(No Model.) 4 Sheets—Sheet 1.

J. GATES.

DIRECT ACTING STEAM PUMP.

No. 261,700. Patented July 25, 1882.

Fig. 1.

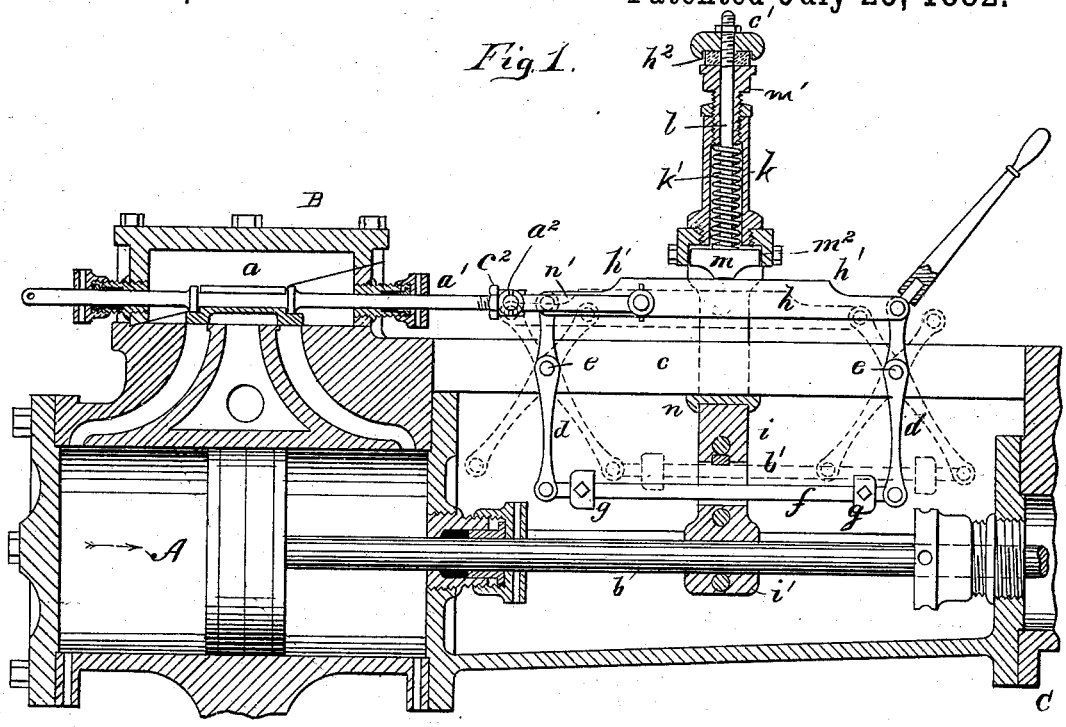


Fig. 2.

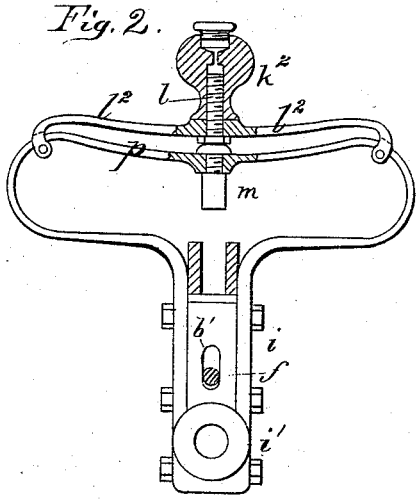


Fig. 3.

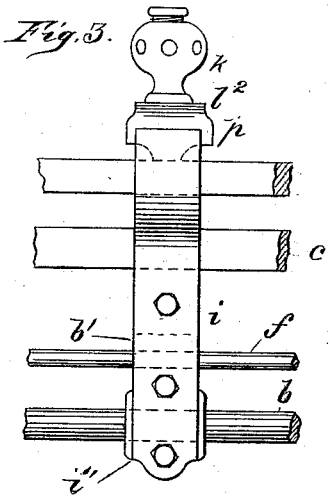
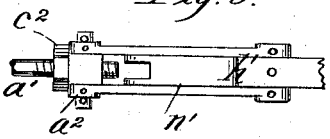


Fig. 9.



WITNESSES:

Henry F. Parker

C. Sedgwick

INVENTOR:

J. Gates

BY Munn & Co

ATTORNEYS.

(No Model.) 4 Sheets—Sheet 2.

