(No Model.)

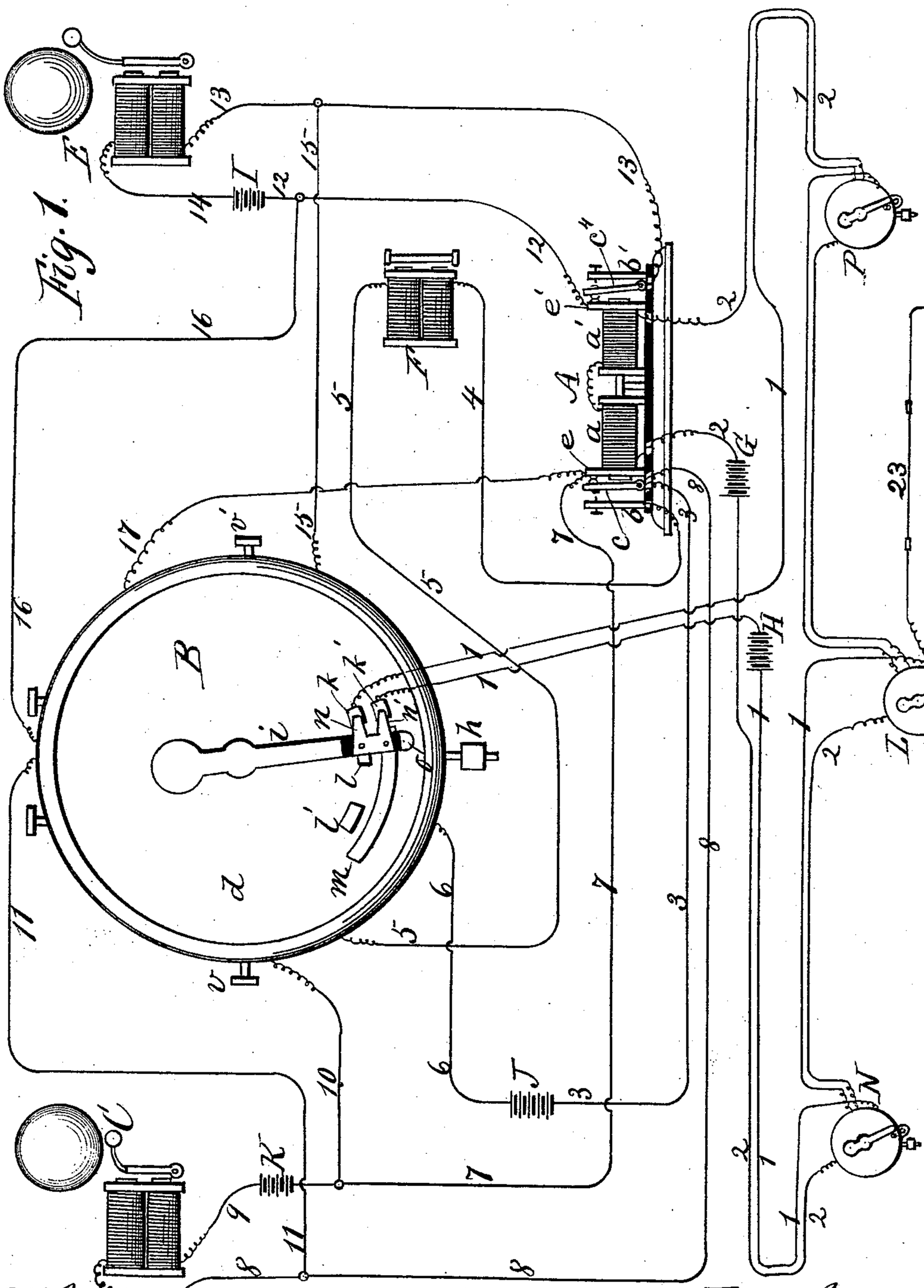
3 Sheets—Sheet 1.

W. W. HIBBARD.

ELECTRIC SIGNAL BOX.

No. 523,124. Patented July 17, 1894.

Fig. 1.



Witnesses.
C. G. Crannell
Geo. B. Selden.

Inventor.
Wm. W. Hibbard
per R. F. Osgood, Atty.

(No Model.) 3 Sheets—Sheet 2.

W. W. HIBBARD.

ELECTRIC SIGNAL BOX.

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Fig. 3.

