Aug. 1, 1939. E. H. ROUSE 2,168,244

RETARD DEVICE FOR AUTOMATIC FIRE CONTROL SYSTEMS

Filed Dec. 18, 1934

Fig. 1

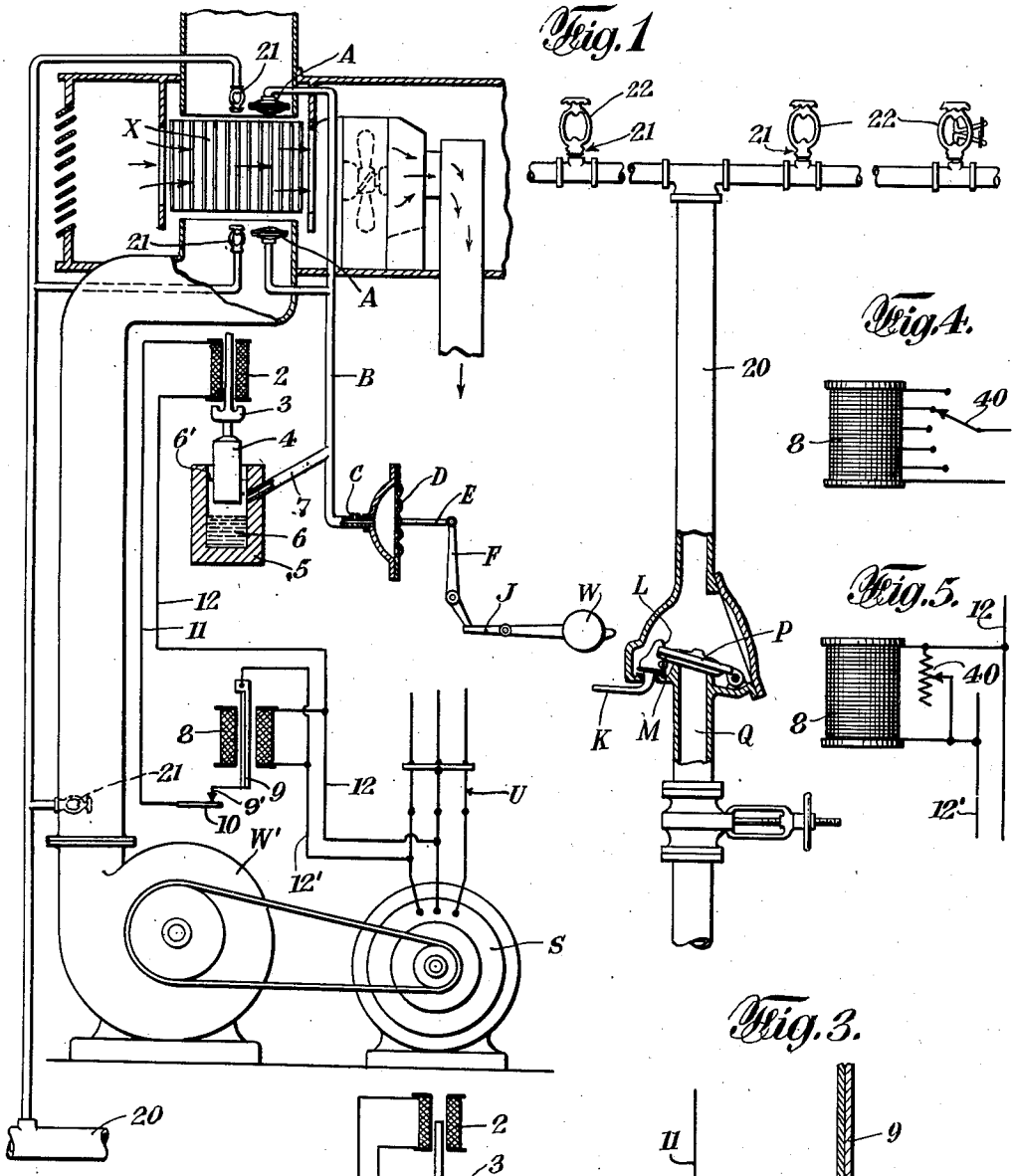


Fig. 4.

