(No Model.)

A. F. NAGLE.

SPRINKLER FOR AUTOMATIC FIRE EXTINGUISHERS.

No. 419,705. Patented Jan. 21, 1890.

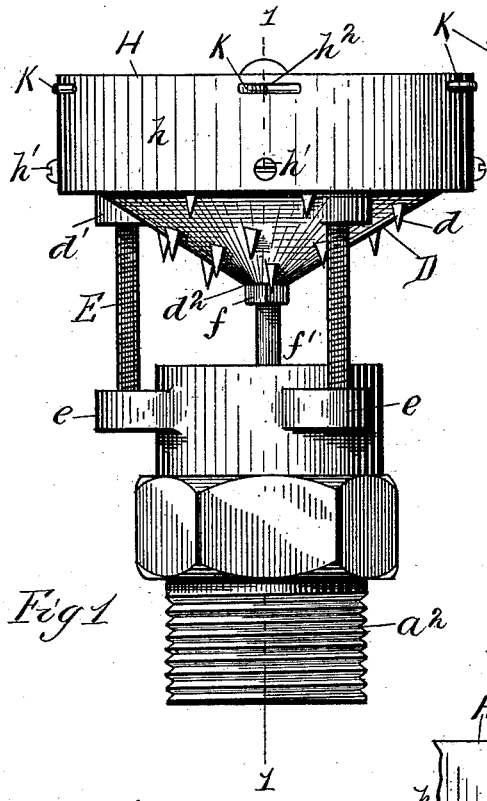

Fig 1

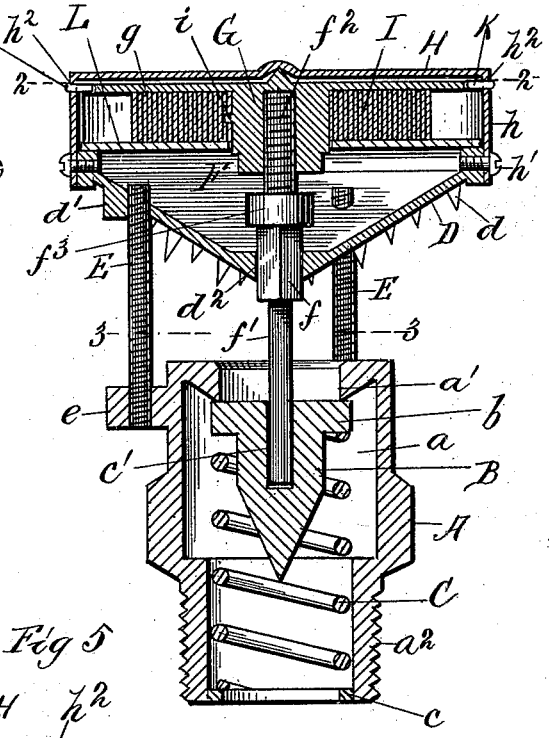

Fig 2

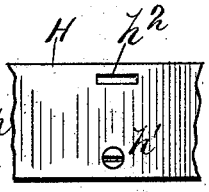

Fig 5

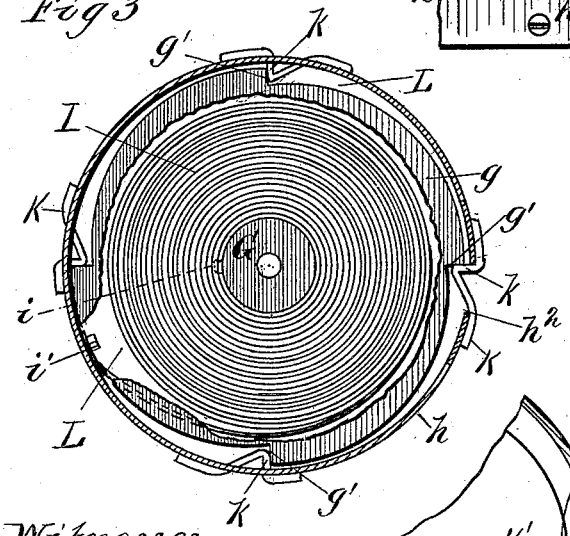

Fig 3

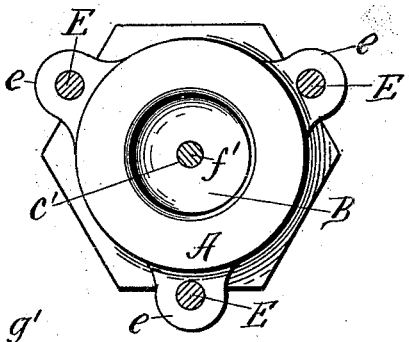

Fig 4

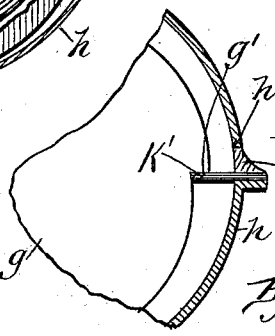

Fig 6

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UNITED STATES PATENT OFFICE.

