(No Model.) 3 Sheets—Sheet 1.

F. W. COLE.

NON-INTERFERENCE SIGNAL BOX.

No. 453,993. Patented June 9, 1891.

FIG. 1.

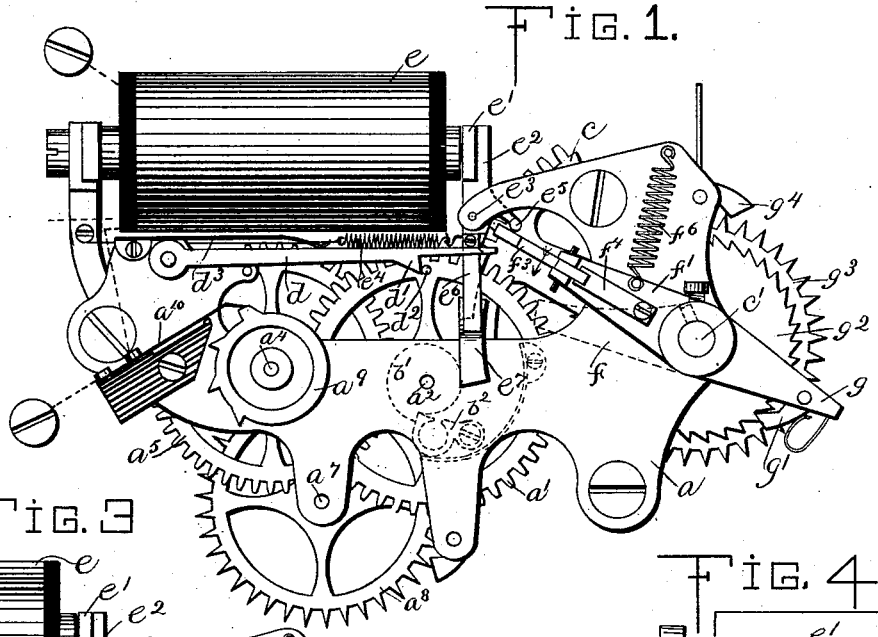


FIG. 3.

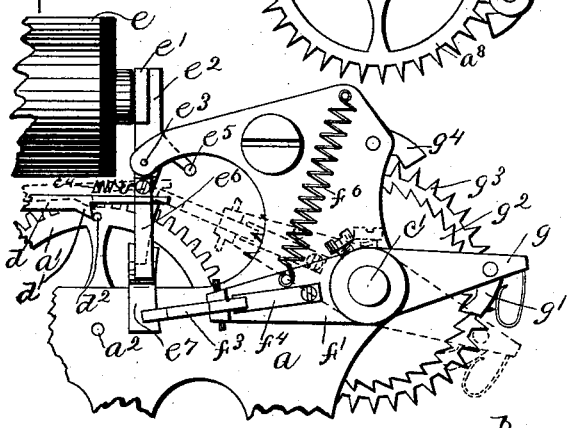
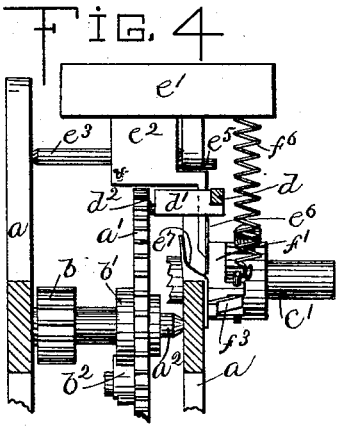


FIG. 4.



