June 30, 1942. E. GEERTZ ET AL 2,287,873

FIRE EXTINGUISHING APPARATUS

Filed May 19, 1941 5 Sheets-Sheet 1

Fig. 1.

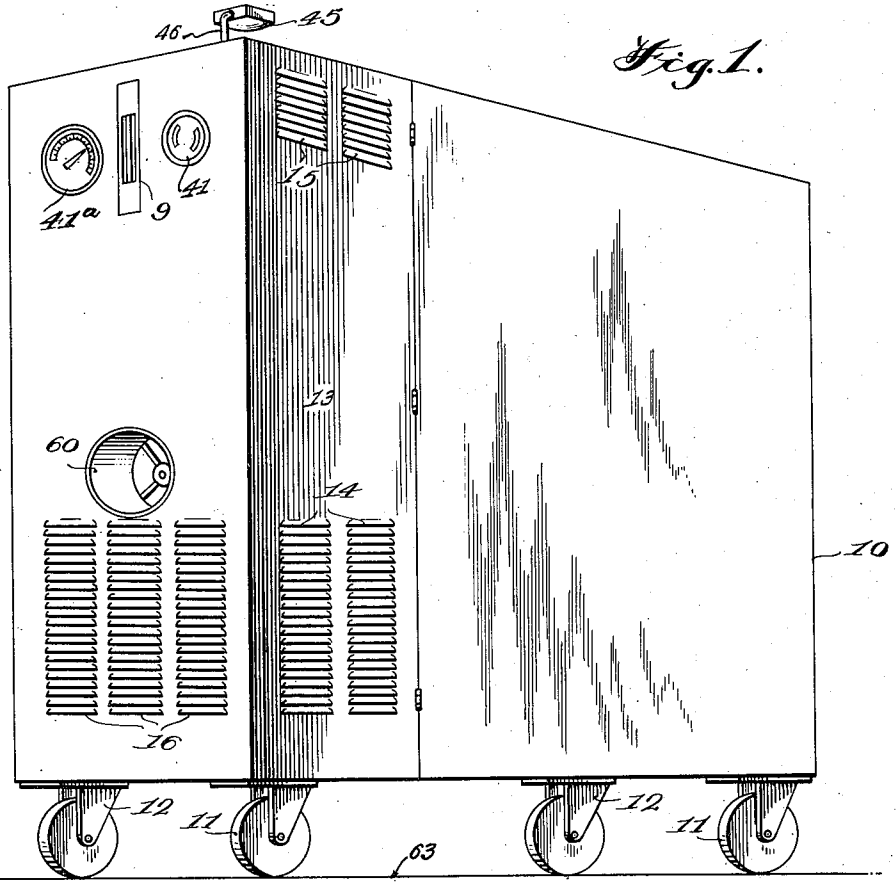
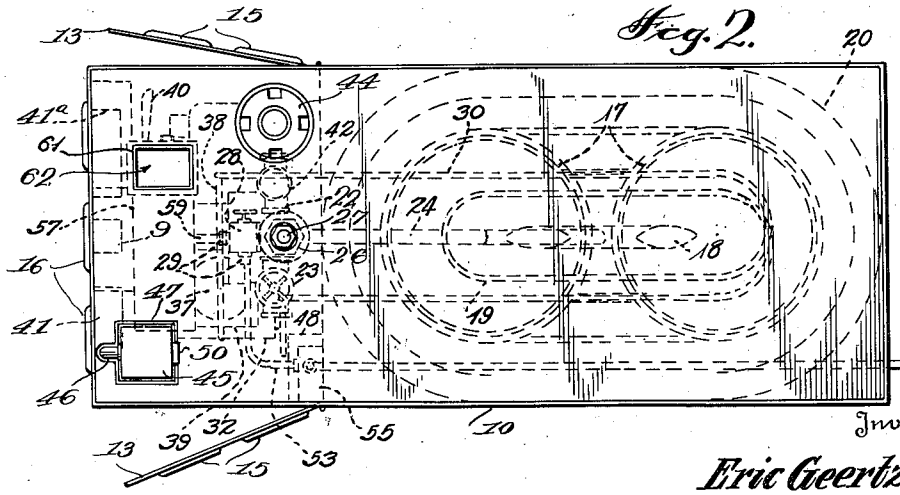


Fig. 2.



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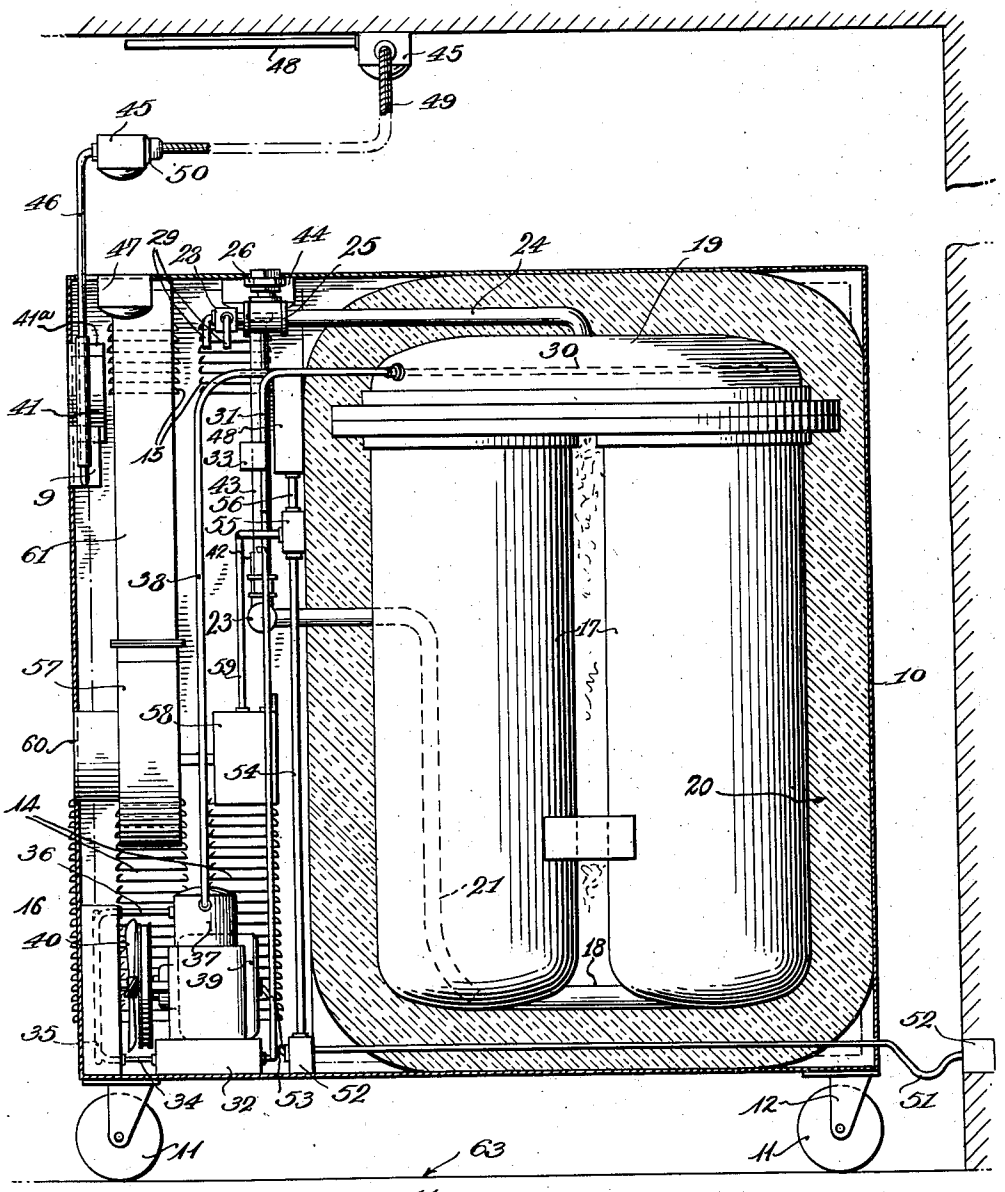


Fig. 3.

