

Feb. 1, 1938.

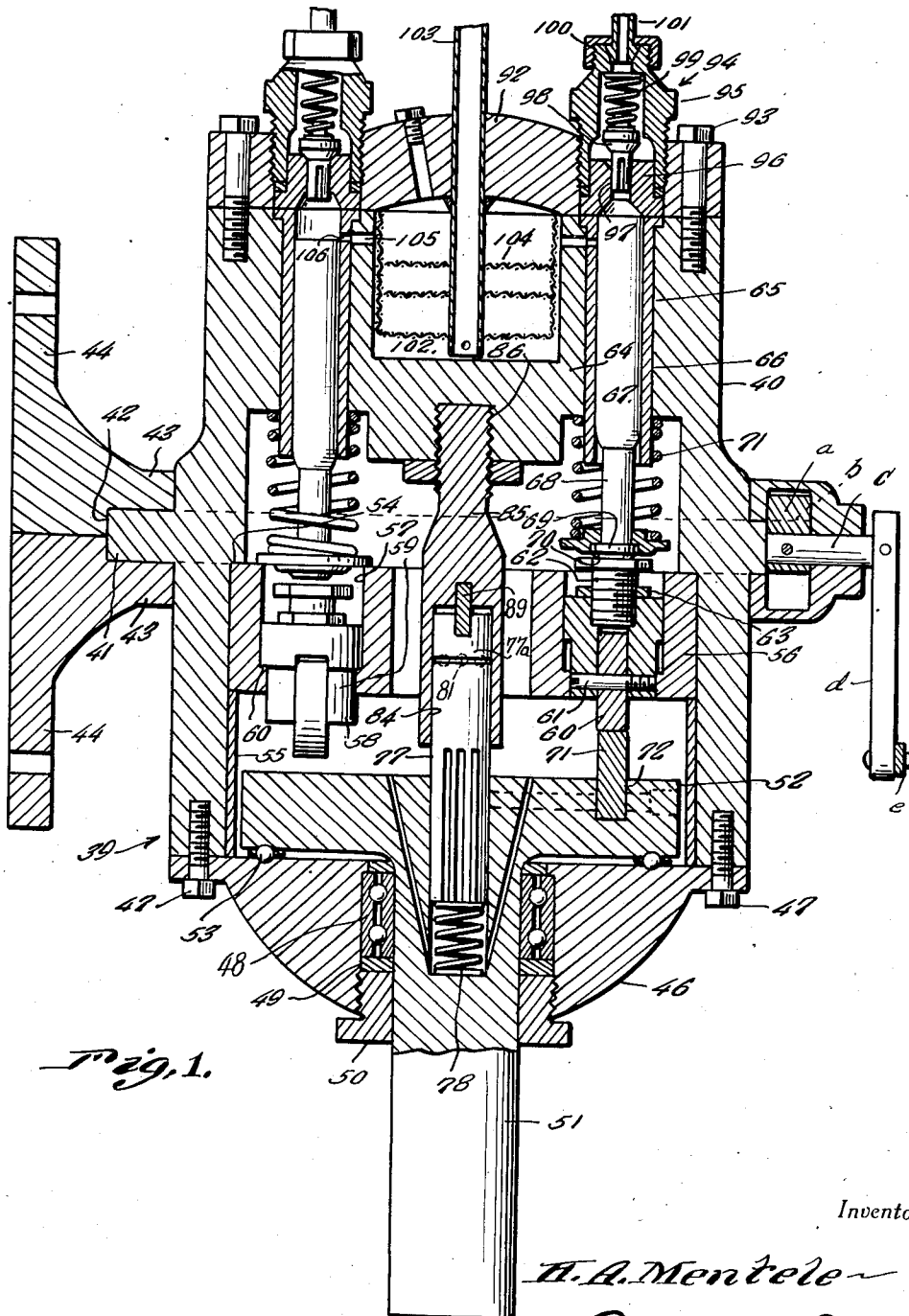
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2,107,079

FUEL INJECTION PUMP

Filed Dec. 22, 1936

3 Sheets-Sheet 1



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Fig. 2.

