No. 821,603. PATENTED MAY 29, 1906.

W. J. ARTIBEE.

COMPOUND ROTARY ENGINE.

APPLICATION FILED SEPT. 5, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

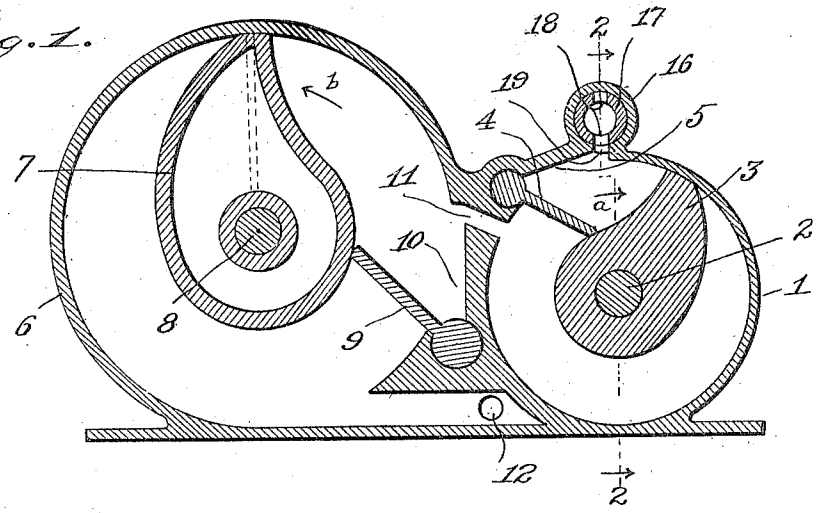


Fig. 2.

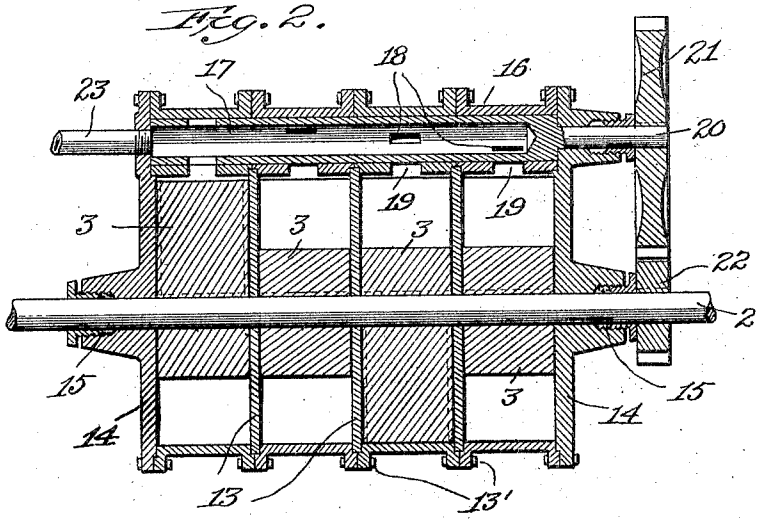
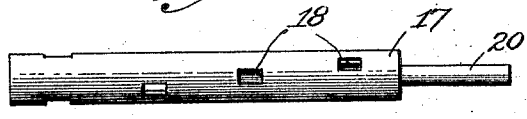


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 4.

