(No Model.) 2 Sheets—Sheet 1.

A. A. SMITH.

FIRE ALARM SIGNAL BOX.

No. 378,983. Patented Mar. 6, 1888.

Fig. 1,

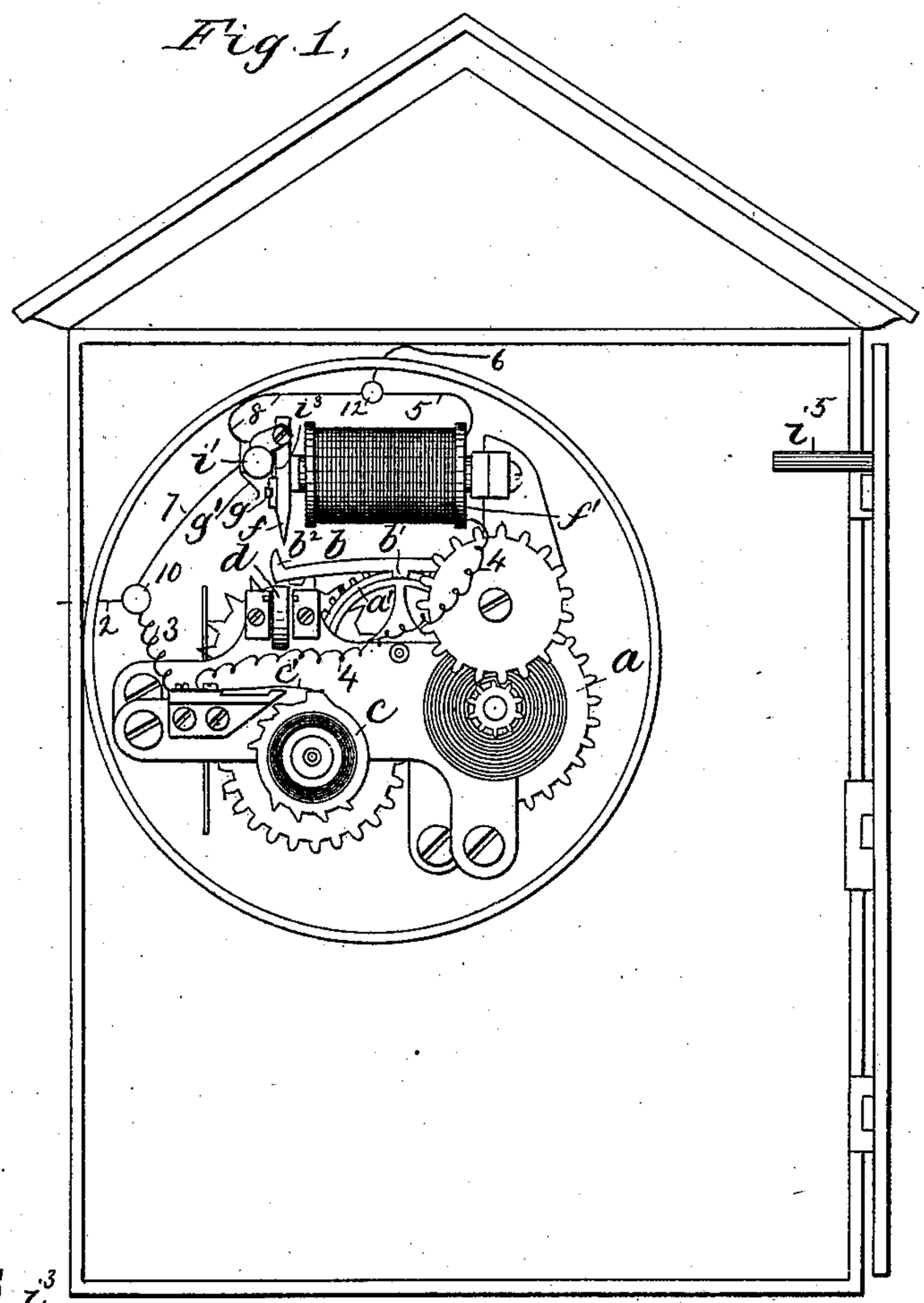


Fig 1a

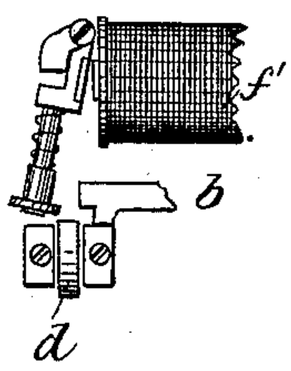


Fig. 3

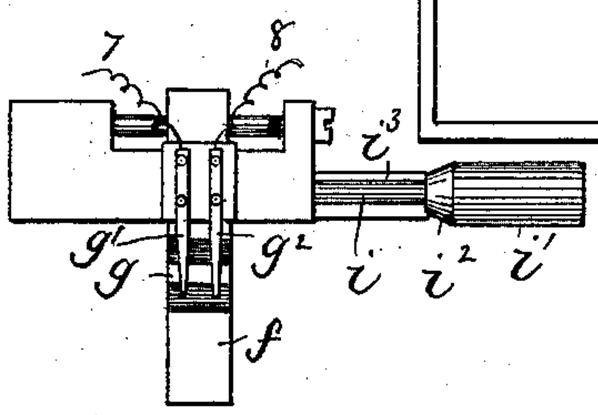


Fig. 2,

