(No Model.) 2 Sheets—Sheet 1.

A. A. W. VAN REEDE.

ROTARY ENGINE.

No. 305,358. Patented Sept. 16, 1884.

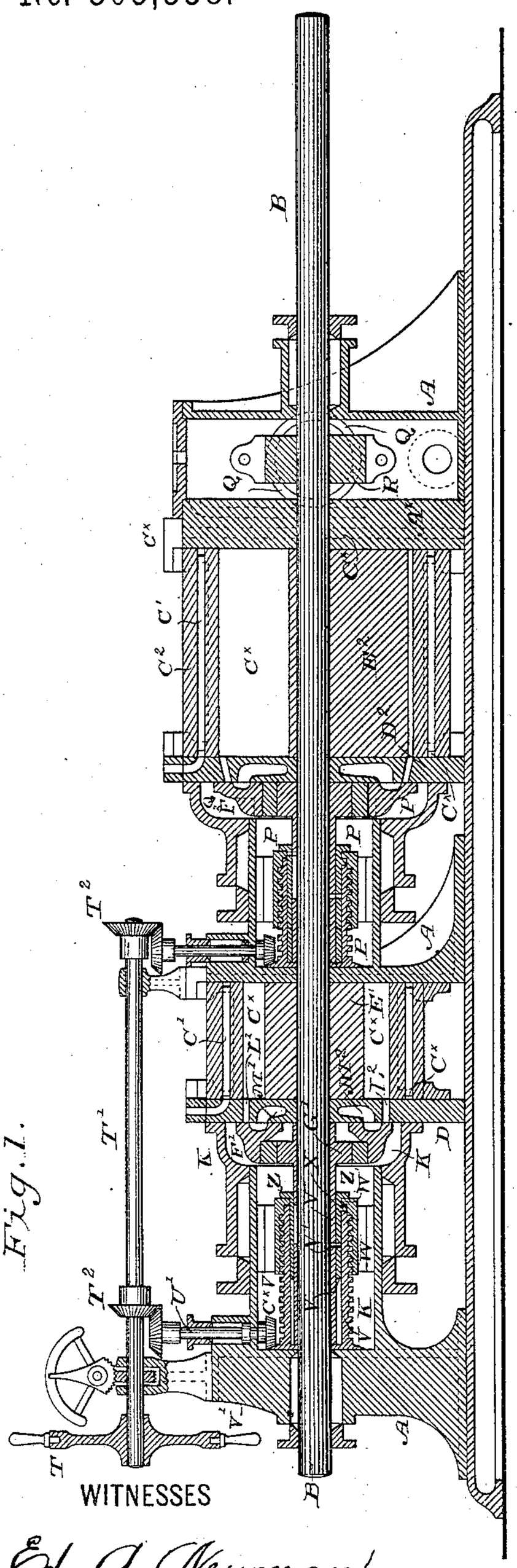

Fig. 1.

WITNESSES

Ed A. Newman

Al. E. Newman.

