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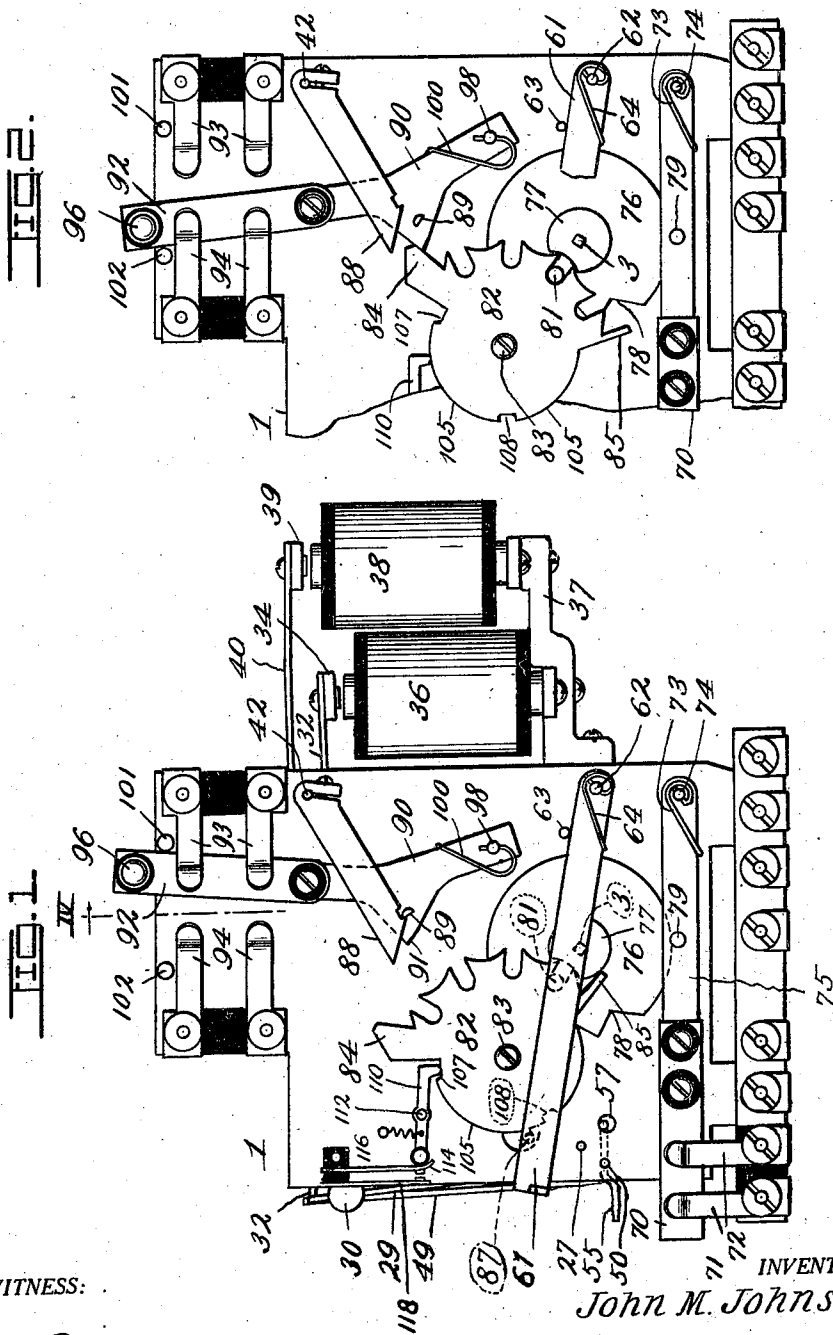
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J. M. JOHNSON

SIGNAL SYSTEM

Filed June 7, 1919

3 Sheets-Sheet 1



WITNESS:

L. J. Fischer

INVENTOR:

John M. Johnson,

BY

F. G. Fischer,

ATTORNEY.

