

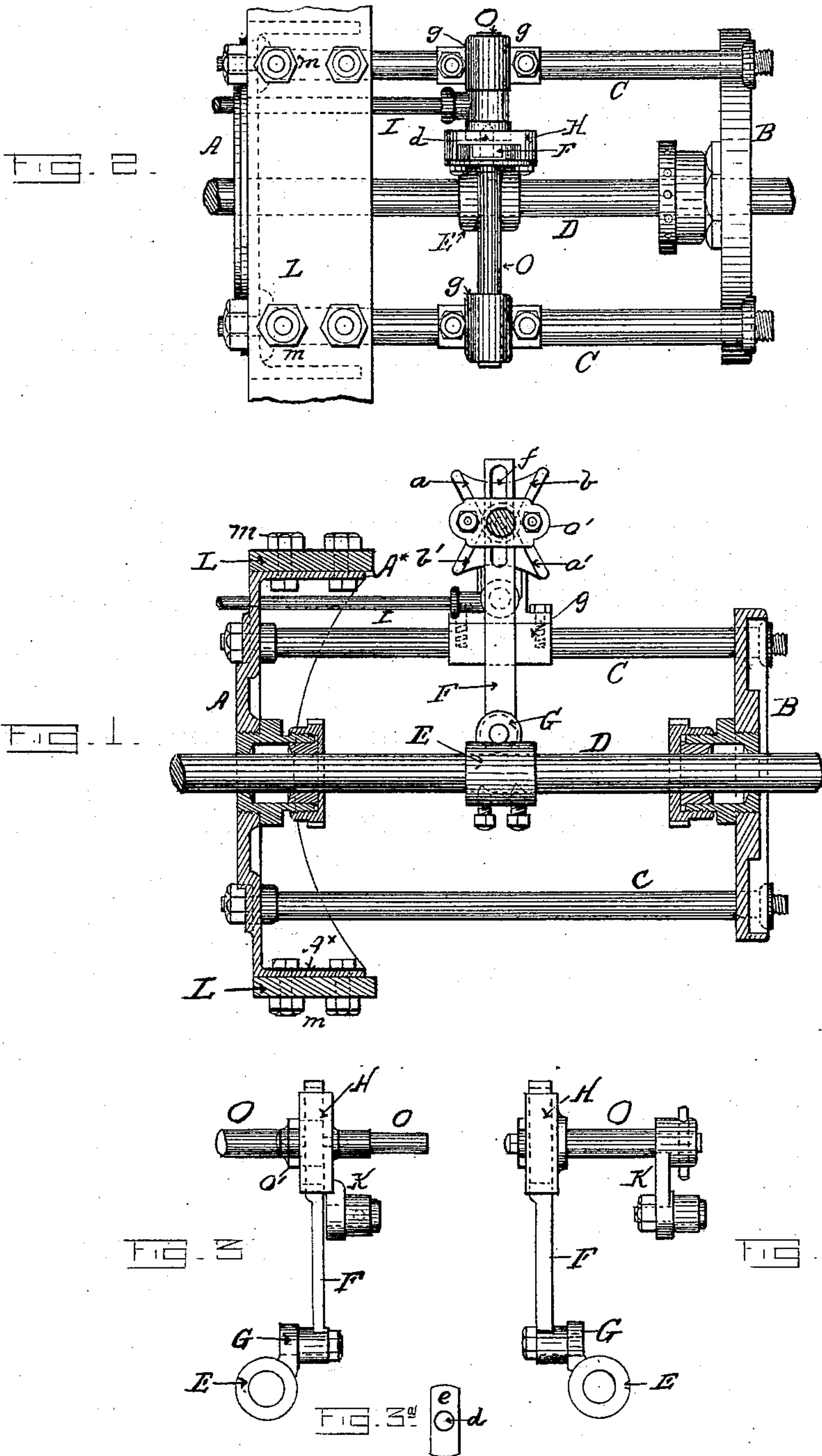
(No Model.)

W. D. HOOKER.

VALVE MOVEMENT FOR DIRECT ACTING ENGINES.

No. 349,045.

Patented Sept. 14, 1886.



