

July 21, 1959

T. J. MAHON ET AL
DISPENSING DEVICE

2,895,651

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2 Sheets-Sheet 1

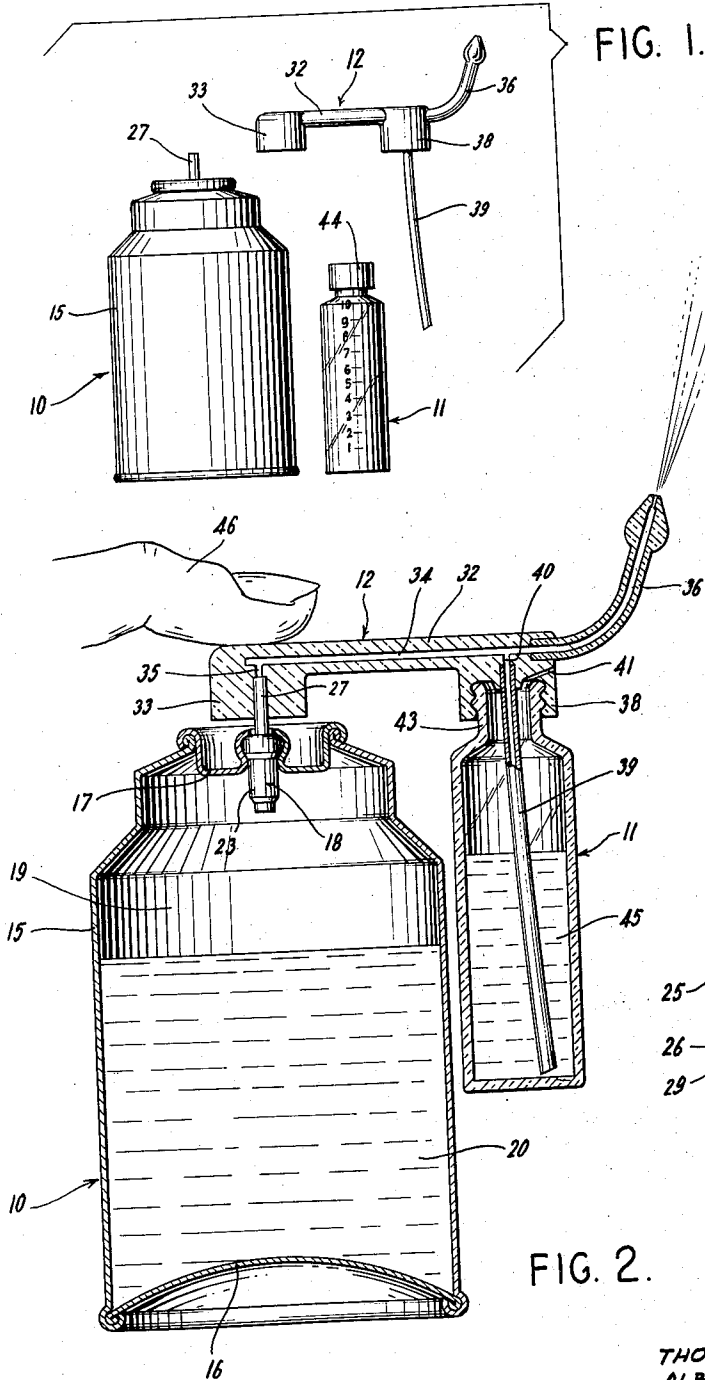


FIG. 1.

FIG. 3.

FIG. 2.

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FIG. 4.