Fig. 5.

Fig. 2.

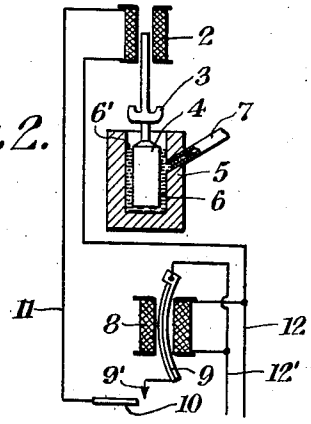
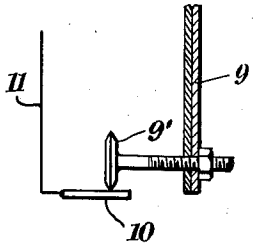


Fig. 3.



INVENTOR
Edward H. Rouse
BY
Townsend & Decker
ATTORNEYS

Patented Aug. 1, 1939 2,168,244

UNITED STATES PATENT OFFICE

2,168,244

RETARD DEVICE FOR AUTOMATIC FIRE CONTROL SYSTEMS

Edward H. Rouse, Thomaston, Conn., assignor to Automatic Sprinkler Company of America, Cleveland, Ohio, a corporation of Delaware

Application December 18, 1934, Serial No. 758,005

25 Claims. (Cl. 169—17)

My invention relates to automatic fire control apparatus wherein releasing devices are brought into action through the operation of a heat actuated detector and has reference more particularly to systems wherein said detector consists of a rate-of-rise temperature responsive device acting upon increase of temperature at a greater than a predetermined rate predetermined by the adjustment of the device or the intermediary devices between the same and the releasing device.

The invention is particularly useful to those systems wherein the rate-of-rise device operates through expansion or change of air pressure condition and such change of pressure condition is communicated to a pressure responsive diaphragm or similar device operating upon the releasing mechanism or upon such other device as may be chosen for control of the fire mechanically or through visual or audible indications giving notice of the existence of fire calling for the application of the hand extinguishers or other expedients.

The invention has particular reference to installations where the heat actuated device may be subject to abnormal changes of temperature incident to normal operations conducted in the building or plant where the same is installed and wherein such fluctuations do not necessarily indicate the presence of fire.

The invention consists essentially in applying means for temporarily rendering the heat actuated detectors ineffective by modifying, neutralizing or nullifying the operation of the intermediate devices between the same and the fire control mechanism such for instance as a valve controlling the flow of fire extinguishing fluid.

The invention is particularly useful also for installations wherein fans or blowers circulate the air in a way such that the circulated air will impinge upon or affect the rate-of-rise device. The utility of my invention in such a plant finds an illustrative example in a paper making plant wherein the air is circulated to dry the pulp by means of fans or blowers and wherein at the starting operation the conditions may be such that a change of temperature of an exceedingly great amount or rate due to the circulation of the air impinging upon the heat actuating device would in the absence of my invention call the fire extinguishing appliance into operation.

The special utility of my invention in such an installation will be apparent from the statement below as to operating conditions in a paper making plant, although, as will be obvious, the invention is equally useful and advantageous in its application to other plants or enclosures where an abnormal rate of rise of temperature is artificially produced.

My invention also consists in details of construction and combinations of devices as hereafter more particularly described and preferably involves the operation of a valve which is applied to the pressure conveying piping through which pressure is brought to the pressure responsive device, said valve being so constructed as to modify such pressure or nullify the effect of the pressure medium upon the pressure responsive device employed for governing the action of the fire control device and thereby temporarily disable the operation of the system.

It should be understood that while I have described the use of a heat detector which produces change of air pressure and operates on the rate-of-rise principle I do not limit myself to such particular character of heat responsive device operating through rate-of-rise of temperature but intend to cover by my claims any rate-of-rise device which upon operation releases or brings into operation a pressure which will act upon a pressure responsive diaphragm or other medium that is effective in bringing the release mechanism into action.