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FIRE EXTINGUISHING APPARATUS

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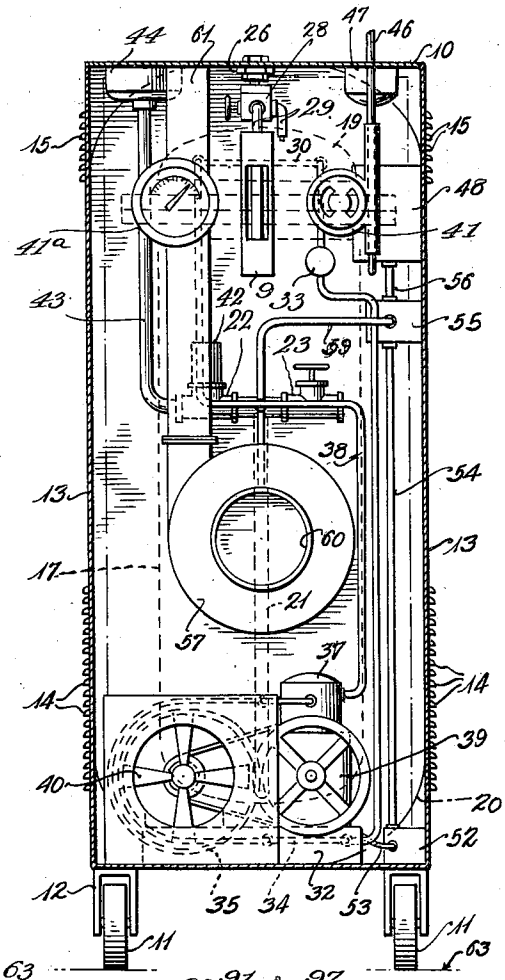


Fig. 4.

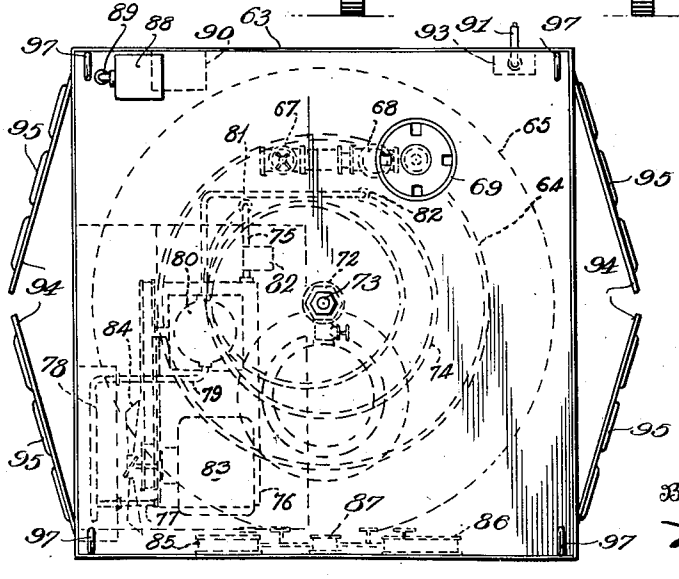


Fig. 5.

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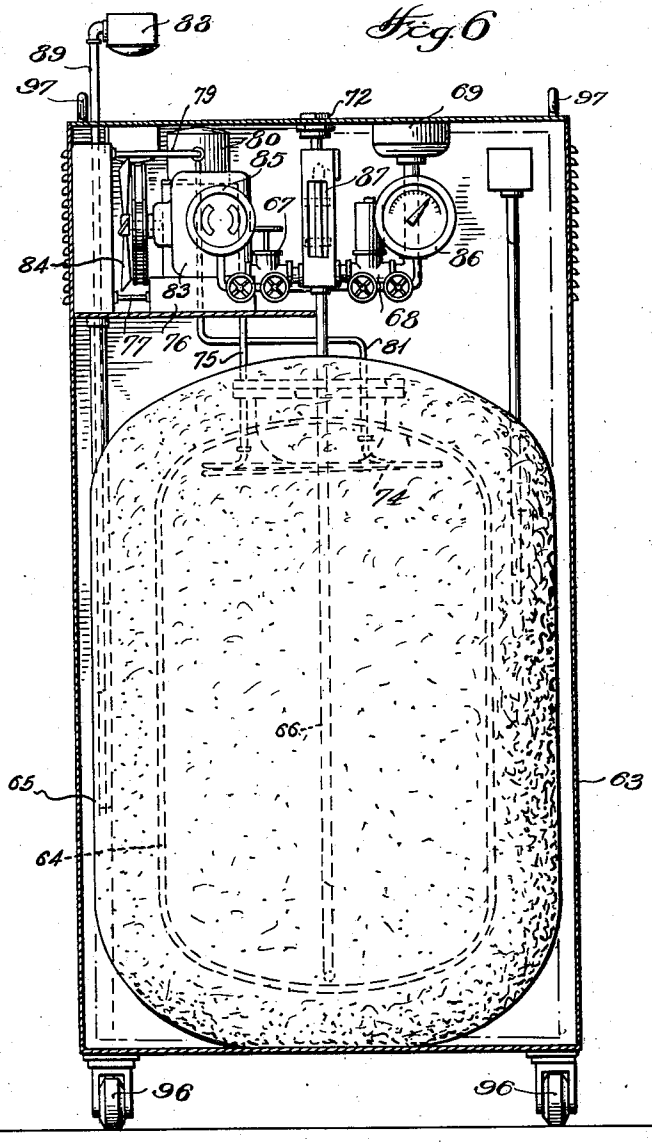
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June 30, 1942. E. GEERTZ ET AL 2,287,873

FIRE EXTINGUISHING APPARATUS

Filed May 19, 1941 5 Sheets-Sheet 4

Fig. 6



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FIRE EXTINGUISHING APPARATUS

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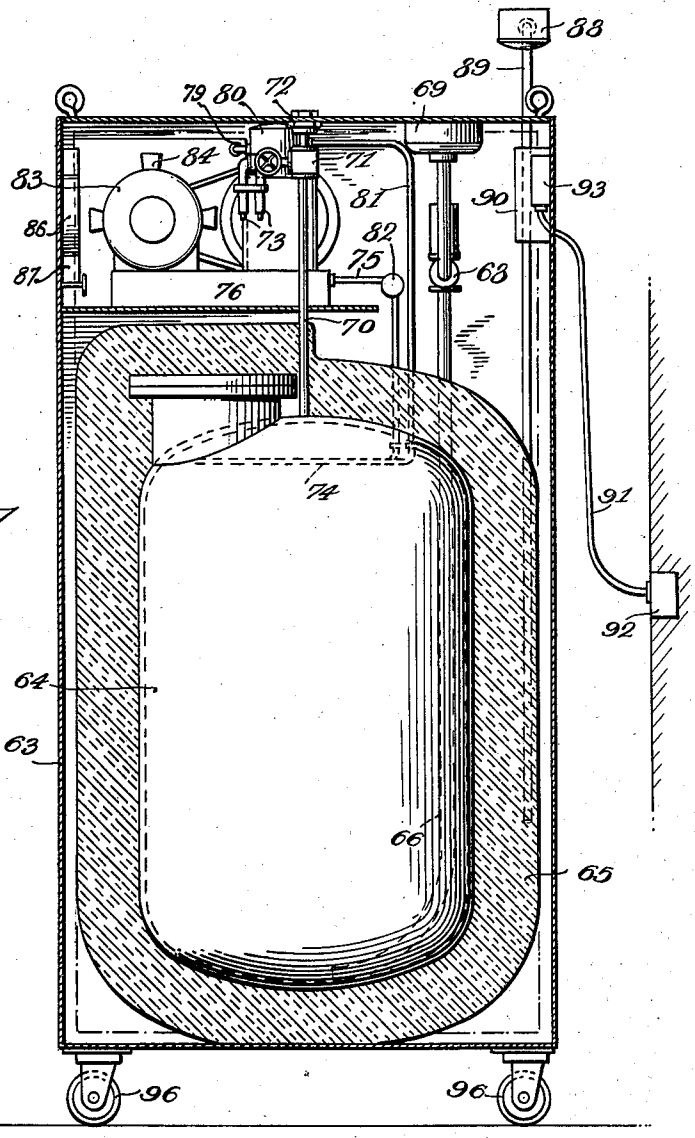


Fig. 7.

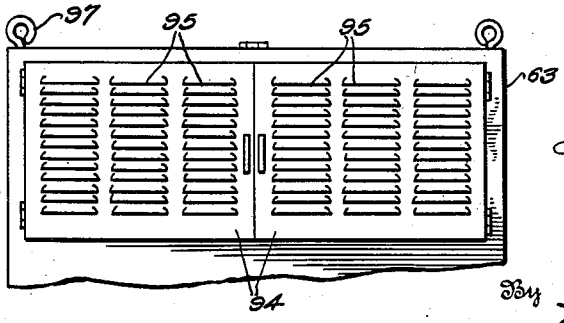


Fig. 8.

