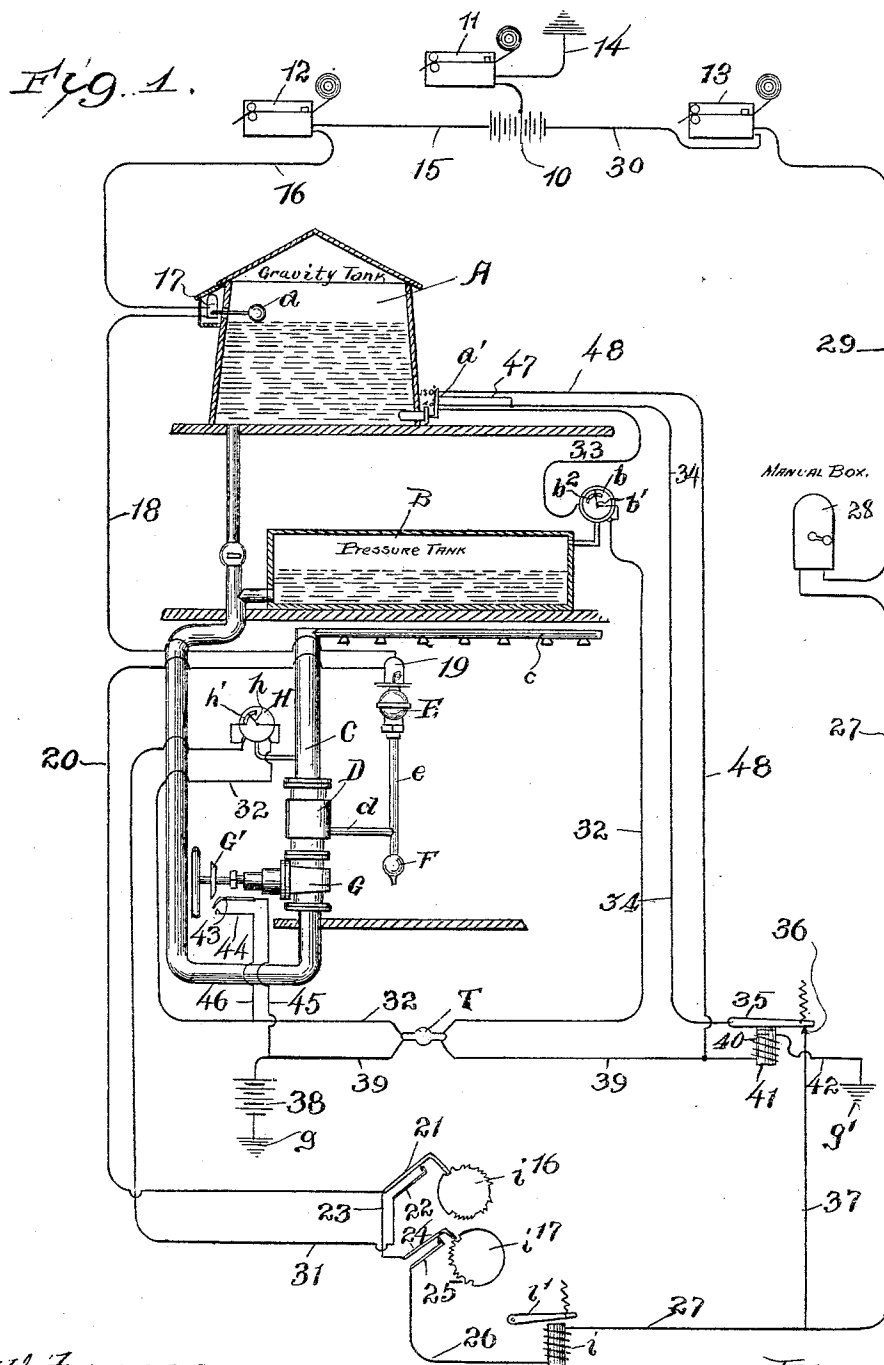


J. G. NOLEN & J. E. SHEPHERD.
FIRE PROTECTION SIGNAL SYSTEM.
APPLICATION FILED APR. 25, 1904.

939,293.

Patented Nov. 9, 1909.

3 SHEETS—SHEET 1.



Witnesses:
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Ray White.

