Aug. 22, 1933. M. W. McLAREN 1,923,160

FIRE EXTINGUISHING SYSTEM

Filed Nov. 23, 1928 4 Sheets-Sheet 1

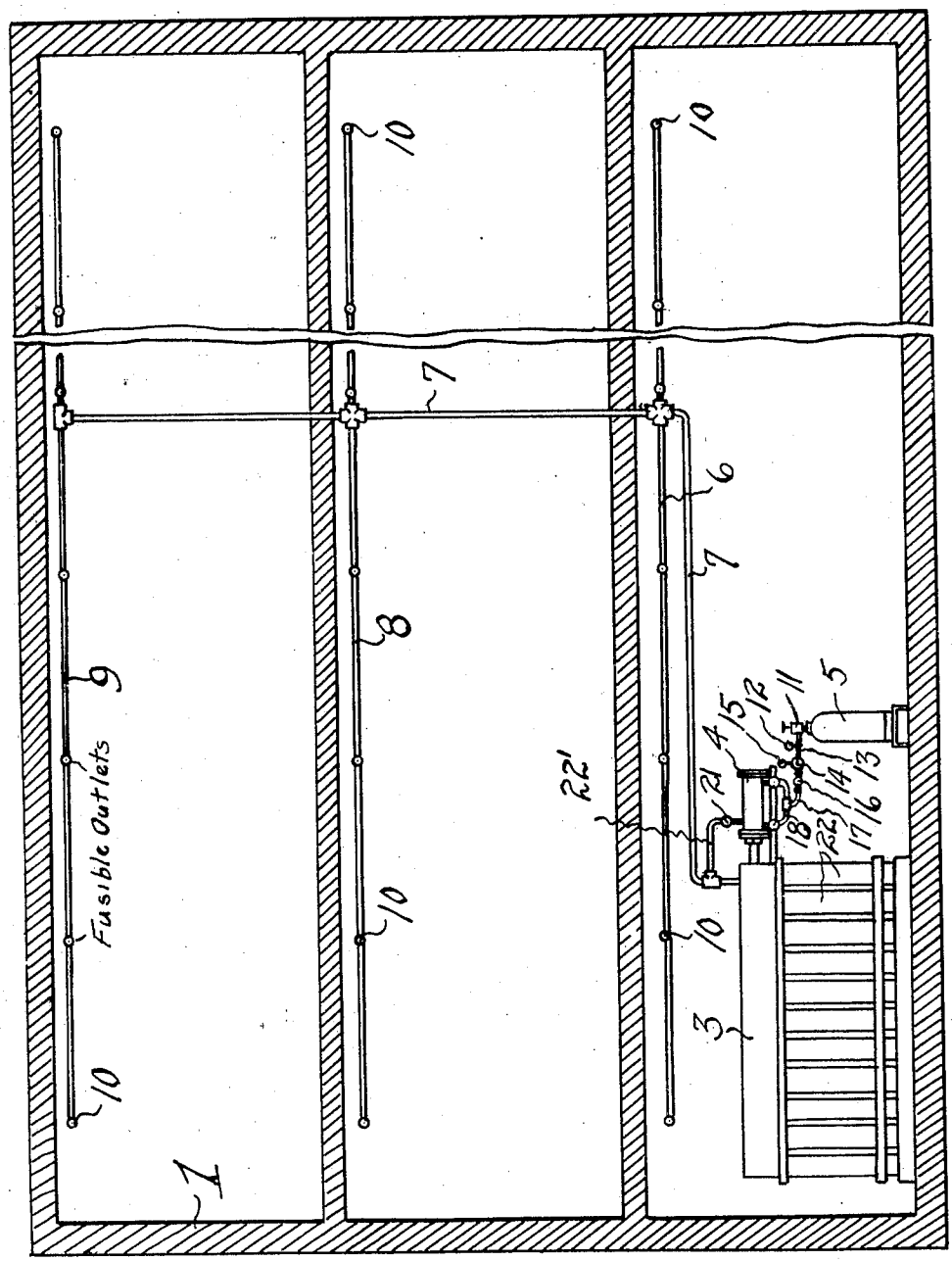


Fig. 1.

