P. CRAMER.

ROTARY STEAM ENGINE.

No. 111,818. Patented Feb. 14, 1871.

Fig. 1.

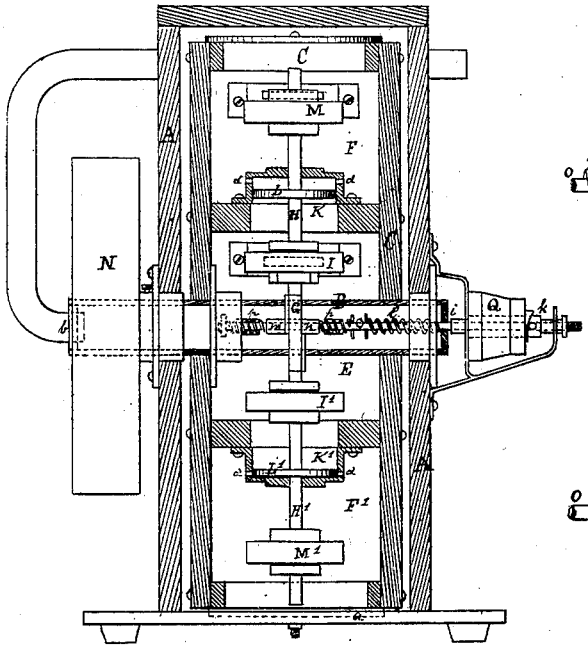


Fig. 3.

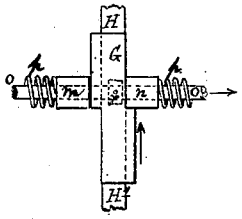


Fig. 4

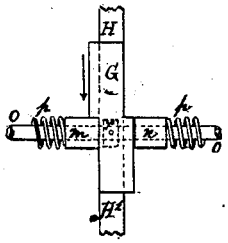
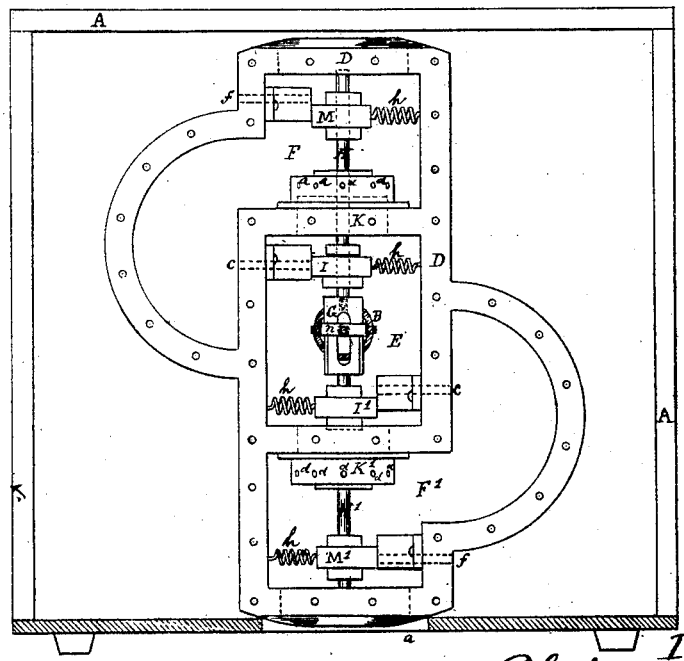


Fig. 2.



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United States Patent Office.

PHILIPP CRAMER, OF PROVIDENCE, RHODE ISLAND.

Letters Patent No. 111,818, dated February 14, 1871.

IMPROVEMENT IN ROTARY STEAM-ENGINES.

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

To all whom it may concern:

Be it known that I, PHILIPP CRAMER, of the city and county of Providence and State of Rhode Island, have invented a certain new and useful Rotary Steam-Engine.

My invention consists in a certain novel arrangement of steam-chambers, with valves and operative devices, by means of which motive-power is derived from the force of a column or columns of discharged steam acting upon the atmosphere; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming a part of the same, is a true, clear, and exact description thereof, reference being had to the drawings.

Figure 1 represents, in cross-section, one of my engines.

Figure 2 represents the same, with one of its sides removed.

Figures 3 and 4 represent, in detail, a portion of the mechanism for controlling the operation of the valves.