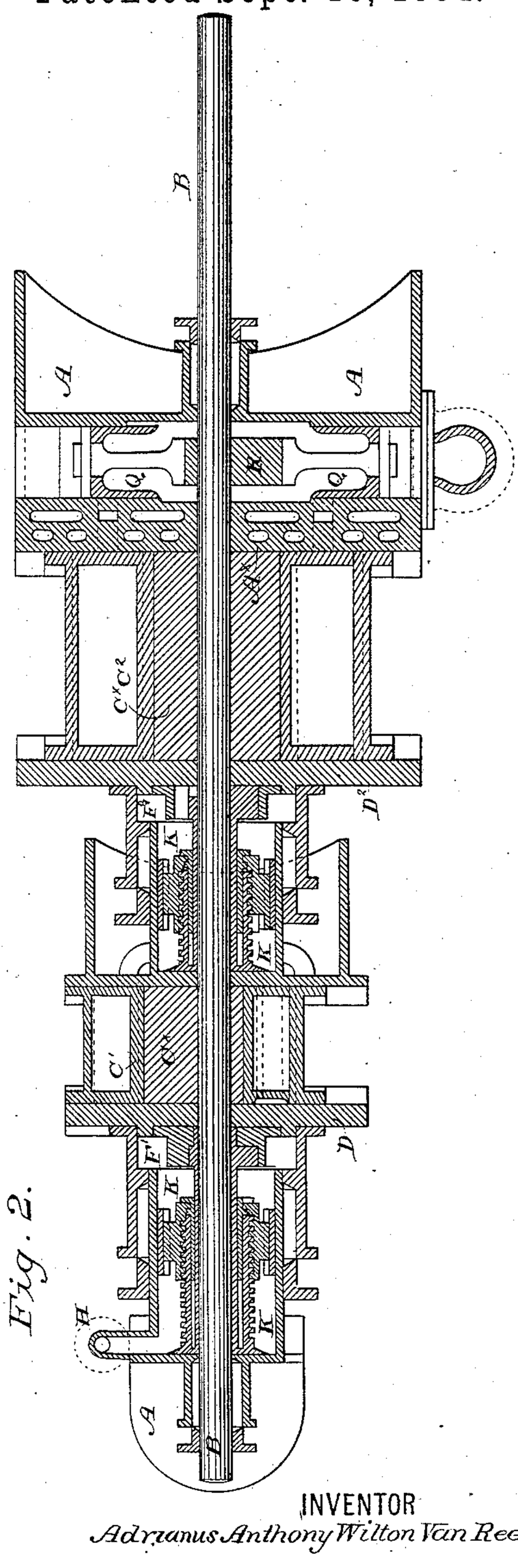

Fig. 2.

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Baldwin, Hopkins & Peyton.

(No Model.) 2 Sheets—Sheet 2.

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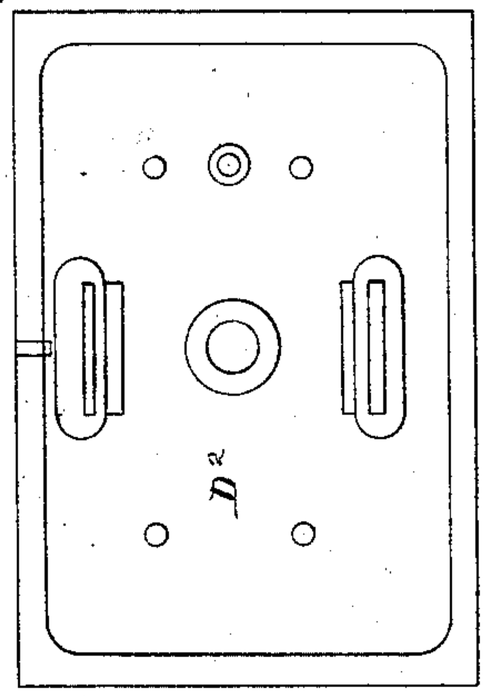

Fig. 7.

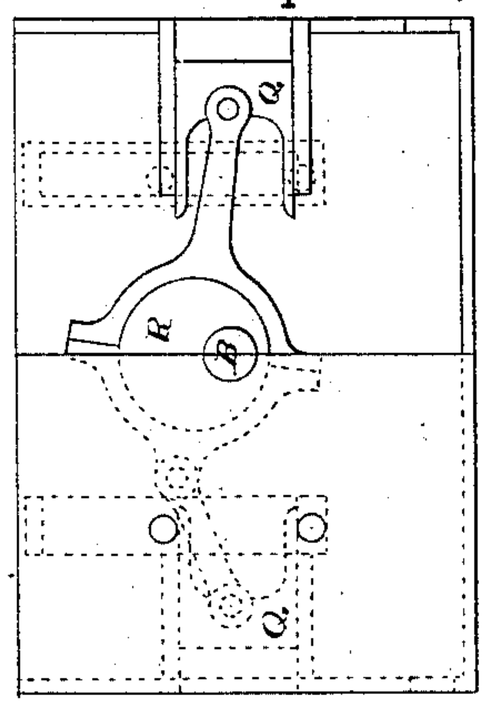

Fig. 8.

