April 24, 1928. 1,667,425

A. J. LOEPSINGER

HEAT RESPONSIVE APPARATUS

Filed Aug. 27, 1921

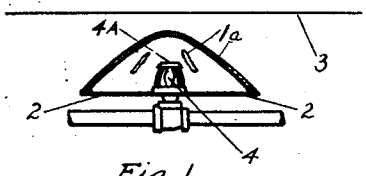


Fig. 1

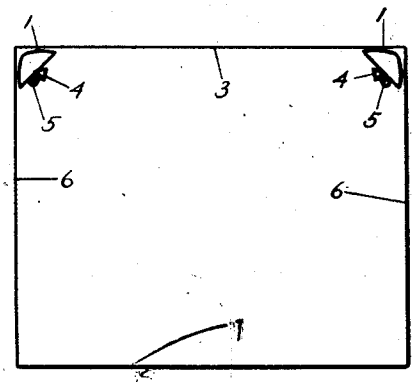


Fig. 2

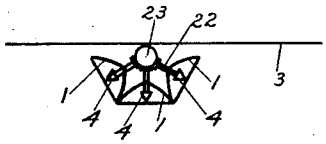


Fig. 3

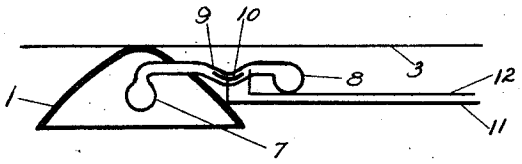


Fig. 4

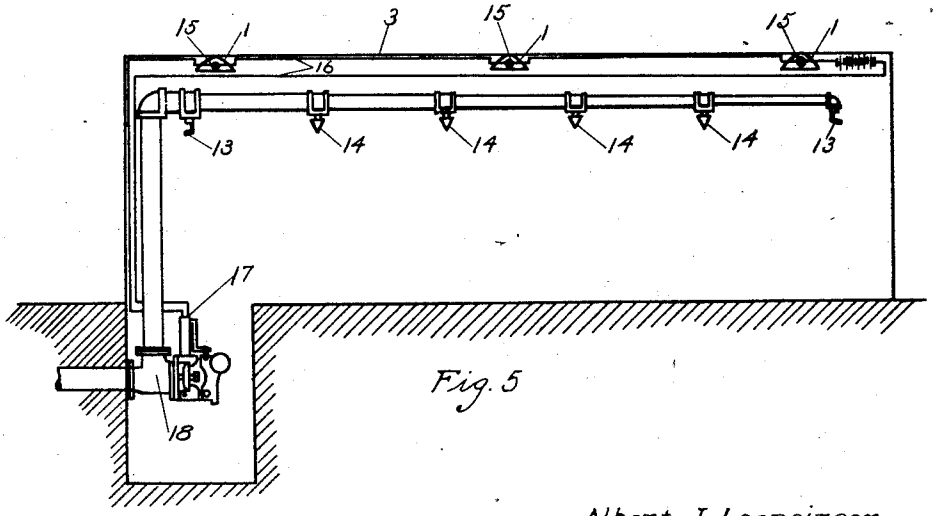


Fig. 5

Albert J. Loepsinger
INVENTOR

BY
Mitchell, Chadwick & Kent,
ATTORNEYS.

Patented Apr. 24, 1928. 1,667,425

UNITED STATES PATENT OFFICE.

ALBERT J. LOEPSINGER, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR, BY MESNE ASSIGNMENTS, TO GENERAL FIRE EXTINGUISHER COMPANY, OF PROVIDENCE, RHODE ISLAND, A CORPORATION OF DELAWARE.

HEAT-RESPONSIVE APPARATUS.

Application filed August 27, 1921. Serial No. 496,011.

This invention relates to processes for detecting and locating fire, and to apparatus therefor and for extinguishing the fire thus located. It is herein described and illustrated as it may be applied in connection with an automatic sprinkler system for extinguishing the fire thus located, or other automatic apparatus whose operation may be desired upon the occurrence of a fire, such as an automatic release for closing a door, or covering a vat, or for giving an alarm. Devices such as thermostats and fusibly closed nozzles are already in widespread use, which respond when a predetermined temperature is reached, and other devices which respond when the rate of rise of temperature becomes abnormal; but these are actuated only by temperatures at the device itself. It is well known that in a considerable portion of all fires occurring in sprinkler-protected property, perhaps as many as a third of them, the sprinkler which first opens is not the one in position to extinguish the fire. This is because a current of air has carried the heat to one side. Sometimes a sprinkler opens when no fire has occurred, the temperature in its vicinity having been raised to the critical point by some ordinary cause such as heat from a boiler in the vicinity. It is the object of the invention to eliminate the shortcomings of present methods and apparatus illustrated by the two cases mentioned, and to make the improvements and obtain the advantages that in other respects characterize the process and apparatus hereinafter described. These objects are attained by selecting a portion of that part of the heat emanating from a fire, which travels in straight lines. The invention is not dependent upon a rise in temperature of the air in the vicinity of the sprinkler or other sensitive apparatus, although there may be such a rise, nor need the apparatus be located over the area which it protects. It may indeed be screened or enclosed.

