

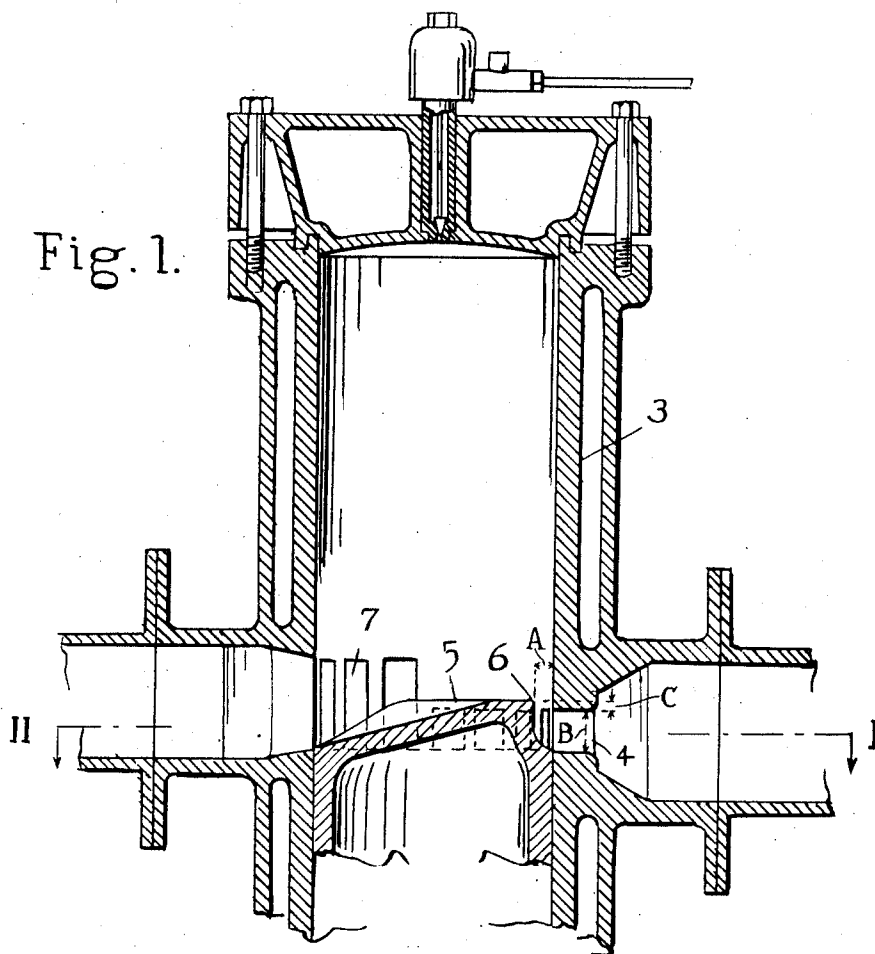
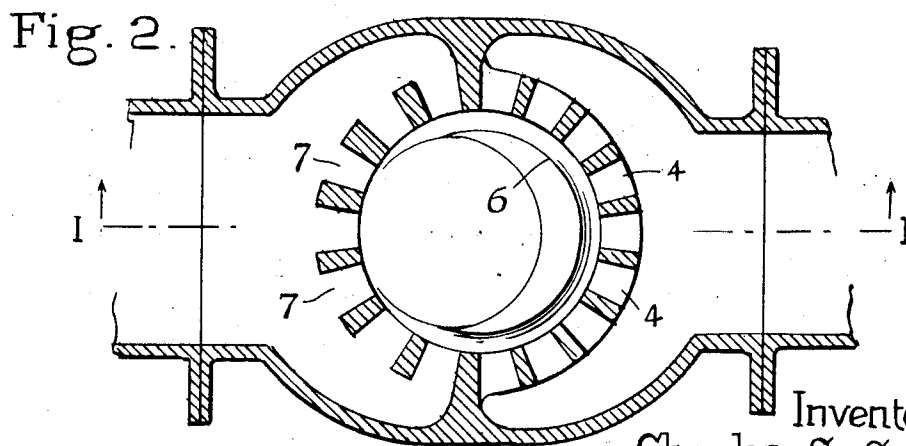
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TWO-CYCLE INTERNAL COMBUSTION ENGINE

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TWO-CYCLE INTERNAL-COMBUSTION ENGINE

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This invention relates to and has as its object the improving of the scavenging efficiency of two-cycle engines of the port-scavenged type.

5 It has been common practice in port-scavenged engines, particularly in the small sizes, to build the cylinders with radial inlet air ports (that is ports pointing towards the center of the cylinder) and to use protruding
10 flanges or baffles on the piston heads which deflect the streams of incoming scavenging air towards the combustion end of the cylinder. Such engines have generally had a low scavenging efficiency, so that they have had
15 to be operated at comparatively low mean effective pressures in order to avoid smoke and to give a reasonable fuel efficiency. They have also been open to the objection that the baffles or flanges are liable to heat strains
20 which cause cracking or a wearing away, and they have not been used commercially to any considerable extent except in small engines.

