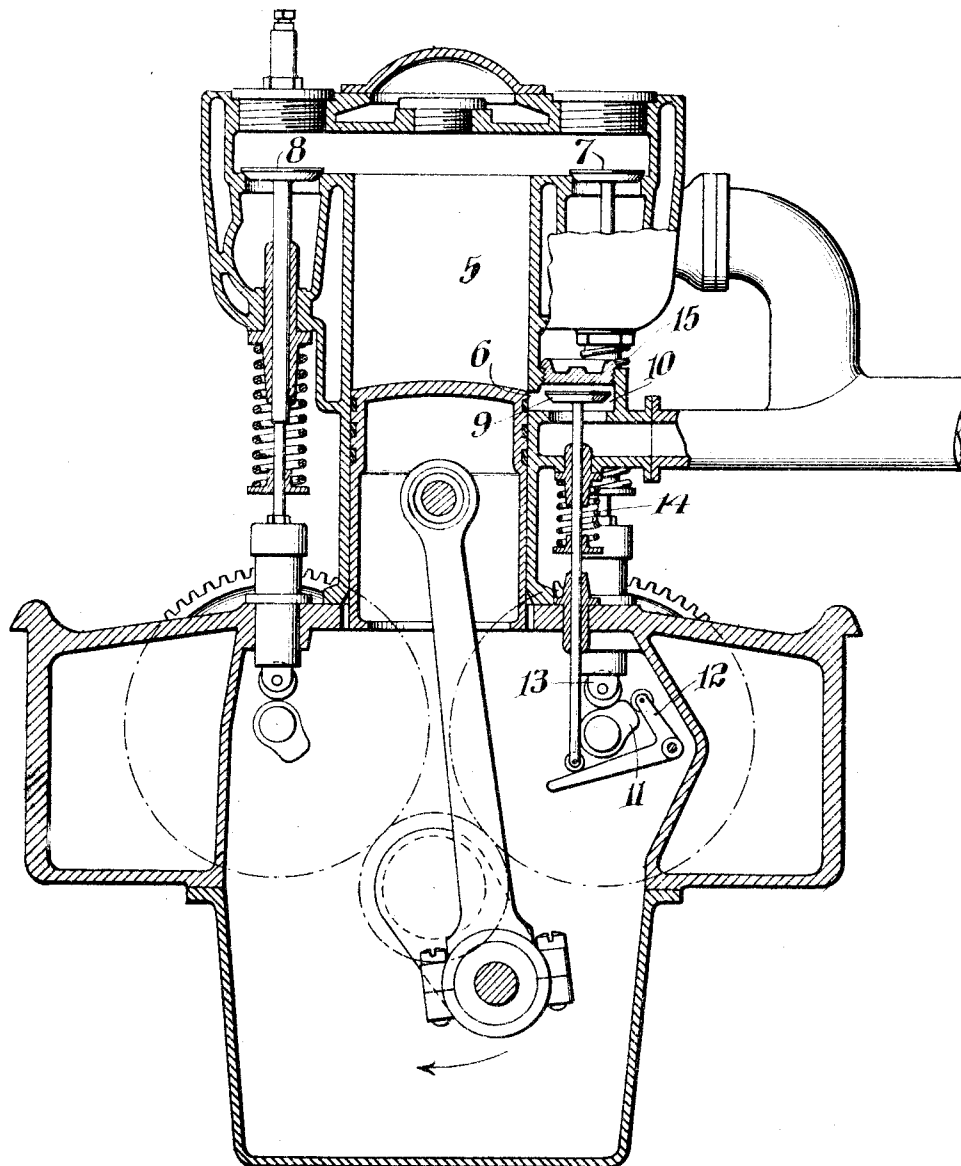


L. J. R. HOLST.
VALVE FOR INTERNAL COMBUSTION ENGINES.
APPLICATION FILED MAR. 8, 1912.

1,052,340.

Patented Feb. 4, 1913.



WITNESSES

Thomas M. Smith
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BY

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UNITED STATES PATENT OFFICE.

LODEWYK JAN RUTGER HOLST, OF LANSDOWNE, PENNSYLVANIA, ASSIGNOR OF ONE-THIRD TO MORRIS EARLE AND ONE-THIRD TO HENRY S. WILLIAMS, BOTH OF PHILADELPHIA, PENNSYLVANIA.

VALVE FOR INTERNAL-COMBUSTION ENGINES.

1,052,340.

Specification of Letters Patent.

Patented Feb. 4, 1913.

Application filed March 6, 1912. Serial No. 681,929.

To all whom it may concern:

Be it known that I, LODEWYK JAN RUTGER HOLST, a citizen of the United States, residing at Lansdowne, in the county of Delaware and State of Pennsylvania, have invented certain new and useful Improvements in Valves for Internal-Combustion Engines, of which the following is a specification.