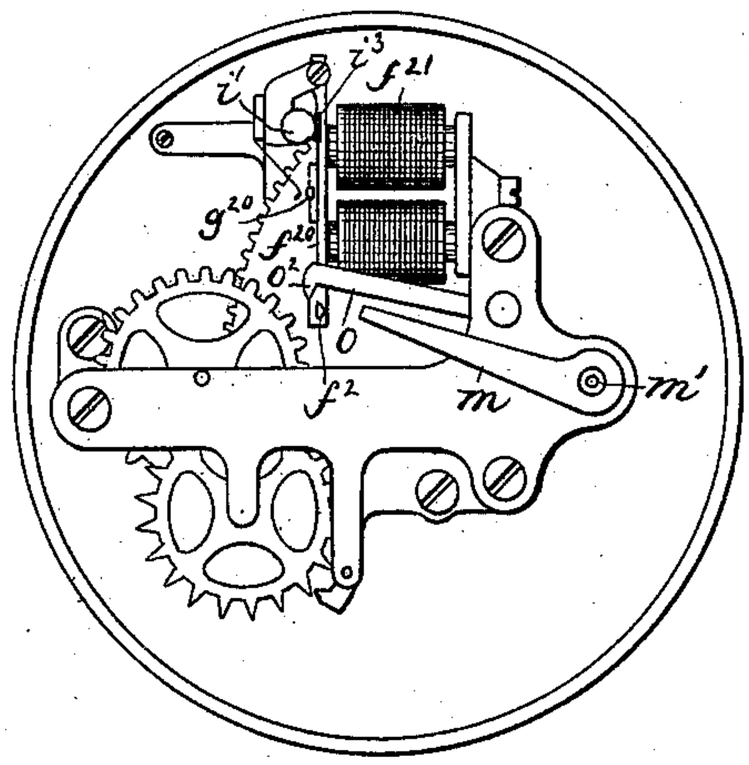


Fig. 4,

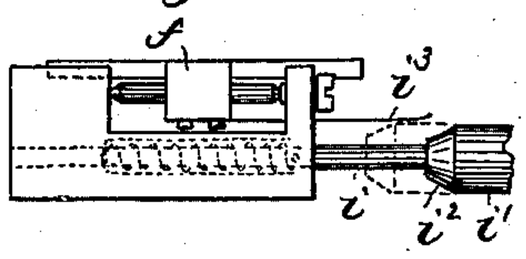
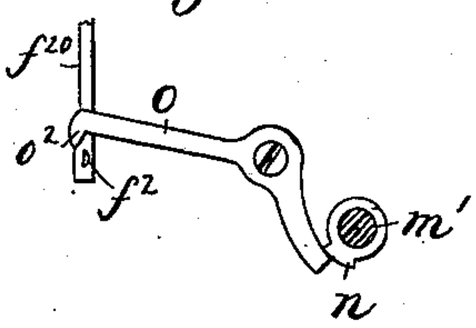


Fig. 5,



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(No Model.) 2 Sheets—Sheet 2.

A. A. SMITH.

FIRE ALARM SIGNAL BOX.

No. 378,983. Patented Mar. 6, 1888.

