D. J. POWERS.

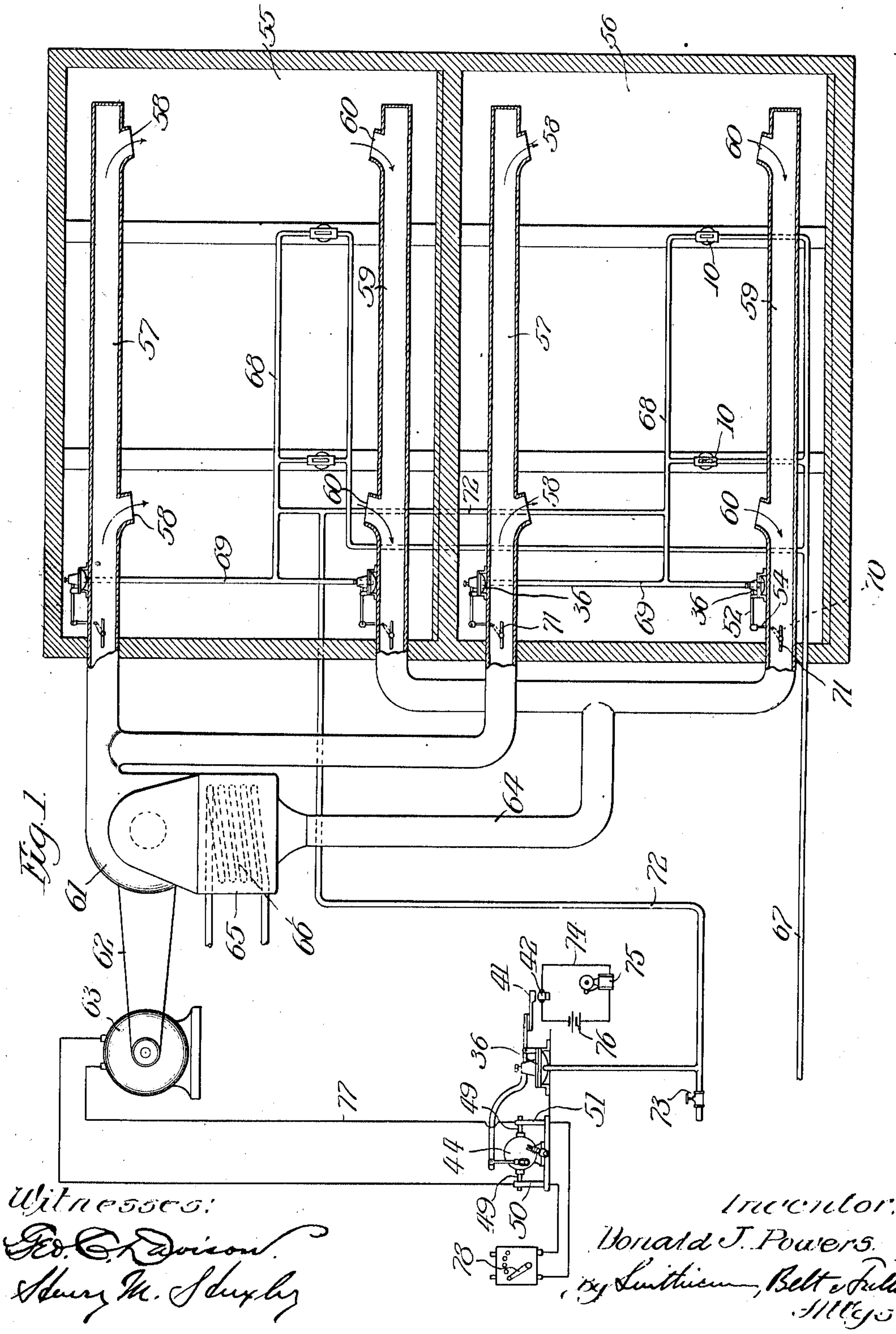
FIRE PROTECTION.

APPLICATION FILED FEB. 25, 1911.

1,004,074.

Patented Sept. 26, 1911.