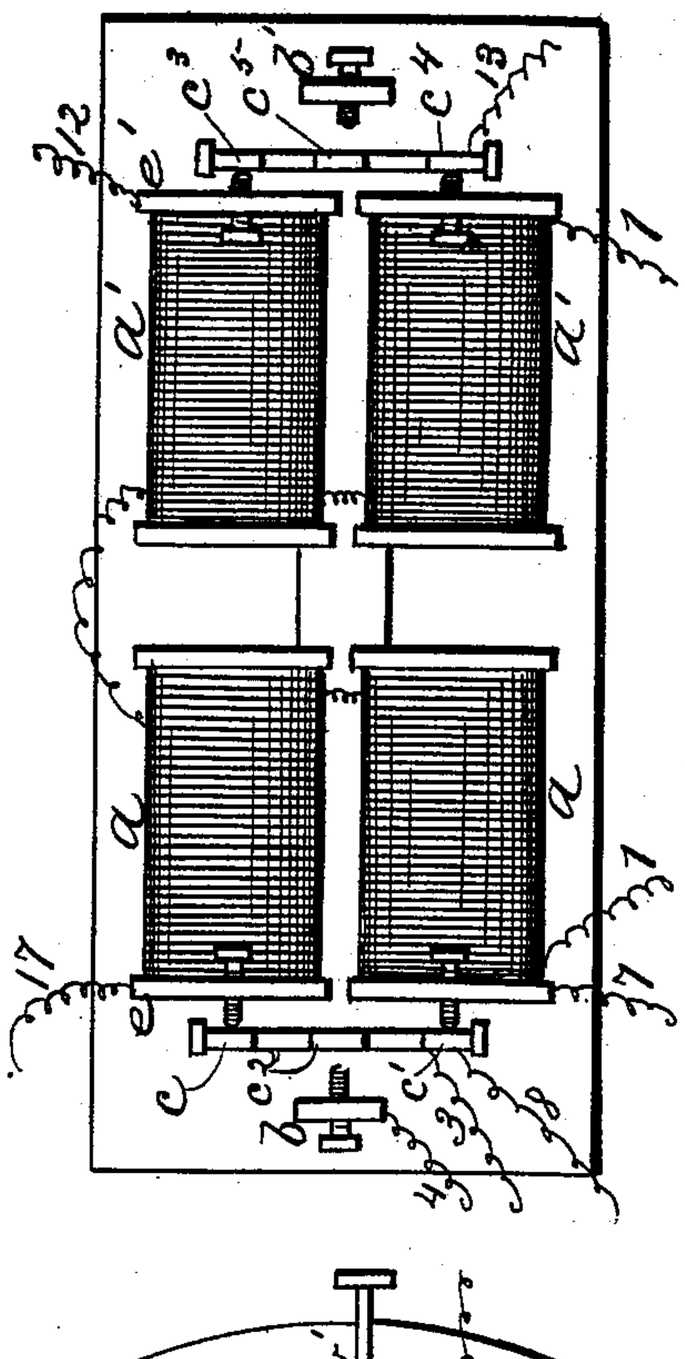


Fig. 4.