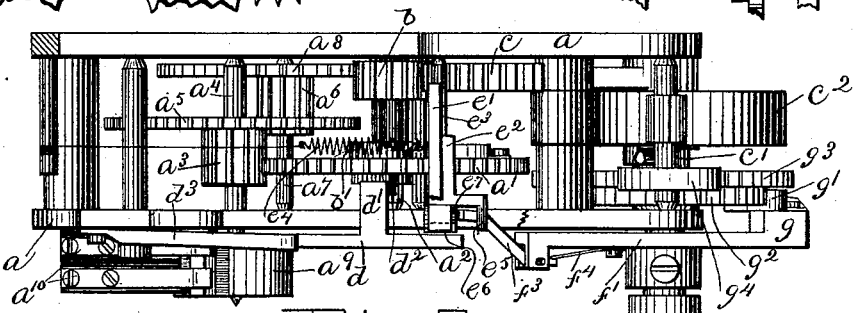


FIG. 2.

Witnesses.
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(No Model.) 3 Sheets—Sheet 2.

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NON-INTERFERENCE SIGNAL BOX.

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FIG. 9

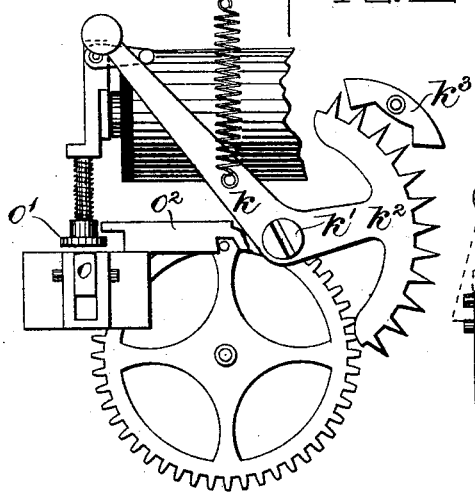


FIG. 10

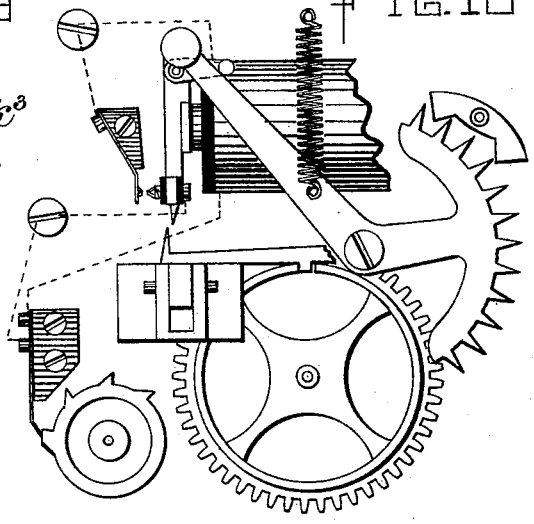


FIG. 12

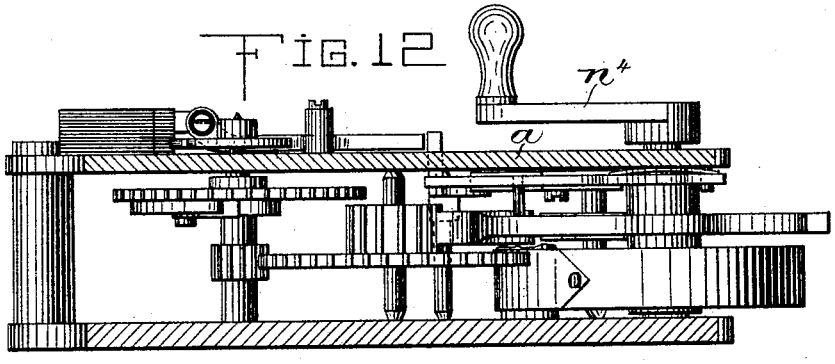
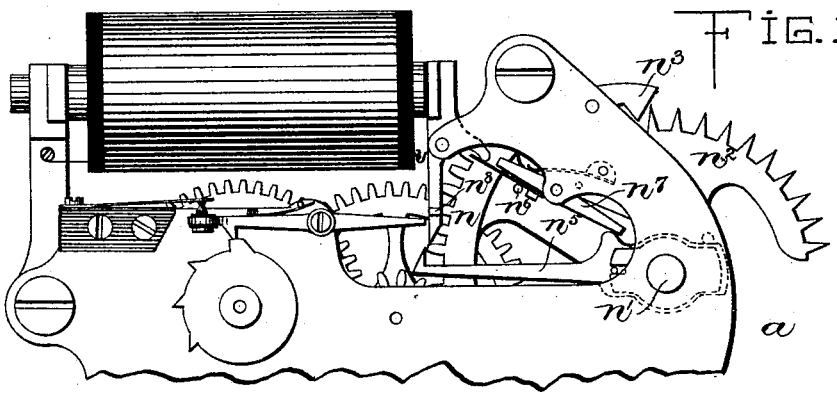


