Jan. 10, 1939. H. M. SALMOND ET AL 2,143,133

DISCHARGE DEVICE FOR FLUID CONTAINERS

Filed April 12, 1937 3 Sheets-Sheet 1

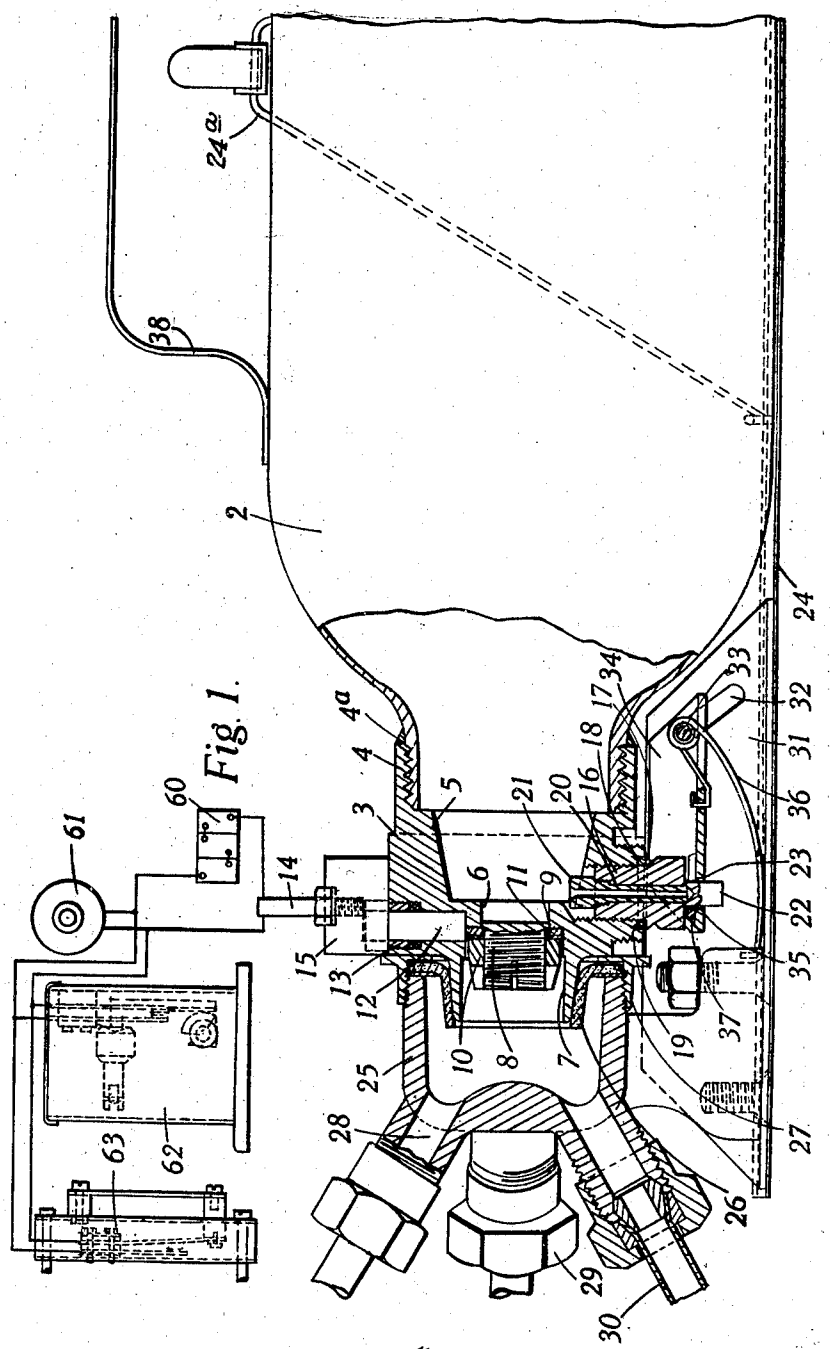


Fig. 1.

