April 23, 1935. F. L. FISHER 1,999,092

TWO-CYCLE INTERNAL COMBUSTION ENGINE

Filed Aug. 25, 1933 2 Sheets-Sheet 1

Fig. 1.

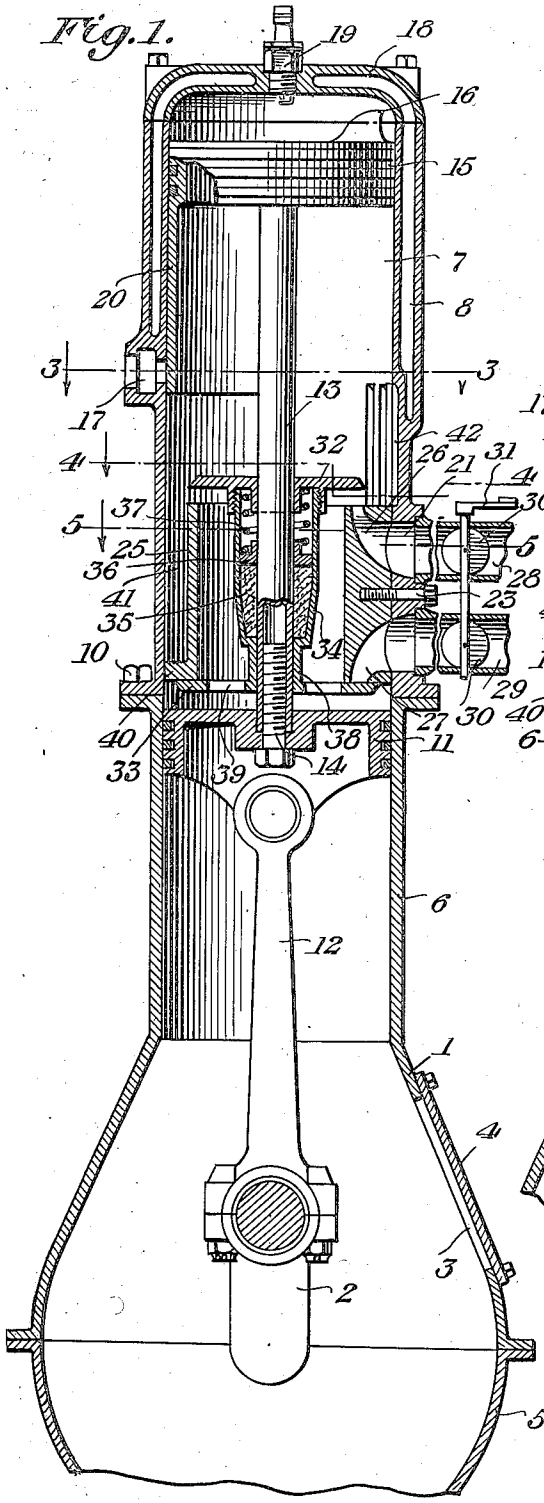
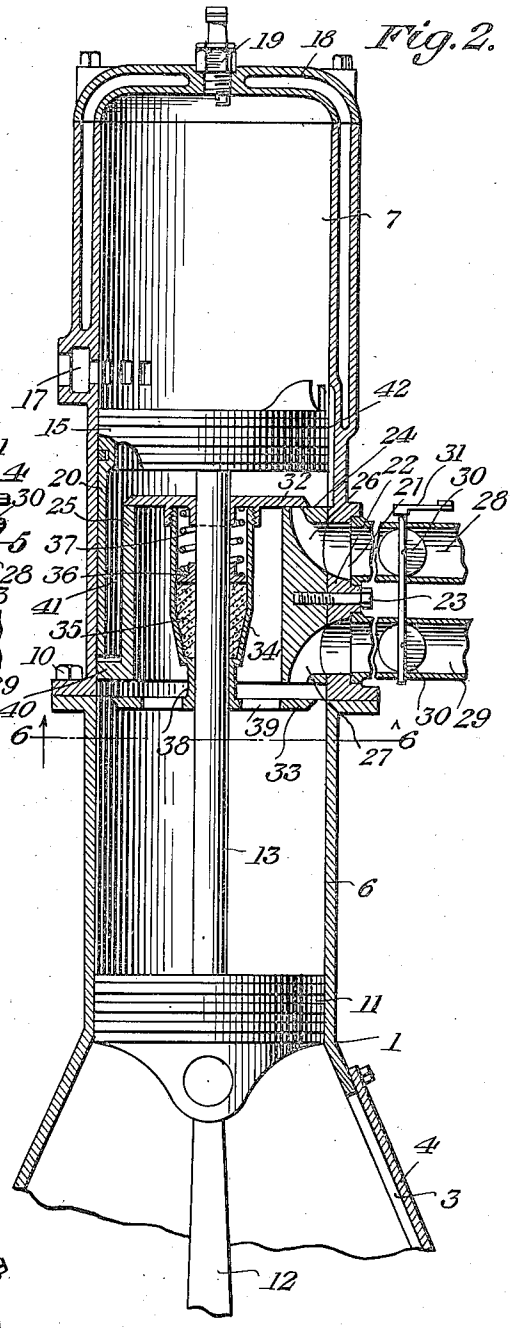


