H. BOETTCHER.

Rotary Steam-Engines.

No. 154,118. Patented Aug. 18, 1874.

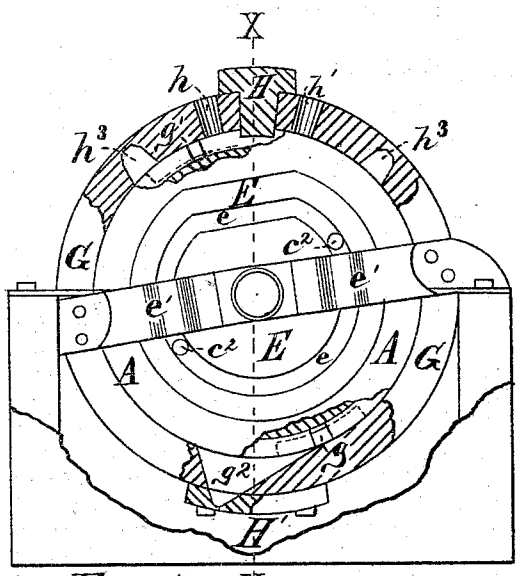

Fig. 1.

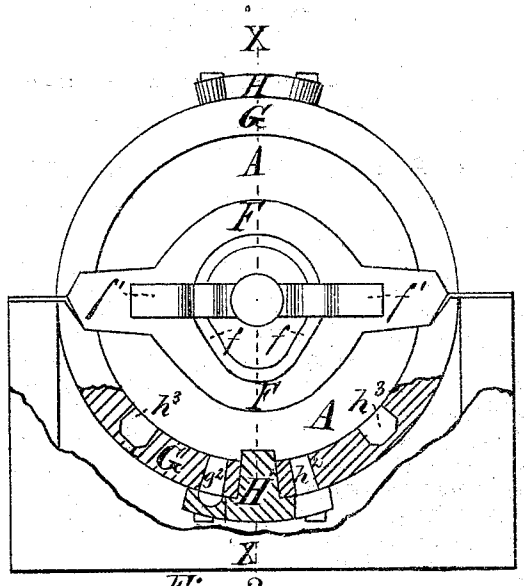

Fig. 2.

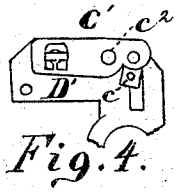

Fig. 4.

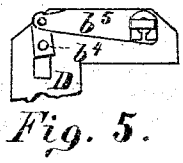

Fig. 5.

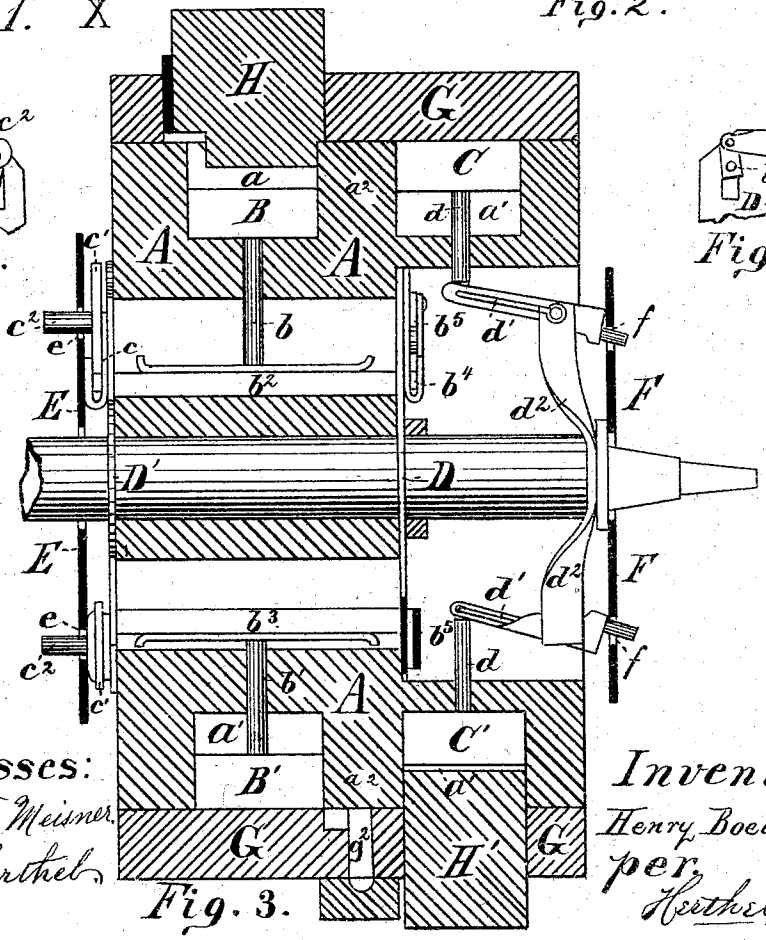

Fig. 3.