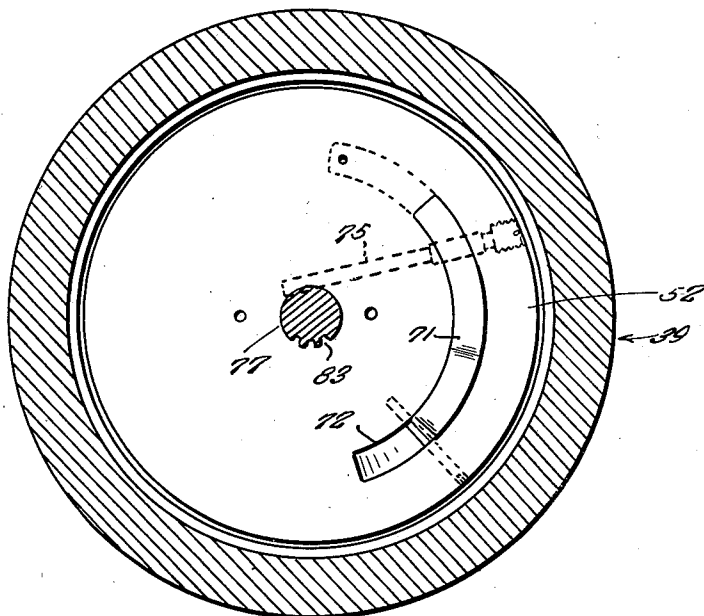


Fig. 3.

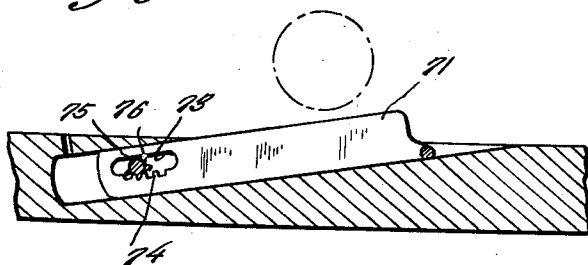


Fig. 4.

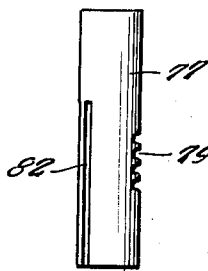


Fig. 5.

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Fig. 6.

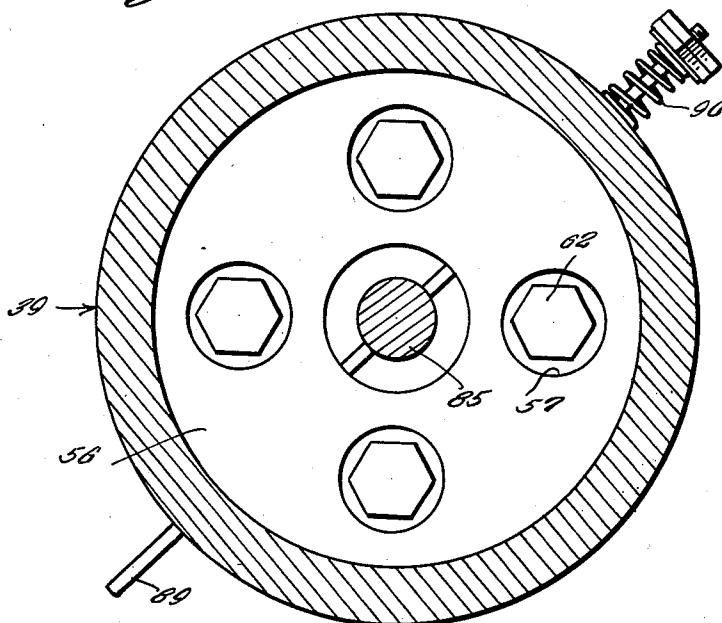


Fig. 7.

