(No Model.) 2 Sheets—Sheet 1.

F. W. COLE.

SUCCESSIVE NON-INTERFERENCE SIGNAL BOX.

No. 445,801. Patented Feb. 3, 1891.

Fig. 1.

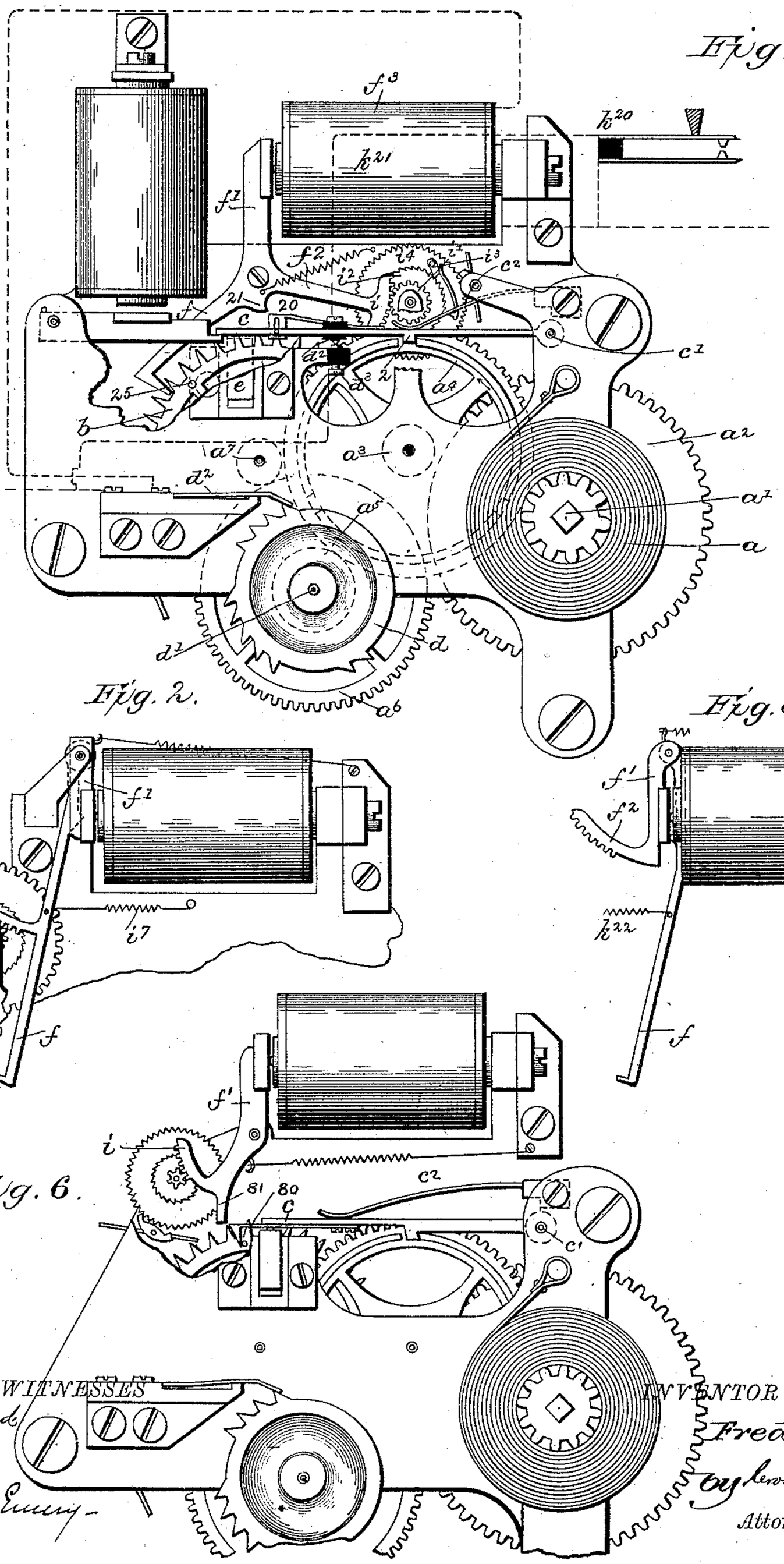

Fig. 2.

