No. 711,239. Patented Oct. 14, 1902.

E. B. TREE.

ROTARY ENGINE.

(Application filed Oct. 31, 1901.)

(No Model.) 2 Sheets—Sheet 1.

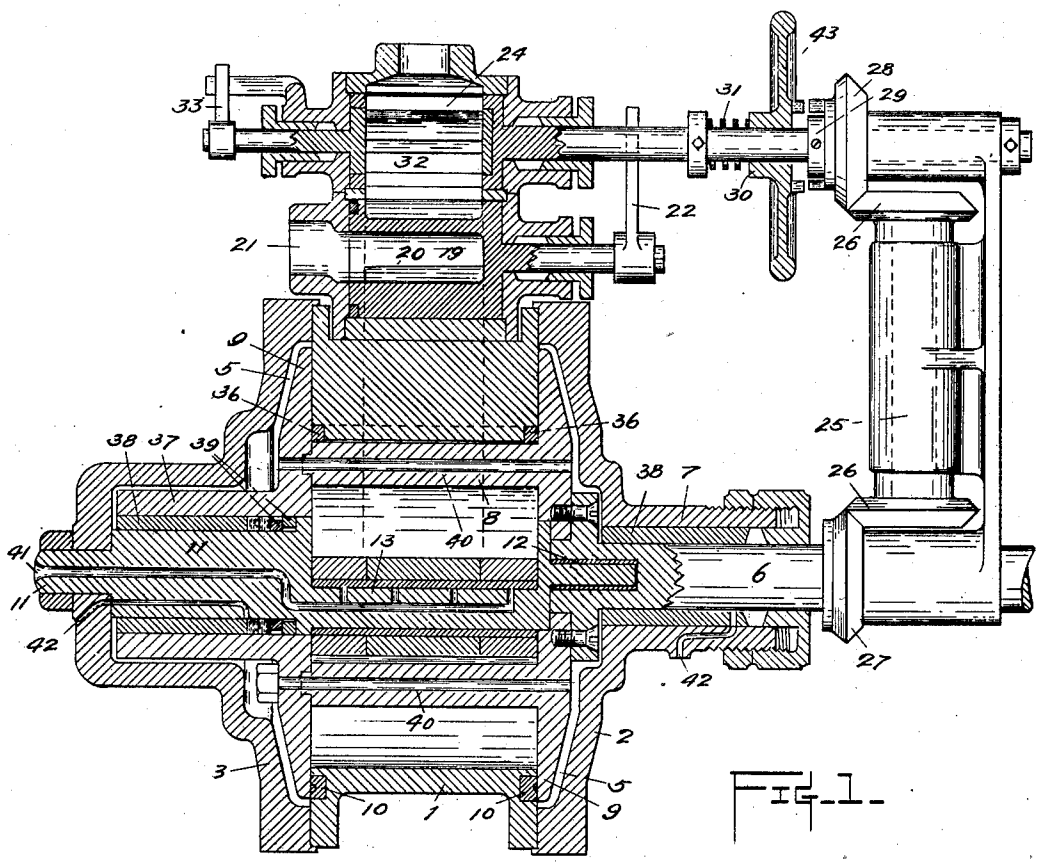


FIG. 1.

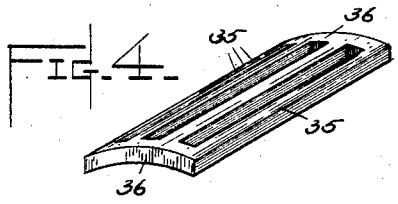


FIG. 4.

