No. 819,003.

PATENTED APR. 24, 1906.

J. H. CORTHÉSY.

ROTARY ENGINE.

APPLICATION FILED FEB. 1, 1905.

3 SHEETS—SHEET 1.

FIG. 2.

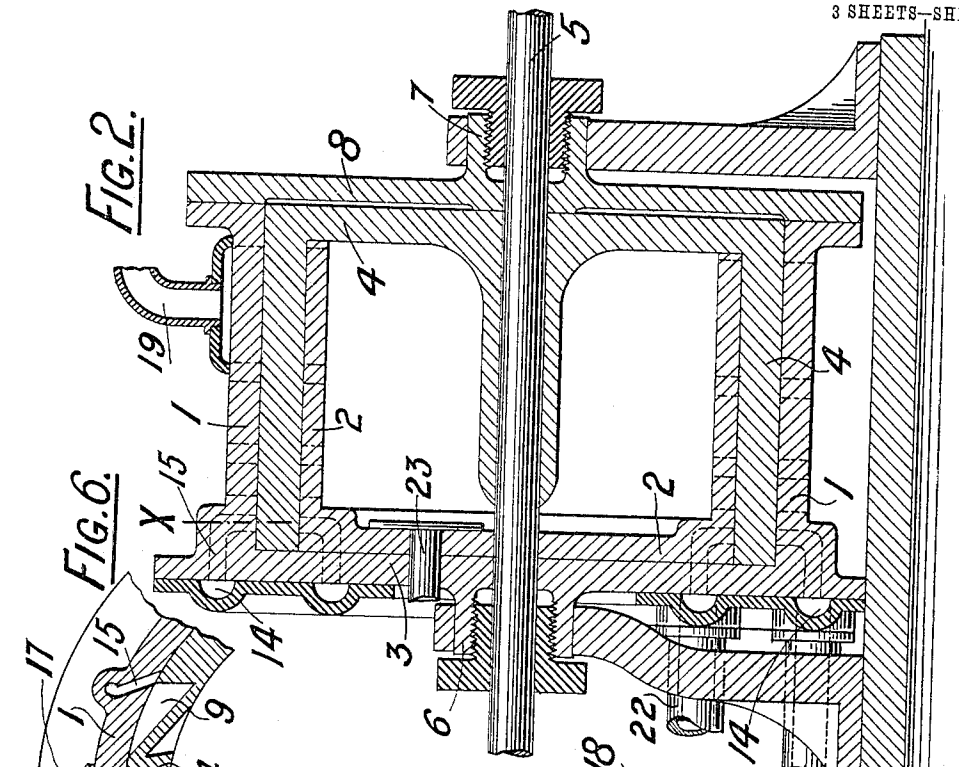


FIG. 6.

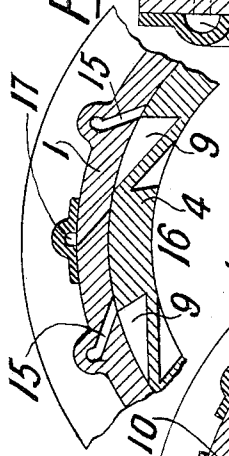
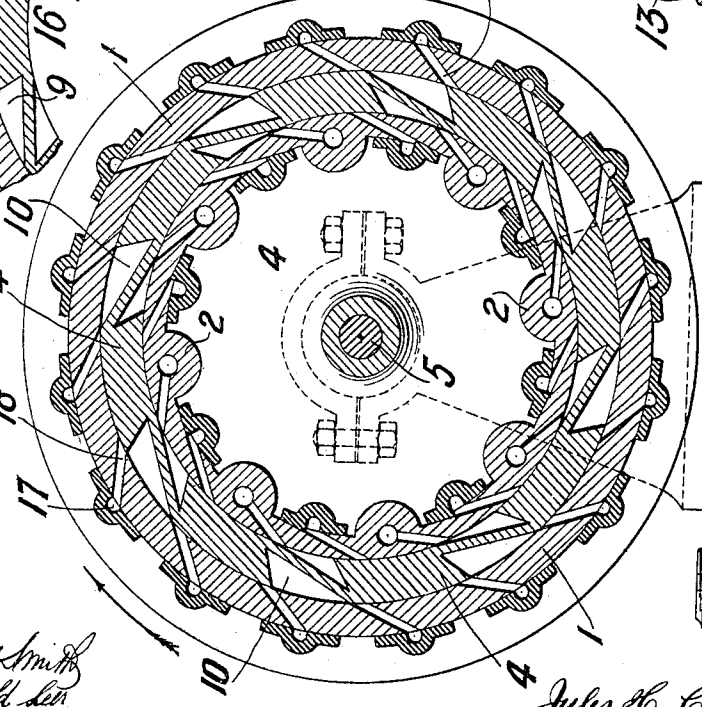