Fig. 6,

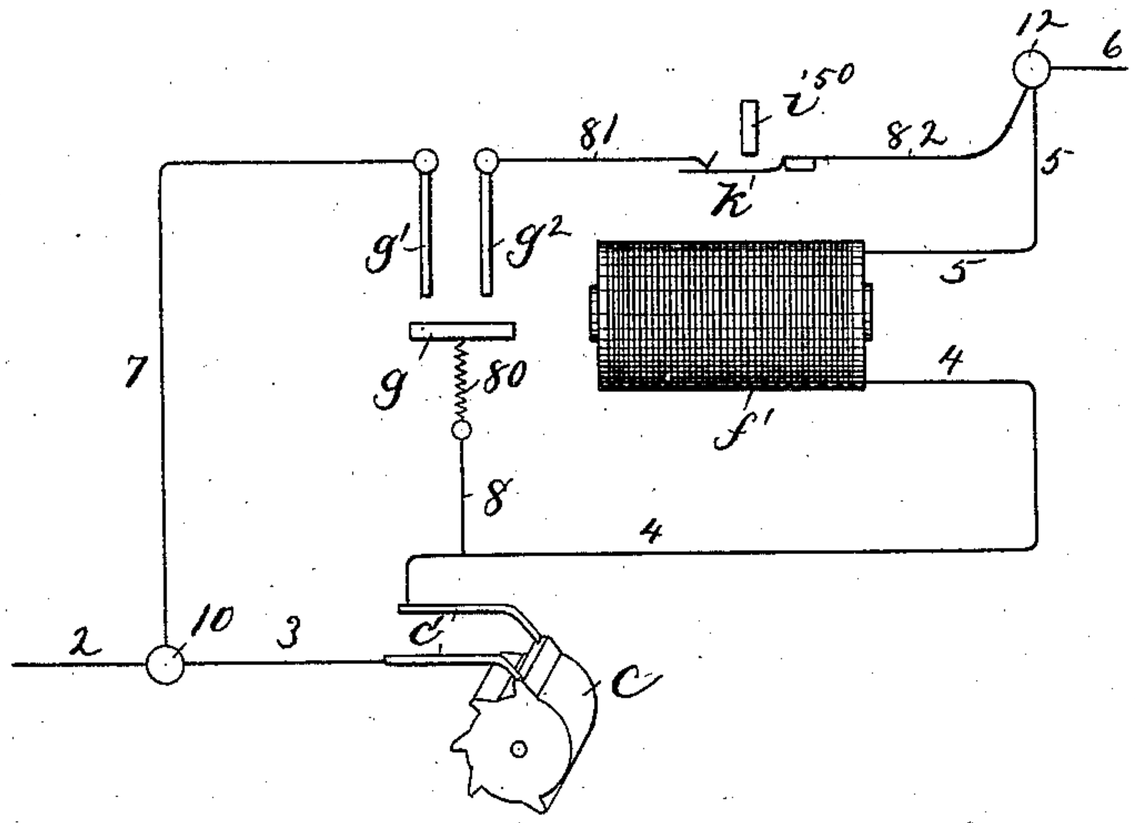
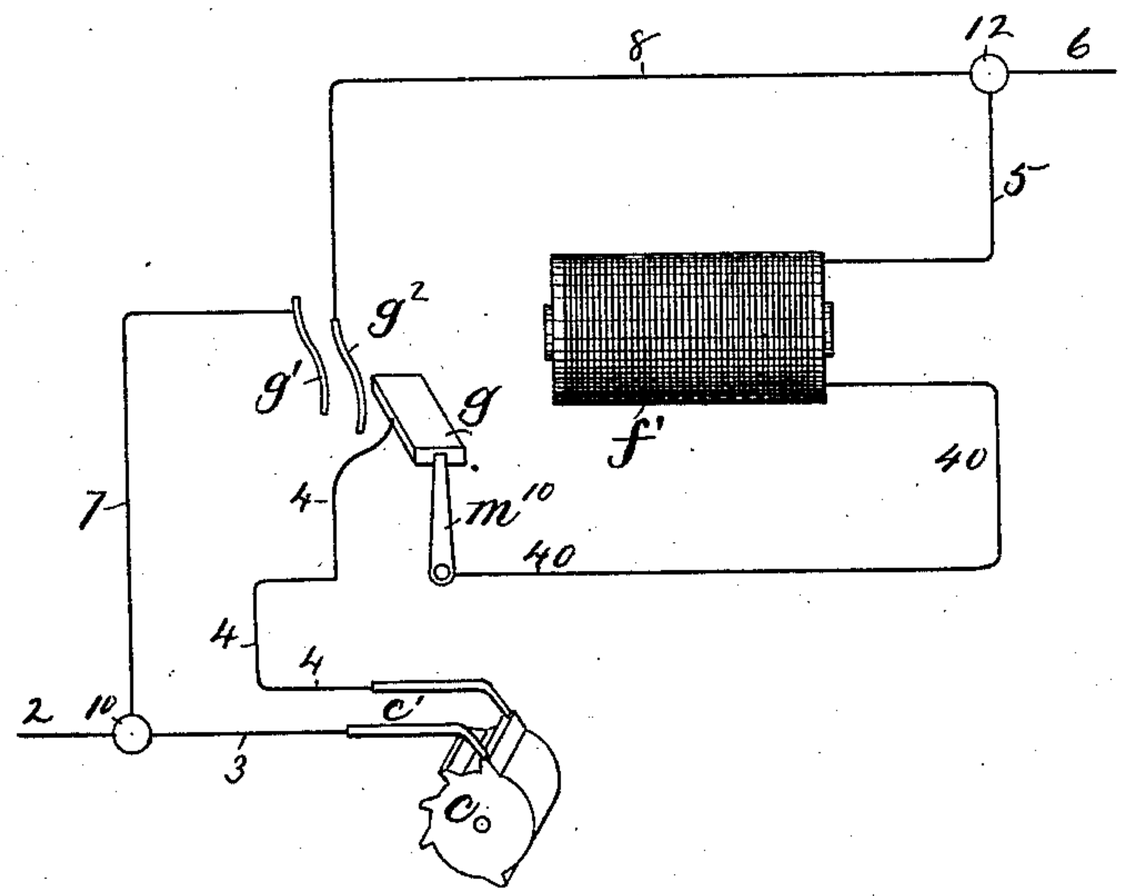


