(No Model.) 3 Sheets—Sheet 1.

M. E. GILBERT.

ROTARY ENGINE.

No. 605,460. Patented June 7, 1898.

Fig. 1.

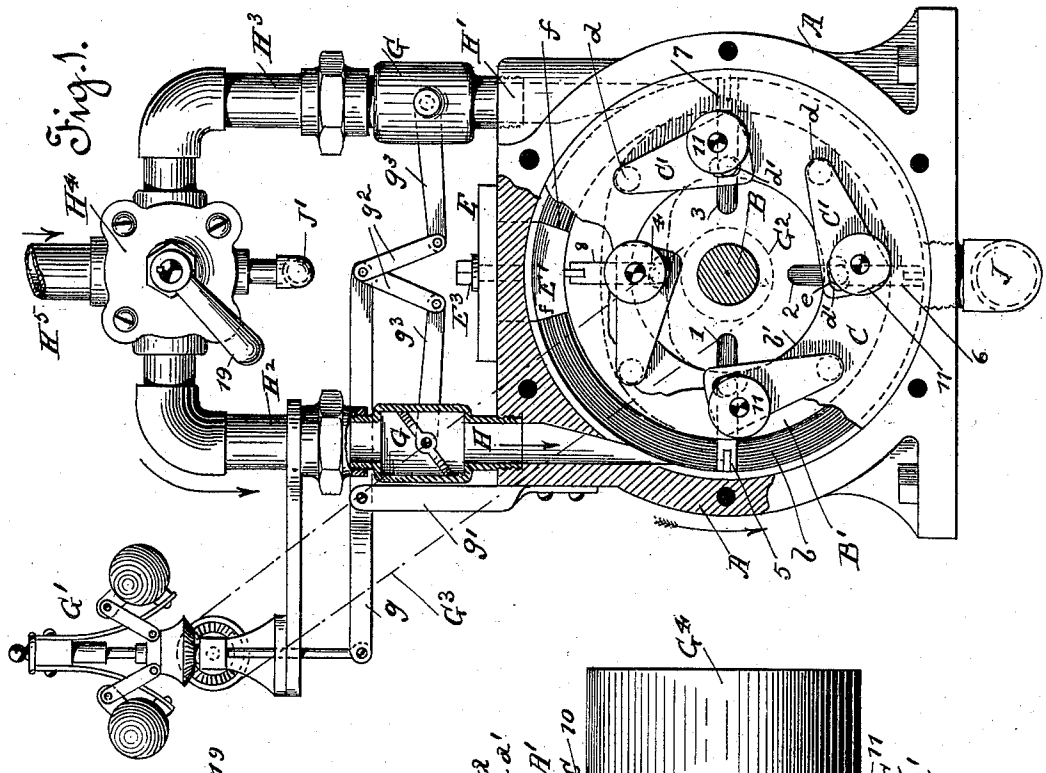
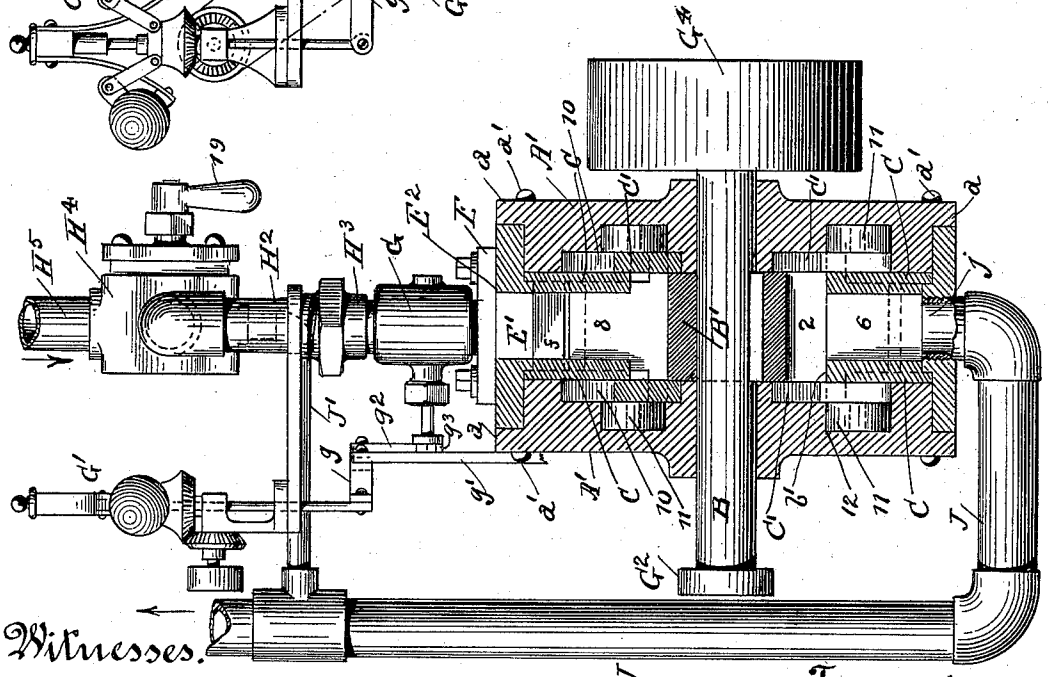


