No. 883,911. PATENTED APR. 7, 1908.

H. PIERCE.

ROTARY ENGINE.

APPLICATION FILED JULY 9, 1907.

4 SHEETS—SHEET 1.

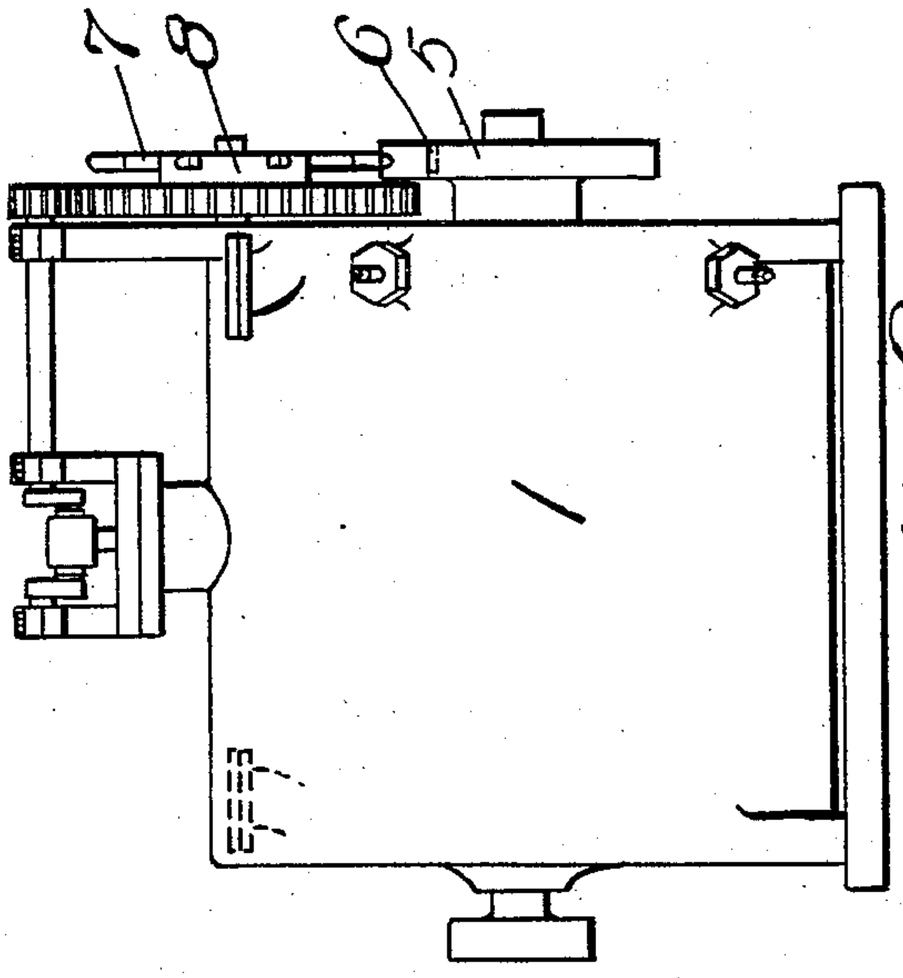

Fig. 1.

