J. D. NELSON.

ELECTRICAL SIGNALING APPARATUS.

APPLICATION FILED MAY 4, 1907.

920,378.

Patented May 4, 1909.

2 SHEETS—SHEET 1.

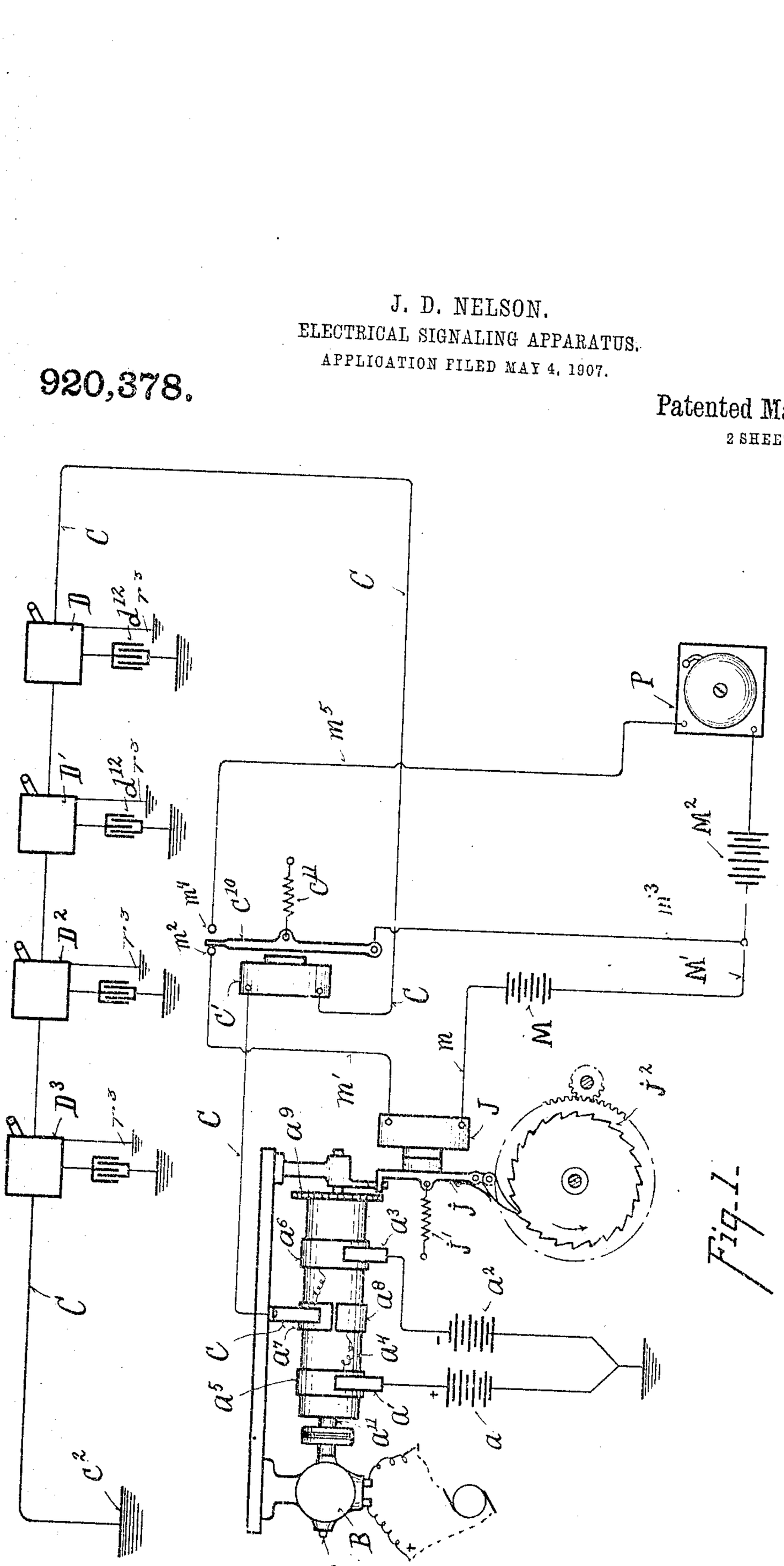


Fig. 1.

WITNESSES:

C. W. Miller

A. McCormack.

INVENTOR.