Fig. 2.



Witnesses.

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Fig. 3.

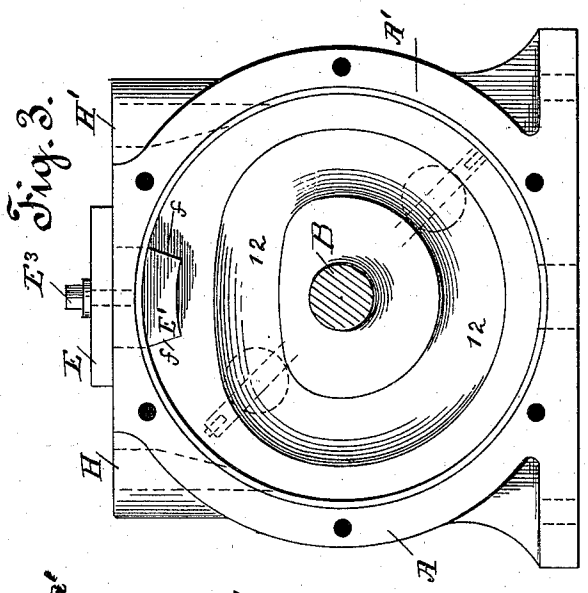


Fig. 5.

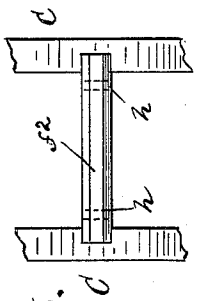


Fig. 4.

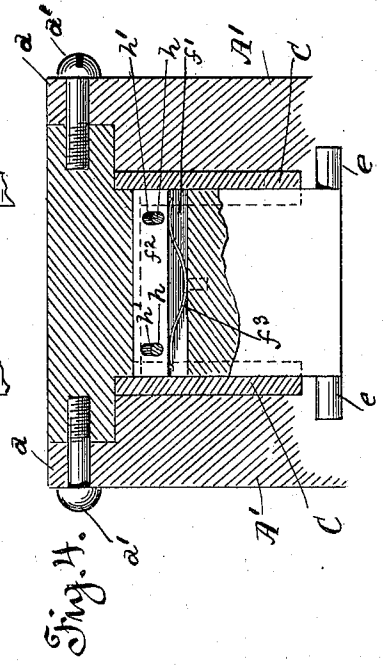
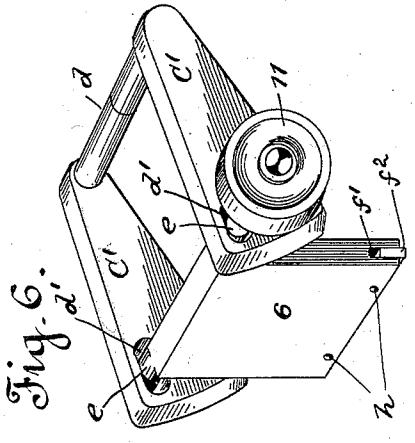


Fig. 6.



Witnesses.

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(No Model.)

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Fig. 7.

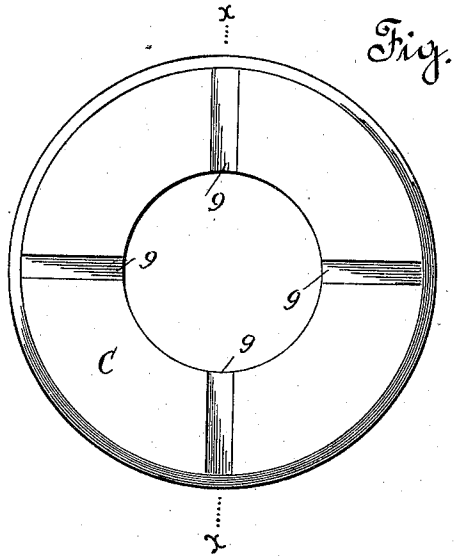


Fig. 8.