FIG. 11



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(No Model.) 3 Sheets—Sheet 3.

F. W. COLE.

NON-INTERFERENCE SIGNAL BOX.

No. 453,993. Patented June 9, 1891.

FIG. 6

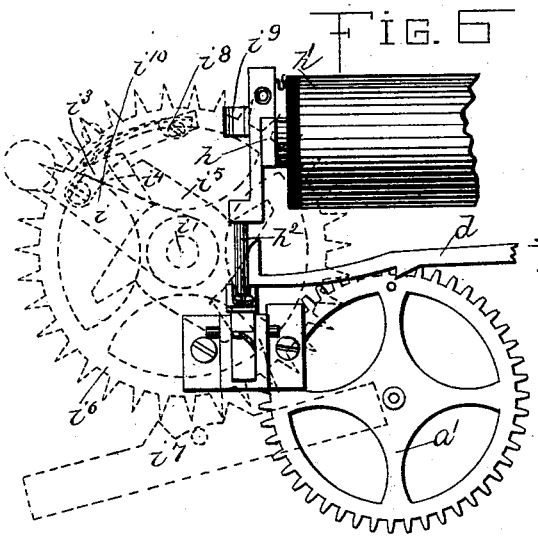


FIG. 5

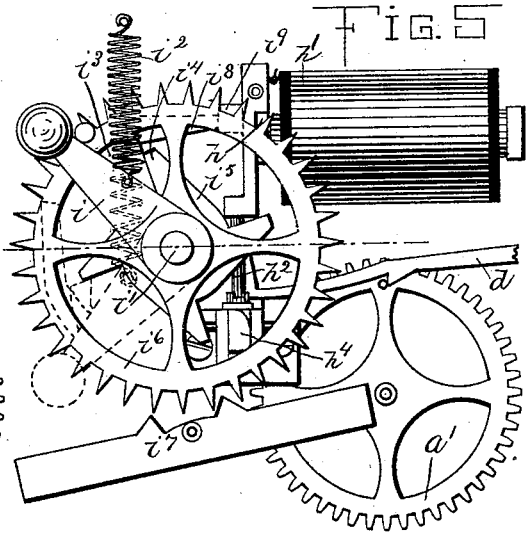


FIG. 7

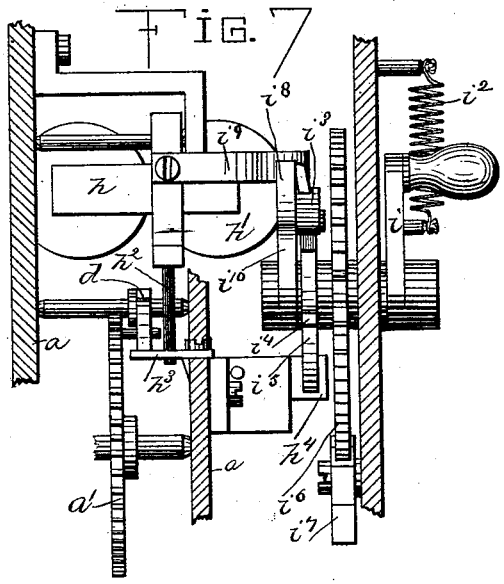
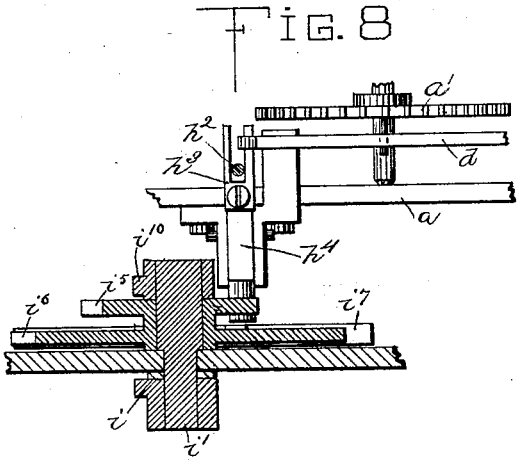