Fig. 7.



Witnesses,
Jas. L. Maloney.
M. E. Heil.

Inventor,
Alson A. Smith,
by Jos. P. Livermore,
Att'y.

UNITED STATES PATENT OFFICE.

ALSON A. SMITH, OF NEWTON, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO FREDERICK W. COLE, OF SAME PLACE.

FIRE-ALARM SIGNAL-BOX.

SPECIFICATION forming part of Letters Patent No. 378,983, dated March 6, 1888.

Application filed May 3, 1887. Serial No. 236,908. (No model.)

To all whom it may concern:

Be it known that I, ALSON A. SMITH, of Newton, county of Middlesex, State of Massachusetts, have invented an Improvement in Fire-Alarm Signal-Boxes, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention relates to a signal-box or transmitter such as used in fire-alarm telegraphs; and it consists in novel means for effecting non-interference between the signals of different boxes, or, in other words, for preventing any box from breaking in upon a signal that is already being transmitted from some other box that has been previously set in operation. Non-interference has been accomplished in various ways, most of which involve the use of a controlling electro-magnet, which, if demagnetized at the moment that the pull or starting device is operated, either prevents said box mechanism from being started, or prevents it from affecting the circuit if it is started. Thus if a second box has its pull operated during a break in the circuit forming part of a signal from some other box the said second box will not operate to change the circuit.

In all previous constructions, so far as I know, the controlling-magnet referred to has remained in the circuit, and thus been affected by the closures of the circuit forming part of a signal from any other box, and various devices have been employed for preventing the armature from responding to such closures if the box is opened while a signal is being transmitted from some other box. One such expedient consists in making the armature polarized, so that it remains in the same position whether the circuit is closed or broken, being moved once for all by a reversal of the current at the beginning and during the transmission of the signal. Another expedient consists in permitting the armature to move out of the field of the magnet, so that the normal current cannot draw it up, the said armature being restored after a signal is completed by throwing an abnormally large current on the line for a moment, or restored mechanically by a device operated by the box-door; and still another expedient consists in providing a locking device that mechanically retains the armature in its retracted position, said locking device being released by closing the box-door.

The present invention consists in throwing the controlling-magnet out of circuit in case the circuit is broken, when or immediately after the box-door is opened, either by opening a branch in which said magnet is included, or preferably by closing a shunt of low resistance around said magnet, and means are provided for restoring the said magnet into the circuit when the box-door is closed after a signal previously started from some other box has been completed. This way of effecting non-interference is especially advantageous for the purpose of altering old boxes that have been made to effect partial non-interference by rendering the box inoperative if its starting-lever is operated during an actual break in the circuit, but did not fully effect non-interference for the reason that the box might be started during one of the momentary closures that occur in the signal that is being transmitted from the box previously started.