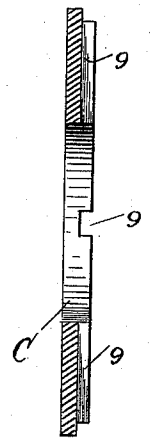


Fig. 9.

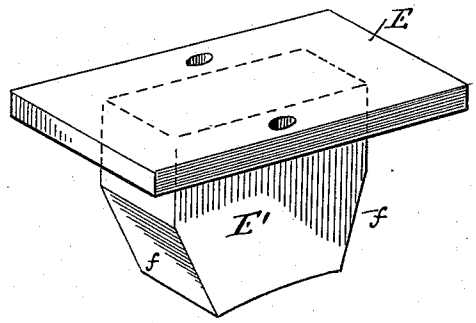
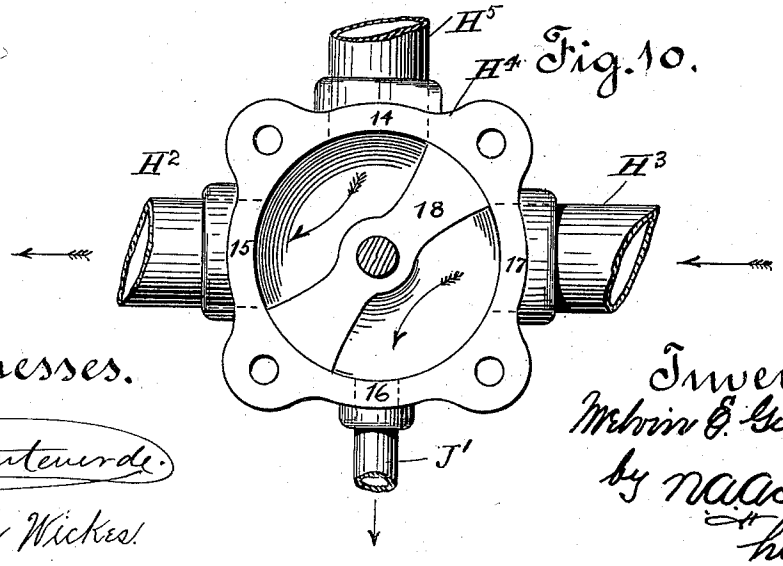


Fig. 10.



Witnesses.

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UNITED STATES PATENT OFFICE.

MELVIN E. GILBERT, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR OF ONE-HALF TO FRANK P. WICKERSHAM, OF FRESNO, CALIFORNIA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 605,460, dated June 7, 1898.

Application filed June 15, 1897. Serial No. 640,896. (No model.)

To all whom it may concern:

Be it known that I, MELVIN E. GILBERT, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Rotary Engines; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention relates to certain new and useful improvements in that class of machinery known as "rotary engines," which consists in the arrangement of parts and details of construction, as will be hereinafter fully set forth in the drawings and described and pointed out in the specification.

The object of the invention is to do away with the present style of crank and fly-wheel engines and to produce an engine without a dead-center which will maintain an even pressure or power and run at a high rate of speed without throwing out of balance and causing vibration, while at the same time obtaining full power from the high pressure of steam, being so constructed as to make the loss of steam and back pressure very slight, while securing the greatest efficiency of the steam entering therein, the engine being simple of construction, durable, and inexpensive of manufacture, it being so constructed that the impelling wings or blades will be gradually moved toward or from the inner face of the casing, thus removing or dispensing with the excessive jarring or pounding incident to machines of this class.