Bg

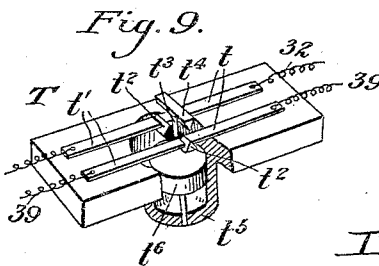
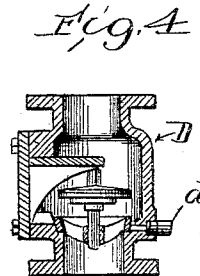
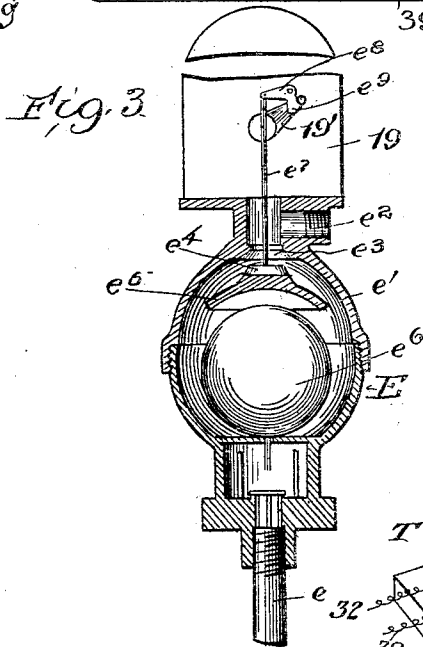
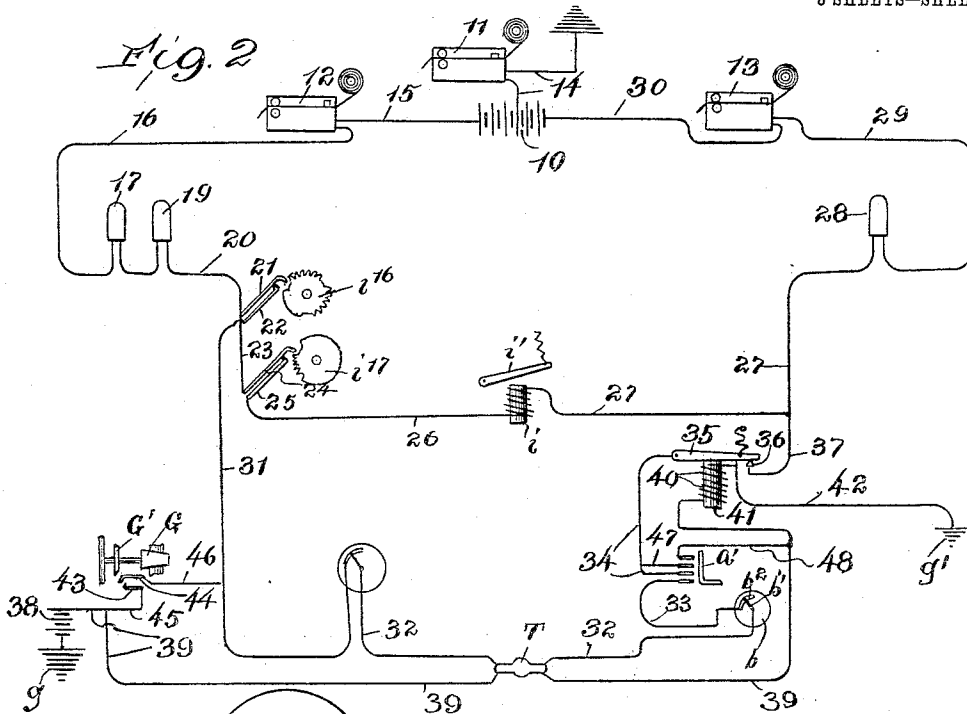
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3 SHEETS—SHEET 2.



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3 SHEETS—SHEET 3.

Fig. 5.

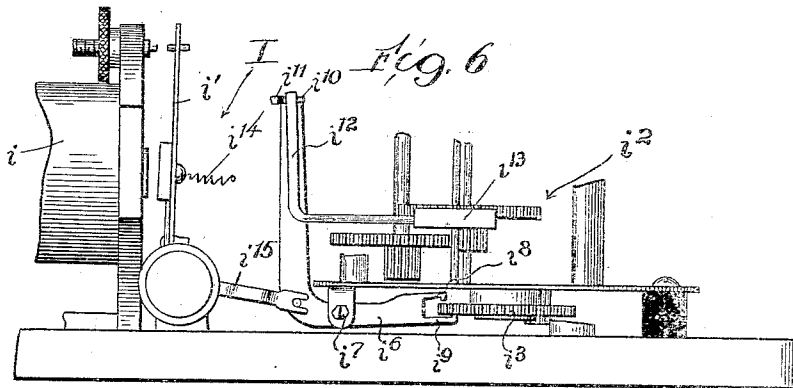
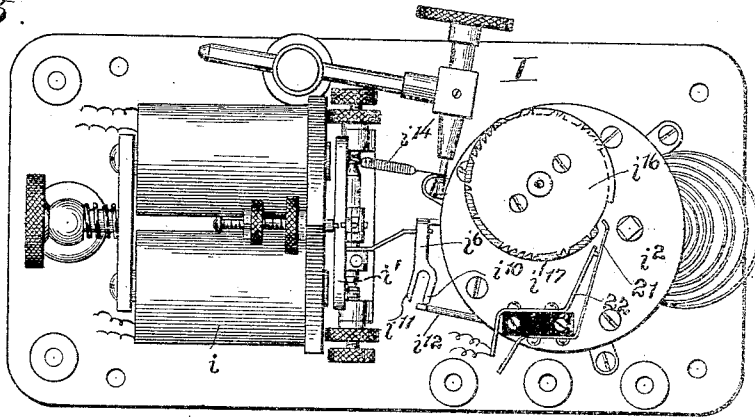


Fig. 7.

