

Jan. 31, 1939.

A. C. VOGELEI ET AL

2,145,379

FUEL PUMP

Filed April 27, 1938

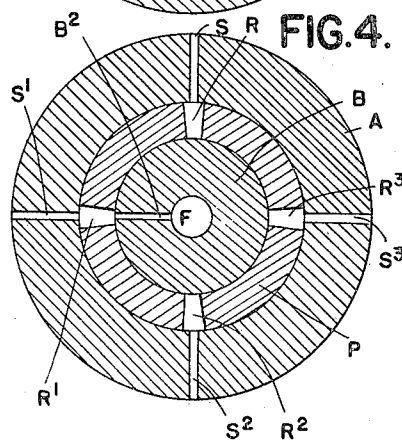
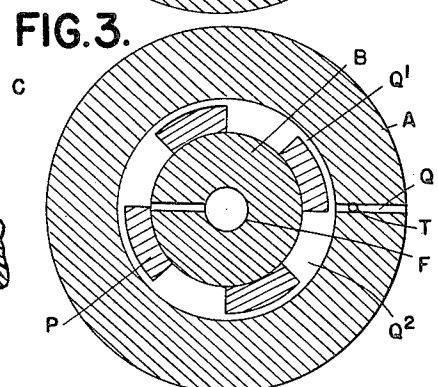
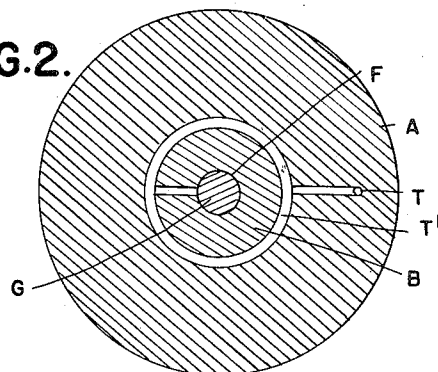
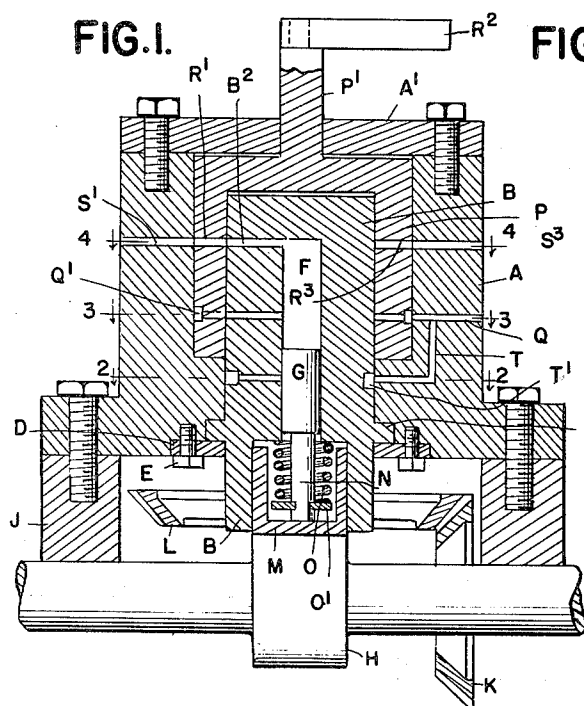


**FIG.5.**

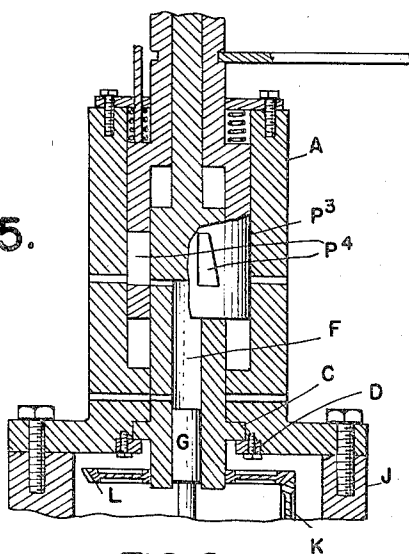
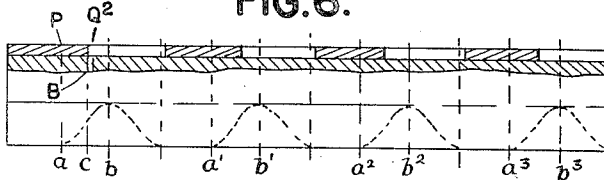


**FIG.6.**



INVENTORS  
ALVIN C. VOGELEI  
BY  
MARSHALL O. GROAT  
*Whittemore Hulbert & Belknap*  
ATTORNEYS

## UNITED STATES PATENT OFFICE

2,145,379

## FUEL PUMP

Alvin C. Vogeley and Marshall O. Groat, Melvin,  
Mich.

