(No Model.)

2 Sheets—Sheet 1.

# J. R. HAMILTON.

## ROTARY ENGINE.

No. 488,277. Patented Dec. 20, 1892.

Fig. 2.

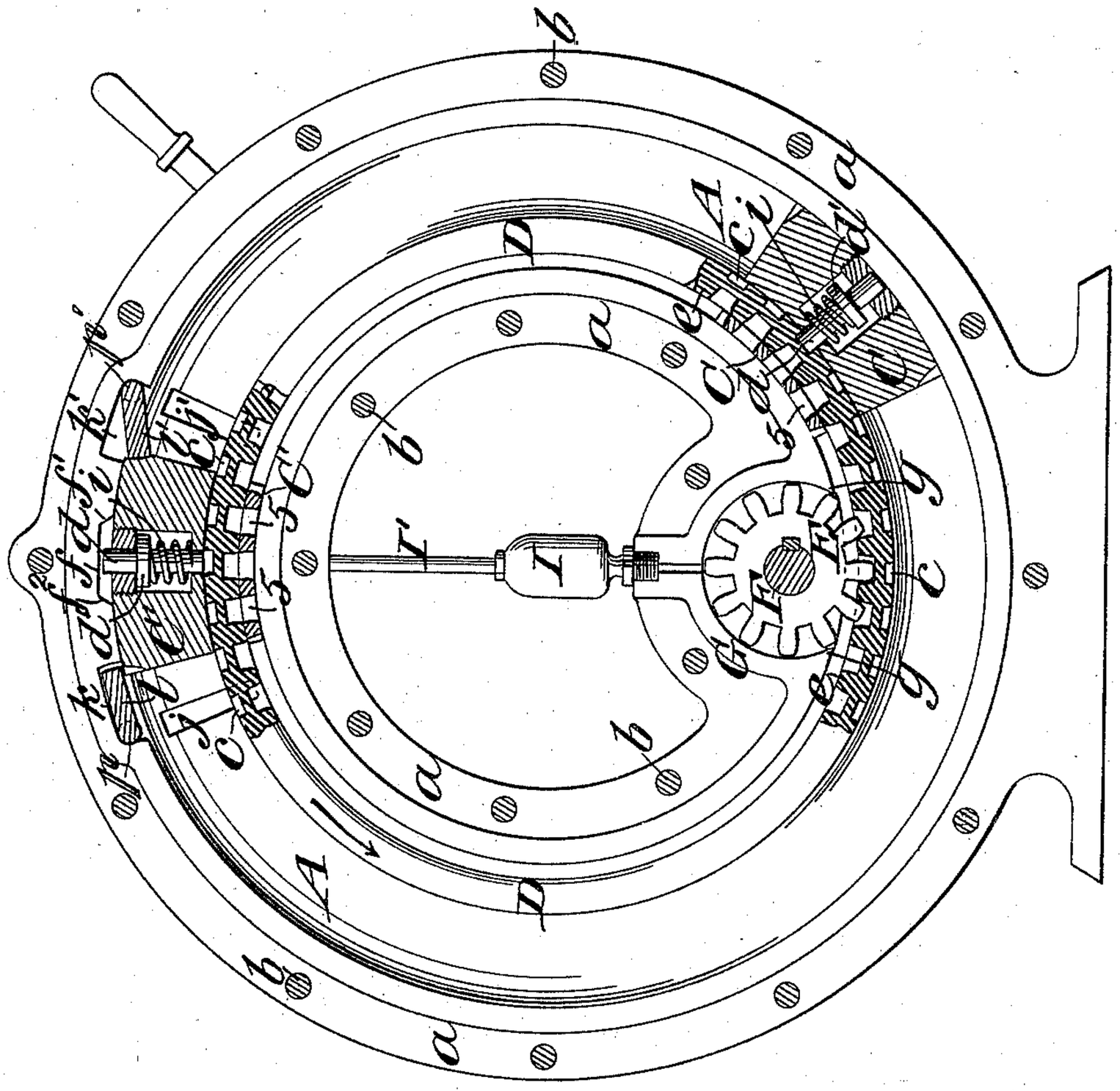
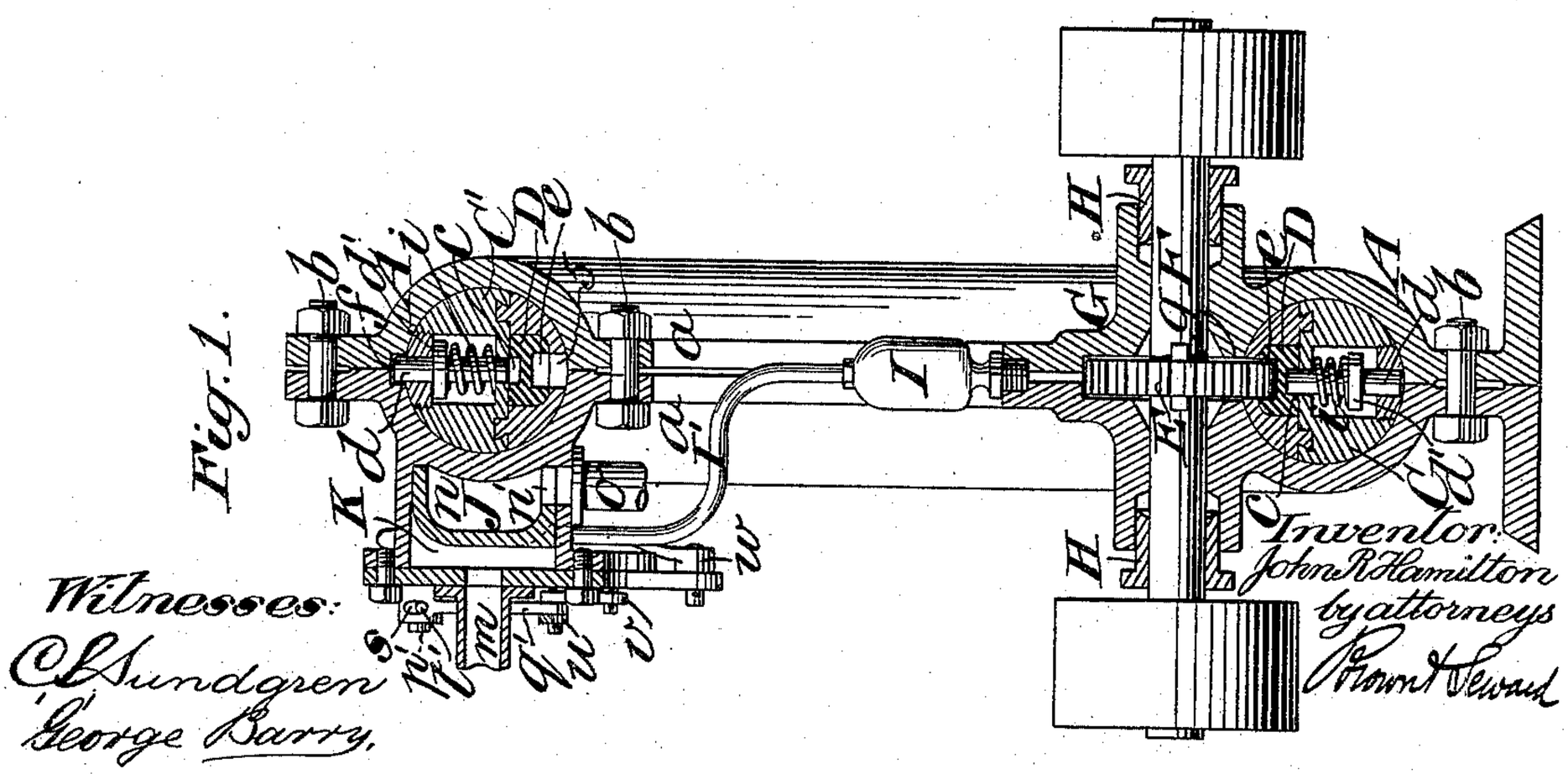


Fig. 1.



