Aug. 13, 1946. F. J. HOGENMILLER ET AL 2,405,652

FIRE EXTINGUISHING APPARATUS

Filed Oct. 12, 1943 2 Sheets-Sheet 1

Fig. 1

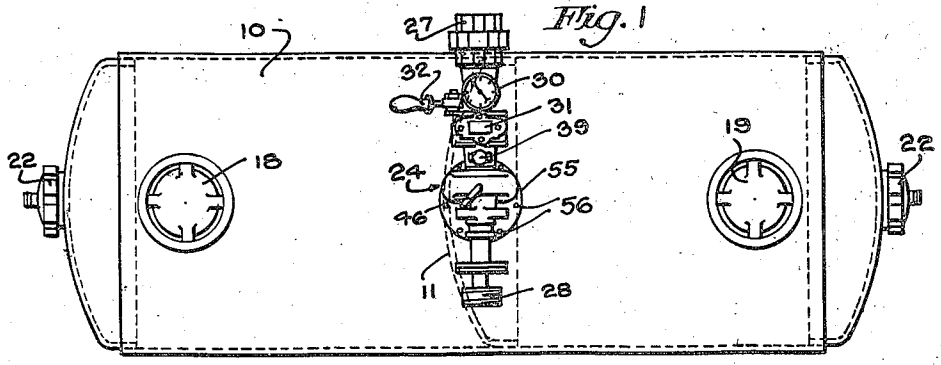


Fig. 2

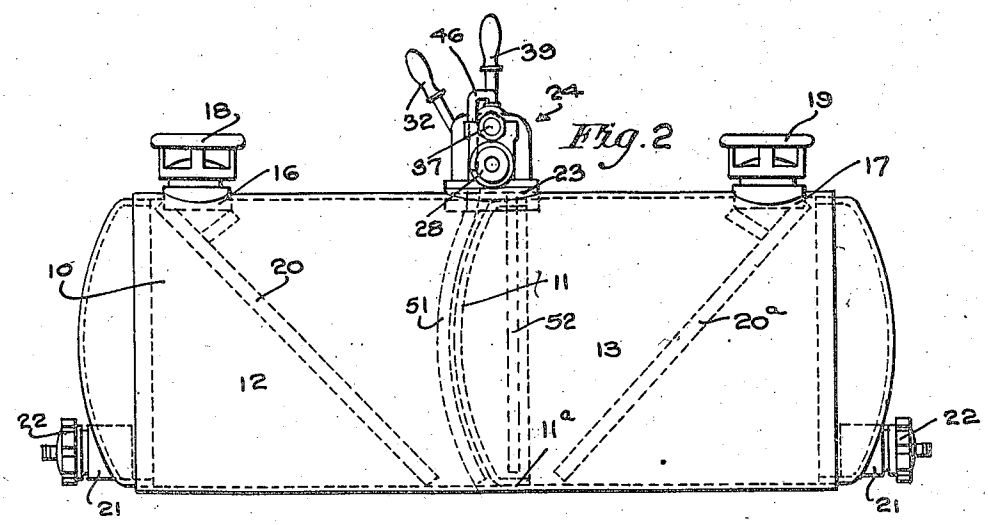
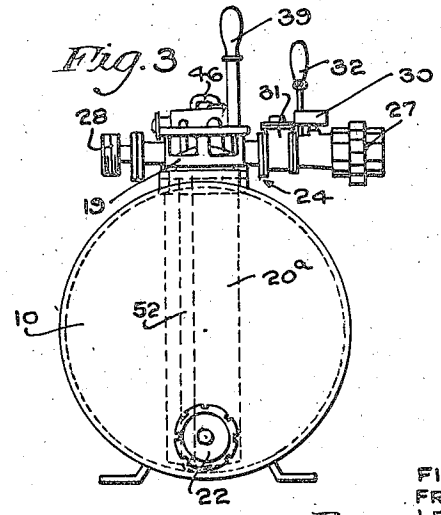


Fig. 3



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FIRE EXTINGUISHING APPARATUS