J. GATES.

DIRECT ACTING STEAM PUMP.

No. 261,700. Patented July 25, 1882.

Fig 4

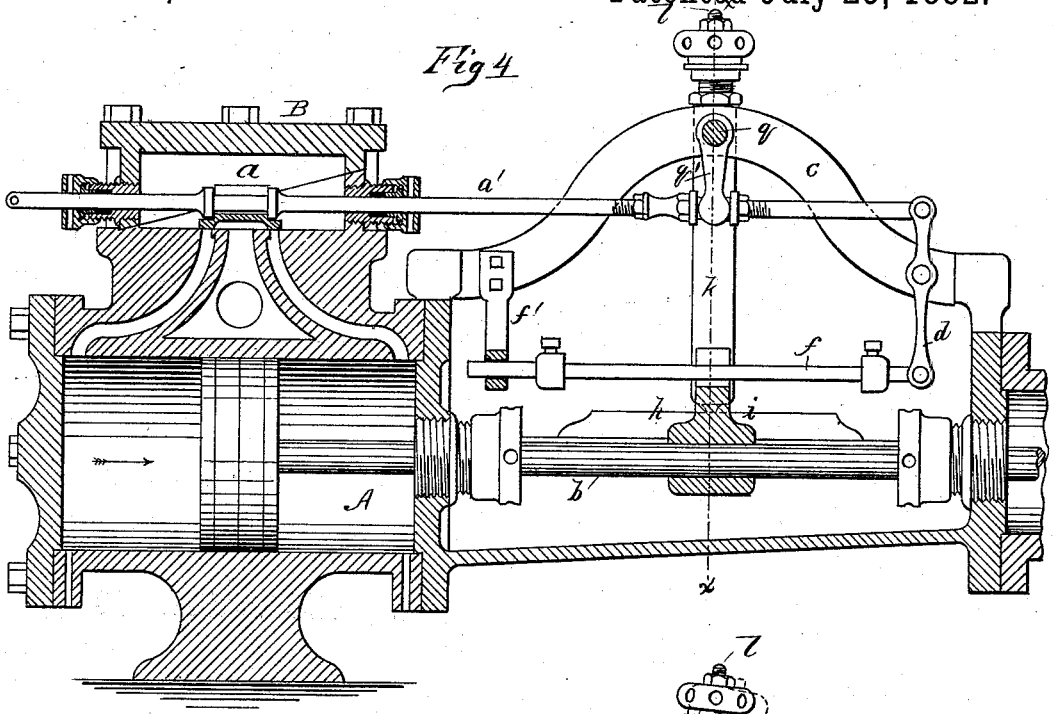
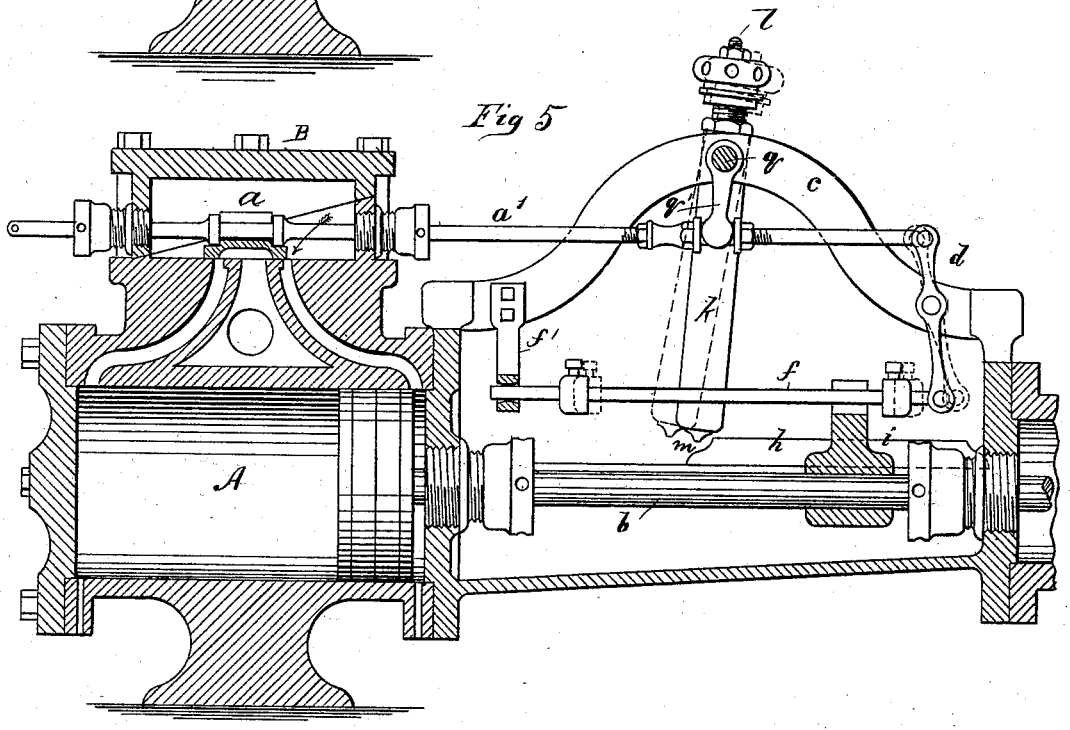