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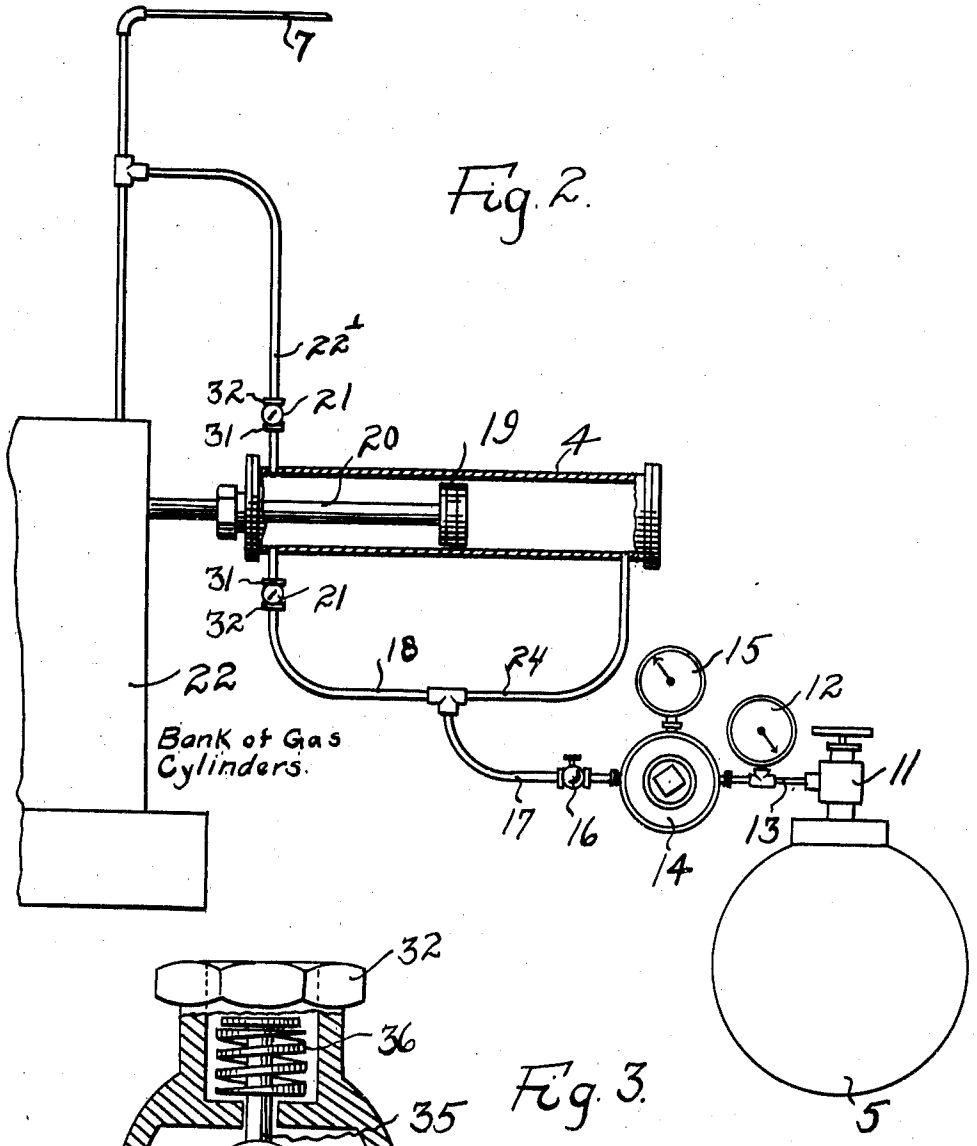


Fig. 2.

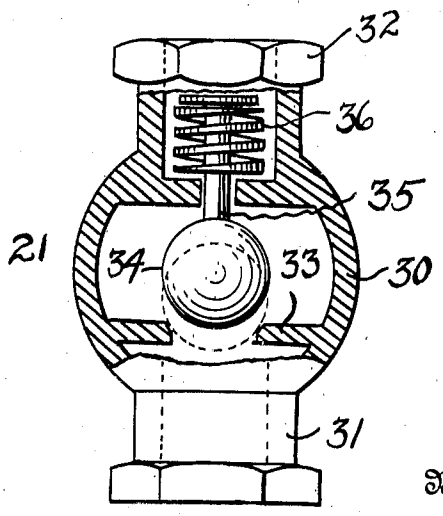


Fig. 3.

