(No Model.)

W. H. KIRNAN.

NON-INTERFERENCE SIGNAL BOX.

No. 548,317. Patented Oct. 22, 1895.

Fig. 1.

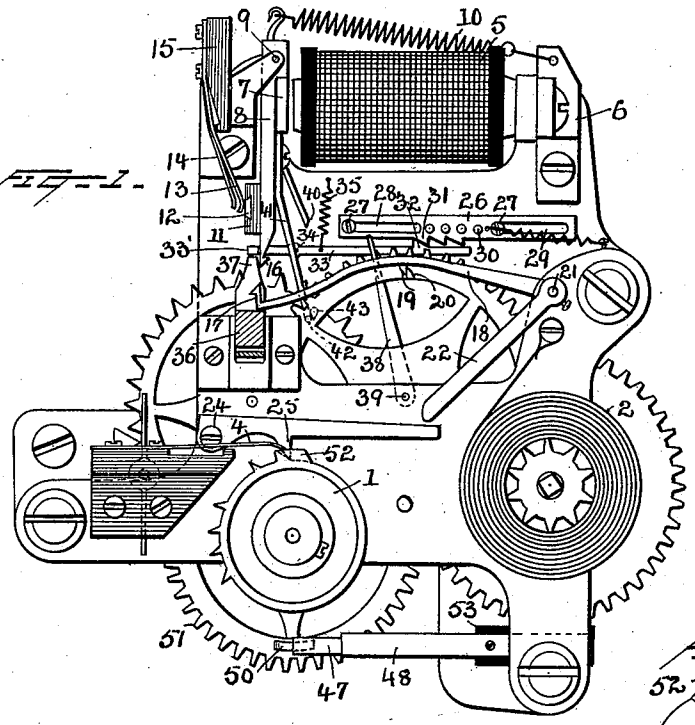


Fig. 3.

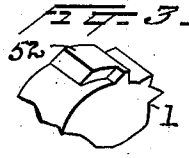
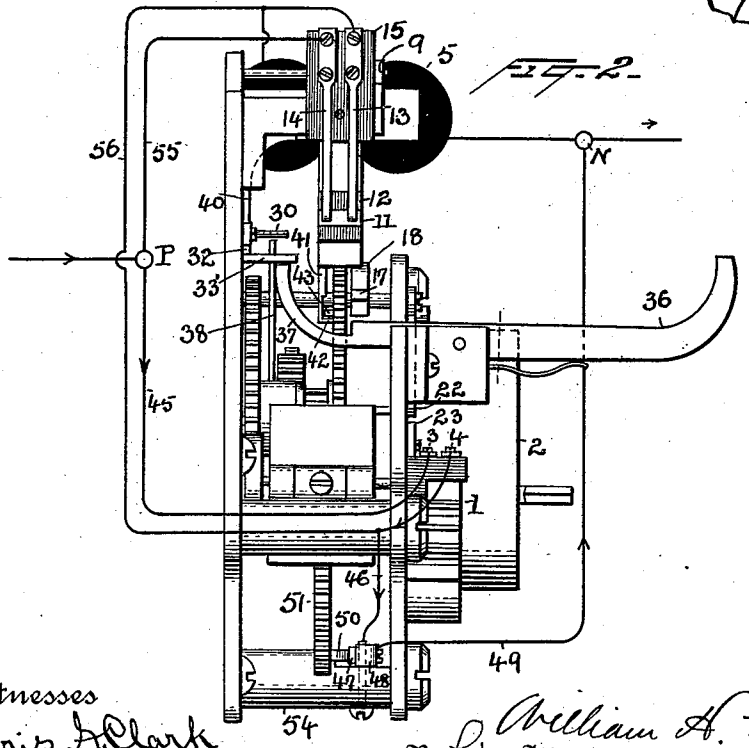


Fig. 2.



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NON-INTERFERENCE SIGNAL-BOX.

