

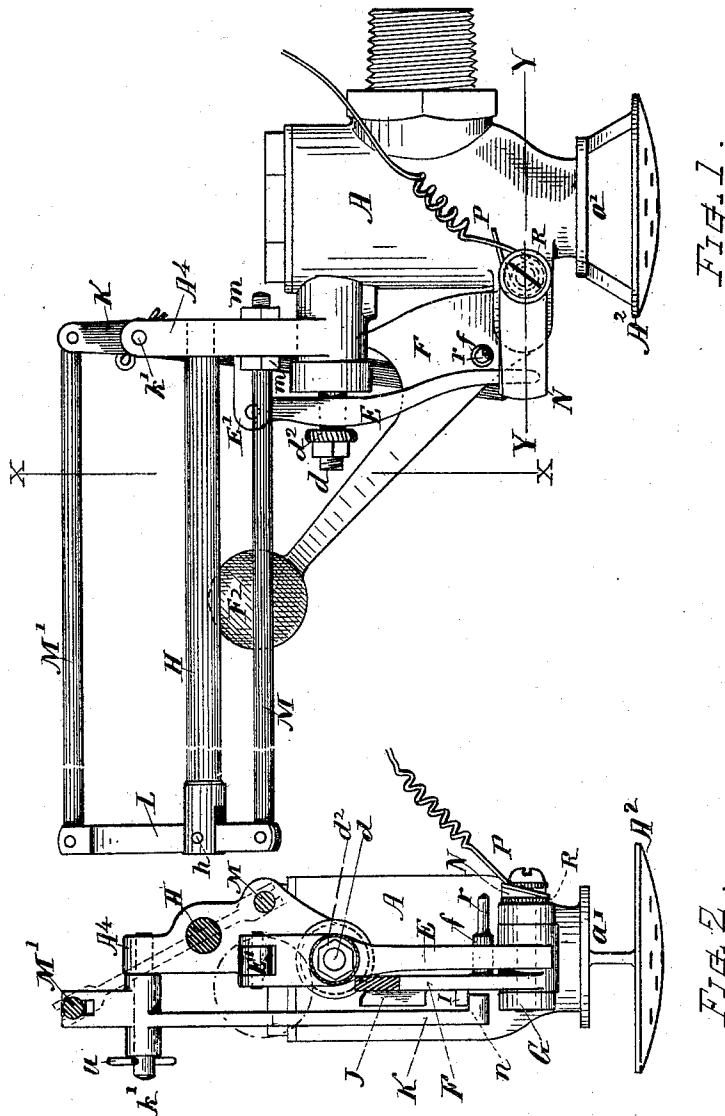
(No Model.)

3 Sheets—Sheet 1.

A. P. HOWES.
AUTOMATIC SPRINKLER,

No. 473,628.

Patented Apr. 26, 1892.



