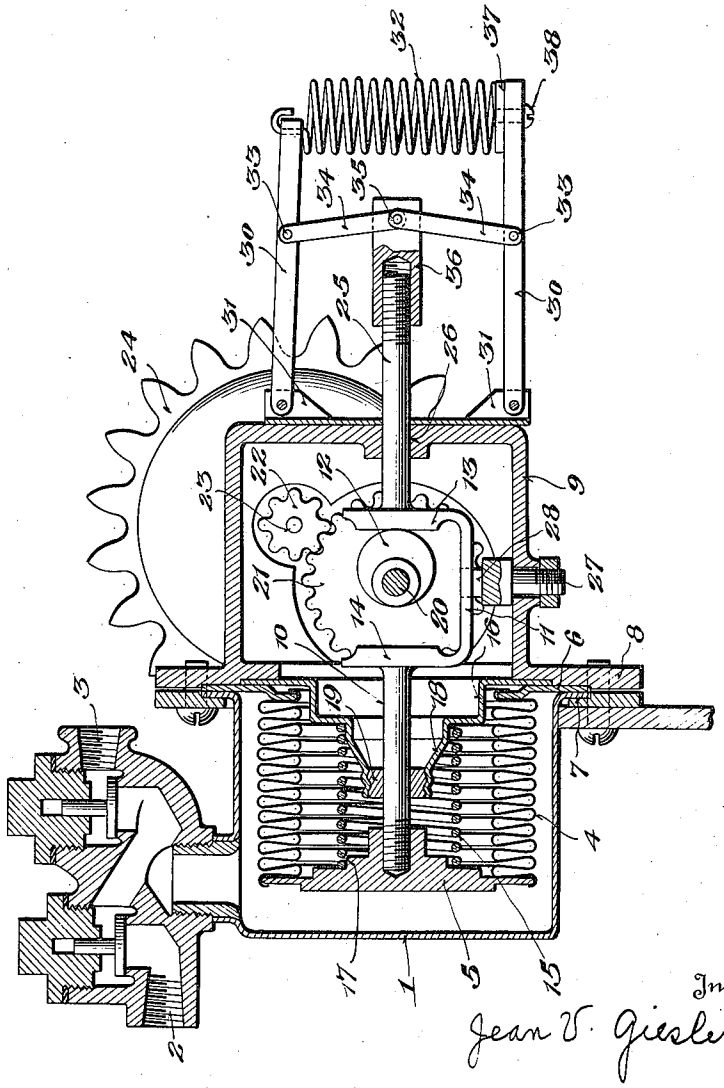
May 15, 1923. 1,454,886

J. V. GIESLER

PUMP

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UNITED STATES PATENT OFFICE.

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PUMP.

Application filed April 16, 1921. Serial No. 461,949.

To all whom it may concern:

Be it known that I, JEAN V. GIESLER, a citizen of the United States, and a resident of Knoxville, Tennessee, have invented new and useful Improvements in Pumps, which invention is fully set forth in the following specification.

This invention relates to pumps and, while capable of use with a wide variety of pumps, has special utility when employed with a pump for fuel feeding systems of the character disclosed in my application for fuel feeding systems, Sr. No. 396,783, filed July 16, 1920.

In said application is disclosed a pump wherein the pumping member, preferably of flexible or resilient material, is moved in one direction i. e. on its delivery stroke by the force of resiliency, either inherent in said pumping member or applied thereto by resilient means cooperating therewith or both. Thereby the length of stroke of said pumping member and the pressure exerted thereby are automatically determined by the rate of delivery of the pumped fluid, since the pressure on said fluid can not exceed the resilient force by which said pumping member is moved and the stroke of said member is limited and determined by the pressure developed thereby on said fluid. But, as the stroke of said pumping member varies, the mean pressure exerted thereby on the fluid also varies more or less, so that the mean pressure is somewhat higher when the rate of delivery is low and the pumping member is making short strokes than it is when the rate of delivery is higher and the pumping member is making full strokes. Consequently, if the force of resiliency for moving said pumping member be designed to afford a desired pressure on the fluid when said member is making its full stroke, the pressure on the fluid will be somewhat higher than the desired pressure when the rate of delivery is reduced so that the pumping member does not have to make its full stroke in order to deliver the required quantity of fluid. This increase in the pressure under such conditions is sometimes disadvantageous:—Thus, when the pump is employed for supplying fuel to a carbureter, the increased pressure when the rate of fuel consumption is reduced tends to produce a higher fuel level in the carbureter and may result in flooding the latter.

