No. 825,625. PATENTED JULY 10, 1906.

H. G. WEBSTER.

COMBINED TELEPHONE AND ALARM SYSTEM.

APPLICATION FILED JULY 11, 1904.

2 SHEETS—SHEET 1.

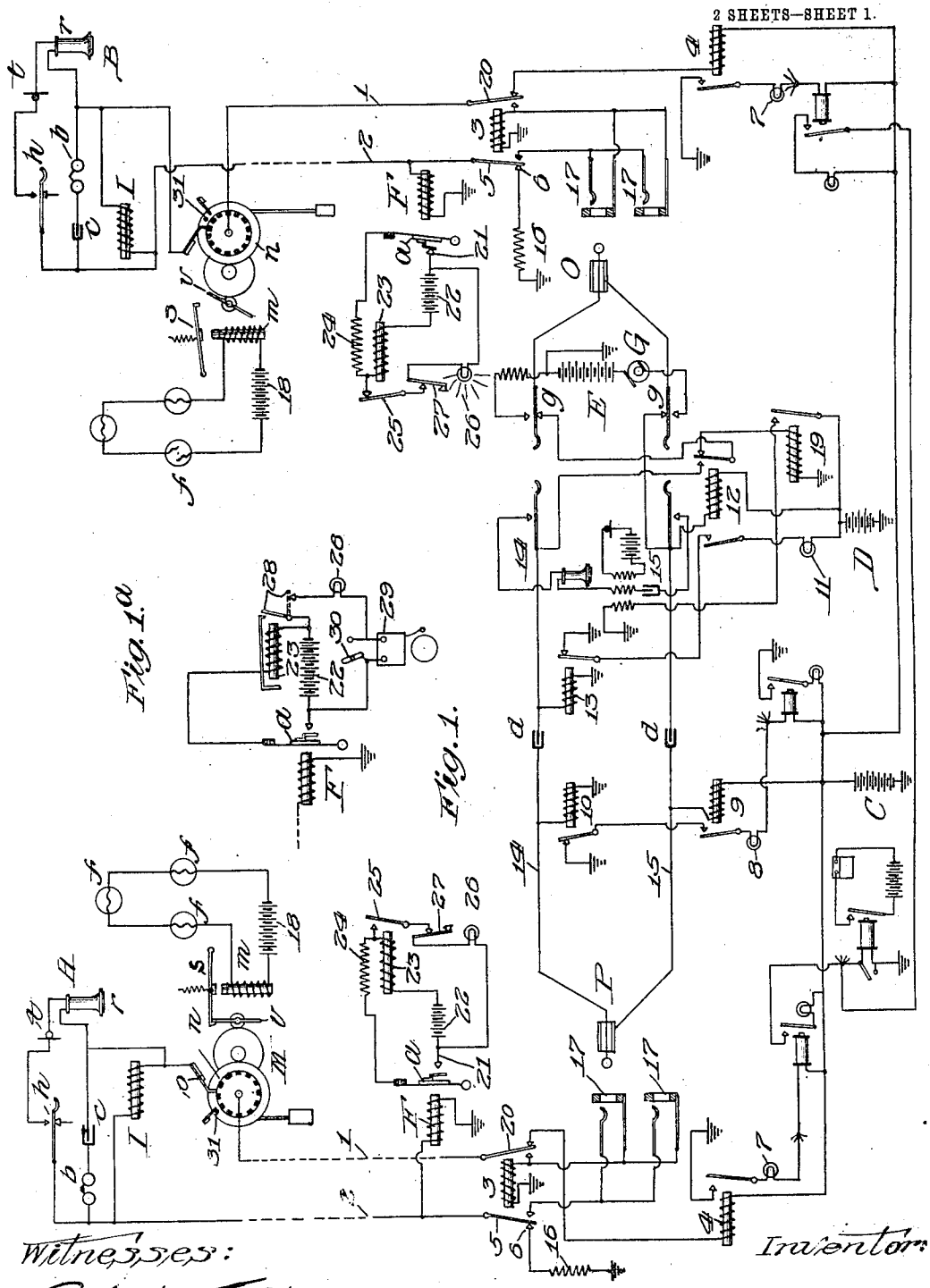

Fig. 1a

Fig. 1.

Witnesses:

Robert F. Weir

T. W. Dunbar

Inventor:

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2 SHEETS—SHEET 2.