Fig. 2.



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Fig.3.

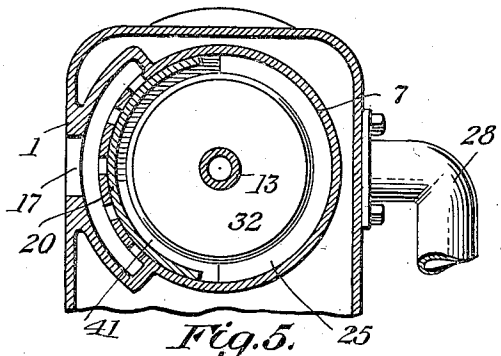


Fig.4.

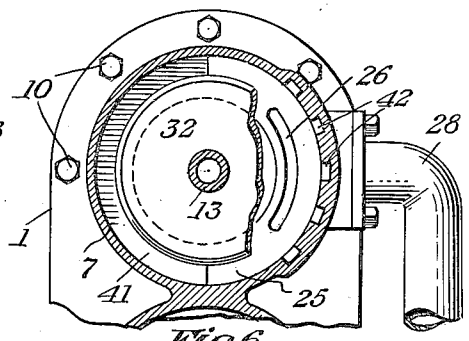


Fig.5.

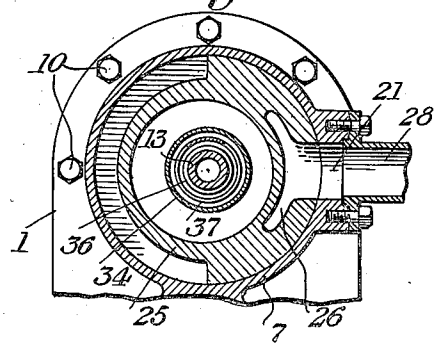


Fig.6.

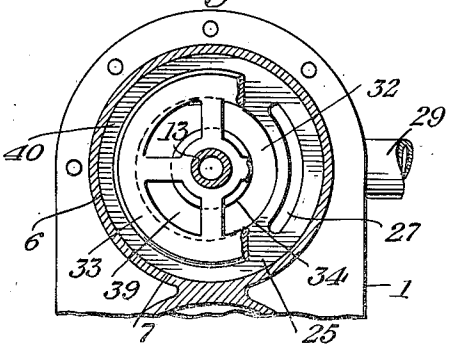


Fig.7.

