May 29, 1956 E. SCHREIBER 2,747,556

INTERNAL-COMBUSTION ENGINES

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Fig. 1

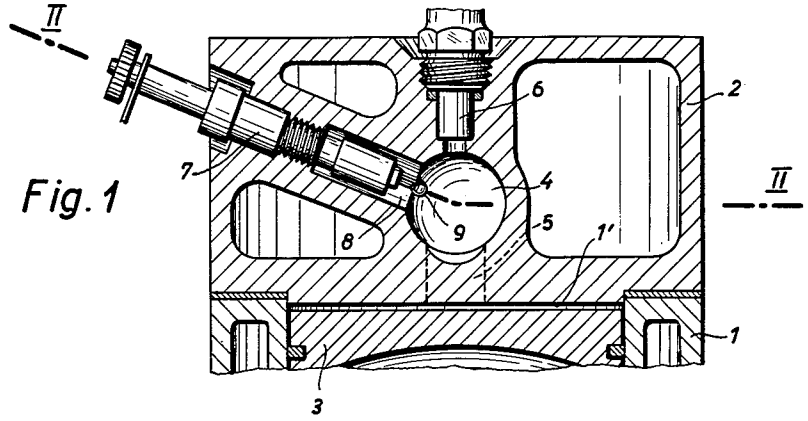


Fig. 2

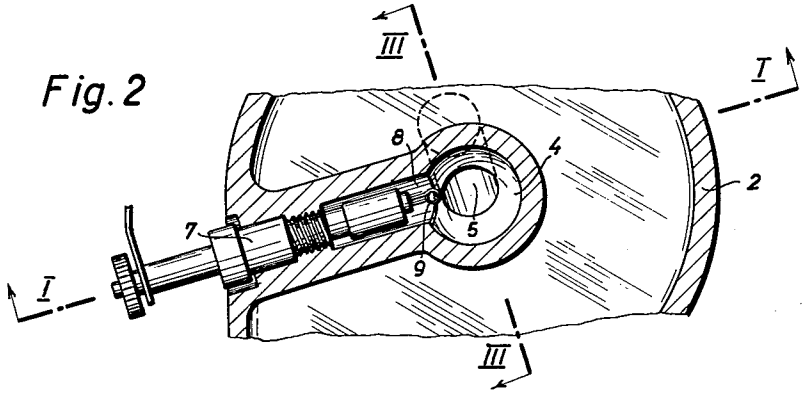
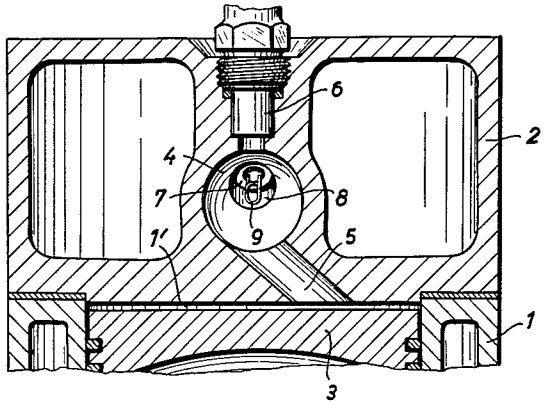


