

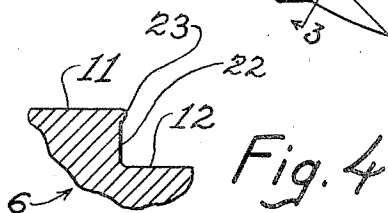
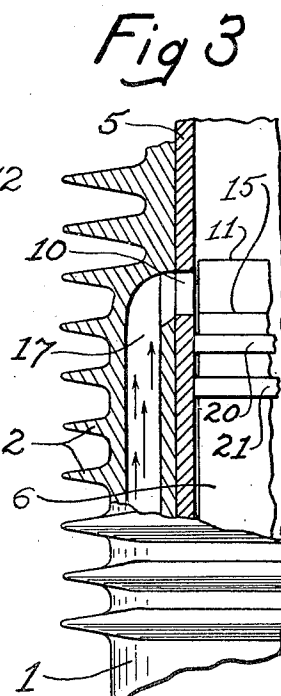
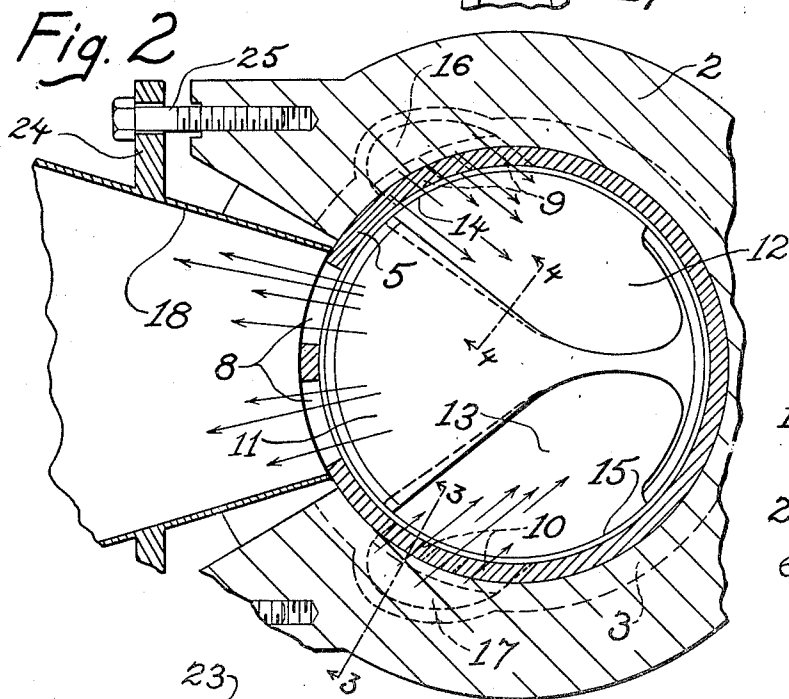
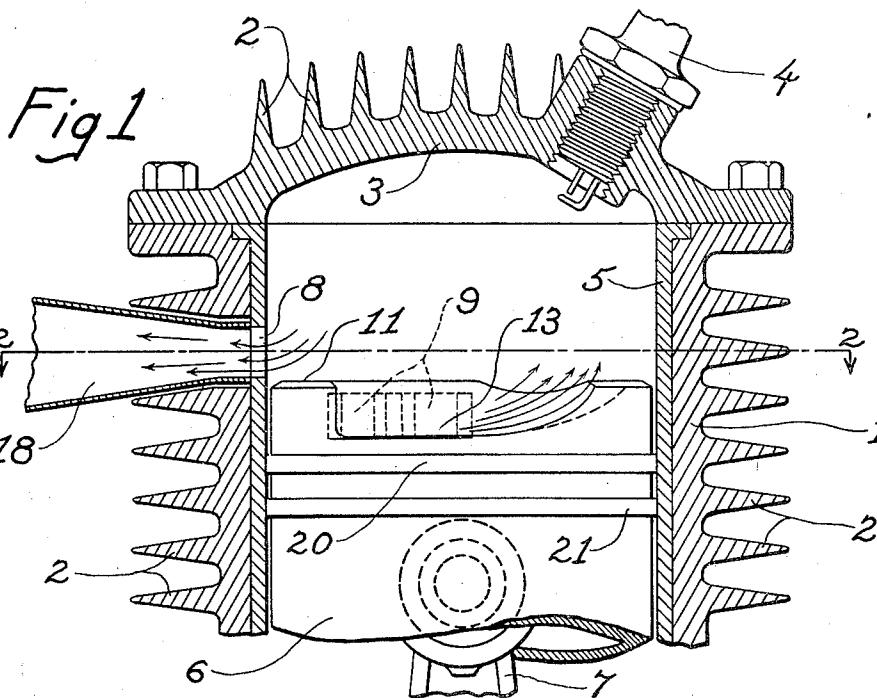
Feb. 19, 1946.