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2,287,873

UNITED STATES PATENT OFFICE

2,287,873

FIRE EXTINGUISHING APPARATUS

Eric Geertz and Charles A. Getz, Glen Ellyn, Ill., assignors to Cardox Corporation, Chicago, Ill., a corporation of Illinois

Application May 19, 1941, Serial No. 394,196

20 Claims. (Cl. 169—31)

This invention relates to new and useful improvements in portable fire extinguishing units adapted for employing such extinguishing gases as carbon dioxide and for effecting automatic extinguishment of fires occurring in enclosed spaced by totally flooding such spaces.

Heretofore, it has been the practice to employ carbon dioxide, or the like, as a fire extinguishing medium either in portable extinguishers, which are entirely under manual control, or in fixed systems which may be manually and/or automatically controlled.

The portable extinguishers have taken several forms which may be generally defined as follows:

a. Small extinguishers, holding up to approximately ten pounds of the extinguishing gas, which must be carried by a person to the location of the fire and manipulated to effect direct application of the medium onto the fire.

b. Containers holding 25 or 50 pounds of extinguishing gas which are supported on transportable wheeled carriers or on cradles adapted to be carried by two or more persons. These larger containers also must be moved to the location of the fire and manipulated to effect direct application of the medium onto the fire.

c. Wheeled trucks, carrying tanks or banks of small containers having a total capacity for considerably more than 100 pounds of the extinguishing gas. These trucks usually are motor propelled to the location of the fire and hose lines must be manipulated to effect direct application of the medium onto the fire or flooding of enclosures in which the fire is burning.

Each one of these prior portable extinguishers has been provided with one or more manually operable valves, or the like, that are employed to start the release of the extinguishing medium through the associated discharge nozzle, or nozzles, when the latter are properly positioned with respect to the fire. Consequently, this type of extinguisher is useless if the required person or persons are not present to properly handle the same. Of course, the relatively small capacity extinguishers can only be used successfully on comparatively small fires, while use of the large capacity wheeled trucks in connection with sizable fires is subjected to all of the hose manipulation handicaps, etc., encountered with any large piece of fire fighting apparatus which must be kept on roadways, or other solid ground, exteriorly positioned with respect to involved buildings or enclosed spaces.

Obviously, the real advantage of using portable equipment comes from its ready availability for hazards at different locations and its low initial cost.

As stated, fixed systems are either entirely manually controlled, entirely automatically controlled, or a combination of both manual and automatic. They are employed when the hazard is of such a character that one or a reasonable number of small portable extinguishers will not provide a sufficient quantity of extinguishing medium to cope with the anticipated emergency. When they are entirely of the manually controlled type, they also are useless if someone is not present to initiate the release of the extinguishing medium. Systems which embody controls that are automatically actuated, in response to a temperature rise resulting from the existence of a hostile fire to start the flow of the extinguishing medium, afford the desired fire protection regardless of the presence or absence of an attendant.

Many types of hazards can only be fully protected by equipment which automatically detects the presence of a fire and starts the release of the extinguishing medium as a result of such detection. However, an extremely large percentage of such hazards are not provided with this type of protection at the present time because because of the extremely high cost of making the necessary installation of piping which will carry the extinguishing medium from the source of supply, which must be of relatively large capacity and readily accessible for replenishing service, to the location of the hazard or hazards to be protected.

Due to the inherent characteristics of this type of system, it is extremely non-flexible or fixed insofar as the location or locations of the protected hazards are concerned. That is to say, each hazard to be protected, regardless of whether it is permanent, periodic, or temporary in character, must be anticipated when the system is planned. The proper pipe lines for the extinguishing medium as well as the required fire detection devices with their connections to the control valves, to cover the locations of all of said hazards, must be provided and permanently installed.

When every hazard to be protected is continuous or permanent in character, and the value of the property involved is large enough, the high cost of installing an adequate, fixed, automatic system can be justified. However, when one or more of the hazards is only temporary or periodic insofar as a given location is concerned, a real cost penalty attaches to the making of a permanent installation which includes such loca-

tion. As a result, temporary or periodic hazards are seldom provided with the automatic fire protection they really should have and the inadequate protection afforded by manually controlled equipment is all that is usually relied upon.

To explain what is meant by periodic hazards, let us assume that a fireproof building having several rooms or enclosed spaces is involved. The building is not in danger of being destroyed or damaged by fire if proper protection is given the combustible objects or materials confined within the rooms or spaces of the same. Many such buildings are normally used in such a manner that certain of their rooms or spaces are always provided with valuable, combustible objects or materials while the remaining rooms or spaces are only periodically employed for temporarily confining valuable, combustible objects, etc. That is to say, certain of these remaining rooms may be used for one period of time, while the others are empty, and the rooms which are occupied may vary from time to time.

A fixed automatic fire extinguishing system, to provide adequate protection for such a building, must include every one of the several rooms and yet only a fractional portion of the entire system is ever relied upon at any one time. In such a situation, if the owner cannot afford or justify the installation of an automatic system which will protect all of the rooms of his building, he may decide that he might just as well rely on the conventional, manually controlled, portable equipment for the entire building. On the other hand, he may install a fixed, automatic system to take care of the rooms most frequently used and run the risk of being able to protect the remaining rooms with portable equipment. Prior to the development of the present invention, there was no real solution for this man's fire problem.

There are numerous examples of temporary hazards which might be given, but reference to one or two should be sufficient to illustrate the need for the present invention to protect this type of hazard.

a. For example, a new building, or an enlargement on an old building is being erected and, when the construction work has been completed, it will be provided with the necessary automatic fire protection, or

b. As a result of extensive remodeling operation being performed in a room which normally contains valuable, combustible objects or materials and is protected by an automatic fire extinguishing system, it becomes necessary to temporarily disassemble a portion of the system so that the room is no longer provided with automatic protection, or the contents of the room must be moved into an unprotected portion of the building.

In each of these cases fire hazards exist which, although they are only temporary in character, are abnormally dangerous because of the well recognized careless habits of workmen engaged in construction operations. However, manually controlled portable equipment is all that has been available to protect this type of property and, because it is so inadequate, it is seldom provided.

It is the primary object of this invention to provide fire extinguishing units which are entirely self-contained; which may be placed so as to permanently protect one space or readily moved from one location to another to afford protection for periodic or temporary hazards; which may be readily transported from the space being protected to a point entirely outside of the building, or on the ground floor of the building adjacent an exterior wall so that the supply of fire extinguishing medium may be replenished when necessary; and which will automatically detect the existence of a fire and will accomplish extinguishment of the same as a result of such detection.

A further important object of the invention is to provide a completely unitized piece of fire fighting equipment which will operate to automatically detect the existence of a fire in an enclosed space; which will flood the space with a sufficient quantity of vapors to create a fire extinguishing atmosphere as a result of such detection; and which will maintain a uniform distribution of the vapors throughout the height of the space notwithstanding the "heavier than air" characteristics of the vapors.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings forming a part of this specification and in which like numerals are employed to designate like parts throughout the same,

Figure 1 is a perspective view of one complete-unitized, automatically operable, portable fire fighting apparatus embodying this invention,

Figure 2 is a top plan view of the apparatus of Fig. 1 with the mechanism of the apparatus, which is confined within a transportable cabinet, disclosed in dash lines,

Figure 3 is a vertical sectional view through the cabinet of the apparatus disclosed in Figs. 1 and 2 and illustrates in side elevation the mechanism confined within the cabinet,

Figure 4 is a sectional view similar to Fig. 3 but taken at right angles thereto,

Figure 5 is a top plan view of a slightly modified form of unitized, portable apparatus embodying this invention,

Figure 6 is a vertical sectional view of the cabinet of the apparatus shown in Fig. 5 with the mechanism confined within the cabinet illustrated in side elevation,

Figure 7 is a combined vertical sectional view and side elevational view which is taken at right angles to the disclosure of Fig. 6, and

Figure 8 is a detail elevational view of a portion of the cabinet illustrated in Figs. 5 to 7, inclusive, and discloses one pair of louvred doors which may be opened to provide access to the mechanism located within the cabinet.

In the drawings, wherein for the purpose of illustration are shown the preferred embodiments of this invention, and particularly referring to Figs. 1 to 4, inclusive, which illustrate one embodiment of the invention, the reference character 10 designates the cabinet which houses the mechanism of the unit.