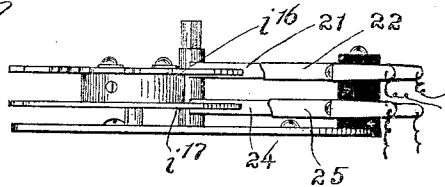
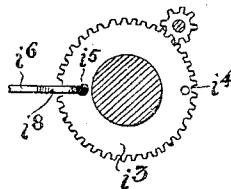


Fig. 8.



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By

UNITED STATES PATENT OFFICE.

JAMES G. NOLEN AND JOHN E. SHEPHERD, OF CHICAGO, ILLINOIS.

FIRE-PROTECTION SIGNAL SYSTEM.

939,293.

Specification of Letters Patent.

Patented Nov. 9, 1909.

Application filed April 25, 1904. Serial No. 204,779.

To all whom it may concern:

Be it known that we, JAMES G. NOLEN and JOHN E. SHEPHERD, of Chicago, in the county of Cook and State of Illinois, have
5 invented certain new and useful Improvements in Fire-Protection Signal Systems; and we hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying
10 drawings, which form part of this specification.

Our invention relates to improvements in fire protection signal systems and contemplates the combination of an electric signaling system with a fire extinguisher system
15 in such manner that upon the occurrence of any ordinary trouble in the fire extinguisher system (or in the alarm system itself) an alarm or signal will be transmitted to a central station to notify those interested in the
20 protection of the risk of the existence of abnormal or dangerous conditions therein.

In the drawings; Figure 1 is a diagrammatic view illustrating graphically characteristic proportions of a fire extinguisher
25 system, equipped with a signal system embodying our invention. Fig. 2 is a simplified view of the circuits of our system, as applied in Fig. 1. Fig. 3 is a detail of a float valve forming part of the fire extinguisher system showing its association with
30 an alarm box of the alarm system. Fig. 4 is a sectional detail of a variable-pressure check-valve in the extinguisher system. Fig. 5 is a plan view of a master box in the alarm system. Fig. 6 is a side elevation of portions of said box. Fig. 7 is a detail of the signal transmitting wheels and pens of the
35 said master box. Fig. 8 is a detail of the wheel upon the bottom of the box with which the detent devices are associated. Fig. 9 is a detail of a form of thermostat adapted for use in our system.

Throughout the drawings like characters
45 of reference refer always to like parts.

Referring now particularly to Fig. 1, A indicates a tank or reservoir upon the top of the building, such as is usually supplied with water from the city mains. *a* indicates a
50 float movable up and down with the rise and fall of the water in the tank, and associated in any desired manner with a normally-set signal-box of the alarm system, so that upon the undue fall of the water in the tank the
55 box 17 is tripped. *a'* indicates a thermometer having its bulb immersed in the water

in the tank A, and having electrical contact points in the path of travel of the mercury of the thermometer arranged in two pairs, one pair being arranged so that contact is broken therebetween when the mercury indicates a temperature lower than is
60 desirable in the water tank A,—say 40° F.—and the upper pair being arranged to be closed when the mercury indicates an unduly
65 high temperature,—say 180° F. B indicates a pressure tank containing water under air pressure, and connected with the water supply tank A in the usual manner. *b* indicates a pressure gage associated with the
70 pressure tank B having a hand *b'* arranged to sweep over a segment *b²* in electrical contact therewith. The segment *b²* is of a length corresponding with an indicated normal range of pressure in the tank B; so that
75 as long as pressure is normal in the tank B the hand *b'* is in contact with the segment *b²*, but when the pressure falls below its normal range contact between said parts is broken. C indicates a riser of the fire extinguisher
80 system connected with the pressure tank B in the usual manner. The riser C is provided with the usual variable pressure valve D one form whereof is shown in Fig. 4, the construction of which is well understood and
85 needs no detail description herein, said valve being provided with an escape pipe *d* normally closed by the valve and communicating with a vertically disposed pipe *e* the upper end of which communicates with a float
90 valve structure E. *e'* indicates a valve casing, provided at its upper end with a relief outlet *e²* having at its inner surface a valve seat *e³* with which coacts a valve member *e⁴* provided with a cup-shaped skirt *e⁵* arranged
95 to overlie a float ball *e⁶* arranged within the casing *e'*. This construction is such that air escaping through the pipe *e* can find its way up around the float *e⁶* without elevating the latter, and may escape
100 through the valve seat *e³* and outlet *e²*, but that water flowing into the casing *e'* through the pipe *e* lifts the float *e⁶* and raises the valve *e⁴* to closed position upon its seat *e³*. Mounted upon the top of the valve casing
105 *e'* is an alarm box 19 arranged to be tripped or conditioned for operation when the valve member *e⁴* is raised as aforesaid. We have shown a simple connection for effecting such operative association of the box and valve. *e⁷*
110 representing a stem rigidly connected with the valve member *e⁴* and projecting upward