Witnesses
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Inventor
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UNITED STATES PATENT OFFICE.

WILLIAM DAVIS HOOKER, OF ST. LOUIS, MISSOURI.

VALVE-MOVEMENT FOR DIRECT-ACTING ENGINES.

SPECIFICATION forming part of Letters Patent No. 349,045, dated September 14, 1886.

Application filed January 18, 1886. Serial No. 188,916. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM DAVIS HOOKER, a citizen of the United States, residing in the city of St. Louis, and State of Missouri, have
5 invented certain new and useful Improvements in Valve-Movement for Direct-Acting Engines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to
10 which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

15 My invention relates to valve-movements for direct-acting engines.

The object of my invention is to connect and drive the auxiliary valve of a direct-acting engine direct from a peculiarly-shaped
20 plate; and I attain this object by the mechanism hereinafter set forth, and pointed out in the claims.

The accompanying drawings illustrate what I consider the best means for carrying my in-
25 vention into practice.

Figure 1 is a side elevation of the mechanism constituting my improved valve-movement, showing a section of the engine and pump heads. Fig. 2 is a plan view of Fig. 1.
30 Fig. 3 is an end elevation of the valve-movement mechanism, taken from the right-hand side of Figs. 1 and 2. Fig. 3^a is a detail of a centering and guiding piece for the driving-arm. Fig. 4 is a modification.

35 Similar letters of reference indicate corresponding parts in all the figures where they occur.

A is the lower head of the steam-cylinder, and B is the upper head of the pump. The
40 steam-cylinder and pump are secured together by four connecting-rods, C. These rods C have shoulders near each end, and are fitted to holes in the steam-cylinder head A and secured by nuts outside of the circumference of
45 the steam-cylinder flanges. The lower ends of these rods are threaded and pass outside of the pump-cylinder head, and are secured in lugs cast on the outside of the pump. By
50 means of these rods the steam and water cylinders are brought into true alignment and fastened securely together. This connection

and accuracy of position between the engine and pump, may, however, be obtained in various other ways, and I would not be understood as limiting myself to the means here
55 shown and described.

The steam-cylinder head A has flanges A* on its sides, which are securely bolted to the frame L L of a steam fire-engine by suitable bolts, as *m*, thus securing the steam-pump rig-
60 idly to the frame L.

D is the piston-rod, which passes through stuffing-boxes in the heads A and B, and bears upon one end the steam-piston and upon the other the pump piston or plunger in the man-
65 ner common to these engines. I have not deemed it necessary to show either of these parts, as their construction, location, and respective functions are well understood.

To the piston-rod D, midway between the
70 stuffing-boxes, I fasten the hub E. This hub has a lug, G, projecting out from one side, to which is journaled or pivoted the driving-arm F, which is provided with a longitudinal slot in its outer end to insure even, easy op-
75 eration; but, as will be seen presently, the slot may be omitted.

H is a driving plate or casting, through which the arm F passes loosely. The part H is formed with angular sides or faces *a a'*
80 *b b'*, disposed in the manner substantially as shown, whose purpose and function will be presently set forth.

Cast or forged with plate or part H is a shaft, O, which is journaled and rests in box *g*, which
85 is fixed upon one of rods C, or upon other suitable support. The opposite end of this shaft O is made separate, and has a flange, *o'*, on its end, and is secured to the open side of plate H by bolts, as shown. This end of shaft
90 O is also journaled in a box, *g*, similar to and supported in a manner analogous to the box *g* on opposite end of shaft. This shaft O is made in two pieces to facilitate the manufacture; but it is obvious that it could be made in one
95 piece, if so desired. The parts of the shaft O, before being put together, have holes drilled in their centers, in which is inserted the pin *d*, over which may or may not be placed the piece *e* for centering and guiding the driving-
100 arm F. The piece *e* or pin *d* lies in slot *f* in arm F, and the arm moves freely over it. By

this means the arm F is kept in the center of shaft O when running at high rate of speed; but in most cases neither pin *d* nor piece *e* will be required, and the arm F will work smoothly and effectively without their aid.

An arm, K, projects from plate H, to which is connected the valve-rod of the engine, which latter is marked I.

