K. RUSHTON.

SCAVENGING VALVE FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED MAR. 18, 1916.

1,199,616.

Patented Sept. 26, 1916.

2 SHEETS—SHEET 1.

Fig. 1.

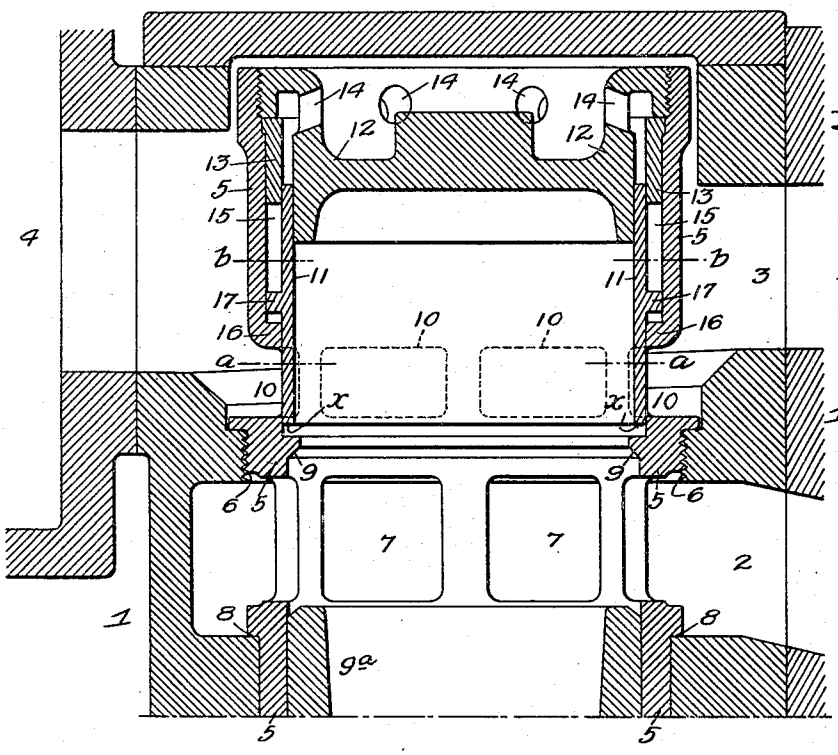


Fig. 2.

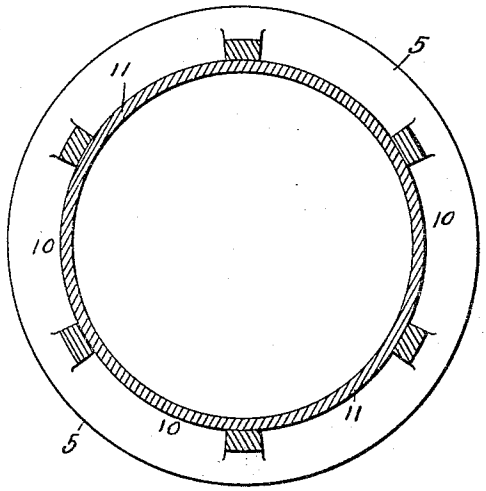
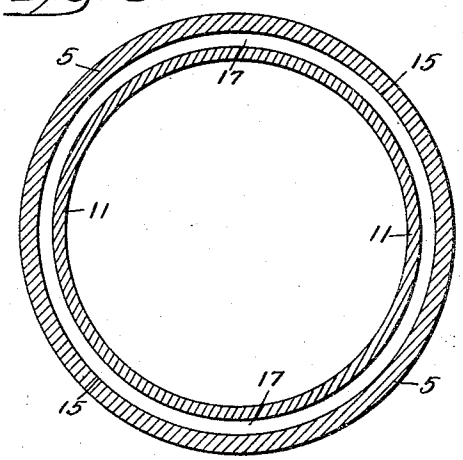


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 4.

