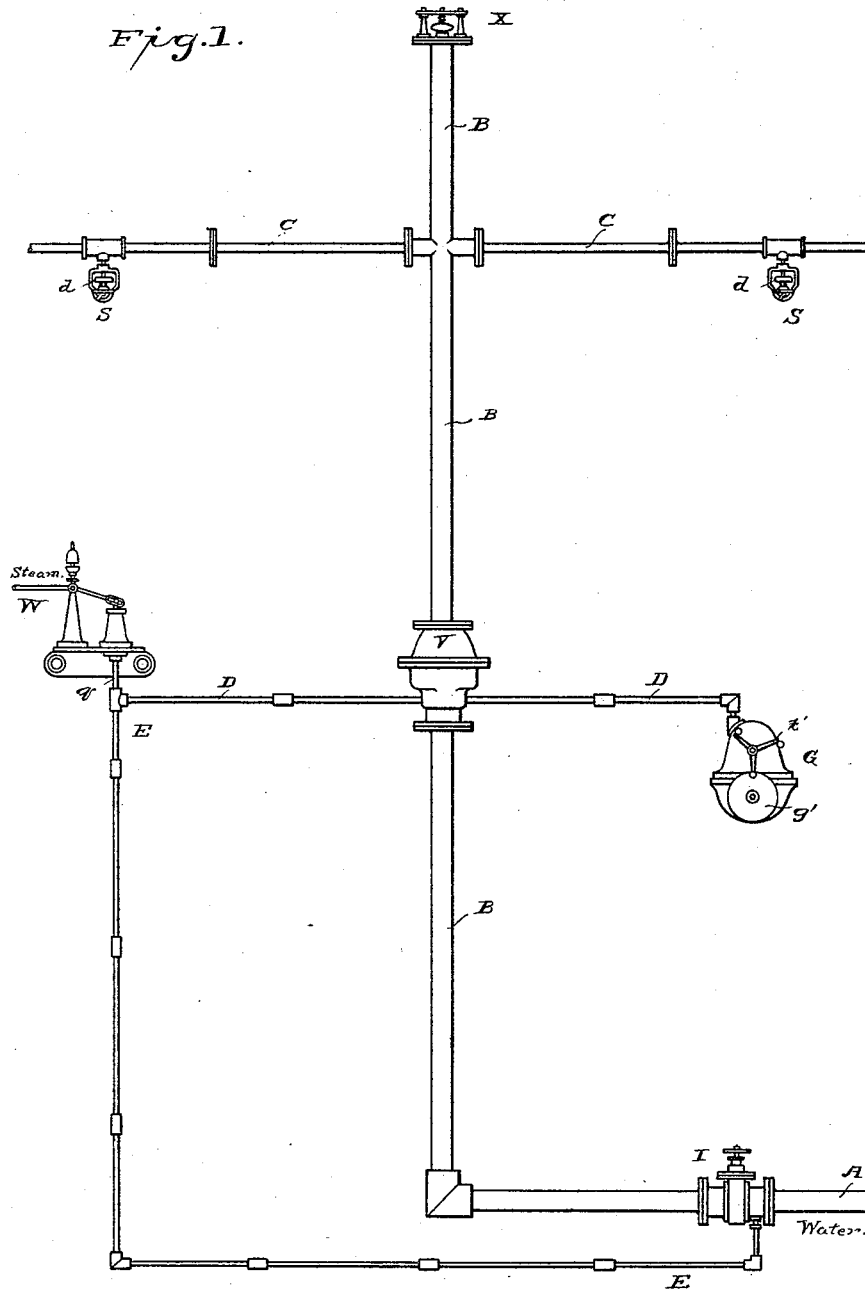


W. MAYALL & T. THOMASSON.  
AUTOMATIC FIRE EXTINGUISHING SPRINKLER AND ALARM.

No. 454,914.

Patented June 30, 1891.

Fig. 1.



Witnesses

H. F. Lamb

David P. Volhaupter.

Inventors.

WILLIAM MAYALL  
THOMAS THOMASSON

By their Attorney

H. L. Swin.

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Fig. 4.

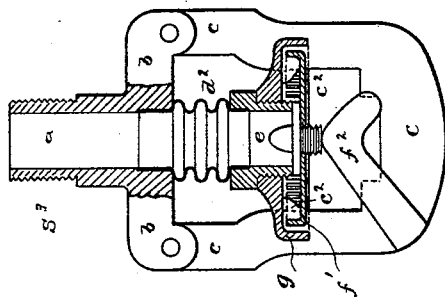


Fig. 3.