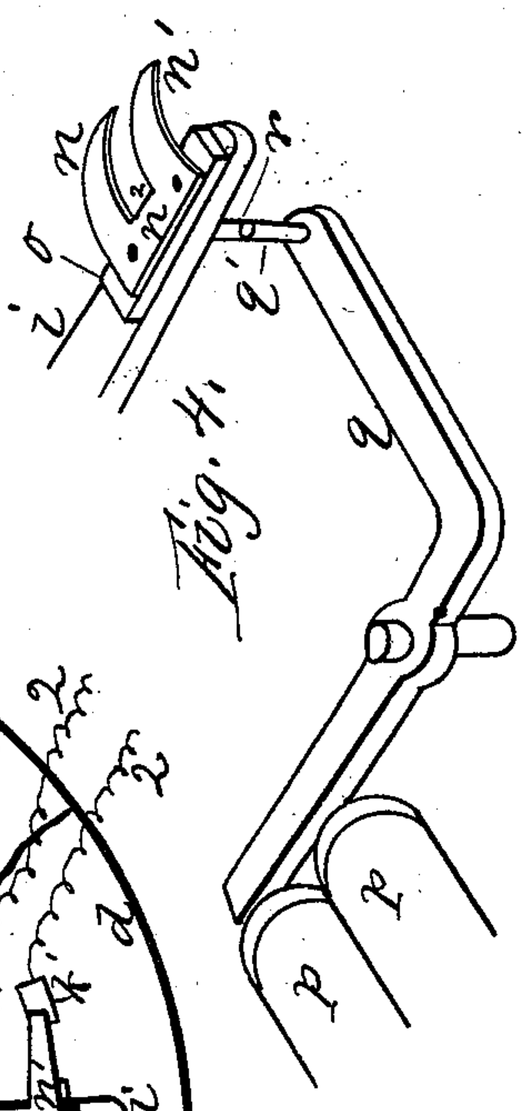
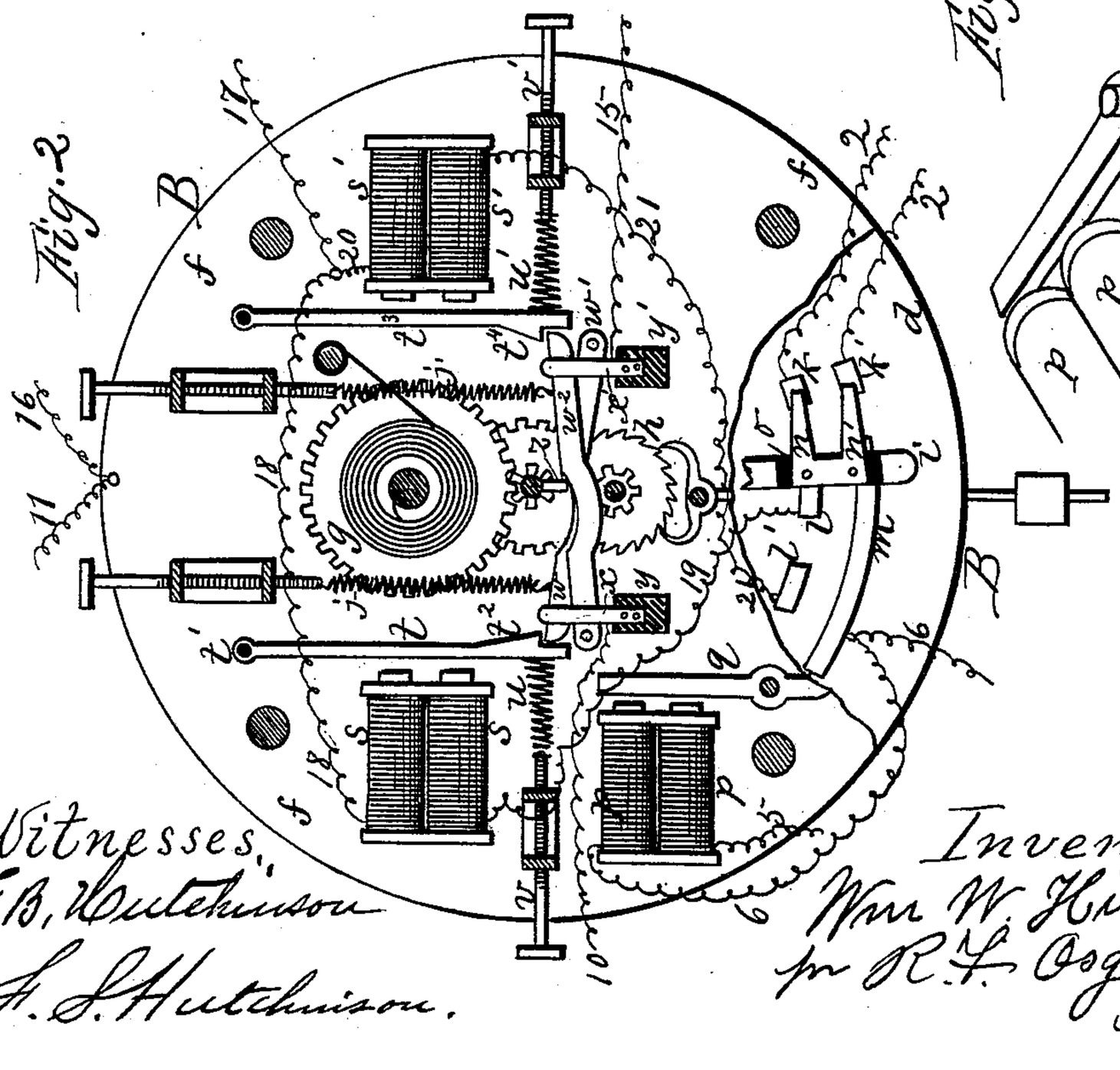