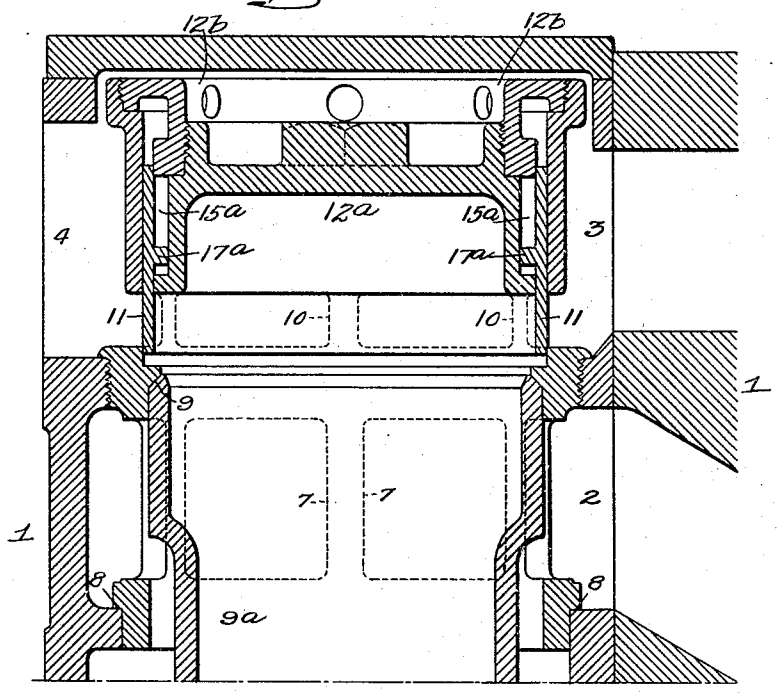
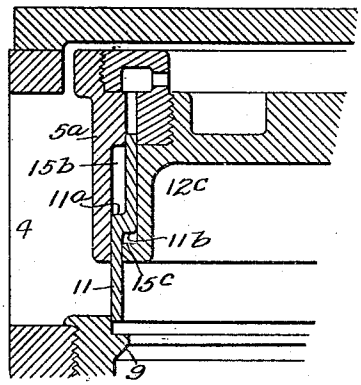


Fig. 5.



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UNITED STATES PATENT OFFICE.

KENNETH RUSHTON, OF PHILADELPHIA, PENNSYLVANIA.

SCAVENGING-VALVE FOR INTERNAL-COMBUSTION ENGINES.

1,199,616. Specification of Letters Patent. Patented Sept. 26, 1916.

Application filed March 18, 1916. Serial No. 85,088.

To all whom it may concern:

Be it known that I, KENNETH RUSHTON, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Scavenging-Valves for Internal-Combustion Engines, of which the following is a specification.

My invention relates to certain improvements in internal combustion engines, particularly of the "Diesel" type, in which air compressed in one unit of the engine is used to expel the spent gases from the cylinder to an adjoining unit.

The object of my invention is to improve the construction of the scavenging air delivery valve so that it will be noiseless in operation and will operate quickly and accurately.

In the accompanying drawings: Figure 1 is a vertical sectional view of sufficient of the valve casing and the valve to illustrate my invention; Fig. 2 is a sectional view on the line *a*—*a*, Fig. 1; Fig. 3 is a sectional view on the line *b*—*b*, Fig. 1; and Figs. 4 and 5 are sectional views illustrating different modifications of the invention.

Referring to the drawings, 1 is the portion of the engine casing in which there are two passages, one passage 2 leading from the scavenging cylinder to the valve casing and the other passage 3 is the air inlet passage leading to the working cylinder.

4 is the manifold leading to the air inlet passage of the working cylinder of an adjoining unit.

The air compressed in the scavenging cylinder is forced through the passage 2 by its piston, into the valve casing and through the manifold 4 to the air inlet passage 3 of an adjoining unit, and acts to remove the spent gases from the cylinder of the said unit. This action is alternated in the two units so that air compressed in one unit is used to expel the spent gases in the cylinder of the other unit. This feature forms no part of my present invention.

The valve heretofore used to control the flow of air through the valve casing has been so constructed that it made considerable noise in its action and rapidly wore away so that it had to be constantly renewed. By the invention, which I will now proceed to describe, the valve is so constructed that it floats in what may be termed a "dash pot", so that it is practically noiseless. It is also constructed so that the wear is imperceptible.

5 is a valve casing having a screw threaded portion 6 which is adapted to a threaded opening in the casing 1, as shown, and has ports 7 below this screw threaded portion which communicate with the air passage 2 leading to the compression cylinder. A shoulder 8 fits in the casing of the engine, as shown. In the portion 6 is a beveled valve seat 9 for a piston valve 9^a used only when the engine is started. The arrangement of the piston valve forms no part of the present invention.

