

Aug. 30, 1927.

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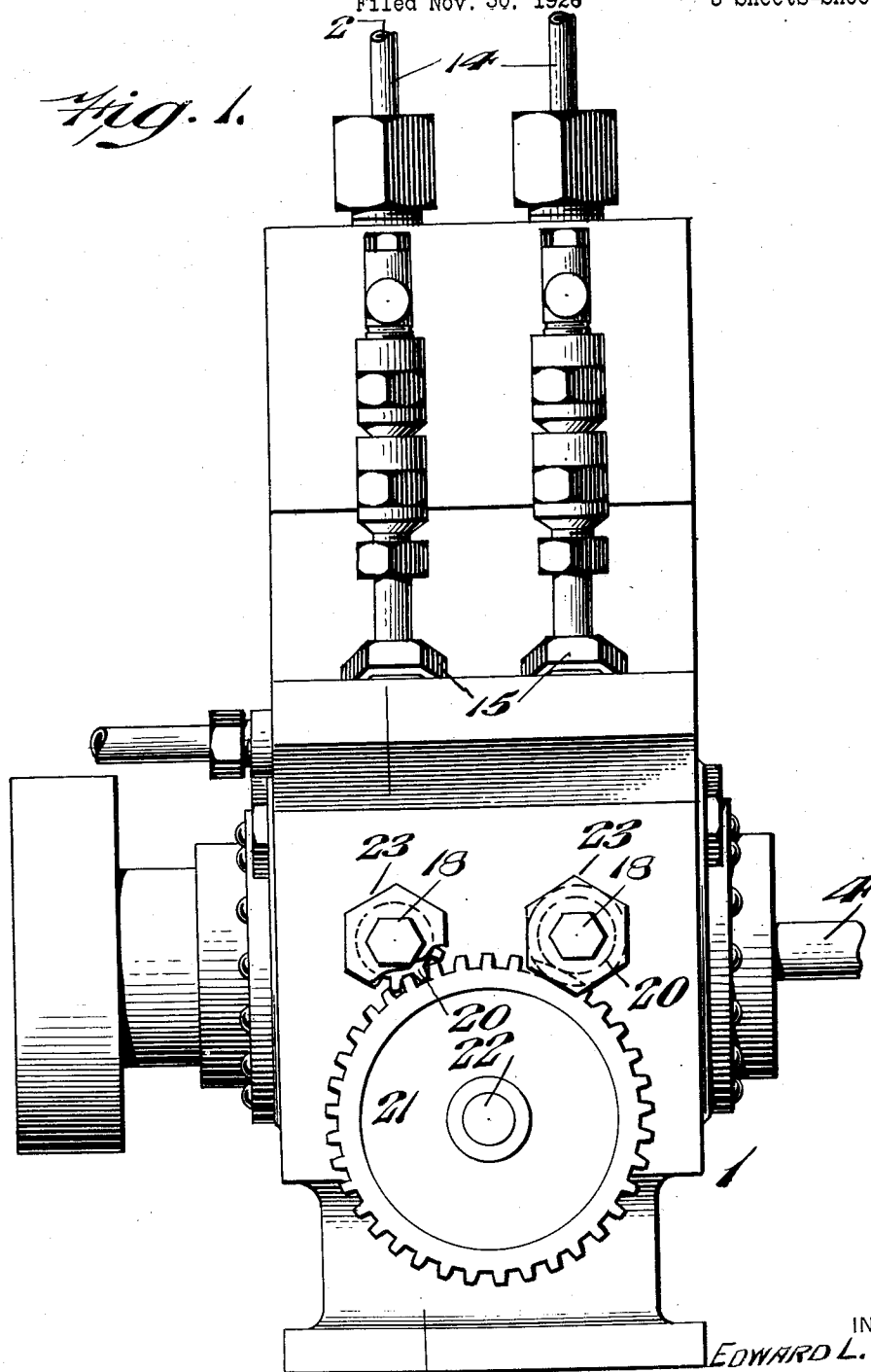
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FUEL PUMPING MECHANISM FOR INTERNAL COMBUSTION ENGINES

Filed Nov. 30, 1926

3 Sheets-Sheet 1

Fig. 1.