SPECIFICATION forming part of Letters Patent No. 548,317, dated October 22, 1895.

Application filed December 1, 1892. Serial No. 453,720. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. KIRNAN, a citizen of the United States, residing at Bayonne, county of Hudson, State of New Jersey, have invented a certain new and useful Improvement in Non-Interference Signal-Boxes, of which the following is a specification.

The present invention relates to fire-alarm or similar signal-boxes adapted to be used in series in a circuit without danger of loss or mutilation of signals when two or more boxes are pulled or started at the same time or so nearly together that the first does not complete its operation before a succeeding box starts. Such non-interference boxes are well known.

The main object of my invention is to simplify and improve boxes of the character mentioned; and the invention consists in devices and combinations, as hereinafter more fully described, and set forth in the claims.

In the accompanying drawings, Figure 1 is a side view of a signal-box embodying my improvement, and Fig. 2 is a view at right angles thereto. Fig. 3 is a perspective view of a portion of the signaling-wheel, showing one of the teeth cut away in the back.

In the drawings like letters and numerals refer to like parts.

The main mechanism of the box is of well-known construction and is shown and described in patent to Crane, No. 165,918, dated July 27, 1875.

1 on the drawings in this application is a metal signal-wheel having teeth for making and breaking the circuit when caused to rotate by means of the spring 2 and suitable intermediate gearing.

3 4 are circuit making and breaking springs, the ends of which stand over the signal-wheel 1 and are adapted to make and break contact with the ends of the teeth on said wheel.

5 is the non-interference magnet in the main line and is rigidly supported on the frame 6.

7 is the armature carried by the plate 8, pivoted at 9 and having a retracting-spring 10. Near the lower end of such plate is an insulating-block 11, carrying a metal piece 12, adapted when the armature is moved away from the magnet to connect the springs 13 14, which are supported on the insulating-block 15 and which serve to complete a short circuit around the springs 3 4. The plate 8 terminates in a hook, tooth, or catch 16, adapted to engage with the similar device 17 at the end of the detent-lever 18 when the latter is raised under certain conditions. Lever 18 also has a tooth 19, which engages a stop-pin 20 on a wheel of the train and serves to arrest the same. Said wheel, however, differs from the corresponding wheel of the patent above mentioned, in that it has not a flange to hold the detent-lever up when it has been raised and the mechanism has started. No construction corresponding to the engaging parts 16 17 is shown in said patent. The arm or lever 18 is fixed on the spindle 21, on which also is fixed the arm 22, which terminates just above the lever 23, which is pivoted at 24 and has a cam-tooth 25. This lever stands directly over the circuit-wheel, (or a wheel having teeth similarly arranged,) and the teeth of said wheel, co operating with the cam-tooth 25, alternately raise and drop the lever 23 as the circuit-wheel rotates. Each movement of the lever 23 moves levers 22 and 18 far enough to bring the tooth 17 above the tooth 16, (either in front of or behind it, according as the armature is retracted or attracted.)

26 is a reciprocatory bar or body supported by the screws 27 in slots 28 and normally pulled toward the right by a spring 29. This bar, which is part of a safety stop device to prevent entire running down of the motor under certain abnormal conditions, is provided with a number of projecting pins corresponding with the number of revolutions which it is desired the signal-wheel shall make, when the circuit it open, before coming to a stop, four being shown. The bar also has teeth 31, one less in number than the number of pins, and so placed as to co-operate with the tooth 32 on the lever 33, pivoted at 34 and having a retracting-spring 35. Evidently the positions of teeth 31 and 32 may be reversed.

36 is an ordinary pivoted pull or handle, which when it is tilted raises the lever 18 and releases the signal mechanism. It also tilts lever 33 and allows bar 26 to move to its extreme position at the right under the influ-

ence of its spring. This lever 36 in the present instance is provided with an extension 37, adapted to strike arm 33', projecting from the lever 33, to move said lever on its pivot.

