(No Model.) 3 Sheets—Sheet 1

C. H. HUDSON & E. SMEDLEY.

VALVE FOR STEAM PUMPING ENGINES.

No. 263,338. Patented Aug. 29, 1882.

Fig. 1.

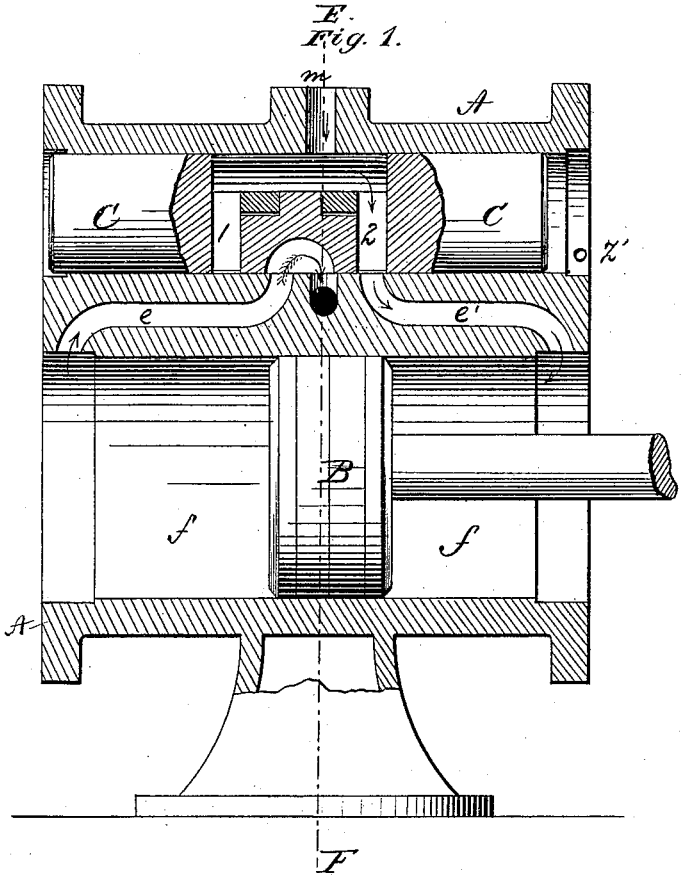
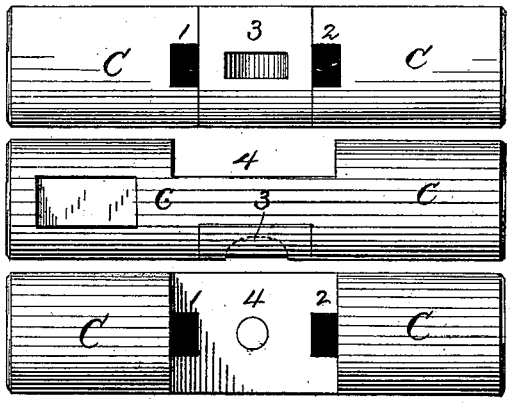


Fig. 5.



