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O. W. HART.

ELECTRIC RAILROAD SIGNALING.

(Application filed Apr. 9, 1901.)

(No Model.)

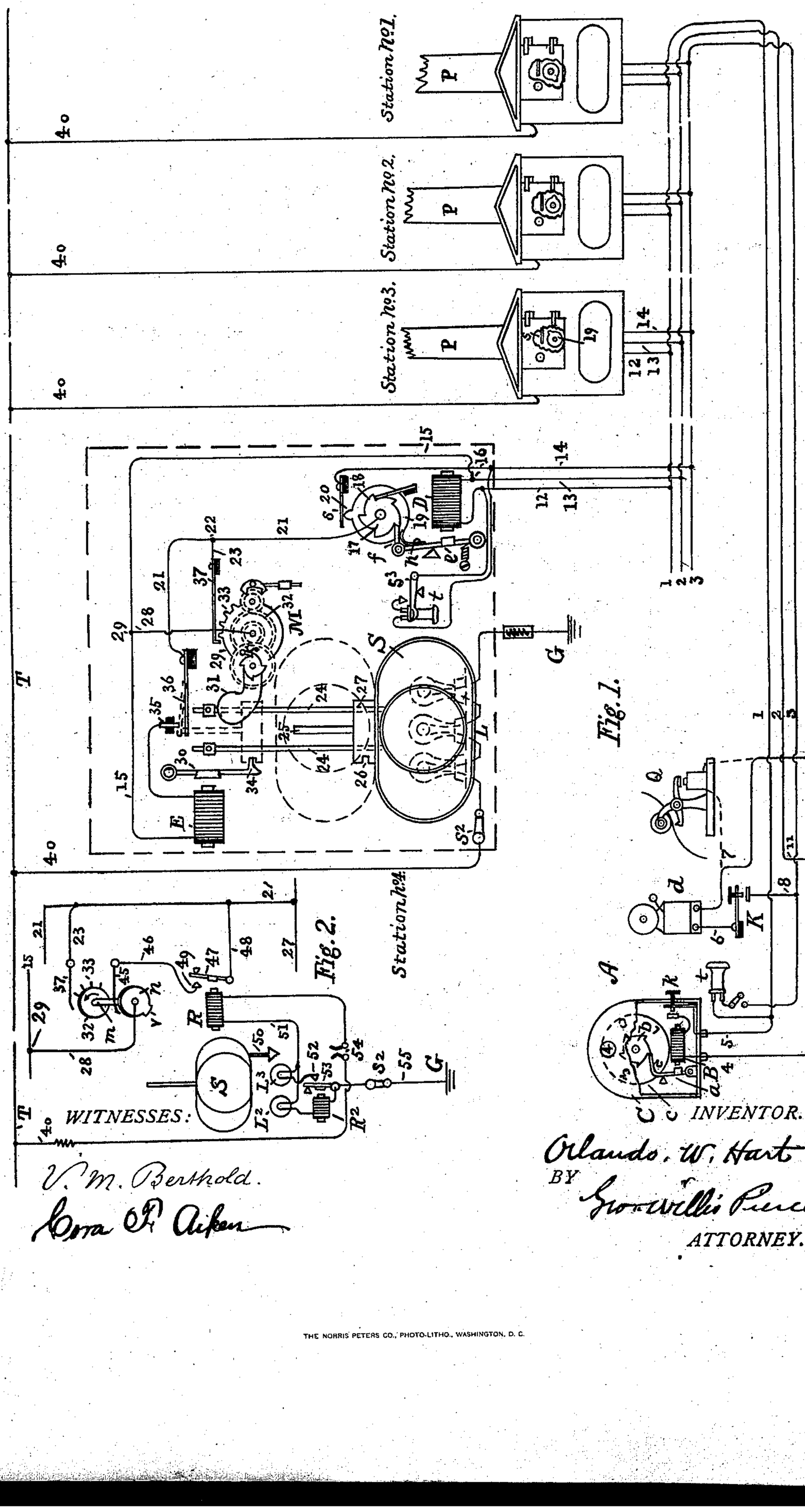

Fig. 1.

Fig. 2.

UNITED STATES PATENT OFFICE.

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ELECTRIC-RAILROAD SIGNALING.

SPECIFICATION forming part of Letters Patent No. 695,456, dated March 18, 1902.

Application filed April 9, 1901. Serial No. 55,012. (No model.)

To all whom it may concern:

Be it known that I, ORLANDO W. HART, residing at Fall River, in the county of Bristol and State of Massachusetts, have invented certain Improvements in Electric-Railroad Signaling, of which the following is a specification.