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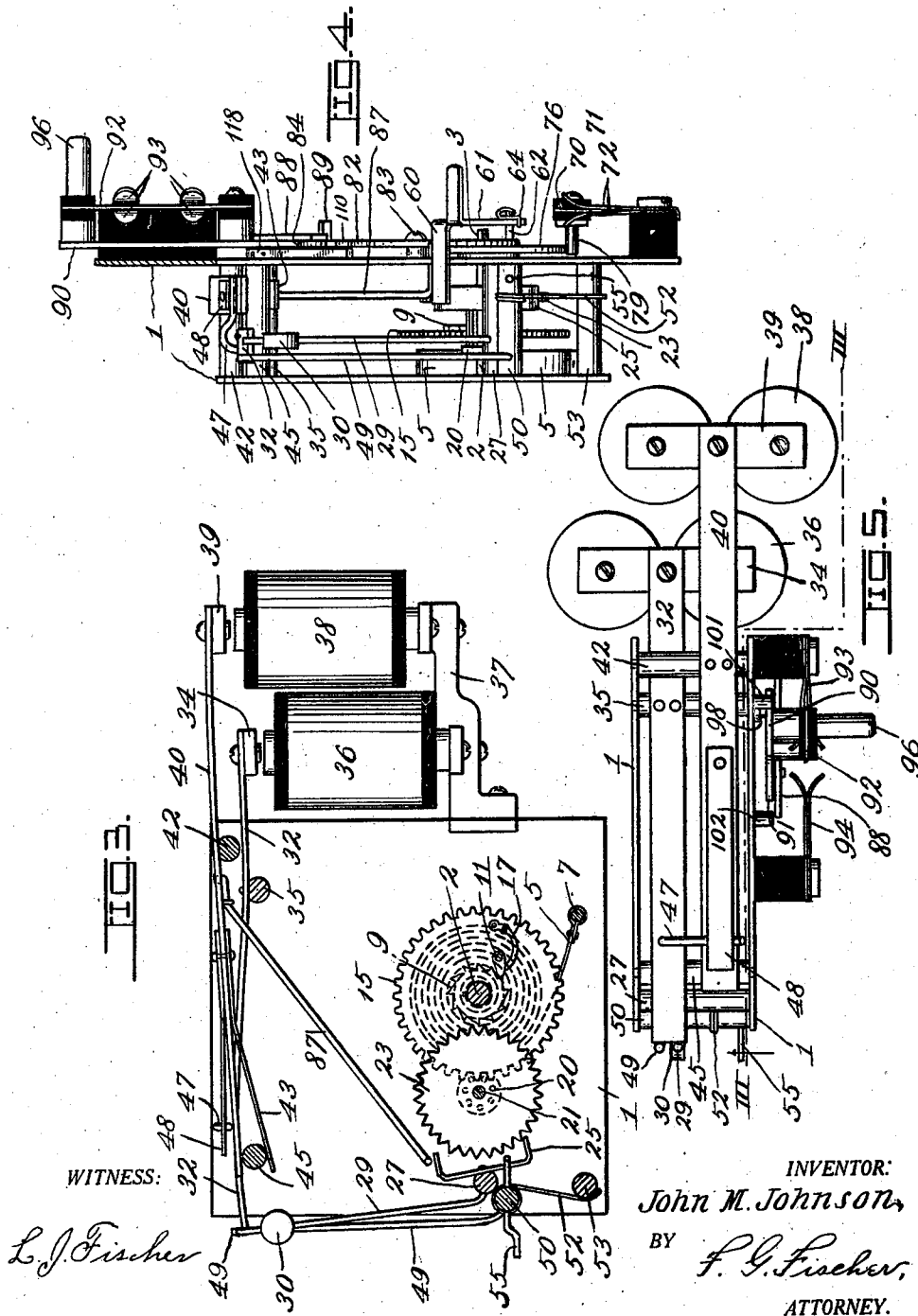
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