Fig. 3



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Fig. 4

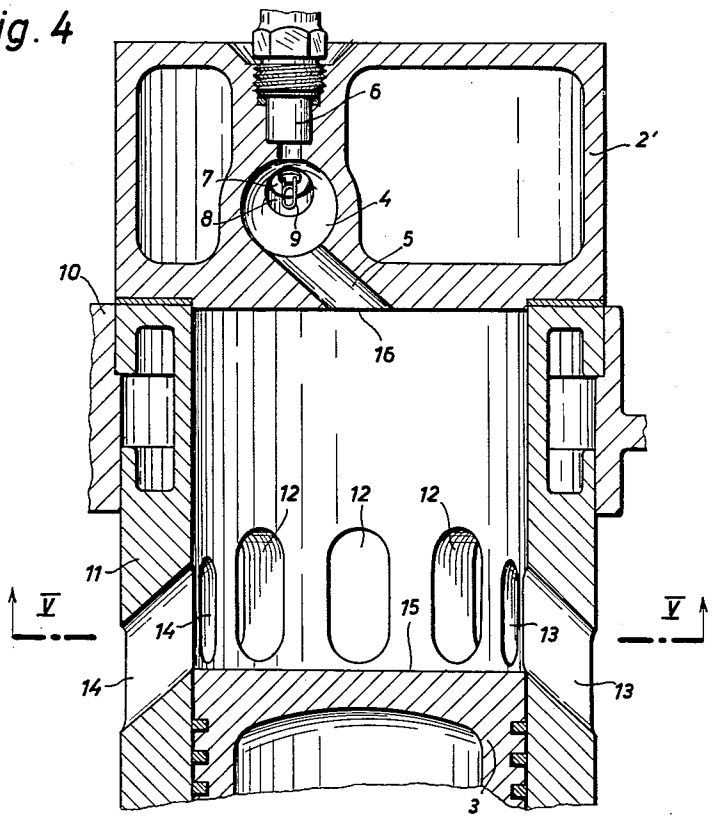
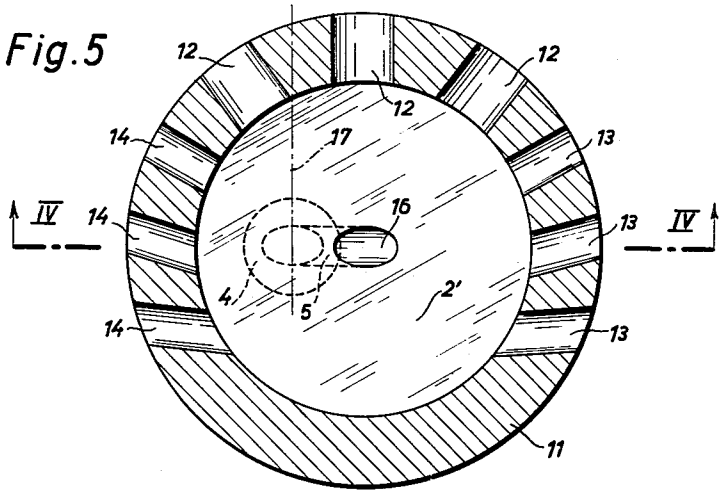


Fig. 5



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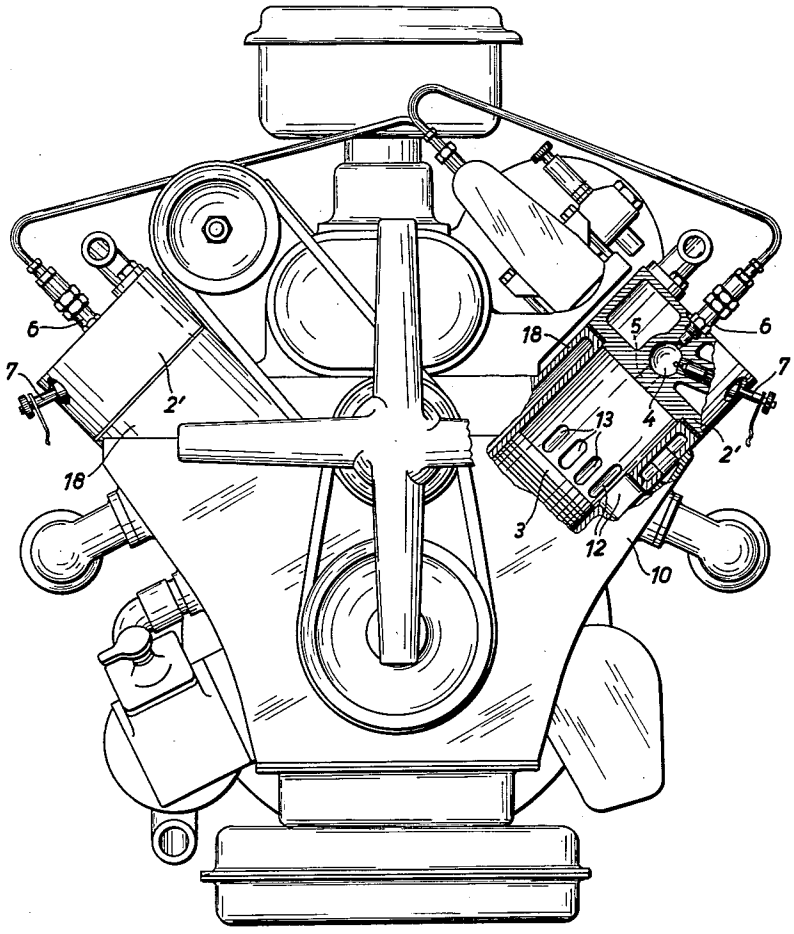
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Fig. 6



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2,747,556

INTERNAL-COMBUSTION ENGINES

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Claims priority, application Austria January 4, 1952

2 Claims. (Cl. 123—32)

The invention relates to an internal-combustion engine with compression ignition and an igniting device arranged in a whirling chamber, into which the connection duct to the cylinder space discharges approximately tangentially. In the known engines of that type the glow plug projects radially or obliquely into the swirl, whereby the same is disturbed and the efficiency of the engine is reduced and its fuel consumption increased.

