No. 815,246. PATENTED MAR. 13, 1906.

E. T. YOUNG & L. J. CAVANAUGH.

ROTARY ENGINE.

APPLICATION FILED JULY 27, 1903.

2 SHEETS—SHEET 1.

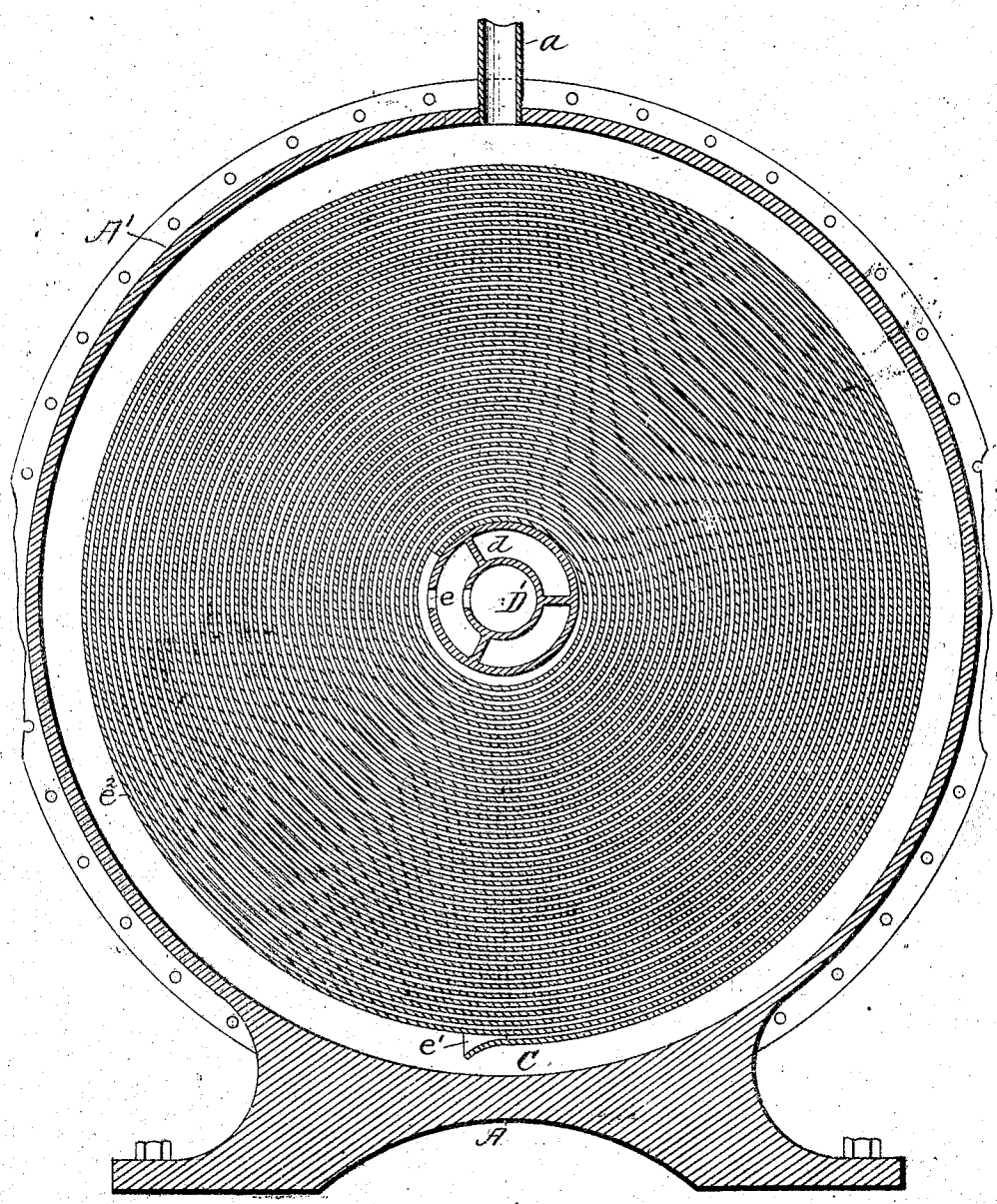


Fig. 1.

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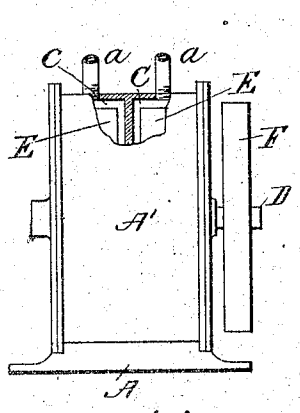


Fig. 4.

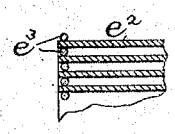


Fig. 3.