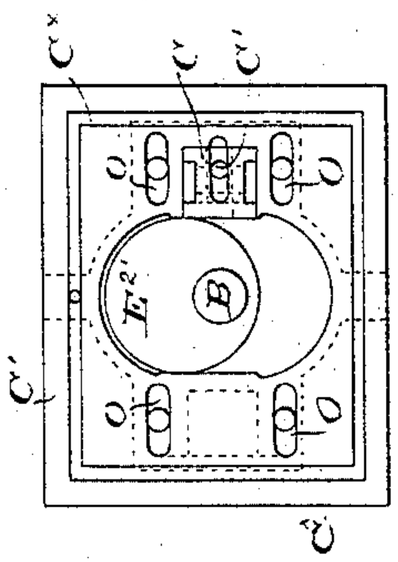

Fig. 4.

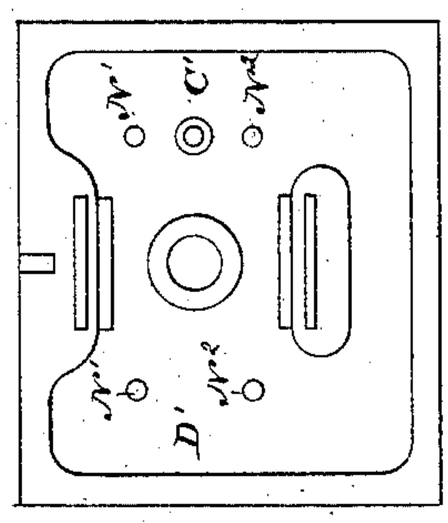

Fig. 5.

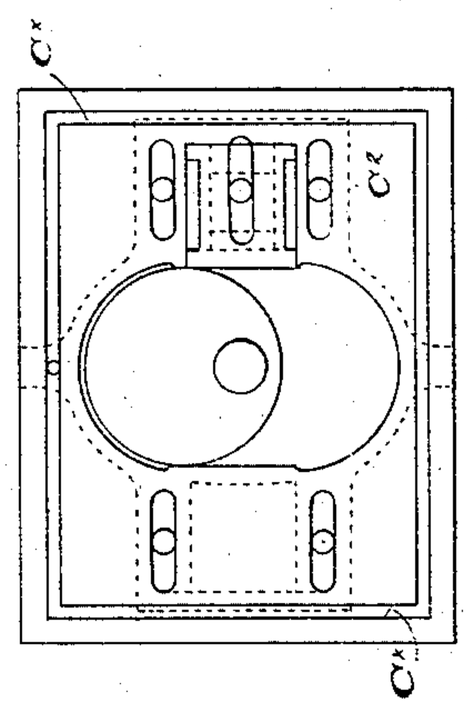

Fig. 6.

