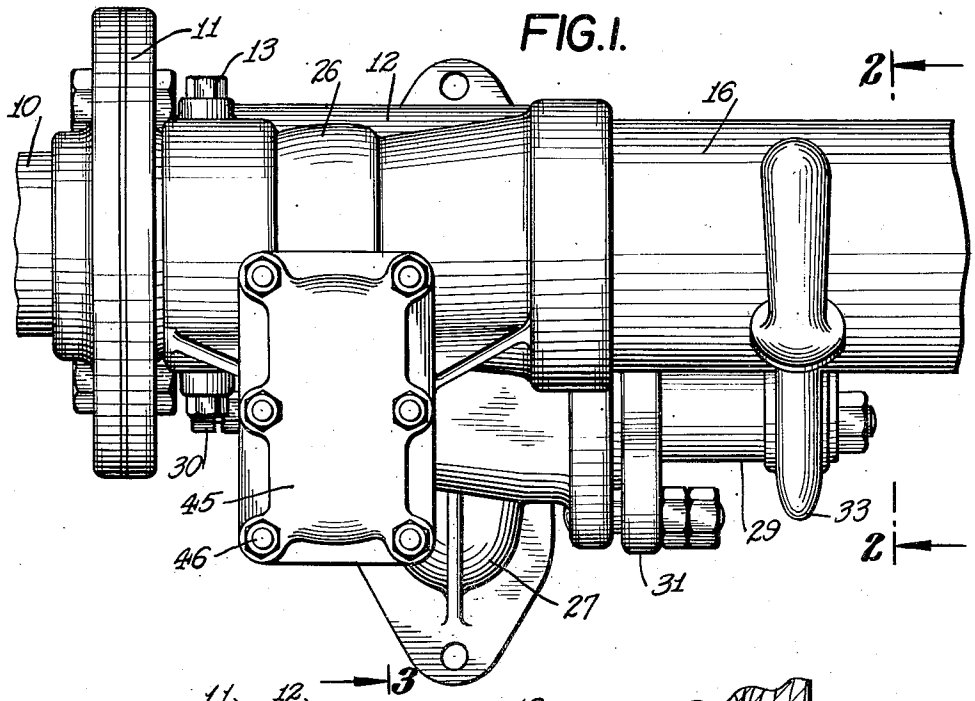
Dec. 5, 1950 H. E. BEDFORD ET AL 2,532,986

FIRE EXTINGUISHING APPARATUS

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FIG. 1.



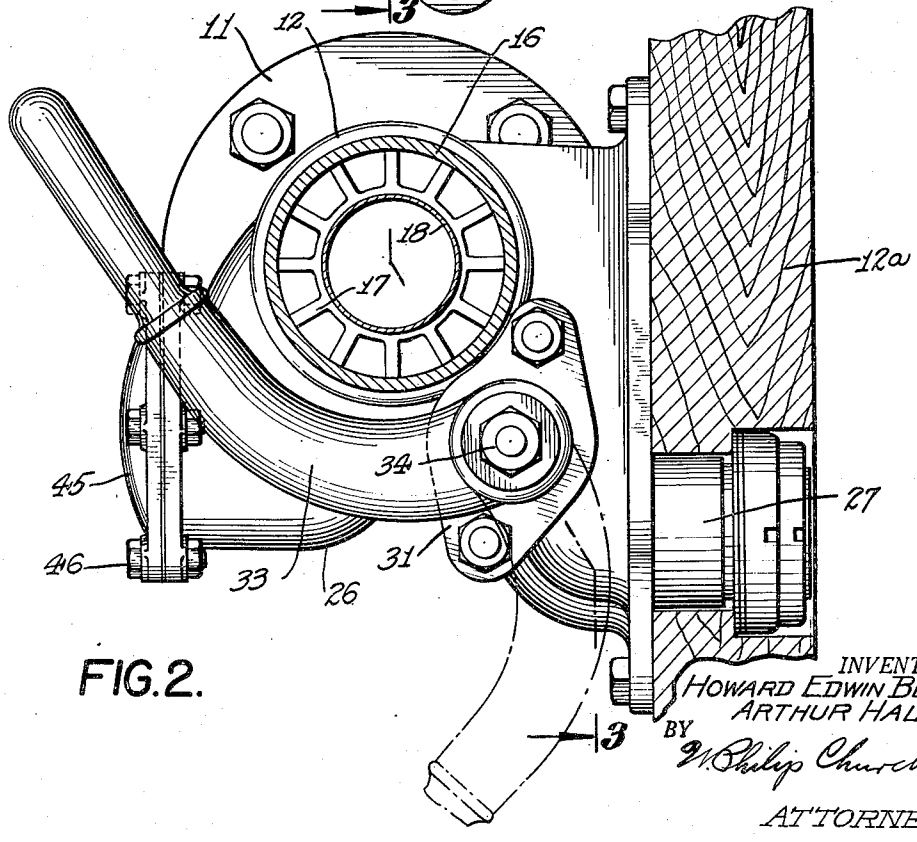


FIG. 2.