FIG. 1.



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3 SHEETS—SHEET 2.

FIG. 4.

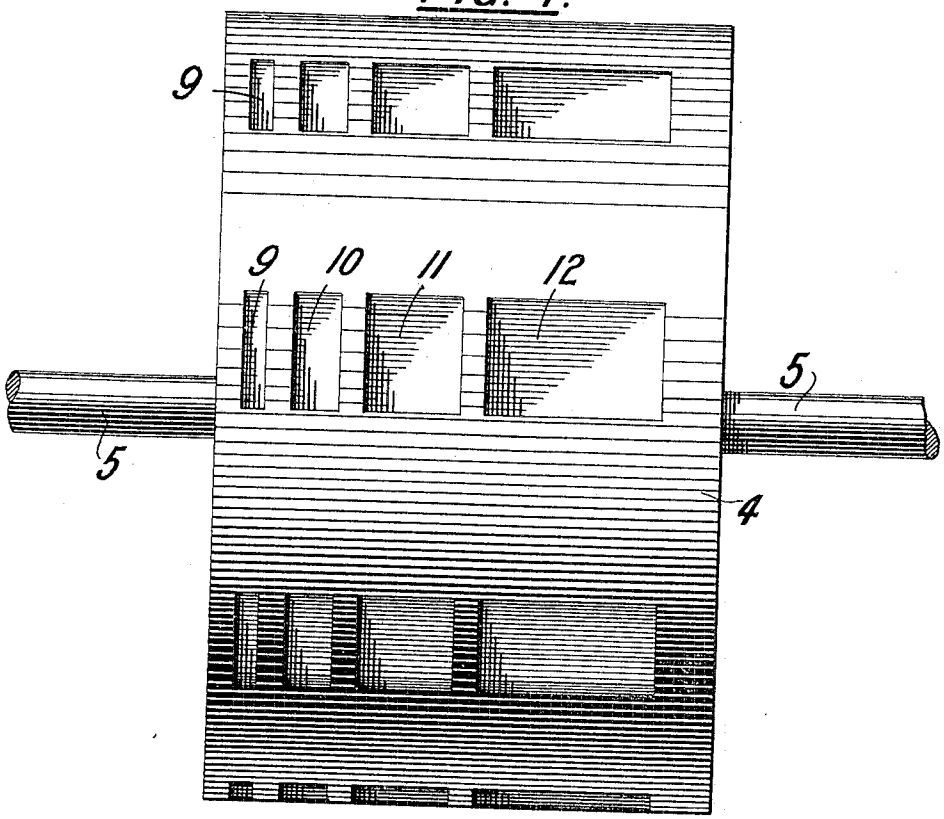


FIG. 3.

