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FIRE PROTECTION AND SIGNAL SYSTEM.

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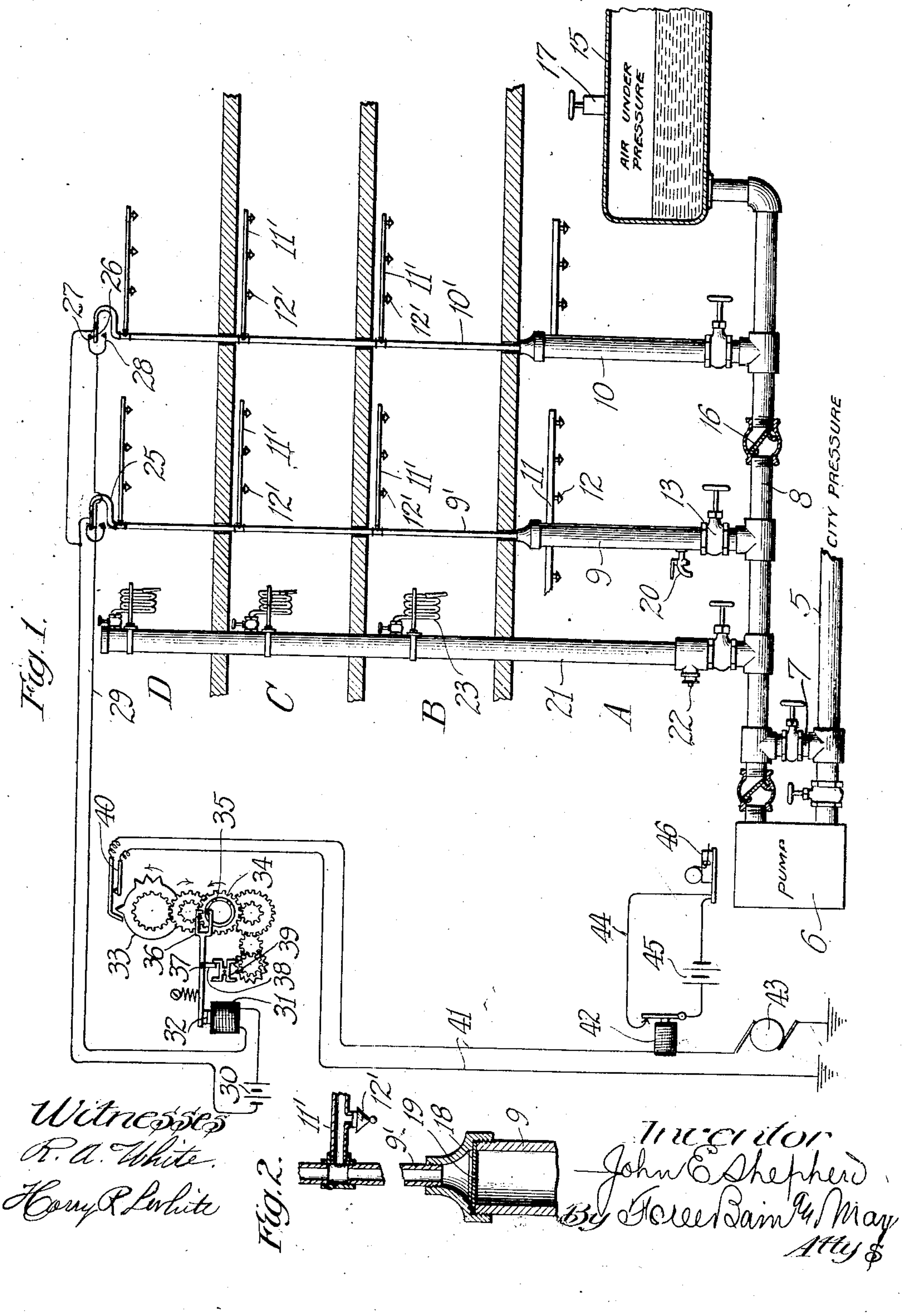
941,048. Patented Nov. 23, 1909.



UNITED STATES PATENT OFFICE.

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FIRE PROTECTION AND SIGNAL SYSTEM.

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Application filed February 13, 1908. Serial No. 415,746.

To all whom it may concern:

Be it known that I, JOHN E. SHEPHERD, 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 Fire-Protection Signal System, of which the following is a specification.

My invention relates to improvements in fire protection and signal systems, and has for its primary object to provide an improved fire signal initiating system operable independently of, or to best advantage in conjunction with, automatic sprinkler systems for fire extinguishing purposes.