Referring to the drawings forming a part of this application, Figure 1 is a front view of the engine with one of the face-plates removed to disclose the inner mechanism thereof, one of the rings being partly broken away. Fig. 2 is a vertical sectional end view in elevation. Fig. 3 is a front view of the engine-casing with one of the face-plates removed. Fig. 4 is an enlarged detail sectional end view, partly broken away, of a portion of the casing, showing the inner side rings or flanges and one of the slide-wings. Fig. 5 is a detail broken top plan view showing the inner rings or flanges and one of the wings. Fig. 6 is a perspective view of one of the wings or flanges and the oscillatory cam-arm for raising and lowering the same and one of the bearing-rolls. Fig. 7 is an inside view of one of the inner rings or flanges. Fig. 8 is a vertical sectional view of the ring on line $x\,x$, Fig. 7. Fig. 9 is a perspective view of the removable head-block or abutment; and Fig. 10 is a detail view of the four-way stem-valve, the cover of the valve-casing being removed.

In the drawings the letter A is used to indicate the casing of the engine, which is closed by the circular face-plates A′, the flange a of said face-plates being secured to the edges of the casing by bolts a'. Through the face-plates A′ and casing extends the drive-shaft B, to which shaft is keyed or otherwise secured the disk B′. The diameter of this disk is somewhat less than the interior diameter of the casing, so as to leave an annular passage-way b between the periphery of the said disk and the inner face of the casing.

The disk B′ is provided in the present case with four radial slots 1 2 3 4, within which are fitted to slide vertically the wings or blades 5 6 7 8, which wings or blades also slide in radial grooves or channels 9, cut in the inner face of the rings or flanges C, located a distance apart within the casing at each side of the disk B′. These rings or flanges are fitted upon the shoulders b', projecting from each side of the disk B′, and completely fill the space existing between the inner side of the face-plates A′ and the outer faces of said disk, being bolted or otherwise secured to said disk. Being thus held in position, it is impossible for the side rings or flanges to move from side to side or from their adjusted position. Inasmuch as the wings or blades fit and work within the radial grooves or channels cut in the inner face of the rings or flanges and within the radial slots cut in the disk B′, it is obvious that as the said disk is rotated by the movement of the drive-shaft, to which it is keyed, the said wings or blades will be carried around within the casing.

To the outer face of each ring or flange C are fulcrumed, by cross-rod d, the oscillatory cam-arms C′, which arms have cut in their free end the elongated opening d'. Through these openings project the trunnions e, Fig. 6, projecting from the lower end of the wings or blades. Each fulcrumed cam-arm C′ fits and works within the countersunk portion 10

of the face-plates B′, and each arm carries a bearing-roll 11, which works within the countersunk eccentric groove or channel 12 of the face-plates, Figs. 1 and 2. The wings or blades 1, 2, 3, and 4 are gradually lowered and raised vertically during the rotary movement of the disk B′ and rings C as the bearing-rolls 11 move into or out of the eccentric portion of the groove or channel 12.

To the top of the casing A is bolted or otherwise secured the plate E, which supports the block E′, fitted through an opening E^2, formed through the casing. The lower end of this block projects into the annular passage-way *b* and fits between the inner faces of the rings C. This block acts as a bulkhead for preventing the live steam entering the casing forcing itself backward beyond a given point, said head-block E′ being held in place by the screw-bolts E^3, by means of which it may be readily removed in case it is desired to insert a new block in lieu thereof.

In order that the wings or blades may when outward their full distance bear against and maintain a tight joint with the inner face of the casing, each wing or blade has a transverse slot or groove *f*′, within which is fitted an end piece f^2. This end piece is held forced outward by a spring-cushion f^3 and is prevented from moving completely out of its seat by means of the pins or studs *h*, which pass through the said end piece and play within elongated openings *h*′, cut through the wings or blades, Figs. 4, 5, and 6. By thus constructing each wing or blade with a spring-cushioned end or tip the same may give to any irregularity in the metal of the casing and undue frictional wear be avoided, which is essential in this class of machinery.

Through the casing, at each side thereof, preferably, are formed two passages H H′, which act in accordance with the running of the engine as steam inlet or escape ports. These ports or passages communicate with the annular passage-way *b*, Figs. 1 and 3, and with the ports or passages connect the steam-pipes H^2 H^3, which lead from the four-way valve-casing H^4, into which steam enters from the pipe H^5. Within each pipe H^2 H^3 is located a butterfly-valve G, which is connected to the governor G′ by the lever *g*, fulcrumed to standard *g*′, attached to the casing, and the levers g^2 g^3, as shown in Fig. 1, connection between the governor and the belt-wheel G^2, secured upon one end of the drive-shaft B, being made by the belt G^3. Upon the opposite end of the said shaft is affixed the pulley-wheel G^4.