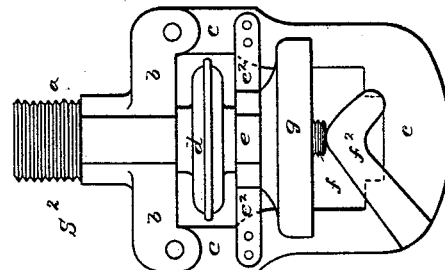


Fig. 2.

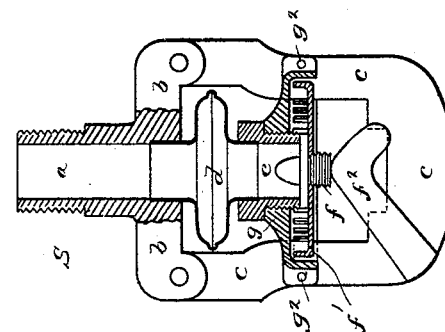


Fig. 6.

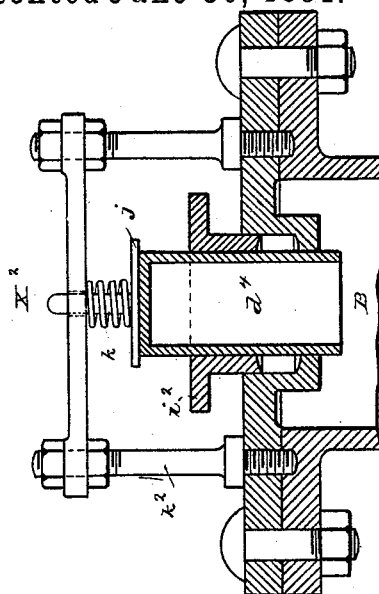
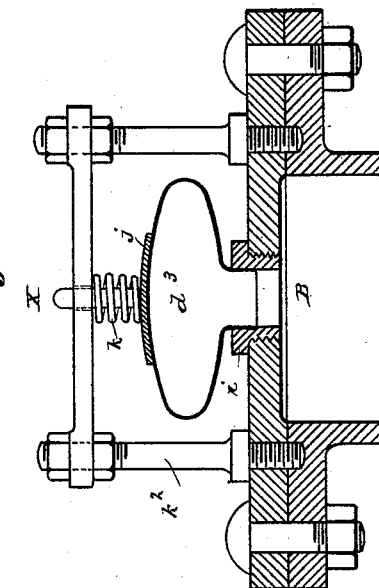


Fig. 5.



Witnesses

H. H. Lamb

David P. Volkmann.

Inventors

WILLIAM MAYALL  
THOMAS THOMASSON

By their Attorney

*W. L. Swin*

W. MAYALL & T. THOMASSON.

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Fig. 9.

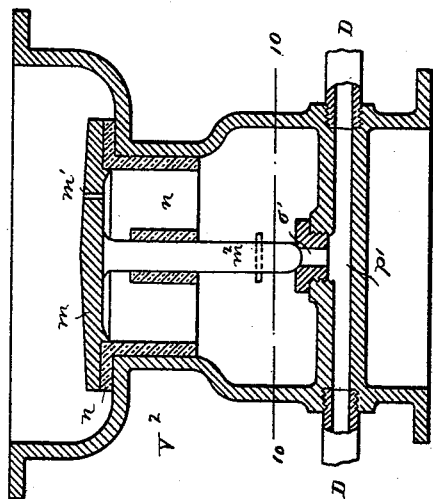


Fig. 10.

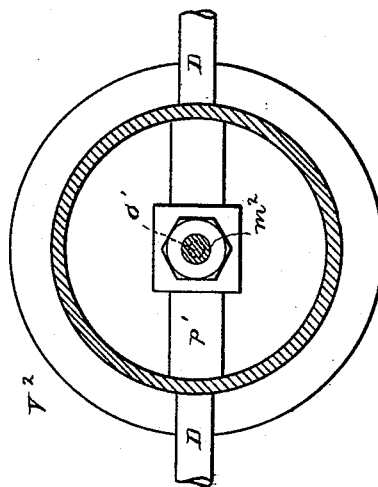


Fig. 7.