Figure 1 is a front elevation of a fire-alarm signal-box embodying this invention of the kind in which the break-wheel motor is actuated by a spring that is wound for a number of operations; Fig. 2, an elevation of a signal-box embodying this invention of the kind in which the break-wheel motor is wound at each operation; Figs. 3 and 4, details of a portion of the mechanism shown in Fig. 1; Fig. 5, a detail of a portion of the mechanism of the box shown in Fig. 2, and Figs. 6 and 7 diagrams representing modifications in the arrangement of the circuit.

The invention is applicable to various kinds of signal-boxes, being shown in Fig. 1 as applied to a box comprising a motor or train of wheel-work, *a*, provided with a controlling or stop wheel, *a'*, governed by the stop-lever *b*, that has a projection, *b'*, entering a notch in a flange on the face of the wheel *a'* to stop the said wheel and the motor. The motor also operates the break-wheel *c*, consisting of a toothed metallic ring insulated from its arbor and metallic frame-work of the box and having two springs, *c'*, co-operating with it, the said springs being insulated from one another

and connected with the terminals of the main line, which is thus complete when a tooth or projection of the break-wheel bears against said springs, and is interrupted when the springs fall off from one of the teeth and are in the space between the teeth.

The locking or controlling lever *b* is operated by a pull or starting lever, *d*, and is provided at its end with an upwardly-projecting finger, b^2, co-operating with the armature-lever *f* of a controlling electro-magnet, *f'*, in the main circuit, the said armature-lever controlling a circuit-closer, *g*, governing a shunt or branch circuit, 7 8, around the break-wheel *c* and its co-operating springs *c'*.

The apparatus as thus far described is well known, and forms no part of the present invention; but as heretofore made the shunt 7 8 has been around the break-wheel only, and the magnet *f'* has remained permanently in the main circuit during the transmission of signals, so that its armature responds to each opening and closing of said circuit, unless mechanically prevented, the magnet being energized at each closure of the circuit.

The main circuit is represented in Fig. 1 as entering the box at 2, where it is connected with the binding-post 10, from which it passes by wire 3 to one of the springs *c'*, the other of which is connected by wire 4 with one terminal of the magnet *f'*, the other terminal of which is connected by wire 5 with the binding-post 12, connected with the main line 6, leading out from the box. The circuit-closer *g* consists of a strip of metal connected with but insulated from the armature *f*, and co-operating with a pair of springs, g' g^2, (see Fig. 3,) connected with the wires 7 8, respectively.

Fig. 3 is a side elevation of the armature-lever and co-operating parts as seen looking from the left in Fig. 1, and Fig. 4 is a plan view of said parts.

The projection b^2 of the stop-lever *b* co-operates with the armature-lever *f*, in the usual manner, to retain the said armature-lever in whichever position it happens to be when the stop-lever *b* is raised and the box started. Thus the circuit-closer *g* in the shunt 7 8 is retained in whatever condition it happens to be when the box is started during one complete operation of the box, and if the armature *f* happens to be retracted at the moment that the box is started the said circuit-closer *g* will retain the shunt 7 8 for the break-wheel closed, so that no effect will be produced by the rotation of the break-wheel.

When the shunt 7 8 does not include the magnet *f'*, as has been the case in boxes of this kind as heretofore used, the said magnet, as before stated, responds to every change in the circuit, and consequently its armature is attracted at each closure of the circuit in the transmission of a signal from any other box, and consequently there is a chance that any given box may be started during such closure, forming part of a signal that is already coming in from some other box, in which case the box last started would operate with its break-wheel in circuit and the two signals would interfere. In order to prevent such an occurrence the magnet *f'* is, in accordance with this invention, itself thrown out of circuit by the retraction of the armature *f*, which may be accomplished by a circuit-changing device operated by said magnet in any suitable manner.

In the construction represented in Fig. 1 the shunt 7 8 of the break-wheel also forms a branch of low resistance around the magnet *f'*, as shown, so that when the armature *f* is once retracted and the shunt 7 8 closed by the circuit-closer *g* thereof no current will pass through the magnet, which therefore cannot again attract its armature, and the latter thus remains unaffected by the closure in the circuit forming part of a signal that is being transmitted from some other box.

