(No Model.) 2 Sheets—Sheet 1.

# C. E. DUNCAN.

## ROTARY ENGINE.

No. 589,076. Patented Aug. 31, 1897.

Fig. 1.

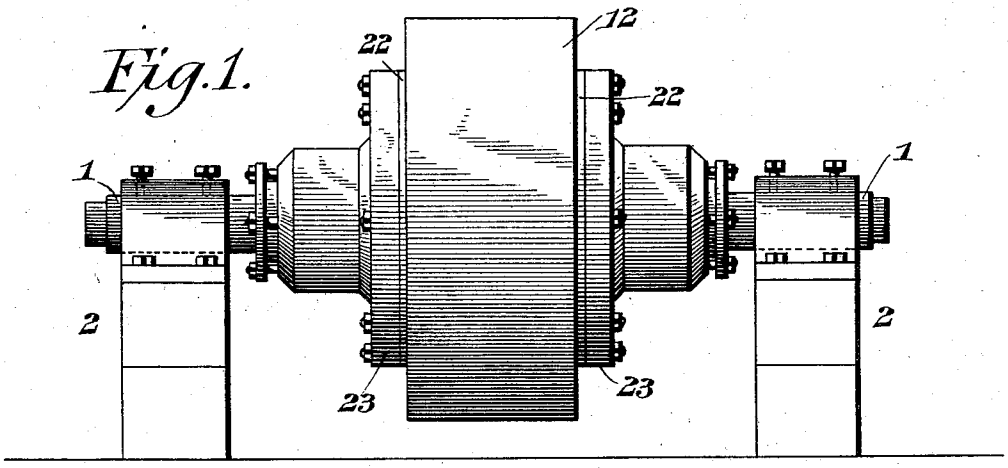



Fig. 5.

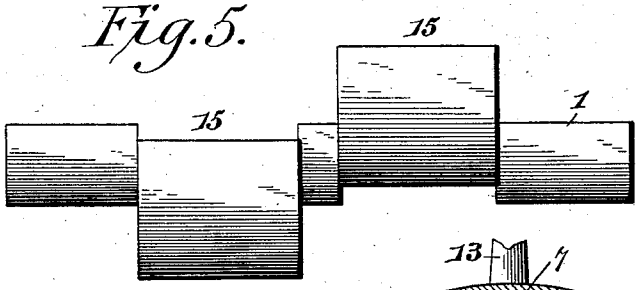



Fig. 6.

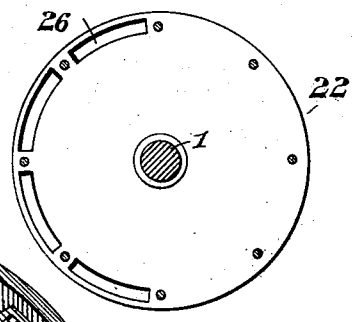



Fig. 3.

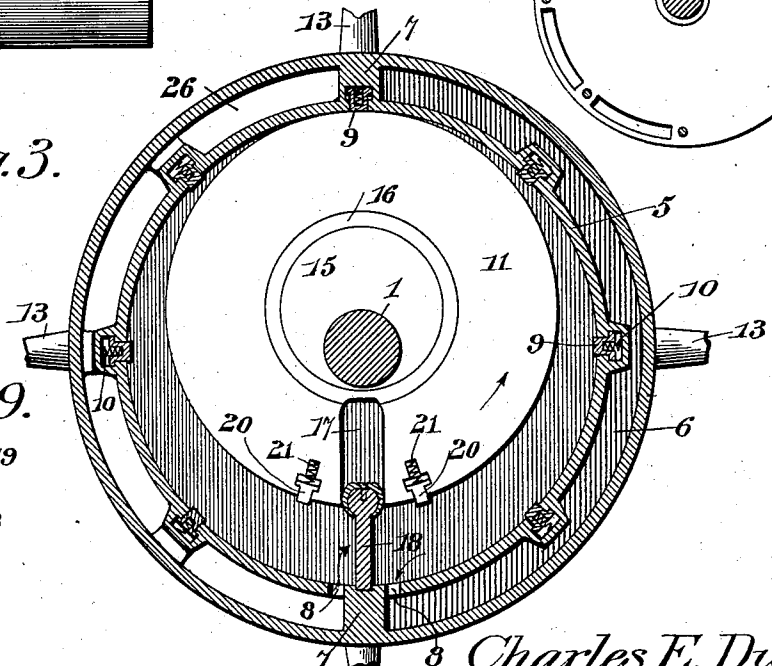
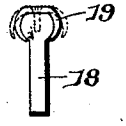



Fig. 9.




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(No Model.) 2 Sheets—Sheet 2.