Filed Oct. 12, 1943 2 Sheets-Sheet 2

Fig. 7

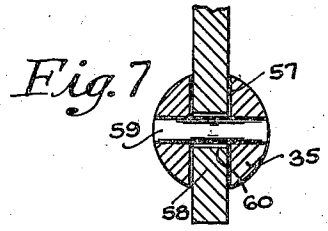


Fig. 6

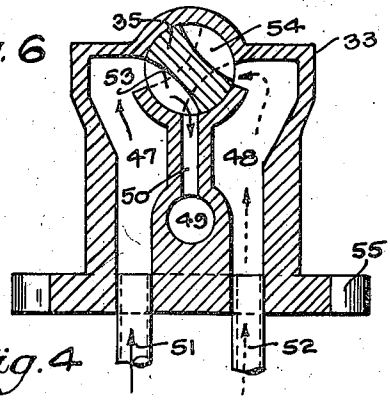
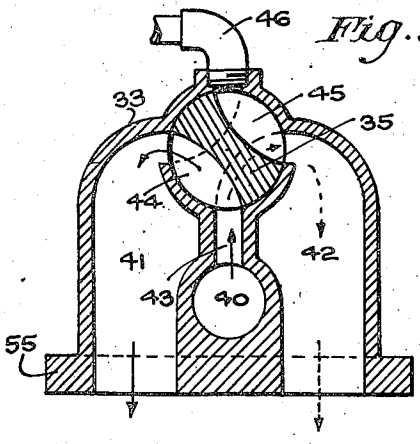


Fig. 4

Fig. 5



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2,405,652

FIRE EXTINGUISHING APPARATUS

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Application October 12, 1943, Serial No. 505,900

12 Claims. (Cl. 169—15)

1

This invention relates generally to apparatus for use in the generation of mechanical or air foam employed in the extinguishment of fires and more particularly to an improved construction of apparatus for introducing a foam stabilizing solution into a stream of water.

In the production of the so-called mechanical or air foam, the usual procedure involves flowing a high velocity stream of water laden with a foam-forming substance through a conduit to a point therein where the stream is finely sub-divided or dispersed and where a suitable gas (usually air from atmosphere) is entrained in such manner as to cause a mingling of the liquid and gas as they move in the conduit toward the point of discharge therefrom. Typical of this method of producing mechanical foam is that which is described in United States Letters Patent No. 2,106,043, granted January 18, 1938, and No. 2,198,585, granted April 23, 1940.

In order to insure the production of foam of the desired uniform quality, it is necessary that the rate of introduction of the foam-forming material into the flowing stream of water be proportional to the rate of flow of the water, while in order to insure an adequate projection of the foam from the discharge nozzle it is necessary to maintain a considerable head of pressure upon the water stream.

An apparatus for securing these objectives is disclosed in United States Letters Patent No. 2,327,335, granted August 24, 1943, to L. W. Boerner and F. J. Hogenmiller, it being noted that by means of such apparatus there is insured not only the maintenance of a maximum head of pressure in the water stream to provide for adequate projection of the stabilized foam, but also the utilization of the full available head of pressure to inject the stabilizing material into the water stream at a rate which is automatically proportioned to the rate of flow of the water stream. Also, such apparatus includes means for utilizing the full head pressure of the water stream to force the foam-forming material from its source of supply into the water stream without, however, effecting any substantial mixing of the water with the supply of foam-forming material.

More recently there has been devised a dual construction of apparatus operable in accordance with the principles disclosed in the said Boerner and Hogenmiller application, the primary purpose of which is to provide an arrangement for producing mechanical or air foam substantially continuously and uninterruptedly over an extended period, as may be required in the extinguishment of an extensive fire requiring a large quantity of foam-forming material. In one form of this dual arrangement of pressure proportioner unit, a pair of vertically spaced reservoirs are provided for the foam-forming material from which the latter may be withdrawn for injection into the water stream, the foaming material being delivered first from one reservoir and, then, upon exhaustion of that supply, from the other reservoir. In addition, the arrangement provides means for filling the exhausted reservoir with a further supply of foaming liquid during the period that the filled reservoir is in operation, the two reservoirs being thus adapted to be alternately exhausted of and filled with the foam-forming liquid to provide for continuous injection thereof into the flowing stream of water and corresponding continuous production of fire-extinguishing foam.

