

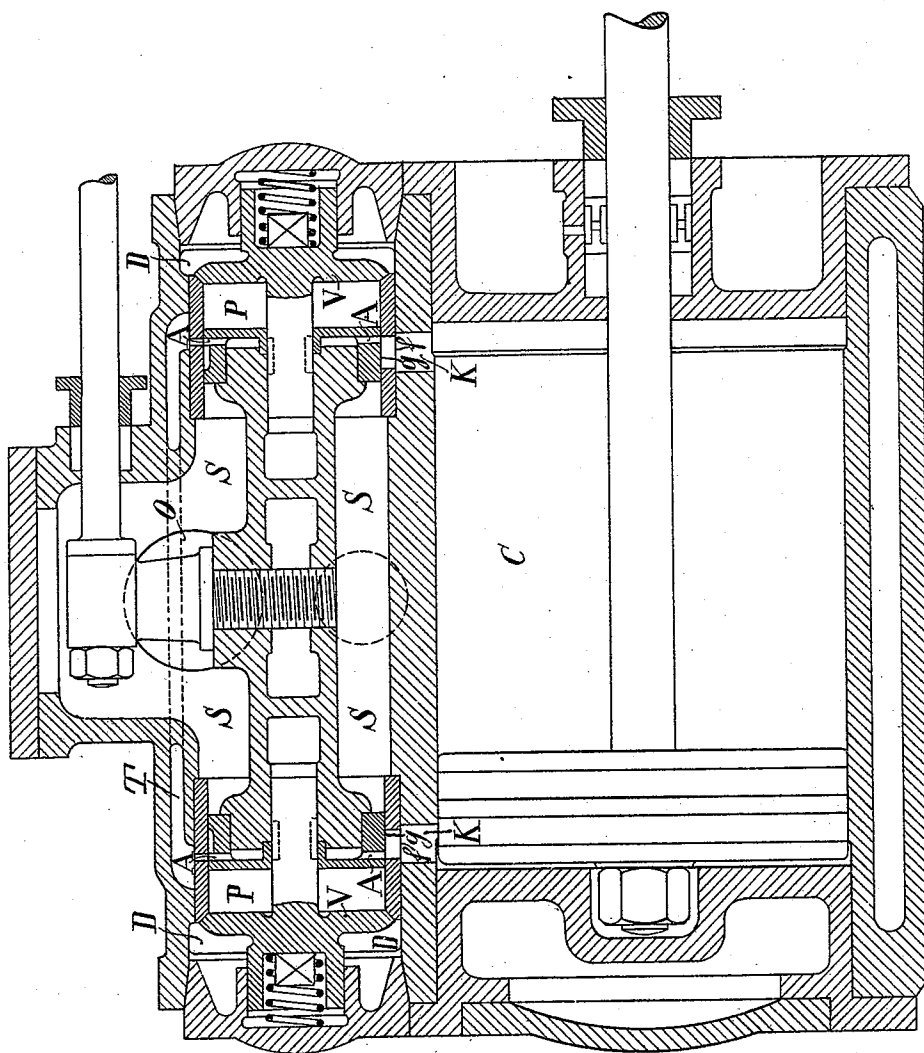
(No Model.)

E. W. KÖSTER.

VALVE GEAR FOR FORCE PUMPS AND SUCTION PUMPS.

No. 553,961.

Patented Feb. 4, 1896.



Witnesses.

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UNITED STATES PATENT OFFICE.

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VALVE-GEAR FOR FORCE-PUMPS AND SUCTION-PUMPS.

SPECIFICATION forming part of Letters Patent No. 553,961, dated February 4, 1896.

Application filed March 5, 1895. Serial No. 540,619. (No model.) Patented in Germany December 7, 1893, No. 76,308.

To all whom it may concern:

Be it known that I, ERNEST WILLIAM KÖSTER, a citizen of the Empire of Germany, and a resident of Höchst-on-the-Main, Germany, have invented certain new and useful Improvements in Valve-Gear for Force-Pumps and Suction-Pumps, (for which I have obtained a patent in Germany, No. 76,308, dated December 7, 1893,) of which the following is a specification.

The object of the present invention is to keep the noxious spaces which make their appearance in the valve-gears used for force-pumps and suction-pumps as small as possible, as well as to remove the air remaining below the return-valve after closing the forcing-canal, for in the valve-gears used until now for the aforesaid pumps the air remaining beneath the return-valve goes again behind the main piston, either pursuant to the equalizing of pressure or when the canal opens at the beginning of the compression part of the stroke. Therefore the air gets recompressed, the consequence thereof being a diminution of the dynamical efficiency of the pumping-engine.

Reference is to be had to the accompanying drawing, showing a sectional view of the cylinder and the valve-chest, the period shown in the said drawing being the one during which the equalizing of pressure takes place.

C represents the cylinder with the main piston, the valve-chest together with the piston-valve being disposed aside or thereupon. The angle of transposition of the eccentric actuating the piston-valve as to the crank-shaft connected with the main piston is about ninety degrees, so that, when the main piston reaches its dead-point on the left-hand and is to go to the right, the piston-valve which slides in the valve-chest reaches its central position and goes to the left, as shown in the drawing. Reciprocally, when the main piston occupies its dead-point on the right and is to go to the left, the piston-valve reaches again its central position, but goes to the right.