M. L. FORREST

2,395,110

TWO CYCLE ENGINE

Filed May 17, 1944



INVENTOR
MARK L. FORREST
BY *Chapin & Neal*
ATTORNEYS

UNITED STATES PATENT OFFICE

2,395,110

TWO-CYCLE ENGINE

Mark L. Forrest, Framingham, Mass.

Application May 17, 1944, Serial No. 535,974

1 Claim. (Cl. 123-65)

This invention relates to gas engines of the two cycle type and has for its object the construction and organization of the parts in a manner to obtain improved efficiency in operation, economy in manufacture and durability in use.

A particular feature of improvement is in the provision of means for guarding against the injurious effects from the hot exhaust gases at certain vital areas which when overheated reduce the efficiency of operation and shorten the life of the parts.

A further object is to obtain better scavenging of the cylinder by the discharge of the spent gases without undue mixing thereof with the incoming fresh charge and to accomplish this by a relatively simple and inexpensive modification of the piston head in combination with a special arrangement and location of the inlet and exhaust ports.

A further object is to provide in an engine having inlet and exhaust ports at the same side of the cylinder and uncovered by the piston simultaneously or in overlapping sequence, means for channeling the incoming flow of fresh gas largely separate from the exhaust gas until said incoming gas builds up a pressure at the opposite side of the cylinder for sweeping out the last remnants of the spent gases.

Further objects and advantages of my invention will become apparent from the following specification taken in connection with the accompanying drawing which shows a preferred embodiment of my invention and in which:

Fig. 1 is a vertical section of so much of the engine cylinder and associated parts as is necessary for understanding of the present invention;

Fig. 2 is a horizontal section through the cylinder on line 2-2 Fig. 1;

Fig. 3 is a fragmentary vertical section through the cylinder wall on line 3-3 Fig. 2 adjacent an inlet port and showing the piston at the top of the exhaust port; and

Fig. 4 is a detail section through a top part of the cylinder on line 4-4 Fig. 2 to show the overhanging lip of the baffle wall.

Referring more particularly to the drawing the cylinder of the engine comprises the main casing 1 provided with cooling fins 2 and a head 3 bolted thereto as shown. The usual ignition device 4 is mounted through the cylinder head. The cylinder casing is preferably provided with a metal liner 5 forming an inner cylindrical wall for said cylinder within which reciprocates the piston 6 having its usual connecting rod 7. The lower part of the engine is not shown since this

may be of the usual conventional character including crank and inclosing crank case serving as a pumping chamber for drawing in the fresh charge and delivering the same to the inlet ports for the cylinder as will be hereafter described.

The exhaust port through the cylinder wall is located at 8 and although divided by grid bars may be regarded as a single port. On the same side of the cylinder as the exhaust port 8 and likewise cut through the cylinder wall are the inlet ports 9 and 10 one at each side of and below said exhaust port 8. Considering the engine as in upright position these two inlet ports are on the same level with each other but are preferably located entirely below the exhaust port, by which is meant that the top edge of each inlet port is slightly below the bottom edge of the exhaust port.

The piston is designed to uncover both the exhaust port and the inlet ports during the lower end or dwell portion of its outward stroke. For this purpose the solid head or top 11 of the piston is gouged out from the top and sides into lower step portions 12 and 13, one at each side of the centrally located unrelieved top portion 11. The central top portion 11 of the piston registers with the exhaust port 8 so that this part of the piston covers and uncovers said exhaust port while each of the lower step portions 12 and 13 being exposed at opposite sides of the piston are designed to register respectively with the inlet ports 9 and 10 for a similar purpose. As shown in the drawing the threshold of each lower step such as 14 and 15 is a sufficient distance below the top 11 of the piston so that said inlet ports will be completely uncovered by said lower steps at the same time that the exhaust port is completely uncovered by the top 11 of the piston, namely at the lower dead center of the piston stroke. However it is preferable to have the exhaust port start its opening phase slightly in advance of the opening of the inlet ports and for this purpose the lower steps are designed with the drop distance below the top as shown and the top edges of said inlet ports are at a short distance below the bottom edge of the exhaust port as shown in the drawing.