Above the portion 6 of the valve casing are ports 10 which communicate with the passage leading to the manifold 4. Arranged to close these ports is a cylindrical valve 11 mounted in the casing 5 and adapted to work between a cap 12 and a bushing 13 held in the casing by the cap. In the cap is a series of openings 14, which communicate with the space in which the outer end of the valve works, thus the space is open at all times to the manifold leading to the two cylinders. The lower edge *x* of the valve is exposed to the action of the air within the valve casing so that when air under pressure is delivered to the interior of the casing through the passage 2 and ports 7, the cylindrical valve 11 is immediately raised opening the ports 10 and allowing air to pass from the interior of the valve casing to the manifold 4, but, as soon as the pressure is reduced and there is a suction due to the return of the compressor piston, the valve 11 immediately returns to its first position and closes the ports 10, cutting off communication with the manifold.

In order to prevent the valve striking at either of its two extreme positions, I provide what may be termed a "dash pot", so that the valve will be air cushioned when it nears its two extreme positions; the valve practically floats in air as it is reciprocated. The dash pot is formed by an annular recess 15 in the casing and the bushing 13 forms the upper end of the said dash pot, while the internal flange 16 on the casing forms the lower end of the dash pot.

On the exterior of the valve 11 is an annular rib 17 which forms a piston which works in the dash pot 15. The fit between the parts is comparatively tight so that as the valve reciprocates in the dash pot the air above and below the annular rib is alternately compressed so that the ends of the valve do not strike any portion of the cas-

ing. As the valve reciprocates very rapidly, this construction is quite important and as the valve is of rigid construction it will not deteriorate from use and will not wear away rapidly, owing to its cylindrical form.

In Fig. 4, I have illustrated a modification of the valve in which the annular rib 17^a on the valve 11 is an internal rib instead of an external rib and the dash pot 15^a is formed in a section 12^a forming the part of the cap in which is screwed the ring 12^b forming the other part of the cap.

In Fig. 5, I have illustrated another modification in which the cylindrical valve 11 is offset, forming a shoulder 11^a on the exterior and a shoulder 11^b on the interior and the upper dash pot 15^b is in the casing 5^a and the lower dash pot 15^c is in the cap section 12^c.

I claim:—

1. The combination in a scavenging valve of an internal combustion engine, of a casing having ports communicating with an air compressing cylinder and ports leading to the main cylinder of the engine; and a hollow cylindrical valve controlling the flow of air from said casing, said valve being operated by air under pressure within the casing.

2. The combination in a scavenging valve of an internal combustion engine, of a casing having inlet and outlet ports; a hollow cylindrical valve controlling the passage of air through the outlet ports; and means for closing the upper portion of the valve, the lower end of the valve being exposed within the casing so that air under pressure within the casing will raise the valve, allowing air to flow from the casing, and, when the valve is relieved of pressure, it will close.

3. The combination in a scavenging valve of an internal combustion engine, of a valve casing having inlet and outlet ports; a hollow cylindrical valve controlling the flow of air through the outlet ports; and a dash pot in which the said valve travels so that as the valve is opened and closed it compresses the air in the dash pot.

4. The combination in a scavenging valve of an internal combustion engine, of a casing having inlet and outlet ports; a cylindrical valve within the casing arranged to close the outlet ports; a cylindrical dash pot formed in the casing; and an annular rib on the exterior of the valve located in the dash pot so that the valve will be cushioned as it is actuated.

5. The combination in a scavenging valve of an internal combustion engine, of a casing having inlet and outlet ports; a cylindrical valve located within the casing and having the upper end inclosed and the lower end exposed to the action of the air within the casing; a cylindrical dash pot surrounding the valve; and an annular rib on the cylindrical valve extending into the dash pot so that when the valve is reciprocated it will be cushioned by the air in the dash pot.

6. The combination in a scavenging valve of an internal combustion engine, of a casing having inlet and outlet ports; a cap extending into the casing; a bushing mounted in the casing and held in position by the cap; a dash pot formed in the casing, the upper end of the dash pot being closed by the said bushing and the lower end of the dash pot being closed by an internal rib on the casing; and a cylindrical valve mounted within the casing and having its upper end extending into an annular space formed between the cap and the bushing and having its lower end exposed to the action of air within the casing and having an annular rib projecting into the dash pot so that on the reciprocation of the valve it will be cushioned by the air in the dash pot.

7. The combination in a scavenging valve for an internal combustion engine, of a casing having inlet and outlet ports; a cylindrical valve within the casing arranged to close the outlet ports; and a cylindrical dash pot, the valve having an annular rib extending into the dash pot so that the valve will be cushioned as it is actuated.

8. The combination in a scavenging valve of an internal combustion engine, of a casing having inlet and outlet ports; a hollow cylindrical valve in the casing arranged to close the outlet ports; and a dash pot so arranged in respect to the valve that the valve will be cushioned as it is actuated.

KENNETH RUSHTON.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."