INVENTORS

Hubert Mackenzie Salmond Anders Mathisen
Gilbert Palmer and Harry David Ernest Goodall

By J. L. Thomy

their ATTORNEY

Jan. 10, 1939. H. M. SALMOND ET AL 2,143,133

DISCHARGE DEVICE FOR FLUID CONTAINERS

Filed April 12, 1937 3 Sheets-Sheet 2

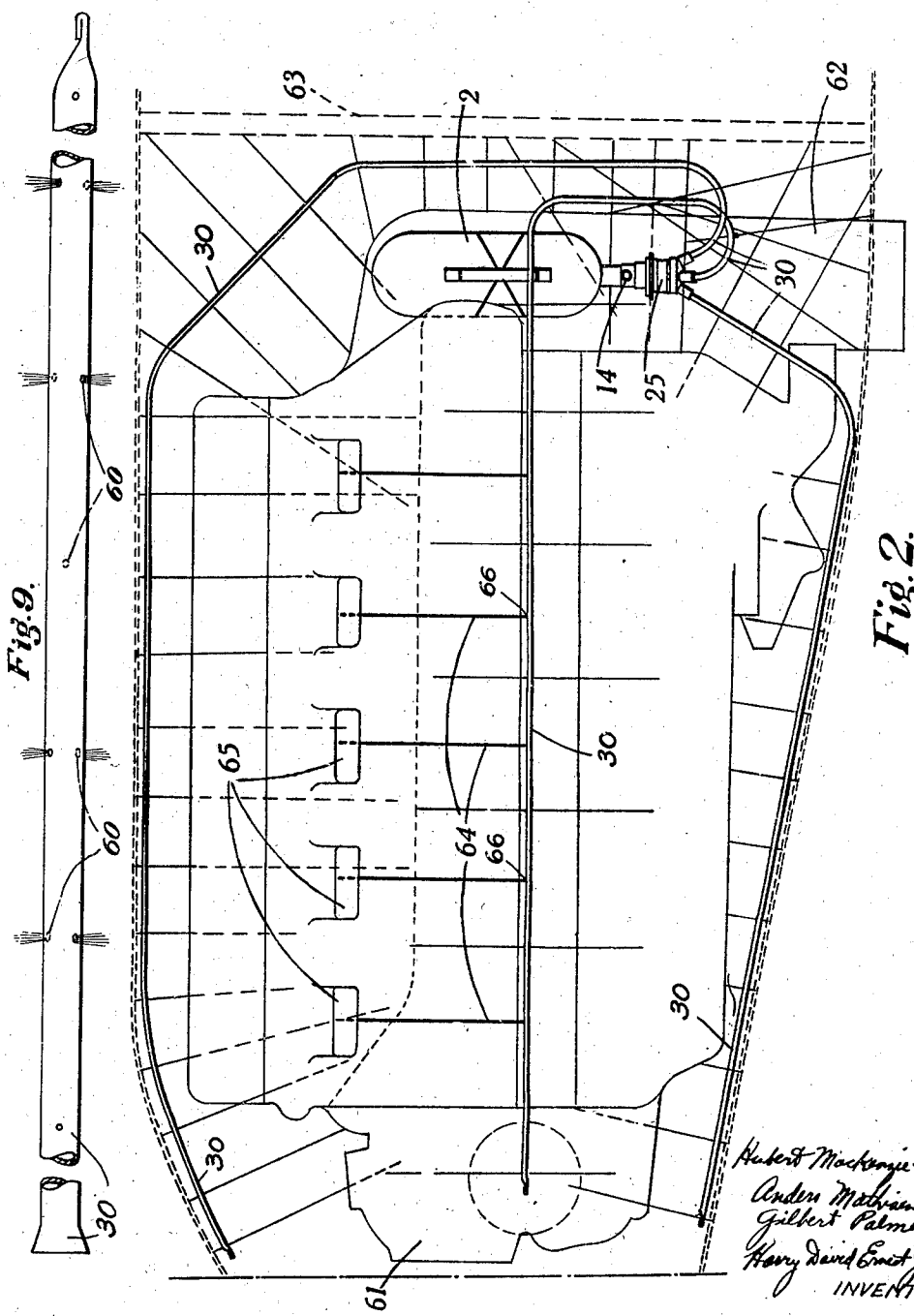


Fig. 2.

Fig. 9.



Fig. 10.