The same letters of reference are used in all the figures.

My engine is mounted upon a hollow-pipe shaft, through which steam is inducted to its interior. The whole is incased within a chamber into which exhaust steam is delivered and from which it is discharged.

For the purposes of illustration I have prepared drawings which exhibit an engine of rectangular form, having upon opposite edges, at or near each end, protruding chambers.

A represents the outer casing or chamber containing the engine, and into which steam is discharged, and from which it escapes at *a*.

B represents the main shaft, upon which the engine is mounted, and with which it revolves. Its bearings are mounted in the sides of the chamber A. This main shaft is also the induction steam-pipe, and at *b* the steam-pipe from the boiler is connected after the manner of such connections in oscillating engines.

C represents the side and corresponding ends of the exterior of the engine.

D represents the edges and corresponding ends of the same.

E is the main steam-chamber, into which steam is conducted direct from the boiler, by pipes, through pipe-shaft B, and in which the degree of steam pressure is always the same as in the boiler, with which it has a direct connection.

F and F′ are auxiliary steam-chambers, into which steam, at intervals, is alternately admitted from chamber E, and from which, at proper alternating intervals, it is discharged into the outer chamber, within the walls or casing A, thence to space.

G is a slotted slide-block passing through a slot in the pipe-shaft B, and at right angles to it.

H and H′ are valve-rods, secured into the opposite ends of slide-blocks G. Both operate valves in the main steam-chamber E, rod H extending into auxiliary-chamber F, and rod H′ extending into chamber F′.

I and I′ are slide-valves, by which steam is permitted to escape through eduction-ports *c* from the main into the auxiliary-chambers. They are operated by the valve-rods H, to which they are attached, in such a manner that when one valve is open the other is closed.

K and K′ are cylindrical chambers parallel with the valve-rod, and which form a portion of the partitions between the main and auxiliary steam-chambers. These chambers K have heads at their ends furthest from the pipe-shaft B, through which the valve-rods pass in the usual manner of piston-rods. A short distance from the inside of the heads, in the walls of these chambers, are several apertures *d*, which open into the auxiliary chambers.

L and L′ are plungers or pistons secured to the valve-rods, and fitted nicely to the interior of the cylindrical chambers K. These plungers are of a thickness greater than the diameter of the apertures *c*, so that, when the plungers are opposite thereto, they are all completely closed.

M and M′ are slide-valves in the auxiliary steam-chambers. They are secured to and operated by the valve-rods H, upon which they are so set that when one valve is open the other is closed.

These valves control auxiliary eduction-ports *f*, through which steam is permitted to escape into space, or into the interior of the outer or incasing-chamber, and thence to space.

N is a pulley upon the main shaft B, from which power may be taken.

The operation of the mechanism, thus far described, is as follows:

Referring to fig. 2, main steam-chamber E, it will be observed that slide-valve I has closed the eduction-port *c*, while the valve I′ is below its port *c*, which is, consequently, open.

In auxiliary steam-chamber F it will also be observed that its valve M, at port *f*, is open, while in chamber F′ valve M′ and port *f* are closed.

Steam is let into the main chamber E, which freely escapes by port *c*, valve I′, at right angles to the line of the axis of the engine, into auxiliary chamber F′, thereby inducing a rotary motion of the engine in an opposite direction.

When the pressure in the auxiliary chamber becomes equal to that in the main, steam ceases to flow in that direction, and pressure is expended upon the piston L, which, having but an atmospheric pressure at its back, gives way, moving the valve-rod in that direction, closing valve I′ and opening valve I,

permitting steam to flow through the port *e* into auxiliary-chamber F.

By this same action port *f*, by valve M, has been closed, while valve M′, with its port, has been opened.

Auxiliary-chamber F′, having a pressure equal to that in the main chamber, discharges its steam through port *f*, at valve M′, inducing by its action an accelerated rotary movement.

When the pressure in auxiliary-chamber F equals that in the main chamber the pressure in chamber F′ has become so reduced that the force of the steam in chamber E, upon the plunger L′, moves it forward with the valve-rods H, again opening valve I′ and closing valve I in chamber E, closing valve M′ and opening valve M in the chamber F.

By the opening of the valve M steam escapes by its port *f*, as before described, contributing additional accelerated motion and power to the motor.

