

UNITED STATES PATENT OFFICE.

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PROTECTIVE APPLIANCE FOR MILLS, FACTORIES, &c.

SPECIFICATION forming part of Letters Patent No. 664,331, dated December 18, 1900.

Application filed October 17, 1898. Serial No. 693,725. (No model.)

To all whom it may concern:

Be it known that I, MORRIS MARTIN, of Malden, county of Middlesex, State of Massachusetts, have invented an Improvement in Protective Appliances for Mills, Factories, Store-

5 houses, &c., of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.
10 Most of the large mills, factories, storehouses, &c., to be insured at low rates have to be equipped with what is known as a "sprinkler system," the sprinklers operating automatically on the occurrence of a fire and per-
15 mitting the escape of water from the pipe system, and frequently by the action of the sprinklers alone destructive fires are obviated. The sprinklers used are all liable to accidents, whereby the valves may be disturbed, causing
20 them to leak, and sometimes there is a fault in the connection of the sprinkler to the pipe, which results in leakage and damage, and this leakage of water is frequently very great, flooding a factory or storehouse and damag-
25 ing valuable machinery and goods. It sometimes happens that a slow leak in a storehouse which is not visited frequently results in damaging great quantities of goods. This damage, due to leakage of the sprinklers, is recognized as a serious evil, and the insurance
30 companies have been obliged to meet this contingency and also insure against water damage due to leakage of the sprinkler system, as well as against fire. I have aimed to produce
35 an appliance whereby on the occasion of any leakage in the sprinkler or water-pipe system with which the sprinklers are connected, be it ever so little, the escape of said water will instantly close an electric circuit and ring a
40 bell or sound an alarm to give notice at suitable headquarters of the room, floor, or sprinkler, it may be, where the leakage is manifest. To do this, I mount the appliance, hereinafter to be described, in an electric circuit contain-
45 ing suitable annunciators and bells, and, if desired, the circuit may also include a register and time-stamp to record the time of operation of the signals.

The bells used may be tap or vibrating bells,
50 and hereinafter I shall in the claims designate

this bell, annunciator, or register as an "indicator," either one or all of which may be used, if desired.

The part of my appliance of the greater importance herein to be described is that
55 which I shall designate as a "hydrostat," and with it I may and preferably will combine a thermostat.

The hydrostat will be so located with relation to the pipe system or sprinklers that any
60 leakage will by gravity enter a suitable cup, and the water entering the cup, be it ever so little, will immediately effect the movement of material contained in said hydrostat, so that it will operate a circuit-controller to make and
65 break an electric circuit. With this hydrostat I have combined operatively a thermostat, it having as one of its parts a piston and spring, the piston being held by a drop of easily-fusible solder or material which will
70 melt at preferably a lower temperature than that required to let off the usual sprinkler, so that an incipient fire in its very early stage will let off the thermostat—that is, loosen its
75 piston, so that it will move and operate the circuit-controller of the hydrostat—thus giving the alarm as if the hydrostat had received water.

The invention herein contained is considered as a broad one and is not in all cases
80 limited to the particular form of hydrostat described; but I have devised a most effective and simple form of hydrostat which is especially adapted for quick or substantially
85 instantaneous work and is therefore most valuable in the particular connection in which the hydrostat is to be used.

My improved hydrostat consists, essentially, of a chamber or holder adapted to receive and
90 support the material which under the influence of water applied to it will quickly act to operate the circuit-controller of the hydrostat. The hydrostat is represented as provided at its upper end with a cup having a
95 connected chamber, the water entering said chamber so disturbing the material therein that it will be started in motion to effect the operation of the circuit-controller. The chamber referred to contains a substance
100 which readily enlarges or extends itself on

the admission of water, even of a very small amount—say half a teaspoonful—and it will act instantly to operate the circuit-controller.

The material contained in the chamber in one simple form of my invention may be composed of dry cellulose or paper or corn-pith. I have found that paper of the character designated as "blotting-paper" cut into disks superimposed in series to constitute a pile acts with the greatest rapidity and as it enlarges or elongates acts with considerable power to safely operate the circuit-controller. Instead of cutting this paper into disks the pulp from which it is made might be molded into a stick of greater or less length and diameter. This invention is not, however, limited in all instances to the employment of the materials named, as I may use any dry anhydrous material or any chemicals in their dry state, the chemicals being of such nature as will upon the addition of water thereto be put into a state of commotion and generate gas, creating a power sufficient to move the circuit-controller. As one illustration of this class of chemicals I will mention the ingredients of a sedlitz-powder. The cellulose material or blotting-paper or substance employed when in use may rest at one end against a piston fitted in said cylinder. This piston has been, as stated, devised to act as a thermostat, it having mounted under its head and about its shank a spring, the piston being then pushed in a direction to compress the spring, the shank of the piston being held in position by means of usual easily-melting solder or equivalent material. On the occurrence of heat sufficient to fuse this material the piston will be moved by the spring and move with it the paper or other material in the chamber, causing it to be moved to operate the circuit-controller.