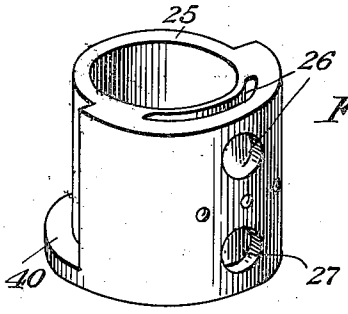


Fig.8.

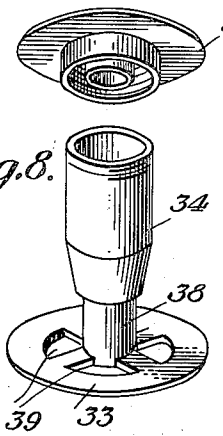
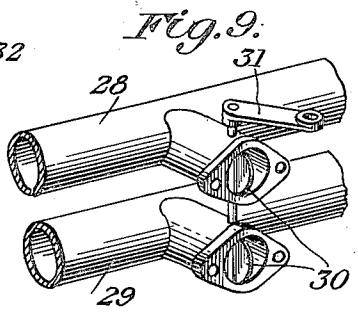


Fig.9.



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UNITED STATES PATENT OFFICE

1,999,092

TWO CYCLE INTERNAL COMBUSTION ENGINE

Frank L. Fisher, Cumberland, Md.

Application August 25, 1933, Serial No. 686,825

10 Claims. (Cl. 123—69)

This invention relates to internal combustion engines of the two cycle type and has for the primary object, the provision of an improved means for compressing the fuel and delivering the same to the cylinder of the engine for further compression prior to being ignited and which obviates the usual practice of compressing the fuel in the crank case of the engine.

Another object of this invention is the provision of a compression chamber for the cylinder of the engine and provided with a valve in communication therewith and a piston reciprocal with the piston of the cylinder so that air may be drawn into the chamber and compressed and then delivered to the cylinder of the engine along with fuel for further compression prior to the ignition thereof, whereby the compressed air passing into the cylinder from the chamber will aid in drawing fuel from a source into the cylinder for mixing with the compressed air so as to provide a highly combustible mixture capable of producing maximum power when ignited.

A further object of this invention is the provision of a novel valve structure for controlling the passage between the chamber and cylinder and which is automatically operated by the suction created in the chamber and cylinder during the reciprocation of the respective pistons of said chamber and cylinder.

A still further object of this invention is the provision of an engine construction which is easy to assemble or take apart or to remove the interior working parts thereof without removing the crank case or disturbing the lubricant therein.

With these and other objects in view, this invention consists in certain novel features of construction, combination and arrangement of parts to be hereinafter more fully described and claimed.

For a complete understanding of my invention, reference is to be had to the following description and accompanying drawings, in which

Figure 1 is a transverse sectional view illustrating an internal combustion engine constructed in accordance with my invention.

Figure 2 is a similar view showing the position of the pistons within the cylinder and compression chamber during the exhausting of spent gases from the cylinder and the supplying thereof with fresh fuel and the drawing in of air to the compression chamber.

Figure 3 is a fragmentary sectional view taken on the line 3—3 of Figure 1.

Figure 4 is a similar view taken on the line 4—4 of Figure 1.

Figure 5 is a similar view taken on the line 5—5 of Figure 1.

Figure 6 is a similar view taken on the line 6—6 of Figure 2.

Figure 7 is a perspective view illustrating a combined valve cage and fuel passage.

Figure 8 is a perspective view illustrating the valve.

Figure 9 is a fragmentary perspective view partly in section illustrating a manifold of the engine.

Referring in detail to the drawings, the numeral 1 indicates an engine base rotatably supporting a crank shaft 2 and is provided with hand openings 3 closed by removable covers 4. The engine base is provided with the usual removable crank case 5. The engine base may be designed for use with any number of cylinders desired and as each cylinder and the working parts associated therewith are identical in construction I have elected to show and describe the engine of a single cylinder type however it is to be understood that the same principle may be employed with a multiplicity of cylinders.

