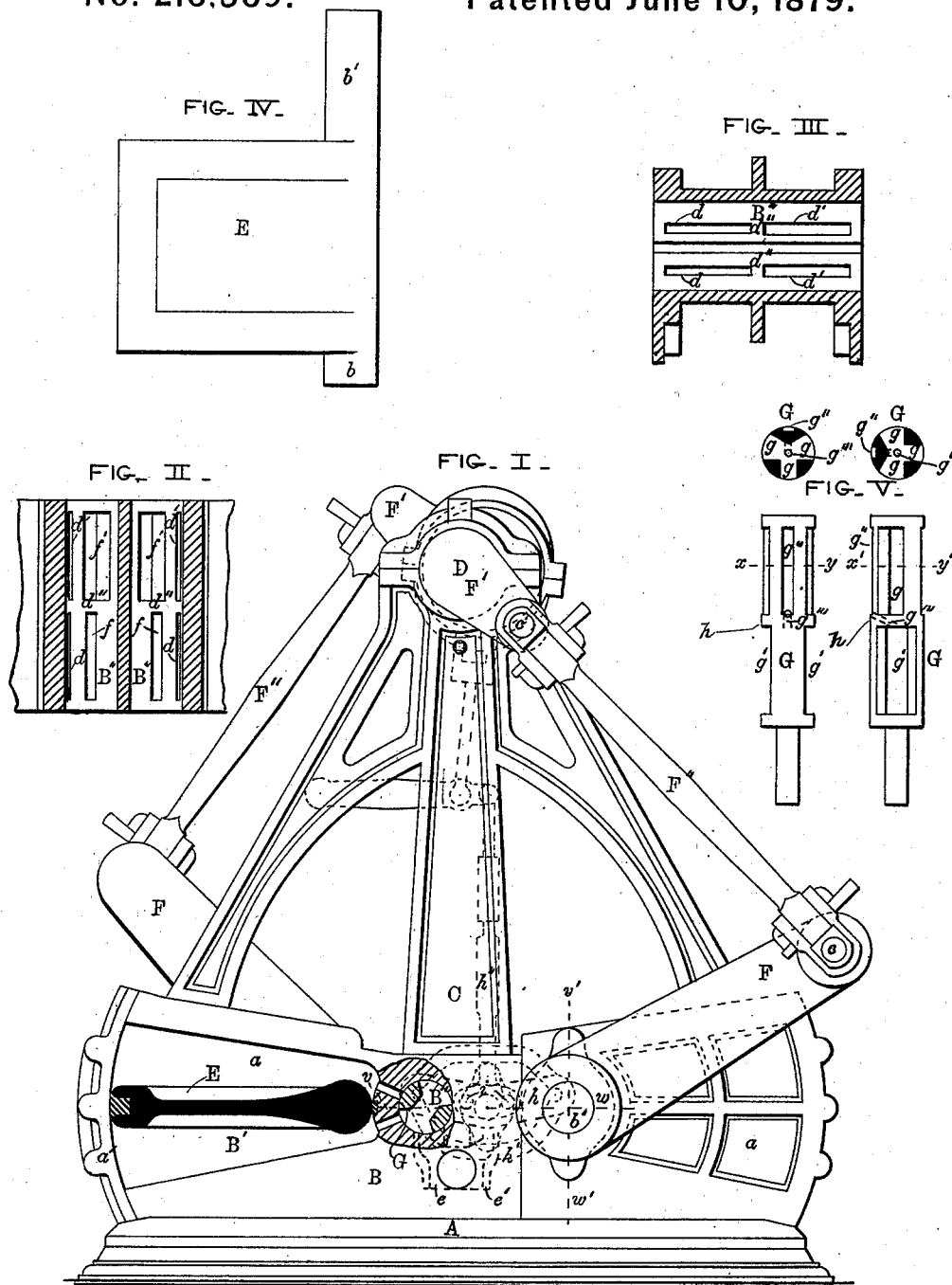


R. H. ATWELL.  
Steam or Water Motor.

No. 216,369.