to the top of the casing, and its end pivotally connected to one extremity of a bell crank arm e^8 , at the opposite extremity of which is a hook e^9 adapted to engage the end of a handle 19' of the signal box 19 to hold the same in elevated or set position. It will be obvious that as the valve is raised the bell crank is turned upon its pivot to release the handle 19' which under the impulse of the spring of the box descends. F indicates a waste valve of any well known construction adapted to permit the escape of water from the pipe e after the pressure in the pipe is cut off by the restoration of the valve D to normal or closed position. G indicates a gate valve of well known construction, arranged as usual in the riser C. H is a pressure gage associated with the riser C to show the pressure therein above the variable pressure valve D, said gage being provided with a hand h adapted to sweep over a segment h' in electrical contact therewith, said segment representing the normal variation of pressure in the riser.

We will now describe the mechanical construction of a master box or signaling apparatus, such as we employ in the practice of our invention, and herein illustrated in Figs. 5 to 8.

I indicates the box as a whole; i the electro-magnet forming part of the actuating device for the contact controlling mechanism; i' the magnet armature, and i^2 indicates generally a spring motor or clock work mechanism carrying and controlling the electrical contact members or signaling devices proper. The motor and contact devices we will, for brevity, call the signal transmitting instrument, and the magnet and armature we will refer to as its actuating devices. The clock work frame or motor includes a pinion i^3 mounted on the under face of the motor and having formed therein two apertures i^4 and i^5 diametrically opposed and at different radial distances from the axis of the pinion; i^6 indicates a bell crank lever mounted on a pivot i^7 with its inner end extending in parallelism to the pinion i^3 and having its extremity cut away to leave two fingers i^8 and i^9 provided with inturned ends arranged for engagement respectively with the perforations i^4 and i^5 of the pinion i^3 . The outer end of the lever i^6 extends upward, is provided with a horizontal extremity divided to form two prongs i^{10} and i^{11} suitably separated and arranged in operative proximity to a stem i^{12} projecting from the escapement member i^{13} of the clock work. This construction as a whole is such that the portion of the lever in front of its pivot i^7 may be raised to depress finger i^8 into engagement with the perforation i^4 of the wheel to hold the motor mechanism against movement, the prong i^{11} at the same time swinging in front of the stem i^{12} to pre-

vent the escapement from operating; or the forward portion of the lever i^6 may be depressed to raise the lower finger i^9 , into engagement with the perforation i^5 of the pinion, the prong i^{10} at the outer end of said lever moving to intercept the movement of the stem i^{12} of the escapement. When neither of the finger ends i^8 or i^9 is in engagement with its perforation i^4 or i^5 , that is to say when the wheel is traveling so that its unperforated portion is passed between the fingers the upper end of the lever is in such position that the stem i^{12} vibrates between its prongs i^{11} and i^{10} .

The armature i' , normally held in outward position by a spring i^{14} , is provided with a lever arm i^{15} extending to and connected with the lever i^6 in front of its pivot i^7 , and accordingly the train in its normal condition is held as indicated in Fig. 6, that is to say with the lower finger i^9 in engagement with the perforation i^5 . If now the armature i' be moved toward its magnet poles and held in such position, the finger i^9 is removed from its aperture i^5 , and the pinion starts in rotation, the finger i^8 resting on the upper surface of the pinion, and the escapement stem playing between the prongs of the outer arm of the lever. When now the pinion i^3 completes a half revolution the finger i^8 engages the aperture i^4 and stops the pinion. The release of the armature from the poles, however, at any time after the pinion starts in motion restores control to the armature spring, and the finger i^8 either can not engage in its aperture, or, if already engaged, is removed therefrom, so that the pinion completes its revolution. It will then be seen that movement of the armature in either direction under the influence of its magnet and spring actuates the contact controlling mechanism which in turn works the contact members.

Mounted upon the upper face of the motor are the two member wheels i^{16} and i^{17} of the master box, mounted for simultaneous rotation upon a common stem, and so geared as to make two rotations to one of the pinion i^3 . Each of the wheels is provided with a toothed portion, and an elevated peripheral portion, the elevated portion of each being coextensive with and in position corresponding to the toothed portion of the other. The upper wheel i^{16} has associated therewith contact devices comprising a spring pen 21 and its contact 22, and wheel i^{17} has associated with it pen 24, contact 25 arranged in circuits to be described. The arrangement of the pens is such that contact is normally made by each with its contact point, said contact being broken whenever a tooth or the elevated peripheral portion of the corresponding member wheel of the contact controlling mechanism passes beneath the pen.