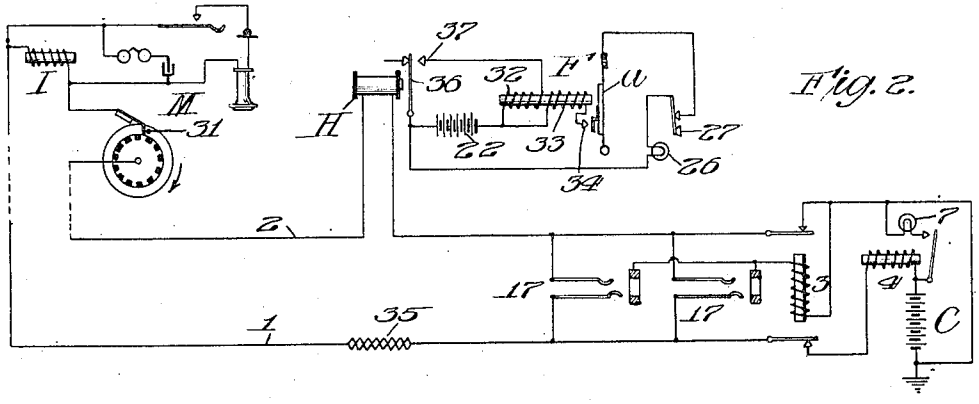

Fig. 2.

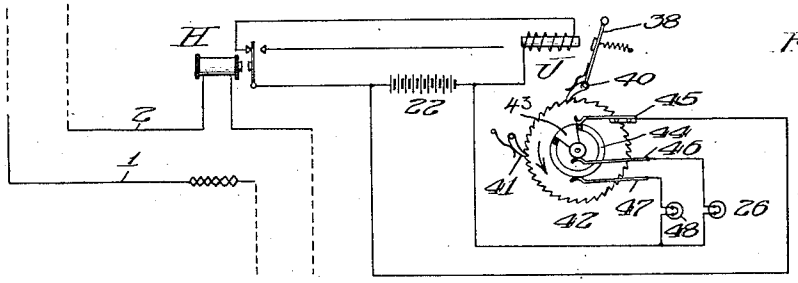

Fig. 3.

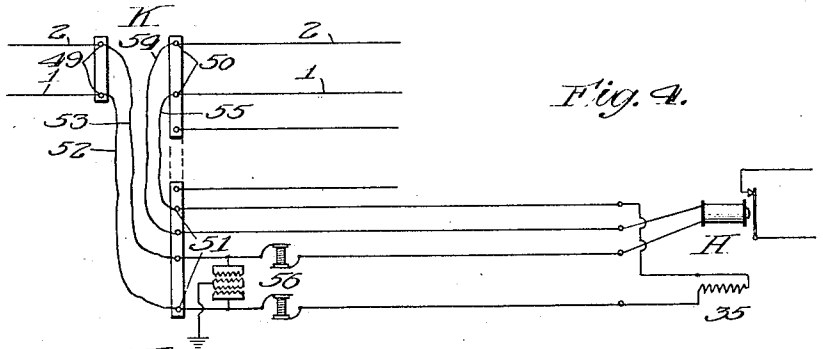

Fig. 4.

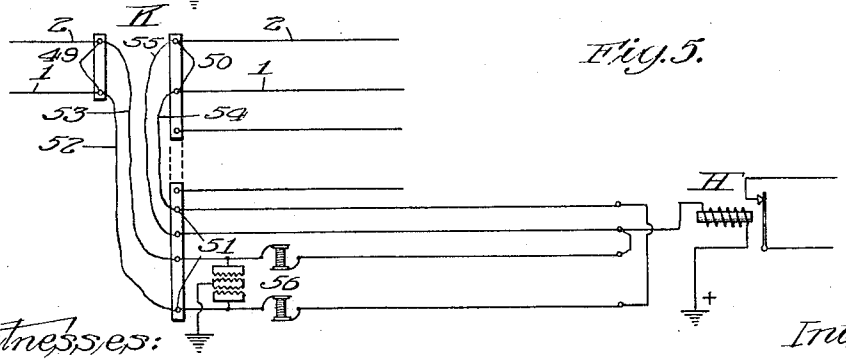

Fig. 5.

Witnesses:

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T. W. Dunbar

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UNITED STATES PATENT OFFICE.

HARRY G. WEBSTER, OF CHICAGO, ILLINOIS, ASSIGNOR TO MILO G. KELLOGG, OF CHICAGO, ILLINOIS.

COMBINED TELEPHONE AND ALARM SYSTEM.

No. 825,625. Specification of Letters Patent. Patented July 10, 1906.