In considering the following exposition the distinction must be borne in mind between the three several methods by which heat is transmitted, conduction, convection and radiation. Automatic thermostats and sprinklers as heretofore installed have been worked by heat reaching them by convection. The heat moving by conduction and by radiation is too low in intensity and too small in quantity to effect so small and so remote a thing as the strut of an automatic sprinkler. But if and when a current of heated air and gases rises and moves to the location of the sprinkler, and envelopes it, the strut begins to acquire the temperature of this new medium that surrounds it, and soon reaches the temperature predetermined for its action. It is one purpose of the invention to provide aparatus that will operate while the air or other gaseous medium surrounding it, or the pipes leading to it, are still unchanged in temperature, or not sufficiently changed to actuate it. To gain these various advantages, the invention takes a part of the heat which has heretofore been ineffective to operate the responding device because of being too weak, but which has the characteristic that its propagation is independent of wind currents and which therefore affords a reliable index of direction. Experiments show that this variety, known as "radiant heat", when gathered from a reasonable area of flame and deflected and concentrated upon a relatively small spot is sufficient in quantity to cause the device to respond. The deflection is preferably accomplished by reflection from a concave mirror, whose surface may be a surface of revolution of an hyperbolic or other conic section. Such a mirror may be set so as to receive rays of radiant heat coming from a delimited area, i. e., the area that is to be protected. As the heat responsive strut of the sprinkler, or the heat receiving part of the thermostat, is never a mere mathematical point, rays do not have to be reflected to an exact focus in order to be interrupted. And it is not essential that all the rays falling within the area of the reflecting surface be deflected by it, for the apparatus is substantially as effective when openings are provided in the surface to permit a portion of the sprinkler discharge to pass therethrough for protecting the area beyond. It is obvious that such openings also permit passage of heat rays, but the number going through is so small, compared with the number deflected, that their loss is entirely negligible.

It is among the advantages of the invention that apparatus operated by it may effectively be placed to one side of the region to

which it relates, as in the corner of a room where its presence is inconspicious or horizontally beside something that is to be protected. The action may be direct, as where the heat is focused upon the strut of a sprinkler, the yielding of which directly releases water; or it may be indirect as in the case of a thermostat operating a release box, which in turn may operate or release anything desired, such as a dry pipe valve, a fire door, the drain or the cover of a tank, or an alarm. The showing of the invention herein made illustrates typical instances of its applications in these various fields. It is intended that the patent shall cover by suitable expression in the appended claims, whatever features of patentable novelty exist in the invention disclosed.

In the accompanying drawings, which are more or less diagrammatic:

Figure 1 is a side elevation of apparatus embodying the invention;

Figure 2 may be considered as an elevation showing how the device can be applied inconspicuously in the corners of a room;

Figure 3 shows a cluster of three such devices which, although at a single location, would be responsive to fire at any of three different regions;

Figure 4 illustrates the application of the same to a thermostat; and

Figure 5 illustrates its application to a thermostat operating a release box which opens a dry pipe valve for a deluge system of sprinklers.

In the drawings, throughout the several figures, the reference character 1 indicates a reflector for heat which may be of any suitable material and shape, being in Figure 1 mounted on arms 2 that spring from the sprinkler body. In Figure 3 reflectors are mounted on branches 22 from a short stem 23 or other form of support which is fastened directly to the ceiling 3. The strut 4 of the sprinkler is set substantially at the focus of the mirror. In a case such as that of Figure 1 most of the water is deflected downward by the deflector 4^a on the sprinkler head. In consequence the presence of the heat reflecting mirror 1 as a hood over the sprinkler does no harm. However, if the ceiling were combustible and it were desired to wet the surface directly above the sprinkler head, the reflector 1 might be perforated to permit the passage of water, as shown in Fig. 1, where the perforations are numbered 1^a.

The arrangement illustrated in Figure 2 shows an installation that may be made where sprinkler pipes 5 are located in the angle formed between the walls 6 and ceiling 3. The reflectors are placed on an inclined axis and thus are in position to receive heat radiated from a fire in the middle of the room, even though the gas and air currents should take the heat by convection in any direction.

The invention affords means of reducing the expense of installation of sprinkler systems, which is a matter of importance, because it is only the matter of expense which at the present time prevents their installation in certain classes of buildings. The invention permits saving by cutting down the number of heads used, and thus saving piping expenses, which is possible because of proximity of sprinkler heads at present thought necessary is not required by the spraying device, but is due to the need for insuring prompt action of the extinguishing device. It is practicable with the present invention to extend greatly the spacing between sprinkler heads and yet to provide adequate protection. One way of accomplishing this is by arranging the sprinkler and reflectors in clusters as shown in Figure 3. In this case the reflectors are so placed that each will receive rays of heat radiating from the particular area to which each applies, the group as a whole protecting a large area with each sprinkler and reflector pertaining to a particular section of it.