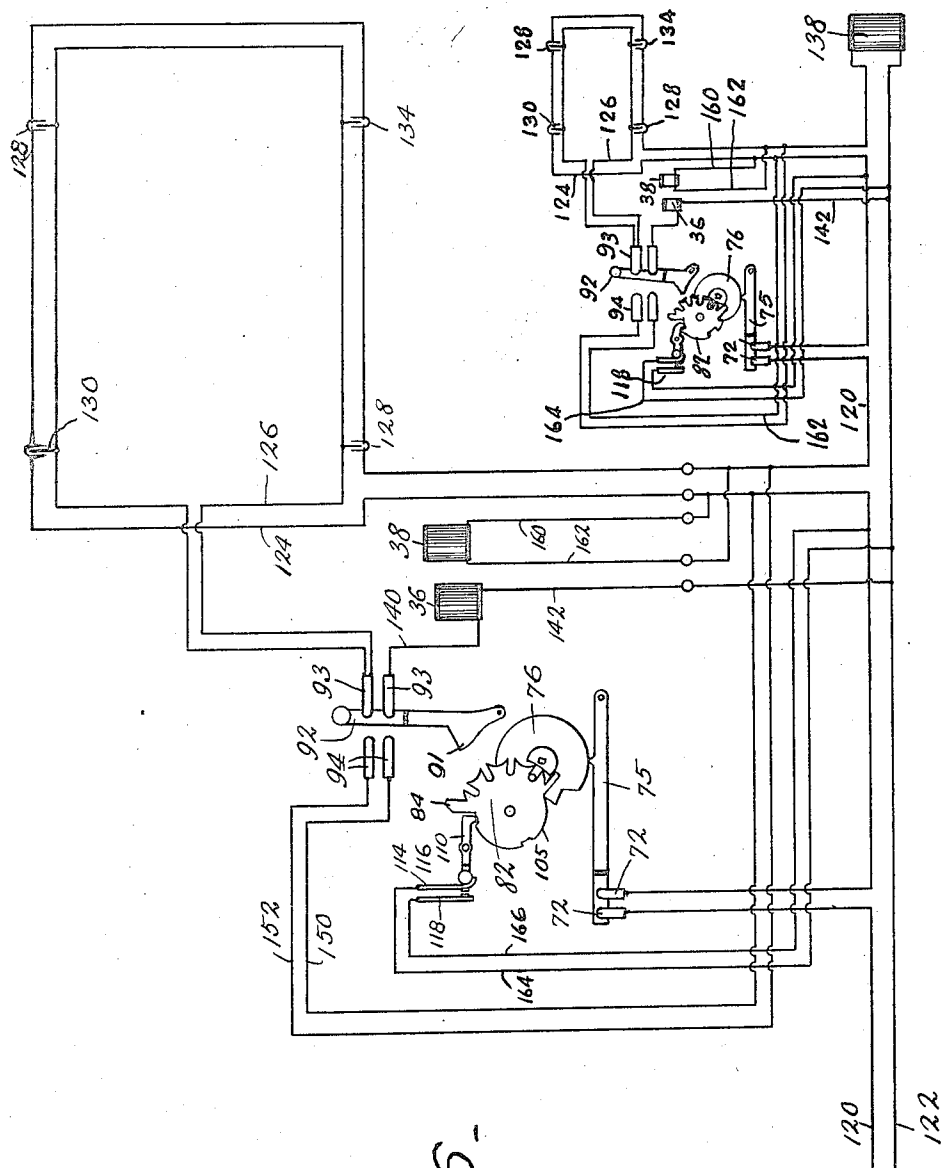
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WITNESS:

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ATTORNEY.

UNITED STATES PATENT OFFICE.

JOHN M. JOHNSON, OF KANSAS CITY, MISSOURI, ASSIGNOR TO THE UNITED STATES
AUTOMATIC FIRE ALARM COMPANY, A CORPORATION OF MISSOURI.

SIGNAL SYSTEM.

Application filed June 7, 1919. Serial No. 302,463.

To all whom it may concern:

Be it known that I, JOHN M. JOHNSON, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Signal Systems, of which the following is a specification.

This invention relates to signal systems, and an important feature resides in a transmitter which may be employed to advantage in various signaling systems, but is more particularly adapted for use in connection with the automatic fire alarm system disclosed in a copending application filed May 28, 1917, Serial Number 171,559.

One object of the invention is to provide an all metallic circuit, so that ground circuits need not be employed in transmission of signals.

A further object is to provide a transmitter which automatically transmits two signals—one a fire alarm signal and the other a trouble signal—so that an operator in charge at the central station can readily distinguish between the two.

Another object is to provide a transmitter of this character which cannot be set for operation unless the circuit wires are intact.

Other objects of the invention will hereinafter appear, and in order that said invention may be fully understood, reference will now be made to the accompanying drawings, in which:

Fig. 1 is a side elevation of the transmitter set ready for operation.

Fig. 2 is a fragmentary, side elevation, showing the position certain parts occupy after the transmitter has sent in a trouble signal.

Fig. 3 is an irregular, vertical, sectional view on line III—III of Fig. 5, and embodies a number of features not disclosed by said Fig. 5.

Fig. 4 is an end elevation of the transmitter with some of the parts removed, and upper portion in section on line IV of Fig. 1.

Fig. 5 is a plan view of the transmitter, with some of the parts removed.

Fig. 6 is a diagram of the transmitter connected to a house circuit and the main line circuit, and in the act of transmitting a signal over the main line.

Referring first to the mechanical construction of the transmitter, 1 designates a frame in which a main shaft 2 is journaled. Said main shaft 2 has a rectangular terminal 3 (Figs. 1 and 2) at one end to receive a key (not shown), whereby it may be rotated to wind a motor spring 5, connected at one end to the shaft 2 and at its opposite end to a transverse frame member 7, secured to opposite sides of the frame 1.

The main shaft 2, Fig. 3, is provided with a fixedly-mounted ratchet wheel 9 engaged by a pawl 11, pivotally mounted upon a large cog wheel 15, which is loosely-mounted upon the shaft 2. The free end of the pawl 11 is yieldably-held in engagement with the ratchet wheel 9 by a spring 17, bearing at one end against said pawl 11 and fixed at its opposite end to the cog wheel 15.

Unwinding of the motor spring 5 is regulated by a train and a governor, comprising the cog wheel 15, a pinion 20 intermeshing with said cog wheel 15 and fixedly-mounted upon a shaft 21 journaled in frame 1, an escape wheel 23 fixed to the pinion 20, a detent 25 to coact with the escape wheel 23, a governor arm 29, and a weight 30 on said governor arm 29. The detent 25 is fixed to a rock shaft 27, mounted in opposite sides of the frame 1 and carrying the upwardly-extending governor arm 29. When the transmitter is in set position, Figs. 1 and 3, the spring 5 is prevented from unwinding through the intermediacy of the train of gearing, the governor, and a lever 32, the rear end of which abuts the upper end of the governor arm 29 and holds the same stationary under normal conditions.

The lever 32 is provided at its forward end with an armature 34 and is mounted upon a spindle 35, journaled in opposite sides of the frame 1. Said armature 34 is mechanically controlled by the lever 32 under normal conditions and electrically controlled when a signal is transmitted by an electromagnet 36 fixed to a bracket 37, secured to the frame 1 and carrying a second electromagnet 38, adapted to electrically control an armature 39 fixed to the forward end of a lever 40, mounted upon a spindle 42 journaled in opposite sides of the frame 1. A spring 43, fixed at one end to the lever 40 and bearing at its opposite end

against the underside of a transverse frame member 45, of the frame 1, normally holds the armature end of said lever 40 in raised position. The frame member 45 limits the air gap between the electromagnet 38 and the armature 39, by checking the downward movement of the rear end of the lever 40.