10 The principal object of my present invention is to provide internal combustion engines working with the four stroke cycle with improved means for the prompt afflux of the products of combustion immediately
15 after they have performed their useful work so that only a minimum will remain in the cylinder to give off heat to the walls thereof, during the upward exhaust stroke, thereby also reducing the back pressure and thus
20 generally improving the efficiency of the engine. This result is obtained by providing the cylinder near its open end with an auxiliary exhaust-port, which is uncovered by
25 the piston as soon as it reaches on the downward stroke that point of its course at which the exhaust is to begin. As, however, this point is reached and passed also during the suction stroke means are provided to maintain this auxiliary-port closed during the
30 suction period or during that part of it, where the piston uncovers said auxiliary-port.

I am aware that it has been proposed to provide exhaust-ports near the open end
35 of cylinders in engines working on the two-cycle principle, in which case no further protection for this port is required owing to the fact that each time the piston uncovers this port in such engines, that port is intended to lead off the combustion products. In such instances this port is to be considered the principal exhaust-port. I am also aware that it has been proposed to provide engines working with the four stroke
40 cycle but in which the suction and explosion strokes are of unequal length with an auxiliary exhaust port; and also in such engines no protection is required for this port as in such cases the auxiliary-port is only uncovered by the piston each time this port is
50 intended to operate. I am further aware that it has been proposed to provide engines working with the four stroke cycle with ex-

haust-ports located at or near the open end of the cylinder and to use such ports as the
55 only exhaust-ports, eliminating the valved exhaust ports in the combustion chamber, and such ports are thus far left unprotected during the suction stroke entailing a partial loss of the charge, or are intentionally
60 opened again by the action of automatically operating valves for the purpose of drawing in an additional charge of air at the end of the suction stroke; also in many cases such ports are used for the admission of a scavenging or a cooling charge but do not act as exhaust-ports. None of these constructions, however, satisfy the purpose of my invention, which is to provide an auxiliary exhaust-port in combination with positive closing
70 ing means for the same during the suction period, in order to dispose as promptly as possible of the bulk of the heat stored in the exhaust gases, thereby reducing to a minimum the heating of the cylinder walls, and
75 at the same time materially reducing the resistance of puppet-exhaust valves against opening the same, by previously receiving the excess pressure therefrom, as applied to engines with stationary cylinders in which
80 the pistons reciprocate through equal strokes in all phases of a four cycle engine.

I am still further aware that it has been proposed to operate auxiliary exhaust valves by means of separate cams attached to the
85 half-time shaft.

The nature, scope and characteristic features of my present invention will be more fully understood from the following description taken in connection with the accompanying drawing forming part hereof, which shows a vertical cross-section through the central line of the cylinder of an engine in an adaptation of the same to an ordinary puppet valve construction.
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Referring to the drawing, the cylinder 5, is provided with the usual exhaust and suction valves 7 and 8, which may be disposed in the manner of a so-called T-head, as illustrated, or again in the cylinder head or on
100 the same side of the cylinder, all of which is immaterial for the purposes of this invention. Near the lower or open end, the cylinder is provided with a port 6, communicating with a valve chamber 10, containing the
105 auxiliary-puppet-valve 9. This valve is op-

erated by means of the bell-crank lever 12, which is adapted to contact with the exhaust-cam 11, a suitable time ahead of the contact of such cam with the valve-lift 13, operating the principal exhaust-valve 7. By this arrangement, the port 6, will give exhaust to the combustion products the instant the piston uncovers the said port 6, and as the auxiliary valve 9, is lifted before this takes place, no pressure except that of the valve spring 14, need be overcome, for the operation of the valve 9. During the period absorbed by the piston to reach the lower limit on its continued downward stroke and to again cover the outlet 6, in the upward exhaust stroke, the main exhaust-valve is opened by the cam 11, and valve-rod 13, thereby also reducing the effort required to lift the main exhaust-valve 7, to practically not more than overcoming the spring pressure exerted on this valve by the valve-spring 15. It will be evident that on the suction stroke the auxiliary-valve 9 is closed, and thus prevents

drawing in exhaust gases from the exhaust-pipe when the piston overruns the port 6. 2.

Having thus described the nature and objects of my invention, what I claim as new and desire to secure by Letters Patent is:—

In an internal combustion engine having a stationary cylinder provided with an explosion-chamber, a main exhaust-valve communicating with said chamber, a cam operating said valve, an auxiliary exhaust-valve arranged near the open end of said cylinder and a lever interposed between said cam and auxiliary exhaust-valve to thereby open said auxiliary exhaust-valve in advance of said main exhaust-valve, substantially as and for the purpose described. 30 35

In witness whereof, I have hereunto set my signature in the presence of the two subscribing witnesses hereto. 40

LODEWYK JAN RUTGER HOLST.

Witnesses:

J. WALTER DOUGLASS,
THOMAS M. SMITH.