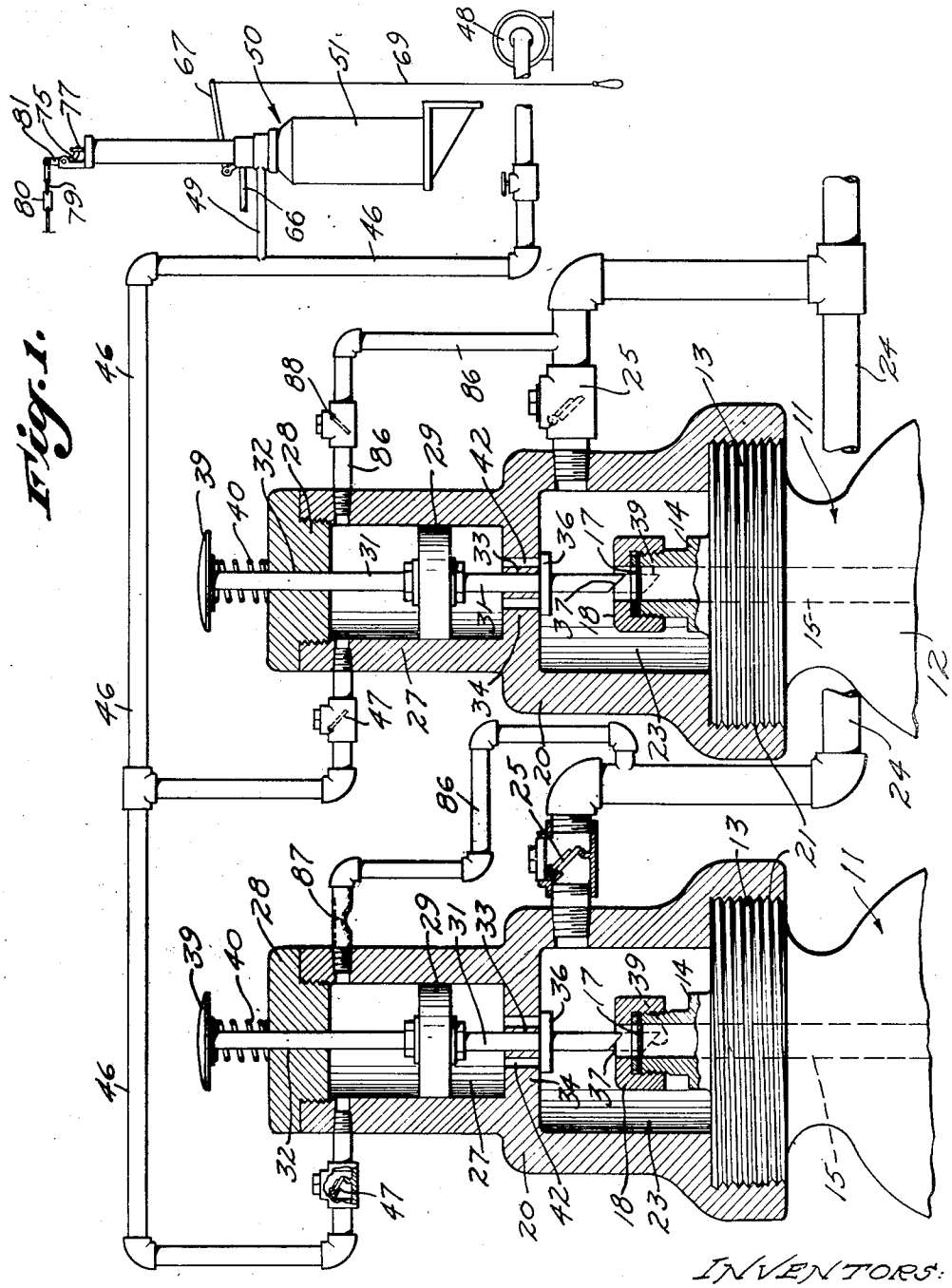
Oct. 13, 1931. S. E. ALLEN ET AL 1,827,723

PRESSURE OPERATED MEANS FOR PUNCTURING CLOSURE DIAPHRAGMS

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Fig. 1.