Patented June 10, 1879.



—WITNESSES—

—INVENTOR—

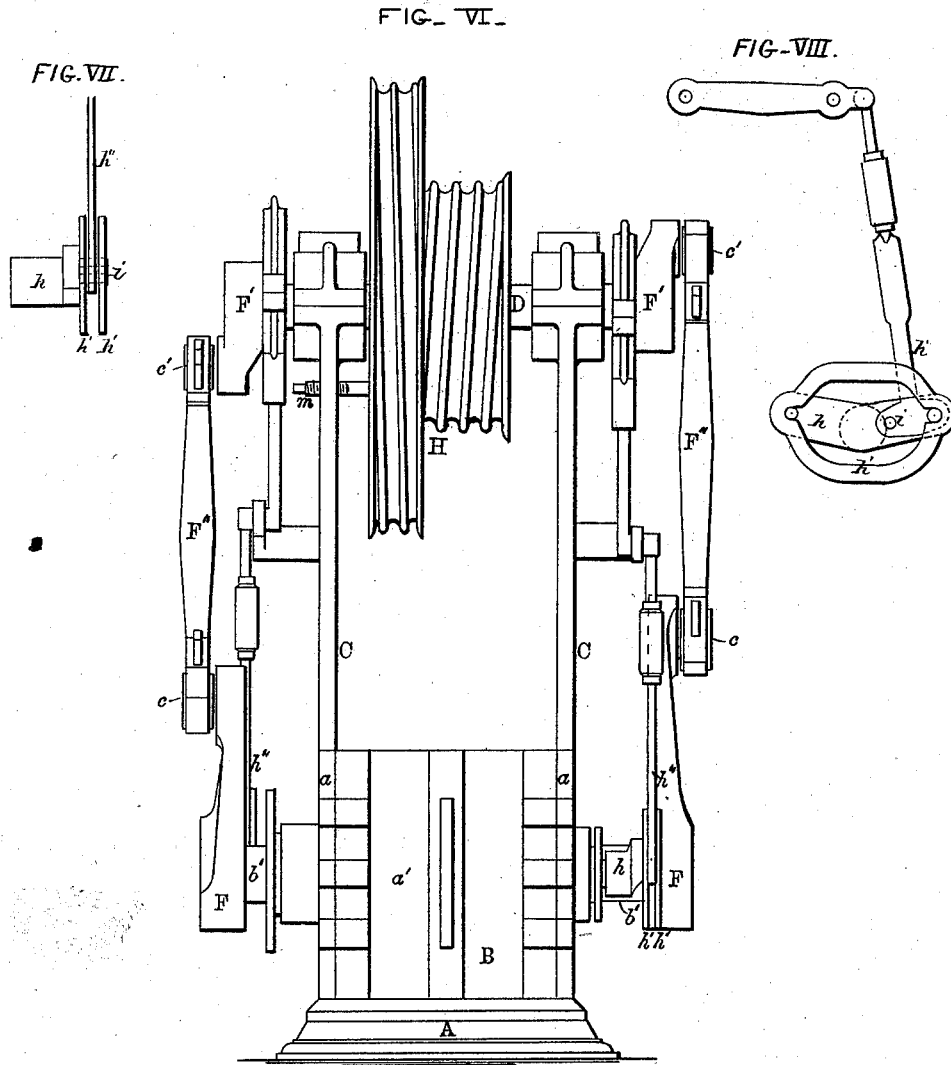
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# UNITED STATES PATENT OFFICE.

RICHARD H. ATWELL, OF BALTIMORE, MARYLAND.

## IMPROVEMENT IN STEAM OR WATER MOTORS.

Specification forming part of Letters Patent No. **216,369**, dated June 10, 1879; application filed May 23, 1878.

