E. FISHER, JR.

ROTARY ENGINE.

APPLICATION FILED MAY 4, 1910.

988,989. Patented Apr. 11, 1911.

2 SHEETS—SHEET 1.

Fig 1

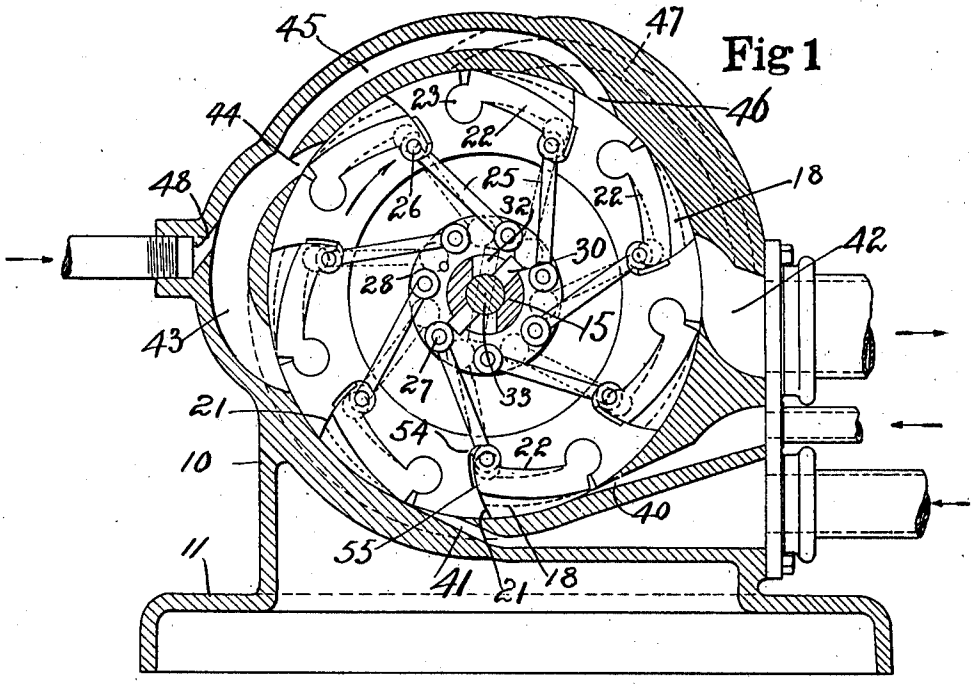
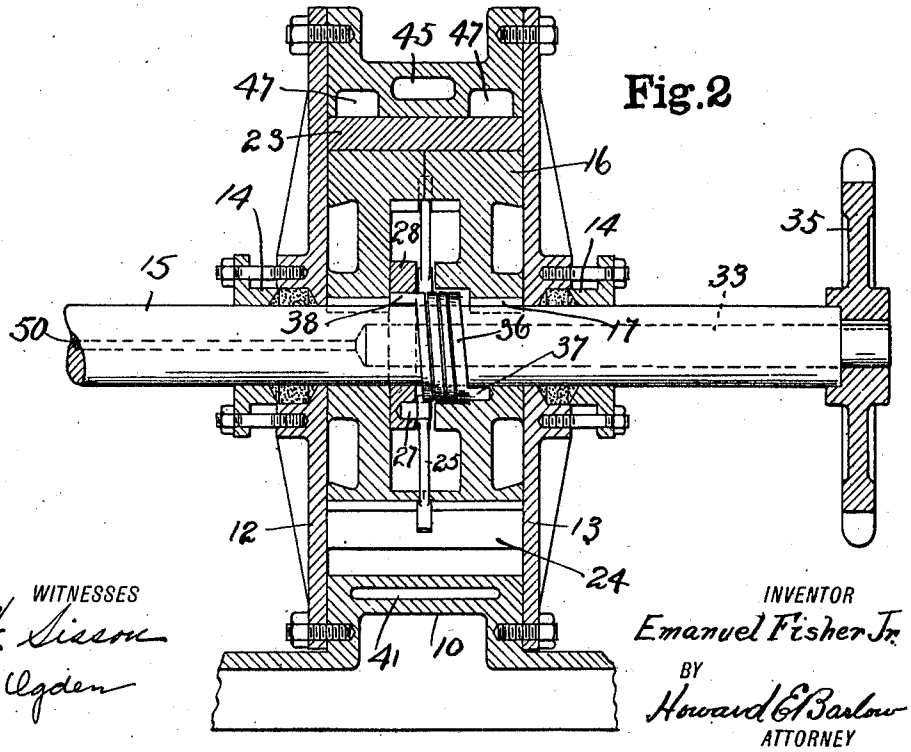