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Fig. 2. Fig. 3.

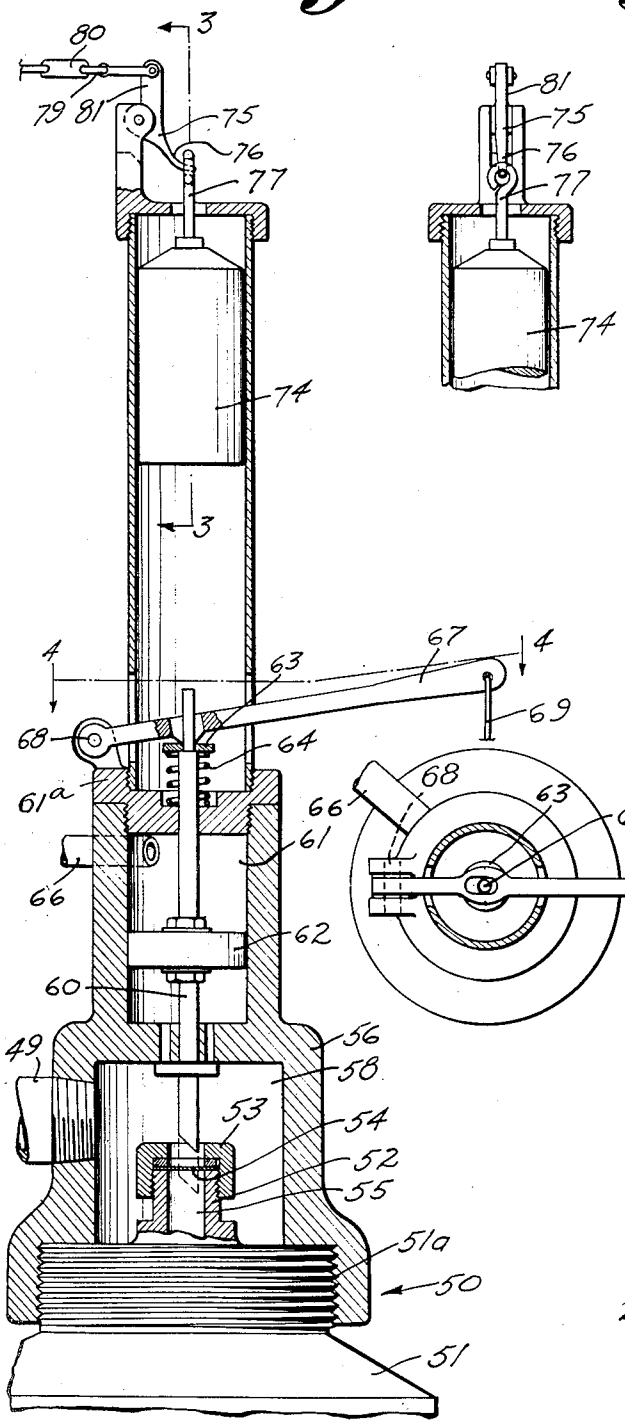
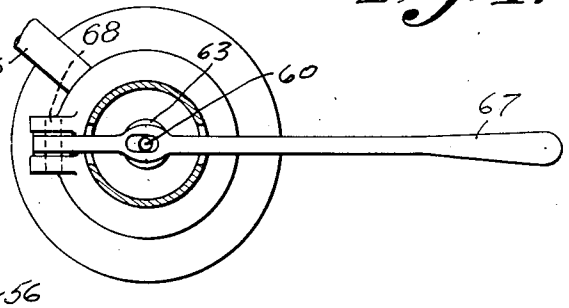


Fig. 4.



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Patented Oct. 13, 1931 1,827,723

UNITED STATES PATENT OFFICE

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PRESSURE-OPERATED MEANS FOR PUNCTURING CLOSURE DIAPHRAGMS

Application filed July 27, 1927. Serial No. 208,795.

