No. 835,441. PATENTED NOV. 6, 1906.

W. E. LAIRD.

SIGNALING SYSTEM.

APPLICATION FILED JULY 22, 1904.

Fig. 1.

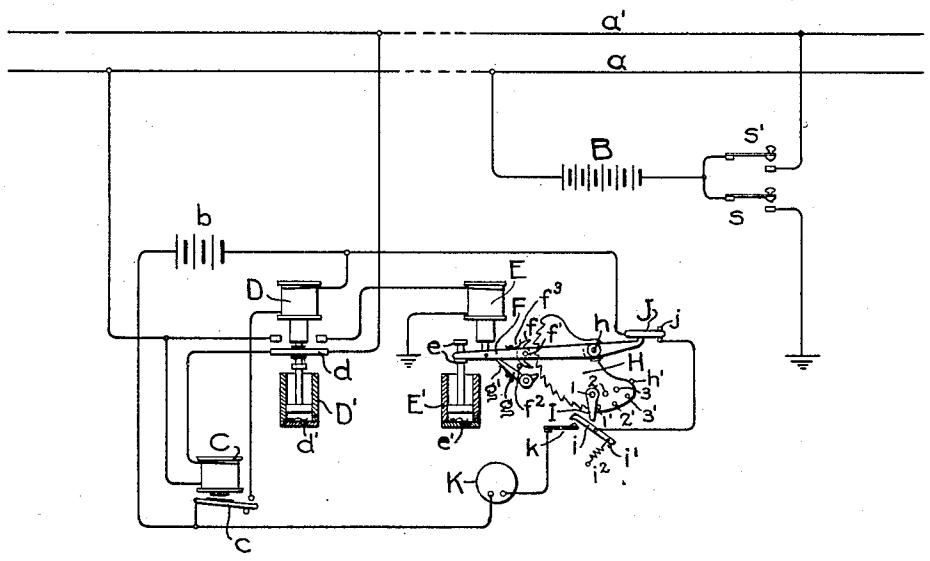
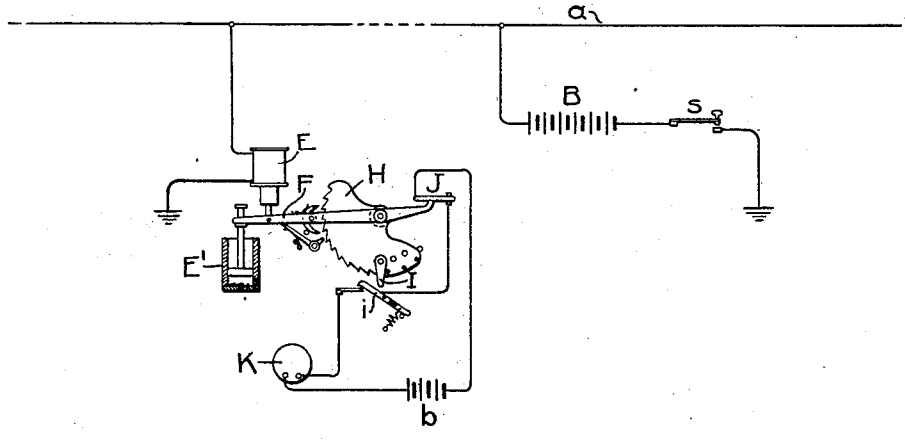


Fig. 2.



Witnesses.

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SIGNALING SYSTEM.

No. 835,441. Specification of Letters Patent. Patented Nov. 6, 1906.

Application filed July 22, 1904. Serial No. 217,627.

To all whom it may concern:

Be it known that I, WESLEY E. LAIRD, a citizen of the United States, residing at Pittsfield, in the county of Berkshire and State of Massachusetts, have invented certain new and useful Improvements in Signaling Systems, of which the following is a specification.

My invention relates to selective signaling systems; and its object is to provide a system enabling any desired station to be called without calling other stations connected with the same line, which embodies a number of novel features, and which is simple in arrangement and reliable in action.

When used with a number of stations connected by a metallic circuit, my invention possesses the advantage that it requires no additional wires; but the wires of the metallic circuit may be employed for signaling without interfering with any other use of the wires, such as telephoning, at the same time. On the other hand, where no metallic circuit is employed my invention requires only a single wire for its application.