Witnesses

Geo. M. Rice
Simon E. King

Inventor

Albert P. Howes
By *Chas. H. Durlough*
Attorney

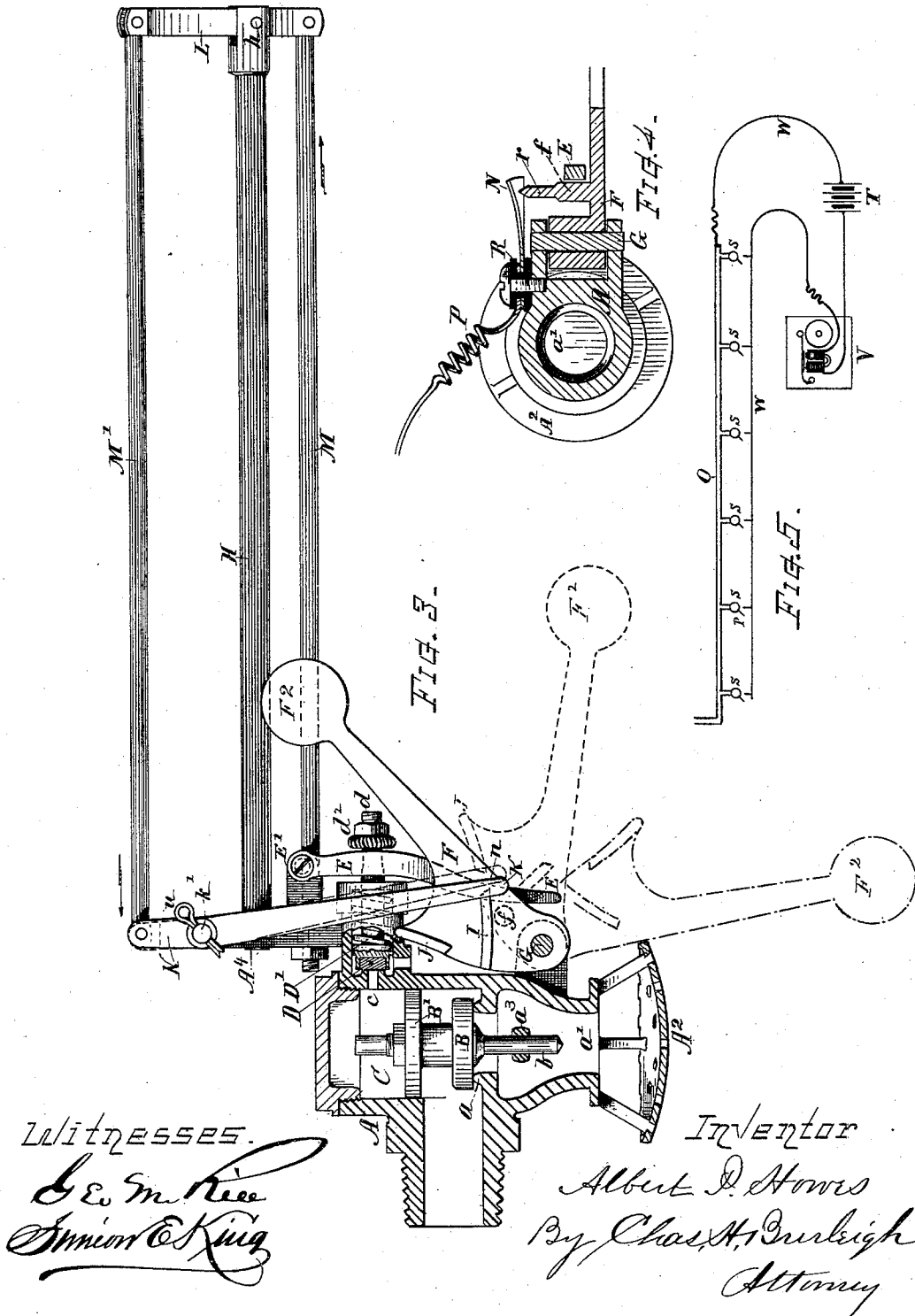
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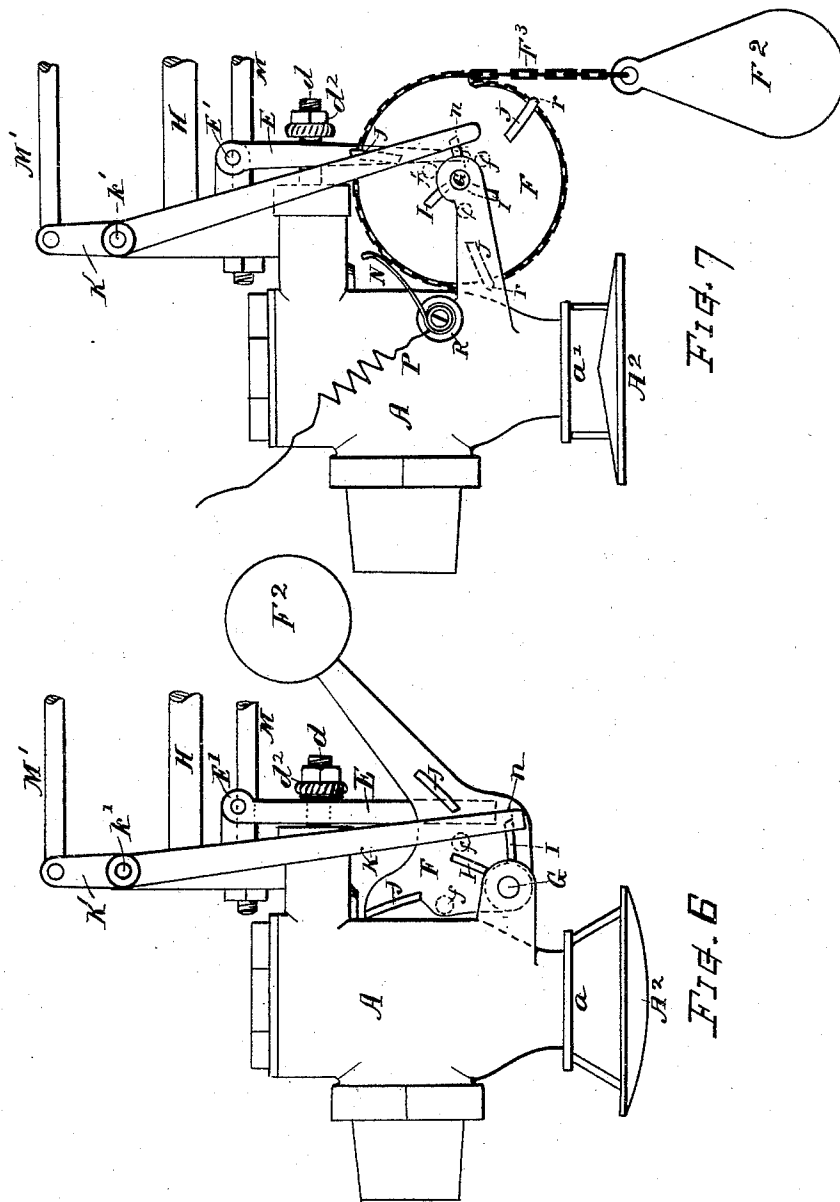
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Witnesses
Geo Justice
Samuel E King.