Hubert Mackenzie Salmond
Anders Mathisen
Gilbert Palmer and
Harry David Ernest Goodall
INVENTORS

BY Benj. J. Chroney
their ATTORNEY

Jan. 10, 1939. H. M. SALMOND ET AL 2,143,133

DISCHARGE DEVICE FOR FLUID CONTAINERS

Filed April 12, 1937 3 Sheets-Sheet 3

FIG. 3.

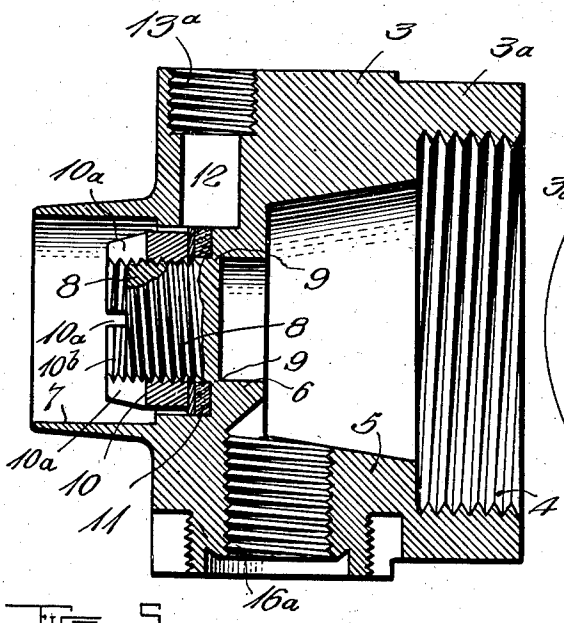


FIG. 4.

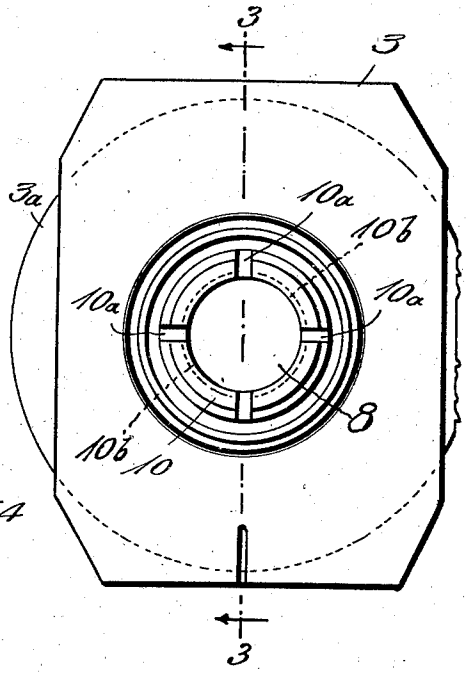


FIG. 5

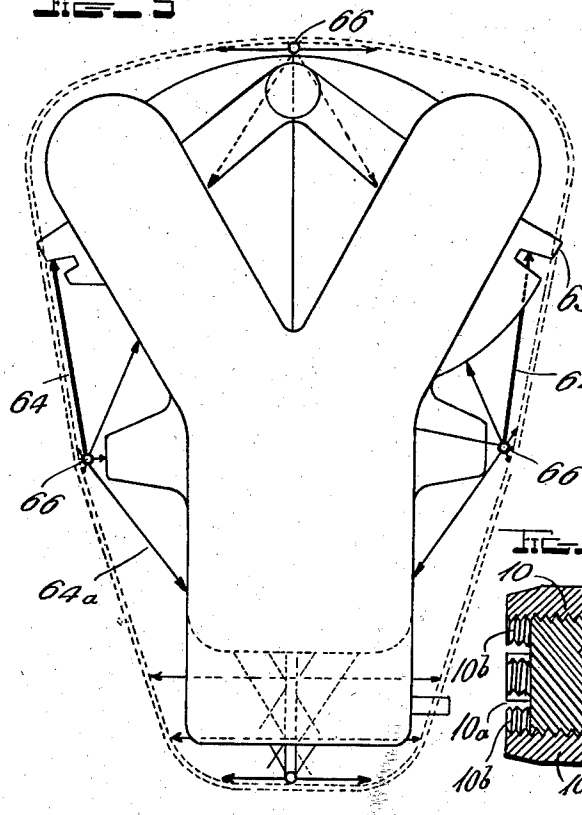


FIG. 6.

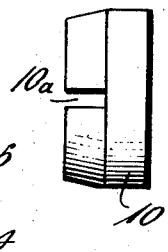


FIG. 7.

