G. D. POGUE.

VALVELESS LIQUID ELEVATING DEVICE.

APPLICATION FILED MAY 17, 1917.

1,260,574.

Patented Mar. 26, 1918.

Fig. 1.

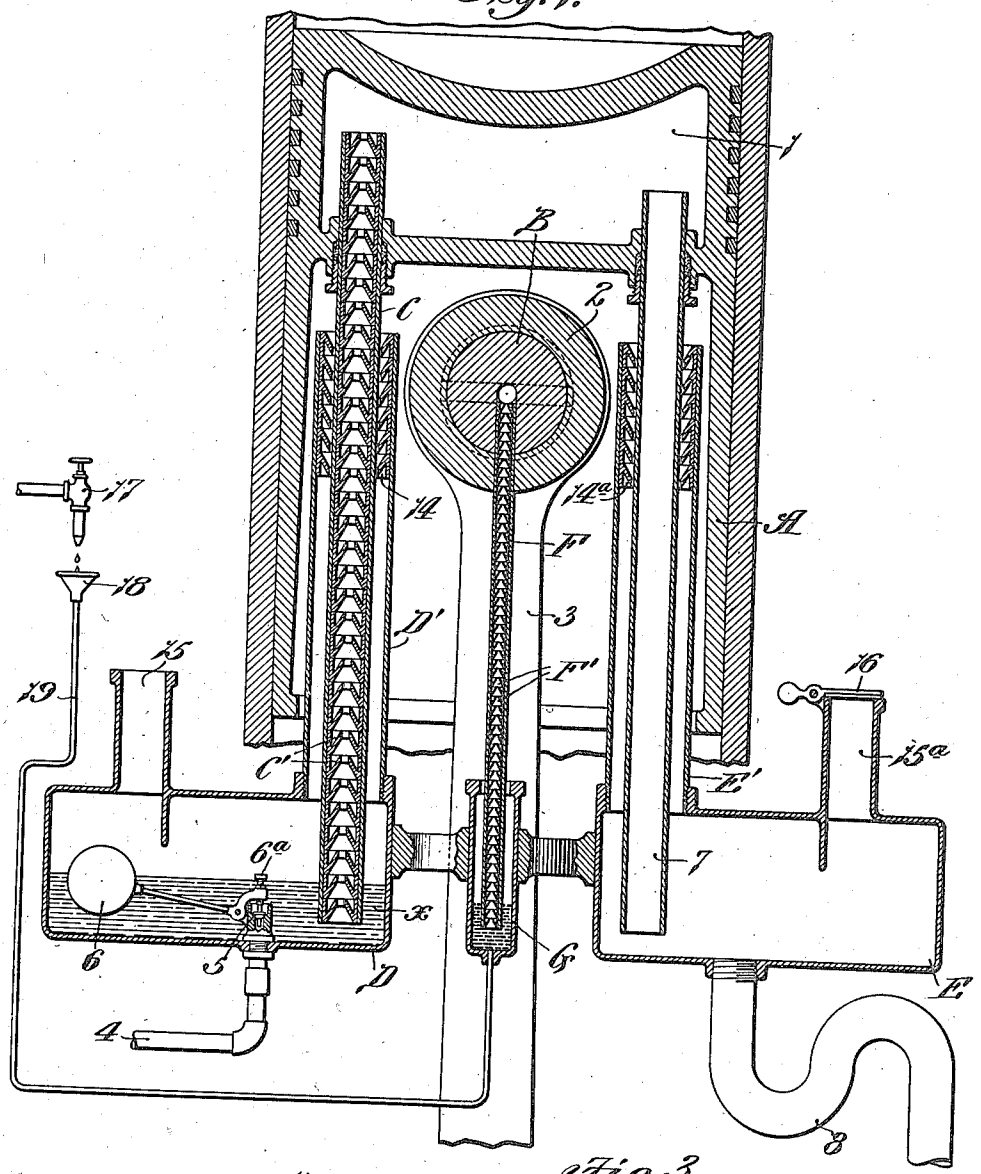


Fig. 2.