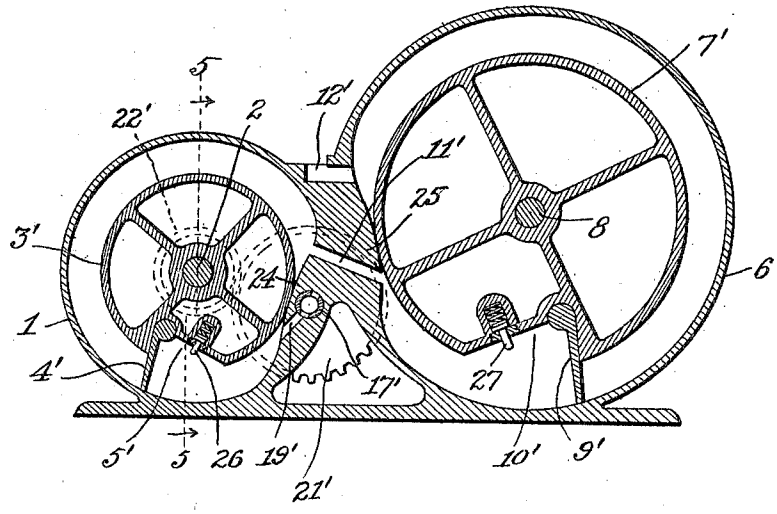
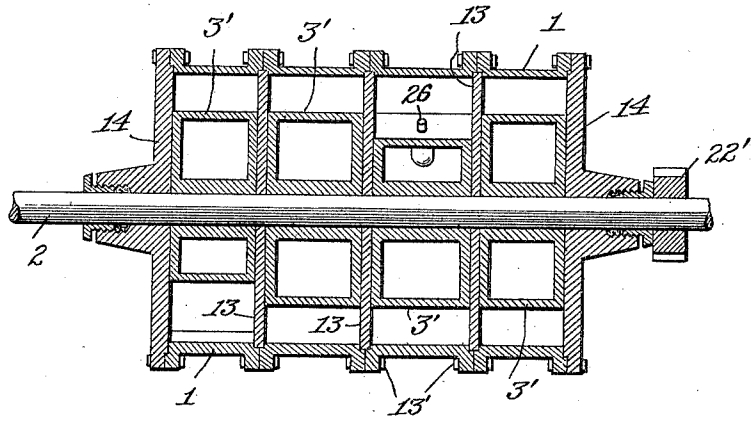


Fig. 5.



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COMPOUND ROTARY ENGINE.

No. 821,603. Specification of Letters Patent. Patented May 29, 1906.

Application filed September 5, 1905. Serial No. 277,028.

To all whom it may concern:

Be it known that I, WILLFRED J. ARTIBEE, a citizen of the United States, residing at Chazy, in the county of Clinton and State of New York, have invented certain new and useful Improvements in Compound Rotary Engines, of which the following is a specification.

My invention relates to compound rotary engines, and has for its object to devise a construction wherein is provided two rotary shafts from which power can be transmitted independently or to one main shaft by any means readily suggested to those skilled in the art.

A further object is to construct the cylinders, pistons, distribution-valve, and steam-chest so that a motor may be built up from a plurality of unit-sections and enable engines of different horse-power to be readily assembled or similar engines to be increased or decreased with slight changes, thereby avoiding the necessity of having many patterns or different-sized tools for the construction of large and small engines.

My invention consists of features and relative arrangements of parts which will hereinafter appear from the detailed description and be particularly pointed out in the appended claims.

In the accompanying two sheets of drawings, in which similar reference characters indicate the same parts throughout the several figures, Figure 1 is a transverse section through a high and low pressure cylinder of one form of my invention. Fig. 2 is a longitudinal section taken on line 2 2 of a form of my engine comprising four high-pressure cylinders. Fig. 3 is an elevation of the distribution-valve as applied to an engine in which four cylinders are used. Fig. 4 is a transverse section of a modified form of my invention. Fig. 5 is a longitudinal section taken on line 5 5 of Fig. 4, in which four high-pressure cylinders are used.

Referring to Fig. 1 of the drawings, my invention consists of a high-pressure cylinder 1, having a central rotary shaft 2, to which is rigidly connected a piston 3, preferably shaped as indicated and having its outer end and sides so machined or packed as to form a fluid-tight joint with the inner sides or walls of the cylinder 1.

4 is an abutment suitably pivoted at one end to the inner side of the cylinder, the outer end of which is adapted to ride and rest on the outside of the rotary piston during its entire revolution.

5 is a recess into which the abutment 4 is permitted to pass when the outer end of the piston 3 passes the portion of the cylinder occupied by the abutment.

