G. H. Reynolds,

Rotary Steam Engine.

No. 26,400. Patented Dec. 6, 1859.

Fig. 2.

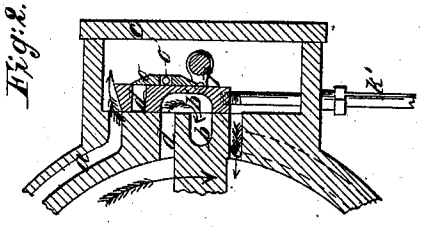
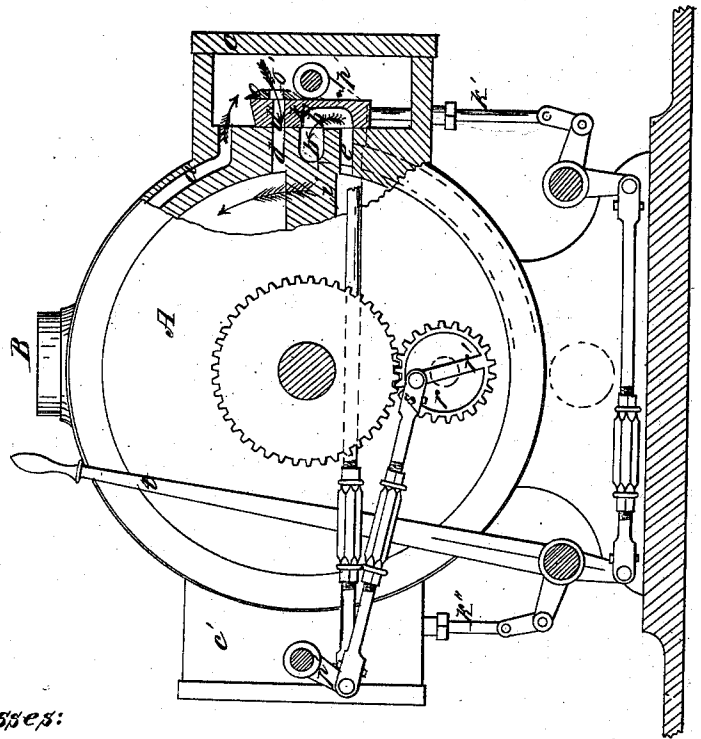


Fig. 1.



Witnesses:

S. H. Maynard

Inventor:

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by his attorney
J. P. Simpson

UNITED STATES PATENT OFFICE.

GEORGE H. REYNOLDS, OF NEW YORK, N. Y., ASSIGNOR TO CALEB BARSTOW AND D. D. BADGER, OF SAME PLACE.

CUT-OFF VALVE OF STEAM-ENGINES.

Specification of Letters Patent No. 26,400, dated December 6, 1859.

To all whom it may concern:

Be it known that I, GEORGE H. REYNOLDS, of New York, county of New York, and State of New York, have invented certain new and useful Improvements in the Valves of Rotary Engines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being made to the annexed drawing, making a part of this specification, in which—

Figure I is an end view or elevation partly in section. Fig. II is a sectional view of a part in detail.

Similar letters indicate similar parts throughout the figures.

My invention of improvements in rotary steam engines has for its object the securing of the advantages and economy arising from the employment of the principle of expansion in steam engines. In the rotary form this has heretofore proved difficult of accomplishment in such a simple and effective manner as in engines upon the reciprocating principle. In order to get the highest effect of this mode of applying steam in those engines, it is well known that the "cut-off" should be made as close to the cylinder ports as possible, and in my improvement upon the rotary engine I am enabled to accomplish the same equally well.

My invention consists in so constructing and applying the valve that it will effect the "cut-off" and at the same time permit of the reversing of the engine, and the application of the steam at "full stroke" when so reversed without requiring that the cut-off be in any way uncoupled from its driving mechanism.