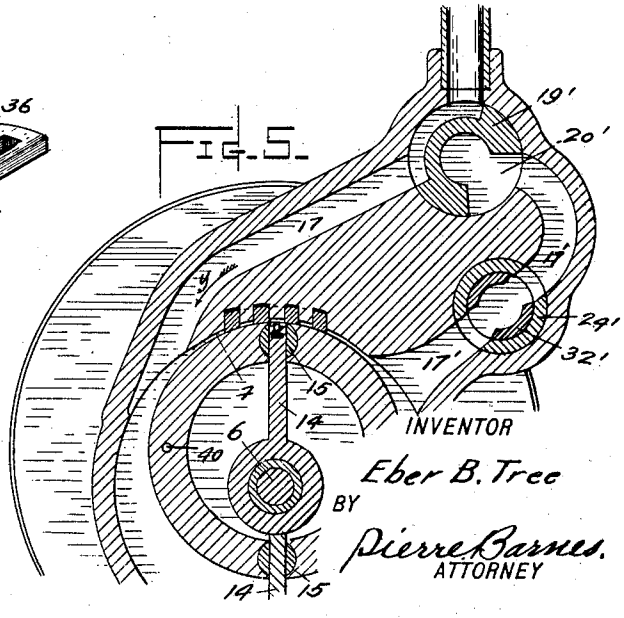


FIG. 5.

WITNESSES:

Geo. C. McDonald

Wm. J. Dick

INVENTOR

Eber B. Tree

BY

Pierre Barnes.

ATTORNEY

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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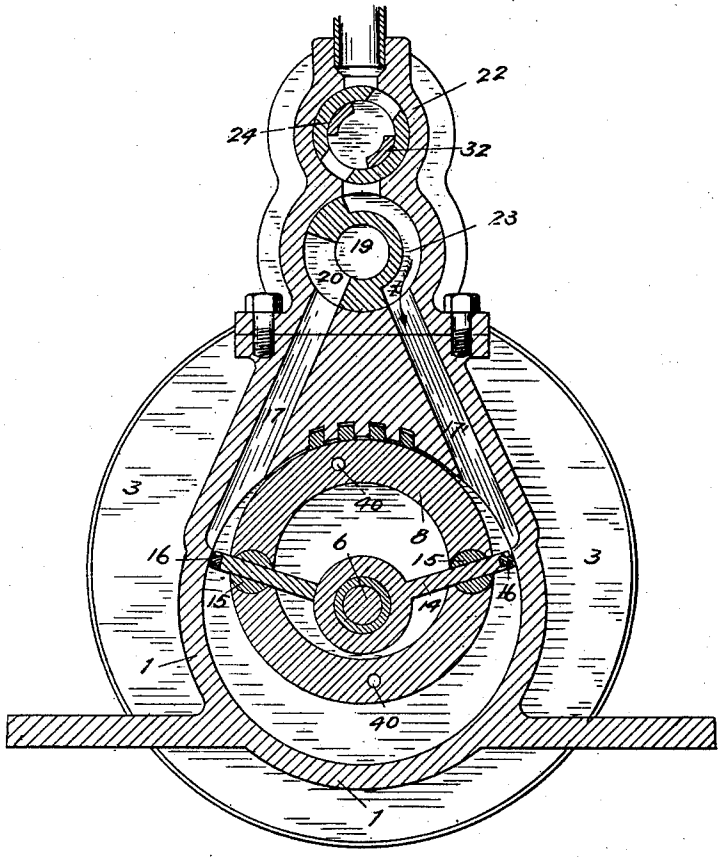


FIG. 2.

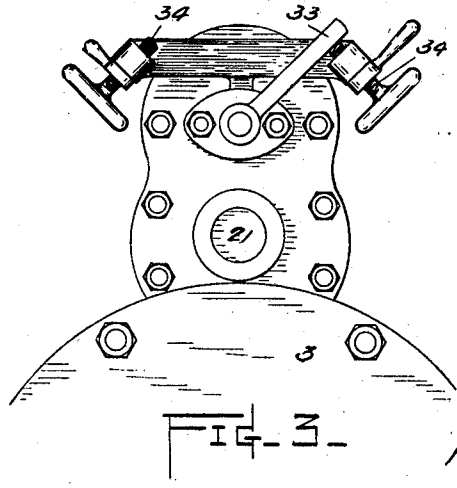


FIG. 3.

WITNESSES:

Geo. E. McDonald

Wm. J. Dick

INVENTOR

Eber B. Tree

BY

Pierre Barnes.