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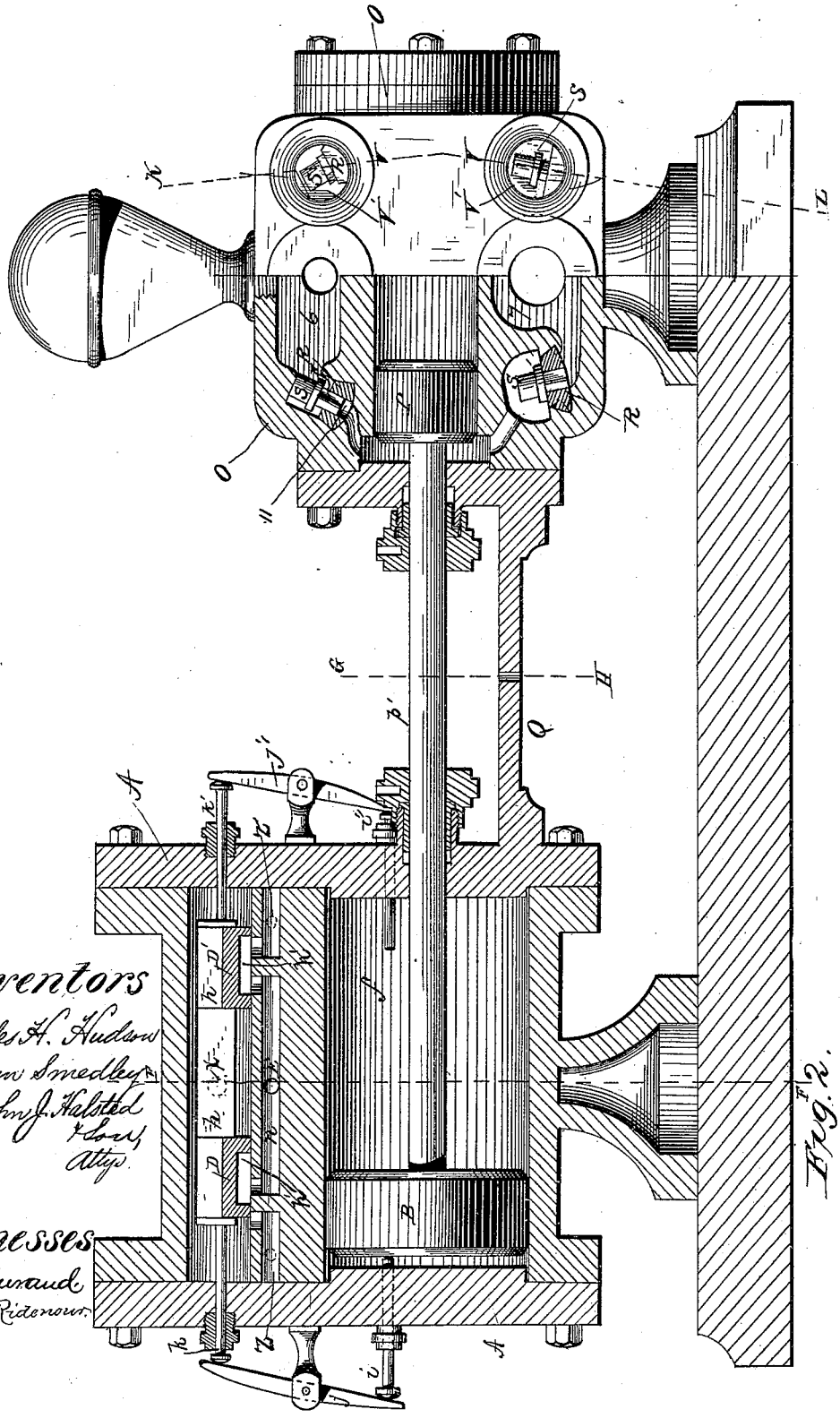

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Fig. 2.

(No Model.) 3 Sheets—Sheet 3.

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VALVE FOR STEAM PUMPING ENGINES.

No. 263,338. Patented Aug. 29, 1882.

Fig. 1.

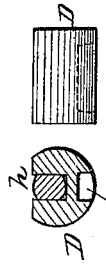

Fig. 6.

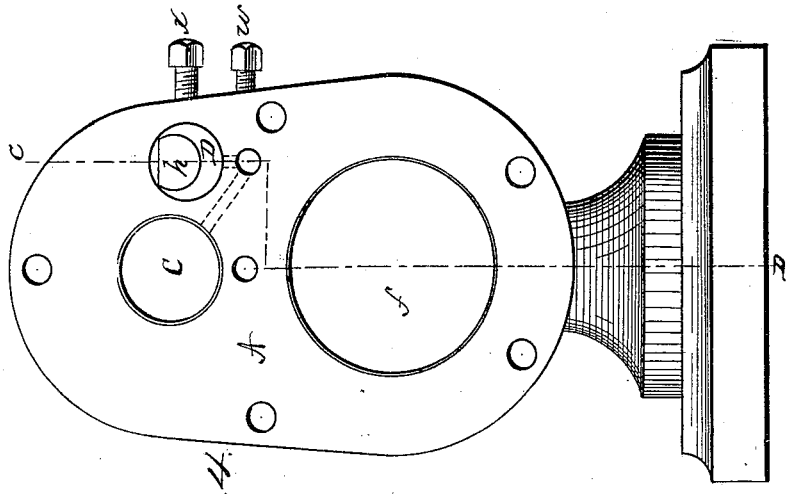

Fig. 4.