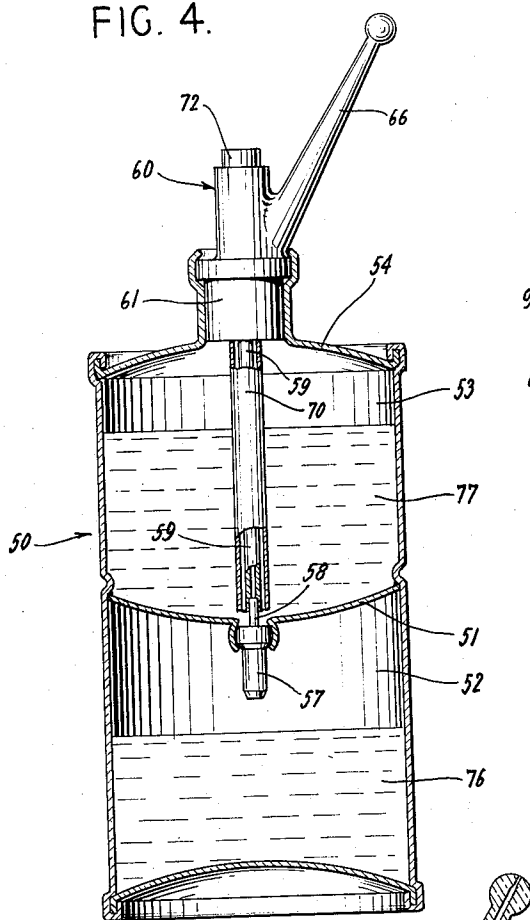


FIG. 6.

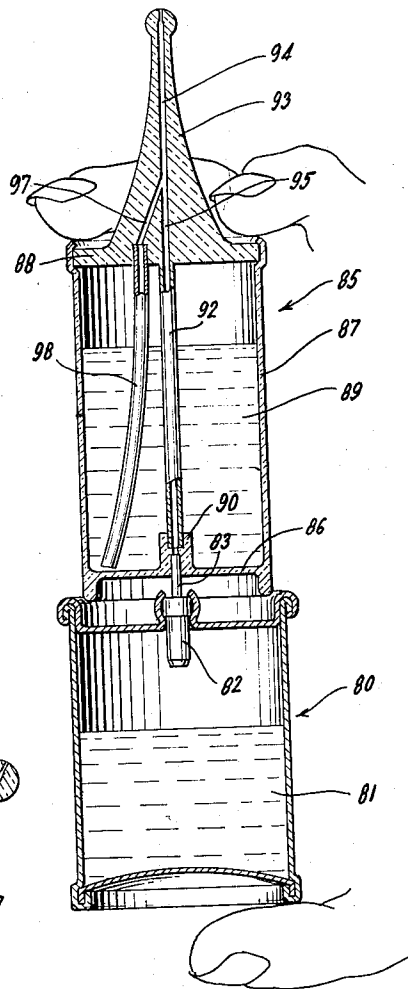
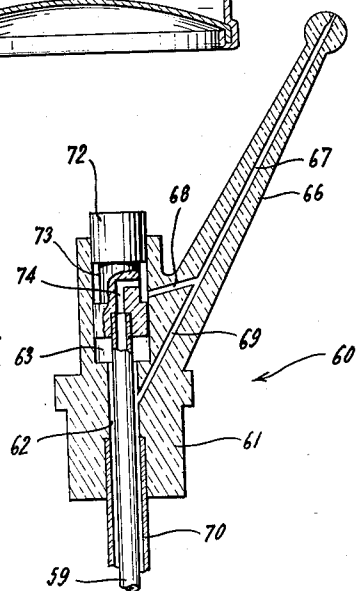


FIG. 5.



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DISPENSING DEVICE

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Application February 23, 1956, Serial No. 567,281

2 Claims. (Cl. 222—399)

This invention relates generally to dispensing devices, and is particularly directed to devices for dispensing fluent materials under pressure.

While the device of the instant invention has been primarily developed and employed in connection with the administration of medicines, including veterinary medicines, and is herein illustrated and described with particular reference thereto, such disclosure is made for purposes of illustration and not in limitation, it being fully appreciated that the instant invention is capable of advantageous employment in the dispensing of a wide variety of products, such as plastic coatings, paints, adhesives, aqueous solutions and others. In particular, the instant invention has been found highly advantageous for dispensing surface active agents, antibiotics, chemotherapeutic agents and all other therapeutic agents that can be used for inhalation, and in animal medication, such as lung worm infestation.

As is well known to those versed in medicine, it is often desirable or necessary to dispense certain active materials by nebulizing or atomizing. Heretofore, the nebulizing of medicines required considerable equipment, such as tanks, hoses, compressors, etc. which equipment was relatively difficult to operate and time consuming to prepare for operation. In addition, prior nebulizing apparatus was relatively heavy, occupying considerable space, and was expensive to purchase, use and maintain.

There are certain conditions of the lungs such as bronchiectasis where only by inhalation therapy can the maximum effect be achieved without surgery. The device of the present invention renders home medication available and simple, not heretofore possible, in the treatment of the same.

Accordingly, it is a general object of the present invention to provide novel means for use in dispensing fluent and solid material under pressure, which means overcomes the above mentioned disadvantages, is extremely simple to operate, enabling unskilled or semi-skilled persons to efficiently dispense active materials, and which is compact in construction and small in size.