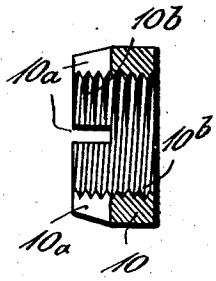


FIG. 8.

Inventors
H. M. Salmond,
A. Mathisen,
G. Palmer,
H. D. E. Goodall,

BY Ben J. Chromy.
ATTORNEY.

Patented Jan. 10, 1939 2,143,133

UNITED STATES PATENT OFFICE

2,143,133

DISCHARGE DEVICE FOR FLUID CONTAINERS

Hubert Mackenzie Salmond, Fareham, Anders Mathisen, Twickenham, and Gilbert Palmer and Harry David Ernest Goodall, South Farnborough, England, assignors to Graviner Manufacturing Company Limited, London, England

Application April 12, 1937, Serial No. 136,514
In Great Britain April 23, 1936

8 Claims. (Cl. 169—11)

This invention relates to stoppering and discharge devices for fluid containers such as for chemical fire extinguishing liquids.

Methyl bromide is one of the most effective fire extinguishing mediums known to science and its use for this purpose has been proposed for air and water craft as well as for vehicles.

Difficulties in enclosing the same are, however, experienced in that the liquid is liable to form hydrobromic acids which virulently attack most metals, but copper and high copper content alloys have been found suitable for methyl bromide containers.

The known means for stoppering and effecting discharge from methyl bromide extinguishers comprise a copper seal soldered to the copper container, a seal piercing plunger or tool being provided for effecting discharge. In another known construction a copper tube extends from the copper container and this can be fractured at a cut or recessed point by the fingers to effect discharge from the tube.

It is the object of the present invention to provide a tenacious-material stoppering device for methyl bromide containers which shall be integral and mechanically robust and capable of fracture by force applying means to effect discharge of the container contents which is under gas pressure.

Another object of the invention is to provide a discharge device of tenacious material for fluid containers which device is in the form of a plug in one end of which a recess is produced, the other end being machined to form a stem concentric with said recess and connected thereto by a thin rim of material integral with the recessed portion of the device and the rim.

A further object of the invention is to provide screw threads upon the recessed portion upon the above described device whereby it may be hermetically secured to a copper container. The stem may also be screw-threaded and provided with a nut. A sleeve surrounding said stem and nut is produced integrally with the device or secured thereto so that explosive substance may be confined below the nut and upon the said rim and within the sleeve, which substance when ignited by an electric fuse serves to sever the nut and stem from the device at the rim to permit discharge of the contents of the container which is under gas pressure.

A still further object of the invention is to provide resilient means secured in a junction box device for engagement by said sleeve, and pipes extending from said junction box to the engine compartment of an airplane or to other fire danger source for distributing said fluid thereover upon discharge of the container.

It has previously been proposed to provide perforated distributing pipes from fire extinguishers containing carbon tetra-chloride which acts by blanketing action in extinguishing fires and for that reason is unsatisfactory for use upon aircraft as the vapors are blown away by the slip stream.

Methyl bromide is gaseous under ordinary temperatures and pressures but is liquid under high pressure and when liberated creates intense lowering of temperature during evolution into gas. Moreover when liquid methyl bromide is mixed with gasoline in the ratio of one volume to 8 volumes the resultant mixture is incapable of supporting combustion due to a powerful inhibiting action by the methyl bromide.

To utilize the peculiar properties of methyl bromide it is an additional object of the invention to provide fluid distributing piping in which longitudinally and angularly spaced orifices are produced for squirting fluid upon a fire danger source as well as upon its surrounding housing or enclosure walls, orifices of enlarged areas being produced upon the pipes facing special fire danger points upon the surface.

Still another object of the invention is to provide a stoppering and discharge device in the form of a sealing plug for a liquid container, said plug being provided with a recess in one end and a concentric stem at the other end connected to the recessed portion by a thin integral rim, mechanical means being provided for fracturing said stem when the container is withdrawn from a mounting bracket.

Other objects will appear from the following description with reference to the drawings.

