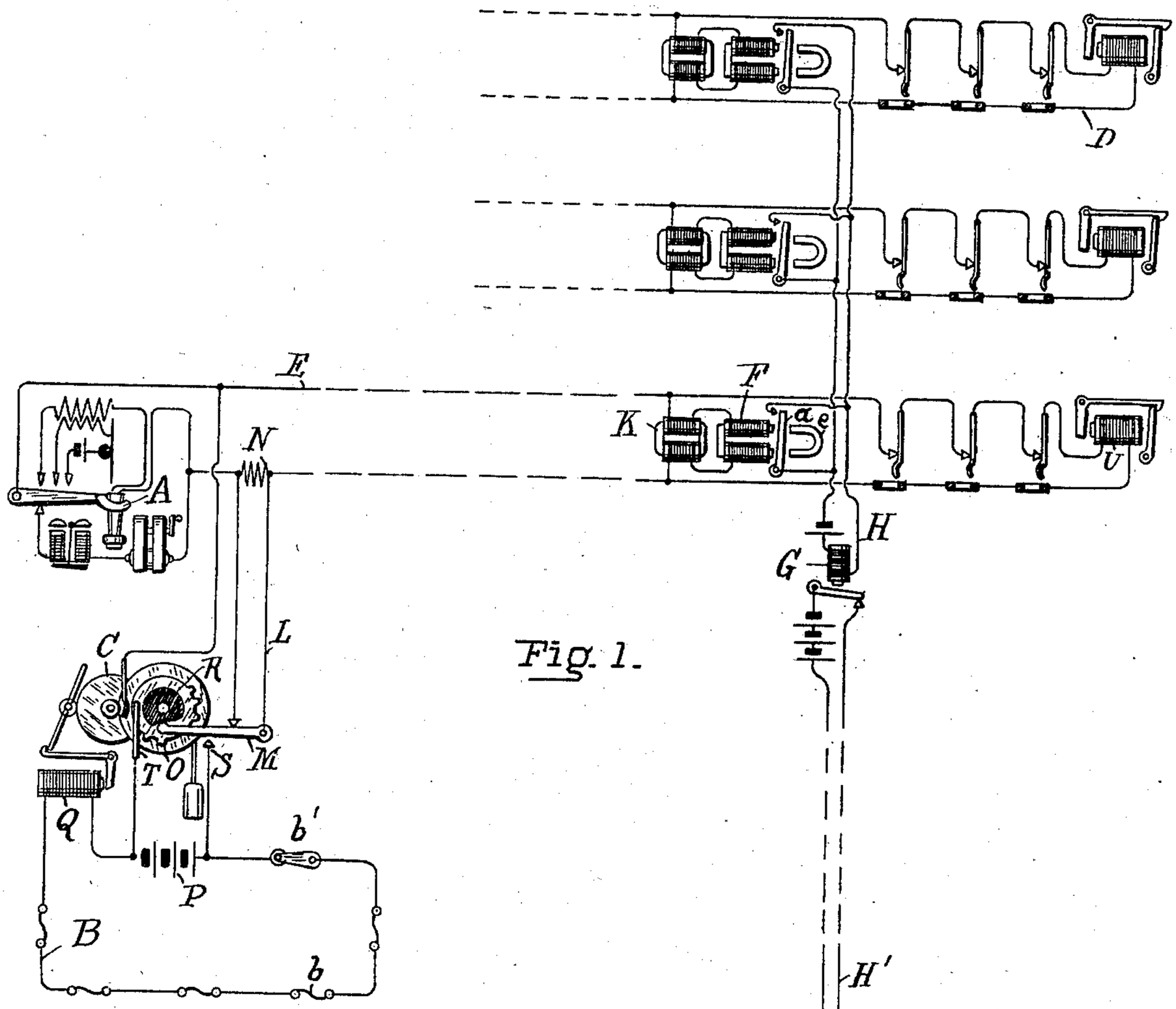

Fig. 1.

