E. F. GIROD.

ROTARY ENGINE.

APPLICATION FILED FEB. 25, 1911.

1,005,957.

Patented Oct. 17, 1911.

2 SHEETS—SHEET 1.

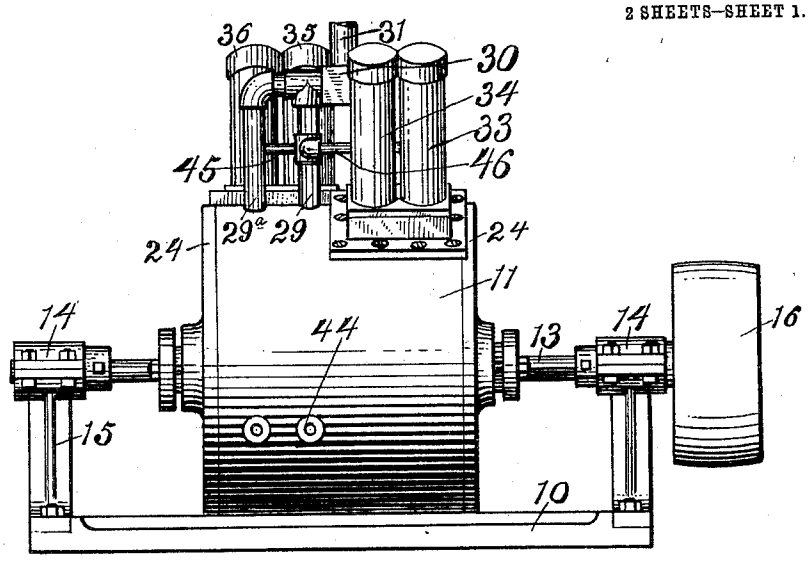


Fig. 1.

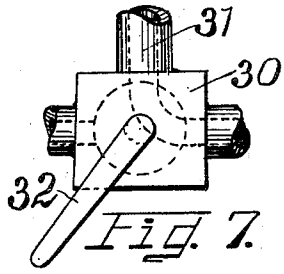


Fig. 7.

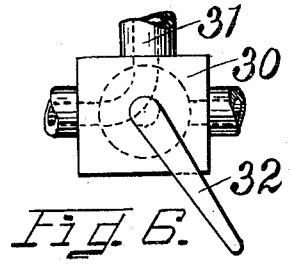


Fig. 6.

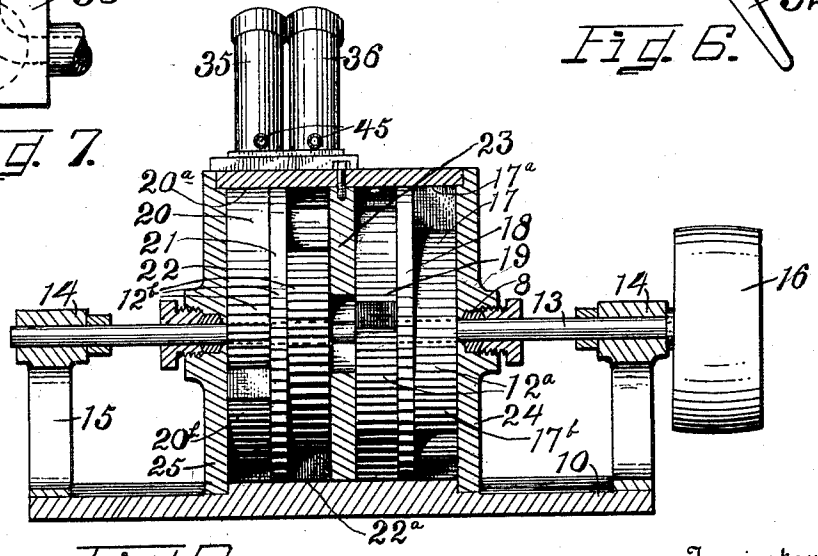


Fig. 2.

Witnesses

Mrs. S. S. Berlin.