Fig. 2.



Witnesses,
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Inventor:
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Atty.

(No Model.) 3 Sheets—Sheet 3.

W. W. HIBBARD.

ELECTRIC SIGNAL BOX.

No. 523,124. Patented July 17, 1894.

Fig. 5.

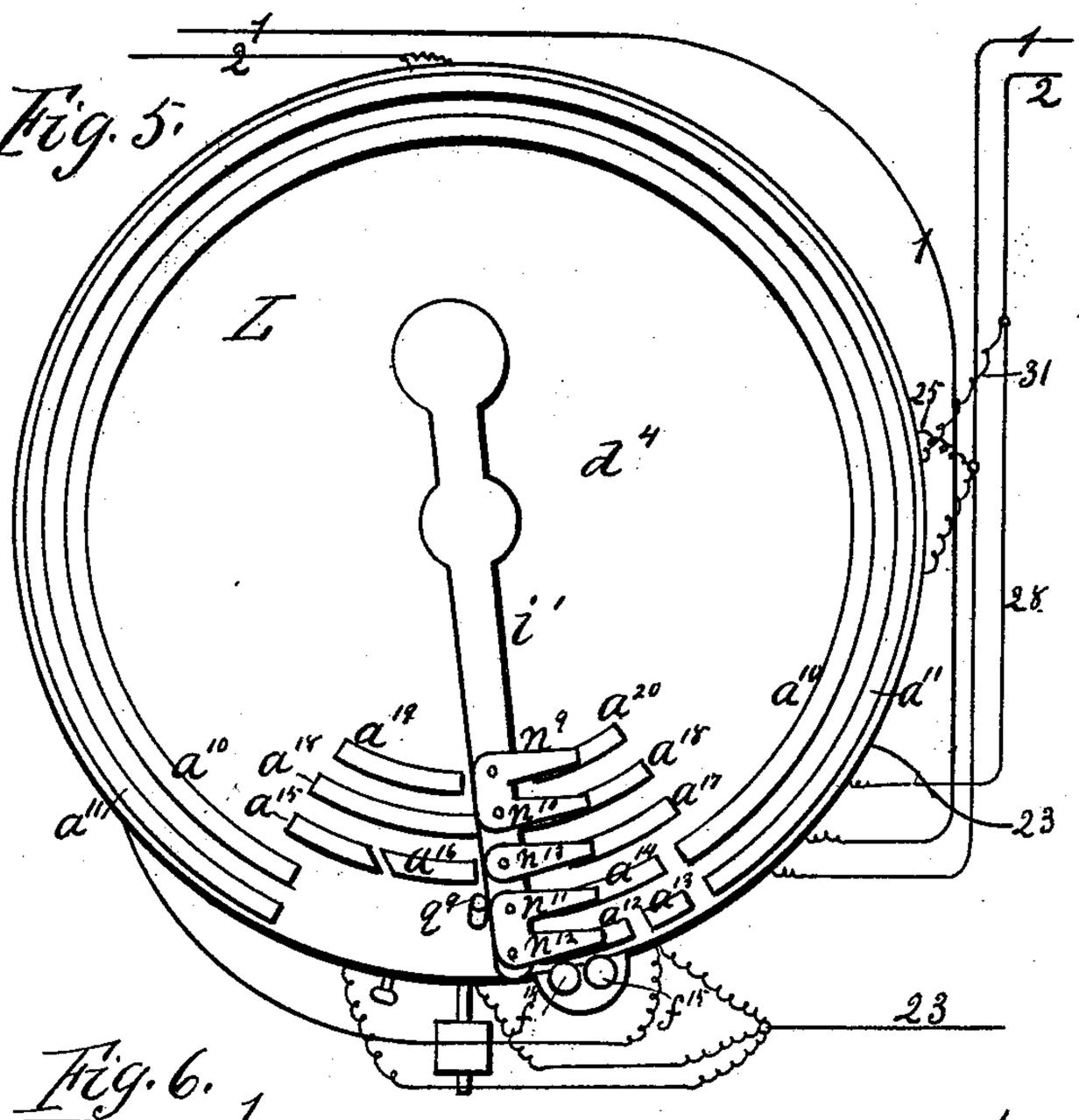


Fig. 7.

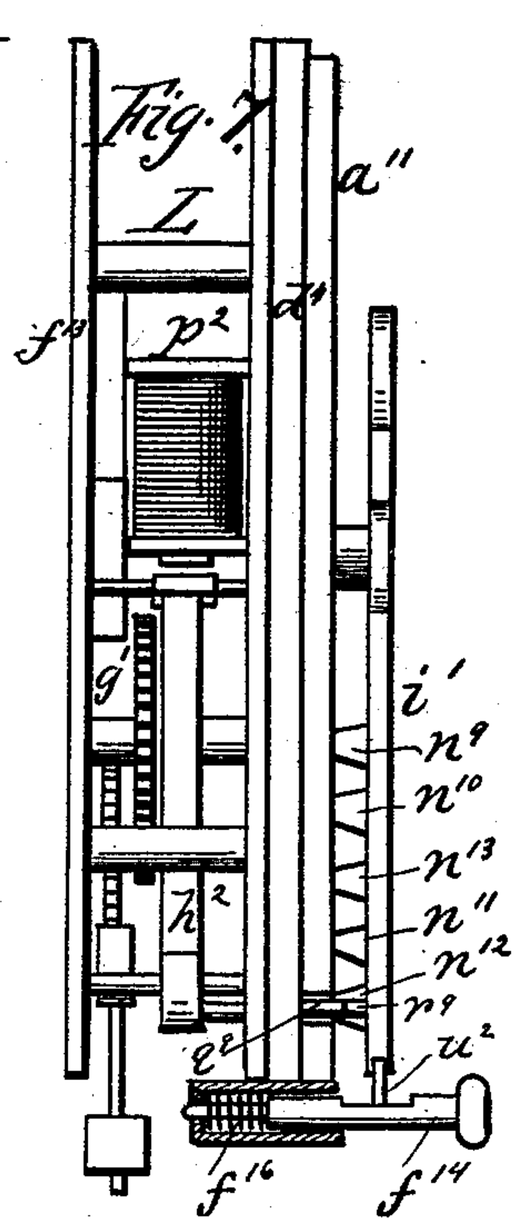


Fig. 6.

