Sept. 24, 1929. J. P. LANDRUM 1,729,392

INTERNAL COMBUSTION ENGINE

Filed Oct. 21, 1927

Fig. 1

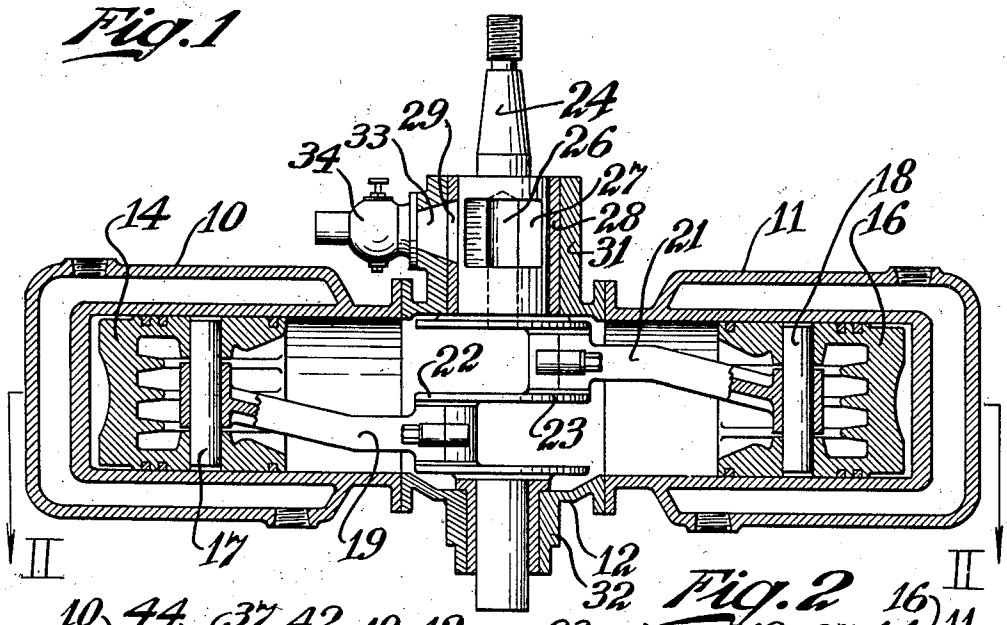


Fig. 2

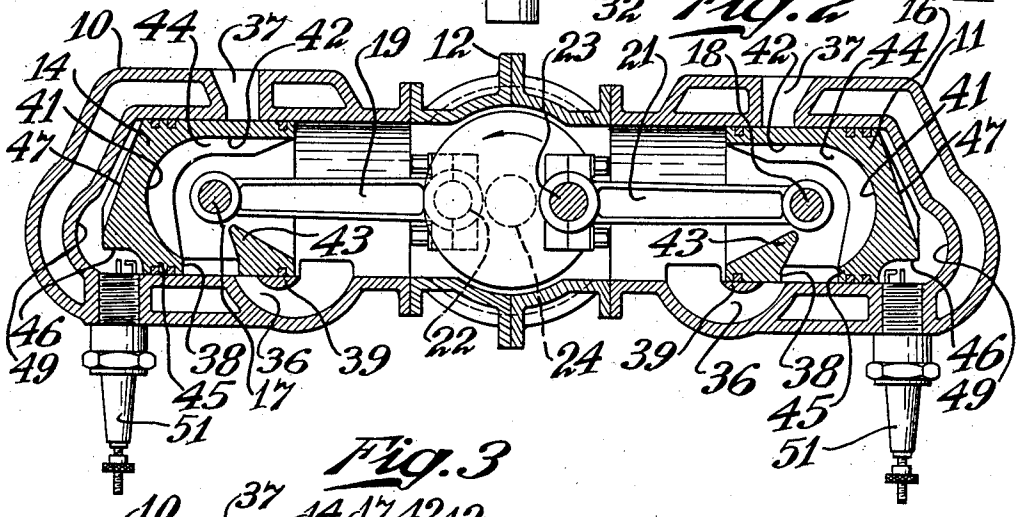
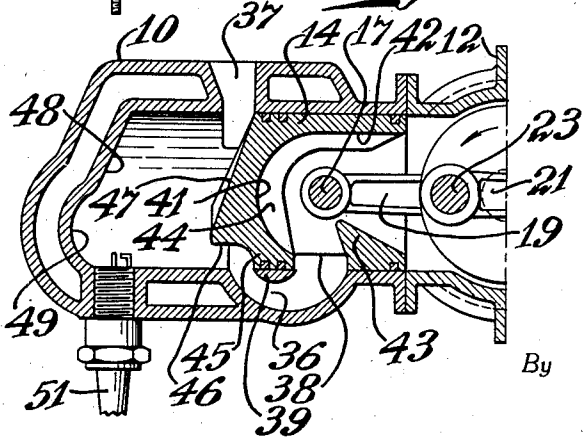