ATTORNEY

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

EBER BLAKE TREE, OF WOODSTOCK, CANADA, ASSIGNOR TO PORTLAND ENGINE COMPANY, OF PORTLAND, OREGON, A CORPORATION.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 711,239, dated October 14, 1902.

Application filed October 31, 1901. Serial No. 80,588. (No model.)

To all whom it may concern:

Be it known that I, EBER BLAKE TREE, a subject of the King of England, residing at Woodstock, in the county of Oxford and Province of Ontario, Canada, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to rotary steam-engines, and especially to improvements in the rotary engine shown and described in my Patent No. 616,642, issued December 27, 1898; and the object of the invention is to produce a simple and efficient engine of the class in which the several parts are constructed and disposed so as to utilize to the fullest extent the steam-power, together with means for controlling the same, which is easily and nicely done by the peculiar form of valves and their operating mechanism, these latter features being among the more important ones of the invention.

The invention consists in certain novel features of construction and combination of parts, which will be hereinafter described and claimed.

In the accompanying drawings, where similar numerals indicate corresponding parts in all of the views, Figure 1 is a central longitudinal vertical section of a rotary engine embodying my improvements. Fig. 2 is a transverse vertical section of the same, showing the valves in position for admitting steam to the cylinder in the direction of the arrow *x*. Fig. 3 is an end elevation of a portion of the engine, showing adjustable means for regulating the travel of the cut-off valve. Fig. 4 is a perspective view of a gridiron-packing device used in the rotary cylinder. Fig. 5 is a transverse vertical section of a part of the engine to show a special arrangement of valves in relation to the cylinder, which is particularly adapted for boat propulsion.

Referring to Figs. 1 and 2, the numeral 1 indicates the main or cylindrical portion of the shell, provided with heads 2 and 3, secured thereto by bolts. The shell is bored so as to be cylindrical, except at the top, where the chamber protrudes in a crescent shape therefrom, its concave surface 4 being the arc of a circle with its center the axis of the main driving-shaft 6, which is eccentric of the cylinder-bore. The cylinder-heads 2 and 3 (see Fig. 1) are dished to provide disk-shaped depressions therein of diameter greater than the diameter of the cylinder-chamber, thus forming annular cavities 5 therearound. The main driving-shaft extends through a stuffing-box 7 in the head 2 and is rigidly secured to a rotatable drum or hollow cylinder 8, having a radius of a sixteenth of an inch, approximately, less than the radius of the concave surface 4 of the said depression and concentric therewith.

Annular flanges 9, integral with the drum, are provided upon its ends to overlap the margin of the cylinder-bore and extend into the annular cavities 5 aforesaid. Grooved packing-rings 10 are interposed between the flanges and the cylinder ends to make as near steam-tight joints as practicable.

At the opposite end of the rotary drum to the main shaft 6 and in line therewith is a stationary shaft 11, extending longitudinally through the drum and projecting into a socket 12, provided in the main shaft, the part 13 within the drum being offset equal to the eccentricity of the cylinder-bore, so as to be central thereof. Hinged upon this offset portion of the stationary shaft are two radial wings 14, which extend through slotted rocking cylinders or crank-pins 15, mounted diametrically opposite in the peripheral wall of the drum.

The wings are provided with T-shaped packing-pieces 16, inserted in registering grooves upon their opposite sides and outer ends for wiping, respectively, the corresponding vertical walls of the rotary drum 8 and the circular wall of the cylinder.

Steam-passages 17 17′ enter the cylinder adjacent to the opposite sides of the crescent-shaped depression and communicate with a compartment in which is located a reversing-valve 19, consisting of a chambered plug having a longitudinal slot 20, which may be brought to register with either of the steam-passages aforesaid and connect the same to an exhaust-opening 21 through the chamber

of the valve by oscillating the same by means of a handle 22, fixed to the valve-spindle external of the casing.

