W. SCHENKER.

FUEL INJECTOR.

APPLICATION FILED FEB. 6, 1913.

1,238,828. Patented Sept. 4, 1917.

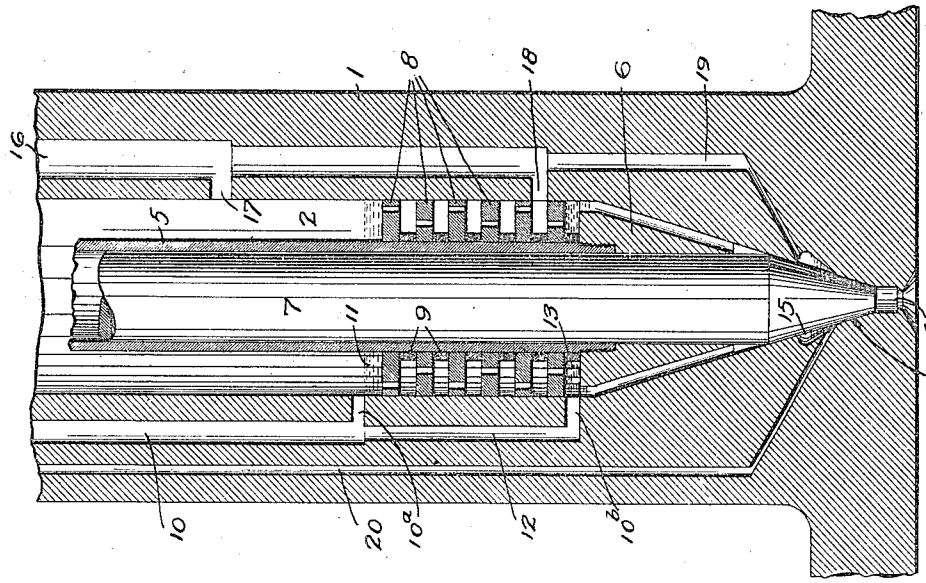


Fig. 2.

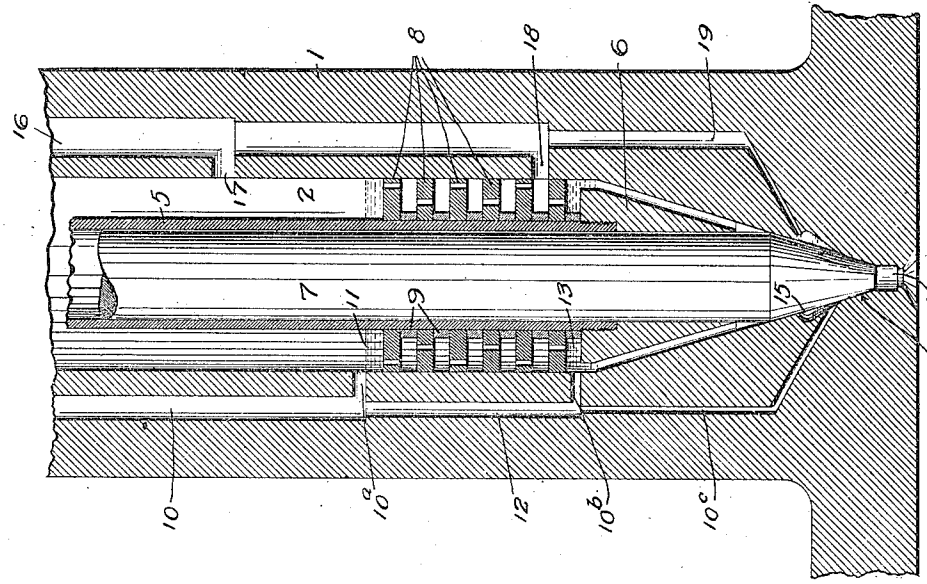


Fig. 1.

WITNESSES

K. L. Brandt

INVENTOR

Walter Schenker

BY

ATTORNEY

UNITED STATES PATENT OFFICE.

WALTER SCHENKER, OF WINTERTHUR, SWITZERLAND, ASSIGNOR TO BUSCH-SULZER BROS.-DIESEL ENGINE COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF MISSOURI.

FUEL-INJECTOR.

1,238,828. Specification of Letters Patent. Patented Sept. 4, 1917.

