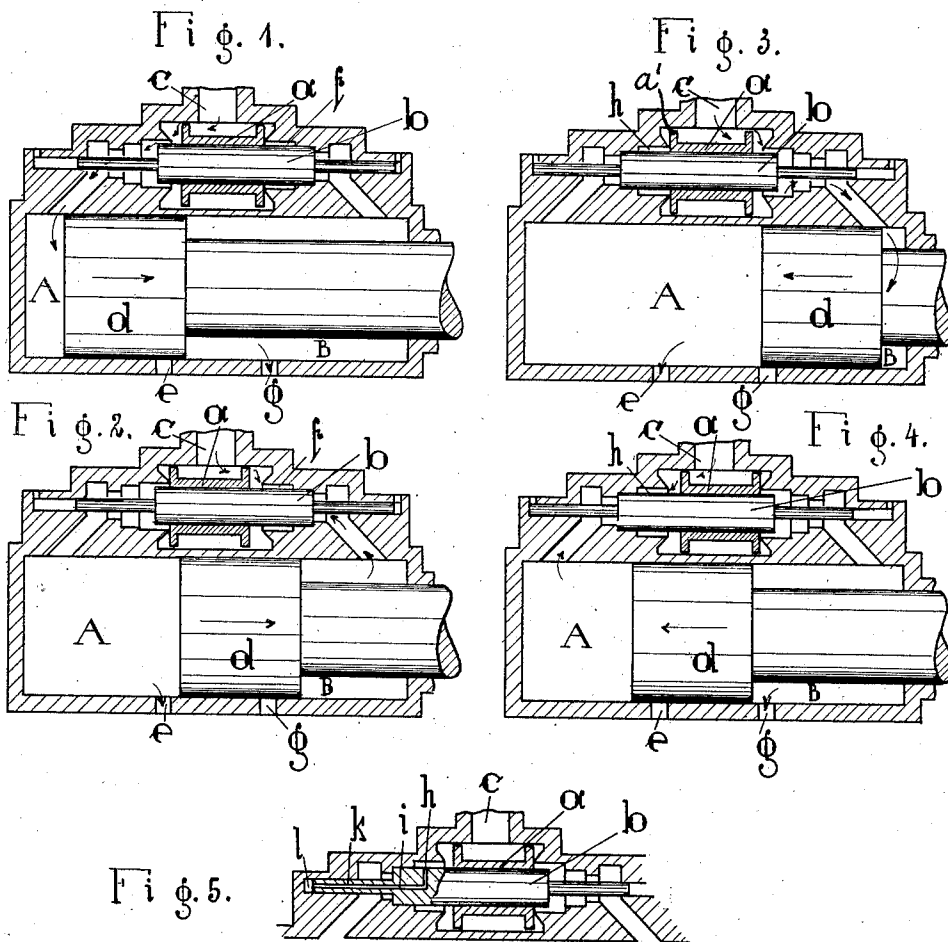


E. KETTERER.
VALVE GEAR.
APPLICATION FILED MAR. 27, 1911.

1,034,121.

Patented July 30, 1912.



WITNESSES:

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UNITED STATES PATENT OFFICE.

EUGEN KETTERER, OF ESSEN-ON-THE-RUHR, GERMANY.

VALVE-GEAR.

1,034,121.

Specification of Letters Patent.

Patented July 30, 1912.

Application filed March 27, 1911. Serial No. 617,012.

To all whom it may concern:

Be it known that I, EUGEN KETTERER, a subject of the German Emperor, and residing at Essen-on-the-Ruhr, Germany, have invented certain new and useful Improvements in Valve-Gear, of which the following is a specification.

My invention relates to valves for tools operated by compressed air, and a primary object is to provide improved valve gear, particularly for machine tools comprising a piston driven by compressed air, such that the air conduits or passages leading to the two sides of the piston are closed at two places in succession, so that compressed air can pass to either side of the piston only when both the places in the passage leading to the side in question are open. According to the invention the valve controlling the one of said places is moved by the fall in pressure arising when the exhaust port is opened, and the valve controlling the second place in the same passage is moved by the compression arising behind the piston. In consequence of this arrangement the time of exhaust is shortened and the valve gear is also not so liable to be leaky. As valves piston-valves are preferably employed, and I obtain a simple arrangement when the valve moved by the fall in pressure is formed as a liner movably surrounding the other valve.