Fig. 3.

Fig. 6.

WITNESSES

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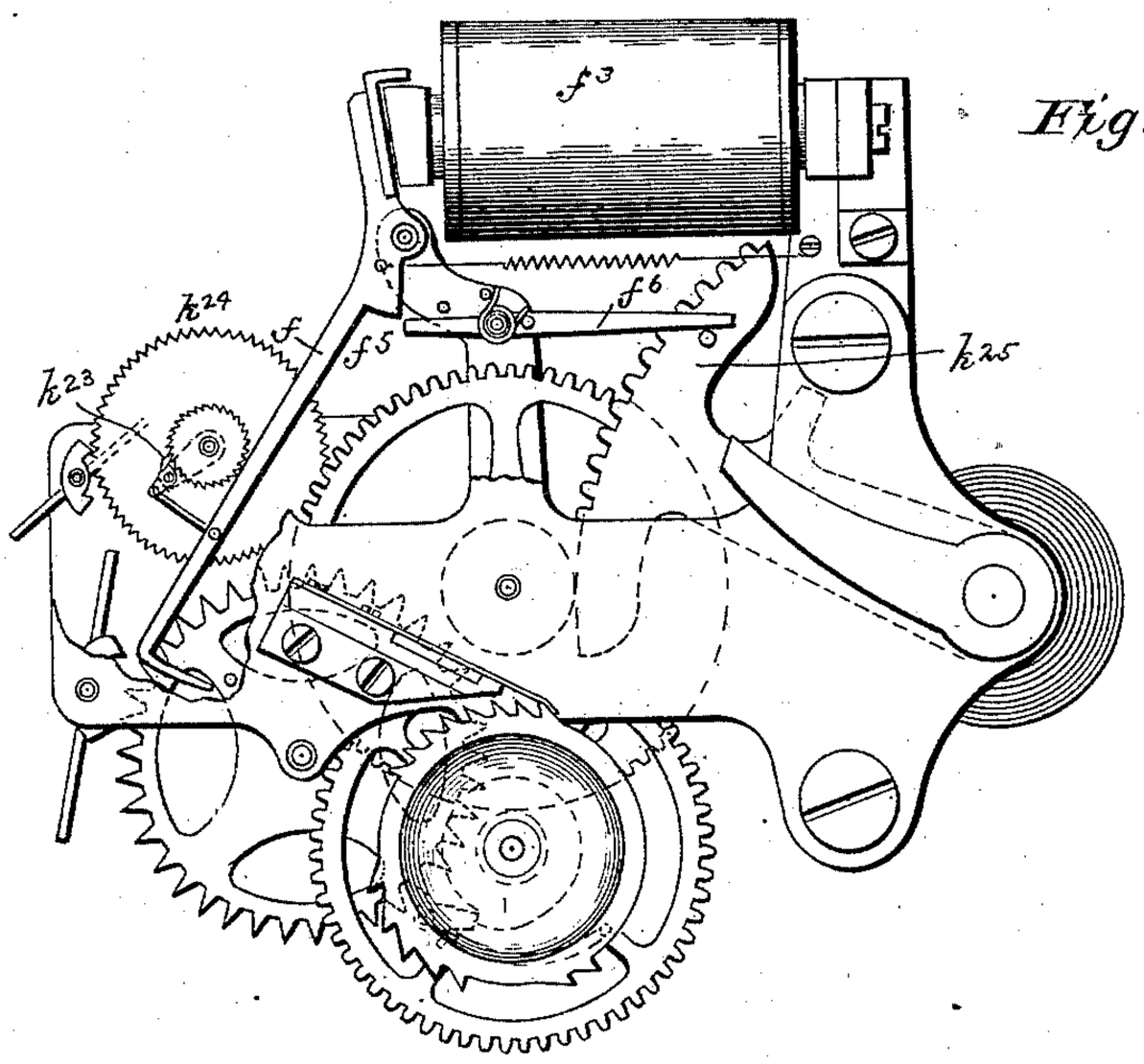
