Dec. 20, 1938. H. W. DAWSON 2,140,517

VAPORIZING NOZZLE

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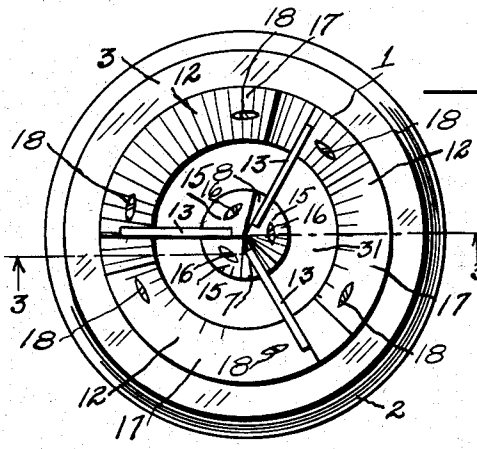


Fig. 2.

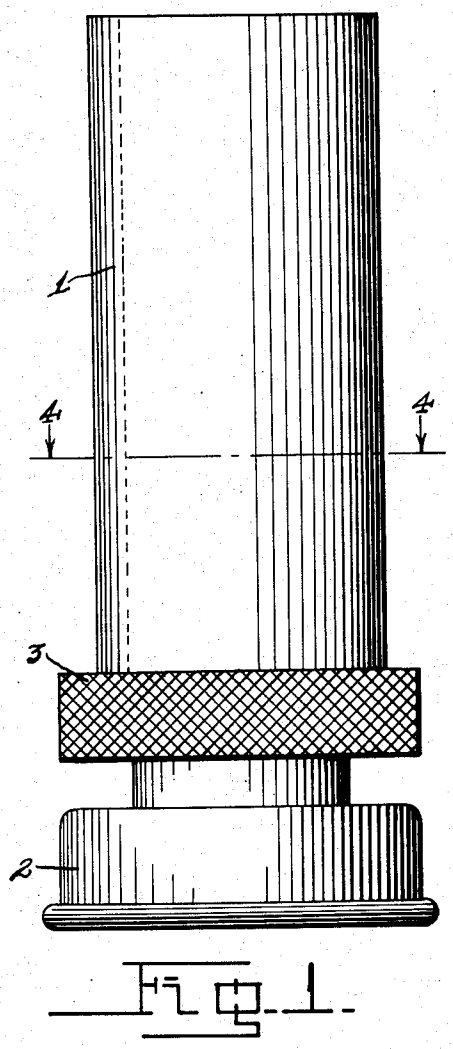


Fig. 1.

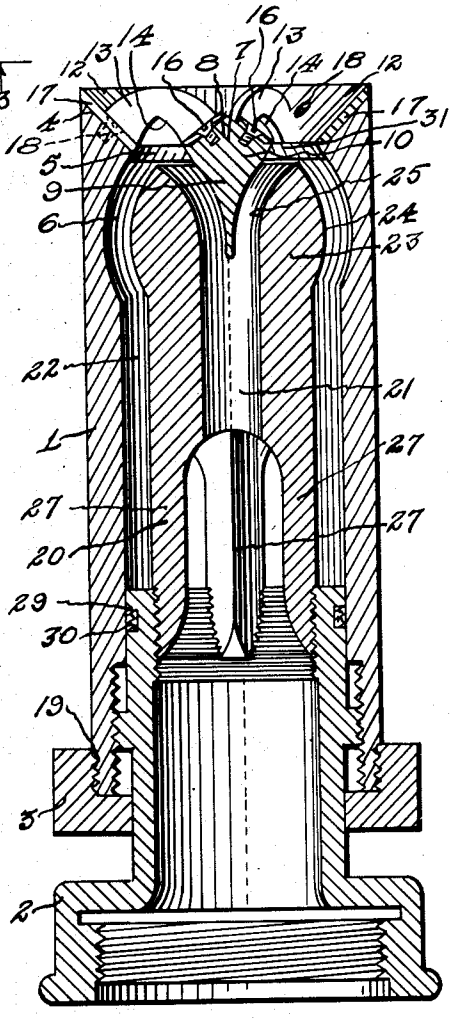


Fig. 3.