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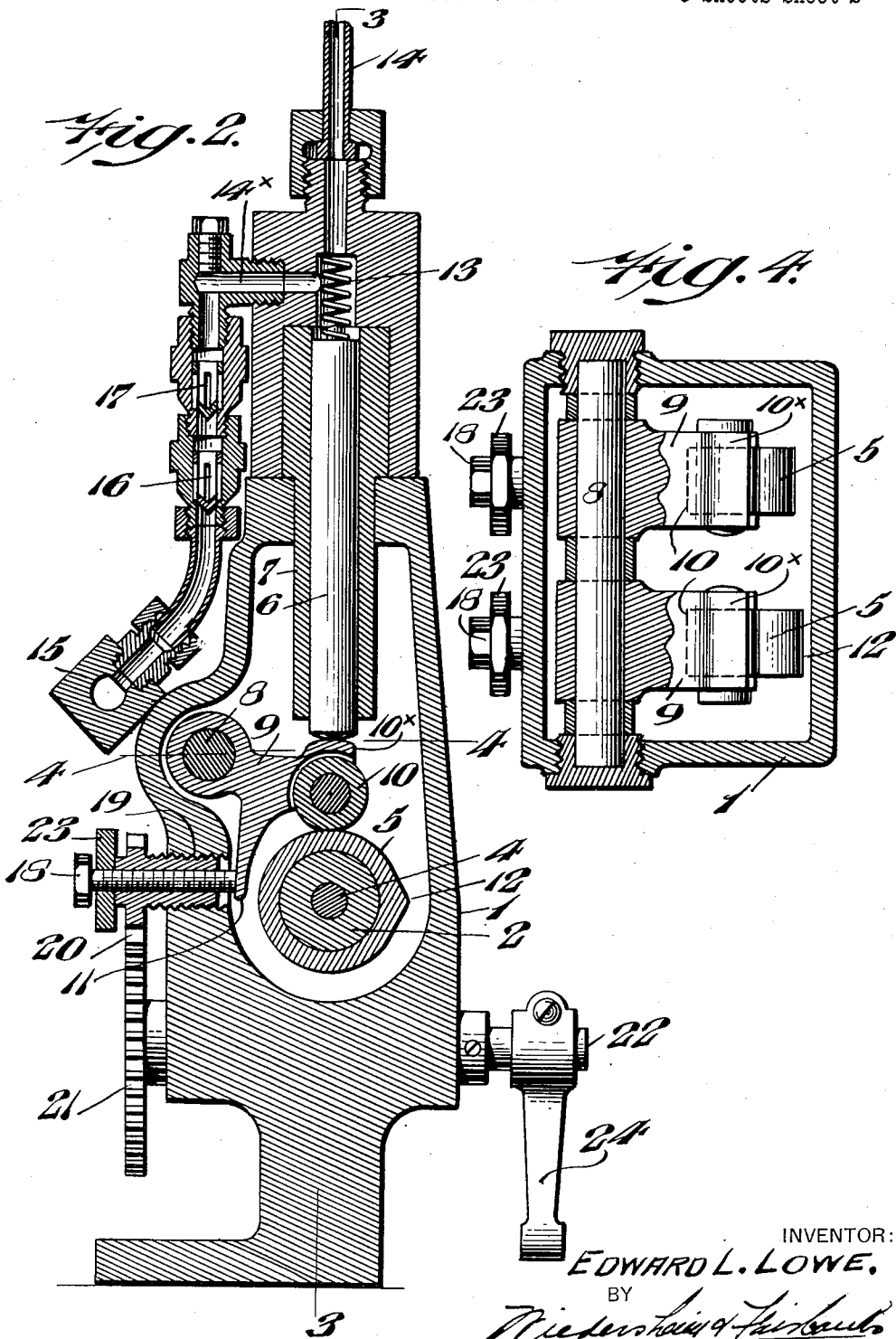
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Filed Nov. 30, 1926