Fig. 1 shows in elevation an assembled view of a fire extinguisher embodying our invention, the terminal portion of the containing tank and the plug and discharge device being shown in section;

Fig. 2 shows a side view of an airplane engine structure to which is applied fire extinguishing liquid discharge piping from our fire extinguisher.

Fig. 3 is a sectional view on an enlarged scale of the stoppering or discharge member shown in Fig. 1, taken on the line 3—3 of Fig. 4.

Fig. 4 is an end elevation on a larger scale of the stoppering or discharge member of Fig. 1 showing the locking nut.

Fig. 5 is an end view of the structure of Fig. 2.

Fig. 6 is a side elevation on a large scale of the locking nut.

Fig. 7 is a diametral sectional view on an enlarged scale of the locking nut taken through two opposite slots.

Fig. 8 is a sectional view on an enlarged scale of the locking nut in threadedly engaging position on the frangible stem, taken through a diameter intermediate adjacent slots of the nut.

Fig. 9 is a side elevation on an enlarged scale of the discharge pipe of Figs. 2 and 5.

Fig. 10 is a sectional view on an enlarged scale of the pipe of Fig. 9.

In Figure 1 is shown a fire extinguisher adapted for automatic as well as hand operation. Numeral 2 denotes the copper liquid vessel or container for methyl bromide and numeral 3 denotes a stoppering device for the container machined from solid copper alloy material and secured to container 2 by a screwed joint denoted 4 soldered externally at the joint at 4a. Device 3 is provided with a tapered recess internally therein as shown at 5 and a further or continuation recess or discharge conduit denoted 6 is bored in the bottom of recess 5. Device 3 is machined to form a sleeve 7 which is bored out externally so as to leave a central stem 8 integral with device 3 at a narrow rim of metal 9. As will be seen from the drawings, recess 6 is of greater diameter than stem 8 as the result of which the material of rim 9 is capable of being severed in shear when tension is applied to stem 8. Stem 8 is threaded and a nut 10 is adapted to be screwed thereon as shown in the drawings. At the bottom of the bored-out sleeve 7 a groove is formed as a result of the above described construction in which explosive substance 11 is confined by nut 10, rim 9 and sleeve 7. An electrically energized fuse device 12 is secured by gland 13 in device 3 and is connected to an electric current supply through plug devices 14 secured in insulation block 15. By igniting substance 11, stem 8 and nut 10 are severed at rim 9 thereby producing a clean orifice in device 3 of substantial size through which the contents of the container are rapidly discharged under gas pressure. Due to the fact that the material in rim 9 is severed in shear the force required to operate the device is comparatively small.

Device 3 is bored and tapped to take a liquid or fluid discharging plug denoted 16. Plug 16 is provided with a faced surface 17 forcing ductile metal ring 18 onto a faced surface 19 produced in device 3. Plug 16 is recessed internally at 20 in a similar manner to device 3. Recess 20 is fitted with a jet device 21 faced at the discharge end and screwed into the recess. Externally the plug is machined to form a frangible pip or stem 22 corresponding to stem 8 of device 3 and integral by a narrow rim of metal 23 with plug 16. It is an important feature of this construction that the liquid discharge plug is normally closed by pip 22 concentric with the drilled hole 20. When pip 22 is fractured at 23 a stream of liquid is squirted from the faced discharge end of jet 21 which ensures a concentrated jet of liquid capable of being thrown a considerable distance with great force.

Container 2 is mounted in a bracket device 24 adapted to be secured to any suitable part in an aircraft and clamping device 24a serves to clamp container 2 to the bracket. A junction box device denoted 25 is secured to bracket 24 by screws or the like and is provided with a resilient washer or gasket 26 clamped by a threaded gland 27 to box 25.

As will be apparent from the drawings, sleeve 7 is forced into washer 26 to form a liquid tight joint, and junction box 25 is provided with one or a plurality of liquid outlets 28 provided with union nuts 29 for securing discharge pipes 30 thereto, said pipes leading to the engine compartment or other fire danger source as will be further described.

