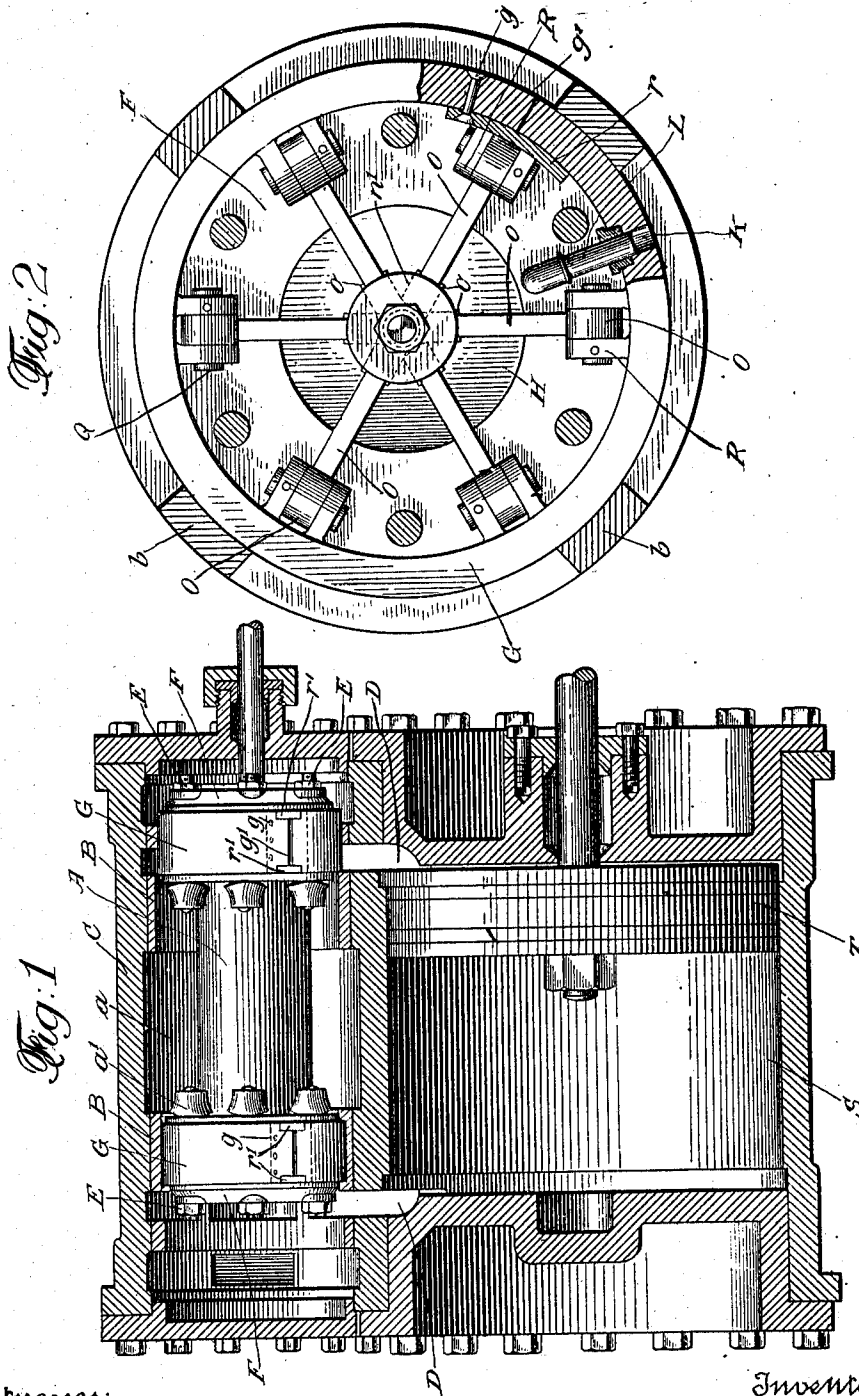


974,432.

C. REEVES.  
ENGINE VALVE.  
APPLICATION FILED DEC. 2, 1909.

Patented Nov. 1, 1910.  
2 SHEETS-SHEET 1.