George N. Buck.

Inventor

Edgar F. Girod.

Sterling P. Buck, Attorney.

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

E. F. GIROD.

ROTARY ENGINE.

APPLICATION FILED FEB. 25, 1911.

1,005,957.

Patented Oct. 17, 1911.

2 SHEETS—SHEET 2.

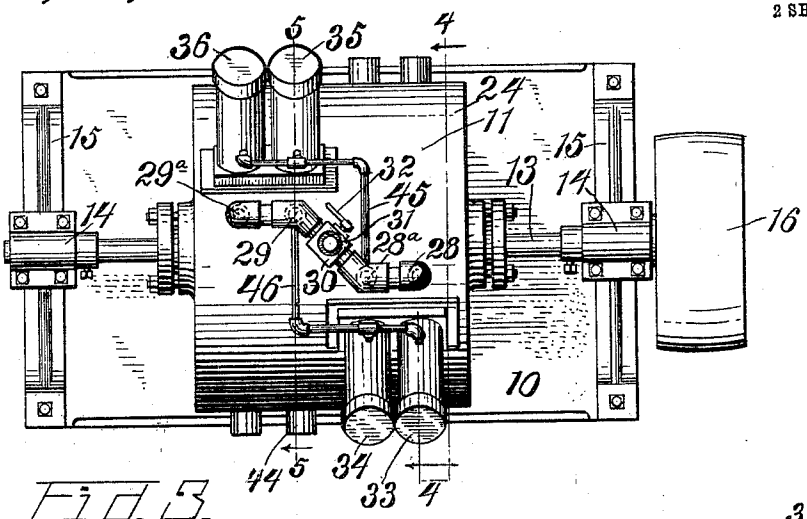


Fig. 3.

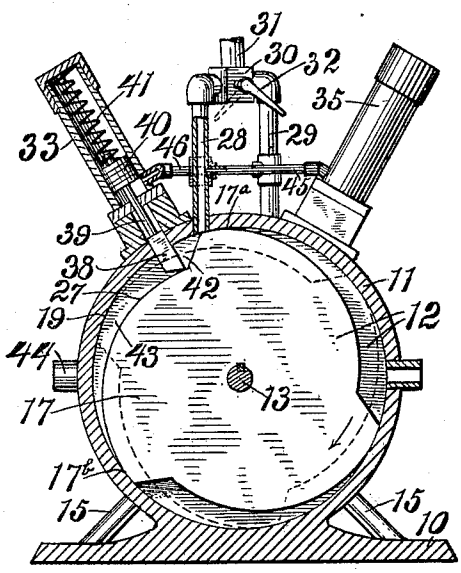
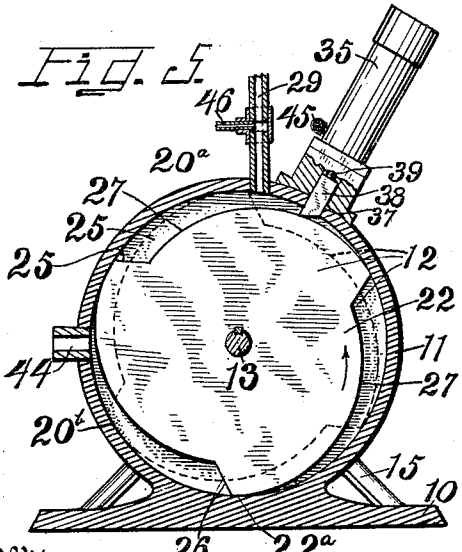


Fig. 4.

Fig. 5.



Witnesses

Mrs. S. D. Berlin.

George N. Buck.

Inventor

Edgar F. Girod.

Sterling P. Buck, Attorney.

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

EDGAR F. GIROD, OF DELHI, LOUISIANA, ASSIGNOR OF ONE-HALF TO PERRY W. GIROD, OF MONROE, LOUISIANA.

ROTARY ENGINE.

