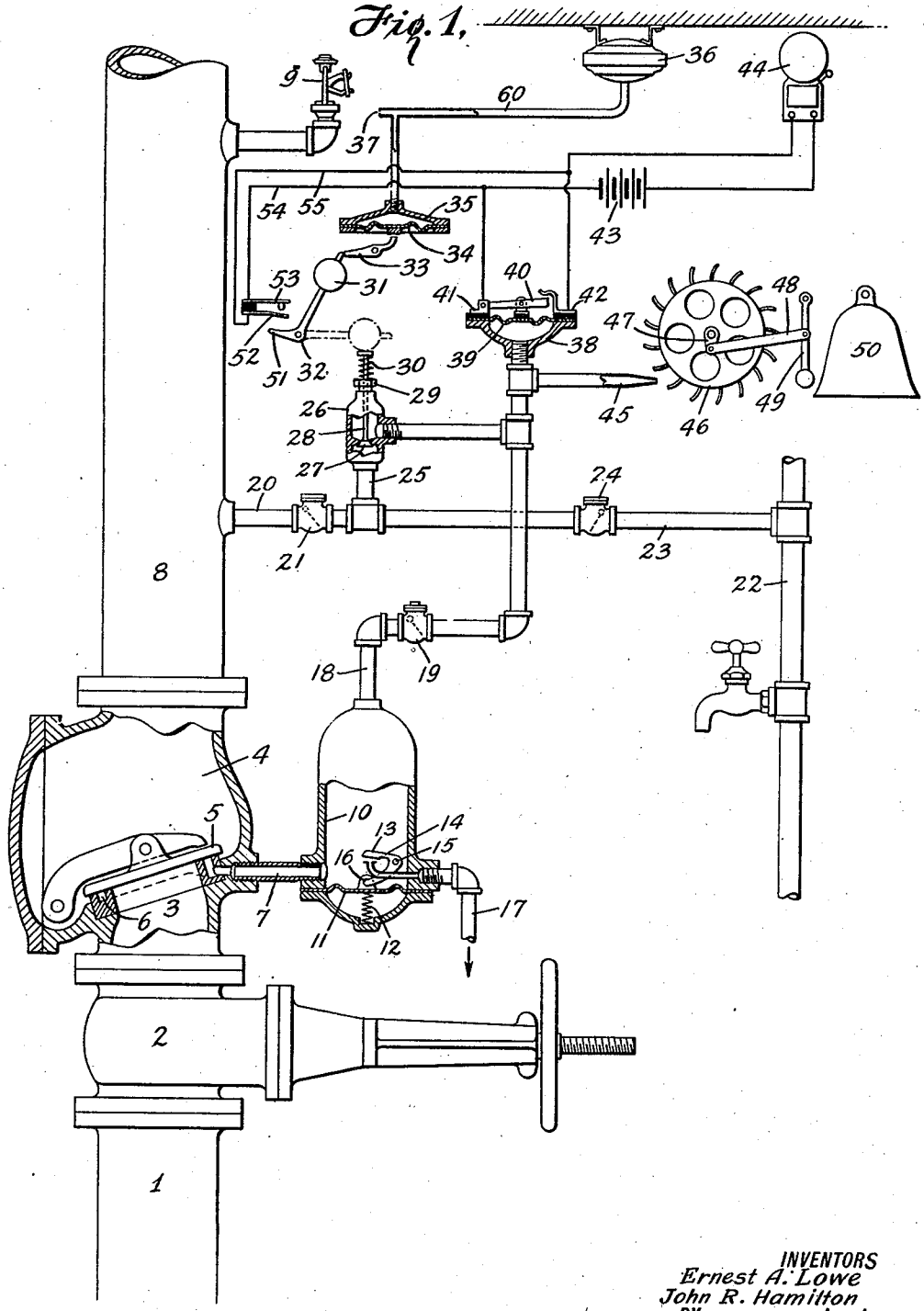
Dec. 10, 1929. E. A. LOWE ET AL 1,738,656

AUTOMATIC THERMAL SIGNAL ACCELERATOR FOR FIRE EXTINGUISHING SYSTEMS

Filed March 12, 1927 2 Sheets-Sheet 1

Fig. 1.



