C. R. COLT.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED JUNE 16, 1920.

1,436,574.

Patented Nov. 21, 1922.

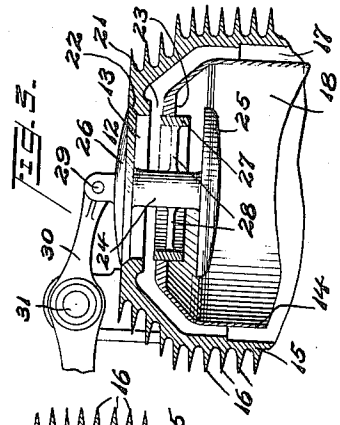


FIG. 5.

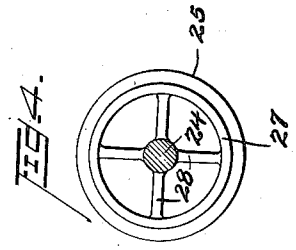


FIG. 4.

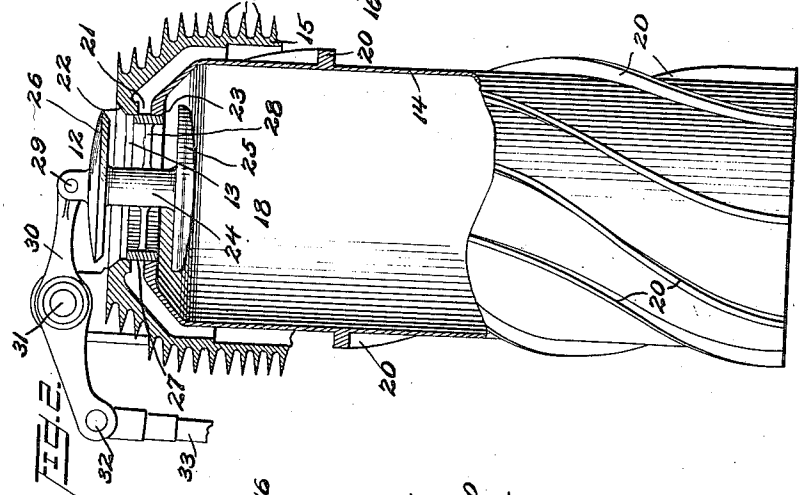


FIG. 2.

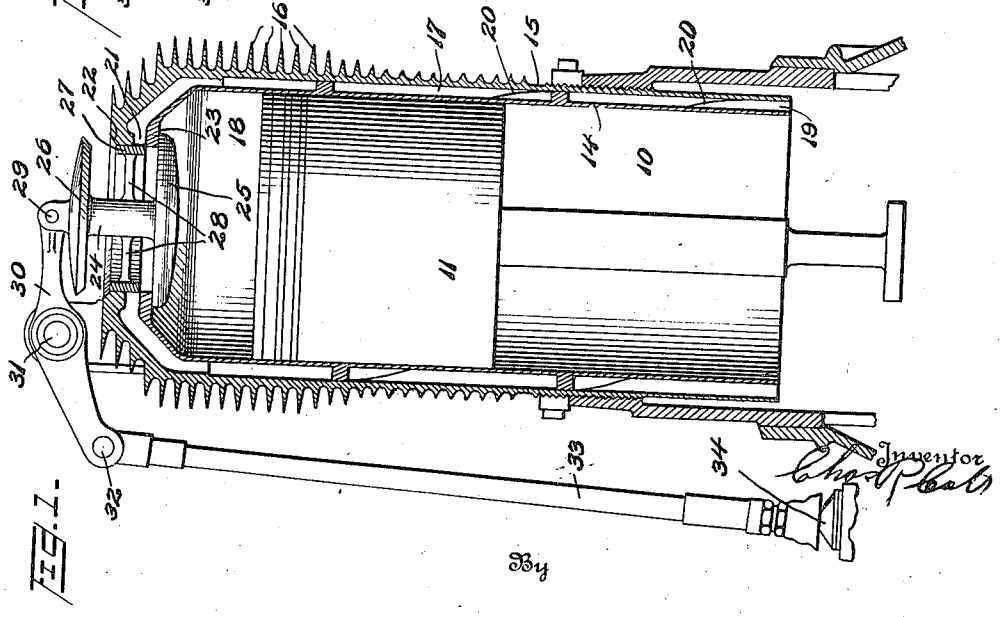


FIG. 1.