James D. Nelson

BY Walter F. Murray

ATTORNEY.

J. D. NELSON.

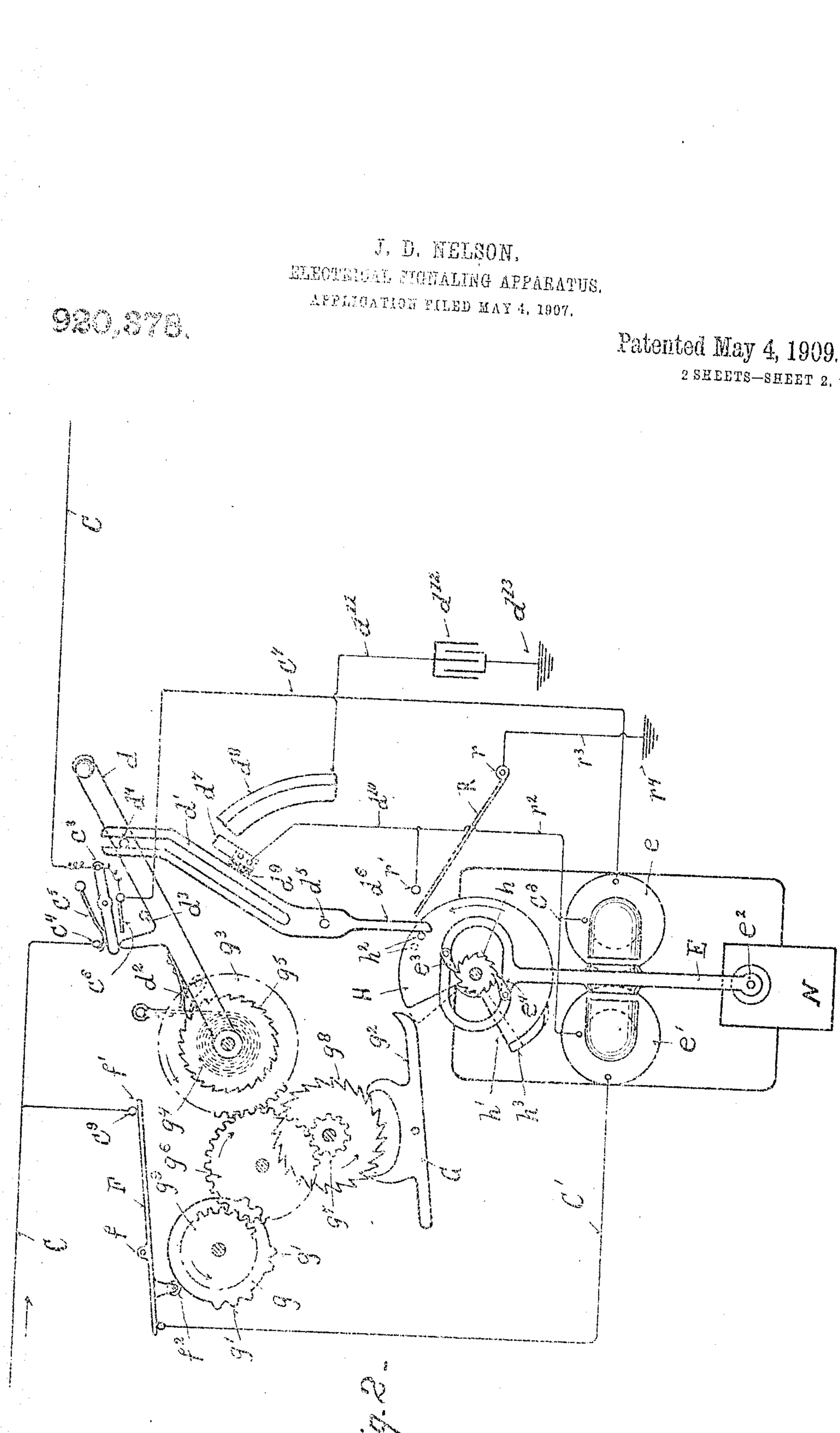
ELECTRICAL SIGNALING APPARATUS.

APPLICATION FILED MAY 4, 1907.

920,378.

Patented May 4, 1909.

2 SHEETS—SHEET 2.



WITNESSES:

C. W. Bailey

A. Dee Cormack

INVENTOR.