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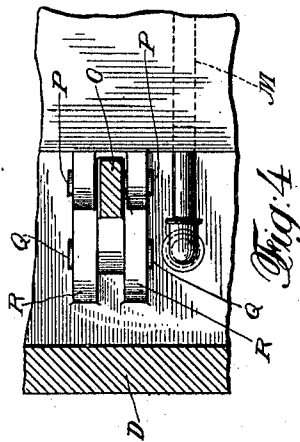
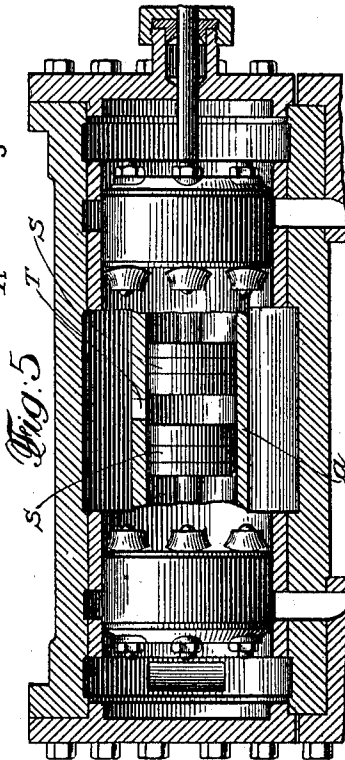
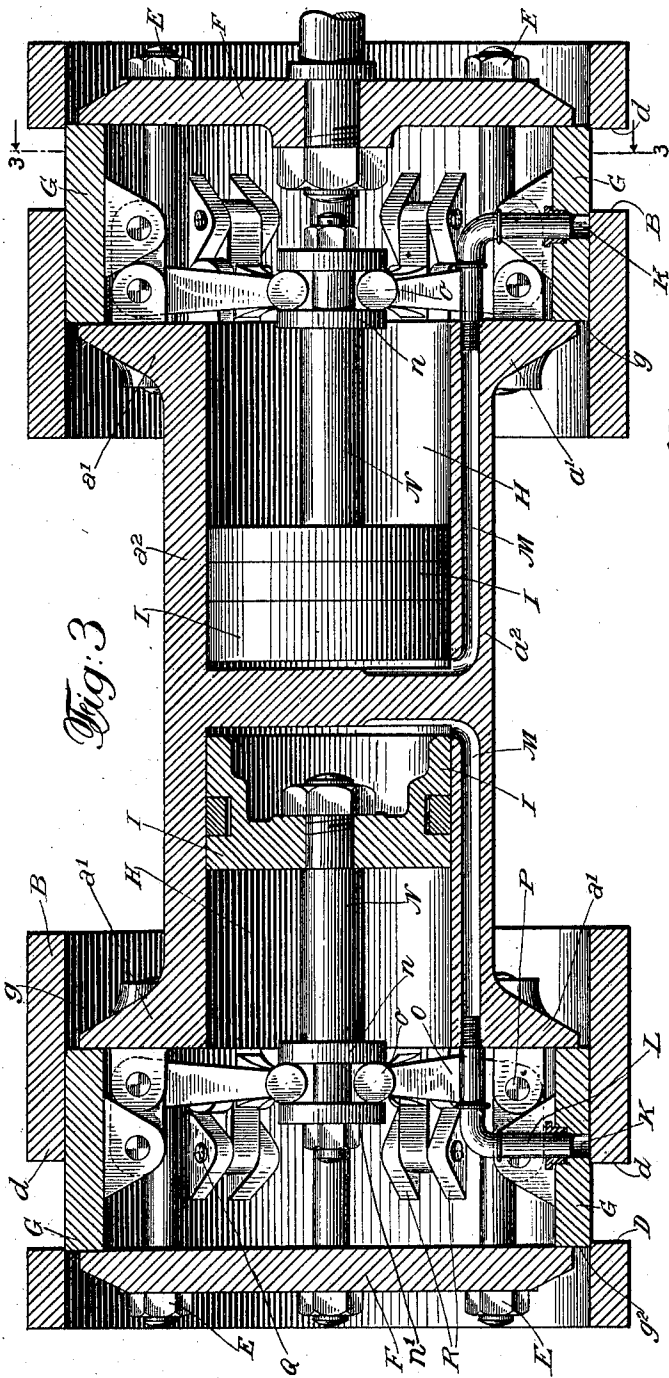
### ENGINE VALVE.

APPLICATION FILED DEC. 2, 1909.

974,432.

Patented Nov. 1, 1910.

2 SHEETS—SHEET 2.



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# UNITED STATES PATENT OFFICE.

CLIFTON REEVES, OF TRENTON, NEW JERSEY.

## ENGINE-VALVE.

974,432.