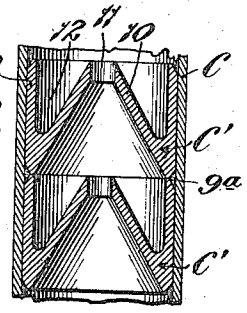
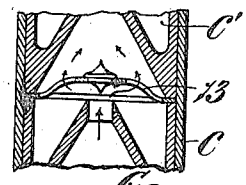


Fig. 3.



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UNITED STATES PATENT OFFICE.

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VALVELESS LIQUID-ELEVATING DEVICE.

1,260,574. Specification of Letters Patent. Patented Mar. 26, 1918.

Application filed May 17, 1917. Serial No. 169,190.

To all whom it may concern:

Be it known that I, GEORGE D. POGUE, a citizen of the United States, residing at St. Louis, Missouri, have invented a certain new and useful Improvement in Valveless Liquid-Elevating Devices, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to devices of the character that are used for raising a liquid from a lower to a higher level.

The main object of my invention is to provide a device for elevating liquids that is not equipped with valves, stuffing boxes or coöperating rubbing parts that are subjected to wear and which require frequent adjustment.

Another object is to provide a liquid elevating device of the character just referred to, which is so constructed that the amount of liquid raised and discharged by same can be controlled or regulated.

Another object is to provide a liquid raising device that is particularly adapted for use in the circulating system of a water cooled internal combustion engine and which is so constructed that the water is caused to circulate through the water space or jacket of the piston without the necessity of subjecting such space to any pressure relative to the surrounding atmosphere, thereby overcoming the necessity of using valves or stuffing boxes, as is necessary with the water cooled pistons now in use.

And still another object is to provide a simple and reliable means for lubricating the piston pin bearings of an internal combustion engine equipped with pistons of the trunk type. Other objects and desirable features of my invention will be hereinafter pointed out.

To this end I have devised a liquid elevating device that consists merely of a reciprocating member, preferably a conduit, provided with liquid holding portions or devices arranged at different levels and constructed in such a manner that the reciprocating movement of said member will cause the liquid to be thrown upwardly from a lower device to a higher device until it finally reaches the point where it is to be discharged. Said liquid holding portions or devices can be constructed in various ways without departing from the spirit of my invention, but they preferably consist of projections, flanges, cups or shelves arranged on the interior of said conduit and open at their upper sides or upper ends so that the liquid which is displaced and forced upwardly into the lower end of said conduit when it dips into or reciprocates in a body of liquid will be caught by the liquid holding devices at the lower end of the conduit and thereafter thrown upwardly into the liquid holding devices arranged higher up on the conduit by the subsequent reciprocating movements of the conduit, said liquid eventually reaching the upper end of the conduit and escaping therefrom. The liquid holding portions extend throughout the entire length of the conduit, or, at least, up to the level where the liquid is to be raised and discharged, so that the liquid from the source of supply will be raised progressively or by a step by step action to a point in proximity to the highest liquid holding portion on the conduit. While I prefer to use a reciprocating member of tubular form and arrange liquid holding devices on the interior of said member, it is not essential that said member be of tubular form, nor is it essential that the liquid holding devices be arranged on the interior of same. Moreover, while I prefer to supply the liquid to the liquid holding portions at the lower end of said reciprocating member by causing said member to dip into or reciprocate in a body of liquid, various other means could be used for supplying the liquid to said member without departing from the spirit of my invention.

My improved liquid elevating device can be used for so many purposes that I will not attempt to enumerate all of the various uses of said device. It is particularly adapted for use, however, in internal combustion engines for supplying cooling water to the water jacket of the piston and for supplying lubricating oil to the piston pin bearing of a trunk type piston, on account of the fact that it does not comprise stuffing boxes, accurately fitted valves or coöperating rubbing parts that are subject to wear or liable to get out of adjustment. Therefore, I have

herein illustrated it used for the two purposes mentioned, but it will, of course, be understood that it is not limited to these uses, but, on the contrary, is capable of use in practically any place where it is desired to raise a liquid from a lower to a higher level.

Figure 1 of the drawings is a vertical sectional view of a portion of an internal combustion engine equipped with devices constructed in accordance with my invention for supplying cooling water to the piston and for supplying lubricating oil to the piston pin bearing.