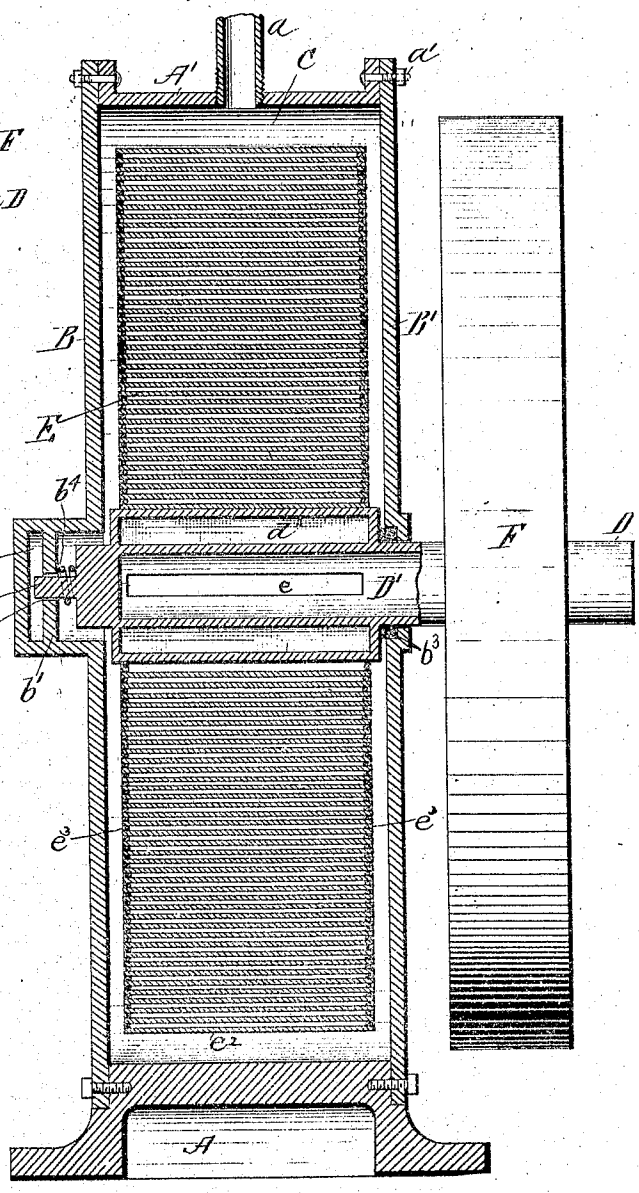


Fig. 2.

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UNITED STATES PATENT OFFICE.

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ROTARY ENGINE.

No. 815,246. Specification of Letters Patent. Patented March 13, 1906.

Application filed July 27, 1903. Serial No. 167,090.

To all whom it may concern:

Be it known that we, EDWARD T. YOUNG and LEANDER J. CAVANAUGH, of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Rotary Engines, of which the following is a specification.

In the description of our invention we shall use the word "steam" to describe the fluid by which power is applied to our engine; but we use this term merely for convenience, as it will be evident to all skilled in the art that other fluids under pressure—for example, the products of a hydrocarbon explosion or a liquid, such as water—will cause the operation of our invention in the same manner as steam.

The purpose of our invention is to utilize the contact of steam or other fluid with the walls of a passage in which it is moving as a means of developing work; and it consists in a movable passage connected with suitable means whereby the action of steam under pressure moving in said passage in contact with its walls will so actuate said passage as to produce power in a form capable of practical use. By the means hereinafter described the entire energy of steam may be utilized during its movement in the movable passage, and it may be discharged at atmospheric pressure.

Our invention will be understood by reference to the drawings, in which we have shown a rotary engine embodying our invention in what now seems to us the simplest form.

Figure 1 is a vertical section of such an engine, Fig. 2 being also a vertical section taken at right angles to the sectional plane of Fig. 1, Fig. 3 being a cross-section, enlarged, of a portion of the tube, showing details of construction. Fig. 4 shows diagrammatically a modification.

A is the base, which is a casting, and preferably formed in one piece with it is the part A′, which forms the periphery of the casing which incloses the engine.

B and B′ are disks which close in the front and rear of the casing, respectively, being connected with the base A and periphery A′ by bolts a' or in such other way as will make a steam-tight joint. A steam-inlet is provided by the pipe a, which connects with a suitable source of supply. A steam-chamber C is thus formed within the casing in which the movable part of our engine moves.

The rear wall B of the casing is provided with a recess b, containing a web b', in which is a bearing b^2 to receive the rear journal d of the piston-shaft D of the piston-wheel E. As shown in the drawings, the shaft D is substantially hollow to afford an exhaust-chamber D′, being preferably strengthened by a spider d', and its front end extends out through an opening in the disk B′ to form the exhaust-outlet for the steam, b^3 being a packing to prevent the steam in chamber C from escaping through this opening in the disk B′. A spring b^4 serves to throw the shaft D forward against the packing b^3. The shaft D also carries the driving-pulley F. Upon this shaft D is mounted the piston-wheel E, which, as shown, comprises a closely-wound spiral tube of considerable breadth compared with its height and is of very considerable length. One end of this tube is connected, as at the opening e, with the exhaust-chamber D′ in the shaft D, and the other end e' opens into the chamber C, so that the tube as a whole forms a passage connecting the chamber C within the casing A, A′, B, and B′ with the chamber D′ in the shaft D. This tube, as shown in the drawings, is made by winding a long thin strip e^2 of sheet metal—brass, for example—and two wires—say one sixty-fourth of an inch in diameter—e^3 e^3 about the shaft D, to which one end of the strip and one end of each wire is soldered or otherwise connected at a point just beyond the opening e into the chamber D′ of the shaft D. The wires e^3 e^3 are placed one near each edge of the strip e^2 and serve to separate each layer of the strip from the one next it, and after the spiral has been formed in the manner described and the outer end finished off by soldering or otherwise, so that the spiral will not unwind, the entire sides of the spirally-formed structure are closed in either by disks suitably connected thereto by soldering or otherwise or by a steam-tight cement, so that a spiral passage of substantially the width of the sheet-metal strip and of a height of the diameter of the wires will be formed. We prefer