2 SHEETS—SHEET 1.



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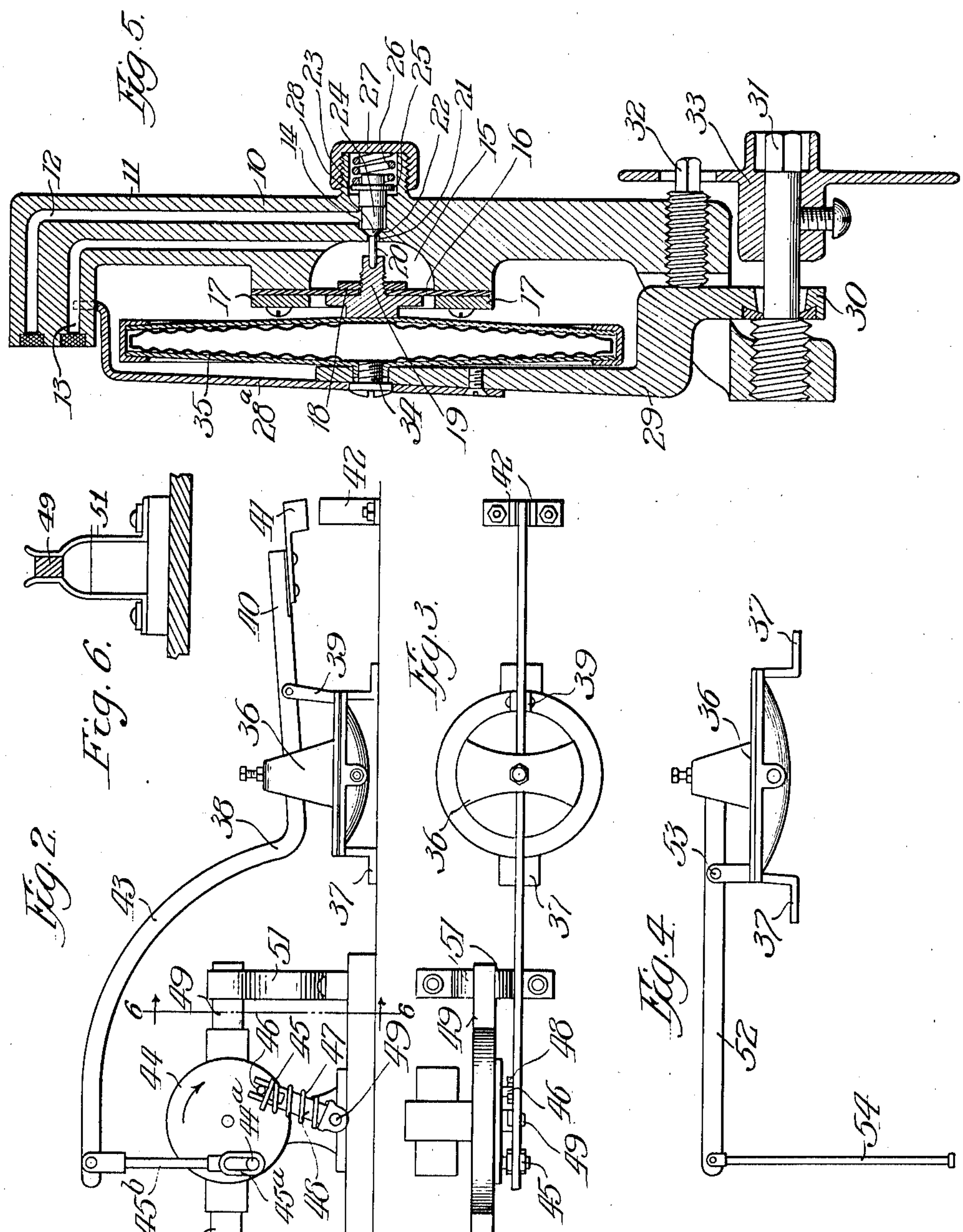

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UNITED STATES PATENT OFFICE.

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FIRE PROTECTION.

1,004,074. Specification of Letters Patent. **Patented Sept. 26, 1911.**

Application filed February 25, 1911. Serial No. 610,956.

To all whom it may concern:

Be it known that I, DONALD J. POWERS, a citizen of the United States, residing in New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Fire Protection, of which the following is a specification.

My invention relates to fire protection systems, and is particularly useful in connection with cold storage chambers or vaults.