Made integrally or secured to one side of the high-pressure cylinder 1 is a larger or low-pressure cylinder 6, which is provided with a similar-shaped rotary piston 7, fastened on an independent shaft 8. In the cylinder 6 is provided a like swinging or pivoted abutment 9, with a similar recess 10, the parts constructed made fluid-tight and cooperating in the same manner as those of the high-pressure cylinder 1.

11 is a port connecting the high-pressure cylinder with the low-pressure cylinder, and 12 is the exhaust-port for the low-pressure cylinder.

As will be seen from Fig. 2, a plurality of the above-described set of high and low pressure cylinders may be placed side by side, being separated by walls 13 and secured together by bolts 13′, so as to form one engine with two separate and distinct rotary shafts 2 and 8, the shaft 2 being fastened and common to all the pistons in the high-pressure cylinder 1, while shaft 8 is common to those in the low-pressure cylinder 6.

14 14 are the ends or heads of the cylinders, which are provided with the usual stuffing-boxes 15 15 for the section of the rotary shafts passing through the same.

Any form or construction of packing for the section of the pistons sliding against the side or outer walls of the cylinders may be provided and forms no essential part of my invention.

Attached to the upper side of the high-pressure cylinder is a steam chest or chamber 16, which is preferably cylindrical in shape and is provided in its interior with a hollow rotary valve 17. Piercing the walls of the valves 17 and properly spaced along its length are ports 18, which register with ports 19, leading into the interior of the high-pressure cylinder 1 directly in front of the pivoted abutment 4. Said valve 17 has a stem or extension 20 at one end, which passes through a suitable stuffing-box in the head 14 of the cylinder. Attached to said stem 20 is a gear

21, which meshes with a gear 22, fixed to one end of the rotary shaft 2 of the high-pressure cylinder. These gears 21 and 22 are proportioned so that the shaft 2 rotates as many times faster than the valve-stem 20 as there are sets of high and low pressure cylinders, and, as indicated in the present case, four to one, and while I show and prefer this relation of the two gears 21 and 22 it may be changed without departing from the essential features of my invention.

23 is a pipe leading the live steam or fluid-pressure into the interior of the hollow rotary valve 17.

Referring to Figs. 4 and 5, the general construction and operation of the modification shown therein are the same as that shown in Figs. 1 and 2, with the exception that the pistons 3′ and 7′ are cylindrical in form and of a smaller diameter than their inclosing cylinders 1 and 6. Each of the high-pressure pistons 3′ and low-pressure pistons 7′ is provided, respectively, with hinged extensions 4′ and 9′, which project beyond the outer cylindrical surface of the piston and bear against the inner surface of their respective cylinders and form a fluid-tight joint therewith. Said pistons 3′ and 7′ are also provided with cut-out sections 5′ and 10′, respectively, for permitting their hinged extensions 4′ and 9′ to return within the cylindrical portion of the piston and have the outer ends of the extensions pass over the protrusions 24 and 25 in the inner surfaces of the cylinders 1 and 6, respectively. The protrusions extend out to the cylindrical portion of the pistons in their cylinders and close up the space or gap between the inner sides of the cylinders and pistons, thereby forming fixed abutments having gradually-inclined sides for the hinged extensions 4′ and 9′ to ride up and down or over them during the revolution of the high and low pressure pistons 3′ and 7′.

26 and 27 are spring-pressed buttons in the cut-out sections 5′ and 10′ and against which the hinged sections 4′ and 9′ are forced in passing over the protrusions or abutments 24 and 25. By this arrangement the extensions 4′ and 9′ are forced out by the spring-buttons, whereby the fluid-pressure is enabled to pass between the extensions and cylindrical portions of the pistons.

19′ is the inlet-port for the fluid-pressure to the high-pressure cylinder and is controlled by a rotary valve 17′ of the same construction and rotated by the gears 21′ and 22′, as previously described.

11′ is the port connecting the high and low pressure cylinders, and 12′ is the exhaust-port of the low-pressure cylinder.