Fig. 3



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UNITED STATES PATENT OFFICE

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INTERNAL-COMBUSTION ENGINE

Application filed October 21, 1927. Serial No. 227,786.

My invention relates to internal combustion engines and has for its object the provision of apparatus of the character designated which shall have improved power developing and endurance qualities.

A further object of my invention is to provide an improved piston and cylinder construction for two cycle internal combustion engines, whereby the cylinder is more thoroughly scavenged of the burnt gases of combustion.

A more specific object of my invention is to provide an improved piston and cylinder construction for two cycle internal combustion engines of the type wherein the fuel mixture is admitted through the crank case and piston to the combustion end of the cylinder, whereby partial combustion of the fuel mixture on the crank case side of the piston and consequent carbon deposits therein shall be obviated.

A still further object of my invention is to provide improved means for the supplying of fuel and for cooling the piston of a two cycle internal combustion engine by the fuel mixture whereby carbon deposits on the piston are obviated and the fuel mixture is preheated before admission to the cylinder.

Another object of my invention is to provide an improved piston and cylinder construction for internal combustion engines which shall effect a more thorough mixture of the fuel and air for combustion purposes, and wherein advantage may be taken of the well known benefits derivable from high compression in the cylinder and high speed of the engine.

As described in this application, my improved internal combustion engine is of the valveless two cycle type, embodying an enclosed crank case, a hollow piston, and means for supplying a fuel mixture through the crank case and the piston to the combustion end of the cylinder. Apparatus of this general type has heretofore been proposed and has gone into wide commercial use. It is to overcome difficulties which have been encountered in the operation of engines of this type, and to improve the power developing qualities of such engines, that my invention is particularly directed. It will be obvious, however, from the detailed description, which is to follow, that it has a still wider field of application and that the improvements set forth may be adapted for advantageous use with a wide variety of internal combustion engines. In the operation of internal combustion engines, of the type shown, difficulties have been encountered in cooling the piston of the engine, especially when run at high speed. Furthermore, partial combustion of the fuel mixture often occurs on the crank case side of the piston, causing carbon deposits, reducing the power developed, and interfering with the lubrication of the engine. Another serious difficulty which has been encountered, has been to supply a fuel mixture of sufficient volume to the cylinder and to provide for the high compression and thorough mixture of the fuel and air supply.

These and other difficulties are overcome by my invention by providing, first, an improved method of supplying a cool fuel mixture to the crank case of the engine of ample volume to fill the cylinder at the desired moment. The cool mixture, after being drawn into the crank case, is sealed against outward leakage by action of the crank shaft, and it is then compressed by action of the piston and admitted to the cylinder at the end of the power stroke of the piston. In its passage from the crank case to the combustion end of the cylinder, the fuel mixture is caused to flow through the hollow piston in an arcuate path and heat radiating fins are provided in the hollow piston in the path of the fuel mixture. The heat radiating fins serve to dissipate the heat from the piston sufficiently to prevent premature partial combustion of the mixture on the crank case side of the piston and also serve to preheat the mixture before it is admitted to the combustion end of the cylinder. A fuel mixture inlet passage having a curvilinear form is provided in the walls of the cylinder in such position as to register with a suitable port in the piston at the completion of the power stroke thereof. This curvilinear passage insures a smooth flow of the mixture

into the cylinder without eddies or pockets. The active face of the piston and the head of the cylinder are so formed that upon entry of the fuel mixture into the cylinder it is deflected first upwardly to the head of the cylinder and then outwardly towards an exhaust outlet opposite the fuel mixture inlet so that the burnt gases of combustion are thoroughly scavenged out of the cylinder. Furthermore, the construction of the cylinder and piston are such that the fuel mixture is highly compressed into a relatively small pocket and a spark plug is provided adjacent this pocket. The features just enumerated, insures thorough scavenging, high compression of the fuel mixture and thorough combustion thereof.