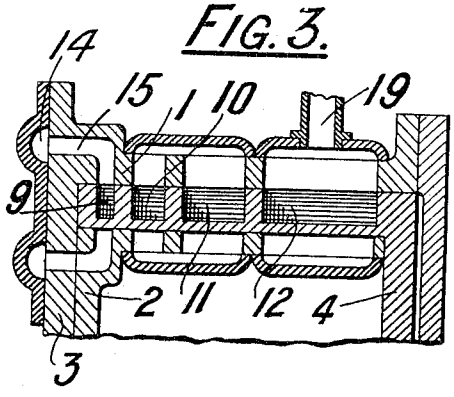
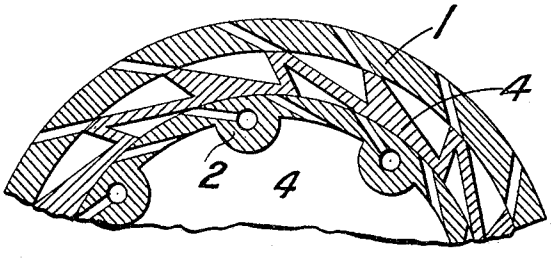


FIG. 7.



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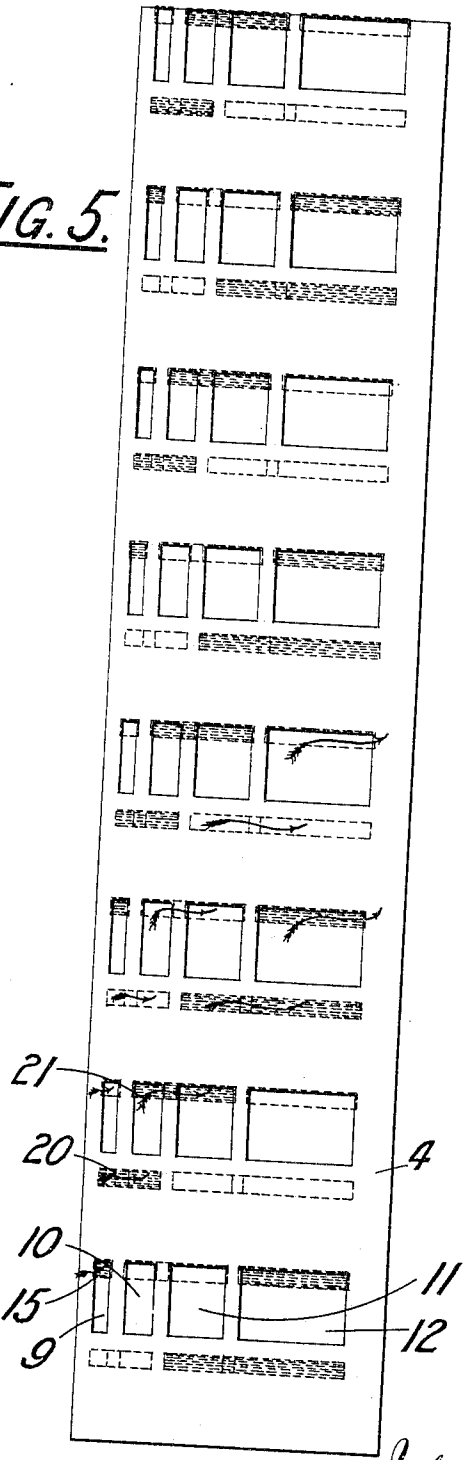
3 SHEETS—SHEET 3.

FIG. 5.



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UNITED STATES PATENT OFFICE.

JULES HIPPOLYTE CORTHÉSY, OF LONDON, ENGLAND, ASSIGNOR OF ONE-HALF TO GERARD FEATHERSTONE GRIFFIN, OF LONDON, ENGLAND.

ROTARY ENGINE.

No. 819,003. Specification of Letters Patent. Patented April 24, 1906.

Application filed February 1, 1905. Serial No. 243,616.

To all whom it may concern:

Be it known that I, JULES HIPPOLYTE CORTHÉSY, a citizen of the Swiss Republic, residing at London, England, have invented a certain new and useful Improvement in Rotary Steam-Engines, of which the following is a specification.

