

H. SOELDNER.
FUEL INJECTION NOZZLE FOR OIL ENGINES.
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937,390.

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Fig: 1,

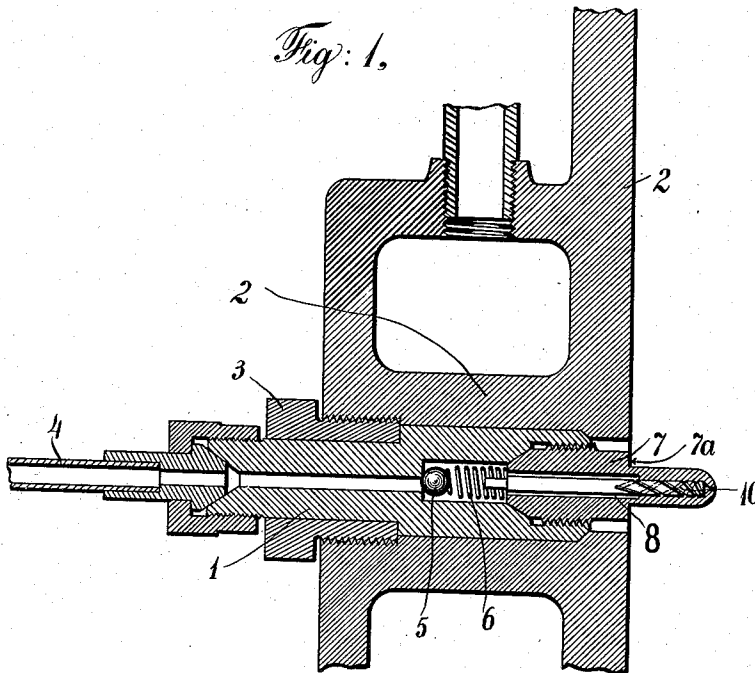


Fig: 2,

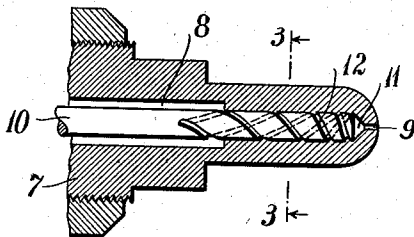
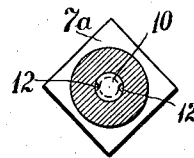


Fig: 3,



Witnesses:
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UNITED STATES PATENT OFFICE.

HENRY SOELDNER, OF EAST WILLIAMSBURG, NEW YORK, ASSIGNOR TO DE LA VERGNE MACHINE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

FUEL-INJECTION NOZZLE FOR OIL-ENGINES.

937,390.

Specification of Letters Patent.

Patented Oct. 19, 1909.

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To all whom it may concern:

Be it known that I, HENRY SOELDNER, a citizen of the United States, residing in East Williamsburg, county of Queens, State of New York, have invented certain new and useful Improvements in Fuel-Injection Nozzles for Oil-Engines, of which the following is a full, true, and concise specification.

This invention is an improvement in injection nozzles for spraying fuel into internal combustion engines, and particularly into engines adapted for burning the heavier fuel oils, the object of the invention being particularly to improve the fineness and uniformity of distribution of such fuel throughout the combustion space and to promote the rapidity of its introduction, vaporization and combustion, thereby improving the efficiency of the engine.

The invention also involves features of construction and operation as hereinafter explained and shown in the drawings, and more particularly pointed out in the appended claims.

In the drawings, Figure 1 represents in longitudinal central section a spraying device constructed and operating according to this invention, and includes a portion of the water-jacketed wall in which the device is located, when in use. Fig. 2 is an enlarged detail view of the tip portion of the same device shown; and Fig. 3 is a transverse section of Fig. 2 on line III—III.

The device comprises a tubular nozzle support or casing 1 adapted to be removably secured within an opening in the cylinder or head of the engine designated 2, for which purpose it is shouldered and provided with a threaded sleeve 3, revolvably fitted upon its portion of reduced diameter, so as to be screwed into the opening to confine the casing therein. The casing is bored with a central passage-way and its outer end carries a union coupling connecting it with the oil supply pipe 4 which leads from the oil pump, not shown. The central portion of the interior passage-way is enlarged to form a valve chamber which contains a ball-valve 5 with its seating spring 6 for the purpose of preventing back flow of fuel through the nozzle and casing and preventing the com-

bustion from reaching the oil in the supply pipe. The inner end of the central passage-way is further enlarged and interiorly threaded at its extreme end, to receive the threaded base of the nozzle proper, marked 7, which closes the valve chamber and affords an abutment for the thrust of the valve spring. This nozzle 7 is provided with coaxial bores of two diameters. The larger bore 8 communicates directly with the valve chamber, and the smaller bore terminates in a centrally located and comparatively fine needle-jet aperture 9 in the tip end of the nozzle, which constitutes the discharge orifice of the device, through which the oil emerges into the combustion space.