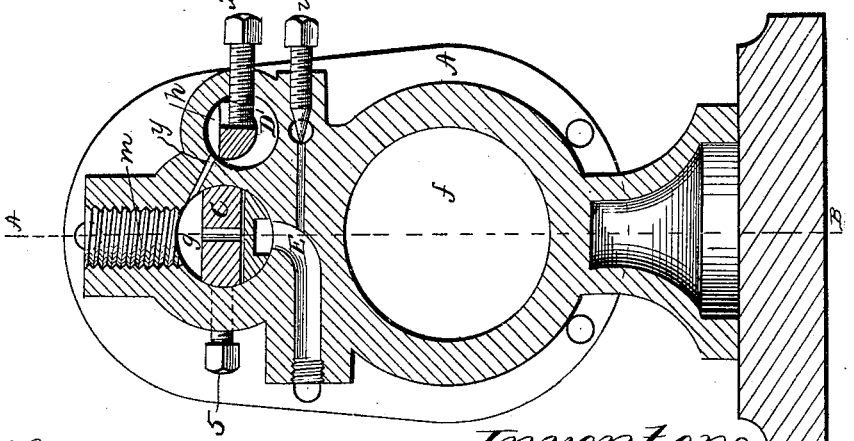

Fig. 3.

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UNITED STATES PATENT OFFICE.

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VALVE FOR STEAM PUMPING-ENGINES.

SPECIFICATION forming part of Letters Patent No. 263,338, dated August 29, 1882.

Application filed November 1, 1881. (No model.)

To all whom it may concern:

Be it known that we, CHARLES H. HUDSON, of Hinsdale, in the county of Du Page, State of Illinois, and EDWIN SMEDLEY, of Dubuque, in the county of Dubuque and State of Iowa, have invented certain new and useful Improvements in Valves for Steam Pumping-Engines; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters or figures of reference marked thereon, which form a part of this specification.

Our invention relates to a special construction of the steam cylinder, valves, and other parts of a direct-acting steam-pump, whereby live steam is not only kept constantly in the cylinder between the auxiliary valves at one end or the other of the cylinder, but in which there is no dead-center, the main valve being practically balanced and incapable of being forced against the cylinder-heads, because it is steam-cushioned, the pump always starting promptly when steam is put on, all as more particularly hereinafter described.

Figure 1 represents a longitudinal section, in the line *a b* of Fig. 3, of a steam-cylinder constructed in accordance with our invention; Fig. 2, a longitudinal section in the line *c d* of Fig. 4; Fig. 3, a vertical transverse section in the line *e f* of Figs. 1 and 2, the end pieces and tappets being removed; Fig. 4, an end view, the cap or end piece being removed; Fig. 5, an elevation and a bottom and top view, respectively, of the main valve and piston, showing the D-shaped valve on the main-valve piston; Fig. 6, an elevation and a section of the auxiliary valve; Fig. 7, an elevation of the auxiliary-valve stem.

A is the cylinder or casing, within which are the piston B, the main piston or cylinder valve C, and the auxiliary valves D D′.

e e′ are ports or steam-passages for steam, connecting the piston-chamber *f* with the main valve chest or chamber *g*, as indicated by arrows in Fig. 1.

The auxiliary valves D D′ have a rigid stem-connection, *h*, between them, and which is common to both, and is acted upon by the inward movement of each of them; and this stem serves to keep them in position when the pump is at rest, and at all other times the pressure of steam keeps them in proper position. These valves D D′ may be fixed upon or removably attached to the stem, and each has a slot or cavity, *h′*, which is always in place over its port or ports. The stem *h* has a flat side, and a screw, *x*, passing through the side of the case A, serves to prevent its turning the valves out of position and to limit their lengthwise motion. This stem may be made to drop into the valve-pieces D D′, as seen in Fig. 2.

The tappets *i i′*, projecting into the piston-chamber *f*, when respectively operated by the piston-head, actuate, by means of the levers *j j′*, the tappets *k k′* to move alternately the auxiliary valves D D′.