# C. E. DUNCAN.

## ROTARY ENGINE.

No. 589,076. Patented Aug. 31, 1897.

Fig. 2.

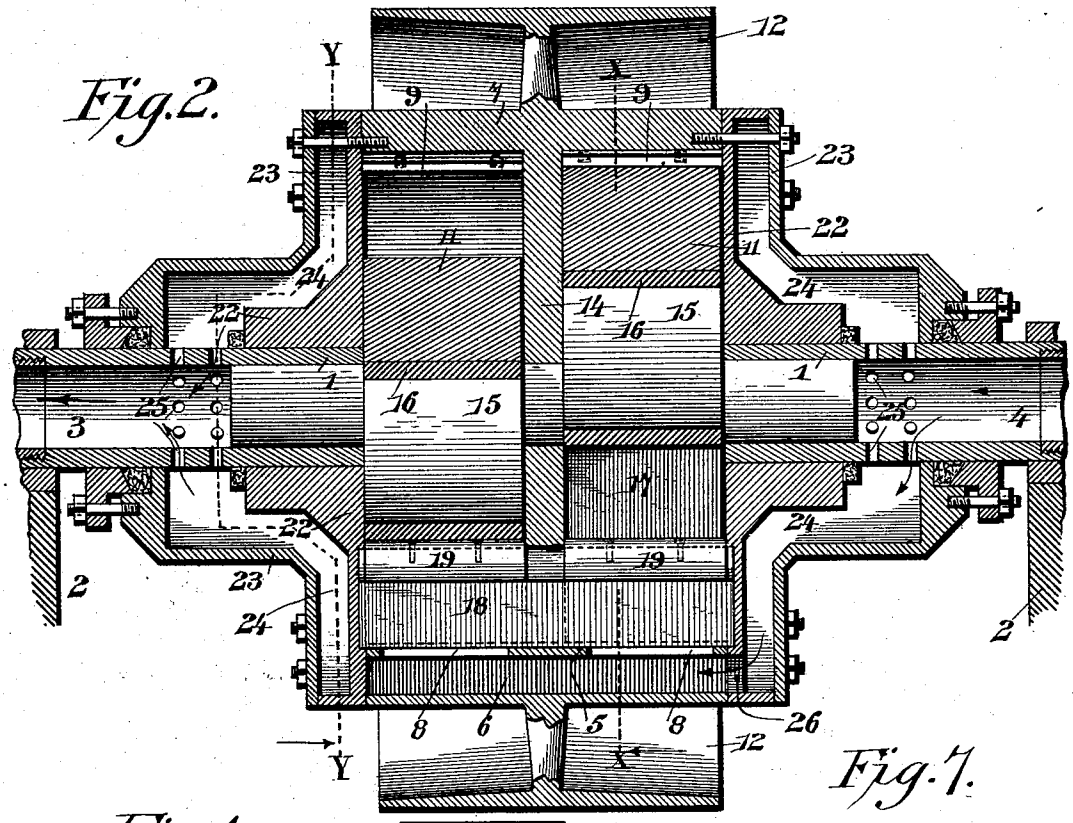



Fig. 7.

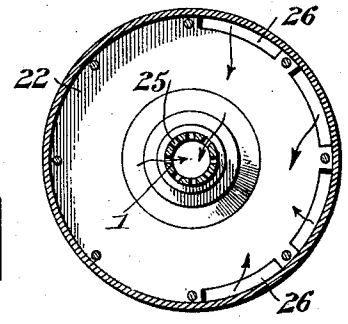



Fig. 4.

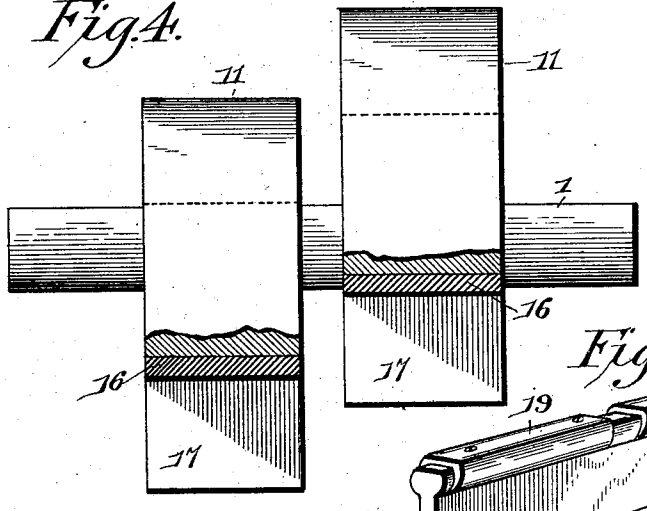
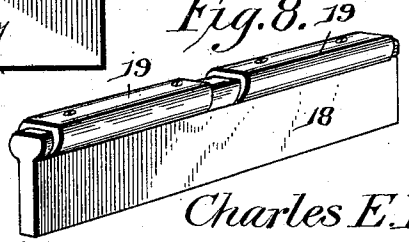



Fig. 8.