As the current in the main circuit cannot restore the armature after it has been once retracted, and has thus removed its magnet from circuit, it is necessary to provide means for restoring the magnet into the main circuit after a signal has been completed, which is accomplished, as shown in this instance, by a device for mechanically opening the shunt around the magnet or restoring the said magnet into its normal condition in the circuit. The said device consists of a spring-pressed slide-rod, *i*, provided with a head, *i'*, having a tapering or cam portion, i^2, co-operating with a spring, i^3, attached to the armature-lever *f*.

When the box-door is closed, the head *i'* is engaged by a projection, i^3, on the said door and moved into position shown in dotted lines, Fig. 4, where it lies in the path of the spring i^3, and thus prevents the armature from being retracted when the circuit is broken while the box-door is closed.

When the box-door is open, the head *i'* is moved back to the full-line position, so as not to engage the spring i^3 and interfere with the retractive movement of the armature, and consequently if the magnet *f'* is demagnetized at the moment when or immediately after the door is opened the armature will be retracted and will close the shunt around the break-wheel, and also throw the said magnet out of circuit, so that it will not be energized when the circuit is again closed. If the box should be started when in this condition, the end b^2 of the lever *b* would engage the armature *f* and lock it in its retracted position, so that it would retain the break-wheel shunted until the motor had made one complete operation and brought the notch of the wheel *a'* beneath the projection *b'* of the locking-lever *b*, when the said lever would fall and release the motor *f*. If the box-door were closed while the motor was thus running, the inclined portion or cam i^2 would engage the spring i^3 and tend to move the armature toward the magnet; but as the armature is locked the spring i^3 would itself yield, instead of moving the armature, and would be strained, so that the moment the armature-lever was unlocked by the return

of the locking-lever *b* to its normal position the said armature would be moved forward, thus breaking the shunt 7 8 and again placing the magnet *f'* in control of the main circuit. If the lever *b* were operated when the armature *f* was held up to the magnet, it would lock the armature in its forward position, so that it could not shunt the break-wheel while the box-motor was running.

It is not essential that the magnet *f'* should be in the same shunt that passes around the break-wheel, or that the said magnet should be thrown out of control of the circuit by shunting it, as it might be placed in open circuit after an independent branch for the circuit had been closed.

Fig. 6 represents a modification in which the magnet and break-wheel are controlled by different shunts. The line 2 3 4 5 6, including the break-wheel and magnet, is substantially as before described; but the anvil-piece *g*, that co-operates with the springs g' g^2 to form the shunt-circuit closer, is connected by a flexible connector, 80, and a wire, 8, with the line 4 between the break-wheel and magnet *f'*, so that when the anvil *g* comes in contact with the springs g' g^2 it connects the former spring, g', with the wire 80, and thus closes the shunt 7 80 8 for the break-wheel, which does not, however, remove the magnet *f'* from circuit. The spring g^2 in this construction is connected by wires 81 82 with the wire 6, so that the anvil-piece *g*, when in contact with the springs g' g^2, completes an independent shunt, 7 g' g g^2 81 82, for the magnet *f'*. In this construction the shunt 81 82 for the magnet *f'* may be provided with an independent circuit-breaker, *k*, operated by a projection, i^{50}, on the door of the box, so that when the door is closed the shunt of the magnet is broken, leaving the said magnet in circuit, so that as soon as the armature is released by the projection b^2 of the locking-lever it will be restored by the magnet itself to its normal position and thus open the shunt 7 80 8 for the break-wheel. The shunt for the break-wheel should not be broken until the motor has stopped running, and in the arrangements shown in Fig. 6 the breaking of the shunt 81 82 for the magnet does not open the shunt 7 8 for the break-wheel, for the reason that the armature is locked back by the projection b^2 of the locking-lever *b*, but it does leave the magnet *f'* in condition to be energized, so that as soon as its armature-lever is released by the projection b^2 it will be restored to its normal position and the box may then be operated. The shunt for the magnet in this construction might be broken by lifting the spring g^2 off from the anvil-piece *g*, without, however, breaking the connection between g' and *g*.