Great difficulty has heretofore been experienced in obtaining adequate protection for cold storage vaults, especially those used for the storage of furs and the like. Two systems of cooling have been used: First, the direct system, in which the cooling coils are located in the vault itself, and, second, the indirect system, in which the air is previously cooled and is then impelled through the vault by means of a suitable blower. The direct system has been much more extensively employed than the indirect, on account of less danger from fire since with the indirect system there is a constant circulation of air, and if a fire is once started it is thus caused to spread with great rapidity, and action of the commonly used sprinkler system is greatly retarded. Aside from the danger of fire the indirect system is much superior to the direct, since in the former there is no formation of frost in the vault itself and an adequate ventilation is always obtained through the vault, thus causing an equal temperature throughout the entire chamber.

By my improved system of fire protection it is possible to use the indirect system of cooling and at the same time to minimize the danger from fire. I obtain this result by preferably providing a number of thermostats located in the vault and also in the outlet flue leading from the same. These thermostats control the operation of the motor which actuates the fan blower, the dampers located in both the inlet and outlet flues, and a suitable alarm system in case the temperature rises above a predetermined maximum. When my fire protection apparatus is supplied with fluid under a predetermined pressure, certain valve motors are held in such position that the switch controlling the motor circuit is closed, the dampers are held open and the alarm circuit remains open. On the other hand, when the temperature rises above the predetermined maximum, the thermostats cause the pressure of the above-mentioned fluid to be released, thereby operating the valve motors and causing the motor circuit to be automatically opened, the dampers to close, and the alarm to be sounded.

It will be apparent that should a fire start in the vault, by stopping the motor and the blower which is operated thereby, and shutting the dampers, circulation of air and the supply of oxygen therein are immediately stopped and the fire is thereby prevented from spreading with rapidity, and more promptly operates the usual sprinkler system by allowing the heat to pass upwardly to the sprinkler heads.

It will immediately be apparent to those skilled in the art that this system is greatly superior to any which has been heretofore employed, as under normal circumstances a thorough ventilation and equal distribution of temperature are obtained in the vault and no frost is formed therein. It is customary to use the well known type of automatic sprinkler system in vaults of this nature, and practical experience has shown that such a system is very inefficient, inasmuch as the sprinklers are not released until the temperature reaches such a point that great damage has already been done, since in order to melt the fusible links it is necessary that the temperature should be quite high in the immediate vicinity of the sprinklers. The damage caused by the water flowing from the sprinklers is frequently eliminated by summoning assistance before the temperature has become sufficiently raised to bring the sprinkler system into operation. It has likewise been proposed that the dampers should be operated by fusible links, but on account of the fact that such links only operate when the temperature in their immediate vicinity is quite high, such would not be wholly efficient.

These and other advantages of my invention will be more readily understood by reference to the accompanying drawings, which show a preferred embodiment of my improvements, and in which—

Figure 1 is a diagrammatic section through two floors of a cold storage vault with the various fire protection apparatus applied thereto; Fig. 2 is a side elevation of a valve motor, showing the electric motor switch associated therewith; Fig. 3 is a plan of the parts shown in Fig. 2; Fig. 4 is a side elevation of the valve motor for operating the dampers, and Fig. 5 is a vertical section through one of the thermostats. Fig. 6 is a vertical section on the line 6—6 of Fig. 2.

I will first describe the detailed construction of the various devices which are used in my system, and will then pass to a description of the system as a whole.

One of the most important devices used in my system is the thermostat 10, a vertical section of which is shown in Fig. 5. This thermostat consists of a main frame 11, through which pass the ports 12 and 13. The port 12 leads to the valve chamber 14, while the port 13 leads to the chamber 15.

A diaphragm 16, held in position by the ring 17, extends across the chamber 15. Passing through the center of this diaphragm and secured thereto by the ring 18 is the valve block 19, which engages the valve stem 20. Connecting chambers 14 and 15 is the passage 21, in connection with which is provided the beveled seat 22 for the beveled surface 23 leading from the valve stem 20 to the main portion of the valve 24. Valve 24 is provided with an annular projection 25, which is engaged by one end of the compression spring 26, the other end of which engages the inner surface of the cap 27 screwed onto the projection 28 of the main frame 11. It will be apparent that the spring 26 will normally keep the beveled surface 23 of the valve 24 seated against the seat 22, thereby cutting off communication between the chambers 14 and 15.