Each of the slide-valves is provided with a spring, *h*, to secure proper engagement with its seat.

It will be at once observed that, without some additional means to secure prompt action of the valve-rods H their motion would be too sluggish, and the time occupied in effecting its changes of direction would be too great to secure a desirable and practical result. I have, therefore, invented a means for securing the prompt action of the valves, which I will now proceed to describe.

O is a slide-rod, extending nearly the length of the pipe-shaft B, in its interior.

Its inner end has a bearing in a cross-piece secured to the inside of the pipe-shaft.

It also has another bearing in the outer head of the pipe-shaft B, at *i*, through which it extends.

Its outer end is embraced with a sleeve, *k*, the ends of which are square, while the intermediate portion thereof is round. The square portion of the sleeve *k* is fitted to slide-bearings at each end.

Upon the outer end of the slide-rod O is a screw-thread and nut. The latter is turned up on the rod until its inner face engages closely with the outer end of the sleeve *k*.

Upon the round portion of the sleeve *k* is mounted a conical loose pulley, Q, which has a vertical bearing at its inner end and a cam-face at its outer end.

A pin, set in the sleeve *k*, projects therefrom and engages with this cam-face in such a manner that, as the pulley revolves, the sleeve is thrown out, carrying with it the sliding rod O, which, as the cam-face recedes, follows it closely, being actuated by a spiral spring, *l*, which embraces the rod O within the pipe-shaft B.

This rod O, at the center of the engine, passes through the slot in the slide-block G, and at right angles thereto.

On each side of the slide-block G there are corresponding shoulders, as shown in figs. 3 and 4 more clearly.

Upon the sliding rod O are two stop-blocks, *m* and *n*, which, by means of spiral springs *p*, are made to constantly press against the opposite-shouldered sides of the slide-block G.

It is to be remembered that the stop-blocks *m* and *n* are so fitted to the slide-rod O as to slide freely thereon.

Between their inner faces, securely pinned to the rod O, is a collar, shown in dotted lines in figs. 3 and 4, and marked *r*.

Referring more particularly to fig. 3, it will be observed that the stop-block *n* engages with the shoulder in the slide-block G; consequently preventing the valve-rod from being moved in the direction of its arrow.

The lower valve being open and the upper closed, as shown in fig. 1, the pressure upon piston L is not permitted to move the rod by reason of this stop-block *n*.

Upon drawing out the rod O in the direction of its arrow the collar *r* on the rod engages with the inner side of the block *n* and causes it to move with the rod and disengage from the shoulder in the slide-block G, allowing the piston, valve-rods, and valves to move upward until the shoulder on the opposite side of the slide-block passes the stop-block *m*, which, by engaging therewith, (see fig. 4,) prevents any return action until the rod O is released and forced back by its spring, by which action the collar *r* engages with the inner end of the stop-block *m* and forces it out from the shoulder, and so on at proper intervals, to be determined by practice or as may be required in each engine.

Power may be applied to this conical pulley as if to an ordinary regulator or governor, to which the usual devices may be attached for increasing or decreasing the speed thereof, and thus effect the action of the rod O, and thereby control the operation of the steam-valves.

The motion of the valves is very rapid, and the space in the cylinders L, between the apertures *d* and the inside of the cylinder-heads, is sufficient to afford an air-cushion, upon which the force of the blow would be practically expended.

In practice, I purpose to increase the number of the auxiliary-chambers to any desired extent, in order that the power of the steam, when it shall pass from the final auxiliary-chamber into space, may be practically exhausted.

Having thus described my invention,

I claim as new and desire to secure by Letters Patent—

1. The main steam-chamber E, in combination with two or more auxiliary steam-chambers F, mounted upon the pipe-shaft B, provided with suitable eduction-valves, operated by the direct pressure of steam, and arranged to deliver two or more columns or jets of steam into an interior or exterior space at right angles to the line of the axis of the engine, substantially as described.

2. In combination with a rotary steam-engine, having a main and two or more auxiliary steam-chambers, and valves operated by the direct pressure of steam, the sliding rod O, stop-blocks *m* and *n*, sliding block G, and cam-pulley Q with sleeve *k*, the whole being arranged to control the action of the valves, substantially as shown and described.

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Witnesses:
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