# R. C. Bristol,

# Rotary Steam Engine.

No. 11,546. Patented Aug. 22, 1854.

Fig. 2.

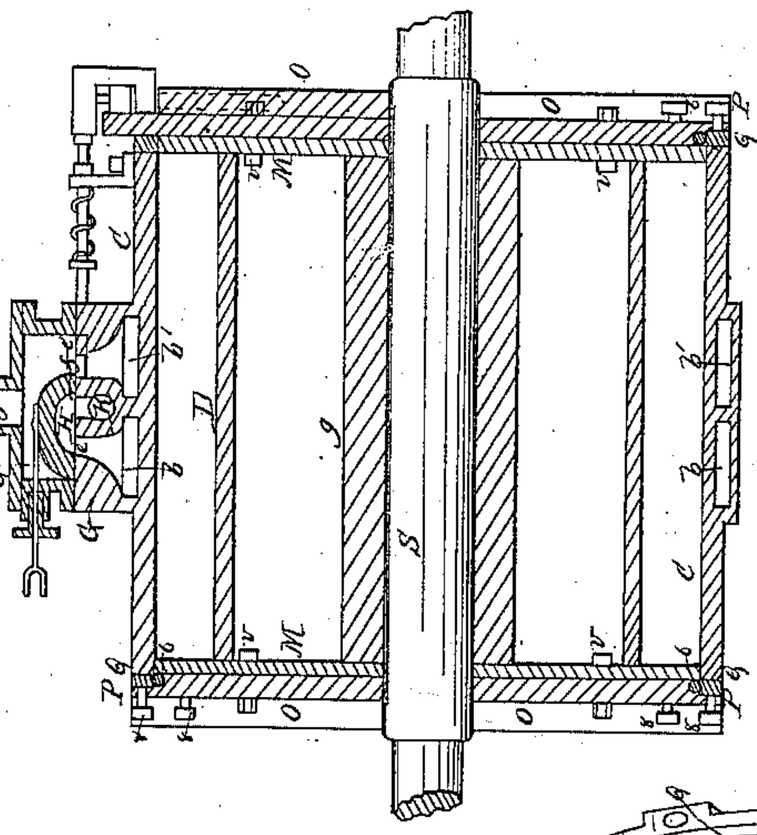


Fig. 5.

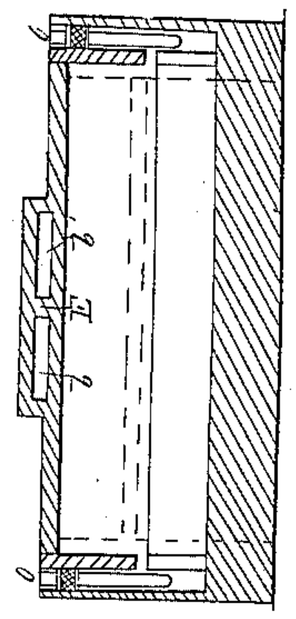


Fig. 6.

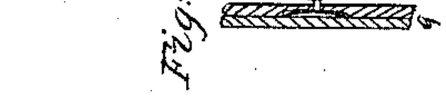


Fig. 1.



Fig. 3.