FIG. 8



Witnesses:
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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.

NON-INTERFERENCE SIGNAL-BOX.

SPECIFICATION forming part of Letters Patent No. 453,993, dated June 9, 1891.

Application filed February 7, 1891. Serial No. 380,584. (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 Non-Interference Signal-Boxes, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention has for its object the production of a non-interference signal-box which requires for its operation a closure of the signaling-circuit of longer duration than the longest closure in any signal; and my invention consists in the combination of a signaling-train, which is placed under the control of the non-interference magnet for a period of time after the signaling-lever has been operated and before the first impulse has been transmitted, such period of time being longer than the longest closure in any signal, whereby the control of the signaling-circuit will not be given to a box unless the said circuit has been closed a longer time than the longest closure in any signal, a non-interference magnet and its armature and a signal-controller governed by said armature, and a signaling-lever for the train which requires a longer time for operating than the longest closure in any signal.

Figure 1 shows in front elevation a signal-box embodying this invention. Fig. 2 a plan view of the signal-box shown in Fig. 1, the non-interference magnet being omitted; Figs. 3 and 4, details of the box shown in Fig. 1; Figs. 5 to 8, views of a modified form of signal-box embodying this invention; Fig. 9, another modified form of signal-box embodying this invention; Fig. 10, a modification to be referred to; Fig. 11, a modification to be referred to; and Fig. 12 an under side view of signal-box shown in Fig. 11, the magnet being omitted.

The main frame-work a is of suitable construction to support the operating parts.

The signaling-train herein shown comprises a toothed wheel a', secured to a shaft a^2, which meshes with a pinion a^3, secured to a shaft a^5, to which shaft is secured a toothed wheel a^3, which meshes with a pinion a^6, secured to a shaft a^7, to which shaft is secured an escape-wheel a^8. A signal-wheel a^9 is secured to the shaft a^4 and suitable contact-pins a^{10} are provided, which co-operate with said signal-wheel to constitute a box-number circuit-changing device. A pinion b is arranged loosely on the shaft a^2, which has a ratchet-tooth hub b', which is engaged by a pawl b^2, secured to the toothed wheel a'. A sector c is loosely arranged on the shaft c', which engages the pinion b, and on the hub of said sector a main spring c^2 is placed, one end of which is connected with the said sector-hub and the other end with a suitable fixed support, such as one of the posts of the frame.

A controlling-lever d (herein represented as a locking-lever) is pivoted to the main frame-work and has a suitable projection or shoulder d', which engages a pin d^2 on the wheel a', said locking-lever d acting to stop the train at a certain point in order that it may run a definite length of time when wound up and let off. The locking-lever d is normally held in its locking position by means of a spring d^3.

A non-interference magnet e is provided, the armature e' of which is borne by a suitable support e^2, pivoted at e^3 to the main frame-work, and a suitable retracting-spring e^4 is provided, which acts to retract the armature when the non-interference magnet is demagnetized and the armature free to move. In lieu of this particular form of support for the armature any other suitable means may be employed.