Witnesses:
Samuel W. Balch
Fly H. Whitman

Inventor,
John Morris Latimer,
by Thomas Ewing Jr.
Attorney

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(No Model.) 3 Sheets—Sheet 2.

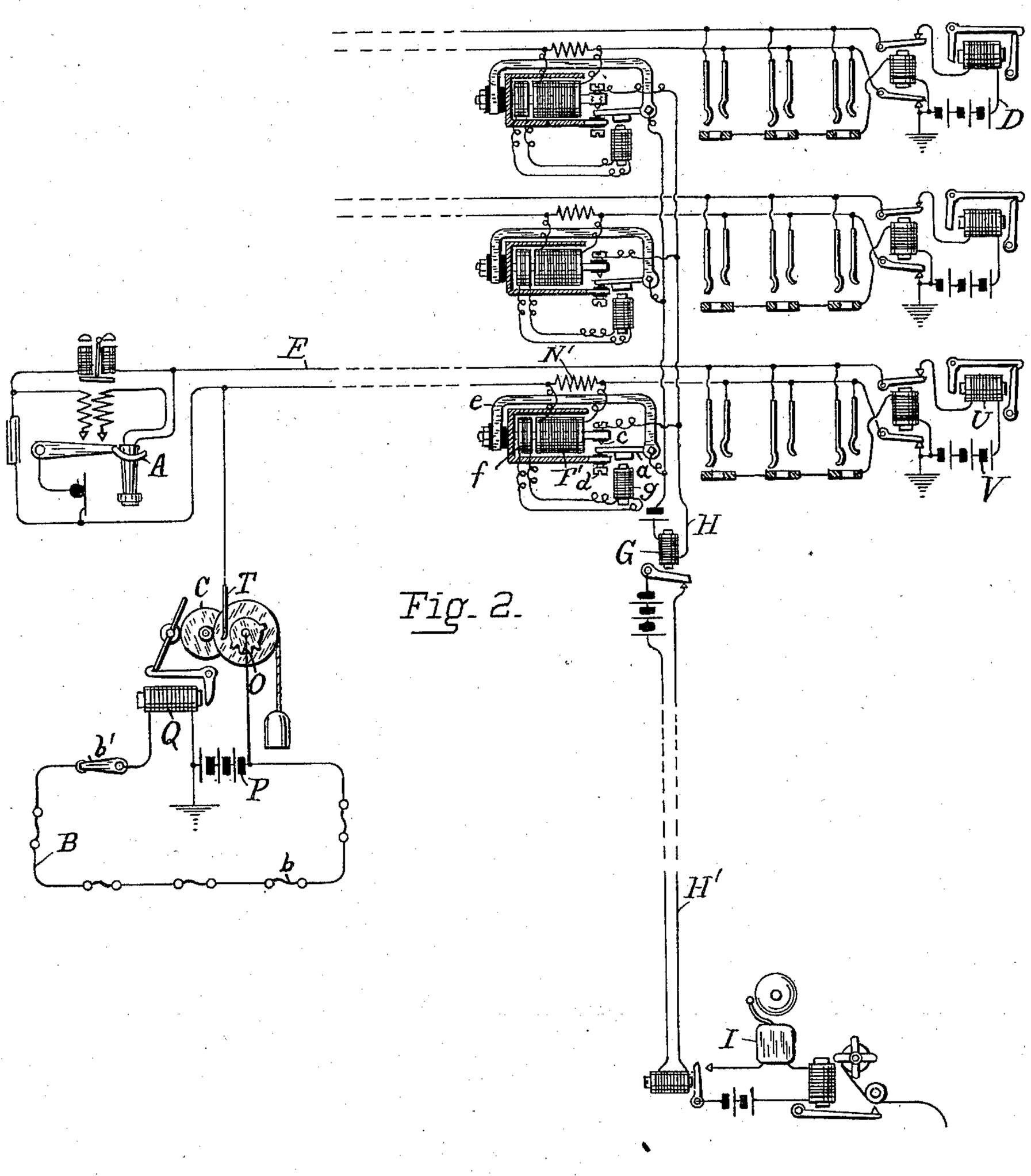

Fig. 2.