2

The present invention relates more particularly to the control means for effecting the selective and alternate operation of the dual mechanisms for continuously introducing the foaming liquid into the flowing stream of water and has as its primary object the provision of a valve means which is designed to render the dual pressure proportioner unit operative for its intended purpose.

A further object of the present invention is to provide a control means for the dual unit aforesaid which includes a pair of commonly actuated valves operative respectively to divert a portion of the water under pressure from its main conduit into one or the other of the dual reservoirs containing the foam-forming liquid to provide a suitable pressure head upon the liquid therein and to direct the liquid so subjected to pressure into the water stream, the control means being adapted to be set in one or the other of two extreme positions so that a portion of the water under pressure may be diverted from its main stream into one or the other of the two reservoirs to force the foaming liquid therefrom and into the main stream of the flowing water.

Still another object is to provide the control means with an atmospheric vent which is operative automatically as the valves are set to force foaming liquid out of one reservoir to open the interior of the other reservoir to atmosphere, thereby relieving the latter reservoir of internal pressure and enabling it to be quickly drained of accumulated clear water preliminarily to its being refilled with the foam-forming solution.

A still further object of the present invention is to provide a dual construction of pressure proportioner for producing fire extinguishing foam

wherein the two reservoirs for the foam-forming liquid are horizontally spaced in a single container and wherein the control means hereinbefore referred to is constructed in the form of a unitary assembly which is adapted to be quick-detachably connected in operative relation to the dual reservoirs of the apparatus.

While it is generally an object of the present invention to provide a readily operable control mechanism for a dual pressure proportioner unit irrespective of whether it be of the type having vertically spaced reservoirs or of the type having horizontally spaced reservoirs as hereinafter specifically disclosed, it is a special object of the present invention to provide a unitary control means which includes as component parts thereof all of the essential valves and tubes for controlling and directing the supply of water under pressure into and the delivery of foaming liquid from each of the two reservoirs in alternating sequence.

Still other objects and advantages of the present invention, such as the provision of a unit which is exceedingly compact and simple in construction, which is readily portable and easily operable without requiring the constant attendance of an operator and which is extremely efficient in use, will appear more fully hereinafter, it being understood that the invention consists substantially in the combination, construction, location and relative arrangement of parts, all as will be described in detail hereinafter, as shown in the accompanying drawings and as finally pointed out in the appended claims.

In the said accompanying drawings, which illustrate a preferred embodiment of the present invention:

Figure 1 is a top plan view of the apparatus embodying the present invention;

Figure 2 is an elevational view thereof;

Figure 3 is an end view thereof;

Figure 4 is a sectional view of the water conduit and valve assembly;

Figure 5 is a sectional view taken on line 5—5 of Figure 4;

Figure 6 is a sectional view taken on line 6—6 of Figure 4; and

Figure 7 is a sectional view of a detail of the valve assembly taken on the line 7—7 of Figure 4.

Referring now to the drawings and more particularly first to Figures 1 to 3, inclusive, it will be observed that the control means of the present invention, designated generally by the reference numeral 24, is shown operatively associated with a supply tank 10 for the foam-forming material, this tank being disposed horizontally and being provided internally thereof with a central partition 11 to form a pair of separate chambers 12 and 13 for the foaming liquid. Preferably, the partition 11 is arched, as are the opposite ends of the container 10, to strengthen the chambers against the relatively high pressures developed therein during the operation of the apparatus.

The container 10 is provided with a pair of filling pipes 16 and 17 for filling the chambers 12 and 13, respectively, with foam-forming liquid, these filler pipes being respectively provided with closure caps 18 and 19. Preferably, each of the chambers 12 and 13 is provided internally thereof with filling chutes 20 and 20a which are operatively associated with the filling tubes 16 and 17 (see Figure 3) to facilitate filling of the chambers 12 and 13 with the foam-forming material

with a minimum of splash and agitation thereof. In addition, each of the chambers 12 and 13 is provided with a drain fitting 21 equipped with a closure cap 22.