Specification of Letters Patent.

Patented Nov. 1, 1910.

Application filed December 2, 1909. Serial No. 530,908.

*To all whom it may concern:*

Be it known that I, CLIFTON REEVES, of Trenton, in the county of Mercer, and in the State of New Jersey, have invented a certain new and useful Improvement in Engine-Valves, and do hereby declare that the following is a full, clear, and exact description thereof.

The object of my invention has been to provide a balanced valve for a steam engine, in which the packing rings shall be forced against their seats with a predetermined pressure and yet be free to yield to excessive pressure such as that due to water of condensation; and to such ends, my invention consists in the engine valve hereinafter specified.

In the drawings Figure 1 is a longitudinal sectional view of an engine cylinder and steam chest, containing a valve embodying my invention; Fig. 2 is an enlarged sectional view, taken on the line 3—3 of Fig. 3; Fig. 3 is an enlarged longitudinal sectional view of the valve and steam chest linings shown in Fig. 1; Fig. 4 is a fragmentary, detail view, showing the connections for carrying steam to the ring-expanding piston; and Fig. 5 is a longitudinal sectional view of a valve and steam chest, illustrating another embodiment of my invention.

In that embodiment of my invention which is shown in Figs. 1 to 4, the valve A is shown as mounted in linings B in the bore of a steam chest C, the latter having a port D that enters the engine cylinder. The valve consists of a cylindrical body *a* having secured thereto heads *a'*, the heads being secured as by bolts E. Between each head *a'* and a flange F, formed on the valve-body, is mounted one or more packing-rings G, which are split in any desired manner so that they may be expanded and contracted as may be necessary to fit the valve bore. Within the piston-body is formed, preferably at each end, a bore H having within it a piston I. The piston I is to be used to expand the ring G against its seat at such times as may be desired, so that the said ring will be held to its seat with sufficient firmness to prevent any escape of steam beneath it, and yet will be able to yield in case of an emergency, such as the passage of water of condensation. For this purpose steam is to be admitted to one side of the piston I, and the movement of said piston is to be com-

municated to the ring G by any desired form of mechanism.

In that embodiment of my invention which I have illustrated in Figs. 1 to 4 of the drawings, and which is only one of many forms it may take, I have provided the ring G with a port K in which is mounted a tube L that connects with a port M in the valve-body, the tube either being made sufficiently flexible, as by being given sufficient length, so that it may yield to the movements of the ring G, or a sliding joint being formed between the said tube and the ring G. The port M opens back of the piston I. The piston I is connected by a stem N with bell crank levers O that are fulcrumed on pins P mounted in ears on the heads *a'*. The bell crank levers are preferably provided with rounded ends *o* which are received between a flange *n* on the stem and a collar *n'* that is bolted in the stem. The opposite arm of each bell crank lever is pivoted on a pin Q mounted in ears or lugs R on the ring G. As I have illustrated it, the lugs R of one of the levers O are formed on a plate *r* that is secured to one end of the ring G by rivets *g*, and such plate, as shown in Fig. 1, has lugs or ears *r'* which are fitted in recesses in the ring G and extend across the slot *g'*, so that such lugs prevent escape of steam through said slot. There may be one bell crank lever or several, as desired; or other form of mechanical connection between the piston I and the packing-ring may be used.

In describing the operation of the above-illustrated embodiment of my invention, the live steam is assumed to be admitted around the neck *a''* of the valve-body, and the ends of the valve bore to be connected with the exhaust ports. Assuming the valve to be moving to the left, as seen in Fig. 3, and regarding only the parts at the left hand end of said figure, the ring G is about to close communication between the left hand port D and the exhaust. This movement also opens the port K to the port D and, as the compression occurs in the engine cylinder, the steam passes through the ports K and M to the rear of the piston I, forcing the said piston to the left, swinging the bell crank levers O, and forcing the ring G against its seat with a pressure which depends upon the area of the piston I, and which can, therefore, be precisely predetermined. If there is water in the engine cylinder which must escape or break some por-

tion of the engine (such as the cylinder-head) the ring G can yield to allow the water to pass out, since the ring is only held to its seat by the yielding pressure of the steam against the piston I. This condition continues until the edge  $g^2$  of the ring G passes the edge  $d$  of the port D, when live steam will enter such port and the engine piston be reversed. The valve then reverses and moves to the right, and when the port K passes beyond the port D the steam in the said port at the back of the piston I is bottled up and remains there, holding the piston I to its work. So long as the port K is in communication with the port D the pressure behind the piston I of course lowers with the expansion of the engine cylinder.