The lever 32 is electrically-controlled by the armature 34, and mechanically controlled by the lever 40 through the intermediacy of a transverse arm 47 and a spring 48, which latter bears on top of said arm 47 and is secured at its forward end to the lever 40. The arm 47 is fixed to the lever 32 and extends across the top of the lever 40, to enable the latter to raise the rear end of the lever 32, when the armature 39 is attracted by the electromagnet 38. When the rear end of the lever 32, is raised it is secured in such position by a lock bar 49, fixed at its lower end upon a rock-shaft 50, journaled in the frame 1 and actuated to swing the lock bar 49 beneath the raised end of the lever 32 by a spring 52, fixed at one end to the shaft 50 and bearing at its opposite end against a transverse member 53 of the frame 1. The rocking movement of the shaft 50 is restricted by an arm 55, fixed to said shaft 50 and having its forward end bent at right angles and extending through an opening 57 (Fig. 1) in the adjacent side of the frame 1 to restrict the rocking movement of the arm 55. Said arm 55 extends rearwardly into the path of a lateral projection 60 (Fig. 4) on the free end of a hand lever 61 (Figs. 1 and 4), mounted on a pivot 62 and normally held in raised position against a stop 63 by a spring 64. When the free end of the hand lever 61 is swung downwardly the projection 60 engages the rear end of the arm 55 and rocks the shaft 50, causing it to swing the lock-bar 49 from beneath the rear end of the lever 32, which is then depressed to normal position against the top of the frame member 45 by the springs 43 and 48.

The hand lever 61 normally covers the rectangular end 3 of the main shaft 2. Hence, a key cannot be applied to said rectangular end 3 to wind the spring 5, without depressing said lever 61 and causing it to contact the arm 55, which in turn rocks the shaft 50 and swings the lock bar 49 from beneath the lever 32, so that the same can be restored to normal position by the springs 43-48. When the hand lever 61 is depressed to engage the arm 55 as above described, said hand lever 61 is also brought into close relation with a make-and-break switch 71 and prevents the blade 70 thereof from becoming disengaged from the switch contacts 72, against the action of a spring 73 bearing against the underside of the switch lever 75 and tending to swing the same upwardly on its pivot 74. The switch

blade 70 is insulated from the lever 75, to prevent current from flowing to the latter.

The switch 71 coacts with a code-wheel 76, in transmitting signals over the main line circuit. Said code-wheel 76 is fixed upon the main shaft 2 and has peripheral notches 78 to receive a transverse pin 79, projecting from the lever 75. When the parts are in normal position (Fig. 1), the switch 71 is held in closed position by the periphery of the code-wheel 76 bearing upon the transverse pin 79, but when the transmitter is in action and the code-wheel is revolving the switch 71 intermittently interrupts the circuit passing therethrough as the pin 79 successively enters the notches 78.

The code-wheel 76 is provided with a wrist-pin 81 for engagement with a gear wheel 82 of the Geneva type, journaled upon a stub shaft 83 secured to the adjacent side of the frame 1. Said gear wheel 82 is provided at its upper side with a tooth 84 and at its lower side with a stop 85, which latter contacts a Geneva wheel 77 and limits winding of the spring 5. Said stop 85 is also adapted to engage the outturned lower end of a push-bar 87 (Fig. 3) when the spring 5 unwinds and thus causes said push-bar 87, through the intermediacy of the lever 40 to which it is connected, to rock the spindle 42 and thus raise a latch 88 (Fig. 1) mounted thereon, out of engagement with a lug 89 on a lever 90 carrying a switch blade 92, adapted to coact with two pairs of contacts 93 arranged at the opposite side of said blade.

The lever 90 is insulated from the blade 92 and provided at its upper end with a handle 96 and mounted at its lower end upon a pivot 98, projecting from the adjacent side of the frame 1. A stop 91 on the lever 90, is adapted to engage the tooth 84 on the gear 82, as disclosed by Fig. 2, to check the rotation of said gear 82 when a trouble signal is transmitted. A spring 100 fixed to the pivot 98 and bearing against the lever 90 swings the same to the left to throw the blade 92 out of engagement with the contacts 93 and into engagement with the contacts 94, when the latch 88 is raised out of engagement with the lug 89. Stops 101 and 102 fixed to the frame 1 and disposed at opposite sides of the lever 90 serve to limit the pivotal movement thereof.