The present invention relates to signaling systems for electric railroads, and especially to the long single-track roads which extend across the country between small towns and which employ sidings or turnouts upon which one or more cars stop to permit other cars coming in the opposite direction to pass.

The signaling apparatus is inclosed in suitable boxes which are attached to supports, preferably the poles which carry the brackets upon which are suspended the trolley-wire. The boxes are placed at proper intervals along the route of an electric railroad, especially at the turnouts and sidings. Each box constitutes a station, and associated therewith are signals consisting of electric lamps, which are lighted by current from the trolley-wire, a switch being located in each box for the purpose. Each box also contains a semaphore-signal, by means of which special day and night signals may be set from a distant central station in order to call the attention of the motorman and conductor of a car. There are also telephones at each station, by which communication may be had with the central station. The invention provides means whereby any number of such signal-stations may be located on a line of railroad, and at any desired one of the stations signals may be set from the central station to the exclusion of all the other stations.

The invention also discloses a return-signal device by means of which after a signal has been selectively set at any one of the post-stations from a distant central station a bell at the said central station is selectively tapped the number of times to indicate the number or numeral of the post-station. Thus the operator at the central station receives certain information that the signal has been set.

The invention also relates to the circuit arrangements and apparatus, all of which I will now proceed to describe, and point out in the appended claims.

Figure 1 of the drawings illustrates the invention as a whole, and Fig. 2 shows a modification of a portion of the same.

Referring to Fig. 1, the conductors 1, 2, and 3, extend from a central station A to the post-stations 1, 2, 3, and 4 along the route of an electric railroad. The apparatus at the station 4 is shown in detail and displayed for clearer understanding, while at the other stations boxes are indicated. At the central station A there is an automatic transmitter C, consisting of a metal box inclosing a relay B, whose helices are connected by the wires 4 and 5, respectively, with one pole of the generator *Gen* and with the conductor 1. The armature *a* is provided with a detent which engages the ratchet-wheel *b*, which is upon a spindle to which is also secured the disk indicator *c*, upon the outer face of which are numerals "1, 2, 3, 4," which are adapted to be rotated past a window in the opening of the transmitter-case. A signal-bell *d* is connected on one side to the key K by the wire 6 and on the other side by wire 7 to a pole of the generator, while the anvil of the key is connected by wire 8 to conductor 3. The generator is divided by the wire 11 into two portions. The said wire is the terminal of the conductor 2. At each post-station a wire 12 branches from conductor 1, a wire 13 from conductor 2, and a wire 14 from conductor 3. The wire 12 extends to the point 16, where it unites with wire 15 and includes the helices of relay D, and from said point 16 the wire 15 extends to the contact 35 and includes the helices of the relay E, and the wire 14 connects with the spring *s*. Armature *e* of relay D is provided with a pivoted extension *f*, held upward by the spring *h*. The extension *f* acts as a detent to the ratchet-wheel 18, which is secured to the same spindle 17 with the cam-wheel 19, whose cam or projection 20 is shown in contact with the tip of spring *s*. A wire 21 connects the spindle 18 with the spring 36. A branch wire 23 connects with spring 37 at point 22. S is a semaphore-signal composed of an oval disk of opaque ma-

terial provided in the center with a transparent disk adapted to show red color. The disk is suspended from a block 27, one end of which has a notch 26 cut therein, and in the block are holes through which pass two rods 24 24, and from the center of the block is a pin 25. When the disk is raised, as shown in dotted lines, the detent 34 on the end of armature 30 of relay E catches in the notch 26 and holds the disk up. At the same time the pin 25 presses the spring 36 against the terminal 35, and the block 27 holds the weighted lever 31 upward. M is a clock-train provided with an escapement adapted to be rotated by the falling of the lever 31, which turns a wheel in engagement with a pinion 32, upon whose spindle is the make-and-break wheel 29, having the teeth 33, adapted to engage with the spring 37. The boxes at each of the post-stations are provided with the same apparatus as described of station 4, the position of the cam 20 being different in each box, one being behind the other in rotation and in reaching the spring *s*.

