

E. J. FROST.
ELECTRIC SIGNAL-BOX.

No. 172,415.

Patented Jan. 18, 1876.

Fig. 1.

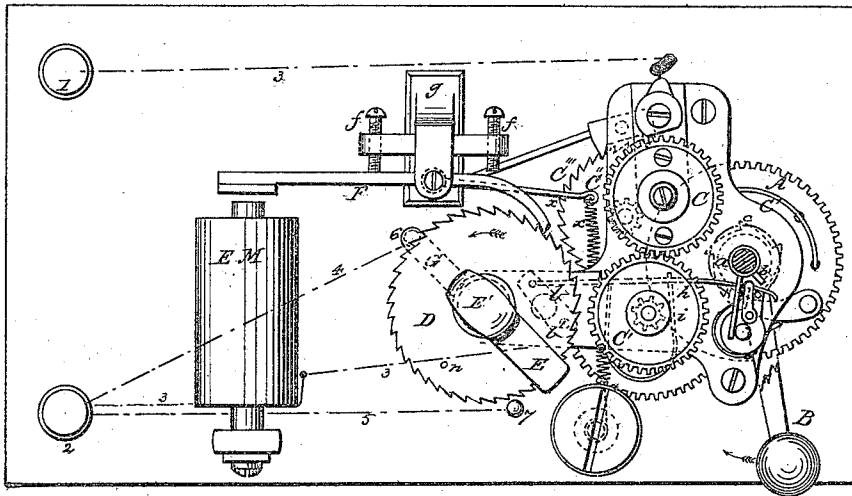


Fig. 2.

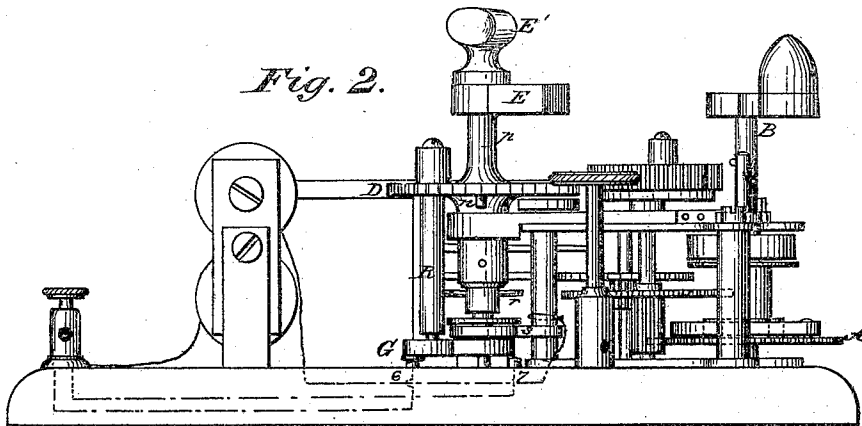


Fig. 4.

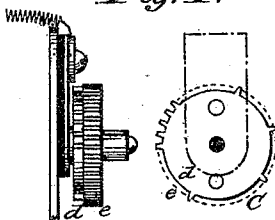


Fig. 5.

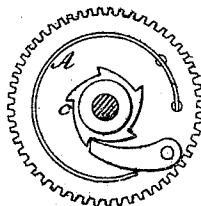
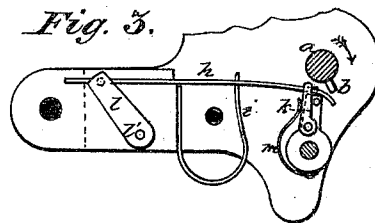


Fig. 3.



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UNITED STATES PATENT OFFICE.

EDWARD J. FROST, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN ELECTRIC SIGNAL-BOXES.

Specification forming part of Letters Patent No. **172,415**, dated January 18, 1876; application filed December 15, 1875.

To all whom it may concern:

Be it known that I, EDWARD J. FROST, of the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Electrical Signal-Boxes; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawing, and to the letters of reference marked thereon, which form a part of this specification.