Application filed February 6, 1913. Serial No. 746,521.

To all whom it may concern:

Be it known that I, WALTER SCHENKER, a citizen of the Republic of Switzerland, residing at Stadthausstrasse 44, Winterthur, Switzerland, have invented the following-described new and useful Improvements in Fuel-Injectors.

The invention is an improvement in fuel injection mechanism for Diesel engines and engines of like type, and consists in a simple and compact oil-atomizing structure adapted to receive each charge of oil in subdivided portions which are independently subjected to the action of compressed air from a common source and projected thereby through a common nozzle into the combustion space of the engine. By such division and disposition of the fuel charge, the improved valve mechanism of this invention produces thorough atomization of large as well as smaller charges of fuel, and is also adapted for use with different kinds of oil as will be later explained.

In the drawings forming part hereof, Figure 1 is a vertical central section through a fuel injecting valve showing a construction constituting this invention; and Fig. 2 is a like sectional view showing a modified form.

In this embodiment of the invention, the main casing of the valve mechanism is marked 1 and may be regarded as an integral part of the cylinder-head or a separate part removably attached thereto or to the wall of the combustion chamber, as will be readily understood. The chamber 2 within this casing is tapered or coned at its lower end to form the valve seat 3, and contains a fixed central sleeve 5, the lower end of which carries a coned head 6 of such size and position in the chamber as to leave an annular conical space between itself and the wall of the chamber. The valve stem 7, constituting the fuel valve proper, is fitted to slide in and through the sleeve 5, protruding beyond the sleeve head 6 to the valve seat, where it controls the nozzle orifice 4 which leads to the combustion space of the engine. It will be understood that the sleeve 5 may be held fixed in the valve casing by any suitable means at the top of the latter, not necessary to be here shown or described, and that the fuel valve stem 7 passes outwardly through the sleeve and such means to a connection with an appropriate operating mechanism after the manner of the usual fuel valve.

The annular space between the sleeve and the wall of the valve chamber is occupied by a series of superposed perforated disks or plates 8 conforming in shape and size to the said annular space and separated from each other by means of an alternate series of spacers 9. These devices form a part of the atomizing mechanism of the valve.

In Fig. 1 fuel oil is admitted through a common oil channel 10, which may be bored in the casing and which distributes the oil charge in appropriate amounts, a part going through a branch passage 10^a to the upper part 11 of the atomizing mechanism, another part going through a continuing channel 10^b of less cross-sectional area, to the lower part of the said mechanism marked 13, and a part going through a further restricted channel 10^c to a further place of deposit marked 15, the latter being an annular cavity or trough set in or close to the path of the compressed air. This cavity also forms part of the atomizing mechanism and is preferably formed in the conical seat of the valve 7, as shown in the drawing, though it may be located above such seat if desired. The relative cross-sectional areas of the successive passages 10^a, 10^b and 10^c are designed in accordance with the relative amounts of fuel it is desired to place in each of the places of deposit 11, 13 and 15, and there may be any plural number of such places. Compressed air is admitted to the atomizing mechanism from a common channel 16 through a branch air passage 17 leading to a point just above the uppermost place of deposit 11, a second branch air passage 18 leading to a point just above the second place of deposit 13, and a further branch 19 leading to the upper portion of the annular chamber 15 in the valve seat. All of these branch passages are normally open, so that the pressure is equal at all the places of deposit and their cross-sectional areas are proportioned according to the relative amounts of fuel deposited in each of such places or so that the atomizing effect of the air moving through each passage shall be as uniform as possible.

In the operation of the device the removal of the fuel valve 7 from its valve seat causes movement of compressed air through each of the passages just mentioned and an imme-

diate individual atomization thereby of the separate deposits of fuel, as they move to the nozzle orifice and into the combustion space. By reason of the different distances of each place of deposit from the nozzle orifice, the several oil portions move successively into the combustion space, but of course with such rapidity as to constitute substantially one continuous admission, the whole charge being uniformly and thoroughly atomized because of the balance established between the cross-sectional areas of the several branch passages, as above explained.