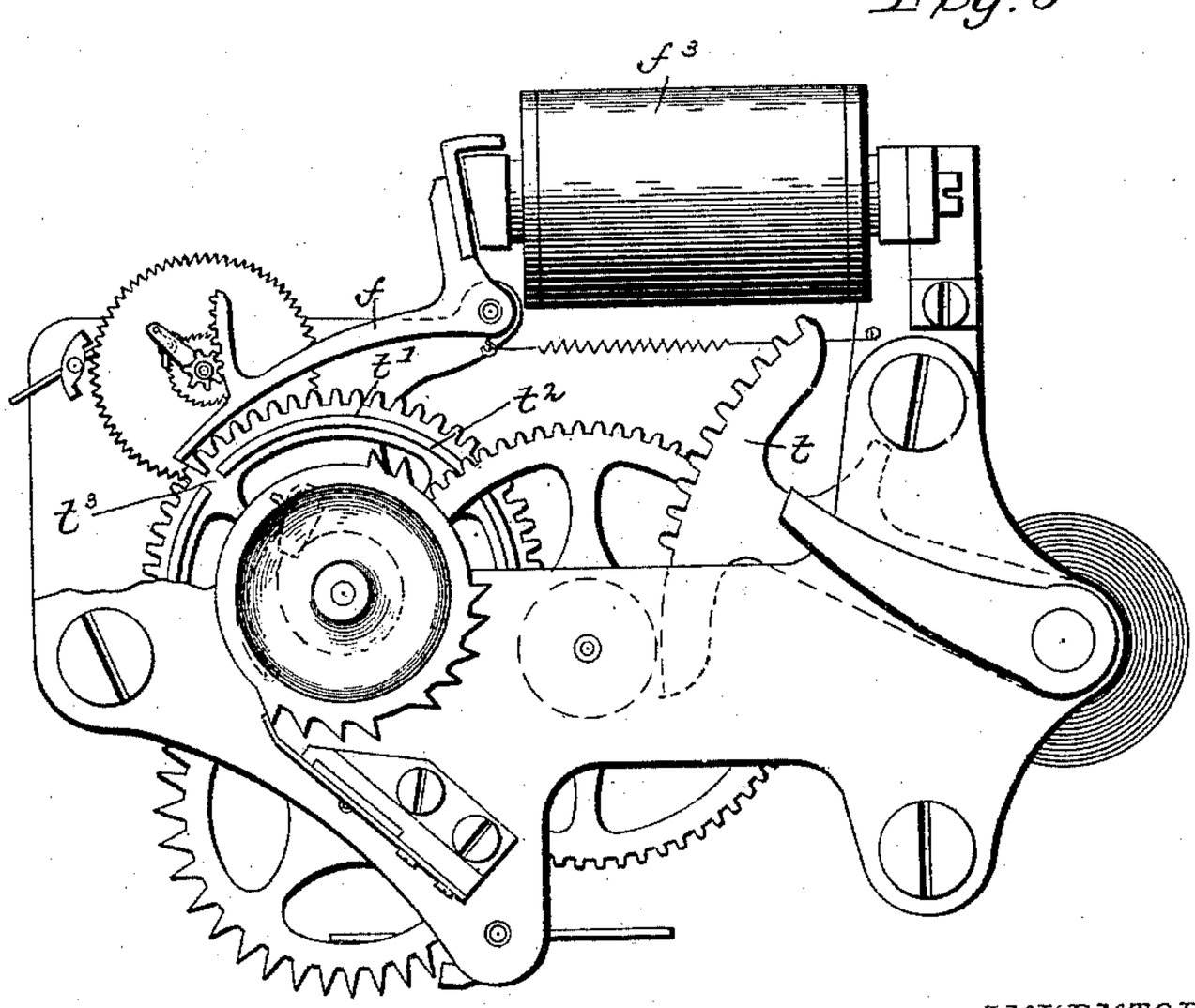


Fig. 4

Fig. 5



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UNITED STATES PATENT OFFICE.

