A. S. HARLAN.

ROTARY STEAM ENGINE.

No. 112,591.

Patented Mar. 14, 1871.

Fig. 1.

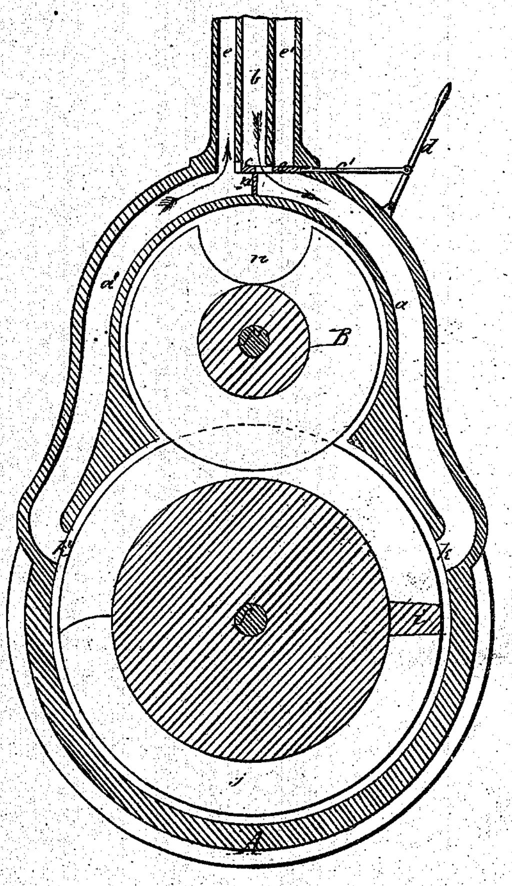
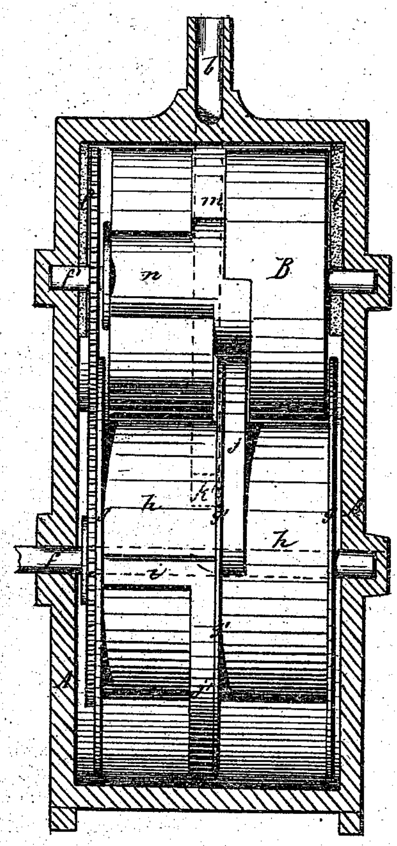


Fig. 2.



A. S. Harlan. Inventor.

by Geo. E. Brown (per m.)

his Attorney.

Witnesses

H. J. Dietz

[signature]

United States Patent Office.

AARON S. HARLAN, OF BLOOMINGTON, ILLINOIS.

Letters Patent No. 112,591, dated March 14, 1871.

IMPROVEMENT IN ROTARY STEAM-ENGINES.

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

I, AARON S. HARLAN, of Bloomington, McLean county, Illinois, have invented certain Improvements in Rotary Steam-Engines, of which the following is a specification.

Of the drawing—

Figure 1 is a sectional elevation; and

Figure 2 is a side elevation of the cylinder, with a sectional elevation of the inclosing case.

This invention relates to a rotary steam-engine in which the revolving cylinder is provided with circumferential flanges, forming two circumferential passages, each of which alternately receives and discharges steam, and has placed across it the transverse rib, against which the steam acts to produce the revolution of the cylinder, said ribs being at opposite sides of the latter; to the central one of the aforesaid circumferential flanges there being secured two metal half rings, on opposite sides, both of the cylinder and of the flange, the faces of which half rings, as the cylinder rotates, pass across the ports in the opposite sides of the steam-chest that incloses the cylinder, turning all the steam of the induction-port into one of the aforesaid circumferential passages, and, at the same time, turning the steam in the other circumferential passage into the eduction-port, there being a constant steam pressure upon one or the other of the transverse ribs aforesaid, and a constant discharge of steam from one or the other of the circumferential passages; there being also a second cylinder mounted in the steam-chest above the first and connected with the first by cog-gearing, said upper cylinder having a circumferential groove, into which the central circumferential flange of the lower cylinder, with its half rings, enters, the said upper cylinder abutting, at its extremities, against the inner sides of the circumferential flanges at the ends of the lower cylinder, and forming, with the latter, a joint sufficiently tight to prevent the passage of steam, thus compelling the latter to press against the transverse ribs of the lower cylinder passages and to flow out at the eduction-port when reached; the said upper cylinder being recessed lengthwise of its periphery at the proper points, and to a sufficient extent to admit of the transverse ribs of the lower cylinder entering said recesses and remaining therein until clear of the upper cylinder.