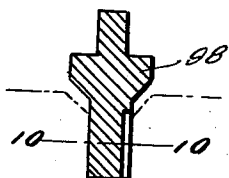
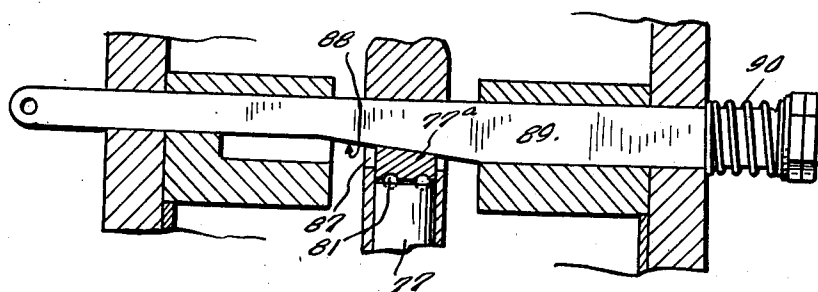


Fig. 8.

Fig. 9.



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UNITED STATES PATENT OFFICE

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FUEL INJECTION PUMP

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Application December 22, 1936, Serial No. 117,202

3 Claims. (Cl. 74—568)

This invention generically relates to internal combustion engines, and more especially to a mechanism or pump for injecting fuel under the requisite working pressure into the power cylinders of an internal combustion engine; and the invention together with its objects and advantages will be best understood from a study of the following description taken in connection with the accompanying drawings wherein:—

Figure 1 is an enlarged vertical sectional view through the injection pump.

Figure 2 is a transverse sectional view illustrating certain details hereinafter more fully referred to.

Figure 3 is a fragmentary detail view partly in section and partly in elevation showing a cam assembly for adjusting the strokes of the individual pumping units.

Figure 4 is an elevational view of a shaft hereinafter more fully referred to.

Figure 5 is a plan view of a shaft hereinafter more fully referred to.

Figure 6 is a transverse sectional view through a lower portion of the injector pump.

Figure 7 is a fragmentary vertical sectional view illustrating certain details hereinafter more fully referred to.

Figure 8 is a vertical sectional view through a valve member.

Figure 9 is a transverse sectional view taken substantially on the line 10—10 of Figure 9.

The pump 39 as clearly shown in Figure 1 comprises a drum or casing 40 which intermediate its end is equipped with a flange 41 that is engaged in a groove 42 formed by complementary circular clamping or retaining plates 43 which latter are provided with apertured attaching flanges 44 through the medium of which and bolts or other suitable fastening elements 45, the pump casing 39 is mounted on one side of the engine block (not shown). It will thus be seen that the pump cylinder or casing 39 is mounted perpendicularly and in a manner to be rotated either to the right or left as and for the purpose hereinafter made manifest.

For the casing 39 there is provided a bottom plate 46 bolted or otherwise secured to the casing as at 47. The bottom plate 46 is equipped with a bearing 48, washer 49, and gland nut 50 to accommodate a shaft 51 which is adapted to have one end thereof connected with a suitable driving part of the internal combustion engine so as to cause the shaft 51 to rotate relative to the casing 39.

On the inner end thereof the shaft 51 is pro-

vided with an enlarged head 52 that rests on ball bearings 53. Secured against movement within the pump casing 39 and confined within said casing between an internal shoulder 54 and a liner sleeve 55 as shown in Figure 1 is a relatively thick guide plate 56 that is provided, in the present instance, with four openings 57 there-through.

Arranged in each opening 57 is a roller assembly which consists of a substantially cylindrical body member 58 provided with a shoulder 59 that cooperates with a shoulder 60 internally of the opening 57 adjacent the lower end of the opening to limit downward movement of the body member 58. The body member 58 is also provided with a slot that accommodates a roller 60 journaled on a suitable screw or the like 61.

Also threaded in the upper end of the body member 58 is a tappet member 62 that is secured at the desired adjustment through the medium of a lock nut 63.

Also at its upper end the casing 39 is provided with a substantially solid web 64 which in the present instance is provided with four bores 65.

Associated with each bore 65 is a pump unit, there being one pump unit for each power cylinder 6. Each pump unit consists of a cylinder 66 having a snug fit within the bore 65 and a plunger or piston 67 having a snug working fit in the cylinder 65.