Connected to the main frame 11 by means of the spring 28^a is the arm 29, the lower portion 30 of which is held in the main frame 11 by means of the bolts 31 and 32 passing through the lower front portion 33 of the main frame 11. It will be evident that by a proper regulation of the bolts 31 and 32 the position of the arm 29 may be varied as desired.

Attached to the arm 29 by means of screw 34 is the hollow expansion disk 35, which is filled with chloroform, ether or some other volatile liquid, the vapor of which creates a strong pressure as the temperature in the vicinity of the disk rises. The valve block 19 engages the surface of the disk 35, so that when this disk expands by reason of an increased temperature the block 19 is moved outwardly, thereby unseating the valve 24 and affording communication between the chambers 14 and 15 and the ports 12 and 13. On the other hand, when the hollow disk 35 contracts on account of the decrease in temperature, the spring 26 becomes effective to seat the valve 24, and communication between chamber 14 and 15 is again cut off.

I will next describe the valve motors used in connection with my system. The general principle of operation of the motor shown in Figs. 2 and 3 is exactly the same as that shown in Fig. 4, but the details of construction are somewhat different. Each of the valve motors 36 has supports 37 for attachment to a wall or the like. The general principle of operation of these valve motors is the same as described in Patent No. 764,819, granted to William P. Powers July 12, 1904.

In the case of the valve motor 36, shown in Figs. 2 and 3, the bell-crank-lever 38 is pivoted to the arm 39. The arm 40 of the bell-crank-lever 38 is provided with a switch blade 41, which operates to close the circuit between the terminals 42. The arm 43 of the bell-crank-lever 38 is connected with the pin 44^a of the disk switch 44 through the link 45^b having the slot 45^a. This disk switch tends to rotate in a counter-clockwise direction by means of the engagement of the pin 46 by the plate 45, the plate 45 being actuated by the spring 47 which incloses the arm 48 pivoted at 49. Attached to the disk 44 are the switch blades 49, which serve to close the circuit between the terminals 50, 50 and 51, 51.

As indicated in Figs. 2, 3 and 6, the terminals 50 and 51 are bellied outwardly in their lower portions, so that on moving either of the blades 49 downwardly it is freed from contact with said terminals.

It will be apparent that when the valve motor 36 is actuated by allowing air under pressure to flow thereto, the arm 40 of the bell-crank-lever 38 will be depressed, thereby connecting the terminals 42, 42, whereas the arm 43 will be raised, thereby rotating the disk 44 in a clockwise direction until pin 46 passes the center line. The spring 47 then becomes effective and further rotates the disk 44 until pin 44^a comes in contact with the upper end of slot 45^a, in this way insuring the removal of the blades 49 from the terminals 50 and 51, the right-hand blade 49, shown in Figs. 2 and 3, being depressed and removed from contact with the ends of the terminals 51, while the left-hand blade 49 is elevated and similarly removed from contact with its terminals 50, thus breaking the circuit which controls the fan operating the electric motor, as will be explained hereafter. Similarly, when arm 43 is again depressed, disk 44 is rotated in a counter-clockwise direction until pin 46 again passes the center line, when the spring 47 becomes effective to further rotate disk 44 until pin 44^a comes in contact with the lower end of slot 45^a and the position of parts shown in Fig. 2 is resumed, the switch blade 49, shown on the right in Figs. 2 and 3, being elevated until it comes in contact with the upper ends of the terminals 51, and the blade 49 on the left being depressed until it similarly comes in contact with its terminals 50.

The valve motor 36, which is shown in Fig. 4, operates a lever 52 pivoted at 53, this lever in turn being connected with the link 54, which serves to close the dampers when the valve motor is operated, as will be hereinafter explained.

I will now describe my system as a whole: My system may be applied to a single room, or, as shown in Fig. 1, may be used in connection with two chambers 55 and 56 one above the other; or by changing the connections, as will be perfectly obvious to those skilled in the art, this system could, with equal facility, be applied to a plurality of chambers occupying any desired positions.