Provided in the top of the container 10 in the immediate region of the central partition 11 is a collar 23 having a single opening therethrough which is common to both of the chambers 12 and 13. In other words, a portion of this opening is disposed to one side of the partition 11 and communicates with one of the chambers, while another portion of this opening is disposed to the other side of the partition 11 and communicates with the other chamber. In this connection, it will be observed that the partition member 11 is provided wtih an annular flange 11a which is welded or otherwise secured to the inner wall surface of the drum or container 10, the flange 11a being suitably cut out within the area defined by the collar 23 to provide a free passage through said flange 11a which is in registry with the bore of the collar 23.

Referring now more particularly to Figures 4, 5 and 6, which shows the details of construction of the unitary valve control mechanism, designated generally by the reference numeral 24, it will be noted that this unit essentially consists of a tube through which water is delivered under suitable pressure from a source of supply to a point of discharge, this tube including a Venturi passage and having associated therewith a valve for controlling the passage of water therethrough and additional valve means for diverting a portion of the main water stream into one or the other of the chambers 12 and 13, as desired, for imposing upon the foam-forming liquid contained in said chamber a head of pressure sufficient to force the liquid out of the chamber and inject it into the stream of water as the latter passes through the low pressure section of the Venturi passage.

More specifically, the unit 24 essentially consists of a main body member 25 generally in the form of a longitudinally extending tube having a bore 26 extending therethrough. This bore is provided with an inlet fitting 27 and with a discharge fitting 28 and is formed intermediate of its length to provide a Venturi passage 29 through which a stream of water from a suitable source of high pressure supply is adapted to be projected in the direction indicated by the arrows. It will be understood, of course, that the water inlet end of the unit is adapted to be connected by way of the fitting 27 and a hose (not shown) to a hydrant or other source of water under suitable pressure, while the outlet or discharge fitting 28 of the unit is adapted to be connected to a hose (not shown) through which the water mixed with a foam stabilizer solution is delivered to the point where air is entrained therein and thence discharged in the form of fire extinguishing foam. The manner of and means for effecting the entrainment of air or other gas into the stream of water laden with the foam-forming substance forms no part of the present invention, and, no detailed description thereof will be given herein, the present invention being limited more particularly to the control means for introducing into the water stream the requisite quantity of the foam stabilizing solution. It will be understood in this connection that this invention is not limited to the use of any particular type of foam-forming material. Usually this material is in the form of an aqueous solution of a secondary extract of licorice, of saponin or of

other suitable substance having the capacity of being foamed when a gas is injected into a solution or suspension thereof.

Included in the unit 24 as component parts thereof are a pressure gauge 30 and a main water valve 31, both of which are located in advance of the Venturi passage 29. The water valve 31, which may be of any suitable type for interrupting the flow of water through the bore 26 of the unit, is adapted to be operated by a handle 32.

In addition to the Venturi passage 29 extending longitudinally through the injecting unit 24, the latter is provided with a valve body 33 formed as an integral extension of the body portion of the unit in which is formed the Venturi passage. This valve body 33 is provided with a tapered bore 34 extending longitudinally therethrough and in this tapered bore is fitted a valve plug 35. This valve plug 35 is provided at its reduced end with a threaded stud or shank 36 for reception of a cap nut 37 by means of which the valve plug 35 is drawn snugly into operative position within the tapered bore 34 of the valve body. Preferably, a coiled compression spring 38 is interposed between the cap nut 37 and the valve body so as to impart a bias upon the valve plug operative normally to maintain it in operative position axially of the valve body while permitting it to be rotated freely about said axis in one direction or the other by means of an operating handle 39.

