



# United States Patent Office.

CHARLES P. DEANE, OF SPRINGFIELD, MASSACHUSETTS.

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## IMPROVEMENT IN DIRECT-ACTING ENGINES.

The Schedule referred to in these Letters Patent and making part of the same.

I, CHARLES P. DEANE, of Springfield, county of Hampden and Commonwealth of Massachusetts, have invented a new and improved Arrangement of Valves for Steam-Engines, of which the following is a specification.

My invention relates to the arrangement of valves in that class of engines known as direct-acting; and

My improvements consist in a convenient arrangement of the valves and ports, and also in so arranging the valves that, while the main slide-valve is operated by steam let on to a motive-piston by the action of a separate secondary valve moved mechanically by the engine, the certainty and promptness of the operation of said main valve are further insured by moving it also mechanically, by power from the engine, whenever, by reason of any sticking of said motive-piston or other cause, it shall fail to be moved with sufficient promptness by the steam let onto it, as aforesaid.

I will now describe my invention, referring to the accompanying drawings, in which—

Figure 1 is a section of my improved engine, showing the arrangement of the valves.

Figures 2 and 3 are detail views, showing one of the valves and the arrangement of its ports

A is the main piston of the engine.

B, the cylinder.

In the valve-chest G I arrange the main slide-valve C and the secondary slide-valve D, which is operated by the valve-rod *a* and the tappet-arm *b*, which is attached to the piston-rod E.

Above the valve-chest A I arrange the motive-piston F, working in its cylinder H, and attached to the main slide-valve C by the connection I.

The main ports 1, 2, 3 are similar in arrangement to those of ordinary engines.

The main slide-valve C is an ordinary B-valve.

I construct the secondary valve D, as shown, in two parts, *c* and *d*, connected together, so that the said valve can be arranged around the main valve C, and in the same chest, the part *c* being arranged to operate the motive-piston F in one direction, and the part *d* to operate the same in the opposite direction.

The arrangement of the ports *x*, *y*, and *z* to oper-

ate the motive-piston in one direction, I will now describe.

*x* is the port which communicates between the end *e* of the cylinder H and the exhaust-port *y*, when the valve D is in the position shown.

*z* is the induction-port to let in steam to the end *f* of the cylinder H at the same time.

The port *y* communicates with the main exhaust 3.

The end *e* of the port *x* enters the cylinder H at a short distance from the end, for the purpose of cushioning the piston F.

The operation of this invention is as follows:

The piston A is supposed to be moving in the direction indicated by the arrow, the valve C having been brought into position to effect this by the action of the tappet-arm *b* on the valve D, bringing it into the position shown in fig. 2, so that steam passes through *z* to the end *f* of cylinder H, and is exhausted from end *e* by means of ports *x* and *y*, thus giving the requisite motion to motive-piston F, carrying slide-valve C. If, however, from any cause, the motive-piston F should fail to be moved promptly in the manner described, it will be moved by means of the tappet-arm *b*, in connection with the secondary valve D, by power derived from the main piston.

The opposite half of the valve D has ports arranged in a similar but reversed manner to the half above described, and produces a motion of the motive-piston in the opposite direction.

I claim—

1. The contingent mechanical connection of motive-piston F, carrying main slide-valve C, with a separate secondary slide-valve D, or its rod *a*, whereby said motive-piston is moved mechanically by power from the engine, when not moved with sufficient promptness by the previous action of the secondary valve.

2. The arrangement of the valve C and double valve D in the same chest, substantially as shown.

3. The manner of operating the motive-piston F by the valve D, constructed and having ports arranged substantially as shown.

Witnesses:

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CHARLES P. DEANE.