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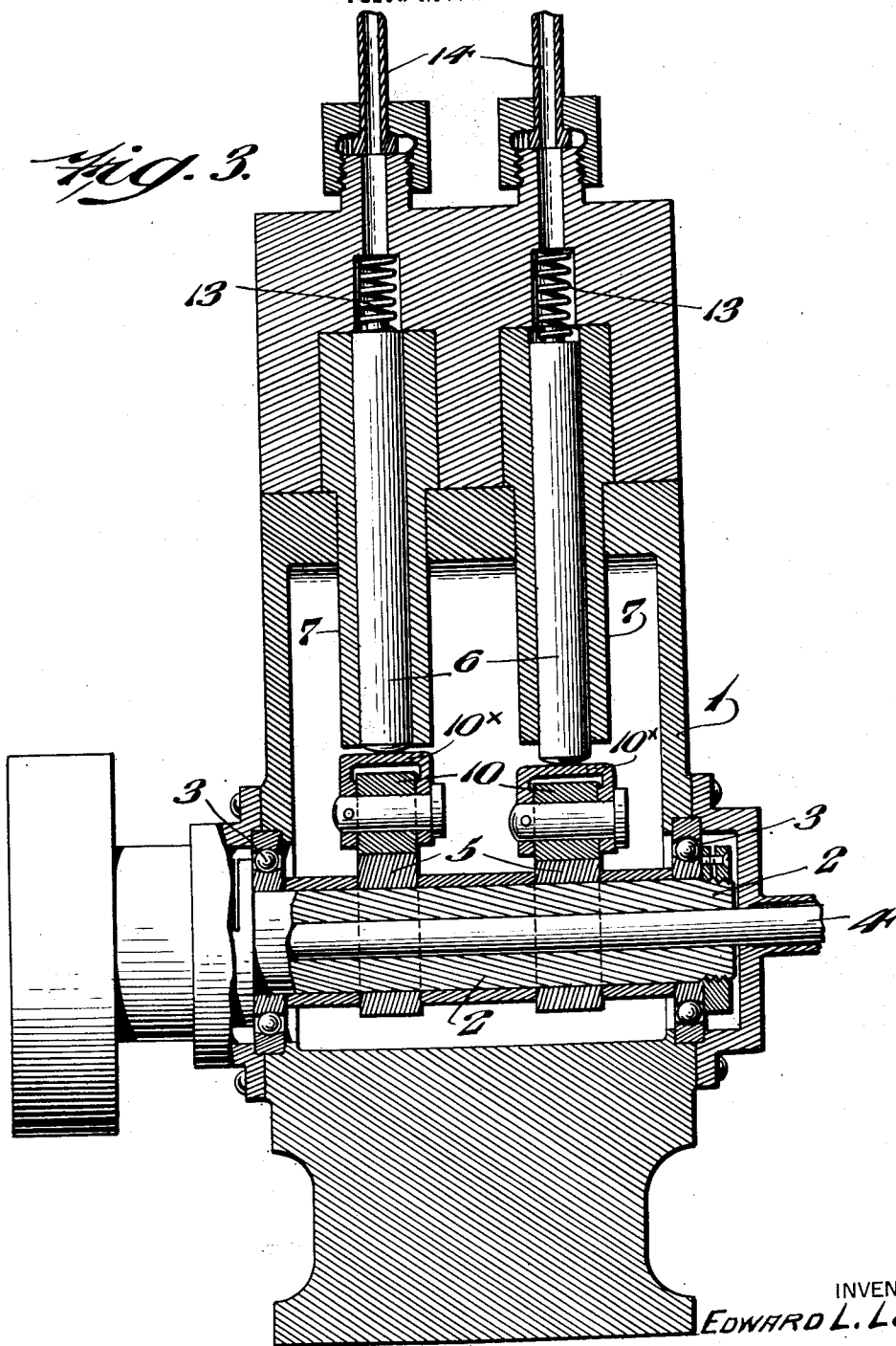
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FUEL PUMPING MECHANISM FOR INTERNAL COMBUSTION ENGINES

Filed Nov. 30, 1926

3 Sheets-Sheet 3



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1,640,509

UNITED STATES PATENT OFFICE.

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FUEL-PUMPING MECHANISM FOR INTERNAL-COMBUSTION ENGINES.

Application filed November 30, 1926. Serial No. 151,637.

This invention stated in its broadest terms relates to fuel pumping means for burners of internal combustion engines, such burners being disclosed in prior Letters Patent granted to me, Nos. 1,443,187; 1,450,691; 1,462,514; and 1,454,972. In internal combustion engines of the character under consideration it is desirable, and essential, that efficient cam actuated pumping mechanism for the injection of fuel be provided.

The leading object of the present invention resides in the provision of novel means for the efficient pumping of fuel such as the heavier hydrocarbons in a simple, practical and mechanically effective manner and through a positive mechanical action.

A further object of the present invention is to provide novel means, whereby the cam operated plunger elements may be adjusted to a nicety and with great exactness for regulating the extent of the reciprocations of the pump plungers or pistons.

Other and further objects of the present invention reside in the provision of novel features of construction and arrangement and combination of parts for attaining the results sought by the said leading object.