This cabinet should be of proper dimensions to permit the same to pass readily through conventional, single width doorways which constitute the entrance openings of the rooms or enclosures which may be given fire protection by this unit. To facilitate movement of the unit into and out of such rooms and into different locations within a building, the cabinet is supported by wheels 11 which are connected by caster mounts 12 to the bottom of the cabinet. Figs. 1 and 2 clearly illustrate hinged doors 13 which are provided for one end portion of the cabinet and are arranged on opposite sides of the same. Louvres 14 and 15 are provided in the lower and upper portions of both of these doors to provide

for a circulation of air through this end portion of the cabinet. The adjacent end wall of the cabinet, also, is provided with louvres 16 which cooperate with the door louvres for providing this circulation of air.

The cabinet 10 is intended to have housed therein proper tank or container means for confining the required quantity of carbon dioxide which is employed, in the event of a fire, to flood the room or enclosure in which the unit is located for the purpose of creating an extinguishing atmosphere of carbon dioxide vapors mixed with the air of the enclosure. The following table illustrates the quantities of liquid carbon dioxide which are recommended for use in different sized rooms to create proper fire extinguishing atmospheres for different types or classes of fires or hazards. It will be appreciated that this table is based on the requirement that the room or enclosure be reasonably well shut off or sealed against the egress of the extinguishing atmosphere. The quantities of carbon dioxide must be increased or given sized rooms to compensate for conditions which will allow the extinguishing atmosphere to escape at abnormal rates. The table covering normal operating conditions is given as follows:

Quantity of CO_2	Types or classes of hazards, room sizes in cubic feet		
	A	B	C
¼ ton	5,000	7,500	5,000
½ ton	10,000	15,000	10,000
¾ ton	15,000	22,500	15,000
1 ton	20,000	30,000	20,000

Of course, the cabinet may be provided with a bank of 50-pound, high pressure cylinders for confining the required carbon dioxide. However, for this type of unit, there are numerous reasons for and advantages to be obtained from the use of low pressure storage tanks which are enclosed in a heat insulating envelope and in which the liquid carbon dioxide is maintained at a predetermined subatmospheric temperature and its corresponding vapor pressure. In employing the expression "subatmospheric temperature," a normal atmospheric temperature of 70° F. is used as a basis of comparison.

Because one of the principal reasons for developing a fire extinguishing unit of this character was to provide automatic protection at a cost which is considerably less than the cost of installing a fixed system which will give the same type of protection, a comparison between the cost of employing high pressure cylinders and low pressure insulated tanks, for confining the liquid carbon dioxide, is important. Containers capable of handling liquid carbon dioxide at the high vapor pressures required for maintaining the liquid at the surrounding atmospheric temperatures usually cost purchasers from $450.00 to $600.00 per ton of carbon dioxide capacity, depending upon the capacity of each container and the number of containers purchased at any one time. The use of low pressure insulated containers, with mechanism capable of maintaining the liquid carbon dioxide at the desired subatmospheric temperature, and its corresponding vapor pressure, requires an outlay of approximately $275.00 per ton of carbon dioxide.

Another factor which is of considerable importance in dealing with a unit of this character is the overall dimensions of the unit and the amount of liquid carbon dioxide that can be provided with a unit that occupies a given floor space. As stated, the units embodying this invention are intended to be capable of ready movement from one room or enclosure to another in a building of conventional design. Therefore, the units must be capable of being moved through conventional, single width doorways.

A unit of the character illustrated in Figs. 1 to 4, inclusive, having the overall dimensions of 2 feet 7⅛ inches in width, 6 feet 1¾ inches in depth, and 6 feet 11⅞ inches in height including the wheels 11, is capable of confining 1000 pounds of liquid carbon dioxide in properly insulated, low pressure tanks with the necessary mechanism for maintaining the liquid carbon dioxide at the desired subatmospherical temperature and, additionally, with the mechanism which will provide the required automatic fire protection. If high pressure cylinders are used, i. e., conventional cylinders having a capacity of 50 pounds of liquid carbon dioxide for each cylinder, each one of these cylinders, when standing on end, will occupy one square foot of floor space. Therefore, 8 cylinders, holding 400 pounds of liquid carbon dioxide could be substituted for the illustrated low pressure tanks and their enclosing insulation while 12 cylinders, holding 600 pounds of liquid carbon dioxide could be arranged in the entire cabinet. It is obvious, therefore, that considerably more liquid carbon dioxide can be provided for a unit of a given size if the carbon dioxide is stored in low pressure tanks and is maintained at a desired subatmospheric temperature, and its corresponding vapor pressure.

Another important advantage which results from the use of low pressure insulated storage tanks is that the tanks need not be disturbed once they are properly mounted in the cabinet. When low pressure storage tanks are employed, a liquid level gauge 9 is provided which indicates at all times the amount of liquid carbon dioxide stored in the tanks. If conventional 50-pound cylinders were employed, it is necessary to weigh each cylinder individually to determine the amount of carbon dioxide that cylinder contains. If a full charge of carbon dioxide is not found in the cylinder, it is necessary to send the cylinder to a charging plant for the addition of more carbon dioxide, or the recharging of the cylinder. These weighing and recharging operations make necessary the removal of the cylinders from the cabinet. A unit which stores its liquid carbon dioxide in low pressure tanks may be transported to a convenient position with respect to the exterior of the building and then recharged from a transportation truck which has been driven to the building. The liquid carbon dioxide charged into the tanks of the unit may be at any desired low temperature, and its corresponding vapor pressure.

The above noted advantages accruing from the use of low pressure insulated storage tanks have particular bearing on the type of fire fighting equipment being considered. There are, however, several additional benefits or advantages to be obtained from the use of low pressure, low temperature liquid carbon dioxide as distinguished from high pressure, atmospheric temperature liquid carbon dioxide.

For example, the latent heat of vaporization

of carbon dioxide liquid (at 0° F. and 290 lb. gauge pressure) is 120.1 B. t. u. per pound, whereas (at +70° F. and 838.8 lb. gauge pressure) the latent heat of vaporization is only 63.8 B. t. u. per pound. In low pressure carbon dioxide stored at 0° F., we have in addition to the latent heat of vaporization of the liquid at this low temperature, the refrigeration involved in raising the temperature of the discharged vapors from 0° F. to +70° F. In high pressure carbon dioxide stored at atmospheric temperature (70° F.) the only refrigerating capacity consists of the latent heat of vaporization of the liquid at that temperature because the initial and final temperatures are identical. Therefore, for every 100 pounds of liquid carbon dioxide, stored at 0° F., we have a total B. t. u. refrigerating effect (latent heat plus specific heat) of 13,480 B. t. u. For every 100 pounds of high pressure liquid carbon dioxide, stored at 70° F., we have a total refrigerating effect (latent heat only) of 6380 B. t. u. The net gain in refrigerating effect, when comparing the above figures, is 7100 B. t. u. per 100 pounds of liquid carbon dioxide discharged to effect extinguishment of a fire. As extinguishment of a fire is dependent primarily upon the lowering of the temperature of the materials being consumed to a value below their ignition temperature, this increase in refrigerating effect is of vital importance.

Figs. 2 and 3 disclose two low pressure, liquid carbon dioxide storage tanks 17 which are interconnected at their lower ends by the short pipe section 18 and are provided with a common vapor chamber at their upper ends by the header 19 which is in open communication with both of the tanks. These tanks are completely enclosed in a suitable envelope or covering 20 which is formed of appropriate heat insulating material.

A liquid discharge line 21 extends from the bottom of one of these tanks to a point within the cabinet 10 but located exteriorly of both insulated tanks. This discharge line connects at its outer end with one branch of the casing of a discharge valve 22 as well as to one branch of the casing of a manually controlled charging valve 23, see Figs. 2, 3, and 4.

Fig. 3 clearly discloses the vapor chamber of the header 19 as having connected thereto a pipe line 24 which extends exteriorly of the insulation 20 and terminates in a coupling 25. Figs. 2, 3, and 4 disclose this coupling as having connected thereto a fitting 26 which holds a rupturable, blow-out disc 27 that will be fractured and will release the carbon dioxide from the tank in the event of failure of all of the apparatus, to be described, which is normally relied upon to maintain the stored liquid at the preselected, subatmospheric temperature, and its corresponding vapor pressure. The coupling 25 also has attached thereto a fitting 28 to which are connected two automatic, bleed-off valve devices 29. These bleed-off devices are set for operating at different pressures for slowly bleeding carbon dioxide vapors from the tank. It will be appreciated that when carbon dioxide vapors are slowly withdrawn from the vapor space of a tank holding both liquid and vapor carbon dioxide, the vaporization of liquid to take the place of the vapors bled from the container will cause self-refrigeration of the remaining liquid. This self-refrigeration will be accompanied by a lowering of the pressure of the stored carbon dioxide to a value which will be below the opening pressure of the bleed-off device. This bleed-off device, therefore, will automatically close after the required amount of self-refrigeration has taken place. These bleed-off devices 29 are merely employed as supplemental temperature and pressure control devices to be relied upon in case of mechanical failure, etc., of the refrigerating apparatus, which will be described at a later point, that is normally employed for maintaining the stored liquid at the desired subatmospheric temperature. The two bleed-off devices 29 are set for operating at different pressures so that the protection afforded by one of these devices will be supplemented by the protection afforded by the other.