Fig 5



WITNESSES:

Henry F. Parker

C. Sedgwick

INVENTOR:

J. Gates

BY Munn & Co

ATTORNEYS.

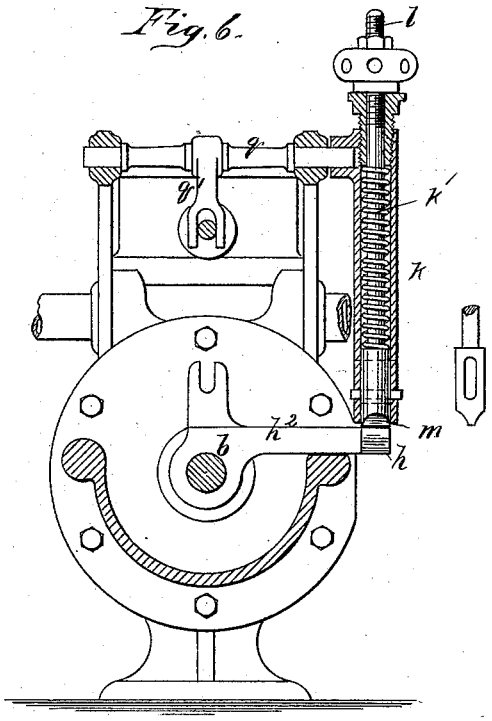
(No Model.) 4 Sheets—Sheet 3.

J. GATES.

DIRECT ACTING STEAM PUMP.

No. 261,700. Patented July 25, 1882.

Fig. 6.



WITNESSES:

Henry F. Parker.

C. Sedgwick

INVENTOR:

J. Gates

BY Munn & Co

ATTORNEYS.

(No Model.) 4 Sheets—Sheet 4.

J. GATES.

DIRECT ACTING STEAM PUMP.

No. 261,700. Patented July 25, 1882.

Fig. 7.

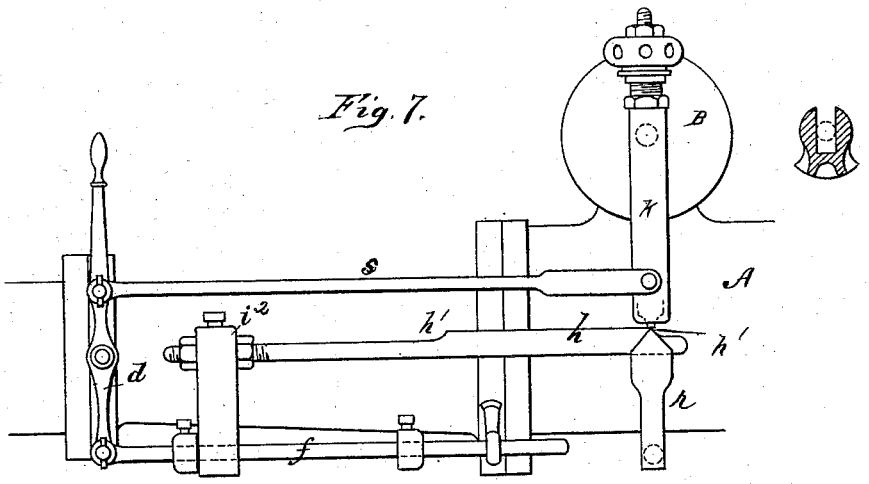


Fig. 8.