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Inventor:
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by attorneys
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(No Model.) 2 Sheets—Sheet 2.

# J. R. HAMILTON.

## ROTARY ENGINE.

No. 488,277. Patented Dec. 20, 1892.

Fig. 3.

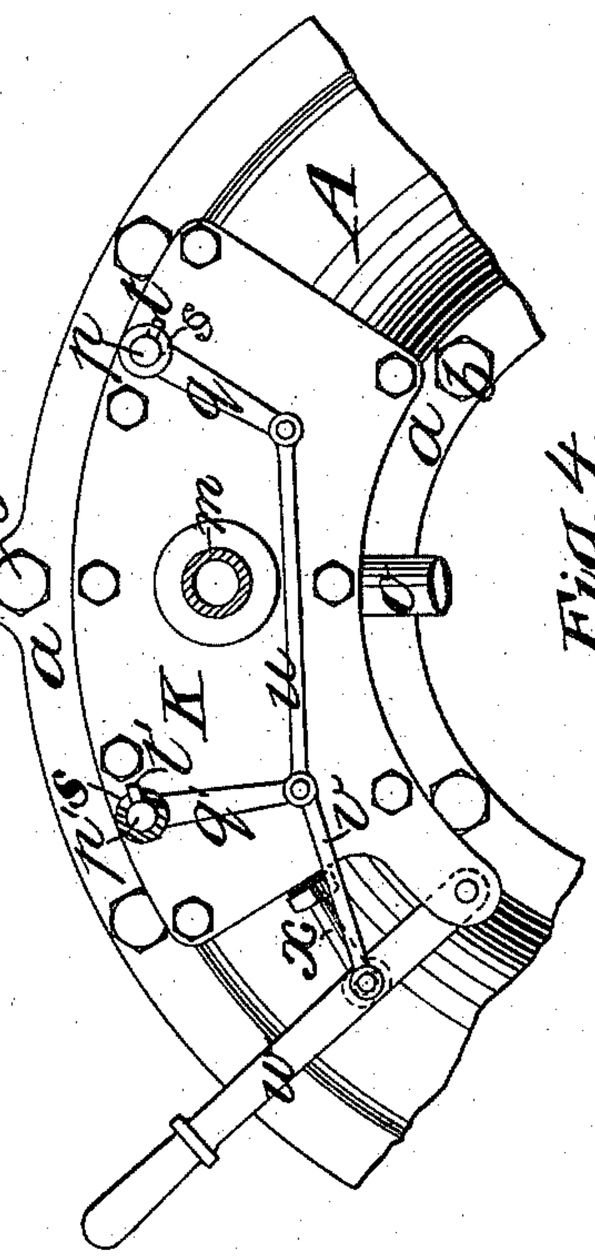
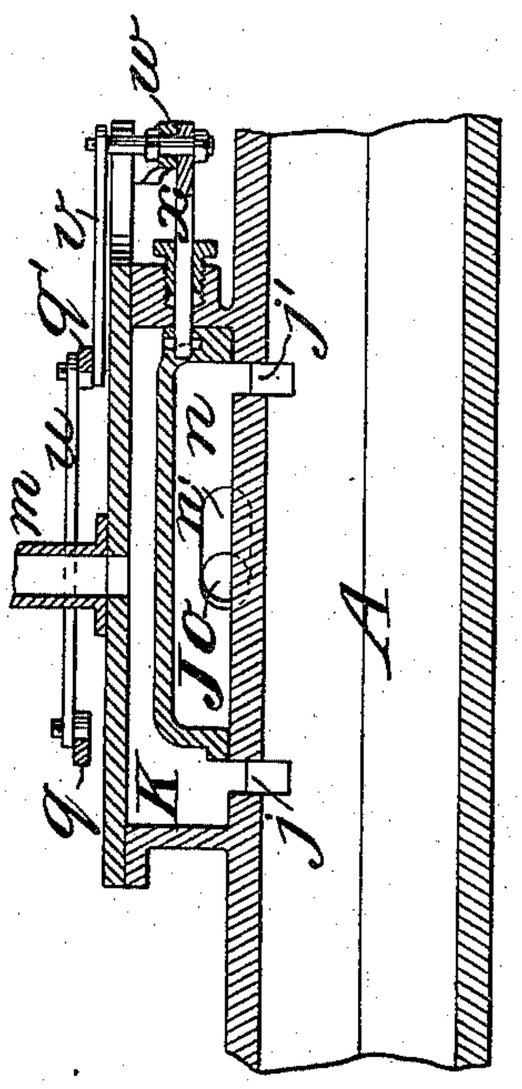