This invention refers to rotary steam-engines which have a steam-revolved drum mounted and fixed concentrically upon a shaft, the drum fitting within a stationary casing; and the invention particularly refers to the construction and arrangement of the revolving drum and of conducting steam-passages formed in the stationary casing, whereby the expansion of the steam is utilized to advantage.

The invention also provides for the reversal of the engine when required, and, further, the arrangement is such that the drum is properly balanced.

According to this invention the outer surface of the drum is formed with trough-like channels extending longitudinally of the said drum and at equal distances apart around the periphery thereof. Each channel is divided transversely of its length by partitions (formed integrally with the drum) into chambers of unequal cubical capacities, and the outer casing has ports and passages by which the steam after entering the smallest chamber of a channel is as the drum revolves conducted through a passage in the casing and allowed to expand into the next larger chamber, and so on to utilize the expansive force of the steam. When the engine is made reversible, similar series of unequal-sized chambers are formed in the interior surface of the drum, and an interior stationary casing has ports and passages to serve the said interior chambers. The solid parts of the drum between the divided trough-like channels effect the opening and closing of the steam and exhaust ports in the casing as the drum revolves, obviating the employment of separate moving valves, and steam is admitted to the drum by diametrically opposite ports, so balancing the said drum.

The invention is described with reference to the accompanying drawings, which show an example of construction of my improved expansion rotary engine.

Figure 1 is a vertical section taken transversely to the axis of the engine. Fig. 2 is a longitudinal section of the engine shown at Fig. 1. Fig. 3 is a longitudinal section of a portion of the engine similar to Fig. 2, but taken in a plane passing through steam-distributing passages in the stationary casing and through chambers in the drum. Fig. 4 is a longitudinal elevation of the revolving drum removed from its inclosing casing. Fig. 5 is a development of the surface of the revolving drum, showing the steam-chambers therein and indicating the direction taken by the steam during the working of the engine. Fig. 6 is a vertical transverse section taken about the line X of Fig. 2 and shows a portion of the outer casing in section and a portion of the drum in section in order to illustrate the arrangement of the inlet and outlet passages for the steam to and from the high-pressure chambers of the drum. Fig. 7 shows a portion of an engine similar to the view shown at Fig. 1, but of slightly-modified construction.

According to this invention a stationary cylindrical outer casing 1 is constructed, and there is provided (when the engine is to be reversible) an inner stationary casing 2 within the outer casing aforesaid, there being thus formed between the interior wall of the outer casing 1 and the exterior walls of the inner casing 2 an annular chamber which at one end is closed by an end wall 3 and at the other end is open. Within this annular chamber there is introduced a hollow drum 4, adapted to fit and be capable of being revolved within the annular chamber aforesaid. The drum 4 is fixed on a shaft 5, passing concentrically through the stationary casings and having bearings, one of which, 6, is shown as being formed in the end wall of the stationary casing 3, while the other bearing, 7, is formed in a cover 8, which closes the otherwise open end of the said stationary casing. That annular portion of the drum 4 which enters between the inner and outer stationary casings 1 2 is the portion which is to be acted upon by the steam in order to cause the revolution of the drum 4 and of the shaft 5.

At equal distances apart around the circular outer surface of the drum a number of trough-like channels are formed (such as are very clearly shown at Fig. 4) extending longitudinally. Each "longitudinal channel," as it is termed, is divided transversely of its length by partitions formed integrally with

the drum into several separated chambers differing in width and cubical capacity, there being in the present construction four of such chambers 9 10 11 12 in each series, and in the construction shown as an example there are eight series at equal distances apart around the external periphery of the drum.

Each of the chambers in vertical transverse section is of wedge form, Fig. 1, and the steam enters in a tangential direction into the said chambers at the broad end of the wedge and acts by impact up against the broader end of the wedge, with the result of driving the drum round, and so driving the shaft 5.