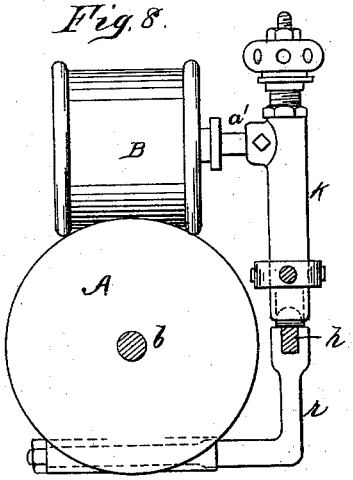
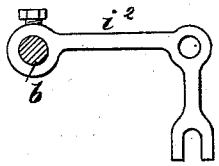


Fig. 10.



WITNESSES:

Henry A. Parker.

C. Sedgwick

INVENTOR:

J. Gates

BY Munn & Co.

ATTORNEYS.

UNITED STATES PATENT OFFICE.

JOHN GATES, OF PORTLAND, OREGON.

DIRECT-ACTING STEAM-PUMP.

SPECIFICATION forming part of Letters Patent No. 261,700, dated July 25, 1882.

Application filed April 14, 1882. (No model.)

To all whom it may concern:

Be it known that I, JOHN GATES, of Portland, in the county of Multnomah and State of Oregon, have invented a new and useful Improvement in Direct-Acting Steam-Pumps, of which the following is a full, clear, and exact description.

My invention relates to the mechanism for shifting the valves in direct-acting engines; and it consists in the novel devices hereinafter described and claimed.

Reference is to be had to the accompanying drawings, forming part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a vertical longitudinal section of a direct-acting engine provided with my improved valve mechanism. Fig. 2 is a cross-section, and Fig. 3 a side view, of a modification in which a plate-spring is substituted for a spiral. Figs. 4 and 5 are sectional elevations, showing modifications in the arrangement of the gearing. Fig. 6 is a cross-section on line *x x* of Fig. 4, and Figs. 7 and 8 show the mechanism as applied in connection with a rotary valve. Fig. 9 is a detail view of the shuttle-bar-carrying arm, and Fig. 10 is a detail view of the shuttle-bar-carrying arm when the mechanism is applied to a rotary valve.

Referring first to Fig. 1, A is the steam-cylinder; B, the steam-chest containing slide-valve *a*. C is the pump-cylinder. *b* is the piston-rod, and *c c* are side bars connecting the two cylinders. *d d* are steel bars pivoted on cross-pins *e* between the said bars *c*, and connected at their lower ends by a rod, *f*, on which are collars *g g*, held by set-screws, so that the collars can be adjusted. *h* is a bar, which I term the "shuttle-bar," connecting the upper ends of bars *d*, and formed near its ends with beveled shoulders *h'*. In connecting the rod *f* and bar *h* they are to be fitted tightly, so as to take up all slack, and the bars *d* thereby given spring enough to strain the connections. On the end of the valve-stem *a'* is screwed a block, a^2, that is formed with trunnions on its sides for receiving the ends of the links *n'*, by which the valve-stem is connected to the shuttle-bar. (See Fig. 9.) The check-nut c^2 on the valve-stem is enlarged to take against the ends of the links, so as to take up the slack caused by wear, and at the same time to hold the valve-stem as adjusted. In case the valve is one-sided the check-nut will be loosened and the stem turned until the valve is evened, which may be done while the pump is running. *i* is a standard rising from cross-head *i'* on piston-rod *b*, slotted at *b'* for the collar-bar *f* to pass, and forked to extend at sides of the side bars, *c*. On its upper end the standard *i* supports a hollow post, *k*, in which is a rod, *l*, that carries at its lower end a dog, *m*, resting on shuttle-bar *h*. The rod *l* has upon it within the post *k* a spiral spring, *k'*, that tends to force the dog *m* upon the shuttle-bar with more or less pressure, which is regulated by a follower-screw, *m'*, in the upper end of post *k*. The downward movement of rod *l* is limited by a set-nut, C', on the rod, above the screw *m'*, a block, h^2, of rubber, being interposed between the head and nut to prevent rattling; or a spiral spring may be used in place of the block. The standard *i* takes by a bearing-block, *n*, beneath the under side of side bars, *c*, to prevent strain on the piston-rod by the spring *k'*. Upon each side of the dog *m*, Fig. 1, plates m^2 are attached by bolts that pass through the dog. These plates lap upon the standard *i* and serve to hold the dog against the side pressure when it is moving the shuttle-bar, and they can be set up to compensate for wear.