The gear wheel 82 has a concentric surface 105 with recesses 107 and 108 to receive the downturned end of a lever 110 fulcrumed at 112 and bearing at its opposite insulated end against the spring contact 114 of a short-circuit switch 116 secured to but insulated from the frame 1. The short circuit switch 116 is normally open but when the gear wheel 82 rotates and raises the lever 110 out of the recess 107, the rear end of said lever 110 forces the contact 114 against the

companion contact 118 and closes the switch 116, which remains closed until the down-turned end of the lever 110 drops into either of the recesses 107 and 108.

Referring now more particularly to the diagram disclosed by Figs. 6 and 7, 120 and 122 designate a part of the main line, and 124 and 126 designate house wires. The house wire 124 is normally closed and connected to the opposite poles of mercurial thermostats 128, which are spaced apart as desired, while the house wire 126 constitutes a normally open circuit and has terminals 130 extending down into the thermostats but not normally in contact with the mercury in the lower portions of the glass or other nonconducting tubes 134. The ends of the house wire 124 are connected to the main line wire 120, while the ends of the circuit wire 126 are connected to the upper pair of contacts 93.

Normally the current enters over the main line wire 120 and passes through one pair of contacts 72, the switch blade 70, the opposite pair of contacts 72, back to the main line wire 120 to the house wire 124, through the thermostats 128, back to the main line wire 120, through a resistance coil 138, and returns through the main line wire 122 to the central office.

Should a fire occur and cause the mercury in one of the thermostats to expand and contact the respective terminal 130, the resistance offered by the coil 138 causes the current on the wire 124 to pass through the closed thermostat to the wire 126, over which it flows to the upper contacts 93, the switch blade 92, the lower contacts 93, a wire 140, the electromagnet 36, and to the main line wire 122, through a wire 142.

The passage of the current through the electromagnet 36 energizes the same and causes it to attract its armature 34, which rocks the lever 32, causing its rear end to swing upwardly against the resistance of the springs 43 and 48 and release the governor 29 and the lock-bar 49. When the governor 29 is thus released and free to oscillate, it, through the intermediacy of the detent 25, unlocks the train of gearing and permits the spring 5 to unwind. As the spring 5 unwinds it rotates the shaft 2 and the code-wheel 76, which in turn intermittently rotates the gear 82, until the stop 85 contacts the outturned end of the push-bar 87, causing the same to rock the lever 40 against the resistance offered by the spring 43 until checked by the armature 39 contacting the electromagnet 38. Before the gear 82 is checked and in turn checks the code-wheel 76, the latter makes several revolutions and carries its notches 78 successively into coincidence with the pin 79 on the blade 70 of the make-and-break switch 71, thus permitting said blade 70 to be intermittently forced

upwardly out of engagement with the contacts 72 by the spring 73 and repeatedly transmit a fire alarm signal to the central office.

When the electromagnet 36 is intermittently deenergized by the intermittent opening of the make-and-break switch 71, the rear end of the armature lever 32 is prevented from being forced downwardly by the springs 43 and 48 into the path of the governor arm 49 and interrupting the fire alarm signal, by the lock bar 49, which was instantly forced by the spring 52, beneath said lever 32 when the electromagnet 36 was initially energized.

When the lever 40 rocks until checked by the armature 39 contacting the electromagnet 38, as above described, said lever 40 rocks the spindle 42, causing it to raise the latch 88 out of engagement with the lug 89 on the lever 90, which is immediately urged to the left by the spring 100 until it strikes the stop 102. This movement of the lever 90 throws the switch blade 92 out of engagement with the contacts 93 and into engagement with the contacts 94, thus cutting out the house circuit and establishing the main line circuit through the contacts 94, the blade 92, and circuit wires 150 and 152. Hence, should a fire occur in a second building similarly equipped before the transmitter in the first building is reset a second alarm is transmitted to the central office through the newly established circuit.

