

Oct. 19, 1937.

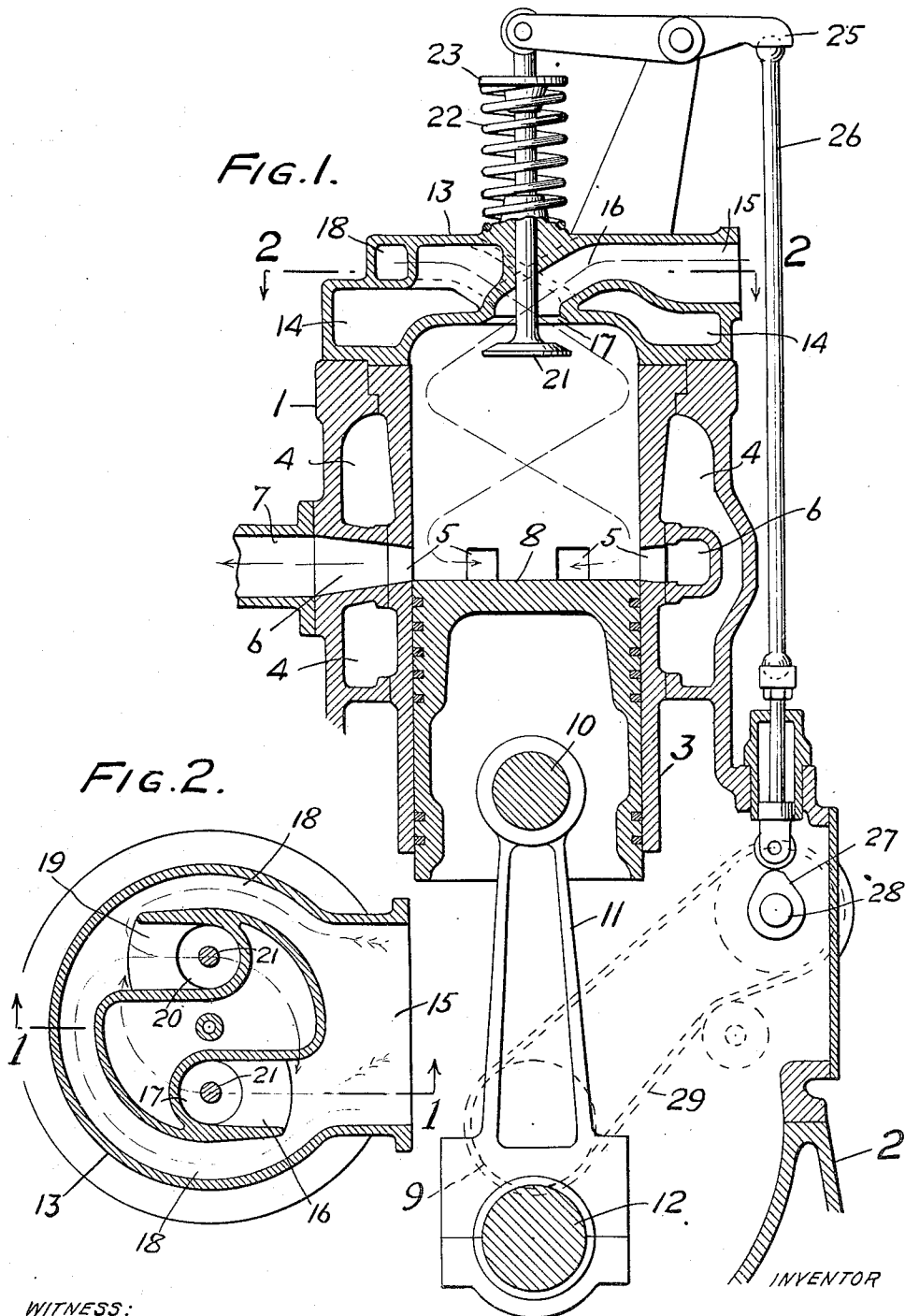
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2,096,327

INTERNAL COMBUSTION ENGINE

Filed Oct. 22, 1935

2 Sheets-Sheet 1



WITNESS:

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2 Sheets-Sheet 2

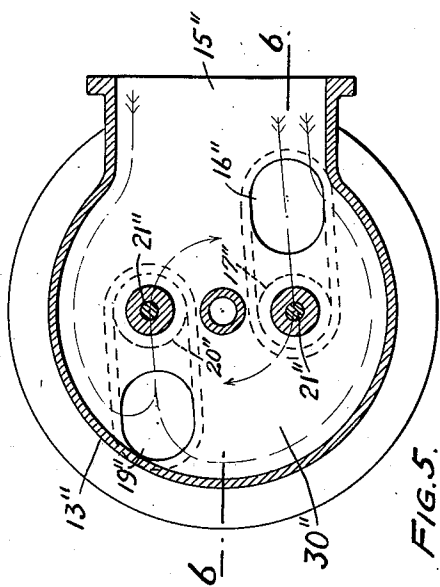


FIG. 5.

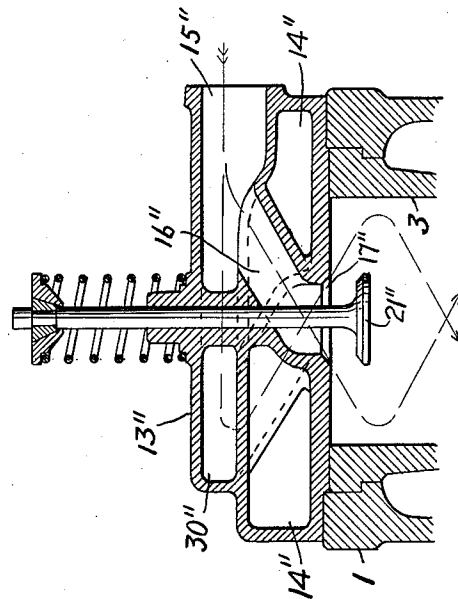


FIG. 6.

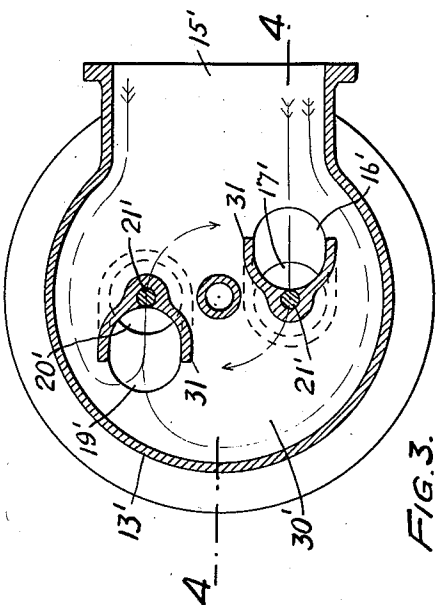


FIG. 3.

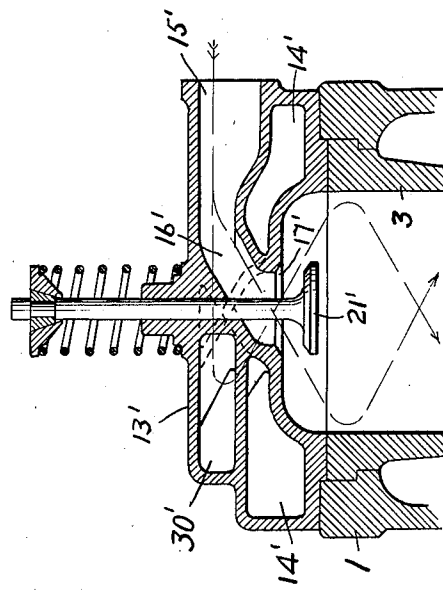


FIG. 4.

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INTERNAL COMBUSTION ENGINE

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Application October 22, 1935, Serial No. 46,067

5 Claims. (Cl. 123—65)

This invention relates to an improvement in internal combustion engines of the single piston, two stroke cycle type. The invention is applicable to engines of the Diesel type and likewise to engines adapted for operation with gasoline, gas or other fuels.

