June 17, 1924. 1,498,273

K. J. E. HESSELMAN

INTERNAL COMBUSTION ENGINE

Filed April 21, 1922

Fig. 1.

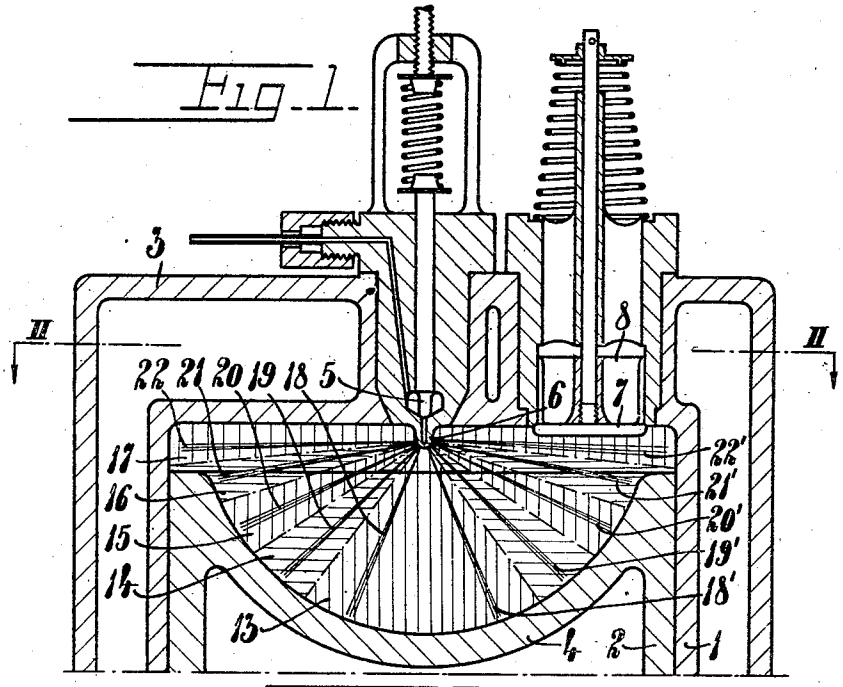


Fig. 2.

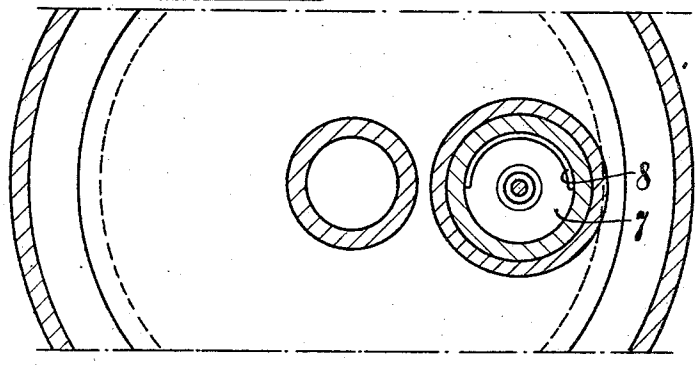
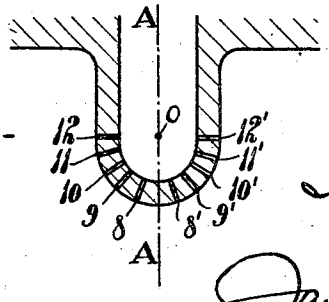


Fig. 3.



Inventor

K. J. E. Hesselman

James L. Ludwig & Co.,

Attys.

Patented June 17, 1924. 1,498,273

UNITED STATES PATENT OFFICE.

KNUT JONAS ELIAS HESSELMAN, OF SALTSJO-STORANGEN, NEAR STOCKHOLM, SWEDEN.

INTERNAL-COMBUSTION ENGINE.

Application filed April 21, 1922. Serial No. 555,802.

To all whom it may concern:

Be it known that I, KNUT JONAS ELIAS HESSELMAN, a citizen of the Kingdom of Sweden, residing at Saltsjo-Storangen, near Stockholm, Sweden, have invented new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

It has been proposed heretofore to improve the mixing of the air with the fuel in internal combustion engines by causing the air to perform a rotary movement within the cylinder chamber.

The object of this invention is to further improve the mixing of the air with the fuel in such engines. To this end means are provided to ensure uniform distribution of the fuel with relation to the air as seen in an axial section of the combustion chamber. In the preferred embodiment of the invention hereinafter described such means consist in the provision in the fuel supplying nozzle of outlet openings so positioned as to feed equally large quantities of air with fuel.

In the accompanying drawing forming part of this specification so much of one embodiment of the invention is shown as is deemed sufficient for understanding this invention. Fig. 1 is an axial section through the upper portion of the cylinder as well as of the piston of an internal combustion engine having fuel supplying means according to this invention. Fig. 2 is a diagrammatic plan view of the air inlet valve taken on the line II—II in Fig. 1. Fig. 3 is an axial section on a larger scale through the fuel supplying nozzle.