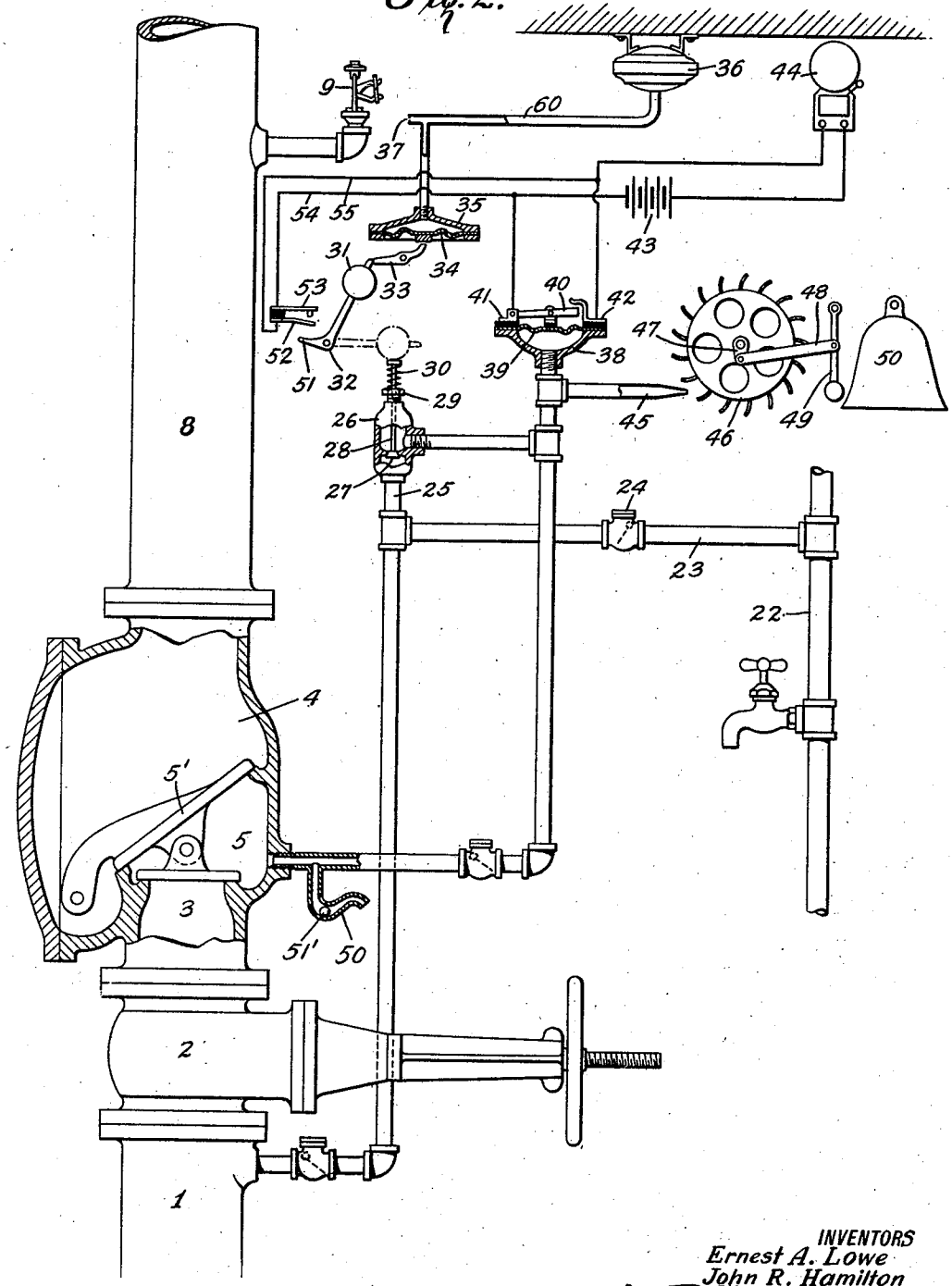
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AUTOMATIC THERMAL SIGNAL ACCELERATOR FOR FIRE EXTINGUISHING SYSTEMS

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Fig. 2.



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UNITED STATES PATENT OFFICE

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AUTOMATIC THERMAL SIGNAL ACCELERATOR FOR FIRE-EXTINGUISHING SYSTEMS

Application filed March 12, 1927. Serial No. 174,889.

Our invention relates to automatic fire extinguishing apparatus wherein the action of a thermostat in response to dangerous increase of temperature results in the flow of a fire extinguishing medium through a system of distributing pipes by which said medium is conveyed to the discharged from a suitable outlet in the area to be protected.