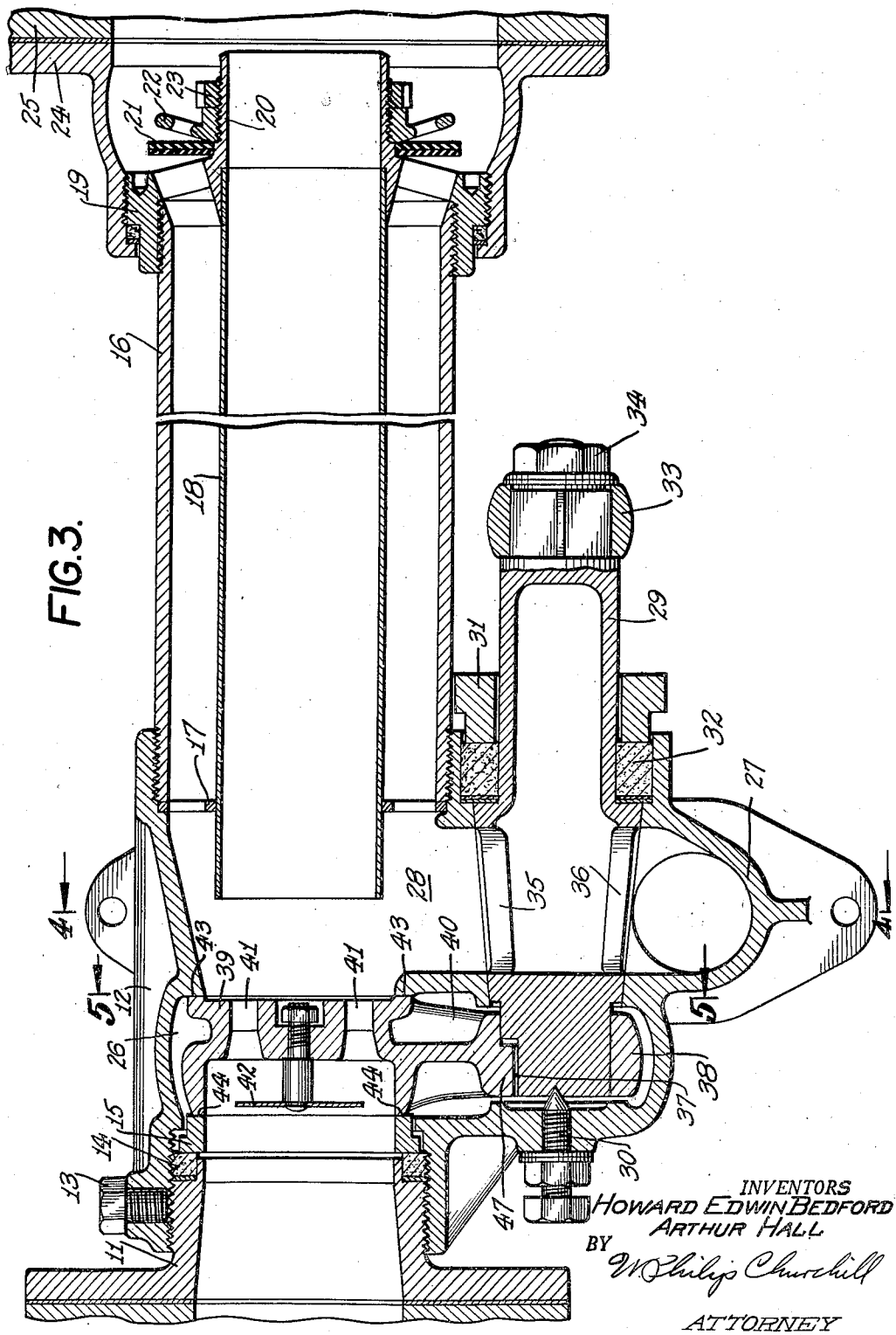
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FIRE EXTINGUISHING APPARATUS

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FIG. 3.



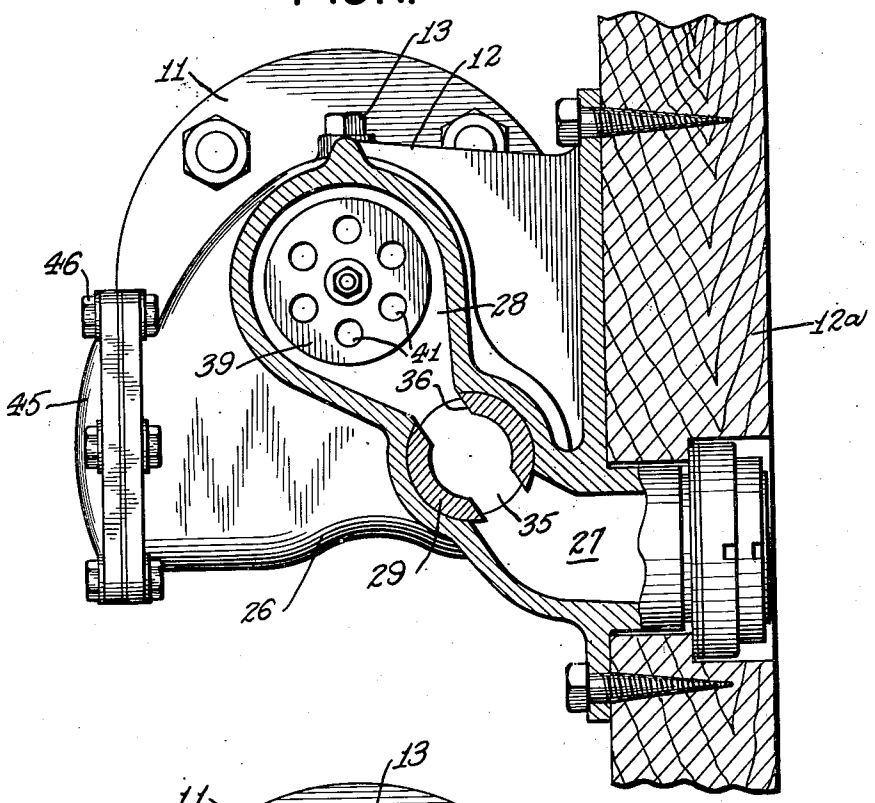
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FIRE EXTINGUISHING APPARATUS

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FIG.4.



