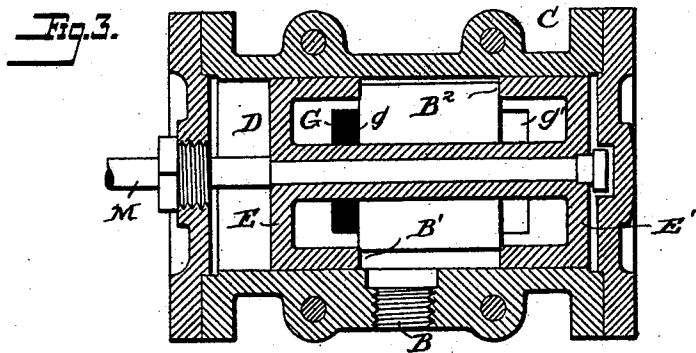
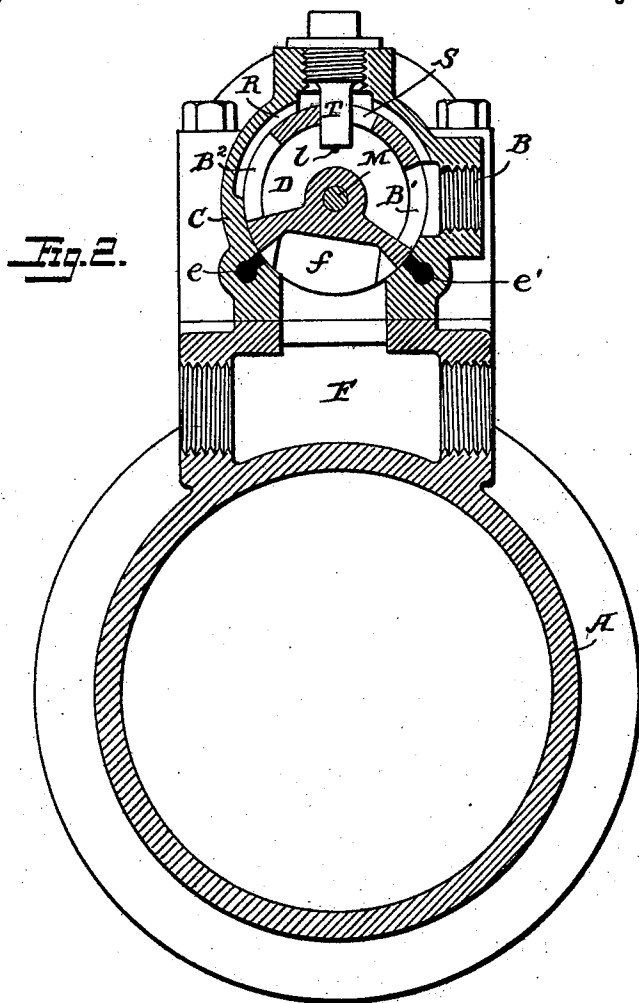


W. A. DREWETT.
DIRECT ACTING STEAM ENGINE.

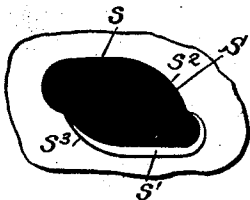
No. 497,443.

Patented May 16, 1893.



Witnesses
Wm. G. Hinkel
Allen S. Dobson

Fig. 4.



Inventor
William A. Drewett
By *Freeman*
Attorneys

UNITED STATES PATENT OFFICE.

WILLIAM A. DREWETT, OF BROOKLYN, NEW YORK, ASSIGNOR TO MARSHALL
T. DAVIDSON, OF SAME PLACE.

DIRECT-ACTING STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 497,443, dated May 16, 1893.

Application filed October 11, 1892. Serial No. 448,509. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. DREWETT, a citizen of the United States, residing in Brooklyn, Kings county, New York, have invented certain new and useful Improvements in Direct-Acting Steam-Engines, of which the following is a specification.

My invention relates to direct acting steam engines and it has for its object to improve and simplify the construction of such engines and the arrangement and operation of the valve, and it consists in the various features of construction having the mode of operation substantially as hereinafter set forth.

Referring to the accompanying drawings wherein I have illustrated the preferred embodiment of my invention, Figure 1 is a longitudinal vertical section of the engine. Fig. 2 is a transverse vertical section on the line 2—2 Fig. 1. Fig. 3 is a horizontal section through the steam chest; and Fig. 4 is an outline showing the preferred form of the cam in the valve.