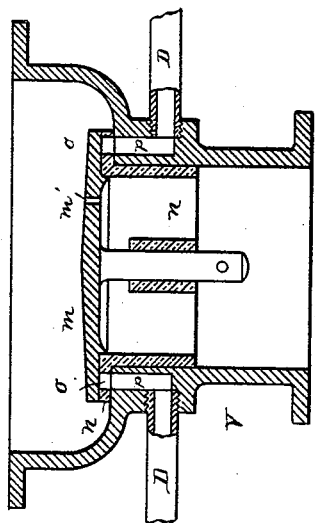
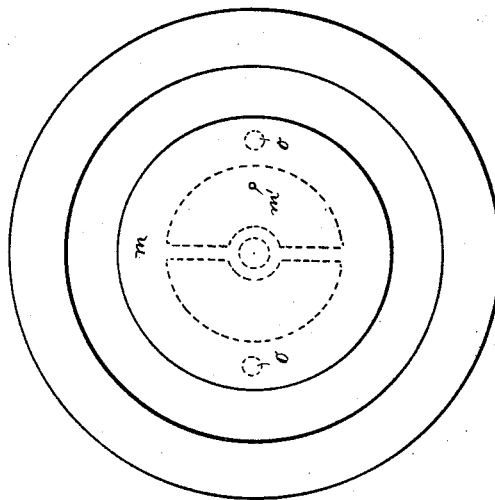


Fig. 8.



Witnesses

H. A. Lamb

David P. Oberhauser.

Inventors.

WILLIAM MAYALL  
THOMAS THOMASSON

By their Attorney

R. L. Swin.

W. MAYALL & T. THOMASSON.

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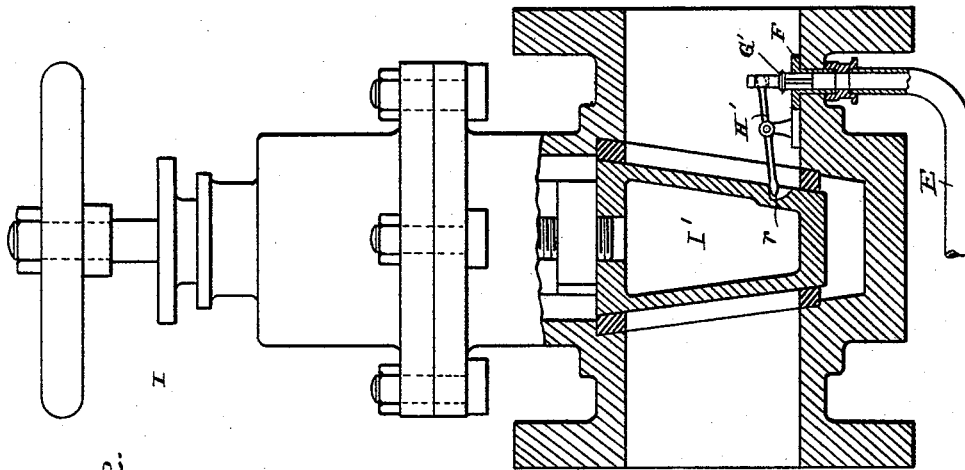


Fig. 12.

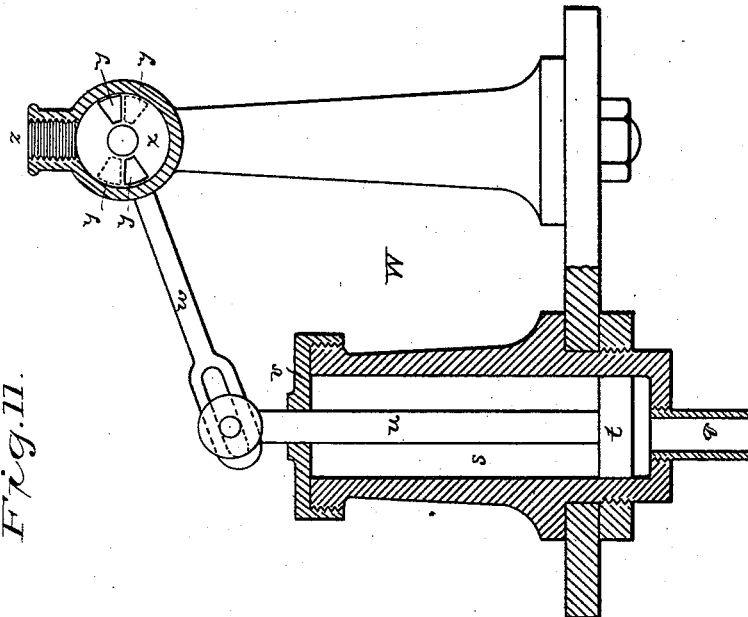


Fig. 11.