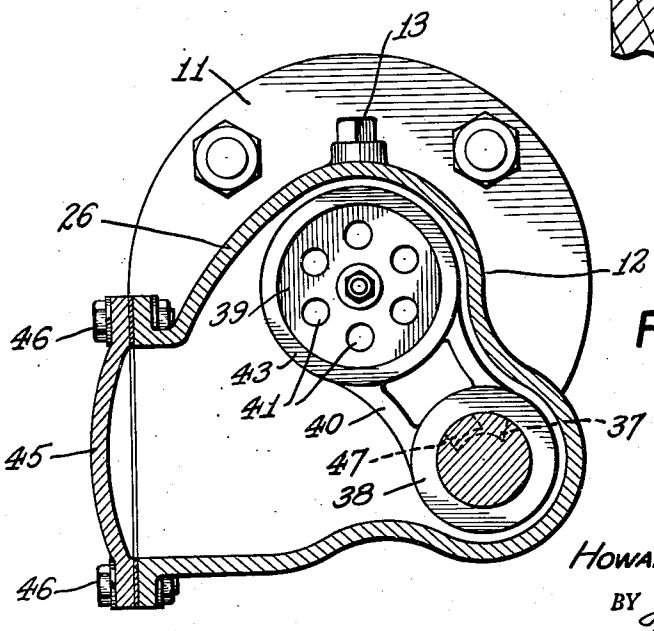


FIG.5.

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FIRE EXTINGUISHING APPARATUS

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FIG.6.

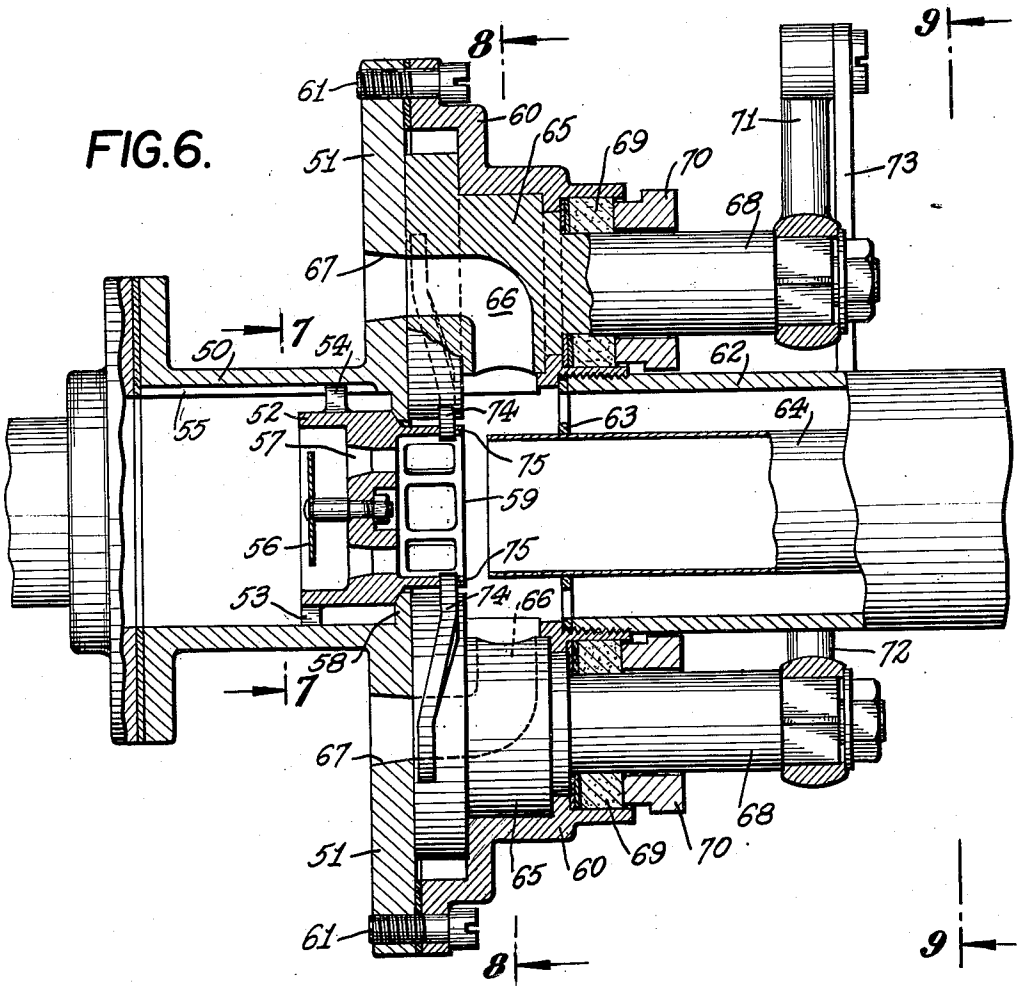
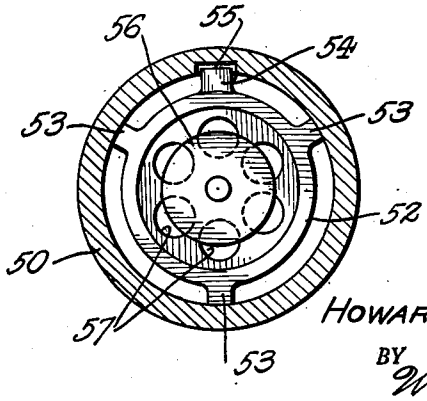


FIG.7.



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FIRE EXTINGUISHING APPARATUS

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FIG. 9.