Now a characteristic feature of the present invention is that the steam acts expansively, and to this end it is caused to enter first a chamber 9 of small cubical capacity, from which chamber the steam is transferred after the drum has rotated through a certain angle, being conveyed by passages in the stationary casing to the next chamber 10 of larger capacity, and at the next period of rotation it is conveyed through passages in the stationary casing to the chamber 11 and in due course from that chamber to the chamber 12, from which the steam is exhausted. In order to carry out this steam distribution, pressure-steam is supplied by a pipe 13, Fig. 2, to an annular supply-conduit 14, from whence it enters supply-passages 15, formed in the casing 3. (Shown clearly at Fig. 3.) These passages 15 extend inward through the wall of the casing 1 and open out on the interior surface thereof, being also inclined in a tangential direction, as is clearly shown by the detached sectional view at Fig. 6. There are eight of these supply-passages 15 in the construction shown, alternating with similarly-inclined outlet-passages 16, extending through the wall of the casing 1, through which passages 16 the steam is conducted away to the next larger chamber of the drum.

The passages 15 and 16 open into the interior of the casing 1 just above the path of travel of the high-pressure chambers 9 of the drum, (see Fig. 4,) and the length of the circular surface of the drum between the adjacent ends of any two chambers 9 is in such relation to the distances between the passages 15 and 16 that the inlet-passage 15 is closed by the circular surface of the drum at about the same time that the outlet-passage 16 comes into communication with the said chamber 9.

Each passage 16, Fig. 6, communicates by a tubular passage 17 (which may be formed in the casing 1 or constructed exteriorly upon the same, as shown) with inclined inlet-passages 18, (see Fig. 1,) which open into the interior of the casing 1 in the path of travel of the next larger chambers 10, so that the steam exhausted from the chamber 9 passes through the passages 16, 17, and 18 and expands into the next chamber 10 of larger capacity, and the passage 18 being inclined the expanding steam acts by impact against the end of the said chamber 10 to aid in driving the drum.

From the chamber 10 the steam passes by similar passages to those described and is admitted to the larger-capacity chamber 11 and from thence in due course to the chamber 12, from which as the drum revolves the steam is taken off by an exhaust passage and pipe 19. (See Fig. 3.)

The diagram view at Fig. 5 well illustrates the course taken by the steam, showing that the steam is admitted to that high-pressure chamber 9 of the drum indicated at the lower left-hand of the diagram Fig. 5, the admittance being by the passage 15, which is indicated by the shaded dotted rectangle, and so produces rotary motion of the drum. It will be understood that high-pressure steam is admitted simultaneously to all the chambers 9; but for simplicity of description I will only refer to that chamber 9 as above stated. As the drum revolves the high-pressure chamber 9 comes opposite to the passage 16, Fig. 6, and by passages 17 and 18, Fig. 1, all represented by the shaded dotted rectangle 20 of the diagram, the steam is delivered into the chamber marked 10, which will then be opposite to the inlet-passage 18, so that the steam which has been employed in the chamber 9 will be allowed to expand into and to give its impulse to the chamber 10 as it passes. From the chamber 10 as the drum revolves the steam will be allowed to enter by the passages indicated by the shaded rectangle 21 to the chamber marked 11 of still larger capacity, and so on, and it will therefore be seen according to this arrangement that the steam will be expanded into chamber after chamber of each series as the drum revolves.

The description so far has dealt entirely with the exterior channels of the drum and the passages in the outer casing, and when the engine is to be driven only in one direction the channels need only be formed upon the said exterior surface, and in such an instance I may dispense with the inner stationary casing; but where the engine is to be made reversible the inner stationary case becomes essential and is therefore shown in the drawings. In the reversible engine shown the interior periphery of the drum is formed with channels transversely divided and with ports and passages in the inner stationary case precisely similar to those described with reference to the chambers or channels on the outer surface of the drum, excepting that the position of the wedge-section channels is reversed, as will be readily seen, so that the entering steam drives the drum in the reverse direction to that at which it would be driven through the medium of the channels on the exterior surface of the drum. Therefore such an engine, which is intended to be gen-

erally driven in the direction of the arrow, Fig. 1, can be immediately reversed in direction by cutting off the steam from the steam-supply pipe 13 and allowing the entry of steam by the steam-supply pipe 22, which serves the passages of the inner stationary case 2. 23, Fig. 2, is an exhaust-pipe by which the steam is exhausted from the interior of the case 2 after it has been utilized and expanded in the inner chambers of the drum.