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Fig. 4.

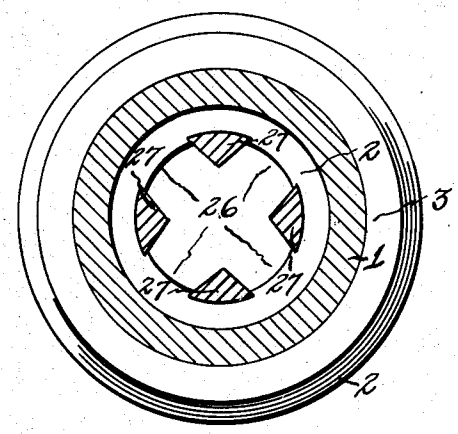


Fig. 5.

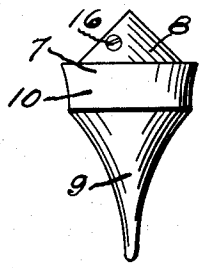
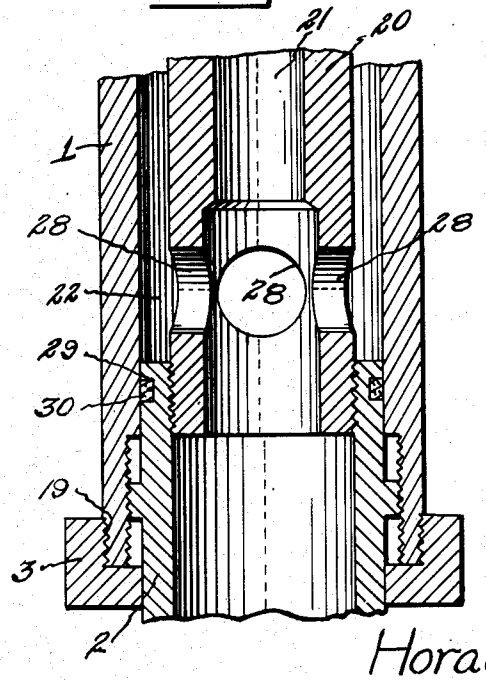


Fig. 6.



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UNITED STATES PATENT OFFICE

2,140,517

VAPORIZING NOZZLE

Horace W. Dawson, Fort Lewis, Wash.

Application April 26, 1938, Serial No. 204,389

5 Claims. (Cl. 299—131)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

This invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates to nozzles, more particularly it is directed to a device of this character for use on fire hose or sprinkler systems for fire extinguishing purposes.

One of the objects of the invention is to provide a nozzle that will thoroughly vaporize any liquid flowing therethrough and which is adapted to be adjusted in such a manner as to produce various changes in the shape or characteristic of the vaporized stream of liquid discharged from the nozzle.

Another object of the invention is to provide a vaporizing nozzle that will break up the liquid flowing through the nozzle into minute particles and which completely fills a cone-shaped vapor field produced by the nozzle.

Other objects of the invention are to provide a vaporizing nozzle which is adapted to completely shut-off the flow of liquid through the nozzle, which is simple in operation and so constructed that it may be easily and quickly taken apart for cleaning or repairing.

With these and other objects and advantages in view, the invention consists of certain novel details of construction, combination and arrangement of parts to be more particularly hereinafter described and claimed.

With reference to the accompanying drawings in which corresponding parts are indicated by similar reference characters:

Fig. 1 is a side elevation of the improved vaporizing nozzle;

Fig. 2 is an end elevation thereof;

Fig. 3 is a longitudinal sectional view of the nozzle taken on line 3—3 of Fig. 2;

Fig. 4 is a cross-sectional view taken on the line 4—4 of Fig. 1;

Fig. 5 is a side elevation of a divider-block used in carrying out the invention, and

Fig. 6 is a fragmentary sectional view of a modified portion of the nozzle.

In the illustrated embodiment characterizing the invention, 1 indicates the body of the nozzle, which is cylindrical in form and screw-threaded internally and externally at its lower end for the attachment, respectively, of a screw coupling 2 and a flange ring 3.