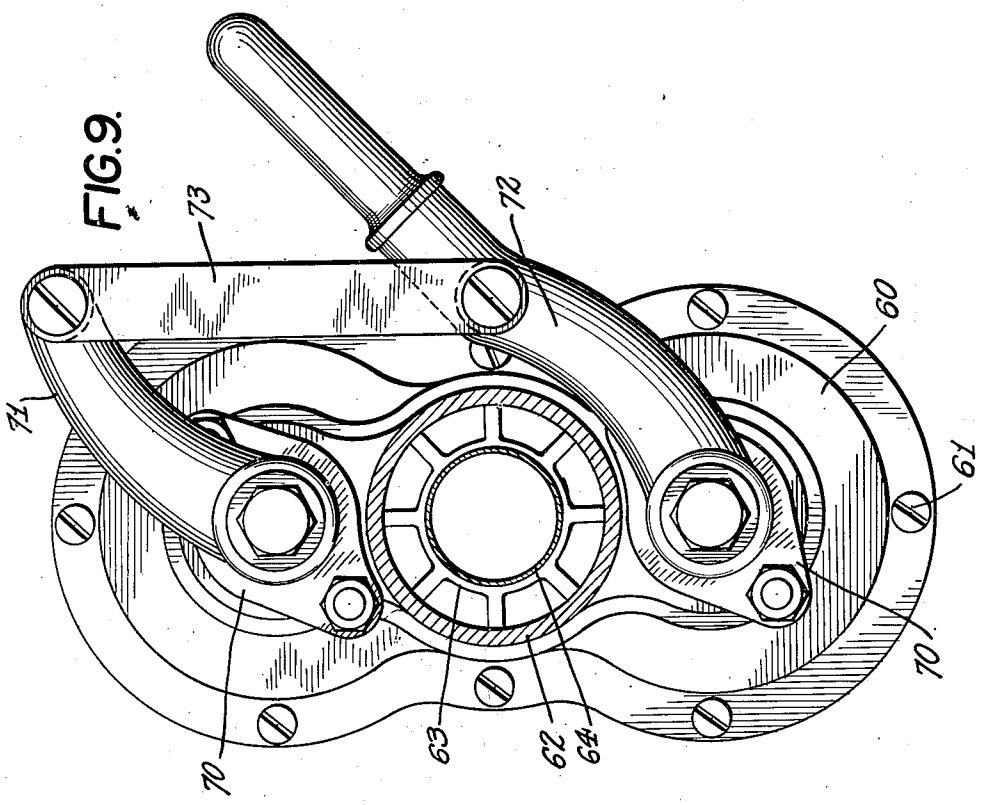
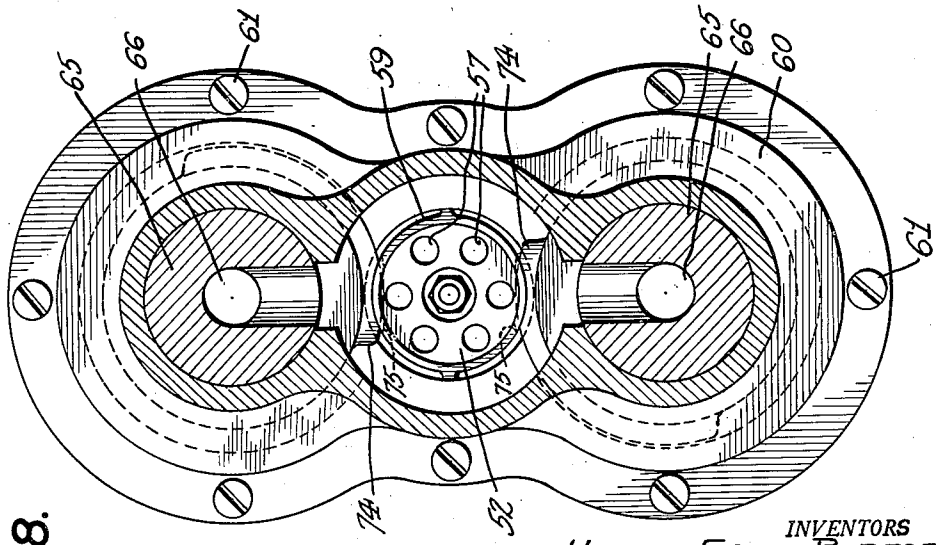


FIG. 8.



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FIRE EXTINGUISHING APPARATUS

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FIG. 10.

