Jan. 5, 1932. K. MOHR ET AL 1,839,576

SCAVENGING TWO-STROKE CYCLE INTERNAL COMBUSTION ENGINE

Filed May 17, 1930

Fig. 1

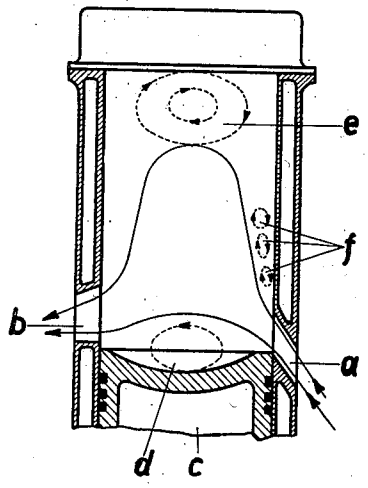


Fig. 3

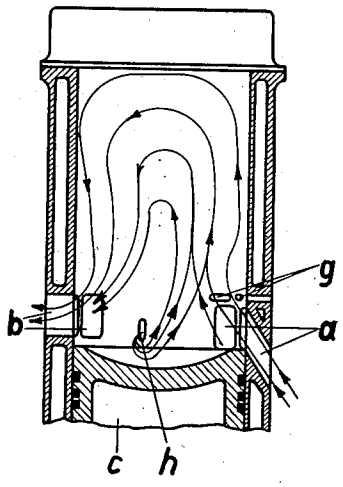


Fig. 2

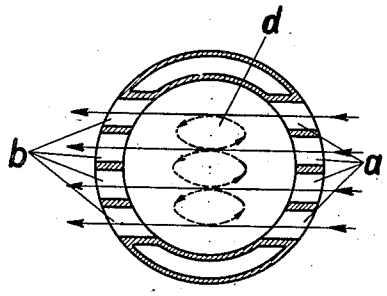
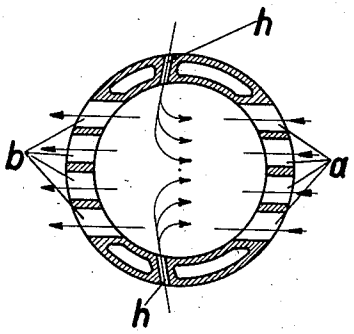


Fig. 4



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UNITED STATES PATENT OFFICE

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SCAVENGING TWO STROKE CYCLE INTERNAL COMBUSTION ENGINE

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The invention has for its object a port arrangement for two-stroke cycle internal combustion engines having scavenging inlet ports directed toward the cylinder cover and effecting transverse scavenging of the cylinder. In engines of this type, more particularly those of the long stroke type, it is very difficult, even when the scavening ports are directed very steeply toward the cylinder cover, to obtain satisfactory scavenging of the cylinder, because of the fact that the scavenging current has to rise therein without being guided in any way, and that the directing action of the inlet ports is very unreliable due to their small guiding length. Therefore a whirl of remaining waste gases is produced very easily near the cylinder cover above the scavenging current which whirl is due to edge whirls produced by the scavenging current at the cylinder wall and preventing the current from rising up to the cylinder cover. Besides, there is another current whirl above the piston end face as a consequence of the inlet ports being directed toward the cylinder cover, which whirl tends to flow off toward the outlet ports and thus draws the scavenging current downward, whereby a premature reversal of the current toward the outlet ports is caused. These two whirls of remaining waste gases therefore seriously derogate the effective guidance of the scavenging current and by intermingling with the fresh scavenging air substantially reduce both quality and quantity of the really operative air of combustion.

The invention has for its object to obviate these drawbacks and consists in the fact that additional inlet and outlet scavenging ports are provided on the cylinder in the following manner. Two additional inlet ports are arranged oppositely to one another and about at right angles to the direction of the scavenging current, through which inlet ports auxiliary air currents enter the cylinder and while flowing over the piston end face in the direction between the cylinder axis and the outlet ports drive the lower whirl into the scavenging current so that it flows to the outlet ports together with the latter. The further provided additional outlet ports are arranged above the main inlet ports and carry away whirls formed above the main inlet ports so that the entering air current is sucked toward the cylinder wall.