Operation of the fire extinguisher is obtainable by connecting plugs 14 in series with an electric battery 60 by a hand operated push button switch 61 operated by the pilot of an aircraft, for example, or by an inertia operated switch 62 actuated in a crash of the aircraft, or alternatively by a flame actuated switch 63 which operates if the aircraft should catch fire

Hand operation of the fire extinguisher by fracturing pip 22 is possible by means of the following mechanism. A form of guide channel 31 is secured to bracket 24 and is provided with inclined guide slots 32 in which a pin 33 is slidably mounted. Pivoted upon pin 33 is a further guide channel 34 which is provided with a hole 35 adapted to engage pip 22 as shown in the drawings. A spring 36 normally tends to force channel 34 upwardly into a position inclined from the horizontal at about 30 degrees.

The bracket 24 is secured in any desired position in the aircraft but preferably within reach of the pilot or other personnel and when container 2 is to be mounted in the bracket the tubular part of device 3 is guided into washer 26 while pip 22 is guided into channel 34 thereby depressing this against the action of spring 36. When container 2 finally is fully in position in bracket 24, hole 35 snaps onto pip 22 and to assist engagement an abutment 37 may be fitted in the channel as shown.

Should a fire break out in the cockpit or personnel compartment upon an aircraft the pilot or operator passes the four fingers of the hand through handle 38 of container 2 thus automatically releasing clamping device 24a. By pulling on handle 38 the container is withdrawn from bracket 24, pip 22 being automatically fractured by channel 34 which slides with pin 33 in guides 32 until the pip snaps off, after which liquid is discharged from the container without further effort on the part of the operator who then plays the jet of liquid upon the seat of the fire.

The application of the automatically and manually operable fire extinguisher of Figure 1 upon an aircraft engine is shown in Figures 2 and 5. Container 2 with electric terminals 14 is mounted with junction box 25 in bracket 24 which is secured by suitable means mounted upon the engine structure 61 as indicated in Figure 2. Pipes 30 are disposed with respect to the engine structure as shown in Figures 2 and 5, and to obtain maximum fire extinguishing effect with a minimum amount of methyl bromide, piping 30 is provided with orifices as shown in Figures 9 and 10.

In Figure 9 is shown a side view of a pipe 30 which is provided with holes 60 spaced longitudinally along the pipe, the holes being oriented at different angular positions as shown in Figure 10.

The holes are of the order of $\frac{3}{32}$ inch diameter and are spaced in opposed pairs along the pipes as shown in Figure 9. They are spaced longitudinally by about three inches between adja-

cent pairs of holes whereby about 8 holes per foot of pipe is provided. The pipes 30 are generally of the order of 3 to 4 feet long and the total number of holes must thus slightly exceed a hundred which provides adequate distribution to cover the engine surface as well as the internal cowling surface upon which fuel and oil or other combustible substance may collect or be sprayed.

The pipes 30 are usually drilled with the hole arrangement shown in Figure 9 in the factory, and are then mounted upon the engine somewhat as shown in Figures 2 and 5, being secured thereto by suitable clips of known construction and not shown.

After mounting, orifices 66 facing fire danger spots upon the engine such as exhaust manifold or pipes 65 are enlarged as shown at 64 so that the amount of methyl bromide squirted thereon is greater than that sprayed upon other surface parts.

In a similar manner orifices facing cavities in the engine structure in which fuel or oil may collect are enlarged to ensure adequate drenching with methyl bromide.

Another fire danger source is the carburettor or fuel intake system generally disposed at the rear upon modern engines as shown at 62 in Figure 2. Overflow or loss of fuel, breakage of fuel pipes or the like, leads to flooding of the cowling near the fuel intake, and to ensure extinction of fire, pipes 30 are disposed as shown in Figure 2 so as to cover the cowling as well as the fire proof bulkhead shown at 63 with an adequate number of methyl bromide streams.

Having thus fully described our invention, what we claim as new and desire to protect by Letters Patent is:

1. A discharge device for fluid containers comprising a tenacious-material plug provided with a circular recess in one end of said plug, a circular stem concentric with said recess in the other end of the plug, a thin integral material rim joining the recessed portion and the stem, said stem being provided with screw threads, said device having an annular recess surrounding said stem, a nut screwed on the stem, a sleeve, integral with said device and extending from the wall of said annular recess, and explosive substance confined by said nut, said stem, rim of material and said wall of said annular recess.