Apparatus embodying features of my invention is illustrated in the accompanying drawing, forming a part of this application, wherein;

Fig. 1 is a longitudinal sectional view of the engine and showing the pistons at the completion of the compression stroke thereof;

Fig. 2 is a sectional view taken along the line II—II of Fig. 1; and

Fig. 3 is a sectional view similar to Fig. 2, but showing the piston at the completion of the power stroke thereof.

Referring now to the drawing for a better understanding of my invention, I show an engine comprising opposed cylinders 10 and 11 having a crank case 12 interposed between the cylinders and secured thereto. Within the cylinders 10 and 11 are pistons 14 and 16 having wrist pins 17 and 18 cooperating with connecting rods 19 and 21, which latter are coupled to cranks 22 and 23 on a crank shaft 24.

The crank shaft 24, at one end, is provided with an internal passage 26 opening into a peripheral port 27 and also opening into the interior of the crank case. surrounding the crank shaft 24, at the end provided with the passage 26, is a sleeve 28 having a port 29 therein. The crank case 12, at each end thereof, is formed with housings 31 and 32 for the shaft 24. The housing 31 surrounds the sleeve 28 and is provided with a port 33, in communication with the port 29, and has secured thereto, a carburetor 34 which latter may be of any approved design.

The cylinders 10 and 11 are each provided with an inlet passage 36, and an exhaust outlet port 37 diametrically opposed to the inlet port. The pistons 14 and 16 are made hollow and each is provided with a port 38 adapted to register with the receiving end of the passage 36 at the end of the power stroke of the piston, as may be seen in Fig. 3, to admit the fuel mixture to the cylinder. As may be seen in Figs. 2 and 3, the inlet passage 36 is made curvilinear in form so that the fuel mixture in passing therethrough meets with a minimum of resistance. As may be seen in the drawing the ends of the passage 36 are separated by a relatively narrow bridge 39 which, together with the curved walls serves to further reduce the frictional resistance to flow through the passage.

The interior construction of the pistons 14 and 16 forms a particular part of my invention and will now be pointed out. The hollow of each of the pistons is formed toward the head portion thereof with a circuitous wall 41 merging at one side, where the major flow of fuel mixture occurs, into a straight wall 42 and merging on the opposite side into the port 38. The circular wall 41, as may be seen by the drawing, partially surrounds the wrist pin. On the opposite side of the interior of the piston from the wall 42, the wall is cast with a projecting lug or vane 43 which acts to deflect the fuel mixture around the wrist pin and against the circular wall 41. Provided in the circular wall 41 are heat radiating fins 44, which serve to cool the piston and to preheat the fuel mixture before its passage into the cylinder.

The sweep of the incoming fuel over the cooling fins and around the circular wall 41 insures that no dead pockets of the mixture will remain in the piston to become heated and burned. The cooling effect of the mixture on the piston is such that the engine may be run at a much higher speed than engines of similar type with which I am acquainted, without danger of overheating the piston. Between the port 38 and the active side of the piston is a bridge 45 which is co-extensive in width with the bridge 39. When the piston is at the end of the power stroke, as may be seen in Fig. 3, the bridge 45 is directly over the bridge 39, thus affording the shortest possible path for the fuel mixture flowing to the cylinder.

The active face of each of the pistons is formed on one side to provide a curved deflector 46 which, upon the admission of the fuel mixture through the passage 36, serves to deflect said fuel mixture toward the head of the cylinder and close to the adjacent cylinder wall. From the edge of the deflecting portion 46, each of the pistons is provided with an inclined portion 47 directed toward the exhaust outlet port 37.