In the operation of the invention, the cams being disengaged from the springs *s*, if the operator at A wishes to set a signal at any post-station—say at station No. 4—the key *k* of the transmitter C is pressed, each time closing a circuit from generator via wire 4, relay B, wire 5, conductor 1, wire 12, relay D, wire 13, conductor 2, wire 11 to generator, the result being that relay B operates its armature *a* and relay D its armature *e*, and after four pulsations the numeral 4 shows through the window at the transmitter C, and the cam 20 bears against the spring *s*. The operator then presses the key K, and a circuit is formed from the generator, wire 11, conductor 2, wires 13 and 15, relay E, terminal 35, spring 36, wire 21, cam 19, spring *s*, wire 14, conductor 3, wire 8, key K, bell *d*, and wire 7 to generator, and the relay E attracts its armature 30 and the semaphore S drops. At the same time the weighted lever 31 falls and rotates the clock-train, and the teeth 33 of the break-wheel 29 pass under the spring 37. A circuit is formed through the bell *d*, substantially as just described, except that the relay D is cut out by the spring 36 drawing away from 35; but as a tooth strikes the spring 37 the circuit is closed by wire 28, wheel 29, spring 37, and wire 23, and as each tooth 33 thus closes the circuit a tap is given upon the bell, and as the four taps are given the operator is aware that the semaphore S has fallen at station 4. The disk is raised to the position shown in dotted lines by any ordinary and well-known means—for instance, by a cord attached to the disk, extending upward over a pulley located in the upper part of the inclosing case and hanging down through the bottom of the case—and when the disk is to be reset the conductor or motorman of a car pulls upon the cord and raises the disk until the lever 31 is reset and the spring 36 closed to terminal 35. It will be seen that to effect the dropping of the semaphore and the operation of the return-signal the key K must be kept closed, and when the bell has sounded the return-signal the key is then released. It will be understood that any suitable receiver for the return-signal other than a bell may be employed, as a telegraph-sounder or a register using a paper strip. A wire 40 extends from the trolley-wire T to ground at each station and has in series the lamps L, whose circuit is closed or opened by the switch s^2. The lamps are lighted in the night and show white; but when the semaphore is down a red light is given by the disk of the semaphore. Telephones *t* are in normally open bridges between the conductors 1 and 3 at the central station and at all of the post-stations, and when the switches s^3 are closed conversation can take place between two stations.

Fig. 2 is a modification showing the selective return-signal combined with a device to indicate positively to the central station that the semaphore S has fallen and also that the signal-lamps L are lighted. These indications follow the operation of the return-signal make-and-break wheel. Upon the same shaft *m* which carries the break-wheel 32 is a disk *n*, having a long tooth *v* so arranged as to follow the teeth 33 upon the wheel 32. A contact-spring 45 is in the path of the tooth *v*, which is connected by the wire 46 to the front contact 49 of the armature 47 of relay R, the armature being connected by wire 48 to conductor 21. The conductor 40 from the trolley-wire connects with one terminal spring of the normally open circuit-closer 54, the other spring connecting by wire 51 to the armature 53 of relay R^2 and including in circuit the relay R and lamps L^3 and L^2, and the armature 53 connects to ground when the switch s^2 is closed. The lamp L^3 is in a parallel branch from conductor 51 to the rear contact 52 of armature 53. The semaphore S is provided with a metal plunger 50, adapted when the semaphore falls to close the circuit between the springs of the circuit-closer 54, and current from trolley T passes to ground, energizing relays R and R^2 and lighting lamp L^2. When the switch s^2 is closed, the armature 53 of relay R^2 is drawn up and the lamp L^3 is not in circuit. The operation is the same as described of Fig. 1. The semaphore is tripped. The break-wheel 32 gives the characteristic return-signal, which in this case is indicated upon the paper strip of a register Q at the central station, (indicated as being connected in series with the bell *d* by dotted lines.) After the recording of the breaks of wheel 32 the long tooth *v* of wheel *n* comes into contact with the spring 45, and current passes from wire 21 to the register Q, and a long mark is made on the paper strip, which is an indication that the circuit through the signal-lamp is complete and the signal lighted; but should the electric lamps L^2 L^3 be burned out or otherwise become inoperative and ren-

der illumination of the signal impossible the circuit containing the relay R would become open and its helices would be demagnetized. Consequently its armature 47 would fall away onto its back-stop and open the circuit of which it forms a part, and when the tooth *v* of the wheel *n* comes into contact with the spring 45 no current will be transmitted to the register Q, and the said long mark will be omitted. This will in no wise prevent or interfere with the transmission of the characteristic signal made by the teeth 33 striking upon the spring 37. The absence of the long mark upon the paper strip of the register indicates to the observer at the station A that there is no illumination of the signal at the signal-box from which the characteristic signal has been received and notice for him to supply the box with new lamps. In the event of the lamp L^2 becoming inoperative and broken the circuit is opened thereat, the armature 53 falls upon its back contact-stop 52, and the circuit is reëstablished through the lamp L^3, which becomes lighted, thus preventing the signal from becoming dark or obscured.