James D. Nelson

BY Walter F. Murray

ATTORNEY.

UNITED STATES PATENT OFFICE.

JAMES D. NELSON, OF CINCINNATI, OHIO

ELECTRICAL SIGNALING APPARATUS.

No. 920,378. Specification of Letters Patent. Patented May 4, 1909.

Application filed May 4, 1907. Serial No. 371,804.

To all whom it may concern:

Be it known that I, JAMES D. NELSON, a citizen of the United States of America, and resident of Cincinnati, county of Hamilton, State of Ohio, have invented certain new and useful Improvements in Electrical Signaling Apparatus, of which the following is a specification.

My invention relates to signaling apparatus, which include an electrical circuit, interposed in which are signaling devices, or boxes, which may be actuated to make and break the circuit and thereby to send in signals to a main office.

The object of my invention is an apparatus of this kind wherein the actuation or "pulling" of one signal box automatically prevents the running of another box until the first one actuated has finished sending in its signal, wherein should two boxes be pulled simultaneously, the one nearest the office automatically prevents those more remote from sending in their messages until it has finished its message, and in which, should the circuit become broken or "opened" beyond a signal, means is provided whereby the box may still send in its message. This object is attained by the means described in the specification and illustrated in the accompanying drawings, in which,

Figure 1 is a diagrammatical view of an apparatus embodying my invention, showing the office or receiving part of the apparatus, in detail, and the signaling devices, or boxes in a general way. Fig. 2 is a detail view upon an enlarged scale, of one of the boxes.

A general description of my apparatus is this: The circuit is normally supplied with an undulating current, such as an alternating current, or a reversed current. When the boxes are in their normal position, the current does not pass through them, but when the handle or lever of a box is pulled, this directs the current through that signal box. In going through the box, the current passes through a switch, which when vibrated, will send a signal to the main office. This signaling switch is to be vibrated by a wheel, which is held locked by a clock mechanism, which in turn is locked by a pawl held normally in position by a cam, which is connected to the armature of a magnet, through which the current passes when the box is pulled. The passing of the current through this magnet, vibrates the armature, and a certain number of vibrations of the armature turns the cam a distance such as to release the pawl, which has been locking the clock mechanism. The clock mechanism then vibrates the switch, which breaks the circuit, and thereby sends the signal back to the main office. The first break in the circuit has the effect of changing the current in the circuit from an undulating one to a direct current. Since it requires an undulating current to release the clock mechanism, it is seen that other boxes which may be pulled will not have their clock mechanism released to send in a signal until the first box to be pulled has completed its signal. Having given this general idea of the operation of my device, I will now proceed to give a description more in detail.

Referring to Fig. 1: a, indicates a source of electrical energy from which a positive current proceeds to brush, a'. a^2, indicates the negative source of supply connected to a brush, a^3. a^4, is a cylinder which carries electrical conductors, a^5, a^6, which contact the brushes, a', a^3. a^7, a^8, are semi-cylindrical rings mounted upon cylinder, a^4. Semi-cylindrical ring, a^8, is in electrical communication with the positive band, a^5, and semi-cylindrical ring, a^7, is in electrical communication with the negative band, a^6. Cylinder, a^4, is rotated by a motor, B. While the cylinder, a^4, is kept rotating, it is seen that the brush, c, will supply an undulating current to the main line, C, which passes around a magnet, c', and thence past the signaling devices, D, D', D^2, D^3, etc., and thence to the ground at c^2, beyond the last of the signaling devices. At each signaling device, a switch, c^3, is inserted in the circuit. Switch, c^3, is held normally upward by the lever, d, of the signaling device, so that it makes contact with point, c^4, but when the lever, d, is pulled downward, switch, c^3, falls by gravity, or is pushed downward by a spring, c^5, so as to come into contact with point, c^6, which is connected with a wire, c^7, which leads to one pole, e, of a polarized magnet, is wound around that pole, proceeds thence to a contact point, c^8, thence is wound around the other pole, e', of the magnet and passes thence to the switch, F, the vibration of which is to break the circuit to send the signal into the office. Switch, F, is pivoted at, f, and is held so that its end, f', normally makes contact with the point, c^9, so that the current coming from the brush, c, in the of-

