

Oct. 6, 1931.

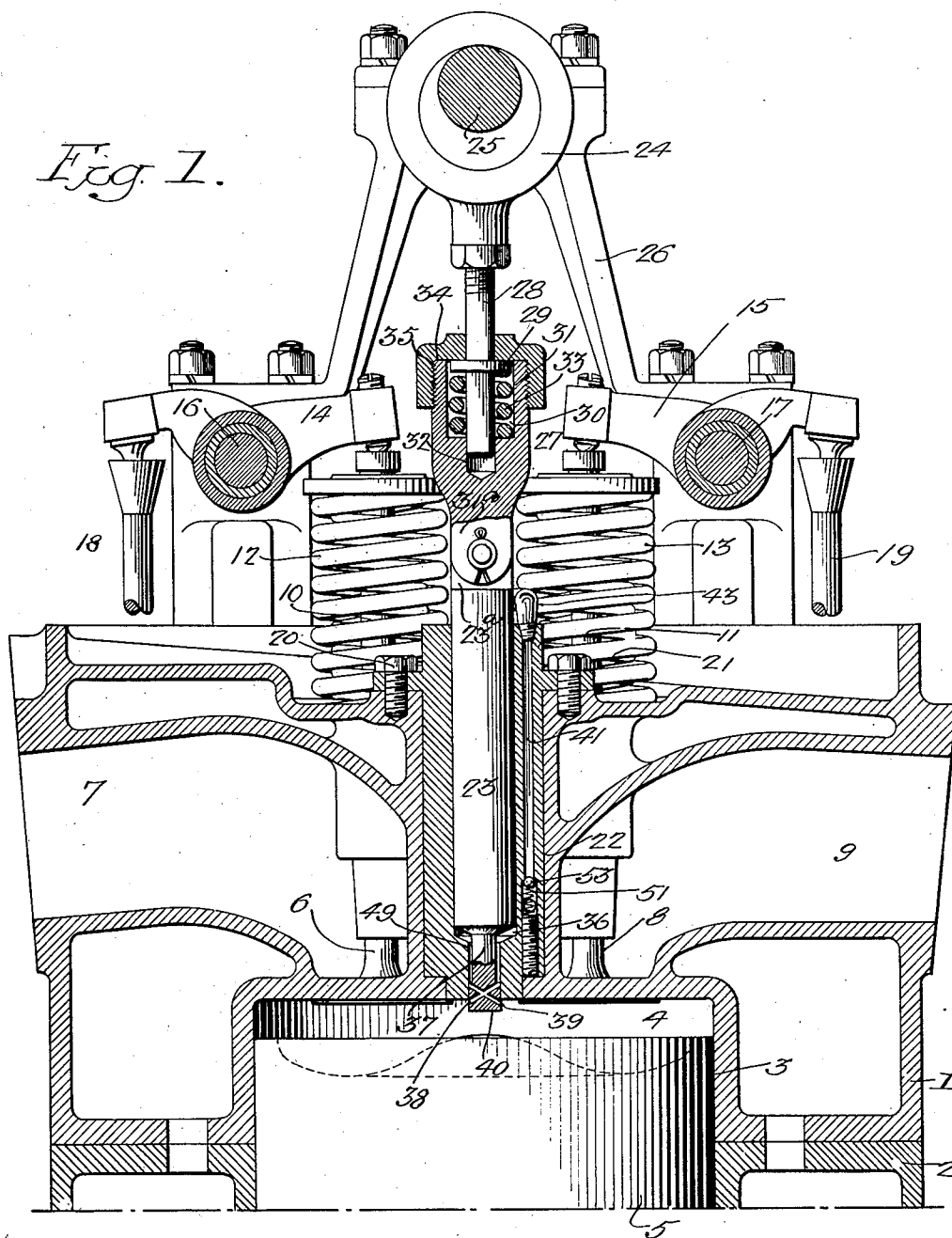
C. THOMAS

1,826,535

INJECTING MEANS FOR INTERNAL COMBUSTION MOTORS OR FOR DIESEL ENGINES

Filed Nov. 8. 1928

3 Sheets-Sheet 1



Inventor:-
Cyril Thomas
by his Attorneys
Howson & Howson

Oct. 6, 1931.

