(No Model.)

F. GRAY.

AUTOMATIC FIRE EXTINGUISHING SYSTEM.

No. 341,902. Patented May 18, 1886.

Fig. 1.

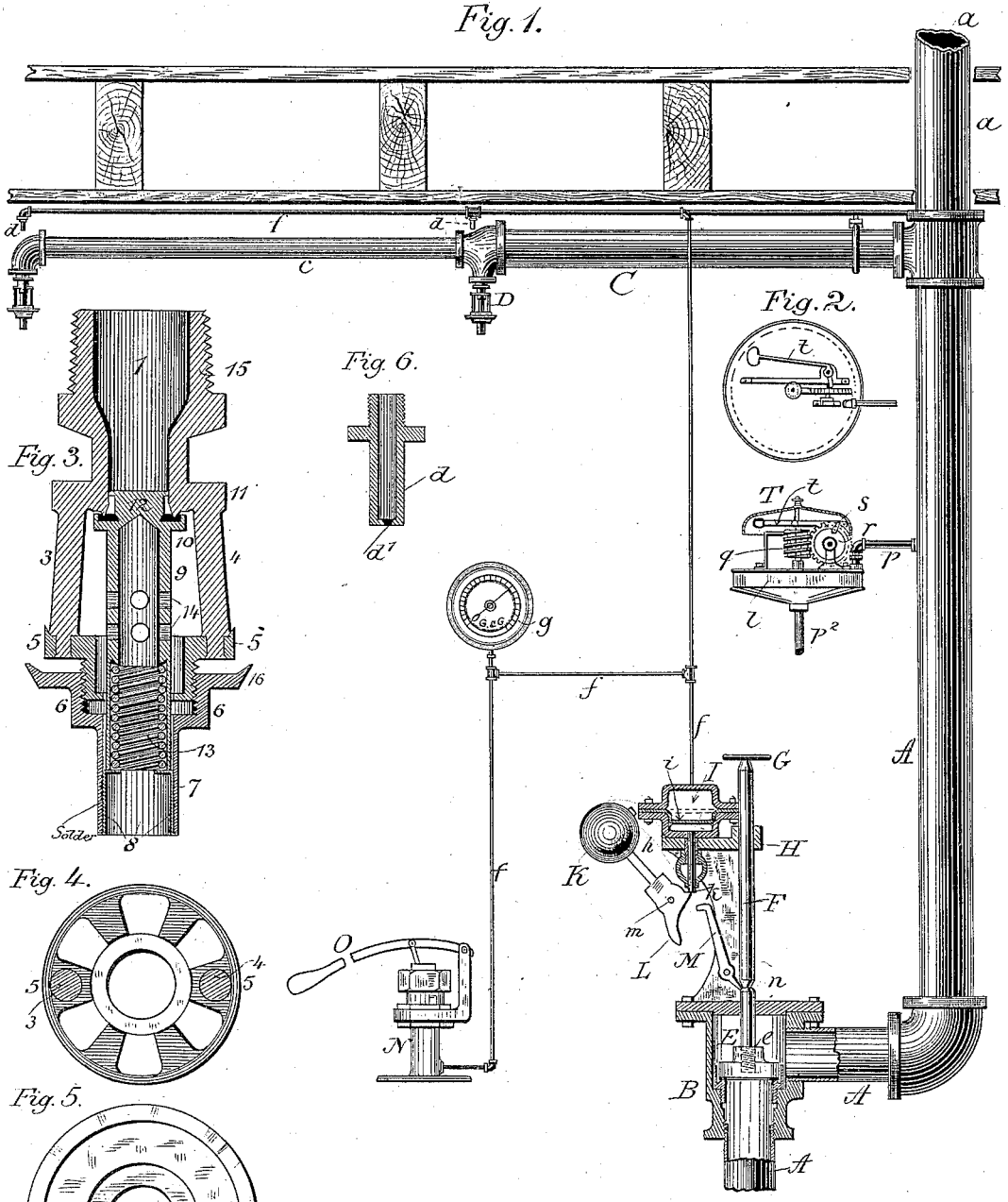

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

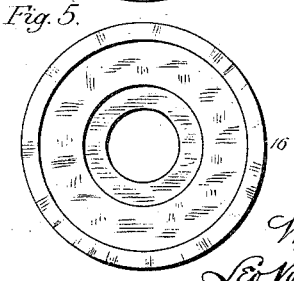

Fig. 6.