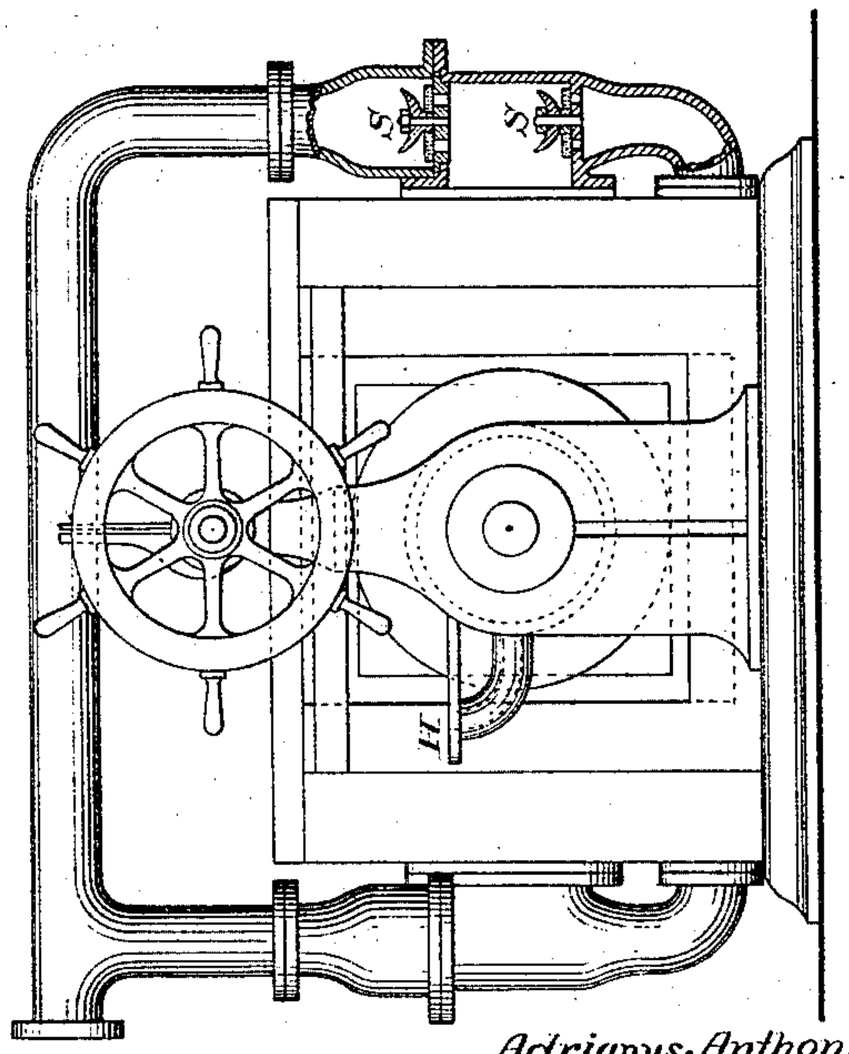

Fig. 3.

WITNESSES

Ed. A. Newman.

A. E. Newman.

INVENTOR

Adrianus Anthony Wilton Van Reede,

By his Attorneys:

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UNITED STATES PATENT OFFICE.

ADRIANUS ANTHONY WILTON VAN REEDE, OF PAPENDRECHT, NEAR DORDRECHT, HOLLAND.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 305,358, dated September 16, 1884.

Application filed December 20, 1883. (No model.) Patented in England November 22, 1883, No. 5,487; in France November 26, 1883, No. 158,786; in Belgium November 26, 1883, No. 63,348; in Germany by provisional protection November 28, 1883; in Austria January 26, 1884, No. 44,200, and in Denmark March 25, 1884, No. 2,541.

To all whom it may concern:

Be it known that I, ADRIANUS ANTHONY WILTON VAN REEDE, a subject of the King of Holland, residing at Papendrecht, near Dordrecht, Holland, have invented certain new and useful Improvements in Rotary Engines, (for which I have obtained Letters Patent in Great Britain, No. 5,487, dated November 22, 1883; in France, No. 158,786, dated November 26, 1883; in Belgium, No. 63,348, dated November 26, 1883; in Austria, No. 44,200, dated January 26, 1884, and in Denmark, No. 2,541, dated March 25, 1884, and have applied for Letters Patent in Germany by an application dated November 28, 1883,) of which the following is a specification.