Formed integrally with the base 1 is a compression chamber 6 having communication with the interior of the base and the crank case and mounted upon the upper end thereof is a cylinder 7 properly water-jacketed as shown at 8 and detachably secured to the compression chamber 6 by bolts or like fasteners 10. A compression piston 11 is reciprocally mounted in the chamber 6 and is connected to the crank shaft 2 by a connector 12 and a piston stem 13 is detachably secured to the piston 11 by a bolt or like fastener 14, the head of which is so disposed that a person may detach the stem 13 from the piston 11 by working through the hand opening 3. As shown in Figure 1 the top face of the piston 11 is recessed and apertured to receive the lower end of the stem 13 and the bolt 14, the latter extending through the opening in the piston 11 and threaded into the stem 13. The upper end of the stem 13 carries a piston 15 having formed on its top face adjacent one edge a deflecting element 16 for the purpose of directing the incoming fuel upwardly in the cylinder 7 and away from the exhaust port 17 located at one side of the cylinder 7 and substantially intermediate its ends. The upper end of the cylinder is closed by a removable head 18 carrying the usual spark plug 19 for igniting the fuel within the cylinder. A semi-cylindrical skirt 20 is formed on the pis-

ton 15 and is of such a length that it will overlie and close the exhaust port 17 except when the piston 15 is in its lowermost position or when the upper face of the piston is disposed below the exhaust port 17 as shown in Figure 2 so that the spent gases within the cylinder may escape to the atmosphere.

The pistons 11 and 15 are provided with the usual ring grooves in which compression rings are located and the cylinder 7 adjacent its lower end and at one side thereof is provided with a manifold opening 21. A web 22 traverses the opening 21 and forms an integral part of the cylinder 7 and has detachably secured thereto by a bolt or like fastener 23 a combined valve cage and fuel passage 24. The combined valve cage and fuel passage 24 comprises a cylindrical body 25 one side of which is formed with a thickened wall and in which is formed a fuel passage 26 and an air passage 27. The passages 26 and 27 communicate with manifolds 28 and 29 respectively connected with the opening 21. The manifold 28 is adapted to supply fuel in the form of a gas to the passage 26 while the manifold 29 supplies air to the passage 27. Control valves 30 are located in the manifolds and are simultaneously operated by an operating medium 31 whereby the air and gas to the engine may be admitted to the engine in corresponding amounts so as to insure a proper formation of mixture to support combustion capable of producing maximum power without waste of fuel.

The ends of the body 25 form valve seats to be engaged by valves 32 and 33 which during their operation open and close the passages 26 and 27 to the cylinder 7 and compression chamber 6 and also control the passage of air from the compression chamber through the body to the cylinder 7. The valve 32 is provided with an opening to slidably receive the stem 13 and is detachably secured to a packing sleeve 34 located within the body and in which is located a packing 35 contacting with the stem to prevent leakage between the stem and the sleeve or between the compression chamber and the cylinder 7. The packing 35 is engaged by a follower 36 slidable in the sleeve and urged against the packing by a spring 37 having seated engagement with the valve 32. The lower end of the sleeve 34 is restricted to form a neck 38 slidably receiving the stem 13 and on which is formed the valve 33 and the latter is provided with openings 39 permitting a continuous communication to always be had between the interior of the body 25 and the compression chamber 6. The body 25 at its lower end is flanged as shown at 40 having a tight fit with the walls of the cylinder to cooperate with the fasteners 23 in retaining the body stationary within the cylinder. The flanged portion at one side of the body 25 provides a space 41 to receive the skirt 20 of the piston 15 during the downward movement of the latter. The cylinder 7 above the body and passage 21 is provided with a series of grooves 42 located opposite to the exhaust port 17 for the purpose of permitting the air and fuel within the cylinder 7 below the piston 15 to pass about the latter when in its lowermost position so as to enter the upper portion of the cylinder and be compressed by the upward movement of the piston 15 and be ignited by the spark plug when the piston reaches its uppermost or substantially uppermost position prior to starting on its downward or power stroke.

