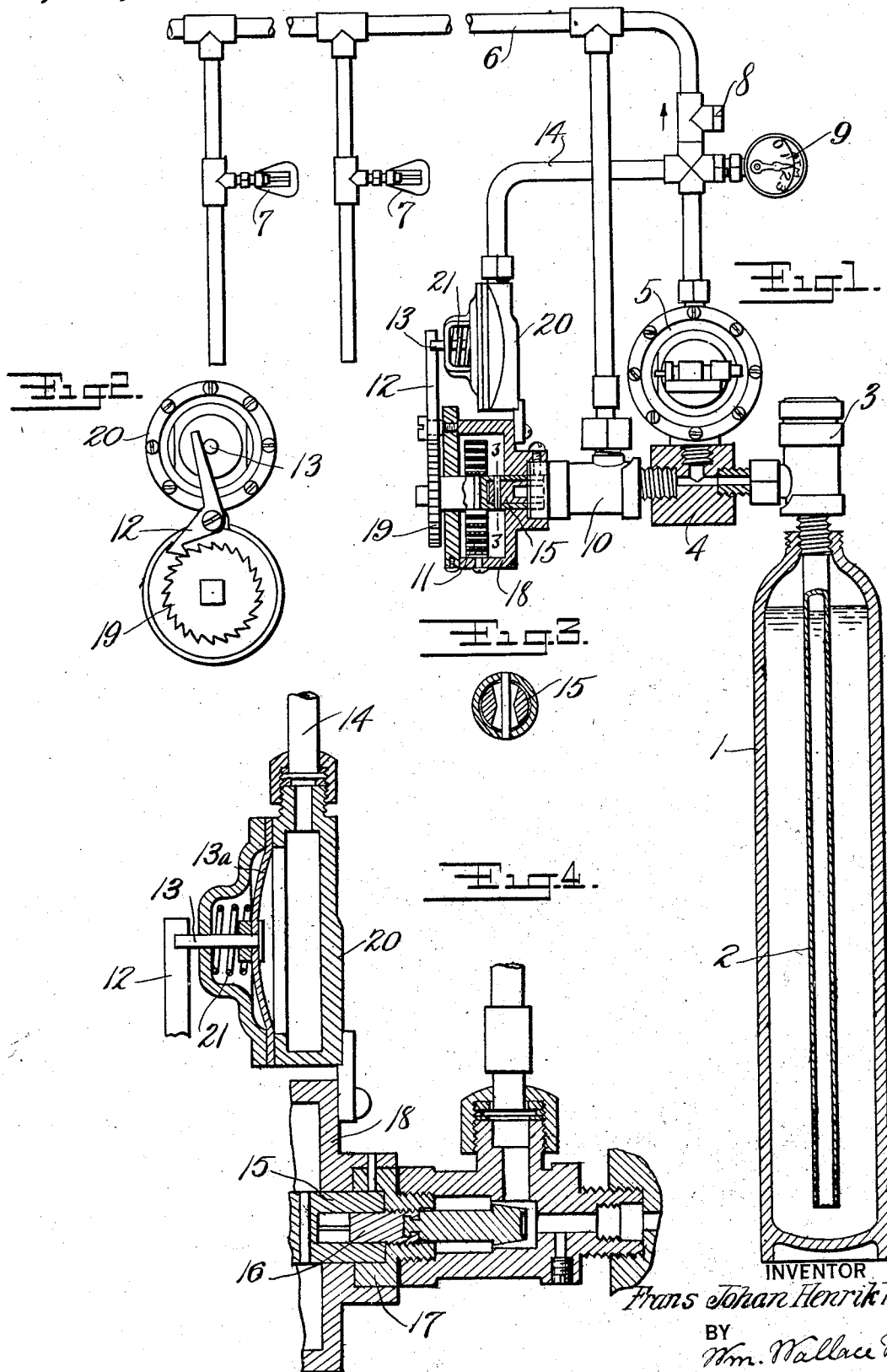


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FIRE EXTINGUISHER.
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FIRE-EXTINGUISHER.

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To all whom it may concern:

Be it known that I, FRANS JOHAN HENRIK RUSTIGE, a subject of the King of Sweden, residing at Lilla Essingen, Stockholm, Sweden, have invented new and useful Improvements in and Relating to Fire-Extinguishers, of which the following is a specification.