Our invention relates more particularly to those systems in which a fluid-operated alarm or signal is brought into action upon the establishment of the flow of the fire extinguishing medium in the system and is particularly useful in a system wherein the fluid for operating the alarm or signal is derived from the main pipe or connection therefrom which is opened at the same time that the main valve is opened.

The invention is of especial value in connection with a system of the character described wherein sprinkler heads are employed and the sprinkler outlets are controlled or opened by the action of a fuse. In such a system the fluid-operated alarm or signal will only come into action after the sprinkler fuse melts or is broken or after some other abnormal condition is established such for instance as a damage to the piping or a leakage therein.

For the purpose of explaining our invention we shall assume that the system embodies outlets thermostatically controlled by what is usually known as a sprinkler head wherein the outlet valve is held in closed condition by a restraining fuse which on fusing releases the valve whereupon water or other medium may escape through the outlet for extinguishing the fire.

In this system as ordinarily constructed an alarm or signal means is usually provided for detecting the flow of water passing to the open sprinkler or other outlet and sounding an alarm or signal usually by flow of water operating a gong and preferably derived from the supply thereof for fire extinguishing purposes. In addition provision is usually made for sounding an alarm by closure of an electric circuit through the action of a pressure diaphragm switch responsive to the pressure of the water that operates the signal.

The principal object of our invention is to provide for the giving of a signal or alarm in advance of that which, in a normal operation, would result from the opening of a sprinkler head and would ordinarily be delayed owing to the time necessary to bring the fuse to melting temperature.

The invention consists essentially in the provision of an independently operated and thermostatically controlled means for giving an alarm or signal, the latter controlled means preferably including or embodying a type of thermostat which is more sensitive to heat than the fusible member of the usual sprinkler head or other fuse-controlled outlet.

Our invention is further specially useful in connection with those systems which are provided with means for discriminating between momentary surges or water hammer of the liquid supply and the continuous flow of water or other medium into the system automatically produced through the opening of the sprinkler head or other outlet brought into action by the fire. Such discriminating action is secured by means which delay or withhold the operation of the fluid-actuated signal for a predetermined length of time and essentially is in the nature of a retarding action which disregards a flow due to the surge and usually of short duration, but after an interval will allow the signal to act so that the latter will respond to the establishment of the continuous flow passing to the distributing pipe for escape through the sprinkler head outlet or through other means for distributing the same in the fire area.

The air thermostat may be and preferably is of the type in which an equalizing vent for the air is provided to neutralize the ef-

fect of slight changes of pressure due to normal changes in temperature in the premises equipped but so small in size as to permit accumulation of pressure when heat, as from a fire, expands the air. The air thermostat comprises preferably an air container of metal or other material sensitive to heat and of considerable volume connected with an air piping duct or connection by which the increasing air pressure may be conducted to an air pressure responsive device like a flexible diaphragm.

By the use of our invention fires in their incipiency would sound or cause to be given an alarm before the fire had increased sufficiently to fuse a sprinkler. Thus a fire alarm will be given while the system for the time being retains its normal state. This advance notice or signal would permit the extinguishing of the fire through any first-aid means such as the application of water from a fire pail or small hand extinguisher.

Our invention does not impair or interfere with the normal action of the system to which it is applied and will permit the usual alarm apparatus to give a signal should a sprinkler head be opened through other means than fire or a flow in the distributing piping be brought about through existence of other abnormal conditions such as a leak therein.

Having outlined some of the advantages of our invention we will first describe the same in its preferred manner of application to a wet-pipe system, and one wherein the alarm is sounded by fluid pressure derived from any suitable source, preferably from a main distributing pipe or connection supplying the water under pressure or other fire extinguishing medium thereto.

We will also describe the system as having the auxiliary or supplemental thermostatically controlled signal as actuated by fluid pressure. In carrying out this part of our invention we preferably provide fluid pressure for actuating the alarm from a source independent of the fire extinguishing fluid or medium, said independent source being, for instance, the usual domestic water supply. We thereby guard against failure of either one of said sources at the critical instant when the alarm should be sounded.

Our invention also consists in the provision of means for giving a signal or alarm even if both sources of water supply should fail.

In the drawings, Fig. 1, we show our invention in partial elevation and in partial section as applied to a wet-pipe system, the drawing being largely diagrammatic in nature as is permissible in view of the fact that the elementary devices employed are largely and preferably of the standard or well known construction.