Inventor.
Albert D. Howes
By Phos. H. Quiligh
Attorney

UNITED STATES PATENT OFFICE.

ALBERT P. HOWES, OF WORCESTER, MASSACHUSETTS.

AUTOMATIC SPRINKLER.

SPECIFICATION forming part of Letters Patent No. 473,628, dated April 26, 1892.

Application filed March 28, 1891. Serial No. 386,818. (No model.)

To all whom it may concern:

Be it known that I, ALBERT P. HOWES, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Automatic Sprinkler, of which the following, together with the accompanying drawings, is a specification sufficiently full, clear, and exact to enable persons skilled in the art to which this invention appertains to make and use the same.

The object of my present invention is to provide an automatic sprinkler with controlling mechanism that will act by rise and fall of temperature to open and let on the water when the temperature exceeds a given degree and to again close and stop the flow of water when the temperature falls below the given degree.

Another object is to provide a sprinkler and thermostatic valve-operating mechanism having means of adjustment whereby the mechanism can be regulated for acting automatically to open and close the valve at any desired degree of temperature.

Another object is to provide an automatic sprinkler having an electric-alarm connection simultaneously operative with the sprinkler action.

Another object is to provide an automatic sprinkler having a thermostatic controlling mechanism adapted for opening and closing the sprinkler-valve, and an electric signaling mechanism operating in conjunction with the valve-controlling mechanism and put into and out of action simultaneously with the opening and closing of the sprinkler-valve.

These objects I attain by mechanism the nature and operation of which is illustrated in the drawings, in which—

Figure 1 is a side view of a sprinkler with thermostatic operating devices constructed in accordance with my invention. Fig. 2 is a section of the same at line X X. Fig. 3 is a part side part sectional view showing the valves and escapement apparatus, with dotted lines indicating the movements of the escapement. Fig. 4 is a horizontal section at line *yy* showing in detail an electrical connection that can be used in some instances when desired. Fig. 5 is a diagram illustrating the man-

ner in which a system of automatic sprinklers with electric-alarm connections can be arranged for use in factories or other situations. Fig. 6 shows a modification in the construction of the escapement or operator mechanism for giving repeated action, and Fig. 7 shows another modification in the operating mechanism and electric contact devices.

In my automatic sprinkler the shell or body A is made substantially as shown, with the connecting-boss having the inlet therethrough, an internal chamber C, with valve-seat *a*, and a discharge passage or nozzle *a'*, having the deflector or spray plate A² connected therewith. The upper part of the chamber C is provided with a small outlet-orifice *c*, closed by a valve D, that is worked from the exterior by suitable mechanism, hereinafter described.