AUGUSTUS F. NAGLE, OF CHICAGO, ILLINOIS.

SPRINKLER FOR AUTOMATIC FIRE-EXTINGUISHERS.

SPECIFICATION forming part of Letters Patent No. 419,705, dated January 21, 1890.

Application filed July 16, 1889. Serial No. 317,711. (No model.)

To all whom it may concern:

Be it known that I, AUGUSTUS F. NAGLE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Sprinklers for Automatic Fire-Extinguishers, which are fully set forth in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 represents a side elevation of a sprinkler embodying my improvements; Fig. 2, a vertical section of the same, taken on the line 1 1 of Fig. 1; Fig. 3, a plan section of the same, taken on the line 2 2 of Fig. 2, and partly broken away; Fig. 4, a plan section of the same, taken on the line 3 3 of Fig. 2; Fig. 5, a detail side elevation of the spring-case, and Fig. 6 a detail plan section showing a modified fastening.

In the usual systems of automatic fire-extinguishing apparatus the service-pipes distributed over a building and in the rooms thereof terminate in sprinklers, sometimes called "sprinkler-heads," which are closed by a suitable valve normally retained upon its seat, but automatically released in case of fire when a certain degree of heat is reached.

My present invention relates to this automatic sprinkler or sprinkler-head; and it consists in an arrangement of the closing-valve within the head and with its seat inside thereof, whereby it is held in position by the water-pressure and the combination therewith of certain devices for opening said valve against the water-pressure in case of fire.

I will proceed to describe one way in which I have carried out my invention in practical form, and will then point out definitely in claims the special improvements which I believe to be new and wish to secure by Letters Patent.

In the drawings, A represents the nozzle of the sprinkler, which is enlarged somewhat near the orifice to form a chamber a, within which is constructed a suitable valve-seat a' around the outlet-opening. At the other end the nozzle terminates in a threaded stem a^2, whereby the nozzle is secured in the ends of the distributing water-pipes. Within the chamber of the nozzle is a suitable valve B, which is fitted to the seat a', and will obviously be held thereto by the pressure of the water in the pipes, and that, too, whether the wet or dry system is employed. Behind this valve is a light coiled spring C, held in position between the valve and a pin c, extending across the threaded end of the nozzle, or in any other suitable manner. This spring assists in retaining the valve in position, and keeps it upon its seat when not under pressure of the water in the pipes.

The valve B may be made slightly conical in form, as shown in the drawings, in which case the cone portion is somewhat smaller than the head, thereby providing a seat b for the retaining-spring, and a circular recess c' is drilled into the valve from the face, for a purpose to be presently explained.

The distributer D is a cone-shaped shell, which is provided with projections d upon its outer conical surface, which surface is arranged toward the nozzle of the sprinkler, and the distributer is attached to the latter by means of threaded rods or posts E, which enter threaded ears or lugs e upon the circumference of the nozzle and at their other ends pass into threaded seats d' in the distributer. It will be seen that the distributer is thus held in a stationary position with reference to the nozzle, but by means of the threaded rods may be adjusted nearer to or farther from the nozzle, as may be desired. At the apex of the distributer a square or angular opening d^2 is cut. A rod or plunger F is passed through this central opening in the distributer, and is provided with an angular section f, near the center thereof, which is of angular shape corresponding to the said opening in the distributer, so that the plunger may slide back and forth in the opening, but cannot turn therein. The end f' of this rod toward the nozzle is round, and is adapted to easily enter the corresponding circular recess in the valve B. The other end of the rod is a threaded section f^2, and between this threaded portion and the angular section is an enlarged collar f^3. A nut G is fitted to turn upon the threaded end of the plunger and is provided with a wide flange or disk g, extending outward horizontally from its outer face, as seen in Figs. 2 and 3 of the drawings. This flange