*To all whom it may concern:*

Be it known that I, RICHARD H. ATWELL, of the city of Baltimore and State of Maryland, have invented certain Improvements in Steam or Water Motors, of which the following is a specification; and I do hereby declare that in the same is contained a full, clear, and exact description of my said invention, reference being made to the accompanying drawings and to the letters of reference marked thereon.

This invention relates to certain improvements in motors; and consists, first, in a novel construction of that part of the machine comprising the piston-chamber in which the vibratory piston is confined and operates to communicate movement to the revoluble driving-shaft, whereby the said chamber is fitted to receive two vibratory pistons, which, although practically separate and governed in their movements by separate valves, operate together in producing the revolution of the driving-shaft before alluded to.

The said invention consists, secondly, in certain improvements in the construction of the various parts of the motor looking to its increased efficiency, both in its single and duplex form.

In the following description of the improved motor, which is adapted to hoisting purposes, reference is made to the accompanying drawings, forming a part hereof, and in which—

Figure 1 is a partly-sectional view of parts of the motor. Fig. 2 is a sectional view of a part of the machine on the dotted line *v w*. Fig. 3 is a sectional view of a part of the invention on the dotted line *v' w'*. Fig. 4 is an exterior view of a part of the piston. Fig. 5 represents two exterior and two sectional views of another part of the invention, the sections being on the dotted lines *x y* and *x' y'*. Fig. 6 is an exterior end view of the motor. Figs. 7 and 8 are views of parts of the machine hereinafter more particularly described.

Similar letters of reference indicate similar parts in all the views.

A is the base-plate of the machine. B is a casting, in which are located the piston-chambers B', valve-chests B'', and to which the frame C, supporting the revoluble shaft D, is securely attached. The piston-chambers are

of such shape as to admit of the oscillation therein of the pistons E, and are closed at their sides with flat bonnets *a*, and at their outer ends by means of circular bonnets *a'*. The said pistons E consist of plates grooved at the edge for the reception of packing material, and provided with trunnions *b b'*. The trunnions *b* merely rest in depressions in the flat bonnets which serve to sustain them, and the ones *b'* pass through the opposite flat bonnets, which are provided with stuffing-boxes, the trunnions carrying the levers F. The outer ends of the levers F are fitted with pins *c*, which correspond with pins *c'* in the cranks F', forming a part of the crank-shaft, and the crank and lever pins are connected by the rods F''. The valve-chests, which are cylindrical in form, communicate with the piston-chambers by means of the induction and eduction ports, respectively represented by *d* and *d'*, which are separated by the partitions *d''*, and they also communicate with the induction and eduction channels *e* and *e'*, situated in the casting B, below the said chests, by means of the passages *f* and *f'*.

The pipes for conveying steam or water to the induction-channels and from the eduction-channels to the place of discharge are not shown in the drawings, as they form no part of the present improvement.

The valves G for controlling the movements of the pistons are cylindrical or conical vibratory bars fitting closely within the valve-chests, and actuated as hereinafter described.

The induction and eduction openings in the valves G are respectively designated by *g'* and *g*.

By referring to Fig. 5 of the drawings it will be seen that the valves G are provided with the recesses *g''*, in communication by means of the ducts *g'''* with the induction-openings. By this means the said valves are balanced and not forced into contact with the surface of the chests in such manner as to cause undue friction or unequal wear of the parts.

The outer ends of the valves, which are reduced in diameter and pass through packing-boxes in the bonnets *a*, are provided with double arms *h*, (shown in dotted lines in Fig. 1 of the drawings and in full lines in Figs. 7

and 8 of the same,) which double arms carry the skeleton guiding-frames  $h'$ , between each pair of which is the rod  $h''$ , having the ahead and backing pins  $i$ . Each one of the rods  $h''$  constitutes the termination of a system of rods and supporting-pins, which receive their movement from an eccentric; and in the operation of the motor either the ahead or backing pins of the rods  $h''$  are held within a slot or recess in the skeleton bars provided for the purpose. The mechanism for changing the position of the rods  $h''$  in order to effect the forward or backward motion of the engine may be of any desired description.

