May 8, 1928. 1,669,398

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DISTRIBUTOR FOR COMBUSTION ENGINES

Filed Dec. 20, 1926

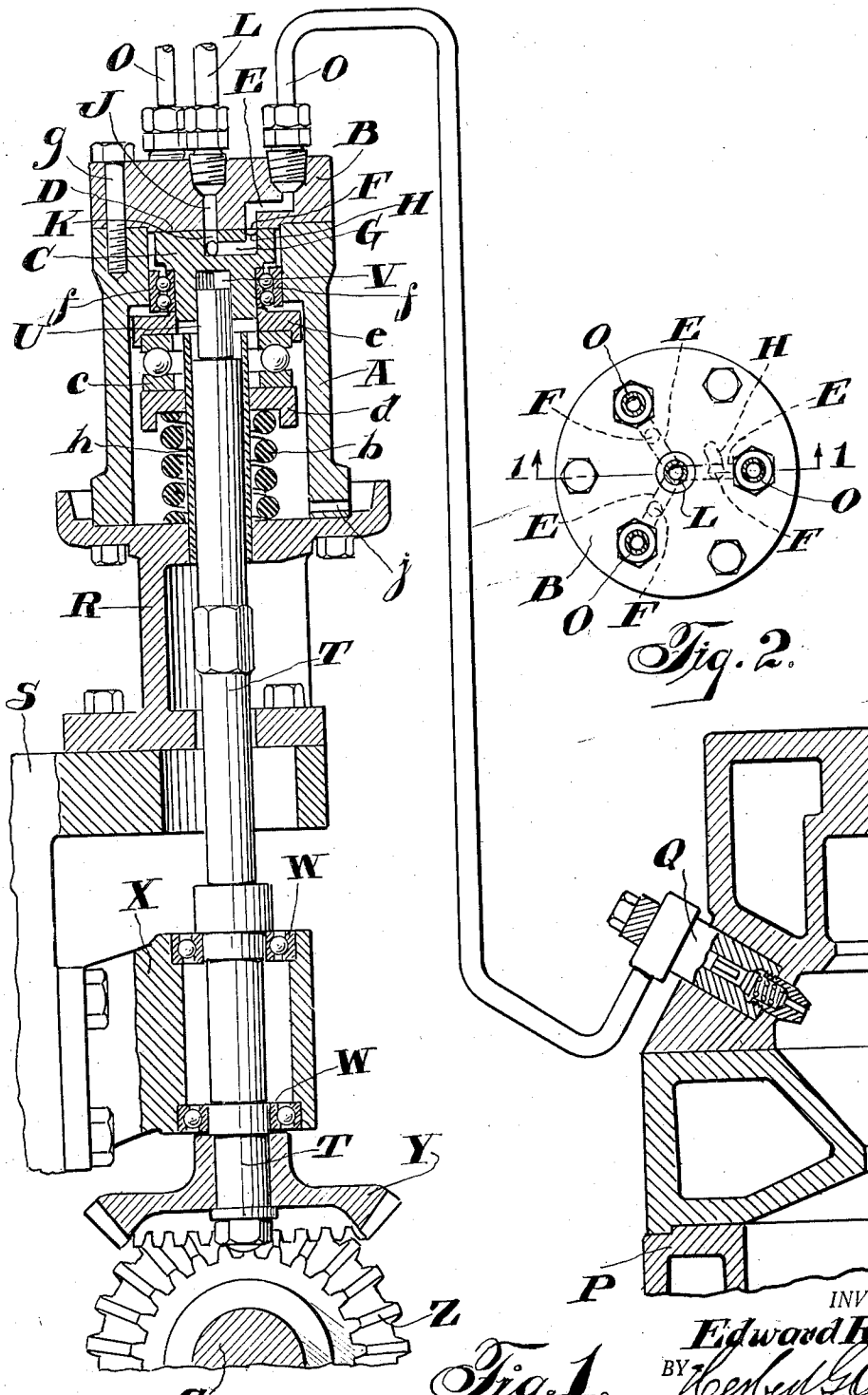

Fig. 1.

Fig. 2.

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Patented May 8, 1928. 1,669,398

UNITED STATES PATENT OFFICE.

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DISTRIBUTOR FOR COMBUSTION ENGINES.

Application filed December 20, 1926. Serial No. 155,917.

This invention relates to internal combustion engines and more particularly to a device for distributing liquid fuel from a single source to a plurality of cylinders and without the admixture of air.