Referring now to the electrical circuits of our system, 10 indicates a central battery located at a central station in conjunction with three signal receiving instruments 11, 12 and 13. The instrument 11 is arranged in the ground connection 14 splitting the central battery 10, while the instruments 12 and 13 are arranged directly in a main circuit on the left and right sides respectively of battery 10.

To trace now the main circuit, from battery 10 extends a wire 15 connected with the recording instrument 12 from whose other terminal extends wire 16 connected to one terminal of the box 17 which is arranged to be tripped by its float when the water level in tank A falls. The other terminal of box 17 is connected to wire 18 extending to box 19 associated with the valve E as heretofore described. From box 19 extends a wire 20 connected to the pen 21 associated with the upper wheel of the master box, heretofore described. From the pen 21 extends a wire 23 connected to pen 24 of the lower wheel of the master box, whose contacting contact 25 is connected by wire 26 with one terminal of the electro magnet *i*. The opposite terminal of the electro magnet is connected by wire 27 with the manually operable signal box 28, whose opposite terminal is connected by wire 29 with one terminal of the receiving instrument 13, the other terminal whereof is connected by wire 30 with the right hand pole of the central battery 10. This constitutes what we will term the main circuit, which it will be noted includes in series the central battery signal receiving instruments, a float-operated tank alarm box, the variable pressure alarm box of the riser system, the pens of the lower wheel of the master box, the magnet of said master box, and the manual signal box.

A normally-closed, local shunt, or sub-circuit is provided around the portion of the main circuit including the magnet *i*, such shunt being provided by the contact member 22 associated with the pen 21 connected to the main circuit, whence extends a wire 31 connected to the segment *h'* of the riser pressure gage H. The hand *h* of said gage is connected to wire 32 which is connected in series along one side of all the thermostats T (if any) employed in the system, one thermostat only being shown for simplicity. This wire 32 has its opposite extremity connected to the hand *b'* of the pressure gage *b* associated with the pressure tank B. The segment *b'* of said gage is connected by wire 33 with the lower contact of the series of the thermometer *a'*, the coating contact point being connected by wire 34 with the armature 35 of an electro-magnet 41 whose winding is contained in a circuit to be described. 36 indicates the front contact point for the armature, connected by wire 37 with the

wire 27 forming part of the main circuit. Thus the armature 35 forms in effect a circuit breaker, held forward in circuit closing position, against the tension of its spring, by a magnet in another circuit. It will now be seen that as long as the various devices in the sub-circuit described are closed the said sub-circuit forms a closed circuit parallel to a portion of the main circuit including the electro magnet *i* of the master box. The magnet *i* is so wound that when the said sub-circuit is closed the armature is not energized sufficiently to attract the armature, but should the said sub-circuit be broken and all of the current from battery 10 sent through the magnet winding, the armature *i'* of the master box is attracted and the box set in operation.

An independent local circuit is provided, preferably grounded at both ends, and extending as follows; from ground at *g* through a local battery 38 to wire 39, through all the thermostats T to the coil 40 of the electro-magnet 41, whose opposite terminal is connected to wire 42 extending to ground at *g'*.

The thermostats T heretofore adverted to are not essential to our system and may be omitted, but if employed, they are preferably of the character shown in Fig. 9 consisting essentially of two pairs of separated circuit parts *t* and *t'* arranged in opposing relations and normally connected in closed circuit relation by two insulated contact blocks *t*²—*t*² supported on a vertically movable rod *t*³ in such a manner that, when the rod is released for vertical movement under the influence of gravity, the blocks *t*²—*t*² are removed from between the two coating pairs of strips, to break circuit therethrough. Upon the said rod *t*³ is also mounted a cross bar *t*⁴ of conducting material so disposed that when the rod falls under the influence of gravity as aforesaid, the bar *t*⁴ closes circuit between the pairs of contact strips and connects them in electrically crossed relation subsequent to the breaking of the circuit by the removal of the contact blocks *t*²—*t*² from contact therewith. Suitable heat releasable means, such as the body of fusible solder *t*⁵, should be provided for normally maintaining the rod *t*³ in elevated position, and a weight *t*⁶ is preferably attached to the rod to make its descending action, when released by the fusing of the solder, sharp and effective. Other forms of thermostat, however, may be used in conjunction with our system but should be adapted, when the heat conditions are such as to set the thermostat in operation, to throw a cross between the wires 32 and 39. It will be apparent that the arrangement of the circuits and devices is such that if either of the said wires 32 or 39 be broken the integrity of the sub-circuit including the shunt circuit wire

32 is destroyed, as the breakage of the independent circuit wire 39 withdraws current from the magnet 41 and permits the armature 35 of said magnet to be moved by its
 5 spring away from its contact 36 thereby destroying the integrity of the sub-circuit including the wire 32.