This invention relates to apparatus for releasing a fluid under pressure from a receptacle. The invention is particularly useful in fire extinguishing apparatus in which inert gas such as carbon dioxide is released from receptacles and delivered to burning parts for extinguishing them. In the description which follows, our invention will be described in connection with fire extinguishing apparatus, but it should be understood that the invention may be utilized in other arts and therefore we do not wish to limit ourselves to the particular use disclosed herein. The invention provides an improved apparatus whereby the discharge opening of a receptacle containing a fluid under pressure may be opened for delivering this fluid to its place of application.

One of the objects of the invention is to provide a fluid releasing apparatus which is operated by a fluid under pressure.

Another object of the invention is to provide an apparatus of this character in which fluid under pressure may be released from one or more receptacles by the action of a fluid under pressure.

A still further object of the invention is to provide an apparatus of the character mentioned in which the fluid released from one receptacle will release the fluid from another receptacle.

A still further object of the invention is to provide an apparatus of the character described in which the supply of operating fluid to the operable parts for releasing the fluid under pressure is automatically or manually controlled.

Other objects and advantages of the invention will be apparent from the following detailed description of a typical form and application of the invention throughout which description reference is had to the drawings in which we illustrate our invention:

Fig. 1 is a view illustrating the apparatus provided by the invention, certain parts being shown in section.

Fig. 2 is an enlarged vertical section of the operating fluid supply means.

Fig. 3 is a section taken on the line 3—3 of Fig. 2.

Fig. 4 is a section taken on the line 4—4 of Fig. 2.

Referring to the drawings in detail and particularly Fig. 1, the numeral 11 designates a receptacle which in this application is in the form of the ordinary bottle 12 in which carbon dioxide gas is supplied to the market. The bottles 12 employed to handle carbon dioxide gas are provided with cylindrical threaded portions 13 to receive a cap or head. Projecting upward from the cylindrical threaded portions are projections 14 and formed through the projections 14 are discharge openings 15. The outer ends of the projections 14 are sealed by closure members in the form of discs or diaphragms 17 retained in place by caps 18. It is understood that other means for closing the discharge openings 15 may be provided if desired.

Heads or bodies 20 are screwed onto the threaded portions 13, the bodies 20 having internally threaded portions 21 which engage the threaded portions 13. The bodies 20 provide or form chambers 23 which enclose the projections 14, the closure members 17 and the caps 18. The chambers 23 are connected to delivery means in the form of a delivery pipe 24. The pipe 24 is provided with check valves 25 adjacent to the points where it connects to the chambers 23 for preventing flow from the pipe into the chambers 23 but allowing free flow from the chambers 23 into the pipe 24. The delivery pipe 24 is adapted to extend to any place where it is desired to apply the carbon dioxide. The upper parts of the bodies 20 are in the form of cylinders 27, the upper ends of these cylinders 27 being closed by covers 28. Placed in the cylinders 27 are pistons 29 which are operable therein. The pistons 29 are operatively connected with fluid release means or penetrating means in the form of plungers 31. The plungers 31 extend upwardly through openings 32 formed in the covers 28 and downwardly through openings 33 formed in walls 34, the lower ends thereof extending into the chambers 23. The plungers 31 are provided with flanges 36 which engage the walls 34, thus determining the upper positions thereof. The lower ends of the plungers 31 are provided with points

37 which, when the plungers are moved downward into the positions indicated by dotted lines 39, penetrate the closure members and open the discharge openings 15. It should be understood that the plungers 31 may be designed to operate other types of closure members and any alterations necessary to adapt the plungers to other closure means is within the scope of this invention. The upper ends of the plungers 31 are provided with external knobs 39 and compressed between the knobs 39 and the upper faces of the covers 28 are compression springs 40 which normally yieldingly hold the plungers in the positions shown by full lines in the drawings. Formed through the walls 34 around the openings 33 are pressure relief ducts 42 which prevent a pressure from building up in the cylinders 26 below the pistons 29 prior to actuation of the pistons and which allow fluid released from the bottles 12, when the discs 17 have been punctured, to act on the pistons 29 to move them up in the cylinders.