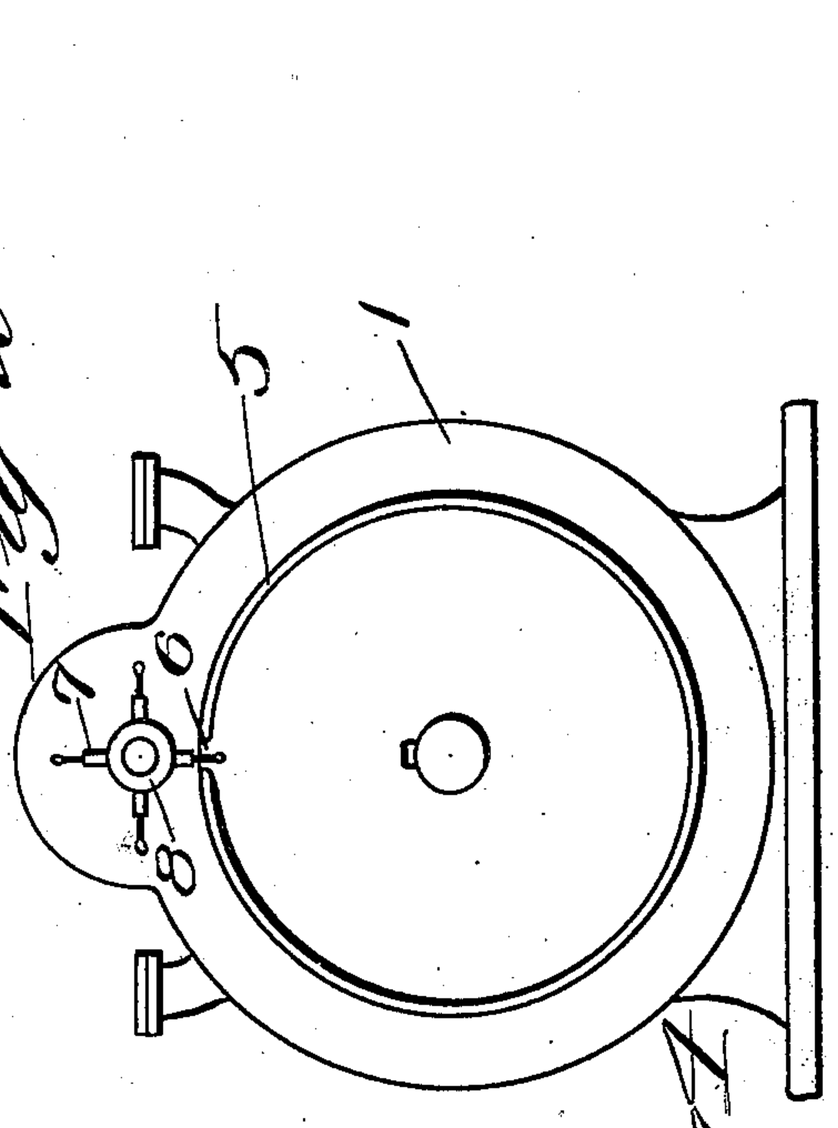

Fig. 2.

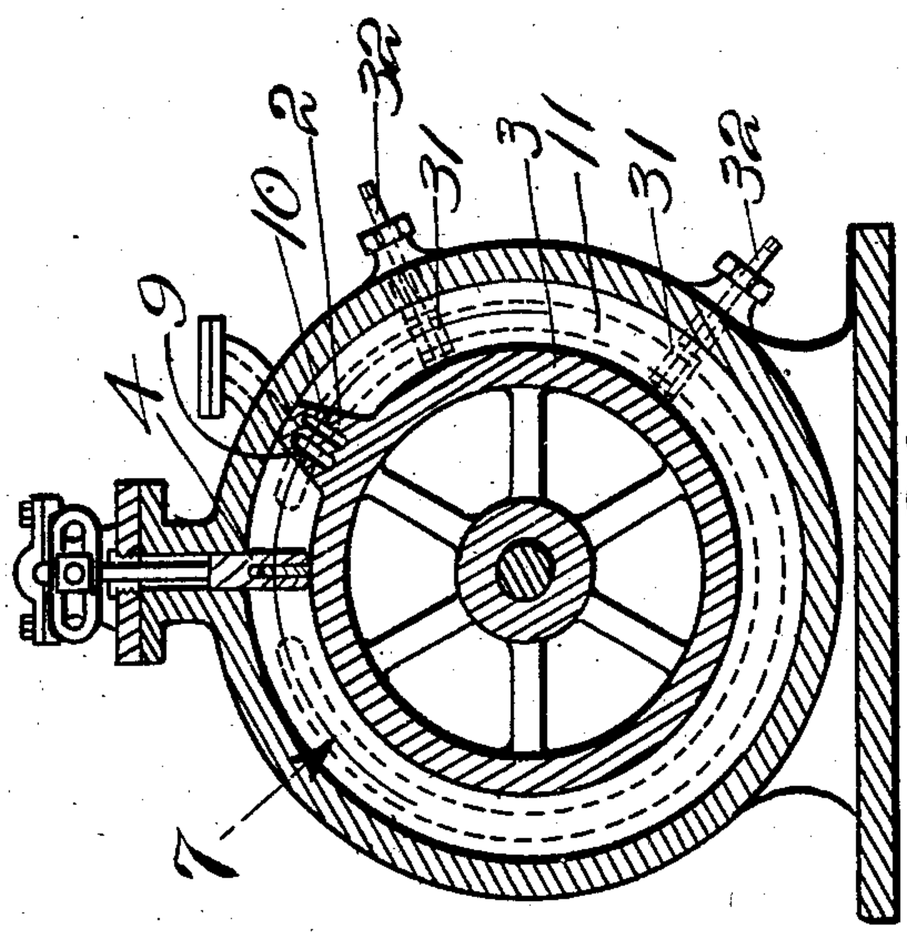

Fig. 3.

