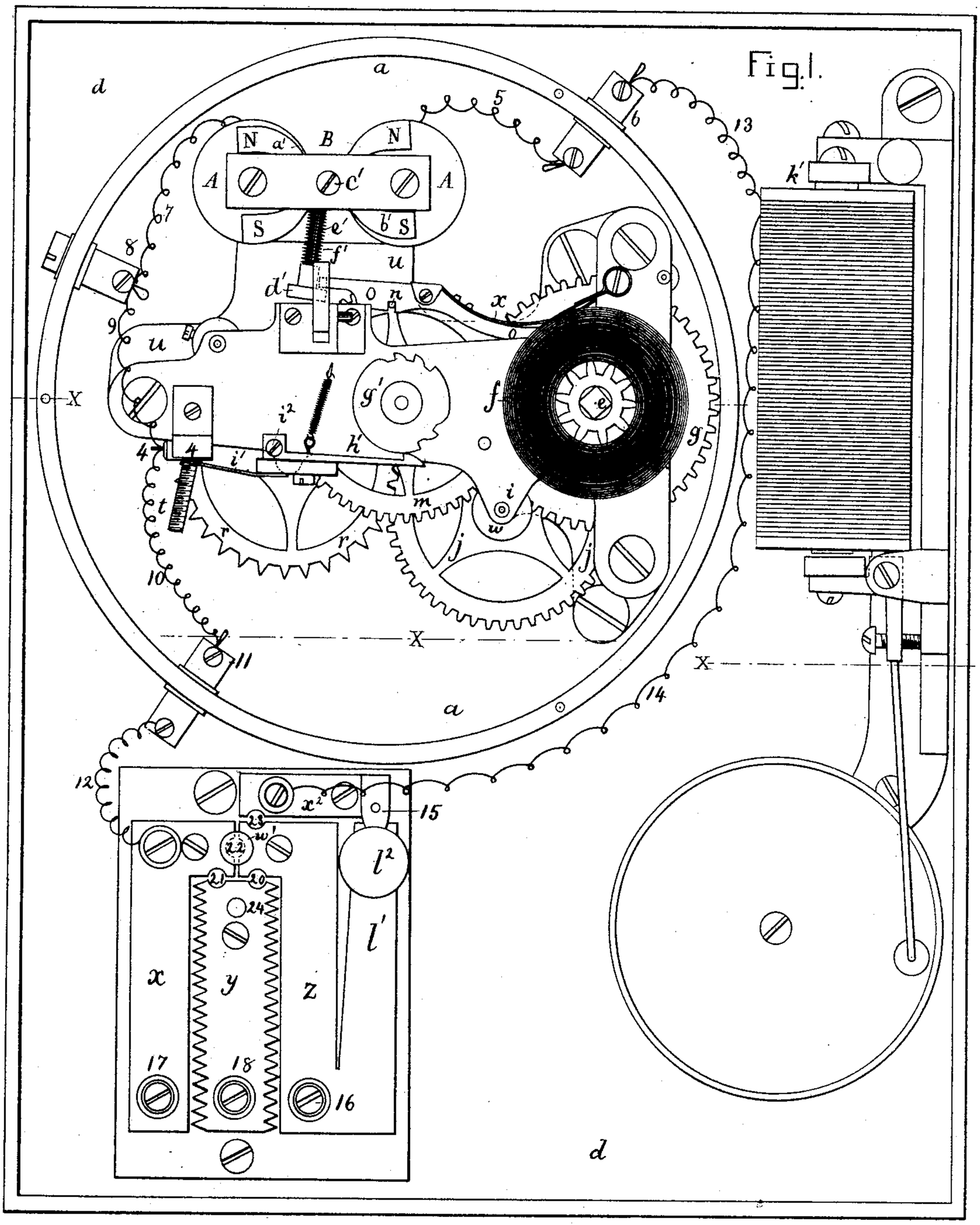
2 Sheets—Sheet 1.

M. G. CRANE & E. ROGERS.

Non-Interfering Fire-Alarm Signal-Box.

No. 223,218. **Patented Jan. 6, 1880.**

Fig. 1.



Witnesses.