A valve-chest 22 is communicatively connected to the said compartment and by a channel 23, formed in the back of the reversing-valve, to one or the other of the steam-passages 17 or 17′. A valve 24, having two diametrically opposite ports to admit steam to the cylinder twice in each revolution, corresponding with the passage of the wings by the receiving-port, is seated in the steam-chest and rotated coincidently with and from the main driving-shaft by intermediate shaft 25, having miter gear-wheels 26 mounted thereon, meshing with like wheels 27 and 28 on the main shaft and valve-spindle, respectively. The latter wheel 28 is mounted on the said valve-spindle to turn freely thereabout, but kept in mesh with its coupler by a collar 29, rigidly secured to the spindle.

A clutch member 30, splined to the spindle, so as to be free to slide thereon, engages with horns upon gear-wheel 28, operatively connecting the valve with the main shaft, a compression-spring 31 being provided to normally hold the same in engagement. Internally of the valve 24 is seated a supplemental or cut-off valve 32, having, like the main valve, two opposite openings, and is actuated by the frictional contact with its revolving seat, the amount of cut-off or the travel of the valve being regulated by an arm 33, (see Fig. 3,) secured on the end of its spindle, striking an adjustable screw 34 upon one or other side of the medial line, according to the direction in which the engine is rotating.

A packing of peculiar design (see Fig. 4) is introduced between the steam-passages at the top of the cylinder, consisting of a plurality of transverse bars 35, integrally connected at their ends by curved longitudinal bars 36, making a gridiron-like structure, with its under side curved to the arc of a circle having a radius the same as that of the rotary drum and registering in slots arranged to receive the several bars comprising the packing. A sleeve 37 is formed on the end of the rotary drum, extending over the stationary shaft to furnish a journal-support thereat, and this, as well as the other journal of the main shaft and the valve-spindle, is provided with antifriction metal linings 38.

Stuffing-boxes are used where shown, the one on the stationary shaft being positioned between the rotary drum and its journal and formed, preferably, of two metallic rings 39, with a hemp or like fibrous backing. Holes 40 extend from end to end of the rotary drum for passage of steam to equalize the pressure should any escape into either of the spaces beneath the cylinder-heads. Oil is supplied by suitable channels, such as 41, to the journals, and other channels, as 42, are provided to carry away condensations and surplus oil.

A wheel 43 is made integral with the clutch member 30 for the purpose of assisting in starting the machine by uncoupling the clutch against the action of the spring, as shown in Fig. 1, and moving the spindle so that the valve-ports coincide with the steam-passages.

Referring to Fig. 5, the steam-passages 17 17′ enter the cylinder from the reversing-valve compartment, as in the arrangement already described; but in this the steam-regulating valve 24′, with the supplemental cut-off 32′ seated therein, is positioned between the reversing-valve 19′ and the cylinder on the go-ahead side, thus admitting steam under full pressure in the reverse direction, as shown by arrow *y*. The exhaust then passes through the steam-valve, and thence by way of the port-opening 20′ to the atmosphere, the valve-driving mechanism being uncoupled during this operation. By oscillating the reverse-valve and releasing the coupling upon the valve-spindle the go-ahead motion is quickly accomplished.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a rotary engine, the combination with a cylinder, a driving-shaft extending therein and eccentric thereto; a drum concentric of and rotatable with the driving-shaft; a stationary shaft in line with and projecting through the drum from the side opposite to the said driving-shaft, the part internal of the drum being offset to be central of the cylinder-bore; and two wings hinged to said offset portion of the stationary shaft; of a sleeve extension to the drum to provide a journal, upon the said stationary shaft, external of the drum; annular flanges upon the drum ends adapted to extend beyond the margin of the cylinder-bore into cavities provided between the cylinder ends and heads; a packing-ring provided between said flanges and the cylinder ends; a gridiron packing between the top of the drum and the cylinder; a packing introduced between the drum-journal on the stationary shaft and the drum; and communicative connection between the cavities between the drum and the cylinder-heads.