In extinguishing fire by means of carbonic acid stored for this purpose in a liquid form the method has hitherto been employed that the carbonic acid has been vaporized before flowing out into the room or chamber where its extinguishing action shall be performed. It has been found, however, in experiments with such apparatus, that the large absorption of heat which always accompanies the vaporization often cools the carbonic acid itself and surrounding conduits sufficiently to cause the latter, which are generally rather narrow, to be obstructed by solid carbonic acid whereby the action of the apparatus is interrupted.

According to the present invention, therefore, the carbonic acid is led in a liquid state from the receptacle or receptacles all through the pipe conduits or system to the mouths thereof so as to flow out into the room or chamber surrounding the fire in a liquid state and be vaporized in said room or chamber.

The invention also comprises an arrangement for making this manner of operation possible, said arrangement consisting in that the outlet pipe from the receptacle or receptacles for the carbonic acid leads from their bottom or the neighborhood thereof, and that the continuation of said pipe extends practically continuously unto the mouths of the pipe system without any vaporizing device being inserted anywhere therein. Such a vaporizing device could for instance consist of a place where the pressure in the conduit would sink below a certain limit. For preventing such sinking there should not be any changes in the cross sectional area of the conduit which exceed a predetermined limit. Finally the invention comprises automatic controlling means for enabling the entire pipe conduit or connecting system for leading the carbonic acid to the place of its action to be normally kept only under a small pressure determined by a reducing valve, while said conduit, when the apparatus is put into action, is brought into direct communication

with the carbonic acid receptacle where of course a considerably higher pressure prevails. The action of this device is based upon the circumstance that the pressure in the conduit between the reducing valve and the outlet, which normally is kept at a certain value determined by said valve, instantaneously sinks, when the apparatus is put into action, on account of the comparatively low pressure due to the action of the reducing valve, until near the atmospheric pressure, which decrease of pressure can be utilized for releasing a controlling device.

A form of the invention is illustrated in the accompanying drawing, in which,

Figure 1 is a side view, partly in section and showing the piping system broken away;

Fig. 2 is an end view of the mechanism for controlling the device;

Fig. 3 is a detail, sectional view taken approximately on the line 3—3 of Fig. 1; and

Fig. 4 is a longitudinal section through the controlling valve and the mechanism for operating the same, said mechanism being shown partly broken away.

The receptacle 1 for carbonic acid is provided with an outlet pipe 2 reaching to, or nearly to, its bottom and connected by means of a main valve 3 to a branch piece 4. From the latter, a conduit goes to the high pressure side of a reduction valve 5, the low pressure side of which is in connection with the fire extinguishing pipe system 6 with the sprinklers 7 through a non-return or check valve 8, and also preferably with a manometer 9 the direction of flow through the valve 8 being indicated by the arrow in Fig. 1. The valves 3, 5 and 8 may be of any well-known form suitable for the purpose, a conventional showing thereof being deemed sufficient herein. Another conduit from the branch pipe 4 is by a valve 10 directly connected to the pipe system.

The valve 10 is normally closed, but suitable mechanism is provided for opening such valve automatically whenever the pressure in the pipe system is sufficiently reduced. In the present instance, the stem of the valve 10 is shown swiveled in what may be termed an auxiliary stem 16, which is provided with a head portion exteriorly threaded and adapted to cooperate with the interior threads of a housing member 17 secured to the casing of the valve 10. The

rear portion of the member 16 is preferably squared and adapted to slide in a similarly formed longitudinal opening in a stub shaft 15, which is mounted for rotation in the end walls of a cylindrical housing 18, within which is carried a band spring 11, one end of the spring being secured to the side wall of the housing 18 while the opposite end of the spring is secured to the stub shaft or pintle 15 by means of a pin passing through a transverse opening in said shaft 15, said opening being so formed that when the spring is released it is permitted to run idle for a short distance and thus acquire a certain amount of speed or momentum before it rotates the stub shaft 15, the formation of this transverse opening being clearly illustrated in Fig. 3. The extreme rear end of the shaft 15 is preferably squared and is provided outside of the spring housing with a ratchet disk 19 adapted to cooperate with a latch 12 pivoted on the housing for retaining this spring 11 wound. Above the spring housing 18 is mounted a second housing 20, which is in two parts having clamped between them a flexible diaphragm 13^a, centrally of which is secured a pin 13 which projects through an opening in the rear end of the casing 20 into the path of the latch 12, whereby said latch is retained in position to lock the ratchet disk against rotation. Around the pin 13, between the diaphragm 13^a and the end of the housing 20 is placed a coil spring 21 adapted to exert pressure on the diaphragm to normally withdraw the pin 13 out of the path of the latch 12. The housing 20, at the opposite side of the diaphragm is in communication, by means of a conduit or pipe 14, with the low pressure side of the pressure reducing valve.