It is an object of this invention to provide a pump wherein the pumping member is moved in one direction by the force of resiliency with means for compensating variations in said force of resiliency so that said pumping member will exert a substantially uniform pressure on the fluid being pumped thereby.

Another object of this invention is to provide a resiliently actuated pumping member with compensating means which may be adjusted to suit particular requirements and to compensate for different degrees of variation in the resiliency of different resilient elements.

Another object of this invention is to provide a resiliently actuated pumping member with compensating means which is simple in construction, easy to install and adjust, and efficient in operation. Other objects will appear as the description of the invention proceeds.

Stated broadly, the invention comprises a pump having a pumping member moved in one direction by the force of resiliency, either inherent in said pumping member or applied thereto by resilient means cooperating therewith or both, and means cooperating with said pumping member to compensate for changes in the force of said resiliency whereby said member may exert a substantially uniform pressure on the fluid being pumped thereby.

The invention is capable of receiving a variety of mechanical expressions, one of which is shown on the accompanying drawing, but it is to be expressly understood that the drawing is for purposes of illustration only and is not to be construed as a definition of the limits of the invention, reference being had to the appended claims for that purpose.

Said drawing represents an axial section through a pump constructed in accordance with the present invention, the illustrated embodiment comprising a pump of substantially the same construction as described and illustrated in my application above identified.

In the form shown, a casing 1 is provided with valve-controlled inlet and outlet connections 2 and 3 adapted to be respectively connected with a source of fluid, such as a fuel tank, and a point of delivery, such as the fuel-consuming elements of an engine. Within said casing 1 is a pumping member, preferably composed in whole or in part of a flexible wall and, in the form shown, composed of a generally tubular, expansible and collapsible, corrugated wall 4, preferably of resilient material, such as brass, connected at one end to a relatively rigid, movable end wall 5. The opposite end of said corrugated wall 4 is fixedly clamped in position in any suitable way, as by clamping the end corrugation or an annular flange 6 suitably secured thereto between the flanged end 7 of the casing 1 and the flanged end 8 of a gear casing 9 to be referred to.

Operatively connected to said movable end wall 5, as by means of the axially extending rod 10 threaded thereinto, is means for actuating said pumping member of any suitable construction whereby said pumping member is moved in one direction by some external force acting thereon and moved in the opposite direction by the force of resiliency, either inherent in the flexible wall 4 or applied thereto by a resilient means coacting therewith or both. In the form shown, a yoke 11 is connected to the rod 10 and embraces a cam or eccentric 12, said yoke being of such size and arrangement with respect to said cam or eccentric that one side of said yoke, that designated 13 in the form shown, is engaged and moved in one direction by the cam or eccentric, during each revolution of the same, to flex the member 4, but the opposite side of said yoke, that designated 14 in the form shown, is so spaced with respect to said side 13 that the eccentric 12 does not engage and move the yoke in the opposite direction. The movement of the pumping member in the latter direction is obtained by the force of resiliency. This force of resiliency may be supplied by resiliency inherent in the pumping member, as when the tubular wall 4 is made of resilient material, or may be supplied by resilient means cooperating with said member, or the latter resilient means may be employed to coact with and supplement the resiliency afforded by a resilient pumping member. In the form shown, a coil spring 15 is positioned within the tubular wall 4 in engagement with the movable end wall 5 at one end and in engagement with a stationary abutment wall 16 at its opposite end and tends to move the end wall 5 and flex the tubular wall 4 in the direction for effecting the pressure stroke of the pumping member. The movable end wall 5 may be desirably supplied with an annular boss 17 to center the coil spring 15 and the abutment wall 16, which may be desirably clamped in position between the flange 6 of the flexible wall and the flange 8 of the gear casing 9, may also be so shaped as to provide a centering boss 18 for said coil spring. In the form shown, said boss is also extended into the interior of the tubular wall 4 and provided at its inner end with an annular plug 19 which performs the dual function of guiding the rod 10 in its reciprocal movements and providing a stop against which the movable end wall 5 may engage and prevent an excessive collapse of the tubular wall 4.

