(No Model.)

H. A. CHASE.

SIGNAL TRANSMITTING MECHANISM.

No. 465,990. Patented Dec. 29, 1891.

Fig: 3.

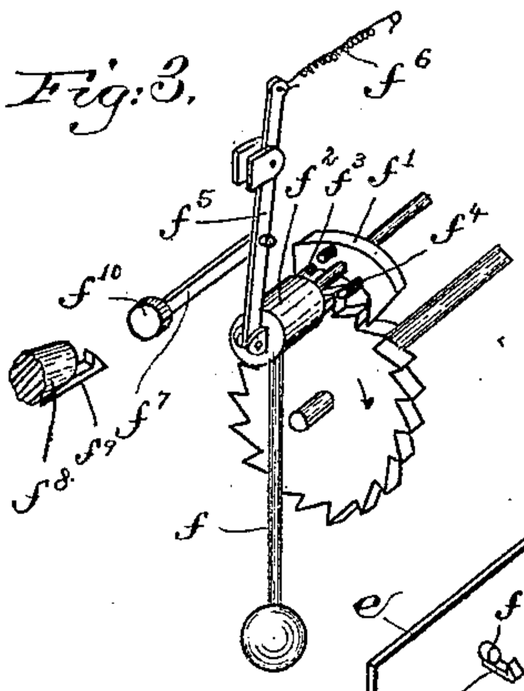


Fig: 1.

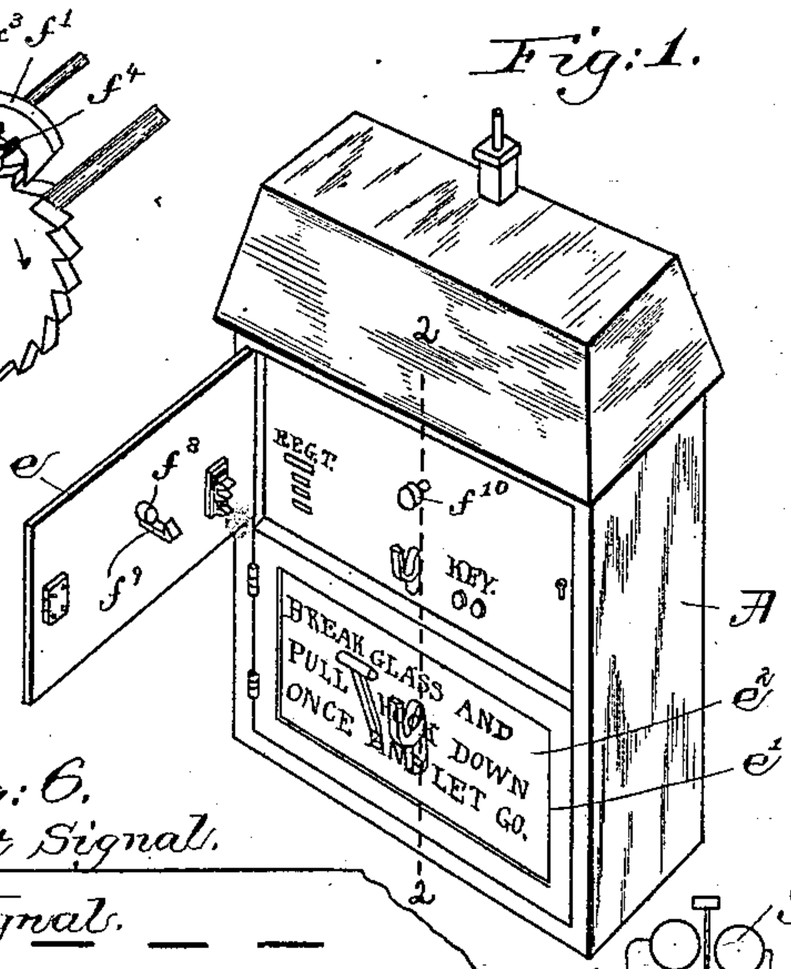
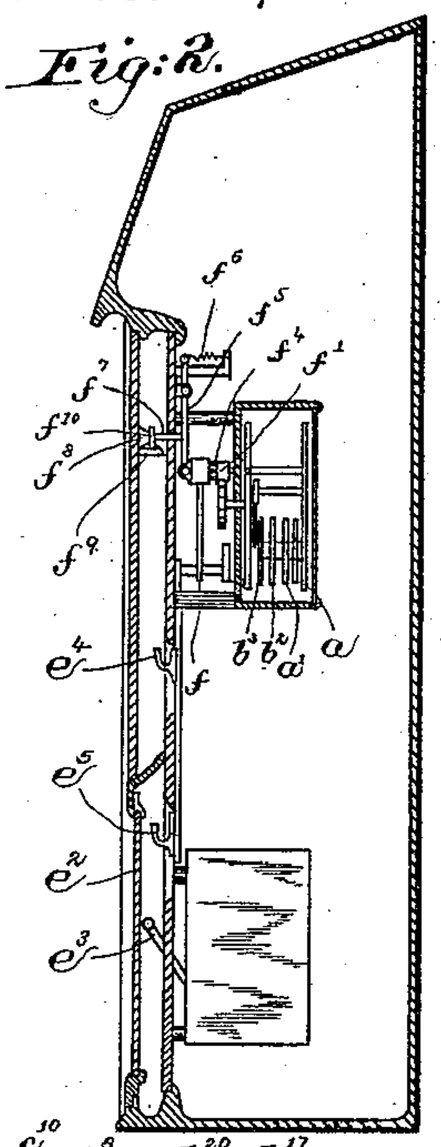


Fig: 6.