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FIRE EXTINGUISHING SYSTEM

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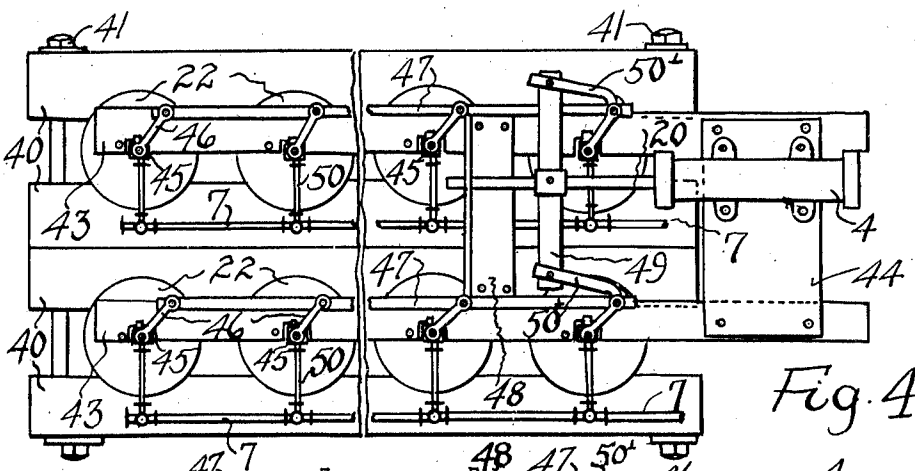


Fig. 4

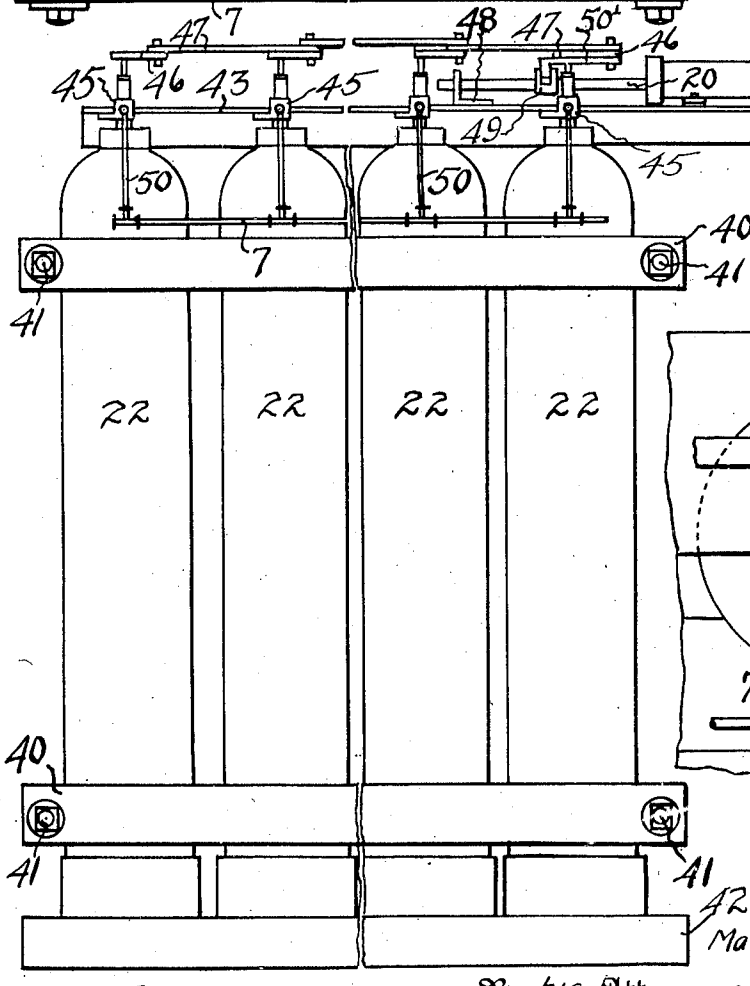


Fig. 5.

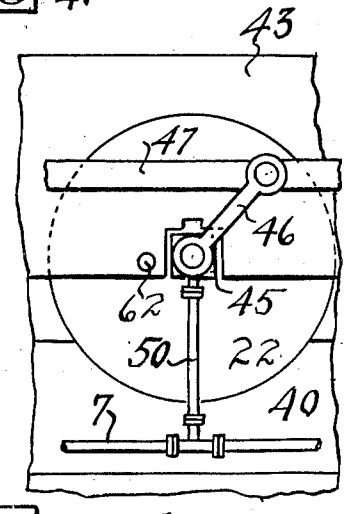


Fig. 6.