I claim as my invention—

1. In a signaling system for electric railroads, a plurality of signal-stations, at each of which are electric lamps, a signal, a selective switching device, and a return-signal device; electric circuits extending to each signal-station, and to a central station; with means at the central station for sending electric impulses to the signal-stations to operate the selective switching device at any one station, and to set the signal, and means for receiving a selective return-signal, as set forth.

2. In a signaling system for electric railroads, a plurality of signal-stations at each of which are electric lamps, a signal, a selective switching device, and a return-signal break-wheel; electric circuits extending to each signal-station and to a central station; with means at the central station for sending electric impulses to the signal-stations to operate the selective switching device at any one station and to set the signal, and a bell to receive a selective return-signal, as set forth.

3. In a signaling system for electric railroads, a plurality of signal-stations at each of which are electric lamps in a circuit from the trolley-wire, a signal, a selective switching device, and a mechanically-operative selective return-signal device, electric circuits extending to each signal-station, and to a central station, with means at the central station for sending electric impulses to the signal-stations to operate the selective switching device, consisting of a circuit-closing key which when closed is adapted to operate an indicator at the central station and to rotate the cams of all the selective switching devices and to close a circuit at one signal-station only, means at the central station for sending successive impulses over the said closed circuit to set the signal, release the clock-train of the selective return-signal device, and operate the same, as set forth.

4. In a signaling system for electric railroads, a plurality of signal-stations, at each of which are electric lamps, a signal, a selective switching device, a return-signal device adapted to transmit a predetermined box number or indication, and a return-signal device adapted to transmit an indication of the closure of the lamp-signal circuit and the lighting of the lamp; electric circuits extending to each signal-station and to a central station; with means at the central station for sending electric impulses to the signal-stations to operate the selective switching device at any one station, and to set the signal, and means for receiving the selective box number or indication and the lamp-signal indication, as set forth.

5. In a signaling system for electric railroads, a plurality of signal-stations, at each of which are electric lamps, a semaphore-signal, a selective switching device, a return-signal device adapted to transmit predetermined box numbers or indications, and a return-signal device adapted to transmit an indication of the closure of the lamp-signal circuit and the lighting of the lamp-signal, an automatic device for simultaneously switching out a disabled lamp and switching in a second lamp; electric circuits extending to each signal-station and to a central station; with means at the central station for sending electric impulses to the signal-stations to operate the selective switching device at any one station, and to set the semaphore-signal, and means as a register for receiving the selective box-number and the lamp-signal indication, as set forth.

6. In a signaling system for electric railroads, a plurality of signal-stations, at each of which are electric lamps, a semaphore-signal normally held retracted, a selective switching device, a return-signal device adapted upon the tripping of the semaphore to transmit a predetermined box number or indication, and a second return-signal device adapted to transmit an indication of the closure of the lamp-signal circuit and the lighting of the lamp-signal by the semaphore; electric circuits extending to each signal-station and to a central station; with means at the central station for sending electric impulses to the signal-stations to operate the selective switching device at any one station, to trip the semaphore-signal and operate the return-signals, with means for receiving the selective box number or indication, and the lamp-signal indication, as set forth.

7. In a signaling system for electric railroads, a plurality of signal-stations at each of which are electric lamps, a signal, a selective switching device, and a return-signal device; electric circuits extending to each signal-station and to a central station; with means at the central station for sending electric impulses to the signal-stations to operate the se-

lective device at any one station, and set the signal, and means for receiving a return-signal characteristic to the station selected, as set forth.

8. In a signaling system for electric railroads, a plurality of signal-stations, at each of which are electric lamps, a signal, a selective switching device, a return-signal device, and a return-lamp-circuit-indicating device; electric circuits extending to each signal-station and to a central station; with means at the central station for sending electric impulses to the signal-stations to operate the selective signal device at any one station and to set the signal, means for receiving a return-signal characteristic of the station selected, and means for indicating the condition of the said lamp-circuit.

9. In a signaling system for electric railroads, a plurality of signal-stations, at each of which are electric lamps, a signal, a selective switching device, a return-signal device, and a return-lamp-circuit-indicator device; electric circuits extending to each signal-station and to a central station; with means at the central stations for sending electric impulses to the signal-stations to operate the selective signal device at any one station and to set the signal, means for receiving a return-signal characteristic of the station selected, and means for receiving a signal indicative of the closure of a circuit through the said lamps and the lighting of the same.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 18th day of March, 1901.

ORLANDO W. HART.

Witnesses:
C. E. SMITH,
BENJAMIN COOK, Jr.