Heretofore automatic fire alarm signaling has usually been effected by a system of one of three types, electric circuits embodying thermostats, "Ludlow" systems, or signaling systems operating in conjunction with fire extinguishers. Of these several systems thermostatic systems are open to objection on account of frequent failure due to the delicacy and lack of power in the movements of the thermostatic circuit controlling parts and their liability to become inoperative after long periods of inactivity.

The "Ludlow" system of signal initiation sometimes employed contemplates the provision of a piping system normal under atmospheric pressure but containing therein a volatile substance tremendously expansive under the influence of heat to create a signal actuating pressure upon the occurrence of an undue heat condition in the locality of the system. Such systems heretofore have been deemed objectionable owing to the lack of certainty of the condition of the volatile substance and have been found frequently to fail to accomplish their object. Furthermore it is now customary to operate a signaling system in conjunction with an automatic sprinkler system, providing supervisory means for various important elements of the extinguisher system arranged for actuation upon the occurrence of undue conditions in the system, such as the presence of water-flow in the piping and the like. Such systems operating as auxiliaries to a fire extinguishing sprinkler equipment, have been highly organized, but viewed from the standpoint of signaling alone, they have the disadvantage that a water-flow signal must practically be delayed in order to obviate the difficulty of false alarms due to water hammer, and further the cost of installation of the sprinkler system is often a bar to the provision of adequate signaling protection in areas or risks where the fire danger is not sufficient to warrant the installation of a complete sprinkler system or the conditions of water supply do not favor such an installation.

My invention is designed to provide a fire protective signal system, which will afford complete and efficient signaling protection in risks where it is inexpedient or too expensive to install complete sprinkler systems, which will obviate the difficulty of thermostatic action and insure maintenance of proper potentiality in the system and will enable the instant transmission of a fire alarm upon the occurrence of undue heat conditions within the supervised area.

Furthermore my invention is operable in conjunction with a partial fire extinguisher equipment so that in risks where the fire hazard is confined to lower areas, such as the basements and lower floors, the desired sprinkler protection for the hazardous areas may be combined with signal protection for the less hazardous areas.

In the drawings I have illustrated in schematic fashion, for illustrative purposes only, a simple embodiment of my invention sufficient for disclosure of its nature and to illustrate a practical installation, although it will be understood by those skilled in the art that precise conditions as to installation both of the hydraulic and electric apparatus so vary in particular localities and in particular buildings to be protected that changes may and often must be made in the details of equipment to meet the imposed conditions, without departure from the spirit and scope of my invention.

In said drawings; Figure 1 is a diagrammatic view of a plant equipped for partial extinguisher-service and partial signal protection, showing in diagrammatic fashion one form of electric installation suitable for the practice of my invention. Fig. 2 is an enlarged detail of a fragment of the hydraulic equipment, showing the restrictor or reducer preferably employed in the practice of my invention.

In the drawing A, B, C and D, represent respectively the basement, first, second and third floors of a building to be protected,

wherein it may be that the fire hazard is mainly confined to the basement or lower floor, or wherein the water supply conditions make it inexpedient to provide an extinguisher equipment throughout the entire building, or where for other causes sprinkler protection is desired through only lower areas, and signal protection is desired in upper floors.

In the drawing, a localized sprinkler system for the basement or lower floors indicated by A, is shown, 5 indicating a pipe representing a city main or other general source of water supply, communicating either through a fire pump 6 or a valved by-pass 7 with a main 8, with which are connected risers 9 and 10 constituting part of a normal fire extinguisher system localized to the desired lower floors, such risers being provided with distribution pipe 11, equipped with ordinary sprinkler heads 12 of any desired construction, normally closed but responsive to a predetermined degree of heat to open and discharge water supplied through the riser 9. This normal sprinkler system may be of any desired character, and each riser is illustrated as provided with a usual gate valve 13 of any desired construction. In some instances it may be practical to supply the localized sprinkler system with water direct from the city pressure mains 5, and the riser 9 is shown as connected for such supply, but in other instances it may be necessary or desirable to provide auxiliary pressure supply means, such as a pressure tank 15, shown as connected with the riser 10, wherein the pressure applied through the pressure tank 15 may be localized by the interposition of a check valve 16 between the high pressure riser and the lower pressure source of supply.

The tank 15 is illustrated as of customary character containing a body of water or other fire extinguishing fluid, maintained under air pressure, which may be generated as by a pump 17.

In the areas where signal protection alone is to obtain I provide a miniature sprinkler equipment of corresponding character comprising relatively small risers 9′ and 10′, having communicating therewith miniature distribution pipes 11′ equipped with miniature discharge heads 12′, of similar construction to the regular sprinkler heads. Whether operated in association with the localized sprinkler system or in connection with any other source of water supply, such miniature equipment is so arranged that the discharge capacity of one or more of its sprinkler heads is greater than a fluid receptive or supply capacity, and in installations such as I have described I provide for the positive imposition of such condition by arranging a restrictor which, while permitting of communication between the normal sprinkler system and the miniature system, will not admit of sufficient fluid flow from the former to the latter to satisfy the discharge capacity of one, or any other determined number, of the miniature discharge heads.