It is a more particular object of the present invention to provide a nebulizing or atomizing device which is adapted to be used in conjunction with an aerosol-type bomb for administering fluent and solid material in proximity to sensitive animal tissues, topically and in cavities, such as the nose, mouth, ear and rectum, so that the material is dispensed in the desired particle size without objectionable odor or pressure, and without the "cold feel" or "freeze" of the tissues as is produced by the conventional aerosol dispensers. This "cold feel" or "freeze" is undesirable in that it produces a vaso-constriction of the peripheral vessels in the mucosa and sub-mucosa. Such condition can very well produce necrobiosis of the local cells. In addition, such vaso-constriction also may prevent proper action of the employed medication at the site of the tissues. The elimination of such "cold feel" or "freeze" is consequently highly desirable.

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The elimination of this "cold feel" or "freeze" is made possible by the improved device in using as the vehicle the gaseous phase of the propellant, which is the primary object of this invention.

Still another object of this invention is to provide a device that will prevent condensation, which is made possible by utilizing only the gaseous phase as the propellant.

Another object of the invention is to permit use of elongated nozzles and catheters which heretofore was not possible because of condensation from drawing off the liquid phase of the propellant.

A further object of the invention is to provide a novel dispensing device which has certain advantages over conventional steam vaporizers. Surface active agents can be dispensed with the improved device but not with a steam vaporizer. An additional advantage over the steam vaporizer resides in the fact that in the improved device the moisture comes off at a lower or room temperature than in the case of a steam vaporizer with the resultant increase in humidity.

It is a further object of the present invention to provide a dispensing device for fluent and solid materials having the advantageous characteristics mentioned in the foregoing paragraphs, which is capable of long and continuous use, many times longer than that of a conventional aerosol of the same size, and which can be manufactured and sold at a price sufficiently low to economically justify disposal of the device or parts thereof after a single use.

Other objects of the present invention will become apparent upon reading the following specification and referring to the accompanying drawings, which form a material part of this disclosure.

The invention accordingly consists in the features of construction, combination of elements, and arrangements of parts, which will be exemplified in the construction hereinafter described, and of which the scope will be indicated by the appended claims.

In the drawings:

Fig. 1 is an elevational view showing the various components of the instant dispensing device in unassembled relation;

Fig. 2 is a sectional, elevational view showing the components of Fig. 1 in their assembled operative relation;

Fig. 3 is a longitudinal sectional view, somewhat enlarged, showing a valve adapted to be employed in the assembly of Fig. 2;

Fig. 4 is an elevational view, partially in section, showing a slightly modified form of dispensing device of the present invention;

Fig. 5 is a partial, sectional elevational view showing in greater detail an outlet mechanism of the device of Fig. 4; and

Fig. 6 is a sectional elevational view showing still another dispensing device constructed in accordance with the present invention.

Referring now more particularly to the drawings, and specifically to Figs. 1 and 2 thereof, the dispensing device illustrated therein comprises a pressure-resistant propellant container or vessel, generally designated 10, a container or vessel 11 for holding the active material or product to be dispensed, and outlet means, generally designated 12, adapted for connection to both of the vessels for conducting the active product to the ambient atmosphere.

The vessel 10 is best seen in Fig. 2 as including a generally vertically disposed cylindrical side wall 15 having its lower end closed by a bottom or end wall 16, and having its upper end closed by an upper end wall or closure cap 17.

A valve 18 is mounted in the upper end closure 17 and communicates, when open, between the upper interior region or headspace 19 of the vessel 10 and the exterior of the vessel, as will appear presently in greater detail.

The vessel 10 is illustrated in Fig. 2 as containing a partially liquefied propellant gas, such as one of the fluorinated hydrocarbons or other suitable propellant, under substantial pressure. When the vessel 10 is in its normal upright position, as illustrated, the lower interior region 20 of the vessel will contain the liquid phase of the propellant gas, while the upper vessel region or headspace 19 will contain the gaseous phase. Hence, the valve 18 is communicable between the gas phase of the propellant and the exterior of the vessel 10.