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UNITED STATES PATENT OFFICE.

HENRY BOETTCHER, OF BUNKER HILL, ILLINOIS.

IMPROVEMENT IN ROTARY STEAM-ENGINES.

Specification forming part of Letters Patent No. **154,118**, dated August 18, 1874; application filed April 1, 1874.

To all whom it may concern:

Be it known that I, HENRY BOETTCHER, of Bunker Hill, Macoupin county, State of Illinois, have invented an Improved Rotary Steam-Engine, of which the following is a specification:

In this rotary steam-engine the steam-cylinder has two divided annular steam-chambers, with communicating ports, by which steam is admitted from one chamber to another. Each steam-chamber has diametrically-positioned piston-heads, which are connected to peculiar cam-plates, and operated by motions imparted from same. The action of steam upon one piston-head when completed is passed into the opposite steam-chamber, and again utilized to perform the same action upon the remaining piston. Thus the steam acts upon two opposite piston-heads uninterruptedly and at the same time, but the steam for the first piston-head is from the boiler, the steam for the other piston being the same steam before used.

Of the drawings, Figure 1 is a side elevation of the engine with parts broken away, showing detail constructive features. Fig. 2 is also a side elevation from the opposite side of engine, with parts broken away to show detail features. Fig. 3 is a plan section at line $x\ x$, Figs. 4 and 5 being respective detail views of connections to operate the pistons.

A is the steam-cylinder. The steam-cylinder A I provide with two annular steam-chambers, a a^1, divided by a center wall, a^2. (See Fig. 3.) Each of the steam-chambers a a^1 is slotted to allow for the operation of two piston-heads in each chamber, B B′ being the pistons for the chamber a, and C C′ being the pistons for the chamber a^1. Thus there are four (4) piston-heads in all used, and these I position diametrically in their respective chambers, as shown in Fig. 3. The pistons B B′ C C′ are to be operated at proper times to close their respective chambers, and be acted upon by the power of steam, and also to open said steam-chambers to allow the exhaust of steam. I therefore connect the piston-heads B B′ by their stems b b^1 to a cross-bar, b^2 b^3. The inner end of each cross-bar b^2 b^3 passes through a vertical slot provided in a bearing-plate, D, which is secured to the shaft of the cylinder. (See Fig. 3.) Further, the inner ends of cross-bars b^2 b^3 are connected to one end of an arm, b^4, the other end thereof being pivoted to the end of an arm, b^5, which is pivoted to said bearing-plate D, as shown in Figs. 3 and 5. The outer end of each cross-bar b^2 b^3 of pistons B B′ is similarly connected—that is, to engage a vertical slot in a bearing-plate, D′, which is secured to one side of cylinder A. (See Figs. 3 and 4.) Also, the outer end of cross-bars b^2 b^3 is connected to one end of an arm, c, the other end thereof being pivoted to the end of an arm, c^1, which is pivoted to the outer bearing-plate D′, as shown in Figs. 3 and 4. Each of the pivoted arms c^1 has a crank-pin, c^2, engaging a cam-plate, E. The cam-plate E I provide with a cam-slot, e, of the constructive shape shown in Fig. 1, the design thereof being to operate the piston-heads B B′ to enter and close their steam-chambers a, and be acted upon by the pressure of steam, and also to withdraw from and open said steam-chamber to permit a free passage of the steam from said chamber into the opposite chamber, as well as to exhaust the steam. The cam-plate E is properly secured along one side of the cylinder A by its branch arms e', bolted to the frame that supports the engine. The opposite piston-heads C C′, by their stems d, connect to a vibrating lever, d^1, pivoted to a standard, d^2, which has its bearings near end of shaft of engine. (See Fig. 3.) The outer ends of the levers d^1 form crank-pins to engage a cam-plate, F. The cam-plate F I form to have the cam-slot f of the constructive shape shown in Fig. 2, so as to impart to the piston-heads C C′ the same action at required times to open and close the steam-chamber a^1, so as to be acted upon by the steam and exhaust same, similar to the operation performed by the piston-heads B B′ aforesaid. The cam-plate F is on the opposite side of the cylinder A to that of E, and is also properly secured to the frame by its branch arms f'. (See Fig. 2.)