Jos. P. Livermore

N. E. Whitney.

Inventors.

Moses G. Crane and Edwin Rogers

by Crosby & Gregory

Attys

2 Sheets—Sheet 2.

M. G. CRANE & E. ROGERS.

Non-Interfering Fire-Alarm Signal-Box.

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Fig. 2.

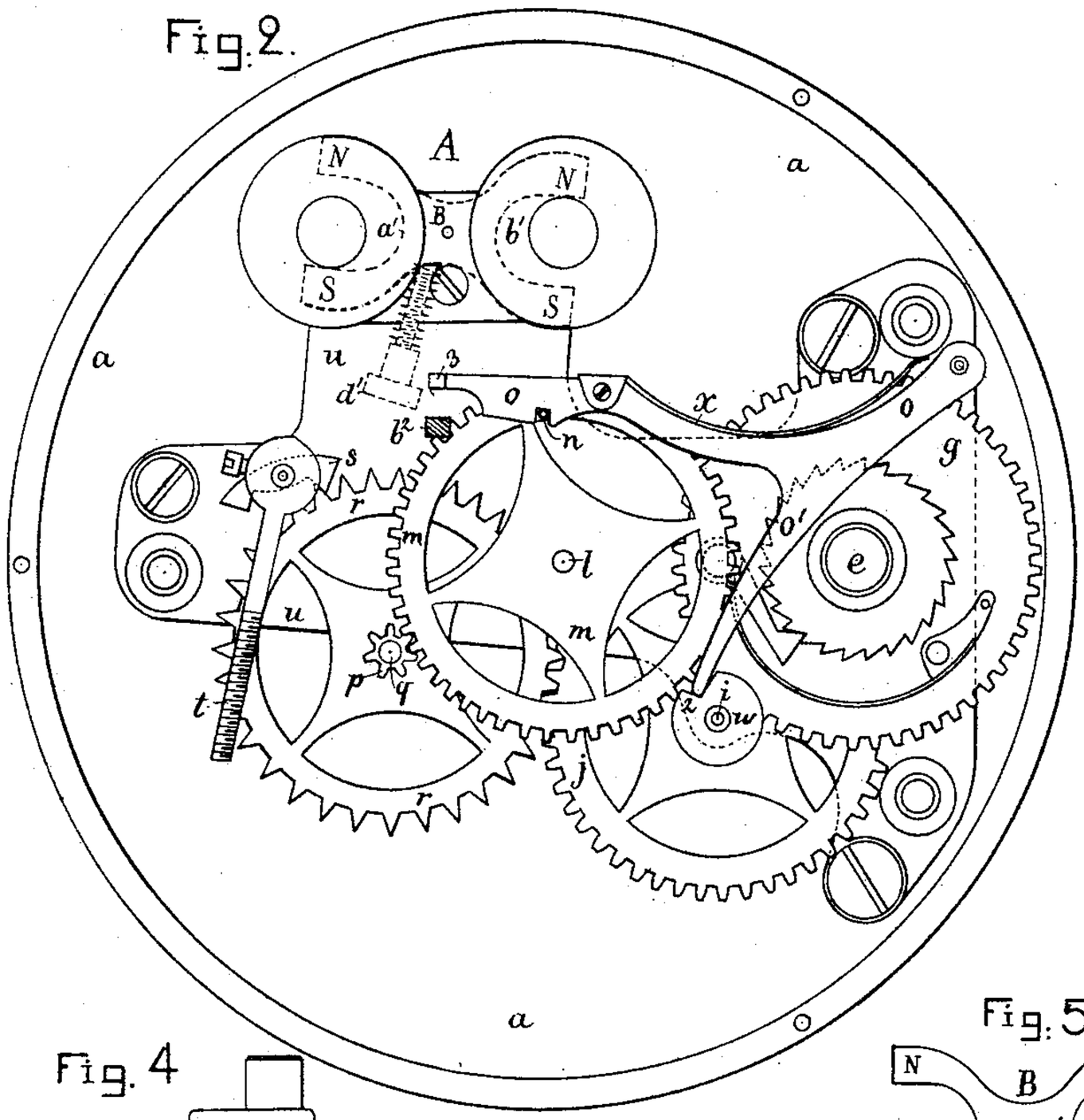


Fig. 4

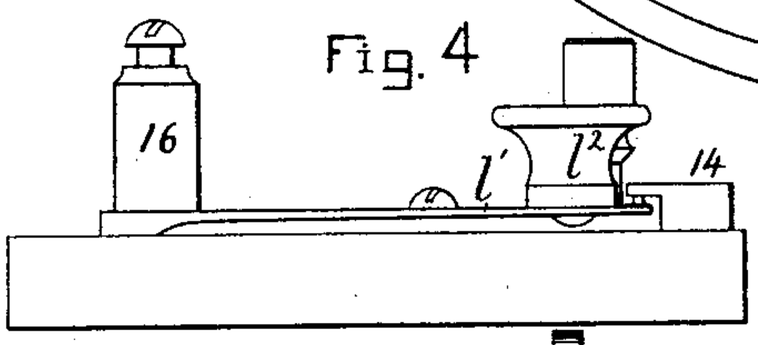


Fig. 6

Fig. 5

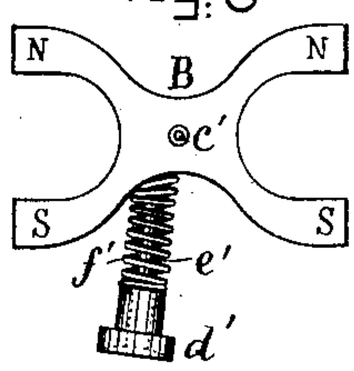
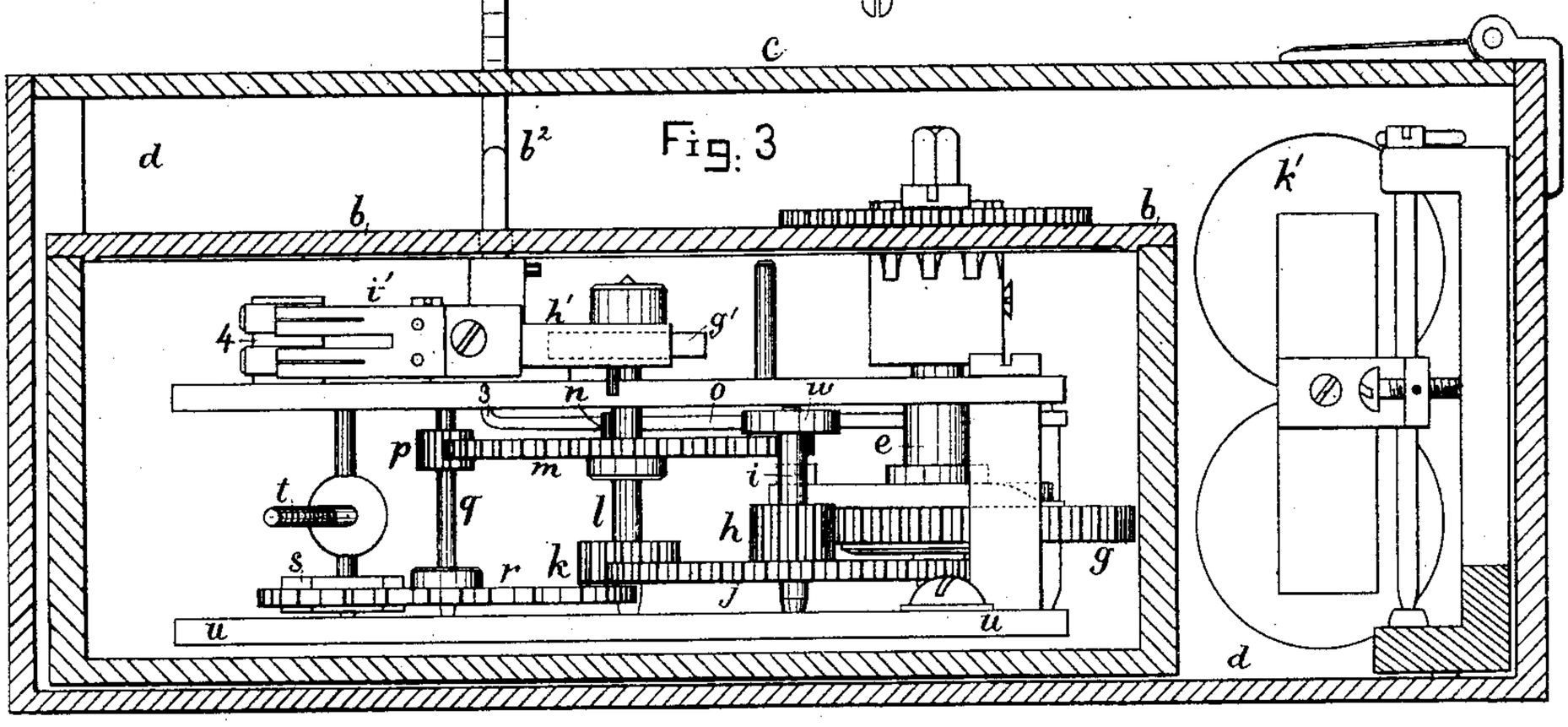


