

(No Model.)

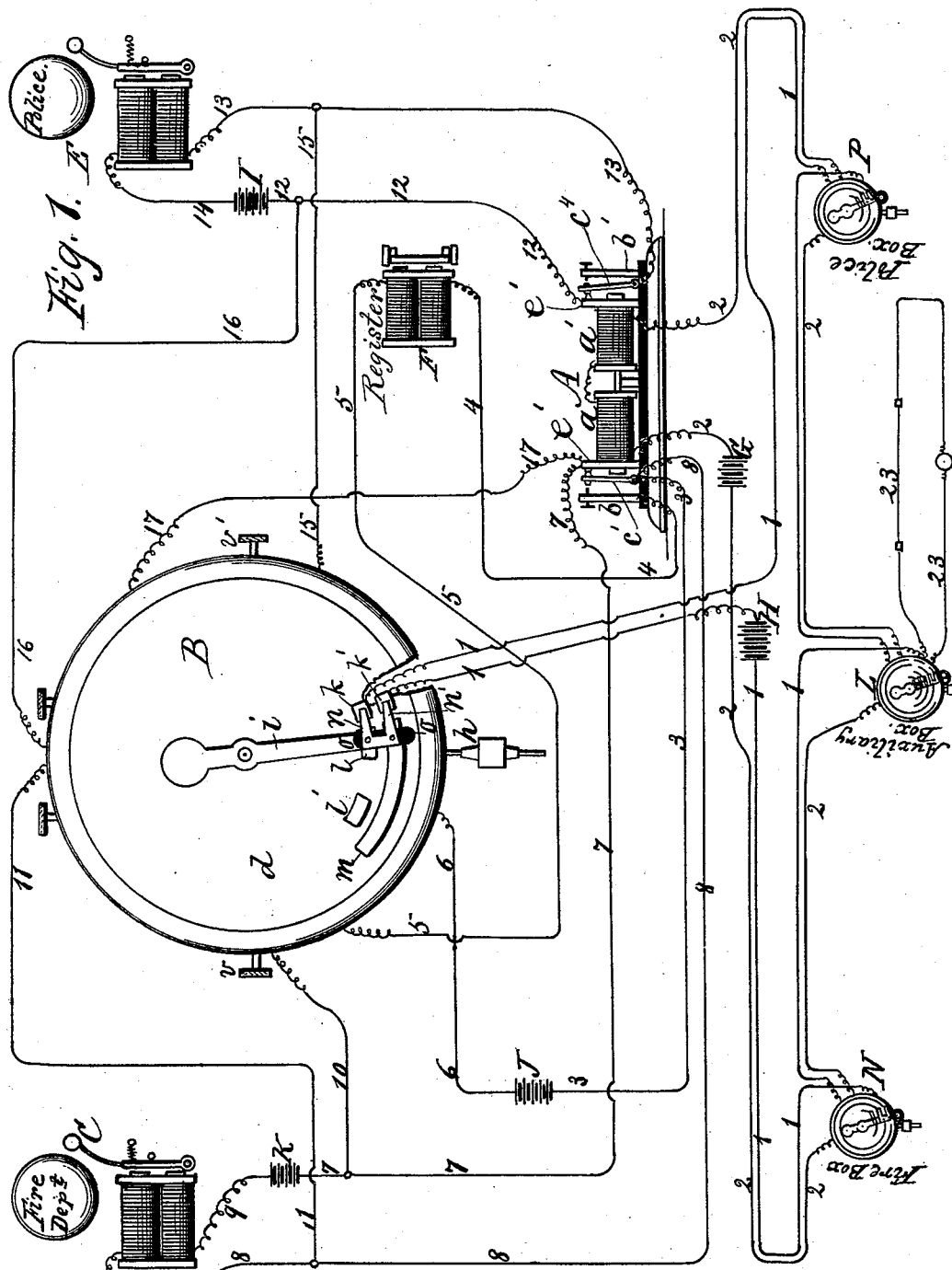
2 Sheets—Sheet 1.

W. W. HIBBARD.

DIFFERENTIATING APPARATUS FOR ELECTRIC SIGNAL SYSTEMS.

No. 523,122.

Patented July 17, 1894.