Recognizing the possibility of materially improving the scavenging efficiency of such
25 engines (that is engines with radial ports, either horizontal or inclined) I have carried on elaborate experiments to determine the conditions under which the best efficiency can be obtained and I have discovered that there
30 is a relationship between the height of the baffle head and the height of the ports and between the shape and width or area of the gap between the baffle and the adjacent cylinder wall and the area of the inlet ports, which
35 relationship has a very marked influence on the scavenging efficiency.

The prior art is full of incidental disclosures of both horizontal and inclined radial inlet ports directing the air streams against
40 protruding baffles on the piston head, but I do not find any disclosure of the relationship necessary for high scavenging efficiency.

On the accompanying sheet of drawings
45 which forms a part of this description,

Figure 1 of the drawing is a sectional elevation of an engine cylinder showing the ports and piston head with baffle on the line I—I of Fig. 2.

50 Fig. 2 is a section on the line II—II of

Fig. 1 showing the gap between the baffle and the cylinder wall.

In Fig. 1 a cylinder 3 has air inlet ports 4, a piston 5 with a baffle 6, and exhaust ports 7. Assuming that the air inlet ports extend
55 about half way around the circumference the baffle should be carried around so as to a little more than cover these inlet ports leaving an annular space or gap between the baffle and the cylinder wall through which the air flows
60 in a generally upward direction. In order to produce a high scavenging efficiency it is important that the column or streams of air be made to shoot upward at sufficiently high
65 velocity and along the surface of the cylinder wall so as to pass up to the combustion end on one side of the cylinder and interfere as little as possible with the downward movement of the column of air on the other side of the cylinder and out through the exhaust ports.
70

The area of the gap between the baffle and the adjacent cylinder wall plays, I have found from experiment, a very important part in the scavenging efficiency. It should
75 be made small enough so that a part of the total pressure drop from the scavenging air supply pressure to the cylinder pressure takes place at this point whereby a velocity is set up in the desired direction, that is toward the cylinder cover and as nearly parallel to
80 the cylinder wall as practicable. If this area be made less or no more than the total area of the ports a considerable velocity is set up due to the drop in pressure at this point. In other words by contracting this area a "nozzle
85 throat" condition is established and the greater part of the total pressure drop takes place here instead of in the ports themselves. This insures a better directed scavenging air stream with sufficient velocity to carry to the
90 cylinder cover. Even if the area of the gap and that of the ports are made equal a substantial part of the total pressure drop will take place at the gap.

The area of the ports is of course deter-
95 mined not only by the height of the ports but by the thickness of the bridges between the several ports. For practical reasons these bridges should not be made too thin and should probably be made equal to at least one
100

third of the pitch of the ports. The ports would then occupy about two thirds of the total arc covered by the bank of ports. The area of the gap should be adjusted with reference to the effective or combined area of the ports. If the area of the gap materially exceeds the area of the ports the scavenging efficiency falls off very rapidly and a material increase in the amount of scavenging air is necessary unless an objectionable baffle height is resorted to.

I have also found by my experiments that the height of the baffle relative to the height of the port is an important factor in producing high scavenging efficiency. It is important that the height of the baffle should in any event be not less than the height of the port. A still better scavenging efficiency can be obtained by carrying the baffle to a height more or less above that of the port, preferably as much as ten percent higher than that of the port, but for practical reasons on account of heat strains, danger of cracking and the difficulty of forming a good combustion space, it is very desirable to keep the height of the baffle as low as possible. By combining a gap area no greater or less than the total port area with a baffle height which is substantially as high as or higher than the port height, I am able to secure much higher scavenging efficiencies than heretofore. The result is that two-cycle engines of this type can now be operated at considerably higher mean effective pressures and at higher fuel efficiencies without necessitating the use of any greater amount of scavenging air or of using scavenging air at any higher pressures than heretofore.

The cycle of operations is the same as is common to all simple ports scavenged two-cycle engines and hence need not be described here.

What I claim is:

1. A port-scavenged two-cycle engine comprising a cylinder, air inlet ports on one side of the cylinder, exhaust ports on the side opposite, a piston and a baffle on the piston head so arranged and proportioned that the area of the gap between the baffle and the cylinder wall is no more than the total area of the air inlet ports.

2. A port-scavenged two-cycle engine comprising a cylinder, air inlet ports on one side of the cylinder, exhaust ports on the side opposite, a piston and a baffle on the piston head so arranged and proportioned that the area of the gap between the baffle and the cylinder wall is no more than the total area of the air inlet ports and the baffle is at least as high as the air inlet ports.

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