Fast or Test Signal.

Slow Fire Signal. — — —

Fig: 2.



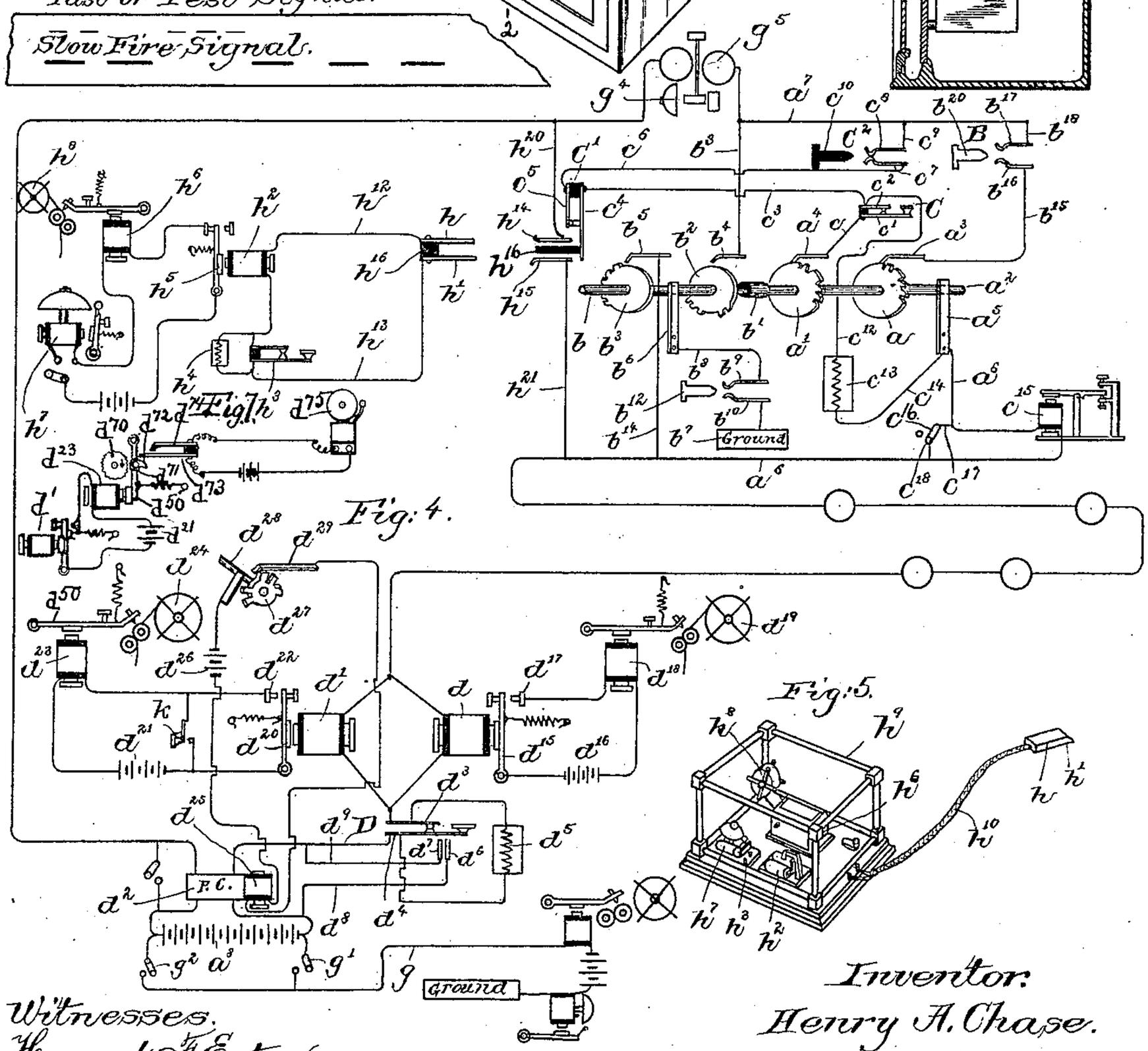


Fig: 4.

Fig: 5.

Witnesses.
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UNITED STATES PATENT OFFICE.

HENRY A. CHASE, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO ALBERT WATTE, OF SAME PLACE.

SIGNAL-TRANSMITTING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 465,990, dated December 29, 1891.

Application filed July 10, 1891. Serial No. 399,033. (No model.)

