

March 5, 1935.

M. J. GOLDBERG

1,993,369

PUMP

Filed April 27, 1933

Fig 1

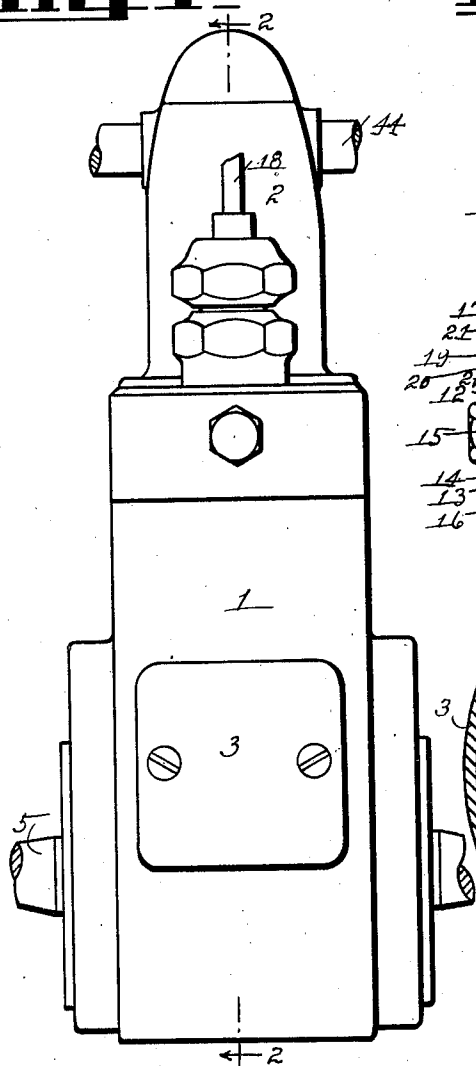


Fig 2

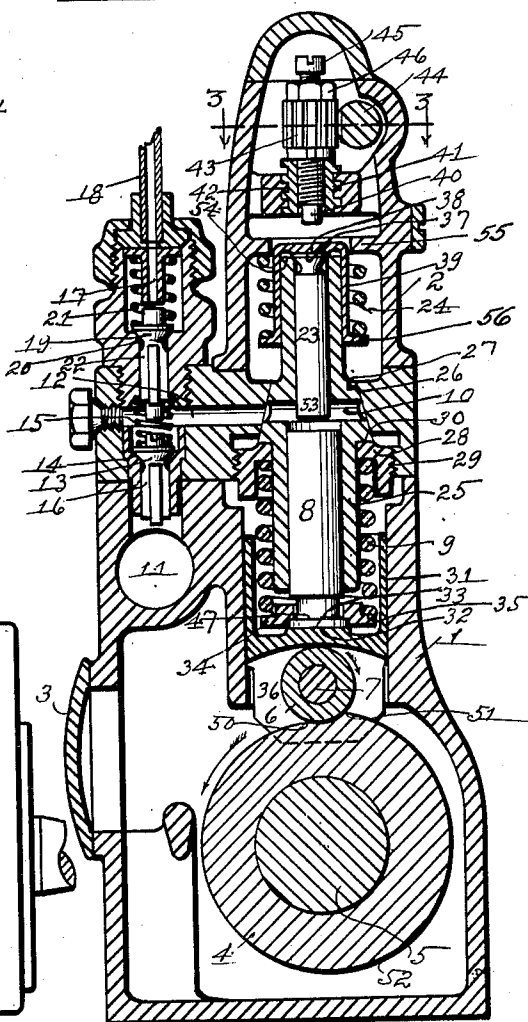
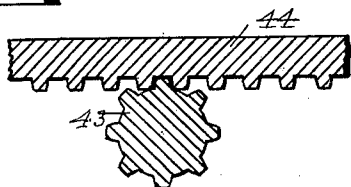


Fig 3



INVENTOR
Mark J. Goldberg
BY Rice and Rice
ATTORNEYS

UNITED STATES PATENT OFFICE

1,993,369

PUMP

Mark J. Goldberg, Muskegon Heights, Mich., assignor to Campbell, Wyant and Cannon Foundry Company, Norton Township, Mich., a corporation of Michigan

Application April 27, 1933, Serial No. 668,175

5 Claims. (Cl. 103—37)

The present invention relates to pumps for injecting fluid fuel into internal-combustion engines, particularly engines of the Diesel type and the like; and its object is to provide such a pump having means for adjustably regulating the quantity of fuel injected into the combustion chamber of the engine; to prevent or eliminate gasification of liquid fuel injected into the engine; and, to provide a fuel pump of strong and simple construction for injecting the fuel against extremely high pressure in the engine.