In Fig. 2 it is shown that between the normal riser 9 and the miniature riser 9′, is interposed a restricting member 18 shown as comprising a disk having therethrough a small aperture 19 of less area than the discharge area of a discharge head 12′, so that obviously while under normal conditions when the piping system is tightly closed throughout, the fluid pressure within the miniature system is determined by the pressure within the localized extinguisher system or other supply source, and upon the opening of a discharge head the pressure is immediately reduced, as the restriction 18 reduces the fluid supply to a quantity less than the discharge.

It will be obvious that the pressure maintained within the system when in potential condition ready for operation to be above atmospheric pressure, and where a water head insufficient to fill the pipes with water to the uppermost area to be supervised is depended upon, the requisite pressure may be maintained in the upper floors by air. For convenient manipulation to secure the desired effect in the system a drain cock 20 may be provided at a suitable point, preferably just above the gate valve 13 of the risers. Where the natural water supply is sufficient, or where auxiliary supply devices such as a pressure tank 15, are employed, obviously the entire system may be kept constantly under water pressure throughout.

Preferably in installations such as I have herein described wherein signal protection only is provided in certain areas, a stand pipe 21 is arranged to be supplied with water through the normal pressure or the fire pumps and any usual engine connection 22, may be provided therefor, the stand pipe having on its several floors the customary hose connections 23.

Obviously the normal sprinkler system may be supervised in any desired or known manner and the supervision of such normal sprinkler system *per se* forms no part of this invention.

In association with each riser of the miniature fluid pressure system I provide a pressure gage 25 responsive to the pressure within the system, such pressure gages being diagrammatically shown as of the Bourdon type, and each carrying an electrical contact tip 26, normally making contact with an anvil 27 and adapted when the pressure drops below normal to a predetermined degree not as low as atmospheric pressure, to make contact with a normally idle anvil 28, the anvils 27 and 28 are together connected in one leg of a circuit 29, the opposite leg of

which has connection to the contact points 26 of the gages.

Each pressure gage is operatively associated with a signaling device, preferably a plural impulse electric signal transmitter of suitable construction, one embodiment of which I will now describe.

The circuit 29 embodies therein a source of current supply 30, and a controlling magnet 31, normally holding in attracted position its armature 32, which is connected with the controlling mechanism of a normally wound signal transmitter, arranged to be tripped and subsequently stopped upon movement and maintenance of the armature in either direction, the arrangement being such that upon movement of the armature away from its magnet the transmitter is permitted to run to a predetermined extent sufficient to occasion the transmission of a characteristic plural-impulse signal and is then stopped, while upon reattraction of the armature to its magnet the transmitter is released and allowed to run for a different period to cause the transmission of a distinguishable signal.

In the drawing I have indicated a form of transmitter now well known, embodying a signal wheel 33 arranged to be spring driven through a train including a slower moving wheel 34, provided with a raised rim 35 having an interior notch and an exterior notch at different circumferential points and stand by a forked arm 36 centrally pivoted as at 37 and carrying on its other extremity the armature 32, said arm being provided with a finger 38, arranged when at either extremity of its movement to engage the rapidly vibrating parts 39 of the escapement of the transmitter, but when in mid-position to free said escapement for movement. Consequently as the transmitter stands with one of its forked arms engaging the inner notch of the rim 35 the transmitter is held stationary, and when the magnet 31 releases its armature the lever 36 is drawn over to mid-position freeing the motor mechanism for operation until the exterior notch in the rim 35 comes into engagement by the outer tine of the fork when the motor is again stopped. Further release of the motor by reattraction of the armature permits the running of the motor until the interior notch of the rim may be again engaged by the lower tine of the fork. The parts may readily be so proportioned that during the first movement of the motor parts the signal wheel 33 makes a different number of revolutions from the number made during the succeeding period of release of the motor, for example, when the armature is retracted the signal wheel may make two revolutions, and when the armature is reattracted it may make three revolutions. The signal transmitter may be arranged in any suitable circuit extending to a supervisory station, at which station is provided a signal responsive mechanism.

In the specific embodiment shown the signal wheel 33 is provided with pens 40 connected in a circuit 21, one leg of which is at central station connected through a relay magnet 42, to the positive pole of a generator 43 the negative terminal of which is grounded. The other leg of the circuit 41 being grounded. The signaling relay 42 has an armature controlling a local circuit 44, suitably energized by a battery 45 and containing a signal receiving and recording device 46 of suitable character.