2. In a rotary engine, in combination with a cylinder, a main driving-shaft carrying a hollow drum eccentric with the cylinder, a stationary shaft having one of its ends projecting into said main driving-shaft, an extension carried by the drum and receiving the other end of said stationary shaft, an offset portion on said stationary shaft within the drum carrying revoluble wings, said drum being rigidly secured to the main driving-shaft and carrying flanges with a space between themselves and the side walls of the cylinder, said drum having longitudinal steam-passages therein communicating with the space formed between the said flanges and the side walls of the cylinder, and packing carried by the wings, substantially as described.

3. In a rotary engine, the combination with a cylinder having cavities between its ends

and the heads carried thereby, a rotatable drum eccentric with the cylinder carrying flanges upon its ends, a main driving-shaft having said drum rigidly secured thereto, a stationary shaft extending into said drum and having its end supported by said main driving-shaft, an offset portion on said stationary shaft carrying revoluble wings, an extension on said drum surrounding said stationary shaft, and passages connecting said cavities extending through the drum, substantially as described.

4. In a rotary engine, the combination with the cylinder, a rotary drum, a driving-shaft, and revoluble wings hinged to a stationary shaft and protruding through the said drum; of a transversely-curved packing composed of transversely and longitudinally arranged bars integrally connected together and adapted to register in slots provided in the wall of cylinder.

5. In a rotary engine, in combination with a cylinder, a rotary drum, a driving-shaft, a stationary shaft, revoluble wings hinged upon an offset of the stationary shaft and extending through the peripheral wall of said drum, and a valve-chest communicatively connnected by passages with the cylinder and the source of power; of a rotary valve having an aperture diametrically therethrough positioned within said valve-chest, means connected to the driving-shaft and to said valve for actuating the latter, a clutch connected to said valve and adapted for engagement with said means, a supplemental valve located within first-named valve, and means carried by the supplemental valve and adapted for engagement with adjustable means carried by the engine whereby the cut-off may be regulated, substantially as described.

6. In a rotary engine, in combination with a cylinder; a rotary drum, a driving-shaft; a stationary shaft; revoluble wings hinged upon an offset of the stationary shaft and extending through the peripheral wall of said drum; a valve-chest communicatively connected by passages with the cylinder and the source of power; a rotary valve having an aperture extending diametrically therethrough positioned within said valve-chest, and gearing and shaft mechanism for driving the valve from the said shaft; of a supplemental valve, seated within the said valve, and actuated by frictional contact therewith; and a cut-off-regulating device, such device comprising an arm fixed to the outer end of supplemental valve-spindle and adjustable stops secured to framework upon the engine.

7. In a rotary engine, in combination with a cylinder; a rotary drum; a driving-shaft, a stationary shaft; revoluble wings, hinged upon an offset of the stationary shaft and extending through the peripheral wall of said drum; and a valve-chest communicatively connected by passages with the cylinder and the source of power; of a rotary valve positioned within said valve-chest, and gearing and shaft mechanism for driving the valve from the said shaft; and means for operating the valve by hand.

8. In a rotary engine, the combination with a cylinder, of a drive-shaft, a stationary shaft having one of its ends projecting into said drive-shaft, a drum having flanged ends rigidly secured to said drive-shaft, and an extension carried by one of said flanges and journaled on said stationary shaft, substantially as described.

9. In a rotary engine, in combination with a cylinder, a rotary drum, a stationary shaft, wings hinged to said stationary shaft and extending through the periphery of the said drum, a driving-shaft, and two steam-passages entering said cylinder and connected together; of a reversing-valve positioned in said connection, a steam-valve interposed in one of the steam-passages between the said reversing-valve and the cylinder, and means for operating the same by hand or from the main driving-shaft.

10. In a rotary engine, the combination with a cylinder, of a rotary drum, a stationary shaft having wings, hinged thereto, a driving-shaft, two steam-passages entering said cylinder and being in communication with each other, said stationary shaft having longitudinal oil-channels therein, with a series of transverse oil-passages leading to the journals, and channels located within the said shaft to carry away the surplus oil, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

EBER BLAKE TREE.

Witnesses:
PIERRE BARNES,
JOHN N. PERKINS.