Fig. 4.




Witnesses:
C. L. Sundgren
George Barry.

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# UNITED STATES PATENT OFFICE.

JOHN R. HAMILTON, OF NEW YORK, N. Y.

## ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 488,277, dated December 20, 1892.

Application filed April 13, 1892. Serial No. 428,977. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN R. HAMILTON, of the city and county of New York, in the State of New York, have invented a new and useful Improvement in Rotary Engines, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to that class of rotary engines which have two pistons and a rotating ring with which each of the pistons is in turn connected and moves while the other one is temporarily arrested and made to constitute an abutment between which and the moving piston the pressure of the motive fluid, which will be hereinafter designated as steam, acts to produce rotary motion.

Figure 1 represents an axial vertical section of an engine embodying my improvement. Fig. 2 represents a vertical section taken parallel with the plane of rotation. Fig. 3 is a side view of a portion of the cylinder, the valve-chest and the reversing gear. Fig. 4 represents a horizontal section of the valve-chest and valve and part of the cylinder.

Similar letters and numerals of reference designate corresponding parts in all the figures.

A is the annular cylinder which is represented as having a bore of circular form transversely and as made in two halves, provided with flanges *a* through which they are bolted together by bolts *b*.

C C′ are two similar pistons fitted to work steam-tight in the bore of the cylinder.

D is a rotating ring within and concentric with the cylinder and passing through the two pistons. This ring which is the equivalent of a piston-rod as it transmits the motive power of the steam from the pistons, has in its outer circumference a series of notches *c* for the purpose of engaging it with either of the pistons C C′, by means of a bolt *d* with which each piston is furnished. The said ring is also furnished around its inner circumference with a series of cogs *e* which gear with and drive a cog wheel E on the main shaft F of the engine, the said cog wheel being arranged within a box G which is open to the cylinder at *g*, *g*, but otherwise closed and the said shaft passing through stuffing-boxes H H provided in the sides of the wheel box G. The pistons C C′ must be long enough to cover the openings *g*, *g*, in order to prevent the steam from blowing through as they pass the said openings. In the inner faces of the said pistons there are openings 5, 5, to correspond with the spaces between the cogs *e* of the ring for the entrance of the teeth of the cogs of the wheel E.