Connected to the upper parts of the cylinders 27 above the pistons 29 is operating means in the form of an operating fluid line 46. The operating fluid line 46 is provided with check valves 47 adjacent to the points of connection with the cylinders 27 for the purpose of preventing a flow from the cylinders into the operating fluid line 46. The operating fluid line 46 is connected with a source of fluid pressure. The operating fluid line 46 may extend to a compressor 48 adapted to supply fluid under pressure to the cylinders 27 or may be connected by a pipe 49 to an operating fluid supply indicated in general by the numeral 50.

This operating fluid supply 50 is shown in the form of a bottle or other receptacle 51 which contains a fluid under pressure, preferably the same kind of fluid that is retained in the receptacle 11. As illustrated in Figs. 2, 3 and 4 the receptacle 51 is substantially the same in form and construction as the receptacle 11 except that it is smaller. The receptacle 51 is provided with a threaded portion 51*a* from which a projection 52 extends. The projection 52 has a cap 53 which secures a closure member 54 in place, this closure member 54 being adapted to close a discharge passage 55. A body 56 is screwed onto the threaded portion 51*a*, this body providing a chamber 58 to which the pipe 49 is connected. The closure member 54 is adapted to be penetrated by a penetrating means in the form of a plunger 60. This plunger 60 extends through a cylinder 61 and is connected to a piston 62 operable in the cylinder. The upper end of the plunger 60 has a plate 63, and compressed between the plate 63 and the cap 61*a* of the cylinder 61 is a spring 64 which normally yieldingly retains the plunger in the position shown in full lines in Fig. 2. The plunger 60 may be depressed by supplying the fluid under pressure to the upper end of the cylinder 61 by means of a pipe 66 or by depressing a lever 67 which is pivoted at 68 to the body 56 and engages the plate 63. The lever 67 may be operated directly or by pulling upon a chain or cord 69. The plunger 60 may also be depressed by means of a weight 74 normally supported above the upper end of the plunger by a supporting means 75, this supporting means having a hook 76 which engages an eye 77 of the weight 74. The hook may be normally held in position to engage the eye by means of a member 79 having a fusible link 80 which member 79 is connected to an arm 81 of the supporting member 75. The weight 74 is released when the fusible link 80 is melted, this resulting from an unusually high temperature. The weight drops on the upper end of the plunger 60 and depresses it so as to penetrate the closure member 54.

Connected to each of the cylinders 27 and to the delivery pipe 24 adjacent to each of the check valves 25 are by-pass means in the form of by-pass pipes 86. One of the by-pass pipes 86 is provided with a constriction 87, and the other of the by-pass pipes 86 is provided with a check valve 88 which prevents a flow from one of the cylinders 27 to the pipe 24.

The operation of the invention is as follows:

The closure members 17 are penetrated whenever a fluid under pressure is supplied to any one of the cylinders 27. This pressure is supplied either by the compressor 48 or by the operating fluid supply 50. The operating fluid supply 50 is released for operation either manually, automatically or by fluid pressure. Either of these methods will operate the plunger 60 to penetrate the closure member 54 and thus release an operating fluid under pressure to the operating fluid line 46. This operating fluid passes into the upper parts of the cylinders 27 and forces pistons 29 downward. The plungers 31 are moved downward into positions indicated by dotted lines 39, penetrating the closure members 17. This releases the fluid under pressure into the chambers 23, this fluid passing through the check valves 25 into the supply pipes 24. The pressure relief ducts 42 are provided so that there will be no resistance to the downward movement of the pistons 29. When any one of the discharge openings 15 has been opened, fluid under pressure will also pass through the by-pass pipes 86 and into the upper parts of the cylinders 27. When the pressure in the cylinders 27 exceeds that in the operating fluid line 46 the check valves 47 will close, thus preventing a reverse flow therethrough. In the event that one of the pistons is not operated by the operating fluid under pressure it will be operated by the fluid from the delivery pipe

supplied to the cylinder thereof through the by-pass 86 connected thereto. Although in the drawings we have shown the operating line connected to each cylinder 27 it is only necessary to connect it to one of the cylinders 27, since the fluid release means associated with the pistons of the other of the cylinders 27 will be operated by the fluid under pressure which passes through the delivery line 24 and the by-pass pipes 86. The by-pass pipe 86 on the left is not provided with a check valve but with the constriction 87 for the purpose of allowing any operating fluid to pass into the pipe 24 when the pressure in the supply pipe 24 drops below the pressure in the operating fluid line 46.