Associated with the gate valve G are normally open contact members adapted when
 10 closed to bridge the thermostat wires 32, 39, and arranged to be closed when said gate valve is moved to closed position. In the construction herein indicated 43 and 44 indicate a pair of normally separated contact
 15 springs connected respectively by wires 45 and 46 to the wires 39 and 32 of the thermostat sub-circuit and the independent thermostat circuit. A wheel G' may be provided upon the stem of the valve G and ar-
 20 ranged to close the said springs when the valve is moved to closed position. The upper contacts of the thermometer *a'* of the tank A are likewise arranged in a normally open path bridged between the sub-circuit
 25 and the independent circuit, one of the contact points being connected by wire 47 to the wire 34 of the sub-circuit and the other being connected by wire 48 to the wire 39 of the independent circuit.

30 In operation the system will work as follows; Should the conditions of the water level in the tank A or of water flow in the riser C become such as to trip either of the boxes 17 or 19, or should the manual box
 35 28 be set in operation, either of such boxes will operate upon the main circuit in a portion not paralleled by the sub-circuit and send its predetermined and characteristic signal to the central station. Should ab-
 40 normal conditions of pressure, in the pressure tank or riser or the undue cooling of the water in tank A open the sub-circuit 32 through either of the gages H or *b* or the thermometer *a'*, all of the current from the
 45 central battery 10 will be transmitted through the magnet *i*, of the master box, thereby magnetizing the same to such a degree that it attracts its armature *i'* against the tension of its spring and holds the same
 50 closed until the sub-circuit is reestablished. Under these conditions the master box, as heretofore described, will be actuated so that its signal wheels make one round, but it will be apparent that as only the lower
 55 pen and contact under such conditions receive current—the upper pen-contact being in the sub-circuit—the signal transmitted will be simply that of the lower wheel, that is to say, the number of the box
 60 once made followed by a long dash or "run-down". Should now conditions be so restored that the sub-circuit is again completed, the magnetism of the electro magnet *i* will be so reduced that its armature *i'* is
 65 retracted by the spring, and the detent de-

vices of the spring motor moved to permit another revolution of the number wheels. It will be noted, however, that now the circuit is complete through both the main circuit and the sub-circuit, so that both pairs
 70 of pens receive current when closed and the signal transmitted to the central station will be the box number thrice repeated.

Under other conditions—for instance when the heat of the water tank A reaches danger
 75 point, or a thermostat T fuses, or the valve G is closed, a short circuit is established between the wires 39 and 32. Now the current from the local battery 38 is partially diverted from the independent thermostat circuit
 80 and taking the cross wherever offered to the sub-circuit, finds its way to the main circuit and thence to ground, through the ground connection splitting the central battery. By this diversion of a portion of the
 85 current the magnet 41 is so weakened that it is unable to hold the armature 35 against the tension of its spring and, therefore, said armature 35 is retracted, breaking the sub-circuit at the contact point 36. Consequently
 90 the effect of a cross is to break the sub-circuit, thereby causing a transmission to the central station of the same signal as when any one of the devices included in the sub-circuit is operated to break the same.
 95 Should, however, the cause of the cross be removed and the cross broken, as for example by the restoration of the valve G to its normal position or the cooling of the water in the tank A, the current of local
 100 battery 38 will again traverse its normal, independent path, and energize the magnet 41 to such an extent that it again attracts its armature, arranged in the sub-circuit. Accordingly the detent devices of the master
 105 box are again actuated to permit the second round of said box, and current being supplied through both pairs of pens the full signal of the box number thrice repeated will be sent in. It will now be apparent that
 110 our system provided for the sending of a signal to central station upon the occurrence of any one of the usual troubles in the extinguisher system or in the alarm system itself, and for the transmission to central station
 115 of a different signal upon the restoration of the normal conditions of the circuit by the removal of the causes of trouble. Should, however, a fire occur within the protected area a distinctive signal will be trans-
 120 mitted to the central station. As soon as the heat conditions become excessive one (or more) of the sprinkler heads goes off and the pressure above valve D is momentarily relieved, but immediately restored as the valve
 125 lifts and the water flow begins. Accordingly the hand *h* of gage H makes a quick oscillation, falling below its normal range as the pressure is reduced, and so breaking contact with its segment *h'*, and then as the pressure
 130