Witnesses

H. A. Lane

David O. Stolhaupfer.

Inventors

WILLIAM MAYALL  
THOMAS THOMASSON

By their Attorney

*R. A. Swin.*

# UNITED STATES PATENT OFFICE.

WILLIAM MAYALL AND THOMAS THOMASSON, OF MOSSLEY, ENGLAND.

AUTOMATIC FIRE-EXTINGUISHING SPRINKLER AND ALARM.

SPECIFICATION forming part of Letters Patent No. 454,914, dated June 30, 1891.

Application filed January 2, 1890. Serial No. 335,682. (No model.) Patented in England January 5, 1889, No. 224.

*To all whom it may concern:*

Be it known that we, WILLIAM MAYALL and THOMAS THOMASSON, subjects of the Queen of Great Britain and Ireland, and residents of Mossley, in the county of Lancaster, England, have invented certain new and useful Improvements in Automatic Fire-Extinguishing Sprinklers and in Alarm Apparatus Used in Conjunction Therewith, (patented to us in England by Letters Patent No. 224, dated the 5th of January, 1889,) of which the following is a specification.

This invention consists in certain novel combinations of peculiarly constructed and arranged parts, as hereinafter set forth and claimed, the whole being adapted and primarily designed for embodiment in a single improved "sprinkler" system or "stationary" fire-extinguishing apparatus.

The objects of the present invention are, first, to more effectively protect the movable supports of the outlet-valves against being loosened by the constantly-recurring and pulsating or knocking action of the pump, or, in other words, to keep said valves tight under all circumstances until they are opened by heat; secondly, to afford for said purpose a provision within each individual sprinkler, itself for the automatic expansion of the water-space without any resulting movement of the valve or valve-seat, and, thirdly, to provide for giving a sonorous alarm in case the water is turned off at the inlet-valve of the installation or system of sprinklers.

Four sheets of drawings accompany this specification as part thereof.

Figure 1 of the drawings is a small-scale diagrammatic elevation of an improved sprinkler system embodying all the several parts of this invention. Fig. 2 is a sectional elevation of one of the individual sprinklers shown in Fig. 1 detached. Fig. 3 is an elevation of a slightly-modified sprinkler. Fig. 4 is a sectional elevation of another sprinkler, illustrating additional modifications. Fig. 5 is a sectional elevation of a supplemental or alternative "expansion" device shown at the top in Fig. 1. Fig. 6 is a like view illustrating a modification of said expansion device.

Figs. 7 and 8 are respectively a sectional ele-

vation and a top view of the valve-containing base of the "alarm-valve" shown at the center in Fig. 1. Figs. 9 and 10 are respectively a sectional elevation and a horizontal section of the alarm-valve, illustrating a preferred construction thereof. Fig. 11 is a sectional elevation of the steam-whistle device shown at the left in Fig. 1, and Fig. 12 is a sectional elevation of the inlet-valve shown at the bottom in Fig. 1.

Like letters of reference indicate corresponding parts in the several figures.

Our said sprinkler system (represented as a whole by Fig. 1) comprises a water-supply pipe A, leading from a suitable reservoir or pump and provided with the chamber or shell of an inlet-valve I; a vertical pipe B, coupled to said supply-pipe and provided with the chamber or shell of an "alarm-valve" V or V<sup>2</sup> and with or without a terminal expansion device X or X<sup>2</sup>; pipes C, of any required number and extent, leading horizontally from said stand-pipe above said alarm-valve and provided with depending individual sprinklers S or S<sup>2</sup> or S<sup>3</sup>; one or more pipes D, leading from the shell of said alarm-valve below its valve-disk to a steam-whistle W, and preferably also to a gong-alarm G or other supplemental alarm or indicator, and a pipe E, leading from the pressure side of the gate (or its equivalent) of said inlet-valve I to said whistle W. Each of our said individual sprinklers comprises an inlet-neck *a*, Figs. 2 to 4, adapted to be coupled to a water-pipe C by a screw-union and provided with a pair of arms *b*, to which the extremities of a depending U-shaped yoke *c* are riveted. An expansion-ring *d* or *d*<sup>2</sup>, formed of thin copper and having vertical necks at top and bottom, is brazed fast by means of its upper neck within said inlet-neck *a*, and its under neck is brazed fast within a nozzle *e*, the lower end of which forms the valve-seat for the outlet-valve *f*, Figs. 2 and 4. This valve occupies the central part of an annular dispersing-plate *f*<sup>1</sup>, and is held up and in contact with its said seat by an inclined support or "lever" *f*<sup>2</sup>, the lower end of which is attached to the yoke *c* at bottom by a solder capable of melting, say, at a temperature of about 155° Fahrenheit. Upon the

outlet end of the nozzle *e* a cap or canopy *g* is screwed fast, the nozzle forming a bushing within the canopy.