fice, may pass through the line, C, to the contact point, c^9, thence through the switch, F, the poles of the magnet, e, e', thence to the contact point, c^6, through the lever, c^3, to the line, C, and thence onward to the ground at c^2, when the handle, d, of a box has been pulled. The other end of the lever, F, carries a wheel, f^2, which is held in contact with a pinion, g, of a clock mechanism. This pinion, g, has teeth, g^1, at intervals, so that when the pinion, g, is rotated, the teeth, g', will intermittently make contact with the wheel, f^2, and raise that end of the switch, F, and intermittently break the circuit at, c^9. The pinion, g, is actuated by suitable clock mechanism, which is normally locked by a pawl, G, whose end, g^2, makes contact with a cam, H, which is rotated by the vibration of armature, E, which is pivoted at, e^2, between the poles, e, e', of the magnet. As long as the undulating current is passing through the circuit, C, the armature will vibrate between the poles, e, e', and its vibration will be communicated through pawls, e^3, e^4, to a pinion, h, mounted upon the shaft of the cam, H, so that the vibration of the armature, E, communicates a rotation to the cam, H, in the direction of the arrow, shown in Fig. 2. The cam, H, has been set by the lever, d, through the means of the intermediate lever, d', in a position such that it will take a certain number of vibrations of the armature, E, to bring the notch, h', in the cam beneath the pawl, G, at which time the end, g^2, of the pawl, G, will drop into the notch, h', and release the clock mechanism, which will then actuate the pinion, g, to vibrate the switch, F, and break the circuit at, f', to send in the signal.

I will now describe the clock mechanism and the action of the levers, d, and d', more in detail, and will then call attention to the mechanism whereby the first break in the circuit caused by the vibration of the switch, F, will change the current from an undulating, to a direct one. Lever, d, is journaled upon the shaft of a wheel, g^3, upon which a coiled spring, g^4, is wound. Lever, d, carries a pawl, d^2, which engages the teeth, g^5, formed upon the wheel, g^3. The pulling down of the lever, d, coils the spring, g^4, more tightly, so that upon the release of the pinion, the spring will cause it to be raised again until it comes into contact with stud, d^3, at which point the arm of the lever, d, will have made contact with the switch, c^3, and have thrown it into contact with the point, c^4. Pinion, g', meshes with a pinion, g^6, which in turn meshes with a small pinion, g^7, mounted upon the shaft of pinion, g^8, the last of which is normally engaged by the pawl, G. Pinion, g^5, also intermeshes with a pinion, g^9, mounted upon the same shaft with the pinion, g. Through this strain of gears, the rotation of the wheel, g^3, is conveyed to the pinion, g, when the pawl, G, has released the pinion, g^8. Lever, d, has a stud, d^4, which engages the upper end of secondary lever, d', which is fulcrumed at d^5 and whose lower end, d^6, is in the path of a stud, h^2, upon the cam, H. When the lever, d, is pulled downward, it rotates the lever, d', about its fulcrum point, d^5, and the end, d^6, of the lever rotates the cam, H, so that the pawl, G, is raised out of the notch, h', and interlocked with the pinion, g^8, and likewise places the cam, H, in relation to the pawl, G, such that it will take a certain number of vibrations of the armature, E, to bring the notch, h', underneath the pawl, G, to release the pinion, g^8, to set the clock mechanism in motion and to vibrate the switch, F.

The first break in the circuit, C, made by the lever, F, causes the cylinder, a^4, at the main office (see Fig. 1) to cease revolving and thereby changes the current in the main line, C, from an undulating to a direct current. The means by which this break in the current, C, is instrumental in creating this change in the circuit, is as follows: Adjacent to cylinder, a^4, is a magnet, J, whose armature, j, when the magnet, J, is deënergized, is drawn by a spring, j', into contact with the teeth, a^9, secured upon the end of the cylinder, a^4, in order to stop the rotation thereof. The connection between the shaft, a^{11}, of the cylinder, a^4, and the shaft, b, of the motor, B, is frictional, so that when the pawl, j, engages with the teeth, a^9, the rotation of the cylinder, a^4, is stopped. The coils of magnet, J, are connected by wires, m, with a positive pole, of a battery M and upon the other side are connected by a wire, m', to a contact point, m^2, which stands adjacent to the armature, c^{10}, of magnet, c'. When the magnet, c', is energized, the armature, c^{10}, stands in contact with the point, m^2. The opposite end of the armature, c^{10}, is connected by a wire, m^3, and a wire M' with the negative pole of battery M. Adjacent to the free end of armature, c^{10}, is a second contact point, m^4, from which a wire, m^5, leads through a gong, P, to the positive pole of a battery M^2.