The relation of the casing to the engine wall is such that the nozzle is supported in a projecting position within the combustion space, so that it becomes heated from the combustion and thereby pre-heats and vaporizes the oil passing through it. A pin 10 occupies the smaller bore of the nozzle, fitting it sufficiently close to be sustained in axial alinement with the casing and nozzle, with its free end extending into and through the bore 8 of larger diameter and projecting through the same into the valve-chamber and the spiral spring 6 therein. The end of the pin 10 in conjunction with the tip end of the smaller bore, forms a small chamber or space marked 11 immediately behind the discharge orifice 9. The end of the pin is preferably flat for this purpose, the extreme end of the bore being tapered or dished toward the orifice as shown, preferably at an angle of 45 degrees with the axis of the device. The engaging surfaces of the pin and bore are so formed as to provide between them one or more spiral channels or passages 12 which lead from the space surrounding the pin in the larger bore and pass spirally around the pin, with a progressively decreasing pitch toward the tip, until they reach the chamber 11, which they enter in a tangential direction. Two such channels are shown in the drawing and each is formed by spirally grooving the surface of the pin, beginning at a point on the pin within the larger bore where the grooves are nearly parallel with the axis thereof, and then winding around the pin with decreasing

pitch until at the inner extremity they are nearly at right angles to the said axis where they will be substantially parallel with each other and separated only by a thin fin or thread.

The oil or fuel admitted under suitable pressure to the nozzle casing passes longitudinally through the valve chamber and larger bore of the nozzle and thence follows the two channels of decreasing pitch into the chamber 11, in the meantime becoming more or less vaporized by heat absorbed from the nozzle and gradually acquiring a change in its direction so that a reservoir of pre-heated fuel is thus produced in the chamber 11 and maintained in a state of violent rotary motion while the fuel is passing. The discharge orifice emits a revolving jet of such fuel from the center of this whirling body and such jet on emerging into the combustion space instantly bursts into expanding particles from the centrifugal effect, and produces a thoroughly disseminated and finely divided charge of fuel which results in immediate combustion. The decreasing pitch of the supply passages allows the oil to be brought to its required high rotary velocity against the frictional resistance of the passages and the inertia of the fuel in the chamber with practical instantaneity and with the least shock or wear on the controlling valves. The pin is held in the nozzle by its friction and by the pressure of the oil, and is readily removable for cleansing by withdrawing it, by grasping its squared free end which, as described above, projects outwardly beyond the base of the nozzle for this purpose. The projecting tip of the nozzle is relatively slender as compared to its base in order to facilitate the heating of the fuel, and between the tip and the base, it is provided with a portion 7^a of squared or angular section adapted for engagement by a wrench for unscrewing the nozzle from the casing.

I claim the following:

1. An injection nozzle for liquid fuel engines, having a fuel collecting chamber at its extremity and provided with a fine, centrally located discharge orifice, opening directly from said chamber into the combustion space of the engine and having one or more spirally formed liquid supply passages entering said collecting chamber tangentially.

2. An injection nozzle for liquid fuel engines, having a collecting chamber at its extremity and provided with a fine centrally located discharge orifice opening therefrom directly into the combustion space of the engine, the wall of said chamber being internally beveled toward the said orifice at an angle of substantially 45 degrees with the axis of the nozzle, and having one or more spiral liquid supply passages terminating in

said collecting chamber and entering the same tangentially.

3. An injection nozzle for oil engines comprising a nozzle tip portion having a central bore terminating in a fine discharge orifice, a flat-ended pin fitting said bore and forming an interior chamber at the end thereof, the engaging surfaces of said pin and bore being shaped to form one or more spiral channels entering said chamber tangentially.

4. An injection nozzle for oil engines formed with an internal bore of two diameters, the smaller of said bores terminating in a fuel discharge orifice, a tubular casing in which said nozzle is supported containing a chamber in communication with the larger of said bores, in combination with a pin having one end within said smaller bore and forming therewith one or more spiral passages leading to said orifice, the other end of said pin projecting into the said chamber in the tubular casing.

5. An injection nozzle for oil engines having a spiral liquid supply passage formed of decreasing pitch with its end of least pitch communicating with the discharge orifice.

6. An injection nozzle for oil engines provided with a central bore terminating in a relatively fine discharge orifice, and a pin within said bore, the contacting surfaces of said pin and bore being formed to provide a spiral passage of decreasing pitch communicating with said discharge orifice at its end of least pitch.

7. An injection nozzle for oil engines formed with an internal bore of two diameters, the smaller of said bores terminating in a discharge orifice, in combination with a pin held by said smaller bore and forming therewith a spiral passage of decreasing pitch communicating with said orifice at its end of least pitch, said pin being extended within said larger bore.

8. In a device of the kind described, a tubular nozzle casing adapted for connection in an opening in the engine wall and a nozzle carried at the terminal of said casing to project within the combustion space and formed with an internal bore terminating in a fuel collecting chamber having a relatively fine central discharge orifice, in combination with a pin sustained within said bore and forming therewith one or more spiral passages leading from said tubular casing and entering said chamber tangentially.

9. In a device of the kind described, a tubular nozzle casing adapted to be secured in the engine wall and formed with a longitudinal oil passage interiorly enlarged and threaded at its end, a nozzle threaded into said end and formed with an interior bore terminating in a fine discharge orifice, in combination with a pin having one end sustained within said interior bore, forming therewith a fuel passage leading to said

orifice, the free end of said pin projecting beyond the nozzle into said nozzle casing.

10. In a device of the kind described a nozzle held in a projecting relation within the combustion space of the engine and provided with an interior bore terminating in a fine central discharge orifice, in combination with a pin in said bore forming therewith a plurality of spiral passages leading to said

orifice and having decreasing pitch as they approach the same.

In testimony whereof, I have signed my name to the specification in the presence of two subscribing witnesses.

HENRY SOELDNER.

Witnesses:

CHAS. H. HERTER,
A. LEBRECHT.