is circular and is of about the same diameter as the distributer, and has a series of notches g' cut in its edge. A cap or cover H is made a little larger than the disk of the nut and is provided with a flange h, adapted to fit over the said disk and just outside the rim or edge of the distributer, to which it is fastened by screws h'. A series of short slots h^2 is cut in the flange just within the cap portion or the cover. The direction of these slots is around the cap, and their number is the same as the notches in the edge of the nut-disk. A coiled spring I, something like a clock-spring, is arranged within the flange or disk of the nut and between it and the edge of the distributer, as seen in Fig. 2 of the drawings. The inner end of this spring is fastened to the nut, as seen at i, and the outer end is fastened to the rim or flange of the cover by a small screw i', both fastenings being shown in Fig. 2. Now, it is obvious that the nut will be held in place by the spring, but at the same time may be rotated, and also that the rotation of the nut will set the plunger lengthwise, the latter being held from rotating by its bearing in the distributer, through which, however, it is free to slide. It is also obvious that when the nut is rotated in the proper direction to set the plunger outward through the distributer toward the nozzle it will, if carried far enough, force the valve inward from its seat, thereby opening the nozzle. If the nut is turned within the cover-casing in a direction to wind up the spring thereon, it is evident that the tensile force of the spring when released will rotate the nut, and if the latter is properly applied to the plunger when the spring is thus released obviously this rotation will automatically open the nozzle, as just described.

Now, to adapt this device for use in an automatic fire-extinguishing apparatus, it is only necessary to secure the nut in position with the spring wound up by some device readily released by heat. For this purpose I provide a series of small stop-pins or ratchets K. These are preferably made of wire and are separate and independent of each other and are bent centrally to form a square shoulder k toward one end of the piece, while toward the other end it is inclined and the two ends are straight, as seen in Fig. 3 of the drawings. The central bent portion of these stop-pins or ratchets is adapted to enter the slots in the cap-flange heretofore described, and to engage with the square-shouldered notches in the edge of the nut-disk heretofore mentioned, and as shown in Fig. 3 of the drawings. When in position, as seen in said figure, these separate stops or ratchets are fastened to the outside of the cap-flange by a little solder applied to the ends of each. In Fig. 6 a modification of this stop is shown. Here a slight flange is thrown out at the forward end of the slot h^2, and the stop is a straight pin K', which is inserted, as shown, and soldered at its outer end to the said flange. The space in the slot back of the pin is filled with solder h^3.

This device is prepared for use by first arranging the valve properly within the nozzle and securing the distributer thereto in suitable adjustment. The plunger is inserted in proper position and the nut and spring, already applied to the cover-casing, as described, are turned upon the end of the plunger and the casing continuously rotated until the spring is wound up. The small ratchets are then inserted through the cap-flange, and by properly adjusting the parts brought into engagement with the nut-disk and then fastened in position by solder. The cover is then secured to the distributer, as already described.

Now, when these sprinklers are in position upon the distributing-pipes, if a fire breaks out in any room the heat will soon melt the solder fastening of the small ratchets and the said ratchets will be thrown out of their slots, thereby releasing the nut and permitting it to yield to the force of the coiled spring, whereby it is immediately rotated in a direction to force the plunger outward and raise the valve from its seat, when of course the water will at once escape through the nozzles and will be scattered in all directions by coming in contact with the conical distributer.

If desired, an annular disk L may be arranged within the casing between the edge of the distributer and the coiled spring for the purpose of sustaining the spring and preventing sagging thereof in cases where the sprinklers are set with the distributer upward. I have shown this support in Fig. 2 of the drawings. It is not, however, absolutely essential to the operation of the device and is not at all necessary when the sprinklers are applied to the distributer depending from the pipes.

It will be seen from the above description that as the device which secures the automatic mechanism is divided into several distinct and separate parts the resistance is correspondingly distributed, and so the amount of solder required to hold the stopping device in position is correspondingly divided, thereby requiring only a comparatively small quantity at each of the separate stop-pins. This makes the device extremely sensitive, so that the release is effected quickly and at a low degree of heat, while at the same time taking the ratchets together a perfectly reliable fastening is secured. Now, in the sprinklers generally used at the present time there are at least three defects in their operation, namely: first, occasional accidental release, thereby flooding the premises; second, occasional failure to open in case of fire, and, third, destruction by corrosion.

In the improved sprinkler described above a number of advantages are obtained which entirely obviate these defects. The valve is closed by the pressure of the fluid in the pipes and opened by a screw whose nut is

rotated by a long coiled clock-spring, when the several soldered stops, which prevent the nut from rotating, are released by the action of heat. From these features of construction the following advantages are obtained:

First. Great sensitiveness is secured by using a small amount of solder around each of the small stop-pins.