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# UNITED STATES PATENT OFFICE.

CHARLES E. DUNCAN, OF OLD HUNDRED, NORTH CAROLINA.

## ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 589,076, dated August 31, 1897.

Application filed November 11, 1896. Serial No. 611,769. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES E. DUNCAN, a citizen of the United States, residing at Old Hundred, in the county of Richmond and State of North Carolina, have invented a new and useful Rotary Engine, of which the following is a specification.

This invention relates to rotary engines of the type in which the cylinder and piston revolve together about a shaft, the latter forming a stationary or fixed support and being tubular at its ends for the ingress and egress of the steam or motive medium utilized in driving the engine, power being taken from the latter in any of the usual ways, preferably by means of a belt passing around a rim connected to and revolving with the cylinder. The piston is eccentrically mounted within the cylinder and is journaled upon eccentric portions of the shaft and is formed with a radial slot, in which moves an abutment rigidly connected to the cylinder and against which the live steam impacts when the engine is in operation, said abutment also serving to divide the live from the exhaust steam.

For a full understanding of the merits and advantages of the invention reference is to be had to the accompanying drawings and the following description.

The improvement is susceptible of various changes in the form, proportion, and the minor details of construction without departing from the principle or sacrificing any of the advantages thereof, and to a full disclosure of the invention an adaptation thereof is shown in the accompanying drawings, in which—

Figure 1 is a side elevation of a rotary engine embodying the vital features of this invention. Fig. 2 is a central longitudinal section thereof. Fig. 3 is a transverse section on the line X X of Fig. 2, looking to the left, as indicated by the arrow. Fig. 4 is a detail view of the shaft and pistons. Fig. 5 is a detail view of the shaft. Fig. 6 is a face view of a cylinder-head. Fig. 7 is a section on the line Y Y of Fig. 2, looking in the direction of the arrow. Fig. 8 is a detail view of the abutment. Fig. 9 is an end view of the abutment, showing the spring-packing expanded by dotted lines.

Corresponding and like parts are referred to in the following description and indicated in the several views of the accompanying drawings by the same reference-characters.

The shaft 1 is supported at or near its ends by means of pillow-blocks 2 and is relatively fixed, and its end portions are hollow or tubular, as shown at 3 and 4, to provide for the ingress of the live steam or other motive medium into the cylinder and for the exhausting of the same when spent.

The cylinder 5 is rotatably mounted upon the shaft and is hollow, being composed of inner and outer walls, between which a steam-space 6 is formed. This steam-space is subdivided by longitudinal webs 7, which extend the full length of the cylinder, so as to prevent any intercommunication between the separated parts of the space 6. Ports 8, formed in the inner wall of the cylinder, establish communication between the space 6 and the interior of the cylinder, said ports being located adjacent to one of the webs 7, preferably the lower one. A series of packing-strips 9 are located at intervals in the circumferential length of the inner wall of the cylinder and are projected into the cylinder by means of springs 10, the purpose of these packing-strips being to secure a steam-tight joint between the piston 11 and the cylinder.

Inasmuch as the power is taken directly from the cylinder in the ordinary way by means of a belt the said cylinder has connected therewith a rim 12, by means of spokes 13, the intervening space between the rim and cylinder preventing the overheating of the rim to the detriment of the drive-belt.

So far as the scope of the invention is concerned a single cylinder and a single piston are contemplated, and a series of pistons may be used jointly with a single cylinder, the said pistons being arranged relatively at different angles, so as to secure a uniform power. As shown, the cylinder is subdivided by a partition 14 into two compartments, and a piston 11 is located in each compartment; but this arrangement is not essential, and the number of compartments and pistons will depend upon the capacity and the purpose for which the engine is constructed. Inasmuch as the pistons, if more than one is employed, are similarly mounted, a detailed description

of one will suffice for a clear understanding of the invention. Each piston is eccentrically mounted with respect to the cylinder and is located upon an eccentric 15 of the shaft 1, a brass or bushing 16 being interposed between the piston and the eccentric. A radial slot 17 having parallel walls is formed in a side of the piston to receive an abutment 18, which is secured rigidly to the cylinder in line with the webs 7, the ends of the abutment being let into the heads of the cylinder and its outer edge being let into the web 7, adjacent to the ports 8. The inner edge of the abutment 18 is expanded or made rounding and is provided with a metallic spring-packing 19, which normally tends to expand, as indicated by the dotted lines in Fig. 9, so as to maintain a steam-tight joint with the opposite and parallel walls of the slot 17. Packing-strips 20, similar in construction to the packing-strips 9, are located upon opposite sides of the slot 17, within recesses formed in the piston, and are moved outward by springs 21, and are adapted to engage with the inner wall of the cylinder adjacent to the ports 8, so as to prevent any leakage of steam when in the rotation of the piston and cylinder the opposing parts of the piston and cylinder touch upon opposite sides of and adjacent to the abutment 18.