Witnesses:
Samuel W. Balch
Hyatt Whitman

Inventor,
John Morris Latimer,
by Thomas Ewing, Jr.,
Attorney.

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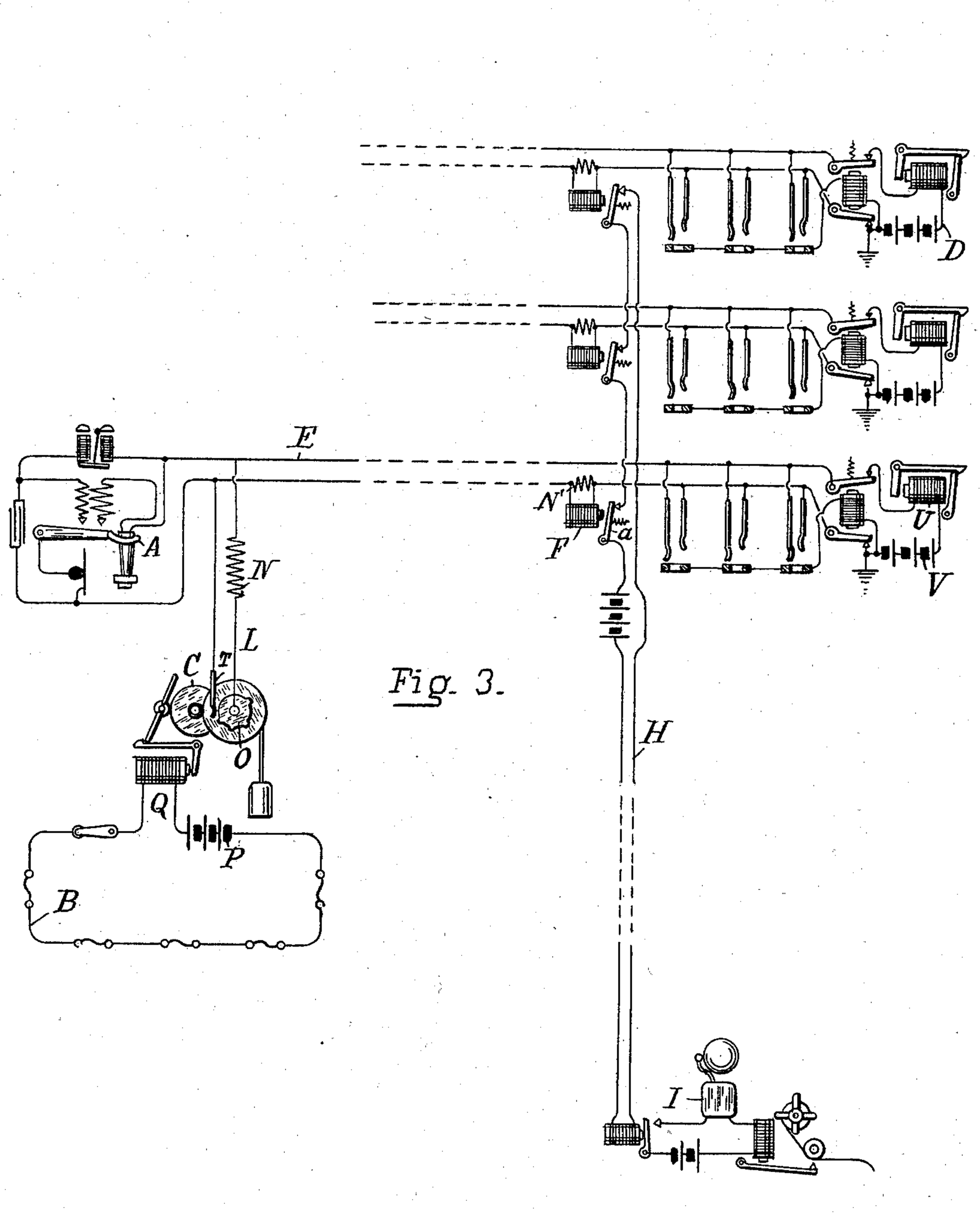

Fig. 3.

