Aug. 15, 1933. A. E. BERDON 1,922,656

HIGH PRESSURE DISCHARGE UNIT

Filed June 10, 1929

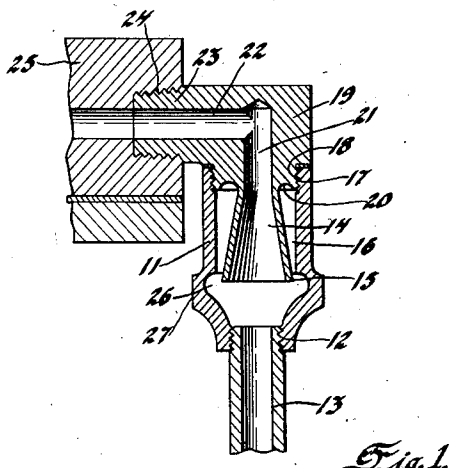


Fig. 1.

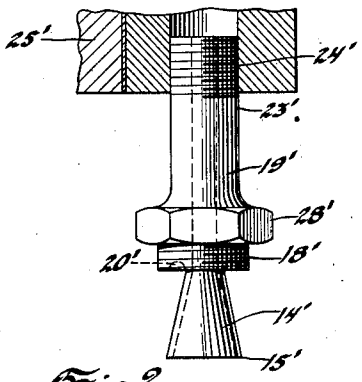
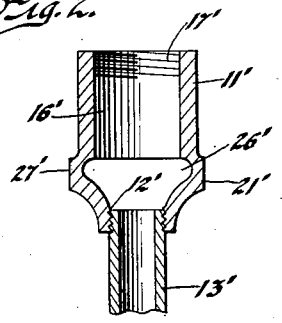


Fig. 2.



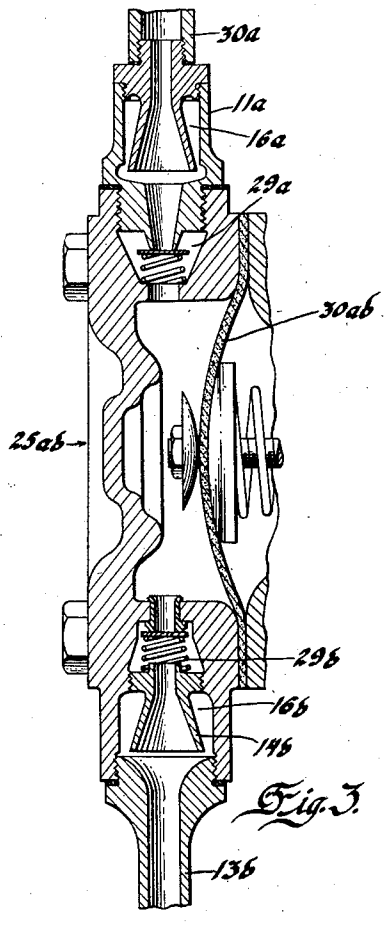


Fig. 3.

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HIGH PRESSURE DISCHARGE UNIT

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Application June 10, 1929. Serial No. 369,695

5 Claims. (Cl. 103—224)

This invention relates to means and methods for promoting the advance of liquids, such as engine fuels containing limited quantities of absorbed or entrained air and/or vapors, through pipes connected with reciprocatory pumps, or the like; and it is a particular object of this invention to provide, for the general purpose referred to, a simple and inexpensive device adapted to be incorporated in or attached at or near to the inlet or the outlet from a fuel pump, or the like, and to collect and retain air and/or vapors from the pumped fuel,—in such manner as to provide a self-replenishing "air dome" and thereby substantially to enhance the efficiency of the pumping system in which said device may be included.

A device somewhat similar to that upon which protection is herein sought has been described and claimed in my pending application "Liquid fuel feed system" Serial No. 243,781, filed December 31, 1927; but the present invention differs therefrom in numerous details, being decidedly simpler and entirely suitable for use at comparatively high pressure,—although resembling the mentioned prior device in its general principle of operation. It is believed that the embodiments herein described may satisfactorily illustrate both the general principles referred to, in their generic aspects, and the range of utility of such devices in connection with intermittently acting means for advancing a liquid.