C. THOMAS

1,826,535

INJECTING MEANS FOR INTERNAL COMBUSTION MOTORS OR FOR DIESEL ENGINES

Filed Nov. 8, 1928

3 Sheets-Sheet 2

Fig. 2.

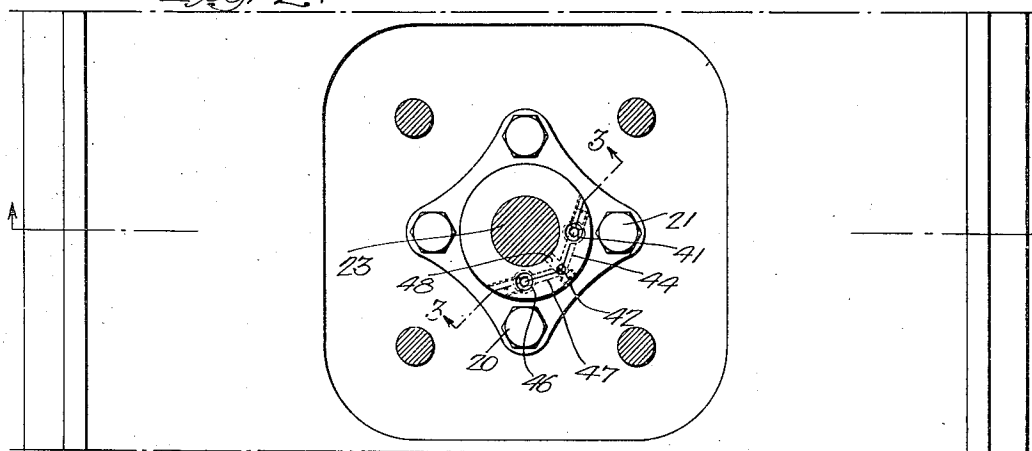


Fig. 3.

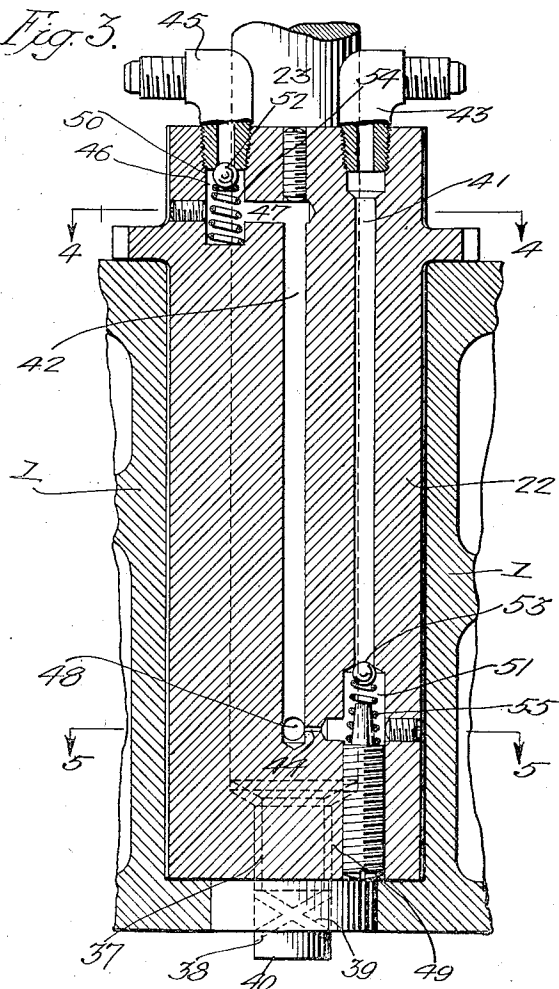


Fig. 4.