This invention has for its object improvements in rotary engines. The engine in its simplest form consists of an axis upon which is mounted an eccentrically-cylindrical block. The block serves as a piston, and is contained in a "cylinder" or working-chamber. The width of the working-chamber in one direction is the same as the diameter of the cylindrical block, and this fits it steam-tight. In the direction of the height the chamber is elongated to such an extent as to enable the axis and eccentric block to rotate, at the same time imparting a to-and-fro rectilinear movement to the chamber and to the casting in which the chamber is formed, this part being mounted on horizontal guides which permit the movement. The working-chamber is closed at the ends. At one end it works against a vertical abutment forming part of the frame, and at the other end it receives a stationary cover-plate, which constitutes a valve-face, and is held up against the end of the working-chamber by the steam-pressure in a valve chest or chamber on the farther side. Steam is admitted to the working-chamber alternately at the top and bottom by a sliding valve upon the cover, to which a vertical movement is imparted by another eccentric upon the shaft. The valve-eccentric is received into a cavity in the valve similar in form to the working-chamber. This valve alternately uncovers ports in the end cover leading to the top and bottom of the working-chamber and allows steam to enter; also, covering these ports and exhaust-ports formed in the cover, it allows the steam to pass out from the working-chamber. The pressure of the steam thus applied imparts a rotary motion to the axis. The exhaust-passages in the cover lead the steam into channels passing longitudinally through the casting in which the working-chamber is formed. The steam traverses these channels and passes out by ports in the cover-plate at the farther end of the working-chamber. If the engine be single, the steam is either received into the condenser or is allowed to escape; but usually I make these engines compound, and then the steam from the first working-chamber is received into a second valve-chest containing a slide-valve similar to that already described and belonging to another working-chamber, in all respects similar to the first, but of larger dimensions. The steam expands into the second working-chamber and operates against the eccentric cylindrical block which this chamber contains. From the second chamber the steam emerges into a receiver in connection with a condenser, and provided with air-pumps which are operated by an eccentric upon the main shaft. In order to admit of the engine being reversed, the eccentrics actuating the valves are not fixed upon the shaft itself, but upon a sleeve surrounding the shaft, and the reversal is obtained by turning these sleeves with the eccentrics partly round upon the shaft. This is effected in each case in the following manner: Outside the sleeve there is a loose collar, and a pin within this collar projects through a slot cut longitudinally in the sleeve and enters another inclined slot in the shaft. The sleeve can be moved longitudinally upon the collar by a fork embracing its neck. The fork forms part of a nut, which is held in guides within the valve-box, and prevented from turning, but free to traverse longitudinally. This nut receives a hollow screw within it surrounding the axis, the sleeve, and the collar, and having upon it at one end a beveled wheel engaging with a pinion on an axis which passes out by a stuffing-box through the side of the valve-box. On the outer end of this axis there is

another beveled pinion engaging with a corresponding pinion upon a horizontal shaft carrying the hand-wheel, by turning which the engine is reversed. By turning this wheel the collar is drawn along the sleeve, and its pin, passing through the two slots, causes the sleeve to be turned relatively to the axis. In order that my said invention may be most fully understood and readily carried into effect, I will proceed to describe the drawings hereunto annexed.

In the drawings, Figure 1 is a vertical and longitudinal section of a compound rotary engine constructed in accordance with my invention. Fig. 2 is a horizontal section of the same. Fig. 3 is an end view, partly in section. Figs. 4, 5, 6, 7, and 8 show separate parts of the engine.

A is the main frame.

A′ A′ are the abutments, forming parts of the frame by which the castings containing the working-chambers are supported.

B is the main shaft. It is carried in bearings upon the frame.

C′ C² are the castings. In these the working chambers or cylinders C* C* are formed.

D′ D² are the cover-plates. In them ports and passages are formed. The cover-plates and abutments have upon them guides, on which the castings C′ C² travel. The casting in which the smaller cylinder C* is formed is closed at one end by the standard A* upon the frame, and at the other end by a plate, D′, similar in all respects to D², but of smaller dimensions.

E′ E² are cylindrical blocks fixed eccentrically upon the main shaft B, and at right angles the one to the other.

Fig. 4 is an elevation of the casting C′ with the block E′ within it. Fig. 5 shows an elevation of the cover-plate D′, in contact with which the casting C′ moves to and fro. Fig. 6 is a view similar to Fig. 4, but representing the casting C². Fig. 7 represents the cover-plate D², against which the casting C² works.

F′ is the valve of the smaller or high-pressure working-chamber. It is moved to and fro in guides in a vertical direction by an eccentric, G′, upon the main axis. The cavity into which the eccentric is received may be similar to that of the working-chamber itself—*i. e.*, such as to admit of the shaft with the eccentric revolving within the cavity, and thereby imparting to the valve the requisite movement up and down in its guides.