Among the many applications of my invention I may mention its utility when employed in connection with a plurality of automatic indicators of the type described in Patent No. 742,681, issued to me October 27, 1903. My present invention renders it possible to put in operation the actuating mechanism for any one of a plurality of these indicators connected to a single line. My invention, however, is not limited to this specific application, but may be used in connection with telephone and telegraph lines for sending and receiving all kinds of electrical signals, for exploding mines, or any service whatever where a single line connects several different stations.

By means of my invention not only may any one of a plurality of stations be called up from a single point, but any station may call up any of the others without operating a signal at any station but the one desired.

One feature of my invention consists in a step-by-step mechanism and means for setting it from a distance, together with a normally open switch in the circuit of a signal device arranged to be closed by the step-by-step mechanism on one of its positions, a normally closed switch also in the signal-circuit and arranged to be opened while the mechanism is being set, and means for returning the step-by-step device to its first position after a predetermined time.

Another feature of my invention consists in the combination with a metallic circuit and a station or stations connected thereto of means controllable from a distance for temporarily grounding one wire of the metallic circuit through the signal-actuating mechanism at that station, so that the signal mechanism may be operated from one wire and the earth-return, so as not to interfere with any use of the metallic circuit at the same time, together with retarding means operatively connected to the grounding means to prevent the breaking of the ground connection for a predetermined time.

More specifically considered, my invention comprises an electromagnetically-actuated switch for accomplishing this grounding, together with a dash-pot or other retarding means operatively connected to the switch and arranged to prevent it from breaking the ground connection for a predetermined time long enough for sending the desired signal.

My invention will best be understood by reference to the accompanying drawings, in which—

Figure 1 shows diagrammatically an arrangement embodying my invention used in connection with the metallic circuit of telephone, telegraph, or similar systems; and Fig. 2 shows a modification of the same in which no metallic circuit is employed.

In Fig. 1, a a' represent the two wires of a metallic circuit, such as a telephone or telegraph circuit, or the circuit of the automatic indicators shown in my patent above referred to. B represents a battery having one terminal connected to the line-wire a and its other terminal arranged to be connected to earth or to line-wire a' by the switches s and s', respectively. The arrangement as described thus far constitutes the apparatus for sending a message. The apparatus at the receiving-station consists of the following: C represents a magnet-coil having one terminal connected to the line-wire a and the other terminal connected through the bridging member d to the line-wire a'. The

magnet-coil C controls an armature *c*, which when raised closes the circuit of a battery *b* through the winding of a magnet-coil D. The core of magnet-coil D carries bridging member *d* and the movable member of a dash-pot D′. This dash-pot is provided with a check-valve *d*′, which permits free movement of the movable member in an upward direction and retards its movement in a downward direction. The bridging member *d*′ when in its lowest position, as shown, closes the circuit of magnet-coil C, and when raised to its upper position to engage the upper set of stationary contacts connects line-wire *a* to one terminal of magnet-winding E, the other terminal of which is connected to earth. The core of magnet E engages the long arm of a lever F, which is pivoted at *h*, and which engages, by means of a lost-motion connection, the movable member of a dash-pot E′. This dash-pot is also provided with a check-valve *e*′, which permits free upward movement of the movable member and retards its downward movement. The lost-motion connection between the movable member of the dash-pot and lever F may consist of two collars *e*, between which the end of lever F is allowed a certain amount of play. The lever F carries a pawl *f*, pivoted at *f*′ and pressed in a clockwise direction by the spring f^3. When lever F is at its lowest position, as shown, the pawl *f* is engaged and rotated by the stop f^2, so as to move it against the pressure of spring f^3 into the position shown. When lever F is raised, however, pawl *f* is pushed by spring f^3 into engagement with the teeth on the periphery of the ratchet member H, which is also pivoted at *h*. *g* is a second pawl which is also rotated in a clockwise direction by the spring *g*′. When lever F is in its lowest position, it engages the long arm of pawl *g* and holds it in the position shown against the tension of spring *g*′. When lever F is raised, however, pawl *g* is rotated by the spring *g*′ to bring the short arm of the pawl into engagement with the teeth of ratchet member H. Member H, which, as has been said, is pivoted at *h*, is normally held by gravity or by a spring against the stop *h*′. This member carries two sets of pins, one set being indicated by the reference characters 1, 2, and 3 and the other set by reference characters 1′, 2′, and 3′. I is a short lever which at the first station is loosely hung on the pin 1 and engaged on one side by the pin 1′. *i* is a pivoted normally open switch member adapted to be engaged by the lever I when member H is moved in a clockwise direction and which is normally held against the stop *i*′ by the tension-spring i^2. When engaged by arm I, the member *i* is pressed into engagement with the contact *k*, which thereby closes a circuit from battery *h* through switch member J and the signaling device K. Thus in order to close the circuit of signaling device K it is seen that not only must member *i* be in engagement with contact K, but switch J must also be in engagement with contact *j*. Switch member J is normally supported in its closed position by the short arm of lever F.

