2 Sheets—Sheet 1.

C. H. BURTON.

Steam-Engine.

No. 209,750. Patented Nov. 12, 1878.

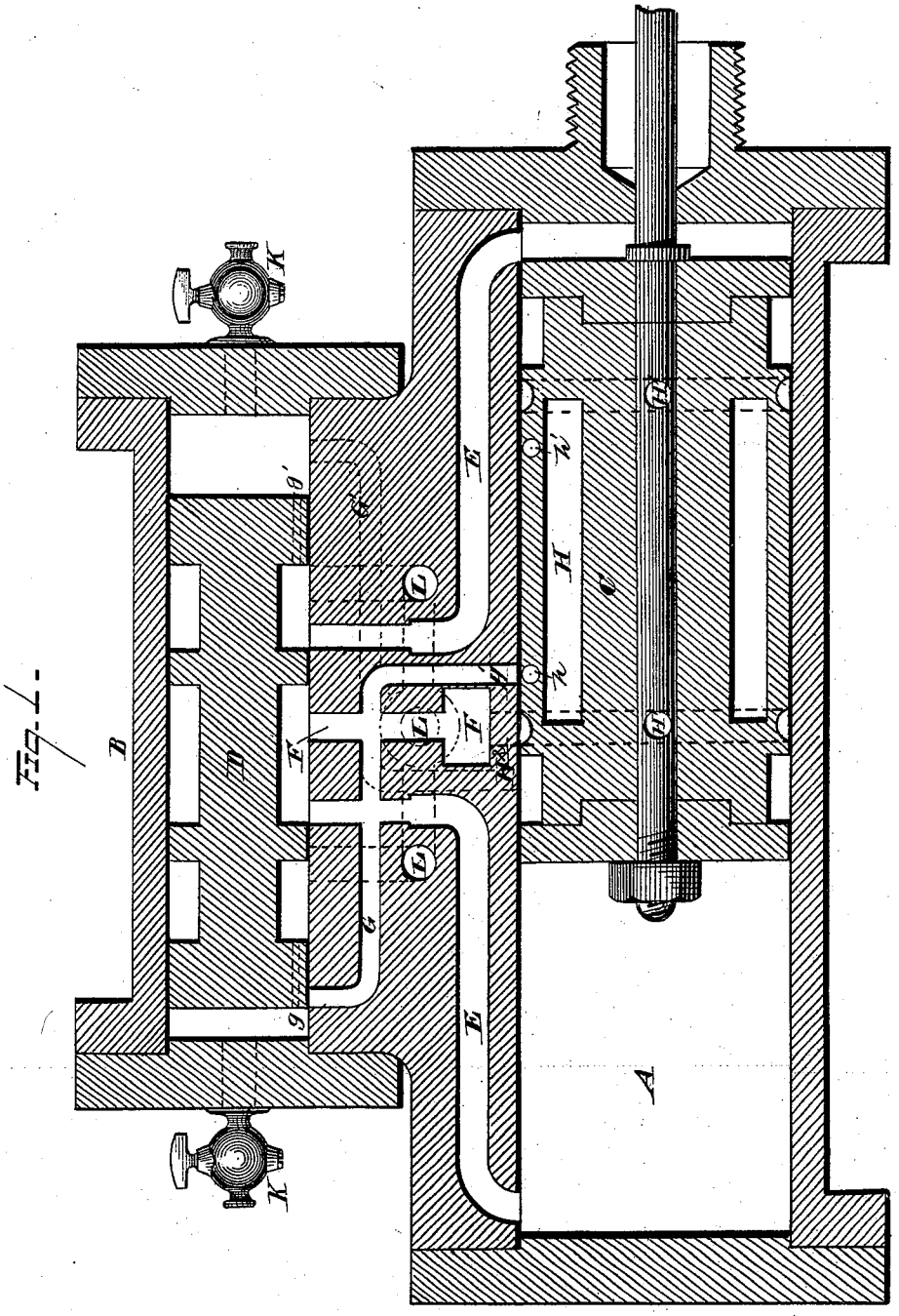

Fig. 1.