The object of my invention is to furnish a box certain and reliable in its operations, and capable only of being used when the line is in such condition—*i. e.*, not in use by others than the one wishing to use a certain box—that its use will lead to no confusion; and to this end it consists in those devices and combinations hereinafter fully set forth and claimed.

In order that those skilled in the art may be enabled to make and use my invention, I will describe the same in detail, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a plan view. Fig. 2 is a side view, and Figs. 3, 4, and 5 are views of details.

a is the main driving-shaft, to which is attached the master-wheel A, a driving-spring, (not necessary to be shown here,) a pawl and ratchet, *c c'*, and a crank and handle, B, all of ordinary construction, and operating a train of gearing, C C', in the usual manner. The train is provided with an anchor and escape-wheel, C' C'', or equivalent devices, for regulating its movements. One of the wheels C of the train is arranged so as to form, of itself, the circuit maker and breaker for controlling the circuit to give a signal. As shown in Fig. 4, this wheel is composed of two halves, *e* and *d*, united, *e* being made of hard rubber or other insulating material, and *d* of metal. A part of the teeth of *d* is cut away, so that the metal portion of *d* shall not at all times engage with the metal wheel C', but shall only engage therewith at the times nec-

essary to complete the circuit for sending the signal.

By this construction I am enabled to dispense with the ordinary circuit-wheel and spring and utilize one of the wheels of the train therefor.

The wheel C is mounted on an insulated bearing, and one end of the line-wire is put in connection with the shaft of the wheel, the other end being connected to the frame of the machine.

It is evident that the wheel need not necessarily be divided lengthwise, but that it may be made of alternate conducting and non-conducting portions, the teeth being cut across the entire width of the face.

Where several boxes of this general character and purpose are used upon one circuit it is desirable that there should be combined therewith some means for preventing two or more of them being used or turned in simultaneously, so that there may be no interference of signals. This I accomplish in the following manner: Below the train of gearing is journaled a ratchet-wheel, D, provided with a spring, *s*, which holds it normally in the position shown in Fig. 1, a pin, *r*, passing through the shaft *p* of the wheel, limiting its motion in either direction by taking against the shaft R. This wheel is furnished with a knob, E', for rotating it, and arm E projects from the shaft. Normally this arm, as shown in Fig. 1, is in the path of the handle B of the alarm or signal mechanism, the teeth on the ratchet-wheel *c* being so proportioned that the movement of the crank and handle B, before striking the arm E, will affect no winding up of the mechanism. This necessitates the removal of the arm E. Ordinarily this would be prevented by the pawl on the end of the armature-lever F of the electro-magnet E M. This lever is pivoted on the block *g*, and is provided with adjusting-screws *ff* for limiting its motions. At the other extreme of the shaft *p* of the arm E is a switch-arm, G, normally resting upon a switch-button, 6, from which a wire, 4, leads direct to binding-post 4, so that normally the electro-magnet E M is shunted out of the circuit, the circuit being

by post 1, wire 3, wheel C, frame of instrument, button 6, and wire 4 to post 4.

The position of the teeth in wheel D, and of the pawl, are so arranged in relation to each other that the shaft *p* may have normally a slight motion, sufficient to carry the switch-arm G from button 6, and so break the shunt-circuit described. This first movement, then, in attempting to move arm E out of the path of winding-arm B, causes the circuit to be thrown through the magnet, via 1, 3, C, frame, 3, E M, to 2. Now, if the circuit be not in use, but closed, (as it will be if unused,) the magnet E M attracts its armature, and the arm E may be removed entirely from the path of B. In so moving it the switch-arm G has been brought in contact with button 7, establishing a new shunt-circuit via 1, 3, C, frame, s, G, 7, 5, 2, again cutting out the magnet E M and lessening the resistance in the circuit. The arm B may now be turned to wind the spring, which, upon its recoil, gives motion to the train and causes the desired signal to be transmitted.

