

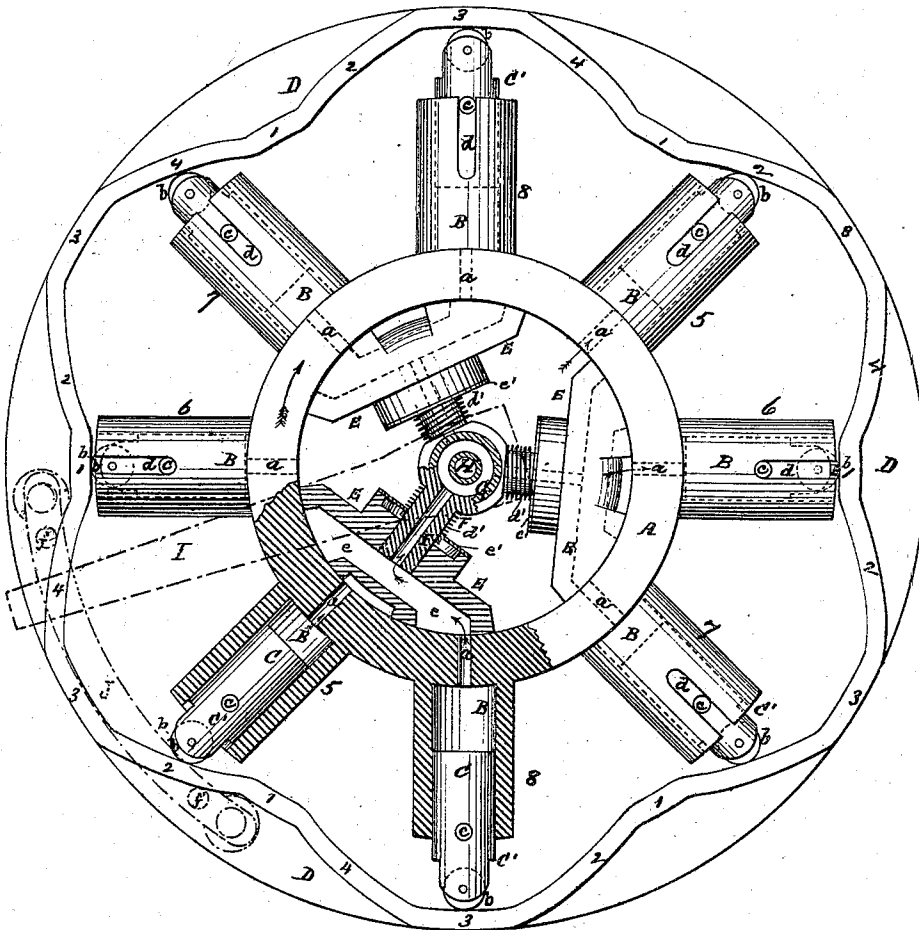
H. TAYLOR.

Rotary Steam-Engines.

No. 137,261.

Patented March 25, 1873.

Fig. 1.



Witnesses:

John Byerley
Wm. Anderson

Inventor:

Henry Taylor
by Atty. A. Pollock

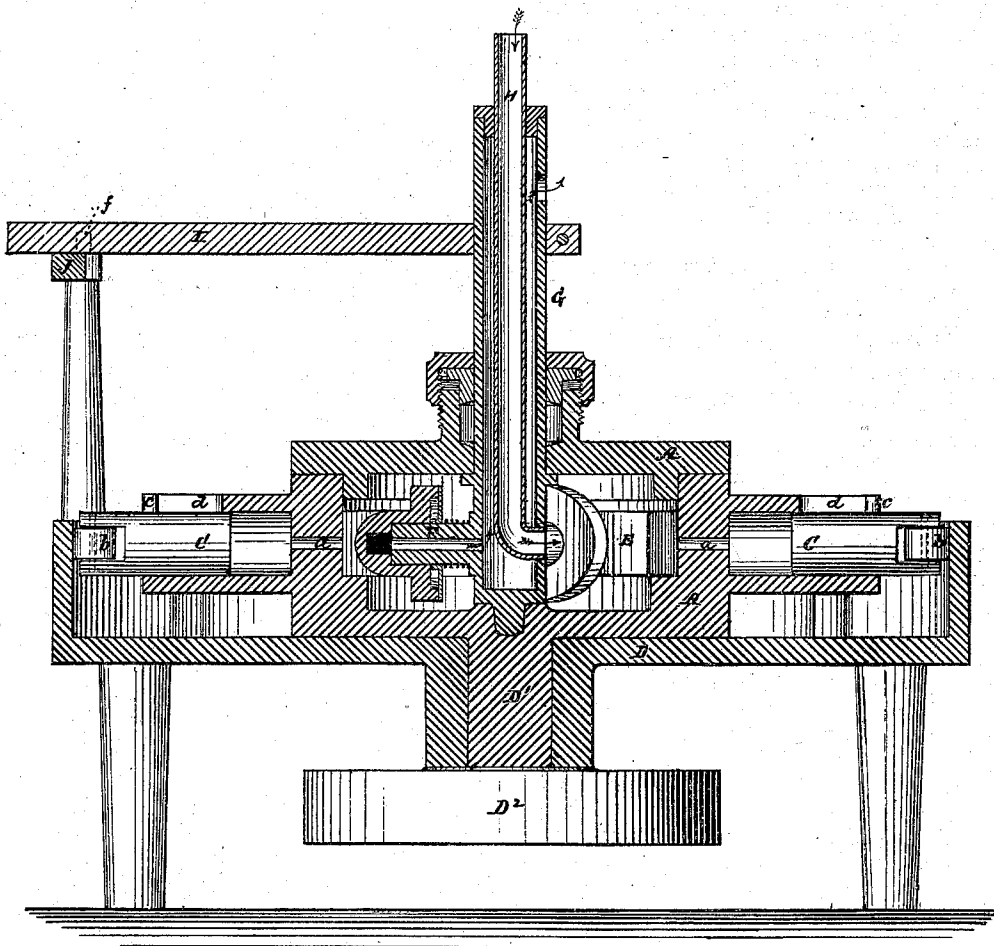
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Fig. 2.



Witnesses:

John Buckley
M. Anderson

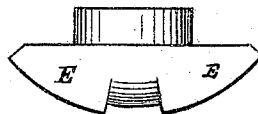
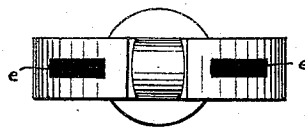


Fig. 3.



Inventor:

Henry Taylor
by atty, Rollock

UNITED STATES PATENT OFFICE.

HENRY TAYLOR, OF BALTIMORE, MARYLAND.

IMPROVEMENT IN ROTARY STEAM-ENGINES.

Specification forming part of Letters Patent No. 137,261, dated March 25, 1873.

To all whom it may concern:

Be it known that I, HENRY TAYLOR, of the city and county of Baltimore and State of Maryland, have invented certain new and useful Improvements in Steam-Engines, of which the following is a specification:

This invention relates to a steam-engine in which a rotary movement of the hub which carries the steam-cylinders is derived from the reciprocations of the pistons within said cylinders acting upon inclined faces of a stationary case surrounding the said hub and cylinders which it carries.

The nature of my invention and the manner in which the same is or may be carried into effect will be understood by reference to the accompanying drawing, in which—

Figure 1 is a plan view of the engine partly in section. Fig. 2 is a vertical central section of the same.

The principal elements of the engine are as follows: First, a series of steam-cylinders, B, carried by and radiating from the axis of revolution of a hub or drum, A, and receiving steam at their inner ends only. Second, pistons C, one for each cylinder, pressed outwardly at the proper times by steam admitted to the inner ends of the cylinders, and provided with rods or extensions C', to project beyond the outer ends of the cylinders. Third, a surrounding case, D, provided with a series of inclined faces, against which the rods or extensions C' of the pistons act to put and maintain the drum or hub A in revolution. Fourth, steam chest and valves to admit and exhaust steam at the proper times and intervals into and from the cylinders.

The wall of the case D is undulating, approaching and receding at regular intervals from the center of the case, and forming a series of faces or inclines, over which the parts C' travel. Steam is admitted to each cylinder when its rod C' reaches the top of each incline, and then, the steam pressure, acting on the piston, causes the outer end of the same—that is, the part C'—to travel down the incline, thus effecting at each outward impulse of each piston a partial rotation of the hub or drum to which the cylinders are fixed; and by so arranging the cylinders that there shall always be one or more which is thus acting, the

hub and its cylinders will be kept in constant rotation so long as steam is let on.