The valve 18 is best seen in Fig. 3 as including an open ended body or casing 23 having its upper end portion formed to define an internal peripherally extending channel 24 for receiving an annular packing ring or casket 25. A pin 26 is arranged longitudinally of and slidably within the valve casing 23 and formed on its upper end with an upwardly opening tubular member or actuating stem 27 which projects through and beyond the upper casing end. The tubular stem 27 is formed in its lower region, adjacent to the pin 26 with a lateral opening or port 28; and, the pin 26 and tube 27 are resiliently biased upwards by a coil spring 29 to a limiting upper position in which the side port 28 is closed by the packing ring 25. Thus, in the illustrated, upper limiting position, the packing ring 25 closes the port 28 and the space between the body 23 and tube 27, so that no fluid may pass through the valve. However, upon depression of the unitary pin 26 and tube 27 against the force of spring 29 so that the tube communicates through the port 28 with the interior of the valve body 23, gaseous state propellant under pressure will pass upwards into the valve body, through the port 28, and upwards through and out of the upper end of the tube 27.

The outlet means 12, see Figs. 1 and 2, includes a generally horizontally elongate, relatively rigid conduit 32 having an enlarged depending head 33 at one end. The conduit 32 is provided with a longitudinally extending internal passageway 34 which opens at one end into the upper end of a generally vertically disposed passageway 35 formed in the head 33. Further, the head 33 has its underside shaped to snugly and firmly receive the upper end portion of the valve tube 27 with the latter in fluid communication with the passageway or bore 35. Secured on the conduit 32, remote from the head 33 and in fluid communication with the passageway or bore 34 is a dispensing nozzle 36.

Depending from the generally horizontally disposed conduit 32, spaced from the head 33, is a downwardly opening, internally threaded socket 38. A normally generally vertically disposed tube or standpipe 39 has its upper end secured to the interior of the socket 38, centrally thereof, and depends spacedly through and considerably below the socket. The upper end of the standpipe 39 is connected in fluid communication through a bore or passageway 40 with the conduit passageway 34, intermediate the ends of the latter. A suitable vent opening or passageway 41 is also formed in the socket 38 and opens inwards from one side of the latter through the interior socket top wall.

The vessel 11 may be of any suitable type, such as the conventional bottle having an upwardly opening, externally threaded mouth end 43 suitable for threaded engagement in the socket 38. A conventional cap 44 is shown on the vessel 11 in the disassembled or exploded view of Fig. 1; and a quantity of active fluent material 45 is shown in the lower region of the container 11 in Fig. 2.

It will now be appreciated that the outlet conduit 32 is rigidly connected to and valved by the valve 18 so that depression of the conduit, as by the illustrated finger 46, will open the valve and permit gaseous state propellant

to pass through the valve, passageways 35 and 34, and outwards through the nozzle 36 to the ambient atmosphere. This stream of gaseous state propellant will flow rapidly through the conduit bore or passageway 34 and lower the pressure in the bore 40 communicating with the standpipe 39, thereby serving to draw the active fluent material 45 through the standpipe or tube 39 into the conduit passageway 34 where it is entrained with the stream of gaseous state propellant and thus carried out through the nozzle 36 to the ambient atmosphere.

As it is the gaseous state propellant, rather than the liquid state propellant that carries the active fluent material 45 to the ambient atmosphere, there will be no evaporation of the propellant when it is applied to sensitive tissues. Hence, the "cold feel" or "freeze" of prior aerosol dispensers is eliminated. Further, as the fluent material carrying medium is in its expanded or gaseous state before egress from the dispensing device, the weight rate of propellant flow through the outlet means is relatively small, as compared to the weight rate of liquid flow from conventional aerosols of the same outlet size, so that a relatively long period of use, either interrupted or continuous as desired, may be obtained from relatively small aerosol vessels. The instant dispensing device also enables active fluent material to be administered in proximity to sensitive tissues without excessive pressure and objectionable odor, as the relatively light specific weight gas phase of the propellant is applied to the tissues and there is little or no vaporization at the tissues.

A modification of the instant invention is illustrated in Fig. 4, wherein a single container, generally designated 50 is separate by an internal wall or partition 51 to subdivide the container into a lower chamber 52 and an upper chamber 53, which chambers may be generically considered as separate vessels. Thus, the internal wall or partition 51 defines the top or upper end wall of the lower vessel 52 and the bottom or lower end wall of the upper vessel 53, while the top wall 54 of the entire container 50 defines the upper end or top wall of the upper vessel 53. Stated otherwise, the vessels 52 and 53 may be considered as fixedly secured together in superposed relation.