Each of the cylinders 10 and 11 has its head portion formed with an inclined wall 48 complementary to the inclined portion 47 of the piston and with a concave pocket 49 in the path of the incoming fuel mixture directed by the deflecting portion 46 of the piston. The walls of the concave pocket 49, when the fuel mixture is being admitted to the cylinder, deflects it across the cylinder where it sweeps the inclined wall 48 and passes longitudinally of the cylinder toward the exhaust outlet port 37. It will be seen that the path taken by the incoming fuel mixture is such

that all of the burned gases of combustion are swept out of the cylinder by the fuel mixture. The concave pocket 49 has another important function. As the piston moves in its compression stroke towards the end of the cylinder, the complementary inclined walls 47 and 48 forces the mixture into the concave pocket 49 where it is highly compressed and into the small space defined by the walls of the cylinder and the piston head. A spark plug 51 is provided in the cylinder wall adjacent to the pocket 49 so as to ignite the highly compressed mixture in the pocket at the desired period in the engine stroke.

From the foregoing description, the operation of apparatus made in accordance with my invention will be apparent. As the pistons move during the compression stroke toward the ends of the cylinders, a partial vacuum is formed in the crank case 12. During the required period in the compression stroke, the port 27 in the crank shaft 24 is in communication with the carburetor 34 and fuel mixture is drawn into the crank case 12. The fuel mixture in the crank case is then entrapped by rotation of the crank shaft moving the port 27 out of registry with the port 29 and, as the pistons move inwardly of the crank case during their power stroke, they compress the entrapped mixture until the port 38 registers with the inlet passage 36. The fuel mixture is then diverted by the deflecting lug 43 around the wrist pin and against the circular wall 41 of the interior of the piston where it sweeps the heat radiating fins 44, cooling the piston and preheating the mixture without any sacrifice of the volume of the mixture. Upon entry into the cylinder the fuel mixture is deflected by the piston portion 46 and concave pocket 49, driving before it the burned gases of combustion through the outlet port 37.

As the piston moves toward the end of the cylinder on its compression stroke, the fuel mixture, previously flowing toward the outlet port 37, is reversed in its direction of movement and is carried back into the concave pocket 49 where it is ignited by the spark plug 51 at the desired period in the piston stroke. The reversal of movement just described insures a more thorough mixture of the fuel and air, and a more thorough combustion thereof.

From the foregoing it will be apparent that I have devised an improved internal combustion engine capable of high speed and of developing a relatively high power and which includes improved cooling and scavenging means.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications, without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:

1. In a two cycle internal combustion engine, a cylinder having a fuel mixture inlet in its side wall and an exhaust outlet in the side wall opposed to the fuel mixture inlet, means on the piston head to deflect the fuel mixture toward the end of the cylinder, a concave recess in said cylinder end disposed to receive the deflected mixture and direct it toward the exhaust outlet, a surface on the cylinder head extending at an incline from said recess toward the exhaust outlet, the active face of said piston being inclined in substantial parallelism to the inclined surfaces on the cylinder head.

2. In a two cycle internal combustion engine of the character described, a cylinder having a fuel mixture inlet in its side wall and an exhaust outlet opposite the inlet, a piston in the cylinder having its active face cut away to provide a deflector for the entering mixture to deflect it toward the cylinder head, a concave pocket in the cylinder head in the path of the deflected mixture and formed to direct said mixture toward the outlet, a wall portion for the cylinder head merging with the concave pocket and inclined toward the exhaust outlet, a cooperating inclined wall portion provided on the active face of the piston, substantially parallel to the inclined portion of the cylinder head wall, and fuel igniting means disposed adjacent to the concave pocket.

3. In a two cycle internal combustion engine of the character described, a cylinder having a fuel mixture inlet in its side wall and an opposed exhaust outlet, a piston in the cylinder having its active face cut away to provide a deflector for the entering mixture to divert it toward the cylinder head, a concave pocket in the cylinder head in the path of the diverted mixture to direct said mixture and formed toward the exhaust outlet, a wall portion for the cylinder head merging with the concave pocket and inclined toward the exhaust outlet, and an inclined wall portion of the piston complementary to the inclined cylinder head wall.

In testimony whereof I, JOHN P. LANDRUM, affix my signature.

JOHN P. LANDRUM.