With reference to Fig. 1 the numeral 1 indicates the cylinder and 2 is the piston of an internal combustion engine. The cylinder cover 3 is shown as formed with a flat lower surface, said lower surface, however, may also consist of a conically or otherwise shaped surface of revolution, the axis of revolution of which, coincides with the axis of the cylinder. The piston head 4 is formed with a concave recess the bottom of which comprises a spherical or other surface of revolution the axis of which coincides with the axis of the cylinder. The fuel supplying valve 5 is disposed centrally in the cylinder cover. The valve casing is formed with an extension 6 projecting below the lower surface of the cylinder cover and constituting a fuel distributing nozzle. The fuel supplying valve may be of any well known design, as, for instance, mechanically controlled or controlled by means of the oil pressure generated by the fuel pump. The air supply valve 7 is positioned in close proximity to the circumference of the cylinder chamber and is formed with a shield 8 at one of its sides, as is more clearly shown in Fig. 2, so as to cause the air to enter the cylinder chamber in a tangential direction and, as a result, perform a rotary movement in said chamber with respect to the axis of the cylinder. The distributing nozzle 6 is provided with five apertures 8, 9, 10, 11, 12 and 8′, 9′, 10′, 11′, 12′, respectively, Fig. 3 shown at diametrically opposite sides of the nozzle. Said apertures, while illustrated as lying in the same axial plane may also, if desired lie, in different axial planes. The direction of the apertures relatively to the axial direction of the cylinder, however, as represented by the dotted line A—A in Fig. 3, has been determined in the following way.

Due to the shaping of the cylinder cover and of the piston head as above described, the shape of the combustion chamber will correspond to a body of revolution the axis of revolution of which corresponds to the axis of the cylinder. This space may be said to be divided into a plurality of portions of equal capacity by means of conical surfaces having a common apex at the point O (Fig. 3) on the axis of the cylinder and a common axis coinciding with that of the cylinder. In Fig. 1 said portions are alternatingly indicated by vertical and horizontal lines and comprise a central conical portion 13 and four surrounding hollow cones 14, 15, 16, 17. The apertures of the distributing nozzle are directed so that the apertures 8 and 8′ lie on an imagined conical surface dividing the cone 13 in two equal portions. The apertures 9 and 9′ lie on an imagined conical surface dividing the hollow cone 14 in two equal portions, and so on. When the entering air is rotating about the cylinder axis, the various air quantities filling the imagined conical spaces 13, 14, 15, 16, 17 of equal capacity will be supplied with equally large fuel quantities which will at the same time be distributed uniformly to the greatest extent possible within the

respective air quantities. In Fig. 1 the various fuel jets are indicated at 18, 19, 20, 21, 22 and 18′, 19′, 20′, 21′, 22′, respectively.

It should be noted that, as movement of the piston is taking place and the combustion chamber is consequently varied, a suitable intermediate position of the piston should be chosen in determining the direction of the fuel outlet apertures according to the method described.

In the drawing, Fig. 3, the fuel distributing nozzle is shown as provided with two sets of apertures, each set comprising five apertures, and the apertures of each set corresponding to those of the other set as regards their angular direction with respect to the longitudinal axis of the fuel valve. Furthermore, the cross section area of all of the apertures is assumed to be of the same size. It should be noted, however, that it is possible to vary the number and cross section area of the apertures within the scope of the invention. For instance, the number of apertures having the same angular position relatively to the above said axis may be less or more than two. Similarly, the number of apertures having different angular position as to the same axis may be less or more than five.

When the cross section area of the various apertures are of different size, the apertures will, of course, allow correspondingly varying quantities of fuel to pass through themselves. In such case the angular position of the apertures should be varied accordingly so as to ensure a uniform distribution of the fuel on the principles underlying this invention.

While the invention is described above as applied to a single acting internal combustion engine, it should be understood that the invention may also be applied to double-acting internal combustion engines without departing from the principle on which it is based.

What I claim as new is:—

1. In an internal combustion engine, a cylinder, a piston therein, means for introducing air into the cylinder so as to cause said air to perform a rotary movement within the cylinder, and means for centrally supplying fuel to the cylinder through a plurality of openings so directed as to feed equally large portions of the rotary air with fuel.

2. In an internal combustion engine, a cylinder, a piston therein, means for introducing air into the cylinder so as to cause said air to perform a rotary movement within the cylinder, and means for centrally supplying fuel to the cylinder through a plurality of openings so directed as to lie on imagined conical surfaces having a common apex and a common axis and forming different angles with said axis.

3. In an internal combustion engine, a cylinder having a cylinder chamber, a piston in said cylinder, means for introducing air into the cylinder chamber so as to cause said air to perform a rotary movement within the said chamber, and means for centrally introducing fuel into the cylinder chamber through a plurality of openings so directed as to eject the fuel along imagined conical surfaces having a common apex and a common axis and each dividing one of a corresponding number of equally large imagined conical portions of the cylinder chamber right in two.

4. In a method for operating an internal combustion engine, having means for rotating a mass of air within the cylinder; consisting of centrally introducing the fuel into said rotary air mass through openings directed so that the fuel will be injected along an imaginary conical surface from the apex thereof, said surface dividing the entire combustion chamber into two equal parts.

5. In a method for operating an internal combustion engine consisting of centrally introducing fuel into the cylinder thereof through a plurality of openings that are so directed as to eject fuel along two or more imaginary conical surfaces from the common apex thereof; said surfaces having a common axis and each surface dividing one of a corresponding number of conical portions of the cylinder chamber; the fuel introduced by each series of openings being proportionate to the volume of corresponding air surfaces.

In testimony whereof I have signed my name.

KNUT JONAS ELIAS HESSELMAN.