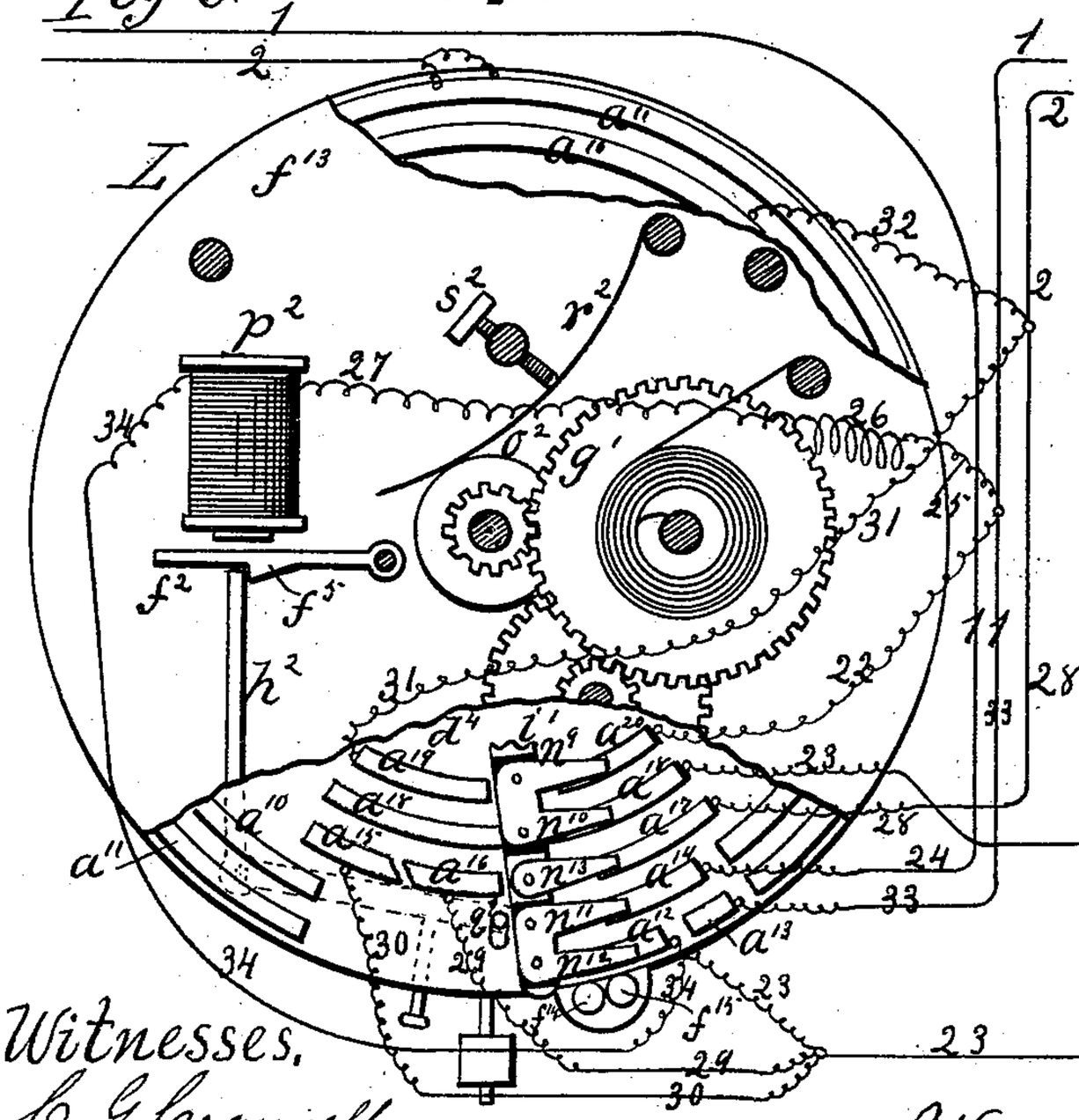
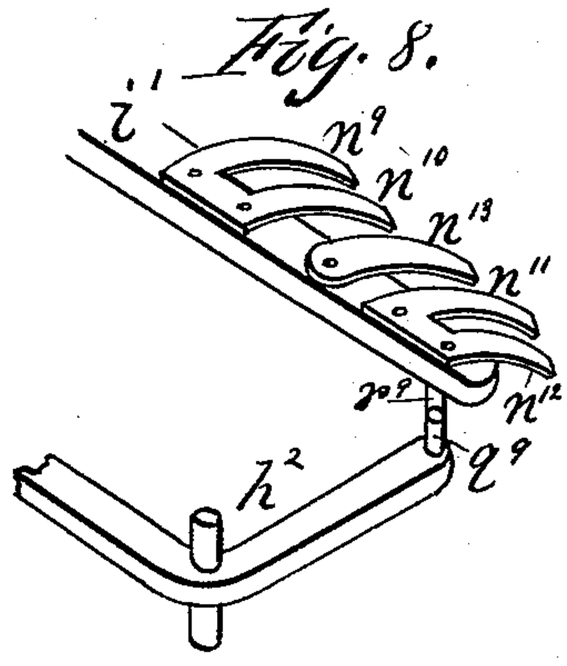


Fig. 8.



Witnesses,
C. G. Crandell
Geo. B. Selden.

Inventor:
Wm. W. Hibbard
per R. F. Osgood, Atty.

UNITED STATES PATENT OFFICE.

WILLIAM W. HIBBARD, OF ROCHESTER, NEW YORK, ASSIGNOR TO THE STANDARD ELECTRIC SIGNAL COMPANY, OF SAME PLACE.

ELECTRIC SIGNAL-BOX.

SPECIFICATION forming part of Letters Patent No. 523,124, dated July 17, 1894.

Application filed August 12, 1893. Serial No. 483,026. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM W. HIBBARD, of Rochester, in the county of Monroe and State of New York, have invented a certain new and useful Improvement in Electric Signal-Boxes; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the drawings accompanying this application.

My improvement relates to electric signaling apparatus, and consists in the construction and arrangement of the signal boxes as hereinafter more fully described and embodied in the claims.

In the drawings—Figure 1 is a diagram showing a face view of the system with which the boxes are connected. Fig. 2 is a face view of the differentiating apparatus with a portion of the top broken away. Fig. 3 is a plan view of the relay. Fig. 4 is a perspective view of the electrical stop connected with the differentiating apparatus. Fig. 5 is a plan view of the signal box. Fig. 6 is a similar view with a portion of the top broken away. Fig. 7 is an edge elevation of same. Fig. 8 is a perspective view of the electrical stop connected therewith.

In this system a central station or office is used, in which are located the working parts, except the signal boxes on the main line.