To all whom it may concern:

Be it known that I, HENRY A. CHASE, of Boston, county of Suffolk, State of Massachusetts, have invented an Improvement in Signal-Transmitting Mechanism, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates to a novel system for the transmission of signals, and is especially adapted to be used as a fire-alarm system. In another application, Serial No. 391,591, I have shown and described a system in which the fire-alarm-transmitting mechanism is employed to transmit a signal, designated the "test-signal," over a third wire to a receiving-station.

My present invention has for one of its objects to provide apparatus, as will be described, whereby a signal from a transmitting mechanism may be sent over the metallic circuit to the receiving-station and therein recorded without actuating the fire-alarm-receiving instrument.

Another feature of my present invention consists in providing means, as will be described, whereby communication may be established over the metallic circuit between the transmitting mechanism and the receiving mechanism, and vice versa, without disturbing the metallic circuit so as to render it inoperative for receiving a fire-alarm signal from any other mechanism connected in the metallic circuit.

Another feature of my present invention consists in a novel construction of transmitting mechanism, whereby communication may be established from outside the transmitting mechanism and between it and the receiving-station, and vice versa, as will be described. This last feature of my present invention is especially advantageous in case it is desired to summon extra apparatus in time of fire without sending in another alarm from the transmitting mechanism.

The particular features of my invention will be pointed out in the claims at the end of this specification.

Figure 1 is a perspective view of a fire-alarm box embodying my invention, the outer door of the said box being shown open; Fig. 2, a section of the box shown in Fig. 1 on line 2 2; Fig. 3, a detail to be referred to; Fig. 4, a diagram of circuits to enable my invention to be more clearly understood; Fig. 5, a detail to be referred to; Fig. 6, a detail of a portion of the recording-strip, and Fig. 7 a detail of a modified form of receiving apparatus.

The box A, containing the operating parts of my improved transmitting mechanism, as will be described, may be made of iron or other suitable material. The transmitting mechanism referred to, as shown in diagram view, Fig. 4, consists of two signal-transmitting or break wheels or disks a a', mounted upon a shaft a^2 and having co-operating with them contact pens or brushes a^3 a^4. The shaft a^2, as shown in Fig. 4, is connected by a pen or brush a^5 to one line-wire a^6 of a metallic circuit, and the pens a^3 a^4 are also connected by independent paths, as will be described, to the other line-wire a^7 of the said metallic circuit, the said line-wires being connected, respectively, to the negative and positive poles of a battery a^8, located in the receiving-station. The shaft a^2, as herein represented, has fastened to it a shaft b, electrically separated from the shaft a^2 by suitable insulation, as at b', and the shaft b, as shown in Fig. 4, has mounted upon it two brake-wheels b^2 b^3, with which co-operate contact-pens b^4 b^5.

The shaft b has co-operating with it a pen or brush b^6, connected to the ground b^7 by a wire b^8, contact-arms b^9 b^{10}, and metallic plug b^{12}, substantially as in the application referred to. The contact-pen b^4 is connected by branch wire b^{13} to one line-wire a^7, while the pen b^5 is connected by branch wire b^{14} to the other line-wire a^6.

The brake-wheels b^2 b^3 are arranged on the shaft b so that the teeth of the said wheels will not be simultaneously in contact with their co-operating pens b^4 b^5, but will be successively brought in contact therewith by the operation of the motor mechanism actuating the transmitting mechanism, the teeth of the wheel b^2 being brought in contact with the pen b^4 before the teeth of the wheel b^3 are brought in contact with its pen b^5.

The pen or brush a^3, co-operating with the

brake-wheel a, is connected by a wire b^{15} to a contact-pen b^{16}, forming one-half of one member of a normally-closed circuit-controller B, the other half of the said member being shown as a like contact-pen b^{17}, connected by wire b^{18} to the line-wire a^7, the co-operating member for the said contact-arms being shown as a metallic plug b^{20}, the wires b^{15} b^{18} and circuit-controller B forming one path for the signal-transmitting mechanism.

The pen or brush a^4 is connected by wire c to one member c' of a normally-closed circuit-controller or key C, the other member c^2 of which is connected by wire c^3 to one member c^4 of the normally-closed circuit-controller C', the other member c^5 of which is connected by wire c^6 to a spring-arm c^7, co-operating with a like spring-arm c^8, connected by wire c^9 to the line-wire a^7, the spring-arms c^7 c^8 constituting a normally-open circuit-controller C^2 and being normally separated, as will be described, by a plug c^{10} of insulating material, the said wires and circuit-controllers forming a second path for the signal-transmitting mechanism.

The member c^2 of the circuit-controller C is connected by a wire c^{12} to one end of a resistance-coil c^{13}, having its other end connected by a wire c^{14} to the line-wire a^6. The line-wire a^6, as shown in Fig. 4, includes within it, as shown, an electro-magnet c^{15}, herein represented as operating an ordinary sounder, such as commonly employed in telegraph-work. The electro-magnet c^{15} is normally shunted out of circuit by means of a circuit-terminal c^{16}, connected by wire c^{17} to the line-wire a^6 on one side of the electro-magnet c^{15}, and a co-operating terminal c^{18}, also connected to the line-wire a^6 on the other side of the said electro-magnet.