In the form shown in Fig. 2, the construction is the same as just described excepting that this form is adapted for use with two kinds of fuel, as for instance, a fuel of relatively high inflammability serving to establish the ignition, and a fuel of relatively lower inflammability constituting the body of the charge. To this end a secondary oil duct 20 is formed in the casing to lead the more highly combustible oil direct to the lower place of deposit 15, where it will be subject to atomization by the compressed air the same as before and will enter the combustion space in advance of the lower grade oil admitted to the upper deposit places through the properly proportioned branch ducts 10^a and 10^b as before, the two kinds of fuel being thus kept separate until after their entrance to the engine.

It will be observed in both of the forms above described that the arrangement provides no restriction to the admission of any desired quantity of fuel oil through the oil passages, whether communicating or isolated, inasmuch as all of the several places of deposit are in communication through the air passages to accommodate and balance the air displacement. In both cases atomization of the oil is uniform and thereby best provides for the thorough and efficient combustion of the fuel or fuels. It will be further noted that the chamber 15 containing the ignition fuel is mechanically isolated from the spaces wherein the main combustion fuel is located, by the intervention of the tapered end of the fuel valve 7, which arrangement prevents the formation of an emulsion of the one kind of oil with the other which might clog the ducts in the valve mechanism. The valve mechanism may be used vertically as shown, or otherwise, and may be made in a variety of different forms all incorporating the arrangement and connections above explained, and in place of the perforated disks 8 other means for subdividing the oil and mixing it with the air may be used with like effect.

I claim:

1. In a fuel injection valve for combustion engines, a valve casing providing a valve seat and an interior valve chamber, fuel-atomizing means therein comprising a series of members providing a staggered passage for air and fuel, a valve plug member coöperating with the valve seat, means for introducing fuel into the valve chamber at different locations in the said staggered passage, and channels for conducting compressed air to each of said locations in the staggered passage, the fuel and air being conducted separately to said locations.

2. In a fuel injection valve for combustion engines, a valve casing having a chamber containing atomizing means and means for leading compressed air and fuel to the said chamber, a single valve plug member controlling the admission of atomized fuel from said chamber to the cylinder, a fuel pocket near the exit of the valve casing, said pocket being normally closed and isolated from the atomizing chamber by the single valve plug member, and separate channels for leading compressed air and fuel to said pocket.

3. In a fuel injection valve for combustion engines, a valve casing having a chamber containing atomizing means and means for leading compressed air and fuel to the said chamber, a single valve plug member controlling the admission of atomized fuel from said chamber to the cylinder, a fuel pocket near the exit of the valve casing, said pocket being normally closed and isolated from the atomizing chamber by the single valve plug member, and separate channels for leading compressed air and fuel to said pocket, both said separate channels being formed in the valve casing.

4. In a fuel injection valve for combustion engines, a valve casing having an atomizing chamber with means for leading compressed air and fuel thereto, a valve seat, a single valve plug member coöperative with said valve seat to control the admission of atomized fuel to the engine, a fuel pocket in said valve seat normally closed and isolated by said single valve plug member, and separate channels for leading compressed air and fuel to said pocket.

5. Fuel injection means for combustion engines employing two fuels, comprising a valve casing having an exit opening to the engine, a single valve plug member cooperative therewith, means in said casing affording a staggered passage for fuel and air, there being a space for reception of compressed air above and in communication with said means, means for supplying working fuel to said staggered passage separately from the air, means for introducing ignition fuel at a point nearer said exit opening, and a compressed air channel communicating with said space and leading to the place of introduction of the ignition fuel.

6. Fuel injection means for combustion engines employing two fuels, comprising a valve casing having an exit opening to the

engine, a single valve plug member co-operative therewith, means in said casing affording a staggered passage for fuel and air, means for supplying working and ignition fuels to said passage at different distances from said exit opening, and compressed air channels adapted to lead an appropriate quantity of injection air to each place of fuel introduction.

7. A fuel injection valve for combustion engines, comprising a valve casing having an atomizing chamber with means for supplying compressed air and working fuel thereto, a single valve plug member controlling the admission of the working fuel to the engine, an ignition fuel pocket adjacent the outlet of the valve casing and normally closed and isolated by the said single valve plug member, means for introducing ignition fuel into said pocket, and a special compressed air channel formed in the valve casing for conducting compressed air to atomize the ignition fuel in said pocket when the valve plug member is opened.

In testimony whereof, I have signed this specification in the presence of two witnesses.

WALTER SCHENKER.

Witnesses:
MAX PRECHSEL,
CARL GUBLER.