When the first break in the circuit, C, is made by the switch, F, the magnet, c', becomes deënergized for a moment and the spring, c^{11}, then draws the armature, c^{10}, into contact with the contact point, m^4. This breaks the circuit from the battery, M, through the magnet, J, which deënergizes the same and permits the spring, j', to draw the armature, J, into contact with a tooth, a^9, thereby stopping the rotation of the cylinder, a^4, and changing the current in the main line, C, to a direct current. The return movement of the armature, j, toward the magnet, J, is retarded by clock work, j^2, so that the intermittent energy of the magnet, c', while the switch, F, is vibrating, is not of sufficient duration to draw the arma-

ture, j, back into contact with the magnet, J, so that the armature, j, remains in contact with the teeth, a^9, until the lever, d, has regained its normal position in contact with the stud, d^3, and the clock work, g through g^9, has come to rest. While the armature c^{10} is in contact with the point, m^4, the current passes through the wire, m^3, the armature, c^{10}, the wire, m^5, through the gong, P, and causes the same to ring in response to the vibrations in the switch, F, and thus gives a signal at the office. As soon as the clock-work, g through g', has come to rest, the steady direct current through main line, C, will hold the armature, c^{10}, in contact with the point, m^2 causing the magnet, J, to remain energized, thereby throwing the armature, j, out of contact with the teeth, a^9, and permitting the cylinder, a^4, to start rotating again and starting the undulations in the circuit, C, again. As long as the current in the circuit, C, remains direct, no clock-work of a box can be released, since it takes an undulating current to vibrate the armature, E. Thus, after the box has started to send in its signal, its message cannot be interrupted by the sending of a message through another box.

Should the levers, d, of two or more boxes be pulled simultaneously, the messages of all boxes except the one nearest the office are cut off automatically by the box nearest the office in the following manner: Adjacent to the notch, h', cam, H, has a tooth, h^3, which just before the time the notch, h', comes to register with the pawl, G, makes contact with a switch, R, which is pivoted at, r, and stands adjacent to the cam, H, and carries it into contact with point, r', which is connected by a wire, r^2, with the contact point, c^8, to which the wires of the poles, e, e', of the magnet are connected. The pivot, r, of the switch, R, is connected by a wire, r^3, with the ground. When the switch, R, contacts the point, r', the current from the main lines, C, instead of passing through the wire, c^7, and on to the other boxes, is turned from the point, c^8, through the wire, r^2, through the switch, R, to the wire, r^3, and then to the ground, at, r^4. Thus, before the boxes more remote from the main office, which may have been pulled at the same instant with the nearer box, have reached the point where their cams, H, are brought to a position to release their pawls, G, their current is cut off and their armatures, E, will stop vibrating. Thus the cam, H, the depressed lever, d, the pawl, G, the armature, E, and the rest of the mechanism of the box will all be held in the position in which they were when the current was cut off from them until the first box has finished sending in its message, and the armature, j, has been brought back into contact with the magnet, J, again starting an undulating current in the main line, C, to finish the vibrations of the armature, E, in the boxes that have been stopped to allow them to send in their massages. If there be more than two of these boxes which have been stopped, it is seen that the one nearer the office will send in its message first, since it will cut off boxes more remote than it, until it has finished its message.

Should the circuit, C, become broken and left open beyond a box, I have provided means whereby the boxes between the break and the main office may send in their signals. Lever, d, of each box is provided with a strip, d^7, which rides over a track, d^8, of conducting material. Strip, d^9, which is mounted upon the lever, d', and carries the strip, d^7, is of insulating material. The strip, d^7, is connected by a wire, d^{10}, with contact points, c^8, to which the wires from the poles, e, e', of the magnet lead. The track, d^8, is connected by wire, d^{11}, with a condenser, d^{12}, which is connected at d^{13}, to the ground. Now, should the circuit be open beyond a box, when the lever, d', is depressed by the lowering of the lever, d, strip, d^7, comes into contact with the track, d^8. Thereupon the current flows from the circuit, C, to the point, c^8, thence from the point, d^{10}, through the strip, d^7, to the track, d^8, thence through the wire, d^{11}, to the condenser, d^{12}. The magnet, e, e', is made of a strength such that the winding about one pole, e', energizes the magnet sufficiently to vibrate the armature, E, to release the clock mechanism and to send in the signal.