Application April 27, 1938, Serial No. 204,648

5 Claims. (Cl. 103—2)

This invention relates to fuel pumps such as are used in connection with multi-cylinder internal combustion engines of the fuel injection type. It is the object of the invention to obtain a simple construction which can be manufactured at low cost and which is capable of injecting fuel successively into the different cylinders and in variable amounts. It is a further object to obtain a construction which may be used with a variable number of cylinders requiring only a change in the cam and the location of the ports, but without change in the other elements of the structure. With these objects in view the invention consists in the construction as hereinafter set forth.

In the drawing:

Figure 1 is a vertical central section through our improved pump;

Figures 2, 3 and 4 are cross sections respectively on lines 2—2, 3—3 and 4—4 of Figure 1;

Figure 5 is a view similar to Figure 1, showing a modified construction;

Figure 6 is a diagram illustrating the means for varying the effective stroke of the piston and the quantity of fuel ejected thereby.

As shown in Figure 1, A is a suitable casing having an axial cylindrical bore for receiving a revoluble cylinder member B, this being held from axial movement by a flange C engaging a counterbore at the lower end of the casing A and by a retaining flange D detachably secured to the casing by screws E. The cylinder B has an axial bore F for receiving a reciprocating piston or plunger G. The latter is actuated by a cam or eccentric H on a shaft I extending transversely of the casing A and secured thereto by suitable bearings J. The shaft I also transmits rotary motion to the cylinder B through the medium of beveled gear wheels K and L which are preferably in a ratio of 1 to 2. This will cause the cylinder B to rotate at one-half the angular speed of the cam shaft.

The cylinder B has a portion B' extending below the casing A on which the gear L is mounted and this portion has a counterbore for receiving a reciprocating cup-shaped cylindrical shoe M which bears against the cam H. N is a shank of the piston G which extends downward into the cup M, and O is a spring sleeved on this shank, one end of which bears against a collar O' and the other end on a shoulder on the cylinder B. This forms the resilient means for retracting the piston G and for holding the shoe M in contact with the cam H.

The casing A is further provided in its upper

portion with a counterbore for receiving a controlling sleeve P which surrounds the cylinder B. This sleeve has an operating shaft P' passing outward through an aperture in a cover A' of the casing A, and a rock arm P<sup>2</sup> attached to the shaft forms a means of rotatively adjusting the sleeve. The liquid fuel to be ejected is supplied through a suitable conduit, not shown, and enters the casing A through a port Q which is in constant communication with an annular channel Q' in the sleeve P. This channel is connected with ports Q<sup>2</sup> extending through the sleeve and positioned to be in the path of a port B' in the cylinder B, which communicates with the bore F thereof. This port B' is located above the uppermost position of the piston G, so that whenever said port registers with one of the ports Q<sup>2</sup> there will be free passage for the fluid from the source of supply into the bore F. The cylinder B is further provided with a port B<sup>2</sup> which during rotation of said cylinder will successively register with ports R, R', R<sup>2</sup>, R<sup>3</sup> in the sleeve P and corresponding ports S, S', S<sup>2</sup>, S<sup>3</sup> in the casing A, which latter are connected by suitable conduits, now shown, with the several cylinders of the engine.

With the construction as thus far described, it will be understood that when rotation is imparted to the shaft I, this through the cam H and shoe M, will actuate the piston G to move the same upward in the bore F, while the spring O will effect the return movement. Simultaneously, the gears K and L will communicate rotary motion to the cylinder B, so as to successively register the ports B' and B<sup>2</sup> with the corresponding ports in the sleeve P and casing A. Assuming that the sleeve P is in a position where the ports Q<sup>2</sup> thereof will successively register with the port B' simultaneously with the piston G reaching the top of its stroke, then fluid will be admitted to the bore F during the entire downward stroke of the piston, after which the port B' passing out of registration with the port Q<sup>2</sup> will close the inlet during the upward stroke of the piston. This will result in ejecting a quantity of fuel equal to the full displacement of the piston during each upward stroke thereof, and the fuel so ejected will be distributed successively through the ports S, S', S<sup>2</sup> and S<sup>3</sup> to the several cylinders of the engine. It is, however, sometimes necessary to vary the quantity of fuel ejected, which can be accomplished by rotatively adjusting the sleeve P so that the port B' will register with each of the ports Q<sup>2</sup> before the completion of the upward stroke of the piston. This will permit the remainder of fluid displaced by the piston to re-