In the construction represented in Fig. 7 the magnet *f'* is placed in open circuit when its armature is retracted. In this case the portion 4 40 of the line between the break-wheel *c* and the magnet *f'* includes a circuit-breaker, g m^{10}, the part *g* of which operates as a circuit-closer for the springs g' g^2 in the shunt 7 8 for both the break-wheel and magnet, as before described. The parts are so adjusted that the anvil-piece *g* will make contact with the springs g' g^2 before it leaves the spring m^{10}, so that the main circuit will not be interrupted, and after the shunt 7 8 for the break-wheel is closed the branch 4 40, that includes the magnet *f'*, will be opened at g m^{10}, thus leaving the said magnet in open circuit.

Figs. 2 and 5 show the invention applied to the well-known sector-box, which is wound for each operation by turning the lever *m* by a pull or handle in the box. The main shaft m' of the box-motor connected with the said winding-lever *m* is provided with a cam, *n*, (see Fig. 5,) that controls a locking-lever, *o*, provided at its end with a projection, o^2, co-operating with a projection, f^2, on the armature-lever f^{20} of the controlling-magnet f^{21}, in substantially the same manner that the projection b^2 of the lever *b* controls the armature-lever *f* in the mechanism shown in Fig. 1—that is, the moment that the winding-lever *m* is turned to wind the box the lever *o* drops and locks the armature-lever f^{20} in whichever position it may happen to be—either attracted or retracted—until the motor is run down, when just at the end of its movement the cam *n* again engages the locking-lever *o* and unlocks the armature-lever.

In boxes of this kind as heretofore made the shunt 7 8, controlled by the circuit-closer g^{20} on the armature-lever f^{20}, has operated for the break-wheel only, the magnet f^{21} always remaining in circuit; but in accordance with the present invention the said shunt also passes round the magnet f^{21}, as already described in connection with Fig. 1, so that after the armature is once retracted it will not respond to subsequent closures in the circuit until the said shunt 7 8 has been broken, which may be effected by a plug, i', co-operating with a spring, i^3, on the armature-lever and operated by a projection on the box-door, just as described in connection with the mechanism shown in Figs. 1, 3, and 4. The magnet f^{21} governs the operation of the sector-box shown in Fig. 2 in just the same manner that the magnet *f'* controls the box shown in Fig. 1, and any of the modifications described for Fig. 1 are applicable to the kind of box shown in Fig. 2.

The invention may also be applied to spring-boxes substantially like that shown in Fig. 1, in which the pull or starting lever *d* is made mechanically inoperative on the locking-lever *b* when the magnet *f'* is demagnetized, substantially as shown in Patent No. 223,218, granted January 6, 1880. (See Fig. 1ª.) In this construction no shunt is required for the break-wheel, and the shunt for the controlling-magnet may be opened by a switch, as shown at *k*, Fig. 6, or may be opened by the same devices as represented in Figs. 1, 3, and 4, and the circuit may be the same as in Fig. 6 or 7, with the wire 7 omitted.

It is not essential that the magnet should be restored into the main circuit by a device operated by the movement of the box-door, it being necessary only that the magnet should be restored into circuit before the box-pull is operated, and the devices shown and described for effecting this meet all the requirements, and are believed to be the most convenient and effective that can be adopted.

I claim—

1. The combination of a main circuit and break-wheel with a controlling electro-magnet and armature, the coils of which magnet are normally included in said main circuit, and an additional circuit around said magnet, and circuit-closer therein operated by the armature of said magnet, substantially as and for the purpose described.

2. The combination of the main circuit and break-wheel therein with a controlling electro-magnet and armature, the coils of which magnet are normally included in the main circuit and an additional circuit around the coils of said magnet, and circuit-closer in said additional circuit, operated by the armature of said magnet, which when retracted closes the said additional circuit, and a mechanically-operated circuit-breaker in said additional circuit, by which the latter may be opened independently of the attraction of said magnet, substantially as described.

3. The combination of the break-wheel of a fire-alarm signal-box and a controlling electro-magnet and armature, with a shunt-circuit around the break-wheel and magnet, and a circuit-closer therein controlled by the armature of said magnet, and a device controlled by the door of the box for mechanically operating the said circuit-closer, substantially as and for the purpose set forth.

4. The combination of the break-wheel and controlling electro-magnet and armature, with a circuit-controlling device operated by said armature, whereby the said magnet is removed from the main circuit when the said armature is retracted, a spring connected with said armature, and a movable cam-plug operated by the door of the box and co-operating with said spring, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALSON A. SMITH.

Witnesses:

JOS. P. LIVERMORE,

JAS. J. MALONEY.