is restored swinging back to normal position and making contact with its segment. By this operation the sub-circuit is broken and reestablished so that the armature of the master box magnet is first attracted and then instantly released, thereby operating the detent mechanism of the motor to permit two uninterrupted revolutions of the number wheels. The rapidity of movement of the gage hand *h* is such that the sub-circuit is closed before the number wheels begin to transmit their signals, and accordingly, both the main and sub-circuits being closed, both wheels send their characteristic signals and the recorders at the central station receive the number of the master box six times repeated. Furthermore, the unbalancing of valve D admits water to float valve chamber E, and trips box 19. Said box is preferably timed to act later than the master box, and a second signal characteristic of said box 19 is received at the central station. Further, the pressure in tank B is slowly reduced as the water is forced therefrom, and the hand of the gage *b* finally breaks contact with its segment, again breaking the sub-circuit, and actuating the master box, which this time sends only usual trouble signal. It will thus be seen that three separate signals are successively transmitted following the blowing of a sprinkler head, and such a succession of signals, irrespective of character is construed to mean fire. The signal-sequence referred to will be sent only in the event a sprinkler head blows but not a thermostat, or that the thermostats are left out of the system. If a thermostat and a sprinkler head blow practically simultaneously then the fact that a permanent cross is effected between the sub-circuit and the independent local circuit, thereby breaking the sub-circuit as heretofore described—prevents the transmission of anything but a single trouble signal from the master box. This, however is followed by the signal from box 19, as heretofore described, and such sequential signals are interpreted as a fire signal.

We do not herein claim jointly the arrangement of devices for transmitting the successive signals, which is claimed in an application of John E. Shepherd filed April 25, 1904, Serial No. 204,777.

While we have herein described in detail one operative embodiment of our invention, we desire it understood that many changes might be made in the particular application of our invention without departing from the spirit and scope thereof.

Having thus described our invention, what we claim and desire to secure by Letters Patent, of the United States, is:—

1. In combination with a fire extinguisher system comprising a water tank, a float therein to indicate a drop in the water level, a riser, a variable pressure valve in the riser,

a float valve controlled by said variable pressure valve, and a sprinkler connected with the riser, of a signal system comprising a central signal-receiving instrument, a signal transmitting instrument associated with the water tank float for actuation thereby, as described, another signal transmitting instrument associated with the float valve for actuation thereby, a battery and circuit connections including in series the battery, the signal receiving instrument and both of said signal transmitting instruments.

2. In combination with a fire extinguisher system comprising a riser and a gate valve in said riser, an alarm system comprising a signal receiving instrument, and a battery included in a grounded main circuit, a sub-circuit parallel to a portion of said main circuit, a signaling device in one of said circuits, an electro-magnet for actuating said device arranged in a portion of the main circuit paralleled by the sub-circuit, an independent grounded local circuit, a battery in said circuit, a circuit breaker in the sub-circuit, a magnet controlling said circuit breaker in the independent circuit, contact springs associated with the gate valve arranged to be moved into contact as the valve is closed and separated when the valve is open, and connections from one of said springs to the independent local circuit and from the other spring to the sub-circuit.

3. In a fire protection signal system, a valve; a normally-wound transmitter adapted to transmit different, distinguishable signals, and comprising two sets of circuit make-and-break-devices, and a motor for actuating said make-and-break devices; a main circuit including one of said sets of make-and-break devices; a signal responsive apparatus operatively associated with said circuit; a supervisory circuit in shunt to said make-and-break devices of the main circuit, said shunt including the remaining make-and-break devices; electro-magnetic means controlled by the condition of the supervisory shunt, for controlling the motor; and means associated with the valve for control thereby adapted and arranged to condition the shunt to initiate one signal as the valve is moved from normal position and to initiate another distinguishable signal as the valve is returned to normal position.

4. In a fire protection signal system, a valve; a normally wound transmitter adapted to transmit two distinguishable signals and comprising two sets of signaling devices, and a motor for said signaling device; a main circuit including one set of signaling devices; a signal responsive apparatus operatively associated with said circuit; a supervisory circuit in shunt to said set of signaling devices of the main circuit, and including the other set of signaling devices, electro-magnetic means controlling the

motor, responsive to a break of the supervisory circuit to condition the transmitter to transmit one signal and to the closing of said circuit to condition the transmitter to transmit another distinguishable signal, and means associated with the valve for automatic control by movement thereof, controlling the condition of the supervisory shunt.

5. In a fire protection signal system, the combination with a valve of a fire extinguisher system, of a signaling system comprising signal responsive apparatus, means of current supply, circuit connections and a signal transmitter arranged and adapted to transmit one signal as the valve is moved in one direction, and another distinguishable signal as the valve is moved in the opposite direction.

6. The combination with a fire extinguisher system involving a valve, of a signal system comprising a main circuit, a supervisory shunt thereto, a normally-wound signal transmitter operatively associated with one of said circuits, a signal responsive device operatively associated with said main circuit, electro-magnetic means for controlling the transmitter, associated with the supervisory circuit for control by its electrical condition, and means operatively associated with the valve for breaking the supervisory shunt when the valve is moved in predetermined manner.

7. The combination with a fire extinguisher system involving a valve, of a signal system comprising a main circuit grounded at central station, a supervisory shunt thereto, a normally-wound signal transmitter operatively associated with one of said circuits, a signal responsive device operatively associated with said main circuit, electro-magnetic means for controlling the transmitter, associated with the supervisory circuit for control by its electrical condition, and means operatively associated with the valve for grounding the supervisory shunt when the valve is moved in predetermined manner.