On account of the unavoidable variations of the strength of currents, the armature when retracted, may be at times out of magnetic field of the non-interference magnet, and hence means are preferably provided for returning said armature to its normal position or placing it within the magnetic field. An arm f is secured to the shaft c', which is engaged by the operating lever or pull, (not shown,) and to said shaft c' an arm f' is secured, which has pivoted to it at its outer end a bent arm f^3, which is held in one of its extreme positions by a spring f^4. The arm f' and the arm f^3, pivoted to it, as shown, serves as a jointed or two-part arm, which constitutes the signaling-lever for the train. It is designed that the signaling-lever shall be

controlled by the armature, and shall also serve as the means for restoring the armature to its normal or attracted position. To accomplish the latter function, the support e^2 has a projection e^5, which overlies the arm f^3, so that when the said arm resumes its elevated position it will strike the projection e^5 and turn the support e^2 on its pivot e^3 and restore the armature. To accomplish the former and most essential function, the support e^2 has on it a guide end, which carries a latch-spring e^6, and on a fixed support, as the main frame-work, for instance, a bevel faced or inclined block e^7 is secured, upon which the lower end of the spring e^6 bears or nearly approaches, said spring and bevel-faced block presenting between them a V-shaped recess or passage, which is located in the path of movement of the arm f^3, so that when said arm f^3 is depressed or moved in the direction of the arrow thereon it passes between the said spring and block, the spring acting as a latch to prevent return through the same passage, so that when said arm is moved in the opposite direction or returns to its normal position it passes by at the outside of the spring e^6. The locking-lever d projects forward sufficiently and at that side of the guide end of the armature to lie in the path of movement of the arm f^3, when the latter resumes its normal position at the outside of the spring e^6, so that it will be struck and lifted by said arm f^3 to let off the box, as shown in dotted lines, Fig. 3. As the arm f^3 returns to its normal elevated position on the outside of the spring e^6, it is held in its abnormal position against the tension of the spring f^4, and as soon as said arm f^3 has on its return reached that point where the guide end of the armature no longer obstructs, as represented in Fig. 3, the said arm f^3 will be turned on its pivot by the spring f^4, and thereby moved from beneath the outer end of the locking-lever d into the recess formed or presented beneath the projection e^5. The signaling-lever f' f^3 is restored to its normal position by means of a spring f^6.

An arm g is secured to the shaft c', which carries a pawl g', which engages a ratchet-toothed wheel g^2, arranged loosely on the shaft c', said ratchet-toothed wheel being rigidly connected with a toothed escape-wheel g^3, which has co-operating with it a suitable pallet g^4. The escape-wheel, ratchet-wheel, and pawl subserve the purpose of a retarding or timing device for the signaling-lever, and, as will be seen, is operated in only one direction, so that the signaling-lever may be moved in one direction quickly, but will return to its normal position slowly.

When a signal is being transmitted from any box, the line is opened and closed repeatedly, and if the line remains closed a longer time than the longest closure in any signal it is evident that no signal is being transmitted. Hence by placing the signal-controller of a box always under the control of the line for a longer time than the longest closure in any signal, just prior to giving the control of the line to said box, the said signal will not interfere with another, and such feature I desire to herein broadly claim. This result is accomplished, as represented in Figs. 1 to 4, by the employment of a retarding or timing device operated by or in conjunction with the signaling-lever, whereby the signaling-lever is not allowed to lift or operate the locking or controlling lever until after a certain period of time after it has been operated. The co-operation of the signaling-lever with the locking or controlling lever is dependent on the position of the armature, and, as herein shown, this result is accomplished by moving the guide end of the armature-support out of the path of movement of the signaling lever or arm f^3, which is done by the armature retracting, and when so moved the signaling-lever will return to its normal position following along on the block or returning in precisely the same path in which it was depressed, and thereby will not strike the locking-lever d. The time consumed by the signaling-lever returning, controlled by the retarding or timing device, is longer than the longest closure in any signal, and hence the armature must remain in its attracted position a longer time than the longest closure in any signal, that the signaling-lever may follow along on the outside of the spring e^6 and engage to lift the locking-lever d.