One illustrative embodiment of the invention and a modification thereof are represented in longitudinal sectional elevation by way of example in the accompanying drawing, wherein:—

Figures 1 to 4 show my valve gear and a piston controlled thereby in various positions during one cycle, and Fig. 5 shows the modified form of valve gear.

Referring to the drawing, in the initial position represented in Fig. 1, compressed air entering the inlet *c* passes between the left-hand edge of the tubular valve or liner *a*, surrounding the piston-valve *b*, and the wall of the valve chest in the direction of the arrows into the cylinder chamber *A* and drives the piston *d* in the direction of its arrow. The tubular valve or liner *a* is provided with a circumferential rim *a'* at each end. As soon as the piston *d* releases the exhaust port *e*, the operative air flows out through the same and the fall of pressure thereby brought about in the chamber *A* causes the liner *a* to move to the left onto

its left-hand seat as clearly shown in Fig. 2, while the right-hand edge of the liner *a* leaves its seat, so that fresh air passes into the chamber *f*. The piston *d* moving farther to the right delivers up its kinetic energy and simultaneously compresses air in the chamber *B* which exercises pressure on the right-hand end of the piston-valve *b* and drives it to the left, so that it leaves its right-hand seat and fresh air, as shown in Fig. 3, now flows into the chamber *B* and drives the piston *d* to the left. When this piston releases the second exhaust port *g*, a fall in pressure is occasioned in the chamber *B*, and consequently the valve *a* is again moved to the right, as shown in Fig. 4, that is to say closes toward the chamber *B* and opens toward the chamber *A*, so that compressed air passes into the chamber *h*. The compression produced in the chamber *A* at the end of the movement of the piston to the left presses on the left-hand end of the valve *b* which then leaves its left-hand seat, so that the parts again occupy the position in which they are shown in Fig. 1 when fresh air flows into the chamber *A*. The cycle of operations is then repeated in the described manner.

Fig. 5 shows a modified form of the valve *b*. If the piston *d* cannot return to the left, owing for example to reversing gear comprising helical motion, or the like jamming, no compression would occur and the valve *b* would not move toward the right. In order to produce this motion under all circumstances, however, I provide in the valve *b* a duct *i* which connects the chamber *h* with the chamber *l* in which the tail rod *k* of the valve *b* moves. In the position in question, fresh air consequently passes through this duct into the chamber *l*, presses on the end of the tail rod *k* and brings about the requisite movement of the valve *b* to the right, even when no compression occurs in the chamber *A*. Consequently, the tool will start even in the case of the piston jamming in the described manner. The right-hand side of the valve *b* may be formed, when necessary, in like manner.

I claim:—

1. In a valve-gear for pneumatic tools, the combination, with a cylinder, having inlet and outlet-ports, and a piston in the same, of a valve-chest, provided with two valve-seats at each end, a piston-valve adapted to open or close one of the valve-seats at each

end, and a tubular valve or liner guided on said piston-valve and adapted to open or close the other valve-seats, the liner being operated by the drop of pressure at the rear of the piston, and the piston-valve by the compression at the front of the piston.

2. In a valve-gear for pneumatic tools, the combination, with a cylinder having inlet and outlet-ports, and a piston in the same, of a valve-chest provided with two pairs of valve-seats, one pair at each end, a piston-valve in said chest, a tubular valve or liner guided on said piston-valve and provided with a circumferential rim at each end, said piston-valve and liner being adapted to be operated in conjunction with the valve-seats at each end of the valve-chest.

3. In a valve-gear for pneumatic tools, the combination, with a cylinder having inlet and outlet-ports, and a piston in the

same, of a valve-chest provided with a pair of valve-seats at each end, a piston-valve adapted to operate in conjunction with one of the valve-seats at each end of the valve-chest, and a tubular valve or liner adapted to be operated in conjunction with the other valve-seat at each end of the valve-chest, said piston-valve being provided with a bore in its ends for admitting compressed air to the same as soon as the tubular valve or liner has left its seat by the fall of pressure in the cylinder.

In testimony whereof I have signed my name to this specification in the presence of two witnesses.

EUGEN KETTERER. [L. S.]

Witnesses:

CHAS. J. WRIGHT,
ALFRED HENKEL.

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