Each of the chambers 55 and 56 has an inlet ventilating pipe 57, having the inlets 58. Similarly, each chamber has an outlet pipe 59, having therein the outlets 60. The inlet pipes 57 are connected with the fan-blower 61, operated through the belt 62 by the electric motor 63. The outlet pipes 59 are connected with each other, and lead through pipe 64 to the cooling chamber 65. in which there is a cooling coil 66. It will now be clear that when the fan 61 is operated air will pass into the pipes 57, then through inlet openings 58, into the chambers 55 and 56. The air will then be carried through the outlet pipes 59 to the pipe 64, thence through the cooling compartment 65, and again return to the fan-blower 61.

In the chambers 55 and 56 I provide the thermostats 10, the port 12 of each thermostat being suitably connected with the pipe 67 leading from the source of compressed air. The port 13 of each thermostat 10 is connected with a pipe 68 or a suitable branch thereof. The pipe 68 in each of the chambers 55 and 56 leads to a pipe 69 connecting the valve motors 36, which are connected through levers 52, links 54 and arms 70 with the dampers 71.

The pipes 68 are connected with the pipe 72 leading to the valve motor 36 which operates the disk switch 44 and the switch blade 41. In the pipe 72 is provided the release valve 73, the object of which will be explained hereafter. Associated with the terminals 42 is a circuit 74, in which is the alarm bell 75, this circuit 74 leading from the battery 76. It will be clear that when circuit 74 is closed, by inserting the switch blade 41 between the terminals 42, the bell 75 will be sounded.

The motor 63 is included in the electric circuit 77, which is, in turn, connected with the terminals 50 and 51. In this circuit is also provided a controller 78. When the switch blades 49 close the connection between the terminals 50, 50 and 51, 51, it will be clear that motor 63 will be operated, whereas when this connection is broken, the circuit 77 will be opened and the motor 63 stopped.

Having thus described the construction of the various parts used in my invention, the operation of the same may now be readily understood. Compressed air is supplied through pipe 67 to the various thermostats 10, the valves 24 in these thermostats being normally seated, and thereby interrupting communication between the ports 12 and 13. The pressure in pipes 68, 69 and 72 is merely atmospheric pressure, and the valve motors 36 are in this way held in such positions that the dampers 71 are open, the switch 44 is closed, thereby operating the motor 63 and the blower 61, and the switch blade 41 is held away from the terminals 42, thus keeping the alarm circuit 74 open.

If the temperature in the vicinity of any thermostat rises above a predetermined maximum, the valve 24 is unseated, and air flows from the pipe 67 into the pipe 68, thence into the pipe 69 and the pipe 72. The valve motors are operated by this increased pressure of air to close the dampers 71 and to open the switch 44 and close the switch 41. In this way the motor 63 and the fan blower 61 are stopped, and on account of the fact that the dampers 71 are closed, there will be no ventilation within either of the chambers 55 or 56. At the same time the alarm circuit 74 is closed, ringing the bell 75, and thereby notifying any attendants in the vicinity that the temperature in one of the chambers has risen above a predetermined maximum.

When the temperature again falls below the maximum, the valve 24 in the thermostat which has been operated will become seated, and communication will be interrupted between the pipe 67 and the pipes 68, 69 and 72. It will be apparent, however, that air under pressure will still remain in the three last-mentioned pipes, and in order to release this air the valve 73 is opened, thereby allowing the compressed air to escape from pipes 72, 68 and 69. The dampers 71 will then be opened, the motor circuit 77 will be closed and the alarm circuit 74 opened.

It will be apparent to those skilled in the art that many changes could be made in the construction of the parts which I have described without departing from either the spirit or scope of my invention.

What I claim is:

1. In a fire protection system, the combination with ventilating means, of a source of compressed fluid, and means connected with said source of fluid for stopping the operation of said ventilating means when the temperature exceeds a predetermined maximum, substantially as described.

2. In a fire protection system, the combination with ventilating means, of a damper

associated with said ventilating means, a source of compressed fluid, and means connected with said source of fluid for stopping the operation of said ventilating means and closing said damper when the temperature exceeds a predetermined maximum, substantially as described.

3. In a fire protection system, the combination with a room having a ventilating inlet thereto, of ventilating means operating through said inlet, closing means for said inlet, a source of compressed fluid, and means connected with said source of fluid for stopping the operation of said ventilating means and operating said closing means when the temperature exceeds a predetermined maximum, substantially as described.

