Nov. 17, 1931. O. BAUR 1,832,758

INTERNAL COMBUSTION ENGINE

Filed Oct. 19, 1928 2 Sheets-Sheet 1

Fig. 1.

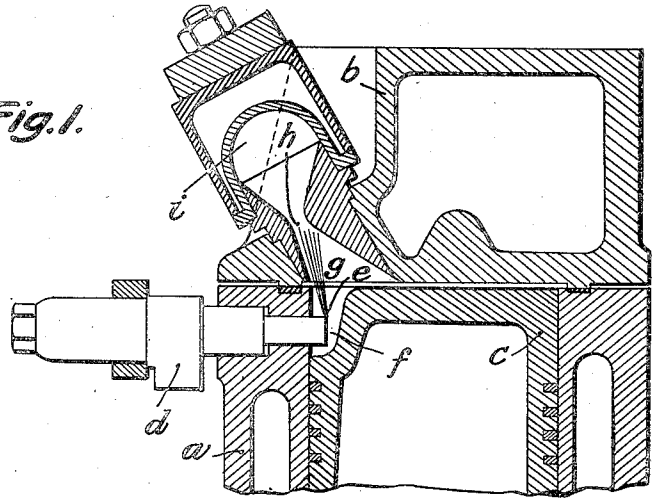
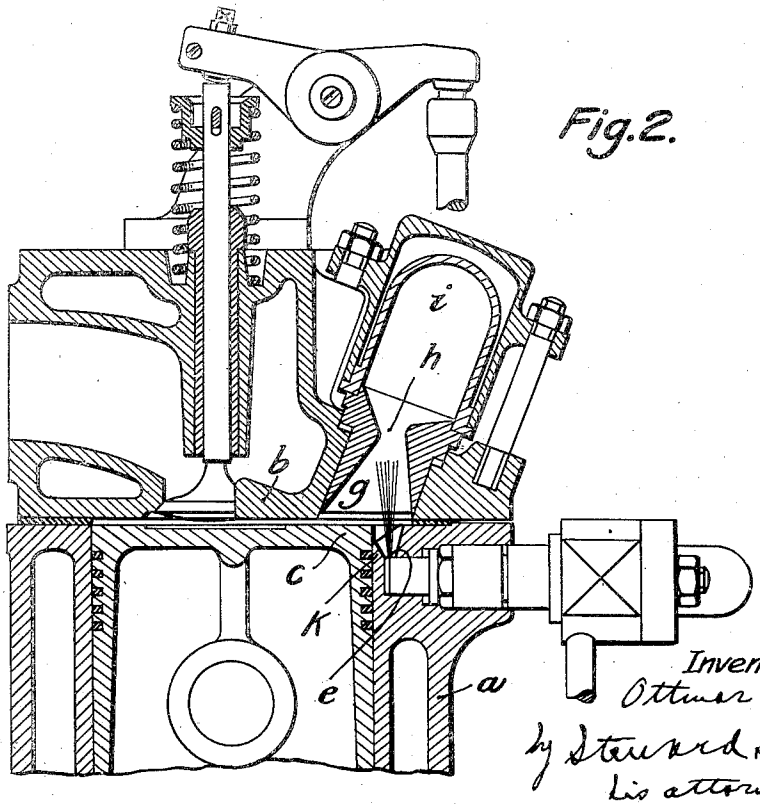


Fig. 2.