The operation is then as follows: When it is desired to send a signal, switch *s*′ is first depressed, momentarily closing a circuit through the magnet-coil C. Magnet-coil C draws up its armature *c*, completing a circuit from battery *b* through magnet-winding D. Magnet-winding D consequently draws up its core, shifting switch member *d* from the lower to the upper contacts. The circuit of coil C is thus broken, and line-wire *a* is connected to one terminal of coil E. Thus by the operation as described thus far one wire *a* of the metallic circuit is grounded at each station through the magnet-coil E at that station. This ground is maintained for a time by the dash-pot D′, which while it permits the free upward movement of the core of magnet D retards its downward movement and holds the bridging member *d* in engagement with the upper contacts after armature *c* has opened the circuit of coil D for a sufficient length of time for signaling—as, for instance, thirty or forty seconds. Now while the line-wire *a* is grounded at all the stations through the coils E if the switch *s* is closed all the coils E will be energized by the battery B. Each coil E will consequently draw up the long arm of lever F, raising the movable member of dash-pot E′ and releasing pawl *f* from stop f^2, allowing it to be pressed into engagement with the teeth of member H, so as to move member H one tooth. This brings the lever I into engagement with the pivoted contact *i*, so as to press it against the contact *k*. The circuit of the signal device K is not closed, however, since the raising of the long arm of lever F has lowered the short arm, so as to let switch J fall out of engagement with the contact *j*. It will be understood that switch *s* is depressed for only an instant, so as to send an impulse over the line *a*. The coils E are consequently deënergized immediately after they have raised their cores, and the levers F are permitted to fall back part way to their lowest position. They are prevented from falling back into the position shown in Fig. 1 by the lower collar *e*, carried by the movable member of the dash-pot E′. This dash-pot holds its movable member in raised position long enough for the signal to be sent. The distance between the two collars *e* is enough, however, to let the lever F fall back a sufficient distance to allow the pawl *f* to engage another tooth of the member H, so as to rotate it by another step if coil E is again energized. The member H is held in position during this movement of arm F by the pawl *g*, which is released from arm F and

pressed by its spring into engagement with ratchet H. The movement of lever F from the upper to the lower collar *e* is not sufficient, however, to restore the switch J into engagement with its contact *j*. If it is desired to call station No. 1, which is the station represented in Fig. 1, only a single impulse is sent by the switch *s*. Consequently the member H is rotated only one tooth, so as to bring member I directly over the contact *i*. Then as the movable member of the dash-pot E′ returns slowly to its lowest position the long arm of lever F slowly falls until switch J is closed by the short arm of the lever. The circuit of the signaling device K is then closed, and the signal is then given. As the long arm of lever F continues to fall it engages the pawl *g*, rotating it out of engagement with the member H and allowing the member H to return to the stop *h′*.

The apparatus at the other stations is identical with that shown in the drawings, except that the member *i* is placed on another pin, such as 2 or 3. Consequently when a single impulse is sent by switch *s* all the members H are moved a single tooth, and the other levers I are not moved far enough to close the circuit of their signaling devices. On the other hand, if it is desired to call station 3 three impulses would be sent over line-wire *a*, which would bring the lever I at station 3 into engagement with its pivoted contact *i*, but would carry the levers I at stations 1 and 2 past their pivoted contact *i*. Station 3 will be the only one to be called in this case, since the pivoted levers I are free to move, so as to slip over the ends of the pivoted contact *i* when the members H return to their starting positions.

It will be seen that the arrangement as outlined above does not interfere in any way with the use of the metallic circuit for any purposes, such as telephoning, at the same time that signals are being sent. The signaling system acts merely to ground temporarily one line of the magnetic circuit, and this line and the earth-return are employed for sending the signals.