Application filed July 11, 1904. Serial No. 216,083.

To all whom it may concern:

Be it known that I, HARRY G. WEBSTER, a citizen of the United States, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in a Combined Telephone and Alarm System, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to systems in which line-circuits extending from a telephone-exchange to subscribers' stations are utilized for the transmission of special fire, burglar, and other alarm signals in addition to their ordinary telephonic use.

The object of my invention is to provide an improvement upon a system proposed heretofore, in which the line-circuit is at all times available for the transmission of an alarm-signal and in which the alarm-sending and alarm-receiving apparatus do not cause any interference with telephonic signaling or conversation except upon the sending of an alarm-signal, when the telephonic requirement may be disregarded. In such a system it is desirable that an alarm-signal should be permanently maintained at the receiving-station until acted upon by the person in charge, that the indication given should be one which is positively the result of the actuation of the alarm-sending apparatus, that its nature should be such that the alarm-receiving operator may determine instantly from which particular line the signal is being sent, and that the apparatus employed should be of the most simple and reliable character.

The improvement of my present invention consists in novel means for meeting these requirements. It has been proposed to employ as an alarm-sending device in such a system mechanism in the nature of the ordinary district-messenger box, which shall intermittently break or make a circuit of the line to produce a dot-and-dash or "code" signal at the receiving-station. Under such an arrangement it is necessary that there should be a separate register or recording device for each line or that the makes and breaks should be of a different character for each sending-station of the system.

In accordance with my present invention I am enabled to employ sending devices which are uniform and interchangeable, as well as to avoid the use of a bulky and cumbersome receiving device, such as a telegraph-register. In a preferred embodiment I employ sending mechanism which will produce makes or breaks of regular, definite, and relatively slow frequency, and preferably of definite number, and receiving mechanism which will only give an indication after receiving a certain number of pulsations of the determined frequency. Sending devices of this character are well known, such as a revolving contact-wheel controlled by an escapement or fan governor and adapted to be released manually or automatically, and I do not limit myself to any specific mechanical construction or arrangement in such a device.

The receiving device consists of an electromagnet associated with the line either directly or indirectly in a manner to be energized and deënergized by the pulsations set up by the sending mechanism and make this electromagnet act upon a vibrating armature, which, through being weighted or otherwise, will synchronize with such pulsations and after a sufficient number have been sent will produce an audible signal (as upon a bell) or will close the local circuit of an electrical signal. This electrical signal consists, preferably, of a mechanical target or an incandescent lamp, so arranged that after its circuit is once closed it will remain displayed until effaced by the alarm-receiving operator.

In a modified construction the above-mentioned electromagnet acts upon a slow-acting armature carrying a pawl which engages a ratchet-wheel. This ratchet-wheel has associated with it a commutator and brushes and is revolved one tooth at each attraction or retraction of the armature. If the wheel comes to rest after the determined number of pulsations, contact is made between a brush and a commutator-segment, which completes a local circuit including the signal; but if the number of pulsations is greater or less than the determined number a signal associated with a different commutator-segment indicates that the wheel is to be restored to its normal position by the operator.

I have illustrated my invention in the accompanying drawings, in which—

Figure 1 is a diagram showing two subscribers' lines and the central-station connecting apparatus of the well-known "two-wire" telephone system as embodying my invention in a preferred form. Fig. 1ª shows the alarm-receiving apparatus with a mechanical-target signal. Fig. 2 is a diagram illustrating a modification of the system of Fig. 1 in an exchange system of the "three-wire" type. Fig. 3 shows diagrammatically a modification of the alarm-receiving apparatus using the ratchet device. Figs. 4 and 5 indicate means by which the receiving apparatus may be conveniently associated with any line of an exchange system.

Like characters refer to like parts in the several figures.