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AUTOMATIC FIRE-EXTINGUISHING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 341,902, dated May 18, 1886.

Application filed August 24, 1885. Serial No. 175,161. (No model.)

To all whom it may concern:

Be it known that I, FRANK GRAY, a citizen of the United States, residing at the city of New York, in the county and State of New York, have invented certain new and useful Improvements in Automatic Fire-Extinguishing Apparatus, which invention or improvements are fully described and illustrated in the following specification and accompanying drawings.

This invention relates to the "dry-pipe system" for the automatic extinguishment of fire, for which Letters Patent No. 307,456 were issued to me on the 4th day of November, 1884.

The object of this invention is to provide a trustworthy closing and quick-acting opening device for excluding and admitting the extinguishing-water from the system of distributing-pipes by means of a low pressure of compressed air, regardless of the head or variation in head or pressure of the extinguishing-liquid.

It is also its object to provide an automatic hydraulic-motor alarm, which shall start into action upon the occurrence of a fire and continue in operation until either the extinguishing-liquid is shut off or said alarm forcibly put out of operation.

It is further its object to provide a sensitive and efficient sprinkler head or distributer for scattering or spraying the extinguishing-liquid upon an incipient fire.

The invention consists of the parts and combinations of parts, as hereinafter described, and set forth in the claims.

In the accompanying drawings, Figure 1 shows in side elevation a general view of the complete apparatus, showing its distributing-pipes and sprinkler-heads mounted under a section of the ceiling or roof of a building. Fig. 2 shows in plan the automatic hydraulic-motor alarm shown in elevation in Fig. 1. Fig. 3 shows an enlarged cross-section of the sprinkler-heads shown in Fig. 1. Fig. 4 is a detached view in plan of the perforated scattering-plate, marked 5 in Fig. 3. Fig. 5 is a plan of the dished coupling-nut, marked 6 on Fig. 3, which forms a bottom for the scattering-plate, marked 5 in Fig. 3. Fig. 6 shows in vertical cross-section enlarged one of the nipples containing fusible metal, shown at *d* in Fig. 1.

In said figures the several parts are indicated by letters, as follows: A, the service-pipe from the water-supply; B, the water-stop valve within said pipe, which pipe is continued up within the building to be protected, to the ceiling of one of the floors, where it branches off under said ceiling into the pipe C, which is reduced to a smaller pipe, *c*, as may be desired. From the pipes C *c* depend the sprinkler-heads D D, (shown in enlarged section in Fig. 3,) hereinafter more particularly described. The pipes C may be prolonged the whole length of any building, and of course located under the ceilings of every floor in one or more lines; and said pipes may be provided with sprinkler-heads at such intervals and in such numbers as may be desired. The pipe A is shown broken at *a*, whence it may lead to any elevation desired. The valve B is an ordinary disk-valve, having an ordinary annular seat within a valve-chamber, E. Said valve is provided with a stem, F, secured to it by screw-threads *e*. The valve-stem F is prolonged upward and provided at top with a disk or wheel-handle, G, and said stem is guided in a frame, H, bolted to or forming part of the top or cover of the valve-chamber E. On top of said frame H is secured the air-compression chamber I, provided within it with a flexible diaphragm, *i*, of rubber, metal, or other suitable material, and under said diaphragm with a piston, *h*, whose rod *k* passes through guides downward and rests on a stop on the tripping lever or arm L, pivoted at *m* to the frame H. To the upper or outer end of arm L is fixed a ball or weight, K. Pivoted also in the frame H is the pawl or dog M, forming a two-ended lever, whose shorter and lower end engages the jog or notch *n* turned in the valve-stem F. From the top of the air-compression chamber I rises the air-pipe *f*. Said pipe follows the same general course of the pipe or pipes C *c* near thereto, and is provided at suitable intervals, preferably near the sprinkler-heads D, with nipples *d d*, having plugs or joints *d'*, sealed with a solder fusible at a low temperature, similar to fusible joints likewise placed in the sprinkler-heads D. To the pipe *f* is connected a pressure-gage, *g*, and an air-compression pump, N, operated by a handle, O. To the water-supply pipe A is connected, by a short pipe, *p*, a water-motor