The main valve B for closing the water-way through the valve-seat *a* is best formed, as shown in Fig. 3, with a piston-disk B' connected thereto that fits the chamber C not absolutely water-tight, but so as to afford comparatively close easy-sliding fit, and with a dependent stem *b*, that works in a guiding-bar *a*³ below the valve-seat *a*. This valve-puppet, composed of the piston-disk, valve-stem, and valve proper, is disconnected and free to move by gravity or by variation of pressure in the inlet-passage and chamber, it being closed to its seat *a* when the orifice *c* is closed and lifted from its seat to open the delivery-passage by the upward pressure on the piston-disk B' when the valve D is retracted and the orifice *c* is opened. When the orifice *c* is closed, the pressure on the disk becomes neutralized, or so as to be nearly the same on top and bottom thereof by reason of the flow from the chamber C being stopped and the passage of water past the edge of the piston into the upper part of said chamber, and the pressure then acts on the valve with a downward force corresponding to the area of the exit-passage. This pressure, together with the weight of the valve-puppet, forces the valve to its seat, the leakage of water past the edge of the disk into the upper part of the chamber being just sufficient to permit the fall of the water with a slow and easy action.

The principle of the valve action is substantially similar to that of the improved faucet

described in my application for Letters Patent, Serial No. 386,817, executed on even date herewith.

A suitable bracket or arm A^4 is arranged at a convenient position upon the exterior of the body A for supporting the thermostatic mechanism, and suitable bosses or ears are provided, as required, for the attachment of the various operating parts.

The valve D for controlling the outlet c is best made as shown in Fig. 3, and is arranged in a supplemental chamber having a waste-passage on the side of the sprinkler-body. A spring D' is provided for closing said valve to its seat and normally keeping the opening c stopped. Said spring is confined between the screw-cap and shoulder on the valve-stem. The stem d of the valve projects from the chamber, and a lever E is combined therewith for effecting the opening of said controlling-valve. Adjusting-nuts d^2 are preferably arranged on the valve-stem for engaging it with the lever E , thus affording facility for adjusting the degree of movement. The lever E is fulcrumed on the stationary ear E' , and has a dependant arm for engagement and operation thereof.

F indicates the operator or escapement, consisting of a lever or plate arranged to have swinging or rotative action about a pivot or axis G , supported by suitable ears in connection with the sprinkler-body. Said escapement is provided with a backwardly-projecting stud (or studs) f , that work into and out of contact with the valve-lever E as the escapement operates, as hereinafter explained. The escapement plate or operator is provided with detents or projecting flanges, as at I and J , that work in conjunction with a lever K , fulcrumed to the bracket A' at k' and having at its lower end a notch or projection n , that engages one of the escapement detents or flanges I or J , accordingly as the lever is swung to the right or left. The upper end of lever K is connected with a thermostat or expansion device for effecting movement of the lever by increase or decrease of temperature.

The main bar H of the thermostat is formed of iron or steel, and one of its ends is rigidly fixed in the bracket A^4 . It carries at its other end a lever or swing-bar L , fulcrumed therein at h , as shown.

M and M' indicate the thermostat expansion-rods, formed of brass or other suitable material. One end of rod M is threaded and fixed in the bracket A^3 by means of nuts $m m$ to facilitate adjustment of the rod endwise, while its other end is connected to the short arm of lever L . The expansion-rod M' has one end connected to the longer arm of lever L and its opposite end connected to the short arm of the escapement-lever K . The purpose of the lever L is to change the direction of and transmit the movement due to the expansion of rod M to the rod M' with an increased action proportional to the relative lengths of the two arms of said lever.

The escapement-plate F is provided with a weight F^2 , whereby it is caused to drop or swing on its pivot-center when the escapement-lever K swings off from the end of the flange I or J , these flanges being so located that movement of the lever K toward the right will carry its lug n off from flange I , but to a position where it will engage and arrest the flange J , and movement of the lever toward the left releases the flange J and engages the flange I , thus alternately adjusting the part F either to a position where the stud f will force back the valve-lever or to a position where said valve-lever will be released.

P indicates an electric connection for an alarm-signal, which is combined with the sprinkler and provided with a spring or electrode N , disposed in position to make contact with a point r , attached to the escapement-plate F . Said contact-point r is preferably an extension of the stud f , but may be a separate projection, if desired, and is disposed so that it will close the electric circuit when the sprinkler-valve is opened and break the circuit when the sprinkler-valve is closed. The connection is insulated from the body A by a disk or washer of rubber or other suitable material, and the circuit-wire W is held in attachment with the spring N by a binding-screw, as illustrated.