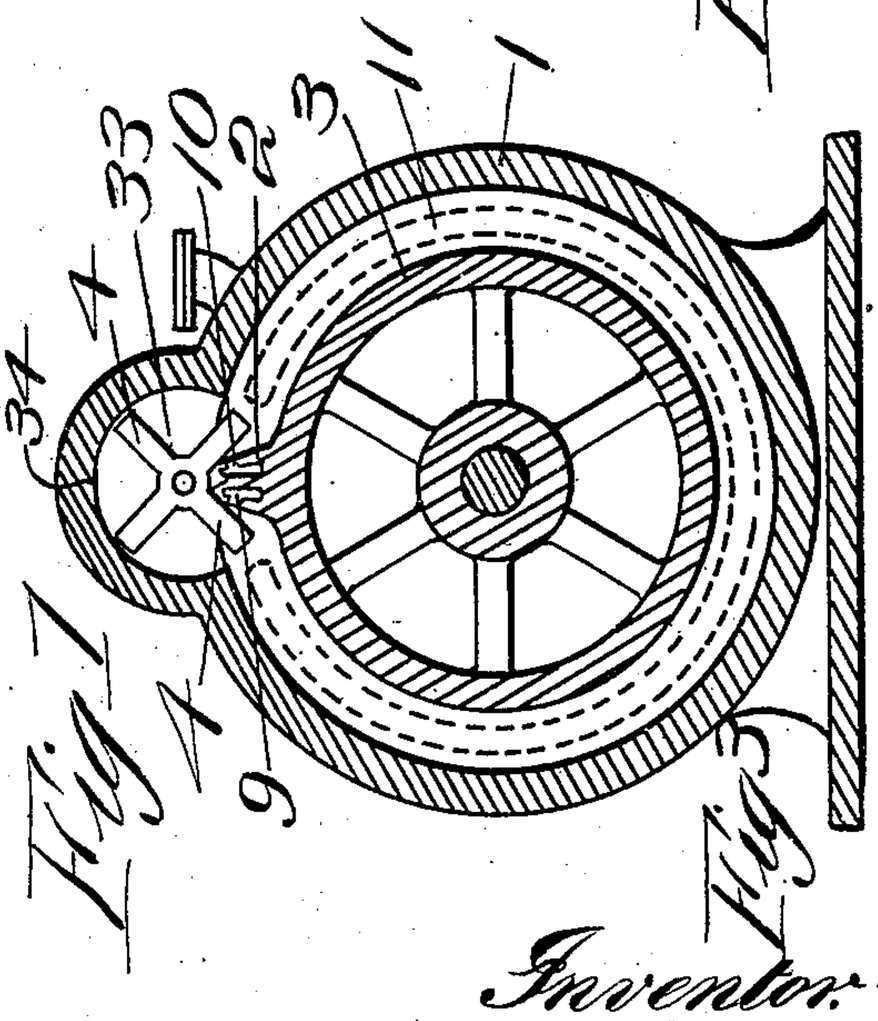

Fig. 4.

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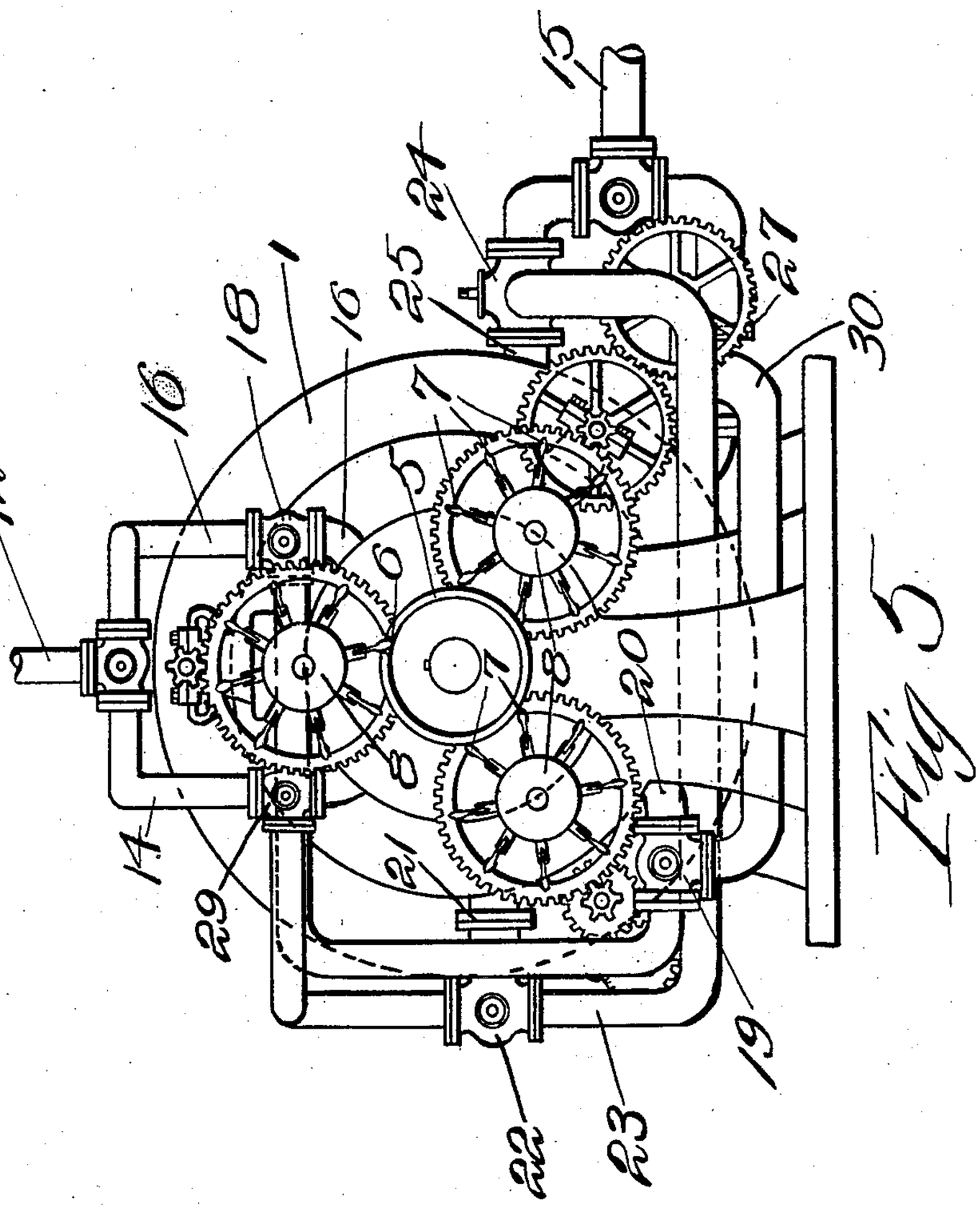