Each cylinder of an internal combustion engine should be supplied with a charge of fuel preferably of exactly the same amount as every other cylinder. Practically this is possible only when a single fuel pump is used to inject the fuel into all of the cylinders. If this arrangement is used there is provided a fuel distributor by means of which the discharge line from the oil pump is connected to the pipes or passages leading to the injection nozzles successively in the firing order of the cylinders. Hitherto it has been the practice to provide a valve-like member which registers successively with the fuel supply lines to the injection nozzles and to operate the valve member intermittently. In that case the valve member is moved only during a period of substantially no pressure in the fuel supply line from the pump and while moving the valve acts as a check valve preventing the fuel oil from escaping from the fuel supply line.

It is an object of this invention to operate the distributing valve as a pressure relief valve during the time at which the valve is being shifted from one fuel injection position to another. In accordance with this invention the valve is set to relieve the pressure in the fuel supply line at some pressure supposedly in excess of the maximum normal pressures obtained in the fuel lines to the injection nozzles. Inasmuch as the increased fuel line pressures only tend to reduce the pressure of contact between the valve and its seat this type of valve may be continuously moving.

Other objects and advantages of the invention will be in part obvious and in part pointed out hereinafter.

In the drawing forming part of the specification and in which similar reference characters refer to similar parts,

Figure 1 is a side elevation in section of a fuel distributing device, the section being taken along line 1—1 of section 2 looking in the direction of the arrows, constructed in accordance with the practice of the invention including the driving connections therefor and one of the engine cylinders provided with an injection nozzle associated with the distributor. For simplicity of illustration the remainder of the cylinders and nozzles are not shown.

Figure 2 is a top plan view of the distributor shown in Fig. 1.

Referring to the drawings, the distributor comprises a casing A having a head B suitably attached thereto as by means of the bolts *g*. The head B is provided with a flat surface D on its lower face which provides a seat for the valve member C adapted to move constantly on said seat and is constantly rotated thereon in this instance.

The casing A is supported by a mounting R supported in a bracket S of the engine base. The mounting R is preferably provided with a bearing sleeve *h* within which is adapted to rotate a shaft T having a square head U engaging the valve member C in a square aperture V in its lower face. Preferably the square end U may slide freely in the aperture B so as to permit longitudinal movement of the valve C with respect to the shaft T and also permit slight relative sidewise movement. The shaft T is also journaled in anti-friction bearings W fitted in bracket X and is driven at a suitable speed from the bevel gear Z by means of a gear Y.

The valve member C is adapted to rotate about a central supply passage J as an axis, there being a bore K in the valve C constantly registering with the supply passage J. The supply passage J is associated with a fuel pump (not shown) of any suitable type by means of a supply pipe L.

The central bore K of the valve C leads to a radially extending passage G in the valve C terminating in a distributing port H in the face of the valve C contacting with the head B at the face D.

As shown in Fig. 2 there are a plurality of ports F arranged in the head B leading from the face D through suitable passages E to pipes O arranged to conduct the fuel oil to spray nozzles Q secured in any suitable manner in the combustion heads of the engine cylinders P. In this instance three ports F are provided for illustration, it being assumed that the engine associated with the pump in this instance has three cylinders and corresponding injection nozzles Q. As the valve member C is rotated by the

shaft T in its journal provided by the anti-friction bearing of the port H which may be called the distributing port registers successively with the ports F permitting fuel oil to pass from the supply passage G into the reservoir passages and thence through the pipes O to the nozzles Q. Usually in internal combustion engines of the solid fuel injection type the period of injection is somewhat prolonged to produce a continued combustion of the fuel within the combustion chamber of the cylinder and as is well known suitable devices are usually employed to regulate the power delivered by the engine or the speed of the engine. Such devices are adapted to lengthen or shorten the period of injection by by-passing the fuel discharged by the injection pump.

As has been said above it is an object of this invention to permit continuous motion of the valve member C as distinguished from the method heretofore provided of rotating said valve member intermittently. To this end means is provided to permit the fuel oil to escape when the ports H and F are not registering with each other.

In devices heretofore provided the valve corresponding to the member C has been held to its seat corresponding to the surface D by the pressure of the fuel being injected. This device differs from the former practice in that the pressure of the fuel being injected tends to lift the valve member C from its seat. This tendency is counteracted by a coil spring *b* exerting pressure against the valve member C through the medium of two discs *d* and *e* and separated by an anti-friction bearing *c* and pressing against the bearing *f*. The coil spring *b* at its opposite end is seated on the mounting R. Relative rotation of the valve member C with respect to the coil spring *b* is permitted through the thrust bearing *c*.