The bolts *d* hereinbefore mentioned for engaging the pistons with the ring D are made of a length a little greater than the distance between the outer circumference of the said ring and the outer circumference of the bore of the cylinder so that they may be held in engagement with the ring for rotation therewith by their outer ends being in contact with the cylinder bore. The said bolts are provided with collars or shoulders *d′* at the back of which springs *i* are arranged to constantly press the bolts outward so that the bolt *d* of either piston may be thrown out of engagement from the ring D when it arrives opposite a recess *f* provided in the outer circumference of the bore of the cylinder when the piston arrives at the position in which it is to be arrested to serve as an abutment, that position in the example represented being at the top of the cylinder, or in the upper part thereof where, on opposite sides of the said piston are two parts *j j′* (see Fig. 2) for the induction and eduction of the steam. For the purpose of stopping the piston in the aforesaid position there are on opposite sides of the recess *f* before mentioned two pivoted dogs or stops *l l′*, one of said dogs serving the purpose of stopping the piston in one direction and the other for the purpose of stopping it in the opposite direction. Recesses *k k′* are provided in the cylinder to receive the said dogs or stops *l l′* in such manner illustrated by *l* in Fig. 2 that they may be out of the way of the rotation of the pistons. Each of the said dogs or stops is free to be moved out of the way of the rotation of the other piston when either piston completes its period of duty as an abutment. The ends of the first mentioned recess *f* are inclined as shown at *f′ f²* in Fig. 2, that the said piston bolts coming into contact with these inclined ends as the pistons rotate may be forced inward into engagement with the notches *c* of the ring D. If

the engine should be intended always to work in one direction, one of the dogs might be dispensed with entirely and there might be a direct connection between either port *j j'* and the steam pipe and a direct connection with either of said ports with the exhaust pipe.

To make the engine reversible any known or suitable kind of reversing valve may be employed as for instance a D-slide-valve J arranged in a steam-chest K on one side of the cylinder, as shown in Figs. 1, 3 and 4, the said chest being always kept supplied with steam by a steam pipe *m*, and the cavity *n* in the face of the valve being always in communication through an opening *n'* with the exhaust pipe *o*, the length of the valve being such that while uncovering either of the cylinder ports *j j'* to the steam in the chest K, it forms communication with its cavity *n* between the other cylinder port and the exhaust pipe *o*.

In the reversible engine each of the dogs *l l'* must be capable of being locked in its cavity *k* or *k'* while the other one is left unlocked and free to drop behind the piston and to be moved out of the way of it as required. To provide of this, I have, in the example represented, extended the pivots *p p'* of the said dogs through the walls of the cylinder and of the steam-chest K, as shown in Figs. 1 and 3, and on these pivots I have provided loosely fitted arms *q q'* which are capable of a certain movement upon the said pivots limited by slots *s* in said arms and pins *t t'* projecting from the pivots *p p'* through said slots. The arms *q q'* are connected together by a rod *u* so that while one arm *q* or *q'* brings one end of its slot *s* into a position against the pin *t* or *t'* of its respective pivot *p* or *p'* to keep its respective dog *l* or *l'* within its recess *k* or *k'* in the cylinder, the corresponding slot *s* in the other arm *q* or *q'* will bring its slot *s* in a position to permit the pin *t'* or *t* of the other dog to move freely as required for the movement of that dog to produce the stoppage and permit the passing by of the pistons.

The arms *q q'* of the dogs *l l'* are represented in Figs. 3 and 4 as connected by a rod *v* with a hand-lever *w* which is connected with the stem *x* of the reversing valve, in such manner that when the said valve is set for the engine to run in one or the other direction the proper dog *l* or *l'* is locked out of the way of the pistons for running in that direction, while the other of said dogs is left free.

I is a lubricator connected with the wheel box G and connected by a pipe I' with the valve-chest for conveying lubricating material from the valve-chest to the said box, whence it is supplied to the ring D, the pistons and the cylinder.