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4 SHEETS—SHEET 3.

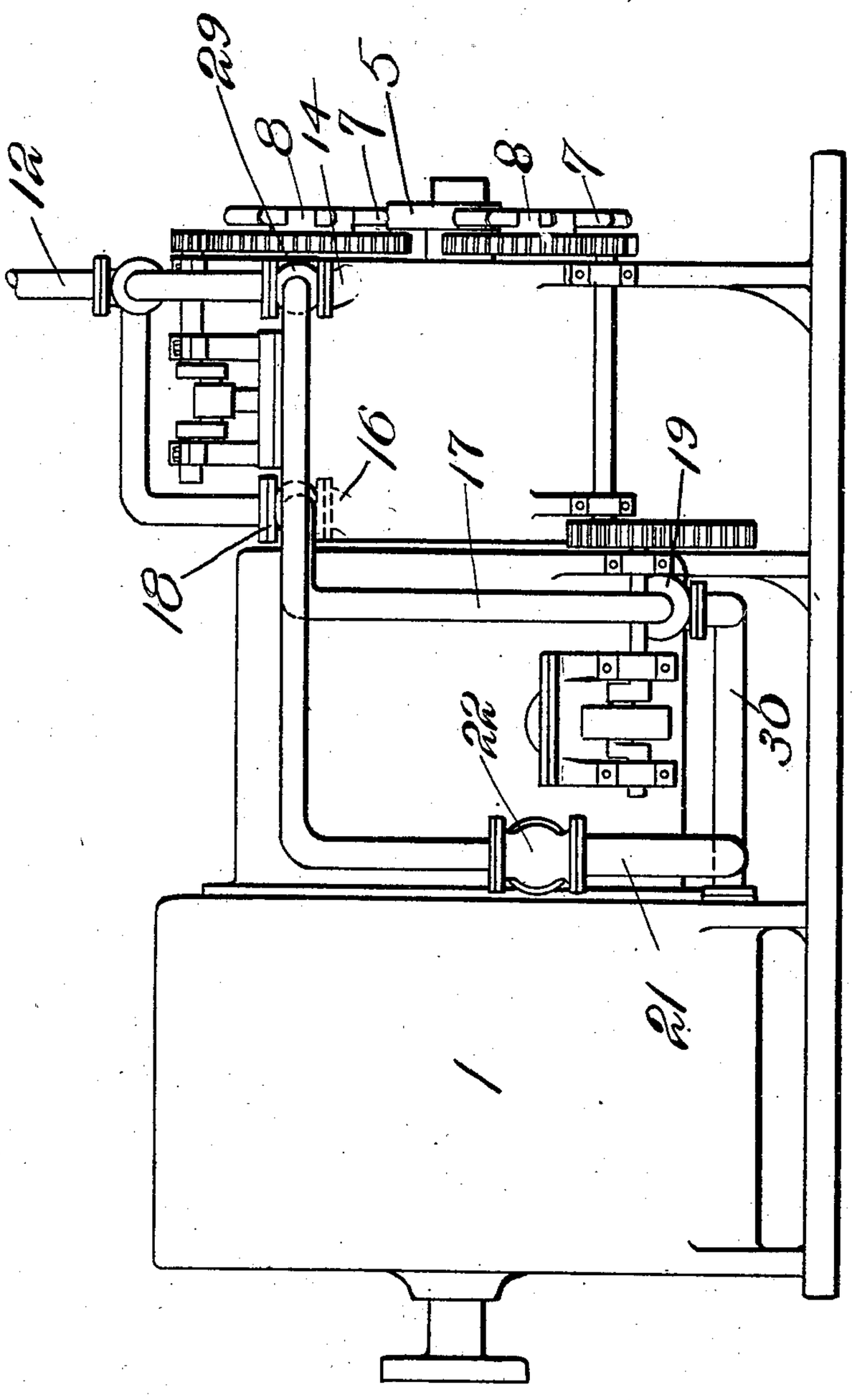

Fig. 6.