A valve 57, which may be substantially identical to the valve 18 of Figs. 1-3, including an upwardly projecting actuating stem 58, may be mounted in the upper wall of the lower vessel 52; and, a relatively stiff or rigid conduit or tube 59 is arranged interiorly of the upper vessel 53, having its lower end rigidly connected to the valve stem 58 for vertical shifting movement therewith and fluid communication therethrough when the valve 57 is open. The upper end of the conduit 59 extends movably through and beyond the upper end wall 54 of the upper vessel 53, as will appear presently.

Mounted in the upper end wall 54 of the upper vessel 53 is an outlet mechanism, generally designated 60 as best seen in Fig. 5. The outlet mechanism includes a generally vertically disposed body 61 having a bore or passageway 62 extending upward through the lower body end and opening at its upper end into an enlarged generally cylindrical hollow or bore 63 which opens upwards through the upper body end. Formed on the body 61 is an upwardly and outwardly projecting nozzle 66 having an internal passageway or bore 67. The enlarged hollow 63 of the body 61 communicates with the nozzle bore 67 by a bore or passageway 68, while a branch passageway or bore 69 is formed in the body 61 communicating between the lower body bore 62 and nozzle bore 67.

A tube or standpipe 70 is arranged interiorly of the upper vessel 53, concentrically spaced about the conduit 59, and has its upper end firmly connected to the body 61 in fluid communication with the body bore 62 while the lower end of the standpipe depends toward the partition wall 51 and opens into the lower region of the vessel 53. An actuating button or plug 72, which is of generally

cylindrical configuration and formed with a peripheral, external recess or groove 73 intermediate its ends, is slidably mounted in the hollow 63 of the body 61 and has its upper end projecting through and out of the body. The upper end of the conduit 59 is rigidly secured in the lower end of the actuating button or plug 72 and communicates through a passageway 74 formed in the button with the space defined by the groove 73 and body 61.

In operation, the button 72 is depressed to the position of Fig. 5 in which the space within the groove 73 communicates through the bore or passageway 68 with the nozzle passageway 67. This depression of the button 72 serves to shift the conduit 59 downwards against the normally upwardly urging force of the valve stem 58, to thereby open the valve 57 and afford gaseous communication from the upper region of the lower vessel 52 through the valve, conduit, button passageway 74, body passageway 68, and through the nozzle passageway 67 to the ambient atmosphere. As the lower vessel 52 contains a partially liquefied propellant gas 76, with the gas phase thereof in the upper region or head space of the vessel, the gaseous state propellant will pass under pressure to the atmosphere. Simultaneously, the standpipe 70 opens from its lower end in the lower region of the vessel 53, upwards through the body passageways 62 and 69, and outwards through the nozzle passageway 67 to the ambient atmosphere. A suitable air vent (not shown) is provided in an upper region of the vessel 53, so that a reduced pressure in the passageway 68 and 67 produced by the rapid flow of gas state propellant, will draw a fluent product 77 contained in the lower region of the vessel 53 upwards through the standpipe 70 and passageway 69 for entrainment with the outwardly moving propellant gas stream to be carried by the latter. Upon release of the button 72, the valve stem 58 will shift the conduit 59 and button upwards, the latter serving to close the space defined by the groove 73 to the body passageway 68, and thereby prevent the egress of propellant.

A further embodiment of the present invention is illustrated in Fig. 6, wherein a lower vessel, generally designated 80, is adapted to contain a partially liquefied propellant gas 81, and is provided with a valve 82, which may be identical to the valve of Fig. 3, mounted in an upper end wall portion of the vessel for communication between the interior upper region of the vessel and the exterior of the vessel. The valve 82 includes an upwardly projecting tubular stem 83 exteriorly of the vessel 80 which is vertically shiftable to actuate the valve, and corresponds to the stem 27 of the valve 18 in Fig. 3.

A separate vessel, generally designated 85, is superposed over the vessel 80 and includes a bottom wall 86, a side wall 87, and a top wall 88. The vessel 85 is adapted to contain a fluent material 89 desired to be dispensed. The bottom wall 86 of the vessel 85 is provided with an internal boss or lug 90 adapted to snugly and firmly receive the upper end of the valve stem 83, and thus connect the vessel 85 to the vessel 80 for shifting movement toward and away from each other to actuate the valve 82. A conduit 92 is arranged generally vertically interiorly of the vessel 85 and has its lower end connected to the boss 90 in fluid communication with the upper end of the valve stem 83 for receiving gaseous state propellant from the vessel 80 when the valve 82 is open. The conduit 92 has its upper end connected to the upper end wall 88 of the vessel 85, which wall is formed with an upwardly projecting nozzle 93 having an internal bore or passageway 94.