The line-wire a^6 within the receiving-station has connected to it, preferably, two relays d d' for the best results in multiple with each other, and the line-wire a^6, within the receiving-station, includes in it, as herein shown, the normally-closed circuit-controller or key D. The line-wires a^6 a^7 are connected to a pole-changer d^2, which may be of any usual or well-known construction, by means of which the polarity of the battery a^8 may be reversed, for a purpose as will be described. The circuit-controller D, as represented in Fig. 4, consists of two terminals or members d^3 d^4, the terminal d^3 having connected to it one end of a resistance-coil d^5, having its other end connected to the terminal d^4. The terminal d^4, when moved to open the main line a^6, preferably co-operates with the terminals d^6 d^7 of a shunt-loop d^8 d^9 for the pole-changer, for a purpose as will be described.

The relay d in the receiving-station is provided with an armature d^{15}, forming one terminal of a local circuit including a local battery d^{16}, the other terminal for the said local circuit being a back-stop d^{15}, to which is connected one wire of an electro-magnet d^{18}, controlling the movement of a register d^{19}, of any usual or well-known construction, and upon which the fire-alarm signal is received. The relay d', herein shown in multiple with relay d, is also provided with an armature d^{20}, forming one terminal of a local circuit including a local battery d^{21}, the other terminal being formed by a back-stop d^{22} for the said armature, the back-stop d^{22}, as herein shown, being connected to an electro-magnet d^{23}, controlling a register d^{24}, of any usual or well-known construction, and which I prefer to hereinafter designate as a "test-register." The relay d' is constructed and adjusted so as to respond to changes in the current strength of the main-line circuit, whereas the relay d is constructed and adjusted so as to be unaffected by the changes in current strength, but to be affected by long interruptions or breaks in the circuit, and for the sake of distinction I prefer to designate the relay d as the "slow relay," and the relay d' as the "fast relay."

The pole-changer d^2 in the receiving-station has co-operating with it an electro-magnet d^{25}, located in a local circuit provided with a local battery d^{26}, the terminals for the said local circuit being shown in Fig. 4 as a break-wheel d^{27}, mounted on the shaft d^{28} of the register d^{24}, and a contact brush or pen d^{29}.

The break-wheel a of the transmitting mechanism I prefer to designate as the "fire-alarm wheel," and the break-wheel a' as the "test-wheel." These two wheels are represented in Fig. 4 as independent of each other; but in practice they may be one wheel having a periphery of sufficient width to make contact with both the pens a^3 a^4.

The metallic plugs b^{12} b^{20} and the insulating-plug c^{10} in practice are preferably secured to the door e of the box, and in the normal condition of the box the door e is closed, so that the metallic plug b^{20} is in engagement with the contact-springs b^{16} b^{17}, and the insulating-plug c^{10} in engagement with and between the contact-springs c^7 c^8, and the metallic-plug b^{12} is in engagement with the contact arms or brushes b^9 b^{10}. In the normal condition of the box A the door e is closed and the circuit for the fire-alarm wheel or signal a is closed by the plug b^{20}, the circuit of the test-wheel a' is opened by the insulating-plug c^{10}, and the ground-tap circuit in the box is closed by the plug b^{12}, but is open at the break-wheels b^2 b^3. It will thus be seen that in the normal condition of the box—that is, when the door e is closed—the circuit from the contact-pen a^3 is closed, while the circuit from the contact-pen a^4 is open, and consequently if the transmitting mechanism should be operated while the door e is closed the wheel a would transmit a signal, while the wheel a' would be rendered practically inoperative.

The circuit for the fire-alarm signal may be traced as follows, viz: from the positive pole of the battery through the pole-changer d^2 by wire a^7 to the wire b^{18}, thence by con-

tact-arm b^{17}, plug b^{20}, arm b^{16}, wire b^{15} to pen a^3, thence by break-wheel a, shaft a^2, brush a^5, wire a^6, wire c^{17}, switch c^{16}, terminal c^{18} to line-wire a^6, thence through the relays d d', key D, through the pole-changer d^2, to the negative pole of the battery.

The box A, as represented in Figs. 1 and 2, is provided with an auxiliary door e', having a glass pane e^2, against which bears a lever e^3, controlling the movement of an escapement for a bell-operating motor mechanism, substantially as shown and described in the application referred to.

The signal-transmitting or break wheel shaft a^2 is rotated by a motor mechanism not shown, but which may be actuated by hooks e^4 e^5 on a pull-bar, substantially as shown and described in the application referred to. When the door e is closed, the box is in its normal working condition, and an alarm of fire may be sent to the receiving-station by breaking the glass e^2 and pulling the hook e^5 to start the motor mechanism, and when thus started, the main-line circuit will be opened by the successive long breaks in the wheel a, and both relays d d' will be operated and the signal received upon the registers d^{19} d^{24}.

In order that an officer or fireman may transmit the signal from the transmitting mechanism without sending in an alarm of fire and at the same time operate the same transmitting mechanism used to send in the fire-alarm signal, the fast relay d', in multiple with the slow relay d, is preferably employed, and preferably a weight or pendulum f, normally in engagement with the escapement-pawl f' of the motor mechanism is disengaged from the said mechanism, to allow the motor mechanism to be revolved at a substantially rapid rate.