These hydrostats, with or without their connected and coöperating thermostats, will be joined in series by wire in a circuit, and the piping of the system may form part of the circuit—for instance, the return-circuit. The hydrostats may be used at any point of the pipe system, but preferably directly under or near a sprinkler, so that any leakage from the sprinkler will readily enter the cup of the hydrostat and thence the chamber containing the material which under the action of water will be made to operate the circuit-controller. I prefer to locate the hydrostats underneath the pipe system, for the reason that any slow leakage will gravitate to the under side of the pipe and drop into the hydrostats; but they may be located at any desired point so long as they are arranged to receive water which may escape from the pipes or from the pipe at a sprinkler or other point.

Figure 1 represents a sufficient portion of a mill, factory, or other place to be protected by sprinklers and my improvements herein to be described added thereto. Fig. 2 shows an enlarged sectional detail of the combined hydrostat and thermostat applied to a pipe

under the opening therein, which in practice will receive a sprinkler. Fig. 3 is a detail showing two floors of a mill or factory with the hydrostats connected in circuit with an annunciator and alarm or tap bell, and Figs. 4 and 5 are modifications to be described.

In the drawings, let A represent the ceiling of a mill, factory, storehouse, or other place to be protected by a sprinkler system; B, suitable hangers to support the horizontal pipes C, said pipes extending from suitable risers C', the pipes C and C' constituting the pipe system. These pipes contain water under pressure, and they have suitable holes, as at a , in which are screwed or fixed sprinkler-heads D, each having a valve which is closed by pressure upon it of a strut composed of two parts D' D², united by some easily-fusible material, such as solder, the melting of the solder, due to a fire or rise of temperature, destroying the connection between the said parts, letting the valve rise under the pressure of the water, so that the water striking the spreader D³ will be thrown about in the vicinity of the sprinkler on whatever may be in the mill, factory, or storehouse.

The sprinkler shown is one of usual variety, and instead of it I may use any other usual or well-known form of sprinkler adapted to be released by rise of temperature in any other usual manner.

It frequently happens that the sprinkler-valve accidentally becomes loosened and water leaks through the sprinkler, and also sometimes a leak occurs at the point of connection of the sprinkler with the pipe. This leakage will drop down from the pipe and, falling upon machinery, goods, &c., is liable to do great damage, depending upon the value of the material which is wet down. I so locate my hydrostat E with relation to the pipe carrying the water and the sprinkler that any leakage will enter the open top of cup e , surrounding the chamber e' . The chamber e' is prolonged at e^2 above or into the cup, and said prolongation is provided with inlets, as e^3 , one or more, so that water entering the cup may pass through the inlet into the chamber. The top of this chamber is closed by an insulating-block f , which may be composed of india-rubber or other equivalent material, held in place by suitable screws f' . This insulating-block receives a bolt g , forming one member of a circuit-controller, the other member being movable, and, as herein shown, it is represented as composed of a disk g' , located within and guided by the inner walls of the chamber e' , said disk having, as shown, one or more spiral springs g^6 to always maintain contact with the metallic wall of the chamber, and said second or movable member of the circuit-controller rests, as represented in Fig. 2, upon the material which under the action of water will be enlarged or expanded to operate said movable member of the circuit-controller. The material employed in Fig. 2 is supposed to be blotting-

paper cut into disks and superimposed one on the other to make a pile. The stationary member *g* of the circuit-controller affords a means for connecting with the hydrostat the wire *h*, used as one member of the electric circuit. Fig. 2 shows the contact made between the wire and the fixed member of the circuit-controller by means of suitable nuts *h'* and *h''*, which are screwed together tightly one with relation to the other, so as to grasp the wire firmly. The cup *e* is in this instance of my invention represented as supported by a bracket made as a fork *m*, it having teats *m'*, which are sprung into holes in the cup, and the upper end of the bracket may have two jaws *m*, which may be sprung over the pipe C at any desired point; but instead of this bracket I may use any other suitable or convenient form or shape of bracket in order to support the hydrostat properly with relation to the pipe system and sprinklers. In the bottom of this chamber I have located a piston (designated as *g''*) having a stem *n*, the said stem being extended out through a hole in the bottom of the chamber, which stem receives upon it a quick-melting solder or material which holds the piston in its depressed position, it compressing a spring *n''*, located between the under side of the head of the piston and the end of the chamber. The piston so held constitutes what is herein designated as a "thermostat."

Assuming that the apparatus is in position and water should enter the cup, it will immediately enter the inlets *e''*, and ever so little of it, even half a teaspoonful, will meet the blotting-paper or equivalent cellulose or dry material, and the latter will expand and elongate itself, lifting and operating the movable member *g'* of the circuit-controller, causing the point *g''* to meet the inner end of the stationary member of the circuit-controller, and immediately thereafter this operation of the circuit-controller will be announced at an indicator or annunciator, as *o* or *o'*, and the bell or alarm *o''* will also be actuated, sounding the same and calling attention to the fact that leakage is occurring, and the annunciator will show the particular floor or room, or it may be the particular hydrostat, at which the water is escaping.

