

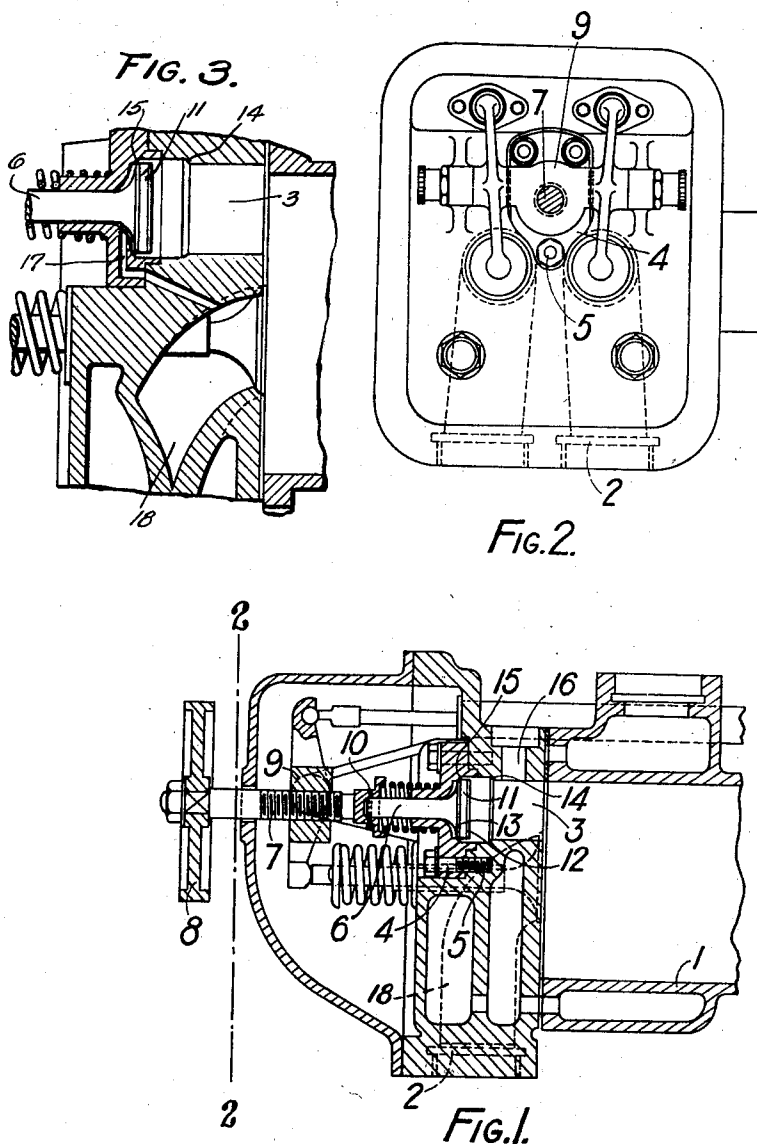
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VOLUME VARYING AND COMPRESSION RELIEVING MEANS FOR THE
COMBUSTION CHAMBERS OF INTERNAL COMBUSTION ENGINES

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VOLUME-VARYING AND COMPRESSION-
RELIEVING MEANS FOR THE COMBUSTION
CHAMBERS OF INTERNAL COM-
BUSTION ENGINESArthur Alexander Sidney, Thornton Heath, Eng-
land, assignor to Bryce Limited, a company of
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2 Claims. (Cl. 123—48)

This invention relates to volume-varying and compression-releasing means for the combustion chambers of internal combustion engines and has for its object to provide means whereby the compression ratio of the engine may be reduced to zero, set at a normal value or set at an increased value.

A variable compression ratio is particularly desirable in the case of compression ignition or heavy oil engines. In order to obtain the air temperature necessary for self ignition when starting such an engine from the cold condition, a high compression ratio has to be employed. When the engine is in normal operation, however, the heating of the air in the cylinder by the hot cylinder walls results in a considerably increased compression pressure and a lower compression ratio is then desirable in order to reduce the stresses in the various parts of the engine.

Furthermore, in order to reduce the resistance against initial rotation of the engine crank shaft, it is desirable to be able to release the compression appreciably.

All the above stated three requirements are fulfilled by the present invention.

The invention comprises a cylindrical chamber communicating at one end with a cylinder chamber of the engine and having a pair of oppositely-directed seats, a disc disposed transversely of said chamber with substantial clearance between its periphery and the chamber wall and having a face on each of its front and rear surfaces adapted to cooperate, respectively, with the seatings in the chamber, and means for moving the disc axially of the chamber to locate it positively in either of its extreme positions to cooperate with one or the other of the seatings, or to locate it positively in an intermediate position.

Further features of the invention will be hereafter described or indicated.

In the accompanying drawing:—

Figure 1 is a part sectional side elevation of a compression ignition engine embodying the invention.

Figure 2 is a section on the line 2—2 of Figure 1 with the cover for the valve mechanism removed.

Figure 3 is a fragmentary section through the cylinder head, on an enlarged scale.