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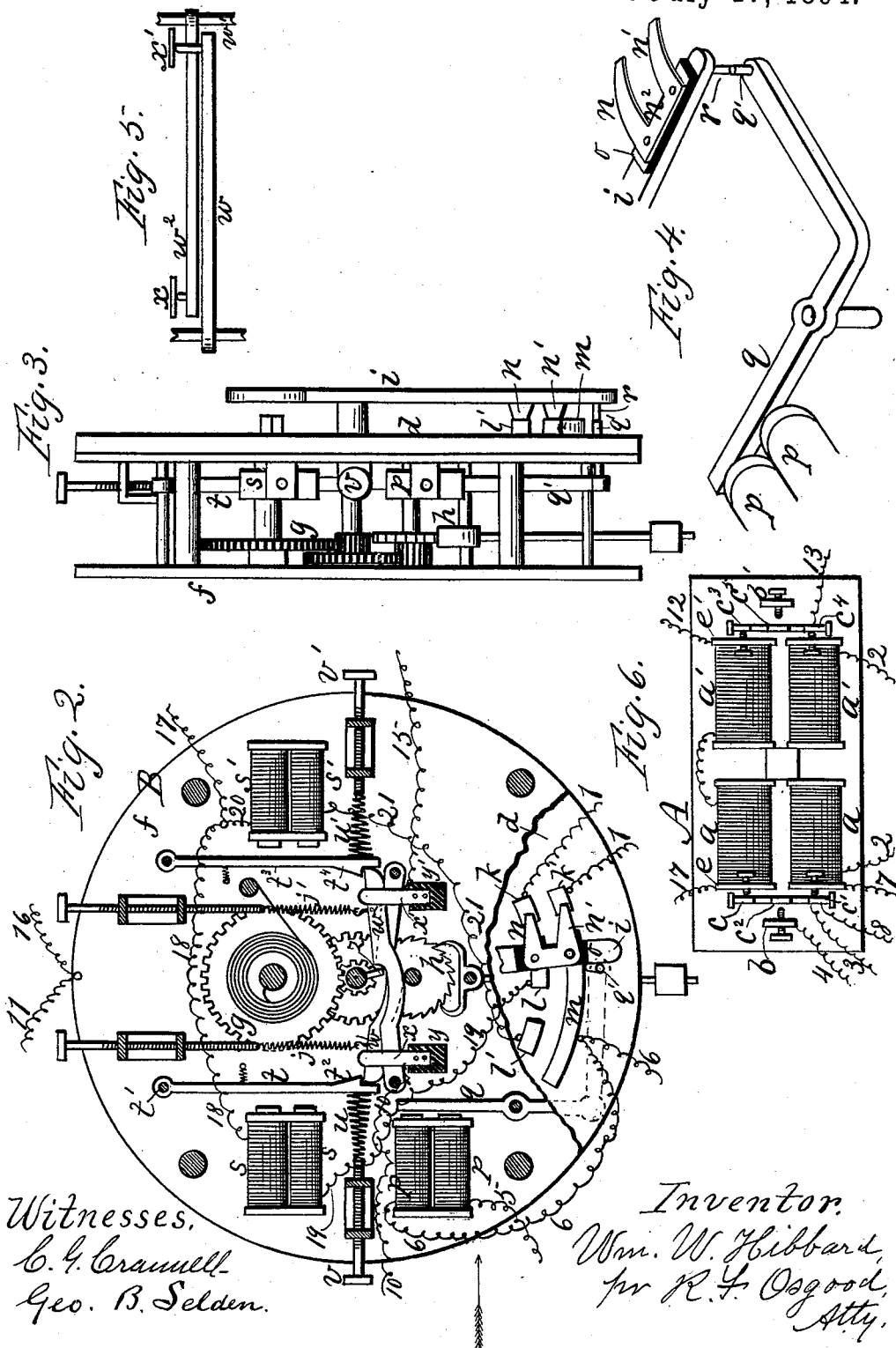
Inventor.  
Wm. W. Hibbard,  
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Atty.

# UNITED STATES PATENT OFFICE.

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

## DIFFERENTIATING APPARATUS FOR ELECTRIC SIGNAL SYSTEMS.

SPECIFICATION forming part of Letters Patent No. 523,122, dated July 17, 1894.

Application filed August 12, 1893. Serial No. 483,024. (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  
5 new and useful Improvement in Differentiating Apparatus for Electric Signal Systems; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the drawings accompa-  
10 nying this application.

This improvement relates to electric signaling apparatus, and consists of a differentiating apparatus located at the central station, capable by its action of changing the circuits,  
15 thereby enabling signals to be sent over the main line to different points, such as fire and police departments, without interference or difficulty.