A indicates the relay, B the differentiating apparatus, C an engine house or fire department station, E a police or other station, and F an electro magnet for operating a register at the central station whereon is recorded the number of the box from which the signal is sent.

The relay A is made double where connection is made by circuits with two different departments, such as fire and police. It consists of two pairs of electro-magnets a a and a' a', two sets of swinging armatures c c' c^2 and c^3 c^4 c^5 located at opposite ends of the magnets, and two upright contact posts b and b'. The armatures play between the magnets and the posts in the usual way.

The object of the differentiating apparatus B is to change the current from one circuit to another by the rotation of an arm which comes successively in contact with different conducting points on an insulated surface of the box. It consists of a box provided with a conducting base plate f and an exterior face d, of rubber or other insulating material.

g is a time movement or clock work of any suitable construction and h an escapement connected therewith.

i is an arm, which I denominate the swinging arm, attached to a shaft of the time movement, said shaft extending from the base out through the insulated face, and the arm resting across the face, but not in contact therewith. The time movement when released gives motion to the arm and causes it to traverse over the face of the apparatus.

k k' l l' and m are contact blocks forming conductors set into the insulated face, and n n' are spring tongues attached to the swinging arm i and connected together by a web n^2 said tongues and their connection being insulated from the arm by a rubber block o. As the arm rotates the spring tongues come in successive contact with the several conducting blocks and change the currents, as will be more fully described.

p p is an electro magnet, and q a pivoted crank forming an armature which operates in connection with said magnet. On the outer end of this crank is a pin q' which passes out through a slot of the face of the apparatus and intercepts a corresponding pin r, on the under side of the swinging arm i, thereby holding said arm against rotation. When the magnet p p is charged the armature is drawn back removing pin q' from the path of pin r and allowing the swinging arm to rotate.

s s is another electro magnet connected with the apparatus, and t an armature pivoted at t' and provided with an inclined lug t^2. The armature t is pressed forward by a spring u tightened by a screw v. When the magnet is charged it overcomes the spring and draws the armature back.

w is an arm provided with a pivot w' connected with the base, the free end of the arm engaging with the inclined lug t^2 of the armature. When in this position the arm w rests in contact with a spring x attached to an insulating block y. When the armature is drawn back by the magnet the arm w frees from contact with the spring and opens the

circuit passing therethrough, and remains open till arm w is struck by a pin z on the shaft of the swinging arm i which restores it to place by pressing it under the lug t^2. The arm w is drawn from contact with spring x by a coiled spring j.

The above described arrangement is for communication with the fire department only.

The same arrangement is duplicated on the opposite side of the apparatus, consisting of magnets s' s', armature t^3 provided with inclined lug t^4, spring w', screw v' pivoted arm w^2, contact spring x' attached to insulating block y', and coiled spring j', the whole operating to establish communication with the police department or other station than the fire department.

The main circuit consists of two wires 1 and 2 laid through the streets or other locality where the line is to be established, said wires being provided, respectively, with batteries G H, or other sources of electricity. The terminals of wire 1 connect with the two contact blocks k k' on the face of the differentiating apparatus, and the terminals of wire 1 with the two sets of magnets a a' of the relay, as shown in the diagram Fig. 1. The main line is provided with suitable fire boxes N, police boxes P, and auxiliary boxes L, the latter connected with circuits extending through buildings and provided with thermostats and manuals, either or both. By means of these boxes signals are sent to the various destinations over the same main line. Under normal conditions the circuit through the main line is closed, the magnets of the relay are charged, and the armatures of the relay are drawn in connection with the magnets. But any opening of the circuit of the main line releases the armatures, which are then drawn toward the posts b b', and the circuits at the central station are then ready to come into operation. The circuits are as follows:—A circuit extends from battery J, through wire 3 to armature c', thence, (when the main circuit has been broken and said armature is in contact with post b,) through post b, wire 4, through the register magnet F, charging same and causing it to operate the registering apparatus, through wire 5, magnet p p, charging same, wire 6, (touching the conducting block m,) back to battery J, completing the circuit. The energizing of magnet p p draws back armature q, removes pin q' from the path of pin r and thereby releases the swinging arm i and allows it to rotate by means of the time mechanism before described. Prior to this time the spring tongues n n' have remained in contact with the blocks k k'. They now leave said blocks and pass to blocks l and m. Another circuit extends from battery K to the fire department. This circuit is from battery K through wire 7, upright e, armature c', wire 8, the magnet at the fire station, and wire 9 back to battery K. Auxiliary to circuit K is another circuit thus:—from battery K through wire 7, wire 10, spring, x, arm w, the pivot w' of said arm, through the metallic base of the differentiating apparatus, wire 11, wire 8, the magnet at the fire department, and wire 9 back to battery K. Another circuit extends from the central station to the police or other department, from battery I through wire 12, upright e', armature c^3, wire 13, the magnet at the police station, wire 14, back to battery I. Auxiliary to this circuit is a circuit from battery I through wire 14, the magnet at the police station, wires 13 and 15, spring x', arm w^2, the pivot w^3, of said arm, the base of the apparatus, wire 16, and wire 12 back to battery I.

The circuit K and its auxiliary just described are duplicates of the circuit I and its auxiliary before described, one circuit and its auxiliary connecting with the police department and the other circuit and its auxiliary with the fire department.