Witnesses:
Samuel W. Baleh
Ay M. Whitman

Inventor,
John Morris Latimer,
by Thomas Ewing, Jr
Attorney.

UNITED STATES PATENT OFFICE.

JOHN MORRIS LATIMER, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE UNITED PNEUMATIC FIRE ALARM TELEGRAPH COMPANY, OF NEW JERSEY.

COMBINED TELEPHONE-EXCHANGE AND FIRE-ALARM SYSTEM.

SPECIFICATION forming part of Letters Patent No. 647,307, dated April 10, 1900.

Application filed July 3, 1899. Serial No. 722,622. (No model.)

To all whom it may concern:

Be it known that I, JOHN MORRIS LATIMER, a citizen of the United States of America, and a resident of the city and county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in a Combined Telephone-Exchange and Fire-Alarm System, of which the following is a specification.

The object of this invention is to utilize existing telephone-circuits for the transmission of fire-alarm, burglar-alarm, or other signals from a subscriber's premises to fire, police, or other alarm-receiving headquarters by means of suitable transmitting and repeating apparatus connected to the telephone-circuit, but so constructed that they will not interfere with the telephone service or respond to the telephone signaling or talking currents.

The invention may be described, briefly, as the combination of a local alarm apparatus, a subscriber's telephone apparatus, a telephone-circuit which connects the telephone apparatus with a telephone-exchange, which circuit is utilized for the transmission of signals from the local alarm apparatus, a relay in the telephone-circuit so utilized, which relay is at the exchange and is constructed so as to be responsive only to signals transmitted from the local alarm apparatus, and an alarm-circuit from the relay to an alarm-receiving apparatus at the headquarters. The relay in the telephone-circuit is so constructed that it will not interfere with the ordinary operation of the telephone service and that it will not be responsive to the signaling or talking currents employed in the telephone service. The alarm-signal currents may or may not affect the telephone signal-receiving devices at the switchboard; but if they do it is not necessary that any attention be given to them by the exchange operators, for the alarm-repeating relay in the telephone-circuit automatically repeats the alarm to the headquarters, so that its transmission is independent of any attention from the exchange operators, together with the consequent danger of oversight or delay on their part. The construction is such that it is also immaterial whether or not the telephone-circuit is in use for conversation and connected to another circuit when used for the transmission of the alarm-signals. It is important to be independent of this condition, because when the telephone-circuit is connected to another exchange by means of a trunk connection the telephone-subscriber's clearing-out signal would, according to usual telephone practice, be cut out at the local exchange and only be received in the exchange at the long-distance point in the event that the distant subscriber is the calling subscriber, and therefore the exchange in which the signal is so received may be in another city.

In the accompanying three sheets of drawings, which form a part of this specification, Figure 1 is a diagram showing the alarm system applied to a telephone-exchange system of the magneto type in which the alarm-signal is sent with current from a source placed at the subscriber's premises. Fig. 2 shows the same alarm system applied to a common-battery telephone-exchange system in which the alarm-signal is sent with current from a source located at the subscriber's premises. Fig. 3 is a diagram showing the alarm system applied to circuits of a common-battery telephone-exchange system, the battery at the telephone-exchange being the source which supplies current for the alarm-signals transmitted from the subscriber's premises.