FREDERICK W. COLE, OF NEWTON, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO MOSES G. CRANE, OF SAME PLACE.

SUCCESSIVE NON-INTERFERENCE SIGNAL-BOX.

SPECIFICATION forming part of Letters Patent No. 445,801, dated February 3, 1891.

Application filed November 14, 1890. Serial No. 371,427. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK W. COLE, of Newton, county of Middlesex, State of Massachusetts, have invented an Improvement in Successive Non-Interference Signal-Boxes, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention has for its object to improve the construction of non-interference signal-boxes, more especially in the production of a successive box, or one which when once started will send in its signal if the line is clear or will wait until such time arrives and then send in its signal without repetition on the part of the operator.

The invention consists in a signal-box containing the following instrumentalities, viz: a signaling mechanism, a non-interference magnet and its armature, means for setting a signal, means for retaining the set signal when the line is in use, signal-controlling mechanism governed by said armature, which operates to effect or permit the transmission of the retained signal on that closure in the signaling-circuit which is of longer duration than the longest closure in any signal. The signaling mechanism may be of any well-known or suitable construction, consisting of a train-work and a signaling-circuit changer adapted to operate the signaling-circuit to transmit the box-number. The means employed for retaining the set signal when the line is in use may be any form of controlling lever or device—such, for instance, as a locking-lever—which may be moved into position to hold the train in suspension, or otherwise prevent the transmission of the signal on a break in the signaling-circuit. The signal-controlling mechanism comprehends any form of device or devices for restoring the means employed for retaining the signal to its normal position, or placing it in such position as to allow the signal to go in, or not longer to obstruct the transmission of the signal, only on a closure in the signaling-circuit of longer duration than the longest closure in any signal. By means of signal-controlling mechanism of this kind a box when once cut out will not again obtain control of the signaling-circuit until the signaling-circuit has been closed a longer time than the longest closure in any signal, and hence will not interrupt a signal going in.

Figure 1 shows in front elevation the signaling mechanism of a fire-alarm box having a non-interference device embodying this invention; Figs. 2 and 3, details of the non-interference devices alone slightly modified; Fig. 4, a modification to be described, showing how a non-interference device embodying this invention herein shown may be applied to another form of signaling mechanism; and Figs. 5 and 6, still other modifications to be referred to.

The signaling mechanism shown in Fig. 1 consists of a normally-wound train or motor comprising the main spring a, placed on the winding-arbor a', the intermeshing gears, and pinions a^2 a^3 a^4 a^5 a^6 a^7 and the escape-wheel b and escapement not shown. The wheel a^4 of the train has a flange having a notch which receives a projection 2 on the starting-lever c, which lever is pivoted at c' and is held depressed by a spring c^2. A circuit-wheel d is secured to the shaft or arbor d' and has bearing upon it the contact-pens d^2. The pivoted actuating-pull e engages and lifts the starting-lever c when depressed, removing the projection 2 to release the motor mechanism, thereby permitting the circuit-wheel d to rotate until the notched wheel a^4 completes one revolution, at which time the projection 2 of the starting-lever enters the notch of the wheel a^4.

The lever c, which I herein denominate a "signaling-lever," as herein shown, carries a contact-point d^2, which normally bears on a stationary contact-point d^3, said contact being employed as the usual shunt for the box.