Fig.2



WITNESSES

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2 SHEETS—SHEET 2.

Fig. 3

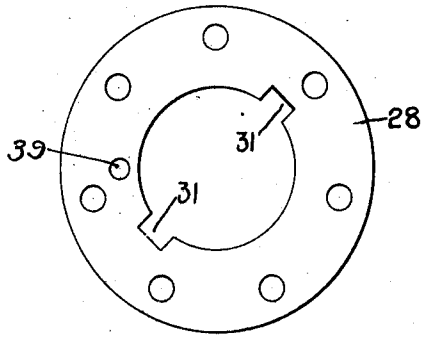


Fig. 4

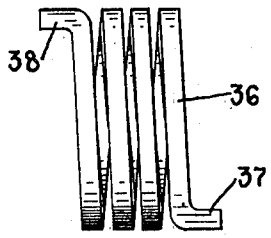


Fig. 6

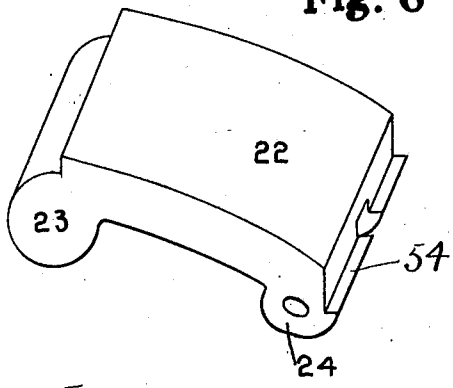


Fig. 5

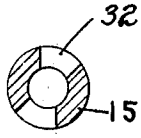


Fig. 7

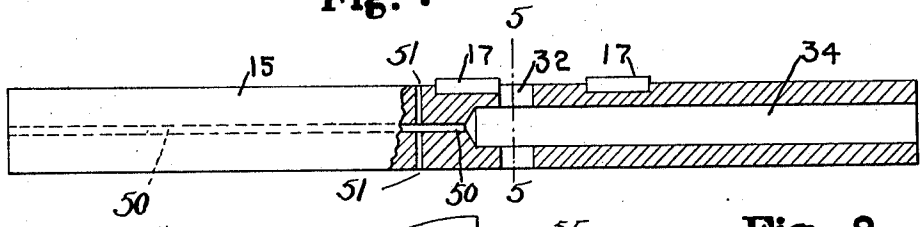
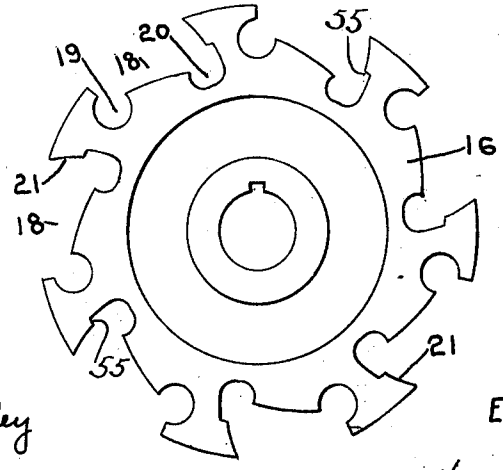


Fig. 8



WITNESSES

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ROTARY ENGINE.