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UNITED STATES PATENT OFFICE.

CHARLES R. COLT, OF WASHINGTON, DISTRICT OF COLUMBIA.

INTERNAL-COMBUSTION ENGINE.

Application filed June 16, 1920. Serial No. 389,439.

To all whom it may concern:

Be it known that I, CHARLES R. COLT, a citizen of the United States, residing at Washington, District of Columbia, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

My invention relates to engines and particularly to internal combustion engines, the improved engine being especially adapted for aeronautical use.

An object of my invention is to provide novel means for controlling the intake and exhaust operations of each cylinder of an engine and at the same time providing for maintaining such cylinder in a cool and efficient working condition without the aid of the usual water-cooling system, thereby saving weight and certain complications due to the employment of the water-cooling system.

A further object of my invention is to provide in conjunction with a cylinder having a certain arrangement of mixture heating and cylinder wall cooling space and also having a combined inlet and exhaust port, a valve unit or body having a plurality of valve faces so arranged with relation to each other and to said port that in the back and forth movements of the valve, the different cycles of operation of the engine are taken care of in proper sequence and in proper timing.

A further object of my invention is to provide a valve unit or body comprising several valve faces, all of the valve faces being combined in fixed relation to each other and as an integral unit. This results in great strength of parts and therefore durability and long life, said feature lending itself particularly to aeronautical engines in which the weight is necessarily reduced to the greatest practical extent.

With the above and other objects in view my invention consists in the novel construction, combination and arrangement herein fully described, illustrated and claimed.

In the accompanying drawings—

Fig. 1 is a diametrical section through one cylinder of the internal combustion engine, showing the improved valve structure and the preferred formation of the cylinder, the valve being shown in its compression position;

Fig. 2 is a similar view showing the valve in exhaust position;

Fig. 3 is a similar view showing the valve in inlet position;

Fig. 4 is a cross section through the valve in close proximity to the intermediate valve face.

In the accompanying drawings 10 designates one of the cylinders of an internal combustion engine especially adapted for aeronautical purposes; 11 designates a reciprocatory piston working therein and 12 designates generally a valve unit or body hereinafter more particularly described and working in conjunction with the combined inlet and exhaust port 13 in the head of the cylinder 10.

The cylinder 10 comprises an inner wall 14 and an outer wall 15, said walls being arranged in spaced and concentric relation to each other as shown, and the outer wall being formed with cooling fins 16 similar to those now in use on air cooled engine cylinders. The space 17 left between the inner and outer walls 14 and 15 of the cylinder, serves as a mixture heating chamber or space surrounding the combustion chamber 18 of the cylinder, said space 17 being open at 19 adjacent the crank case for the purpose of receiving the mixture partially compressed in the crank case. The mixture received from the crank case and flowing through the space 17 is caused to describe a spiral path in its movement lengthwise of the cylinder, such spiral movement of the mixture being caused by spirally arranged web portions 20 more clearly shown in Fig. 2, said webs extending between said outer and inner walls of the cylinder. It will be obvious that the webbed portions 20 may be formed either upon the inner wall or upon the outer wall of the cylinder, the function thereof being simply to direct the mixture around the inside wall of the cylinder as well as lengthwise thereof.

The space 17 extends through the entire length of the cylinder and intersects the port 13 thereby forming an annular orifice 21

which is controlled by the working face of the valve 12 as will presently appear. The port 13 is chamfered at its outer side to form a beveled valve seat 22, while the inner face of the head of the cylinder forms another valve seat 23 for a purpose which will appear.