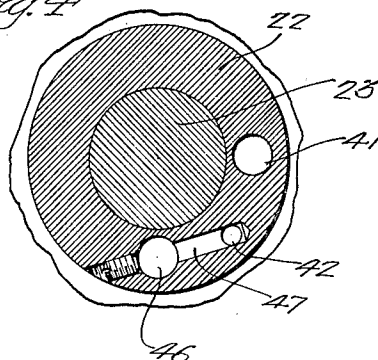
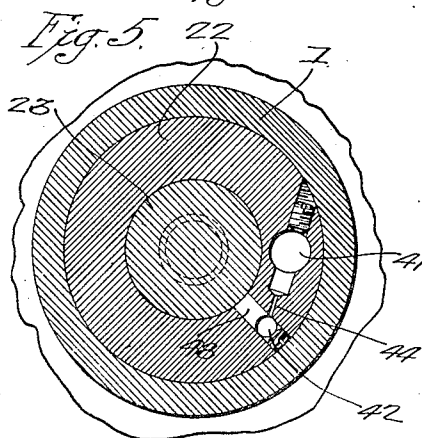


Fig. 5.



Inventor
Cyril Thomas
By his Attorneys,
Howson & Howson

Oct. 6, 1931.

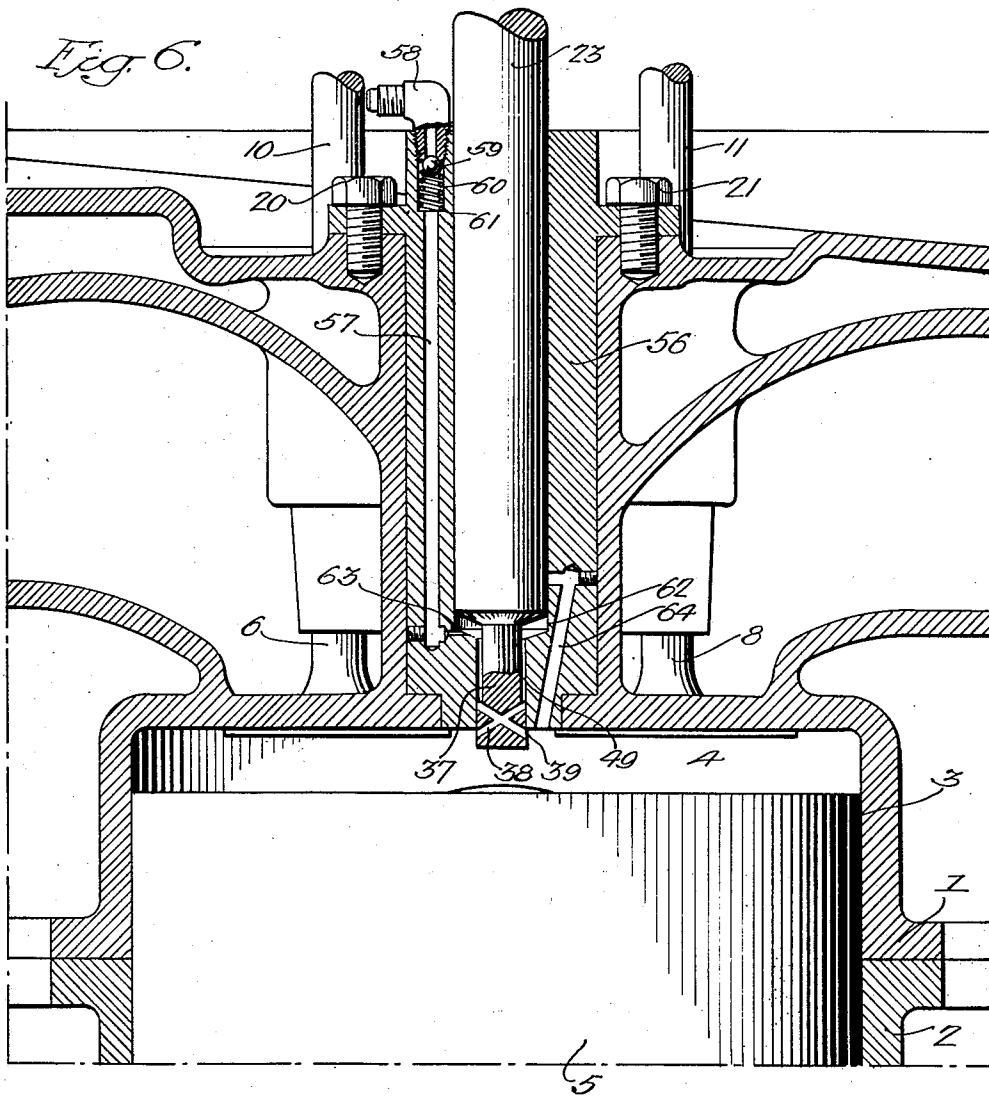
C. THOMAS

1,826,535

INJECTING MEANS FOR INTERNAL COMBUSTION MOTORS OR FOR DIESEL ENGINES

Filed Nov. 8, 1928

3 Sheets-Sheet 3



Inverto:-
Cyril Thomas
by his Attorneys.
Howson & Howson

UNITED STATES PATENT OFFICE

CYRIL THOMAS, OF YEADON, PENNSYLVANIA, ASSIGNOR TO THE J. G. BRILL COMPANY,
OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA

INJECTING MEANS FOR INTERNAL COMBUSTION MOTORS OR FOR DIESEL ENGINES

Application filed November 8, 1928. Serial No. 317,972.

This invention relates to injection means for the fuel supply of an internal combustion engine, and is more particularly concerned with injecting the fuel supply into the combustion chamber at a predetermined pressure.

An object of the invention is to force a fuel supply into the combustion chamber of an internal combustion engine at a predetermined pressure.

Another object of the invention is to force a fuel charge into the combustion chamber of an internal combustion engine by means of air at a predetermined pressure.

Still another object is to force a fuel supply into the combustion chamber of an internal combustion engine at a predetermined point in the compression stroke, under a predetermined pressure.

Yet another object is to devise means to uniformly supply fuel to an internal combustion engine.

Other objects will appear hereinafter.

In the drawings, which illustrate several modifications of my invention,

Fig. 1 is a vertical section through a cylinder head and a portion of a cylinder block, employing the preferred form of the invention;