turn to the inlet instead of being ejected through the port B<sup>2</sup>. Such adjustment is permitted without restriction to the inlet of fluid during the entire downward stroke of the piston for the reason that the angular movement required for the complete reciprocation of the piston is less than the angular movement between successive reciprocations. This is indicated diagrammatically in Figure 6, in which  $a, a', a^2, a^3$  indicate the beginnings of successive upward strokes of the piston, and  $b, b', b^2, b^3$  indicate the beginnings of successive downward strokes of the piston. The sleeve P is shown as adjusted to a position where the ports Q<sup>2</sup> thereof will register with the port B' when the piston reaches the point c or before it has completed its upward stroke. This port Q<sup>2</sup> will then remain in registration with the port B' until after the completion of the downward stroke of the piston. In this manner the quantity of fuel ejected by each stroke of the piston can be varied as desired by merely rotatively adjusting the sleeve P. To render the measurement of fuel still more accurate, we preferably by-pass the fuel during the early portion of the upward stroke of the piston at which time it is traveling relatively slow. This is accomplished by providing a passage T connecting with the inlet passage Q and communicating with an annular groove T' in the cylinder B, which in turn communicates with a port T<sup>2</sup> located to communicate with the bore F' when the piston G is at the bottom of its stroke. As a consequence, the fluid in the bore F' will be by-passed through these ports and passages until the rise of the piston G will seal the port T<sup>2</sup> so that the effective stroke of the piston will be between this point and the point at which the port Q<sup>2</sup> opens into communication with the port B'. The adjustment of the sleeve P may be accomplished either manually or through the medium of an automatic governor, not shown.

A modified construction is shown in Figure 5, in which the sleeve P<sup>3</sup> instead of being adjusted rotatively, is moved axially. This sleeve is provided with ports P<sup>4</sup> having inclined contours, so that their registration with the inlet port B' is advanced or delayed by such vertical movement.

What we claim as our invention is:

1. A combined fuel injection and distributing pump comprising a ported cylinder, a piston therein, a ported distributor casing surrounding said cylinder and piston, means for simultaneously reciprocating said piston and rotating said cylinder in timed relation, and a sleeve intermediate said cylinder and casing controlling the ports thereof and adjustable to vary the effective injection stroke of said piston.

2. A combined fuel injection and distributing pump comprising a revolvable cylinder having inlet and outlet ports in different planes of rotation, a piston in said cylinder, a distributor cas-

ing surrounding said cylinder and piston having an inlet port and a series of outlet ports respectively in the planes of the corresponding ports of said cylinder, means for reciprocating said piston and rotating said cylinder in timed relation, and a sleeve intermediate said cylinder and casing having a series of ports in constant communication with the inlet port of said casing and successively registering with the inlet port of said cylinder, said sleeve being adjustable to change the timing of the opening and closing of the latter ports.

3. A combined fuel injection and distributing pump comprising a revolvable cylinder having inlet and outlet ports in different planes of rotation, a piston in said cylinder, a distributor casing surrounding said cylinder and piston having an inlet port and a series of outlet ports respectively in the planes of the corresponding ports of said cylinder, means for reciprocating said piston and rotating said cylinder in timed relation, and a sleeve intermediate said cylinder and casing having a series of ports in constant communication with the inlet port of said casing and successively registering with the inlet port of said cylinder, said sleeve being rotatively adjustable to change the timing of the opening and closing of the latter ports.

4. A combined fuel injection and distributing pump comprising a revolvable cylinder having inlet and outlet ports in different planes of rotation, a piston in said cylinder, a distributor casing surrounding said cylinder and piston having an inlet port and a series of outlet ports respectively in the planes of the corresponding ports of said cylinder, means for reciprocating said piston and rotating said cylinder in timed relation, and a sleeve intermediate said cylinder and casing having a series of ports in constant communication with the inlet port of said casing and successively registering with the inlet port of said cylinder, said sleeve being rotatively adjustable to change the timing of the opening and closing of the latter ports and being provided with a series of ports respectively in constant communication with the registering outlet ports in said cylinder and casing in all positions of adjustment of said sleeve.

5. A combined fuel injecting and distributing pump comprising a revolvable cylinder having inlet and outlet ports in different planes of rotation, a piston in said cylinder, a distributor casing surrounding said cylinder and piston having an inlet port and a series of outlet ports respectively in the planes of the corresponding ports of said cylinder, a cam shaft journaled in fixed relation to said casing, a constant ratio step-down gearing between said cam shaft and cylinder to rotate the latter at a slower speed, and a cam on said shaft for reciprocating said piston.

ALVIN C. VOGELI.  
MARSHALL O. GROAT.