within a casing or box, *l*, provided with an exit or exhaust pipe, p^2. To the vertical spindle of said motor is secured the worm *q*, gearing with the worm-wheel *r*, provided with a lug or stop, *s*, near its periphery. Over said gearing is suitably secured an ordinary gong, T, supplied with a hammer, *t*, having a bent handle, whose shorter end is turned to lie in the path of the revolving stop *s* on the worm-wheel *r*.

Before explaining the complete operation of the parts as above detailed, the construction of the sprinkler-heads D, (shown in enlarged section in Fig. 3,) and also of the nipples *d*, Fig. 6, will first be described, substituting figures for letters in designating the several parts.

In Fig. 3, 1 indicates the valve-chamber or metal casting forming the substance of the head proper. As part of said casting, depend two side rods, 3 4, the lower ends of which are riveted to a radially barred or perforated scattering-plate, 5. Upon the hub of said scattering-plate is screwed the dished coupling-nut 6. Said nut has a prolonged hub, 7, bored out and containing a tubular plug, 8, soldered within and to said bore by any of the usual solders fusible at a low temperature—say from 160° Fahrenheit upward. Above said tubular plug, and resting thereon, is a bored valve-stem, 9, forming part of an annular valve, 10, provided with a renewable face, 11, of soft metal—such as lead or other soft metal. Above said valve the stem is turned into a guide-head, 12, which fits neatly within the bore of the casting 1. The soft-metal valve-face 11 makes a close fit upon the valve-seat bored in the bottom of the casting 1, as clearly shown in Fig. 3. The bore of the valve-stem 9 is counterbored for some distance up from its bottom, which counterbore is fitted with a spiral spring, 13, whose base rests upon the tubular plug 8. Above said spring the valve-stem is perforated by holes 14, which open through said stem into the surrounding atmosphere. It can now be readily seen that if the solder melts which holds the plug 8 within the hub 7 of the nut 6 the compressed spring 13 will force said plug out of said hub, when the valve 10, with its stem 9, will immediately fall and open the interior of the sprinkler-head for the exit of any water that may be within it or the pipes, to which it is secured by the threads 15. The spring 13 will of course fall out disconnected; but the valve will rest within the base of the device upon either the scattering-plate 5 or the coupling-nut 6, forming its base.

In Fig. 6 are shown the nipples *d*, provided with fusible metal plugs or joints *d'*, which will melt like the solder between the tubular plugs 8 in the hub 7, Fig. 3. Said joints are all intended to fuse upon the breaking out of a fire near enough thereto to raise the temperature of the surrounding air to the melting-point of the solder used to make said joints.

The complete operation of this apparatus is very simple, and is as follows: The water-stop valve B being seated, as seen in Fig. 1, and the point of the dog M thrown into the notch or jog *n* in the valve-stem F, the valve may be conveniently securely closed by turning the handle G from left to right, which action presses the valve tight in its seat, for the threads *e*, being shown left-handed, will cause the valve-stem F to tend to screw out of the valve B; but the rise of said stem being opposed by the dog M, the effect of so turning the handle G is to press the valve B tighter to its seat the more said handle is turned to the right—that is, apparently downward, but in reality upward. Of course right-handed threads may be used, if desired, instead of the left-handed threads *e*, in which case the handle G would be turned from right to left—the other parts remaining the same—in order to jam the valve B tight up to its seat. The valve B being secured to its seat, the air-pump N is operated by its handle O and air pumped into the chamber I through the small air-pipe *f* until the pressure gage *g* indicates a sufficient pressure to depress the diaphragm *i* within said chamber. The depression or distention of said diaphragm transfers the whole downward pressure of the air so compressed upon the piston *h*, whose rod or stem *k* is thus permanently set as a fixed point below suitable guides under the chamber I. The stem *k* is thus made to take the weight and leverage of the ball K, and forcibly holds the lever L depressed by forming a stop at the point *k* upon an offset or jog in said lever. The weight K is thus held elevated and the lever L depressed so long as the piston-rod *k* is depressed. The parts above described are thus held in their respective positions shown in Fig. 1, and in said positions the apparatus is properly set for automatic operation should a fire occur. The pipe *f* is provided with the nipples *d*, as before explained, and the solder in said nipples prevents the air compressed in said pipe from escaping until said solder is melted.