Fig. 2 is a plan view showing details of the shaft which houses the plunger;

Fig. 3 is a longitudinal section taken on the line 3—3 of Fig. 2;

Figs. 4 and 5 are transverse sections taken respectively, on the lines 4—4 and 5—5 of Fig. 3, while

Fig. 6 is a vertical section showing a modified form of my invention.

At 1 is shown a cylinder head which is secured by any suitable means to a cylinder block 2. The head 1 and block 2 cooperate to form the usual cylinder chamber 3, the top of which comprises a combustion chamber 4. Within the cylinder rides any suitable type of piston 5.

As will be noted, the piston chamber is provided with valves which may be of any conventional type. As shown, these valves are of the poppet type and comprise an exhaust valve 6 opening into an exhaust port 7 and an admission valve 8 opening into an ad-

mission port 9. The valves 6 and 8 are respectively connected to stems 10 and 11, which in turn, may be rocked against the tension of springs 12 and 13 by suitable means such as rocker arms 14 and 15. In the form shown, these rocker arms are carried on rocker shafts 16 and 17, and are actuated by push rods or other suitable means 18 and 19, actuated by a cam shaft or cam shafts (not shown).

Secured to the cylinder head by any suitable manner as by bolts 20 and 21, and extending vertically therethrough, is a shaft 22, provided with a plurality of longitudinal channels. This shaft houses in its central channel a plunger 23. This plunger is vertically reciprocable preferably by means of an eccentric 24 rotated on shaft 25 which is actuated from any suitable source. As shown, the eccentric shaft and its strap 24 are mounted on the cylinder head by means of a yoke 26. Between the plunger 23 and the eccentric strap 24 is preferably provided a safety spring assemblage 27.