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FIRE EXTINGUISHING SYSTEM

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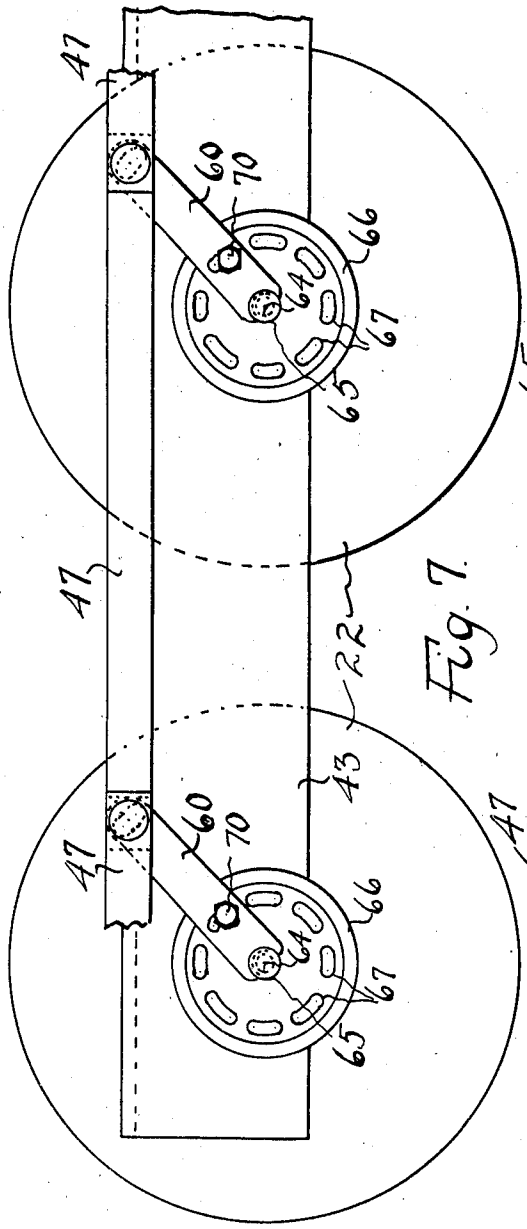


Fig. 7.

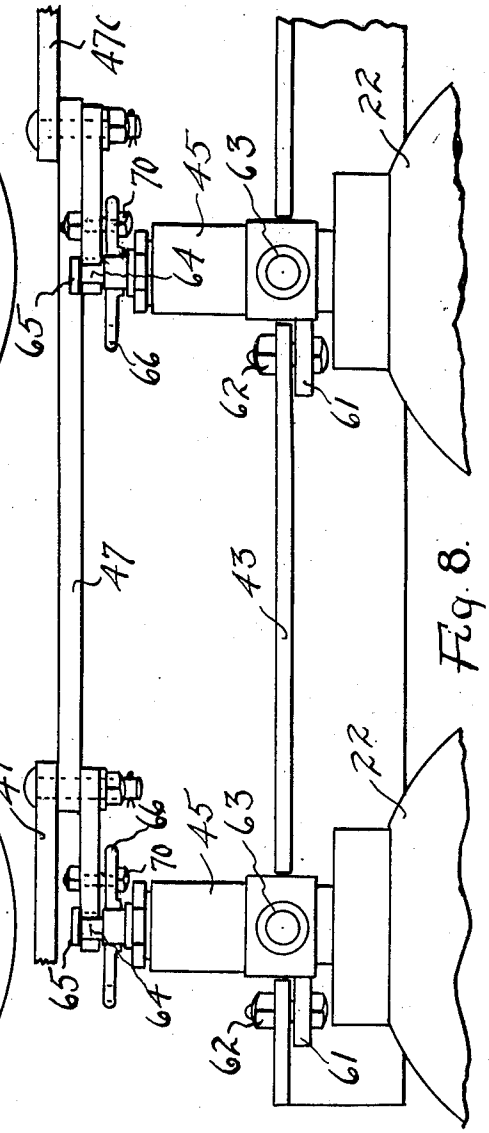


Fig. 8.

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UNITED STATES PATENT OFFICE

1,923,160

FIRE EXTINGUISHING SYSTEM

Malcolm Wate McLaren, Jackson Heights, N. Y., assignor, by mesne assignments, to Walter Kidde & Company, Inc., a Corporation of New York

Application November 23, 1928
Serial No. 321,379

12 Claims. (Cl. 169—11)

This invention relates in general to fire extinguishing systems particularly of the type which employs carbon dioxide gas as the extinguishing medium.

One of the objects of this invention is the provision of a simple and efficient apparatus employing carbon dioxide gas for use in extinguishing fires.