988,989. Specification of Letters Patent. Patented Apr. 11, 1911.

Application filed May 4, 1910. Serial No. 559,325.

To all whom it may concern.

Be it known that I, EMANUEL FISHER, Jr., a citizen of the United States, residing at the city of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to motors of impact type, and the same will be hereinafter referred to as for use in connection with steam, but I wish to be understood as not limiting myself to steam as the motive fluid.

One of the objects of this invention is to provide a rotary engine having means for varying the piston area thereof.

Another object is to provide a rotary engine of this type having an automatic cut-off for varying the piston area.

Another object is to provide a rotary engine having means whereby the compound effect of both low and high pressure steam may be secured.

With these and other objects in view, the invention consists of certain novel features of construction, as will be more fully described and particularly pointed out in the appended claims.

In the accompanying drawings: Figure 1— is a side elevation of an engine constructed in accordance with my invention the casing and certain other parts hereinafter described being shown in section. Fig. 2— represents a vertical longitudinal section of the engine. Fig. 3— is a detail elevation of the disk which forms part of the automatic control mechanism. Fig. 4— is a detail view of the spring which connects the control disk with the piston member. Fig. 5— represents a section on line 5—5 of Fig. 7. Fig. 6— is a perspective view of one of the cut-off plates. Fig. 7— is a side elevation partly in longitudinal section of the main shaft. Fig. 8— is a detail side view of the rotary piston.

Similar reference characters represent the same or similar parts in all of the views.

The casing of the engine comprises a cylindrical member 10 which is mounted upon or formed as a part of a suitable base 11, side members 12 and 13 being secured to the central member as by bolts and nuts. Mounted in gland bearings 14 in the said side members is a shaft 15 to which is keyed the rotary piston member 16. For convenience in assembling and for operating the cut-offs hereinafter described, this piston member 16 is made in two parts as shown in Fig. 2, said parts however being so secured to the shaft 15, as by keys 17, that the two parts may be considered as one. Said piston member is formed in its periphery with recesses or pockets 18, each of said recesses having a ground bearing 19 at one end and a depression 20 at the other end, one surface or wall of each recess or pocket, as at 21, being hereinafter referred to as the impact surface.

In each pocket or recess is a cut-off plate 22 having a knuckle 23 fitting a bearing 19 so as to constitute a hinged connection with the rotary piston member. At the other end, each cut-off plate is formed with a rib 24 having a transverse hole. A link 25 is connected to each cut-off by means of a pintle 26 fitting said hole in the rib 24, the other end of each link being connected by a pivot 27 to a disk 28 which is rotatively mounted on the shaft 15. A pin 30 has its ends fitting recesses 31 in the disk 28, said pin passing through a transverse aperture 32 in the shaft 15 and being carried by and rigidly mounted in a spindle 33 which is mounted in a longitudinal aperture 34 in the shaft 15 and has a momentum wheel 35 secured to its outer end. As shown by comparing Figs. 5 and 7 the aperture 32 in the shaft 15 is wide enough to permit the disk 28 and the pin 30 and the spindle 34 to have a limited movement of rotation relatively to the shaft 15 and consequently relatively to the piston member 16 which is keyed on the shaft. The momentum wheel 35 is never to be manually actuated and therefore, in practice, it will be best to have said wheel inclosed in a casing to protect it from handling.

A spring 36 is coiled about the shaft 15 and has one end 37 fitting a recess in the rotary piston member 16, the other end 38 of said spring fitting a recess 39 in the disk 28. This spring is so formed and connected that it will have a normal tendency to hold the parts in the relative positions indicated in Fig. 1, and it, and its operation, will be more fully hereinafter described.

