

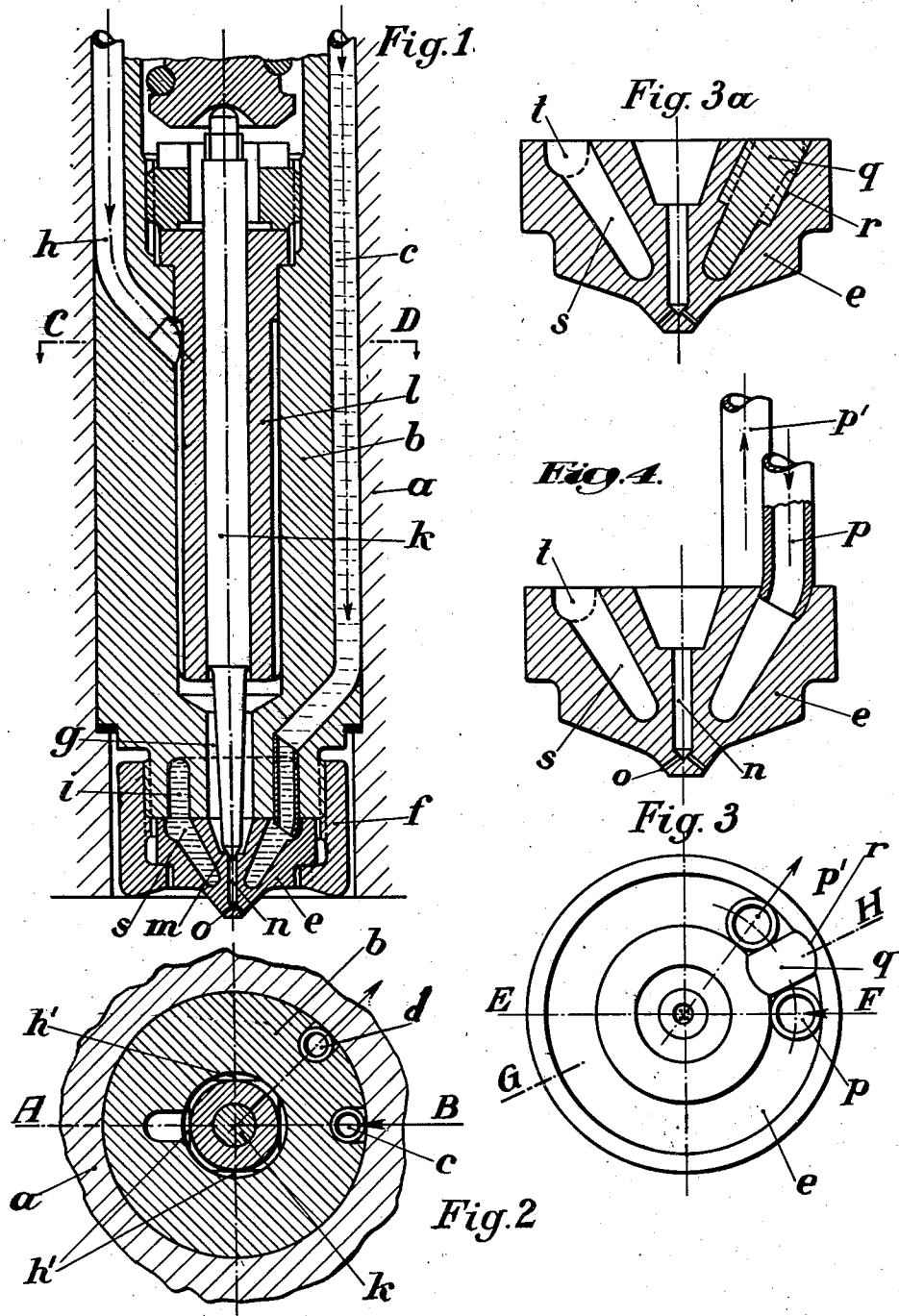
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COOLED NOZZLE FOR FUEL VALVES IN INTERNAL COMBUSTION ENGINES

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UNITED STATES PATENT OFFICE

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COOLED NOZZLE FOR FUEL VALVES IN INTERNAL COMBUSTION ENGINES

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The present invention relates to a water-cooled nozzle for the fuel valves of internal combustion engines.

The invention, which has among its objects the provision of a water-cooled nozzle of improved construction in which the nozzle tip is effectively cooled, will be best understood from the following description when read in the light of the accompanying drawing of one embodiment of the invention, the scope of which latter will be more particularly pointed out in the appended claims.

In the drawing:—

Fig. 1 is a longitudinal section on the line A—B of Fig. 2 of a nozzle constructed according to the invention;

Fig. 2 is a section on the line C—D of Fig. 1;

Fig. 3 is a plan of the nozzle tip; and

Figs. 3a and 4 are respectively sections on the lines G—H and E—F of Fig. 3.