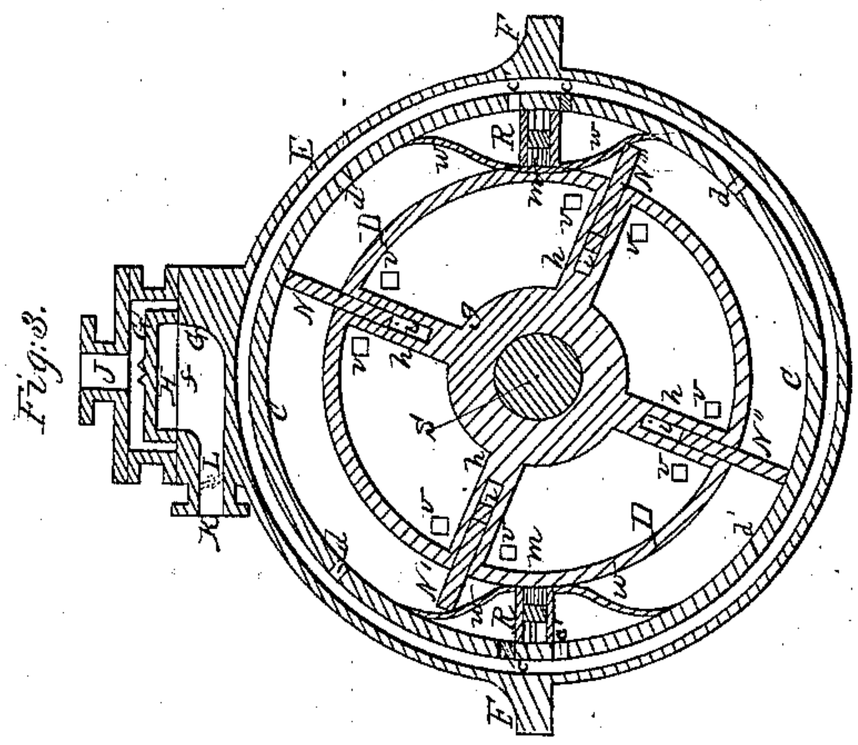
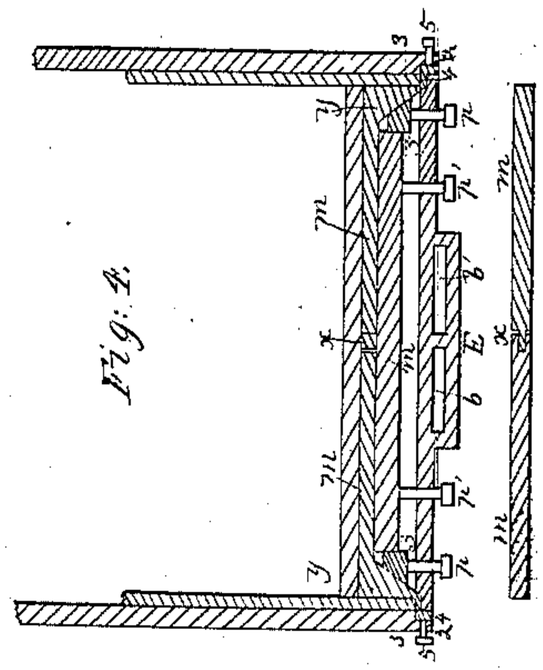


Fig. 4.



# UNITED STATES PATENT OFFICE.

R. C. BRISTOL, OF CHINA, MICHIGAN.

## ROTARY ENGINE.

Specification of Letters Patent No. 11,546, dated August 22, 1854.

*To all whom it may concern:*

Be it known that I, RICHARD C. BRISTOL, of China, in the county of St. Clair and State of Michigan, have invented certain new and useful Improvements in Rotary Engines; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, making a part thereof, in which—

Figure 1, represents a perspective view, Fig. 2 represents a vertical longitudinal section, Fig. 3, represents a vertical transverse section, Fig. 4, represents a longitudinal section through one of the abutments, and showing the manner of packing, Fig. 5, represents a longitudinal section through one of the chambers, and Fig. 6, represents a detached portion of the ring and one of the ends of the case or outside cylinder, in section.

Similar letters where they occur refer to like parts.

The nature of my invention relates to the resting of the outer cylinder by lugs upon a convex bearing, with a plate interposed adjustable by set screws, or by a wedge without a plate, by which means the outer cylinder can be made to conform to all possible variations of the shaft and inner cylinder. Also, in driving out the slides by steam acting under pistons at each end of them, two being drawn out in equilibrio, while the other two are being acted against to propel. Also, in using a cock or valve in the exhaust pipe to be closed before starting the engine, for the purpose of filling the engine with steam, and causing the pistons to force out the slides. Also, in the metal rings upon the outer head being fitted over the elastic packing, and forced up to the ends of the cylinder by springs, thus providing for expansion and contraction of the metals. Also, in holding back the metal rings aforesaid by screws or otherwise to prevent the atmospheric pressure upon them, from causing too much friction. Also, in the method of making the joint in the abutment, by which it is made adjustable, and perfect on the face of the inner cylinder at the end of the abutment and on the periphery of the inner heads.