1,005,957. Specification of Letters Patent. **Patented Oct. 17, 1911.**

Application filed February 25, 1911. Serial No. 610,843.

To all whom it may concern:

Be it known that I, EDGAR F. GIROD, a citizen of the United States, residing at Delhi, parish of Richland, and State of Louisiana, have invented a new and useful Steam-Engine of the Rotary Type, of which the following is a specification.

My invention relates to that class of steam engines, in which the power is transmitted through a shaft, secured to a rotor, and adapted to rotate therewith, in a cylinder to which steam is applied under pressure; and has for its several objects,—first,—to provide an engine of this type, embodying novel and improved construction, whereby the direction of rotation may be easily, quickly and positively reversed; second;—to provide means for effecting the reversal of the rotor, by manipulation of a single member; third;—to provide withal, an engine that is comparatively inexpensive to manufacture, install and maintain; fourth;—to provide a compact, durable, convenient and altogether efficient means of motive power. I attain the foregoing objects by the mechanism illustrated in the accompanying drawings, in which, similar reference characters designate similar parts, throughout the several views, and in which,—

Figure 1 is a view in side elevation, of an engine embodying my invention; Fig. 2, a similar view; the base, bearings and cylinder being in section; Fig. 3, a plan view; Fig. 4, a sectional view, taken on the line 4—4 of Fig. 3; Fig. 5, a similar view taken on the line 5—5 of Fig. 3; and Figs. 6 and 7 are enlarged detail views of the 3-way valve.

It is to be understood that the particular form of 3-way valve here illustrated, and other features of the invention, are merely illustrative of the principles involved, and that the same is susceptible of modifications within the scope of these principles.

Referring now to the drawings, the base 10, the cylinder 11, and the rotor 12, constitute the essential elements of the engine to which this invention is applied. The rotor is fitted for rotation within the cylinder, and is keyed to a shaft 13, which is seated for rotation in the bearings 14, mounted upon supports, 15, which are secured to the base. On an end of the shaft is a pulley 16, from which power is transmitted in the usual manner.

In the present illustrated embodiment of my invention, the rotor 12, comprises two groups of disks which are separated from each other by a steam tight partition 23, secured to the interior wall of the cylinder, near the center thereof. The main shaft 13, extends through an aperture at the center of said partition, and the said disks are fitted to rotate with steam tight joints against the sides of said partition. Each group comprises two cam disks 17, 19 and 20, 22 respectively, and intermediate of each group is a circular disk, 18 and 21 respectively, which are fitted peripherally steam tight within the cylinder, and being fitted steam tightly and in fixed relation with the disks of their respective groups. The cylinder heads 24 are fitted steam tightly against the outer cam disks 17 and 20. These cam disks are preferably of the configuration illustrated; but the invention is not limited to this specific form or arrangement.

As is shown in Figs. 2, 4 and 5, the cam disks have steam tight contact with the cylinder at points designated 17^a, 17^b, 22^a, 20^a, and at the other like points; and intermediate of these contact points, are steam chambers of semi-crescent outline. An end wall of each of these steam chambers, constitutes an abutment 26, the surface of which lies at an angle to the radial line intersected thereby. One end of each abutment adjoins one of said contact surfaces, and the other end adjoins a cam surface such as 27, which merges with the next succeeding contact surface. The purpose of these abutments and cam surfaces will be set forth hereinafter. Conveniently located intake ports 28 and 29 supply steam to the chambers 25, and there is one of such ports for each of said cam disks. There is also an exhaust port 44, for each of said cam disks.

The intake ports are arranged in groups, or pairs, and each group is connected with the other by a 3-way-valve 30, which is adapted to receive steam from the main steam pipe 31, and direct it to the elected pair, or group, of intake ports. This directing of the steam may be accomplished by means of the simple form of 3-way valve shown in Figs. 6 and 7, in which the valve disk and steam passage are shown in dotted lines. It is quite obvious that when the lever 32 is in the position shown in Fig. 6, the steam is directed rightward, and when

in position as shown by Fig. 7 the steam is directed leftward. It is also clearly obvious that if the lever 32 were placed in any other position, the steam supply would be either partially or totally cut off from the cylinder.