The first action in opening and then closing the main circuit through wire 2 is to temporarily close the local circuit J, and thus release the time mechanism of the differentiating apparatus and allow the swinging arm i to rotate as before described. The movement of arm i now causes the tongues n n' to come in contact with the blocks l m, thereby forming a new circuit, from battery J through wire 3, armature c' (then in contact with the upright of the relay magnet), wires 17 and 18, magnet s s, wire 19, to contact block l, through tongues n n' to contact block m, through wire 6, back to battery J. The charging of magnet s s draws back armature t and releases the arm w allowing it to separate from the spring x, thus breaking the shunt circuit that previously existed by the contact of the arm with the spring and extending through the base of the apparatus to wire 11. The further progress of swinging arm i causes tongue n to leave block l, breaking the circuit just described, and brings tongues n n' in contact with blocks l' m, and forms a new circuit, from battery J through wire 3, armature c', upright e, wires 17 and 20, magnet s' s', wire 21, contact block l', tongues n n', block m, and wire 6 back to battery J. The energizing of magnet s s' s' draws back armature t^3 releases the pivoted arm w^2 from spring x' in the same manner as on the opposite side of the differentiating apparatus, thereby breaking the shunt circuit that previously existed leading from battery I through the base of the apparatus to wire 16. This shunt circuit, together with its companion on the opposite side, will not be re-established again until arms w and w^2 are forced into contact with the armatures t and t^2, by the pin z near the end of rotation of the swinging arm i. Under such conditions, with both shunt circuits open, the circuit through the fire department is from battery K through wire 7, upright e, armature c c' (then drawn back by the magnets a a, and subject to any action of the relay), wire 8, through the magnet at the fire station, and wire 9 back to bat-

tery K. At the same time the circuit through the police station is from battery I through wire 12, upright e', armatures c^3 c^4, wire 13, through the magnet at the police station, and wire 14 back to battery I.

It will be seen that the register F, the magnets at the fire station C and the police station E, are each, through the armatures at the relay, rendered susceptible to the operation of the relay, and that the circuits are changed to send the signal to one department or the other through the instrumentality of the differentiating apparatus before described. By the use of this differentiating apparatus all signals which come to the central station are recorded there and dispatched to the proper destination, such as the fire department or the police department, without one interfering with the other.

The box L, which forms the subject of my present invention has a base plate f^{13} and an insulated face plate d^4 similar to those of the differentiating apparatus. It also has a time mechanism g' and swinging arm i' similar to those of said apparatus.

a^{10} a^{11} a^{12} a^{13} a^{14} a^{15} a^{16} a^{17} a^{18} a^{19} a^{20} are conducting rings and blocks attached to the insulated face.

The swinging arm i' has two pairs of spring tongues n^9 n^{10} and n^{11} n^{12}, the tongues of each pair connected together and insulated from the arm, and a single intermediate tongue n^{13} electrically connected with the arm. These several spring tongues rest over and in line with the sets of conducting rings and blocks.

p^2 is an electro magnet similar to the magnet p p of the differentiating apparatus, and f^2 a pivoted armature provided with an inclined lug f^5. It also has a crank arm h^2 carrying a stop pin q^9 at its outer end, which stands in the path of a corresponding pin r^9 on the under side of the swinging arm. The energizing of magnet p^2 attracts the armature, releases the crank-arm, and removes the stop-pin allowing the swinging arm to rotate.

o^2 is a small wheel on the shaft of the swinging arm, against the periphery of which bears a spring r^2, pressed up by a spring s^2, the object of which is to apply sufficient friction to prevent back action of the gearing of the clock work.

t^{15} and t^{14} are two plungers resting in a barrel attached to the case and forced up by spring t^{16}. These plungers have projecting pins u^2 u^2 against which the end of the swinging arm strikes in its rotation. By pressing down on the first plungers the pin is depressed allowing the swinging arm to pass to the second plunger, and by pressing on the second plunger it allows the arm to pass to the stop-pin on the end of crank-arm h^2, from which it is started only by the electrical action.

The box L is interposed in the main line, and from it extends the lateral circuit 23, which passes through a building, or other place to be guarded, and is provided with thermostats and manuals, either or both, in the usual way.