Fig. 2 is an enlarged vertical sectional view, illustrating the construction and arrangement of the liquid holding devices arranged inside of the reciprocating conduit up through which the liquid is raised; and Fig. 3 is a similar view, illustrating a slight modification of my invention.

Referring to the drawings, A designates the piston of the engine which is of the trunk type and provided with a water jacket or space 1 in the upper portion of same through which water is circulated, so as to cool the top of the piston, said piston also having internal lugs or bosses 2 (only one of which is shown) that receive the usual pin B upon which the upper end of the connecting rod 3 is pivotally mounted. Cooling water is supplied to the water jacket or space 1 in the upper portion of the piston by means of a reciprocating member C, preferably a conduit that is mounted on the piston A in such a manner that its upper end terminates in or communicates with the water space 1 in the piston and its lower end terminates in or communicates with a stationary water reservoir D to which water is supplied by means of a pipe 4 equipped with a controlling valve 5 that is governed by means of a float 6 arranged in the body of liquid x in the reservoir D. The water is conducted away from the water jacket or space in the piston through a discharge pipe 7 carried by the piston and arranged in such a manner that the lower end of same terminates in or communicates with a stationary discharge reservoir E from which a discharge pipe 8 leads.

The reciprocating member C is provided with water holding portions or devices C′ which are so arranged that they form a series of flanges, projections or cups on the interior of said member C, and when the engine is in operation said water holding portions coöperate with each other to raise the water progressively or by a step by step action from the reservoir into the water jacket 1 in the piston. In the form of my invention herein shown the water holding portions on the reciprocating conduit C are formed by a number of devices arranged one above the other inside of said conduit and each provided with an annular outer wall 9 that fits snugly inside of the conduit and a hollow cone-shaped center portion 10 whose lower edge is connected to said outer wall 9 and whose upper end is provided with a discharge hole 11, as shown clearly in Fig. 2. The annular space 12 between said outer wall 9 and said cone-shaped center portion 10 forms a pocket that receives and holds the liquid that is thrown upwardly through the center opening 11 in the device when the conduit C is in operation. The devices C′ are securely connected to the conduit C, and if desired, rings 9^a of lead or other suitable material can be arranged between said devices and the inner surface of the conduit C, so as to form water-tight joints between said parts.

When the conduit C moves downwardly into the water in the supply reservoir D, one or more of the liquid holding devices C′ at the lower end of said conduit will be filled with water. As the conduit continues in operation, the impulses or agitation that is imparted to the water in the liquid holding portions C′ at the lower end of the conduit will throw said water upwardly into one or more of the liquid holding portions C′ arranged higher up in the conduit until said water finally reaches the liquid holding portion C′ at the upper end of the conduit from which it is discharged into the water space 1 in the piston. As previously stated, it is immaterial how the liquid holding portions on the reciprocating member are formed, but I have found that liquid holding devices C′ of the kind herein shown are very efficient, due to the fact that the cone-shaped center portions 10 of same guide the liquid into the center openings 11 up through which the liquid travels. Said portions also tend to guide the liquid away from said openings after it has passed through said openings. If desired, baffles 13 can be arranged between the devices C′, as shown in Fig. 3, so as to eliminate the possibility of the water passing downwardly through the alined openings 11 in said devices, but these baffles 13 are not essential to the successful operation of my device.

In order to prevent the water in the receiving reservoir D from splashing out of same and escaping into the crank case when the reciprocating conduit C is in operation, I have provided said reservoir D with an upwardly-projecting tubular portion D′ that surrounds the conduit C, said tubular portion being provided adjacent its upper end with baffles formed by downwardly-inclined annular flanges 14 arranged one above the other and spaced in close proximity to the outer surface of the conduit C, as shown in Fig. 1. The discharge reservoir E is also provided with an upwardly-pro-