Other objects of the present invention, which need include but one or two parts (said parts being preferably radially symmetrical with reference to a longitudinal and preferably substantially vertical axis or line of advance of the pumped liquid therethrough, and being preferably provided with separable connecting means such as a male thread at one end and a female thread at the other end, in such manner as to permit of the direct and easy insertion of the device in a fuel feed or fuel delivery line) may be best appreciated from the following descriptions of illustrative embodiments of the present invention, taken in connection with the appended claims and the accompanying drawing.

Figure 1 may be regarded as a median vertical section through an embodiment of the present invention as applied to a pump outlet which extends in a horizontal direction,—one element of this device being adapted to serve as an elbow.

Figure 2 is a corresponding view of an alternative form in which parts are shown partially in elevation and disassembled,—one element thereof being shown as threaded into a downwardly extending outlet opening from a fuel pump, or the like.

Figure 3 is a vertical sectional view through one type of fuel pump equipped with two embodiments of this invention.

Referring first to certain details common to the forms shown in Figures 1 and 2, an outer cylindrical chamber element 11 or 11' is shown as provided with a female thread at 12 or 12', suitable to receive a pipe 13 or 13', which may be connected with the float bowl of a carburetor, or the like, not shown; and an inner conical and downwardly flaring and bubble-collecting bell element 14 or 14' is shown as so interfitting within the said cylindrical element as to provide a bubble-passing clearance at the lower edge 15 or 15' of said bell,—enabling bubbles, such as may form and coalesce upon the interior of said bell (by reason of the downward expansion and inclination of its walls) peripherally to escape past the mentioned edge and to rise into an annular chamber 16 or 16',—whose inner and outer walls are respectively provided by said bell and by said cylindrical element. The mentioned elements may be interconnected by any suitable means, such as a female thread, shown as provided at 17 or 17' within the upper end of the cylindrical element, and a male thread, shown as provided at 18 or 18', upon a body 19 or 19', integral with said bell,—said body being shown as provided with an annular channel 20 or 20', upwardly terminating the bubble-receiving chamber 16 or 16' and enlarging the same.

In the form shown in Figure 1, the body 19 has the form of an elbow through which extend passages 21 and 22, the former being co-axial with the bell 14 and the latter extending into a projection 23, shown as provided at 24 with a male thread, suitable for engagement within a corresponding thread provided in an outlet from a fuel pump 25, including a reciprocatory diaphragm, or the like.

In the form shown in Figure 2, the extension 23' is shown as co-axial with the bell 14', the entire device being radially symmetrical with reference to its longitudinal axis and the male thread at 24' being suitable to cooperate with a corresponding thread in a downwardly extending outlet from a reciprocatory pump 25', or the like.

In perfecting devices of the described types, it

may usually be advantageous to form the same in two parts, and frequently advantageous to obtain the desired bubble-passing clearance, at the lower edge 15 of any downwardly expanding element such as the bell 14, by providing, opposite said edge, a groove or channel 26 or 26'; and incidental weakening of the lower element may be obviated by externally providing a non-circular or other wrench-engageable reinforcement as suggested at 27 and 27'. This reinforcement may have substantially the same outside dimensions as a corresponding wrench-engageable reinforcement 28', optionally provided upon the body 19 or 19',—whether the bell is formed integral therewith or as a separate tubular thimble gripped between the threaded members refererd to or otherwise held (as in specific forms illustrated in the mentioned prior application).

In operation, as above implied, both a peripheral slowing of the stream of pumped liquid and a succession of impulses therein are favorable to a gradual separation of bubbles from an outer and slow-moving zone; and the slope of the interior of the bell, or that of any preferred element providing downwardly divergent walls so disposed as to effect a progressive retardation at the periphery of a stream directly advancing therethrough, is intended to be such that, in view of the rate of advance of the liquid, the bubbles shall gradually descend, against gravity and owing to the advance of the stream of liquid, until they reach the edge of the mentioned bell or its equivalent,—preferably coaxial with the stream and radially symmetrical with reference thereto. Upon reaching and passing said edge, the bubbles naturally rise into the chamber thereabove, if that is not already filled with air and/or vapors; and the elasticity of the resultant self-replenished body of entrapped gas and/or vapor serves to produce an even flow beyond said bell,—maintaining the advance of the pumped liquid during intervals wherein an adjacent valve of the mentioned pump, in the case illustrated, may be entirely closed. The use of these devices is found particularly advantageous at the outlets of fuel pumps; but it should be understood that, if desired, either the bell-including element or the cylindrical or other chamber element may be formed integral with a pump or pump part, according as the device is to be employed separately or at the outlet opening or the inlet opening of a pump. For example, it is suggested in Figure 3 that a vapor-receiving chamber element 11*a* serve incidentally to retain inlet valve spring 29*a*; and a bell element 14*b* is shown as wholly interior and similarly holding an outlet valve spring 29*b* of a pump 25*ab*, including a reciprocable diaphragm 30*ab*.