Referring now to the case of a paper making machine to which for sake of illustration my invention is herein shown as applied.

In a typical paper making plant it is usual to employ heat exchangers, sometimes called economizers, through which the heat of the heated vapor drawn from the machine by the blower or exhaust fan is used to heat fresh incoming air which is forced through suitable ducts into the machine room for circulation as the drying agent by passing over the pulp or material to be dried.

Due to the large quantities of vapor handled by the fans, the draft is very great, often 3000 lineal feet per minute. The heated vapor, as it leaves the paper machine, is heavily loaded with finely divided paper particles and is saturated with oil, grease and corrosive substances in suspension. These substances are deposited on the outer surface of the corrugated metal boxes, enclosure and ducts of the economizer. The quantities of vapor involved can be visualized when it is considered that the pulp supplied to the paper machine consists largely of water, which water must be evaporated before the paper is finished. Thus, for every ton of paper made, several tons of water must be vaporized and pass through the economizer. Ordinarily, the material deposited on the boxes is wet and not highly inflammable, but

the flow of pulp over the machi
temporarily stopped (as for inst
broken paper sheet)
through the

vices are indicated as located in the chamber in which the economizer is located and through which the air would be circulated by the action of the blower and another one of them is indicated at 21 in the air duct through which the blower circulates the air. For simplicity the connections of said outlets at the water control valve are omitted.

As the heat detectors A are located in position to be affected by heated air incident to the use of the manufacturing process, as for instance in the ducts or chambers through which the air is circulated during the operation of the plant, they may be at the temperature of the room or enclosure which at times may be quite cold. When the process is started, such heated air reaching thermostats A may bring about a very rapid rate of increase in the temperature of the air contained in A, whereas there would be at that particular time no fire, with the result nevertheless that the fire control or extinguishing apparatus would be brought into operation although the action thereof is unnecessary or undesirable at this time, as for instance on the resumption of operation of the machine after a shutdown.

In the particular manufacturing operation selected to illustrate the application of my invention S indicates an electric motor obtaining its operating energy through electrical supply lines through switch U used in starting and carrying on such operation. Motor S drives blower W' causing air to be drawn through the blower and discharged through economizer X.

To overcome the likelihood of operation by the heat detectors actuated under these conditions, I provide, in the preferred manner of carrying out my invention, a mercury valve acting as a vent control and comprising essentially a body of mercury or other liquid which normally closes a vent connected to the pressure conveying tube or some portion of the apparatus in which the change of pressure takes place for operating on the pressure responsive device, and by suitable means, as for instance a magnet or solenoid, change the position or level of said mercury or liquid to uncover or open the vent, while the restoration of the liquid to its normal position or level effects the closing of the vent and puts the apparatus in condition for normal operation.

The particular type of mercury valve shown comprises a mercury holding dashpot 5 containing a body of mercury 6 the change of level of which is effected by the operation of the plunger or liquid displacing element 4 under the control of the solenoid 2. When the plunger is in the position shown in Fig. 2 in which the mercury 6 is at the level 6' said mercury closes the branch or air vent tube 7 connected to the pressure conveying pipe B. At such time magnet or solenoid 2 is inactive so that through the bias effected by the weight of 4 and associated parts the parts will be in the position shown in that figure. When, however, the solenoid or magnet 2 is energized it draws the plunger or liquid displacing element 4 up into the position shown in Fig. 1 and temporarily maintains it in such position against the biasing action of gravity in which position the level of the mercury in the dashpot or chamber 5 is allowed to fall thus uncovering the lower end of air tube 7, and permitting the expanding air pressure in thermostat A to escape to the atmosphere and temporarily nullify the effects of pressure or change of pressure developed by A. This prevents operation of the release devices the action of which is controlled by the pressure responsive device D.