These and any other and more specific objects hereinafter appearing are attained by, and the invention finds preferable embodiment in, the illustrative pump structure particularly described in the body of this specification and illustrated by the accompanying drawing, in which:

Figure 1 is a side view of a pump structure;

Figure 2 is sectional view of the same taken on line 2—2 of Figure 1; and

Figure 3 is a sectional view of parts thereof taken on line 3—3 of Figure 2.

In the embodiment of the invention illustrated by this drawing a pump structure is shown having a body or housing comprising a hollow member 1 and a cap member 2 rigidly fastened together. In the hollow member (which is closed by a removable cover 3) a cam wheel 4 on shaft 5 driven by the engine (not shown) bears on a roll 6 journaled at 7, to impart to the reciprocating plunger 8 its pumping stroke or movement against the pressure of a spring 9.

The structure has the pump chamber 10 into which the fluid fuel is drawn, as from a cavity 11, to which the fuel, as oil, may be supplied by suitable means such as a low-pressure pump (not shown). The fuel is drawn into chamber 10 by the suction stroke or movement of said plunger through inlet port 12 provided with a valve 13 normally pressed to closed position on its seat 14 by a weak spring 15 and being opened by said suction movement. The stem of this valve has the usual fluid passages indicated at 16.

The pumping stroke or movement of said plunger ejects the fuel from chamber 10 through the outlet port 17 and injects the same into the combustion chamber of the engine through a suitable pipe 18 leading thereto. Said outlet port is provided with a valve 19 normally pressed to closed position on its seat 20 by a spring 21 and being opened by the pumping stroke or movement of said plunger. The stem of this valve has the usual fluid passages indicated at 22.

The capacity or content—in other words, the size—of the chamber 10 (including its inlet por-

tion 12) may be reduced or increased by moving its size-regulating or accumulator plunger—the valve-like element 23—farther into or out of said chamber. This element and the pumping plunger 8 are preferably aligned and at the opposite sides of chamber 10 as shown. Said accumulator plunger 23 is slidably pressed by a spring 24 to reduce the size of the chamber and is forced oppositely by increased pressure in said chamber thus increasing the size of the chamber. This element, or its end portion 53 thus forms, essentially, a wall of chamber 10 whose size is reduced or increased by the movement of this element one way or the other.

The valve 19 (governing outlet port 17) and the plunger element 23 (regulating the size of the chamber) are so related that this plunger element is permitted by the absence of pressure in chamber 10 to be moved by its spring 24 to its desired size-regulating position before the charge of fuel is drawn into this chamber, and on the following pumping stroke of pump plunger 8 (creating pressure in said chamber) is moved against spring 24 and until stopped by stop 40, whereupon the pressure in the chamber opens valve 19 to the engine. To effect this operation of said valves, the spring 21 of valve 19 may be made stiffer or stronger than spring 24 of element 23. The result is that the quantity of fuel to be injected into the engine by a pumping stroke of plunger 8 is governed by the position to which the element 23 has been previously moved, and before the charge of fuel is injected into the engine.

Various ways of constructing and mounting the parts may be devised. In the construction illustrated, the plunger 8 slidably fits in a cage 25 removably inserted into a conical bore 26 of the structure's body, the cage's portion 27 fitting in said bore being correspondingly conical; and the plunger element 23 also slidably fits in the same cage. This cage is held in the bore by its surrounding annular nut 28 threaded at 29 in said body and engaging the cage's shoulder 30. The said cage is surrounded by a hollow cylindrical element 31 on whose bottom 32 the inner end 33 of plunger 8 is pressed by spring 9 which engages at 35 a ring 34 which rests on the shoulder 47 of said inner end. The roll 6 being mounted on the inner end 36 of this element 31 is pressed by said spring on the cam wheel 4. The end 37 of plunger element 23 rests on the bottom 38 of a hollow cylindrical element 39 slidably surrounding said cage and pressed by spring 24 toward the pump chamber 10 until stopped by the end 55

54 of the cage, or said element's conical end 37 is thus stopped. This spring 24 presses between the annular shoulder 56 of the hollow cylindrical element 39 and the inwardly-extending annular flange 55 of the housing's cap member 2, and said element 39 is held against lateral movement by said flange.

An adjustable threaded stop 40 limits the movement of cylindrical element 39 and plunger element 23 away from said chamber. This stop is shown threaded in a nut 41 which is threaded at 42 in said body. This nut may be manually turned to desired set position, or its gear 43 meshing with a slidable toothed rack 44 may be turned thereby, the rack being connected by suitable means with the engine or a speed controlled governor thereof. The stop 40 has a head 45 for turning it to adjusted position in nut 41 and has also a jam nut 46.

In the illustrated construction, the chamber 10 is formed in the cage 25 and the chamber's inlet portion 12 is formed in the body of the structure.