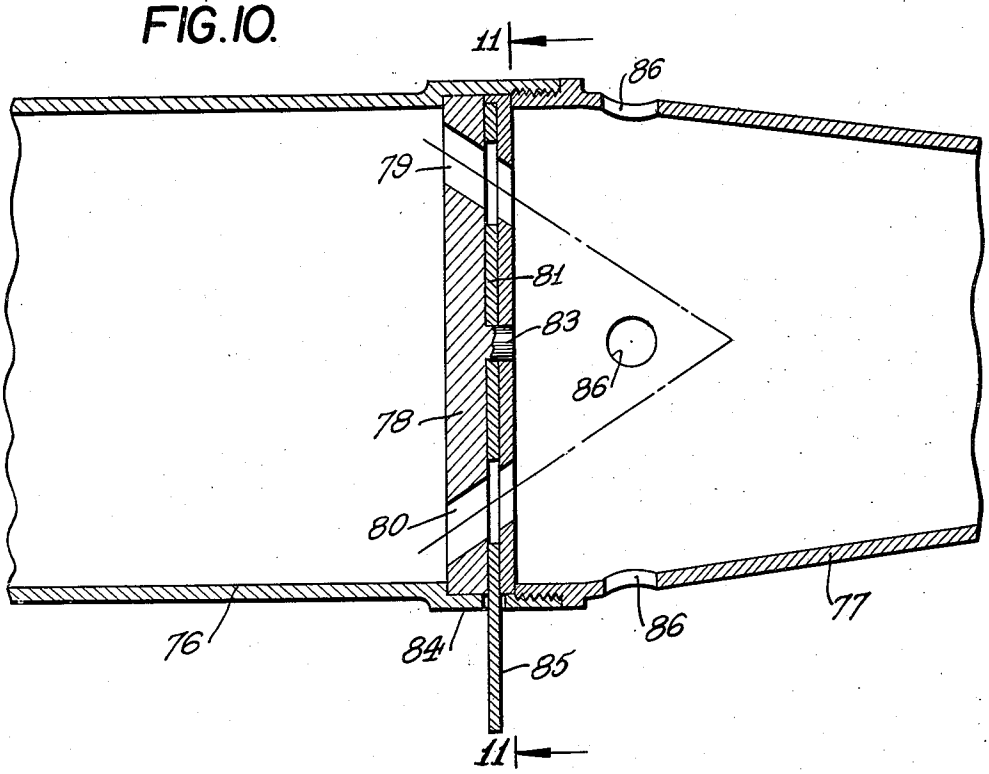
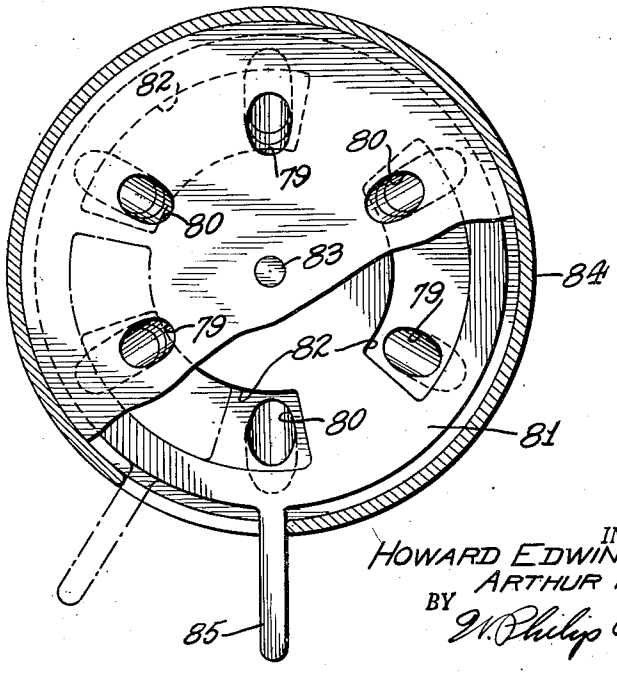


FIG. 11.



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Patented Dec. 5, 1950 2,532,986

UNITED STATES PATENT OFFICE

2,532,986

FIRE-EXTINGUISHING APPARATUS

Howard Edwin Bedford and Arthur Hall, Brentford, England, assignors, by mesne assignments, to Pyrene Manufacturing Company, a corporation of Delaware

Application November 20, 1946, Serial No. 711,170
In Great Britain November 7, 1945

Section 1, Public Law 690, August 8, 1946
Patent expires November 7, 1965

13 Claims. (Cl. 169—15)

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This invention relates to fire extinguishing apparatus, and more particularly to apparatus that can be changed or adjusted quickly to deliver either fire extinguishing foam or a simple stream of fire extinguishing liquid such as water.

The production of what is commonly known as air foam or mechanical foam is now well understood in the fire extinguishing field, and such foam is used extensively for putting out fires, particularly those involving inflammable liquids such as oil, gasoline, and the like. The apparatus used for producing this air foam usually consists of a device in which water under pressure and carrying a foam stabilizing compound is projected in one or more jets into one or more receivers in such a manner as to entrain or aspirate air into the stream by ejector action. The turbulent mixture of air, water and foam stabilizing agent thus formed becomes foam by the time it reaches the end of the hose or pipe used for directing it on the fire.

In many instances it is desirable to apply foam to one portion of a fire, and when this portion is under control to deal with other portions of the fire by means of an ordinary stream of water. In most forms of foam producing apparatus, the velocity at which the foam is delivered, or the throw of the foam, is considerably restricted by reason of the fact that some of the energy of the original stream of water under pressure is used up in producing the foam. Consequently, if the supply of air in such an apparatus were merely cut off, the stream of water thus obtained from the apparatus would not have much force because the pressure of the initial stream of water would not be utilized to best advantage. Also, the stream would be smaller in size than would be desirable.

One object of this invention is to provide apparatus which can be quickly changed from an apparatus for producing and delivering fire extinguishing foam to an apparatus for delivering a substantially full size stream of water.

Another object of the invention is to provide foam making apparatus in which the means for producing the aspirating jets of liquid can be moved to allow greater flow of the liquid and in which the supply of air can be simultaneously cut off.

Another object is the provision of such apparatus in which an orifice plate for producing the aspirating jets can be moved to permit relatively free passage of the water simultaneously with the closing of the air inlet, and in which an enlarged conduit is automatically made available for the

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passage of water so that substantially the full stream of water may be delivered to a nozzle.

Other objects and advantages of our invention will be explained and will be apparent from the following description of two embodiments of the apparatus illustrated in the accompanying drawings, in which

Fig. 1 is a side elevation view of one form of apparatus embodying our invention.

Fig. 2 is a vertical sectional view through the apparatus taken approximately on the line 2—2 of Fig. 1.

Fig. 3 is a longitudinal sectional view through the apparatus taken approximately on the offset line 3—3 of Fig. 2.

Figs. 4 and 5 are vertical sectional views taken, respectively, about on the lines 4—4 and 5—5 of Fig. 3.

Fig. 6 is a vertical longitudinal sectional view through approximately the center of the apparatus illustrating a second embodiment of our invention.

Fig. 7 is a vertical sectional view illustrating a detail of this apparatus and taken about on the line 7—7 of Fig. 6.

Figs. 8 and 9 are vertical sectional views taken, respectively, about on the lines 8—8 and 9—9 of Fig. 6.