Suitably located near the top of the main cylinder, and external thereto, are secured a number of supplemental cylinders, 33, 34, 35 and 36, which are preferably alined with the radii of the main cylinder. These cylinders communicate with the interior of the main cylinder through the medium of rectilinear apertures 37, and in these apertures are seated, for reciprocation, abutments 38, which contact with the periphery of the cam disks. Hereinafter, the abutments 38 will be referred to as "reciprocatory abutments," and those formed on the periphery of the cam disks will be spoken of as "revoluble abutments." Fitted within the supplementary cylinders, are pistons, 40, which are connected to the reciprocatory abutments 38, by piston rods 39, and are under influence of a spring 41, which tends to force the abutment 33 against the cam disks, and to hold them in steam tight relation therewith. The reciprocatory abutments of one group are designed to be out of contact with the cam disks whenever those of the other group are in operation, and this is accomplished by means to be presently described. When these abutments are in contact with the cams as shown in Figs. 4 and 5, they divide the steam chambers into two compartments, 42 and 43, which have no means of outer communication other than the intake and exhaust ports, and (from an examination of Fig. 4) it is obvious that, as the steam enters the compartment 42, through the port 28, and the volume of steam therein increases, the chamber 42, is caused thereby, to lengthen; the pressure of the steam moving the revoluble abutments away from the reciprocatory abutments, and in so moving, the rotor and main shaft are caused to rotate. It is quite obvious, that as the rotor (and cams) move, the reciprocatory abutments are elevated until the revoluble abutments, in their travel, have passed thereunder, whereupon, the reciprocatory abutment will suddenly change its direction of travel, under pressure of the spring 41, and assume a position in contact with the next succeeding cam on the cam disk, which at this interval is at the starting point, as shown in Fig. 4, and the operation is repeated. Meanwhile, the disk 19 is being similarly driven by steam from the port 28ª.

As is shown in dotted lines, Figs. 4 and 5, the elements of the cam disks 19 are in staggered relation to those of the cam disk 17; and therefore, when the least force is being exerted, by the steam, upon the abutment of one said disks, the greatest force is being exerted upon the abutment of the other disk, which insures a uniform speed and power, under a given load.

In the foregoing disclosure, the rotor has been considered as going in the direction of the arrow, or in a "clockwise" direction; the reciprocatory abutments in connection with the cylinders 33 and 34, have been active and those in the cylinders 35 and 36 have been idle and out of the way; and this condition has been effected by means of the cross-connecting steam pipes 45 and 46; the connections of which are best shown in Figs. 3 and 4. These pipes connect with the steam intake ports of each group, and cross over and connect with the supplemental cylinders of the other groups, respectively. Therefore, when the steam was entering the cylinder 11 through the pipes 28 and 28ª, steam was also entering the cylinders, 35 and 36, through the pipe 45, and coacting with the piston 40, to hold the abutments 38, out of the way.

Assuming, now, that we wish to reverse the direction of motion to that shown by the arrow, in Fig. 5, (or to a "contra-clockwise" direction), we have only to change the position of the lever 32, from the full line position, shown in Fig. 4, to the broken line position, thereby cutting off the steam supply from the clock-wise rotatable group of disks, and directing the steam through the pipes 29 and 29ª, to the contra-clock-wise group. Simultaneously with this operation, and by the same manipulation of the lever 32, the steam supply is cut off from the cylinders 35 and 36 and directed to the cylinders 33 and 34, whereby the former are permitted to contact the cams, and the latter are raised out of contact therewith. The relation of these cross connecting pipes, with the cylinders and pistons, is best shown in Fig. 4, where the pipe 46 enters the cylinder 40.