To replenish the tanks, after the liquid carbon dioxide has been discharged therefrom to accomplish extinguishment of a fire, the unit is wheeled to an accessible location for a carbon dioxide delivery truck. The liquid space of the truck will be connected to the second branch of the charging valve 23. The vapor space of the truck tank will be connected to the vapor space of the tanks 17 of the unit through the medium of the fitting 26, or the coupling 25 to which the fitting is attached. With the liquid and vapor spaces of the supply tank and extinguished tanks thus interconnected, the required amount of liquid carbon dioxide may be displaced from the supply tank into the extinguisher tank. After this recharging operation has been accomplished, the previously referred to connections are broken and the unit may be returned to the location of the hazard to be protected thereby.

For the purpose of normally maintaining the liquid carbon dioxide within the storage tanks 17 at the desired subatmospheric temperature, and its corresponding vapor pressure, a cooling coil 30 is located in the vapor space of the header 19. This coil, see Figs. 2 and 3, is connected by the pipe line 31 to the refrigerant receiver 32 of a conventional mechanical refrigerating device. A suitable expansion valve 33 is coupled in the conventional manner in the pipe line 31. The refrigerant receiver 32 is connected by a branch line 34 to one end of an air cooled condenser coil 35. The remaining end of this condenser coil is connected by the branch line 35 to the discharge side of the compressor 37. The intake side of this compressor is connected by the pipe line 36 to the remaining side of the cooling coil 30. An electric motor 39 is provided for driving the compressor 37 and its armature shaft has mounted thereon a fan 40 associated with the condenser coil 35 for blowing air over this coil to cool the same.

The cooling coil 30 in the vapor space of the tank header 19 maintains the liquid carbon dioxide in the tanks 17 at the desired subatmospheric temperature by condensing carbon dioxide vapors in said vapor space and allowing the drops of condensation to be returned by gravity to the liquid bodies in the tanks. The mechanical refrigerating device connected to this coil 30 is operated at proper intervals and for appropriate lengths of time to accomplish this desired temperature control of the stored liquid carbon dioxide. When the pressure of the carbon dioxide in the tanks 17 reaches a predetermined maximum, the mechanical refrigerating device will be automatically placed in operation. This device will continue to operate until the carbon dioxide pressure has been lowered to a predetermined minimum when the refrigerating device will shut off automatically. The various figures disclose a mercoid pressure switch

41, of any suitable construction, for controlling this automatic operation of the refrigerating device. Fig. 1 discloses this mercoid switch as being visible through a suitable opening formed in the illustrated end wall of the cabinet 10. A gauge 41a for indicating tank pressure also is visible.

The previously referred to discharge valve 22 is automatically operated for the purpose of initiating the discharge of carbon dioxide from the two tanks 17 into the enclosure, in which the extinguisher unit is placed, in response to detection of a hostile fire. This valve 32, of course, may be of numerous different designs and may employ different sources of operating power. In the present illustration, the valve is operated by a solenoid which is diagrammatically illustrated in Figs. 3 and 4 and is designated by the reference character 42. This valve normally is closed but is opened when the solenoid coil is energized. When this solenoid valve is opened, liquid carbon dioxide flows from the tanks 17 through the discharge line 21 to the valve 22. From this valve it flows through the perpendicular line 43 to the discharge nozzle 44 which is mounted in a suitable opening formed in the top wall of the cabinet 10. As the liquid carbon dioxide is discharged through this nozzle 44 into the room or enclosure being protected by the unit, the liquid is permitted to suddenly expand and the actual discharge takes the form of a mixture of carbon dioxide vapors and snow. Several different types of discharge nozzles may be employed, but the one specifically illustrated in Figs. 2 to 4, inclusive, corresponds with the type of apparatus disclosed and claimed in the application of Harry Ensminger, Ser. No. 247,268, filed December 22, 1938. By employing different sizes, or diameters, for the discharge line 21 and the discharge nozzle 44, any desired rate of discharge may be employed. For example, a one and one-half inch discharge line with a single discharge nozzle of corresponding size will release approximately 1000 pounds of liquid carbon dioxide in 60 seconds. Faster rates of discharge may be obtained by increasing the diameter of the discharge flow path through the line 21 and the discharge nozzle.

The release of the stored liquid carbon dioxide into the room or enclosure to be protected accomplishes automatic flooding of the room. The desired carbon dioxide concentration to accomplish extinguishment of a fire in any portion of the room may be obtained by employing a proper quality of carbon dioxide for that particular room. Where different sized rooms are to be protected at different times by a single unit, the unit should have a capacity for the largest one of these rooms, in accordance with the table given above. As carbon dioxide vapors possess the characteristic of flowing in three directions and will penetrate small cracks and crevices, the release of the carbon dioxide at any one point within the room or enclosure will accomplish extinguishment of a fire located at any other point or in any other place within the room or enclosure.

To accomplish automatic detection of the fire, a suitable heat responsive device must be employed. The details of this device are not disclosed, but the housing for the same is illustrated in Figs. 1 to 3, inclusive, and is designated by the reference character 45. This housing is mounted on a stem or pipe 46 which extends through the top wall of the cabinet 10. This stem or pipe is extensible or vertically adjustably attached to the cabinet so that the casing 45 may occupy the pocket or recess 47 when the unit is being moved from one place to another. When the unit is properly installed in the room or enclosure to be provided with automatic fire protection, the stem or pipe 46 with its casing 45 should be adjusted vertically so as to locate the casing, and its heat responsive means, adjacent the ceiling of the room or enclosure. The heat responsive device located in the casing 45 should operate in response to rapid rates of rise of temperature within the room or enclosure and should close an electric circuit when thus actuated. Diagrammatically represented by the casing or housing 48 is a suitable holding relay, of any conventional design, which will function to maintain the coil of the valve solenoid 42 energized for a sufficient length of time to allow all of the stored liquid carbon dioxide to be discharged through the nozzle 44. In other words, this holding relay will maintain the solenoid valve energized for the proper length of time after the operating circuit of the relay has once been closed by the heat responsive device within the casing 45.

When the room or enclosure to be protected by the unit of Figs. 1 to 4, inclusive, if of considerable dimensions horizontally, it will be found to be desirable to have more than one heat responsive fire detecting means connected to the unit. Fig. 3 discloses one way of accomplishing this desired result. In this figure, one or more additional heat responsive devices 45 may be permanently installed in the room by being attached to the ceiling and interconnected through appropriate piping 48. These additional or auxiliary heat responsive devices may be connected to the heat responsive device of the unit through a flexible, armored conduit 49. This conduit, of course, will house the required electric wires and may be connected to the casing 45 of the unit by a conventional, electric plug and socket structure 50. In other words, when the unit is wheeled into the room or enclosure to be protected and this room or enclosure is provided with a series of permanently installed heat responsive devices, the permanent devices will be coupled to the device of the unit and the solenoid controlled discharge valve for the carbon dioxide will be actuated in response to energization of any one of the heat responsive devices. Of course, additional or auxiliary heat responsive devices may be provided with suitable supporting means so that they may be transported with the unit from one room to another. Such portable, auxiliary heat responsive devices could be mounted on suitable standards, having properly weighted bases, which could be spotted at suitable locations around the room and properly connected to the heat responsive device of the unit in the manner generally illustrated in Fig. 3.

Exclusive of the use of additional or auxiliary heat responsive devices, the unit is entirely self-contained except for a source of supply of electricity for operating the electrical devices. Fig. 3 shows a wire connection 51 which is attached to the unit and is intended to be plugged into an electrical wall outlet 52 which is provided at the proper location in each room or enclosure to be protected at different times by the unit. The cable 51, or conduit for the electrical supply wires, extends through the cabinet 10 to a combined outlet and junction box 52. A suitable connection 53 for the motor 39 of the refrigerator device extends from this outlet and junction box

52. A branch conduit 54 extends to a second junction box 55 while a conduit 56 extends from this box to the casing 48 of the relay. After the unit is properly located in the room or enclosure to be protected, the proper connection with the wiring system of the building is established through the medium of the cable 51.