Fig. 3



Witnesses.

Jos. P. Livermore

A. E. Whitney.

Inventors.

Moses G. Crane and Edwin Rogers

by Crosby & Gregory Attys

UNITED STATES PATENT OFFICE.

MOSES G. CRANE, OF NEWTON, AND EDWIN ROGERS, OF BROOKLINE, MASSACHUSETTS.

NON-INTERFERING FIRE-ALARM SIGNAL-BOX.

SPECIFICATION forming part of Letters Patent No. 223,218, dated January 6, 1880.

Application filed May 26, 1879.

To all whom it may concern:

Be it known that we, MOSES G. CRANE, of Newton, county of Middlesex, and EDWIN ROGERS, of Brookline, county of Norfolk, 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.

This invention relates to a fire-alarm signal-box, and has for its object to produce a non-interfering box, or one which, when started, so affects the other boxes that an alarm cannot be sounded from them until the first alarm is completed. This has been previously done by shunting the other boxes automatically as soon as an alarm is started in one box, cutting their circuit-breakers out of the circuit, to thereby render them ineffective. This method requires careful adjustment of the contact-points of the shunting device. This shunting does not prevent the circuit-breaking train from being started when the box is pulled and going through the motions of giving an alarm, but does prevent a signal.

Our invention consists, essentially, in a device to automatically render the starting lever or pull of a box inoperative while an alarm is being sounded on another box, without, however, throwing the circuit-breaker out of circuit, or shunting the box. This we do by interposing a block or other equivalent connecting mechanism between the pull of the box and the locking-arm of the train which drives the circuit-breaker, said block or connection being adapted to be removed automatically on the sounding of an alarm from another box, to thereby render the pull unable to move the locking-arm of the train to start the box. It is obvious that this block or connection may be operated in various ways, some of which will form the subject of a future application for Letters Patent.

As herein shown, the box is adapted to be used with the repeater invented by us, which is the subject of a concurrently-filed application for Letters Patent, to which reference may be had, the said repeater being provided with rheotropes driven by a so-called "locking-out train," the connections of the rheotropes being such as to reverse the currents on all the circuits while an alarm is being sounded, without, however, reversing the currents through the electro-magnets of the repeater.

The signal-box is provided with an electro-magnet having a polarized armature, to which is attached the block or connection between the pull and locking-arm of the box, which, by the action of the armature, when the polarity of the magnet is reversed by the rheotrope of the repeater, is withdrawn from between the pull of the box and the locking-arm which locks the train, thereby preventing the pull of the box in which this change of the block has been made from being able to release the locking-arm.

In this form of our invention we have shown the polarized armature as two connected horse-shoe-magnets, the pivot of the armature being parallel with the cores of its magnet. The locking-arm which holds the train is provided with an extension which, when the train is started, is released from a notched governing-disk, which acts upon and holds the locking-arm in elevated position for, say, four or any other desired number of revolutions of the circuit-breaking wheel.