The casing is formed with a plurality of ports and passages, and said ports and passages may be considerably greater in number

than indicated in Figs. 1 and 2, in which one inlet port is indicated at 40 and another and larger one is indicated at 41, an exhaust port through the casing being shown at 42. The ports 40 and 41 are so inclined that steam passing through said ports will strike the impact surfaces 21 of the piston member, the steam acting successively. Owing to the fact that the port 40 is smaller than port 41 the pockets or recesses as they pass, cannot be completely filled by steam entering through the port 40, therefore leaving opportunity for a second impact of steam as each surface 21 passes the port 41. To still further provide for steam acting against each surface 21 at successive points of rotation of the latter, the pipe which supplies steam to the port 40 will usually lead from a source of supply of steam at a lower pressure than that which passes through the pipe leading to the port 41. The differences in pressure in these two pipes and the ports to which the pipes lead may be obtained in suitable manner either by differences in original pressure, or by employing a reducing valve in the conduit leading to the pipe which supplies the port 40.

The casing is formed with a passage 43 which I refer to as a transmission passage because it transmits steam from one portion of the wall of the casing to another portion so that the steam may escape from one pocket and pass through a portion of the casing and return to act again, through an inlet or port 44. Said passage 43 is divided so as to provide a branch transmission passage 45 through which steam may pass to another inlet or port 46 where the steam may re-enter the piston chamber. Passages 47 (see Fig. 2 and dotted lines in Fig. 1) are provided to permit steam to pass to the exhaust port 42.

The structure described is such that the steam after the first impact, passes around with the rotary piston member and as each recess reaches the first end of the passage 43, some of the steam is thrown out and continues to travel along the transmission passage 43 so as to re-enter again through the ports 44 and 46, thereby enabling me to utilize such force as the steam possesses after it has first acted but continues on its way to escape at the final exhaust 42.

At 48 I have shown a port to which a steam supply pipe is connected, and which may be utilized in emergencies if the engine is not furnishing sufficient power.

Suitable means may be provided for lubricating the engine such as by an oil duct 50 leading longitudinally of the shaft 15 and having branch ducts 51. To prevent undue strain upon the links 25 when the engine is moving at a high speed, I provide the cut-off plates with lips 54, and form the rotary piston 16 with shoulders 55, said shoulders and lips occupying such relative positions that the lips will contact with the shoulders when the outer surface of the cut-off plates 22 are flush with the portions of the piston member intermidate the recesses or pockets thereof.

In Fig. 1 I have indicated by full lines the relative positions of the parts when the engine is at rest and when steam is first turned on, the dotted lines showing the relative positions when the engine is running normal. When the engine is to be started, it is of course desirable that the full power of the steam shall be obtained in order to overcome the inertia of the moving parts of the engine and of the load. With the cut-off plates 22 in their innermost positions, the piston areas 21 are at their maximum. As the engine gathers speed centrifugal force tends to throw the cut-off plates outward to or toward the dotted line positions indicated in Fig. 1. This, through the links 25, slightly rotates the disk 28 and also the pin 30 and of course also rotates the spindle 33 and the momentum wheel 35 until a balance is secured between the outward pressure due to centrifugal force of the cut-offs and inward pressure due to the steam in the pockets or recesses. When this balance is attained, the parts will remain at somewhat the intermediate position indicated by the dotted lines in Fig. 1. If however there is a sudden increase in the load such as momentarily retards rotation of the shaft 15 and piston member 16, the momentum of the wheel 35, or its instant tendency to continue at the same speed as before, causes the pin 30 to assume the relative position indicated by full lines in Fig. 1. Since said pin must carry with it the disk 28, the result is to instantly draw the cut-off plates inward and so increase the piston or impact areas 21, thereby enabling the engine power to suffice for the load put upon it. As soon as the normal speed has been re-gained, the spring 36 again causes the momentum wheel and its spindle and the disk 28 and links 25 and cut-off plates 22 to all again assume the position of balance between steam pressure tending to force the plates 22 inward and centrifugal force tending to force said plates outward.