jecting tubular portion E′ that surrounds the discharge pipe 7, said tubular portion being equipped with baffles 14ª for a similar purpose. The receiving reservoir D is preferably in open communication with the atmosphere at all times through a vent 15, but the discharge reservoir E is preferably provided with means that causes a partial vacuum to be created in the discharge reservoir E when the piston A moves upwardly, thereby tending to remove or strip off any water that clings to the outer surface of the discharge pipe 7 on the upward stroke of the piston. In the form of my invention herein shown this is accomplished by providing the discharge reservoir E with a vent 15ª that is equipped with a flap valve 16. On the downward stroke of the piston the valve 16 opens and prevents pressure from building up in the discharge reservoir, but on the upward stroke of the piston said valve closes, and thus causes a partial vacuum to be created in the discharge reservoir and in the tubular extension E′ on same that surrounds the discharge pipe 7. A water cooling system of the construction above described is simple to manufacture and maintain in operative condition, because it does not comprise stuffing boxes, accurately fitted valves or any coöperating sliding parts that are liable to wear and which require frequent adjustment. In addition to the desirable features above mentioned, such a system enables the quantity of water that is supplied to the water jacket of the piston to be controlled or regulated by simply adjusting the device 6ª that governs the position of the float 6 in the supply reservoir that holds the water inlet valve 5 closed. When the body of water *x* in which the lower end of the conduit C reciprocates is relatively deep, more water will be supplied to the water jacket 1 of the piston at each cycle of operations of the piston than when said body of water is comparatively shallow.

The means employed for supplying lubricating oil to the piston pin bearing 2 embodies the same desirable features and characteristics as the means previously described for supplying water to the water jacket 1 of the piston and consists of a conduit F carried by the piston, preferably by one of the lugs or bosses 2, a stationary oil container G into which the lower end portion of said conduit F projects, and oil holding portions or devices F′ arranged on the interior of said conduit F throughout the entire length of same and constructed in substantially the same manner as the liquid holding devices C′ on the conduit C. Any means can be used for supplying oil to the oil reservoir G, but I prefer to use a drip feed device 17, as shown in Fig. 1, that discharges oil into a funnel 18 on the upper end of a supply pipe 19 which leads to the oil reservoir G. When the piston is in operation oil will be carried upwardly progressively through the conduit F from the oil reservoir G to the piston pin bearing 2. By regulating the drip feed device 17 the operator in charge of the engine can accurately control the quantity of oil that is supplied to the piston pin bearing.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is:

1. A liquid elevating device, comprising a reciprocating member arranged in an upright, or substantially upright position, and liquid holding portions on said member arranged at different levels and constructed in such a manner that the reciprocating movement of said member will cause liquid which is supplied to the liquid holding portion at the lower end of said member to be thrown upwardly from one liquid holding portion to a higher one successively until the liquid reaches the point where it is to be discharged.

2. A liquid elevating device, comprising a reciprocating member arranged in such a manner that the lower end of same will dip into or reciprocate in a body of liquid, and liquid holding portions arranged on said member in such a manner that the reciprocating movement of said member will cause the liquid to be thrown upwardly from one liquid holding portion to a higher one successively.

3. A device for raising a liquid from a lower to a higher level, comprising a member provided with liquid holding portions arranged at different levels, and means for moving said member in such a manner that the impulses imparted to the liquid by the movement of said member will cause the liquid to be thrown upwardly progressively from a lower to a higher liquid holding portion until said liquid finally reaches the liquid holding portion at the upper end of said member from which the liquid is discharged.

4. A device for raising a liquid from a lower to a higher level, comprising a member provided with liquid holding portions arranged at different levels, means for supplying liquid to the bottom liquid holding portion on said member, and means for reciprocating said member so as to cause the liquid supplied to said bottom liquid holding portion to be thrown upwardly progressively from one liquid holding portion to the one above same by the impulse imparted to the liquid by the reciprocation of said member until said liquid finally reaches the point where it is to be discharged.

5. A device for raising a liquid from a lower to a higher level, comprising a member provided with a plurality of liquid holding portions arranged at different levels,

means for reciprocating said member longitudinally, and means for holding a supply of liquid into which the lower end portion of said member dips or reciprocates, said liquid holding portions being arranged sufficiently close together so that the impulses imparted to the liquid by the reciprocating movement of said member will cause the liquid to be thrown upwardly progressively from a lower to a higher liquid holding portion.

