July 5, 1938. F. SASS 2,123,065

AIR INLET ARRANGEMENT FOR TWO-CYCLE INTERNAL COMBUSTION ENGINES

Filed June 8, 1935

Fig. 1.

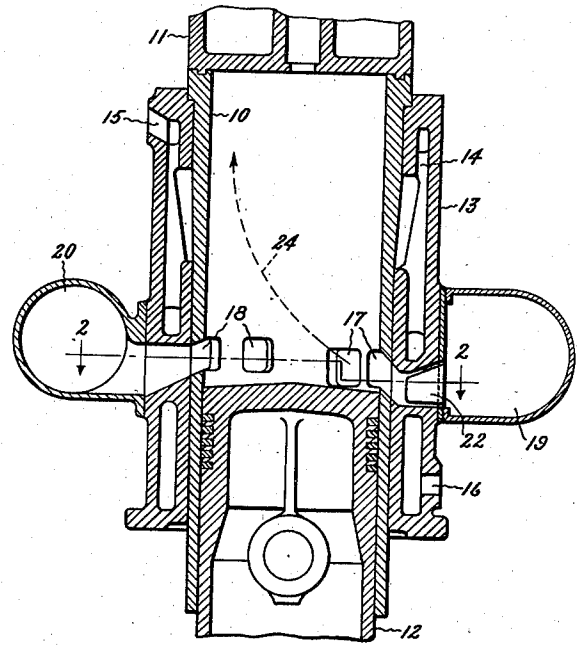



Fig. 2.

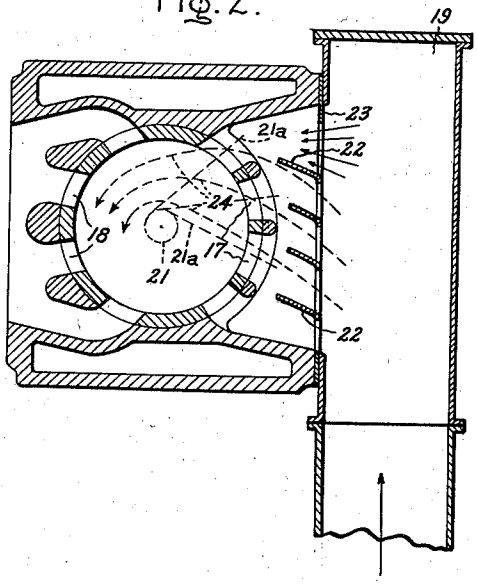
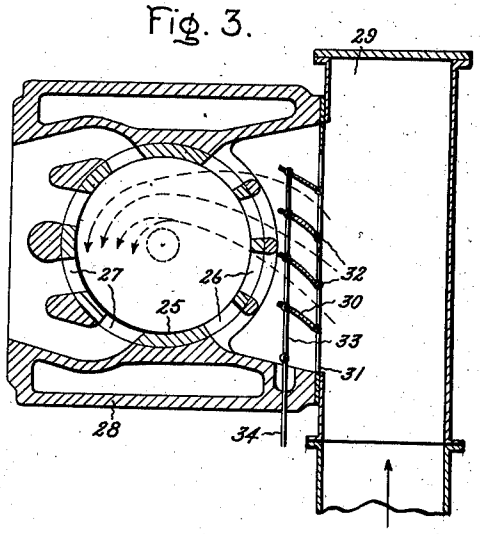



Fig. 3.




Inventor:
Friedrich Sass,
by Harry E. Dunham
His Attorney.

Patented July 5, 1938 2,123,065

# UNITED STATES PATENT OFFICE

2,123,065

## AIR INLET ARRANGEMENT FOR TWO-CYCLE INTERNAL COMBUSTION ENGINES

Friedrich Sass, Berlin-Charlottenburg, Germany, assignor to General Electric Company, a corporation of New York

Application June 8, 1935, Serial No. 25,604
In Germany June 23, 1934

2 Claims. (Cl. 123—65)

The present invention relates to air inlet arrangements for two-cycle internal combustion engines. In solid injection engines of this kind the scavenging air must be conducted through the combustion space with a circling or rotary motion of a definite velocity in order to obtain thorough scavenging and good combustion. Experience has shown that in cases where the air circles too slowly the combustion becomes worse and in cases where the air circles too fast the fuel consumption increases. In two-cycle combustion engines with air inlet ports in the cylinder liner the desired air rotary motion may be obtained in many cases by properly forming the air inlet or scavenging ports or channels. However, it may easily happen that for some reason the most favorable air rotary motion is not obtained, and in addition it is desirable to improve old or finished machines in order to effect better scavenging of the cylinders.

The object of my invention is to provide an improved construction of air inlet arrangements for two-cycle combustion engines whereby the most favorable air rotary motion with a consequent thorough scavenging and effective combustion in the cylinder is obtained. This is accomplished in accordance with my invention by the provision of a plurality of guide vanes in the path of the air to the air inlet ports in the cylinder wall or walls. These guide vanes effect a circling or rotary motion of the air, which motion is maintained within the cylinder or cylinders.

For a better understanding of what I consider to be novel and my invention, attention is directed to the following specification and the claims appended thereto in connection with the accompanying drawing.