In Fig. 2 I have shown a simplified arrangement which is applicable where no metallic circuit exists, but where a number of devices—such, for instance, as mines—are to be selectively operated by a single wire. In this arrangement only a single wire *a* is employed, which is permanently grounded at the several stations through the magnet-winding E. The coils C and D of Fig. 1, together with the devices controlled thereby, are omitted; but otherwise the apparatus is the same as in Fig. 1, and the operation is identical with that already described, except that it is unnecessary to send any preliminary impulse to ground the line-wire.

I do not desire to limit myself to the particular construction and arrangement of parts shown, since many modifications may be made therein without departing from my invention, and I aim in the appended claims to cover all such modifications.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a signaling system, an electromagnet, a reciprocating member actuated thereby, means for retarding the movement of said member when said magnet is deënergized, a lost-motion connection between said member and said retarding means, a ratchet adapted to be moved step by step by the movement of said member permitted by said lost-motion connection, a signal device adapted to be actuated by said ratchet in one position only of said ratchet, and means operatively connected to said retarding means for rendering said device inoperative.

2. In a signaling system, an electromagnet, a reciprocating member actuated thereby, means for retarding the movement of said member when said magnet is deënergized, a lost-motion connection between said member and said retarding means, a step-by-step device adapted to be moved by the movement of said member permitted by said lost-motion connection, a normally open switch arranged to be closed by said step-by-step device in one position thereof, an electroresponsive signal device controlled by said switch, a normally closed switch in circuit with said signal device, and means for maintaining said normally closed switch open while said step-by-step device is being set.

3. In a signaling system, a step-by-step device, means controllable from a distance for setting said device, a normally open switch adapted and arranged to be closed by said device in one position thereof, an electroresponsive signal device controlled by said switch, a normally closed switch in circuit with said signal device, means for maintaining said normally closed switch open while said device is being set and means for returning said step-by-step device to its first position after a predetermined time.

4. In a signaling system, a step-by-step device, means controllable from a distance for setting said device, an electroresponsive signal device, a switch in circuit with said device adapted to be operated by said step-by-step device in one position thereof, a switch arranged to break the circuit of said signal device while said step-by-step device is being set, and means for returning said step-by-step device to its first position after a predetermined time.

5. In a signaling system, a step-by-step device, means controllable from a distance for setting said device, an electroresponsive signal device, a switch in circuit with said device adapted to be operated by said step-by-step device in one position thereof, a switch arranged to open the circuit of said signal

device while said step-by-step device is being set, and a dash-pot operatively connected to said step-by-step device whereby said device is returned to its first position only after a predetermined time.

6. In combination, a metallic circuit, a signal-station connected thereto, a signal-actuating winding at said station having one terminal grounded, a switch adapted to connect the other terminal to one wire of said metallic circuit, means controllable from a distance for moving said switch to establish said connection, and retarding means operatively connected to said switch adapted to prevent the breaking of said connection for a predetermined time.

7. In combination, a metallic circuit, a signal-station connected thereto, a signal-actuating winding at said station having one terminal grounded, a switch adapted to connect the other terminal to one wire of said metallic circuit, a second magnet-winding connected to said circuit and adapted when energized to move said switch to establish said connection, means at a distance for supplying current to said circuit to energize said winding, and retarding means operatively connected to said switch adapted to prevent the breaking of said connection for a predetermined time after said winding is deënergized.

8. In combination, a metallic circuit, a signal-station connected thereto, means controllable from a distance for grounding one wire of said circuit at said station, retarding means operatively connected to said grounding means to prevent the breaking of the ground connection for a predetermined time, and a signal-operating device included in said ground-circuit.

9. In combination, a metallic circuit, a signal-station connected thereto, means controllable from a distant point for temporarily grounding one wire of said circuit at said station, a signal-operating device included in said ground-circuit, retarding means operatively connected to said grounding means to prevent the breaking of the ground connection for a predetermined time, and a second connection from said wire to ground at said distant point including a source of current and controlling means therefor.

In witness whereof I have hereunto set my hand this 18th day of July, 1904.

WESLEY E. LAIRD.

Witnesses:

S. E. WIDDIFIELD,

H. G. STAPLETON.