Reference will first be made to Fig. 1. This shows one complete telephone apparatus A, a subscriber's local alarm-circuit B, and apparatus C, the latter consisting in this case of an automatic fire-alarm circuit and apparatus, a telephone-exchange D, a telephone-circuit E, extending to the telephone-exchange, an alarm-repeating relay F in a shunt across the telephone-circuit at the telephone-exchange, a second repeating-relay G at the exchange, alarm-transmitting circuits H H′, extending to the alarm-receiving headquarters, and an alarm-receiving apparatus I.

The telephone-circuits of three fire-alarm subscribers are indicated at the exchange; but the subscriber's end of but one circuit is shown in the figure. A number of alarm-repeating relays are shown in connection with the fire-alarm subscribers' circuits at the tele-

phone-exchange. Each relay is actuated from a subscriber's alarm apparatus at the subscriber's end of the telephone-circuit in which the relay is placed. In the repeating-relay here used a permanent magnet is placed opposite the poles of the electromagnet to retract its armature. The armature is normally held open by the attraction of the permanent magnet, but is attracted when a current of suitable strength and duration traverses the coils of the electromagnet in the proper direction. The adjustment can thus be made more positive and sensitive than it would be if the armature were retracted by weight or spring. The alarm-repeating relays by means of their armatures operate a second repeating-relay in a local circuit at the exchange, which in turn operates the alarm-receiving apparatus at the alarm-receiving headquarters through a suitable circuit.

If at the time the alarm is sent in the telephone-circuit is connected through the exchange to another telephone-circuit which contains an alarm-repeating relay for another subscriber, both relays will respond; but as they will respond simultaneously and they repeat into the same alarm-receiving apparatus no confusion will result and the distinctive character of the signal will indicate its source.

Obviously the alarm-receiving apparatus might be operated directly by the alarm-repeating relay. In order that this relay shall not be responsive to the alternating currents generated by the magneto of the telephone system, a retarding-coil K is placed in the shunt in series with the relay. This retarding-coil also prevents the diversion and loss of any of the talking-current of the telephone system through the shunt and relay, since it prevents the passage of rapidly-alternating currents, though it does not obstruct the passage of the more prolonged pulsations of direct current in the signals made by the alarm apparatus.

In one branch of the telephone-circuit is a loop L, leading to the subscriber's alarm apparatus, in which is a normally-closed switch M. This switch is permanently shunted by a non-inductive resistance N, which offers little impedance to talking-currents. Consequently bad contact at the switch or its opening in sending in an alarm will not interfere with the use of the circuit for telephone purposes.

The alarm-transmitting apparatus at the subscriber's premises has a metallic signaling-wheel O, which carries contact-teeth on its periphery. These close a circuit through a local alarm-battery P, which includes the telephone-circuit between the subscriber's telephone and the exchange. The contact-teeth are of such number and grouping that they will send a distinctive signal. Suitable driving mechanism actuated by a weight or otherwise is provided to rotate the signaling-wheel. This mechanism is controlled by an electromagnet Q in the local alarm-circuit. This electromagnet is normally energized. Upon the opening of the alarm-circuit through the melting of a fuse *b* or by opening it at the switch *b'* by hand or otherwise the electromagnet releases the driving mechanism of the signaling-wheel. The driving mechanism may also be released directly by hand. The end of a switch M normally rests in a notch in a switch-controlling wheel R of insulating material. This wheel is connected with and revolves with the signaling-wheel. Immediately on the starting of the driving mechanism the switch is thrown to a contact S and connects one side of the local battery of the local alarm-circuit to one of the wires of the subscriber's telephone metallic circuit and leaves the non-induction resistance in series with the telephone-subscriber's apparatus. In the further revolution of the alarm apparatus the signaling-wheel closes and opens at a contact T a connection from the other side of the building alarm-battery to the other wire of the subscriber's metallic circuit. This opening and closing throws the local-battery current onto the telephone-circuit, so as to send a distinctive signal. The high resistance of the non-inductive resistance prevents the local-battery current from passing to any extent through the telephone-subscriber's apparatus and diverts the current in the direction of the alarm-repeating relay at the telephone-exchange. The alarm-repeating relay repeats the signal to the alarm-giving apparatus at the headquarters. The signal which is transmitted from each building is different, so that although all are received by the same apparatus the distinctive character will indicate the source of the alarm.