Fig. 2 illustrates our invention in a similar way as applied in connection with a dry-pipe system.

Referring to the drawings, 1 indicates an inlet pipe from a water supply used for fire extinguishing purposes and 2 indicates a manually-operated control valve in the nature of a gate valve for cutting off said supply at will from the main water control valve and pipe 8 and its branches constituting the distributing system. At 9 is indicated one of the usual thermostatically controlled sprinkler heads of any usual or desired construction. Said sprinkler head is thermostatically controlled so that on occurrence of fire the sprinkler outlet may be opened and the fire extinguishing medium will escape through said outlet. 3 indicates a water throat by which the fluid passes to the pipe 8 through a chamber 4 wherein a water main control valve is located. Said main valve normally closes the connection between 3 and 4. Said valve shown typifies any main control valve opening preferably by diminution of the pressure in the distributing pipe 8 as usual in the art although it might be controlled and operated in other ways. In addition, however, said control valve employs or is associated with means for permitting water under pressure to flow through a branch pipe 7 to operate an alarm or signal whenever the main supply valve opens. For this purpose a clapper 5 of the main valve may be provided with a grooved ring seat. The groove 6 is ordinarily closed by the clapper against the passage of water from 3 to 7 as clearly indicated in the drawings. On opening of the main valve water flows from 3 into the groove 6 and from there passes to 7 for further operation of the apparatus. In the type of apparatus shown in Fig. 1 we have illustrated a signal retarding device of the character to be now described but which may vary in its construction and mode of application and manner of control. The type shown is merely for purposes of illustration and is indicated generally by the numeral 10.

The means already described as connected with pipe 7 constitute one of the forms of device employed for discriminating between the actions due respectively to any transitory change of flow and to a regular or established flow issuing through the main valve upon the occurrence of fire. This principle of discrimination has as its essential feature a predetermined delay in the signal resulting from the latter action, thereby providing for transitory changes in connection with which it is not desired that any signal should be sounded.

The chamber of 10 into which the pipe 7 opens and delivers the water has an outleading drain pipe 17 controlled by a valve 13 which is made to close the opening to 17 when sufficient water flows into the chamber to deflect a diaphragm 11 against the action of a spring 12 thereby rotating the valve supporting arm 14 around its pivot 15. If

valve clapper 5 should be lifted from its seat momentarily as from a water hammer or from other momentary surge of fluid, a small quantity of water will flow through pipe 7 into chamber 10 and from the latter will flow through the open valve 13 into and out from the drain pipe 17; but if clapper 5 remain off its seat for a predetermined time, as after establishment of the flow of the fire extinguishing medium from 1 to 8 and through the outlets, water will accumulate in 10 of sufficient head or weight to act upon the fluid pressure responsive device such as diaphragm 11 thereby causing valve 13 to close and wholly or partially stopping the wastage through pipe 17. As soon as this condition arises and flow through the escape 17 is stopped the water will then pass through the connection 18, check valve 19 and branch pipe 45, and the gong or alarm 50 will operate by action of an hydraulic or fluid pressure motor of any type, typified by wheel 46 carrying vanes upon which the nozzle of pipe 45 directs the water, and crank 47, link 48 and bell hammer lever 49. The latter device may obviously be replaced by any form of fluid pressure motor and any desired means of actuating a bell hammer therefrom.

In addition to the hydraulically operated signal it is desirable to employ an electric signal or indication which may be produced if desired from the pressure in the pipe to which 45 is connected. Thus for instance said fluid pressure may enter a diaphragm switch case 38 and therein operate on a pressure responsive diaphragm 39 so as to lift the same and close the electric switch for an electric bell 44. The switch 40 may be of the knife type and adapted to close connection between post 42 and 41 thereby completing the circuit for battery 43 and bell 44.

According to our present invention we eliminate the undesirable delay in the giving of a signal or indication resulting from the presence of the discriminating device such as described or of any other character, by employing independently acting means for giving a signal, responsive to a thermostat acting independently of the thermostatic control of the sprinkler head or other outlet 9. In said independent thermostatic control we prefer to make use of a sensitive thermostat comprising essentially a confined body of air caused to expand by the heat and exert pressure upon a pressure responsive device whereby a mechanical or electrical control of a bell or signal may be effected.