The controlling-lever for the box which forms a co-operative part of the means employed for retaining the signal when the line is in use is herein shown as a locking-lever, (represented in Fig. 1 at f,) and, as shown, is formed integral with the armature-carrying lever f' and sector-carrying arm f^2, the said arms diverging from a central pivotal point, although they may be variously arranged, as will be more fully explained. When the controlling-lever f is moved for the purpose of

locking the train, it co-operates with or engages a pin 25 on the escape-wheel. The electro-magnet f^3 is included in the signaling-circuit, as shown, during the time the signaling lever or arm c is raised, although it may be included during the time the box-door is open or all at the time if the shunt-circuit be omitted. The position of the locking-lever may be changed to lock the signaling mechanism after it has started by the demagnetization of the electro-magnet f^3, caused by the circuit being interrupted, as by a signal being transmitted from one of the other boxes in the circuit.

A stop or lever 20, held in its normal position by a spring or equivalent, is herein shown as attached to the signaling-lever c, terminating adjacent to a projection 21 on the locking-lever f, or it may be on the other levers f' or f^2, so that when the signaling-lever c is lifted by the actuating-pull the end of the said stop or lever 20 will occupy a position at one side of the said projection 21 on the locking-lever, and thereby serve as a stop or abutment to prevent the locking-lever or other controlling member from stopping the train during the time the circuit-wheel d is itself interrupting the circuit. Yet owing to the yielding action or independent movement of the stop 20, the said signaling-lever c is free to be lifted at any time, being depressed or held down by the projection 21 should it be in the way.

With the parts as shown in Fig. 1, the box-door being open, and the armature attracted in consequence, if the actuating-pull be moved the signaling-lever c will be lifted, the stop 20 will pass to the right-hand side of the projection 21, thereby holding the controlling-lever in the position shown, with the armature against the poles of the magnet, and the projection 2, disengaging its wheel a^4, will permit the motor to operate and transmit the signal; but if a signal is being transmitted from another box in the circuit at the time the present or "home" box is operated, the armature of the non-interference magnet will not be attracted, and the locking-lever will occupy a position to engage with the pin 25 as soon as the train has moved said pin 25 up to it, so that the motor when started by the signaling-lever will be stopped after it has been started or held in suspension. It is desired to return the controlling-lever to its normal position as soon as possible, that the motor may continue to operate and transmit the signal, and yet a sufficient length of time should elapse before the completion of the signal which is being transmitted from another box, and hence I have provided means for controlling the return movement of the said controlling-lever, which may be so timed as to permit the said lever to return to its normal position in a predetermined length of time after the circuit has ceased to be interrupted or is closed, such means constituting the signal-controlling mechanism. This controlling mechanism, as herein shown, consists of a retarding device herein shown as a toothed sector i, attached to the sector-carrying bar f^2, (see Fig. 1,) and engaging a pinion i', fixed to a shaft carrying a ratchet-wheel i^2. A spring-controlled pawl i^3 is pivoted to the side of a toothed wheel i^4, mounted loosely on the shaft carrying the ratchet-wheel i^2, and said toothed wheel i^4 serving as an escapement-wheel and having co-operating with it an escapement. As the sector-carrying bar f^2 is retracted, the motor i rotates the pinion i' and ratchet-wheel in the direction to allow the pawl i^3 to slip freely over the teeth of the ratchet, and as the armature is attracted the sector is returned by the force of the magnet, and during its return movement the pawl is engaged and the wheel i^4 moved in unison with the ratchet-wheel, its speed being regulated by the escapement. It will thus be seen that very shortly after the circuit has been restored to its normal condition the arm f^2 will be restored, and as the controlling-lever f is movable simultaneously with or controlled by it the motor will be released and the signal will be transmitted.