On the upper end of the body 1, which constitutes the outlet of the nozzle, is formed an outwardly inclined surface 4, a beveled surface 5 and a concave or partially spherical curved reentrant portion 6 which is formed on the inner surface of the body and extends to the lower edge of the beveled surface 5.

A divider-block 7 which comprises two substantially conical-shaped portions 8 and 9, having a substantially inverted frusto-conical shape portion 10 between their bases, is provided centrally of the body at its upper end. The substantially conical-shaped portion 9 of the divider-block is inverted and extends downwardly below the outlet portion of the nozzle, the surface thereof being concave or having a reverse curve formation. The divider-block 7 is carried by a plurality of supporting members 12, each containing an integral flattened blade or knife edge 13 which is disposed edgewise to the nozzle, and having an inverted substantially V-shaped cut-out portion 14 formed in its middle lower edge, which bridges the space between the upper edge of the beveled surface 5 on the body 1 and the upper edge of the frusto-conical shaped portion 10 of the divider-block for a purpose which will hereinafter appear.

The blades 13 are arcuate in shape on their upper edge and are arranged equally around the upper end of the body 1, as illustrated in Figs. 2 and 3 and are fastened to the divider-block 7 by integral end portions 15 provided on one end of the blades which conform to a part of the outer surface of the conical-shaped portion 8 of the divider-block and secured thereto in any other suitable manner such as by countersunk screws 16 or the like and the other end of the blades is secured to the body 1 by arcuate shaped inclined end plates 17 which are adapted to seat around on the inclined surface 4 on the upper end of the body and suitably secured thereto by countersunk screws 18 or the like.

The flange ring 3 is threaded internally at 19 for engagement with the external threads on the lower end of the body 1 and surrounds the screw coupling 2 which is screw-threaded internally at its lower and upper end for attachment, respectively, to a fire-hose or the like (not shown) and to the lower end of a valve 20, containing a central opening 21.

The hollow valve 20 is smaller in diameter than the internal diameter of the body 1, whereby an annular channel 22 is formed between the inner surface of the body of the nozzle and the outer surface of the valve. On the upper end of the valve 20 is an outwardly projecting lip bulbular portion 23 which is provided with a concave or partly spherical shaped outer surface 24 and with an outwardly flared or convex surface 25 which

constitutes the outlet end of the opening 21 of the valve. The inside diameter of the opening 21 is enlarged at the bottom of the valve 20 and the valve may be provided with a plurality of lateral cut-out portions providing openings or passages 26 around its lower end which form a plurality of vertically extending legs 27 threaded externally for attachment to the internally threaded portion on the upper end of the screw coupling 2, as illustrated in Figs. 3 and 4, or the lower end of the valve may be provided with spaced inlet ports or openings 28, as illustrated in Fig. 6. The lip portion 23 on the upper end of the valve 20 is so located with relation to the outlet end of the nozzle that it may be projected well into the outlet end thereof, and cause the stream of liquid flowing out of the valve to take a particular form, or it may be brought into contact with the beveled surface 5 on the upper end of the body 1 of the nozzle and the frusto-conical shaped portion 10 of the divider-block which form a seat for the lip portion 23 of the valve, to thus shut-off the liquid from the outlet, the inverted V-shaped portion of the blades 13 permitting the outward movement of the lip portion 23 of the valve. The valve itself is not moved in order to produce changes in the shape of the stream of liquid at the discharge end of the nozzle, but the nozzle is turned on the coupling 2 and is moved lengthwise with relation to the valve. Hence in order to shut-off the stream or change its shape it is simply necessary to turn the nozzle so as to move it lengthwise with relation to the valve.

In order to prevent leakage between the coupling 2 and the nozzle, there is provided a recess 29 around the outer surface of the coupling which carries a packing 30 which rests against the inner surface of the nozzle.