The cut-off plates 22 are indicated in the drawings as quite heavy. Upon the thickness or amount of metal or weight thereof must depend the amount of centrifugal force generated by any certain speed of rotation of the engine. If the plates were thinner than shown, the engine would have to rotate faster in order to generate sufficient centrifugal force to effect the balance desired to counteract the inward steam pressure. The proper relationship between outward tendency of the plates 22 due to centrifugal force and inward tendency due to pressure

of steam against them, may be obtained by making the said plates with the proper amount of metal, or by counterbalancing them.

My invention is not restricted to the precise construction and arrangement of parts herein shown and described nor to the various details thereof, as the same may be modified or re-arranged in various particulars without departing from the spirit and scope of my invention, one practical embodiment of which has been herein illustrated and described without attempting to show all of the various forms and modifications in which my invention might be embodied.

Having thus described my invention, what I claim is:

1. An engine having means for varying the effective area of its piston surface, and a momentum device for instantly increasing said effective area upon the application of a sudden increase of load upon the engine.

2. A rotary engine having a plurality of piston surfaces, and means for varying the areas of said surfaces which are exposed to the action of the motive fluid, said means including a momentum device and connections for automatically increasing said areas upon the application of a sudden increase of load upon the engine.

3. A rotary engine having a plurality of piston surfaces, and momentum mechanism for automatically varying the areas of said surfaces which are exposed to the action of the motive fluid.

4. An engine having a rotary piston member provided with a plurality of recesses, movable cut-offs in said recesses, and a momentum device for instantly shifting said cut-offs upon the application of a sudden increase of load upon the engine.

5. An engine having a rotary piston member provided with a plurality of recesses, movable cut-offs in said recesses, connections whereby the positions of said cut-offs are affected by a balance between centrifugal force and steam pressure, and a momentum device for instantly shifting said cut-offs upon the application of a sudden increase of load upon the engine.

6. In an engine, a shaft, a rotary piston member secured to said shaft and having peripheral recesses, cut-off plates pivotally mounted in said recesses, a disk mounted on said shaft and having means for permitting it to have a limited rotative movement on said shaft, and links connecting said disk with the cut-off plates, said disk limiting means comprising a spindle mounted on said shaft, a pin carried by the spindle and connected with the disk, and a momentum wheel carried by said spindle.

7. In an engine, a shaft, a rotary piston member secured to said shaft and having peripheral recesses, cut-off plates pivotally mounted in said recess, said shaft having a longitudinal aperture leading to one end, and an oil duct leading from said aperture to another portion of the shaft, a spindle in said aperture and connections from said spindle to the plates for controlling the positions of the latter.

8. In an engine, a shaft having a longitudinal aperture and a transverse aperture, a spindle mounted in said longitudinal aperture and having a momentum wheel, a pin connected to said spindle and projecting through the transverse aperture, a disk mounted on said shaft and connected with said pin, a rotary piston member secured to the shaft and having peripheral recesses, cut-off plates mounted in said recess, and links connecting said plates with said disk.

9. In an engine, a shaft having a longitudinal aperture, a spindle mounted in said aperture and having a momentum wheel, a disk mounted on said shaft and connected with said spindle, a spring coiled about the shaft and having one end connected to said disk, a rotary piston member secured to the shaft and having the other end of said spring connected to it, and cut-off plates carried by said piston member, the cut-off plates being operatively connected with said disk.

10. In an engine, a shaft, a rotary piston member secured to said shaft and having peripheral recesses, cut-off plates pivotally mounted in said recesses, each plate having a lip at its swinging end, the piston member having shoulders to co-act with the lips of the said plates to limit their outward swinging movements, and connections for controlling the positions of said plates.

In testimony whereof I affix my signature in presence of two witnesses.

EMANUEL FISHER, JR.

Witnesses:

HOWARD E. BARLOW,

E. I. OGDEN.