In carrying the invention into effect by the embodiment thereof illustrated in the drawing, the cylinder 1 of an engine is provided with a detachable cylinder head 2 having a substantially cylindrical cavity 3 which forms the combustion

chamber of the engine, the said engine being preferably so constructed that its working piston approaches the inner face of the cylinder head as closely as is mechanically possible so that the bulk of the charge is confined in the chamber 3. The outer enlarged end of the chamber 3 is closed by a cover 4 secured to the cylinder head 2 by studs 5 and formed with a bore in which the stem 6 of a member for regulating the volume of the combustion chamber is slidably mounted.

A spindle 7, provided with a hand-wheel 8, is screw-threaded into a bridge-piece 9, which bridge-piece is attached to the cylinder head 2, and said spindle is connected to the stem 6 by means of a pin 10. The stem 6 is formed with a disc head 11 having front and back faces 12 and 13 adapted to engage seats 14 and 15, respectively. The seating 14 is formed in the cylinder head 2 and the seating 15 in the cover 4.

The circumference of the disc head 11 is preferably smaller than and has a sliding fit in the bore of the combustion chamber 3. A channel 17, formed in the cover 4, extends between a point in the chamber 3 outwardly of the seat 15 and the exhaust outlet 18 of the engine. By means of the hand wheel 8 the disc head 11 may be moved axially towards the cylinder 1 so as to move its face 12 against the seat 14, whereby a combustion chamber of minimum volume and a consequent high compression ratio for the engine is secured, or said disc head may be withdrawn away from the cylinder 1 so as to move its face 13 against the seat 15 so as to secure a combustion chamber of maximum volume and, therefore, a low compression ratio for the engine.

The cylinder head 2 is provided with an aperture 16 communicating with the combustion chamber 3 in which may be inserted an ignition device, for example either a fuel sprayer, in the case of a compression ignition engine, or a spark plug, in the case of a hydrocarbon or like engine.

In the operation of the invention, particularly in its application to compression ignition engines, when starting the engine, the hand wheel 8 is turned in a direction to set the face 12 of the disc head 11 against the seat 14 so as to secure a high compression ratio in the chamber 3. It is thus possible to obtain the necessary ignition temperature of the charge of air even when the engine is cold. Later on, however, when the engine has become warm, the continued use of this high compression ratio would result in abnormally high compression pressures and consequent engine stresses as the result of the higher initial temperature of the air which is being compressed,

and the disc head 11 is, therefore, moved to its low compression position in which its valve 13 is seated against the seat 15.

As previously stated, the piston of the engine is made to approach the inner face of the cylinder head closely, so as to leave the minimum possible clearance between it and the cylinder head. By this means, substantially the entire contents of the cylinder 1 are concentrated at the moment of ignition in the combustion chamber 3 thereby obtaining the highest possible efficiency of operation.

The clearance provided between the circumference of the disc head 11 and the bore of the combustion chamber 3 enables the cylinder charge to escape, whenever the disc head 11 is in an intermediate position, by way of a channel 17, formed in the cover 4, which channel may communicate either with the atmosphere or with the exhaust conduit in the cylinder head. The cylinder compression may thus be released in order to facilitate the initiation of rotation of the engine crankshaft when starting.

It is to be understood that the invention is not limited to the above details but is capable of being variously modified according to any requirements or practical conditions it may be desired to fulfill. Thus, other means may be employed for adjusting the position of the regulating member, and shapes other than cylindrical may be adopted for the combustion chamber which may also be disposed with its axis other than parallel to the cylinder axis.

I claim:—

1. In an internal combustion engine, a cylinder, a head for the cylinder having a cylindrical combustion chamber and an exhaust outlet therein, said combustion chamber communicating at

its inner end with the cylinder and at its outer end with the exhaust outlet, said combustion chamber having a seat adjacent its outer end and a second seat between its ends, a disc disposed transversely of said chamber with substantial clearance between its periphery and the chamber wall, said disc having a face on each of its front and rear surfaces adapted, respectively, to cooperate with said seats of the chamber, and means for moving the disc axially of the chamber to locate it positively in either of its extreme positions with one or the other of its faces in contact with one or other of the seats to vary the volume of the combustion chamber, or to locate it in an intermediate position to relieve the compression.

2. In an internal combustion engine, a cylinder, a head for the cylinder having a cylindrical combustion chamber and an exhaust outlet therein, said combustion chamber communicating at its inner end with the engine cylinder and at its outer end with the exhaust outlet, said combustion chamber having an annular seat at its outer end and an oppositely directed annular seat axially displaced from said other seat, a disc disposed transversely of said chamber between said seatings with substantial clearance between its periphery and the wall of the chamber, said disc having an annular face on its front surface and an annular face on its rear surface, and means for moving the disc axially of said chamber to seat one of its annular faces at one end of its movement on the first-named annular seating or to seat its other annular face on the second-named annular seating at the other end of its movements to vary the volume of the combustion chamber, or to position the disc between its extreme positions to relieve the compression.

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