The operation of my invention is as follows: Referring to the form shown in Figs. 1 and 2, the steam or fluid-pressure enters, by means of the pipe 23, into the hollow rotary valve 17 and by means of the ports 18 and 19 is permitted to pass into the high-pressure cylinder 1. The fluid-pressure reacts against the swinging abutment 4 and causes the piston 3, with its shaft 2, to rotate in the direction as indicated by the arrow *a*. As soon as the outer end of the piston passes beyond the port 11 the expanded steam passes into the low-pressure cylinder and reacts against the abutment 9 and forces the piston 7 and shaft 8 to rotate in the direction of the arrow *b*. The steam after its second expansion passes to the atmosphere or a suitable condenser by means of the exhaust-port 12. The gears 21 and 22 are so proportioned and the shafts so connected that when the piston of the high-pressure cylinder is at the end of its stroke the low-pressure piston is about to commence its stroke in order to receive the once-expanded steam from the high-pressure cylinder.

It can be readily seen owing to the several sets of high and low pressure cylinders being entirely independent and distinct from each other the power of an engine can be increased or decreased by adding or removing one or more of the sets comprising a high and low pressure cylinder, it being simply necessary to construct a proper length of shaft, distribution-valve, with the necessary ports and operating-gears, in order to preserve their proper operative relation, as above described.

The operation of the modification shown in Figs. 4 and 5 is substantially the same, only the pressure of the steam acts against the abutments 24 and 25 and the pivoted extensions 4′ and 9′. The steam enters the high-pressure cylinder by ports 19′, distributed by a similar rotary valve 17′.

11′ is the port leading the steam from the high to the low pressure cylinder, and 12′ is the final exhaust-passage.

From the foregoing description and mode of operation of my invention it will be seen that I have devised a simple means for constructing a compound rotary engine which is provided with two independent shafts, one of which is rotated by the high-pressure cylinders and the other by the low-pressure cylinders, and the horse-power can be changed without the necessity of much additional cost or delay.

Having now fully described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. A compound rotary engine comprising a plurality of separable and independent high-pressure cylinders, a rotary piston in each of the cylinders, a rotary shaft connecting the pistons in the high-pressure cylinders, a steam-chest, a distribution-valve controlling the live steam into the high-pressure cylinders, a plurality of low-pressure cylinders corresponding to the number of high-pressure cylinders, a port connecting each one of the high-pressure cylinders with a corresponding low-pressure cylinder, a rotary pis-

ton in each of the low-pressure cylinders, a separate rotary shaft connecting the pistons in the low-pressure cylinders and an exhaust for the low-pressure cylinders.

2. A compound rotary engine comprising a plurality of separable and independent high-pressure cylinders, a rotary piston in each of the cylinders, an abutment in each of the cylinders, a rotary shaft connecting the pistons in the high-pressure cylinders, a steam-chest, a distribution-valve controlling the live steam into the high-pressure cylinders, a plurality of low-pressure cylinders corresponding to the number of high-pressure cylinders, an abutment in each of the low-pressure cylinders, a port connecting each one of the high-pressure cylinders with a corresponding low-pressure cylinder, a separate rotary shaft connecting the pistons in the low-pressure cylinders, an exhaust for the low-pressure cylinders and means for properly operating the distribution-valve.

3. A compound rotary engine comprising a plurality of high-pressure cylinders, a rotary piston in each of said cylinders, a rotary shaft connecting the pistons, a steam-chest, a distribution-valve in the steam-chest and controlling the live steam to the high-pressure cylinders, a plurality of low-pressure cylinders, a port connecting each of the high-pressure cylinders with a low-pressure cylinder, a rotary piston in each of the low-pressure cylinders, a separate rotary shaft connecting the pistons in the low-pressure cylinders, an exhaust-port for the low-pressure cylinders, and means for properly operating the distribution-valve.

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

WILLFRED J. ARTIBEE.

Witnesses:
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ORRIN E. MINKLER.