4. In a fire protection system, the combination with a room having a ventilating inlet thereto, of mechanism for blowing air through said inlet, a damper for closing said inlet, and means for simultaneously stopping said blowing mechanism and closing said damper when the temperature exceeds a predetermined maximum, substantially as described.

5. In a fire protection system, the combination with a room having a ventilating inlet thereto, of mechanism for blowing air through said inlet, a damper in said inlet, and a plurality of controlling devices, whereby when the temperature in the vicinity of any one of said devices exceeds a predetermined maximum the operation of said blowing mechanism will be stopped and said damper closed, substantially as described.

6. In a fire protection system, the combination with a room having an inlet thereto, of means for blowing air through said inlet, and a plurality of controlling devices associated with said blowing means, whereby when the temperature in the vicinity of any of said devices exceeds a predetermined maximum the operation of said blowing means will be stopped, substantially as described.

7. In a fire protection system, the combination with a room having a ventilating inlet thereto, of electrically operated means for blowing air through said inlet, a switch controlling the operation of said blowing means, and means for opening the circuit controlled by said switch when the temperature exceeds a predetermined maximum, substantially as described.

8. In a fire protection system, the combination with a room having a ventilating inlet thereto, of electrically operated means for blowing air through said inlet, a switch in the operating circuit of said blowing means, and a plurality of controlling devices associated with said switch, whereby when the temperature in the vicinity of any of said controlling devices exceeds a predetermined maximum the said switch will be operated to break said circuit and stop the operation of said blowing means, substantially as described.

9. In a fire protection system, the combination of a room having a ventilating inlet thereto, electrically operated means for blowing air through said inlet, a switch in the operating circuit of said blowing means, a damper in said inlet, a source of compressed fluid, a controlling device connected with said source, and means connecting said controlling device with said switch and said damper, whereby when the temperature exceeds a predetermined maximum the switch will be operated to open the circuit of said blowing means and to close said damper, substantially as described.

10. In a fire protection system, the combination of a room having a ventilating inlet thereto, electrically operated means for blowing air through said inlet, a switch in the operating circuit of said blowing means, a damper in said inlet, a source of compressed fluid, a plurality of controlling devices connected with said source, and means connecting each of said devices with said switch and said damper, whereby when the temperature in the vicinity of any of said controlling devices exceeds a predetermined maximum the switch will be operated to break the circuit of said blowing means and the damper will be closed, substantially as described.

11. In a fire protection system, the combination of a room having a ventilating inlet and a ventilating outlet therefor, means for blowing air through said inlet, and a plurality of controlling devices located in said room and in said outlet, whereby when the temperature in the vicinity of any one of said devices exceeds a predetermined maximum the operation of said blowing means will be automatically stopped, substantially as described.

12. In a fire protection system, the combination with a room having a ventilating inlet thereto, of means for blowing air through said inlet, a source of compressed fluid, a controlling device connected with said source, a motor connected with said controlling device, and means connecting said motor with said blowing means, whereby when the temperature in the vicinity of said controlling device exceeds a predetermined maximum said motor will be operated and said blowing means stopped, substantially as described.

13. In a fire protection system, the combination with a room having a ventilating inlet thereto, of ventilating means associated with said inlet, a source of compressed fluid, a controlling device connected with said source of fluid, a motor connected with said controlling device, and means connecting said motor with said ventilating means,

whereby when the temperature in the vicinity of said controlling device exceeds a predetermined maximum, said motor will be actuated to stop the operation of said ventilating means, substantially as described.

14. In a fire protection system, the combination of a cold storage vault having a ventilating inlet thereto, cooling means for lowering the temperature of said air before it enters said vault, and pneumatically controlled means for stopping said blowing means when the temperature of the air in said vault exceeds a predetermined maximum, substantially as described.

15. In a fire protection system, the combination with a cold storage vault having an inlet thereto, of means for blowing air through said inlet, means for cooling the air before it reaches said blowing means, a damper in said inlet, and pneumatically operated means for stopping said blowing means and closing said damper when the temperature in said vault exceeds a predetermined maximum, substantially as described.

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