Engines embodying this invention may be constructed with one or a plurality of cylinders which may be arranged in vertical, horizontal or inclined position.

This invention has for its object a provision of means for adequate and efficient scavenging of the cylinder, or cylinders, of the two stroke cycle type. More particularly, in accordance with this invention, means are provided whereby scavenging of such cylinder is effected from end to end with two streams of scavenging air whirling spirally down through the cylinder.

Having now indicated in a general way the nature and purpose of this invention, a detailed description of a preferred embodiment thereof with reference to the accompanying drawings will be given.

In the drawings:

Figure 1 is a vertical section through an engine embodying this invention, a part of the structure not necessary for an understanding of the present invention being omitted.

Figure 2 is a horizontal section taken on the line 2—2 through Figure 1.

Figure 3 is a horizontal section similar to Figure 2 but showing a modified form of engine in accordance with this invention.

Figure 4 is a vertical section taken on the line 4—4 of Figure 3 showing the upper part of the cylinder.

Figure 5 is a horizontal section similar to Figures 2 and 3, showing a still further modification of this invention, and

Figure 6 is a vertical section taken on the line 6—6 in Figure 5, showing the upper part of the cylinder.

Referring to Figures 1 and 2, 1 indicates a main frame supported on a base plate 2, and supporting a cylinder liner 3. The main frame and the cylinder liner are designed to form a water jacket 4 about the upper part of the cylinder. Exhaust ports 5 are formed in the cylinder liner and communicate with an exhaust passage 6 formed in the main frame and extending around the cylinder to communicate with an exhaust pipe 7.

Within the cylinder is a piston 8 connected to a crank shaft 9, supported from base plate 2,

through a wrist pin 10, connecting rod 11 and crank 12.

Supported from the main frame 1 is a cylinder head 13 provided with a water cooling space 14. The cylinder head is also provided with an inlet 15 from a source of air under pressure, communicating through the sloping passage 16 with a port 17 between the cylinder head and the combustion space within the interior of the cylinder. The inlet 17 likewise communicates, by means of sloping passages 18 and 19, with a second port 20 between the cylinder head and the interior of the cylinder. Ports 17 and 20 are controlled by puppet valves 21. These valves are retained in closed position by means of valve springs 22 and retaining rings 23. The valves 21 are operated to open against the action of the valve springs 22 by means of rocker arms 25 and push rod assemblies 26, actuated by cams 27 on cam shaft 28. The cam shaft 28 is driven from the crank shaft 9 by means of a chain 29.

Referring to Figures 3 and 4, there is shown a modified type of cylinder head 13', provided with a cooling water space 14' and an inlet 15', and a chamber 30', communicating through inlet 15' with a source of air under pressure and through passages 16' and 19' and ports 17' and 20' with the interior of the cylinder. The ports 17' and 20' are controlled by puppet valves 21' in the same way as in the structure shown in Figures 1 and 2. Semi-circular deflectors 31, rising to the top of chamber 30', surround the openings to passageways 16' and 19'.

In Figures 5 and 6, a further modified form of cylinder head 13'' is shown. This cylinder head is provided with cooling water passages 14'' and a chamber 30'' which communicates through inlet 15'' with a source of air under pressure and through passageways 16'' and 19'' and ports 17'' and 20'' with the interior of the cylinder. The ports 17'' and 20'' are controlled by puppet valves 21'', as heretofore described. This type of cylinder head is especially adapted for use with a high compression Diesel engine in which the combustion space does not extend up into the head. The types of cylinder heads shown in Figures 1, 2, 3 and 4, and in which the combustion space, as shown, extends up into the cylinder head, are designed more particularly for operation with low compression gas engines.