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2 Sheets—Sheet 2.

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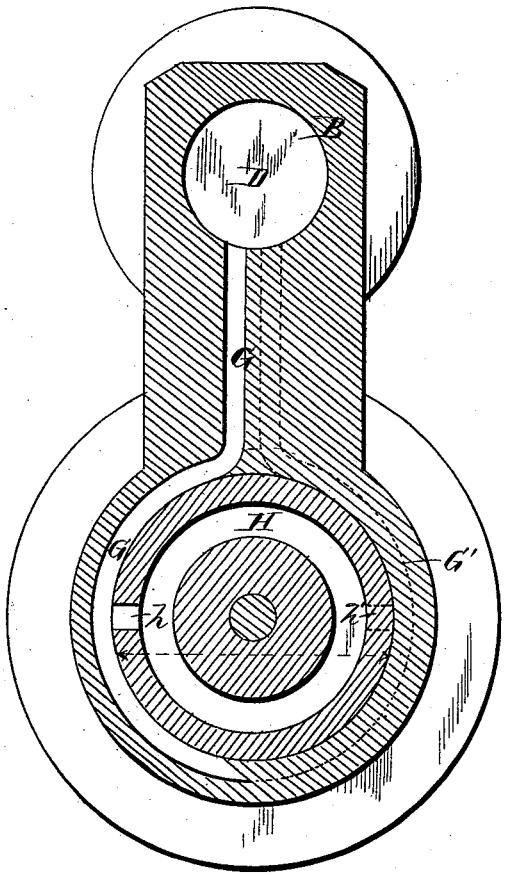
Fig 2



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UNITED STATES PATENT OFFICE.

CHARLES H. BURTON, OF CLEVELAND, OHIO.

IMPROVEMENT IN STEAM-ENGINES.

Specification forming part of Letters Patent No. **209,750**, dated November 12, 1878; application filed September 20, 1878.

To all whom it may concern:

Be it known that I, CHARLES H. BURTON, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Steam-Engines; and I 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 pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to a new and useful improvement in steam-engines; and consists in providing the steam-chest with a closely-fitting cylindrical or other slide-valve, which may or may not be poised upon a central stem, and in providing the main cylinder with a piston-head, through the body of which steam may exhaust alternately from the opposite ends of the slide-valve, thereby causing it to change its position automatically at the proper moment; also, in providing steam-cocks at the ends of the slide-valve chamber, whereby the engine may be stopped, reversed, or started in either direction at any moment.

In the drawings, Figure 1 is a longitudinal section, and Fig. 2 a cross-section, of a steam-chest and steam-cylinder, with their valve and piston, respectively embodying the features of my invention.

A is a steam-cylinder; B, a steam-chest; C, a piston-head, and D the slide-valve. E are the steam-ports, and F the main exhaust-port. G G′ are the exhaust-ports from the ends of the slide-valve. H is a hollow space in the piston-head, through which steam is exhausted from the ends of the slide-valve. *g g′* are steam-ports for supplying steam to the ends of the slide-valve. H^1 are exhaust-ports in the body of the cylinder, communicating by ports H^2 with the exhaust-chamber H in the piston-head. K K are steam-cocks, located at opposite ends of the slide-valve chamber.