In the drawing *a* designates the lower part of the cylinder cover, *b* the lower end of valve casing with the cooling water supply passage *c* and the cooling water discharge passage *d*. The top surface of the nozzle tip *e* has been ground into the bottom face of the valve casing *b*, which is firmly pressed upon the former by means of the nut *f* in such a manner that the oil chamber *g*, which is supplied by the pipe line *h* and the passages *h'*, is tightly closed towards the water chamber *i*.

The fuel needle valve *k* is guided by the sleeve *l* of the valve casing *b*, and at its lower pointed end cooperates with a seat *m* at the upper end of the passage *n* formed in the nozzle tip, the needle by this construction being adapted to control the passage of fuel through the spray openings *o*.

As shown, the nozzle tip *e* is provided with an annular water jacket chamber *s* surrounding the passage *n* and valve seat *m*, this annular chamber being of reduced diameter at its lower end and extending to adjacent the spray openings *o*, while at its upper end it opens on the face of the nozzle tip and communicates with the annular chamber *i* formed in the nozzle body, with which

latter chamber the discharge passage *d* in the nozzle body communicates.

Herein, a small bore tube or pipe *p* places the water jacket chamber *s* of the nozzle tip *e* in communication with the water supply passage *c*, while this chamber is placed in communication with the water discharge passage *d* by a similar pipe *p'*, the two pipes communicating with said chamber in closely adjacent relation, as clearly illustrated in Fig. 4. For causing the water to circulate all around the jacket chamber *s*, the nozzle tip is herein formed with a recess *r* intersecting the chamber *s* between the points of communication therewith of the pipes *p* and *p'*. In this recess is inserted a plug *q* which provides a partition between the aforesaid points of communication, thus enforcing the water which enters the jacket chamber through the pipe *p* to travel substantially entirely around the jacket chamber before it can discharge therefrom through the pipe *p'*.

The securing of the nozzle against twisting, when screwing same on or off by means of the nut *f*, has been provided for by the two small diameter pipes *p—p'*, which are fixedly mounted—for instance by way of soldering—in the openings of the passage *c* and *d* at the lower face of the valve casing *b*.

It will be understood that wide deviations may be made from the embodiment of the invention above described without departing from the spirit of the invention.

I claim:

1. A fuel injection valve for an internal combustion engine having, in combination, a nozzle body portion, a needle valve carried thereby, a one-piece nozzle tip separate from said body portion formed to provide a seat for said valve; said nozzle tip also formed with a cavity for cooling water, which cavity opens on that surface of said nozzle tip which abuts with said nozzle body portion, and which cavity surrounds that portion of said nozzle tip which is formed to provide said seat; the abutting surfaces of said nozzle body portion and nozzle tip being unitary plane surfaces contacting in fluid tight relation at opposite sides of the opening of said cavity, and means including a screw cap for securing

said body portion and nozzle tip in assembled relation.

2. A fuel injection valve for an internal combustion engine having, in combination, a nozzle body portion, a needle valve carried thereby, a one-piece nozzle tip separate from said body portion formed with a recess for receiving the end portion of said needle valve, said recess opening on that surface of said nozzle tip which abuts with said nozzle body portion and being formed inwardly of said surface with a seat for said valve; said nozzle tip being also formed with an annular frusto-conical cavity for cooling water, the large diameter end of which cavity opens on said surface of said nozzle tip, and which cavity surrounds said recess and valve seat; the abutting surfaces of said nozzle tip and body portion being unitary plane surfaces contacting in fluid tight relation at opposite sides of the opening of said cavity, and means including a screw cap for securing said nozzle body portion and nozzle tip in assembled relation.

3. A fuel injection valve for an internal combustion engine having, in combination, a nozzle body portion, a needle valve carried thereby, a one-piece nozzle tip separate from said body portion formed with a tapered recess for receiving the end portion of said valve, said recess at its base opening on that surface of said nozzle tip which abuts with said nozzle body portion, and said recess at its apex formed to provide a seat for said valve; said nozzle tip also formed with a small diameter passage extending from said seat to the nozzle tip end, and also formed with an annular frusto-conical cavity for cooling water, which cavity at its large diameter end opens on the same surface of said nozzle tip as said recess, and surrounds said recess, seat and passage, extending to adjacent said nozzle tip end, the wall separating said cavity from said recess and passage being of generally uniform thickness; the abutting surfaces of said nozzle body portion and nozzle tip being unitary plane surfaces contacting in fluid tight relation at opposite sides of the opening of said cavity, and means including a screw cap for securing said nozzle body portion and nozzle tip in assembled relation.

In testimony whereof, I have signed my name to this specification.

HANS LÜMMEN.

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