Referring now to Fig. 3, I have shown the weight or pendulum f as secured to or forming part of a clutch (shown as a sleeve or hub f^2) provided with engaging pins f^3, adapted to lock with like pins f^4 on the escapement or pawl f', controlling the movement of the motor mechanism. The clutch-hub f^2 may be disengaged from the escapement-pawl by a disengaging mechanism or device (herein shown as a lever f^5) pivoted to the clutch-hub and acted upon by a spring f^6, having one end fastened to the lever f^5 and its other end to a stationary part of the motor mechanism or to the box A. The clutch-hub f^2 is brought into engagement with the escapement-pawl when the door e is closed by an engaging device (herein shown as a rod f^7) secured to the lever f^5, and which in practice is extended through a suitable opening in the door and adapted to be struck by a projection or knob f^8 on the side of the door when the latter is closed. The knob f^7 is provided, as shown in Fig. 1, with a latch f^9 to engage a ring or enlarged head f^{10} of the rod f^7. When the door e is closed, the knob f^8 strikes the enlarged head f^{10} and pushes the lever f^5 and the clutch-hub f^2 inward, so as to engage the clutch with the escapement-pawl. It will readily be seen that when the clutch-hub is engaged with the pawl the weight or pendulum f controls or regulates the rate of movement of the motor mechanism, so that if a signal should be sent with the door e closed, as when an alarm of fire is given, the motor mechanism would revolve substantially slowly, and a comparatively long lapse of time would expire in transmitting this signal, which in practice would preferably be thirty seconds, whereas when the door e is open and the clutch disengaged from the escapement-pawl it will readily be seen that if the motor mechanism is set in operation it will revolve at a substantially rapid rate and the signal would be transmitted in a substantially short time, which may be supposed to be about three seconds. When the door e is open, the metallic plug b^{20} is withdrawn from the pens b^{16} b^{17} and the circuit governed by the pen a^3 is open, whereas the insulating-plug c^{10} is withdrawn from between the spring-arms c^7 c^8, permitting the said arms to come together and close the circuit controlled by the pen a^4, and it is this circuit that is actuated when the motor mechanism is operated with the door open.

The circuit for the transmitting mechanism when the door e is open may be traced as follows, viz: from the positive pole of the battery a^8 through the pole-changer d^2 by wire a^7 to wire c^9, thence by contact-terminals c^8 c^7, wire c^6, circuit-controller C', wire c^3, circuit-controller C, wire c to pen a^4, thence by break-wheel a', shaft a^2, brush a^5, wire a^6, through wire c^{17}, switch c^{16}, terminals c^{18}, back to wire c^6, through the relays d d', circuit-controller D, pole-changer d^2 to the negative pole of the battery a^8. The break-wheel a' has the same number of breaks on its periphery to correspond to the break-wheel a, or it may, if desired, have a different or distinguishing number.

The signal sent by the operation of the motor mechanism with the box-door e open I prefer to designate as the "test-signal." The test-signal referred to, as shown in Fig. 4, is received upon the test-register d^{24}, controlled by the test-relay d', which is a fast-operating relay, and owing to the sluggish operation of the relay d the test-signal is not received upon the fire-alarm register d^{19}, and when the door is open and the test-signal sent the register d^{19} and relay d remain quiet and do not respond to the short breaks in the main circuit caused by the transmission of the test-signal.

When the motor mechanism is operated to transmit the test-signal, the break-wheel a, used to transmit the fire-alarm signal, is rotated and the contact-surfaces of the said wheel and its co-operating pen a^3 are kept bright and in good condition. Furthermore, the remaining parts of the transmitting mechanism which are actuated when the fire-

alarm signal is sent are also operated when the test-signal is sent, and are therefore kept in good electrical and mechanical condition.

The break-wheels b^2 b^3, provided with the same number of teeth or breaks, are employed to transmit the fire-alarm signal from the right or left of the line in case of a break in the metallic circuit, substantially as described in the application referred to, the ground-tap at the transmitting-instrument being normally closed by the plug b^{12} when the door e is closed and normally open at the break-wheels b^2 b^3 until the latter are started in rotation, the right and left of the line being connected to the ground-tap g at the receiving-instrument by switches g' g^2, which in practice may be controlled by a single lever, as described in the application referred to.

The box A contains within it a polarized bell g^4, having its magnets g^5 included in the line-circuit, and by means of which an officer making a test may know from what box the last alarm of fire was sent in. This feature is accomplished, as represented in Fig. 4, by placing upon the shaft d^{28} of the test-register a toothed wheel d^{27}, having on its periphery a number of teeth corresponding to the number of the box or transmitting apparatus from which the last signal was sent to the receiving-station. It will be seen that as soon as the test-register is operated by the officer sending in his test-signal the local circuit for the electro-magnet d^{25} is closed by contact of the teeth of the wheel d^{27} with the pen d^{29}, and the said magnet operates the pole-changer so as to reverse the current of the main battery a^8 at each closure of the local circuit controlled by the wheel d^{27}, and the main-line battery being thus reversed the bell g^4 in the box will be struck, and the officer will thus have given to him the number of the box, indicated by the break-wheel placed upon the test-register shaft by the proper officer or fireman at the receiving-station, without breaking the metallic circuit.