Fig. 3 shows the auxiliary-valve chamber at the side of the main-valve chamber, from which the steam is admitted through the port *y*. (See Figs. 2 and 3.) When the piston strikes a tappet *i* motion is transmitted to the auxiliary valve D, which opens it, and thus admits steam to the end of the main valve through the port or passage Z, and throws it. The instant the piston, by means of the tappet, opens the auxiliary valve, steam from the latter throws the piston-valve C, thus forcing the piston, and with it the valve, to change position, and live steam from the opening *m* on top being permitted to pass through one of the transverse passages, 1 or 2, and through one of the longitudinal passages, *e* or *e′*, steam is admitted to the other end of the piston or cylinder chamber *f*, and the piston B is forced in the opposite direction. The same movement of the auxiliary valve closes the steam-port Z and opens the exhaust-port Z′ from the back of the valve-piston at the other end of the auxiliary valve, and allows the steam behind the main-valve piston to escape through the passage E. (See Figs. 2 and 3.) The auxiliary valve remains in the position gained until the piston reaches the other end of its stroke, and moves the tappets *i′ k′*, and thereby the auxiliary valve. Live steam is thus kept at one end

or the other of the main-valve piston, holding it in place positively.

In order to prevent the "pounding" of the valve-piston, a set or adjusting pin or screw, *w*, is placed with its point or end in a small passage communicating with exhaust-port E, (see Fig. 3,) so arranged that the area or size of the exhaust-opening may be enlarged or decreased until the back-pressure shall be just enough to cushion the piston, and at the same time there shall be no rebound.

The main-valve piston C has steam-passages 1 2 transversely through it, and the D-shaped valve-piece 3 inserted therein at its bottom, as shown, and with an open space, 4, at its top. A set-screw, 5, inserted through one side of the casing, enters a recess formed by a flat portion of the valve-piston C, (see Fig. 3,) thus preventing the piston from turning axially and insuring the proper action of the piece 3 during the longitudinal movements of this piston. A steam-passage, *n*, below the auxiliary-valve chamber and a small steam-passage, *z z'*, near each end of the main-valve chamber *g* open a communication between the same and the auxiliary-valve chamber. Steam being always in the chest or chamber containing the main or cylindrical valve C, and the ports communicating directly with the cylinder *f*, containing the piston B, motion is imparted to the piston, and thence, by means of the tappet *k*, to the small auxiliary valve D, admitting steam to the valve C, which then starts at once, carrying with it its D-shaped valve, and thus steam is admitted first into one end and then into the other end of the chamber *g*. Thus there can be no dead-center as long as steam from the boiler is turned on. The piston-valve which carries the main valve moves instantly as soon as the piston strikes the tappet, (*k* or *k'*, as the case may be,) thus instantly reversing the motion of the valve-piston C, and at the same time supplying it with a steam-cushion, and thereby preventing the piston from ever striking the cylinder-head.

In all other constructions with which we are familiar there is none that has not a dead-center, though we are aware that some do have live steam constantly in the cylinder-chamber.

It will also be observed that by our peculiar combination of the D-valve with the large cylindrical or piston valve C this D-shaped valve is practically a balanced valve, because it is so locked into the piston-valve that there is little or no downward pressure upon it.

A trough, Q, may connect the steam and water portions of the pump and extend under and parallel with the piston-rod *p'* to catch any drippings and waste water and oil from the rod. (See Fig. 2.)

We claim—

1. The rigid stem *h*, serving to connect the valve-pieces D D', and provided with a flat side, in combination with a set-screw, *x*, serving to prevent its turning, while allowing its proper lengthwise movements.

2. The steam-actuated piston-valve C, constructed as described—namely, of a solid cylinder throughout its main body, with a recess at the center of its top, with a cavity at the center of its bottom to receive the main valve having an exterior conforming to the circumference of the cylinder, and with the vertical passages 1 2 through the cylinder, as and for the purposes set forth.

3. The main valve, made as shown and described—that is, plano-convex in its cross-section and with parallel ends, and with a single cavity on its convex side, and adapted to fill a space made in the piston-valve for its reception, and provided with means to prevent its turning relatively to the piston-valve.

4. In combination, the piston-valve C, being a solid cylinder throughout the main part of its body, its plano-convex main valve conforming at all its sides thereto, exhaust-pipe E, and passage communicating therewith, and conical-pointed screw or pin *w*, the combination being and operating as set forth.

5. In combination, the auxiliary-valve stem *h*, removable auxiliary valves D D', and set-screw *x*, with the piston-valve C, and its main valve constructed and applied thereto, as described, and with the steam ports or passages, all as and for the purposes set forth.

6. In combination, the piston and its tappets, the auxiliary valves removably held on their rigid connecting-stem and its tappets, the main valve constructed and applied to the piston-valve, as set forth, and appropriate ports and passages, as and for the purpose described.

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