Each of the lower steps 11 and 12 is shaped in the nature of a ramp sloping upwardly from its lowermost part at the threshold 14 and 15 respectively to the top 11 of the piston at the other side thereof remote from the exhaust port. It will be observed from Fig. 2 that these ramps converge toward one another from their lower to their upper ends, the latter merging into the

top surface 11 of the piston. Inlet fuel passages 16 and 17 may be formed as cored-out portions of the cylinder casing as shown so as to lead from the lower crank chamber (not shown) upwardly to communicate respectively with each inlet port 9 and 10. Other and different forms of inlet fuel conduits leading to the inlet ports may be provided if desired. It will be noted that inlet charge of gaseous fuel is directed by its inlet port or ports horizontally across the threshold of the respective step 14 or 15 and will impinge against the inner side wall such as 22 of said step (see Fig. 4). This wall 22 will direct the flow of the inlet charge toward the side of the cylinder which is remote from the exhaust port. As a further hindrance to the flow of inlet gas over the top edge of said wall 22, the latter is preferably formed with an overhanging lip 23 (see Fig. 4).

The exhaust pipe or manifold 18 extends as shown in Fig. 1 through a cutaway portion of the cylinder case without coming in direct contact therewith and is held firmly abutted against the inner liner 5 of said cylinder. Lugs 24 remote from the inner abutting end of said exhaust manifold 18 are provided as shown whereby the manifold may be securely fastened to the engine case 1 by bolts 25. An air space or clearance is thus provided between said exhaust pipe and cylinder case 1 in the vicinity of said exhaust opening. The purpose of this construction is to offer as much resistance as possible to the conduction of heat from the hot exhaust gases directly into the cylinder case 1. This area of the cylinder case in the vicinity of the exhaust pipe or manifold is one of the most difficult parts of the engine to keep from becoming overheated, and the means herein disclosed will in large part remedy this trouble. This cooling effect will be greatly enhanced by having the cooling air draft through the fins 2 in a horizontal direction transversely across the exhaust pipe 18.

The piston is provided with the usual piston rings such as 20 and 21 and it will be noted that the uppermost piston ring 20 can be no higher than slightly below the threshold 14 and 15 of the lower step portions of said piston. This conditional circumstance of my design locates the piston ring 20 considerably below the top 11 of the piston, with the result that when said top 11 of the piston begins to uncover the exhaust port (see Fig. 3) the uppermost piston ring 20 has

traveled completely past said exhaust port and lies below the same, whereby it is shielded from contact with hot gases discharging through said exhaust port. In the usual construction of this type of engine the uppermost piston ring will be exposed to a direct contact with said hot gases of the exhaust when the exhaust port is partly opened by the piston and the extreme heat from such direct contact in a short time destroys the usefulness of said uppermost piston ring.

The scavenging operation of my engine will be clearly understood from the foregoing description but may be briefly reviewed as follows:

When the exhaust and inlet ports are opened, as in Fig. 1, the incoming charge of gas will be directed by the ramps 12 and 13 toward the opposite side of the cylinder and with an upward sweep toward the top of the cylinder where the streams join together and create a pressure for pushing out the spent gases through the exhaust port 8. It will be observed as indicated by the small arrows that the incoming streams of gas are guided in a direction generally opposite to that of the outgoing gas stream but are prevented from directly mixing with said outgoing gas stream by the baffle side walls of each ramp portion 12 and 13. By this means a cleaner fresh charge is introduced into the cylinder and a more complete discharge of the spent gases is effected than in usual engines of this type.

It will be understood that the present disclosure and specific description of a suitable embodiment for carrying out my invention is for purposes of illustration and that equivalent variations thereof may be employed within the scope of the invention as hereinafter claimed.

What I claim is:

A two cycle engine comprising a cylinder having a main casing with cooling means for said casing and a metallic liner forming an inner wall for said cylinder, said liner having an exhaust port therethrough arranged for being uncovered by a piston reciprocable in said cylinder and an exhaust pipe extended through said main casing of the cylinder without substantial contact therewith and held down directly against said inner liner of the cylinder adjacent the exhaust port for conducting away the exhaust gases from the interior of said cylinder and thereby preventing the hot exhaust gases from making contact with any part of said cylinder casing.

MARK L. FORREST.