After the fire alarm has been transmitted to the central office by the first house equipment, the transmitter cannot be reset until the spring 5 is rewound by merely swinging the blade 92 back into engagement with the contacts 93, as the latch 88 cannot engage the lug 89, owing to the fact that said latch is held in raised position through the intermediacy of the spindle 42, the lever 40, the push-bar 87, and the gear 82, the stop 85 of which bears against the outturned end of said push-bar 87. However, when the spring 5 is rewound the code-wheel 76 and the gear wheel 82 are restored to normal position, Fig. 1, and the gear stop 85 is carried out of engagement with the outturned end of the push-bar 87, thus permitting the spring 43 to rock the lever 40 to normal position, Fig. 3. This operation of the lever 40 rocks the spindle 42 and swings the latch 88 downwardly to engage and hold the lug 89 after the lever 90 has been manually swung back to restore the blade 92 into engagement with the two pairs of contacts 93, for the purpose of re-establishing the first house circuit.

When the hand lever 61 is forced downwardly to expose the rectangular terminal 3 of the main shaft 2, for the application of the winding key, said lever 61 is brought adjacent to the top of the blade 70 and pre-

vents the same from swinging upwardly out of engagement with the contacts 72, as the notches 78 of the code-wheel 76 pass the pin 79. Thus the circuit through the contacts 72 and the main line is maintained, and a false alarm is prevented from being transmitted to the central office during the winding operation. As the lever 61 is depressed its lateral projection 60 contacts the rear end of the arm 55, causing the same to rock the spindle 50 and swing the lock-bar 49 from beneath the lever 32, so that the same may be forced downwardly into engagement with the frame member 45 by the spring 48 and hold said lock-bar 49 and the governor 29 in normal position.

In case no fire exists and the normally closed local circuit is interrupted by the breakage of a thermostat 128, or the breakage of the house wire 124, a trouble signal is transmitted to the central office, as follows: The current entering over the main line wire 120, is shunted through a wire 160, the electromagnet 38, and returns through a wire 162 to the main line wire 120. Said current energizes the electromagnet 38, causing it to attract the armature 39 and rock the lever 40, which in turn rocks the spindle 42, causing it to raise the latch 88 out of engagement with the lug 89, whereupon the lever 90 is urged by the spring 100 to the left and carries the switch blade 92 into engagement with the contacts 94. This movement of the lever 90 carries the stop 91 into the path of the tooth 84 on the gear 82, thereby checking the same after the code-wheel has completed about one revolution only and transmitted a short trouble signal, which can be readily distinguished at the central office from the longer fire alarm signal. When the lever 40 is rocked by the attraction of the armature 39 as above described, said lever 40, through the intermediacy of the arm 47, rocks the lever 32 therewith, causing its rear end to raise and allow the upper end of the governor arm 29 and the lock bar 49 to pass under said rear end, so that the governor can oscillate and allow the code-wheel 76 to revolve until checked by the tooth 84 contacting the stop 91, as above-described.

When the gear 82 is rotated at the time a fire alarm is transmitted, the concentric surface 105 actuates the lever 110, causing it to close the contact 116 and short circuit the main line through wires 160 and 162. This cuts out all other transmitters between the one sending in the alarm and the resistance coil 138, and hence confusion due to one or more transmitters sending in different alarms at the same time is avoided. After the transmitter has sent in an alarm the contact 116 is opened by the end of the lever 110 dropping into the recess 108, and thus the main line is automatically restored

to receive signals from any of the transmitters connected thereto.

When the gear 82 is rotated only part of a revolution at the time a trouble alarm is transmitted, the concentric surface 105 holds the contact 116 closed, and keeps the main line short-circuited until an inspector repairs the defective parts causing such trouble alarm.

Having thus described my invention, what I claim and desire to secure by Letters Patent, is:

1. In a device of the character described, a code-wheel, a switch to coact with said code-wheel in transmitting messages, a train of gearing associated with the code-wheel, a spring to drive said train and which on winding or unwinding drives the code wheel, a vibratory governor to normally lock the train from rotation and also regulate the speed of such rotation, an electrically-controlled device normally in the path of said governor to hold the same stationary, an element to hold the device out of the path of the governor after said device has been energized, and means to restore said element to normal position and also hold the switch in closed position during winding of the spring.

2. In a system of the character described, a code wheel, a make-and-break switch to coact with said code wheel in transmitting signals, a motor spring which on winding or unwinding rotates said code wheel, means to normally restrain said motor spring from unwinding, magnetic means to effect the release of said motor spring so that it may unwind, and means for performing the dual function of holding the switch in closed position during the winding of the spring to prevent said switch from coacting with the code wheel and for restoring the spring restraining means to normal position.