In Fig. 2 the controlling-lever f and the sector-bar f^2 are formed in one piece, which is loosely mounted upon the shaft of the armature-carrying bar f', and in this instance the armature is extended laterally to strike the sector-bar and move it as the armature is retracted, while a spring i^7 is employed to return the sector-bar to its normal position instead of the force of the magnet, as in Fig. 1, and hence the armature is left free to respond quickly to the interruptions of the circuit.

In Fig. 3 the sector f^2 is formed integral with or attached to the armature-carrying bar f', and the locking-lever f is made independent, being pivoted on the shaft supporting the armature-carrying bar, and said locking-lever f is moved away from the non-interference magnet into position to lock the train by means of a spring k^{22} when permitted to do so by means of the armature which lies in the path of movement of the said locking-lever.

Referring to Fig. 4, the controlling-lever f is connected with the retarding device and carries the armature. A shoulder f^5 is formed on said controlling-lever, with which co-operates a spring-controlled arm or stop f^6, the function of said arm or stop f^6 and the shoulder f^5 being substantially the same as the function of the stop 20 and projection 21. (Shown in Fig. 1.)

Referring to Fig. 5, a motor mechanism is shown adapted to be wound up as the sector t is pulled down. One of the wheels of the train, as t', has a rim t^2 with a notch t^3. The locking-lever f is shown as secured to the armature, so that when the armature is retracted the train is engaged by the locking-lever f. The escapement or retarding device in this and other figures is timed to consume

a little more time in operating than is occupied by the longest break in the signal-wheel, so that the locking-lever *f* will not be moved or returned sufficiently to release or disengage the signaling mechanism on a closure of short duration. By thus timing the retarding device it will not be necessary for a box to be held in suspense a long time after a signal has been transmitted, as the locking-lever will be restored almost immediately after the first signal has been completed, and the second can then follow immediately.

Referring to Fig. 6, the locking projection or stop is arranged on the spring-arm 80, corresponding with the yielding stop 20, Fig. 1, and a projection 81 is arranged on the armature-carrying lever, which corresponds with the projection 21 and subserves the same function. In all instances shown a "successive" box appears.

As I have herein shown my invention as applied to signaling mechanism of different forms, I do not desire to limit myself to its application to any particular form.

It is not intended to limit this invention to the specific form of means for retaining the signal set when the line is in use, or to the specific form of signal-controlling mechanism herein shown, as it is obvious that other forms or constructions—such, for instance, as that shown in my pending applications, Serial No. 326,607, filed October 10, 1889; No. 331,192, filed November 2, 1889; No. 353,845, filed May 31, 1890; No. 352,099, filed May 16, 1890; No. 348,785, filed April 21, 1890; No. 350,423, filed May 31, 1890; No. 352,550, filed May 20, 1890; No. 355,827, filed June 8, 1890, and No. 358,600, filed July 14, 1890—could be substituted without departing from my invention, which is to be construed broadly, irrespective of the specific forms of means and mechanism employed.

I claim—

1. A successive non-interference signal-box containing the following instrumentalities, viz: a windable signaling mechanism, a non-interference magnet, its armature, means for setting a signal, means for retaining the set signal when the line is in use, and signal-controlling mechanism governed by said armature and constructed and arranged to effect or permit the transmission of a signal on a closure in the signaling-circuit of longer duration than the longest closure in any signal, substantially as set forth.

2. In a signal-box, a signaling mechanism, signaling-lever, and a locking-lever which when moved positively engages and holds the signaling mechanism, combined with an electro-magnet and its armature, movement of which in one direction moves the locking-lever into engagement with the signaling mechanism or train, and a retarding device for the said locking-lever, substantially as described.

3. In a signal-box, signaling mechanism and a non-interference electro-magnet, combined with a locking-lever controlled by the armature of the said electro-magnet, and adapted to be moved freely or unrestrained in one direction to lock the signaling mechanism by a change in the condition of the circuit, and a retarding device for the said locking-lever, which is engaged by said lever on its return movement, that the said locking-lever may return to its normal position slowly, substantially as described.