The valve body or unit 12 comprises a central stem 24, an inlet valve portion 25, an exhaust valve portion 26, and an intermediate valve portion 27. All of the parts 24, 25, 26 and 27 are formed as an integral body or unit and while parts 26 and 27 are preferably solid and imperforate, the intermediate part 27 is of open center or spider formation as best shown in Fig. 4 where it is seen to comprise a series of spokes 28 which extend outwardly from the stem 24 to the working portion of that part of the valve. The valve 12 is operatively connected by the usual pivotal connection 29 to one branch of the rocker arm 30 which is fulcrumed at 31 on the cylinder and operatively connected by means of the usual pivotal connection 32 with a push rod 33 actuated in the ordinary manner by a cam 34 thereby properly timing and controlling the back and forth movements of the valve body.

From the foregoing description taken in connection with the accompanying drawings the operation of the engine will be understood. In the intake or suction stroke of the engine, the valve member 25 moves inwardly so as to open port 13 into the cylinder, while the outside of said port is closed by the exhaust valve member 26 as shown in Fig. 3. In such position of the valve body, the valve member 27 is moved inwardly to an extent to fully open the orifice 21 thereby admitting the heated mixture from the mixture heating space 17 into the combustion chamber 18. While the valve is in the position shown in Fig. 3 the piston 11 is moved inwardly toward the crank shaft on its suction stroke. In the return outward movement of the piston 11, it compresses the mixture with which the cylinder has just been charged, and to that end the valve is moved from the position shown in Fig. 3 to the position shown in Fig. 1, closing port 13 at its inner end and also closing orifice 21. The valve 13 is held in the last named position during the firing stroke as the piston 11 is driven on its working stroke toward the crank shaft. As the piston 11 moves outwardly again to perform its scavenging stroke, the valve 13 is moved to the position shown in Fig. 2 wherein it will be observed that the valve members 26 and 27 are both away from their seats while the orifice 21 is closed by valve member 27. This permits the exhaust or burned gases to be forced freely outwardly through port 13. The valve 12 is then shifted to the position shown in Fig. 3 whereupon the next suction stroke of the piston takes place.

It will be understood that the mixture in passing through the space 17 absorbs heat from the inner wall 14 of the cylinder thereby assisting in keeping in an efficient and cool working condition that wall of the cylinder which immediately surrounds the combustion chamber. Said cooling mixture also absorbs a portion of the heat from the outer wall 15 of the cylinder, the additional cooling of which is affected by the cooling fins 16. In this way the cylinder keeps in a cool working condition without the aid of the usual water cooling system. Furthermore the explosive mixture is heated on its way from the crank case or other source of supply to the point of its discharge into the combustion chamber. As a result the explosive mixture is in better condition for quick ignition and more perfect combustion which increases the reliability of the motor and also adds to its power efficiency.

The improvement hereinabove described is applicable to engines of various types but is shown for the purpose of illustration as applied to a cylinder of an internal combustion engine of what is known as a rotary or rotating type in which the cylinders are rotated around a central crank shaft which is ordinarily non-rotary. A salient feature of the invention resides in the valve body or unit and the working relation thereof and the several parts or members thereof to the combination port in the cylinder head, whereby the different cycles of operation are taken care of under the proper timing, while at the same time insuring practical cooling of the cylinder walls and increasing the combustibility of the explosive mixture.

What I claim is:

1. In an internal combustion engine, an air cooled cylinder having an enclosed mixture-heating and cylinder wall-cooling space surrounding the combustion chamber thereof and also having a combined inlet and exhaust port through the head thereof intersecting said space; a valve unit, embodying an internally arranged inlet valve face, an exteriorly arranged outwardly opening exhaust valve face, and an intermediate valve face operating to open and close the orifice formed at the intersection of said mixture heating and said cylinder head port.

2. In an internal combustion engine, an air cooled cylinder having an enclosed mixture-heating and cylinder wall-cooling space surrounding the combustion chamber thereof and open at the crank case end, said cylinder also having a combined inlet and ex-

haust port through the head thereof intersecting said space; a valve unit embodying an internally arranged inlet valve face, an exteriorly arranged outwardly opening exhaust valve face, and an intermediate valve face operating to open and close the orifice formed at the intersection of said mixture heating space and said cylinder head port, all of said valve faces being formed on the valve unit body and fixed in relation to each other.

In testimony whereof I have affixed my signature.

CHAS. R. COLT.