The mechanism is preferably so constructed that when released the signaling-wheel will be revolved a number of times and the signal thereby repeated.

In Fig. 2 a modified form of the invention is shown in connection with a common-battery telephone system. The local alarm-battery is normally grounded and only one of the wires of the telephone-circuit is used in transmitting the alarm-signals. At the telephone-exchange in each telephone-circuit to which the alarm system is applied is a polarized relay F' in series with the telephone-exchange annunciator-coils U and call-battery V. The coil of each of these relays is inclosed in an iron sleeve, which forms a part of the magnetic circuit for the coil and prevents cross-talk, which would otherwise be liable between the circuits of adjoining relays in the exchange. The armature *a* of the relay plays between a contact-screw *c* in the end of the relay-core and a contact-screw *d* in a projection from the iron sleeve. The end of the relay-core and the end of the iron sleeve, constituting the pole-pieces of the electromagnet of the relay, have the same polarity induced in them by the permanent magnet

e, but have opposite polarities induced in them by the passage of current through the relay. When there is no current through the relay, the armature rests by gravity against the contact-screw in the sleeve. The connection to the telephone call-battery is such that current from it through the relay increases the attraction of the armature toward the sleeve, and it will consequently not be disturbed by the passage of current from the telephone call-battery. Current from the alarm-battery, however, increases the attraction of the armature toward the core, thereby closing the local fire-alarm circuit in the telephone-exchange. To keep the armature from being affected by alternating currents which are sent out from the exchange to call subscribers, a secondary coil *f* is so arranged that current will be induced in it whenever alternating currents are sent over the telephone-circuit. Current from this is conducted to an electromagnet *g*, which attracts the relay-armature against the contact-screw in the iron sleeve and prevents its vibration by alternating currents. The relay and induction coils are combined on one core, and the relay-coil serves as the primary of the induction-coil. The local-alarm-battery current flows through the circuit oppositely to the current from the telephone call-battery. Consequently when current passes over the telephone-line and through the relay the armature is attracted against the contact-screw in the end of the relay-core. This closes a circuit through the relay G, thereby transmitting a signal. This relay is shunted by a non-inductive resistance N′, which passes the pulsatory call-signals of the telephone system and the telephone talking-currents. Hence the alarm-receiving relay offers no impedance to the telephone service. In the figure the non-inductive resistance is shown outside of the relay; but it may, however, be conveniently wound on the core of the relay.

For convenience of diagrammatic representation separate call-batteries are shown at the exchange for each telephone-circuit; but in practice a single battery or equivalent source of energy supplies all the telephone-circuits, and it may also supply the alarm-circuit to the alarm-receiving apparatus.

Normally the local alarm apparatus is electrically separated from the telephone-circuit, for the wire which leads from that circuit to the signaling-wheel of the building alarm-circuit is normally open at the contact T. When, however, the local alarm-circuit is opened, the relay in that circuit releases the signaling-wheel mechanism and the wheel commences to revolve, with the result that each time the contact is closed at the teeth on the signaling-wheel a ground-circuit is formed between the subscriber's premises and the telephone-exchange and the current from the local alarm-battery reverses the previous polarity of the alarm-repeating polarized relay and its armature is repelled. The polarized alarm-repeating relay may be of any suitable construction.