3. In a system of the character described, a code wheel, a make-and-break switch to coact with said code wheel in transmitting signals, a motor spring which on winding or unwinding rotates said code wheel, means for normally holding one side of the switch yieldable in coactive relation with the code wheel, means to normally restrain said motor spring from unwinding, magnetic means to effect the release of said motor spring so that it may unwind, and manual means for performing the dual function of holding the switch in closed position during the winding of the motor spring to prevent said switch from coacting with the code wheel and for restoring the spring restraining means to normal position.

4. In a system of the character described, a motor spring, a shaft provided with a terminal to receive a key to wind said spring, a code wheel fixed to said shaft, a make-and-break switch to coact with said code

wheel in transmitting signals, and means to prevent the application of the key to the shaft until said means has been adjusted to hold the switch in closed position during the winding of the spring to prevent said switch from coacting with the code wheel.

5. In a system of the character described, a code wheel, a make-and-break switch to coact with said code wheel in transmitting signals, a motor spring which on winding or unwinding rotates said code wheel, means for locking the spring from unwinding, magnetic means for releasing the spring locking means, and means for holding the switch in closed position during the winding of the spring and also for resetting the locking means.

6. In a system of the character described, a code wheel, a make-and-break switch to coact with said code wheel in transmitting signals, a motor spring which on winding or unwinding rotates said code wheel, mechanism including an oscillatory governor for normally preventing the spring from unwinding, a lever to prevent said governor from oscillating and allowing the spring to unwind, electrically controlled means for disengaging said lever from the governor so that the same may oscillate and permit the spring to unwind, a lock bar to hold the lever out of the path of the governor, and means for restoring said lock bar to normal position and also holding the switch in closed position during the winding of the motor spring.

7. In a system of the character described, signal transmitting mechanism, a motor spring for actuating said mechanism, a train including an escapement for controlling the unwinding of the spring, a governor for normally holding said escapement stationary and also to oscillate therewith to control the speed thereof when in operation, a lever to hold said governor stationary, means to disengage said lever from the governor so that the spring may unwind and actuate the signal transmitting mechanism, a rockable lock bar for holding the lever out of the path of the governor so that the same may continue to operate after the electromagnet becomes deenergized, a spring to rock said lock bar to active position, and manual means for performing the dual function of

adjusting the lock bar out of the path of the lever so that the same may be restored to normal position after transmission of the signals and for holding the signal transmitting mechanism closed during rewinding of the motor spring.

8. In a system of the character described, a code wheel, a motor spring which on winding or unwinding rotates said code wheel, mechanism to restrain said spring from unwinding, a switch to coact with the code wheel in transmitting signals, a main line wire over which the signals are transmitted, a normally open local circuit, thermostatic means for closing communication between said local circuit and the main line circuit, means to prevent the spring restraining mechanism from prematurely checking the unwinding of said spring and stopping the transmission of signals, and a device for restoring the last means to normal and holding the switch from coacting with the code wheel during winding of the spring.

9. In a system of the character described, a signal transmitting mechanism, restraining means therefor, a main circuit over which the signals are transmitted, a normally open local circuit, a normally closed local circuit connected to the main circuit, thermostatic means for short-circuiting said normally closed circuit through the normally open circuit should the temperature become abnormal, a shunt circuit connected to the main circuit and having open terminals opposite similar terminals of the normally open local circuit, a switch to close a path between the open terminals of the normally open local circuit and one side of the main circuit, latch means to normally hold the switch in position to close said path, an electromagnet which is energized and releases the restraining means when the normally open local circuit closes, and means geared to the signal transmitting mechanism for releasing the switch so that the same may cut out the local circuits and establish the main line circuit through the shunt circuit.

In testimony whereof I affix my signature, in the presence of two witnesses.

JOHN M. JOHNSON.

Witnesses:

F. G. FISCHER,
L. J. FISCHER.