It will be understood that the annunciator may be of any usual known or suitable kind and may have any desired number of drops and that the wiring from the annunciator to the circuit-controller may be made in any usual or well-known way, as may be readily understood by a practical electrician.

In the drawings, Fig. 3, I have shown a building of two floors, one floor having the wire *h*, running to the annunciator *o*, and the other floor having a wire *h''*, which runs into an annunciator *o'*, the battery being located at B^x and the return-circuit wire *h''* being connected with the pipe system.

In the modification Fig. 4 I have shown the circuit-controller normally closed; but pref-

erably the said controller will be normally open, as in Fig. 2. In Fig. 4 the cellulose material or paper will be put on a rod *r*, attached to a head *r'*, supported by a spiral spring *r''*, said rod constituting the movable member of the circuit-controller, said movable member being kept compressed against the stationary member *g''* of the controller by said spring. Should water fall on the paper or material, the same will quickly swell between the fixed plate or support *r''* and the head *r'* and will move the head and rod to break the normally-closed circuit, thus operating the indicator, alarm, or annunciator.

When the movable member of the circuit-controller (see Fig. 2) is actuated to close the circuit, the spring *g''* thereon keeps in contact with the inner metallic side of the chamber *e'*, and when the controller is closed the electricity passes through said movable member, the upper part *e''* of the chamber, and the cup and hanger to the pipe C.

The cellulose, paper, &c., is dry or anhydrous, and, as has been stated, this invention is not intended to be limited in all respects to the particular kind of dry material used in the hydrostat to operate the circuit-controller quickly when water is added to the dry material.

Fig. 5 shows a modification wherein a powdered dry substance—for instance, a seditz-powder—is contained in the chamber *e'*, and lying on this dry material is a thickness of blotting-paper *t''*, on which rests a movable member composed of metal having a metallic point *s'* and one or more perforations, as *s''*, to let water entering the chamber pass through the said member and mix with the powder, and the effervescence of the powder will create a gas which will lift the member carrying the point *s'* sufficiently to cause it in this instance to close the electric circuit on the stationary member *s''* and operate the indicator. The paper *t''* will check the outflow of the gas generated in the powder.

I may use a hydrostat at each sprinkler, or I may use a less number of hydrostats, connecting adjacent hydrostats with a trough *t*, it receiving any water which may leak from the system and conduct it into the hydrostat.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a protective appliance for mills and the like, a hydrostat comprising a reservoir or chamber, hydro-expandible material supported in said chamber and means for conducting liquid into said chamber.

2. In a protective appliance for mills and the like, a hydrostat comprising hydro-expandible material, means for supporting said material, means for conducting liquid to said hydro-expandible material, and an indicator set in motion by the expansion of said material.

3. A hydrostat composed of a chamber or holder, a circuit-controller, and hydro-expan-

sible means sustained by said chamber or holder, and adapted in the presence of water to operate said controller and means for conducting water to said chamber, substantially as described.

4. A hydrostat composed of a chamber containing anhydrous material in a free or loose condition and a circuit-controller actuated through the movement of the said material in the presence of water.

5. A hydrostat composed of a chamber or holder containing paper of the character known as "blotting-paper," and a circuit-controller, said controller being operated quickly by the expansion of said paper after the application of water thereto, substantially as described.

6. A hydrostat having a chamber containing hydro-expansible material supported by said chamber, an electric circuit, an indicator controlled by said circuit, and a circuit-controller adapted to be operated by the expansion of such material.

7. In combination with a water-supply system of a hydrostat having hydro-expansible material and means to sustain said material, said hydrostat being connected to and adapted to catch water issuing from said system.

8. A hydrostat having a hydro-expansible material, and means for sustaining the said material, in combination with a thermostat adjacent thereto and a circuit-controller operable by both the hydrostat and thermostat.

9. A circuit-controller, and a chamber or holder having a movable piston and rod at one end to sustain dry cellulose material adapted to swell and increase in size rapidly by the action of water to operate said circuit-con-

troller, combined with a spring acted upon by said piston and held compressed by easily-fusible solder, the melting of said solder also operating the said circuit-controller, substantially as described.

10. An electric circuit, an indicator governed by the circuit, a circuit-controller, a hydrostat having hydro-expansible material adapted to control said circuit-controller, and a thermostat also adapted to control said circuit-controller.

11. A sprinkler, a hydrostat subjacent thereto and comprising a chamber, hydro-expansible material contained within said chamber and an indicator under control of the said hydro-expansible material.

12. A hydrostat comprising a chamber and a drip-cup leading thereto, said chamber containing material the cubical area of which is changeable by water, and an indicator under control of said material.

13. A sprinkler, a hydrostat subjacent thereto and comprising a chamber, a drip-cup leading thereto, said chamber containing material the cubical area of which is changeable by water, and an indicator under control of said material.

14. A hydrostat having hydro-expansible material, a thermostat, and an indicator under control of both said hydrostat and thermostat.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MORRIS MARTIN.

Witnesses:

GEO. W. GREGORY,
MARGARET A. C. DUNN.