Assuming that the nozzle has been turned to move it lengthwise a predetermined amount with relation to the valve 20 for opening the outlet 31 of the nozzle, the liquid flowing under pressure through the coupling 2 into the valve 20 is caused to go through the valve opening 21 and through the inlet ports or openings 26 formed on the lower end of the valve, as illustrated in Figs. 3 and 4, or through the openings 28 as in Fig. 6, thereby producing two streams of liquid flowing to the upper end of the nozzle, the stream of liquid flowing through the valve opening 21 is caused to be formed into an inverted hollow conical spray at the upper end of the valve by striking the lower conical-shaped portion 9 of the divider-block 7 and by the outwardly curved surface 25 formed on the inner surface of the lip portion 23 of the valve at the upper end of the opening 21. The stream of liquid flowing through the annular channel 22 between the inner surface of the body 1 of the nozzle and the outer surface of the valve 20, which has entered through the ports on the bottom of the valve is caused to be formed into a substantially hollow conical-shaped spray of liquid by being deflected outwardly and thence inwardly at the upper end of the nozzle by the concave or partly spherical shaped surface formed on the inner surface of the body 1 and the outer convex or partly spherical shaped surface 24 of the lip portion 23 of the valve. By this construction the two streams of liquid which have been broken up into two conical-shaped sprays, are caused to oppose each other, which, when they attempt to cross each other are further broken up into a fine vapor filling a conical field in front of the nozzle. Should the nozzle be moved forwardly with relation to the valve there will be less restriction of the flow of the two sprays of liquid through the discharge end of the nozzle and the characteristic of the vapor field will be altered and in case the nozzle is moved forward sufficiently with relation to the valve a solid stream of liquid is created.

The fine spray produced by the nozzle can be used for drenching large areas, such as the sides or roofs of houses adjacent to a fire or for quickly saturating draperies or highly inflammable goods on fire or in close proximity to the fire and when not needed the nozzle can be quickly opened and thus cause a full stream of liquid to be directed through the nozzle.

It will thus be seen that there is herein provided a highly novel and useful improvement in vaporizing nozzles which is well adapted for providing a fine vapor and may be adjusted for various purposes, as well as for other purposes indicated. Although there is herein shown specific uses, features of construction and operation of parts, it is nevertheless to be understood that various changes may be made therein without departing from the spirit and scope of the invention.

Having described my invention, what I claim as new and wish to secure by Letters Patent is:

1. A valve nozzle comprising a tubular coupling member, a tubular body member adjustably mounted on said coupling member and having a spherically curved reentrant portion therein adjacent the discharge end thereof, a tubular valve member mounted on the inner end of said coupling member and spaced from said body member, lateral passages formed in the walls of said tubular valve member adjacent the lower end thereof, said valve member having an outwardly curved bulbular portion arranged to coact with said reentrant portion to direct fluid flowing therethrough in an inwardly directed annular stream, a divider-block mounted on the discharge end of the body member and arranged to coact with a stream issuing from the tubular valve member so as to direct the last mentioned stream across the inwardly directed stream.

2. A valve nozzle comprising a tubular coupling member, a tubular body member adjustably mounted on the coupling member and having a spherically curved reentrant portion and a valve seat therein adjacent to the discharge end thereof, a tubular valve member mounted on the inner end of said coupling member and spaced from said body member, lateral passages formed in the walls of said tubular valve member adjacent to the lower end thereof, said valve member having an outwardly curved bulbular portion arranged to coact with said reentrant portion to direct fluid flowing therethrough in an inwardly directed annular stream, a divider-block including a valve seat mounted on the discharge end of the body member and arranged to coact with a stream issuing from the tubular valve member so as to direct the last mentioned stream across the inwardly directed stream, said valve member coacting with said valve seat of the body member and divider-block when the body member is adjusted in one direction relative to the coupling member, thus closing off both streams flowing through said nozzle and when the body member is adjusted relative to the coupling member in another direction the said nozzle is opened to permit the streams to pass out of the nozzle.