The modified construction of the drum 4, as shown at Fig. 7, differs from Fig. 1 in that a greater number of series of chambers are formed on the exterior of the said drum.

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

1. In a rotary steam-engine, the combination with a drum having trough-like channels extending longitudinally and at equal distances apart around the periphery, the channels being each wedge-shaped in cross-section, and tapering in the opposite direction to the rotation of the drum, a number of partitions extending transversely across each channel to divide the latter into a number of chambers of unequal cubical capacities, a chamber of small capacity near one side of the cylinder, and then a chamber of larger capacity, and another chamber of still larger capacity, and so on toward the other side of the cylinder, and a shaft passing axially through the drum on which shaft the drum is fixed; of a stationary casing formed with steam-passages for the distribution of steam to the chambers, the admittance-passages to the chambers extending to the interior of the casing and inclined tangentially to the direction of motion of the drum, the steam-exit passages in the casing being located between the admittance-passages, the distance apart of the openings of the passages in the interior of the casing taken consecutively being less than the length of surface of the cylinder in a circular direction between the channels, the casing also having conveyance-passages communicating between the exhaust-passages serving one circular series of chambers and the admittance-passages serving a second larger circularly-arranged series of chambers and so on.

2. In a rotary steam-engine, the combination with a drum having trough-like channels extending longitudinally and at equal distances apart around the periphery, the channels being each wedge-shaped in cross-section, and tapering in the opposite direction to the rotation of the drum, a number of partitions extending transversely across each channel to divide the latter into a number of chambers of unequal cubical capacities to form a chamber of small capacity near one side of the cylinder, and then a chamber of larger capacity, and another chamber of still larger capacity and so on toward the other side of the cylinder, and a shaft passing axially through the drum on which shaft the drum is fixed; of a stationary casing having an annular channel 14 for pressure-steam and formed with high-pressure-steam-admittance passages 15 extending to the interior of the casing to serve the smallest chambers 9 of the drum with steam as they rotate, a circular series of exit-passages 16 located between the inlet-passages 15 for the exit of steam from the smallest chambers of the drum, the casing having inclined inlet-passages 18 to the next larger series of chambers 10, and passages 17 communicating between the passages 16 and 18 whereby the exhaust-steam from the chambers 9 is conveyed to the chambers 10, and similar passages conveying the steam from the chambers 10 to the chambers 11 and 12 the casing having exhaust-passages for carrying off the steam from the chambers 12, as set forth.

3. In a rotary steam-engine, the combination with a drum having trough-like channels on both its outer and inner peripheries extending longitudinally and at equal distances apart around the surfaces thereof, partitions extending transversely across each channel to divide the latter into chambers of unequal cubical capacity, and a shaft passing axially through the drum on which shaft the drum is fixed; of a stationary casing within which the drum is contained and can revolve, an inner stationary casing entering the drum and fitting its inner periphery, end covers for the stationary casing, bearings in the said covers for the drum-shaft, the outer casing having passages for the distribution of steam to the drum-chambers by which the steam after entering the smaller chambers on the exterior surface of the drum is as the drum revolves conducted therefrom through passages of the casing and allowed to expand into the next larger chamber and from that larger chamber as the drum revolves to a still larger chamber and so on for driving the drum in one direction, the inner casing 2 having similar passages for supplying and conducting steam to and from the series of chambers on the inner periphery of the drum, and means for supplying steam to either the passages in the outer casing or to the passages in the inner casing 2 according to which direction the engine is to be driven as set forth.

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