When carbon dioxide vapors are discharged into a room or enclosure for the purpose of totally flooding the same to extinguish a fire, the entire space of the room or enclosure is provided with the desired extinguishing atmosphere, or CO_2 concentration. As carbon dioxide vapors are more dense than the air of the room or enclosure, these vapors will settle toward the floor after the discharge has ceased. Therefore, the lower levels of the room or enclosure will, normally, be subjected to an extinguishing atmosphere for a greater length of time than the upper levels. This is an extremely undesirable condition if the fire is located in an upper region.

To overcome this undesirable feature, a blower, represented by the casing 57, is located in the cabinet 10. The fan of this blower is driven by the electric motor 58. Electricity for this motor is supplied by wires which extend through the conduit 59 that is connected to the junction box 55. A center inlet 60 is provided for the blower casing 57. This inlet extends to and opens through the end wall of the cabinet, as is clearly illustrated in Fig. 1. The peripheral outlet for the blower casing 57 has connected thereto a conduit 61 which extends to and opens through the top wall of the cabinet, as is indicated at 62 in Fig. 2. It will be noted by inspecting Figs. 1 and 3 that the inlet for the blower is located a reasonable distance from the floor line 63 and, therefore, will permit the blower to draw in the extinguishing atmosphere, having the concentration found at this level, and discharge the same in an upward direction, or toward the ceiling. The extinguishing atmosphere circulated by means of this blower arrangement will function to maintain a uniform concentration of carbon dioxide for a considerable time after the discharge of carbon dioxide vapors has stopped. The electric motor 58, employed for driving the fan of the blower, may be operated in any timed relation to the discharge period of the carbon dioxide which is found to be desirable. For example, the motor 58 may be started at the same time the discharge of the carbon dioxide is initiated and may continue for any desired length of time after the carbon dioxide has been completely discharged or this blower motor may be started by operation of the holding relay 48 to close the automatic valve 22, as a result of de-energizing the solenoid 42, and the motor may be permitted to run until the supply of electricity to the unit is broken by disconnecting the cable 51 from the wall outlet 52.

This unit of Figs. 1 to 4, inclusive, has been given specific dimensions for two low pressure tanks, each one of which has a capacity for 500 pounds of liquid carbon dioxide. It will be appreciated that a unit having a capacity for 500 pounds of liquid carbon dioxide may be provided by dispensing with the use of one of these tanks 17. The unit may be shortened by approximately 22 inches for this reduction in capacity. Of course, one or two additional 500 pound capacity tanks can be added to the two specifically illustrated in Figs. 2 and 3. The overall length of the unit will be increased by approximately 22 inches for each tank which is added.

Figs. 5 to 8, inclusive, discloses a modified form of automatic fire protection unit which is intended to operate in the same manner as and will perform the same functions as the unit shown in Figs. 1 to 4, inclusive. This unit of Figs. 5 to 8, inclsuive, differs principally in design from the previously described unit.

For example, the cabinet 63 is of approximately square formation in top plan and a single low pressure storage tank 64 is arranged therein. This tank, with its enclosing insulation 65, substantially fills the horizontal cross section of the cabinet for a given portion of its height. The unoccupied upper portion of the cabinet houses the refrigerating and controlling apparatus which was described as being located in the end portion of the cabinet illustrated in Figs. 1 to 4, inclusive. This unit of Figs. 5 to 8, inclusive, is not actually illustrated as being provided with facilities for connection with additional heat responsive, fire detecting devices or with blower means for producing a circulation of the extinguishing atmosphere to maintain a uniform concentration throughout the height of the room or enclosure. It is to be understood, however, that this unit of Figs. 5 to 8, inclusive, may be provided with these additional facilities if desired. In describing this modified unit, it should be sufficient to merely identify the various parts or elements of the mechanism. The operation of this mechanism will be understood by those skilled in the art from the detailed disclosure of the unit shown in Figs. 1 to 4, inclusive.

The pipe line 66 is employed for effecting discharge of the liquid carbon dioxide from the low pressure tank 64 and for accomplishing recharging of this tank. This pipe line, therefore, is connected at its upper, exterior end to the manual valve 67, employed for establishing communication between the liquid space of the tank and the liquid space of the supply tank carried by a servicing truck, and to an automatic solenoid valve 68 which controls communication between the pipe line 66 and the discharge nozzle 69.

The vapor space of the tank 64 has a pipe line 70 connected thereto which has attached to its upper, exterior end, a coupling 71. A fitting 72 is suitably connected to the coupling and holds the rupturable safety disc 73. This fitting, also, is employed for establishing a connection between the vapor space of the tank 64 and the vapor space of the supply truck tank when the unit is to be recharged. The coupling 71 also has attached thereto the bleed-off devices 73 which will function to maintain the liquid carbon dioxide stored in the tank 64 at a desired subatmospheric temperature in case the refrigerating apparatus fails to perform its intended function.

A cooling coil 74 is located in the vapor space of the tank 64. One end of this cooling coil is connected by a pipe line 75 to the refrigerant receiver 76. A pipe line 77 connects the receiver 76 to the air cooled condenser coil 78 at one end. The remaining end of this condenser coil is connected by the pipe line 79 to the compressor 80 at its discharge side. The intake side of this compressor is connected by a pipe line 81 with the second end of the cooling coil 74 that is located in the vapor space of the storage tank. An expansion valve 82 is provided in the line 75. An electric motor 83 is provided for driving the compressor 80 and the armature shaft of this motor has mounted thereon a fan 84 which

blows air over the air cooled condenser coil 78 of the refrigerator circuit. A mercoid pressure switch 85 is employed and is operated by the pressure of the carbon dioxide in the storage tank 64 for controlling the periods of operation of the mechanical refrigerating device. A pressure gauge 86 and a liquid level gauge 87 are suitably connected to the tank 64 and are visible through one wall of the cabinet 63 to permit an attendant to determine the condition of the extinguishing medium.

An extensible and retractible heat responsive, fire detecting device 88 is illustrated as being carried by the stem or pipe 89 that extends into the cabinet through its top wall and is vertically adjustably mounted with respect thereto. A holding relay 99 is provided for the solenoid valve 68 and, as was explained for the unit of Figs. 1 to 4, inclusive, this relay will maintain the valve open for a predetermined length of time after the heat responsive device 88 has once been actuated.

The supply of current for the electrical apparatus of this unit is provided by means of the cable 91 which may be connected to the wall outlet 92 and extends to a junction box 93 located in the cabinet.

The upper portion of the cabinet is provided with two pairs of doors 94 which may be opened to obtain access to the mechanism housed within the upper portion of the cabinet. These doors are provided with louvres 95 to allow for a circulation of air through this part of the cabinet.

This unit also is provided with castered supporting wheels 96 to permit the unit to be readily transported from one location to another. To facilitate handling of the entire unit by means of a crane or hoist, lifting eyes 97 are attached to the upper end of the cabinet.

It is believed that this explanation of the modified form of unit, when considered in connection with the description of the more completely illustrated unit of Figs. 1 to 4, inclusive, will enable anyone skilled in the art to fully understand the construction and mode of operation of the unit of Figs. 5 to 8, inclusive.

It is to be understood that the forms of this invention herewith shown and described are to be taken as preferred examples of the same, and that various changes in the shape, size, and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

Having thus described the invention, I claim:

1. A completely unitized, portable fire fighting device providing automatic detection and extinguishment, comprising a transportable cabinet, means housed in said cabinet for confining carbon dioxide to be used for creating a fire extinguishing atmosphere in the enclosure in which the cabinet is placed, a discharge device connected to said confining means and adapted to discharge the carbon dioxide into the enclosure, means for initiating the flow of carbon dioxide to the discharge device, and heat responsive means carried by the cabinet and exposed to the temperature of the said enclosure for actuating the flow initiating means to effect discharge of the carbon dioxide upon detection of a fire.

2. A completely unitized, portable fire fighting device providing automatic detection and extinguishment, comprising a wheeled cabinet, means housed in said cabinet for confining carbon dioxide to be used for creating a fire extinguishing atmosphere in the enclosure in which the cabinet is placed, a discharge device connected to said confining means and adapted to discharge the carbon dioxide in an upward direction from the top of the cabinet into the enclosure, means for initiating the flow of carbon dioxide to the discharge device, and heat responsive means carried by the cabinet and exposed to the temperature of the said enclosure for actuating the flow initiating means to effect discharge of the carbon dioxide upon detection of a fire.