Extending downwardly from the strap 24 is a rod 28 having an upset or annular flanged portion 29 extending outwardly therefrom approximately centrally thereof. This plunger is received in an annular opening 30 of a cylindrical casing 31. The opening 30 communicates at its closed end with a concentric opening 32 of a diameter substantially equal to that of rod 28. Seated in the opening 30 and arranged around the opening 32 is a coiled spring 33. This spring at its other end abuts the under face of plunger 29, the upward movement of the flange being limited by a suitable locking nut or cap 34 which is preferably provided with threads 35 cooperating with similar threads on the casing 31. The casing preferably terminates at its lower ends in forked arms 31a, which engage a flattened extension 23a of the plunger 23. The arms 31a and the portion 23a are preferably provided with cooperating eyes through which extend a bolt. This bolt may be secured in position by suitable means such as cotter pins.

This spring assemblage normally has no function. However, in the instance that the plunger 23 could not for any reason complete

its stroke, the rod 28 is vertically reciprocable in the opening 32, being forced downwardly by the eccentric strap 24 against the resistance of the coiled spring 33.

The plunger 23 reciprocates in a channel 36, and at its lower end may have an extended portion 37 of smaller diameter, which terminates at its outer end in a headed portion of slightly greater diameter. This diameter however, is considerably less than that of the plunger 23. The plunger 37 is preferably provided in its end with a plurality of cross-drilled holes 38 and 39. These holes in the preferred form terminate at their inner ends at the juncture of the extended portion 37 with its headed end 40.

As perhaps better shown in Fig. 3, the shaft 22 is provided with a plurality of longitudinally extending channels 41 and 42. The channel 41 at its upper end connects with a suitable gland or inlet 43 for the admission of a fuel charge. At its lower end the channel 41 communicates by means of a small opening 44 with the channel 42, which channel contains air under a predetermined pressure from gland or inlet 45. As shown, the inlet 45 communicates directly with a short channel 46, offset slightly from the channel 42, with which it communicates by means of a short connecting channel 47.

In the normal functioning of the injection device, fuel oil is admitted through the gland 43 into the channel 41. At the lower end of this channel, the fuel oil communicates with the channel 42 through which air is forced under pressure from the gland 45 which may be connected to any suitable source of air pressure. The mixture of air and fuel is then forced through the channel 48 which opens into the channel in which the plunger 23 reciprocates. The eccentric strap 24 preferably operates at cyclic frequency, and thus in a four cycle engine it operates at one-half engine speed. Consequently, at some time previous to the power stroke, the plunger 23 will be withdrawn to a point where the opening from the channel 42 will be uncovered by the travel thereof. At this time the air from the channel 42 carries the fuel mixture into the channel in which the plunger rides. The plunger 23 then starts on its downward stroke and as the plunger is depressed, the mixture in the annulus 49 provided by the extended portion 37, is compressed. The travel of the plunger 23 is so timed that at a predetermined moment when injection is desired the extension 37 extends into the cylinder a sufficient distance to uncover the supply holes 38 and 39, which causes an injection of fuel under pressure.

It is to be noted that even though the charge may be under a very high compression, admission does not start until the holes 38 and 39 are definitely uncovered. In this manner, admission of a fuel into the combustion

chamber is so controlled that it has been compressed to a predetermined pressure prior to admission, and cannot be admitted until it has reached such pressure.

In order to prevent the compression of the cylinder forcing the air and fuel upwardly through channels 41 and 42, these channels are preferably controlled by means of suitable check valves 50 and 51, shown as being of the ball type, having balls 52 and 53, seating in the openings of gland 45 and channel 41, respectively, and being resiliently pressed thereagainst by means of springs 54 and 55, respectively. While the check valves will permit the flow of air and fuel downwardly from the inlets, they will prevent any flow of the two materials or other mixture upwardly through the inlets.