The tension in the spring *b* is adjusted initially to be in excess of the pressure normally exerted by the fuel oil in the passage J against the valve member C so that under normal operating conditions, there being no abnormal stoppage in the discharge pipes O, no substantial leakage occurs between the valve member C and its seat on the face D. Should such a stoppage occur or the fuel pressure become excessive for any reason, the pressure of the fuel is adapted to lift the valve member C from its seat and to allow the fuel oil to escape into the interior of the casing A whence it is adapted to be drained out through the opening *j*.

I claim:

1. A fuel supply apparatus for multi-cylinder internal combustion engines comprising a continuously moving distributing valve member and a relatively stationary seat, said valve seat having a plurality of discharge ports and a fuel supply port, and said moving member having a passage in connection with said supply port and terminating in a distributing port adapted to register selectively with said discharge ports and resilient means to hold said valve member in contact with said stationary member at a pressure slightly in excess of that normally due to pressure in said fuel supply port.

2. A fuel distributing apparatus for multi-cylinder internal combustion engines, comprising a head having a bearing surface forming a valve seat and a plurality of passages in said head terminating at ports in said valve seat and adapted to be associated with corresponding cylinders, a rotary distributing valve in the form of a disc having a valve surface contacting with the valve seat on the head and formed with a distributing passage terminating in a port registering successively with the ports in the head as the valve rotates, means for forcing the rotating valve resiliently against the valve seat on the head at a pressure slightly in excess of that normally due to pressure in said distributing passage, and means for supplying liquid fuel to the distributing passage in the valve.

3. A fuel distributing apparatus for multi-cylinder internal combustion engines, comprising a head having a bearing surface forming a valve seat and a plurality of passages in said head terminating at ports in said valve seat adapted to be associated with corresponding cylinders, a rotary distributing valve in the form of a disc having a valve surface contacting with the valve seat on the head and formed with a distributing passage terminating in a port registering successively with the ports in the head as the valve rotates, means for forcing the rotating valve resiliently against the valve seat on the head at a pressure slightly in excess of that normally due to pressure in said distributing passage, and a passage in the head in constant communication with the distributing passage in the valve for supplying liquid fuel to the valve.

4. A fuel distributing apparatus for multi-cylinder internal combustion engines, comprising a head having a bearing surface forming a valve seat and a plurality of passages in said head terminating at ports in said valve seat and adapted to be associated with corresponding cylinders, a rotary distributing valve in the form of a disc having a valve surface contacting with the valve seat on the head and formed with a distributing passage terminating in a port registering successively with the ports in the head as the valve rotates, means for forcing the rotating valve resiliently against the valve seat on the head at a pressure slightly in excess of that normally due to pressure in said distributing passage, and a source of fuel sup-

ply for the said distributing passage intermittently under pressure, said distributing port in the rotary valve being out of registry with any of the ports in the head during periods of substantially no pressure in said fuel source.

5. A fuel distributing apparatus for multi-cylinder internal combustion engines, comprising a head having a bearing surface forming a valve seat and a plurality of passages in said head terminating at ports in said valve seat and adapted to be associated with corresponding cylinders, a rotary distributing valve in the form of a disc having a valve surface contacting with the valve seat on the head and formed with a distributing passage terminating in a port registering successively with the ports in the head as the valve rotates, means for forcing the rotating valve resiliently against the valve seat on the head at a pressure slightly in excess of that normally due to pressure in said distributing passage, and a passage in the head in constant communication with the distributing passage in the valve for supplying liquid fuel to the valve, said supply passage in the head being intermittently under pressure from a source of fuel supply, and the distributing port in the rotary valve being shifted by rotary movement from one head port to another during periods of substantially no pressure in said fuel source.

6. A fuel supply apparatus for multi-cylinder internal combustion engines comprising a continuously moving distributing valve member and a relatively stationary seat, said valve seat having a plurality of discharge ports and a fuel supply port, and said moving member having a passage in connection with said supply port and terminating in a distributing port adapted to register selectively with said discharge ports, a non revolving spring to hold said valve member in contact with said stationary member, and a driving member loosely coupled to said valve member to permit said valve member to find its seat without interference.

In testimony whereof I have signed this specification.

EDWARD RATHBUN.