A further object of this invention contemplates an apparatus of the above type which may be connected to the usual first sprinkler system as employed in large buildings by means of which the advantages and features of such a system when employing carbon dioxide gas as the extinguishing medium are secured.

A further object of this invention involves a carbon dioxide fire extinguishing system employing a battery of high pressure gas cylinders connected together to be operated in unison and a power device for effecting their operation automatically.

A further object involves the idea of employing a cylinder of carbon dioxide gas under suitable pressure connected to the power device above by means of which the energy of the stored gas may be employed for its operation.

A still further object of the invention contemplates automatic application of the pressure in the cylinder operating the power device.

Another object of this invention is to provide a valve structure for the gas cylinders which particularly adapts them for connection to the device by means of which they are operated in unison.

A still further object of this invention is the provision of valve structures on gas cylinders and connecting mechanism by means of which the valves may be easily and rapidly connected together by said mechanism to provide a structure in which the valves may be operated in unison.

These and other objects as will be apparent from the following disclosure are secured by means of the devices of this invention.

This invention resides substantially in the combination, construction, arrangement and relative location of parts all as will appear more fully hereinafter and distinctly pointed out in the appended claims.

Referring to the drawings

Figure 1 is a vertical sectional view through a building showing the application of the fire extinguishing apparatus of this invention thereto for purposes of fire protection.

Fig. 2 is an enlarged view with some parts in section showing the power device and its connection to the gas cylinder supplying the operating energy.

Fig. 3 is a sectional view through a check valve employed in this system.

Fig. 4 is a top plan view of a bank of cylinders arranged for simultaneous operation by means of a motive device.

Fig. 5 is a side elevational view of the structure of Fig. 4.

Fig. 6 is an enlarged plan view of one of the cylinders and its valve operating crank.

Fig. 7 is a top plan view of two gas cylinders and a different form of valve operating mechanism, and

Fig. 8 is a side elevational view of the structure of Fig. 7.

This invention involves devices and apparatus by means of which the advantages of the use of carbon dioxide gas as a fire extinguishing medium are secured. The apparatus and principles of the invention are adapted for application to the present piping system employed in water fire extinguishing systems in which the pipes are provided with spaced fusible sprinkler heads which permit of the escape of the water upon the development of abnormal temperature conditions.

The advantages of carbon dioxide gas as an efficient fire extinguishing medium are now well known. The apparatus disclosed below is particularly adapted to most efficiently employ this medium in a manner which is dependable, economical and safe.

For a better understanding of the invention reference is now made in detail to the drawings. At 1 has been shown a cross-section of a building, for instance, having a number of floors on which it is desired to secure fire protection. At 22 has been indicated generally a bank of gas cylinders of a type now well known in which carbon dioxide gas under considerable pressure, as, for instance, one thousand pounds per square inch is stored and shipped. Each cylinder is provided with a valve which valves are operated in a manner to be disclosed more in detail. The cover for these valves has been indicated at 3. The valves are intended to be operated in unison by means of a motive device comprising a cylinder 4. An auxiliary gas cylinder or "power bottle" 5 is connected through the valve 11 and pipe 13 to a pressure gauge 12 that is clearly indicated in Fig. 2. Pipe 13 extends to a pressure reducing valve 14 of which many suitable types are now well known in the art. The gauge 15

indicates the reduced pressure which flows into pipe 17 through the manually controlled valve 16. Pipes 18 and 24 which are connected to pipe 17 extend one to each end of cylinder 4. A check valve 21 is connected in pipe 18 for a purpose to be described later. Within the cylinder 4 is a movable piston 19 having the piston rod 20 which is connected to the valves of the cylinders 22 in a manner to be described later. The left-hand end of cylinder 4 is connected through check valve 21 and pipe 22' to pipe 7 which is fed from all the cylinders 22 in the cylinder bank.

Near the ceiling on each floor are indicated the pipes 6, 8 and 9 which are connected together by means of the pipe 7 which leads from the cylinders 22. Each of the distributing pipes on each floor is provided at intervals with a fusible sprinkler head 10 which may be of any of the well known types adapted to open upon the development of abnormal temperature conditions.

The check valves which have been indicated at 21 in Fig. 2 are shown in greater detail in Fig. 3. They consist of a body portion 30 having integral hollow extensions 31 and 32. The main valve body 30 is hollow and is provided with a transverse wall 33 having a central opening and a seat to receive the ball valve 34. The ball 34 is provided with a stem 35 on which is mounted a spring 36 which normally tends to hold the ball 34 off its seat.