In the form of apparatus preferably used for this purpose and to be now described 36 indicates one of any desired number of sealed air bulbs or chambers preferably of metal and 60 indicates the connecting air passageway or pipe by which the air pressure due to increase of heat is conveyed to a diaphragm case 35. The air passageway or the container or its connections is provided preferably with a small pressure modifying or equalizing vent 37 adapted to neutralize the effect of slight changes of pressure due to normal changes of temperature in the premises equipped and thereby prevent action upon the diaphragm of chamber 35. Said equalizing vent, however, is so restricted that pressure will accumulate and operate said diaphragm when heat as from a fire expands the air. 34 indicates the diaphragm operated by expansion of air in 36 and 60 and diaphragm case 35. Said diaphragm when it acts under such expansion rotates lever 33 whose lefthand end is thereby elevated and caused to trip weighted lever 31. Said lever then falls to the right, revolving around pivot 32, and in its descent strikes the upwardly extended valve stem 28 or other element of a valve causing the same to overcome the upward action of a spring 30 and to open valve 27 by forcing it downward from its seat. The opening of this valve permits flow of water or other fluid from a pipe 25 to a pipe 45 for actuating the bell or signal 50 or other signal as well as the circuit closer for bell 44 or other bell. Pipe 25 may derive its supply of fluid under pressure either from the distributing pipe 8 through pipe or connection 20 and check valve 21 or from another system of piping 22 which may be the usual building or domestic water supply and may be connected to pipe 25 through pipe 23 and check valve 24.

From whichever source the fluid is supplied to 25 it is prevented from entering the other through the actions of check valves 21 and 24. When valve 27 opens the pressure in 25 is conveyed to suitable alarm or signal devices as for instance by a connection as shown leading to the pipe 45 to operate the water wheel 46 and the diaphragm switch 39. It is prevented from flowing downward into retarding device 10 through the action of check 19.

If the water should perchance be shut off from the sprinkler systems, so that there would be no water to supply 25 through 20, the piping system 22 would supply the fluid, or vice versa. Should, however, no water be present in either the domestic piping system 22 or the pipe 8 of the firs extinguishing system, an alarm or indication may be given by electric signal bell 44 or other electric signal. The circuit for said signal is controlled by a thermostat acting on a circuit closer and independently of any action of valve 27 and fluid pressure operated circuit closer 40. This result may be obtained simply by providing the weighted lever pivoted at 32 with a bell crank arm 51 which, on the fall of the lever, rises and causes closure of circuit 54, 55 by electrical contacts 52 and 53, this circuit being that of a signal bell and a suitable battery or source of electrical energy

as for instance bell 44 supplied by current through a circuit independent of 40. Thus a bell or alarm will be caused to sound even if at the time of operation of valve 27, the supply of actuating fluid from both sources and their connections already described should fail.

By our invention we not only eliminate the delay in giving the signal or indication due to the action of the discriminating device already described but we also eliminate delay ensuing from any delay or failure of the sprinkler head or other thermostatically controlled outlet to open under the action of its thermostat control. Also as will be seen the sensitive thermostat, acting to bring circuit closer 52, 53 into action as just described and cause circuit of bell 44 to be completed, will afford a means of giving a signal in advance of the opening of the main valve as well as in advance of any signal produced by said opening.

We will now describe our invention as carried out in connection with a dry-pipe system of the form illustrated in Fig. 2. In this instance the main pipe 8 is supposed to contain air under pressure instead of a fluid extinguishing medium like water. The main valve 5 is held to its seat by the superior air pressure on the rear side of the supplemental valve disk 5′ mechanically connected with 5 as shown. The connection for supplying the fluid pressure directly to the nozzle 45 of the alarm-operating motor is taken directly from the space or chamber between the valves 5 and 5′ and obviously said fluid will flow to the motor 46 and operate the bell or alarm whenever the valve 5 is opened. This occurs when, through relief of air pressure in 8, the valve 5 is permitted to open. As will be seen, the discriminating devices already described are omitted in this embodiment of our invention.