8. The combination with a fire extinguisher system involving a valve, of a signal system comprising a main circuit, a supervisory shunt thereto, a normally-wound signal transmitter operatively associated with one of said circuits, a signal responsive device operatively associated with said main circuit, electro-magnetic means for controlling the transmitter, associated with the supervisory circuit for control by its electrical condition, and means operatively associated with the valve for grounding and breaking the supervisory shunt when the valve is moved in a predetermined manner.

9. The combination with a fire extinguisher system involving a valve, of a signal system involving a normally-wound signal

transmitter, adapted to transmit two distinguishable signals, a signal responsive device, suitable circuits, and operative connections between the transmitter and the valve whereby movement of the valve from open position occasions the transmission of one signal and movement of the valve from closed toward open position occasions the transmission of a different, distinguishable signal.

10. In a system of fire extinguisher supervision, the combination with a fire extinguisher system involving a pressure tank, of a signal system involving a signal responsive apparatus, a signal transmitting apparatus capable of transmitting two distinguishable signals, an electro-magnetic controlling device for said transmitter, suitable circuit connections, and a pressure indicator associated with the pressure tank and provided with circuit controlling means operatively related to the circuit of the transmitter-controlling apparatus, to initiate the transmission of one signal upon a predetermined variation from normal pressure in the tank, and to initiate a distinguishable signal upon the restoration of normal pressure.

11. In a system of fire extinguisher supervision, the combination with a fire extinguisher system involving a pressure tank, of a signal system involving a signal recording apparatus, a signal transmitter adapted to transmit distinguishable signals, suitable circuit connections, and means associated with the pressure tank for conditioning the transmitter to transmit one signal upon a predetermined variation of pressure from normal, and to transmit a distinguishable signal upon the restoration of normal pressure.

12. In a fire extinguisher supervision system, a fire extinguisher system involving a gravity tank, a pressure tank, piping, and a valve, in combination with a main circuit extending from the protected area to a central station, a signal recording device at said central station, means for indicating by positive recordable electric signal variations of conditions from normal in the gravity tank, pressure tank and valve, operatively associated with said main circuit to transmit therethrough to the signal recording apparatus, and means for supplying energy to the electric devices.

13. In a fire extinguisher supervision system, a fire extinguisher system involving a pressure tank, piping and a gate valve in said piping, in combination with a main circuit extending from the protected area to a central station, a signal recording device at said central station, means for indicating by definite recordable electric signal the variation of conditions in either the valve or pressure tank from normal and by distinguishable signal, the restoration of normal

conditions in said device, said means being operatively associated with said main circuit to transmit therethrough to the central recording apparatus, and means for supplying energy to the signal system.

14. The combination with a fire extinguisher system involving a gravity tank, a pressure tank, piping, and a gate valve, of means for indicating water level in the gravity tank, pressure in the pressure tank, temperature in one of said tanks, and movements of the valve, and a signal system comprising a central station apparatus involving a signal recorder, signal transmitting means associated with the indicating means aforesaid for actuation to transmit recordable signals upon the indication of abnormal conditions in the devices supervised thereby, suitable circuit connections between the signal recording and transmitting means and suitable means for supplying electric energy thereto.

15. The combination with a fire extinguisher system comprising a riser and a gate valve in said riser, of an alarm system comprising a signal receiving instrument, a battery, a signal transmitting instrument, an electromagnet for controlling said transmitting instrument, and a circuit including said devices, said electromagnet being responsive to variations of current flow therethrough to actuate the signal transmitting instrument, circuit connections arranged when varied to operatively vary the current flow through the magnet, and means for varying the last said connections associated with the gate valve for control thereby.

16. The combination with a fire extinguisher system involving a gravity tank,

piping, and a gate valve; of means for indicating water level in the gravity tank, and movements of the valve; and a signal system, comprising a central station apparatus involving a signal recorder, signal transmitting means associated with the indicating means aforesaid for actuation to transmit recordable signals upon the indication of abnormal conditions in the devices supervised thereby, suitable circuit connections between the signal recording and transmitting means, and suitable means for supplying electric energy thereto.

17. The combination with a fire extinguisher system involving a source of fluid supply, piping, and a gate valve; of means for indicating predetermined abnormal conditions in the source of water supply, flow of water in the piping and movements of the gate valve, and a signal system comprising a central station apparatus involving a signal recorder, signal transmitting means associated with the indicating means aforesaid for actuation to transmit recordable signals upon the indication of the conditions, in the devices supervised, to which said indicators respond, suitable circuit connections between the signal recording and transmitting means, and suitable means for supplying electric energy thereto.

In testimony that we claim the foregoing as our own, we affix our signatures in presence of two witnesses.

JAMES G. NOLEN.
JOHN E. SHEPHERD.

Witnesses:

GEORGE T. MAY, Jr.,
MARY F. ALLEN.