From the foregoing description it will be seen that this invention provides fluid-operated means for releasing fluid under pressure from one or more receptacles 11. The apparatus is capable of releasing the fluid under pressure from all of the receptacles 11 simultaneously by an operating fluid line or by releasing fluid from one of the receptacles and thereafter releasing the fluid from the other of the receptacles by use of the first released fluid.

Having described only a typical preferred form of our invention, we do not wish to limit ourselves to the specific details set forth but wish to reserve to ourselves any changes or variations that may appear to those skilled in the art or fall within the scope of the following claims:

We claim as our invention:

1. In combination: a receptacle containing a fluid under pressure, and having a closure member for closing a discharge opening thereof; penetrating means adapted to penetrate said closure member constructed to provide free discharge through said closure; means for delivering an operating fluid under pressure to actuate said penetrating means to cause said penetrating means to penetrate said closure member; and means for preventing a reverse flow of the operating fluid.

2. In combination: a receptacle containing a fluid under pressure, and having a closure member for closing a discharge opening thereof; penetrating means adapted to penetrate said closure member constructed to provide free discharge through said closure; means for delivering an operating fluid under pressure for actuating said penetrating means and causing said penetrating means to penetrate said closure member; an operating fluid receptacle; and means for releasing the operating fluid thereof into the means for delivering the operating fluid.

3. In combination: a receptacle containing a fluid under pressure, and having a closure member for closing a discharge opening thereof; penetrating means adapted to penetrate said closure member constructed to provide free discharge through said closure; means for delivering an operating fluid under pressure to cause said penetrating means to penetrate said closure member; an operating fluid receptacle; means for releasing the operating fluid thereof into the means for delivering the operating fluid; and means for preventing a reverse flow of the operating fluid.

4. In combination, a series of receptacles containing a fluid under pressure, each having a closure member for closing the discharge opening thereof; penetrating means adapted to pene rate said closure members; cylinders; pistons associated with said penetrating means and in said cylinders; means for delivering an operating fluid under pressure to said cylinders for moving said pistons, said pistons causing said penetrating means to penetrate said closure members; a delivery means into which said fluid is delivered when said fluid is released; and by-pass means connected to said delivery means and each of said cylinders.

5. In combination: receptacles containing a fluid under pressure, and having closure members for closing a discharge opening thereof; penetrating means adapted to penetrate said closure members; cylinders; pistons associated with said penetrating means and in said cylinders; operating means for delivering an operating fluid under pressure to said cylinders for moving said pistons, said pistons causing said penetrating means to penetrate said closure members; an operating fluid receptacle; means for releasing the operating fluid thereof into said operating means; a delivery means into which said fluid is delivered when said fluid is released; and by-pass means connected to said delivery means and each of said cylinders.

6. In combination: receptacles containing a fluid under pressure, and having closure members for closing the discharge openings thereof; fluid release means for opening said closure members; cylinders; pistons associated with said fluid release means and in said cylinders; means for delivering an operating fluid under pressure to said cylinders for moving said pistons, said pistons causing said fluid release means to penetrate said closure members, and a fluid connection between the cylinders whereby fluid under pressure released from one receptacle operates to actuate the piston in another cylinder.

7. In combination: a series of receptacles containing a fluid under pressure, and having closure members for closing the discharge openings thereof; fluid release means for opening said closure members; cylinders; pistons associated with said fluid release means and in said cylinders; operating means for delivering an operating fluid under pressure to said cylinders for moving said pistons, said pistons causing said fluid release means to penetrate said closure members; an op-

erating fluid receptacle; means for releasing the operating fluid thereof into said operating means; means for preventing a reverse flow of the operating fluid, and a fluid connection between the cylinders whereby fluid under pressure released from one receptacle operates to actuate the piston in another cylinder.

8. In combination: receptacles containing a fluid under pressure, and having closure members for closing the discharge openings thereof; fluid release means for opening said closure members; cylinders; pistons associated with said fluid release means and in said cylinders; means for delivering an operating fluid under pressure to said cylinders for moving said pistons, said pistons causing said fluid release means to penetrate said closure members; a delivery means into which said fluid is delivered when said fluid is released; and by-pass means connected to said delivery means and each of said cylinders.