My invention relates generally to that class of direct acting engines in which there is a valve controlling the steam to the steam cylinder which has a combined oscillating and reciprocating movement, substantially as embodied in the well known Davidson engine, and the main object of my present invention is to simplify the construction and mode of operation of this class of valves. In the Davidson engine, the valve is operated by mechanical means, so that it is first oscillated and then moved longitudinally a distance to complete the closure of the main piston ports, and this operation opens the valve piston ports in the steam chest so that a further movement of the valve is effected by direct steam pressure. Moreover, in the Davidson engine the mechanical oscillation and reciprocation of the valve is accomplished by means of a pin connected to the valve and extending into the exhaust port, in which port is also arranged a cam controlled by the piston or piston rod of the engine, and which produces the oscillating and reciprocating movements of the valve. While this construction is effective, it requires a large exhaust port, and the unbalanced area of the valve is correspondingly great involving as a

consequence greater friction in the movements of the valve, and strain and wear upon the pin and cam. Moreover, in this construction as before intimated, the valve is first oscillated and then reciprocated, and this oscillation is accomplished by mechanical means. By my invention I am enabled to overcome these and other disadvantages and to provide a lighter steam chest, a valve of simple construction having less unbalanced area, and to so arrange the parts that the oscillation of valve is accomplished by the direct steam pressure, instead of by the mechanical means, and I will now describe more in detail what I have found to be a practicable embodiment of my invention.

The steam cylinder A, is provided with a piston P, and piston rod, which latter is arranged to be connected with the pumping apparatus not shown, and mounted on the steam cylinder is the steam chest C, which is supplied with steam through the pipe B, in this instance arranged to enter the steam chest at the side.

Mounted in the steam chest is a valve D, which preferably is made substantially in the form of a cylinder, closely fitting the interior of the steam chest. This valve is provided with a spindle M, extending through the head of the steam chest, and on this spindle are mounted the contact pieces N, N' they being made adjustable in any suitable way, as by the screws *n, n'*. Also mounted to slide freely on the spindle M, is the contact piece O, which is connected as by a link O', with the differential lever Q, which is pivotally mounted on some suitable part of the frame as the spindle Q', and is connected to the piston rod P', in any suitable way, as by a yoke Q² and sliding block P². It will be noticed that this differential lever not being pivoted at the middle, allows the main piston of the engine to have a longer stroke than the valve, and by properly adjusting the contact pieces, I can so arrange the parts that the valve will be moved positively, and only at the proper time, and when the piston is nearing the end of its stroke and in such a manner that the valve will be moved to the proper extent to close the main steam ports and to open the valve piston ports in the steam chest and al-

low it to be moved to complete the opening of the main piston ports. In this way it insures the complete movement of the piston so that the engine will do its full work, and a waste of steam owing to a failure of the piston to fully reciprocate in the steam cylinder is avoided. The valve D while being of a substantially cylindrical shape, is provided with heads E, E', which act as pistons for the valve, and it is also provided with a recessed opening f, arranged to connect the main piston ports G, G' alternately with the exhaust port F, and ports or openings g, g', are also provided in the under side of the cylinder to correspond with the main piston ports in the different positions of the valve. The steam chest is provided with valve piston ports e, e' extending from near the central portion of the chest to each end thereof, and the valve is provided with suitable recesses or ports corresponding to these central openings, so arranged that they will be opened and closed alternately as the valve operates substantially in the manner of the well known Davidson valve. In place of this arrangement, however, the ports may be constructed, and the pistons provided with vent holes l so that the valve will be operated by the steam substantially as indicated in my application, Serial No. 448,507, filed on even date herewith, or any other equivalent arrangement of ports and valves by which the movement of the valve is accomplished substantially in the manner hereinafter set forth may be used.

As the steam enters the chest through the pipe B at the side, the valve cylinder is cut away at the side as shown at B', and in order that it may be thoroughly balanced, I preferably cut away a like portion on the opposite side, as at B², and I may form a recess in the upper central portion of the steam chest as indicated at R, so that the steam may enter the valve on both sides through the ports or openings B', B².