The energization of magnet or solenoid 2 is conveniently effected, at the time the fan or blower is brought into operation by suitable connections of said coil with the means for starting the motor S which operates the blower, said means being shown as a suitable starting switch U. Electrical connections of the solenoid 2 suitable for this action are shown diagrammatically as consisting of wires or connections 11, 12 and 12' to which current is supplied through closing the control switch U for the motor S. In the connections 11—12—12' there is interposed in the preferred form of my invention, an electric switch the elements of which are indicated at 9' and 10, such switch being interposed in the connection from wire 11 to wire 12' leading to the control switch U. Said switch is normally closed but is caused to open after a predetermined interval of time to thereby break the circuit and thereby deenergize the solenoid 2 and allow the liquid displacing element 4 to drop back to the position shown in Fig. 2 and thus close the vent.

The means for effecting the opening of the circuit at the switch 9'—10 may comprise an electric heating coil 8 which is connected to the circuit closed by the operation of switch U, by taps from the wires 12—12' as shown, said coil operating as a heating coil to cause distortion of the bi-metallic strip 9 heated therein and attached to one of the contacts as for instance 9'. The contact 9' is caused to slide, by the action of the bi-metallic strip 9, over contact 10 when current flows through coil 8 so as to distort the element 9 and break the circuit through the heating action of said current flowing through the coil by means of the connection shown when the starting switch U is closed to start the motor S.

As current flows through heating coil 8, bi-metallic strip 9 is distorted and finally assumes the position shown in Fig. 2 in which sliding contact 9' has been withdrawn from contact 10 thus breaking the electric circuit through solenoid 2, when the weight of the armature 2 and plunger 4 will allow these to assume the position shown in Fig. 2 and raise the level of mercury to 6' closing the outlet of tube 7 and putting the thermal system into normal fire detecting condition.

The interval of time between the starting of the motor driven blower W and the breaking of contact between 9' and 10 can be made short or long by adjusting the position of the parts, with relation to one another. For instance, should but a few seconds' duration of time be desired, the position of sliding contact 9' could be quite near the end of 10 so that a very slight movement of the contact end of 9' would break contact. If, however, a longer period of time be desired, the distance that 9' would have to travel on 10 would be made proportionately greater.

Fig. 3 shows in detail one way in which this period of time may be adjusted by adjustment of the position of the sliding contact 9' on the cooperating contact 10 connected to wire 11. For this purpose the contact may be carried by an adjustment screw adjustable in the end of thermostatic strip 9 to determine the distance to which it must move before breaking the connection. By this means the period during which the device shall continue to be rendered inoperative through the action of the vent valve may be readily adjusted since the effect is to prolong the

period during which the thermostat strip 9 shall be heated by the coil 8 in order to cause the parts to move to the position where the circuit over 11 and through coil 2 will be broken.

The restoration of the parts to the position in which the vent will be closed as indicated in Fig. 2 being thus effected the apparatus is in condition for normal operation by the effect of heat operating through the heat detectors upon the pressure responsive device D and means controlled thereby, as for instance the water valve P supplying fire extinguishing medium to the sprinklers or other outlets 21 already referred to. When the control switch U is turned to throw out the motor S the switch 9'—10, being no longer affected by heating current, will resume the position indicated in Fig. 1 so that on reclosing the switch U the magnet or solenoid 2 will be operated to cause temporary opening of the vent and the reheating of the bi-metallic strip 9 after predetermined interval of time will cause the contacts 9'—10 to break the circuit of 2 and thereby cause the vent to be closed. The time delay ensuing before the circuit of the magnet 2 is broken by the heating effect on the switch governing the circuit of said magnet might be governed by adjusting the rapidity of the heating of the bi-metallic strip through the action of the current instead of by adjusting the contacts thereof; thus, for instance, the number of heating coils or the amount of current supplied thereto might be adjusted so that a longer interval of time would be required before the bi-metallic strip is heated sufficiently to operate a switch connected to the circuit of the coil 2. For instance, as indicated in Fig. 4, the number of turns in the coil might be adjusted by switch 40 or as indicated in Fig. 5, a variable shunt around the coils 8 might be employed for the same purpose.