In the drawing—

A is the vertical steam-chest, to the outside of which are attached the pipes *a a'*, which, at their upper ends, are separated by a diaphragm, P, and connected with a pipe, *b*, that conducts steam from the boiler, and is furnished with a slide-valve, *c*, at its lower extremity, by means of which steam may be admitted into either of the pipes *a a'* at pleasure; the valve *c* being operated by the lever *d* that is pivoted to the outside of the steam-chest and jointed to the stem *c* of the valve.

With the pipes *a a'*, near their upper ends, are also connected vertical tubes *e e'*.

At their lower extremities the pipes *a a'* open into opposite sides of the chest A at points suitable for the delivery of steam against the lower cylinder. The steam escapes from the chest by the opposite pipe from the one through which it entered.

The tubes *e e'* are the exhaust passages of the pipes *a a'*, and are furnished with valves *e''* on the same stem as the valve *c*, so arranged as to simultaneously close the exhaust-tube *e* and the pipe *a'* and open the exhaust-tube *e'* and the pipe *a'*, or to open the tube *e* and pipe *a'* and close the tube *e'* and pipe *a* together, so that, whichever pipe conducts the steam, there is always a single unbroken passage from the pipe *b* to the steam-chest, and from the steam-chest to the escape-pipe.

Within the chest A are two cylinders, one above the other, mounted on shafts *f f'* that pass through the sides of the chest.

The lower cylinder has three circumferential flanges *g g' g* of equal dimensions, two at its ends and one central, which flanges bound two circumferential passages, *h h'*, transversely of which, between the flanges *g g' g*, are placed the ribs *i*, one in each passage, of the same height as the flanges, and at diametrically opposite points on the cylinder.

Upon the opposite sides of the central flange *g'* are secured two half rings *j j*; also on opposite sides of the cylinder, each of which half rings abuts at one extremity against one of the ribs *i*, and at the other extremity terminates at a point opposite the other rib *i*.

The combined width of the half rings *j* is equal to that of either of the ports *k k'* of the pipes *a a'*, and as the half rings are in close contact with the interior of the chest A, and the said ports *k k'* are so located that their sides are in the same planes as the outer sides of the two half rings, one or the other of the latter is always passing across and half closing each of the ports, and, owing to the location of the half rings on opposite sides of the flange *g'*, each port is alternately half closed on one side and then on the other.

In fig. 1, where steam is supposed to be entering the chest A through the pipe *a*, the mouth *k* is half closed on the right side and half open on the left, and the mouth *k'* is half closed on the left side and half open on the right.

By this arrangement steam is drawn from the pipe *a* into the left passage *h*, and, pressing against the left rib *i*, produces a rotation of the cylinder.

When this rotation has proceeded so far as to carry the left half ring *j* and the left rib *i* past the port *k'*

tne left side of the latter is, of course, opened, and the steam in the left passage is free to enter said port.

Simultaneously with the passage of the left rib past the port *k'* the right half ring clears the mouth *k*, opening the right side of the latter, the left half ring passes across and closes the left half of the mouth *k*, and the steam is consequently drawn into the right passage *h* and acts against the right rib *i*, which clears the port *k* at the same moment that the left rib clears the port *k'*. The rotation of the cylinder is therefore continued by steam pressure on the right rib while the steam in the left passage is exhausting into the pipe *a'*.

As soon as the right rib clears the port *k'* the steam in the right passage begins to exhaust into the pipe *a'*, and steam pressure is transferred to the left rib; such pressure alternating from one rib to the other in such manner as to maintain a constant and uniform rotation of the cylinder, the exhaust also alternately taking place from each chamber.

The upper cylinder, above referred to, is lettered B, and is, in effect, a valve, its office being to prevent the exhaust steam from rotating with the cylinder instead of escaping by the pipe *a'*, and also to give the steam the proper direction as it enters the chest A.

To this end rubber strips *l l* are interposed at each side lengthwise between the periphery of the cylinder B and the inner surface of the chest A, making a steam-tight packing.

The cylinder B fits closely between the two outer flanges of the lower cylinder and has two circumferential grooves, *m*, which communicate at their ends, and are of the proper width and depth and in the right position to receive the half rings *j* and the central flange *g'* of the lower cylinder, the two cylinders being in contact along one line in each of their peripheries, and being geared together so as to rotate in unison.

Lengthwise of the cylinder B recesses *n* are formed in its periphery, one at each side of the central groove *m*, and at diametrically opposite points in the circumference of the cylinder; said recesses being of the proper width and depth and in the right positions to receive the ribs *i* as they mount upward in the rotation of the lower cylinder, and to afford said ribs space in which to pass clear of the upper cylinder.

I claim as my invention—

1. The lower cylinder, provided with the flanges *g g' g*, the half rings *j*, the passages *h*, and the ribs *i*, all arranged together, as specified.

2. The upper cylinder, provided with the circumferential grooves *m* and the longitudinal recesses *n*, as described.

3. The combination of the upper cylinder, constructed as specified in the second claim, with the lower cylinder, constructed as specified in the first claim.

AARON S. HARLAN.

Witnesses:

CLAYTON C. KERR,

AMOS KEMP.