Having now described separately the construction and operation of the several parts of my invention, I will briefly describe the operation as illustrated by the drawings in which the reversing valve is set in the position for running in the direction of the arrow shown on the ring D in Fig. 2, and the dog *l* is represented as locked out of the way of the piston and the dog *l'* as unlocked. The piston C' is represented as in position to constitute the abutment and the piston C as in operation. The port *j* is in communication with the steam-chest and is the induction port and the port *j'* is the eduction port and is in communication through the valve with the exhaust pipe. The abutment piston C' is held back against the dog *l'* by the steam supplied between it and the operating piston C through the port *j*. As the piston C passes and closes the port *j'*, it confines a certain quantity of steam in the cylinder between its own front face and the corresponding rear face of the abutment piston C', and as the other faces of the two pistons are then *in equilibrio*, the momentum of the piston C compresses the so confined steam to make it act as a cushion which prevents concussion between the pistons and through which the piston C acts to start the piston C' with an easy movement. The starting of the latter piston carries its bolt *d* past the inclined end $f^2$ of the recess *f* in the cylinder and produces the engagement of said bolt and of the said piston with the ring D and by the time the said piston has passed the port *j* and begun to receive steam behind it, the piston C has passed the dog *l'* while its bolt *d* having arrived opposite the resces *f* is disengaged from the ring by the action of its spring *i*. The steam now between the back of the engaged piston C' and the front of the disengaged one C now holds the latter back against the dog *l'* and acting upon C' continues to produce the movement of the power transmitting ring D and through it of the main shaft until the piston C passes the port *j'* when the operations with respect to the pistons C and C' are repeated by the pistons C' and C respectively and so on, each piston being in turn engaged with the power transmitting ring and being the operating piston and being disengaged from the said ring and arrested within the cylinder to constitute the abutment.

By the organization of the engine as described whereby the pistons are made to serve alternately as working pistons and abutments, one of the greatest objections to rotary engines heretofore constructed, viz., that of getting the abutments out of the way of the pistons is overcome.

I have not thought it necessary in this specification to describe the packings which may be necessary between the pistons and the cylinder and between the ring D and the pistons, nor the provision for placing the pistons on the ring as these are mere matters of engineering construction, but I will mention briefly that for the purpose of placing the pistons on the ring I have represented them in Fig. 1 as made in two parts and secured together by dovetail joints.

It is obvious that instead of two pistons four or any multiple of two might be employed with the same provision for engaging

the pistons with and disengaging them from the ring D and the cylinder A alternately.

What I claim as my invention and desire to secure by Letters Patent is:

1. The combination with the cylinder of a rotary engine, a rotary power transmitting ring arranged within said cylinder and two pistons fitted to said cylinder, of engaging devices in the pistons and a stop in the cylinder for alternately engaging said pistons with said ring and arresting them within the cylinder, and a main shaft eccentric to the cylinder geared with said ring, substantially as herein set forth.

2. The combination with the cylinder of a rotary engine having in its bore a recess at one point in its circumference, a rotary power transmitting ring arranged within said cylinder, a piston fitted to said cylinder, a bolt in said piston for engaging it with said ring, and a spring applied to said bolt to force it away from the said ring and into said recess in the cylinder for the disengagement of the piston from the ring, the said recess being inclined at one end to produce the re-engagement of the said bolt and the piston with said ring, substantially as herein described.

3. The combination with the cylinder of a rotary engine having a recess from its bore at one point in its circumference, a rotary power transmitting ring arranged within said cylinder, two pistons fitted to said cylinder and engaging devices for engaging either of said pistons with said ring and leaving the other disengaged therefrom, of a stop pivoted in said cylinder within said recess to fall into the cylinder bore behind and stop the piston which may be disengaged from said ring and to be moved out by either piston which may be engaged with said ring, substantially as and for the purpose herein described.

4. The combination of the cylinder having ports *j j'*, a recess *f* and a recess or recesses *k k'*; the power transmitting ring D having cogs *e e* and notches *c c*; the pistons C C' and the spring-actuated bolts *d d* provided therein; the eccentric shaft F; and the cog wheel on said shaft gearing with the cogs *e e* in the ring D; all substantially as and for the purpose herein described.

5. The combination with the cylinder of a rotary engine, a power transmitting ring arranged within said cylinder and two pistons fitted to said cylinder, of engaging devices in said pistons for engaging either one with and leaving the other disengaged from said ring, two stops one for acting as a stop in one direction and the other for acting as a stop in the other direction to the disengaged piston and means of throwing either stop out of operation while permitting the operation of the other, substantially as herein set forth.

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