If a fireman at the box desires to communicate with the fireman or other officer at the receiving-station, he operates the circuit-controller or key C so as to interpose the resistance c^{13} and thereby weaken the main-line battery sufficient to actuate the relay d' so as to operate the test-register, upon which may be received the Morse alphabet or any other desired code of signals.

If the fireman or other person at the receiving-station desires to answer back to the fireman at the box or transmitting mechanism, the key D is manipulated and the resistance d^5 is interposed, which operates the sounder c^{15} in the box, the fireman at the box at such time separating the terminals c^{16} c^{18}.

In many instances in times of fire it is desired that the chief or other officer in charge at the fire should be able to communicate with the central office or receiving-station and at the same time have a record of the message sent, so as to settle any dispute as to what message was transmitted. For instance, he may desire to obtain special pieces of apparatus without desiring to send in a second alarm. This feature may be accomplished with the apparatus shown in Figs. 5 and 7, wherein two circuit-terminals h h' on an insulating-plug h^{16} are connected by conductors h^{12} h^{13} to an electro-magnet h^2 and to a circuit-controlling key h^3, having in shunt with it a resistance h^4. The electro-magnet h^2 is provided with an armature h^5, forming one terminal of a local circuit containing a register-magnet h^6 and a bell-magnet h^7, the magnet h^6 controlling the register h^8, of any usual or well-known construction. The register h^8 and its magnet h^6, the bell-magnet h^7, resistance h^4, key h^3, and electro-magnet h^2 may be secured within a suitable case or box h^9, which may be carried upon or be detachably secured to the wagon of the chief or other officer, and the circuit-terminals h h' may be connected to the parts of the apparatus just described by a flexible cord h^{10}, containing the two conductors h^{12} h^{13}. The terminals h h' are designed to be inserted through suitable openings in the case of the box A and make contact with the arms or springs h^{14} h^{15}, connected by wires h^{20} h^{21} to the line-wires a^7 a^6. At the same time the insulating-plug h^{16}, separating the contact-terminals h h', strikes the member c^4 of the circuit-controller of the test-circuit and opens the test-circuit. When the contact-arms h h' are connected to the contact-springs h^{14} h^{15}, the main-line circuit may be operated by manipulating the key h^3 so as to interpose the resistance h^4 and thus operate the fast relay d' and consequently actuate the test-register.

The circuit for the electro-magnet h^2 may be traced as follows, viz: from the positive pole of the battery a^8 by wire a^7 to the wire h^{20}, thence to the contact plates or arms h^{14} h, wire h^{12}, magnet h^2, circuit-controlling key h^3, wire h^{13}, contact-terminals h' h^{15}, wire h^{21}, to wire a^6, thence through the relays d d', circuit-controller D to the negative pole of the battery. When the key h^3 is operated by the chief or other officer, a record of the message transmitted is obtained by the chief upon his register h^8, and also the same message is obtained by the receiving-officer upon the test-register d^{24}. If now the officer at the receiving-station should desire to communicate with the chief at the transmitting apparatus or box, he would operate the key D and interpose the resistance d^5, and thus operate the register h^8 through the magnet h^2. In this manner danger of the officer at the receiving-station obtaining a false signal or of sending out apparatus which is not needed is entirely obviated, for by means of the recording-register h^8 the chief or other officer knows exactly what message was received at the receiving station.

In order that the number of the box from which the fire-alarm was last sent may be transmitted to all the boxes in the metallic

circuit, the local circuit for the test-register may be closed manually by a key k. (Shown in Fig. 4.) The fireman or other officer in this case first places upon the test-register shaft the wheel d^{27}, bearing the same number as the number of the box from which the alarm of fire was last sent in, and he would then close the local circuit of the battery d^{21} by means of the key k and start the test-register d^{24}, and thus produce reversals of the main-line battery a^8 and actuate all the polar bells in the metallic circuit.

I prefer to employ two relays d d' in multiple with each other; but I do not desire to limit my invention in this respect, as but a single relay d', capable of responding quickly to changes of condition in the metallic circuit, may be employed in connection with a transmitting mechanism capable of operating at varying speeds.