The cam or eccentric 12 may be driven in any suitable way, the same being shown as mounted on a shaft 20 which also carries a gear wheel 21 in mesh with a gear wheel 22 on a shaft 23. On the latter shaft is a chain wheel 24 which may be driven in any suitable way, as by a second chain wheel (not shown), on an engine-driven shaft. A second rod 25 is preferably connected with the side 13 of the yoke 11 and extends coaxially with the rod 10 through an aperture 26 in the wall of the gear casing 9, said rod cooperating with said aperture to guide the reciprocal movements of the yoke and the connections therefrom to the movable end wall 5. To prevent rotation of the yoke and connected rods around the axis of the latter, any suitable means may be employed. In the form shown, a bolt 27 extends through the wall of the gear casing 9 and its head carries a pair of lugs 28 between which the yoke 11 is designed to reciprocate.

The pump so far described is of substantially the same construction as described and illustrated in my application above identified. In operation, the cam or eccentric 12 is rotated from the source of power through the gearing 24, 23, 22, 21, 20, and at each rotation thereof engages the side 13 of the yoke 11 to positively move said yoke and its connected rod 10 toward the right, as viewed in the drawing. Owing to the positive connection of the rod 10 with the movable end wall 5, the latter is also moved positively toward the right, and the tubular wall 4 is flexed, to provide the suction stroke of the pumping member. As the cam or eccentric 12 rotates past the position shown on the drawing, the yoke 11 and its connected rod 10 move in the opposite direction under the force of resiliency provided by the resiliency inherent in the tubular wall 4 or the spring 15 or both, so that the movable end wall 5 is thereby moved, and the tubular wall 4 flexed, in said opposite direction to provide the pressure stroke of the pumping member. During the latter stroke the side 14 of the yoke 11 is not engaged by the cam or eccentric, the movement of the pumping member being effected solely by the force

of resiliency; therefore, during this stroke, the pumping member can exert no greater pressure on the fluid being pumped thereby than is determined by the magnitude of said force of resiliency. Moreover, as soon as the pressure on the fluid in the pump casing 1 equals the magnitude of said resiliency, the movable end wall 5 stops in its movement toward the left, as viewed on the drawing, and there remains until the cam or eccentric 12 picks up the right hand side 13 of the yoke 11 in its continued rotation to move the pumping member toward the right once more. If little or no fluid is being delivered, the movable end wall 5 will stay substantially at the end of its suction stroke, the pressure on the fluid in the pump casing 1 developed by the force of resiliency acting on the movable end wall 5 being such as to prevent substantial movement of said movable end wall toward the left. Thereby the pressure on the fluid in the pump casing 1 is automatically determined by the force of resiliency acting on the pumping member and the length of stroke of said pumping member is automatically determined by the rate of delivery of the pumped fluid.