The valve body 33, in the region of the high pressure portion 40 of the Venturi passage, is provided with a pair of laterally spaced passages 41 and 42 (see Figure 5), the upper ends of which commonly communicate with the longitudinally extending bore 34 of the valve body 33 and thence with the portion 40 of the Venturi passage by way of a central vertical extending passage 43. The lower ends of these passages 41 and 42 are respectively in communication with the chambers 12 and 13 and to this end are in registry with the portions of the opening through the collar 23 in the top of the container 10 which are disposed to either side of the central partition 11. The valve plug 35 is provided upon opposite sides thereof with arcuately shaped grooves or passages 44 and 45 which are adapted respectively for registry with the passages 41 and 42 (see Figure 5) so that as said valve plug 35 is rotated in one direction or another, free communication is effected between the interiors of either one of the chambers 12 and 13 with the high pressure portion 40 of the conduit leading into the Venturi passage 29.

Thus, when the valve plug 35 is in the full line position as shown in Figure 5, the high pressure portion 40 of the water passage through the injector unit is in free communication with the chamber 12, in consequence of which a portion of the water stream flowing through the unit from its source of supply may be diverted into the said chamber 12 in the direction of the full line arrows, as indicated in Figure 5. On the other hand, when the valve body is rotated into the dotted line position shown in Figure 5, a portion of the said water stream is diverted into the chamber 13, as indicated by the dotted line arrows of Figure 5. Of course, when the valve plug 35 assumes a central position so as to close off completely the central passage 43, no water is diverted out of the main stream into either of the chambers 12 and 13 and the water stream in its entirety is projected straight through the Venturi passage 29.

As also most clearly appears in Figures 4 and 5,

the valve body 33 is provided with a vent 46 to atmosphere, this vent being located substantially in the transverse plane of the passages 41 and 42 and being adapted to vent one or the other of the chambers 12 and 13 to atmosphere depending upon the position of the valve plug 35. Thus, when the valve plug 35 is in the full line position shown in Figure 5, the chamber 13 will be vented to atmosphere, while conversely, when the valve plug 35 is in the dotted line position shown in Figure 5, the chamber 12 will be vented to atmosphere.

The valve body or casing 33 is provided with a second pair of laterally spaced passages 47 and 48 spaced axially from the previously described pair of passages 41 and 42, these passages 47 and 48 being disposed substantially in a transverse plane intersecting the low pressure portion 49 of the Venturi passage 29. These passages 47 and 48 also communicate at their upper ends with the longitudinal bore 34 of the valve casing and thence by way of a common vertically extending passage 50 with the low pressure portion 49 of the Venturi passage. The lower ends of these passages 47 and 48 are respectively connected to a pair of delivery tubes 51 and 52 for the foam-forming liquid, these tubes being respectively projected into the chambers 12 and 13 with their open ends terminating just above the bottoms of said chambers (see more particularly Figure 2).

Adapted for respective registry with the passages 47 and 48 are a pair of passages 53 and 54 formed in the plug body 35, these latter passages being similar in all material respects with the water passages 44 and 45 previously described. It will be apparent that when the plug body 35 is in the full line position shown in Figure 6, the interior of the chamber 12 is in free communication with the low pressure section 49 of the Venturi passage by way of the delivery tube 51, the passage 47, the passage 53 and the passage 50, while when the valve plug 35 is in the dotted line position shown in Figure 6, the interior of the chamber 13 will be in free communication with the bore 49 of the injector unit by way of the tube 52 and the passages 48, 54 and 50. There is no atmospheric vent associated with any of the last mentioned passages.

The injector unit as hereinbefore described, is preferably provided with a mounting plate or flange 55 which fits upon the collar 23 and is bolted thereto by means of suitable bolts or other securing elements 56 (see Figure 1). As has been previously indicated, the delivery tubes 51 and 52 for the foaming solution may be fitted in the injector unit as component parts thereof and the unit, including such tubes, may be attached to or removed from the tank 10 as an entirety. In order to facilitate this, the tube 51 may be bent to conform generally to the curvature of the partition 11 so that when the unit is mouned in position, the tubes are disposed to either side of said partition. Of course, it is within the purview of the present invention to form the tubes as component parts of the container 10 rather than of the injector unit, in which case any suitable means may be provided for establishing tight communications between the upper ends of the tubes 51 and 52 and the passages 47 and 48 of the injector unit when the latter is mounted securely in place.

