(No Model.)

J. HILL.

APPARATUS FOR EXTINGUISHING FIRES.

No. 329,741. Patented Nov. 3, 1885.

Fig. 1.

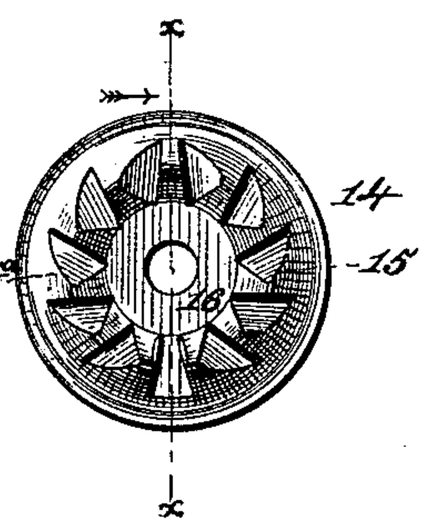


Fig. 2.

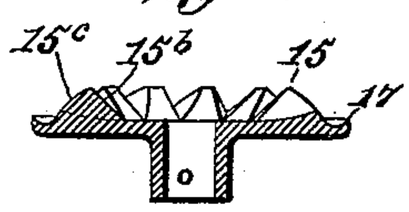


Fig. 3.

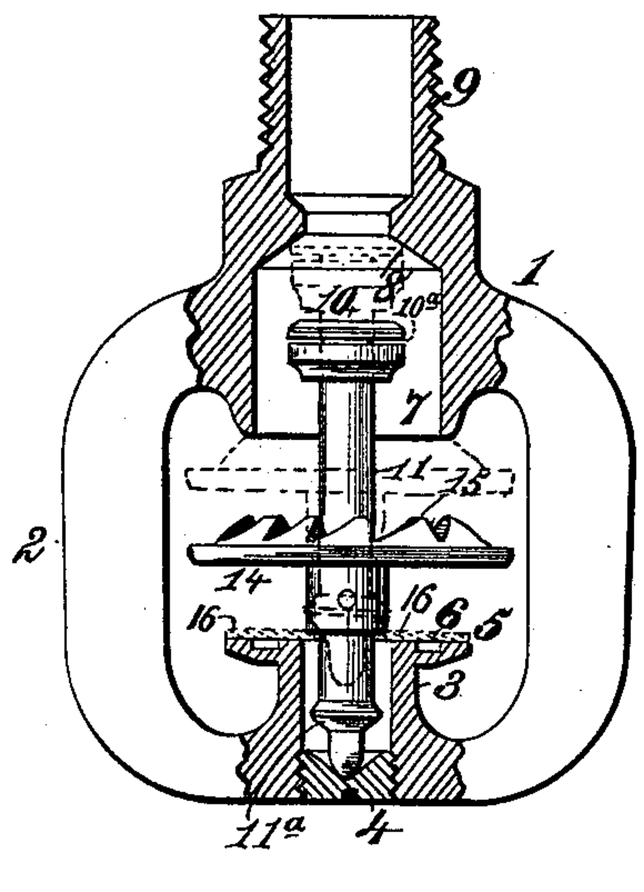


Fig. 4.