But to move the pumping member against the aforesaid force of resiliency the latent energy of the resilient means, whether the latter be the tubular wall 4 or the spring 15 or both, is increased and this increase of latent energy appears as an increased pressure of the pumping member on the fluid in the casing 1 when said member is adjacent the end of its suction stroke. If the rate of delivery of fluid is relatively large so that the pumping member is making its full stroke, the mean pressure acting on the fluid will be the average of the pressures acting on the pumping member at the two ends of its stroke. If, however, the rate of delivery of fluid is relatively small so that said pumping member oscillates through a relatively short distance adjacent the end of its suction stroke, the mean pressure acting on the fluid in the casing is increased and approximates the pressure acting on the pumping member at the end of its suction stroke. Therefore, the mean pressure acting on the fluid in the pump casing 1 varies under the different rates of delivery of the pumped fluid and, if the tension of the resilient means be adjusted so as to provide the desired pressure on the fluid when the pumping member is adjacent the end of its pressure stroke, said fluid is subjected to an increased pressure when the rate of delivery is diminished. While the absolute increase in pressure under these conditions will not be relatively large, it may be sufficient under certain conditions to result in disadvantageous consequences. Thus, when fuel is being pumped to a carbureter, this increase of pressure tends to maintain a higher level of the fuel in said carbureter and may cause a flooding of the latter.

In conformity with the present invention, means of any suitable construction are provided to compensate for the variations in the force of resiliency acting on the pumping member so that the pressure exerted by the latter on the fluid in the casing 1 may be maintained substantially uniform whether said pumping member is making its full stroke or less than its full stroke and whether it be adjacent one end of its stroke or the other. While a variety of means may be provided for compensating for these changes in the force of resiliency, the construction illustrated on the drawing is one of marked simplicity, inexpensiveness of manufacture, and easiness of installation and adjustment, as well as highly efficient in operation. In the form shown, a pair of arms 30 are suitably pivoted at one end on stationary members, as lugs 31 on the gear casing 9, and are normally urged toward each other by a coil spring 32 suitably connected to the free ends of said arms. Pivotally connected at 33 to each arm 30 is a link 34 which is pivotally connected at its opposite end, at 35, to the rod 25 or an extension thereon, being preferably pivoted on an adjustable sleeve 36 threaded on the end of said rod. The links 34 together with the spring 32 provide a toggle mechanism which tends to move the rod 25 in the direction of its axis.

Different springs and different resilient walls, even though made of standard size, differ in their resiliency; moreover, the magnitude of variation in resiliency varies in different constructions and under different conditions of use. Therefore, it is highly desirable that the compensating means be readily adjustable so that it may be made to provide the suitable degree and character of compensation for the particular resilient means with which it is associated. In the form shown, the coil spring 32 is attached at one end to a collar 37 which is threaded onto a screw 38 carried by one of the arms 30 whereby, by turning said screw in one direction or the other, the tension of said spring 32 may be increased or decreased. Additionally, the sleeve 36 may be adjusted axially of the rod 25 to vary the angle of inclination of the links 34 with respect to said axis. Thereby the magnitude of the compensating force provided by the spring 32 and the magnitude of its component acting in the direction of the axis of the rod 25 may be independently or simultaneously adjusted to obtain the compensating action most suitable for the conditions of use and particular resilient means employed in the construction to which it is applied.