While I have described above a time delay apparatus or relay involving a heating coil and bi-metallic strip, I do not wish to confine myself to this method of establishing a time delay in the restoration of the valve to normal position but would use any one of the types of apparatus known to those skilled in the art as definite time relays.

While my invention has been described herein with reference to a fire extinguishing system, manifestly it may be employed in its broader aspects to a fire detecting and a fire signalling system per se and the extent or scope of the invention accordingly is to be measured with this explanation in view.

Having described one application of my invention which I claim as new and novel and on which I desire Letters Patent, I claim:

1. In a fire control apparatus, the combination in an enclosure with a pressure operated release device for said apparatus and a heat actuated device governing the action of the same and installed under conditions in said enclosure where it is subject to temporary fluctuations of temperature incident to operations performed within said enclosure, and a valve movable in response to operations in the enclosure to a position nullifying the release device pressure during the said temporary fluctuations of temperature for rendering the control apparatus ineffective, said valve being automatically restored to normal position effectuating said pressure in the release device to respond to temperature variations after the temporary fluctuations have substantially ceased.

2. In a fire detector system for use in an environment subject to artificially produced conditions sufficient to actuate said system, the combination of a heat actuated pressure producing detector located in a position such as to be actuated by said artificially produced conditions, a pressure responsive device responsive to the action of change of pressure produced by said detector, and a valve operated simultaneously with the production of said artificial conditions, said valve being constructed and arranged to render any change of pressure produced by the detector temporarily ineffective to operate the pressure responsive responsive device during the existence of said artificial conditions.

3. In combination with an automatic fire control device installed in a plant under conditions where it is subject to fluctuations of temperature due to operation of an air circulating fan or blower, a heat actuated detector installed in said plant so as to be subject to fluctuations of temperature incident to starting of the blower and to be responsive to fire conditions, and means responsive to initiation of operation of said fan or blower for rendering said heat actuated detector ineffective temporarily during the duration of said fluctuation of temperature attendant upon starting the fan or blower.

4. In a fire control apparatus responsive to heat generated by fire and also responsive to artificially produced temperature variations, the combination with release mechanism and a heat actuated detector in the fire zone, of control means for automatically freeing said release mechanism on detection of fire by said heat detector, and means responsive to initiation of operation of means producing the artificially produced temperature variations for nullifying the action of said control means for a predetermined duration of time allowing said artificial variations to become normal variations, and then stopping the nullifying action, said means thereby restoring the normal pressure condition of the pressure responsive device to render the same effective under fire conditions.

5. In a fire control apparatus in an environment subject to abnormal temperature conditions sufficient to actuate the same, the combination with a release mechanism and a pressure responsive device for operating the same, of a heat actuated detector located so as to be subject to the abnormal temperature conditions and responsive to abnormal rate-of rise of temperature and controlling the pressure operating an said pressure responsive device, and means responsive to initiation of operation of means producing said abnormal temperature conditions for nullifying or rendering said pressure ineffective for a period of predetermined duration to allow the abnormal conditions to become normal conditions, said means thereupon permitting the pressure developed by the heat detector to be effective on said pressure responsive device.

6. In a paper making plant provided with heat actuated detectors and fire extinguishing devices subject to the control of the latter, a fan or blower for circulating air, means for starting said fan or blower, and means responsive to initiation of operation of the blower or fan for simultaneously nullifying the action of the heat detectors during the starting operation and for a predetermined period of time.

7. The combination in a fire control apparatus, of a pressure conveying tube in which pressure is produced under temperature changes for operating the apparatus, a valve applied thereto and controlling the maintenance of pressure therein, a

magnet for opening the valve to prevent thereby creation of pressure from heat conditions, a blower acting to produce abnormal temperature changes when starting causing changes of pressure in the tube and means for energizing the magnet through the action of the starting means for the blower, said pressure conveying tube being in an environment influenced by the action of said blower.