The motive device for operating the valves in unison is clearly shown in Figs. 4 to 6 inclusive. The cylinders 22 are held in a predetermined fixed relation by means of parallel beams 40 having semi-circular notches at spaced intervals between which the cylinders are secured by means of bolts 41. These bolts extend through the ends of all the beams and serve to clamp the structure into a rigid unit. The cylinders may be supported on a suitable base 42 as indicated in Fig. 5. Extending longitudinally of the unit over each row of cylinders are the angle irons 43 which are secured to projections 61 (Fig. 8) on each valve. These angle irons serve to rigidly unite the cylinders and to support a portion of the operating mechanism. The angle irons 43 extend beyond the beams 40 and are united at their free end by means of a plate 44 on which the cylinder 4 is mounted.

Each cylinder 22 is provided with a valve 45 which controls the escape of gas from the cylinder. Each valve 45 is provided with a crank 46 which cranks are connected together by means of links 47 to provide a pivotal connection. A transverse angle plate 48 is secured to the top of the angle irons 43 and is arranged so that the piston rod 20 passes through a hole therein for guided movement. Secured to the piston rod 20 is a transverse yoke member 49 which is pivotally secured to the links 50' secured to the last link 47 in each row of cylinders. Each valve 45 is provided with an outlet to which is secured a short length of pipe 50. All the pipes 50 are connected to a common pipe 7 of which there are two in this structure. These pipes 7 are united so that the gas from all the cylinders may flow through pipe 7 to the various distributing pipes 6, 8 and 9 (Fig. 1).

As will be obvious the construction shown in Figs. 4 to 6 inclusive, has one disadvantage which might tend to interfere with the correct operation of the apparatus. If the cylinders 22 are not secured between the beams 40 in the correct position it is possible that all the valves 46 would not be simultaneously moved to their completely closed position. To overcome such a possibility the structure shown in Figs. 7 and 8 is provided. As before, the cylinders 22 have valves 45 on which are supported the angle beams 43 through the agency of the lugs 61 and bolts 62. The gas outlets for the valves are shown at 63 to which the pipes 50 are connected. Valves 45 are provided with stems 64 which stems have a cap piece 65 at the upper end to provide in effect an annular groove on the valve stem. The valve stems are provided with the usual hand wheels 66. The cranks 60 are provided as before and are pivotally united by means of the links 47.

In this construction, however, the hand wheels are provided with arcuate slots 67. The cranks 60 are likewise each provided with an arcuate slot adapted to overlie any one of the arcuate slots 67. One end of the crank 60 is notched so that it will lie under the cap piece 65 on valve stem 64. By means of this arrangement the valves may all be properly adjusted so that in one position of the operating cranks 60 they are all completely closed. The cranks 60 may then be secured in their proper position with respect to their hand wheels 66 by means of the bolts 70. By means of this arrangement it is assured that all the valves will be completely closed in one position and will move together when the operating mechanism is operated. This construction permits of ease in disconecting the cranks 60 from the valves by simply removing bolts 70.

The system shown in Figs. 1 and 2 is automatic in operation. The auxiliary cylinder 5 which contains cabon dioxide gas at considerable pressure acts as a source of power which is highly dependable, relatively cheap to produce and maintain, and adapted for ready replacement. This cylinder 5 is always connected to the cylinder 4 of the motive device so that a balanced pressure is maintained on both sides of piston 19. Valve 11 is opened and valve 14 is adjusted so that any desired pressure is maintained within the cylinder 4. The gauge 12 indicates at all times the pressure within cylinder 5 so that the cylinder can be replaced should the pressure get too low by reason of leakage or actual use. The gauge 15 indicates the reduced pressure supplied by valve 14 to the cylinder 4. Since pipe 7 is connected through pipe 22' to the left-hand end of the cylinder it is apparent that the same pressure supplied from cylinder 5 which exists in both ends of the cylinder will also exist in pipes 7, and also in pipes 6, 8 and 9. A suitable pressure, for instance, could be twenty pounds per square inch gauge. The amount of this pressure will, of course, depend upon the size of piston 19 and the extent of the pipe system in the building since it is necessary to have sufficient pressure to operate the piston 19. In initially setting the system for operation the reducing valve 14 is set so as to deliver gas at the desired pressure, and then valve 16 is opened a sufficient amount so that gas will be delivered to the entire system at the desired pressure without causing valve 21 in pipe 18 to seat. Thus a predetermined gas pressure is maintained throughout the pipe system from the independent source 5 without causing valve 21 to seat.