38 is an arm on the spindle 39 of the signal mechanism, which is carried around once for each four rotations of the signal-wheel or once for each complete signal, whatever number of rotations is required.

In the drawings, bar 26 is shown higher up on the back plate of the box than it usually occupies, for convenience of illustration, and arm 38 is correspondingly lengthened and, as shown, would strike one of the spindles of the signal mechanism; but it will be understood that in building the apparatus the arm should be of such length as to revolve freely. As the arm 38 moves around toward the left it will strike the left pin 30 just before completing a revolution and move the bar 26 toward the left, and the bar will be held in its forward position by the tooth 32, engaging the first notch or tooth on the bar 26. Should the apparatus continue to move, the bar 26 will be advanced another step at the close of the second set of four or other suitable number of revolutions of the signal-wheel, and so on until the several teeth 31 have passed the tooth 32. The fourth movement of the bar 26 carries its end against an arm 40, projecting from the armature-lever, moving the same back and dropping the detent-lever 18, arresting the mechanism. Bar 26, after the fourth advance, moves back one step, owing to the fact that there are but three teeth 31, thus removing the bar from the path of the armature-lever.

41 is an arm extending from the armature-lever, having a hook-shaped end 42 in position to be struck by a pin 43 on the wheel 44 of the signal-train when the armature is in its retracted position and lever 18 is held up by the engaging teeth 16 17. The pin is so placed on its wheel that it will strike end 42, while springs 3 4 stand over the space on the signal-wheel between the last tooth of the signal-wheel and the long tooth 52.

The circuit connections are indicated in Fig. 2. The line enters from the left at terminal P, the normal circuit being through wire 45 to spring 3, to spring 4, through line 46 to spring 47, spring 48, wire 49, to the opposite terminal N of the box. Said springs 47 48 are normally—that is, when the box is at rest—held in contact by the cam 50 on the face of the wheel 51 of the train. This cam is so placed that it will move out from under the spring 47 just before the circuit-springs 3 4 leave the first or broad tooth 52 of the signal-wheel, so as to energize the magnet at the box pulled before the springs leave said tooth. The magnet attracts its armature before lever 23 raises hook 17 sufficiently to prevent movement of the armature. The springs 47 48 are shown as supported by an insulating-block 53, which is held in place by a screw passing through the rod 54, forming a part of the framework of the signal mechanism. From terminal P a wire 55 extends to spring 14 and from spring 13 a wire 56 extends to spring 4. The magnet 5 is connected between this wire 56 and the terminal N, as shown.

Suppose several instruments constructed as described are connected in series. The circuit through the several instruments will normally be as indicated by the arrows in Fig. 2 and as already traced, the circuit being held closed by the springs 3, 4, and 47 48 and the main magnets 5 being short-circuited, thereby protecting them from lightning discharges and largely reducing the normal resistance of the line. Since the magnets 5 at the several boxes are short-circuited, their armatures will be retracted by the springs 10, so that the pieces 12 will rest against the springs 13; but the springs 13 14 will not be connected, because the end of the latter is preferably farther to the left than the end of the former and the spring 13 is stronger than spring 10. Now, if the lever 36 of a single box be pulled down it will raise lever 18, releasing the pin 20 and allowing the signal mechanism to rotate. This upward movement, however, of the arm 18 is not sufficient to raise the hook 17 above the hook 16; but as the wheel 1 advances the cam 50 advances and allows springs 47 48 to separate, thereby energizing the magnet 5 just before the tooth 25 rides up onto the tooth 52, raising the lever 23 and the arm 22, and still farther raising the arm 18, carrying its end above the level of tooth 16, but at the rear side of the armature-lever, because the armature is at that moment drawn forward by its magnet and the signal is sent in the usual manner. It will be clear that the detent-lever vibrates up and down with the passage of each tooth of the signal-wheel, but is in the proper position when its action is needed. As arm 38 passes the left pin 30 it moves bar 26 one space to the left; but this has no utility when a box is operated under normal conditions. Before the end of the last rotation of the signal-wheel arm 18 falls so as to be struck by stop 20 to arrest the mechanism. If one box is pulled and before it has completed its signal a second box is pulled, the first box will take control of the line and its signal will be completed before the second box can affect the line, although said second box will continue to run after it is pulled. The second box does not affect the line while the first box is operating by means of its signal-wheel and springs 3 4, because the latter at that box are short-circuited, the short-circuit having been closed by the wedge action of tooth 17 as it was pushed up in front—that is, at the right of tooth 16—moving the armature-lever back far enough to cause the metal piece 12 to make contact with spring 14 as well as with spring 13, this action taking place when lever 23 is raised by the first tooth of the signal-wheel at said second box. The tooth 17 moves up in front of 16 rather than behind it, because