The apparatus being thus set for action upon the breaking out of a fire, its automatic operation for the extinguishment of the fire is as follows: The temperature of the air surrounding any one or more of the nipples *d* rising to the melting-point of the solder *d'*, said solder melts, when the compressed air within the chamber I will escape out of said nipple or nipples. Immediately upon such occurrence the weight of the ball K forces up the piston-rod *k*, and as the ball falls under the effect of gravitation the end or toe of the lever L rises, strikes the dog M and trips its toe out of the jog *n* in the valve-stem F. The water-stop valve B is thus deprived of the holding or locking action of the dog M, and by the upward pressure of the head of water within the pipe A below the valve said valve is opened and the extinguishing-water rushes up the pipe A into the pipes C *c*, and is sprayed upon the fire from any one or more of the sprinkler-heads D,

the solder in which will have melted at about the time of the melting of the solder in the nipples *d*. As soon as the water rushes up the pipe A it also escapes through the pipe *p* into the water-motor *l*, and sets its gong T in operation by the revolution of the worm-gearing *q r*, the stop *s* on the worm-wheel *r* tapping the handle of the gong-hammer *t* at every revolution of said wheel. The striking of the gong is thus rendered continuous and rapid either until it is disconnected or until the extinguishing-water ceases to flow into the pipe A. Not only, therefore, does the apparatus, when once in action, continue the operation of extinguishing the fire, but it continues sounding an alarm until attention has been called to the fire, and until the alarm attachment has been put out of operation by those whom it has aroused. I do not, however, herein claim such an alarm attachment to be new.

Having thus fully described my said improvements as of my invention, I claim—

1. In a dry-pipe system for the automatic extinguishment of fire, the combination of the following-named elements, namely: an air-compression pipe, as *f*, provided with orifices sealed with solder, an air-compression chamber, as I, connected therewith and provided with a resilient diaphragm, and a rod or stem, as K, engaging and supporting a weighted lever, as L, when said diaphragm is subjected to air-pressure in said chamber, a holding-dog, as M, and a water-stop valve, as B, held to its seat by said dog and connected to the extinguishing-pipes of the apparatus, whereby when the air compressed in said chamber is permitted to escape by the melting of said solder said weighted lever falls, and striking said dog trips the same, thereby releasing said stop-valve and admitting water therethrough into the extinguishing-pipes for the extinguishment of fire, substantially as and for the purposes set forth.

2. An automatic sprinkler-head for a fire-extinguishing apparatus, provided with a tubular valve-stem bored and perforated, as described, in combination with a hollow plug or tube secured by solder, fusible at a low temperature, to a dished coupling-nut screwed to the base of the device, substantially as and for the purposes set forth.

3. An automatic sprinkler-head for a fire-extinguishing apparatus, provided with a tubular valve-stem bored and perforated, as described, in combination with a coiled spring within said tube and a hollow plug or tube secured by solder, fusible at a low temperature, to a dished coupling-nut screwed to the base of the device, substantially as and for the purposes set forth.

4. In an automatic sprinkler-head for a fire-extinguishing apparatus, the combination of a fixed annular scattering-plate, as 5, and a dished coupling-nut, as 6, screwed thereon, forming a bottom thereto, and provided with a tubular plug, as 8, secured within the hub of said nut by a soldered joint fusible at a low temperature, substantially as and for the purposes set forth.

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