In the drawings—Figure 1 is a diagram  
20 showing the general system with which the differentiating apparatus is used. Fig. 2 is an enlarged face view of the differentiating apparatus with a portion of its top broken away to show the interior construction. Fig.  
25 3 is an edge elevation of the same. Fig. 4 is a perspective view of the electrical stop apparatus connected with the same. Fig. 5 is a diagram showing a front elevation of the pivoted arms forming a part of the apparatus.  
30 Fig. 6 is a plan view of the relay used in the system.

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.

35 A indicates the relay, B the differentiating apparatus which forms the subject of my present invention, C an engine house or fire department station, E a police or other station, and F an electro magnet for operating a reg-  
40 ister 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 de-  
45 partments, such as fire and police. It consists of two pairs of electro magnets  $a$   $a'$  and  $a''$   $a'''$ , two sets of swinging armatures  $c$   $c'$   $c''$  and  $c'''$   $c''''$   $c'''''$  located at opposite ends of the magnets, and two upright contact posts  $b$  and  
50  $b'$ . 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  
55 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  
60 suitable construction and  $h$  an escapement connected therewith.

$i$  is an arm forming a circuit breaker, which I denominate the swinging arm, attached to a shaft of the time movement, said shaft ex-  
65 tending 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  
70 of the apparatus.

$k$   $k'$   $l$   $l'$  and  $m$  are contact blocks forming electrodes set into the insulated face, and  $n$   $n'$  are spring tongues forming contact points  
75 attached to the swinging arm  $i$  and connected together by a web  $n''$  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  
80 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  
85 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  
90 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  
95 at  $t'$  and provided with an inclined lug  $t''$ . 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  
100

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  $u'$ , screw  $v'$  pivoted arm  $w^3$ , contact spring  $j'$  attached to insulating block  $y'$ , and coiled spring  $x'$ , 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 2 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 toward 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 magnets  $p p$  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  $w^3$ , 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 magnets  $s s$  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  $s' s'$  draws back armature  $t^3$  releases the pivoted arm  $w^3$  from spring  $x'$  in the same manner as on the opposite sides 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  $w^3$  are forced into contact with the armatures  $t$  and  $t^3$ , 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 battery K. At the same time the circuit through the police station is from battery I through wire 12, upright *e'*, armature *c<sup>3</sup> c<sup>4</sup>*, 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.

Although as shown in the drawings the main line consists of two wires 1 and 2, the single wire 2 is effective alone and without the other wire in all ordinary uses. Wire 1 is used only in a non interfering system not here described.

Having described my invention I do not claim, in this application, the system consisting of a main line, relay, differentiating apparatus, and circuits extending to side stations, as embodied in my pending applications, serially numbered respectively 483,022 and 483,023. Neither do I claim the construction of the various signal boxes used in the main line, as embodied in my pending applications, serially numbered respectively 483,025 and 483,026, all filed contemporaneously with this.

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, and with a magnet controlling a side circuit, of a differentiating apparatus provided with insulated electrodes respectively in connection with the main circuit and magnet, said differentiating apparatus provided with a circuit breaker having an insulated contact point resting in line with the electrodes, and operated by suitable means, as and for the purpose specified.

2. The combination, with a main circuit and

with two side circuits, of a differentiating apparatus provided with three insulated electrodes, respectively in electrical connection with said three circuits, a circuit breaker with contact points in line with said electrodes, and suitable mechanism for operating the circuit breaker, said apparatus capable, under one condition of placing both side circuits in electrical connection with the main circuit, under another condition of placing only one side circuit in connection with the main circuit, and under another condition stopping the signal at the main station, as specified.

3. The combination, with a main circuit, of a differentiating apparatus, two insulated electrodes with which the terminals of the main circuit connect, a circuit breaker provided with contact points which rest in line with said electrodes, and means for giving motion to said circuit breaker, the whole so arranged as to close the circuit through the main line by the engagement of the contact points with the electrodes and to open it by their disengagement, as described.

4. The combination, with a main circuit composed of two wires, of a differentiating apparatus, two insulated electrodes with which the terminals of one of the wires connect, a circuit breaker provided with contact points which rest in line with said electrodes, and suitable means for operating the same, the whole capable when in operation of opening one line of the main circuit and holding it open while a signal is being transmitted over the other line, and closing it again after said signal has been transmitted, as specified.

5. In an electric signaling apparatus, the combination, with a main circuit, of a differentiating apparatus in electrical connection therewith, provided with insulated electrodes and a circuit breaker, a circuit connected therewith extending to a side station, a magnet which controls the side circuit, a mechanism for operating the circuit breaker, and a local circuit in electrical connection with said mechanism and the main circuit, for controlling the mechanism, as specified.

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.