Figure 1 represents, in front elevation, one of our improved signal-boxes, the door being opened and the cover-plate of the train being removed, the parts being all in normal position; Fig. 2, a view of the train and locking-arm, the polarized armature and its block being shown in dotted lines in the position they will occupy when the polarity of the magnet is reversed, the pull being shown in section. In this figure parts in front of those shown and fully represented in Fig. 1 are omitted. Fig. 3 shows the interior mechanism of the box, looking upward from the line $x\,x$, Fig. 1; Fig. 4, a side elevation of the lightning-arrester and key; Fig. 5, a separate view of the polarized armature; and Fig. 6, details of the plug-switch.

The main operating parts of the signal apparatus are shown as contained in an interior box, *a*, having a cover, *b*, attached by suitable screws, the cover having an opening for the passage of the pull b^2, as has also the door *c* of the box *d*.

The main axle *e* of the train, driven by a suitable clock-spring, *f*, or by a weight, has

upon it a gear, *g*, which engages a pinion, *h*, on a shaft, *i*, which carries a gear, *j*, that engages and drives a pinion, *k*, on the shaft *l*, provided with the gear *m*, which is provided with a pin, *n*, that is acted upon at suitable times by the locking arm or detent *o*, to hold the train fast. This gear *m* engages a pinion, *p*, on a shaft, *q*, which has attached to it the escapement-wheel *r*, acting upon the pallet *s*, provided with a pendulum, *t*, the pallet retarding the said wheel.

The plate *u*, which is the back plate for the train, has connected with it the electro-magnet A, in front of which is the polarized armature B, composed, as herein shown, of two horseshoe-magnets, *a' b'*, having a pivot, *c'*, parallel with the cores of the electro-magnet.

The double-horseshoe polarized armature has its forked or open ends placed to embrace the poles of the ∪-shaped electro-magnet, and the central pivot of the armature is so located between the poles of the magnet as to leave the armature free to move or respond quickly to the change of polarity of the electro-magnet. This armature has attached to it a block, *d'*, fitted loosely upon an arm, *e'*, surrounded by a spiral spring, *f'*, to press the block down against the head of the said arm.

The shaft *i* has secured to it the notched governing-disk *w*, the periphery of which is so shaped as to act upon the extension *o'* of the locking-arm *o* and hold its notched end up away from the pin *n* when the said notched end has been lifted by the pull, this notched governing-disk preventing the notched end of the locking-arm when once lifted from again descending and engaging the pin, and holding the train until the signal has been repeated the proper number of times—in this instance four times.

A spring, *x*, acts to depress the locking-arm. The end of the locking-arm is shown as provided with a lateral projection, 3, to thereby permit the flanged head of the block *d'* to pass under it when the rod *e'* is in normal position.

The circuit-breaking wheel *g'*, fixed upon the shaft *l*, is herein shown as adapted to strike for box 23, it having its projections so shaped as to operate the arm *h'*, which carries the spring-fingers *i'*, so as to cause them, in connection with the anvil 4, to make and break the circuit in the proper manner to sound 23.

The anvil 4 is composed of two metal plates connected, respectively, with the line-wires entering and leaving the box, and insulated from one another, but connected electrically by the spring-fingers *i'* when the hooked end of the arm *h'* rests on the unnotched portion of the wheel *g'*, as in its normal position.

When the end of the arm *h'* falls into one of the notches of the wheel *g'* the spring-fingers *i'* are withdrawn from the anvil, and the circuit is broken.

The pivot i^2 of the arm *h'* is not in line with the face of the anvil, and the spring-fingers *i'* are attached to the arm *h'* at some distance from the pivot i^2, so that after the spring-fingers first touch the anvil a further motion of the arm *h'* will cause them to slide thereon, giving a frictional, and consequently more perfect electrical, contact. This anvil is inverted to prevent dust settling upon it, which is a very serious objection.

The magnet A is connected by wire 5 with the binding-screw 6, and by wire 7 with the binding-screw 8, this latter screw being connected by wire 9 with one side of the anvil 4, while the other side of the anvil is connected by wire 10 with binding-screw 11, a wire, 12, running from it to a part, *x*, of the plug-switch having metallic connection with a binding-screw, 17, which holds one wire of the main line. The screw 6 is connected by wire 13 with the electro-magnet *k'*, which, by a wire, 14, is connected with the anvil-piece 15 of the break-circuit key *l'*, having an insulated finger-piece, l^2, the said key *l'* having metallic connection with the screws 16, in connection with the other wire of the main line. The binding-screw 18 has a wire which goes to the ground.