Although I have herein described but two separable and two built-in embodiments of the present invention (annular chamber 16*b* being formed directly in the pump body) it should be understood not only that various features thereof may be independently employed, but that other angular and special modifications of said invention, adapted to be used under different conditions and in connection with a feed line 30*a* and/or a delivery line 13, 13' or 13*b*, might easily be devised, without involving in the slightest departure from the present invention. For example, liquid fuels ordinarily contain both low-boiling vapors and air due to exposure and/or splash in a tank; but it would be within the scope of the present invention, in the absence of these conditions, to provide for or permit (by leakage in connection with indicated gaskets or otherwise) for a sufficient admission of air into the fuel line to assure operation in the described manner,—with very marked and favorable effects upon the efficiency of the fuel pump and/or any system in which the present invention is employed. In any case, when an adjacent valve is closed, the liquid may advance in consequence of an acquired momentum and/or by reason of the pressure of the entrapped air and/or vapor; these devices may be used with some advantage in any steams containing air or vapors; and the pitch of the disclosed bells, as well as the direction in which they expand, may naturally depend upon not only the direction but the rate of advance of the liquid—whether such advance is produced by pulsating or other means.

I claim:

1. In an auxiliary device suitable for use in proximity to parts of a reciprocatory pump for liquid fuel: a downwardly expanding bell element provided with an inlet opening to its interior at the top thereof; and an annular chamber element surrounding said bell and extending above and below the lower edge thereof and having an outlet opening below said edge and arranged in line with said bell, and which opening is of greater area than the lower end of said bell, to receive and entrap above said edge bubbles outwardly separating from the pumped liquid during its descent through said bell and outlet opening.

2. In an auxiliary device suitable for use in proximity to parts of a reciprocatory pump for liquid fuel: a downwardly expanding element provided with an inlet opening to its interior at the top thereof; and an annular chamber element surrounding said downwardly expanding element and extending above the lower edge thereof to receive and entrap bubbles outwardly separating from the pumped liquid during its descent through said bell,—said chamber element having a threaded interconnection with an enlarged portion of said bell element above the lower edge thereof, the latter forming a cover for the former.

3. In an auxiliary device suitable for use in proximity to parts of a reciprocatory pump for liquid fuel: a downwardly flaring bell element provided with an inlet opening to its interior at the top thereof: and an annular chamber element surrounding said bell element and extending above the lower edge thereof to receive and entrap bubbles outwardly separating from the pumped liquid during its descent through said bell,—said bell element being upwardly and outwardly shaped, externally thereof, to form a cover for said chamber element and cooperate therewith in providing an annular chamber serving as an air dome.

4. In an auxiliary device suitable for use in advancing liquid fuel: a bell element provided with an inlet; and an annular chamber element surrounding said bell element and extending above the lower edge thereof and having an enlarged chamber adjacent said lower edge to receive and entrap bubbles outwardly separating from the pumped liquid during its advance through said bell,—a bubble-passing constriction being provided between said lower edge of said bell and said annular chamber element; and an outlet leading from said enlarged chamber

and arranged below and in line with the inlet to said bell element.

5. A flow-equalizing device suitable for direct interposition in a substantially vertical line connected with intermittently acting means for advancing a liquid therethrough, said device including: a substantially conical element for the collection of bubbles in the interior thereof; and an annular chamber element extending above and below the lower edge of said conical element and adapted to receive said bubbles and entrap the same above said edge; and thereby to provide self-replenishing elastic means for enhancing the flow of said liquid and said chamber element below said edge being enlarged and converging to an outlet opening for said liquid.

ALBERT E. BERDON.