In order to operate a fire door or window to prevent the spread of a fire, a reflector may be arranged to concentrate the radiant heat from a fire on the fusible link or other responsive part of the releasing system. So, also, a reflector may operate with other devices, as for example, the socalled rate-of-rise devices which operate when there is a rise of temperature greater than that which occurs under normal conditions of temperature change in a room. A device of extreme sensitiveness of this nature is shown in Figure 4 where a glass bulb 7 is provided in the focus of the reflector 1, connected by a tube with a glass bulb 8 which is outside of the reflector and subject to similar general conditions of room temperature but not subject to the action of the reflector. The two bulbs are connected through a tube 9 having a relatively small bore and formed with a dip portion comprising a shallow U wherein a thread of mercury 10 normally rests. An electric conductor 11 leads into the bottom of the U and is in contact with the mercury; the other conductor 12 of the same circuit leads into the tube just above the end of the mercury thread, on the side toward the bulb 8. Under normal conditions bulbs 7 and 8 are heated equally and are cooled equally and the mercury remains in the bottom of the U. But when heat rays from a fire are concentrated upon the bulb 7 the air in this bulb expands driving the mercury along its tube until contact is made with the conductor 12, thus completing a circuit which may be used to perform any desired predetermined function. The applications of the device to make a deluge system of fire

protection automatic, is illustrated in Figure 5 where a series of open sprinklers are shown at 13 and 14 to which water is admitted when the dry pipe valve 18 is open. Thermostats 15, arranged at any desired location with reflectors for concentrating upon them rays which originally emanate from the region to be protected, can be arranged wherever desired and these thermostats may be of any suitable type, as for example arranged to close a circuit through wires 16 so that a current flows; or to break the circuit so that some force is released, with the result of causing the opening of the valve 18 by suitable mechanism.

The deflector may be of any desired shape which will accomplish the functions stated; as for example, it may be hyperbolic to gather heat from a considerable area concentrating it, or it may be parabolic, or made of other conic sections. Moreover the heat concentrating device is not necessarily a reflector.

When the axis of the device is inclined to the protective surface, it will cover a larger area than if directly over it; and the water thrown from the sprinkler so arranged may extend further. This permits the planning of sprinklers without interfering so much with the decorative scheme of an apartment. The shape of the area to which the deflector and sprinkler are responsive may permit the use of sprinklers in places where they are not ordinarily practicable, for the wall of the reflector may protect the strut of the sprinkler from an adjacent surface which is known to be hot normally. Another characteristic advantage of the invention is that it permits the use of a sprinkler whose strut has a higher melting point, because the temperature thereof can quickly be raised by the concentration of heat, caused by the deflector. A sprinkler can then be used which requires a source of heat of considerable intensity to melt it, so that the ordinary temperature of a hot room cannot work the sprinkler (say above 160 degrees) as it may where the sprinkler is set to operate at the lower temperature usually desired. These advantages are additional to those others which follow from the operation of the sprinkler by radiant heat in the direction of promptness, because of the instantaneous transmission of that form of heat; and without detracting from the responsiveness of the sprinkler or any thing further that may come to it by convection as in apparatus heretofore known.

I claim as my invention:

1. Heat responsive apparatus adapted to be controlled by the occurrence of a fire in a predetermined region, comprising means for concentrating heat rays emanating from said region combined with heat responsive means located at the point of concentration.

2. Heat responsive apparatus adapted to be controlled by the occurrence of a fire in a predetermined region, comprising means having a reflecting surface for concentrating heat rays emanating from said region combined with heat responsive means located at the point of concentration.

3. Heat responsive apparatus adapted to be controlled by the occurrence of a fire in a predetermined region, comprising means having a reflecting surface, formed by the revolution of a conic section, for concentrating heat rays emanating from said region combined with heat responsive means located at the point of concentration.

4. An automatic sprinkler adapted to discharge over a region combined with means adapted to gather heat rays from the said region at the heat responsive part of said sprinkler, said means comprising a reflecting surface having openings therein for permitting passage of fluid beyond the said surface.

5. In heat responsive apparatus, means for receiving heat from a region and concentrating it in a smaller region, combined with means located at said region of concentration and responsive to said heat, and fire extinguishing apparatus arranged to be put into action by said responsive means.

6. In a sprinkler system the combination with a room, of a pipe and sprinkler of the system arranged at one side of a region which is to be protected thereby, and a device larger than the heat responsive part of the sprinkler for receiving and concentrating on said heat responsive part heat emanating from said region.

Signed at Boston, Massachusetts, this 24th day of August, 1921.

ALBERT J. LOEPSINGER.