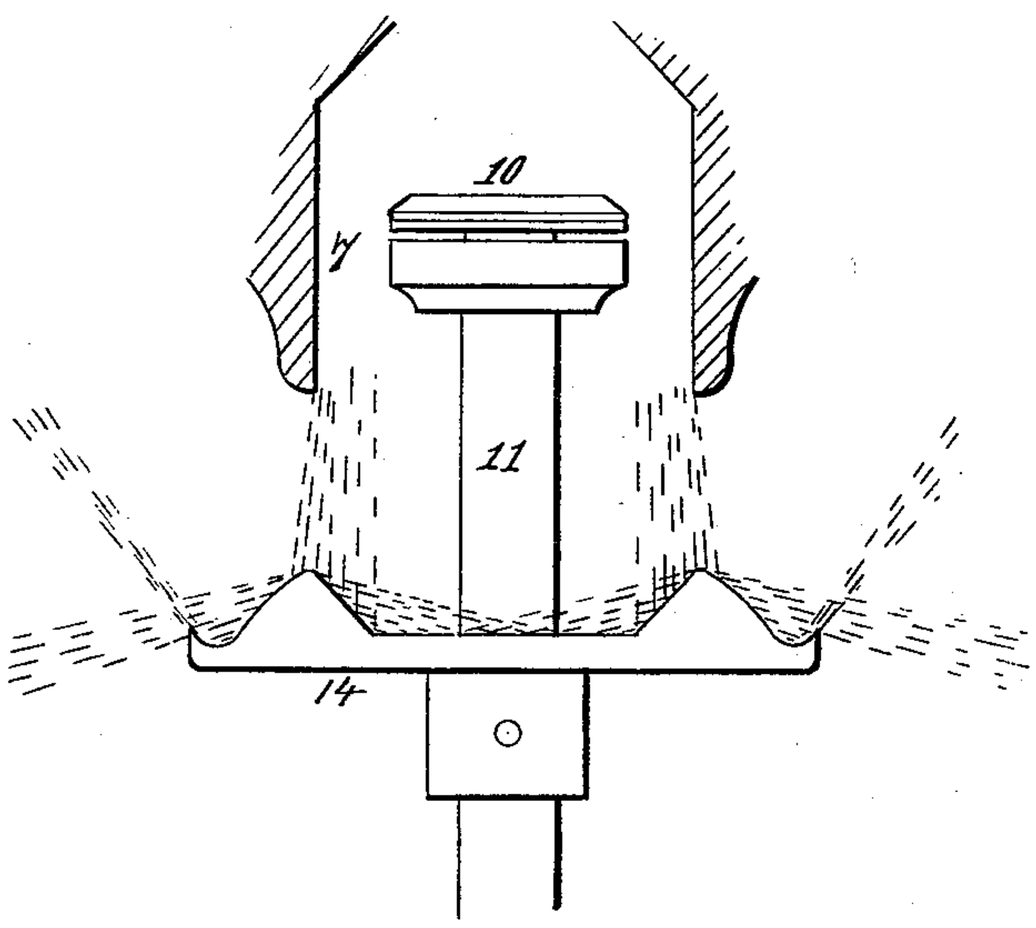
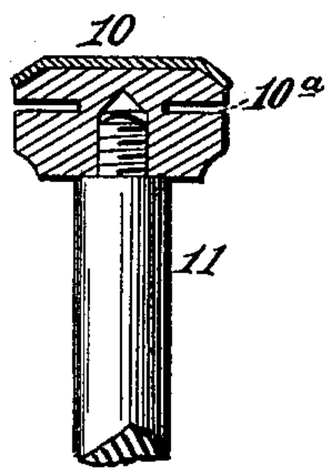


Fig. 5.



Witnesses.
Robert Everett.
Geo. W. Rea

Inventor.
John Hill.
By James L. Norris.
Atty.

UNITED STATES PATENT OFFICE.

JOHN HILL, OF COLUMBUS, GEORGIA.

APPARATUS FOR EXTINGUISHING FIRES.

SPECIFICATION forming part of Letters Patent No. 329,741, dated November 3, 1885.

Application filed August 3, 1885. Serial No. 173,469. (No model.)

To all whom it may concern:

Be it known that I, JOHN HILL, a citizen of the United States, residing at Columbus, in the county of Muscogee and State of Georgia, have invented new and useful Improvements in Apparatus for Extinguishing Fires, of which the following is a specification.

My invention relates to that class of apparatus for extinguishing fires in which the water or other extinguishing-fluid is conducted in suitable pipes, under pressure, to the point or points where its use may be required, and is there automatically liberated, upon the occurrence of a conflagration, by the fusion of a joint which confines the check-valve and deflector.

It is the purpose of my invention to provide a deflector and distributer to be used in automatic fire-extinguishers of the kind shown in Letters Patent No. 283,242, granted to me August 14, 1883, and in my application filed March 12, 1885, Serial No. 158,547, said parts having a novel and peculiar construction, whereby the escaping stream of fluid is broken up and scattered or distributed over all parts of the surrounding space, both above and below as well as around the distributer-head.

It is a further purpose of my invention to provide a distributer of novel construction, which is capable of operation whether the head is upright or pendent, and which shall rotate upon its axis, and at the same time oscillate about the axial center, under the passage of the stream, thereby effecting a more perfect distribution.

It is also the purpose of my invention to provide a valve of novel construction, having slight elasticity, whereby it may adjust itself to its seat as well as maintain a tight condition against said seat by such elasticity taking up and compensating for the fatigue of metals, under pressure or strain, employed in face of valve and solder joint.