9. In combination: a pair of receptacles containing a fluid under pressure, and having closed discharge openings, fluid release means for opening said discharge openings; cylinders; pistons operable in said cylinders, each of said pistons being adapted to operate one of said fluid release means; means for delivering operating fluid to operate said fluid release means; delivery means into which said fluid is delivered when said fluid is released; and by-pass means connecting said delivery means and each of the cylinders.

10. In combination: a pair of receptacles containing a fluid under pressure, and having closed discharge openings, a fluid actuated means for each of said discharge openings to open the same; means for delivering operating fluid to operate said fluid actuated means; and delivery means into which said fluid is delivered when said fluid is released; and by-pass means connecting said delivery means to each of said fluid actuating means.

11. In combination: a pair of receptacles containing a fluid under pressure, and each having a closed discharge opening; fluid release means for opening said discharge openings; cylinders; pistons operable in said cylinders, each of said pistons being adapted to operate one of said fluid release means; means for admitting operating fluid to the face of the piston away from the fluid releasing means; delivery means into which fluid is delivered when said fluid is released; by-pass means disposed between said delivery means and each of said cylinders; and means for preventing a reverse flow through said delivery means.

12. A device for use in connection with a fluid container having a sealed outlet, and means for opening the seal, said means being constructed to provide free discharge of the fluid through the opening and including a body for mounting on the container and having a section forming a chamber to receive fluid from the container and a section forming a cylinder, a cutter within the body for opening the seal of the container, a piston in the cylinder for operating the cutter, the piston being confined in the cylinder in substantially gas tight relation throughout its operation of the cutter, and means for supplying fluid pressure to the cylinder for actuating the piston to move the cutter.

13. In combination, a pair of receptacles holding fluid under pressure, control means in connection with each receptacle for controlling the discharge of fluid therefrom, and communicating means between the control means whereby the control means in connection with one receptacle is operable to release fluid from said receptacle by pressure from the other receptacle, each of said control means including a receptacle opening member and a cylinder and piston device for operating said member.

14. In combination, a pair of receptacles holding fluid under pressure, fluid pressure actuated means in connection with each receptacle for controlling the discharge of fluid therefrom, and a connection between the said means through which pressure released from one receptacle will operate the means controlling the other receptacle.

15. In combination, a plurality of receptacles holding fluid under pressure, an outlet conduit into which the receptacles discharge, fluid pressure actuated means in connection with each receptacle for controlling the discharge of fluid therefrom, and fluid connections between the conduit and the fluid pressure actuated means conducting fluid from the conduit to said means to actuate them.

16. In combination, a fluid container having an outlet opening, a frangible member closing the opening, and means for opening said frangible member, said means being constructed to provide free discharge of the fluid through said member and including a part to be attached to the container including a cylinder, means for attaching said part to the container, a piston operable in the cylinder, a cutter operable by the piston to rupture the frangible member, and means for supplying fluid pressure to the cylinder for actuating the piston to move the cutter to rupture the frangible member.

17. In combination, a fluid container having an outlet opening, a frangible member closing the opening, and means for opening said frangible member, said means being constructed to provide free discharge of the fluid through said member and including a part to be attached to the container including a cylinder, means for attaching said part to the container, a piston operable in the cylinder,

a cutter operable by the piston to rupture the frangible member, a source of fluid under pressure for operating the piston in the cylinder, and a conduit for conducting fluid from said source to the cylinder.

18. In combination, a fluid container having an outlet opening, a frangible member closing the opening, and means for opening said frangible member, said means being constructed to provide free discharge of the fluid through said member and including a part to be attached to the container including a cylinder, means for attaching said part to the container, a piston operable in the cylinder, a cutter operable by the piston to rupture the frangible member, a source of fluid under pressure, a conduit for conducting fluid from said source of fluid to the cylinder, and control means for the fluid from said source remote from the cylinder.