3. A valve nozzle comprising a tubular coupling member, a tubular body member adjustably mounted on the coupling member and having a

spherically curved reentrant portion and a valve seat formed therein adjacent to the discharge end thereof, a tubular valve member mounted on the inner end of said coupling member and spaced from said body member, lateral passages formed in the walls of said tubular valve member adjacent to the lower end thereof, said valve member having an outwardly curved bulbular portion arranged to coact with said reentrant portion to direct fluid flowing therethrough in an inwardly directed annular stream, a divider-block including a valve seat mounted on the discharge end of the body member and arranged to coact with a stream issuing from the tubular valve member so as to direct the last mentioned stream across the inwardly directed stream, said bulbular portion of said valve member coacting with the valve seat of the body member and divider-block when the body member is adjusted in one direction relative to the coupling member, thus closing off both streams flowing through said nozzle, and when the body member is adjusted in another direction relative to the coupling member the said nozzle is opened to permit the streams to pass out of the nozzle, and means for securing said divider-block to the body member, said means including a plurality of supporting members, a flattened blade provided on each of said supporting members and disposed edgewise to the nozzle and a cut-out portion on said blades for the reception of the outer end of the bulbular portion of the valve member when the body member is adjusted relative to the coupling member for closing off both streams flowing through the nozzle.

4. A valve nozzle comprising a tubular coupling member, a tubular body member adjustably mounted on the coupling member and having a spherically curved reentrant portion and a beveled surface formed therein adjacent the discharge end thereof, a tubular valve member mounted on the inner end of said coupling member and spaced from said body member, lateral passages formed in the walls of said tubular valve adjacent the lower end thereof, said valve member having a bulbular portion containing a partially spherically-shaped outer surface and an outwardly flared inner surface, said partially spherically-shaped outer surface of the bulbular portion arranged to coact with said reentrant portion of the body member to direct fluid flowing therethrough in an outwardly directed and thence in an inwardly directed annular stream, a divider-block including a beveled surface portion and a conical-shaped portion mounted on the discharge end of the body member, said conical-shaped portion of the divider-block arranged to coact with the flared inner surface of the bulbular portion of the valve member so as to direct a stream issuing from the tubular valve member across the outwardly directed and thence inwardly directed annular stream, the spherically curved outer surface of the bulbular portion of said valve member coacting with the beveled surface of said body member and the outwardly flared inner surface of said bulbular portion coacting with the beveled surface portion of said divider-block when the body member is adjusted in one direction relative to the coupling member to close off both streams flowing through said nozzle, and when the body member is adjusted in another direction relative to the coupling member the said nozzle is opened for permitting the streams to pass out of the nozzle.

5. A valve nozzle comprising a tubular coupling member, a tubular body member adjustably mounted on said coupling member and having an outwardly inclined surface at the discharge end thereof, a beveled surface providing a valve seat and a spherically curved reentrant portion in said body member adjacent the said discharge end, a tubular valve member mounted on the inner end of said coupling member and spaced from said body member, a plurality of cut-out portions formed in the walls of said tubular valve member at the lower end thereof, lateral passages formed by said cut-out portions, said valve member having an outwardly curved bulbular portion arranged to coact with said reentrant portion to direct fluid flowing therethrough is an outwardly directed and thence in an inwardly directed annular stream, a divider-block mounted on the discharge end of the body member and arranged to coact with a stream issuing from the tubular valve member so as to direct the last mentioned stream across the said outwardly directed and thence inwardly directed annular stream, said divider-block comprising an upwardly extending portion, a downwardly extending substantially conical-shaped portion having a surface of reverse curve formation, a substantially frusto-conical shaped portion providing a valve seat intermediate the said upwardly and downwardly extending portions, said bulbular portion of the valve member coacting with the beveled surface of the body member and the frusto-conical shaped portion of the divider-block when the body member is adjusted in one direction on the coupling member to close off both streams flowing through the nozzle and when the body member is adjusted in another direction the nozzle is caused to be opened for permitting the streams to pass out of the nozzle, and means for securing the divider-block to the discharge end of the body member, said means comprising a plurality of supporting members having inclined end plates provided thereon which are adapted to seat on and be secured to the outwardly inclined surface on the discharge end of the body member, a flattened blade provided on each of said supporting members and disposed edgewise to the nozzle, means on the blades for securing the supporting members to the divider-block and a cut-out portion in each of said blades for the reception of the upper end of the bulbular portion of the valve member when the body member is adjusted relative to the coupling member for closing off the streams flowing through the nozzle.

HORACE W. DAWSON.