3. A completely unitized, portable fire fighting device providing automatic detection and extinguishment, comprising a transportable cabinet, means housed in said cabinet for confining carbon dioxide to be used for creating a fire extinguishing atmosphere in the enclosure in which the cabinet is placed, a discharge device connected to said confining means and adapted to discharge the carbon dioxide into the enclosure, means for initiating the flow of carbon dioxide to the discharge device, heat responsive means for actuating the flow initiating means to effect discharge of the carbon dioxide upon detection of a fire, and means for adjustably mounting the heat responsive means on the cabinet so that it may be projected into a position adjacent the ceiling of the enclosure to be exposed to the enclosure temperature at that level.

4. A completely unitized, portable fire fighting device providing automatic detection and extinguishment, comprising a wheeled cabinet, means housed in said cabinet for confining carbon dioxide to be used for creating a fire extinguishing atmosphere in the enclosure in which the cabinet is placed, a discharge device connected to said confining means and adapted to discharge the carbon dioxide in an upward direction from the top of the cabinet into the enclosure, means for initiating the flow of carbon dioxide to the discharge device, heat responsive means for actuating the flow initiating means to effect discharge of the carbon dioxide upon detection of a fire, and means for adjustably mounting the heat responsive means on the cabinet so that it may be projected upwardly into a position adjacent the ceiling of the enclosure to be exposed to the enclosure temperature at that level.

5. A completely unitized, portable fire fighting device providing automatic detection and extinguishment, comprising a transportable cabinet, means housed in said cabinet for confining carbon dioxide to be used for creating a fire extinguishing atmosphere in the enclosure in which the cabinet is placed, a discharge device connected to said confining means and adapted to discharge the carbon dioxide into the enclosure, means for initiating the flow of carbon dioxide to the discharge device, heat responsive means carried by the cabinet and exposed to the temperature of the said enclosure for actuating the flow initiating means to effect discharge of the carbon dioxide upon detection of a fire, and means carried by the cabinet for drawing carbon dioxide vapors from near the floor level of the enclosure and projecting the same in the direction of the ceiling to effect circulation of said vapors and thereby maintain a uniform concentration of the extinguishing atmosphere throughout the height of the enclosure.

6. A completely unitized, portable fire fighting device providing automatic detection and extinguishment, comprising a wheeled cabinet, means housed in said cabinet for confining carbon dioxide to be used for creating a fire extinguishing

atmosphere in the enclosure in which the cabinet is placed, a discharge device connected to said confining means and adapted to discharge the carbon dioxide in an upward direction from the top of the cabinet into the enclosure, means for initiating the flow of carbon dioxide to the discharge device, heat responsive means carried by the cabinet and exposed to the temperature of the said enclosure for actuating the flow initiating means to effect discharge of the carbon dioxide upon detection of a fire, and means carried by the cabinet for drawing carbon dioxide vapors from near the floor level of the enclosure and projecting them in the direction of the ceiling to effect circulation of said vapors and thereby maintain a uniform concentration of the extinguishing atmosphere throughout the height of the enclosure.

7. A completely unitized, portable fire fighting device providing automatic detection and extinguishment, comprising a transportable cabinet, means housed in said cabinet for confining carbon dioxide to be used for creating a fire extinguishing atmosphere in the enclosure in which the cabinet is placed, a discharge device connected to said confining means and adapted to discharge the carbon dioxide into the enclosure, means for initiating the flow of carbon dioxide to the discharge device, heat responsive means for actuating the flow initiating means to effect discharge of the carbon dioxide upon detection of a fire, means for adjustably mounting the heat responsive means on the cabinet so that it may be projected into a position adjacent the ceiling of the enclosure to be exposed to the enclosure temperature at that level, and means carried by the cabinet for drawing carbon dioxide vapors from near the floor level of the enclosure and projecting them in the direction of the ceiling to effect circulation of said vapors and thereby maintain a uniform concentration of the extinguishing atmosphere throughout the height of the enclosure.

8. A completely unitized, portable fire fighting device providing automatic detection and extinguishment, comprising a wheeled cabinet, means housed in said cabinet for confining carbon dioxide to be used for creating a fire extinguishing atmosphere in the enclosure in which the cabinet is placed, a discharge device connected to said confining means and adapted to discharge the carbon dioxide in an upward direction from the top of the cabinet into the enclosure, means for initiating the flow of carbon dioxide to the discharge device, heat responsive means for actuating the flow initiating means to effect discharge of the carbon dioxide upon detection of a fire, means for adjustably mounting the heat responsive means on the cabinet so that it may be projected into a position adjacent the ceiling of the enclosure to be exposed to the enclosure temperature at that level, and means carried by the cabinet for drawing carbon dioxide vapors from near the floor level of the enclosure and projecting them in the direction of the ceiling to effect circulation of said vapors and thereby maintain a uniform concentration of the extinguisher atmosphere throughout the height of the enclosure.

9. A completely unitized, portable fire fighting device providing automatic detection and extinguishment, comprising a transportable cabinet, heat insulated container means housed in said cabinet for confining liquid carbon dioxide at a desired subatmospheric temperature and its corresponding vapor pressure to be used for creating a fire extinguishing atmosphere in the enclosure in which the cabinet is placed, means housed in said cabinet and operatively connected to said confining means for maintaining the liquid carbon dioxide at said desired subatmospheric temperature and pressure, a discharge device connected to said container means and adapted to discharge the carbon dioxide into the enclosure, means for initiating the flow of carbon dioxide to the discharge device, and heat responsive means carried by the cabinet and exposed to the temperature of the said enclosure for actuating the flow initiating means to effect discharge of the carbon dioxide upon detection of a fire.

10. A completely unitized, portable fire fighting device providing automatic detection and extinguishment, comprising a wheeled cabinet, heat insulated container means housed in said cabinet for confining liquid carbon dioxide at a desired subatmospheric temperature and its corresponding vapor pressure to be used for creating a fire extinguishing atmosphere in the enclosure in which the cabinet is placed, means housed in said cabinet and operatively connected to said confining means for maintaining the liquid carbon dioxide at said desired subatmospheric temperature and pressure, a discharge device connected to said confining means and adapted to discharge the carbon dioxide in an upward direction relative to the top of the cabinet into the enclosure, means for initiating the flow of carbon dioxide to the discharge means, and heat responsive means carried by the cabinet and exposed to the temperature of the said enclosure for actuating the flow initiating means to effect discharge of the carbon dioxide upon detection of a fire.

11. A completely unitized, portable fire fighting device providing automatic detection and extinguishment, comprising a transportable cabinet, heat insulated container means housed in said cabinet for confining liquid carbon dioxide at a desired subatmospheric temperature and its corresponding vapor pressure to be used for creating a fire extinguishing atmosphere in the enclosure in which the cabinet is placed, means housed in said cabinet and operatively connected to said confining means for maintaining the liquid carbon dioxide at said desired subatmospheric temperature and pressure, a discharge device connected to said confining means and adapted to discharge the carbon dioxide into the enclosure, means for initiating the flow of carbon dioxide to the discharge device, heat responsive means for actuating the flow initiating means to effect discharge of the carbon dioxide upon detection of a fire, and means for adjustably mounting the heat responsive means on the cabinet so that it may be projected into a position adjacent the ceiling of the enclosure to be exposed to the enclosure temperature at that level.

12. A completely unitized, portable fire fighting device providing automatic detection and extinguishment, comprising a wheeled cabinet, heat insulated container means housed in said cabinet for confining liquid carbon dioxide at a desired subatmospheric temperature and its corresponding vapor pressure to be used for creating a fire extinguishing atmosphere in the enclosure in which the cabinet is placed, means housed in said cabinet and operatively connected to said confinining means for maintaining the liquid carbon dioxide at said desired subatmospheric temperature and pressure, a discharge device connected to said confining means and adapted to discharge the carbon dioxide in an

upward direction toward the ceiling of the enclosure, means for initiating the flow of carbon dioxide to the discharge device, heat responsive means for actuating the flow initiating means to effect discharge of the carbon dioxide upon detection of a fire, and means for adjustably mounting the heat responsive means on the cabinet so that it may be projected into a position adjacent the ceiling of the enclosure to be exposed to the enclosure temperature at that level.

13. A completely unitized, portable fire fighting device providing automatic detection and extinguishment, comprising a transportable cabinet, heat insulated container means housed in said cabinet for confining liquid carbon dioxide at a desired subatmospheric temperature and its corresponding vapor pressure to be used for creating a fire extinguishing atmosphere in the enclosure in which the cabinet is placed, means housed in said cabinet and operatively connected to said confining means for maintaining the liquid carbon dioxide at said desired subatmospheric temperature and pressure, a discharge device connected to said confining means and adapted to discharge the carbon dioxide into the enclosure, means for initiating the flow of carbon dioxide to the discharge device, heat responsive means carried by the cabinet and exposed to the temperature of the said enclosure for actuating the flow initiating means to effect discharge of the carbon dioxide upon detection of a fire, and means carried by the cabinet for drawing carbon dioxide vapors from nearer the floor level of the enclosure and projecting them in the direction of the ceiling to effect circulation of said vapors and thereby maintain a uniform concentration of the extinguishing atmosphere throughout the height of the enclosure.