The operation of this device is, briefly, as follows: Suppose steam to be entering the steam-chest through the port L, and the slide-valve D to be in the position indicated in the drawing, steam will then enter the right-hand end of the cylinder freely and start the piston-head toward the left. Moreover, at the instant of starting, pressure will have been relieved from the left-hand end of the valve-chamber through its exhaust-port G, the passage H H^1, and main exhaust F. As the piston begins to move to the left the exhaust through G is cut off, and the piston continues moving until an opening, *h′*, comes opposite the exhaust-passage G′. It will be noticed now that from the time the exhaust was cut off through the passage G the slide-valve has been under an equilibrium of pressure, inasmuch as the free steam has been permitted to pass through openings *g* to each end of the slide-valve; but at the instant that the port *h′* comes opposite the passage G′ the pressure on the piston at the right-hand end of the slide-valve is immediately relieved by exhausting through G′, H, H^1, and F, and it is exhausted more rapidly than it can be supplied through the small passage *g′*. This causes the excess of pressure at the other end of the valve to force the valve to the right-hand end of the valve-chamber, thus cutting off steam from the steam-port E′, making the same an exhaust-passage, while at the same time it cuts off the exhaust through the port E and makes it a steam-passage. The steam, entering now through E, forces the piston back to the right, exhaust is cut off through G′, and the piston moves on until the opening *h* comes opposite the passage G. The exhaust thus created at the left end of the slide-valve causes the latter to move to the left end of the chamber, and so on. Thus it is apparent that the slide-valve operates automatically, without any connection whatever with moving parts of the engine.

The slide-valve is made preferably in cylindrical form, and the steam-chest in the form of a cylinder of just sufficient diameter to admit the valve; but it is apparent that the valve may be of any polygonal form. I prefer that it shall be cylindrical, in order that it may always wear uniformly, and as being of the easiest and most simple construction. The valve may slide freely upon the inner surface of the chamber, or, if desired, it may slide upon a central rod or stem.

It is also seen that, from the cylindrical construction of the valve, it will be continually changing its position circumferentially, and thereby insure uniformity of wear both upon its own surface and the surface of the steam-chest. Sufficient space is left between

the ends of the valve-chamber and the points at which the passages G and G′ enter the same that the valve may cut off and hem in a sufficient amount of steam at its ends to cushion it. The steam-cocks K K are located at the ends of the steam-chest, and serve the purpose of stopping the engine, starting, or reversing it, or causing it to move in either direction from its stopping-point. This is effected, as is clearly apparent from the drawings, by simply shifting the valve. Thus, if one of the cocks is opened, the pressure being relieved at that end, the valve will be driven to that end of the chamber, and will remain there as long as the cock is open, and consequently the engine will be stopped. If, however, the piston is on its way to the left, and the valve is in the position shown in the drawing, and it is desired to reverse the engine, it is only necessary to open the cock at the right, thus causing the valve to shift to that end.

Now, suppose the engine to be at rest with the piston midway of its stroke, it may be started to the right by opening the cock at the right-hand end of the valve-chamber, which will cause the valve to shift to that end, and give steam to the left end of the cylinder. If, however, it is desired to start it to the left, then the left-hand cock would be opened, causing the valve to move to that end of its chamber, thus giving steam to the right-hand end of the cylinder.

The valve proper may be of any character—as, for instance, the ordinary D-valve form—and may be made separate from the piston portion of the valve, it only being necessary that the valve, if separate, be so united with the piston portion as to move with it, thereby opening and closing the ports, in which case, of course, the steam from the ports G and G′ would be exhausted from the ends of the pistons which drive the valve.

Steam-ports G G′ may come down direct from the steam-chest; but I prefer to have them cross each other, as shown in the drawings.

What I claim is—

1. In a steam-engine, the combination, with a piston-valve constructed with ports through its opposite ends and exhaust-ports G G′, of a steam-piston provided with an exhaust-steam chamber, H, annular ports *h h′*, connecting therewith, and ports H^1 H^2 leading to the main exhaust-passage F, substantially as set forth.

2. The combination, with the valve D, of the steam-cocks K K, whereby the location of the valve in its chamber may be governed at the will of the engineer by opening either valve, and the motion of the piston thereby controlled, substantially as and for the purposes described.

3. The steam-engine consisting of the combination, with the cylinder and steam-chest, of hollow piston C and valve D, the steam-ports E *g*, and exhaust-ports F G G′ H H^1, substantially as and for the purposes described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES H. BURTON.

Witnesses:

JNO. CROWELL, Jr.,

F. O. MCCLEARY.