8. In a fire control apparatus, the combination with a pressure conveying tubing in which pressure is produced under temperature changes for operating the apparatus, of an outlet valve connected thereto and normally closed, means for opening the valve to prevent creation of pressure from abnormal changes of temperature other than those caused by fire and acting to cause pressure changes in the tubing, and means for closing the valve and for delaying the closing thereof to maintain the same open for a predetermined interval of time during the return of the abnormal temperature changes to normal conditions.

9. In a pressure controlled device, the combination with pressure conveying tubing in which pressure is produced under heat conditions resulting from fire, of a biased and normally closed vent valve for releasing pressure from said tubing, said valve being biased toward closed position, an electromagnet acting on the vent valve to open the same for venting the tubing and preventing operation of the pressure controlled device, under abnormal heat conditions not resulting from fire, and means for delaying the movement of said valve to closed position and thereby enable the abnormal heat conditions to become normal and the pressure to thereupon control the device under fire conditions.

10. In combination, a translating system adapted to supervise a progressively changeable atmospheric condition and to operate when said condition assumes a certain state, a condition changing system adapted to cause said condition to progressively change to said certain state, means for initiating operation of said condition changing system, and means set in operation on such initiating for disabling the translating system for operation at said certain state.

11. In combination, a translating system adapted to supervise a changeable temperature condition and to operate when said condition assumes a certain state, a temperature condition changing system adapted to cause said certain state, means for initiating operation of said condition changing system, means set in operation by such initiating for disabling the translating system for operation at said certain state, and means for automatically again rendering the translating system normally operative after a predetermined time after the disabling thereof.

12. In combination, a translating system adapted to supervise a certain temperature condition subject to change and adapted to be set in operation by said condition when the rate of change exceeds a predetermined rate, operating means adapted when operated to change said condition at a different rate exceeding said predetermined rate, and means set in operation when said operating means is set in operation for preventing the operation of the translating means by said condition due to said different rate.

13. In a fire control apparatus having a pressure controlled operating element, a translating system including a heat detector and associated pressure producing means constructed and arranged to supervise a progressively changeable atmospheric condition and to produce a pressure condition of a degree to operate the fire control apparatus when said atmospheric condition assumes a certain state, a condition changing system constructed and arranged to cause said atmospheric condition to change for a time period to said certain state, means for initiating operation of said condition changing system, and means acting in the operation of said condition changing system for rendering the translating system ineffective for operation of the fire control apparatus during such time period and at said certain state.

14. In fire control apparatus having a pressure controlled operating element, a translating system including a heat detector and associated pressure producing means constructed and arranged to supervise a certain atmospheric condition subject to change and to produce pressure of a degree to set the fire control apparatus in operation on change of said condition to a certain state and when the rate of change of temperature exceeds a predetermined rate, operating means adapted during a period of operation to change said condition at a different rate exceeding said predetermined rate, and means acting during such time period of operation of said operating means for preventing the operation of the translating means by said condition due to said different rate.

15. In combination, a fire control apparatus having a control system embodying operating means constructed and arranged to supervise a progressively changeable atmospheric condition and to set said apparatus into operation when said condition assumes a certain state, a condition changing system acting at a period of operation thereof to cause said condition to change to said certain state, and means acting in the operation of said condition changing system for rendering said operating means ineffective for setting the fire control apparatus in operation at said certain state.

16. In combination, a fire detector system constructed and arranged and normally effective to operate upon an abnormal rate of rise of temperature, means external to said system for temporarily disabling it and rendering it ineffective for operation when an abnormal rate of rise of temperature is artificially produced and automatic means for restoring said system to normal operation.

17. In combination, a fire detector system constructed and arranged to operate upon an abnormal rate of rise of temperature external to said system, means for rendering said system ineffective for operation during a period of time when the abnormal rate of rise of temperature is artificially produced, and means for automatically restoring said system to effective and normal operation at the end of such period of time to again render it responsive to a predetermined rate of rise of temperature.

