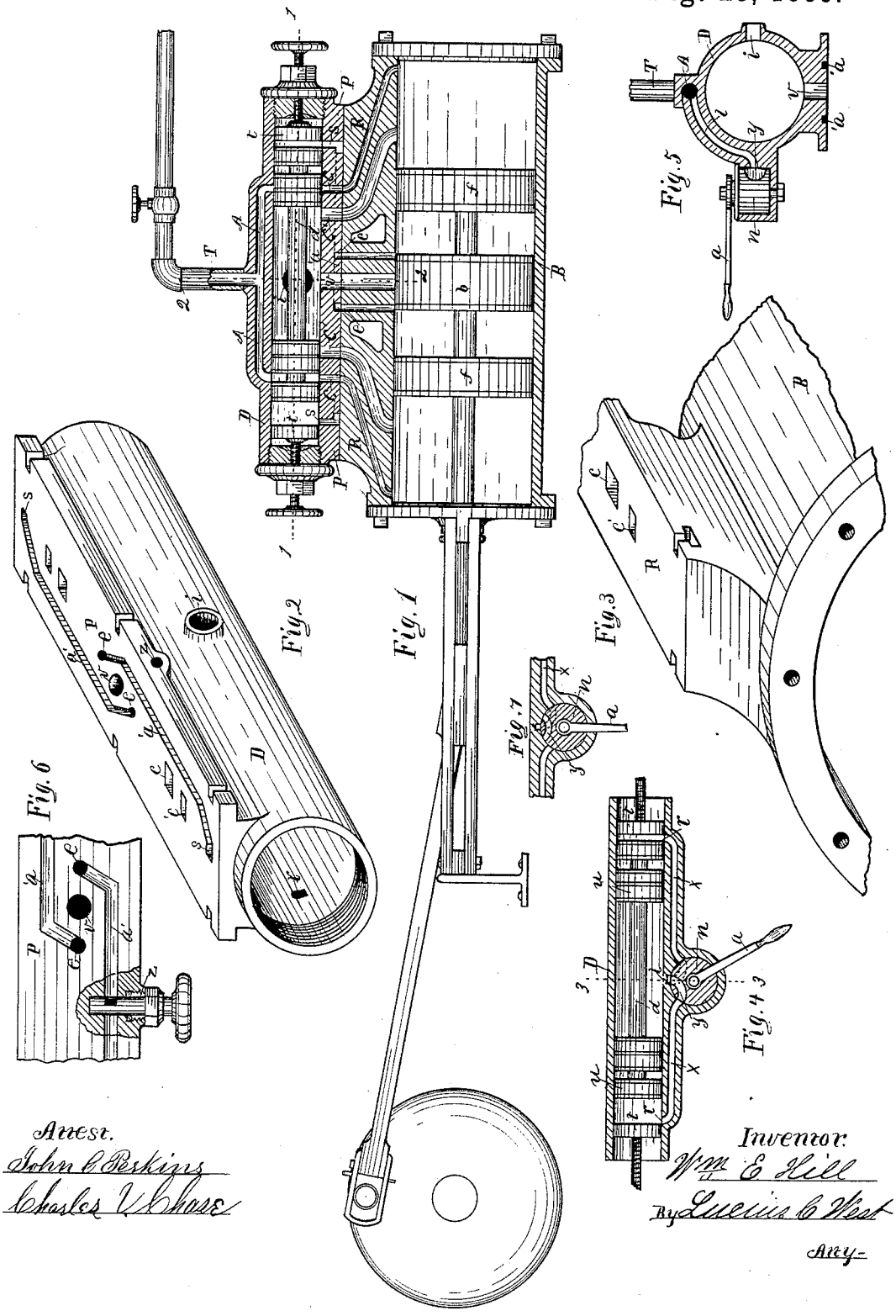
(No Model.)

W. E. HILL.

STEAM ENGINE.

No. 325,079. Patented Aug. 25, 1885.



Witnesses.
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UNITED STATES PATENT OFFICE.

WILLIAM E. HILL, OF KALAMAZOO, MICHIGAN.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 325,079, dated August 25, 1885.

Application filed July 11, 1884. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. HILL, a citizen of the United States, residing at Kalamazoo, county of Kalamazoo, State of Michigan, have invented a new and useful Steam-Engine, of which the following is a specification.

This invention has for its object certain improvements in engines in which the steam-chest valves are actuated entirely by the steam. The novel features are pointed out in the following description and claims.

In the drawings forming a part of this specification, Figure 1 is a vertical section of the horizontal cylinder and steam-chest with parts left full; Fig. 2, an enlarged view of the steam-chest in perspective, bottom upward and detached from its connections; Fig. 3, a broken part of the cylinder in top perspective; Fig. 4, a horizontal section of the steam-chest on a line indicated by line 1 1 in Fig. 1; Fig. 5, a cross-section of steam-chest on a line indicated by line 2 2 in Fig. 1; Fig. 6, a plan view of the steam-chest, bottom upward, enlarged, with each end broken away; and Fig. 7 is a broken part of Fig. 4.

Referring to the drawings, B is the cylinder with thick upper wall, R, forming a seat for the steam-chest D, secured thereto. The cylinder main exhaust-port *v* communicates with the steam-chest through the walls R P at the center. *i* is the main exhaust-port of the steam-chest. The ports *e e*, each side of exhaust *v*, communicate with the steam-chest from the cylinder by means of the passages *a' a'*.