2. A discharge device for fluid containers comprising a tenacious-material plug, a circular recess in one end of said plug, a circular stem concentric with said recess in the other end of the plug, a thin integral material rim joining the recessed portion and the stem, said device having an annular recess surrounding said stem, said stem being provided with screw threads, a nut screwed on the stem, a sleeve extending from said device and substantially continuous with the walls of said annular recess and confiningly surrounding said nut, explosive substance confined by said nut, said stem, said rim of material and said wall of said annular recess, an electrically energized fuse for igniting said substance, an electric battery, a plurality of electric switches connected for selectively energizing the fuse from the battery to cause operation of the discharge device.

3. A discharge device for fluid containers comprising a tenacious-material plug, provided with a circular recess in one end of said plug, a circular stem concentric with said recess in the other end of the plug, a thin integral material rim joining the recessed portion and the stem, said device having an annular recess surrounding said stem, said recessed portion being provided with screw threads, a nut secured upon said stem, a sleeve extending from the wall of said annular recess and surrounding said nut and stem, explosive substance confined by said nut, said stem, said rim of material and said wall of said annular recess, a junction box member and conduits leading from said device to fire danger points, said junction box member being attached to said device and forming therewith a closed chamber, and a flexible gasket engaged between said device and said junction box member and fitting over said sleeve.

4. A discharge member for fluid containers having a substantially annular portion at one end thereof forming a first recess therein, a partition at an intermediate portion of said discharge member transverse thereof and closing the inner end of said first recess, said discharge member having a second recess formed therein on the side of said partition opposite said first recess, a threaded stem projecting from said partition from the bottom of said second recess in the direction opposite said first recessed end of said discharge member, a nut adapted to engage said threaded stem, and a sleeve projecting from said discharge member adjacent said second recess and substantially continuous with the wall of said second recess and surrounding said stem, the said annular portion, said partition, said stem and said sleeve being formed integrally, said stem being integral with said partition only by a narrow rim, the wall of said second recess in said member and said stem forming a substantially annular recess in register with said nut and adapted to receive an annular explosive element.

5. In a discharge plug member for fluid containers having a central passage therein for the discharge of fluid from a container, a partition positioned transversely of said passage and closing said passage, a threaded stem projecting from said partition into the discharge end of said passage, a nut engaged on said threaded stem, and an annular explosive element surrounding said stem and held thereon between said nut and said partition, said discharge member comprising integral rigid means defining the discharge end of said passage and closely surrounding said nut and closely confining said explosive element in its position between said stem, said partition, and said nut.

6. In a discharge plug member for fluid containers having a central passage therein for the discharge of fluid from a container, a partition positioned transversely of said passage and closing said passage, a threaded stem projecting from said partition into the discharge end of said passage, a nut engaged on said threaded stem, and an annular explosive element surrounding said stem and held thereon between said nut and said partition, said discharge member comprising integral rigid means defining the discharge end of said passage and closely surrounding said nut and closely confining said explosive element in its position between said stem, said partition, and said nut, said partition being integral with said discharge member only by a narrow marginal rim, and said explosive element being positioned immediately adjacent said rim.

7. In a discharge member for fluid containers having a substantially annular portion at one end thereof forming a first recess therein, a partition at an intermediate portion of said dis-

charge member transverse thereof and closing the inner end of said first recess, a threaded stem projecting from said partition on the side thereof opposite said first recessed end of said discharge member, a nut engaged on said threaded stem, an annular explosive element surrounding said stem and held thereon between said nut and said partition, and rigid means formed integrally with said discharge member adjacent said partition and closely surrounding said nut and closely confining said explosive element in its position between said stem, said partition and said nut.

8. In a discharge member for fluid containers having a substantially annular portion at one end thereof forming a first recess therein, a partition at an intermediate portion of said discharge member transverse thereof and closing the inner end of said first recess, a threaded stem projecting from said partition on the side thereof opposite said first recessed end of said discharge member, a nut engaged on said threaded stem, an annular explosive element surrounding said stem and held thereon between said nut and said partition, and rigid means formed integrally with said discharge member adjacent said partition and closely surrounding said nut and closely confining said explosive element in its position between said stem, said partition and said nut, said partition being integral with said discharge member only by a narrow marginal rim, and said explosive element being positioned immediately adjacent said rim.

HUBERT MACKENZIE SALMOND.
ANDERS MATHISEN.
GILBERT PALMER.
HARRY DAVID ERNEST GOODALL.