In Fig. 1 the subscribers' stations A and B are provided with the usual apparatus, adapted, preferably, for use with a central source of current-supply and comprising a receiver *r* and transmitter *t* in a circuit which normally stands open at the hook-switch *h*, the bell *b* and condenser *c* being in permanent bridge of the line. The limbs 1 and 2 of the line extend to the central office and are there connected, limb 1 to the contacts of the cut-off relay 3, the line-relay 4, and to the live side of the battery C, and limb 2 of those lines which are not equipped for alarm service is carried direct to the grounded side of the battery through contacts 5 and 6 of the relay 3. A subscriber in calling raises his receiver and completes the low-resistance circuit through his transmitter and hook-switch contact to actuate the relay 4, lighting his line-lamp 7. Upon the insertion of an answering-plug P the operation of relay 3 cuts off the ground and the relay 4, extinguishing the line-lamp and connecting the line-limbs to the jacks 17 and 17 and thence to the strands 14 and 15 of the cord. Current is now supplied to the line from battery C through relays 9 and 10, which also control the supervisory lamp 8, the lamp remaining dark as long as current flows through relay 10. The operator tests, plugs in, and rings a wanted subscriber in the usual way with calling-plug O and ringing-key *g g*. While ringing, the relay 3 is energized by current from battery E and generator G, and after the ringing-key is released relay 12 and relay 3 are energized by current from battery D. The relay 12 when thus actuated cuts off the test-relay 19 and completes the circuit of strand 14 at its contacts and also completes the circuit of supervisory lamp 11. When the called subscriber answers, current is furnished his instrument through relays 12 and 13, and the energization of relay 13 effaces lamp 11, which remains dark until the receiver is replaced. The subscribers are now able to converse over strands 14 and 15, which include the condensers *d d* of the cord-circuit. The hanging up of both receivers deprives the relays 10 and 13 of current, thus completing the circuits of lamps 8 and 11, which being illuminated constitute the disconnect-signal. This is the regular telephonic operation of the system and is not interfered with by the presence of the alarm apparatus upon such lines as are provided with it. Such lines are provided with the high resistance and impedance I in bridge of the line. The electromagnet F is connected from limb 2 to ground or to the office return, and the battery connection of contact 6 is removed or carried through a resistance 16 to equalize the current of magnet F. The resistance of I is so proportioned that it will allow a normal current to flow sufficient to energize the magnet of relay F, but not sufficient in volume to cause the armatures of relays 4, 10, or 13 to be attracted or held up.

The make-and-break device is illustrated at M, the circuit of limb 1 being normally closed through wheel *n* and brush *o*. This wheel is prevented from revolving as long as the releasing-lever S is attracted by the magnet *m* to engage the fan-governor *v*, the magnet *m* being energized by current from battery 18 over a circuit including the thermostats or other circuit-breaking devices *f*. When the mechanism is released, the circuit of limb 1 and battery C is broken each time an insulated portion of wheel *n* passes under brush *o*, and the rate of interruption is comparatively slow as compared with the alternations of the ringing-generator G. A stop 31 is provided by which the wheel is brought to rest after making the required number of interruptions. The magnet F is provided with a swinging or rocking armature, so balanced or weighted that it will only vibrate at a certain rate—namely, that of the interruptions produced in the line by the device M—and that a certain number of pulsations of current through the magnet F will be required before it can attain its full amplitude of vibration. When this point is reached, the armature completes a circuit of battery 22 through contact 21, resistance 24, and relay 23. The relay being thus energized, closes by its contact 25 a circuit through lamp 26, and this circuit remains closed and the lamp illuminated until the circuit is opened by the alarm-receiving operator at key 27. The alarm apparatus of line A is shown in its normal condition, while at line B the circuit of battery 18 and magnet *m* having been broken at *f* the interrupting mechanism has been operated and the signal transmitted. It is to be noted that the current which energizes magnet F normally flows from battery C through relay 4, limb 1, impedance I, and limb 2 to ground or office return; but during the presence of a connecting-plug in a jack the path of current is from bat-

tery C through relay 9, limb 1, impedance I, and limb 2, where it divides, a portion returning through magnet F, and the remainder through relay 10 and under either condition the removal of the subscriber's receiver simply increases the volume of current to the point necessary to operate the relays controlling the telephone-signals. It will also be seen that the display of the alarm-signal will not be produced by the rapid alternations of the calling-generator, nor by irregular or intermittent interruptions due to interference with the line-wires themselves.

Fig. 1ª shows a modification of the receiving apparatus just described. In this case the armature of magnet 23 is provided with a catch which engages a metal drop or shutter 28. When circuit is completed by armature *a*, as previously described, the shutter is released and in falling displays a number and closes a circuit including the lamp 26 and the bell 29. It is evident that the lamp may be individual to each line or common to several and that the bell may constitute a general signal for the entire alarm system, a switch 30 being provided to cut out the bell when desired.