Second. Great strength is obtained by dispensing with the necessity of having a solder joint strong enough to withstand the violent concussion of water-hammer and by substituting a slight force moving through a great distance for operating the valve instead of a great force acting through a short distance, as is usually the case; hence a very small solder joint will resist the small force.

Third. An accidental opening, occasioned by a defect in the solder joint, is prevented by having multiple joints, each of sufficient strength to resist the small strain brought upon it by the spring.

Fourth. Excessive strain caused by the screw used to close many sprinklers is avoided by not closing the sprinkler with a screw or subjecting the solder joint to the action of a screw at any time.

Fifth. Leakages are prevented by closing the valve by the pressure of the fluid in the pipes.

Sixth. It is impossible for the valve to be opened until the stop-ratchets are entirely removed, so that escaping water cannot strike the partially-released joint, thereby cooling the solder. The distributer is stationary, and consequently cannot fail to act, as is sometimes the case when the usual movable distributer fails to drop.

Seventh. This sprinkler can be taken apart and examined and put together again without breaking the solder joints.

The defects mentioned above are avoided by the advantages just specified, for—

First. Accidental flooding is prevented by removing the principal causes, namely, the effect of water-hammer upon valves closing from the outside, by putting the valve on the inside of the nozzle and disconnecting it entirely from the solder joints; also, by obviating the strain produced by closing the sprinkler with a screw, and by reducing the danger of accidental breaking of solder joints by multiplying said joints.

Second. Sprinklers sometimes fail to open in case of fire, because levers, journals, and fulcrums in the usual devices are liable to stick fast after lapse of time, and, further, because the valves are sometimes cemented to their seats by sediment and other impurities in the water. This defect is entirely obviated in the present instance because the valve is opened by an actual positive force, and does not depend upon the light air or water pressure for this opening.

Third. The destructive effect of corrosion is obviated by having all the moving parts incased practically air-tight, and the entire sprinkler may be thoroughly coated with paraffine or similar protecting material, and may be thoroughly air-tight, if desired.

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

1. In automatic sprinklers for fire-extinguishers, a nozzle, in combination with a valve seated therein and closed by the pressure in the pipes, a reciprocating plunger having a threaded section, and an automatically-actuated nut, whereby when the latter is released the plunger is driven toward the valve to open it, substantially as and for the purposes specified.

2. In automatic sprinklers for fire-extinguishers, a nozzle, in combination with a valve seated therein and held in place by the pipe-pressure, a reciprocating plunger mounted in an angular bearing and provided with a threaded section, a rotating nut applied to the threaded portion of the plunger, a spring applied to the nut to rotate the latter, and a fusible fastening which holds the nut against the action of the spring when wound up, substantially as and for the purposes specified.

3. In automatic sprinklers, the nozzle A, in combination with the valve B, seated within the nozzle, so as to be closed by the water-pressure, the reciprocating plunger F, provided with an angular bearing-section f and a threaded section f^2, the rotary nut G, provided with the flange-disk g, notched at its edge, the actuating-spring I, the cap H, and the independent fastening-stops secured by solder to the cover-casing, substantially as and for the purposes specified.

4. The sprinkler-nozzle A, in combination with the internally-seated valve B, the stationary distributer D, provided with a central angular opening b^2, a plunger F, seated at one end in the valve and provided with the angular section f, fitting within the said opening in the distributer, an automatic device adapted to force the plunger inward toward the valve, and a fusible stop which holds the device from operating until released by the heat, substantially as and for the purposes specified.

5. The reciprocating valve-opening plunger F, in combination with the rotating actuating-nut G, provided with a projecting flange g, having a series of notches in its edge, the cover-case H, provided with a series of slots h^2, the coiled spring I, fastened at one end to the nut and at the other to the casing, and a series of separate stops fitted to enter the slots in the casing and engage with the notches in the nut-flange and secured to the said casing by solder, substantially as and for the purposes specified.

6. The sprinkler-nozzle A, in combination with the internally-seated valve B, the spring C, behind said valve, the stationary distributer D, the valve-opening plunger F, having

a bearing in said distributer, and the spring-actuated nut G, forcing the plunger inward to open the valve, substantially as and for the purposes specified.

7. The sprinkler-nozzle A, in combination with the internally-seated valve B, the stationary cone-shaped distributer D, the valve-opening plunger F, mounted to slide in said distributer, the revolving nut G, the actuating-spring I, and the cap H, covering said nut and spring and secured to the rim of the distributer by means of a flange *h*, substantially as and for the purposes specified.

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