With these and other objects in view, the invention consists of the novel construction hereinafter described and finally claimed.

The nature, characteristic features and scope of the invention will be more fully understood from the following description taken in connection with the accompanying drawings forming part hereof, in which:

Fig. 1, represents a front elevation of a pump or fuel injector apparatus, embodying my invention.

Fig. 2, represents a vertical section on line 2—2 of Fig. 1, certain of the parts being shown in elevation.

Fig. 3, represents a vertical section on line 3—3 of Fig. 2, certain of the parts being shown in elevation.

Fig. 4, represents a horizontal section on line 4—4 of Fig. 2.

For the purpose of illustrating my invention I have shown in the accompanying drawings one form thereof which is at present preferred by me, since the same has been found in practice to give satisfactory and reliable results, although it is to be understood that the various instrumentalities of which my invention consists can be variously arranged and organized and that my inven-

tion is not limited to the precise arrangement and organization of the instrumentalities as herein shown and described.

Referring to the drawings, and with more particular relation to Figs. 2 and 3, 1 designates a plunger containing housing, mounted in which is a hollow cam shaft 2 provided with ball bearings 3 of any conventional type. This hollow shaft 2 has extended therethrough a longitudinally adjustable rod 4 for the control of fuel injection, as described in my copending application for Letters Patent No. 151,638, filed November 30, 1926. Fixed to the hollow shaft 2 are a pair of cams 5 for effecting the reciprocation of the pump pistons or plungers 6, each of which is reciprocal in a fixed bushing or cylinder 7 carried by the housing 1. Supported within the housing 1 upon the shaft 8 are a pair of rocker arms 9, each provided with a roller 10, and a pendant finger 11. The roller 10 tracks upon the surface of the cam 5, as clearly shown in Fig. 2, so that as the high part 12 of the cam engages the roller 10 the wall 10* above said roller engages the curved bottom end of the plunger 6, which is moved upwardly against the pressure of the spring 13 for the ejection of the heavy hydrocarbon or other oil through the discharge pipe 14, which leads to the burner of the internal combustion engine. It will be understood that the heavy hydrocarbon or other fuel enters, through a conventional filter, (not shown) a coupling 15, seen at the left of Fig. 2, under the influence of gravity or air pressure, and after leaving the coupling 15, passes up through the check valves 16 and 17 to the suction or inlet 14*, and obviously follows the plunger 6 in its suction or downward stroke and is ejected on the upward or discharge stroke of the plunger, through the discharge pipe 14, to the burner of the engine, whereby, through the reciprocations of the plunger 6, in coordination with the check valves, a discharge of the requisite quantity of fuel to the desired point is maintained. The upper face of each plunger 6, obviously always reaches a fixed upper level in its movement as determined by the raised part 12 of each cam 5. As a result of the engagement of the pendant finger 11 of each rocker arm 9 with the inner end of the adjusting screw 18, the extent of the travel of the plungers 6 in their movement

will be limited or controlled by the position of each of said adjusting screws. The fingers 11 and the rollers 10 may be adjusted by the manipulation of the screws 18 to such a position that the plungers may remain stationary, the rollers 10 being elevated and maintained out of engagement with the cams 5. On the other hand, with the screws 18 properly adjusted, the rollers 10 may be brought into full and continuous engagement with the cams 5 and then the full or extreme extent of movement may be imparted to the plungers 6. Obviously any intermediate position of the screws 18 and the pendant fingers 11 will determine the range of movement to be imparted to the plungers 6, or in other words positions intermediate between rest and full stroke. Thus the amount of the fuel delivered per revolution of a cam may be varied between a maximum amount and no discharge at all. The adjusting screws 18 are carried by a screw threaded member 19 in threaded engagement with the housing 1 and provided with a pinion 20. This pinion 20 in turn meshes with a large gear 21 carried by the shaft 22, rotatably mounted in the housing 1. The lock nuts 23 secure the adjusting screws 18 in the desired adjusted position. The shaft 22 which carries the gear 21, which meshes with the pinions 20 previously described, is provided with an arm 24 operable in any desired manner by the operator of the internal combustion engine. Thus, any movement imparted to the arm 24 by the operator will cause a corresponding rotation of the gear 21, thereby imparting motion to the pinions 20 and to the adjusting screws 18 for the control and regulation of the movement of the pendant fingers 11. In practice the arm 24 is connected to any conventional hand or foot throttle lever to give direct manual or pedal control of the charge of fuel as pumped to the burner of the internal combustion engine by means of the plungers 6. The purpose of the fittings 19 and screws 18 is to form an individual adjustment for each cylinder of a multi-cylinder engine. When this adjustment is made and the lock nuts 23 tightened, no further change ordinarily is necessary. The drawing illustrates an assembly of two units as described and as being suitable for a two cylinder engine in which case the gear 21, shaft 22, and arm 24 are common to both units. It is clear that these units may be either embodied singly or in pairs and may be adapted to any number of cylinders by change of assembly and may be operated to act as a single unit as desired, and to this end it will merely be necessary to couple the arm 24 with suitable rods to the single hand or foot control.