F² is the larger valve, similar in all respects to the smaller.

The high-pressure steam from the boiler is admitted to the engine at H. It enters the valve-casing K, and passes from thence into the smaller working-chamber by the ports L′ and L² as these are alternately opened by the movement of the valve F′. While steam is thus admitted at the top by the port L′ above the eccentric-block E′, steam is able to pass out from the lower part of the working-chamber by the port L² into the cavity of the valve, and thence to the passage M², formed in the thickness of the cover. The passage M² leads to the openings N² N² in the cover. Similarly the passage M′ leads to openings N′ N′. The steam passes from one side to the other of the casting C′ by passages O O, formed in it, and so it reaches the second valve-chest, P. From thence it is permitted by the valve F² to pass into the larger working-chamber C* alternately on the upper and under side of the cylindrical block. The steam passes out from this chamber in the manner already described in respect to the smaller working-chamber, and reaches the condenser of the engine, which is not fully represented in the drawings.

Q Q are the air-pumps. Their pistons are connected by links with the eccentric R upon the main shaft. S S are the pump-valves. These parts are clearly seen in Figs. 3 and 8.

T is a hand-wheel for reversing the engine. It is upon the horizontal axis T′, on which are two beveled pinions, T² T², each of which engages with the corresponding pinion upon a vertical axis. These two vertical axes U′ U² serve to convey the movement of the hand-wheel to the eccentrics which actuate the valves. One of them corresponds to the high-pressure valve, and the other to the low-pressure. Each axis at its lower end passes through a stuffing-box into the valve-box, and has upon it a beveled pinion, U*, engaging with the wheel V′ upon the hollow screw V.

W is a nut, which is moved by this screw. The nut traverses in the direction lengthwise of the axis, being prevented from rotating by guides. The projection W′ upon the nut engages with the collar X upon the sleeve Y. In this sleeve there is a projection, Y′, passing through straight slots in the sleeve Z, upon which the eccentric is fixed, and entering an inclined slot cut in the shaft. Consequently the longitudinal movement of the nut causes the rotation of the eccentric relatively to the shaft, and this so changes the action of the valve as to affect the reversal of the engine.

In order to prevent the steam leaking by the eccentric-blocks E′ E², one side of each of the working-chambers is formed by a movable piston-like piece, *c*, and this can be kept constantly in contact with the eccentric-block by the admission of steam behind it through the passage *c′*.

For starting the engine, it is found desirable to provide a compensation for the pressure of the steam upon the cover-plates D′ D². This is effected by forming all around the casting C′ C² channels $c^{\times}$, to which the steam can be admitted by a passage, $c^{\times\times}$, and thus a partial equilibrium is obtained, the pressure of the steam then acting upon both sides of the covers of the working-chambers. There are similar chambers $c^{\times}$ facing the abutments A′. When the engine is started, the steam admitted to the cylinders by the valves provides

a partial counterpoise, and the admission of steam by the passage $c^{\times\times}$ is then no longer necessary.

Having thus described the nature of my said invention and the manner of performing the same, I would have it understood that I claim—

1. The combination of the cylindrical block, set eccentrically on the main shaft, and the working-chamber, to which the block fits in two dimensions, and which has a to-and-fro rectilinear movement imparted to it by the rotation of the axis and block, substantially as described.

2. The combination of the valve-chamber, the working-chamber, to which to-and-fro rectilinear movement is imparted, and the cover constituting the valve-face, and held in steam-tight contact with the end of the working-chamber by the pressure of the steam in the valve-chamber, substantially as and for the purpose hereinbefore set forth.

3. The means for reversing the engine by producing the rotation of the valve-eccentric upon the shaft by a screw and nut actuating a sliding collar with pins upon it entering grooves in the sleeve of the eccentric and in the shaft, substantially as described.

ADRIANUS ANTHONY WILTON VAN REEDE.

Witnesses:

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P. GROENEDAAR.