In order to produce the oscillation of the valve so that a proper valve piston port will be opened or closed at each reciprocation, I form in the upper portion of the cylindrical valve, an opening S which is substantially lozenge shape, as shown in Fig. 4, that is, it has parallel sides s, s', and inclined sides s², s³, arranged at opposite ends of the opening, and extending into this opening is a pin T, which is secured in the upper portion of the steam chest, and by bearing progressively on the sides of the opening S, it will cause the valve to oscillate to open the valve piston ports.

The operation of the device will be readily understood by reference to the drawings, in which the valve D is shown in its right hand position, and the contact piece O, operated by the differential lever has impinged upon the contact piece N, and as the piston P continues in its movement to the right, the valve will be reciprocated or moved longitudinally to the left by the differential lever a sufficient

distance to cause a closure of the ports G, G' of the steam cylinder. During this operation the surfaces s, of the opening S will move along past the pin T, and the valve piston port E' will be opened to admit steam behind the end of piston E' of the valve, while the port e will be in a position to exhaust steam from the steam chest in front of the piston E, and steam immediately passes behind the piston E', throwing the valve to complete its longitudinal movement. During this operation the pin T will be in contact with the portion s² of the opening S of the valve, and this will cause the valve to oscillate while it is being moved under steam pressure, so turning the valve as to close the valve piston port e' to the admission of steam, and open it to the exhaust, and at the same time to open the valve piston port e, to steam ready for the next reciprocation. Steam having been admitted behind the piston P, it moves forward to the left, and as it approaches the end of its stroke the contact piece O, impinges on the contact piece U', causing the valve D to be reciprocated through a portion of its stroke and exposing the opening from the port e, allowing steam to enter behind the piston E, and closing the ports G, G', when the steam will cause a further longitudinal movement of the valve, and the pin T, bearing on the inclined portion s³ of the slot S, will produce an oscillation of the valve in the reverse direction from that before produced.

It will be seen that by this arrangement, the mechanical devices only move the valve through a portion of its longitudinal reciprocation, while the remainder of its longitudinal reciprocation and its oscillation is produced directly by the steam acting on the piston heads of the valve controlled by the pin and slot. In this way I am enabled to simplify the construction of the parts, attain a substantial balance of the valve, and produce the operation by means which are subject to little wear, and if, perchance, wear does occur on the pin it can be readily repaired by being removed, and a new pin inserted or otherwise. More than that, the pin is more accessible than when extending into the exhaust port, and the port itself can be made smaller than in the old construction, enabling the parts to be made lighter, and at the same time all the advantages due to the combined oscillating and reciprocating valve are retained.

While I have thus described and illustrated the preferred embodiment of my invention, it is evident that the details of construction and arrangement may be varied by those skilled in the art without departing from the spirit thereof, and I do not therefore limit myself to the precise construction and arrangement shown.

What I claim is—

1. In a direct acting engine the combination with the steam cylinder, of a steam chest mounted thereon, a valve having a combined

oscillatory, reciprocatory motion in the chest, a spindle connected with the valve, a differential lever connected to be operated by the engine piston to reciprocate the valve, and
5 means connected with the valve and steam chest to oscillate the valve, substantially as described.

2. In a direct acting engine the combination with the steam cylinder, of a steam chest
10 mounted thereon, a valve fitting the chest, connections between the valve and the engine piston to partially reciprocate the valve ports in the steam chest, controlled by the valve to allow the valve to be further recip-
15 roated by the steam, and mechanical devices connecting the steam chest and valve for oscillating the valve, substantially as described.

3. In a direct acting engine the combination with the steam cylinder and steam chest,
20 of a valve having a longitudinal movement and an oscillatory movement, and means for oscillating the valve during the latter portion of its longitudinal movement, substantially as described.

25 4. In a direct acting engine the combina-

tion with the steam cylinder and steam chest, of a cylindrical valve having ports on its under side corresponding with the main piston ports in the cylinder, an opening in its side
30 to receive the steam and an opening in its top, and a pin mounted in the steam chest and projecting into said top opening, substantially as described.

5. In a direct acting engine the combination with the steam cylinder, of a steam chest
35 mounted thereon, a cylindrical valve having closed ends, mechanical connections between the valve and the engine piston for partially reciprocating the valve, steam passages in the chest controlled by the valve to complete
40 its reciprocation, and connections between the valve and steam chest for oscillating the valve, substantially as described.

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

WM. A. DREWETT.

Witnesses:

JOHN LOWE,

GEO. C. ESKHOLINE.