In Fig. 3 a common-battery exchange system is again represented. In this the telephone-exchange battery is utilized to operate the alarm-repeating relay when alarm-signals are transmitted by the local-alarm-circuit apparatus. For this purpose a non-polarized or ordinary relay is used. It is placed in one of the wires of the metallic telephone-circuit and in series with the ordinary telephone apparatus. The armature of this relay is normally withdrawn by its retractile spring, and the adjustment is such that current flowing in the telephone-circuit will not be sufficient to attract the armature. When alternating currents are sent from the exchange to call a subscriber, they preferably pass through the non-inductive resistance instead of through the relay. When the normal resistance of the telephone-circuit in the subscriber's building is reduced by any suitable means, the current flowing through the alarm-repeating relay is thereby increased and its armature is attracted. To effect this increase of current, a shunt of lower resistance than the telephone-subscriber's apparatus is closed across the telephone-subscriber's circuit and between the telephone-subscriber's apparatus and the telephone-exchange. This shunt is normally open at the local alarm-signaling wheel. When, however, the local alarm-circuit is opened and the signaling-wheel is released, this is alternately closed and opened, with the result that the alarm-receiving relay is closed and opened a number of times and the distinctive signal of the subscriber's building is transmitted.

The alarm-repeating relay is provided with a non-inductive resistance across its coils, as in the form previously described.

It will be seen that in each form of the invention the alarm-repeating relay is not operated by the currents ordinarily used in the telephone service. In each form shown the local alarm apparatus controls devices which when set in operation complete electrical connection with the telephone-subscriber's circuit, and when this has been done alarm-signals are transmitted by said devices over the subscriber's telephone-circuit, thereby operating the alarm-repeating relay and through it the alarm-giving or alarm-announcing apparatus. In the arrangement shown in Fig. 1 the alarm-repeating relay is operated by the opening and closing of the local battery through the signaling-wheel. In Fig. 2 the alarm-repeating relay is operated by current from the alarm-transmitting circuit of opposite polarity to the current normally flowing in the telephone-circuit. In Fig. 3 the alarm-repeating relay is operated by reducing the normal resistance of the telephone-circuit, which reduction of resistance is effected by the closing of a shunt-circuit across the terminals of the telephone-subscriber's apparatus, whereby the normal amount of current

flowing through the alarm-repeating relay is increased and its armature is attracted with the result specified.

It is not material to the system that the telephone-circuit utilized for the transmission of an alarm should be from a telephone in the same building or premises with the alarm apparatus, for it may be connected to any telephone-circuit any part of which is conveniently near. Also the alarm-receiving apparatus may be located in the same premises with the alarm-repeating relay.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination of a telephone apparatus, a telephone-exchange, a telephone-circuit connecting the telephone apparatus with the telephone-exchange, a local alarm apparatus connected to the telephone-circuit, between the telephone apparatus and the telephone-exchange, a relay in the telephone-circuit, which relay is at the exchange and is responsive to the currents controlled by the local alarm apparatus and not to the telephone signaling and talking currents, an alarm-receiving apparatus, and an alarm-circuit to the alarm-receiving apparatus which is controlled by the relay, substantially as described.

2. The combination of a telephone apparatus, a telephone-exchange, a telephone-circuit connecting the telephone apparatus with the telephone-exchange, a local alarm apparatus connected to the telephone-circuit, a relay in the telephone-circuit, which relay is at the exchange, and is responsive to the currents controlled by the local alarm apparatus and not to the telephone signaling and talking currents, an alarm-receiving apparatus which is independent of the telephone-circuit, and is controlled by the relay, substantially as described.

3. The combination of a telephone apparatus, a telephone-exchange, a telephone-circuit connecting the telephone apparatus with the telephone-exchange, a local alarm apparatus connected to the telephone-circuit between the telephone apparatus and the telephone-exchange, a relay in the telephone-circuit, which relay is at the exchange and is responsive to the currents controlled by the local alarm apparatus and not to the telephone signaling and talking currents, an alarm-receiving apparatus, and an alarm-circuit to the alarm-receiving apparatus which is independent of the telephone-circuit and is controlled by the relay, substantially as described.