The piston-valve is provided at both its extremities situated in the direction of its motion with a plate or clack V, subjected to the pressure of a spring and let into the piston-valve by means of a plug. Around this plug and being also let into the body of the piston-

valve is fitted a piston-ring provided on both sides with apertures A, which piston-ring slides in the cylindrical casing disposed in the valve-chest. This cylindrical casing having a conical rim directed outwardly, upon which rests the plate or clack V, shows above the canal K a canal, the outer edge of which is designated by the letter *f* and the inner edge by *g*. Diametrically opposite to the edge *f* is an opening corresponding with the aperture in the piston-ring. Now, when the main piston in the cylinder C leaves its dead-point on the left, as shown in the drawing, to go to the right, the piston-valve which slides in the valve-chest leaves, on account of its aforesaid eccentricity, its central position to go to the left. As soon as the piston-ring provided with apertures has, during its motion to the left, gone beyond the edge *g* of the one of the canals K which lies on the left, the space of the cylinder C behind the piston is put into communication with the middle space S of the valve-chest. As this space S communicates with the suction-opening, the main piston, which in the cylinder goes to the right, can suck air or gas from S—that is, from O through K. In the meantime, however, the piston-valve which goes to the left has opened in the valve-chest the canal K lying on the right side of the cylinder, as the piston-ring provided with apertures, which lies on the right, has gone beyond the edge *f* of the canal to the left. Consequently the space of the cylinder C before the piston is put into communication with the space P of the valve-chest lying between the piston-ring and the valve V. Thus the gas located before the piston which has been drawn in thereby during its motion from the dead-point on the right to the dead-point on the left, as shown in the drawing, gets now displaced through K and P, and as the return valve or clack V being pressed by means of a spring against the seat is adapted to yield the gas is forced behind the valve into the forcing-canal D. When the main piston has reached its dead-point on the right and is to go to the left, the piston-valve in the valve-chest, on account of its mentioned eccentricity, occupies again its central position and goes to the right. The canal K on the right side is again cut off and there is a certain quantity of gas still remaining in the

space P on the right. This gas can no more be expelled by the main piston, because the latter has reached its dead-point on the right and the canal K is cut off. However, this
 5 gas or air remaining in the space P is forced away by the piston-valve itself, which goes now to the right, because as soon as the piston-valve during its further travel to the right has gone beyond its central position
 10 the plate or clack V must be raised from the valve-seat and thus the gas gathered in P is allowed to escape by D. The same operation is repeated on the other side of the piston.

This construction is intended to prevent the
 15 gas contained in the space P beneath the return valve or clack from returning when the canal K reopens at the beginning of the compression part of the stroke behind the main piston into the cylinder C, because the afore-
 20 said gas would get recompressed, the consequence thereof being a diminution of the dynamical efficiency of the pumping-engine.

Owing to the apertures A in the piston-rings of the piston-valve, the use of which has
 25 not been explained until now, the volumetrical efficiency of the pumping-engine gets also sensibly increased. The gas indeed, as may be easily seen in the drawing, which cannot be expelled from the noxious space between
 30 the cylinder-cover and the main piston as well as from the canal K, reaches first the annular space between the piston-ring and the body of the piston-valve, thereafter goes through the aperture in the cylindrical guiding-casing and
 35 reaches through the canal T on the outer side of the valve-chest to the other side of the piston. The noxious space P and the one between the piston and the cylinder-cover are acting quite differently. The compressed air at the
 40 beginning of the following compression part of the stroke would leave the space P, occasion a counter-pressure, and in this way increase the expenditure of power. On the other hand
 45 the main piston and the cover would, at the beginning of the suction part of the stroke, expand anew and diminish the amplitude of the suction, that can be avoided by transferring this gas to the other side of the piston.
 50 For this reason, the air gets expelled from P through the piston-valve in the described manner, while the air between the main piston and the cylinder-cover can be directed by means of the canal intending to effect the

equalizing of pressure into the other side of 55 the cylinder, as to be seen in the accompanying drawing, showing, as already mentioned, the period during which the equalizing of pressure takes place.

Having thus fully described my invention, 60 what I claim, and desire to secure by Letters Patent, is—

1. The combination with a cylinder, a main piston, two ports, a valve-chest provided with a suction passage-way, forcing passage-way 65 and canal connecting the two opposite ends of the cylinder, of a double-headed piston-valve, the spring-actuated valves or clacks disposed at each extremity of the bosses of said piston-valve, the two piston-rings in con- 70 nection with the piston-valve, said piston-rings being provided with opposite apertures, the cylindrical casings fitted symmetrically into the body of the valve-chest and provided with opposite openings or passage-ways cor- 75 responding with the apertures of the piston-rings, these passages opening communication between the mentioned ports and the named canal connecting the two opposite ends of the cylinder, all substantially as described and 80 for the purpose specified.

2. The combination with a valve-chest and two cylindrical casings fitted into the said valve-chest, said cylindrical casings being provided on the outer edge with a conical rim 85 or seat and with opposite openings or passage-ways, of a piston-valve composed of two symmetrical parts, each of the latter comprising a boss, a piston-ring provided with opposite apertures, said piston-ring being to slide within 90 the aforesaid corresponding cylindrical casing, the openings or passage-ways in the cylindrical casing corresponding with the apertures in the piston-ring, a valve or clack let into the body of the piston-valve by means of 95 a plug or pin, the valve proper resting on the conical rim or seat of the mentioned cylindrical casing, said valve or clack being subjected to the pressure of a spring resting against the named valve-chest, all substantially as shown 100 and described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

ERNEST WILLIAM KÖSTER.

Witnesses:

ALVESTO S. HOGUE,
 FRANK H. MASON.