Other methods of mounting and arranging the parts and other means for varying the size of the pump chamber by pressure therein may be devised within the scope of this invention.

The operation of the pump is as follows: As shown in Figure 2, the threaded stop 40 has been turned to the proper position for adjusting the pump chamber 10 to receive the desired amount of fuel, and said amount has been drawn into said chamber. As the roll 6 now travels from low point 50 of cam wheel 4 to its high point 51, the resulting pumping stroke of plunger 8, increasing pressure in this chamber, first moves element 23 toward said stop until it and member 39 are stopped thereby, this movement compressing spring 24, and then the pressure in the chamber, having been increased sufficiently, opens valve 19 to the engine, compressing its stiffer spring 21. As the roll 6 travels along the cam wheel's long portion 52 from point 51 to point 50 the resulting suction stroke of pump plunger 8, exhausting pressure in chamber 10, permits spring 24 to expand and move the element 23 from the stop and farther into chamber 10 thus reducing its size, and draws fuel into this chamber thus reduced.

The invention being intended to be pointed out in the claims, is not to be limited to or by details of construction and arrangement of the particular embodiment thereof illustrated by the drawing or hereinbefore described.

I claim:

1. A fluid fuel pump for internal combustion engines comprising a hollow housing consisting of a plurality of detachable members, one of said members having a conical bore, a plunger cage socketed in said bore and held therein against displacement by an annular ring nut, the said cage consisting of a fluid fuel chamber portion with a fluid chamber therein, extended portions projecting from said chamber portion, one of said extended portions having a pumping plunger bore of one diameter and the other extended portion having an accumulator plunger bore of smaller diameter than the pumping plunger bore, a pumping plunger in said pumping plunger bore spring moved in its suction stroke and cam moved in its compressing stroke, a collar surrounding the end of said pumping plunger out of the said cage, a helical spring between the collar and the said annular ring nut, a sleeve engaging the pumping plunger for freely moving the same, the said sleeve having a cylindrical portion slidable in a bore in the housing, a roller supporting portion and a

roller carried thereby for engaging the pumping plunger operating cam carried by a shaft driven by the engine in unison with the strokes of the engine, an accumulator plunger slidable in the accumulator plunger extended portion of said cage, the said accumulator plunger having an enlarged end bearing against the free end of the cage to provide a stop to prevent the accumulator plunger striking the pumping plunger, a bonnet element engaging one end of the accumulator plunger and slidable exteriorly of the cage extended portion and spring pressed against the accumulator plunger to move said plunger against the pressure of the fluid fuel generated by the pumping plunger, an adjustable screw stop for limiting the movement of the accumulator plunger caused by said pressure consisting of a sleeve screw threaded into the housing having a gear at one end and a set screw at the axis of said screw threaded sleeve and a toothed rack for turning the said screw threaded sleeve by the gear to move the same toward and away from the accumulator plunger, an inlet valve for the fluid fuel in the housing, a discharge valve for the fluid fuel from the housing and contained in a detachable member attached to said housing and a port communicating with the chamber of the said cage and the said valves for the purpose specified.

2. A fluid fuel pump for internal combustion engines comprising a hollow housing consisting of a plurality of detachable members, one of said members having a conical bore, a plunger cage socketed in said bore and held therein against displacement by an annular ring nut, the said cage consisting of a fluid fuel chamber portion with a fluid chamber therein, extended portions projecting from said chamber portion, one of said extended portions having a pumping plunger bore of one diameter and the other extended portion having an accumulator plunger bore of smaller diameter than the pumping plunger bore, a pumping plunger in said pumping plunger bore spring moved in its suction stroke and cam moved in its compressing stroke, a collar surrounding the end of said pumping plunger out of the said cage, a helical spring between the collar and the said annular ring nut, a sleeve engaging the pumping plunger for freely moving the same, the said sleeve having a cylindrical portion slidable in a bore in the housing, a roller supporting portion and a roller carried thereby for engaging the pumping plunger operating cam carried by a shaft driven by the engine in unison with the strokes of the engine, an accumulator plunger slidable in the accumulator plunger extended portion of said cage, the said accumulator plunger having an enlarged end bearing against the free end of the cage to provide a stop to prevent the accumulator plunger striking the pumping plunger, a bonnet element engaging one end of the accumulator plunger and slidable exteriorly of the cage extended portion and spring pressed against the accumulator plunger to move said plunger against the pressure of the fluid fuel generated by the pumping plunger, an inlet valve for the fluid fuel in the housing, a discharge valve for the fluid fuel from the housing and contained in a detachable member attached to said housing and a port communicating with the chamber of the said cage and the said valves for the purpose specified.