The invention consists in the several novel features of construction and combination of parts hereinafter fully set forth, and definitely pointed out in the claims annexed to this specification.

In the accompanying drawings, Figure 1 is plan view of the distributer removed from the distributer-head. Fig. 2 is a central vertical section of the same. Fig. 3 is a side elevation of the distributer attached to the distributer-head and in action, a portion of the latter being sectioned to show the construction, also showing by dotted lines the parts when in position to close the discharge of extinguishing-fluid. Fig. 4 is a view, partly in section and enlarged, indicating the path of the water after striking the distributer, the vertical angles only being shown. Fig. 5 is a view, partly in section, of the deflector and valve, showing the construction of the latter.

In the said drawings, the reference-numeral 1 designates the distributer-head, consisting of an open frame, 2, having a chamber, 3, in its lower member, closed at the bottom by a screw-plug, 4, and having an enlarged annular table, 5, surrounding the upper part of said chamber, and provided with a channel, 6. In the upper arm of the frame is formed a cylindrical chamber, 7, having a valve-seat, 8, and a pipe-coupling, 9, adapted to receive a pipe leading from the reservoir in which the extinguishing-fluid is kept. The pipe is closed by a valve, 10, which rests upon the seat 8, said valve being mounted upon a stem, 11, the lower end whereof lies in the chamber 3. The valve 10 is grooved by a thin groove, 10^a, parallel with the top surface and to a depth almost to the center. The groove is at such distance from the face as to give sufficient rigidity for strength against any ordinary pressure, but becoming somewhat elastic under the strain put upon it in forcing and holding the valve to its seat. The valve-stem is supported by a disk constructed in two or more separable sections, 16 16, (see dotted lines, Fig. 3,) which are united by a fusible metal. This disk lies upon the annular table 5, and a shoulder upon the valve-stem rests upon it, the lower end of the stem projecting through the disk. Beneath the latter, and lying within the channel 6, is placed a spring-annulus, by which the disruption of the sectional disk is aided when the fusible joint is melted. These parts are similar to those shown in my pending application mentioned above, and in Letters Patent No. 283,242, issued to me August 14, 1883.

Upon the valve-stem is mounted a distributer, 14, having a diameter greater than that of the chamber 7. It is provided with teeth 15, which are cut in the manner following: The central portion of the distributer

surrounding the valve-stem 11 is cut away to form a plane surface, 16, surrounded by an annular ridge from which the teeth are cut. Said teeth are formed by cutting with a suitable tool from the angle of the ridge downward, one-half of said teeth being pitched in one direction and the remainder in the opposite direction, as shown at 15ª. They are cut also upon a curve eccentric to the distributer-disk, and the pitch-surface 15ª of each tooth is slightly concaved from top to bottom and from side to side of the tooth. The base-line, also, which lies at the bottom of the pitch-surface of each tooth is, from its inner end, curved gently upward, as denoted in the sectional view, Fig. 2. In short, each tooth has four surfaces—an inner, which has approximately the form of a right-angle triangle resting upon the base and inclined outwardly, said surfaces meeting at the base of the teeth, an outer, and two lateral, one of the latter being the pitch-surface already described, and the other being vertical, or substantially so, as shown in Fig. 3. The inner surface, 15ᵇ, is inclined outwardly, and the outer surface, 15ᶜ, has a compound curve swelling slightly outward from the crown of the tooth toward its base, and thence curved sharply outward and upward into the flange 17, which surrounds the dental ridge. The proportions of the disk and the position and diameter of the serrated ridge are such that the fluid, in escaping from the chamber 7, strikes vertically upon the teeth, instead of striking the plane central portion of the distributer inside the teeth, and thence flowing out over and between them. The forcibly-ejected stream issuing from the distributer-head and striking vertically upon the teeth of the distributer, each atom of water will be directed according to the angle of the surface upon which it strikes, the law being that the angles of incidence and reflection are equal. Therefore, the water striking the inner faces of the teeth will flow toward the center, whereas that portion striking upon their outer surfaces will be deflected outward according to the angle of that portion of the outer surface upon which it strikes. That portion reflected from points near the base of the tooth will be thrown against the flange 17 and diverted sharply upward until it falls by gravity or strikes the ceiling, should there be one. It will be seen that the lines of incidence all lead vertically from the port, but are deflected by the deflector-face inside of the chamber. This causes the current to pass the distributer when it lies against the side of chamber in crescent form, while the constantly-changing positions of the deflector, caused by its oscillation, cause the current to become more or less annular in form, and from that form to that of a crescent, as the deflector is situated against sides of chamber or occupies more central positions in its transits and tangents of oscillations. The relative diameters of the port, the deflector-face, and the points and surfaces of the distributer are such that the lines of fluid-flow strike on top and about the base of teeth of distributer and against the outer flange of same. The angled, curved, and flattened surfaces against which the lines of incidence strike cause the lines of reflection to lead at equal angles, determined by the surface from which such lines radiate. It will be seen that these lines are directed outward, inward, downward, and upward, as well as intermediately-while a portion are in tangent directions. The varying flow from port, crescent, and annular greatly varies these lines of reflection, and causes them to cross each other, and thus cross-currents meet, act on each other, again deflecting and causing further breaking up and distribution of extinguishing-fluid. This is further accomplished by the rotating and oscillating positions of distributer. Again, the water striking the pitch-surfaces 15ª will be thrown outward and upward at a small angle from the horizontal, following the angle of the base-line at the bottom of each pitch-face, and by the action of the current upon these faces a rapid oscillation is imparted to the deflector, whereby the valve-stem is caused to make transits across and to describe the circle which is limited by the diameter of the chamber 7. Rotation is given to the deflector simultaneously with its oscillation, whereby the angles of deflection presented to the outflowing stream are constantly changed, thereby effecting a more perfect and uniform distribution than is possible in a deflector having rotation only.