To enable others skilled in the art to make and use my invention, I will proceed to describe the same with reference to the drawings.

A, is the frame of the engine.

B, B, are the journal boxes (one only being seen) for receiving the main shaft S, to which the revolving part of the engine is secured. C, is the outside cylinder; it is bored true-faced at the ends, and is surrounded by a steam case E, which is furnished with lugs F, F, upon which it is supported on the frame. The side rails of the frame A, are convex, and upon them are placed the supporting plates *a*, which are made adjustable by set screws therein, or by wedges underneath them, and upon these plates, the lugs F, rest, and the outer cylinder is thus made adjustable, so as to conform to all possible variations of the shaft and inner cylinder. By examination it will be found that this adjustment varies essentially from that of James McKay, patented in 1853. McKay supports his outer cylinder upon axes at right angles, and on a plane with the main shaft, which will only allow it to move up or down at the ends, as the shaft may do; whereas by my plan, it will allow the cylinder to move in any direction—the ends may go up, down or laterally, the height being readily adjusted by the set screws and plates under the lugs, which lugs may be on a plane with the shaft, above or below it as may be found most convenient.

The double steam case E, has passages *b* *b′* Figs. 2, 3, 4, 5, both encircling the cylinder, but independent of each other, the former communicating with the interior of the cylinder through openings *c c* and *d d*, Fig. 3, and the latter (*b′*) communicating with the same by openings *c′ c′* and *d′ d′* (same figure). On top of the outer cylinder is the steam chest G, which may be supplied with steam from the boiler, through the pipe J. K, is the exhaust pipe, to receive the whole steam through the exhaust port *f*, (Figs 2, 3).

N, N′, N″, N‴, are four sliding pistons. They are set in the slots, *i*, *i*, *i*, *i*, of the steam wheel, which is composed of a cylinder D, having a hub *g*, secured on the shaft S. In McKay's patent, before referred to, the slides or wings are forced out by letting steam under them while there is no steam operating upon the engine. I force them out by steam under pistons at each end of two of the sliders, while the other two sliders are doing their work in propelling the shaft.

The cylinder C, being stationary, and the

steam acting inside of it on the sliders, it moves the wheel composed of the cylinder D, hub *g*, and shaft S, with their various parts, which form the rotating parts of the engine. When the engine is running in one direction, it takes its steam by only one of the slide valve ports, and is shown in Fig. 2, to be taking the steam through the passage *e*. When moving in a contrary direction it takes its steam by the passage *e'*, where it is now shown exhausting the steam through the cavity of the slide valve H, and through the exhaust port *f*, into pipe K.

The slide valve G', is for reversing the motion of the engine which may be moved by a rod and lever in the well known way of performing this operation, and is like those in common use.

R, R, are two fixed abutments attached to the stationary cylinder C. These abutments have concave flanges *w*, *w*, branching from their apices, and have packing bars *m*, *m*, which are adjustable by screws *p*, *p*, to press them steam tight against the rotary cylinder.

In Fig. 4, one of the packing bars *m*, with its adjusting screws is distinctly seen. The bar has a lap joint *x*, near the center, and inclined planes *y y* at its ends. Upon the inner ends of the adjusting screws *p p*, are two followers *z*, *z*, which have one straight and one inclined side—the latter resting against the inclined planes on the ends of the bar, so that by turning the screws *p*, *p*, said bar may be brought up steam tight against the rotating cylinder. The bar *m'*, and set screws *p' p'*, are for controlling the bar *m* in the other direction. There are small flanges 2, 2, on the extreme ends of the bar *m*, which cover the joint 3, and rest against the packing 4, which is also adjustable from the outside of the cylinder by the screws 5, so that the packing bar *m*, extends entirely through the cylinder and is adjustable from the outside, and makes a perfect steam point throughout its entire length. The engine is represented as receiving the steam through the ports *c' c'*, on both sides of the engine, the one at the right hand side (Fig. 3) on the upper side of the abutment, and at the other side beneath the abutment, causing the engine to rotate in the direction of the arrow. The steam exhausts at the right hand side through the ports below the abutment, and on the left hand side above the abutments. When the engine is moving in a contrary direction, the present steam passages become the exhaust passages. The slides N, N', N'', N''', by this arrangement of the steam and exhaust ports, are relieved of all the steam pressure when passing the abutments, so that there is very little friction upon them. In other rotary engines with abutments, the sliders are forced out by a cam, but these sliders are forced out by steam pressure acting on small pistons in the chambers *u*, *u*, *u*, *u*, in both ends of the engine. The ends of the sliders have projections outside of the ends of D, these are connected to small pistons in the chamber *u u*, which small pistons are actuated by steam in the chambers at the ends of the cylinder. The steam from the small pistons is exhausted before a slider comes to an abutment, but commences to press out the slider when it passes an abutment. These sliders work free in their recesses *i i*, in the arms *h*, *h*, but are always pressed steam tight and allow no steam to pass them.