3. A fluid fuel pump for internal combustion engines comprising a hollow housing consisting of a plurality of detachable members, one of said members having a conical bore, a plunger cage

socketed in said bore and held therein against displacement by an annular ring nut, the said cage consisting of a fluid fuel chamber portion with a fluid chamber therein, extended portions projecting from said chamber portion, one of said extended portions having a pumping plunger bore of one diameter and the other extended portion having an accumulator plunger bore of smaller diameter than the pumping plunger bore, a pumping plunger in said pumping plunger bore spring moved in its suction stroke and cam moved in its compressing stroke, a collar surrounding the end of said pumping plunger out of the said cage, a helical spring between the collar and the said annular ring nut, a sleeve engaging the pumping plunger for freely moving the same, the said sleeve having a cylindrical portion slidable in a bore in the housing, and means associated with the sleeve for engaging the pumping plunger operating cam carried by a shaft driven by the engine in unison with the strokes of the engine, an accumulator plunger slidable in the accumulator plunger extended portion of said cage, the said accumulator plunger having an enlarged end bearing against the free end of the cage to provide a stop to prevent the accumulator plunger striking the pumping plunger, a bonnet element engaging one end of the cage extended portion and spring pressed against the accumulator plunger to move said plunger against the pressure of the fluid fuel generated by the pumping plunger, an inlet valve for the fluid fuel in the housing, a discharge valve for the fluid fuel from the housing and contained in a detachable member attached to said housing and a port communicating with the chamber of the said cage and the said valves for the purpose specified.

4. A fluid fuel pump for internal combustion engines comprising a hollow housing consisting of a plurality of detachable members, one of said members having a plunger cage receiving bore, a plunger cage positioned in said bore and held therein against displacement, an annular ring nut surrounding the cage and threaded in the housing for holding the cage against displacement, the said cage consisting of a fluid fuel chamber portion with a fluid chamber therein, extended portions projecting from said chamber portion, one of said extended portions having a pumping plunger bore of one diameter and the other extended portion having an accumulator plunger bore of smaller diameter than the pumping plunger bore, a pumping plunger in said pumping plunger bore spring moved in its suction stroke and cam moved in its compressing stroke, a collar surrounding the end of said pumping plunger out of the said cage, a helical spring between the collar and the said annular ring nut, a sleeve engaging the pumping plunger for freely moving the same, the said sleeve having a cylindrical portion slidable in a bore in the housing, and means associated with the sleeve for engaging the pumping plunger operating cam carried by a shaft driven by the engine in unison with the strokes of the engine, an accumulator plunger slidable in the accumulator plunger extended portion of the

said cage, the said accumulator plunger having an enlarged end bearing against the free end of the cage to provide a stop to prevent the accumulator plunger striking the pumping plunger, a bonnet element engaging one end of the accumulator plunger and slidable exteriorly of the cage extended portion and spring pressed against the accumulator plunger to move said plunger against the pressure of the fluid fuel generated by the pumping plunger, an inlet valve for the fluid fuel in the housing, a discharge valve for the fluid fuel from the housing and contained in a detachable member attached to said housing and a port communicating with the chamber of the said cage and the said valves for the purpose specified.

5. In a fluid fuel pump, a housing having an internal tapered seat and a chambered portion opposite said seat and also having an internal flange in the upper portion of the housing above the seat and provided with an opening therein, the housing being also provided with an inlet port and a valved outlet port, a cage confined within the housing and including an intermediate exteriorly tapered portion seated in said tapered seat of the housing and having an intermediate chambered portion which aligns with the said chambered portion of the housing to form a fuel receiving chamber, said cage including upper and lower aligning tubular extensions on opposite sides of said chamber, a plunger slidable in the upper extension into and out of said chamber and having a head at its upper end to engage the outer end of said upper extension to limit downward movement of said plunger with relation to said chamber, means for forcing said plunger normally in the direction of said chamber including a cup-shaped element slidably embracing said upper extension and engaging the outer end of said plunger and a spring embracing the cup-shaped member and acting at one end against the latter and at its opposite end acting against the underside of said internal flange, means including a spring-pressed plunger slidable in opposite directions in said lower extension for drawing fuel into the fuel receiving chamber upon one direction of movement and on movement in the opposite direction creating pressure in the fuel receiving chamber such as to first move said upper plunger outwardly of the fuel receiving chamber to increase the capacity of the latter and subsequently unseat the valve of the outlet port to effect discharge of a fixed amount of fuel through said valved outlet, the upper plunger and the cup-shaped element embracing the upper extension being guided through the aforesaid opening in the flange when the upper plunger is moved outwardly of the fuel chamber to maintain said upper plunger against side thrust, and means between the top of the upper portion of the housing and said internal flange and spaced from the latter, and engageable by the cup-shaped element in such movement of the upper plunger to limit such outward movement of the plunger away from the fuel receiving chamber.

MARK J. GOLDBERG.