4. In a signal-box, a signaling-train and a locking-lever movable freely or unrestrained in one direction to engage and hold the signaling-train, and a non-interference electro-magnet permitting such movement, combined with a retarding device which is engaged by said locking-lever on its return movement, said retarding device being timed to restrain or retard the said locking-lever a little longer time than is consumed by the longest impulse of the signal-wheel, substantially as described.

5. In a signal-box, a signaling-train, signaling-lever, and locking-lever *f* for the signaling-train, combined with the non-interference electro-magnet, its armature-carrying bar, the sector *i*, pinion *i'*, ratchet, pawl, and escapement, substantially as described.

6. In a signal-box, the signaling mechanism, combined with a non-interference magnet, its armature, and a lever adapted to co-operate with one member of the said signaling mechanism and control its operation, movement of said lever being governed by the armature of said non-interference magnet, and a retarding device for retarding or restraining the movement of said armature in one direction only, substantially as described.

7. In a signal-box, the signaling mechanism and signaling-lever therefor, and a stop, as 2, on one of the members of said signaling mechanism, combined with the non-interference electro-magnet, and the locking-lever *f*, controlled by said electro-magnet, the engaging end of which, when in its abnormal position, enters the path of movement of the said stop 2, but does not contact therewith until the member having the stop has moved a short distance that the signaling-train may be stopped after it has been started, but before its first impulse has been transmitted, and there held until released by said locking-lever *f*, after which it continues to operate and transmit its signal, and a retarding device for retarding the movement of the said locking-lever from its abnormal to its normal position, substantially as described.

8. In a signal-box, the signaling mechanism comprising as a co-operative part of it a member having a stop and a starting lever, combined with the non-interference electro-magnet, a locking-lever, movement of which is controlled by the armature of the said electro-magnet, said locking-lever when in its abnormal position engaging the aforesaid stop to stop and render inoperative the signaling mechanism after it has been started, and an adjustable

retarding device co-operating with the locking-lever on its return movement, substantially as described.

9. In a signal-box, the signaling mechanism, signaling-lever therefor, the non-interference magnet, and its armature, combined with the pivoted three-armed lever, the arms of which radiate from the pivotal point of the said lever, one of which arms carries the said armature, another of which arms serves as a locking arm or lever and engages and locks the signaling-train when moved into its abnormal position, and a retarding device, substantially as described, co-operating with the third arm only on the return movement of the said three-armed lever to its normal position, substantially as described.

10. In a signal-box, the signaling mechanism and signaling-lever, the non-interference magnet, and its armature, combined with the movable stop 20, independent of but moved by the signaling-lever when the latter is lifted, and the projection 21, with which the stop co-operates to hold the armature of the said non-interference magnet in fixed position, substantially as described.

11. In a signal-box, the signaling mechanism and signaling-lever, the non-interference magnet, its armature, and a locking-lever for the signaling mechanism controlled by said armature, combined with the movable stop for the locking-lever, its engagement therewith depending on the position of the armature of the non-interference magnet, substantially as described.

12. In a signal-box, the signaling mechanism and signaling-lever, the non-interference magnet, its armature, and a locking-lever for the signaling mechanism controlled by said armature, combined with a movable stop for the locking-lever, controlled by the armature of the non-interference magnet, substantially as described.

13. In a signal-box, the signaling mechanism and signaling-lever, the non-interference magnet, its armature, and a locking-lever for the signaling mechanism controlled by said armature, combined with a movable stop for the locking-lever independent of but controlled by the signaling-lever, substantially as described.

14. In a fire-alarm system, several boxes connected in circuit and each having a stop on one of its co-operating members, and a non-interference magnet and a locking-lever controlled by the armature thereof, and a differently-timed retarding device co-operating with the locking-lever of each box on its return movement, substantially as described.

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

FREDERICK W. COLE.

Witnesses:

BERNICE J. NOYES,

EDWARD F. ALLEN.