The engine described above is provided with the usual and desired lubricating devices and the like, and, depending upon its type, is provided with a fuel injection valve, if it be of the Diesel

type, or equivalently, with any conventional intake passage suitably controlled by an automatic or mechanically operated inlet valve, if it be of the gas fuel type. If the engine be of other than the Diesel type, it will be equipped with any suitable and conventional ignition system. In operation, the engine according to the invention will proceed through the usual two stroke cycle. However, after the opening of the exhaust ports 5 on completion of the power stroke, valves 21 will be opened and scavenging air under pressure will be admitted into the cylinder through the sloping passages 16 and 19 and ports 17 and 20. These passages slope in opposite directions 15 and their respective ports are positioned on opposite sides of the central axis of the cylinder. Accordingly, the scavenging air enters the cylinder on the opening of valves 21 in different directions with respect to the axis of the cylinder 20 due to the guiding effect of the sloping passages, which, as has been indicated, slope in different directions. The air, after admission to the cylinder will proceed in whirling spirals down through the cylinder and out through the exhaust ports. 25 These two streams of whirling scavenging air will execute a thorough scavenging of the cylinder and will insure that all dead or burned gas is swept out through the exhaust ports.

In usual operation, on the compression stroke 30 of the piston 8, the valves 21 will be left open for a part of the stroke in order to build up compression.

It will now be appreciated that this invention contemplates, broadly, the provision of new means for the admission of scavenging air into 35 the head end of the cylinder of a single piston, two cycle engine with exhaust ports at its opposite end in streams having circular direction of travel with respect to the cylinder.

It will be understood that various modifications 40 may be made in the specific embodiment of this invention as above described, without departing from the broad scope of the invention, and that consequently the invention is not to be limited 45 to the particular embodiment described by way of illustration.

What I claim and desire to protect by Letters Patent is:

1. In an internal combustion engine of the two 50 cycle type, the combination of a cylinder provided with an exhaust port at its lower end, a piston in said cylinder adapted to uncover said exhaust port in its downward stroke, a plurality 55 of air ports for the admission of scavenging air in the cylinder head, valves controlling each of said ports, and means for conducting scavenging air to each of said ports, said means comprising passageways in the cylinder head each sloping 60 with respect to the cylinder axis in different directions, whereby scavenging air is admitted to

the cylinder in a plurality of streams flowing in circular directions with respect to the cylinder.

2. In an internal combustion engine of the two cycle type, the combination of a cylinder provided with an exhaust port at its lower end, a piston 5 in said cylinder adapted to uncover said exhaust port in its downward stroke, two air ports for the admission of scavenging air positioned in the cylinder head on opposite sides of the central axis thereof, valves controlling each of said ports, 10 and means for conducting scavenging air to each of said ports, said means comprising passageways in the cylinder head each sloping with respect to the cylinder axis in opposite directions, whereby scavenging air is admitted to the cylinder in a 15 plurality of streams flowing in circular directions with respect to the cylinder.

3. A cylinder head adapted to be used with an internal combustion engine of the two cycle type and including an inlet adapted to communicate 20 with a source of scavenging air, a plurality of ports adapted to communicate with the interior of the cylinder positioned about the central axis of the cylinder head, valves controlling each of said ports, and means for conducting scavenging 25 air from the inlet to each of said ports, said means including passageways each sloping with respect to the cylinder axis in opposing directions so as to admit scavenging air to the cylinder in a plurality of streams flowing in circular directions. 30

4. A cylinder head adapted to be used with an internal combustion engine of the two cycle type and including an inlet adapted to communicate with a source of scavenging air, a chamber communicating with said inlet, a plurality of ports 35 adapted to communicate with the interior of the cylinder positioned about the central axis of the cylinder head, valves controlling each of said ports, and passageways leading from said chamber to each of said ports, said passageways each 40 sloping with respect to the cylinder axis in opposing directions so as to admit scavenging air to the cylinder in a plurality of streams flowing in circular directions.

5. A cylinder head adapted to be used with an 45 internal combustion engine of the two cycle type and including an inlet adapted to communicate with a source of scavenging air, a chamber communicating with said inlet, a plurality of ports 50 adapted to communicate with the interior of the cylinder positioned about the central axis of the cylinder head, valves controlling each of said ports, passageways leading from said chamber to each of said ports, said passageways each sloping 55 with respect to the cylinder axis in different directions so as to admit scavenging air to the cylinder in a plurality of streams flowing in circular directions, and means positioned in said chamber to guide scavenging air into each of said passageways. 60

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