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4 SHEETS—SHEET 4.

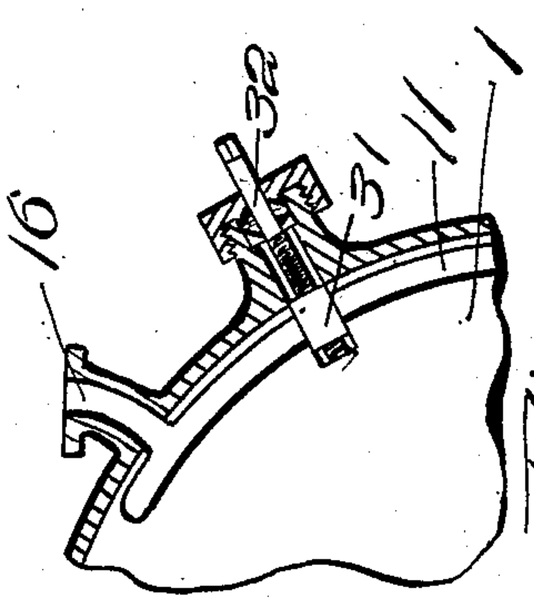

Fig 8

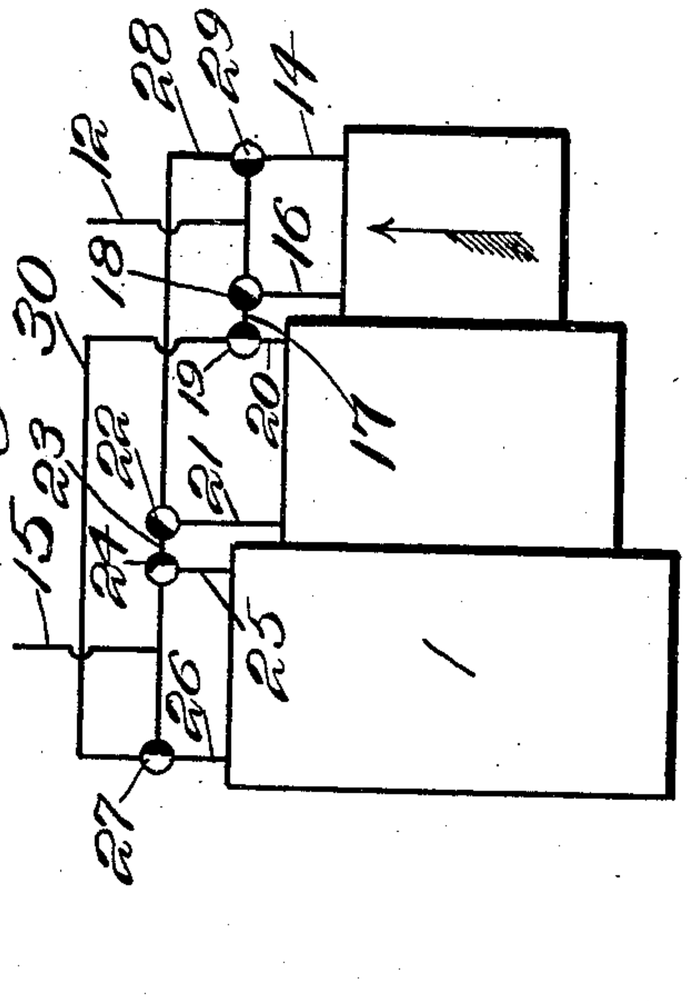

Fig 10

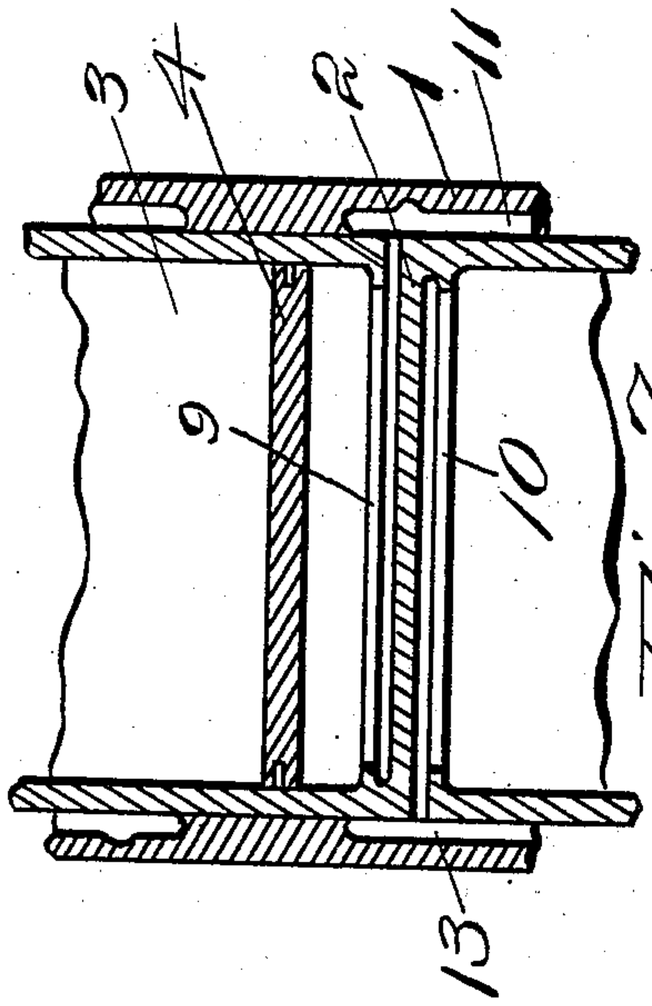

Fig 7

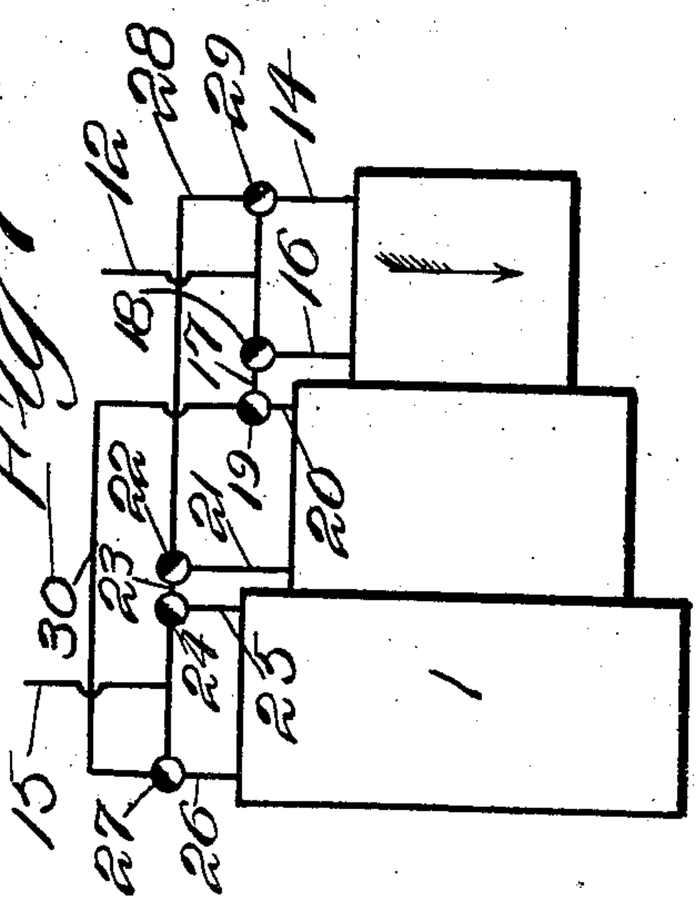

Fig 9

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UNITED STATES PATENT OFFICE.

HARRY PIERCE, OF SEATTLE, WASHINGTON.

ROTARY ENGINE.

No. 883,911. Specification of Letters Patent. Patented April 7, 1908.

Application filed July 9, 1907. Serial No. 382,959.

To all whom it may concern:

Be it known that I, HARRY PIERCE, a citizen of the United States, residing at the Arlington Hotel, in the city of Seattle, county of King, and State of Washington, have invented new and useful Improvements in Rotary Engines, of which the following is a clear and concise specification.

My invention relates to rotary engines in which a concentrically mounted rotor is provided with a projection adapted to fit the inner surface of the engine casing or cylinder, and by the construction illustrated in the accompanying drawings and hereinafter fully set forth I have provided suitable abutments which co-act to form an impelling chamber. I preferably provide one of said projections on each rotor and by having a number of cylinders the stress applied to said projections may be equalized to cause substantial and uniform torsive stress and balance on the spindle of my device. By a system of piping and valves hereinafter more fully disclosed I have provided a means for reversing the direction of rotation of said rotors and spindles. I have also provided abutments adapted to travel intermittently relative to said rotors.

The objects of my invention are to provide a rotary engine which may be readily packed to withstand high steam pressure with little leakage, to construct an engine having a number of cylinders and rotors; to attain economy thereby; to afford a means for cutting the steam off at predetermined intervals relative to the travel of said projection in said impelling chamber. I accomplish these as well as minor objects by the construction now preferred by me and illustrated in the accompanying drawings in which

Figure 1 is a sectional modification of my device showing the crank actuated abutment and cut off stop, Fig. 2 is a side elevation of Fig. 1, Fig. 3 is a section of the balanced abutment, Fig. 4 is an end elevation showing a portion of the casing removed and the intermittent abutment operating device, Fig. 5 is an end elevation of the triple expansion showing the abutment operating devices as well as the piping, Fig. 6 is a side elevation of Fig. 5, Fig. 7 is a section at 7 Fig. 1, Fig. 8 is a fragmentary view showing the cut off stops, Fig. 9 is a diagrammatical view of the reverse valves in the "go ahead" position, Fig. 10 is a diagrammatical view of the reverse valves in the "backing up" position.