In operation when an explosion takes place in the upper end of the cylinder 7, the piston 15 is driven downwardly carrying with the same the piston 11 and imparting power to the crank shaft 2. The downward movement of the piston 11 creates a partial vacum within the compression chamber and the air from the manifold 29 enters the compression chamber. The piston 15 on reaching its lowermost position passes below the exhaust port 17 allowing the spent gases to escape to the atmosphere and on the upward stroke of the pistons 11 and 15 the valve 33 is seated and the valve 32 is unseated allowing the piston to draw fuel into the lower portion of the cylinder 7 and at the same time the air within the compression cylinder passes upwardly through the valve 29, body 25 and into the lower portion of the cylinder 7 and the passing of such air into said cylinder 7 aids in drawing the fuel from the manifold 28 into said cylinder 7. The piston 15 on its downward or power stroke compresses the fuel or air within the lower portion of the cylinder 7 due to the valve 32 being seated and when reaching its lowermost position the compressed fuel and air passes into the upper portion of the cylinder by way of the grooves 42 being directed away from the exhaust port 17 by the deflecting element 16 and the up stroke of the piston 15 compresses the fuel ready for ignition when the piston reaches substantially its uppermost position.

From the foregoing description taken in connection with the accompanying drawings, it will be seen that a two cycle engine has been provided capable of economical operation and which obviates the employment of the crank case as a medium in which the fuel may be compressed prior to entering the explosion chamber and which from actual experience has proven unsatisfactory due to leakage caused by vibration loosening the connection between the engine base and the crank case. Further it is to be noted that it is possible to remove the pistons and valves from the inside of the engine with minimum effort on the part of the repairman and that such parts may be replaced with corresponding ease.

While I have shown and described the preferred embodiment of my invention, it will be understood that minor changes in construction, combination and arrangement of parts may be made without departing from the spirit and scope of my invention, as claimed.

Having thus described my invention, what I claim is:

1. An internal combustion engine comprising an engine base, a crank shaft carried by the base, an air compressing means on the base, a cylinder in communication with said means and having an exhaust, a piston in said cylinder and connected to the crank shaft, ignition means for said cylinder, means for admitting fuel to the cylinder, means for admitting air to the air compressing means, and means for controlling the fuel to the cylinder and the air to the compressing means and from the latter to said cylinder, said air in the air compressing means passing into the cylinder adapted to aid the movement of the fuel into the cylinder.

2. An internal combustion engine of the two cycle type comprising an engine base, a crank shaft carried by the base, an air compressing means on the base, a cylinder in communication with said means and having an exhaust, a piston in said cylinder and connected to the crank shaft, ignition means for said cylinder means for admitting fuel to the cylinder, means for admitting air to the air compressing means, and combined

pressure and suction operated means for controlling the fuel to the cylinder and the air to the compressing means and from the latter to said cylinder during the admittance of the fuel to said cylinder.

3. An internal combustion engine comprising an engine base, a crank shaft carried by the base, an air compressing chamber on the base, a cylinder carried by said chamber and in communication therewith and having an exhaust, pistons in said cylinder and chamber, means connecting the pistons to the crank shaft, ignition means for said cylinder, means for admitting fuel to the cylinder, means for admitting air to the compressing chamber, and a valve controlling the fuel to the cylinder and the air to the compressing chamber and from the latter to said cylinder during the admittance of the fuel to said cylinder.

4. An internal combustion engine comprising an engine base, a crank shaft carried by the base, an air compressing chamber on the base, a cylinder carried by said chamber and in communication therewith and having an exhaust, pistons in said cylinder and chamber, means connecting the pistons to the crank shaft, ignition means for said cylinder, means for admitting fuel to the cylinder, means for admitting air to the compressing chamber, and a valve actuated by suction and compression formed by the movement of the pistons for controlling the fuel to the cylinder and the air to the compressing chamber and from the latter to said cylinder.