There is also one roller and tappet assembly for each of the aforementioned pump units and the piston or plunger 67 of each pump unit is provided at its lower end with a rod 68 on the lower end of which is a head 69 adapted to be engaged by its tappet 62. Also on said lower end of the piston or plunger rod 68 is a washer 70 against which bears one end of a spring 71 that serves to urge the head 69 into engagement with its tappet 62. The washer 70 also is adapted to about the member 56 for limiting the downward movement of a piston or plunger member 67.

For operating the piston plungers 67 in succession through the tappets 62 there is provided a cam bar 71 that has a working fit in an arcuate groove 72 provided therefor in the head 52.

As clearly shown in Figure 4 the cam bar 71 is provided at one end with a slot 73 and at the lower edge of the slot with teeth 74.

Suitably journaled in the head 52 of shaft 51 is a shaft 75 that has a tooth-equipped end 76 engaged in the slot 73 and cooperable with the teeth 74 for moving the cam element 71 to various positions of adjustment.

Also at the inner end thereof the shaft 51 is

provided with a socket in which a vertical stub shaft 77 has a working fit and is normally urged upwardly through the medium of a coil spring 78.

- 5 The shaft 77 is provided on one side thereof with teeth 79 that cooperate with teeth 80 on the adjacent end of the shaft 75 for rotating the shaft 75 incidental to a vertical movement of the shaft 77 and thereby effect an adjustment
10 of the cam 71.

On the upper end thereof the shaft 77 is provided with a separable section 77a resting on ball bearings 81 thus permitting the shaft 77 to rotate with the shaft 51, shaft 77 being provided
15 with vertical ways 82 to accommodate vertical keys 83 provided internally of the shaft 51.

Also the upper end of the shaft 77 is received within a socket 84 provided in the lower end of a pin 85, the upper end of which is threaded into
20 the web 64 as at 86.

At opposite sides of the socket 84 pin 85 is provided with slots 87, and at the upper end of the socket the pin 85 is provided with a groove complementary to a groove in the shaft section
25 77a to accommodate the cam portion 88 of a slide bar 89.

The bar 89 as shown in Figure 7 works through suitable openings provided therefor in the casing 39 and in the fixed guide member 56, and is normally urged in one direction through the medium
30 of a suitably provided spring assembly 90. At its relative opposite end the bar 89 is connected with a control link 91 that may be operated from the body of the automobile by the operator
35 for shifting the bar 89 to, for example, cause the shaft 77 to move downwardly. This downward movement of the shaft would of course through the medium of the engaging teeth 79 and 80 cause the shaft 75 to rotate. This rotative movement
40 of the shaft 75 would through the medium of the engaging teeth 76 and 74 cause the cam member 71 to be shifted so that a selected portion of the hump of the cam member 71 would be brought into engagement with the successive
45 rollers 60 as found desirable for adjusting the strokes of the pump pistons 67.

For the pump casing 39 there is also provided a cap 92 bolted or otherwise secured to the casing as at 93.

- 50 The cap 92 is drilled to accommodate for each of the individual pumping elements a valve assembly 94.

Each valve assembly 94 includes a valve casing 95 tapped into the cap 92, and a valve guide and seat 96 that has an apertured portion fitting within the lower end of the casing 95 to
55 accommodate the stem 97 of a valve element 98 that is normally urged to seat upon the seat 96 through the medium of a coil spring 99.

- 60 Suitably coupled with the upper end of the valve casing 95 as at 100 is one end of a conduit 101 which leads to and is, at one end, tapped into the casing 13 of the inlet valve assembly provided for a power cylinder 6. In this connection
65 it will be understood that in the present instance there are shown four pump assemblies one for each inlet valve assembly and there being in turn one valve assembly for each power cylinder 6, the internal combustion engine, in the present instance being illustrated as having four power
70 cylinders.