When a fire develops in any part of the building 1, as, for example, on the top floor, the tem-

perature rises to the point where the fusible sprinkler head 10 melts and permits the initial escape of carbon dioxide gas from the system. The result is that the pressure falls in pipe 7 and in the left-hand end of cylinder 4 so that check valve 21 in pipe 18 is closed. The tension on the spring 36, of course, can be adjusted so that it is open when the pressures in pipes 18 and 7 are substantially the same. Since the left-hand end of cylinder 4 is now open to exhaust through pipes 22' and 7 the piston 19 will move to the left under the pressure supplied from cylinder 5 through pipe 24. This will cause all the valves on cylinders 22 to be opened simultaneously through the agency of piston rod 20, cross-arm 49, links 50' and 47, and cranks 46. The gas then flows through pipe 7 from cylinders 22 to pipe 9. The gas then escapes under considerable pressure out of the sprinkler heads which have opened and as a result the fire is rapidly extinguished without the use of water which, as is well known, usually causes more damage than the fire. The check valve 21 in pipe 22' being open to the very high pressure of gas supplied to pipe 7 is closed thereby so that gas is not admitted to the left-hand of cylinder 4 to cause the piston 19 to return. From the foregoing description it will be apparent that the system shown in Figs. 1 and 2 is entirely automatic and depends upon, for its operation, an auxiliary cylinder of gas.

I am, of course, well, aware that many changes in the physical construction of the devices embodying the principles of this invention will readily occur to those skilled in the art and I do not, therefore, desire to be strictly limited to the disclosure in the drawings and specification which have been given for purposes of illustration but rather to the scope of the invention as defined in the appended claims.

What I seek to secure by United States Letters Patent is:

1. In a structure as disclosed, the combination comprising a plurality of gas containers, means for holding them in spaced relation, a valve on each container, actuating means for the valve comprising members having a plurality of arcuate slots arranged in a circle, a lever arm provided with an arcuate slot, means passing through the slot on the arm and one of the slots on the member for readily securing the lever to said member at any desired point, and link members for pivotally uniting all of said levers together.

2. In a fire extinguishing system of the type described the combination comprising a tank of extinguishing gas held under high pressure, a pipe distributing system having fusible elements therein connected to said tank, a valve in said connection for releasing the gas from the tank to the pipe system, a cylinder having a piston therein and a connection between the piston and said valve, a connection between the pipe distributing system and said cylinder including a check valve to prevent the flow of gas from the tank through the pipe system to the cylinder, two pipes connected to said cylinder one near each end thereof, a tank having fluid pressure therein and a connection from said tank to said pipes connected to both ends of said cylinder.

3. In a fire extinguishing system of the type described the combination comprising a tank of extinguishing gas held under high pressure, a pipe distributing system having fusible elements therein connected to said tank, a valve in said connection for releasing the gas from the tank to the pipe system, a cylinder having a piston therein and a connection between the piston and said valve, a connection between the pipe distributing system and said cylinder including a check valve to prevent the flow of gas from the tank through the pipe system to the cylinder, two pipes connected to said cylinder one near each end thereof, a tank containing a fluid pressure medium and a connection between said tank and said pipes connected to the ends of said cylinder, including a pressure reducing valve.

4. In a fire extinguishing system of the type described the combination comprising a container holding the fire extinguishing gas under high pressure, a pipe distributing system having fusible members therein connected to said tank, a valve in said connection, fluid pressure means connected to said valve for operating it, an independent source of fluid pressure connected to each side of said fluid pressure operated means, and a connection between one side of said fluid pressure operated means and said pipe distributing system whereby when one or more of the fusible elements fuses the pressure in the pipe distributing system falls permitting said fluid pressure operated means to be operated to open said valve.

5. A gas fire extinguishing system, comprising a container for storing the gas extinguisher therein, a valve on said container for normally holding all of the gas within the container, a pipe distributing system connected to said valve and having a plurality of fusible elements therein, and power means for operating said valve including a fluid pressure source connected thereto on each side thereof and to the pipe distributing system for normally maintaining fluid pressure in the pipe distributing system, whereby the power means actuates said valve when one or more of the fusible elements releases the gas pressure in the pipe distributing system and from one side of said power means.