19. The combination of a container, a delivery connection, a chambered coupling in communication with the container and the delivery connection, a sealing disc interposed between the container and the delivery connection, and means for opening said frangible member, said means being constructed to provide free discharge of fluid through said member and including a piston member having a close working fit in the coupling member and subject to pressure by which it may be driven toward the disc, a device carried by the piston and adapted to rupture the disc in its forward movement with the piston, and means to prevent effective resistance to the operative movement of the piston.

20. In combination, a receptacle carrying a medium under pressure, a penetrable closure member closing a discharge opening of said receptacle, and means for opening said closure member, said means being constructed to provide free discharge of fluid through said member and including a cylinder, a piston in the cylinder, a penetrating means adapted to be operated by the piston to penetrate the closure, and means for developing pressure in the cylinder for actuating the piston, the piston being confined in the cylinder in substantially gas tight relation throughout operation of the penetrating means.

21. In combination, a fluid container having an outlet opening, a frangible member closing the opening, a part to be attached to this container including a cylinder, means for attaching said part to the container to form a chamber to receive fluid from the container when the container is open, an outlet conduit connected with said chamber, a check valve in the outlet conduit to prevent fluid entering the chamber from the conduit, a piston operable in the cylinder, a cutter operable by the piston to rupture the frangible member, and means for supplying fluid pressure to the outlet conduit and to the cylinder for actuating the piston to move the cutter to rupture the frangible member.

22. In combination, a fluid container having an outlet opening, a frangible member closing the opening, a part to be attached to the container including a cylinder, means for attaching said part to the container to form a chamber to receive fluid from the container when the container is open, an outlet conduit connected with said chamber, a check valve in the outlet conduit to prevent fluid entering the chamber from the conduit, a piston operable in the cylinder, a cutter operable by the piston to rupture the frangible member, a source of fluid under pressure for operating the piston in the cylinder, a conduit for conducting fluid from said source to the cylinder and to said outlet conduit.

23. In combination, a fluid container having an outlet opening, a frangible member closing the opening, and means for opening the frangible member, said means being constructed to provide free discharge of the fluid through said frangible member and including a part to be attached to the container including a cylinder, means for attaching said part to the container, a piston operable in the cylinder, a cutter operable by the piston to rupture the frangible member, a source of fluid under pressure, a conduit for conducting fluid from said source of fluid to the cylinder, and manual control means for the fluid from said source remote from the cylinder.

24. In combination, a fluid delivery conduit, a pair of receptacles each carrying fire-extinguishing fluid under pressure and connected in parallel to said conduit, closure means associated with each receptacle for controlling the discharge of the fire-extinguishing fluid therefrom into said conduit, means for opening one of the closure means, and means operable by pressure of the fluid thus released for opening the other closure means.

25. In combination, a pair of receptacles holding fire-extinguishing fluid under pressure, each receptacle having only one opening, a closure for each opening, means for opening the closure of one of said receptacles, and means controlled by the discharge of fluid from the said receptacle for opening the other closure, the latter closure being a frangible member.

26. In combination, a pair of receptacles, a frangible closure means for each receptacle for retaining fire-extinguishing fluid under pressure therein, means for rupturing one of the frangible closure means to permit the discharge of fluid from a receptacle, and means operable by the fluid thus discharged for rupturing the other frangible closure means.

27. In combination, a fluid delivery conduit having an outlet opening to discharge

fluid, a pair of receptacles normally carrying a fire-extinguishing fluid under pressure, each receptacle being individually connected with the delivery conduit to discharge fluid to the conduit for passage directly through the delivery conduit to the outlet opening thereof, a closure for each receptacle, means for opening the closure of one receptacle, and means controlled by initiation of the discharge of fluid from the said receptacle for opening the closure of the other receptacle.

28. In combination, a fluid delivery conduit having an outlet opening, a pair of receptacles for normally holding fire-extinguishing fluid under pressure, each receptacle having only one outlet connected to the delivery conduit, so that fluid from each receptacle discharges therefrom directly into the delivery conduit and passes directly through the delivery conduit to the outlet opening thereof, a closure for each receptacle opening, means for opening the closure of one receptacle, and means controlled by pressure of the fluid thus released for opening the other closure means.