The combined operation of the piston-heads B B′ C C′ thus connected to the cam-plates E and F is therefore such that two (2) opposite pistons, say B and C′, will be simultaneously actuated to raise or close their respective steam-chambers preparatory to being acted

upon by steam-pressure, while the remaining two pistons, B′ and C, will be in receded position and inactive, and vice versa, viz., when the latter are acted upon by the steam the former are inactive. In order, therefore, to utilize the same steam, so that it can act upon two oppositely-positioned pistons, as aforesaid, I provide the wall a^2 (that divides the steam-chambers) with the cored communicating ports $g\ g^1$, also oppositely positioned. (See Fig. 1.) Also, I provide the steam-drum or housing G, that incloses the top of the cylinder A, with a communicating port, g^2. (See Figs. 1 and 2.)

When either of the ports $g\ g^1$ are brought in line with the port g^2 of the steam-drum, the communication is established, and the steam that has been used in the first steam-chamber, a, is permitted to pass into the opposite steam-chamber, a^1. Thus the steam that has completed its action upon one piston-head is passed over, to again act upon the opposite piston, and, having performed its action upon both said piston-heads, is finally permitted to exhaust.

H H′ are stationary heads that pass through the steam-drum G, and close the steam-chambers $a\ a^1$, dividing them into separate chambers for each set of pistons. h is the inlet for steam. Opposite thereto is the exhaust h^1, for the steam-chamber a. h^2 is the exhaust for the steam-chamber a^1. (See Fig. 2.) h^3 are cored ports in the steam-drum G, so as to permit the steam to rise above the piston-heads, and in doing so relieve side pressure of steam from said pistons, and otherwise facilitate their action to recede or withdraw from their chambers, as well as ease the operation of piston-connections to cam-plates.

The ports h^3 in steam-drum are for the purpose of permitting the steam to pass over the pistons, (when the same are in the act of going down,) the little steam that thus passes in the ports h^3 of course in that degree relieves the steam-pressure from the sides of the piston. The steam pressing powerfully the sides of the pistons renders the same difficult of operating down, or to be withdrawn; hence, by relieving this side steam-pressure and permitting part of the steam to rise to the top of pistons in ports h^3, there is steam-pressure at the top of pistons as a result, and this facilitates the downward action of the pistons, and necessarily does not make it so difficult for lever and cam connections to operate the pistons. The ports $g\ g^1\ g^2$ are communicating ports, those of $g\ g^1$ being oppositely positioned and cased in the wall a^2, that divides the cylinder-chamber. When the port g^2 gets in line with either of the ports $g\ g^1$, then steam from the first chamber passes into the opposite chamber. Thus, while steam is acting upon the piston-top of chamber a, it pushes that piston along until it is below in the act of receding. The same steam that has then acted to pass the piston or its cylinder half-round passes off into the port g through the port g^2. Thus the first steam is again obliged, in the second steam-chamber, to operate upon a piston that is ready to operate when the piston that leaves off the steam to pass over to it has withdrawn itself.

What I claim is—

1. The described engine, provided with chambers $a\ a^1$, having ports $g\ g^1$ relatively arranged so that connection is made between the chambers, to permit the exhaust of one to be used in the other, as described.

2. The combination of the pistons B B′ C C′, cross-bars $b^2\ b^3$, arms $b^4\ b^5$, bearing-plate D, arms $c\ c^1$, bearing-plate D′, and cam-plates E F, all constructed to operate as and for the purpose set forth.

3. The combination of the steam-drum G, having ports $g^2\ h^3$, heads H H′, steam-cylinder A, its annular chambers $a\ a^1$ and ports $g\ g^1$, pistons B B′ C C′, and their connections to cam-plates E F, all constructed to operate as and for the purpose set forth.

In testimony of said invention I have hereunto set my hand.

HENRY BOETTCHER.

Witnesses:
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