In the modification shown in Fig. 6, advantage is taken of the pressure provided by the compression stroke of the internal combustion engine to supply the means for forcing the fuel supply into the annulus 49. As shown, the shaft 56 is provided with a fuel channel 57 which is supplied with fuel through a gland or inlet 58 which at its inner end provides a seat for the ball 59 of a ball or other suitable check valve 60. This ball is properly seated to prevent the egress of fuel or fuel mixture by means of a spring 61. The channel 57 communicates with the channel 62 by means of a connection 63, while a channel 64 forms a communication between the cylinder chamber 3 and the channel 62. The remainder of the construction is substantially similar to that shown in Figs. 1—5.

With this arrangement, the plunger 23 is withdrawn, permitting communication between the channel 64 and the channel 62. However, during the compression stroke of the piston 5, this communication is interrupted. During this period, the air pressure within the cylinder varies from approximately 100 to 250 pounds per square inch. The plunger 23 is then depressed, uncovering the cross drilled holes 38 and 39 to the combustion chamber at the time of the injection, substantially in the manner described in connection with Figs. 1—5.

While this device is shown as being applied to a four cycle engine, it is obvious that it is more or less independent of the type of engine used. The primary feature of novelty resides in the fact that the charge may be compressed to any desired amount before the initiation of injection.

It is of course, understood that the invention is susceptible to numerous modifications and adaptations, and it is intended that it be limited only by the scope of the appended claims.

I claim:

1. In an internal combustion engine, means for forcing a fuel mixture into the combustion chamber comprising a plunger reciprocated

at cyclic frequency, and terminating at its end adjacent the combustion chamber in an extension of reduced section, the said extension in turn terminating at its end adjacent the combustion chamber in a headed portion of slightly greater diameter, the headed portion being provided with crossed holes opening at their inner end adjacent the juncture of the extension and the headed portion, and being adapted at their outer ends for communication with the combustion chamber of the engine and a shaft adapted to have one end exposed in the engine cylinder, said shaft having a main bore and a reduced bore in which said plunger and head, respectively, have a sliding fit, the reduced bore opening through said end of the shaft, means for admitting fuel to the bore of the shaft at the junction of said bore with the reduced bore and means for reciprocating said plunger.

2. Fuel injection means for internal combustion engines comprising a body having a main bore and a communicating reduced bore opening through opposite ends thereof, means for supplying fuel to the main bore at the junction of the bores, a plunger operating in the main bore and having a reduced extension provided with a head fitting in the reduced bore, a passage communicating with the main bore at a point spaced above the junction of the bores and with that end of the body through which the reduced bore opens, means for reciprocating the plunger to cause cyclic projection of said head from said end and passages in said extension in communication with the space between the end of the plunger and the shoulder formed by the junction of the bores, said passages being opened on the projection of said head from said body.

3. Fuel injection means for internal combustion engines comprising a body having a main bore and a communicating reduced bore opening through opposite ends thereof, means for supplying fuel to the main bore at the junction of the bores, a plunger operating in the main bore and having a reduced extension provided with a head fitting in the reduced bore, a passage communicating with the main bore at a point spaced above the junction of the bores and with that end of the body through which the reduced bore opens, means for reciprocating the plunger to cause cyclic projection of said head from said end and passages in said extension in communication with the space between the end of the plunger and the shoulder formed by the junction of the bores, said passages being opened on the projection of said head from said body, primary movement of the plunger in a direction to cause projection of said head closing the end of the first-named passage communicating with the bore.

4. Fuel injection means for internal com-

bustion engines comprising a body having a main bore and a communicating reduced bore opening through opposite ends thereof, means for supplying fuel to the main bore at the junction of the bores, a plunger operating in the main bore and having a reduced extension provided with a head fitting in the reduced bore, a passage communicating with the main bore at a point spaced above the junction of the bores and with that end of the body through which the reduced bore opens, means for reciprocating the plunger to cause cyclic projection of said head from said end and passages in said extension in communication with the space between the end of the plunger and the shoulder formed by the junction of the bores, said passages being opened on the projection of said head from said body, said passages each opening at one end through the upper end of the head at the sides of the extension and at its opposite end through the side walls of the head.

CYRIL THOMAS.

90