The web 64 is also hollowed out to provide centrally thereof a fuel chamber or reservoir 102 to which fuel is passed from a suitable source of supply through the medium of a fuel conduit

tube 103 that extends down into the reservoir 102 through an opening in the cap 92. Also arranged in the reservoir 102 is a suitable filtering medium 104.

The reservoir 102 is also provided for each of 5 the individual pumping assemblies with a lateral outlet port 105 that is in registry with a port 106 provided in the casing 65 of a pump assembly.

From the above it will be apparent that as the 10 shaft 51, driven in any manner found desirable or expedient, rotates, head 52 rotates therewith causing the cam bar 71 to engage the rollers 60 of the roller assemblies successively.

As the cam bar 71 engages the roller 60 of each 15 combination roller and tappet assembly said roller and tappet assembly is caused to move upwardly to engage the tappet 62 thereof with the head of the piston stem 68 causing the piston 67 to move upwardly. As each piston 67 moves upwardly it forces the fuel previously drawn into the cylinder 65 from the reservoir 102 through the valve assembly 94, the conduit 101, and the associated intake valve assembly 7 into the combustion chamber of the power cylinder 6 as is 25 thought to be apparent. Obviously as the cam bar 71 moves out of engagement with a roller 60 to engage the next succeeding roller, the first mentioned roller and tappet valve assembly under action of spring 71 moves downwardly 30 causing the piston 67 to move downwardly. As piston 67 moves downwardly below the inlet 106, fuel is drawn into said cylinder from the reservoir 102.

Also for venting the fuel passage or chamber 35 22 in each valve casing 13 there is provided a suitable vent plug 107.

Also for shifting or adjusting the cam member 71 so that the same will be brought into engagement with the successive rollers 60 for adjusting 40 the timing of the pump pistons 67 pump casing 39 is rotated about its vertical axis and relative to head 52. To this end there is provided an eccentric member *a*, operating in a slot *b* in flange 41 as shown in Figure 1. Eccentric *a* is mounted on a shaft *c* equipped with a crank *d* 45 to which is connected an operating link *e*.

It will thus be seen that either a direct manual adjustment of cam 71 or a remote controlling of the adjustment of cam 71 may be effected to advance or retard the time of contact between 50 cam 71 and the successive tappet assemblies 58 to the end that the injection of the fuel to the power cylinders may be changed from time to time and as found desirable in accordance with 55 the speed of the engine crankshaft.

It is thought that a clear understanding of the construction, utility and advantages of an invention of this character will be had without a more detailed description. 60

Having thus described the invention, what is claimed as new is:—

1. An adjustable cam for the delivery plunger of a fuel pump comprising a rotatable cam carrier embodying a disk having an inclined arcuate 65 groove in the surface thereof, a cam member slidably mounted in the groove and engageable with the plunger to actuate the same, a rack and pinion mechanism for slidably actuating the cam member in the groove to regulate the stroke of 70 the plunger and means operable outwardly of the pump for actuating the rack and pinion.

2. An adjustable cam for the delivery plunger of a fuel pump comprising a rotatable cam carrier having an inclined groove therein, a cam

member slidably mounted in the groove and engaged with the plunger to actuate the same, a rack on the cam member, a shaft journaled in the carrier, a pinion on the shaft operatively engaged with the rack for slidably adjusting the cam member in the groove to regulate the stroke of the plunger, a shaft slidably mounted in the carrier and movable axially thereof, gear segments operatively connecting said shafts and means operable outwardly of the pump for slidably actuating said last named shaft.

3. An adjustable cam for the delivery plunger of a fuel pump comprising a rotatable cam carrier having an inclined groove therein, a cam member slidably mounted in the groove and en-

gaged with the plunger to actuate the same, a rack on the cam member, a shaft journaled in the carrier, a pinion on the shaft operatively engaged with the rack for slidably adjusting the cam member in the groove to regulate the stroke of the plunger, a shaft slidably mounted in the carrier and movable axially thereof, gear segments operatively connecting said shafts, a manually operated slidably mounted rod projecting from the pump and positioned transversely with respect to said slidable shaft and camming means between the rod and said slidable shaft to actuate the latter.

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