The switch consists of four metallic plates, *x y z* x^2, with suitable points, 20 21 22 23, for the insertion of the plug *w'*, to give the desired circuits to the current. With the plug at 22 the current passes directly from the part *z* to the part *x*, thereby cutting the box out of circuit. With the plug in the hole 24 in the lightning-arrester *y*, connected with the ground, the said plug is inoperative, and the circuit is through the key *l'*, anvil 15, box-connections, and out at 17. By placing the plug at 23 the current passes from the part *z*, through the plug, to the wire 14, and so completes the circuit, cutting out the key from operation. By placing the plug at 20 or 21 ground-connections may be made at either side of the box. The electro-magnet *k'* sounds the usual gong in the signal-box.

When the mechanism of the signal-box is in its normal position the block rests between the inner end of the pull b^2 and end 3 of the locking-arm, so that the outer end of the pull, when depressed, will act upon and lift the block, and it, in turn, will lift the locking-arm and release from its notch the pin *n*, permitting the train to start, the extension *o'* of the said arm being also lifted from the notch 2 of the notched governing-disk *w*, the motion of the train rotating the circuit-breaking wheel *g'*, to make and break the circuit of the armature of that electro-magnet which governs the repeater for the circuit in which the operating-box is placed, the circuit-breaker repeating the said signal over all the other circuits.

The circuit-breaker of the signal-box, having broken the circuit of its connected electro-magnet of the repeater, as described in our other application, rotates the locking-out shaft and moves the rheotropes, to reverse the currents on the line-wires, and changes the polarity of the magnets in all the boxes, such reversal causing the electro-magnets A of all the boxes to attract the opposite poles of the polarized armatures, to thereby remove the blocks *d'* from

between the pulls b^2 and the ends of the locking-arms; and thereafter, should the pull of any signal-box be actuated before the signal-box first started completes its signal, it could not reach and move or release the hooked arm above it, for in order to do so it is necessary that the block be interposed between the pull and the end of the said arm. The signal having been fully sounded, the current on the line-wire is again reversed by the rheotrope of the repeater, to change the polarity of the electro-magnets of the signal-boxes.

We intend by the word "pull" to include any device or lever which is moved to start or operate a signal-box.

We claim—

1. In a signal-box, the combination, with the starting-lever or pull and the locking-arm of the train, of a block interposed between them, and an electro-magnet and armature to move said block, which is adapted by its movement to render the starting-lever or pull inoperative while an alarm is being sounded from any other box, substantially as described.

2. In a signal-box, a pull and a locking-lever for the driven train of said box, combined with an electro-magnet, a polarized armature therefor, and a connected block adapted to be interposed between said pull and locking-lever, or removed therefrom, according to the direction of the current through the electro-magnet, substantially as described.

3. A projection moved in unison with the break-circuit shaft *l*, and a single governing-disk attached to one of the main arbors of the train, combined with the two-armed locking-lever, one arm of which is adapted to engage or release the said projection, when permitted to do so, by the governing-disk acting upon the other arm of the said lever, this one disk causing the lever to release the projection for several rotations of the break-circuit shaft, as and for the purpose set forth.

4. In a signal-box, the described switch-board, consisting of the plates x y z x^2, arranged as described, to form a lightning-arrester and finger-key, and provided with a plug-switch to cut out either the box or key, and to form ground-connection with either side of the box, substantially as described.

5. The combination, with the inverted anvil and the spring-fingers and their carrying-arm, pivoted with relation to the anvil as described, of the notched circuit-breaker adapted to throw the fingers in contact with, and then by a further movement of the arm slide them longitudinally along, the surface of the anvil, substantially as described.

6. The electro-magnet, its armature B, and attached arm e', combined with the block d', free to slide on said arm, and the spring f', substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

MOSES G. CRANE.
EDWIN ROGERS.

Witnesses:
JOS. P. LIVERMORE,
N. E. WHITNEY.