Fig. 2 is a conventional diagram illustrating my invention in an exchange of the well-known "three-wire" type. Telephonically, this system differs from that of Fig. 1, in that the cut-off relay is included in a third wire, and the jack-terminals are permanently connected to the line. As in the system of Fig. 1, current is normally flowing in the line through line-relay 4 and impedance I. Upon the insertion of a connecting-plug the relay and battery return are removed by the action of the cut-off relay, and current is then supplied to the line through the cord-strands and jack-terminals in the manner well understood by those skilled in the art. The interrupting mechanism of Fig. 1 is indicated diagrammatically at M; but the receiving apparatus instead of being connected directly between limb 2 and the ground is indirectly associated with the line by means of the serially-included relay H. This relay being directly in the talking-circuit has its windings arranged so as to present little or no impedance to voice-currents, and the resistance 35 preserves the balance of the line. At each interruption of the circuit at M the relay contact-piece 36 falls back, engaging contact 37, thus energizing the magnet F by means of its winding 32. The armature *a* is thus set in vibration and on reaching its full range engages contact 34, completing the circuit of battery 22 through winding 33 and lamp 26, and is thus held attracted in this position. The lamp remains lighted until the circuit is opened again at key 27, when the lamp and armature return to normal. The relay H is always energized by current from battery C or from the calling-generator as long as the circuit is complete through the line-limbs, and while it may be released through accidental opening or grounding of the line-circuit the signal-lamp 26 will not light until the armature *a* has received the proper number of impulses at the proper frequency from the magnet F.

Fig. 3 illustrates an alternative receiving device in which an accidental grounding or opening of the circuit will give a special signal, but in which the alarm-signal will not be displayed until the proper number of impulses has passed. In this case relay H is included in limb 2 of the line, as in Fig. 2, and controls the circuit of magnet J. The armature 38 of this magnet carries a pawl 40, which engages the teeth of the ratchet-wheel 42, controlled by the detent 41. This wheel carries with it a contact-wheel 44, having an insulated portion 43. Brush 47 is always in contact with the main portion of this wheel and brush 46 with the insulated portion, while brush 45 will make contact with either portion as the wheel revolves. When the line-circuit is interrupted, as in case of an alarm, the relay H is deënergized and the circuit of magnet J opened, and providing the breaks and makes are of the proper frequency the ratchet-wheel is carried forward one tooth at each closure of the line-circuit. After the requisite number of interruptions as determined by the stop 31, the wheel 42 comes to rest at a point where circuit is completed from battery 22 through brush 45, portion 43, brush 46, and lamp 26, which being illuminated indicates an alarm. If, however, through outside interference with the circuit the current through relay H is interrupted a number of times greater or less than that required circuit will be closed through brush 45, portion 44, brush 47, and lamp 48, and the consequent illumination of this lamp constitutes a signal to the alarm operator of such interference and that the mechanism is to be restored to its normal position.

Figs. 4 and 5 illustrate arrangements of wiring, whereby the alarm-receiving apparatus may be systematically associated with or changed to any exchange-line, Fig. 4 illustrating the case where the relay F is serially included in the line, and Fig. 5 that where the connection is from limb 2 to the ground or office return. It will of course be evident that magnet F of Fig. 1 could be substituted for the relay H of Fig. 5. As will be readily understood, those circuits which are not provided with the alarm equipment enter the exchange by their limbs 1 and 2 at terminals 49 of the main distributing-rack K and are carried by flexible jumper-wires (not shown) to terminals 50 and thence to the telephone-switchboard by permanent wires. The alarm-receiving apparatus being permanently wired to the special terminals 51, it is only necessary in case a circuit is to be provided with the alarm equipment to remove the normal

jumpers from terminals 49 and 50 and replace them by special jumpers, as indicated by lines 52, 53, 54, and 55. The usual lightning and sneak current protectors are indicated at 56.

It will be understood that the several grounds indicated are or may be the exchange return and also that the several batteries C, D, E, and 22 may be one and the same.

While I have particularly described my invention with regard to certain details of construction and arrangement, it is evident that many modifications may be made therein by those skilled in the art without departing from its spirit, and I do not wish to be limited to the precise structures illustrated and described.

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

1. A combined telephone and alarm system comprising a circuit extending from a substation to a telephone-exchange, means for supplying a relatively small current to said circuit, telephone signaling means for sending an increased current over said circuit, telephone signal-receiving means operated only in response to such increased current, alarm-signal-transmitting means for sending decreased current pulsations of regular frequency over said circuit, alarm-receiving means operated only in response to said decreased current pulsations, and means at the substation and exchange for holding conversation over said circuit.

2. A combined telephone and alarm system comprising a circuit extending from a substation to a telephone-exchange, means for supplying a relatively small current to said circuit, telephone signaling means for sending an increased current over said circuit, telephone signal-receiving means operated only in response to such increased current, alarm-signal-transmitting means for interrupting said circuit at a regular frequency, alarm-receiving means operated only in response to said interruptions, and means at the substation and exchange for holding conversation over said circuit.