In order that the invention can be more readily understood, an embodiment of the same is illustrated by way of example in the drawings in which

Figure 1 is a vertical section through a cylinder of an internal combustion engine fitted with known ports for transverse scavenging and shows the course of the scavenging current in the cylinder,

Figure 2 is a horizontal section through this cylinder,

Figure 3 is a section similar to that shown in Figure 1 and illustrates the course of the transverse scavenging current when providing two auxiliary scavenging current inlet ports and additional outlet ports in accordance with the invention.

Fig. 4 is a horizontal section through the cylinder shown in Fig. 3.

Referring first to Figures 1 and 2, *a* denotes the main inlet ports and *b* the main outlet ports, while *c* denotes the piston reciprocating in the working cylinder of a two-stroke internal combusion engine. The scavenging air flows through the cylinder in the direction of the full line arrows, the waste gas whirls *d* and *e* formed being indicated by dotted line arrows.

As to be seen from Figure 1, the scavenging current owing to the directing effect of the inlet ports *a* has the tendency to rise to the cylinder cover, but is deflected from the cylinder wall by the edge whirls *f* formed between it and the cylinder wall, and is deflected furthermore prematurely toward the outlet ports *b* by the whirl *d* formed above the piston end face. Thus the cylinder cover is not touched by the scavenging air current so that the whirl *e* is formed above the latter. In Figure 2 which is a cross section of Figure 1 the whirl *d* for sake of clearness is illustrated perspectively.

Figures 3 and 4 illustrate in what manner this drawback is eliminated according to the invention. As to be seen, additional outlet

ports *g* are provided above the inlet ports *a* while further two oppositely located inlet ports *h* are provided above the piston end face. These latter ports *h* have directions such as to cause the additional scavening air entering through them to stream over the concave piston end face between the cylinder axis and the main outlet ports. The course of these auxiliary currents is indicated by arrows in Figures 3 and 4. These two auxiliary air currents are reversed by the concave piston end face in such a manner as to meet from the side the circumference of the whirl *d* illustrated in Figure 1 and are led toward the center of the piston *c* by the rotation of the whirl *d*. Thereby whirl *d* itself is urged into the rising scavenging air current and replaced from below by the fresh air entering through the additional ports *h*. Any emigration of whirl *d* toward the main outlet ports cannot take place as the two additional air currents are between the whirl and the outlet ports. In this manner the danger is eliminated of the greater portion of the main scavenging air current fed to the cylinder being so to speak short-circuited toward the main outlet ports and of a waste gas whirl *e* being formed near the cylinder cover due to premature reversal of the current in consequence of such short-circuiting. Through the additional outlet ports *g* the edge whirls *f* are sucked away to the atmosphere and, consequently, the rising scavenging current flows upward close along the cylinder wall till the cylinder cover. Any formation of a top whirl *e* is thus not longer possible.

The deflection aimed at toward the cylinder wall of the scavenging air current is already achieved by means of additional outlet ports of small height so that a notable loss of scavenging air does not take place. The ports *g* either extend but little or not at all beyond the main outlet ports *b* and increase the time cross section for the exhaust.

What we claim and desire to secure by Letters Patent, is:—

A cylinder for two-stroke cycle internal combustion engines having scavenging inlet ports directed toward the cylinder cover and oppositely situated outlet ports, additional inlet ports located about at right angles relatively to the direction of the transverse scavenging current passing through said inlet and outlet ports and generally directed towards a point between the cylinder axis and said outlet ports, and additional outlet ports situated above said first-mentioned inlet ports.

The foregoing specification signed at Hamburg, Germany, this 2nd day of May, 1930.

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