In the drawing, Fig. 1 illustrates somewhat diagrammatically a combustion engine cylinder in accordance with my invention; Fig. 2 is a sectional view along the line 2—2 of Fig. 1, and Fig. 3 shows a similar sectional view embodying a modification according to my invention.

The arrangement as shown in Figs. 1 and 2 comprises a cylinder wall 10, a head 11 fastened to the wall 10, and a piston 12 slidably arranged within the wall 10. The cylinder wall 10 is surrounded by a jacket 13 which forms an annular space 14 for cooling the cylinder. Cooling medium such as water is conducted to the cooling space 14 through an inlet 15 and discharged therefrom through an outlet 16. The wall 10 and the jacket 13 are provided with inlet ports 17 for conducting air into the interior of the cylinder, and outlet ports 18 for discharging the combustion gases. The inlet ports 17 receive air from a container or manifold 19 and the outlet ports 18 discharge combustion gases into a discharge manifold 20. The ports 17, 18 in the walls 10 of the cylinder are directed in the present instance upward and their central lines form tangents 21a to a small circle 21 around the axis of the cylinder. The arrangement in this respect is similar to the one disclosed in the U. S. Patent 1,833,861 issued on November 24, 1931 and assigned to the same assignee as the present application. The directing and forming of the ports are not absolutely necessary because the effect may be obtained with my invention more specifically with the provision of guide vanes as will be described presently. It is also important to note that it is sufficient to provide inlet ports extending over a portion only of the circumference of the cylinder wall. In the present instance I have shown three inlet ports 17 and three outlet ports 18, in diametrically opposite portions of the cylinder wall, with each of the two sets of ports extending over about 180 angular degrees of the cylinder wall.

In the passage between the air container 19 and the scavenging inlet ports 17, I provide in accordance with my invention a plurality of guide vanes 22 for guiding the air, more specifically for imparting to the air a circling or rotary motion, which motion is maintained within the cylinder. In the present arrangement, as indicated in Fig. 2, four guide vanes are provided of which the two outer guide vanes are somewhat longer than the inner guide vanes. They are directed to guide air into the cylinder through the ports 17 in such direction as to obtain a minimum of interference from the dividing wall between the ports. The length and the shape of the different guide vanes may be calculated or determined by experiments so as to obtain the best result, to wit: through cleaning of the cylinder and good combustion, or, from another viewpoint, minimum consumption of fuel. The guide vanes 22 in the present instance are produced by a simple manufacturing process. They are cut out from a steel sheet 23 suitably secured between the cylinder jacket 13 and the air manifold 19. The direction of air flow through the vanes into the cylinder is indicated in Figs. 1 and 2 by arrows 24.

The arrangement of Fig. 3 comprises a cylinder having a wall 25 with air inlet ports 26 and outlet ports 27 corresponding to the ports 17 and 18 respectively, of Fig. 1. The cylinder wall is surrounded by a water jacket 28 corresponding to the jacket 13 of Fig. 1. An air manifold 29 corresponding to the manifold 19 of Fig. 1 is secured

to the water jacket **28** and communicates with the ports **26**. A plurality of guide vanes **30** corresponding to the vanes **22** of Figs. 1 and 2 are disposed in the passage of the air between the manifold **29** and the air inlet ports **26**. In accordance with the modification of my invention, the guide vanes **30** are secured to a steel sheet **31** by hinges **32** and in addition are pivotally connected to a rod **33** secured to a lever **34** permitting adjustment of the guide vanes. It is to be noted that in the present instance some of the guide vanes are straight and others curved to obtain the best result.

With my invention I have provided an improved arrangement for conducting the air into the cylinders of two-cycle internal combustion engines whereby a considerable saving in fuel and a clear exhaust are obtained.

A special advantage of my invention is that it can be provided in finished machines. Furthermore, with the application of my arrangement it is no longer necessary to provide the air inlet ports along the entire circumference of the cylinders, but it is sufficient if these air inlet ports are provided in known manner along a part only of the circumference of the cylinder walls. As pointed out above the guide vanes are also effective in machines, the ports of which are radially directed, that is without consideration as to the desired air rotary motion within the cylinders. Also, in these cases a considerable improvement of the operation of two-cycle combustion engines may be obtained by the provision of additional guide vanes in accordance with my invention. The adjustment of the guide vanes may be effected simply by observing the appearance of the exhaust gases, that is the vanes are adjusted until the gases exhausted from the engines are clear or invisible. The guide vanes may also be simply adjusted in accordance with the fuel consumption.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. In a two cycle internal combustion engine having a cylinder with a plurality of circumferentially spaced air inlet ports, the combination of an air container provided with an opening registering with said ports and provided with a plurality of adjustable guide vanes arranged in said opening and in proximity to said ports for effecting a rotary motion of the air moving from said container to said cylinder, said rotary motion being adjustable during operation of said engine by means of said adjustable vanes whereby the most efficient fuel consumption may be obtained for different operating conditions.

2. In a two cycle internal combustion engine, the combination of a cylinder casting provided with a plurality of circumferentially spaced air inlet ports in its side wall which normally direct air substantially toward the center of said cylinder, a sheet metal air tank attached to said cylinder, and provided with openings substantially registering with said ports, and vanes projecting from said openings towards said ports and shaped so as to direct air from said tank through said ports in a direction which is at an angle to the normal air flow through said ports to effect a rotary motion of said air in said cylinder.

FRIEDRICH SASS.