In a factory or other building the series of sprinklers S can all be connected with a line-wire W , (see diagram, Fig. 5,) having in circuit an electric generator or battery T and an annunciator or alarm-bell V , the opposite end of the wire being attached to the supply-pipe o of the sprinklers. By this means the alarm is put in action by the escapement mechanism of the sprinkler (or any one of them) when the sprinkler-valve is opened and the alarm is put out of action by the sprinkler-escapement when the sprinkler is shut off. In any instance, when desired, the sprinkler mechanism can be employed without the electric connections.

In the operation, the sprinkler being connected with the water-supply pipe in the usual position and the thermostat adjusted by its nuts $m m$ to act at any given degree of heat—say 150° , more or less—then the escapement-lever will stand in engagement with flange I so long as the temperature is below that degree, any contraction of the rods $M M'$ by variation of temperature causing the lug n to simply move toward the left along the flange; but should the temperature rise then the expansion of the rods $M M'$ causes such movement of the escapement-lever K that its lug n runs off the end of the flange I , when the dropping of the weight causes the operator F to turn on its pivot until arrested by the flange J striking the lug n of the escapement-lever. This movement swings the stud f against the lever E , forcing back said lever, compressing the spring D' , and retracting the valve D , thus opening the relief-orifice c and relieving the pressure in chamber C . The pressure of water then forces

up the piston, lifting the valve B from its seat, thereby automatically putting the sprinkler into action. At the same time the point *r*, coming in contact with the electrode N, closes the electrical circuit and causes the alarm-bell V to ring, thus giving notice that fire has occurred and that the sprinkler is discharging water thereon. When the lug *n* is on the flange J, any rise of temperature simply moves the lug to the right along said flange; but a fall of temperature will throw the escapement from said flange J. Therefore when the fire has subsided and the temperature cooled to below a given degree (100° Fahrenheit, more or less) the contraction of the thermostat-rods swings the lever K toward the left, carrying the lug *n* off the end of the flange J, and the drop of the weight moves the escapement or operator another step, (see dot and dash lines, Fig. 3,) swinging the stud *f* away from the valve-lever E and allowing the spring *d* to force the valve to its seat, closing the relief-orifice *c*, thus equalizing the pressure above and below the piston-disk B', so that pressure on the valve B will close it to its seat and stop the flow of the sprinkler; also, at the same time the point *r* is moved from the electrode N, breaking the electric circuit and thereby discontinuing the alarm-signal.

In Fig. 3 the escapement is shown with but one pair of flanges I and J, and the sprinkler, after being opened once and closed, must be adjusted by lifting the weight to its first position before it can again operate. This can be done by removing the pin *u*, sliding the lever K forward to clear its lug *n* from the flange I, then swinging the escapement back to position, and readjusting the lever K and replacing the pin *u*.

In Fig. 6 a modification of the escapement or operator is illustrated wherein a series of detents or flanges I and J are provided for engagement with the escapement-lever K, so that the apparatus is rendered capable of a second operation after the valve has been once opened and closed, this second operation being effected in the same manner as the first by further movement of the part F, bringing the succeeding detents I and J successively into engaging positions.

Fig. 7 shows a modification in which the operating plate or escapement is made as a circular disk or wheel and worked by a suspended weight F², instead of a weighted arm. Three pairs (more or less) of detents or flanges I and J are here provided for engaging the escapement-lever K. With this form the sprinkler-valve can be opened and closed any number of times, accordingly as the rise and fall of temperature gives thermostatic action for swinging the escapement-lever back and forth from one detent I to the other J, the rotation of the escapement causing a repetition of the action until the weight F² has run down. The weight is suspended by a chain F³ from the periphery of the escapement-

disk, or, if preferred, can be combined therewith in any suitable manner for effecting rotative or partially rotative action of the escapement.