The operation is as follows:—The condition of the box L being normal, the current is from battery H through wire 1, wire 22, contact block a^{20}, tongues n^9 n^{10}, block a^{18}, wire 23 forming the circuit through the building, block a^{12}, tongues n^{12} n^{11}, block a^{14}, wires 24 and 1 back to battery H. To complete the circuit the tongues n n' of the differentiating apparatus must be in contact with the blocks k k'. If, for any reason, wire 23 is broken, the current of wire 1 being shut out of the building will seek another escape, and will pass by a shunt circuit from battery H through wire 1, wire 25, resistance coil 26, wire 27, electro magnet p^2, wire 34, contact block a^{12}, tongues n^{12} n^{11}, block a^{14}, and wires 24 and 1 back to battery. The current through wire 2 is from battery G, to the base of the instrument at z^4, through the swinging arm i', tongue n^{13}, block a^{17}, and wires 28 and 2 back to battery G. In case wire 23 of the building line is broken magnet p^2 is energized, as before described, thus attracting the armature, withdrawing the stop-pin that restrains the swinging arm, and the swinging arm then begins to rotate. For a short period after commencing its rotation the current in both wires 1 and 2 are absolutely broken, and remain so until the swinging arm brings tongue n^{13} in contact with block a^{16}, tongue n^9 in contact with block a^{19}, and tongue n^{10} in contact with block a^{18}. At this point it is to be determined whether the circuit in the building wire 23 has been broken and immediately restored, as by a thermostat or manual signal, or whether, on the other hand, it has been permanently destroyed, as in the case of a broken wire. In case it has been broken and immediately restored the current through wire 2 is as follows:—from battery G through wire 2 to base of the instrument at z^4, swinging arm i', tongue n^{13}, block a^{16} with which the tongue is then in contact, wire 29, wire 23, contact block a^{18}, tongues n^{10}, n^9, contact block a^{19}, wire 31, wire 2, back to battery. In case where wire 23 in the building is permanently broken there is no current until the further progress of the swinging arm has brought tongues n^{11} n^{12} in contact with the rings a^{10} and a^{11}. In the case of the immediate restoring of wire 23 the further progress of the swinging arm brings tongue n^{13} in contact with block a^{15}. The current is then from battery G, wire 2 to base of the instrument at z^4, swinging arm i', tongue n^{13}, block a^{15}, wire 30, wire 23, block a^{18}, tongues n^{10} and n^9, block a^{19} (with which n^9 is then in contact), wire 31, wire 2, back to battery. This current will energize any electro receptive devices placed in wire 30. The further progress of the swinging arm i' brings tongues n^{11} n^{12} in contact with the rings a^{10} a^{11}. From this time on during the movements of the swinging arm the circuit in wire 2 is the same whether the wire 23 in the building has been broken permanently or has been broken

and immediately restored. In either case the signal will be transmitted to the central station. But in case the circuit has been broken and immediately restored, as by a manual box or thermostat, the signal will be transmitted to the central station and the fire and police departments, while if permanently broken it will be transmitted to the central station only, thus determining at once what is the difficulty and avoiding unnecessary alarms. The condition now is that the tongues n^{11} n^{12} are in contact with the rings a^{10} a^{11}, respectively, and progressing around the instrument. The circuit of wire 2 is now as follows:—from battery G through wire 2, branch wire 1, ring a^{11}, tongues n^{12} n^{11}, ring a^{10}, wire 32, and wire 2 back to battery. Ring a^{11} is notched on its face in two series with the numbers indicating the box as shown at v^2 v^2. As the swinging arm progresses over the face of the instrument tongue n^{12} engages said notches and alternately opens and closes the circuit in a well known way, thus signaling the number of the box at the central station over wire 2. The further progress of the swinging arm brings tongues n^9 n^{10} in contact with blocks a^{20} a^{18}, tongue n^{13} in contact with block a^{17}, and tongue n^{12} in contact with block a^{13}. The circuit now in wire 1, which is restored, is from battery H through wire 1, wire 33, block a^{13}, tongues n^{12} n^{11}, block a^{14}, wire 24, wire 1 back to battery.

The current through wire 2, which has been maintained, is from battery G through wire 2, base of the instrument at z^4, swinging arm i', tongue n^{13}, block a^{17}, wire 28, wire 2 back to battery. Here the swinging arm is stopped by the first finger stop until the lineman, having repaired the broken wire 23 through the building, puts the same in condition for further service. The finger stops for stopping the swinging arm are to enable testing to be made without sounding an alarm at the central station. After such testing has been made the swinging arm is released from the stops and allowed to move forward to the electrical stop-pin on the end of the cranked-arm, when it is ready to be released by the electrical action as before described.

By the construction before described the boxes L are ready to give the signal when the swinging arm has been released from the finger stops and rests against the electrical stop. Any opening of the current in the building wire 23 operates said electrical stop and allows the arm to rotate. The construction is such that the boxes on the line are non-interfering, and while one box is sending in its signal no other box can come into operation, for the reason that at such time the current through wire 1 is broken. But as soon as the first box completes its action the current in wire 1 is restored and a second box can then come into action and give its signal.

Having described my invention I do not claim, in this application, the main line, the street boxes connected therewith, the relay, the differentiating apparatus and the circuits extending to side stations, as embodied in other applications which I have filed contemporaneously herewith, and serially numbered respectively, 483,022, 483,023, 483,024, and 483,025.

What I claim as new, and desire to secure by Letters Patent, is—

1. In an electric signaling apparatus, the combination, with a main circuit composed of two wires, and a lateral circuit provided with thermostats and manuals, either or both, of a box connected with said wires provided with an insulated face, a set of conducting blocks connected therewith, a movable arm provided with contact points resting in line with the conducting blocks and capable of changing the circuits by moving from one block to another, and suitable electrical connections connected with said blocks, as shown and described and for the purpose specified.

2. In an electric signaling apparatus, the combination of a box, a movable arm resting over the face of the box, two manual stops, one in advance of the other, for restraining the movable arm, and an electrical stop succeeding the manual stops for restraining the arm, said electrical stop being controlled by an electro magnet, as specified.

3. The combination, with the movable arm, of two plungers provided with outstanding pins forming stops to the arm, one succeeding the other, and springs for pressing the plungers upward, as described.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

W. W. HIBBARD.

Witnesses:
R. F. OSGOOD,
GEORGE A. BENTON.