If, however, upon the first movement of E, and the consequent throwing of the circuit through E M, the line be in use, and the circuit interrupted, the magnet E M will not attract its armature; hence, the pawl will prevent the arm E from being removed from the path of the arm B, this prevention lasting during the continuance of such use of the circuit, thus preventing any interference of signals.

When the circuit is free for the user of any box, the arm E has been turned in the direction of the arrow, as before described, and the switch-arm G has held contact with button 7 during the use of the box. It is necessary, however, after the signal is sent, that the parts should be restored to their normal position. This I accomplish as follows: *l* is a latch, pivoted at *l'* to a suitable base-plate. Rising from *l* is a rod, *h*, provided with a spring, *i*, for holding it in one normal position. On the under face of wheel D is a pin, *n*, in whose path lies the outer end of latch *l*; hence, when wheel D is rotated in the direction of the arrow, Fig. 1, the pin *n* rides under and elevates the latch *l*, the spring *i* and rod *h* depressing it immediately, thus preventing the return of the wheel D until the latch *l* be lifted out of the path of *n*. At the upper end of rod *h*, and taking into a notch or perforation therein, is a pivoted arm, *k*, having spring *m* for holding it in a normal position. This arm *k* lies in the path of a pin, *b*, projecting from shaft *a* of crank or winding arm B. When, however, the shaft be rotated in the direction of the arrow, Fig. 3, in winding up the box, the pin *b* takes upon and depresses arm *k*, so passing it, spring *m* immediately restoring arm *k*. As the shaft and the arm B, by the action of the mainspring, are restored to their normal position, the pin *b*

takes under and lifts the arm *k*, which carries with it the rod *h*, which, in turn, lifts latch *l*, allowing the wheel D to be restored to its normal position by the action of its spring *s*.

It is evident, where a box is provided with a door, usually kept closed or locked, that the device E E' and attached parts may be arranged so that the arm E shall be in the path of the key or other unlocking device. When the devices are so arranged it will be impossible to open the door while the line is in use.

It will be seen, from the foregoing description of my improved box and its operation, that great certainty of action is secured, and the ends sought fully accomplished, and that by only a momentary use of the electro-magnet, and a momentary increase of the resistance in the circuit.

Having thus described my invention, what I claim, and desire to secure by Letters Patent is—

1. The combination, with the signal mechanism of a signal-box, of a detent, a locking mechanism, and one or more shunt-circuits, the locking mechanism being brought into action, when necessary, automatically, upon a shunt-circuit being broken by the attempted removal of the detent, substantially as and for the purpose set forth.

2. The combination, with the signal mechanism, of a locking mechanism controlled by an electro-magnet, through which the circuit is automatically thrown upon a detent being removed from the winding mechanism.

3. The combination, with the winding-arm of a signaling-train, of a detent, controlling in its movements the circuits of an electro-magnet operating a locking mechanism, substantially as and for the purpose set forth.

4. The combination, with the detent and the locking mechanism and the signaling-train, of an intermediate mechanism operated by the signaling-train, and releasing the detent for restoration to its normal position, substantially as and for the purposes set forth.

5. The locking mechanism, consisting of the combination of the ratchet-wheel D, armature-lever F, electro-magnet stop-pins *n* and *r*, and spring *s*, constructed substantially as set forth.

6. The combination, with the ratchet-wheel D, armature-lever F, electro-magnet stop-pins *n* and *r*, and spring *s*, of arm E, operating as a detent to signaling mechanism, and requiring locking mechanism to be put in condition for operation before the signaling-train can be operated, substantially as and for the purpose set forth.

7. The combination, with an electro-magnet controlling locking mechanism, of the shunt-circuits 4 and 5, controlled by detent E, substantially as and for the purpose set forth.

8. The combination, with the detent, of the latch *l*, rod *h*, arm *k*, and pin *b*, substantially as and for the purpose set forth.

9. In an automatic signal-box, a gear-wheel constructed of insulating and conducting portions, so that, while acting as one wheel of a train, it shall also act as a circuit-controller, substantially as set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

EDWARD J. FROST.

Witnesses:

JAMES C. FAIRBAIRN,
JOSEPH LALLON.