In operation, the spring 32 tends to move

the arms 30 toward the axis of the rod 25 and the force thereby exerted is transmitted by the links 34 to said rod. Furthermore, owing to the inclination of said links to the axis of said rod, a certain component of said pressure is exerted along the axis of said rod in a direction opposite to that in which the force of resiliency tends to move the pumping member. As the cam or eccentric 12 rotates to move the yoke 11 and pumping member toward the right, the tension of the resilient means afforded by the resilient wall 4 or the spring 15 or both is progressively increased. Simultaneously with this movement, however, the rod 25 moves the pivot 35 of the links 34 toward the right to diminish the angle of inclination of said links to the axis of said rod and thereby permit the arms 30 to be drawn toward each other by the spring 32. This latter action diminishes the force exerted by the spring 32 tending to move the rod 25 toward the right, in the form shown, and by suitable adjustment of the tension of said spring and the inclination of the links 34, this diminution in the compensating force can be made to substantially offset the increase in the tension of the resilient means acting on the pumping member. Conversely, as the pumping member moves toward the left under the force of resiliency, the tension of the resilient means cooperating therewith progressively decreases but, simultaneously therewith, the rod 25 moves the pivot of the links 35 toward the left to straighten out the arms of the toggle and separate the arms 30, increasing the tension of the spring 32. This increase in the compensating force provided by the spring 32 substantially offsets the diminution in the force of resiliency acting on the pumping member. Therefore, the total force of resiliency acting on the pumping member is maintained substantially uniform and the latter exerts a substantially uniform pressure on the fluid in the pump casing 1, at whichever end of its stroke said pumping member may be and whether the length of said stroke be long or short.

While the compensating means of the present invention has been shown as applied to a pump of the construction disclosed in my application above identified, the invention is not restricted thereto, as the same is applicable to a wide variety of pumps and, in fact, possesses utility wherever it is desired that a pumping member, moved in one direction by the force of resiliency, shall have the variations in said force of resiliency compensated, so that said pumping member shall afford a substantially uniform pressure on the fluid pumped thereby. Furthermore, while the embodiment of the invention illustrated on the drawing has been described with considerable particularity, it is to be expressly understood that the invention is not limited thereto as the same is capable of receiving a variety of mechanical expressions, some of which will now readily suggest themselves to those skilled in the art. Furthermore, changes may be made in the details of construction, arrangement and proportion of parts without departing from the spirit of this invention. Reference is therefore to be had to the claims hereto appended for a definition of the limits of said invention.

What is claimed is:

1. The combination of a pump casing having inlet and outlet connections, a resilient pumping member in said casing, means whereby said member is flexed in one direction, said member flexing in the opposite direction by the force of resiliency, and means cooperating with said member to compensate for changes in the force of resiliency by which said member is moved in said last-named direction.

2. The combination of a pump casing having inlet and outlet connections, a pumping member in said casing, means whereby said member is moved in one direction, resilient means for moving said member in the opposite direction, and means cooperating with said resilient means to compensate for changes in the force of its resiliency during the stroke of said member.

3. The combination of a pump casing having inlet and outlet connections, a resilient pumping member in said casing, means whereby said member is flexed in one direction, resilient means for flexing said member in the opposite direction, and means cooperating with said member to compensate for changes in the force of resiliency of said member and resilient means.

4. The combination of a pump casing having inlet and outlet connections, a flexible pumping member in said casing, means whereby said member is flexed in one direction, resilient means for flexing said member in the opposite direction, and means cooperating with said pumping member to compensate for changes in the force of resiliency by which said member is moved.

5. The combination of a pump casing having inlet and outlet connections, a pumping member in said casing, means whereby said member is moved in one direction, resilient means for moving said member in the opposite direction, and means cooperating with said resilient means whereby said member exerts a substantially uniform pressure on the fluid in said casing notwithstanding changes in the force of resiliency by which said member is moved.

6. The combination of a pump casing having inlet and outlet connections, a resilient pumping member in said casing, means whereby said member is flexed in one

direction, said member flexing in the opposite direction by the force of resiliency, and means cooperating with said member whereby it exerts a substantially uniform pressure on the fluid in said casing notwithstanding changes in the force of resiliency by which said member is moved.

7. The combination of a pump casing having inlet and outlet connections, a flexible pumping member in said casing, means whereby said member is flexed in one direction, resilient means cooperating with said member to flex the same in the opposite direction, and means cooperating with said member whereby the same exerts a substantially uniform pressure on the fluid in said casing notwithstanding changes in the force of resiliency by which said member is moved.

8. The combination of a pump casing having inlet and outlet connections, a resilient pumping member in said casing, means whereby said member is flexed in one direction, said member flexing in the opposite direction by the force of resiliency, and toggle mechanism cooperating with said pumping member to compensate for changes in the force of resiliency by which said member is moved.

