2 Sheets—Sheet 1.

G. E. DOW.

Steam-Engine.

No. 206,708. Patented Aug. 6, 1878.

Fig. 1.

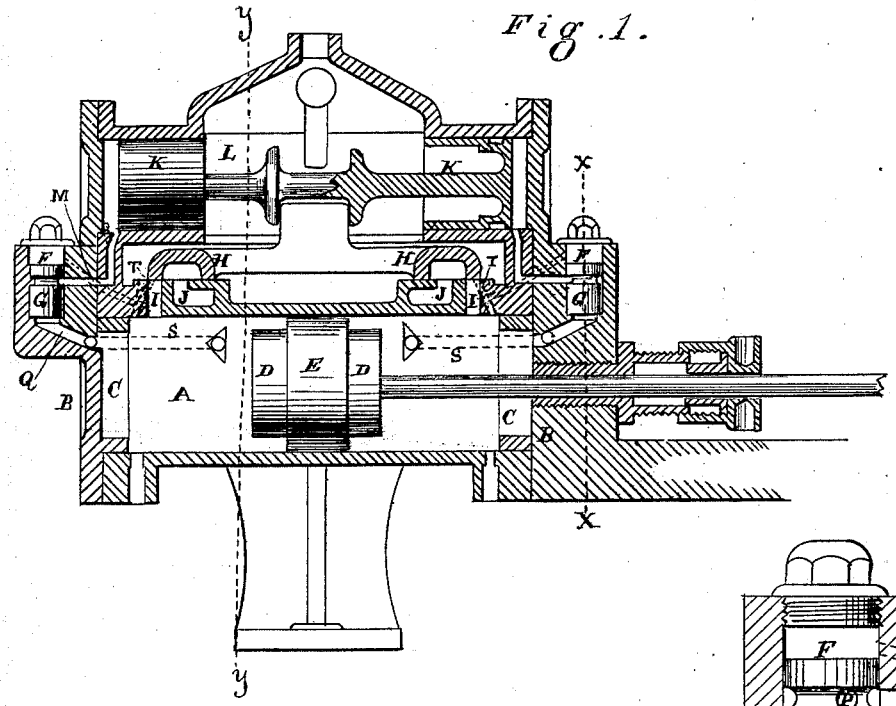
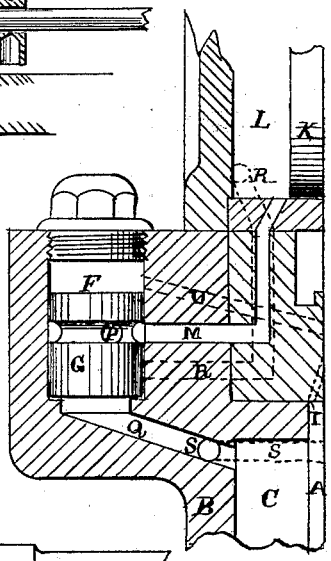
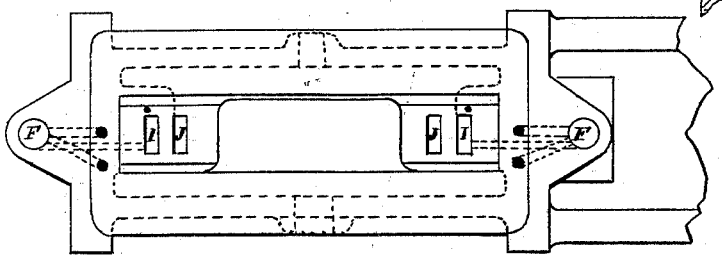


Fig. 2.





Witnesses

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2 Sheets—Sheet 2.

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Fig. 3

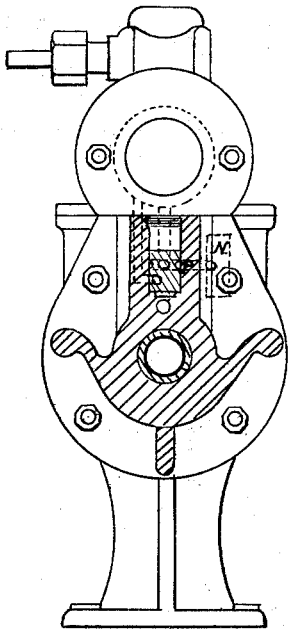
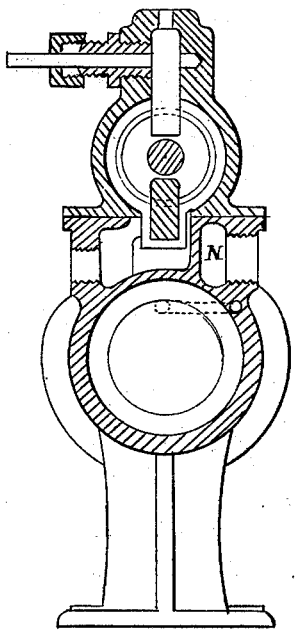


Fig. 4.



Witnesses

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UNITED STATES PATENT OFFICE.

GEORGE E. DOW, OF SAN FRANCISCO, CALIFORNIA.

IMPROVEMENT IN STEAM-ENGINES.

Specification forming part of Letters Patent No. **206,708**, dated August 6, 1878; application filed May 16, 1878.

To all whom it may concern:

Be it known that I, GEORGE E. DOW, of the city and county of San Francisco, and State of California, have invented an Improved Steam-Engine; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings.