The invention has as its object to avoid that disadvantage, and essentially resides in that the igniting element, consisting, e. g., of the glowing filament of a glow plug, is arranged approximately in the axis of the swirl. Thus the aperture necessary in the wall of the combustion chamber for the connection of the igniting device is removed from the range of the swirl so that this interruption of the wall surface no longer interferes with the swirl, and a disturbance of the swirl by the igniting element protruding into the combustion chamber is also avoided. Suitably the arrangement is such that the axis of the glow plug coincides with the axis of the swirl.

In two-stroke cycle internal-combustion engines with piston-controlled exhaust ports and a whirling chamber arranged in the cylinder head, the igniting device is arranged according to the invention aproximately in the direction towards the exhaust side of the cylinder head, preferably from top to botom obliquely with respect to the cylinder axis, and the connecting duct from the whirling chamber to the cylinder space extends in a plane approximately at right angles thereto approximately transversely to the exhaust direction. Thus the stream emerging from the connecting duct is deflected from that side of the piston which controlling the exhaust ports is under higher thermal load, and is directed toward a part of the piston under lower thermal load. Preferably the connecting duct leading from the whirling chamber to the cylinder space is directed toward the intake ports or the piston head adjacent to the intake ports. Thereby an additional thermal loading of the region of the piston head on the exhaust side, which is highly loaded in any case, is avoided and in addition thereto the region of the piston head on the intake side, which is cooled by the fresh air, is heated by the stream of burning gases impinging from the whirling chamber, whereby a much more equalized temperature of the entire piston head is achieved. Thus heat stresses and consequent distortion of the piston can be reduced a minimum. In engines of that known type in which the intake ports are arranged in the cylinder on both sides of the exhaust ports, the connecting duct is directed toward the intake ports arranged on one side of the cylinder, or toward the piston head adjacent to said intake ports, so that the heat stresses relative to the region of the exhaust ports are equalized at least adjacent to one group of intake ports. That heat equalization is not restricted to the piston head, but affects also the cylinder walls which are also under a higher thermal load adjacent to the exhaust ports than adjacent to the intake ports. The equalizing effect of the temperature rise caused by the stream emerging from the connecting duct may be

improved by offsetting the combustion chamber from the center of the cylinder head to such an extent as to have the discharge end of the connecting duct into the cylinder lie approximately at the center of the cylinder.

These advantages of heat equalization are obtained in two-stroke cycle internal-combustion engines of the various types. In two-stroke cycle internal-combustion engines having rows of cylinders arranged in V-formation of that type, known per se, in which the intake ports are arranged in the cylinders between the cylinders which are adjacent to each other in the axial direction of the engine, the igniting devices or glow plugs may be arranged according to the invention on the outsides of the rows of cylinders and since the connecting ducts extend in planes approximately at right angles to the glow plug axes, these connecting ducts can be directed just toward the intake ports or toward the piston head adjacent to these intake ports. Hence, in engines of those types the additional advantage is obtained that the glow plugs are arranged easily accessible on the outsides of the rows of cylinders and the space between the rows of cylinders is kept free for the accommodation of auxiliary machines of the engine.

In the drawing the invention is illustrated schematically with reference to examples.

Fig. 1 is an axial sectional view of a cylinder with cylinder head, taken along line I—I of Fig. 2;

Fig. 2 is a sectional view taken along line II—II of Fig. 1;

Fig. 3 is a sectional view taken along line III—III of Fig. 2;

Fig. 4 is a sectional view taken through the axis of a cylinder with cylinder head along line IV—IV of Fig. 5, and shows another embodiment, whereas

Fig. 5 is a sectional view taken along line V—V of Fig. 4;

Fig. 6 is a partly sectional front view showing an engine with rows of cylinders arranged in V-formation and with a cylinder head according to Figs. 4 and 5.

In the embodiment according to Figs. 1, 2 and 3, **1** represents the cylinder, **2** the cylinder head, and **3** the piston. In the water-cooled cylinder head **2** a whirling chamber **4** is arranged, into which a connecting duct **5** to the cylinder space **1'** discharges tangentially. Hence, the air displaced during the compression stroke of the piston through the duct **5** into the whirling chamber **4** produces in the latter a swirl in the clockwise sense in the showing of Fig. 3 whereby a vigorous mixing of the air with the fuel injected through the nozzle **6** is effected.