It will now be apparent that I have devised a novel and useful construction of

fuel pumping mechanism for internal combustion engines, which embodies the features of advantage enumerated as desirable in the statement of the invention and the above description, and while I have in the present instance shown and described the preferred embodiment thereof which has been found in practice to give satisfactory and reliable results, it is to be understood that the same is susceptible of modification in various particulars without departing from the spirit or scope of the invention or sacrificing any of its advantages.

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

1. In an apparatus of the character stated, a plunger housing, a plunger operable therein, a cam, a cam shaft therefor, a rocker arm arranged in said housing and having a roller at one end and means above said roller contacting with the bottom of said plunger, and a finger at its other end, said roller being arranged in the path of travel of said cam, means for moving said finger toward or away from said cam, and manually operable devices for operating said finger moving means.

2. In apparatus of the character stated, a plunger housing, a pump plunger operable therein, a cam, a cam shaft therefor, a rocker arm arranged in said housing, having a roller at one end and a surface above said roller for contacting with the bottom of said plunger and a finger at its other end, said roller being arranged in the path of travel of said cam, an adjusting screw for moving said finger toward or away from said cam, and manually operable means for actuating said adjustable screw.

3. In apparatus of the character stated, a plunger housing, a reciprocating pump plunger operable therein, a cam, a cam shaft, a rocker arm positioned in said housing and having a roller at one end and a surface above said roller for contacting with the bottom of said plunger and a pendant finger at its other end, said roller being arranged in the path of travel of said cam, an adjusting screw having its inner end contacting with said finger for moving the latter towards or away from said cam, and manually operable means for rotating said adjusting screw.

4. In apparatus of the character stated, a plunger housing, a plunger reciprocating therein, a cam, a cam shaft, a rocker arm arranged in said housing, having a roller at one end and a surface above said roller for contacting with said plunger and a finger at its other end, said roller being arranged in the path of travel of said cam, an adjusting screw for moving said finger toward or away from said cam, a threaded member carrying said adjusting screw and

in threaded engagement with said housing, and manually operable means for actuating said adjusting screw.

5 5. In apparatus of the character stated, a plunger housing, a reciprocating pump plunger therein, a cam, a cam shaft, a rocker arm arranged in said housing, having a roller at one end, and a surface above said roller contacting with the bottom of said
10 plunger, and a pendant finger at its other end, said roller being arranged in the path of travel of said cam, an adjusting screw for moving said finger toward or away from said cam, and manually operable means in-
15 cluding meshing gear wheels for actuating said adjusting screw.

6. In apparatus of the character stated, a plunger housing, a reciprocating plunger therein, a cam, a cam shaft, a rocker arm
20 arranged in said housing, having a roller at one end and a surface above said roller for contacting with the bottom of said plunger, and a finger at its other end, said roller being arranged in the path of travel of said
25 cam, an adjusting screw for moving said

finger toward or away from said cam, a lock nut for securing said screw in the desired position, a threaded element engaging said housing and carrying said adjusting screw, a pinion carried by said threaded element 30 and a gear engaging said pinion.

7. In apparatus of the character stated, a plunger housing, a plunger therein, a cam, a cam shaft, a rocker arm arranged in said housing having a roller at one end and a 35 surface above said roller for contacting with said plunger, and a finger at its other end, said roller being arranged in the path of travel of said cam, an adjusting screw for moving said finger toward or away from 40 said cam, a lock nut for securing said adjusting screw in adjusted position, a threaded member carrying said adjusting screw and threaded into said housing, a pinion on said threaded member, a shaft mounted in 45 the lower part of said housing, a gear on said shaft engaging said pinion, and an arm on the opposite end of said shaft for actuating the latter.

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