In the following specification I shall describe the improvements as applied to the rotary engine patented to Ebenezer Barrows of the seventh February 1854. In Figure I at A is shown a cylinder on the rotary principle, the interior construction of which is upon the plan of said Barrows. The steam and eduction passages, instead of being external pipes, are cast within the solid shell of the cylinder itself, the steam induction passage being seen at (*a*) while the exhaust is shown in dotted lines at (*b*). Inclosing these are two steam chests (*c*) and (*c'*), situated upon opposite sides of the steam drum A as shown. There are two steam ports leading from this chest into the drum A as shown at the letters (*d*) and (*e*) between which on the inside is the abutment block (*i*) fitting against the inner revolving drum, as seen in the aforesaid patent of E. Barrows, and between which also is situated the exhaust opening (*b*). Within the steam chest is placed both the reversing valve and the "cut off." The first of these is shown in section, and in different positions, at (*k*) in Figs. I and II. This has some resemblance in construction to the well known D valve of the reciprocating engine; it however does not operate exactly in the same manner, and is not for the same purpose since it remains always stationary except at the moment of reversing the engine. The exhaust steam passes to the exhaust port by a cavity (*b'*) beneath, as in the D valve, but the direct steam to the other two ports passes differently; to one port, viz. that of (*d*), it enters by an opening through the valve as seen at (*d'*) Fig. I, while in regard to the other port (*e'*), the steam will enter by removing the end of the valve, as at (*e*) in Fig. II. The stem (*k'*) of this valve passes to the outside of the steam chest through a stuffing box as usual. These reversing valves in the two chests (*c*) and (*c'*) are coupled by links, as seen in Fig. I, so that when (*k'*) is pulled down (*k''*) will at the same time be pushed up because the position of the valve is reversed on the opposite side for the reason that both sets of ports (*d*) and (*e*) become steam or exhaust passages according to the position of the valve (*k*). Thus (*d*) in Fig. I is shown as acting as a steam-port, while that which corresponds in the opposite chest (*c'*) will be an exhaust, and while (*e*) in (*c'*) is a steam port it will be evident that in (*c*) it is acting as an exhaust port. The position of valve (*k*) in the steam chest (*c'*) will be reversed so that the passage (*d'*) through it will operate upon the lower port (*e*).

The "cut off" consists of a valve fitted to slide upon the back of the reversing one and is seen at (*o*). It is a plate extending the length of (*k*), or so as to be able to cover the slot, or aperture (*d'*). In (*o*) there is also a slotted opening of like dimension with (*d'*) as seen at (*o'*). This valve is caused to move upon (*k*) so as to effect the alternate opening and closing of the passage (*d'*) when (*k*) is set for the forward motion of the engine, in which position it is represented in Fig. I. The cut off valve (*o*) is

worked by a pair of links extending from two arms (p) upon a rock-shaft and within the steam-chest Fig. II, and these again are moved by cranks p', outside of said chests, and as shown in Fig. I. It will be seen that their valves are worked from a pinion (r) driven by a spur wheel upon the main shaft of the engine, the pinion being of a size to revolve twice to one revolution of the wheel. The reason of this is that there are four pistons in the drum requiring that the steam be cut off four times, to each revolution, each stroke of the valve cutting off twice, the face on each side of the aperture crossing the opening (d') in a complete revolution of the pinion (r). There is a means provided to make the "cut off" variable. In the face of the pinion (r) is a groove (r') in which the crank pin carrying the connecting rod (s) may be slipped along and clamped in any position within the circumference. When therefore this pin is set over the center of (r) of course no motion whatever is imparted to the cut off valve, consequently the steam passes in for the full stroke, the degree of expansion being thereafter regulated by the throw of said valve. The operation will then be as follows: Steam flowing in through B passes by the arched channel way (a) into each of the chests (c) and (c') and when by moving the starting-lever (t) the valves (k) will be moved to uncover the steam ports according as the engine is to go forward or back. In Fig. I it is in position for going forward. The steam passes through first the aperture in the cut off valve (o) then through that of the valve (k) into the cylinder above the abutment block (i) thus propelling the piston in the direction indicated. The steam in the other chest enters in like manner but through a port on the lower side of the abutment-block, and exhausts through the fellow of (e) as seen in the section Fig. I.

When the engine is to be stopped the starting bar (t) is moved until the lap of the valve (k) covers both ports (e) and (d). If now it be desired to reverse the piston, the starting bar is moved still farther in the same direction and until (k) is in the position seen in Fig. II. The lower end of the valve will then be seen to have uncovered the port (e) to the steam chest while (d) is in communication with the exhaust (b) through (b'). It will also be seen that although the "cut off" still continues to move as before upon the back of the starting and reversing valve it does not affect the action of the steam which flows uninterruptedly through (e) and of course acts throughout the stroke upon the pistons. The operations of starting, whether forward or back, and of stopping, are accomplished by the simple movement of the bar (t') while the cut off comes into play of itself immediately on putting the valve (k) into position for the forward motion.

I have described the cut off as acting only on the forward motion of the engine, and this because it would as a general thing only be thus needed. There are however situations where the ability to cut off upon both ports would be advantageous, as in the case of applying these engines to propel a ferry-boat. To be able to perform this it would only be necessary to extend the valve (k) so as to have another aperture like (d') to cover the port (e) and attach another cut-off valve similar to (o), or extend that one in like manner, but when made as a cut off for both ports the crank pin in (s) would have to be transferred to the opposite side of the pinion (r), or else each cut off be driven by separate gear.

I claim—

The arrangement within each steam chest of a rotary engine, of the starting and reversing valve having the cut off valve in combination therewith, the two being so coupled and operating that the starting or reversing may be effected without coupling or uncoupling any of the connecting parts, substantially in the manner set forth.

In testimony whereof I have hereunto subscribed my name.

GEO. H. REYNOLDS.

Witnesses:
I. P. PINSSON,
S. H. MAYNARD.