In order to insure against the valve plug 35 becoming so bound in the bore 34 of the valve body so that it becomes difficult to rotate it into one or another of its operative positions, the end thereof

to which the operating handle 39 is secured is extended outwardly of the valve body and this outwardly extending portion is slotted, as at 57, to receive the bar 58 of the operating handle. This bar 58 is pivoted to the slotted portion of the plug 35 by a transversely extending pin 59, the aperture 60 in the bar 58 being of somewhat greater diameter than that of the pivot 59 to provide for a certain amount of play between the pivotally connected parts. Also, the lower end of the bar 58 of the operating handle projects downwardly below the plug 35 for engagement with the stationary part 61 of the valve body when the handle 39 is swung in counter-clockwise direction about its pivot pin when viewed as in Figure 4.

It will be apparent that when the handle is so swung in counter-clockwise direction, the fixed part 61 of the valve body which is engaged by the lower extremity of the operating handle serves as a fulcrum about which the handle swings and permits the latter to act as a lever to draw the plug 35 axially out of its snug engagement within the bore 34 of the valve body, this axial movement being, of course, resisted by the coiled spring 38. Once the valve plug is freed by this axial movement for free rotation within the valve casing, the handle 39 is released whereupon the spring 38 returns the valve plug to its normal operative position as shown in Figure 4, the unit being then in condition for use.

In the operation of the apparatus of the present invention, it will be assumed that the chambers 12 and 13 are each filled with the requisite foam-forming liquid and that the apparatus is connected to a source of water supply under suitable pressure by way of the fitting 27 and to a foam-forming and discharge conduit by way of the fitting 28. Normally, the handles 32 and 39 will be in their inoperative positions, that is, in positions whereby the main water valve 31 and the foam injecting valves are all closed. When it is desired to place the apparatus in operation, the handle 32 is operated to open the valve 31 and so permit the passage of water under pressure from its source of supply through the bore 26 of the foam injecting unit. It will be understood, of course, that so long as the handle 39 remains in its closed position, no water will be diverted into either of the chambers 12 and 13 and consequently, no foaming liquid will be delivered therefrom for injection into the water stream. When it is desired to produce foam for fire extinguishing purposes, the handle 39 is moved to either one of its two extreme positions. Assuming that both chambers 12 and 13 are filled with foam-forming solution, it would, of course, be immaterial in which direction the control handle 39 is thrown. Assuming this handle to be thrown into position to rotate the valve plug 35 into the full line positions shown in Figures 5 and 6, the portion of the water stream flowing through the injector tube would be diverted from the portion 40 thereof into the chamber 12 by way of the passages 43, 44 and 41. The water so diverted into the chamber 12 immediately exerts an even pressure upon the entire upper surface of the foam solution contained in said chamber, the passages 40, 43 and 41 being of such substantial size that substantially the full head of water pressure is so exerted upon the foam stabilizer solution in said chamber. Due to the fact that the delivery tube 51 for the foam-forming liquid is in free communication with the low pressure portion of the Venturi passage by way of the passages 47 and 50 (see Figure 4),

there exists a pressure differential which results in the flow of the foam solution upwardly through the tube 51 and the passages 47 and 50 into the stream of water flowing through the low pressure portion of the Venturi passage. This flow of foam solution from the chamber 12 into the stream of water flowing through the Venturi passage of the injecting unit will continue, of course, so long as the stream of water under suitable pressure is flowed through the unit and until the supply of foam solution in the chamber 12 is completely exhausted. Inasmuch as the flow of the foam solution upwardly through the tube 51 is dependent upon the pressure differential existing between the high and low pressure portions of the Venturi passage, it will be apparent that by proper design of the cross-sectional areas of the high and low pressure portions of the Venturi passage, the ratio of the rate of flow of the foam solution to the rate of flow of the water stream through the Venturi passage may be predeterminedly established and maintained.

