G. F. MURPHY.

FUEL PUMP FOR EXPLOSION ENGINES.

APPLICATION FILED MAY 27, 1910.

989,027. Patented Apr. 11, 1911.

Fig. 1.

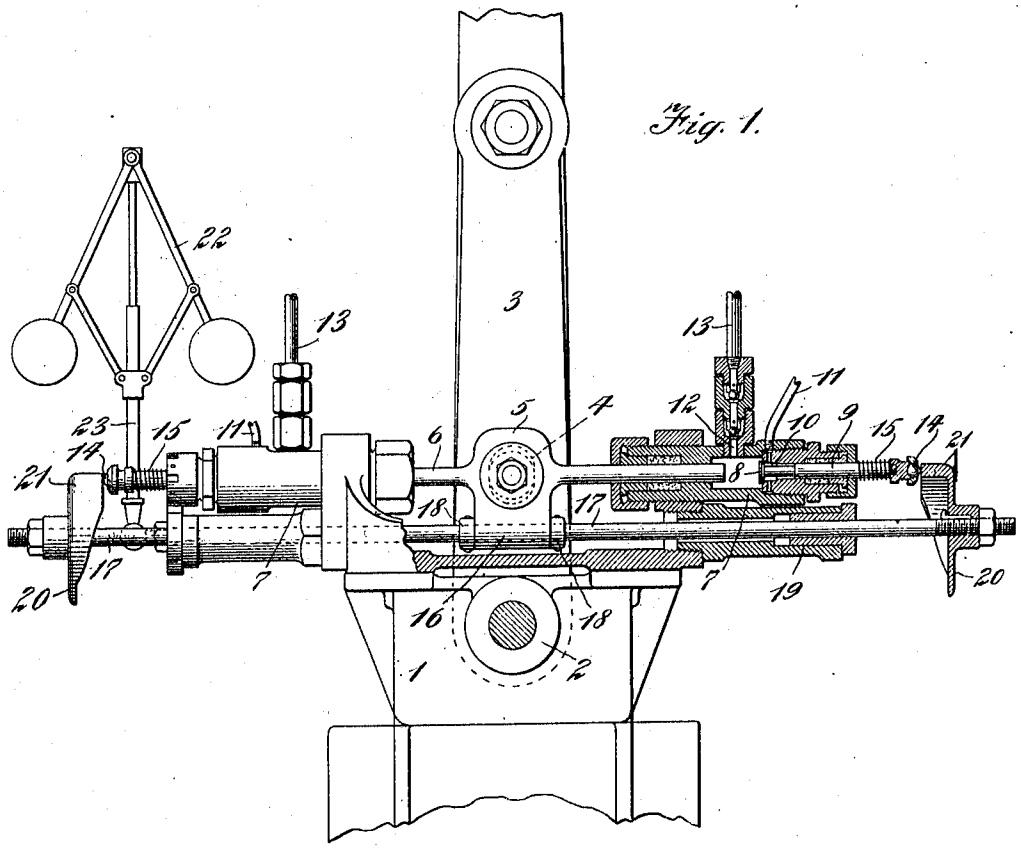
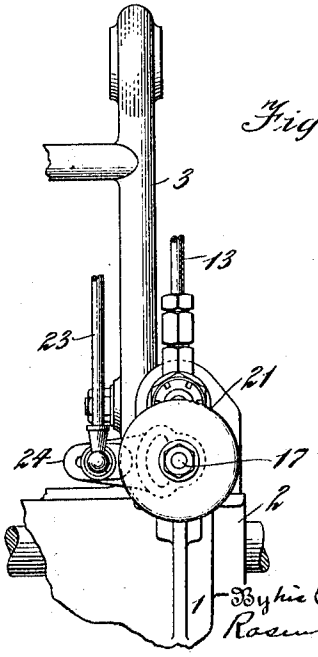


Fig. 2.



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FUEL-PUMP FOR EXPLOSION-ENGINES.

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To all whom it may concern:

Be it known that I, GEORGE F. MURPHY, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Fuel-Pumps for Explosion-Engines, of which the following is a full, clear, and exact description.

This invention relates to pumping apparatus for injecting liquid fuel into the cylinders of internal combustion engines, the object being to provide a simple and reliable construction of pump capable of delivering to the engine accurately measured quantities of the liquid fuel, which quantity can be automatically or manually controlled.

The apparatus I have designed is of double or duplicate nature adapted particularly for delivering the fuel to the respective ends of a double acting engine cylinder.

In the accompanying drawing in which my improved pumping apparatus is illustrated: Figure 1 is a side elevation, partially in section, of the complete pumping apparatus; and Fig. 2 is an end elevation of the same.