Fig. 10 is a fragmentary longitudinal sectional view through the center of apparatus illustrating a third embodiment of our invention.

Fig. 11 is a vertical sectional view taken on the line 11—11 of Fig. 10.

Referring particularly to the embodiment of our invention shown in Figs. 1 to 5, inclusive, a stream of fire extinguishing liquid such as water is delivered to the apparatus under pressure through a hose or pipe connection 10, which is attached in the usual manner to a nipple 11. The nipple 11 in turn is screwed into one end of a housing 12, being held securely in place by the set screw 13 and provided with a packing gland 14 between the end of the nipple and a bearing ring 15 inside the housing to provide a water tight joint. If desired, the housing 12 may be bolted to or otherwise mounted on a wall or support such as shown at 12a. At the opposite side of the housing, a pipe or conduit 16 is screwed into a similar opening (Fig. 3) and by means of a retaining ring or spider 17 holds securely in place the entrance end of a tubular receiver 18, which is concentric with and substantially smaller in diameter than the pipe 16. The outer end of the pipe 16 has secured to it a spider 19 having a centrally located tubular section 20 which serves

to hold the other end of the receiver 18, and which supports a disc 21 of flexible material held in place by a fixed inclined ring 22 and the lock nut 23. The disc 21 may be made of flexible material such as soft rubber or the like, for a purpose hereinafter described. The exit or outer end of the pipe 16 and the exit end of the receiver 18 may be connected by means of suitable couplings 24 and 25 to any desired type of delivery conduit or play pipe suitable for delivering fire extinguishing foam or water to a fire.

The housing 12 is provided with a chamber 26 which has a circular portion in line with the nipple 11 and which extends laterally to one side and below this portion as seen in Fig. 5. The lower portion of the housing is provided with an air intake conduit 27, the outer end of which is in open communication with the air and the inner end of which is in communication with the main chamber 28 in the housing. A rotary plug valve 29 is mounted in the housing with one portion journaled on one side of the air intake 27, and the other or inner end being journaled in the lower portion of the chamber 26. The inner end of the valve stem may be mounted for rotation on the adjustable pivot 30. This valve is preferably held securely in place by a collar 31 and a packing material 32. One end of the plug valve may have a suitable handle 33 attached to it by means of the nut 34. The portion of the plug valve extending through the air intake passage 27 has suitable openings 35 and 36 (see Fig. 4) which are designed to be lined up with the air intake passage 27 when the handle is in one position and to be turned to close the passage 27 when the handle is in the other position.

The inner end of the valve is formed with a key way 37 and projects through a collar 38 to which an orifice plate 39 is rigidly connected by the arm 40. The orifice plate 39 may be provided with suitable openings or orifices 41 which serve to project aspirating jets of liquid into the receiver 18. Preferably a baffle plate 42 is provided just ahead of the openings 41 so that liquid under pressure from the nipple 11 is forced around the outer edge of the baffle 42 and then has to flow radially inward in order to reach the openings 41. This type of orifice plate or jet system for producing fire extinguishing foam is described in more detail in Timpson Patent No. 2,386,918.

The orifice plate 39 is provided around its edge with a suitable seating surface 43 which is adapted to bear directly against a corresponding surface in the housing 12, and with a seating surface 44 which bears against the retaining ring 15. The orifice plate 39, arm 40 and collar 38 are adapted to be rotated about an axis coincident with the axis of the plug valve 29 which moves the entire orifice plate, including the baffle member 42, transversely out of alinement with the nipple 11 and the receiver 18 into the lower portion of the chamber 26. Chamber 26 may have an opening to facilitate assembly and repair of the apparatus that is closed during operation of the apparatus by a suitable plate 45 held in place by bolts 46. The inner surface of the collar 38 is provided with a key 47 which fits into the key way 37, but which is substantially narrower in width than the key way 37.

In the operation of this device, assuming it is to be used to produce fire extinguishing foam, the handle 33 is adjusted to the position shown in full lines in Fig. 2 so that the passageways 35 and 36 in the plug valve are lined up with the air intake 27, and the orifice plate 39 is properly seated in alinement with the nipple 11 and receiver 18. Water under pressure, preferably having a foam stabilizer admixed with it, is delivered through the nipple 11 to the orifice plate where it flows around the baffle 42 and out through the openings 41 as a series of aspirating jets that are projected into the receiver 18. These jets should be arranged to aspirate air at this point by suitable ejector action, and air sucked into the chamber 28 through the intake 27 and the open valve 29 is entrained by the liquid in the receiver 18. Because of the turbulence, foam is produced in the receiver and emerges from the exit end of the receiver 18 for delivery to its point of intended use. The foam stabilizer may be premixed with water, injected into the water stream or introduced into the system in any other suitable manner as will be readily understood by those skilled in the art.

By reason of the aspirating action in the chamber 28, a reduced pressure is produced in the space between the pipe 16 and the receiver 18. A somewhat higher than normal pressure is produced beyond the end of receiver 18 with the result that the pressure differential forces the flexible disc 21 back against the walls of the spider 19, effectively sealing off this space and preventing disruption of the system by any return flow of liquid through the space between the pipe 16 and the receiver 18.

When it is desired to change over the apparatus so that it will deliver a simple stream of water, it is only necessary to move the handle 33 from the position shown in Fig. 3 to the dot-dash line position shown in that figure. During the first part of this movement, the orifice plate 39 is not moved because of the difference in width between the key way 37 and the key 47, but the air intake is closed off as the passageways 35 and 36 are brought around out of alinement with the air intake 27. Continued downward movement of the handle 33 then brings the edge of key way 37 against the key 47, which serves to complete the operation by swinging the entire orifice plate transversely out of the path of water coming from the nipple 11. Water is thus permitted to flow freely through the housing 12, the receiver 18 and also through the space between the pipe 16 and the receiver 18. The pressure of this water forces the flexible check valve member 21 away from the collar 19 and against the fixed ring 22 which serves to prevent it from being damaged by the force of the water flowing past it. The water thus flows freely in a full sized stream to the delivery nozzle. If desired, of course, the supply of foam stabilizing agent can then be cut off, although this is not essential.