What I claim is:

1. In an electrical signaling apparatus the combination of an electrical circuit, a means of sending an undulating current through the circuit, signal boxes each having a circuit breaker, an operative mechanism for the circuit breaker to be set in motion by an undulating current and a lever for directing the current from the circuit through the signal box and a means actuated by the breaking of the circuit to change the undulating current to a direct current.

2. In an electrical signaling apparatus the combination of a circuit, a means of sending an undulating current through the circuit, signal boxes each having a circuit breaker, operative mechanism for actuating the circuit breaker, a means for locking the operative mechanism, an electro-magnet having a vibrating armature, means for actuating the armature and the locking mechanism whereby a certain number of vibrations of the armature releases the locking mechanism, and a lever for directing the current from the circuit through the electro-magnet and a means actuated by the breaking of the circuit to change the undulating current to a direct current.

3. In an electrical signaling device the

combination of a circuit, a rotating pole changer for undulating the current passing through the circuit, signal boxes each having a circuit breaker, an operative mechanism for the circuit breaker to be set in motion by an undulating current and a lever for directing the current from the circuit through the box and a means actuated by the breaking of the circuit to check the rotation of the pole changer to change the current through the circuit to a direct current.

4. In an electrical signaling device the combination of a circuit, a rotating pole changer for undulating the current passing through the circuit, signal boxes each having a circuit breaker, an operative mechanism for the circuit breaker to be set in motion by an undulating current and a lever for directing the current from the circuit through the box, an electro-magnet situated adjacent to the pole changer and having an armature to be brought into contact with the pole changer to check its rotation when the said magnet is deënergized, a source of electrical energy connected to the magnet and a switch actuated by the circuit breaker to divert the current from the electro-magnet, when a box has been pulled.

5. In an electrical signaling apparatus the combination of a circuit, a means for sending an undulating current through the circuit, signal boxes each having a circuit breaker, operative mechanism actuating the circuit breaker, a means for locking the operative mechanism, an electro-magnet having a vibrating armature, means for connecting the armature and the locking mechanism whereby a certain number of vibrations of the armature releases the locking mechanism, a means actuated by the armature just before it completes the said number of vibrations to ground the current beyond the box for preventing the sending in of messages by two simultaneously pulled boxes, a lever for directing the current from the circuit through the box and a means actuated by the breaking of the circuit to change the undulating current to a direct current.

6. In an electrical signaling apparatus the combination of a circuit, a means of sending an undulating current through the same, signal boxes each having a circuit breaker, an operative mechanism for the circuit breaker set in motion by an undulating current and a lever for directing the current from the circuit through the box, a means actuated by the breaking of the circuit to change the undulating current to a direct current and condensers placed beyond each box from the office and means actuated by the pulled lever of the box for putting the condenser into circuit when the lever is depressed.

7. An electrical signal box consisting of a circuit breaker, an operative mechanism for actuating the circuit breaker, a pull-lever for controlling the movement of the operative mechanism, a pawl for locking the operative mechanism, a cam for releasing the pawl, an electro-magnet, an armature situated between its poles, means for connecting the armature and the cam whereby a vibration of the armature rotates the cam and a switch actuated by the pull-lever for putting the electro-magnet into circuit.

8. In an electrical signaling apparatus a circuit, signal boxes, a lever upon each box, means whereby the pulling of the lever turns the current through the box, a mechanism carried by the box for breaking the circuit to send a signal, a condenser adjacent each box, a switch for the condenser and a means actuated by the movement of the circuit breaking mechanism to throw the switch and place the condenser into communication with the box.

9. In an electrical signaling apparatus, the combination of a normally closed circuit, a signal box normally out of circuit, a lever in the box whose pulling puts the box in circuit, a normally locked signaling apparatus in the box, means whereby the pulling of the lever releases the signaling apparatus, a condenser adjacent to the box and means for putting the condenser into circuit when the lever is pulled.

JAMES D. NELSON.

Witnesses:
WALTER F. MURRAY,
AGNES MCCORMACK.