It will be seen that my valve has, among others, the following advantages: It is always balanced, and, while it is free to move, any desired pressure can be put on the ring G to force it to its seat by making the area of the piston I of the proper size to produce that pressure, and the time at which the pressure is applied can be determined by positioning the port K so that it will only receive steam at the desired time. Notwithstanding the ring G is held to its seat, the said ring is free to yield in case of excessive pressure, such as that due to the presence of water. As the steam pressure serves to force the rings against their seats, the pressure of the rings against their seats can be nicely adjusted, and the necessity for using a large amount of spring or expansive action in the rings is avoided. This ability to adjust the pressure, enabling the pressure to be made not more than is necessary, while insuring a firm contact with the seat, enables me to avoid excessive friction of the rings on their valve seats, and therefore to use rings of ample width, so that there will be no breaking or cutting where they extend over the bridges.

The packing rings can be made as wide or wider than the ports, so that the bridges  $b$  of the linings (which bridges span the ports in the steam chest or valve casing) will never wholly support the packing rings, and the body of the lining will take the strain off the bridges. For instance, instead of admitting the steam behind the piston I through a port in the packing rings, the construction illustrated in Fig. 5 may be used. In such figure the construction is the same as in the previous figures, except that the steam is admitted to the pistons S by a port T in the valve-body  $a$ , instead of by a port in a packing ring. The pistons S are thus always under live steam pressure.

While I have illustrated in Figs. 1, 2 and 3 one embodiment of my invention, I am aware that the same principles can be embodied in many different forms, and as I believe myself to be the first to invent a balanced valve with means for holding said

valve to its seat by a predetermined pressure, and also with provisions for applying that pressure only in those positions of the valve where it is needed, I desire to claim the said invention as broadly as possible.

I claim:

1. A balanced valve having means for forcing said valve to its seat with a predetermined pressure, said valve being so constructed as to prevent leakage except under excessive compression.

2. In an engine valve, the combination of a balanced valve having a packing-ring, and means for expanding said ring with a predetermined pressure, said valve being so constructed as to prevent leakage except under excessive compression.

3. In an engine valve, the combination of a valve-body, a packing-ring, a piston mounted in a bore in said body, and mechanical connection between said piston and said ring, said connection being such as to permit the ring to yield under excessive compression.

4. In an engine valve, the combination of a valve-body, a packing-ring, a piston, a connection between said piston and said ring for expanding the latter, said connection being such as to permit the ring to yield under excessive compression, and means governed by the position of the valve for admitting steam to said piston.

5. In an engine valve, the combination of a valve-body, a packing-ring thereon, a piston mounted in a bore in said body, a lever connecting said piston and said ring, said ring having a port in its face that is connected with said piston-bore.

6. In an engine valve, the combination of a valve-body, a packing-ring thereon, a piston mounted in a bore in said valve-body, a series of levers pivoted on said valve-body, each of said levers having one arm connected with said piston and the other arm connected with said ring, said packing-ring having a port in its face, said port being connected with said piston-bore, said packing-ring serving to open and close a port of the engine-cylinder.

7. In an engine valve, the combination of a valve-body, having a packing-ring at each end thereof, the central portion of the body being contracted, two separate pistons mounted in separate bores in said valve-body, connections between said pistons and said packing-rings whereby movements of said pistons shall cause expansion of said packing-rings, said valve being mounted in a valve-bore, said bore having ports connected with an engine cylinder, said packing-rings serving to open and close said ports.

8. In an engine-valve, the combination of a valve-body, having a packing-ring at each end thereof, the central portion of the body being contracted, two separate pistons

mounted in separate bores in said valve-body, connections between said pistons and said packing-rings whereby movements of said pistons shall cause expansion of said packing-rings, said valve being mounted in a valve-bore, said bore having ports connected with an engine cylinder, said packing-rings serving to open and close said ports, and ports in the faces of said packing-rings that are connected with said piston bores.

9. In an engine valve, the combination of a valve-body, a packing-ring, a piston, a

connection between said piston and said ring for expanding the latter, said connection being such as to permit the ring to yield under excessive compression, and means for admitting steam to cause said piston to expand said ring.

In testimony that I claim the foregoing I have hereunto set my hand.

CLIFTON REEVES.

Witnesses:

G. B. PRINDLE,  
M. MERKLE.