On the left hand side of Fig. 1 one of the pumps is shown in side elevation, while the one on the other side, which is of the same construction, is shown in longitudinal section. The two pumps are supported by a central frame 1 which carries a bearing 2 for the operating lever 3 which is common to both pumps. This lever has a slotted connection at 4 with a crosshead 5 located at the middle of a piston rod 6, which rod extends in opposite directions and is common to both pumps. The pump cylinder is indicated by 7 through the head of which rod 6 passes, the ends of the rod serving as the piston. In the opposite end of the cylinder is a central valve seat for a valve 8 which is carried on the end of a push rod or valve stem 9. Immediately behind the valve an annular chamber 10 is formed in the head of the cylinder which communicates freely with a source of oil or other liquid fuel (not shown) through a pipe 11. In the side of the pump cylinder is an outlet port 12 which leads through the pipe 13 to the cylinder of the engine. This passage is controlled by check valves, as shown, preventing backward flow. The valve stem 9 leads outward through the head of the cylinder and is provided at its extremity with an anti-friction ball 14 and is surrounded by a spring 15 which resists the inward movement of the stem.

The crosshead 5 is provided with an extending yoke 16 which embraces the middle portion of a shaft 17 and stands between two collars 18 fixed to the shaft, this construction serving to impart a reciprocating motion to the shaft corresponding to that of the piston rod 6. This shaft 17 extends in opposite directions through suitable bearings 19 under each pump cylinder and at each extremity it carries an abutment preferably having the form of a cam disk 20 having an inclined lateral flange 21 at such a radial distance from the shaft as to bring the edge or face of the cam in line with the end of the valve stem 9 against which it is adapted to impinge. The shaft 17 besides having the reciprocating motion referred to, is also capable of oscillating under the action of a governor 22 driven by the engine, the connection from the governor to the shaft being through a rod 23 and a crank 24. The operating lever 3 is driven by the engine through any suitable connection.

The operation is as follows: As the parts are shown in the drawing the stroke is about at the middle position, oil is being drawn into the cylinder 7 through the pipe 11 and open valve 8. At the completion of this stroke the cylinder is full of oil and the valve 8 is still open being held in that position by the cam 20 which rests against the rear end of the valve stem, the spring 15 being under compression. On the return stroke the piston moves inward and the cam is moved in the same direction. So long as the valve 8 remains opened the oil in the cylinder is forced back through the open valve and pipe 11 to the tank, but the valve is gradually closing due to the recession of the cam. Finally, the valve 8 closes at sometime before the piston has completed its stroke, depending upon the circumferential position of the flange 21 of the cam. When the valve thus closes the oil that is displaced from the cylinder by the further inward movement of the piston is caused to flow through the port 12 and passage 13 to the cylinder of the engine. This amount of oil is the effective capacity of the pump and it is accurately measured by the rotary or circumferential position of the cam 20. This cam is under the control of the governor 22

and is therefore automatically positioned in accordance with the requirements of the engine. On the suction stroke of the engine valve 8 remains closed under the tension of spring 15 until the flange of the cam strikes the end of the valve stem, the piston meantime creating a vacuum in the cylinder which is immediately filled upon the opening of the valve.

It will be seen that the particular construction of cam provided is susceptible of wide and ready adjustment for either hand or automatic operation, and that the quantity of oil delivered at each stroke of the pump can be regulated or measured very accurately. The device is adjustable by hand, since the crank 24 can readily be manipulated even while the engine is running. The two pumps are regulated by a single connection with the governor while the pistons and cams of both pumps are likewise operated from similar connections from the engine.

What I claim, is:

1. In a fuel pumping apparatus for internal combustion engines, the combination of a cylinder, a piston rod entering one head of the cylinder, a valve stem entering the opposite end of the cylinder, a reciprocating and rotatable cam shaft arranged parallel to the piston rod and valve stem, and carrying a cam adapted to engage the valve stem; said cam being rotatable by said cam shaft and being, on reciprocation of said cam shaft, thereby engageable by said valve stem at different points on its cam surface.

2. A fuel pumping apparatus for internal combustion engines, comprising in combination, two pumps, a piston rod common to both pumps, a reciprocable shaft common to both pumps, a single lever adapted to reciprocate both the rod and shaft, a valve in each pump, and an abutment at each extremity of said shaft adapted to operate respectively upon the valve stems of said valves, for the purpose set forth.

3. A fuel pumping apparatus for internal combustion engines, comprising in combination, two pumps, a piston rod common to both pumps, a reciprocable shaft common to both pumps, a lever adapted to reciprocate both the rod and shaft, a valve for each pump, and abutments carried by said shaft adapted to operate said valves, for the purpose set forth.

4. In a fuel pumping apparatus for internal combustion engines, the combination of a cylinder, a piston rod entering one end of the cylinder, a valve stem entering said cylinder, a reciprocable and rotatable shaft operatively connected to said piston rod, a cam shaped abutment mounted on said shaft and adapted to actuate said valve stem; said abutment being rotatable by said shaft and being, on reciprocation of said shaft, thereby engageable by a part of said valve stem at different points on its cam surface.

In witness whereof, I subscribe my signature, in the presence of two witnesses.

GEORGE F. MURPHY.

Witnesses:
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