6. A device for raising a liquid from a lower to a higher level, comprising a reciprocating member of tubular form arranged in an upright, or substantially upright position with its lower end immersed in or arranged in proximity to a body of liquid, said member having a center space or passageway that always remains open, and liquid holding portions arranged on the interior of said member one above the other so as to cause liquid that collects in the liquid holding portions at the lower end of said member to be thrown upwardly progressively from one liquid holding portion to a higher one by the impulses imparted to the liquid by the reciprocating movement of said member.

7. A device for raising a liquid from a lower to a higher level, consisting of a reciprocating conduit arranged in a vertical, or substantially vertical, position in such a manner that the lower end portion of same dips into or reciprocates in a body of liquid, and liquid holding devices on the interior of said conduit arranged one above the other and each provided with a center opening up through which liquid is thrown by the reciprocating movement of said conduit, and a cup-shaped space or chamber that surrounds said opening so as to collect and hold the liquid that passes upwardly through said opening.

8. A valveless liquid raising device, comprising a reciprocating conduit having a continuous center space or passageway that always remains open and provided on its interior with means for causing liquid to travel upwardly through said passageway by a step by step action when the lower end of said conduit is reciprocated in a body of liquid.

9. A valveless liquid raising device, comprising a reciprocating conduit having a continuous center space or passageway that always remains open and provided on its interior with a plurality of superimposed liquid holding devices, each of which comprises an annular liquid holding space that surrounds a hollow cone-shaped portion provided at its upper end with an opening up through which the liquid is thrown by the impulses imparted to the liquid by the reciprocating movement of said conduit.

10. A valveless liquid raising device, comprising a reciprocating conduit whose lower end is adapted to dip into or reciprocate in a body of liquid, said conduit having a continuous center space or passageway that always remain open, and a plurality of liquid holding devices arranged on the interior of said conduit in superimposed relation and in close proximity to each other and each provided with an annular outer wall and a perforated cone-shaped center portion whose lower edge is connected to the lower edge portion of said outer wall.

11. A device for raising a liquid from a lower to a higher lever, comprising a reciprocating conduit arranged in an upright, or substantially upright, position, a reservoir for holding a body of liquid into which the lower end portion of said conduit dips or reciprocates, liquid holding portions on the interior of said conduit that cause the liquid in said reservoir to be raised progressively through said conduit when said conduit is reciprocated, and means for regulating or controlling the amount of liquid that is discharged from the upper end of said conduit.

12. A liquid raising device, comprising a reciprocating conduit arranged in an upright, or substantially upright, position, a reservoir that contains a body of liquid into which the lower end portion of said conduit dips or reciprocates, an upwardly-projecting tubular portion on said reservoir that surrounds said conduit, baffles on said tubular portion for preventing the liquid from splashing out of said reservoir, and liquid holding portions arranged on the interior of said conduit and constructed in such a manner that they will act collectively to cause the liquid in said reservoir to travel upwardly progressively through said conduit when the conduit reciprocates.

13. A liquid raising device, comprising a reciprocating conduit arranged in an upright, or substantially upright, position and provided with an unobstructed center opening up through which liquid can be thrown by the impulse imparted to same by the longitudinal reciprocation of said conduit, and liquid holding portions on the side walls of said conduit arranged at different levels; for the purpose described.

14. A liquid raising device, comprising a reciprocating conduit arranged in an upright, or substantially upright, position, liquid holding devices arranged on the interior of said conduit for the purpose described and each provided with a center opening and a liquid holding space for receiving liquid that is thrown upwardly through said center opening, and baffles arranged between said liquid holding devices so as to tend to prevent the liquid from passing downwardly through said center openings.

15. A valveless liquid elevating device, comprising a reciprocating tubular member arranged in an upright or substantially upright position, and liquid holding shelves or pockets arranged within said tubular member at different levels but sufficiently close together that the momentum acquired during an up stroke of the tubular member will cause the liquid to be thrown from one shelf to a higher one successively until the liquid reaches the upper end of said tubular member where it is discharged.

GEORGE D. POGUE.