In an engine of this kind the number of cylinders employed may vary. I have found that a proper result cannot well be produced with less than six cylinders—that is, three pairs—and I prefer to use eight, ten, or more cylinders, depending upon the diameter of the engine. In the present instance I have shown four pairs of cylinders, the two cylinders of each pair being placed diametrically opposite each other, receiving and exhausting steam synchronously.

I shall now proceed to describe more in detail the construction of the engine.

The hub A is mounted to revolve in the case D, being provided with a central shaft, D¹, extending through a proper bearing in the bottom of the case, and carrying on its outer end a wheel, D², from which power may be transmitted to any machinery which it is desired to put in motion. The drum or hub is provided with steam-cylinders B, eight in number, radiating from the axis of revolution of said drum or hub, and arranged to receive steam through ports *a* from the interior of the hub, which constitutes the steam-chest. The cylinders may be cast in one piece with the hub, or may be formed separate therefrom and then attached in any suitable manner. I prefer the former arrangement. To stiffen the cylinders they may be cast with braces or a skeleton frame-work, connecting and supporting them. Each cylinder is provided with a piston, C, which may be of any suitable construction, and packed, as is usual with steam-pistons, so that it may work steam-tight within the cylinder. The piston is provided with an extension or a rod, C', extending out through the outer and open end of the cylinder, and designed to work against the series of inclines on the case D. For the purpose of reducing friction I prefer to place in the end of the part C' a friction-roller, *b*; and in order to prevent the piston from turning in the cylinder and thus moving the roller from its proper position, I provide the part C' with a guide-pin, *c*, working in a slot, *d*, in the outer part of the cylinder. The cylinders are arranged to work in pairs, the two cylinders of each pair being placed diametrically opposite each other, as

shown. They are surrounded by a case, D; whose wall against which the rollers *b* work, is undulating or made up of a series of faces, arranged substantially as shown. These faces may be described as follows: The faces 1 are struck on a circle whose radius is about equal to the distance between the axis of the hub A and the outer extremity of any one of the rollers *b*, when the piston of that roller is at its innermost position. The faces 3 follow a circle of a radius equal to the distance between the axis of the hub and the outer extremity of any one of the rollers *b* when the piston of that roller is at its outermost position. The inclined faces 2 and 4, which connect the faces 1 and 3, have preferably a cycloidal curve, their outward inclination or curve being greatest where they adjoin the faces 1. The pistons perform their work on the faces 2 or 4 according to the direction in which the cylinders revolve. If, for instance, the revolution be in the direction of the arrow in Fig. 2, then the impulse is derived by the successive travel of the pistons outwardly over the faces 2.

I do not, of course, limit myself to this specific formation of these faces, as in this respect they may be varied to a considerable extent without departure from the principle of my invention. They should, however, be so formed and connected as to prevent the formation of any abrupt angles or corners which would be apt to produce irregularity of movement and wear; and as concerns the size or length of the faces, they should be so proportioned that before or at the time the piston-rods of one pair of cylinders have reached the outer end of their stroke the rods of another pair will be beginning their outward movement, so that at all times there will be at least one pair of pistons exerting their force to drive the engine.

The admission and discharge of steam into and from the cylinders is regulated by means of valves E, six in number, located within the hub A and arranged in pairs, as shown. In each pair of valves an exhaust-channel, *c*, is formed, which channel opens through the face of each valve and communicates through a tubular stem, F, on which each pair of valves is mounted with the exhaust-pipe G. A plan and front elevation of the double valve is shown in Fig. 3. The stems F radiate from the center of the case D, and the valves are placed at equal distances apart from one another. Their outer faces are curved to correspond with the curvature of the wall of the hub A, against which they work. They are capable of sliding on their supporting-stems, and are held up at all times against the face of the hub A or steam-chest, as it may be termed, by springs *d'* pressing against caps *e'*, through which the stems F pass. The exhaust-pipe G passes out through a stuffing-box on the cover or top of the steam-chest B, and its lower end is stepped in the base of the chest, as shown. This pipe and the valves are designed to remain stationary while the cylinders and hub or steam-chest re-