The operation of these devices is as follows: Supposing the piston to move toward either end of the cylinder from the middle position shown, the shuttle-bar would be in the position of the dotted lines and the dog *m* in its lowest position, either resting on the shuttle-bar or held clear of the bar, according to adjustment of the nut *c'*. Now, suppose the shuttle to be at the left-hand position and the piston moving to the left, the standard *i* comes in contact with collar *g* on the rod *f*, and the further movement of the piston brings the bars *d d* to a vertical position and the shuttle-bar up against the dog *m*, thereby setting the spring *k'* and nearly closing the slide-valve by the time the dog reaches the cycloidal bevel at the end of the shuttle-bar. Then the force of the spring, acting by the dog on the bevel, moves the shuttle-bar to the right, at first solely by the bevel, and after the bars *d* have passed the center finishing the movement by downward pressure, so that the valve admits steam to the other end of the cylinder, or, in other

words, the valve is reversed. It will be evident that this throw of the valve can be made more or less by adjustment of the dog by means of the screw m' and nut c'. The completion of the opening of the valve is accomplished when the piston, by its reverse movement, carries the dog m against the bevel of the shuttle-bar. To prevent the valve from going too far, the piston-rod comes in contact with the top of the slot in standard i, where a rubber buffer is provided to ease the shock. By adjustment of the connection between the shuttle-bar and valve-stem the upright bars d are made to pass the center sooner or later with reference to the contact of the dog with the bevel, and the throw thus varied.

The advantage of these devices is that the working parts are all in sight and readily accessible for keeping in order. There is a further advantage that the movements are noiseless. The bevels on the shuttle-bar are of cycloidal form, so that the dog takes first on the curved portion, and the bevel then becoming flat, the force of the spring is brought to rest easily.

The modification shown in Figs. 2 and 3 relates to the form of spring used to force the dog m downward. The upper end of standard i is formed to receive a plate or bow spring, p, that carries rod l and dog m. The spring p is provided with a counter-spring, l^2, on its upper side, above which is a large adjusting-nut, k^2, and between the two springs the rod l is provided with a set-nut.

In the construction shown in Figs. 4, 5, and 6 the parts are essentially the same, and the arrangement modified as follows: The side bars, c, are curved upward, and carry a rock-shaft, q, that has an arm, q', connecting to stem a' of valve a. The collar-bar f is sustained by a fixed guide, f', at one end, and at the other end connects to a pivoted bar, d, to which the outer end of stem a' is jointed. The shouldered bar h is attached to the piston-rod b by an arm, h^2, for reciprocation therewith, and the rock-shaft q sustains the tubular post k, in which is the rod l, attached by a spring, k', and carrying at its lower end the dog m for contact with bar h. Fig. 4 shows the parts in the middle position, while Fig. 5 shows the piston at its extreme of movement, when the valve has been moved by the dog m having slipped off the beveled end of bar h.

In Figs. 7 and 8 the mechanism is shown as applied in connection with a rotary valve. B is the valve-case on cylinder A. a' is the valve-stem, carrying at its outer end the post k, of construction as shown in Fig. 6. h is the shuttle-bar, carried at one side by an arm, i^2, on the piston-rod, and supported beneath the dog m by a fixed guide, r. f is the collar-bar, connected to one end of a pivoted rock-bar, d, and engaged by arm i^2. s is a rod connecting the rock-bar d to the post k. In operation the dog m is released from bar h by the upward swing of post k.

This mechanism is simple and effects the movement of the slide-valve without the use of piston-valves.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In direct-acting engines, the combination of pivoted rock-bars d, collar-bar f, shuttle-bar h, connected to the valve-stem, and spring-dog m, carried by the piston-rod, substantially as described, for operation as specified.

2. The combination, with the valve-stem a', the pivoted bar d, the fixed guide b', and collar-bar f, of the shuttle-bar h, connected to the valve-stem by link n', the tubular post k, the spring-actuated rod l, and the dog m, substantially as and for the purpose set forth.

3. The combination of check-nut c^2, collar a^2, links n', and valve-stem a', substantially as described.

4. In direct-acting engines, the standards i, post k, spring k', rod l, dog m, shuttle-bar h, and side bars, c, substantially as described, combined for operation as set forth.

JOHN GATES.

Witnesses:
EUGENE D. WHITE,
E. W. CORNELL.