In the embodiment of our invention illustrated in Figs. 6 to 9, the water under pressure flows into a conduit 50 provided with flanges 51 on opposite sides. Orifice plate 52 is disposed inside the conduit 50 and arranged so that it may slide axially of the conduit. It is provided with three or more lugs 53 which bear against the inner wall of the conduit to keep the plate centered: and is also provided with an additional lug 54 which slides in an internal groove 55 in the conduit to prevent rotation of the plate.

The plate itself may be provided with a baffle 56 and a number of orifices 57 arranged in a manner described in connection with orifice plate 39. The plate also is preferably provided with beveled outer edges adapted to seat on the inwardly extending flanges 58 to provide a tight joint when the plate is moved to the extreme right

hand position as seen in Fig. 6. Integral with or attached to the plate and extending outwardly therefrom is a slotted sleeve 59.

A housing casting 60 is attached to the flanges 51 by means of bolts 61, and has a pipe 62 fitted thereto holding in place a retaining ring or spider 63 that supports the inner end of a tubular receiver 64. The other end of the pipe 62 and tubular receiver 64 may be constructed and provided with a check valve arrangement as previously described in connection with the exit ends of the pipe 16 and tubular receiver 18.

Mounted for rotation in opposed sides of the housing 60 are a pair of rotary valves 65, 65 provided with L-shaped bores 66, 66. One end of each bore is in open communication with the outside air through one of the openings 67, 67 in the flanges 51, and the other end of each bore leads into the chamber adjacent the inlet end of the receiver 64 when the valve is open. When the valve is turned through an angle of 90°, this end of each bore is simply closed off by the wall of the housing 65. In the position shown in the drawings, the valves are in the open position.

These valves may be provided with stems or shafts 68 projecting out through openings in the housing 60 and held in place by suitable packing materials 69 and the collars 70. The outer end of one valve shaft may have a short crank member 71 fixed to it, and the other end preferably has a longer handle member 72 fixed to it. The two members 71 and 72 may be joined for simultaneous movement by the link 73 which is pivotally connected to each link. At their other end, the valve members are preferably provided with radially projecting cams 74 which ride in the grooves 75 in the sleeve 59 and serve as a means for moving the orifice plate 52 axially of the conduit 50.

When it is desired to use this apparatus for producing foam, it is operated in a manner similar to that previously described, the handle 72 being in the raised position so that the orifice plate 52 is moved all the way to the right as seen in Fig. 6. When the apparatus is to be used to project a stream of water, the handle 72 is pulled down. During the first part of this motion, the valves 65 are rotated so that the bores 66 are turned to a position cutting off the supply of air to the chamber inside housing 60. Continued downward movement of the handle brings the inclined portions of the cams 74 against the slots 75, forcing the entire orifice plate 52 back against the pressure of the stream of water flowing through the conduit 50. As the orifice plate is moved back, the water is allowed to flow not only through the orifices 57 but also around the entire plate and through the slots in the sleeve 59, so that considerably more water flows into the housing 60. The water from there flows not only through the receiver 64 but also through the space between the pipe 62 and the receiver 64, as described above in connection with Figs. 1 to 5, thus delivering a substantially full stream of water.

In the embodiment of our invention illustrated in Figs. 10 and 11, which embodiment is suitable for apparatus of the kind held by hand in use, liquid under pressure is delivered through a hose pipe and connection (not shown) to a tubular part 76 which is connected to a tapering part 77 terminating in a nozzle (not shown). A two-part orifice plate 78 is fixed in the part 76 and formed with six orifices, three of which, 79, are used when foam is being formed and the other

three of which, 80, are used only when water is being delivered. All these orifices are inclined to the axis so that the jets emerging from them meet about a point on the axis of the tapering part 77 to cause the liquid to whirl as it passes onwards through the part 77. A disc 81, formed with three arcuate slots 82, is rotatably carried between the two parts of the orifice plate 78 by a short spindle 83 fixed to one of the parts, the orifice plate 78 and the disc 81 being held axially by a securing ring 84. The disc 81 can be rocked about the spindle 83 by a handle 85. Each of the slots 82 is always in register with one of the orifices 79, but when foam is to be formed the orifices 80 are closed by the body of the disc 81. When water is to be delivered, the disc 81 is turned to bring each slot 82 into register also with one of the orifices 80, so that water passes through all six orifices, that is to say, the cross-sectional area open to the passage of liquid is doubled. In this embodiment, air is drawn in through openings 86 in the wall of the tapering part 77, which part 77 is made of such diameter that it will accommodate either the volume of liquid and air when foam is being formed or the increased volume of liquid when water is being delivered. By reason of the increase in volume of the water, there is little space available in the part 77 for air and so there is very little tendency for air to be drawn in by the water passing through all six orifices in the orifice plate 78.

In accordance with our invention, the apparatus may of course be used in its normal manner to make foam and can also be quickly converted to deliver a flowing stream of water without sacrificing a large portion of the water pressure and volume available at the inlet of the apparatus. The moving of the orifice plate and the provision of extra space around the receiver for the water to flow make this possible. It will be apparent, of course, that when the apparatus is used to deliver a stream of water, the various joints must be tight to prevent loss of water.

The terms and expressions which we have employed are used as terms of description and not of limitation, and we have no intention, in the use of such terms and expressions, of excluding any equivalents of the features shown and described or portions thereof, but recognize that various modifications are possible within the scope of the invention claimed.