In accordance with this invention the nozzle *e* or that portion thereof which forms the valve-seat, as aforesaid, is secured rigidly in position relatively to the yoke *c*, to which the valve-support is directly attached, as aforesaid, so as to prevent the possibility of any motion or movement being communicated from the expansion-ring *d* to the valve-seat or to the outlet-valve *f* or its support *f*<sup>2</sup>, and thus to keep the valve-support intact and the valve tight, as aforesaid, even when all the said parts are directly united within the sprinkler itself, as shown. The nozzle *e* may be so held by riveting, soldering, or otherwise fastening the canopy *g* at each side to the yoke *c*, as represented at *g*<sup>2</sup> in Fig. 2, or by means of arms *e*<sup>2</sup>, Fig. 3, projecting from the nozzle *e*, and riveted, soldered, or otherwise secured at their extremities to the yoke at each side, or by means of snugs or shoulders *c*<sup>2</sup>, Fig. 4, projecting inward from the respective sides of the yoke itself into contact with the canopy *g*. In each case we rigidly support and prevent any downward movement of said canopy or of the nozzle *e* within the same, as and for the purposes aforesaid.

Instead of employing a single expansion-ring, as shown at *d* in Figs. 1 to 3, we may form a series of such rings by means of a circumferentially-corrugated length of thin metal tubing, as shown at *d*<sup>2</sup> in Fig. 4, the latter to be sufficiently yielding to obviate the effects of the pulsating or knocking action of a pump without communicating any motion to the valve, valve-seat, or valve-support, as aforesaid. The said expansion device *X* or *X*<sup>2</sup>, Figs. 1, 5, and 6, is preferably attached to the flanged upper end of the last or endmost length of piping of the vertical pipe *B*, where, as in our aforesaid system, a number of sprinklers are supplied by one such vertical pipe. The effects of the said pulsations throughout the system may thus be materially reduced. In the form shown at *X* in Figs. 1 and 5 a bulb *d*<sup>3</sup>, of thin copper, is attached by its single neck to a bushing *i*, which screws into the cap-plate which closes the end of the pipe, and is kept in shape and re-enforced by a cap or follower *j* and a superposed spring *k*, the latter abutting against the cross-bar of an adjustable yoke *k*<sup>2</sup>, supported by said cap-plate. In the modification shown at *X*<sup>2</sup> in Fig. 6 a hollow cylinder *d*<sup>4</sup>, open at its lower end and sliding through a suitable stuffing-box *i*<sup>2</sup>, takes the place of said bulb *d*<sup>3</sup> and bushing *i*. The cap *j* is simply a follower, and the pulsations within the pipe are met by the gravity and inertia of the sliding cylinder and the resiliency of the spring *k*. Otherwise the two arrangements are alike.

The alarm-valve (represented at *V* in Fig. 65 1 and shown in detail as to its lower part by Figs. 7 and 8) has its valve proper *m* in the form of a puppet-valve mounted upon an an-

nular valve-seat *n*, which is provided with orifices *o*, each communicating through a port *p* with one of said pipes *D*, which communi- 70 cate, respectively, with the water-chambers of said whistle *W* and said gong-alarm *G*. In the preferred form (represented by Figs. 9 and 10) the lower neck of the valve-casing is provided with a hollow cross-bar *p*<sup>1</sup>. A bush- 75 ing having a single orifice *o*<sup>1</sup> is screwed into its upper side in line with the stem *m*<sup>2</sup> of the valve, and the extremity of the valve-stem opens and closes said orifice, the inner ends of the pipes *D* connecting directly with the 80 respective ends of the cross-bar *p*<sup>1</sup>, as shown in Fig. 9. We sometimes interpose an expansion-ring at the junction of the hollow cross-bar *p*<sup>1</sup> with the valve-stem *m*<sup>2</sup>, in order that the valvular extremity of said valve-stem 85 may, by pressing upon the topside of the expansion-ring, effect a perfectly tight joint, which only becomes tighter with increasing pressure.