Similar reference numerals refer to similar parts throughout the several views of my device as illustrated in the accompanying drawings.

I have provided a suitable casing or cylinder 1 bored to fit the addendum of the projection 2 which is provided on the rotor 3 which is concentrically rotatably mounted in said casing 1 and turned to form a steam tight joint between the cylindrical surface thereof and the end surface of the abutments 4 which are operated by the annular member 5 which is driven by said rotor 3 and which is provided with an aperture 6 adapted to receive yielding fingers 7 of the star wheel 8.

The steam is admitted into the impelling chamber, which is between the inner surface of said casing 1 and the outer surface of said rotor 3, through the aperture 9 when the engine is being driven in one direction and through the aperture 10 when traveling in the opposite direction. Said aperture 9 communicates with the annular passage 11 provided in said casing 1, said annular passage 11 communicating with the steam pipe 12, said aperture 10 communicating with the annular passage 13 which is provided in the opposite end of said casing 1. When the steam passes through said aperture 9, said aperture 10 communicates with the exhaust and vice versa, thus by an arrangement of valves as shown in Figs. 9 and 10 I am able to instantly change the direction of travel of said rotor 3 and parts operated thereby. In Fig. 9 I have shown the valves set to drive the engine in the direction of the arrow or "go ahead" position. The steam is admitted to said steam pipe 12 through a pipe 14 communicating therewith which communicates with said aperture 9 and passes through the cylinder and aperture 10 which is in communication with the exhaust 15.

When the engine is constructed as a triple expansion as illustrated in Fig. 9 the exhaust steam passes first through the pipe 16 which communicates with the receiver pipe 17 which may be shut off by the valve 18. The steam passes through the valve 19 and through the pipe 20 in the same manner in the intermediate cylinder as above described, exhausting into the pipe 21 which is provided with a valve 22 allowing the steam to

pass into the receiver pipe 23 thence through the valve 24 into the pipe 25 which communicates with the "go ahead" aperture 9 in said rotor 3 of the low pressure cylinder which exhausts through the pipe 26 and valve 27 into said exhaust pipe 15.

In Fig. 10 I have shown the valves turned to the "backing" position and the steam passes into the cylinder as follows: The steam first enters the steam pipe 12 and passes through the valve 18 into the high pressure cylinder through the pipe 16 exhausting from the high pressure cylinder through the pipe 14 which communicates with the receiver pipe 28 by means of the valve 29 and is delivered to the intermediate cylinder through the valve 22 and pipe 21, exhausting from said intermediate cylinder through the pipe 20 and valve 19 which allows the exhaust steam to communicate with the receiver pipe 30 which delivers the steam to the pipe 26 which communicates with the low pressure cylinder by means of the valve 27. The steam is then exhausted from the low pressure cylinder through the pipe 25 and valve 24 into said exhaust pipe 15.

To provide a variable cut off in the high pressure cylinder the annular passage 11 is intercepted by the cut off stops 31 which I have shown as being adjusted by means of the screw 32 which is accessible from the exterior of my device, thus by referring to Fig. 1 of the accompanying drawings it is obvious that said cut off stops 31 may be disposed at a desired distance to cut off steam in the impelling chamber, thus allowing expansion and a means for economically using the steam.

I am aware that there are rotary engines having teeth or projections adapted to fit the inner surfaces of a suitable cylinder or casing, but by the use of the cut off stops and steam admission heretofore described as well as the abutments having an intermittent movement thus moving only when the steam pressure is released therefrom I attain greater economy with less wear. It is obvious that this may be accomplished in a number of different ways. I have shown in Figs. 1 and 3 a different method for moving the abutments while said projection 2 is passing. In Fig. 1 I have provided a crank motion to raise and lower said abutments 4. In Fig. 3 I have imparted a rotary motion to said abutments thus allowing said projection 2 to travel by said abutments while in motion. It is obvious by eccentrically boring the abutment chamber 33 the oppositely disposed abutments will balance as steam will be admitted to said abutment chamber and will act equally upon the abutments rubbing on the rotor 3 and upon the opposite abutment thereto which touches said abutment chamber at 34; when four abutments are used two of said abutments will not fit said abutment chamber 33, thus the pressure will be equally applied to both sides and the end surfaces thereof. In Fig. 5 I have shown the gearing of the triple expansion engine having the crank motion as shown in Fig. 1. It is obvious that because of the difference in the diameters of the several cylinders that a train of gears may be employed to impart power from said annular member 5 to the several cranks which operate the abutments 4. I do not wish, however, to be limited to a train of gears as shown, as levers may be used to equal advantage.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is;

1. In a rotary engine of the nature indicated, a cylinder, a rotor concentrically mounted therein, a projection on said rotor, an intermittently operated abutment adapted to co-act with said rotor, said projection, and said cylinder to form an impelling chamber, an annular passage, apertures in said projection communicating with said annular passage, means whereby the other of said apertures may be placed in communication with the exhaust of said rotary engine, means whereby the exhaust from one cylinder may communicate with the admission on another cylinder to economically utilize the steam expansively, means whereby said annular passage may be intercepted to cut off the steam.