The modification shown in Figs. 10 and 11 which is disclosed but not claimed herein, is claimed in our copending application Ser. No. 61,668, filed November 23, 1948.

We claim:

1. Fire extinguishing apparatus which may be used to deliver either mechanical foam or a plain stream of fire extinguishing liquid and which comprises a tubular receiver, means for projecting an aspirating jet of fire extinguishing liquid into said receiver to produce foam therein, means for admitting a gas into contact with said jet to be aspirated thereby, and means connected both to said admitting means and said projecting means for closing said admitting means and simultaneously moving the projecting means to increase the flow of liquid and thereby change said jet to a simple stream of the liquid.

2. Fire extinguishing apparatus which may be used to deliver either mechanical foam or a plain stream of fire extinguishing liquid and which comprises a tubular receiver, means for projecting an aspirating jet of fire extinguishing liquid into said receiver to produce foam therein, means for

admitting air under atmospheric pressure into contact with said jet to be aspirated thereby, and means connected both to said admitting means and said projecting means for closing said admitting means and simultaneously moving the projecting means to increase the flow of liquid and thereby change said jet to a simple stream of the liquid.

3. Apparatus for delivering fire extinguishing foam or a stream of plain fire extinguishing liquid which comprises a tubular receiver, a conduit for the passage of fire extinguishing liquid, a plate in said conduit having an orifice through which an aspirating jet of said liquid may be projected into said receiver, means for admitting gas to be aspirated by said jet, and a lever connected to said plate and admitting means for moving said plate to permit free passage of said liquid and simultaneously closing said admitting means.

4. Apparatus for delivering fire extinguishing foam or a stream of plain fire extinguishing liquid which comprises a tubular receiver, a conduit for the passage of fire extinguishing liquid, a plate in said conduit having an orifice through which an aspirating jet of said liquid may be projected into said receiver, means for admitting gas to be aspirated by said jet, means connected to said plate and admitting means for moving said plate out of said conduit and simultaneously closing said admitting means.

5. Apparatus for delivering fire extinguishing foam or a stream of plain fire extinguishing liquid which comprises a tubular receiver, a conduit for the passage of fire extinguishing liquid, a plate in said conduit having an orifice through which an aspirating jet of said liquid may be projected into said receiver, means for admitting gas to be aspirated by said jet, means connected to said plate and admitting means for moving said plate axially in the conduit to let the liquid flow around it and simultaneously closing said admitting means.

6. Apparatus for delivering fire extinguishing foam or a stream of plain fire extinguishing liquid which comprises a tubular receiver, a conduit for the passage of fire extinguishing liquid, a plate in said conduit having an orifice through which an aspirating jet of said liquid may be projected into said receiver, a housing surrounding at least the ends of said receiver and conduit, valve means for admitting air to said housing to be aspirated by said jet, and means connected to said valve means and plate for closing said valve means and simultaneously moving said plate to permit a stream of the liquid to flow past it.

7. Apparatus for delivering fire extinguishing foam or a stream of plain fire extinguishing liquid which comprises a tubular receiver, a conduit surrounding and spaced from said receiver, means for projecting an aspirating jet of liquid into the entrance end of said receiver, a housing enclosing said jet and entrance end, means for admitting air to said housing to be aspirated by said jet, means connected to said admitting means and said projecting means for closing said admitting means and simultaneously changing the position of said projecting means to deliver a plain stream of liquid to said receiver and conduit, and check valve means between said receiver and conduit to prevent flow of fluids towards the entrance end of the receiver.

8. Apparatus for delivering fire extinguishing foam or a stream of plain fire extinguishing liquid which comprises a tubular receiver, a conduit for the passage of fire extinguishing liquid, a plate in said conduit having an orifice through which an aspirating jet of said liquid may be projected into said receiver, a tubular member larger than and surrounding said receiver, a housing enclosing the entrance ends of said receiver and member, means for admitting air into said housing to be aspirated by said jet, means connected to said admitting means and plate for closing said admitting means and simultaneously moving said plate out of the path of liquid in said conduit, and check valve means for preventing the flow of fluids between said receiver and member in a direction towards said entrance ends.

9. Apparatus for delivering fire extinguishing foam or a stream of plain fire extinguishing liquid which comprises a tubular receiver, a conduit for the passage of fire extinguishing liquid, a plate in said conduit having an orifice through which an aspirating jet of said liquid may be projected into said receiver, a tubular member larger than and surrounding said receiver, a housing enclosing the entrance ends of said receiver and member, means for admitting air into said housing to be aspirated by said jet, means connected to said admitting means and plate for closing said admitting means and simultaneously moving said plate axially of said conduit to allow liquid to flow freely around it, and check valve means for preventing the flow of fluids between said receiver and member in a direction towards said entrance ends.

10. Fire extinguishing apparatus for delivering foam or fire extinguishing liquid which comprises a receiver, a conduit for supplying fire extinguishing liquid, nozzle means for restricting the flow of liquid therefrom in such a manner as to project at least one aspirating jet of said liquid into said receiver, means defining an opening regulated by a valve for admitting air under atmospheric pressure to the receiver to be aspirated by said jet, a lever for closing said valve, and linkage actuated by said lever for moving said nozzle means relative to said conduit so as to permit greater flow of said liquid into the receiver.

11. Apparatus as defined in claim 10 in which the linkage is connected to the lever and nozzle means in such a manner as to move the nozzle means after said lever closes the valve for admitting air.

12. Apparatus as defined in claim 10 in which the nozzle means is an orifice plate, and in which the lever and its linkage moves the plate transversely out of the conduit.

13. Apparatus as defined in claim 10 in which the nozzle means is an orifice plate, and in which the lever and its linkage moves the plate axially of the conduit.

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