To illustrate, the right-hand port *e* enters the steam-chest at the left-hand end at S, and the left-hand port *e* enters the steam-chest at the right-hand end thereof at S'. Ports *c c'* start from points between *s* and *v* on each side of *v*, and enter the end portions of the cylinder, *c c* entering right at the end, and *c' c'* a little removed therefrom. Just what point the ports are located at depends on the number of the valve-pistons and their distance apart in the steam-chest and cylinder.

A shaft, *d*, is provided at each end with two pistons a little removed from each other, the extreme end pistons being half the width of the others, Fig. 1. This device constitutes the steam-chest valve and loosely plays horizontally therein. To describe the double function of these pistons in the steam-chest and cylinder, I term them "valve-pistons," as they serve as valves to open and close the ports, as described in the operation.

The valve-pistons in the cylinder *f b f* are separated from each other, the central one being wider than the end pistons. They are connected by a piston-rod, which extends through the end of the cylinder and connects in the usual manner with a crank-shaft; or it may connect in any suitable manner with devices or mechanism to be operated thereby.

Each end of the steam-chest is provided with movable head-blocks *t t*, adjustable by hand-wheels connecting therewith by threaded rods extending through the end caps of the chest, Fig. 1. By means of these blocks the interior length of the steam-chest is controlled to fix the desired degree of steam-cushion at the ends of the valve-pistons.

The steam-induction pipe leading from the boiler (boiler not shown) is shown at T, with branch induction-ports A A, leading into the steam-chest each side of the center.

In the operation, referring to Fig. 1, and to the parts in the position therein shown, the steam enters the steam-chest D through the left hand induction-port, A, and passes between the valve-pistons at said end on into the cylinder B, through the induction-port *c*, registering therewith. At this time the left-hand port, *c'*, is closed by a valve-piston in the steam-chest, and the right-hand port, *c*, is closed as well. The ports *e e* and *v* are closed by the central valve-piston in the cylinder B. The inducted steam forces the cylinder-pistons to the right as the operation continues, and this action opens the port *e*, which leads from the left of the port *v* in the cylinder to the right-hand entrance S into the steam-chest, and steam is forced therethrough by the movement of the cylinder-piston at the left-hand end. The right-hand port, *c'*, being open allows steam to exhaust from the right-hand end of the cylinder into the steam-chest. The steam which has entered the right-hand end of the steam-chest forces its valve-pistons to the left, opening the right-hand induction-port, A *c*, and closing the right-hand port, *c'*, by the time the cylinder-pistons have reached their right-hand limit. At this time the right-hand port *c* is of course opened, and the left-

hand port *e* closed by the left-hand valve-piston in the cylinder. The steam which exhausts from each end of the steam-chest into the cylinder through ports *e e* is educted through exhaust-ports *v i*, and the exhaust from the ends of the cylinder into the steam-chest through ports *c' c'* is educted through exhaust-port *i*, the latter being the final exhaust. As the operation continues, by the reverse movement of the pistons in the steam-chest and cylinder alternating with the movements above described, of course there is an alternating action of the steam through the sets of like ports, as above described.

By this means the steam-chest valve-pistons are actuated by the steam forced into the chest from the cylinder with less resistance of the used steam to the movements of the valve-pistons in the chest and cylinder, and with greater accuracy and promptness. The steam-chest is provided with a valve-plug inserted in a hole, *z*, which extends into each passage *a' a'*, as illustrated in Fig. 6, to control the size of the passage, and hence the amount of steam passed through according to the given steam-pressure and the amount of cushion desired at the end of the chest in certain instances.

The chest D is provided with a passage, *l*, leading from the induction-port A at the point where the pipe T connects to the side of the chest, Fig. 5, and from thence branching to each end of the chest, as at *x x*, Fig. 4. At the juncture of the passages *l* and *x x* is placed a one-way plug, *n*, for the purpose of letting steam into either end of the chest in order to reverse the motion of the engine, or to throw the steam-chest pistons one way or the other previous to starting the engine in case they had from any cause got moved out of proper position to start up. By turning the plug *n* by means of lever *a*, as in Fig. 4, steam will enter the left-hand end of the steam-chest, and when in position shown in Fig. 7 the steam is shut off from entering either end through the passages *x x*.

Having thus described my invention, what I claim as new is—

1. A steam-chest and connected engine-cylinder, the former having an induction-port each side of the longitudinal center, and a central main exhaust-port, the latter having a main exhaust-port leading centrally into the steam-chest, and both having communicating ports, as follows: an exhaust-port for each end of the steam-chest, one leading from the right-hand end to the central portion of the cylinder at the left of the cylinder main exhaust-port, the other leading from the other end of the chest to the right of said main exhaust, a cylinder exhaust-port leading from each end of the cylinder into the central portion of the steam-chest, and a cylinder induction-port leading from the steam-chest into each end of the cylinder, in combination with valve-pistons in the chest and the cylinder arranged to open and close said communicating ports, and the valve-pistons in the chest being also arranged to register the steam-chest and cylinder induction-ports, all substantially as set forth.

2. A steam-chest having a steam-actuated valve therein and provided at the ends with adjustable head-blocks to govern the longitudinal size of the interior of the chest, for the object stated, substantially as set forth.

3. A steam-chest having a steam-actuated valve therein, a passage leading from the main induction-port and branching into each end of the chest, and a one-way plug at the juncture of said passage and branches, for the object stated, all substantially as set forth.

In testimony of the foregoing I have hereunto subscribed my name in the presence of two witnesses.

WILLIAM E. HILL.

Witnesses:
CHARLES V. CHASE,
R. W. MAYHEW.