When a single relay, as d', is employed in the receiving-station, it responds to both the fire-signal and the test-signal and actuates a register which may be supposed to be the register d^{24}. (Shown in Fig. 4.) The register d^{24} may have mounted on its shaft a gear d^{70}, adapted to be engaged by a pinion d^{71}, pivotally mounted on the armature d^{50} of the register-magnet d^{23} and having secured to or forming part of it a cam or projection d^{72}, adapted to be brought into engagement with one terminal brush or pen d^{73} of a normally-open local circuit having its co-operating terminal d^{74} connected, as herein shown, to the magnet of a tap-bell d^{75}, by means of which the box number or signal transmitted may be made known. The pinion d^{71} is brought into mesh with the gear d^{70} by the attraction of the armature d^{50}, and as soon as the register is started in operation by the closing of its local circuit by the armature d^{20} of the relay d' the pinion is revolved and the cam d^{72} is moved toward the terminal d^{73}. When a fire-signal is transmitted, the local circuit of the register-magnet remains closed for a comparatively long time at each interruption of the metallic circuit, and the pinion d^{71} is revolved sufficiently far to bring the cam d^{72} into engagement with the circuit-terminal d^{73} and thereby close the local circuit of the bell or other device located therein and by which the operator or fireman at the receiving-station is notified that an alarm of fire is being received, and the number of the box may be ascertained from the bell. When the test-signal is sent from any box, the speed of the transmitting mechanism is so rapid that the local circuit of the register-magnet does not remain closed sufficiently long to permit the cam or projection d^{72} to be brought into engagement with the terminal d^{73}, and consequently the local circuit containing the bell or other signal is not closed and no notice need be taken by the operator of this signal.

The length of the breaks and closures in the test-wheel a' are, for the best results, the same as in the fire-signal wheel a.

I do not herein claim, broadly, a signaling system in which two different and distinct purposes are indicated by the same signal without additions thereto, subtractions therefrom, or repetitions thereof, as the same forms the subject-matter of another application, Serial No. 411,028, filed by me November 6, 1891.

I claim—

1. In a system for transmitting signals, the combination of the following instrumentalities, viz: a normally-closed electric circuit, a signal-transmitting mechanism included therein and consisting of break-wheels a a' and co-operating pens or brushes a^3 a^4, normally in contact with said break-wheels, independent paths for the current from the pens a^3 a^4 to one side of the line or electric circuit, a normally-closed circuit-controller in the path of the pen a^3, a normally-open circuit-controller in the path of the pen a^4, and a resistance c^{13}, connected to one side of the electric circuit and to the path of the pen a^4 to form a shunt around the break-wheel a', and two relays in the said circuit, both of which are responsive to the signals transmitted over the normally-closed path of the pen a^3 and one of which is responsive only to the signals transmitted over the normally-open path of the pen a^4, substantially as described.

2. In a system for transmitting signals, the combination of the following instrumentalities, viz: a metallic circuit, a signal-transmitting mechanism included therein and connected thereto by independent paths, a normally-closed circuit-controller in one of the said paths, a normally-open circuit-controller in the other of said paths, a motor mechanism to operate the signal-transmitting mechanism, means for positively changing the speed of the motor mechanism and thereby the speed of the signal-transmitting mechanism, and independent receiving-instruments included in the metallic circuit, one of the said instruments being responsive to the transmitting mechanism when operated at one speed and not at the other speed, substantially as described.

3. In a system for transmitting signals, the combination of the following instrumentalities, viz: a metallic circuit, a signal-transmitting mechanism included in said metallic circuit, a motor mechanism to operate it, means for positively changing the rate of movement of the motor mechanism and thereby of the speed of the transmitting mechanism, and two relays included in the metallic circuit in multiple with each other, substantially as described.

4. In a system for transmitting signals, the combination of the following instrumentalities, viz: a metallic circuit, a signal-transmitting mechanism included in said metallic circuit, a motor mechanism to operate it, means for positively changing the rate of movement of the motor mechanism and thereby of the speed of the transmitting mechanism, two relays included in the metallic circuit in mul-

tiple with each other, a pole-changer in the metallic circuit, an electro-magnet to operate it, a register controlled by the operation of one of the said relays, and circuit-terminals for the pole-changer and an electro-magnet rendered effective by the operation of the said register, substantially as described.

5. In a system for transmitting signals, the combination of the following instrumentalities, viz: a metallic circuit, a signal-transmitting mechanism included in said metallic circuit, a motor mechanism to operate it, means for positively changing the rate of movement of the motor mechanism and thereby of the speed of the transmitting mechanism, two relays included in the metallic circuit in multiple with each other, a pole-changer in the metallic circuit, an electro-magnet to operate it, a shaft, an electro-magnet to control its operation, a circuit-terminal on said shaft connected to the pole-changer electro-magnet, a second circuit-terminal for the pole-changer magnet, a circuit-controller governing the operation of the electro-magnet controlling the circuit terminal-carrying shaft, and a polarized electro-magnet in the metallic circuit at the transmitting mechanism, substantially as described.

6. In a system for transmitting signals, the combination of the following instrumentalities, viz: a metallic circuit, a signal-transmitting mechanism included therein and consisting of signal-wheels a a', two independent contact pens or terminals connected to the metallic circuit by independent paths and normally in contact with the said signal-wheels, circuit-controllers in said paths, a resistance interposed in one of the said paths when the circuit-controller is operated, receiving-instruments in the metallic circuit in multiple with each other, one of the said instruments being operated when the resistance is interposed in the metallic circuit, and two local circuits disconnected from each other and controlled by the said receiving-instruments, substantially as described.