The heads or ends of the cylinder are hollow, and in the preferable construction are composed of an inner part 22 and an outer part 23, and between these parts is formed the steam-space 24. These heads are bolted or otherwise secured to the cylinder, and a steam-tight joint is formed between them and the shaft by the usual stuffing-box or in any way found most advantageous. A series of ports 25 are formed in the hollow or tubular ends of the shaft 1 and communicate with the steam-spaces 24 of the cylinder-heads, and communication is established between the spaces 24 and the interior of the cylinder by ports 26, formed in the inner walls, or parts 22 of the cylinder-heads, said ports 26 leading into the space 6 and the steam passing to and from the cylinder by way of the ports 8, as will be readily understood.

The cylinder is rotatably and concentrically mounted upon the shaft 1, and the piston is similarly mounted upon its eccentric 15, the cylinder and piston revolving synchronously and at the same rate of speed and the parts being so proportioned and disposed that an element of the piston is at all times in intimate contact with the inner wall of the cylinder, thereby preserving a separation of the live and exhaust steam. As the cylinder and piston rotate the abutment 18 reciprocates within the slot 17, this action being due to the eccentric mounting of the piston with respect to the cylinder, as will be readily comprehended by any one versed in the operation of rotary engines, pumps, &c., of this type. Supposing that the steam or other motive medium enters by way of the passage 4 and passes into the cylinder through the adjacent hollow head and portion of the space 6 in communication therewith, and, impacting against the abutment 18, rotates the piston and cylinder upon the shaft, at the same time the air or steam upon the opposite side of the abutment will escape into the other portion of the space 6, thence into the opposite hollow head and out through the passage 3.

By admitting the steam in a reverse direction the engine may be driven in an opposite direction, as will be readily understood.

Having thus described the invention, what is claimed as new is—

1. A rotary engine comprising a fixed shaft having tubular or hollow ends, a cylinder rotatably mounted upon the shaft and having hollow heads in communication with the hollow ends of the shaft, and having a space surrounding its bore and subdivided, each part of the space having independent communication with the respective hollow heads and with the interior of the cylinder, a piston eccentrically mounted upon the shaft and having a radial slot, and an abutment secured to the cylinder and adapted to operate in the slot of the piston, substantially as set forth.

2. In a rotary engine, the combination of a fixed shaft having tubular or hollow ends, a cylinder rotatably mounted upon the shaft and having a space which is subdivided and in communication with the hollow or tubular ends of the shaft, a piston eccentrically mounted upon the shaft and rotatable with the cylinder, and having a radial slot, and an abutment fixed with respect to the cylinder and adapted to operate in the radial slot of the piston, substantially as and for the purpose set forth.

3. In a rotary engine, the combination with the cylinder, an eccentrically-mounted piston having a radial slot formed with parallel walls, and means for admitting and exhausting steam or other motive medium, of an abutment secured to the cylinder and operating in the radial slot of the piston, and a spring-packing secured to the abutment to maintain a steam-tight joint between the abutment and the parallel walls of the radial slot, substantially as set forth.

4. In a rotary engine, the combination of a hollow cylinder having its space subdivided by longitudinal webs, and having ports upon opposite sides of a web, a piston eccentrically mounted with respect to the cylinder and having a radial slot, an abutment secured to the cylinder and located opposite a divisional web and between the two sets of ports, and adapted to operate in the radial slot of the piston, and means for admitting and exhausting steam or other motive medium, substantially as set forth.

5. In a rotary engine, a fixed shaft having hollow or tubular ends, a hollow cylinder pro-

vided with hollow ends rotatably mounted upon the said shaft and having the steam-space between its walls subdivided and in communication with the hollow or tubular ends of the shaft, a piston eccentrically mounted upon the shaft and having a radial slot, and provided with packing upon each side of and adjacent to the said slot, and an abutment rigidly secured to the cylinder and operating in the radial slot of the piston, and located between the ingress and egress ports, substantially as and for the purpose set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

CHARLES E. DUNCAN.

Witnesses:
JOHN H. SIGGERS,
WM. B. HUDSON.