4. The combination of telephone apparatuses, a telephone-exchange, telephone-circuits connecting the telephone apparatuses with the telephone-exchange, local alarm apparatuses connected to the telephone-circuits, relays in the telephone-circuits, which relays are at the exchange and are responsive to the currents controlled by the local alarm apparatuses and not to the telephone signaling and talking currents, an alarm-receiving apparatus, and an alarm-circuit to the alarm-receiving apparatus which is controlled by any of the relays, substantially as described.

5. The combination of telephone apparatuses, a telephone-exchange, telephone-circuits connecting the telephone apparatuses with the telephone-exchange, local distinctive signaling alarm apparatuses connected to the telephone-circuits, relays in the telephone-circuits, which relays are at the exchange and are responsive to the currents controlled by the distinctive signaling alarm apparatuses and not to the telephone signaling and talking currents, an alarm-receiving apparatus, and an alarm-circuit to the alarm-receiving apparatus which is controlled by any of the relays, substantially as described.

6. The combination of a telephone apparatus, a telephone-exchange, a telephone-circuit connecting the telephone apparatus with the telephone-exchange, a local alarm-circuit and local battery therefor, means controlled by the local alarm-circuit for connecting the local battery to the telephone-circuit, a relay in the telephone-circuit, which relay is at the exchange and is responsive to the current from the local battery and not to the telephone signaling and talking currents, and an alarm-receiving apparatus which is controlled by the relay, substantially as described.

7. The combination of telephone apparatuses, a telephone-exchange, telephone-circuits connecting the telephone apparatuses with the telephone-exchange, local alarm-circuits and local batteries therefor, means controlled by the local alarm-circuits for connecting the local batteries to the telephone-circuits, relays in the telephone-circuits, which relays are at the exchange and are responsive to the currents from the local batteries, and not to the telephone signaling and talking currents, and an alarm-receiving apparatus which is controlled by any of the relays, substantially as described.

8. The combination of a telephone apparatus and a telephone-exchange, a telephone signaling-battery therefor, a telephone-circuit connecting the telephone apparatus with the telephone-exchange, a local alarm apparatus and local battery therefor, the local battery and telephone signaling-battery being oppositely connected to the circuit, a polarized relay in the telephone-circuit, which relay is at the exchange and is responsive to the currents from the local battery, and not to the telephone signaling and talking currents, an alarm-receiving apparatus, and an alarm-circuit to the alarm-receiving apparatus which is controlled by the relay, substantially as described.

9. The combination of telephone apparatuses and a telephone-exchange, a telephone signaling-battery therefor, telephone-circuits connecting the telephone apparatuses with the telephone-exchange, local alarm apparatuses and local batteries therefor, the local

batteries and the telephone signaling-battery being oppositely connected to the circuits, polarized relays in the telephone-circuits, which relays are at the exchange and are responsive to the currents from the local batteries and not to the telephone signaling and talking currents, an alarm-receiving apparatus, and an alarm-circuit to the alarm-receiving apparatus which is controlled by any of the relays, substantially as described.

10. The combination of a telephone apparatus, a telephone-exchange, a telephone-circuit connecting the telephone apparatus with the telephone-exchange, a local alarm apparatus connected to the telephone-circuit, a relay in the telephone-circuit, which relay is at the exchange and is responsive to the currents controlled by the local alarm apparatus and not to the telephone talking-currents, an alarm-receiving apparatus, an alarm-circuit to the alarm-receiving apparatus which is controlled by the relay, a secondary coil, means for inducing current in the secondary coil by current in the telephone-circuit, and an electromagnet, which is connected to the secondary coil for preventing the operation of the alarm-circuit, substantially as described.

Signed by me in the borough of Manhattan, New York city, State of New York, the 30th day of June, 1899.

JOHN MORRIS LATIMER.

Witnesses:
THOMAS EWING, Jr.,
SAMUEL W. BALCH.