3. In a telephone-exchange system, the combination of a subscriber's line, alarm-sending apparatus for the line, adapted to set up electric pulsations therein of regular frequency and number, and alarm-receiving apparatus adapted to respond only after a definite number of pulsations of such frequency, substantially as described.

4. In a telephone-exchange system, the combination of a subscriber's line, a source of current at the exchange, alarm-sending apparatus adapted to set up electric pulsations of regular number and frequency of said source in the line, and alarm-receiving apparatus associated with the line adapted to respond only after a definite number of such pulsations, substantially as described.

5. In a telephone-exchange system, the combination of a subscriber's line, alarm-receiving apparatus associated with the line adapted to give an indication in response to a definite number of current variations in the line of a predetermined frequency, and alarm-sending apparatus associated with the line adapted to produce such current variations therein, substantially as described.

6. In a telephone-exchange system, the combination of a subscriber's line and instrument, alarm-sending apparatus exterior to the exchange adapted to set up regular electric pulsations in the line, alarm-receiving apparatus associated with the line adapted to respond after a definite number of such pulsations only, and means for maintaining the alarm-signals constant until effaced by the operator, substantially as described.

7. In a telephone-exchange system, the combination of a subscriber's line, alarm-sending apparatus associated with the line and adapted to set up electric pulsations in the line regular in number and frequency, an electromagnet associated with the line, and mechanism controlled by said magnet adapted to cause the display of an alarm-signal only after the transmission of a definite number of said pulsations, substantially as described.

8. A combined telephone and alarm system comprising a circuit extending from the substation to a telephone-exchange, means for supplying a relatively small current to said circuit, telephone signaling means for sending an increased current over said circuit, telephone signal-receiving means operated only in response to such increased current, alarm-signal-transmitting means for sending decreased current pulsations of regular frequency over said circuit, alarm-indicating means included in a local circuit, a relay included in said first-mentioned circuit and responsive only to the decreased current pulsations therein to close said local circuit to cause the actuation of said alarm-indicating means, and means at the substation and exchange for holding conversation over said first-mentioned circuit.

9. A combined telephone and alarm system comprising a circuit extending from a substation to a telephone-exchange, means for supplying a relatively small current to said circuit, telephone signaling means for sending an increased current over said circuit, telephone signal-receiving means operated only in response to such increased current, alarm-signal-transmitting means for sending decreased current pulsations of regular frequency over said circuit, alarm-indicating means included in a local circuit, a relay included in said first-mentioned circuit and

responsive only to the decreased current pulsations therein to close said local circuit to cause the actuation of said alarm-indicating means, means whereby the display of said alarm-indicating means is maintained independent of said relay until effaced by the operator, and means at the substation and exchange for holding conversation over said first-mentioned circuit.

10. In a telephone-exchange system, the combination of a subscriber's line, alarm-sending apparatus associated with the line and adapted to set up electric pulsations in the line, regular in number and frequency, an electromagnet associated with the line, mechanism controlled by said magnet adapted to cause the display of an alarm-indicator in response to a definite number of said pulsations and to display a separate signal in response to pulsations differing in number from said definite number, substantially as described.

11. A combined telephone and alarm system comprising a circuit extending from a substation to a telephone-exchange, means for supplying a relatively small current to said circuit, telephone signaling means for sending an increased current over said circuit, telephone signal-receiving means operated only in response to such increased current, alarm-signal-transmitting means for sending decreased current pulsations of regular frequency over said circuit, mechanism operated only in response to said decreased current pulsations to display an alarm-signal in response to a definite number of said pulsations and to display a separate signal in response to pulsations differing in number from said definite number.

12. A combined telephone and alarm system comprising a circuit extending from a substation to a telephone-exchange, means for supplying a relatively small current to said circuit, telephone signaling means for sending an increased current over said circuit, telephone signal-receiving means operated only in response to such increased current, alarm-signal-transmitting means for interrupting said circuit at a regular frequency, mechanism operated only in response to said interruptions to cause the display of an alarm-signal in response to a definite number of said pulsations and to display a separate signal in response to pulsations differing in number from said definite number.

In witness whereof I hereunto subscribe my name this 30th day of June, A. D. 1904.

HARRY G. WEBSTER.

Witnesses:
JULIA M. BRISTOL,
F. W. DUNBAR.