29. In a gas control system, a fluid pressure container having a discharge fixture including a fixture body, a disc therein sealing the outlet of said container into said body, a disc-clamping member, and means for opening said disc, said means being constructed to provide free discharge of the fluid through said disc and including a piercer-plunger in said fixture in combination with a casing connected to said fixture, and a fluid pressure piston in said casing adapted to depress said plunger and thereby open said sealing disc.

30. A gas control system comprising in combination a pilot bottle provided with a discharge fixture having a disc and an associated disc-piercer mounted thereon, a battery of gas bottles each provided with a discharge fixture having mounted thereon a disc and an associated disc piercing means comprising a piercer member and a fluid pressure cylinder having therein a piston operatively related to the piercer of that fixture, and piping connecting the discharge fixture of the pilot to all of said cylinders for fluid actuation of the piston in said several cylinders by the pressure fluid of the pilot bottle, said piercing means being each constructed to provide free discharge of fluid from the bottle associated therewith.

31. Apparatus of the kind described comprising a discharge manifold, a battery of bottles containing fluid under pressure and respectively closed by puncturable sealing discs and each provided with a piercer-carrying fixture adapted to conduct the pressure fluid to said manifold, in combination with a piercer-actuating head mounted on one of said fixtures, fluid-pressure cylinders with piercer-actuating pistons therein mounted respectively on the other of said fixtures, and a manifold connected to discharge the pressure fluid from the first-mentioned fixture, into each of said cylinders whereby each of the piercers appurtenant to said cylinders is operated independently of the others, each of the disc piercing mechanisms being constructed to provide free discharge of fluid from the bottle associated therewith.

32. In combination, a pair of receptacles holding fluid under pressure, penetrable means in connection with each receptacle for controlling the discharge of fluid therefrom, and a connection between the means whereby the means in connection with either receptacle is operable to release fluid from said receptacle by pressure from the other receptacle, each of the controlling means including a receptacle opening punch and a cylinder and piston device for operating the punch.

33. In combination, a primary receptacle carrying a fluid under pressure, primary fluid retaining means for retaining said fluid in said receptacle, a delivery means into which said fluid is delivered when it is released, a secondary receptacle carrying a fluid under pressure, a secondary fluid retaining means for retaining said fluid in said secondary receptacle, primary operating means for operating said primary fluid retaining means in a manner to release the fluid retaining means in a manner to release the fluid from said primary receptacle, secondary operating means for operating said secondary fluid retaining means in order to release the fluid from said secondary receptacle, and fluid operated means for actuating said secondary operating means, said fluid operated means being operatively connected with said delivery means.

34. A device for use in connection with a container carrying fluid under pressure and having a sealed outlet opening and means for opening the seal, said means being constructed to provide free discharge of the fluid through the opening and including, a body for connection with the container forming a closed chamber communicating with the outlet opening and having a cylinder part, an outlet conduit connected with the chamber of the body, a piston operable in the cylinder of the body, a member operable by the piston to open the seal, and means for applying pressure to the cylinder to actuate the piston therein, the piston being confined in the cylinder in substantially gas-tight relation throughout its operation of said member.

35. A device for opening a fluid container, including an opening member, means for operating the opening member to open the container, and means whereby fluid released from the container acts in a manner to insure return of the opening member to normal position.

36. In combination, a pair of containers for fluid under pressure, discharge control devices for the containers, and means interconnecting the control devices whereby fluid released from either one of the containers causes actuation of the control device of the other container, each of the control devices being adapted for initial operation.

37. In combination a receptacle for carrying fire extinguishing medium under pressure and having an outlet opening, a frangible member closing the opening, a part to be attached to the receptacle including a chamber, means for attaching said part to the receptacle, an outlet conduit connected with the chamber, a check valve to prevent fluid entering the chamber from the conduit, and means for opening said frangible member, said means being constructed to provide a free discharge of said medium through said opening and including a piston operable in the said part, means operable by the piston to rupture the frangible member, and means for supplying fluid pressure to operate the piston.

In testimony whereof, we have hereunto set our hands at Los Angeles, California, this 21st day of July, 1927.

SCOTT E. ALLEN.
OZRO N. WISWELL.