The upper vessel wall 88 is formed with an internal conduit extension passageway or bore 95 communicating between the upper end of the conduit 92 and the passageway 94 of the nozzle 93. Hence, upon depression or downward shifting movement of the vessel 85 relative to the vessel 80 to open the valve 82, the gaseous state propellant will pass through the valve, upwards through the

conduit 92, passageway 95, and out through the nozzle passageway 94.

The top wall 88 of the vessel 85 is further formed with a passageway or bore 97 which communicates at its upper end with the conduit extension passageway 95. A standpipe or tube 98 interiorly of the vessel 85 is connected at its upper end to the lower end of the passageway 97. Further, the standpipe 98 depends from the top wall passageway 97 into the lower region of the vessel 85, so that reduced pressure in the conduit extension passageway 95 serves to draw fluent material 89 upwards through the standpipe 98 and passageway 97 where it is entrained by the gaseous state propellant for egress therewith from the nozzle 93.

By the construction of Fig. 6, it is seen that the valve stem 83 may be removed from the bottom wall 86 of the vessel 85 without disturbing the propellant 81 or product 89, so that various propellant and product vessels may be employed conjointly, as necessary or desired.

From the foregoing, it is seen that the present invention provides a dispensing device for fluent material which fully accomplishes its intended objects, and is well adapted to meet practical conditions of manufacture and use. If desired, means may be provided to control the dosage dispensed. Such controlled dosage may be accomplished by calibrating vessel 11 as shown in Fig. 1 in any desired unit; or by substituting a metered valve for valves 18, 57 and 82; or by using a vial of a measured dosage. In addition, controlled dosage may be effectuated both in controlled intervals and durations by use of a device of the type shown in Patent No. 2,613,108, dated October 7, 1952.

Although the present invention has been described in some detail by way of illustration and example for purposes of clarity of understanding, it is understood that certain changes and modifications may be made within the spirit of the invention and scope of the appended claims.

It would not depart from the spirit of the invention to make the container 10 of such size as to have the fluent material container 11 located therein, by employing a suitable interior partition. Furthermore, a plurality of containers 10 and/or 11 may be arranged in multiples on a common outlet means 12.

What is claimed is:

1. In a dispensing device, a pair of vessels arranged in end-to-end spaced relation, an outlet-valve tube mounted in the adjacent end wall of one vessel projecting outward therefrom toward the other vessel and slidable longitudinally inward of said one vessel to an open position and longitudinally outwardly of said one vessel to a closed position, spring means operatively connected to said valve tube and first vessel and resiliently urging said valve tube longitudinally outward to its closed position, the projecting end of said tube being fixed to the adjacent end of said other vessel to connect said vessels for movement toward and away from each other to open and close said valve tube against the force of said spring means urging said vessels away from each other, a conduit disposed longitudinally within said other vessel having one end in fluid communication with the projecting end of said valve tube and having its other end extending through and beyond the distal end of said other vessel, and a standpipe in said other vessel having one end opening into the interior region of the latter vessel adjacent to said one vessel and having its other end connected in fluid communication with said conduit intermediate the ends of the latter.

2. A dispensing device comprising a first vessel adapted to hold a partially liquefied gaseous propellant under pressure, an upstanding normally closed valve tube mounted in the upper wall portion of said first vessel and shiftable vertically downward and upward for respectively opening and closing communication through said tube between the gaseous phase interiorly of said first

vessel and the exterior of said first vessel, a second vessel arranged in spaced relation over said first vessel and adapted to contain a fluent product separate from said propellant, a generally upright conduit fixed interiorly of said second vessel with its lower end connected through the lower end of said second vessel to said valve tube for movement of said second vessel and conduit with said valve tube and relative to said first vessel for passing gaseous state propellant from said first vessel into said tube and conduit upon movement of said second vessel and conduit downward with said tube, said conduit having its upper end communicating through the upper end of said second vessel with the ambient atmosphere for discharging propellant, and a standpipe having one end connected in communication with said conduit intermediate the ends of the latter and having its other end depending into the lower region of said second vessel

for receiving said fluent material, whereby upon movement of said first and second vessels toward each other the passage of gaseous state propellant through said conduit serves to entrain said fluent material in said propellant stream for dispensing said fluent material to the ambient atmosphere.

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