6. In a fire extinguishing system, the combination with a structure to be protected, of a source of high pressure gas, a pipe system connected thereto and suitably placed within said structure, fusible outlets in said pipe system, valve means for controlling the supply of gas from said source to said pipe system, fluid pressure means for operating said valve means, a pipe connection between said pipe system and one side of said fluid pressure means, and independent means connected by pipes to each side of said fluid pressure means for continually supplying a fluid pressure medium thereto, the pressure on one side of said fluid pressure means being relieved through said pipe connection upon the fusing of one of said fusible outlets whereby said valve means is opened to supply gas from said source to said pipe system.

7. A fire extinguishing system employing a gas extinguisher, comprising a container for storing the extinguishing gas under high pressure, a valve for controlling the flow of gas from said container, a pipe distributing system having a plurality of heat responsive gas outlet means therein, fluid pressure operated means including a piston for operating said valve, an independent source of fluid pressure connected to said fluid pressure operated means on each side of the piston, and a pipe connection between one side of said fluid pressure operated means and said pipe distributing means through which the pressure on said side of said fluid pressure op-

erated means is relieved upon actuation of one of the heat responsive gas outlet means whereby said valve is opened to supply gas from said container to said pipe system.

8. A fire extinguishing system employing a gas extinguisher, comprising a container for storing the extinguishing gas under high pressure, a valve for controlling the flow of gas from said container, a pipe distributing system having a plurality of heat operated outlet means therein, a fluid pressure engine comprising a cylinder and piston, said piston being connected to said valve, an independent source of fluid pressure, a pipe connection between said source and each end of the cylinder, and a pipe connection between said pipe distributing system and one end of said cylinder through which the pressure on said end of said cylinder is relieved upon actuation of one of the heat operated outlet means whereby said valve is opened to supply gas from said container to said pipe system.

9. A gas fire extinguishing system, comprising a container for storing the gas extinguisher, a valve on said container, a pipe distributing system having a plurality of heat actuated discharge devices thereon, fluid pressure operated means for operating said valve, an independent source of fluid pressure connected to each side of said fluid pressure operated means, and a pipe connection from said distributing system to one side of said fluid pressure operated means whereby the fluid pressure from said source exists in said pipe distributing system, said fluid pressure means acting to open said valve upon the actuation of said heat actuated devices and the relief of the pressure from one side of said fluid pressure operated means through said pipe connection.

10. In a fire extinguishing system of the type described, the combination comprising a container for storing the extinguishing gas under pressure, a valve for controlling the flow of gas from said container, a pipe distributing system having a plurality of heat responsive gas outlet means therein connected to said valve, fluid pressure means including a piston connected to said valve to operate it, a connection between the pipe distributing system and one side of the fluid pressure means including means to prevent the flow of gas from the container through the pipe system to said side of the fluid pressure means, an independent source of fluid pressure connected to said fluid pressure means on each side of the piston, and means in the connection to the side of the piston to which the pipe distributing system is connected to prevent the flow of the medium from the independent source of fluid pressure to the fluid pressure means after relief of the pressure therefrom upon actuation of one of the heat responsive gas outlet means, whereby said valve is opened to supply gas from said container to said pipe system.

11. In a fire extinguishing system of the type described, the combination comprising a container for storing the extinguishing gas under pressure, a valve for controlling the flow of gas from said container, a pipe distributing system having a plurality of heat responsive gas outlet means therein connected to said valve, fluid pressure means for operating said valve, a connection between the pipe distributing system and one side of said fluid pressure means including means to prevent the flow of gas from the container through the pipe system to said side of the fluid pressure means, an independent source of fluid pressure connected to each side of the fluid pressure means, and means in the connection to the side of the fluid pressure means which is connected to the pipe distributing system to prevent the flow of the medium from the independent source of fluid pressure to the fluid pressure means after relief of the pressure from the fluid pressure means upon actuation of one of the heat responsive gas outlet means, whereby said valve is opened to supply gas from said container to said pipe system.

12. In a fire extinguishing system of the type described, the combination comprising a container for storing the extinguishing gas under pressure, a valve for controlling the flow of gas from said container, fluid pressure means for operating said valve, an independent source of fluid pressure connected to each side of said fluid pressure means, means to relieve the pressure from one side of said fluid pressure means, and means in the connection from the independent source of fluid pressure to the side of the fluid pressure means which is provided with the relief means to prevent the flow of the medium from the independent source of fluid pressure to the fluid pressure means after relief of the pressure therefrom, whereby said valve is opened to supply gas from said container to said pipe system.

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