The ports or openings in the valve-boxes leading to the piston-chambers in the casting B permit a differentiating line of travel for the induction and eduction currents, and produce an open exhaust-port on both sides of the piston at the instant of the cut off of the induction for reversing the stroke and preventing "water-hammer" as the individual piston does its work. The induction and eduction sides of the valves G are separated by the diaphragms  $n$ .

It will be seen that in Fig. 1 of the drawings only one eccentric and its connections are shown, the outer system of valve-moving devices being removed in order to not interfere with the delineation of other parts of the engine, and also that but one eccentric is employed in the reversing movement of each complete system.

The pistons E are each in one piece, the trunnions being a part thereof, and no followers or removable packing-holding devices are employed. The pistons are therefore not liable to accident from the unscrewing of bolts or the dislocation of members.

It will be seen that the cranks are diametrically opposite each other—that is to say, they are located at opposite sides of the driving-shaft. This arrangement, which is possible only by connecting the pistons to the said crank by means of the levers and rods, as described, has the advantage of equalizing the wear of the journals of the said shaft and the bearing-boxes sustaining them. It also reduces the friction of the said journals in their boxes, the cranks being drawn or forced at all times in opposite directions, which tends to neutralize the thrust of the working parts of the engine upon the shaft-supporting devices.

This special arrangement of cranks when applied to the system of valves herein described produces in the aggregate a motor combining compactness and simplicity with strength and ease of movement, and one in which the defect technically known as "water-hammer" is entirely absent.

I do not claim the oscillating piston in it-

self; neither do I claim that heretofore cranks placed diametrically opposite each other have not been employed in different classes of machinery; neither do I claim, broadly, an oscillating valve provided with induction and eduction ports.

I am aware of the patent to C. W. Isbell, No. 46,800, dated March 14, 1865, and of patent to J. F. Alexander, No. 119,685, dated October 10, 1871, and disclaim the inventions shown therein; but,

Having thus described my invention, what I claim as new, and wish to secure by Letters Patent of the United States, is—

1. In a duplex motor, the combination of the casting B, provided with the piston-chambers B', pistons E, and a pair of independently-actuated valves, the levers F, rods F'', cranks F', placed diametrically opposite each other, and the shaft D, substantially as specified.

2. An oscillating valve, G, having a projecting stem, as described, combined with a double arm,  $h$ , slotted or recessed skeleton-frames  $h'$ , and rod  $h''$ , having the ahead and backing pins  $i$ , substantially as set forth.

3. The valve G, having the central diaphragm  $h$ , dividing the induction from the eduction side, and provided with the induction-openings  $g'$ , eduction-openings  $g$ , recess  $g''$ , and duct  $g'''$ , the latter leading through said diaphragm and establishing communication between the recess  $g''$  and the induction-openings  $g'$ , substantially as specified, whereby the valve is balanced, as set forth.

4. The separate valve-chests B'', each having induction and eduction in common and other openings leading into the piston-chambers, as shown, combined with the independently-actuated oscillating valves G, provided with central diaphragms, induction and eduction openings and recesses, and ducts through said diaphragms connecting said recesses with the induction-openings of said valves, whereby the induction and eduction of the fluid are accomplished, and uninterrupted ingress of induction-water into both valves and into one or both piston-chambers is allowed, thus preventing water-hammer, as set forth.

5. In a motor, a system of reversing mechanism, consisting of a single eccentric double arm,  $h$ , skeleton frames  $h'$ , rod  $h''$ , having the ahead and backing pins  $i$ , combined with devices uniting said eccentric and double arm, substantially as specified.

In testimony whereof I have hereunto subscribed my name this 1st day of May, in the year of our Lord 1878.

RICHARD H. ATWELL.

Witnesses:

WM. T. HOWARD,  
W. W. WHARTON.