To provide for possible leakage into the connection to the motor an automatic ball drip such as indicated at 50 may be provided. This is connected to the pipe leading from the intermediate chamber already described and is provided with a metal ball or valve 51′ which normally lies at the bottom of the elbow or trap of the ball drip as shown and in position to allow slight flow of water or air to pass over the ball and out of the drip through the raised nozzle or spout. When the main valve opens, however, the sudden rush of water or other fluid under pressure will cause the ball to roll upward to the constricted section of the spout-shaped body or outlet of the ball drip and close said outlet. Substantially all the fluid then admitted to the pipe leading to the fluid-operated motor will pass to said motor and cause the bell to sound. The supply of fluid under pressure to the connection 25 for operating the bell when the sensitive thermostat acts may, if desired, be taken from a chamber of the gate valve 2 which is at all times in connection with the pipe 1 although it would be possible to operate the system of Fig. 2 by taking such connection from the main or dry-pipe wherein air pressure is maintained. However, inasmuch as an hydraulic motor for operation by the water supply is preferably employed, it is preferable to supply the pipe 25 also with water under pressure. The supplemental water supply already shown in connection with Fig. 1 may however be retained in either case. The system, excepting for the omission of the discriminating devices and the manner of supplying the pipe 25 shown, functions substantially as already described and will eliminate delay in the giving of a signal or alarm due to the tardy action of the fuse or thermostat of the sprinkler head 9.

What we claim as our invention is:

1. In an automatic fire extinguishing system, the combination of a fuse-controlled outlet in the area to be protected, an alarm or signal apparatus for giving a signal upon the establishment of the flow of the fire extinguishing medium due to the action of said fuse and an independent sensitive thermostat and an alarm or signal controlled thereby, said independent thermostat and signal acting in response to heat in the area in which said fuse is located and in advance of the first-named signal.

2. In a fire extinguishing system, the combination of a fuse-controlled sprinkler, means for giving a signal upon the establishment of the flow of a fire extinguishing medium due to the operation of the sprinkler and an independent thermostat subject to increase of heat in the same heat zone in which the said sprinkler is located and means controlled thereby for giving a signal independently and in advaance of the establishment of flow of the fire extinguishing medium.

3. In a wet-pipe system for fire extinguishers, the combination with a means for giving a signal upon establishment of the flow of liquid, of an independent signal responsive in advance of the first-named signal to the action or control of an air thermostat having an air pressure modifying vent and located in the fire area protected by the establishment of said flow.

4. In a fire extinguishing system, the combination of a main valve, a signal-actuating fluid-operated motor supplied with fluid under pressure from the main valve when the same opens, a thermostat located in the area protected by fire extinguishing medium supplied through the main valve and means controlled thereby for admitting fluid to said motor independently of the action of the main valve.

5. In a fire extinguishing system having a main pipe normally under fluid pressure, a

main valve, a signal-actuating fluid-operated motor, means operatively connected with the main valve for supplying fluid thereto when the main valve operates, a thermostat in the area of heat control of the main valve and means controlled thereby for admitting fluid to the motor independently of the action of the main valve.

6. In a fire extinguishing system, the combination of a main valve controlling the supply of fire extinguishing medium thereto, a signal-actuating fluid-operated motor, means for admitting fluid thereto upon the opening of the main valve, a thermostat subject to the heating effects in the area to be protected by the opening of the main valves, a second valve controlled thereby and serving to admit fluid to the signalling means, and two independent sources of fluid supply connected to said second valve each through a check valve.

7. In a fire extinguishing system, the combination of a main valve controlling the supply of fire extiguishing medium thereto, a signal-actuating fluid-operated motor, means for admitting fluid thereto upon the opening of the main valve, a thermostat subject to the heating effects in the area to be protected by the opening of the main valves, a valve controlled thereby and admitting the fire extinguishing medium under pressure to the signal-actuating motor and an indepedent source of fluid supply connected to said valve through a check valve.

8. In a fire extinguishing system, the combination with means for giving a signal, two independent sources of fluid supply for actuating the signal device, a thermostatically controlled valve controlling the passage of said fluid to the signal device and a check valve interposed between the thermostatically controlled valve and each source of fluid supply.

9. In a fire extinguishing system, the combination of fluid-operated means for giving a signal, two independent sources of fluid supply therefor one of which is the connection from the main fire extinguishing system, a thermostatically controlled valve controlling the passage of the fluid to the signal operating device and a check valve between the thermostatically controlled valve and each source of fluid supply.

10. In a fire extinguishing system, the combination of a main valve controlling the supply of fire extinguishing medium thereto, a signal-actuating fluid-operated motor, means for admitting fluid thereto upon the opening of the main valve, a thermostat, a valve controlled thereby and serving to admit fluid to the signalling means, and two independent sources of fluid supply connected to said valve.

11. A fire extinguishing system having a thermostatically controlled sprinkler head combined with independently acting thermostatically controlled means thermostatically responsive to heat in the heat zone affecting said sprinkler head for giving a signal or alarm in advance of the action of said head.