My invention relates to certain improvements in direct-acting steam-engines; and it consists in the employment of a mechanism by which the main steam-valves which operate the main piston may be moved with a degree of positiveness corresponding with any desired increase in the speed of the piston, so that a complete movement of the main valve and a full opening of the ports may be effected when the conditions require it most—that is, with high speeds.

It also consists in a means of operating by which the change of stroke is accomplished without shock, whatever may be the speed or pressure; and, finally, in a reduction of the waste room between the valve and piston, so that the ports shall be short and direct, and no small ports communicate with the steam-chest in such a manner as to form pockets that will become foul from the precipitation of impure lubricants.

In order to more fully explain my invention, reference is made to the accompanying drawings, in which Figure 1 is a longitudinal section of my cylinder. Fig. 2 is a plan of steam-chest and ports. Fig. 3 is a transverse section through *x x* in Fig. 1. Fig. 4 is a transverse section through *y y* in Fig. 1.

The same letters of reference in each of the drawings refer to the same parts.

A is the cylinder of a direct-acting engine, and B B are the cylinder-heads, which I have shown in the present case extending into the ends of the cylinder, so as to form chambers C to receive the extensions D of the piston E when the piston arrives at each end of the stroke, as will be more fully explained hereinafter. These cylinder-heads have also chambers F formed with them, and extending upward to receive the vertically-moving supplemental valves G; or, if found desirable, the chambers may be formed in the body of the cylinder or steam-chest, the object being to construct them as conveniently as possible.

The main valve H is made long, and each end is fitted to control the steam and exhaust ports I J at that end of the cylinder, so that by this construction I am enabled to shorten the ports and make very little waste room between the steam-chest and cylinder. This main valve is operated by means of a supplemental piston, K, which moves in its cylinder L in the manner usual to this class of engines.

The supplemental valves G have each a groove turned around them, and these grooves, when the valves are seated, form a connection between the passage M from the supplemental cylinder and the main exhaust N through the short passage P.

A passage, Q, leads from the chamber C into the supplemental valve-chamber at the bottom, and another passage, R, leads from the side of this valve-chamber to the supplemental cylinder.

The operation will then be as follows: The piston E moving in the direction shown by the arrows, will approach the end until the extension D enters the chamber C, and the steam compressed by this movement will elevate the supplemental valve G until the groove is above the line of the exhaust-passage M and the valve closes it. This action opens the steam-passage R, and allows steam to enter the supplemental cylinder and move its piston K, so as to reverse the main valve. These movements are all accomplished, as has been described, when the engine is at a high speed; but when it is moving slowly the compression in the chamber may not be enough to insure a perfect operation of the valves. I have, therefore, made a passage, S, which leads from the main steam-cylinder into the passage Q, so that this passage S will be opened for the entrance of live steam from behind the main piston to raise the valve G just as the stroke is finished.

The movement of the supplemental piston moves the main valve H and opens the steam-port I at that end. At the same time this valve exposes a small port, T, which leads to the extreme end or annulus around the chamber C, against which the main piston stops, so

as to start it easily and softly. Steam can enter through the main steam-port I. A small port, U, leads from the steam-port J to the chamber of the supplemental valve G, above the valve, so that if this valve does not close by gravitation the pressure of the steam will close it, and the pressure thus admitted will balance any pressure against the opposite end through the passage Q. The moment the valve G drops to its seat the groove around it comes into line with the passages M and P, and thus allows the steam to exhaust from the supplemental cylinder, so that the supplemental piston is free from pressure the instant after it has moved the main valve and during the stroke of the main piston. As the passage S is only exposed to the admission of steam just as the stroke of the piston is finished, it will be closed by the first impulse of the return movement of the piston before the main steam-port I is disclosed, and before the extension D of the piston has moved out of its chamber, so as to open the port Q—in fact while the piston E is being moved by the action of the steam which is admitted through the small port T.

It will thus be seen that the movement of my piston must always be completed before the necessary action of the valves, and while at a low rate of speed live steam is always admitted through the port S to insure the movement of the supplemental piston and main valve, so when a high speed is attained, the compression within the chambers C, by means of the extensions D of the piston, will be sufficient to instantaneously open the valves to their fullest capacity, and there will be no wire-drawing of the steam through the small ports, nor a consequent partial opening of valves and lack of power at a time when it is most needed. There are no levers or moving parts which will wear or become less effective by service; in fact the parts will all wear tight.

It will be manifest that while the supplemental valves G will do the most effective and satisfactory work when placed vertically, still it would be as easy to place them horizontally and make them operate.

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

1. The piston E, with its extension D, in combination with the chambers C at the ends of the cylinders, and the grooved supplemental valves G, provided with ports P, with the exhaust-passages M and steam-passage R and the passage Q, all constructed and arranged substantially as and for the purpose herein described.

2. The grooved valve G, moving in the chamber F, having the supplemental exhaust-passages M P and steam-passage R, and the passage Q, communicating with the main cylinder, in combination with the steam-passage U, leading above the valve G, substantially as and for the purpose herein described.

3. The main piston E, with its extensions D and the chambers C at the end of the cylinder, in combination with the main valve H, with its two sets of steam and exhaust passages I and J, and the small steam-port T, opening into the main cylinder, substantially as and for the purpose herein described.

4. The piston E, with its extensions D and the chambers C at the ends of the cylinder, in combination with the supplemental valve G, as shown, and the passage Q, and the passages S, from the acting side of the piston, substantially as and for the purpose herein described.

In witness whereof I hereunto set my hand and seal.

GEORGE EDWIN DOW. [L. S.]

Witnesses:

FRANK A. BROOKS,

WALTER C. BEATIE.