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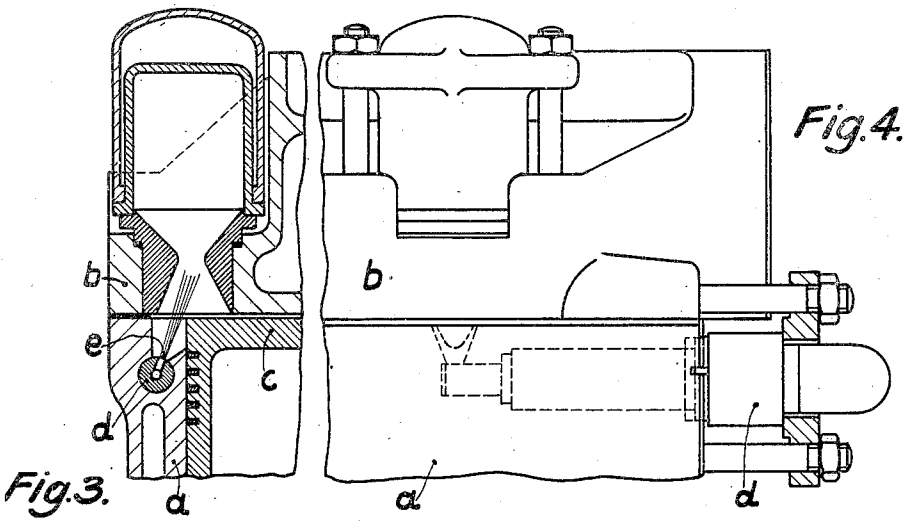
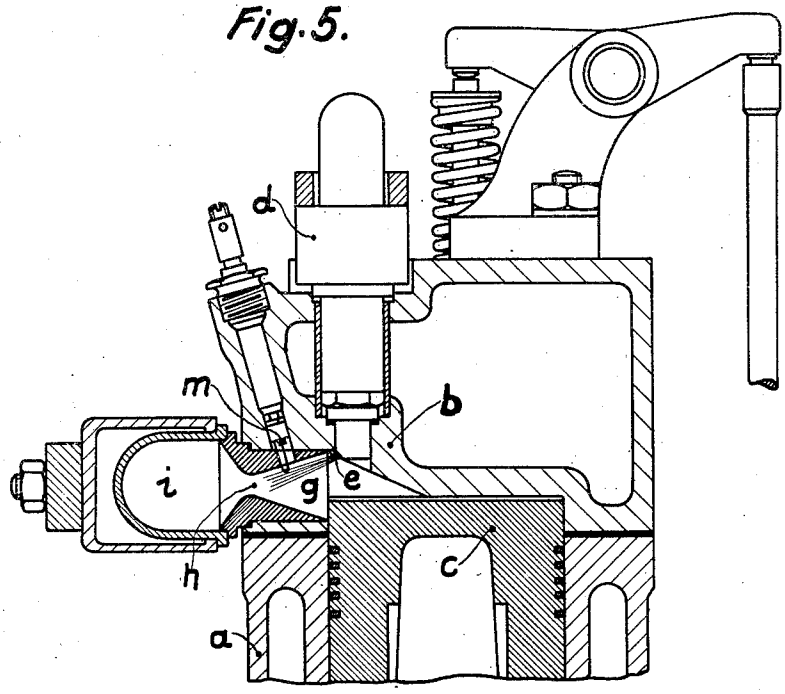


Fig.3.

Fig.4.

Fig.5.



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UNITED STATES PATENT OFFICE

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INTERNAL COMBUSTION ENGINE

Application filed October 19, 1928, Serial No. 313,512, and in Germany October 31, 1927.

The present invention relates to internal combustion engines having self-ignition and of the type in which the cylinder chamber is connected through a throttling aperture with a chamber which is provided with a frustro-conical space, into which the injection of the fuel towards the throttling member commences at the end of the compression stroke.

In the known engines of this type, the jet injects the stream of fuel into the funnel-shaped member axially of its mounting and is therefore arranged substantially coaxially with the funnel and the chamber located behind the latter. This construction can, however, only be carried out with difficulty in many cases, since the introduction of the jet or chamber is often very objectionable and cumbersome so that either the space available for the inlet and outlet ducts and valves, together with their control members, starting means, measuring and indicating pipes, is considerably limited, or the conditions of flow are very unfavorable. In many cases, these difficulties can be overcome if, according to the invention, precautions are taken to ensure the injected stream emerging in known manner at right angles, or substantially at right angles, to the axis of the jet and being directed directly into the funnel and at least substantially towards the throttle member.

Four forms of construction of the object of the invention are shown in the drawings.

Figure 1 is a longitudinal section through a cylinder and piston of the first form of construction in which the jet holder and jet are mounted in the top edge of the cylinder casing and the funnel and chamber are arranged at an angle on the edge of the cylinder head.

Figure 2 is a similar view of the second form of construction which differs from the first mainly in the arrangement of the jet holder and jet.