The operation of the apparatus is as follows: Normally the valve 3 is open, and the valve 10 closed, as stated. In the pipe system there prevails a pressure determined by the reducing valve, for instance 1.5 atmospheres above atmospheric pressure which can be read on the manometer 9. If then one of the sprinklers 7 is opened by a fire in its neighborhood, the gaseous carbonic acid present in the pipe system will readily escape through the wide opening of the sprinkler, while the reducing valve which has a narrow passage cannot supply fresh carbonic acid with the same speed, in spite of the high pressure on its high pressure side, whence a rapid sinking of the pressure in the pipe system will occur. This sinking of the pressure is communicated to the diaphragm 13^a which is pressed to the right and leaves the latch 12 free, so that the latter will release the spring 11 which instantaneously opens the valve 10.

The carbonic acid from the receptacle 1 then can rush out directly to the pipe sys-

tem and out through the open sprinkler valve. The carbonic acid then escapes in a liquid state because it passes from the bottom of the receptacle and no vaporization can take place in the conduits. These therefore cannot be obstructed by solid carbonic acid. The action also will be very efficient on account of the large quantity escaping per unit of time, and the absorption of heat takes place in the room surrounding the fire, so that the temperature therein is materially lowered, which circumstance assists in choking the fire. As soon as the valve 10 is opened, the non-return valve 8 closes automatically and protects the more delicate parts of the apparatus, viz. the manometer 9 and the low pressure members of the reduction valve 5 from injury by the high pressure of the escaping liquid.

The device for opening the valve 10 under the influence of the sinking of pressure in the sprinkler conduit or pipe system 6 may obviously be of any kind, and its construction in other ways affords no difficulties to those skilled in the art.

Having now particularly described the nature of my invention and the manner of its operation, what I claim is:

1. In a fire extinguishing apparatus, a receptacle for containing carbonic acid in the liquid state, an outlet pipe leading therefrom near the bottom of the receptacle and adapted to permit the carbonic acid to escape therethrough, and a pipe system leading therefrom, said pipe system having substantially uniform passage dimension.

2. In a fire extinguishing apparatus, a receptacle for containing carbonic acid in the liquid state, an outlet pipe leading therefrom near the bottom of the receptacle and adapted to permit the carbonic acid to escape therethrough, a pipe system leading therefrom, said pipe system having substantially uniform passage dimension and discharge outlets, and means normally preventing the discharge of the liquid.

3. In a fire extinguishing apparatus, a receptacle for liquid carbonic acid, a system of pipes provided with discharge openings permanently connected to the said receptacle at a point adjacent to the bottom of the same, a pressure reducing valve provided in this pipe connection, a direct communication between said system of pipes and said receptacle, and a valve normally closing said direct communication and being capable of being operated by changes in the pressure on the low pressure side of the reducing valve.

4. A fire extinguishing apparatus, comprising a receptacle for carbonic acid, an outlet pipe leading therefrom near its bottom, a pipe system of substantially uniform carrying capacity and having discharge sprinklers, a reduction valve situated in said sys-

tem to permit the discharge of a limited quantity of the liquid under reduced pressure when said sprinklers are open, and means associated with the pipe system to permit the discharge of said liquid independently of the reduction valve, whereby said carbonic acid will escape in a liquid state without vaporizing before its discharge.

5. A fire extinguishing apparatus, comprising a container for carbonic acid in a liquid state, a valve controlled outlet therefor, a pipe system leading therefrom, a reduction valve in said pipe system to permit the escape of liquid under reduced pressure, a valve controlled connection between said valved outlet and the pipe system beyond said reduction valve, and means associated with the pipe system beyond the reduction valve to operate the second named valve to permit the discharge of said liquid under high pressure independent of the reduction valve.