In both forms of the alarm-valve we pro- 90 vide for variations in pressure in the upper and lower portions of the vertical pipe *B*, or above and below the alarm-valve, by means of a small or contracted equalizing-passage in the form of a hole *m*<sup>1</sup> or a nick extend- 95 ing through the disk of the valve *m*, (or through the valve-seat *n*), and we thus insure a constant and equal pressure upon both sides of the closed valve without the intervention of any so-called "compensating valve" 100 or other apparatus liable to derangement.

The steam-whistle apparatus *W*, Figs. 1 and 11, or that portion thereof affected by the present invention, is shown in detail by Fig. 11, which see. The pipes *D* and *E* unite in a 105 single connection *q* with the bottom of a small water-cylinder *s*, in which a piston *t* is fitted with a rod *u*, passing through a cover *v* to the outer atmosphere. The rod is linked to an arm *w* upon the spindle of a rotary disk- 110 valve *x*, which, being turned a fraction of a revolution, permits steam or the like to pass through coinciding orifices *y* in the valve-seat and valve to a pipe or passage *z*, leading from the valve-casing to the steam-whistle 115 proper.

To provide against any tampering with the water-supply of the installation or system and to give a sonorous alarm in case of the water being turned off, we employ the arrange- 120 ment represented at *I* and *E* in Fig. 1 and shown in detail by Fig. 12. The pipe *E* extends to the whistle apparatus *W*, as aforesaid, from immediately behind the gate *I*<sup>1</sup> of the inlet-valve represented, where a suitable 125 valve-seat *F* is formed on or in connection with a screw-coupling by which the pipe *E* is attached, and a puppet-valve *G*<sup>1</sup>, fitted to said valve-seat, is connected to one end of a lever *H*, which has a fulcrum at about mid- 130 length on the valve-seat casting and is adapted at its other end to engage with the top of a recess *r* in the pressure side of said gate *I*<sup>1</sup>, so that when the latter is shut, as shown in

Fig. 12, the valve G' is opened and water is admitted through the pipe E to the whistle apparatus W, which causes the whistle to blow, as aforesaid, until water is let on or steam is shut off.

The gong apparatus G, Fig. 1, is of an ordinary construction, consisting of a small hydraulic motor, the rotary shaft of which carries a tappet-wheel *t'*, the balls of which strike the gong *g'* as long as water flows through the pipe D, which connects the motor with the casing of the alarm-valve V or V<sup>2</sup>, as aforesaid.

Details which have not been specified may be of any approved description, and other like modifications will suggest themselves to those skilled in the art, such as the employment of other suitable metals or alloys instead of copper for the expansion-rings and of suitably soldering the same in lieu of brazing.

We do not claim herein providing such apparatus with expansion-rings, broadly considered, for the purpose stated; but we claim as new and desire to patent under this specification—

1. An improved automatic fire-extinguishing system comprising expansion-rings (one or more) forming yielding enlargements of the water-passage and outlet-valves (one or more) controlling the outlet of water through the sprinklers and having stationary valve-seats carried by nozzles, which are immovable relatively to said expansion-rings, substantially as hereinbefore specified, for the purposes set forth.

2. In an automatic fire-extinguishing sys-

tem, a sprinkler comprising an inlet-neck, a yoke rigidly attached to said neck, an expansion-ring having necks at top and bottom, the former fastened to said inlet-neck, a nozzle attached to the lower neck of the ring and carrying the valve-seat, an outlet-valve and its heat-released support below said seat, and means, substantially as described, for rigidly holding said nozzle by said yoke against motion or movement with or by said expansion-ring, substantially as hereinbefore specified.

3. In an automatic fire-extinguishing system, a water-supply pipe provided with an inlet-valve having on the pressure side of its gate or the like an outlet-passage controlled by a supplemental valve and means for actuating said supplemental valve to open said outlet-passage when the main valve is closed, in combination with a vertical water-pipe supplied through the main passage of said inlet-valve, sprinklers provided with the main outlet-valves of the apparatus, pipes leading to the sprinklers from said vertical pipe, a steam-whistle apparatus having a water-actuated valve to admit steam or the like to the whistle, and a pipe leading from said outlet-passage of the inlet-valve to the water-inlet of said whistle apparatus, substantially as hereinbefore specified.

In testimony whereof we affix our signatures to the foregoing specification.

WILLIAM MAYALL.  
THOMAS THOMASSON.

Witnesses:

JOHN GUY WILSON,  
WALTER GUNN.