Having exhausted the supply of foam-forming solution contained in the chamber 12, in order to continue the production of foam, it is merely necessary to reverse the position of the control handle 39 so as to rotate the valve plug 35 into the dotted line position shown in Figures 5 and 6. In this position of the valve plug 35, exactly the same conditions will obtain as described in connection with chamber 12 for effecting the delivery of the foam-forming solution from the chamber 13 into the water stream flowing through the injector tube. At the same time, the chamber 12 which has been exhausted of foam-forming solution and is now filled with water under suitable pressure, is automatically vented to atmosphere by way of the vent 46 so as to relieve said chamber of such internal pressure and to facilitate the discharge of the water therefrom by way of its drain 21. Having removed all of the clear water from the chamber 12, it may now be refilled with foam-forming solution by way of its filling pipe 16 so as to provide a further supply of foaming solution which is ready to be used immediately upon exhaustion of the supply in the chamber 13. Obviously, this cycle of operation may be continued so that the requisite quantities of foam may be produced substantially uninterruptedly until the fire is extinguished.

It will be understood, of course, that the invention is capable of various changes and modifications which may be made from time to time without departing from the real spirit or general principles thereof, and it is accordingly intended to claim the invention broadly as well as specifically as indicated in the appended claims.

What is claimed as new and useful is:

1. An apparatus for injecting foam-foaming material into a flowing stream of water comprising, in combination, a tank having a pair of independent chambers respectively adapted to contain separate supplies of foam-forming material, the said tank having an opening common to said chambers and disposed to provide direct access to each of said chambers, and a unitary water conduit and valve assembly mounted over said opening and including means for selectively controlling the flow of foam-forming material to said water conduit alternately from said chambers as desired and for diverting a portion of the water into that one of the chambers from which the foam-forming material is drawn whereby to subject the material in said chamber

to a differential pressure to effect its delivery from said chamber.

2. An apparatus for injecting foam-forming material into a flowing stream of water comprising, in combination, a tank having a pair of independent chambers respectively adapted to contain separate supplies of foam-forming material, the said tank having an opening common to said chambers for providing direct access to each of said chambers, and a unitary water conduit and valve assembly mounted over said opening and having means for selectively controlling the flow of foam-forming material to said water conduit alternately from said chambers as desired, said assembly including a Venturi passage and a pair of delivery tubes for the foam-forming material extending respectively from the low pressure portion of said Venturi passage to the bottoms of said chambers and including also means for diverting a portion of the water from the high pressure side of the Venturi passage to one or the other of said chambers as desired to subject the material contained therein to a differential pressure sufficient to effect its discharge from said chamber into the flowing stream of water.

3. An apparatus for injecting foam-forming material into a flowing stream of water comprising, in combination, a tank having a pair of chambers respectively adapted to contain separate supplies of foam-forming material, the said tank having an opening common to said chambers for providing direct access to each of said chambers, and a unitary water conduit and valve assembly mounted over said opening, said assembly including means for establishing a pressure differential between spaced portions of said water conduit, valve means for connecting the high and low pressure portions of said water conduit with either one of said chambers whereby to subject the material contained therein to a differential pressure sufficient to effect its discharge into the low pressure portion of the flowing stream of water, and means for selectively controlling the discharge of the foam-forming material alternately from said chambers as desired.

4. A water conduit and valve assembly for the delivery of foam-forming material selectively from either of two independent sources of supply into a continuously flowing stream of water comprising a water conduit having a Venturi passage therein to provide a pressure differential between spaced portions of said conduit when water under pressure flows therethrough, and valve means for connecting said spaced portions of the conduit selectively with either of said sources of supply of the foam-forming material.

5. An apparatus for effecting continuous introduction of a foam-forming solution derived from one of two separate sources of supply into a flowing stream of water comprising a unitary water conduit and valve assembly including a main valve for controlling the flow of water through said conduit and an auxiliary valve operable selectively to divert a portion of the water stream to one or the other of said sources of supply of the foam-forming solution for subjecting the same to a positive head of pressure and to connect the source of supply so subjected to pressure to said conduit at a point located beyond that where the water is diverted to said source of supply.