6. A fire extinguisher including a receptacle adapted to contain carbonic acid in a liquid state, an outlet therefor leading from the bottom thereof, an extinguishing conduit in communication with said outlet, fire extinguishers carried thereby, a reduction valve in said conduit to permit the discharge of the liquid under low pressure, means for determining said low pressure discharge, means in said conduit for preventing back pressure on said last-mentioned means and the reduction valve, and means associated with the conduit for discharging the liquid under high pressure independent of the reduction valve, said liquid under high pressure being prevented from escaping to the low pressure determining means and reducing valve.

7. In a fire extinguishing apparatus, a receptacle for liquid carbonic acid, a system of pipes, provided with discharge openings permanently connected to the said receptacle at a point adjacent to the bottom of the same, a pressure reducing valve provided in this pipe connection, a direct communication between said system of pipes and said receptacle, a valve normally closing the said direct communication, said valve having a spring tending to open it, a latch normally locking said spring, and a diaphragm in direct communication with the low pressure side of the reducing valve and acting to release said latch.

8. A fire extinguisher including a container for liquid carbonic acid, an extinguishing conduit having valved connection with said container and provided with discharge openings, means to normally prevent the escape of liquid therefrom but adapted to open in the presence of heat, means for permitting the escape of said liquid into said conduit under reduced pres-

sure, and means operable by the change of pressure on the low side of said last-mentioned means when said first-mentioned means are opened to operate the valve of the extinguishing conduit for permitting the direct discharge of liquid therethrough under high pressure.

9. A fire extinguishing apparatus comprising a receptacle adapted to contain an extinguishing fluid such as carbonic acid and having an outlet, a pipe system connected with the outlet and provided with sprinklers adapted to open under the action of heat, a reducing valve in said pipe system to permit the discharge of the liquid under reduced pressure, a connection between the outlet at the high pressure side of the valve and said pipe system at the low pressure side of said valve, a valve controlling the escape of the fluid through said connection direct to the sprinkler, spring means normally tending to open said valve, means acting against said spring to hold said valve closed and pressure operated means connected with the pipe system at the low pressure side of the reducing valve to release said holding means upon the reduction of the pressure by the opening of the sprinklers to permit the direct discharge of the liquid in an unvaporized state.

10. A fire extinguishing apparatus, comprising a receptacle adapted to contain an extinguishing fluid such as carbonic acid, an outlet therefor, a pipe system provided with sprinklers adapted to open under the action of heat, a reducing valve in said pipe system to permit the discharge of the liquid under reduced pressure, a connection between the outlet at the high pressure side of the valve and the pipe system, a valve controlling the escape of the fluid through said connection direct to the sprinklers, spring means normally tending to open said valve, means acting against said spring to hold said valve closed, said means including a diaphragm having pipe connection with said pipe system at the low pressure side thereof, and means in the pipe system to prevent back pressure against the reducing valve by the escaping high pressure liquid.

11. In fire extinguishing apparatus, a receptacle for liquid carbonic acid, a system of pipes provided with discharge openings permanently connected to the said receptacle at a point adjacent to the bottom of the same, a pressure reducing valve provided in this pipe connection, a direct communication between said system of pipes and said receptacle, a valve normally closing the said direct communication, said valve having a spring tending to open it and a coupling connecting it to the valve and having some play, and means operated by the pressure on the low pressure side of the reducing valve and acting to release said spring.

12. In fire extinguishing apparatus, a receptacle for liquid carbonic acid, a system of pipes, provided with discharge openings permanently connected to the said receptacle
5 at a point adjacent to the bottom of the same, a pressure reducing valve provided in this pipe connection, a direct communication between said system of pipes and said receptacle, a valve normally closing the said
10 direct communication, said valve having a spring tending to open it, a latch normally locking said spring, means operated by the pressure on the low pressure side of the re-

ducing valve and acting to release said spring, and a non-return valve inserted be- 15
tween said low pressure side and the discharge pipe system so as to open only in the direction toward the latter.

In testimony whereof I have signed my name to this specification in the presence 20
of two subscribing witnesses.

FRANS JOHAN HENRIK RUSTIGE.

Witnesses:

BIRGER NORDFELDT,
A. SIMON.