M, M, are the inside cylinder heads, in which there are slots for the projections of sliders, which slots serve as guards and bearings for the ends of sarid sliders. O, O, are other cylinder heads, secured by bolts *v*, *v*, and fitting close to M, M, but have flanges P, P, all around the outer side.

Q, Q, are metallic packing rings, corresponding with the size of the interior of the outer cylinder, and fitting closely over the inner heads M M. Under these packing rings, there is an elastic packing 6, Fig. 2, and back of them are springs 7 Fig. 6, for the purpose of providing for the expansion and contraction of the metals, and the metal rings are in turn held back by screws 8 or otherwise to prevent the atmospheric pressure upon them, from causing too much friction.

L, in Fig. 1, represents a stop cock or valve in the exhaust pipe, which must be closed previous to the starting of the engine, for the purpose of filling the engine with steam, and causing the pistons to force out the slides. Without this or a similar contrivance the steam would blow through the engine without affecting any of the moving parts or bringing them into action. Upon closing this valve and admitting the steam, the slides are immediately thrown out, by the action of the steam under or behind the pistons, then by opening the valve the engine is ready to run.

The metal rings Q, Q, Figs. 1, 2, 6, are fitted to the outer heads O, of the cylinder, and have underneath them elastic packing 6 (Fig. 2)—they are forced up to the ends of the cylinder M, by semielliptic or other springs as seen in Fig. 6, by which means provision may be made for the expansion and contraction of the metals. If there were no restraint upon the springs, Fig. 6, the atmospheric pressure upon the rings added to the pressure of the springs would create a friction detrimental to the free running of the engine. To counteract such effect, the metal rings are held back, or in any fixed position by means of the screws 8, passing through the outer head and into the packing rings, and thus a tight joint is made, which shall not however have any unnecessary pressure or friction upon it other than is incident to making it tight.

Having thus fully described the nature of my invention what I claim therein as new and desire to secure by Letters Patent is:—

1. The resting of the outer cylinder by lugs, upon a convex bearing, with a plate interposed and made adjustable, by set screws, or by wedges, for the purpose of adjusting the outer cylinder, to any and all possible variations of the shaft and inner cylinder, substantially as described.

2. I also claim driving out the slides by steam acting under pistons at each end of them—two being drawn out in equilibrio, while the other two are being acted against to propel the engine, substantially as described.

3. I also claim using a cock or valve in the exhaust pipe, to be closed before starting the engine, for the purpose of filling the engine with steam, and causing the pistons to force out the slides, which fall back upon stopping the engine, substantially as described.

4. I also claim the metal rings upon the outer head, fitted over elastic packing, and forced up to the ends of the cylinder by springs, for providing for the expansion and contraction of the metals as set forth.

5. I also claim in combination with the rings thus forced up the use of set screws for restraining the action of such springs, and preventing the atmosphere from causing undue pressure or friction on said rings.

6. I also claim the peculiar method of making the joint in the abutment, so as to be adjustable and perfect on the face of the inner cylinder at the end of the abutment, and on the periphery of the inner heads, substantially as described.

R. C. BRISTOL.

Witnesses:
J. P. Woodbury,
I. S. Clark.