that the passage shall be so shaped, as we believe the best results will be attained by having the passage in the form of a true spiral, the structure being, in effect, a rotary piston.

The operation of our invention when constructed as described is as follows: Steam being admitted under pressure into the chamber C fills the chamber and immediately begins to fill the tube or passage E, through which it finds an outlet from the opening *c* into the chamber D′ in the shaft D and from thence to the open air. It is well known that there is always friction in the passage of a fluid through a pipe, and as the steam under pressure passes through this passage (the spiral passage may be, say, one hundred feet or more in length) it produces a rapid rotary motion, which may be imparted to any machinery to be run by the engine by means of the pulley E. If desired, the walls of the tube may be roughened somewhat by means of acid or in some other way, so as to increase this friction. By the time the steam has reached the shaft C it will have exhausted its power, and hence there will have been taken from it all the energy which it possessed, whether by impact, expansion, friction, speed, or otherwise, and thus it is believed that this will be found a most economical method of using steam, as the only friction developed other than that of the steam which is utilized for the rotation of the piston will be that developed in the support for the shaft D, and this, if necessery, may be reduced by the use of ball-bearings and in other ways now well known in the art of shafting.

In describing this engine as having a piston comprising a spiral tube of peculiar dimensions we wish it undersiood that we do not mean to limit ourselves to a tube of that shape or dimensions, though it seems to us now that this is the most economical and best shape in which to make the tube.

One advantage of our engine is that when made upon the general plan indicated, to increase the power all that is necessary is to couple up a number of these rotary pistons upon the same shaft, each piston E and its chamber C being independent of the other and all being of the same size, so that the power of a given engine may be easily doubled or trebled by doubling or trebling the number of spirals, and hence getting a large increase of power at the cost of but little additional space. This is shown diagrammatically in Fig. 4. Other means of coupling two or more pistons temporarily or permanently will suggest themselves.

As intimated above, we prefer to use this engine with steam; but it is evident that our engine may be operated by any fluid under pressure. For example, gasolene exploded in a proper chamber in a manner now too well known to need description will create a gas, the production of said explosions which when led into the chamber C will furnish a practically constant supply of such products of combustion under pressure as will form a ready and economical substitute for steam generated in an ordinary boiler, and therefore we by no means mean to limit our invention to a device which can be operated by steam alone.

To reverse our engine, all that is necessary is to connect the exhaust-passage through the shaft D with the steam-supply, making in this case the pipe *a* the exhaust-pipe, and thus causing the tube to reverse its movement—*i. e.*, the piston may be rotated in either direction, as desired, according to which end of the passage is used as an inlet.

The shape and length of the passage may be varied according to the circumstances under which the engine is to be used and the work which it is to do. When two or more engines are coupled together, one or more of the steam-inlets may be closed, if desired, to reduce the power, or the same result may be accomplished by reducing the total steam-pressure. In fact, within certain limits the speed and power of a given engine may be controlled by adjusting the steam-pressure.

We have shown the rotary piston inclosed in a casing; but it is evident that if the chamber in the shaft was suitably connected with a steam-supply the piston would be rotated and the outer end of the spiral would become the exhaust without any further provision therefor. It is also evident that instead of extending the partition between two chambers C, as indicated in Fig. 4, to the central shaft this partition need not make a steam-tight separation between the two chambers, but instead the two chambers may be thrown substantially into one, in which case the two rotary pistons will rotate in unison upon the same shaft and be controlled by the same steam-pressure. Where, however, they are separated by a steam-tight partition, the amount of pressure acting upon each piston may be controlled independently.

What we claim as our invention is—

1. An engine comprising a spiral passage, said passage being formed of a spiral sheet of metal having a relatively small distance between the convolutions of said sheet as compared with its width, the space between the convolutions of said sheet being closed on each side by a spiral wire, as described.

2. A rotary engine comprising a casing, a shaft adapted to rotate in said casing, a packing in said casing, and a plurality of means to force said shaft against said packing comprising a spring and a pressure within said casing, as described.

3. An engine comprising a tight casing, an

inlet, a hollow shaft forming an outlet, supported in said casing and having a hollow spider mounted thereon, a piston-wheel mounted on said spider and having a spiral passage therein, the end of said passage next said spider being connected with the hollow shaft, as described.

In testimony whereof we hereto set our names this 25th day of July, 1903.

EDWARD T. YOUNG.

LEANDER J. CAVANAUGH.

Witnesses:

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M. E. FLAHERTY.