Figure 3 is a longitudinal section and Figure 4 a side elevation of the third form of construction. The jet holder and jet are inserted tangentially into the cylinder casing and the axis of the chamber is parallel to that of the cylinder.

In the fourth form of construction shown in Figure 5, both the jet holder and the jet and also the funnel and chamber are arranged in the cylinder head.

The cylinder is indicated in all forms of construction by *a*, the cylinder head by *b* and the piston, which is shown in its inner dead centre position, by *c*. The reference letter *d* relates to the holder for the injection nozzle and jet and *e* to the orifice of the jet.

In the first form of construction, shown in Figure 1, the jet holder *d* projects at right angles through the cylinder wall into the path of the piston *c* in close proximity to the upper edge of the cylinder. The orifice *e* of the jet is arranged so that the stream of fuel is directed substantially at right angles to the axis of the jet holder into a frustro-conical chamber of a funnel shaped member *g* arranged in the cylinder head *b* in the proximity of the orifice *e* of the jet and top edge of the cylinder *a*.

The throat or narrowest portion *h* of the funnel-shaped member *g* forms a narrow duct connecting the cylinder chamber of the engine with a chamber *i*.

The mouth or widest cross-section of the funnel merges directly into the cylinder chamber without any communicating duct so that the flow can take place without any obstruction.

The chamber *i* and funnel *g* are arranged so that the hot stream directed out of them on the working stroke is directed at an angle into the cylindrical chamber and is uniformly distributed, since it does not strike the walls of the cylindrical chamber at right angles, but glances off them.

A particular result obtained by the arrangement of the jet holder *d* and jet and the

chamber *i* and funnel *g*, more or less in an angle of the top edge of the cylinder, is that the space required for the valves and communications is left absolutely free.

The main difference between the second example shown in Figure 2 and the first is the slightly different construction of the jet holder *d* carrying the jet. Whilst in the first case the jet projects into the path of the piston *c* and is therefore strongly heated, it is, in the second case, protected behind a protecting wall *k* which, however, is arranged so that it does not prevent direct injection by the jet into the funnel *g*. The advantage is also obtained over the first form of construction that the piston *c* and consequently the whole engine is lower, as the recess in the piston *c* can be omitted, and consequently the piston rings can be positioned nearer to the end of the piston.

In the third form of construction shown in Figures 3 and 4, the holder *d* and jet are arranged tangentially in the cylinder *a*. Otherwise there is scarcely any difference between this form and those already described.

In the fourth form of construction shown in Figure 5, the axis of the jet holder *d* is arranged parallel to the axis of the cylinder *a* in the head *b* and the funnel *g* and the chamber *i* are arranged at the side in the head. Further, an incandescent wire ignition plug *m* which is electrically heated on starting projects into the funnel *g*.

Instead of arranging the chamber in the cylinder as in the example shown, it can also be provided in the piston.

It has also been pointed out and can also be clearly seen from the various figures that a simple compact construction can be obtained by the improved assembly of the individual known elements. Further, dangerous spaces in the cylinder *a* can be avoided by the improved construction so that the requirement which is often met with in engines of this type of obtaining as much air as possible in the chamber on the compression stroke is easily fulfilled.

I declare that what I claim is:—

1. In an internal combustion engine, a cylinder head, an engine cylinder, the walls of which are longitudinally recessed at one point adjacent that end connected to said cylinder head, a funnel shaped member in said cylinder head forming a frustro-conical chamber merging directly into said longitudinal recess and into the chamber of said engine cylinder, and a fuel jet holder extending at right angles to the axis of said cylinder and mounted in said cylinder walls, the fuel being projected from said jet holder at right angles to the axis thereof and through said longitudinal recess of said cylinder walls into said frustro-conical chamber.

2. In an internal combustion engine, an engine cylinder, a cylinder head, a funnel shaped member in said cylinder head forming a frustro-conical chamber merging directly into said engine cylinder, a throat in said funnel shaped member, and a fuel jet holder arranged tangentially of and in the walls of said engine cylinder, the jet of said fuel jet holder projecting fuel into said frustro-conical chamber substantially at right angles to the axis of said jet holder.

In testimony whereof I have hereunto affixed my signature.

OTTMAR BAUR.