12. In a fire extinguishing system having a sprinkler head and means for giving a signal responsive to the flow of the fire extinguishing medium to said head, of an independent thermostat thermostatically responsive to heat in the heat zone affecting said sprinkler head and electric alarm controlled thereby for giving a signal in advance of the signal resulting from establishment of flow to the sprinkler head.

13. In a wet-pipe fire extinguishing system, the combination with a sprinkler head and means for giving a signal or alarm automatically upon the establishment of flow through said head of an independent thermostatically controlled means thermostatically responsive to heat in the heat zone affecting said sprinkler head for giving an alarm in advance of said flow.

14. In a wet-pipe fire extinguishing system, the combination of a fluid operated gong or alarm with means for giving a signal or alarm thereby due to the establishment of flow to a sprinkler head, hydraulic alarm operating mechanism, two sources of fluid supply either of which may act for operating said mechanism, means for controlling the action of both said sources upon the alarm-operating mechanism and an independent electric signal thermostatically controlled independently of the action of the sprinkler head for giving an alarm when both sources of fluid supply fail.

15. In a wet-pipe fire extinguishing system, the combination of an hydraulically-operated alarm responsive to establishment of flow to the sprinkler head, a thermostat located in proximity to the sprinkler head and also controlling the action of said alarm, two sources of water supply for operating said alarm, an electric signal and means thermostatically controlled and thermostatically responsive to change of heat in the heat zone in which the sprinkler head is located for closing the circuit of said signal on the occurrence of fire whereby an alarm is sounded if both sources of supply fail.

16. In a fire extinguishing system, the combination of hydraulically operated alarms, separate controls therefor for causing the same to act on the occurrence of fire, sources of water supply for operating said alarms and an independent electric signal responsive to thermostatic control originating in the fire control zone for giving a signal when both sources fail.

17. In a wet-pipe fire extinguishing system, the combination with a water-operated bell operating from a suitable source of water supply on the establishment of flow through a sprinkler head, two sources of bell operat-

ing water supply thermostatically controlled from the fire zone and an electric alarm or signal operated independently and controlled by thermostatic action from the same fire zone.

18. In a fire extinguishing system provided with a sprinkler, the combination of a fluid-actuated signal and controlling means therefor operating upon the establishment of flow through the sprinkler and an independently operating means thermostatically controlled from the fire extinguishing zone in which said sprinkler is located and acting in advance of said controlling means for admitting actuating fluid to said signal.

19. In a fire extinguishing system provided with a sprinkler, the combination of a fluid-actuated signal and controlling means therefor operating upon the establishment of flow through the sprinkler and an independently operating means thermostatically controlled from the fire extinguishing zone in which said sprinkler is located and acting in advance of said controlling means for admitting actuating fluid to said signal from either of two sources.

20. In a fire extinguishing system provided with a sprinkler, the combination of a fluid-actuated signal and controlling means therefor operating upon the establishment of flow through the sprinkler and an independently operating means thermostatically controlled from the fire extinguishing zone in which said sprinkler is located and acting in advance of the establishment of said flow for admitting actuating fluid to said signal from either of two sources each provided with a check valve.

21. In an automatic fire extinguishing system, the combination of means for giving a signal with delayed action upon the establishment of a flow of a fire extinguishing medium in the distributing pipes and thermostatically controlled means thermostatically controlled by heating in the same heat zone from which said flow is established for giving a signal independently of but before such delayed action.

22. In a fire extinguishing system, the combination of a signal operating fluid motor means for admitting an operating fluid thereto upon establishment of the flow of a fire extinguishing medium to the system, means for delaying the action of the fluid upon the motor and an independent thermostat in the heat zone from which the flow of the fire extinguishing medium is controlled, and means controlled thereby for giving a signal independently of the action-delaying means.

23. In a fire extinguishing system, the combination of means for establishing flow of fire extinguishing medium automatically through the distributing piping, indicating means indicating the establishment of such flow through means for discriminating between surges of flow and regular or continuous flow and independent means for causing the signal or indication of fire, itself controlled by the action of an air thermostat in the fire zone or area from which the flow of fire extinguishing medium is controlled.

Signed at Cleveland in the county of Cuyahoga and State of Ohio this 9th day of March, A. D. 1927.

ERNEST A. LOWE.
JOHN R. HAMILTON.