volve. Steam is admitted into the body of the chest through a smaller pipe, H, arranged concentrically within exhaust-pipe G and opening at its lower end through the exhaust-pipe into the steam-space, as shown in Fig. 2. The exhaust-pipe G can, however, be rotated to vary the position of the valves, to cut off steam sooner or later, as desired, or to reverse the engine. A simple device for the purpose is shown in the drawing. It consists of a lever, I, fast at one end to the pipe G and with its outer end extending over an upright frame, J, on one side of the engine, seen in Fig. 2 and in dotted lines in Fig. 1. Two pins, *f f'*, on the top of the frame indicate the extreme points to which the lever can be moved. When the lever rests against pin *f* the engine will revolve in the direction of the arrow in Fig. 1, and steam will be admitted during the entire, or nearly the entire, stroke of the piston. When the lever rests against pin *f'* the engine will be reversed with full admission of steam, as before. By moving the lever slightly away from these points toward the center of the frame steam can be cut off at any desired point. In the drawing the lever is represented as adjusted to cut off steam at from two-thirds to three-fourths stroke. It will be noticed that the faces 1 of the case D permit this cut-off, and are designed for the purpose. The sooner steam is admitted to the cylinders after their piston-rods reach the faces 1 the sooner will steam be cut off during the travel of said rods over the inclines 2, supposing the engine to be moving in the direction of the arrow. It will, of course, be understood that a suitable mechanism for locking or fastening the lever in any position to which it is adjusted should be employed; and it will also be understood that other devices, which will readily suggest themselves, may be employed for regulating the position of the valves and the cut-off, in lieu of the special means herein shown.

The operation of the engine is as follows: To distinguish between the different pairs of cylinders I have marked them 5, 6, 7, 8. We will suppose steam to be let on and the engine to be moving in the direction of the arrow. The piston-rods of cylinders 5 have completed about one-half their stroke. Steam is still entering these cylinders, and is also admitted to cylinders 6, whose piston-rods, however, are still in contact with the faces 1, and consequently cannot yet move outwardly, although they are prepared to do so as soon as they reach the beginning of the next incline 2. The cylinders 7 and 8 are exhausting, as shown. The piston-rods of 7 are being pushed in by ascending the inclines 4 while the piston-rods of 8 are traveling over the faces 3, and, consequently, as yet have not been moved inwardly. By the time cylinders 5 have accomplished, say, three-fourths of their stroke steam is cut off from them, and at about the same time cylinders 6 reach their inclines 2; and their pistons at once move outwardly, and thus for a portion of the time

the engine is receiving the impulse of two pairs of cylinders. When cylinders 5 complete their stroke they commence to exhaust, and cylinders 7 will by this time have reached faces 1. Steam will then be admitted to them, and their action with relation to cylinders 6 will be the same as that of the latter with relation to cylinders 5. The operation of the engine will, from the foregoing, be readily understood.

Having now described my invention and the manner in which the same is or may be carried into effect, I would say, in conclusion, that I do not limit myself to the precise details herein described, as the same may be varied to a considerable extent without departure from the principle of my invention; but

What I claim, and desire to secure by Letters Patent, is—

1. The combination, with a stationary case provided with a series of faces and inclines, as described, of a series of steam-cylinders carried by and radiating from a rotary hub or steam-chest whose axis of revolution is the center of the stationary case, said cylinders receiving steam at their inner ends and containing pistons provided with piston-rods adapted to work against the faces and inclines of the stationary case, at the times and in the manner substantially as shown and set forth.

2. In combination with the rotary hub or

steam-chest, the stationary valves located within the same and arranged to admit steam into and exhaust it from the cylinders carried by said hub or steam-chest, substantially in the manner and for the purposes set forth.

3. In combination with the elements named in the preceding clause, the central exhaust and steam-admission pipes, under the arrangement and for operation substantially as shown and set forth.

4. The arrangement of the valves in pairs, each pair being supported upon and communicating through an exhaust-passage with a tubular stem radiating from and opening into the central exhaust-pipe, substantially as shown and described.

5. The arrangement of the valves upon a central stem capable of being rotated to shift the position of said valves in relation to the cylinder-ports, in order to reverse the engine or to regulate at will the cut-off, substantially as shown and set forth.

In testimony whereof I have signed my name to this specification before two subscribing witnesses.

HENRY TAYLOR.

Witnesses:

EDM. F. BROWN,
M. BAILEY.