Consisting of a glowing filament **9**, the igniting element of the glow plug **7** is arranged approximately in the axis of the swirl in the whirling chamber **4** so that the aperture **8** of the cylinder head **2**, which aperture receives the glow plug, and the glowing filament **9**, are removed from the region of the most intense swirl and no longer interfere with the swirl. The arrangement of the glow plug **7** is such that its axis approximately coincides with the axis of the swirl in the whirling chamber **4**.

The glow plug **7** is arranged approximately in the direction toward the exhaust side of the cylinder, i. e., in the direction toward the exhaust ports, and inclined with respect to the cylinder axis, so that the connecting duct **5** extends approximately transversely to that direction and the piston side controlling the exhaust ports is no longer impinged directly by the combustion gases. In Fig. 3, the exhaust ports are numbered **12** and the intake ports arranged on opposite sides of the cylinder **1** and on both sides of the exhaust ports are numbered **13** and **14**. The inclined arrangement of the glow plug affords advantages as regards cooling. The angle of inclination is not essential, but it is only essential that the igniting element constituted by the glowing filament **9** lies approximately in

the axis of the whirling motion of the gases in the whirling chamber 4.

The embodiment according to Figs. 1 to 3 of the drawing relates to a two-stroke cycle internal-combustion engine, whereas the invention can be applied also to four-stroke cycle internal-combustion engines.

The embodiment according to Figs. 4 and 5 relates to a two-stroke cycle internal-combustion engine with a cylinder liner 11 which is inserted into the engine housing 10 and in which exhaust ports 12 and, on both sides of said exhaust ports 12, intake ports 13 and 14 are arranged. In the conventional manner these ports are controlled by the piston 3, the head of which is designated with 15.

Discharging tangentially into the whirling chamber 4, the connecting duct 5 is directed towards the group of intake ports 13 arranged on one side of the exhaust ports 12 or, when the piston is at its top dead center, toward the piston head 15 adjacent to said intake ports. Thus the said region of the piston head as well as that side of the cylinder liner 11, are heated by the stream of combustion gases emerging from the connecting duct 5 so that the heat difference between the exhaust and intake sides is at least partly equalized. As shown in the drawing, the whirling chamber 4 is offset from the center of the cylinder head 2' to such an extent that the discharge opening 16 of said connecting duct lies at the center of the cylinder. This improves the heat equalizing effect of the gas stream emerging from said connecting duct 5.

In a two-stroke cycle internal-combustion engine having rows of cylinders arranged in V-formation, the adjacent cylinders are arranged at the right and left, in the showing of Figs. 4 and 5. The exhaust ports 12 are directed toward the outsides of the rows of cylinders and the glow plug 7, the axis of which is indicated at 17, is inserted into the cylinder head 2' from the outside of the rows of cylinders. Thus the glow plug is readily accessible. Such an engine with rows of cylinders 18 arranged in V-formation is shown in Fig. 6 in a partly sectional front view.

What I claim is:

1. In an internal combustion engine of the compression-ignition type, comprising a cylinder, a cylinder head, a piston in the said cylinder having a cylinder wall, intake ports and exhaust ports in the said cylinder wall and controlled by the said piston, a whirling chamber in the said cylinder head, a connecting duct connecting the said whirling chamber to the said cylinder, the internal surface of the said whirling chamber being spherical, and the said connecting duct discharging approximately tangentially into the said whirling chamber, an ignition element located approximately in an axis of said spherical whirling chamber disposed at right angles to the plane determined by the axis of said connecting duct and the center of said whirling chamber, the said connecting duct causing a whirling motion of the gases compressed by the said piston and discharged into the said whirling chamber around the said first-named axis, the said plane lying approximately in an axial sectional plane of the said cylinder distant from said exhaust ports, and the said axis of the said connecting duct being disposed from top to bottom obliquely relative to the axis of said cylinder, the said axial sectional plane of the cylinder going through the region of the said cylinder wall in which the said intake ports are located.

2. In an internal combustion engine as clamied in claim 1, having intake ports arranged on opposite sides of the said cylinder wall and exhaust ports arranged between the said intake ports, the said axial sectional plane of the cylinder going through the regions of the said cylinder wall in which the said intake ports are located.

References Cited in the file of this patent

UNITED STATES PATENTS

Re. 19,742	Treiber	Oct. 22, 1935
2,058,827	Ricardo	Oct. 27, 1936

FOREIGN PATENTS

135,841	Switzerland	Dec. 16, 1929
389,863	Great Britain	Mar. 27, 1933
403,980	Great Britain	Dec. 28, 1933
444,879	Great Britain	Mar. 30, 1936