18. In a fire detecting system, and in combination with an apparatus to be operated on the breaking out of a fire, an aerotube constructed and arranged to be subjected to temperature changes producing pressure therein to operate the apparatus when the pressure increases at a rate greater than a predetermined rate, a device acting in operation to artificially produce a temperature change sufficient to cause a pressure increase in the aerotube greater than said prede-

termined rate, and means acting in the operation of said device to reduce the pressure in the aerotube during said temperature change to prevent a pressure increase therein at a rate greater than the predetermined rate.

19. In a fire detecting apparatus for use in a risk environment, a translating system in said environment including pressure producing means adapted to supervise a progressively changeable atmospheric condition and to produce a pressure condition of a state to operate when said atmospheric condition assumes a certain state, a condition changing system adapted to cause said atmospheric condition to artificially change to said certain state, means for initiating operation of said condition changing system, and means set in operation on such initiating for disabling the translating system during such artificial change.

20. In a fire detecting apparatus for use in a risk environment, a translating system in said environment including pressure producing means adapted to supervise a progressively changeable atmospheric condition and to produce a pressure condition of a state to normally operate when said atmospheric condition assumes a certain state, a condition changing system adapted to cause said atmospheric condition to artificially change to said certain state, means for initiating operation of said condition changing system, means set in operation on such initiating for disabling the translating system during such artificial change, and means for automatically again rendering the translating system normally operative after a predetermined time after the disabling.

21. In combination, a thermally energized pressure generating translating system constructed and arranged to supervise a certain atmospheric condition subject to change and adapted to be set in operation by pressure generated under said condition when the rate of change exceeds a predetermined rate, operating means constructed and arranged to change said condition at a different rate exceeding said predetermined rate, and means set in operation when said operating means is set in operation for preventing generation of operating pressure and the operation of the translating means by said condition due to said different rate.

22. The combination of an enclosure, an apparatus responsive to changes in pressure for operating fire control mechanism including means responsive to an abnormal rate of change in temperature for effecting said change in pressure, the said means being located in said enclosure, operable means cooperating with said enclosure and which causes abnormal rates of temperature change therein when operation thereof is initiated, and means cooperating with said apparatus and responsive to initiation of operation of said operable means to render said pressure changes in the apparatus ineffective for a period of time commensurate with the duration of said abnormal changes in temperature resulting from the initiation of operation of said operable means.

23. In a fire control apparatus, the combination of a pressure operated control device responsive to pressure changes, a heat detector for producing such pressure changes, said detector being operative under heat conditions produced by fire and also under heat conditions artificially produced other than by fire to produce pressure sufficient to actuate said detector, a pressure control valve, means for moving said valve to a position to multiply or render effective the action on the control device of the pressure changes developed by the heat detector, and means controlling said valve to shift the same in the presence of said artificial conditions to pressure nullifying position and to shift the same in the absence of such artificially produced pressure conditions to its effective position to render the apparatus responsive to fire conditions.

24. In a fire control apparatus in an environment having an installation subject in normal operation to cause periodic abnormal heat changes not attendant upon fire conditions, the combination of a heat detector and means for governing the operation of the control apparatus through heating of the detector due to fire, and means responsive to abnormal rates of heat changes incident to operation of the installation for rendering the heat detector ineffectual to govern the action of said apparatus during said abnormal rates of heat changes taking place in the installation and incident merely to normal operation thereof but not attending a fire condition.

25. The combination with fire control apparatus and a pressure actuated diaphragm installed in an enclosure subject to the operation of installations therein to abnormal artificially produced temperature changes other than those produced by fire, of means for developing changes of pressure upon temperature changes due to fire to operate the diaphragm, and means for nullifying or modifying said pressure during the presence of artificially produced abnormal temperature changes to render the apparatus irresponsive to said temporary abnormal changes of temperature occurring under normal operation of the installations in the plant.

EDWARD H. ROUSE.