In the constructions shown in Figs. 8 and 9 a number of studs *f*, corresponding to the number of pairs of escapement-flanges I and J, are employed for engagement with the valve-lever E at the several repeating positions, and also, a similar number of contact-points *r* when electric connections are used. This facility for repeating the action while not in all cases essential for a complete and efficient automatic sprinkler is a very desirable feature of my invention, as it gives greater efficiency and security, since it is possible in practice that a fire having broken out and once started the sprinklers, may thereby become quenched sufficiently to allow the temperature to cool down below the degree fixed for the thermostatic action which shuts off the flow of water from the sprinkler and yet not be totally extinguished and then after a time to again break out. In such case these sprinklers, arranged for repeating actions, would again open and discharge a shower of water upon the fire.

I claim as my invention herein, to be secured by Letters Patent—

1. A sprinkler-body having its delivery water-way provided with an inwardly-faced valve-seat, an internal chamber in line with said valve-seat and communicating with the inlet-passage within the body, the outwardly-closing stop-valve provided with a piston-disk fitted to work freely within said chamber, an outlet-orifice from said chamber above the valve-piston disk, a spring-pressed valve controlling said orifice, and a lever fulcrumed on the body-frame and connected with the stem of the controlling-valve to act in opposition to the spring-pressure, in combination with thermostatic expansion mechanism, and connections for moving said lever thereby to effect the opening of the valve, substantially as set forth.

2. The combination, with the controlling-valve in an automatic sprinkler, of a lever for opening said valve, a valve-closing spring, adjusting devices for said lever, a pivoted operator having a stud that engages the arm of said lever and provided with a detent or flange, an escapement-lever that engages with said flanges for retaining said operator, and a thermostat connected to said escapement-lever for imparting movement thereto, substantially as and for the purpose set forth.

3. The pivoted escapement-plate having an actuating-weight, a series of alternated detents or flanges, and an engaging stud or studs, the swinging escapement-lever having a lug or notch for engagement with said flanges, and a thermostat connected with said escapement-lever for automatically moving it in accord with the rise or fall of temperature for releasing and engaging the alternate flanges, in combination with the controlling-

valve and valve-actuating connections in an automatic sprinkler, substantially as set forth.

4. The combination, with the sprinkler-body having the bracket A' thereon, of the thermostat comprising the support-bar H, fixed in said bracket, the expansion-rods M and M', one of which is adjustably secured in the bracket, as at m, the multiplying-lever or swing-bar pivoted to said support-bar and connecting said expansion-rods, the swinging escape-lever fulcrumed at K', with its short arm connected to and receiving motion from the rod M and carrying the lug n on its longer arm, the flanged escapement F, valve-lever E, and valve D for controlling the operation of said sprinkler, substantially as and for the purpose set forth.

5. The combination, with the body in an automatic sprinkler, a thermostatic operator, and mechanism, substantially as described, that effects the opening of the valve by rise of temperature and the automatically closing of the valve by fall of temperature, of an electric connection having insulated attachment upon and to the body, and a contact point or points mounted on the valve-actuating escapement that operates to close the circuit when the valve is opened and to break the circuit when the valve is automatically closed, substantially as set forth.

6. The weighted pivotally-supported escapement F, having alternate detents or flanges I and J and an engaging stud or studs f, a swinging lever having a lug or notch for engaging said flanges, a thermostat connected with said lever for automatically moving the same from the flange, an electric conductor or alarm-circuit, and a contact point or points

7, attached to said escapement that engages therewith for closing the circuit and disengages for breaking the circuit at alternate positions of said escapement, in combination with the controlling-valve and valve-actuating connections in an automatic sprinkler, substantially as set forth.

7. In a sprinkler apparatus, the combination of the chambered sprinkler-body, the valve and valve-piston disposed within the internal chamber free to operate by varied pressure of the water within the body, the relief-orifice from said chamber above the valve-piston, and the controlling-valve closing said orifice, an electric conductor in circuit with an alarm apparatus V and battery X and having an end attached to the body, a thermo expanding and contracting regulator, and an operating-escapement mounted on the body and provided with detents that engage the regulator-trip, studs for working said controlling-valve, and contact-points projecting therefrom into range with the conductor end and engaging therewith when at corresponding position, substantially as described, whereby said mechanism automatically effects the operation of simultaneously opening said controlling-valve and closing the electric circuit with the expansive action of said regulator and the simultaneous closing of the controlling-valve and breaking of the circuit with the contractive action of said regulator.

Witness my hand this 18th day of March, A. D. 1891.

ALBERT P. HOWES.

Witnesses:

CHAS. H. BURLEIGH,
ELLA P. BLENUS.