5. An internal combustion engine comprising an engine base, a crank shaft carried by the base, an air compressing chamber on the base, a cylinder carried by said chamber and in communication therewith and having an exhaust, pistons in said cylinder and chamber, means connecting the pistons to the crank shaft, ignition means for said cylinder, means for admitting fuel to the cylinder, means for admitting air to the compressing chamber, and a double valve actuated by suction and compression formed by the movement of the pistons for controlling the fuel to the cylinder and the air to the compressing chamber and from the latter to said cylinder.

6. An internal combustion engine comprising a base, a crank shaft carried by the base, an air compressing chamber on the base, a cylinder carried by the chamber and in communication therewith and provided with an exhaust, pistons in said chamber and cylinder, means connecting the pistons for movement in unison, means for connecting the piston of the compression chamber to the crank shaft, ignition means for the cylinder, means for admitting fuel to the cylinder below its respective piston, means for admitting air to the compression chamber above its respective piston, and valve means for controlling the fuel to the cylinder and the air to the compressing chamber and from the latter to said cylinder during the admittance of the fuel to said cylinder.

7. An internal combustion engine comprising a base, a cam shaft carried by the base, an air compressing chamber on the base, a cylinder carried by the chamber and in communication therewith and provided with an exhaust, pistons in said chamber and cylinder, means connecting the pistons for movement in unison, means for connecting the piston of the compression chamber to the crank shaft, ignition means for the cylinder, means for admitting fuel to the cylinder below its respective piston, means for admitting air to the compression chamber above its respective piston, valve means for controlling the fuel to the cylinder and the air to the compressing chamber and from the latter to said cylinder, said cylinder having means for permitting the air and fuel compressed between the respective piston and the valve means to pass about said respective piston into the upper portion of the cylinder when the respective piston is in its lowermost position, and a skirt carried by the piston of the cylinder for closing the exhaust until the respective piston reaches its lowermost position.

8. An internal combustion engine comprising a base, a crank shaft carried by the base, an air compressing chamber on the base, a cylinder removably secured to the chamber and in communication therewith and having an exhaust, ignition means for the cylinder, pistons in the cylinder and chamber, means detachably connecting the pistons, means connecting the piston of the chamber with the crank shaft, a valve cage in the cylinder and having passages communicative with the cylinder and the chamber and connected to fuel and air supply means, said cage having a passage therethrough to establish communication between the chamber and the cylder, and suction operated valves associated with the cage for controlling the passages.

9. An internal combustion engine comprising a base, a crank shaft carried by the base, an air compressing chamber on the base, a cylinder removably secured to the chamber and in communication therewith and having an exhaust, ignition means for the cylinder, pistons in the cylinder and chamber, means detachably connecting the pistons, means connecting the piston of the chamber with the crank shaft, a valve cage in the cylinder and having passages communicative with the cylinder and the chamber and connected to fuel and air supply means, said cage having a passage therethrough to establish communication between the chamber and the cylinder, and suction operated valves engaging the cage for controlling the fuel to the cylinder and the air to the compression chamber and from the latter to said cylinder.

10. An internal combustion engine compising a base having a hand opening, a cover for said hand opening, a crank shaft carried by the base, a crank case carried by the base, a compression chamber carried by the base and in communication therewith, a cylinder removably secured to the chamber and in communication therewith, a removable head for the cylinder, ignition means carried by the head, pistons in the cylinder and compression chamber, means detachably connecting the pistons and capable of being manually manipulated by way of the hand opening, means connecting the piston of the chamber to the crank shaft, means for admitting fuel to the cylinder, means for admitting air to the compression chamber, said control means for the fuel and air controlling the passage of air from the chamber to the cylinder so that said air may aid in the passage of fuel into the chamber.

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