14. A completely unitized, portable fire fighting device providing automatic detection and extinguishment, comprising a wheeled cabinet, heat insulated container means housed in said cabinet for confining liquid carbon dioxide at a desired subatmospheric temperature and its corresponding vapor pressure to be used for creating a fire extinguishing atmosphere in the enclosure in which the cabinet is placed, means housed in said cabinet and operatively connected to said confining means for maintaining the liquid carbon dioxide at said desired subatmospheric temperature and pressure, a discharge device connected to said confining means and adapted to discharge the carbon dioxide in an upward direction toward the ceiling of the enclosure, means for initiating the flow of carbon dioxide to the discharge device, heat responsive means carried by the cabinet and exposed to the temperature of the said enclosure for actuating the flow initiating means to effect discharge of the carbon dioxide upon detection of a fire, and means carried by the cabinet for drawing carbon dioxide vapors from nearer the floor level of the enclosure and projecting them in the direction of the ceiling to effect circulation of said vapors and thereby maintain a uniform concentration of the extinguishing atmosphere throughout the height of the enclosure.

15. A completely unitized, portable fire fighting device providing automatic detection and extinguishment, comprising a transportable cabinet, heat insulated container means housed in said cabinet for confining liquid carbon dioxide at a desired subatmospheric temperature and its corresponding vapor pressure to be used for creating a fire extinguishing atmosphere in the enclosure in which the cabinet is placed, means housed in said cabinet and operatively connected to said confining means for maintaining the liquid carbon dioxide at said desired subatmospheric temperature and pressure, a discharge device connected to said confining means and adapted to discharge the carbon dioxide into the enclosure, means for initiating the flow of carbon dioxide to the discharge device, heat responsive means for actuating the flow initiating means to effect discharge of the carbon dioxide upon detection of a fire, means for adjustably mounting the heat responsive means on the cabinet so that it may be projected into a position adjacent the ceiling of the enclosure to be exposed to the enclosure temperature at that level, and means carried by the cabinet for drawing carbon dioxide vapors from near the floor level of the enclosure and projecting them in the direction of the ceiling to effect circulation of said vapors and thereby maintain a uniform concentration of the extinguishing atmosphere throughout the height of the enclosure.

16. A completely unitized, portable fire fighting device providing automatic detection and extinguishment, comprising a wheeled cabinet, heat insulated container means housed in said cabinet for confining liquid carbon dioxide at a desired subatmospheric temperature and its corresponding vapor pressure to be used for creating a fire extinguishing atmosphere in the enclosure in which the cabinet is placed, means housed in said cabinet and operatively connected to said confining means for maintaining the liquid carbon dioxide at said desired subatmospheric temperature and pressure, a discharge device connected to said confining means and adapted to discharge the carbon dioxide in an upward direction from the cabinet toward the ceiling of the enclosure, means for initiating the flow of carbon dioxide to the discharge device, heat responsive means for actuating the flow initiating means to effect discharge of the carbon dioxide upon detection of a fire, means for adjustably mounting the heat responsive means on the cabinet so that it may be projected into a position adjacent the ceiling of the enclosure to be exposed to the enclosure temperature at that level, and means carried by the cabinet for drawing carbon dioxide vapors from near the floor level of the enclosure and projecting them in the direction of the ceiling to effect circulation of said vapors and thereby maintain a uniform concentration of the extinguishing atmosphere throughout the height of the enclosure.

17. Fire extinguishing apparatus comprising the combination with the enclosure to be flooded with carbon dioxide vapors to create a fire extinguishing atmosphere of heat responsive means permanently installed at different locations in said enclosure and exposed to the temperatures prevailing at said locations, a transportable cabinet adapted to be moved into said enclosure, means housed in said cabinet for confining carbon dioxide to be used for creating a fire extinguishing atmosphere in the said enclosure, a discharge device connected to said confining means and adapted to discharge the carbon dioxide into the enclosure, means for initiating the flow of carbon dioxide to the discharge device, heat responsive means carried by the cabinet and exposed to the temperature of the said enclosure for actuating the flow initiating means to effect discharge of the carbon dioxide upon detection

of a fire, and means for connecting the heat responsive means carried by the cabinet to the heat responsive means permanently installed in the enclosure for rendering said latter heat responsive means operative to actuate the flow initiating means in the event of detection of a fire by any one of said permanently installed means.

18. Fire extinguishing apparatus comprising the combination with the enclosure to be flooded with carbon dioxide vapors to create a fire extinguishing atmosphere, of heat responsive means located at different points in the enclosure and exposed to the temperatures prevailing at said points, a transportable cabinet adapted to be moved into said enclosure, means housed in said cabinet for confining carbon dioxide to be used for creating the said fire extinguishing atmosphere in the enclosure, a discharge device connected to said confining means and adapted to discharge the carbon dioxide into the enclosure, means for initiating the flow of carbon dioxide to the discharge device, heat responsive means for actuating the flow initiating means to effect discharge of the carbon dioxide upon detection of a fire, means for adjustably mounting the heat responsive means on the cabinet so that it may be projected into a position adjacent the ceiling of the enclosure to be exposed to the enclosure temperature at that level, and means for connecting the heat responsive means located at different points in the enclosure to the heat responsive means adjustably mounted on the cabinet.

19. Fire extinguishing apparatus comprising the combination with the enclosure to be flooded with carbon dioxide vapors to create a fire extinguishing atmosphere of heat responsive means permanently installed at different locations in said enclosure and exposed to the temperatures prevailing at said locations, a transportable cabinet adapted to be moved into said enclosure, means housed in said cabinet for confining carbon dioxide to be used for creating a fire extinguishing atmosphere in the said enclosure, a discharge device connected to said confining means and adapted to discharge the carbon dioxide into the enclosure, means for initiating the flow of carbon dioxide to the discharge device, heat responsive means carried by the cabinet and exposed to the temperature of the said enclosure for actuating the flow initiating means to effect discharge of the carbon dioxide upon detection of a fire, means for connecting the heat responsive means carried by the cabinet to the heat responsive means permanently installed in the enclosure for rendering said latter heat responsive means operative to actuate the flow initiating means in the event of detection of a fire by any one of said permanently installed means, and means carried by the cabinet for drawing carbon dioxide vapors from near the floor level of the enclosure and projecting them into the direction of the ceiling to effect circulation of said vapors and thereby maintain a uniform concentration of the extinguishing atmosphere throughout the weight of the enclosure.

20. Fire extinguishing apparatus comprising the combination with the enclosure to be flooded with carbon dioxide vapors to create a fire extinguishing atmosphere, of heat responsive means located at different points in the enclosure and exposed to the temperatures prevailing at said points, a transportable cabinet adapted to be moved into said enclosure, means housed in said cabinet for confining carbon dioxide to be used for creating the said fire extinguishing atmosphere in the enclosure, a discharge device connected to said confining means and adapted to discharge the carbon dioxide into the enclosure, means for initiating the flow of carbon dioxide to the discharge device, heat responsive means for actuating the flow initiating means to effect discharge of the carbon dioxide upon detection of a fire, means for adjustably mounting the heat responsive means on the cabinet so that it may be projected into a position adjacent the ceiling of the enclosure to be exposed to the enclosure temperature at that level, means for connecting the heat responsive means located at different points in the enclosure to the heat responsive means adjustably mounted on the cabinet, and means carried by the cabinet for drawing carbon dioxide vapors from near the floor level of the enclosure and projecting them in the direction of the ceiling to effect circulation of said vapors and thereby maintain a uniform concentration of the extinguishing atmosphere throughout the height of the enclosure.

ERIC GEERTZ.
CHARLES A. GETZ.

CERTIFICATE OF CORRECTION.

Patent No. 2,287,873. June 30, 1942.

ERIC GEERTZ, ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, first column, line 6, for "spaced" read --spaces--; and second column, line 27, strike out "because" second occurrence; page 2, second column, line 26, for "complete-" read --completely--; page 3, first column, line 23, for "increased or" read --increased for--; page 4, second column, line 26, for "extinguished" read --extinguisher--; page 5, second column, line 27, for "if" read --is--; page 6, second column, line 1, for "discloses" read --disclose--; page 8, first column, line 67, claim 8, for "extinguisher" read --extinguishing--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 18th day of August, A. D. 1942.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.