I do not desire to limit my invention to the particular form of signaling-train herein shown, as it may be either normally wound or unwound and attracted or let off by the signaling-lever; nor do I desire to limit my invention to the particular construction of the parts or co-operating devices, as many changes may be made and still come within the spirit and scope of this invention, and a few such modifications I will herein describe.

Referring to Figs. 5 to 8, the portion of a signaling-train is represented as the locking-wheel a' and locking-lever d. The armature h of the non-interference magnet h' has a guide end or projection h^2, which extends down and enters the bifurcated end of an arm h^3, pivoted to an arm h^4, which is in turn pivoted to the frame-work, the pivots of the said arms being at right angles with relation to each other. The bifurcated arm h^3 normally occupies a position just beneath the outer ends of the locking-lever d, so that as the said arm h^4 is turned on its pivot the said locking-lever will be lifted to let off the train; but if the arm is retracted the bifurcated arm h^3 will be turned on its pivot independent of the arm h^4, so that when said arm h^4 is turned on its pivot it will not engage the locking-lever d. The arm i is secured to the shaft i', to which shaft is also secured an arm i^{10}, said arms being held in their elevated position by a strong spring i^2, and the arm i^{10} carries a pawl i^3, which is designed to engage

one or another tooth i^4 of a cam-wheel i^5, arranged loosely on the shaft i' and rigidly connected with the escape-wheel i^6, with which co-operates a suitable pallet i^7. As the arm i is depressed or moved into the dotted-line position shown in Fig. 5 the pawl will engage the next tooth of the cam-wheel i^5, and as the said arm returns to its normal position the said cam-wheel will be revolved. The cam-wheel is located just above the arm h^4, so that its teeth will engage and depress the said arm at or near the end of its movement as it revolves, being governed by the retarding or timing device as the arm i returns to its normal position. The projection i^8 (see Figs. 6 and 7) is secured to the arm i^{10}, which strikes a spring or projection i^9, carried by the armature h, and thereby restores the armature to its attracted position. It is to be understood that in this instance the armature is designed to be moved out of the magnetic field when retracted.

Referring to Fig. 9, a different form of non-interference signaling-train is shown. The signaling-lever k is pivoted at k', and has formed integral with it or rigidly secured to it a sector k^2, with which co-operates a suitable pallet k^3 to serve as a retarding or timing device therefor, and said lever k strikes the lever o, which in turn engages the plate o' and lifts the locking-arm o^2.

Referring to Fig. 10, another form of non-interference signaling-train is shown, it embodying a shunt-circuit closer for the signaling-wheel, so that the train can run and no signal will be transmitted unless said circuit-closer is open.

Referring to Figs. 11 and 12, another form of signaling-train is shown, being somewhat similar to the train shown in Fig. 1, except in this case the sector n is rigidly fastened to the main shaft n', and has formed integral with it the retarding escapement-wheel n^2, which engages the pallet n^3. A signaling-lever n^4 is also fastened to the main shaft n', and an arm n^5 is also frictionally connected to the main shaft, to be moved with said shaft when not otherwise held. A pin n^6 is fastened to the sector, which, through the medium of a spring-carrying arm n^7, pivoted to the frame, acts as a restorer for the armature and also for the friction-connected arm n^5. A projection n^8, carried by the armature, is so arranged as to prevent the signal-key from vibrating when the armature is retracted, and the arm n^5 is arranged so as to lock the armature while the train is running.

In the instances shown in Figs. 1 to 9, inclusive, a retarding or timing device is provided, which governs the operation of the signaling-lever to let off or control the operation of the train, and the said signaling-lever is also governed by a signal-controller, which is in turn governed by the armature of the non-interference magnet, said signal-controller determining by its position whether or not the signal shall be transmitted when the signaling-lever has been operated.