2. In a rotary engine of the nature indicated, a cylinder, a rotor concentrically mounted therein, a projection on said rotor, an intermittently operated abutment adapted to co-act with said rotor, said projection, and said cylinder to form an impelling chamber, an annular passage, apertures in said projection communicating with said annular passage, means whereby the other of said apertures may be placed in communication with the exhaust of said rotary engine, means whereby the exhaust from one cylinder may communicate with the admission on another cylinder to economically utilize the steam expansively, means whereby said annular passage may be intercepted, cut off stops adapted to intercept said annular passage.

3. In a rotary engine of the nature indicated, a cylinder, a rotor concentrically mounted therein, a projection on said rotor, an intermittently operated abutment adapted to co-act with said rotor, said projection, and said cylinder to form an impelling chamber, an annular passage, apertures in said projection communicating with said annular passage, means whereby the other of said apertures may be placed in communication with the exhaust of said rotary engine, means whereby the exhaust from one cylinder may communicate with the admission on another cylinder to economically utilize the steam expansively, cut off stops adapted to inter-

cept said annular passage, means for operating said cut off stops from the exterior of said rotary engine.

4. In a rotary engine of the nature indicated, a concentrically mounted rotor, a casing provided with bearings adapted to journal said rotor, abutments co-acting to form an impelling chamber, an annular member, an aperture provided in said annular member, yielding fingers adapted to engage said aperture to intermittently operate said abutments.

5. In a rotary engine of the nature indicated, a concentrically mounted rotor, a casing provided with bearings adapted to journal said rotor, abutments co-acting to form an impelling chamber, an annular member, an aperture provided in said annular member, a star wheel provided with yielding fingers adapted to engage said aperture.

6. In a rotary engine of the nature indicated, an abutment, a cylinder adapted to support said abutment, a rotor concentrically mounted on said cylinder, a projection provided on said rotor and adapted to hermetically fit the inner surface of said cylinder, an annular member secured to said rotor and provided with an aperture, a star wheel, yieldingly mounted fingers secured thereto to insure engagement in said apertures.

7. In a rotary engine of the nature indicated, an abutment, a cylinder adapted to support said abutment, a rotor concentrically mounted on said cylinder, a projection provided on said rotor and adapted to hermetically fit the inner surface of said cylinder, an annular member secured to said rotor and provided with an aperture, a star wheel, yieldingly mounted fingers disposed in said star wheel to springingly press against said annular member to insure a positive engagement of one of said fingers in said aperture.

8. In a rotary engine of the nature indicated, a cylinder, abutments supported thereby, a concentrically mounted rotor, a projection provided in said rotor adapted to hermetically fit the inner surface of said cylinder, apertures provided in said projection, annular passages supplying said apertures, cut off stops provided in said annular passages to admit steam the full length of the stroke of said projection or part thereof, means whereby each of said passages may be thrown into communication with the steam admission and exhaust of said rotary engine to reverse the direction of travel of said rotor.

9. In a rotary engine of the nature indicated, a cylinder, intermittently operated abutments mounted therein, a concentrically mounted rotor, a projection secured to said rotor to co-act with said cylinder, said abutments, and said rotor to form an impelling chamber, means whereby steam may be admitted to said impelling chamber from said projection, means whereby the steam may be exhausted from said impelling chamber through said projection, cut off stops adapted to cut off steam from said impelling chamber at predetermined intervals relative to the extreme capacity thereof.

10. In a rotary engine of the nature indicated, a cylinder, a rotor concentrically mounted therein, a projection on said rotor, abutments adapted to co-act with said rotor, said projection and said cylinder to form an impelling chamber, an annular member, apertures provided therein, and yielding fingers adapted to engage said apertures to operate said abutments.

11. In a rotary engine of the nature indicated, a cylinder, a rotor concentrically mounted therein, a projection on said rotor, abutments adapted to co-act with said rotor, said projection and said cylinder to form an impelling chamber, an annular member, apertures provided therein, yielding fingers adapted to engage said apertures, and gears operated by said fingers to operate said abutments.

12. In a rotary engine of the nature indicated, a cylinder, a rotor concentrically mounted therein, a projection on said rotor, abutments adapted to co-act with said rotor, said projection and said cylinder to form an impelling chamber, an annular member, apertures provided therein, yielding fingers adapted to engage said apertures, gears operated by said fingers, and cranks driven by said gears adapted to operate said abutments.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HARRY PIERCE.

Witnesses:
PAUL A. TALBOT,
A. C. TALBOT.