the first box has control of the line and maintains it open, except for very brief intervals, when springs 3 4 are in contact with a tooth of the signal-wheel, and the armature at the second box is therefore not attracted when the shunt is broken at springs 47 48. Heretofore danger of interference has existed during the entire intervals, which, though short, are quite appreciable, in which springs 3 4 rest on a tooth of the signal-wheel at the first box; but by my improvement the length of the periods during which interference is possible can be largely reduced by so constructing or adjusting the parts that the end of tooth 17 will be almost raised to the end of tooth 16 before the shunt around the non-interference-magnet is broken, and so that the instant after the shunt is broken the end 17 rises behind the armature-lever. In this manner the periods when interference is possible can be made practically of no duration. Immediately after the shunt is broken the end 17 rises above 16 behind it if the line is closed, but in front of it if it is open. In the latter case it is held by it until the end of the fourth round of the signal-wheel, when the pin 43 disengages the teeth by pressing the armature-lever back and lets the detent-lever fall, but not until stop 20 has passed, so that tooth 19 will not come in front of it to stop the apparatus. The succeeding revolution or revolutions of the signal-wheel at said second box will then send a signal.

Supposing that two boxes—say 54 and 72—are pulled simultaneously, the home box being numbered 54, the first group of teeth upon the circuit-wheel of the latter box will, of course, number five. The first group upon the signal-wheel of the distant box will, of course, number seven. The home signal-wheel must, therefore, send five impulses from the first group. Supposing that the five teeth on the home box are the same distance apart, both boxes may operate together up to and including the fifth tooth upon the circuit-wheel of the home box. If, however, the distant box were now allowed to operate, it would send the impulses from its sixth and seventh teeth over the line and the number five from the home box would, of course, not be transmitted to the receiving station. It is therefore necessary to cut out the distant box as soon as the same has sent as many impulses over the line as have the first group of teeth on the circuit-wheel of the home box. The armature of the magnet in the home-box will, of course, be in connection with the poles of the magnet while each of the five impulses are being sent. When, however, the distant box is about to send out its sixth impulse, the circuit through the home box is broken by reason of the disconnection of the springs 3 4. This will happen while the springs 3 4 of the home box are traveling through the space between the last tooth of the group of five and the first tooth of the group of four representing the signal 54. The succeeding elevation of the detent of the distant box will interlock it with the projection upon the armature-lever and secure the latter in such a position as to preclude any further operation of the distant box until the signal from the home box has been completed and the line is again opened.

If a box is pulled when the circuit is permanently broken or otherwise out of order, it will continue to rotate until arm 38 makes four revolutions, at which time bar 26 will strike the arm 12, moving tooth 16 back, allowing the detent-lever 18 to fall and stop the mechanism. This prevents the entire running down of the spring if a box is started when no current is on the line and is for the purpose of keeping the box in position to operate when the line is repaired if again actuated by pulling lever 36.

What I claim is—

1. The combination, with the signal mechanism, non-interference magnet, armature and circuit connections of a signal-box, of a vibrating arm carrying a detent co-operating with said armature to lock the same out of contact with the poles of the magnet, and means for transmitting motion from the circuit-wheel to said detent-carrying arm correspondingly to the makes and breaks of the circuit, substantially as set forth.