Experience having shown that the softer metals—such as lead—are less liable to oxidize and "stick," preventing the prompt opening of the valves, I employ such metals for my valve-face, and attach the same in a thin layer to the face of the valve. In holding the valve firmly against its seat considerable pressure is required, and under such pressure the solder joint and valve-face are required to remain until the apparatus is called into action for extinguishing fires. If such pressure ceases while these two parts are in such positions, they simply occupy rigid positions. Soft metals—such as lead and solder—in rigid positions and under the pressure of the extinguishing-fluid are liable to fatigue, and tend to gradually weaken and after long continuance of said action sprinkler-valves are liable to leak from such cause. To secure sufficient elasticity to overcome the fatigue and compensate for the same, I cut a groove, 10ª, as shown in the metal, to which the valve-face is attached, said groove being very thin and of such thickness that when pressure is applied in seating the valve the thin dish-like portion shown is placed in tension until it springs back and crosses the groove, and rests firmly against the solid portion of the valve, which forms a rigid back-stop. The width of the groove is less than the range of permanent elasticity of the thin metal between the groove and valve-face, so that when under pressure the face

springs back until it rests on the solid part of the valve, the thin spring portion is not under sufficient tension to overcome elasticity and cause a permanent set to the face part. It will thus be seen that in this position the valve-face is rigidly held to its place. Should fatigue under such rigidity and pressure to position cause the metals holding it in position to yield, the elasticity of the thin springing valve will assert itself and take up such yielding and maintain the valve in a tight position. The strength and elasticity of the thin space are considerably beyond the pressure under which the valve is intended to be placed, and hence such elasticity will prevent leakage caused by the yielding of metals upon which such elasticity acts. This form of valve may be employed without the soft-metal face, and in any other form of sprinkler-head than the one described, where solder joints are employed to hold valves to seats, and the elasticity of the valve is secured by the groove shown, and the rigidity secured by such elastic face cushioning and resting on the heavier part of the valve, when the pressure on the same is greater than the elastic strenght maintaining it in its normal position. The range provided for elasticity should be less than the deflection necessary to secure a permanent set to the thin face. I have described the elastic face as being secured by cutting a groove into the solid elastic metal—such as hard-rolled brass—and thus forming a thin elastic face for the valve. It is plain that the same result may be obtained by forming the elastic valve of one piece and the rigid back of another, with a space for tension left between the two equivalent to the groove. The valve 10, lying in the chamber or port 7, forms a deflector for the outflowing stream, by its being thrown from one side to the other of the chamber, thereby throwing the greater volume of the fluid successively upon different sides. This oscillation will in action be quite rapid, and will modify the currents created by the distributer in the manner already described. The water striking the pitch-surfaces of the teeth will in part be thrown off horizontally in lines which are secant to the disk, and part will follow the direction given by the base-lines. The form of the teeth is such that the water following the lines of incidence and striking upon the distributer causes the distributer to tend to revolve. One-half of the teeth are formed to cause revolutions in one direction, and one-half tend in the opposite direction. The distributer in action revolves in whichever direction these lines of incidence and reaction act most strongly—sometimes in one direction and sometimes in the other. The object of such reverse action is to reduce the number of revolutions and avoid a rapid spinning action, which neutralizes the reflection and distribution, and also to give varying lines of reflection. The friction of the reflector against the chamber 7 also modifies the revolutions.