It will be apparent now that if the riser 9 contains water under comparatively low pressure, only the lower floors of the building will be supplied with water, but the air thereabove in the miniature system will be maintained under equivalent pressure and the corresponding pressure gage maintained in circuit closing position against the upper contact 27 of the electrical devices. If fire occurs within the sprinkled area it should be extinguished through the agency of the sprinkler system, and by the provision of any usual alarm apparatus customary alarms may be transmitted to the central station. In the upper areas, however, occurrence of fire immediately fuses a miniature discharge head which by virtue of the maintenance of constant pressure in the piping connected therewith is practically infallible in operation and has reduced to the minimum the disadvantages of deterioration due to long periods of disuse. When such discharge head opens the fluid within the piping rushes out therethrough at a rate faster than it can be supplied through the restrictor 18 and consequently pressure reduction instantly occurs in the miniature system so that the pressure gage 25 responds, first breaking the circuit and then almost immediately making the circuit again against the lower coacting anvil. Thus the circuit 29 is momentarily broken and then restored so that the magnet 31 first releases and then attracts its armature, and the wheel 34 is permitted to make a full cycle before it is stopped, in such cycle occasioning the transmitting wheel 33 to rotate five times, sending its distinctive number signal five times over the circuit to be recorded at central station upon the recorder 46. Thus a distinctive fire signal is caused to be transmitted almost instantly upon the occurrence of undue heat conditions within the area protected by the signaling protective signal. On the other hand in the event of a slow leak in the signaling piping system, where the piping is filled with air under pressure, as in the riser 9', the circuit is opened but a considerable time elapses before it is again closed, so that the transmitter sends its distinctive number only twice and a considerable dwell occurs before the rest of the

signal or three rounds of a signal wheel 33 is transmitted. Thus the double signal is easily distinguishable from a true fire signal.

While I have herein described in some detail a specific embodiment of my invention for purposes of full disclosure thereof, it will be understood that I do not intend to limit myself to the particular apparatus shown and described.

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

1. A fire alarm signaling system comprising a piping equipment extending throughout an area to be protected connected with a source of fluid supply, and containing fluid normally under pressure, and providing heat-released fluid discharging means distributed throughout the protected area, of means for restricting the supply of fluid from the supply source to the discharge means below the volumetric discharge capacity of said discharging means, and a signaling device associated with the piping system beyond the restriction responsive to a drop of pressure therein.

2. In a fire protective system a source of water supply, a miniature piping system communicating therewith and containing fluid normally under pressure, said piping system providing discharge heads normally closed, arranged to open when heated, thereby to discharge the fluid under pressure, means for constantly restricting the water supply to the pipe to a volume below its discharge capacity, and signaling devices associated with said piping system responsive to a drop of pressure therein.

3. In a fire protective system, a source of water supply, a miniature piping system communicating therewith, and containing fluid normally under pressure, said piping system extending throughout the area to be protected providing miniature discharge heads, normally closed, arranged to open when heated, thereby to discharge fluid under pressure, means for restricting the fluid supply of said pipe to volume below the discharge capacity of one of said discharge heads, a pressure gage associated with said piping system responsive to pressure changes therein, an electric signal transmitter associated with the gage for control thereby, an energized signaling circuit for said transmitter, and signal responsive means in said circuit.

4. In a fire protection system, a localized normal sprinkler equipment comprising a riser maintained under fluid-pressure and branch pipes provided with sprinkler heads, local to the lower portions of the protected area, similar miniature sprinkler equipments having communication with said normal equipment sufficient to maintain pressure in the miniature equipment from the normal equipment, but insufficient to supply a fluid commensurate with the discharge capacity of the discharge heads of said miniature equipment, and a signaling device responsive to drop in pressure in said miniature equipment.

5. In a fire protection system, a localized normal sprinkler equipment, comprising a riser maintained under pressure, and branch pipes provided with sprinkler heads, local to the lower portions of the protected area, similar miniature sprinkler equipments connected with the normal equipment and a restricting part affording communication between the miniature and normal equipment insufficient to supply fluid to the miniature system commensurate with the discharge capacity of one of its discharge heads.

6. In a fire protection system, a main source of water supply, a normal riser communicating therewith extending to only the lower portion of the area to be protected, normal sprinkler equipment connected with said riser in the lower areas of said risk, a miniature riser communicating with said normal riser, miniature sprinkler equipment connected with said miniature riser in the upper areas of the risk to be protected, a restriction between the normal and miniature risers, affording fluid supply to the miniature equipment less than its discharge capacity, and alarm devices responsive to a drop in pressure in the miniature piping.

In testimony whereof I hereunto set my hand in the presence of two witnesses.

JOHN E. SHEPHERD.

In the presence of—
FORÉE BAIN,
MARY F. ALLEN.