6. An apparatus for effecting continuous introduction into a flowing stream of water of a foam-forming solution derived from one of two separate confined sources of supply comprising a main water conduit having a Venturi passage therein, a main valve for controlling the flow of water through said conduit, means for selectively connecting the high pressure portion of said Venturi passage with one or the other of said sources of supply whereby to subject the same to water under pressure diverted from said flowing stream, means for selectively connecting the low pressure portion of said Venturi passage with one or the other of said sources of supply whereby to effect the discharge therefrom of the foam-forming solution into the flowing stream of water under the influence of the diverted water under pressure, and means for effecting simultaneous operation of the two last-mentioned means.

7. An apparatus for effecting continuous introduction into a flowing stream of water of a foam-forming solution derived from one of two separate confined sources of supply comprising a water conduit having a Venturi passage therein and a multiple valve unit operatively associated therewith, said valve unit including a pair of passages selectively adapted to establish communication between the high pressure portion of said Venturi passage and either of said sources of supply and a second pair of passages selectively adapted to establish communication between the low pressure portion of the Venturi passage and either of said sources of supply.

8. An apparatus for effecting continuous introduction into a flowing stream of water of a foam-forming solution derived from one of two separate confined sources of supply comprising a water conduit having a Venturi passage therein and a multiple valve unit operatively associated therewith, said valve unit including a pair of passages selectively adapted to establish communication between the high pressure portion of said Venturi passage and either of said sources of supply and a second pair of passages selectively adapted to establish communication between the low pressure portion of the Venturi passage and either of said sources of supply, and means for insuring that the high and low pressure portions of the Venturi passage are simultaneously connected to the same selected source of supply of the foam-forming solution.

9. An apparatus for effecting continuous introduction into a flowing stream of water of a foam-forming solution derived from one of two separate confined sources of supply comprising a water conduit having a Venturi passage therein and a multiple valve unit operatively associated therewith, said valve unit including a pair of passages selectively adapted to establish communication between the high pressure portion of said Venturi passage and either of said sources of supply and a second pair of passages selectively adapted to establish communication between the low pressure portion of the Venturi passage and either of said sources of supply, and means operable to simultaneously change the connections from the high and low pressure portions of the Venturi passage from one to the other of said sources of supply of the foam-forming solution.

10. An apparatus for effecting continuous introduction into a flowing stream of water of a foam-forming solution derived from one of two separate confined sources of supply comprising a water conduit having a Venturi passage therein and a multiple valve unit operatively associated therewith, said valve unit including a pair of passages selectively adapted to establish com-

munication between the high pressure portion of said Venturi passage and either of said sources of supply and a second pair of passages selectively adapted to establish communication between the low pressure portion of the Venturi passage and either of said sources of supply, and means for automatically venting to atmosphere that one of said confined sources of supply of the foam-forming solution which is shut off from communication with the water conduit.

11. An apparatus for effecting continuous introduction into a flowing stream of water of a foam-forming solution derived from one of two separate confined sources of supply comprising a main water conduit having a Venturi passage therein and valve means operatively associated therewith for selectively establishing communication between said conduit and one of said sources of supply, said valve means including a valve body having axially spaced sets of passages, one set of passages being in communication with the high pressure portion and the other set in communication with the low pressure portion of said Venturi passage, and plug means in said valve body having passages adapted to selectively connect corresponding passages of said axially spaced sets with one of said sources of supply whereby to subject the same to a differential pressure adequate to effect delivery of the solution into the flowing stream of water at the low pressure side of the Venturi passage.

12. An apparatus for effecting continuous introduction into a flowing stream of water of a foam-forming solution derived from one of two separate confined sources of supply comprising a main water conduit having a Venturi passage therein and valve means operatively associated therewith for selectively establishing communication between said conduit and one of said sources of supply, said valve means including a valve body having axially spaced sets of passages, one set of passages being in communication with the high pressure portion and the other set in communication with the low pressure portion of said Venturi passage, and plug means in said valve body having passages adapted to selectively connect corresponding passages of said axially spaced sets with one of said sources of supply whereby to subject the same to a differential pressure adequate to effect delivery of the solution into the flowing stream of water at the low pressure side of the Venturi passage, said valve means including means to vent to atmosphere that source of supply of the foam-forming material which is not in communication with the water conduit.

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