I claim:—

1. In a rotary engine, a cylinder, a rotor in the cylinder, comprising a multiplicity of disks, each of said disks comprising a multiplicity of abutments, cam surfaces intervening the abutments, the cam surfaces of certain disks being inclined oppositely with relation to the cam surfaces of the other disks, said cylinder and said cam surfaces embracing steam chambers therebetween, reciprocatory abutments contacting said cam surfaces, steam and exhaust ports communicating with said chambers and pressure actuated means for simultaneously throwing certain of said abutments out of operative relation and throwing certain other of said abutments into operative relation for reversing the direction of rotation of the rotor.

2. In a rotary engine, a cylinder, a rotor in the cylinder, a partition fitted steam

tightly in said cylinder, groups of cam disks rotatable within said cylinder and positioned on opposite sides of said partition, each cam disk having abutments thereon, cam surfaces on the said disks, said cylinder and said cam surfaces having steam chambers therebetween, said cylinder having rectilinear apertures therein, supplementary cylinders communicating with said rectilinear apertures, reciprocatory abutments in said apertures, pistons in said cylinders, said pistons being connected with said reciprocatory abutments, steam supply and exhaust means connected with the cylinder and coacting with the said abutments to rotate the rotor, and means for simultaneously cutting off the steam supply from one group of disks and directing it to the other group.

3. In a rotary engine, a cylinder, a rotor in the cylinder, groups of cam-disks comprising the rotor, said groups being separated by a partition secured within the cylinder, the cam disks of each group being intervened by a disk fitted steam tightly for rotation within said cylinder, revoluble abutments on each of said disks, the abutments on each disk being in staggered relation to those on the other disks of the group, the abutments on the cam disks of the several groups being disposed for rotation in relatively opposite directions, means for applying steam to each group independently of each other group, and means for instantly diverting the steam supply from one group to the other group.

4. In a rotary engine, a cylinder, a rotor comprising a clockwise rotatable portion and a contra-clockwise rotatable portion, each said portion comprising revoluble abutments and cam surfaces adjoining the abutments, said cam surfaces and said cylinders embracing steam chambers therebetween, reciprocatory abutments coacting with the revoluble abutments through steam pressure to actuate the cylinder in clock-wise direction, other reciprocatory abutments coacting with the revoluble abutments of the contra-clockwise portion to actuate the same through steam pressure, means for applying the steam pressure, and means whereby steam pressure operates to retain certain elected reciprocatory abutments out of operative relation.

5. In a rotary engine, a cylinder, a rotor in said cylinder, said rotor comprising revoluble abutments, said cylinder having apertures therein, reciprocatory abutments in the apertures, supplementary cylinders communicating with said apertures, pistons in said cylinders, said cylinders being connected with said reciprocatory abutments by piston rods, pipes for supplying steam for coaction with said abutments to actuate the rotor, means for holding the reciprocatory abutments in contact with said rotor, and steam supply means connected to the supplementary cylinders for retaining said reciprocatory abutments out of contact with said rotor.

6. In a rotary engine, a cylinder, a rotor in the cylinder, said rotor comprising oppositely operatable groups of cam disks, a steam pipe connected to the cylinder in radially opposite relation to each of the cam disks, steam engaging means on the disks, means for directing the steam to an elected one of the groups of cam disks and means for simultaneously throwing certain of said steam engaging means in operative relation and throwing certain other of said steam engaging means out of operative relation.

7. In a rotary engine, a cylinder, a rotor in the cylinder, said rotor comprising cam disks, abutments on the cam disks, reciprocatory abutments contacting the disks, means supplying steam under pressure to coact with said abutments in effecting rotation of said disks, supplementary cylinders on the first said cylinder, pistons in the supplementary cylinders, a rod connecting said reciprocatory abutments with said pistons, and cross-connected pipes communicating with the steam supply and with said supplementary cylinder for retaining the said reciprocating abutments out of operative engagement with said rotor; all substantially as set forth.

EDGAR F. GIROD.

Witnesses:
F. O. BROWNING,
F. B. MORRIS.