From the casing extends the exhaust-pipe J, which communicates with the exhaust-port *j* in the casing. Communication is established between the valve-casing H^4 and the exhaust-pipe J by means of the connecting-pipe J′, which conveys the escape-steam entering the casing into the said exhaust-pipe.

The valve-casing H^4 is provided with four ports 14, 15, 16, and 17, which are controlled by means of the valve 18, operated from the outside of the casing by handle 19.

In operating the engine the valve 18 is turned to open two of the ports—say 14 and 15—when the steam entering within the casing from pipe H^5 will escape into the steam-pipe H^2 and, the butterfly-valve G being open, will enter into the annular passage-way *b* of the engine through the port H. As the steam enters into the annular passage-way *b* of the engine it strikes against one of the wings or blades—say 5—and causes the disk B′, rings C, and the blade or ring to rotate within the casing, the steam impinging against each wing or blade as carried past the steam-inlet port H if rotating in the direction of the arrow and acting as an impelling-jet. The steam entering the annular passage-way *b* is confined within a limited space, for it cannot force itself in one direction beyond the head-block E′, which acts as a bulkhead, or in the other direction beyond the wing or blade. Hence its area of expansion is confined. As the wings or blades are forced beyond the exhaust-port *j* the confined steam will escape into the exhaust-pipe J. Consequently as the wings or blades are carried from the exhaust-port toward the inlet-port there is no load to be raised. Should, however, any steam escape in front of the wings or blades or not be entirely expelled through the exhaust-port, the same will escape from the engine through the port H′ into the pipe H^3 and enter the lower half of the valve-casing chamber through port 17 and flow therefrom through port 16 into the connecting-pipe J′, from which it is discharged into the exhaust-pipe. As the wings or blades approach the head-block E′ during the rotary movement thereof the bearing-rolls enter upon the eccentric portion of the pathway 12, cut in the face-plates, and gradually throw the fulcrumed oscillatory cam-arms downward, which draws or forces the said wings or blades gradually inward within the radial slots cut in the disk and grooves of the rings until the same clears or is enabled to pass under the head-block. As carried past the head-block the cam-arms gradually lift the wings or blades outward as the bearing-rolls move from within the eccentric portion of the pathway 12.

In order to reverse the machine, the handle 19 is turned to open ports 14 and 17, when the flow of steam and the movement of the engine will be the reverse of that just described.

By means of the governor mechanism the speed of the engine is controlled in the usual manner.

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

1. In a rotary engine, the combination with the casing having in its opposite end walls cam-grooves 11, 11, of the radially-slotted disk, the rings or flanges C having radial grooves in their inner faces only, the radially-

slidable wings movably secured in the said slots and grooves, the cam-arms pivotally fulcrumed in the rings or flanges, rolls working in the cam-grooves mounted on the cam-arms, and a pivotal sliding connection between the cam-arms and wings, substantially as described.

2. In a rotary engine, the combination with the casing, of the drive-shaft passing therethrough, the disk secured to the drive-shaft and located within the casing so as to leave an annular passage-way between the periphery and the inner face of the casing, rings or flanges secured within the casing at each side of the disk, radial slots cut in the disk and radial grooves or channels cut in the inner face of the rings or flanges, a series of wings or blades mounted to slide vertically in the radial slots and grooves or channels, the oscillatory cam-arms fulcrumed to the outer face of the rings or flanges, pivotal sliding connection between the oscillatory cam-arms and the movable wings or blades, devices for raising and lowering the fulcrumed oscillating cam-arms, and of the inlet and outlet ports in the casing.

3. In a rotary engine, the combination with the casing thereof, of the face-plates therefor, the eccentric groove formed in the inner face of the face-plates, the disk mounted to rotate within the casing, the rings or flanges located at each side of the disk, radial slots cut in the disk and radial channels in the inner face of the rings or flanges, a series of vertically-movable wings or blades working in said radial slots and channels, oscillatory cam-arms fulcrumed to the outer face of the rings or flanges, pivotal sliding connection between the oscillatory fulcrumed cam-arms and the wings or blades, bearing-rolls carried by the fulcrumed oscillatory cam-arms which travel within the eccentric groove of the face-plates, and of the inlet and outlet ports in the casing.

In testimony whereof I affix my signature, in presence of two witnesses, this 29th day of May, 1897.

MELVIN E. GILBERT.

Witnesses:
LEE D. CRAIG,
N. A. ACKER.