2. The combination, with the signal mechanism, non-interference magnet, armature and circuit connections of a signal-box, of an arm carrying a detent co-acting with said armature to lock the same out of contact with the poles of the magnet, a separately pivoted arm actuated by the teeth upon the circuit-wheel, and a connection between said pivoted arm and said detent-carrying arm for elevating and depressing the latter correspondingly to the makes and breaks upon the circuit-wheel, substantially as set forth.

3. The combination with the signal mechanism, non-interference magnet, armature and circuit connections of a signal box, of an arm vibrating correspondingly to the makes and breaks of the circuit, said arm having a stop for the motor, a pull or handle for giving said arm an initial movement to release the motor and a detent carried by said vibrating arm and co-acting with the armature to lock the same out of contact with the poles of the magnet when said armature is retracted, substantially as set forth.

4. The combination with signal mechanism having suitable detent devices, of a safety stop consisting of a part moved forward as the mechanism rotates, said part being located so that its final movement throws the detent devices into operation automatically, whereby the signal mechanism will be stopped if a box is pulled when the line is out of order, substantially as described.

5. The combination with signal mechanism having a suitable detent, of a safety stop consisting of a movable body 26, a holding

device therefor, and a part moving with the signal mechanism for advancing said movable body to bring the detent into operation, substantially as described.

6. The combination with signal mechanism having a suitable detent, of a safety stop consisting of the movable bar 26 having projecting pins, a holding device 33 therefor, and an operating arm 38, substantially as described.

7. The combination with signal mechanism having a suitable detent, of a safety stop consisting of the movable bar 26 having projecting pins, a holding device 33 therefor, and an operating arm 38, said holding device being in position to be moved by the pull lever of the the signal mechanism, substantially as described.

8. The combination with a signal mechanism having a stop on the wheel of its train, of the pivoted lever 23 bearing on the signaling wheel and engaging the arm 22 to raise and lower the detent with the revolution of the signaling wheel, substantially as described.

9. The combination, in a signal-box of the character indicated, of the armature having a tooth or catch on it, the detent lever having a similar tooth adapted to engage the former, and a pin or device on a moving part of the signal mechanism, adapted to move back said armature to disengage the teeth and allow the detent lever to drop, substantially as described.

10. The combination, in a signal-box of the character indicated, of the magnet, armature, signal wheel, means for controlling the same, and brushes adapted to bear on the signal wheel, a shunt for said magnet, and a circuit-controller operated by a cam on a wheel of the signal box train, said cam being so placed as to open the shunt before the first tooth of the signal wheel passes from beneath the springs, substantially as described.

11. The combination, in a signal-box of the character indicated, of the non-interference magnet, the shunt around the same, a circuit-controller in said shunt, and a cam on a wheel of the signal train for opening the shunt, substantially as described.

12. The combination with the signal mechanism, non-interference magnet, armature and circuit connections of a signal box, of an arm having a stop co-acting with a projection upon a wheel connected with the motor, a pull or handle for releasing said stop from said projection, a detent carried by said arm co-operating with the armature, a wheel having teeth or projections and mechanism intermediate of said wheel and arm whereby the latter is alternately elevated and depressed coincidently with the rotation of said wheel, substantially as set forth.

13. The combination with a signal mechanism, non-interference magnet, armature and circuit connections of a signal box, of a vibrating arm having a motor detent, and an armature detent, the former being operated by means of a pull or handle to release the motor and the latter being elevated and depressed by means of a connection between said arm and the circuit wheel, such elevating and depressing of the detent carried by said arm corresponding to the makes and breaks upon the circuit wheel, substantially as set forth.

This specification signed and witnessed this 22d day of November, 1892.

WILLIAM H. KIRNAN.

Witnesses:
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