In the instances shown in Figs. 10 to 12, inclusive, forms of signaling mechanism are referred to in which the train is always released when the signaling-lever is operated; but the transmission of a signal is governed by the position of the signal-controller when the signal-wheel attempts to open the circuit or transmit a signal, the signal-controller in one of these instances electrically disabling the signal-wheel and in the other instance mechanically disabling said wheel, the signaling-train being allowed to run in these instances; also, the signal-controller is under the control of the signaling-circuit after the operation of the signaling-lever and before the operation of a signal for a period of time longer than the longest closure in any signal.

I do not wish to limit my invention to the specific forms or constructions herein shown, as many ways might be shown whereby the transmission of a signal is dependent upon the armature of the non-interference magnet remaining in attracted position for a period of time after the signaling-lever is operated and before the signal is started, said period of time being longer than the longest closure in any signal.

I claim—

1. In a non-interference signal-box, a signaling-train, a non-interference magnet and its armature, and a locking-lever for the train, combined with a signaling-lever for moving the locking-lever, a retarding or timing device for said signaling-lever, and a box-controller governed by said armature, substantially as described.

2. In a non-interference signal-box, a signaling-train, a non-interference magnet, and its armature, combined with a signal-controller governed by said armature, a signaling-lever for the train, and a retarding or timing device for said signaling-lever, substantially as described.

3. In a non-interference signal-box, a signaling-train, a non-interference magnet, and its armature, combined with a signal-controller governed by the said armature, a signaling-lever, and a retarding or timing device for it which requires a longer time in operating than the longest closure in any signal, substantially as described.

4. In a non-interference signal-box, a signaling-train, a non-interference magnet and its armature, and a locking-lever, combined with a signaling-lever, a retarding or timing device for it which requires a longer time in operating than the longest closure in any signal, and a signal-controller governed by the said armature, which controls the operative connection between the signaling-lever and locking-lever, substantially as described.

5. In a non-interference signal-box, a signaling-train, a non-interference magnet and its armature, and a signal-controller governed

by it, combined with a signaling-lever for the train, which also serves as a restorer for the armature, substantially as described.

6. In a non-interference signal-box, a signaling-train, a non-interference magnet and its armature, and a signal-controller, combined with a signaling-lever for the train, which also serves as a restorer for the armature, and a timing device for said lever, substantially as described.

7. In a non-interference signal-box, a signaling-train, a non-interference magnet and its armature, and a signal-controller governed by said armature, combined with a signaling-lever which controls the operation of the train and also restores the signal-controller to its normal position, substantially as described.

8. In a non-interference signal-box, a signaling-train, a non-interference magnet and its armature, and a signal-controller governed by it, combined with a signaling-lever for the train, which when in its normal position also serves as a holder for the armature, substantially as described.

9. In a non-interference signal-box, a signaling-train, a signaling-lever adapted to cooperate therewith to effect or permit the transmission of a signal, combined with a non-interference magnet and its armature, which controls the co-operation of the signaling-lever and signaling-train, and a part controlled by or formed as a part of said signaling-lever for holding the armature of the non-interference magnet in attracted position, substantially as described.

10. In a non-interference signal-box, a signaling-train, a locking-lever therefor, a signal-controller, a non-interference magnet, and its armature governing said signal-controller, combined with a signaling-lever and a part controlled by or formed as a part of said signaling-lever for holding the armature in its attracted position, substantially as described.

11. In a non-interference signal-box, a motor-driven box-number circuit-controller, a signaling-lever, a non-interference magnet, its armature, a signal-controller governed by said armature for a longer time than the longest closure in any signal upon the operation of the signaling-lever and before the first impulse of the signal can be transmitted, and a spring-actuated timing mechanism operated by the signaling-lever for determining such length of time, 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.