9. The combination of a pump casing having inlet and outlet connections, a pumping member in said casing, means whereby said member is moved in one direction, resilient means for moving said member in the opposite direction, and toggle mechanism cooperating with said resilient means to compensate for changes in the force of its resiliency.

10. The combination of a pump casing having inlet and outlet connections, a resilient pumping member in said casing, means whereby said member is flexed in one direction, resilient means for flexing said member in the opposite direction, and toggle mechanism cooperating with said member whereby the same exerts a substantially uniform pressure on the fluid in said casing notwithstanding changes in the force of resiliency by which said member is moved.

11. The combination of a pump casing having inlet and outlet connections, a pumping member in said casing, means whereby said member is moved in one direction, resilient means for moving said member in the opposite direction, toggle mechanism cooperating with said member to compensate for changes in the force of resiliency by which said member is moved, and means for adjusting said toggle mechanism.

12. The combination of a pump casing having inlet and outlet connections, a pumping member in said casing, means whereby said member is moved in one direction, resilient means for moving said member in the opposite direction, toggle mechanism cooperating with said member to compensate for changes in the force of resiliency by which said member is moved and including a spring, and means for adjusting the tension of said spring.

13. The combination of a pump casing having inlet and outlet connections, a pumping member in said casing, means whereby said member is moved in one direction, resilient means for moving said member in the opposite direction, a rod operatively connected to said member, one or more pivoted arms, a link pivoted to each arm and to said rod, and a spring cooperating with said link or links to urge said rod in the direction of its axis.

14. The combination of a pump casing having inlet and outlet connections, a pumping member in said casing, means whereby said member is moved in one direction, resilient means for moving said member in the opposite direction, a rod operatively connected to said member, one or more pivoted arms, a link pivoted to each arm and to said rod, a spring cooperating with said link or links to urge said rod in the direction of its axis, and means for adjusting the tension of said spring.

15. The combination of a pump casing having inlet and outlet connections, a pumping member in said casing, means whereby said member is moved in one direction, resilient means for moving said member in the opposite direction, a rod operatively connected to said member, one or more pivoted arms, a link pivoted to each arm and to said rod, means for adjusting the angular relationship of said link or links to said rod, and a spring cooperating with said link or links to urge said rod in the direction of its axis.

16. The combination of a pump casing having inlet and outlet connections, a pumping member in said casing, means whereby said member is moved in one direction, resilient means for moving said member in the opposite direction, means cooperating with said member to compensate for changes in the force of resiliency by which said member is moved, and means for adjusting said compensating means.

17. The combination of a pump casing having inlet and outlet connections, a pumping member in said casing, resilient means for moving said member in one direction, and means cooperating with said member to compensate for changes in the force of resiliency by which said member is moved due to the differing degrees of tension of the same.

18. The combination of a pump casing having inlet and outlet connections, a flexible pumping member in said casing, resilient means cooperating with said member

to flex the same in one direction, and toggle mechanism cooperating with said resilient means to compensate for the variations in the force of resiliency during the flexure of said member.

19. The combination of a pump casing having inlet and outlet connections, a pumping member in said casing moved in one direction by the force of resiliency, and means cooperating with said member to compensate for the changes in said force of resiliency at different positions of said member.

20. The combination of a pump casing having inlet and outlet connections, a resilient pumping member in said casing flexed in one direction by the force of resiliency, and means cooperating with said member to compensate for the variations in said force of resiliency arising from changes in the tension of said member.

21. The combination of a pump casing having inlet and outlet connections, a pumping member in said casing, resilient means for moving said member in one direction, and means cooperating with said means to compensate for the variations in the force of resiliency of said resilient means arising from changes in the tension of the same.

In testimony whereof I have signed this specification.

JEAN V. GIESLER.