7. In a fire-alarm system, the combination of the following instrumentalities, viz: a metallic circuit, a signal-transmitting mechanism included therein, circuit-terminals h^{14} h^{15}, connected to the metallic circuit, an electro-magnet h^2, a key h^3, and a resistance h^4 in shunt with said key, adapted to be connected to the circuit-terminals h^{14} h^{15}, and relays d d' in multiple with each other, one relay, as d', being responsive to the operation of the key h^3, substantially as described.

8. In a fire-alarm system, the combination of the following instrumentalities, viz: a metallic circuit, a signal-transmitting mechanism included therein, circuit-terminals h^{14} h^{15}, connected to the metallic circuit, an electro-magnet h^2, a key h^3, and a resistance h^4 in shunt with said key, adapted to be connected to the circuit-terminals h^{14} h^{15}, a register controlled in its operation by the electro-magnet h^2, relays d d' in multiple with each other, one relay, as d', being responsive to the operation of the key h^3, a circuit-controller D in metallic circuit, and a resistance in shunt with the circuit-controller D, substantially as described.

9. In a fire-alarm system, the combination of the following instrumentalities, viz: a metallic circuit, a signal-transmitting mechanism included therein, a normally-closed circuit-controller C′ in circuit with the signal-transmitting mechanism, circuit-terminals h^{14} h^{15} in multiple with the signal-transmitting mechanism, a portable detachable signal receiving and transmitting apparatus adapted to be connected in circuit with the circuit-terminals h^{14} h^{15}, relays d d', included in the metallic circuit in multiple with each other, a circuit-controller D, and a resistance in shunt with the circuit-controller D, the circuit of the signal-transmitting mechanism being opened when the portable apparatus is coupled in circuit, substantially as described.

10. In a system for transmitting signals, the combination of the following instrumentalities, viz: an electric circuit, a signal-box located in said circuit and provided with a door, a signal-transmitting mechanism in said box, included in said electric circuit, a motor mechanism to operate said signal-transmitting mechanism, means for positively changing the rate of movement of the motor mechanism, normally inactive when the box-door is closed, but adapted to be rendered active when the door is open, to change the speed of the motor mechanism and thereby of the transmitting mechanism, and a relay in the said electric circuit responsive to the varying speeds of the transmitting mechanism, substantially as described.

11. In a fire-alarm system, the combination of the following instrumentalities, viz: an electric circuit, a fire-alarm box located in said circuit and provided with a signal-transmitting mechanism having two independent paths for the signal, a motor mechanism for said signal, a positively-acting mechanical speed-controlling device for changing the speed of the motor mechanism, and a door for the box, provided with devices to control the independent paths and the speed-controlling device, substantially as described.

12. In a system for transmitting signals, the combination of the following instrumentalities, viz: an electric circuit, a signal-transmitting mechanism included in said electric circuit, a motor mechanism to operate it, a positively-acting mechanical speed-changing device for changing the rate of movement of the motor mechanism and thereby of the speed of the transmitting mechanism, and a relay in the said circuit responsive to the varying speeds of the transmitting mechanism, substantially as described.

13. In a system for transmitting signals, the combination of the following instrumentalities, viz: an electric circuit, a signal-transmitting mechanism included in said electric

circuit, a motor mechanism to operate it, means for positively changing the rate of movement of the motor mechanism and thereby of the speed of the transmitting mechanism, a relay in the electric circuit, responsive to the varying speeds of the transmitting mechanism, and a signal mechanism operated by the relay when the said relay is actuated by one speed of transmitting mechanism and not by the other speed of the said transmitting mechanism, substantially as described.

14. In a system for transmitting signals, the combination of the following instrumentalities, viz: an electric circuit, a signal-transmitting mechanism included in said electric circuit, a motor mechanism to operate it, means for positively changing the rate of movement of the motor mechanism and thereby of the speed of the transmitting mechanism, a relay in the metallic circuit, responsive to the varying speeds of the transmitting mechanism, and an audible signal upon which is sounded the signal when transmitted at one speed and not at the other, substantially as described.

15. In a system for transmitting signals, the combination of the following instrumentalities, viz: a metallic circuit, a signal-transmitting mechanism included in said metallic circuit, a motor mechanism to operate it, a positively-operating mechanical speed-changing device for changing the rate of movement of the motor mechanism and thereby of the speed of the transmitting mechanism, a relay in the metallic circuit, responsive to the varying speeds of the transmitting mechanism, a polarized bell in the metallic circuit at the transmitting mechanism, a pole-changer in the metallic circuit, a shaft controlled in its operation by the said relay, and a detachable signal-wheel on said shaft to operate the pole-changer, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HENRY A. CHASE.

Witnesses:
JAS. H. CHURCHILL,
SADIE C. FEARING.

Correction in Letters Patent No. 465,990.

It is hereby certified that the name of the assignee in Letters Patent No. 465,990, granted December 29, 1891, upon the application of Henry A. Chase, of Boston, Massachusetts, for an improvement in "Signal-Transmitting Mechanism," was erroneously written and printed "Albert Watte," whereas said name should have been written and printed *Albert Watts;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 5th day of January, A. D. 1892.

[SEAL.]

CYRUS BUSSEY,
Assistant Secretary of the Interior.

Countersigned:

W. E. SIMONDS,
Commissioner of Patents.