In apparatus of the character described it is of the utmost importance that the distributer-disk shall be so constructed that the water directed against it shall be thoroughly broken up and scattered in all directions, both around the distributer-head and above the same. A comparatively slight change in the angular surfaces of the distributer will effect a very great difference in its operation, so much so that two distributers which may upon a brief examination appear to be the same in construction will give entirely different results in operation.

In my application filed March 12, 1885, Serial No. 158,347, I have shown a distributer-disk having teeth, but of a form wholly different from that shown in this application. In the former wide passages or channels are left between the teeth, the inclination of the pitch-surfaces is very slight, the inner faces of the teeth are so limited in area as to present merely an edge to the stream, and there is no flange surrounding the dental ridge. In these respects the disk is entirely different from that shown and claimed in this application, the teeth of the latter being provided with pitch-surfaces having a maximum inclination, or nearly so. The pitch-surface of one tooth adjoins the base-line of the adjacent tooth, the inner faces are of triangulor form and large area, and the series of teeth is surrounded by a flange, which co-operates with the teeth in distributing the water.

What I claim is—

1. In an automatic fire-extinguisher, a distributer having a plane central surface surrounded by an annular serrated ridge, the teeth being cut in lines eccentric to the disk, and having their pitch-surfaces inclined in opposite directions, both the pitch-surfaces and the inner surfaces of said teeth being substantially of triangular form, and the diameter of the serrated ridge being equal to the diameter of the discharge, or thereabout, substantially as described.

2. In an automatic fire-extinguisher, a distributer having a plane central surface, surrounded by a serrated ridge arranged beneath the discharge, the teeth in said ridge having each four surfaces—viz., an outwardly-inclined inner surface, a concaved and inclined pitch-surface terminating in a base-line eccentric to the disk and curving upward from its inner end, a vertical face rising from said base-line, and an outer convex surface descending toward and curving upward to a surrounding flange—substantially as described.

3. The combination, in an automatic fire-extinguisher, of a frame having a chamber, 7, provided at its upper side with a valve-seat, 8, a valve-stem, a support upon which the lower end of the stem may turn and oscillate, a deflector and valve secured to the upper end of the stem and oscillating with the latter inside the chamber of the head, and a distributer-disk rigid on the stem beneath the valve and turning and oscillating with the stem,

said distributer-disk having a plane central surface and marginal teeth formed in lines eccentric to the disk and having their pitch-surfaces in opposite directions, substantially as described.

4. The combination, in an automatic fire-extinguisher, of a frame having a discharge-opening and a valve-seat with a valve-stem, a valve constructed with a groove extending transversely into the valve-body to form an elastic face to the valve and a rigid backing thereto, said face and back being rigidly joined at the center to rigidly seat the valve by holding the elastic face under tension against the rigid back, substantially as described.

5. The combination, in an automatic fire-extinguisher, of a frame having a discharge-opening and a valve-seat with a valve-stem, a valve formed with a rigid back and an elastic face rigidly connected at the center, and the face rigidly seated by being held under tension against the rigid back, the soft-metal covering connected with the elastic face, and a solder joint to rigidly hold the elastic valve in tension against its seat, substantially as described.

6. In an automatic fire-extinguisher, an elastic valve attached to an inelastic base-piece, having an annular space between them, the space being adapted to be closed by the elasticity of the valve held by pressure, substantially as described.

7. In an automatic fire-extinguisher, the combination of a valve having a groove cut to produce an elastic face, a rigid back-stop to limit the elastic tension, and a solder joint to hold the elastic valve in tension against its seat, substantially as described.

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

JOHN HILL.

Witnesses:

HENRY BRUCE,

WOOLFOLK WALKER.