The projections or angular sides or faces *a* *a'* *b* *b'* are placed or formed on plate H, above and below the oscillating shaft O, so that the driving-arm F will, when near the ends of its stroke, or when it comes in contact with them, fit them accurately on opposite sides, the sides *a* and *a'* being struck at one end of the stroke and *b* and *b'* at the other.

Modifications in many of the details may be made within wide limits without departing from the spirit or sacrificing the advantages of my invention.

As already stated the shaft O may be made in a single piece instead of in two parts, as shown. Where any other form of connection is used between the engine and the pump, supports of some sort must be provided for the boxes *g*.

A modification of considerable importance is shown in Fig. 4, where the arm K is fastened to the shaft O, and the box would come between plate H and arm K, as might be desirable in some constructions of connecting-yokes for steam-pumps.

The valve of the engine in all the figures shown will be driven in the same way the piston-rod is moving; but by reversing or fastening the arm K, Fig. 4, the opposite way from that shown, the valve of the engine will be driven the reverse of the engine; and as in steam-pumps both **B** and **D** valves are used, this feature is very desirable and important, as **B** and **D** valves move in opposite directions to accomplish the same result. The pin *d* and piece *e* may be formed in one piece or separate pieces, and pin *d* may be used without the piece or projecting sides *e*.

The operation is as follows: Supposing the piston-rod to be moving to the right, as indicated by the arrow in Fig. 1, when the engine arrives at the point of reversal, the driving-arm F will come in contact with the angular sides *a* *a'* and the plate H and shaft O, with attached arm K, will be caused to slightly oscillate, and as the valve-rod I is attached to arm K, the valve will be very quickly and easily shifted. The engine now commences its return-stroke, and the driving-arm F for nearly the entire stroke slides loosely in plate H, and the plate H and shaft O remain stationary; but when the engine arrives at or near the point of reversal, the driving-arm F will come in contact with the angular sides *b* *b'* and the valve is shifted back, the engine again reversed, and its operation becomes continuous.

Many advantages, both in simplicity and cheapness of production, ease, and accuracy of operation and freedom from friction and wear

accrue from my construction, among which may be named, first, great durability, as the shaft O will not oscillate over one-eighth of an inch on its circumference of bearing at each reversal of stroke, thus making this bearing nearly indestructible. The driving-arm also slides perfectly free through plate H during nearly the whole length of its stroke. Consequently there will be no wear on this arm, except a very slight sliding movement when it comes in contact with the angular sides of plate or part H; second, positiveness of action, as the valve of the engine will always be moved at the exact point of reversal, thereby compelling the engine to measure its strokes; third, great simplicity, as there are but two moving parts in the entire valve-movement mechanism, and can be easily understood and repaired, if required, by any ordinary mechanic; fourth, economy in construction, as the entire device can be made at a very slight cost.

I am aware that an oscillating plate having angular sides or projections is broadly old, and also that a driving-arm oscillating on the center of such a plate, and oscillating the plate when it is in contact with its angular sides, is old, and I do not claim, broadly, such devices.

What I desire to claim and secure by Letters Patent is—

1. The combination, with an oscillating plate having angular sides or projections, connected directly to the valve-stem of the auxiliary valve of a direct-acting engine through the rock-shaft, which is rigidly attached to the plate of the main piston of the engine, of means, substantially as described, for operating said plate from said piston, as set forth.

2. The combination, with the plate or part H, constructed substantially as described, and the parts of shaft O, made in two pieces and bolted together, of connections, as described, to piston-rod and valve-rod.

3. A driving-arm fitted to and oscillating on a bearing on the piston-rod and passing loosely through plate H, and adapted to slide on the angular sides of said plate when it is in contact with said sides, in combination with said plate H, substantially as set forth.

4. The combination, with the plate H and rock-shaft to which it is secured, of the driving-arm fitted to and oscillating in bearing on piston-rod of engine and having a slot, as described, and a centering-piece secured in and oscillating in its bearings in the center of the rock-shaft, the-slotted arm sliding over said centering-piece, substantially as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM DAVIS HOOKER.

Witnesses:

CHAS. A. MAGEE,
C. D. GREENE, Jr.