(No Model.)

S. G. BROSIUS.

ROTARY ENGINE.

No. 453,614. Patented June 9, 1891.

Fig. 1.

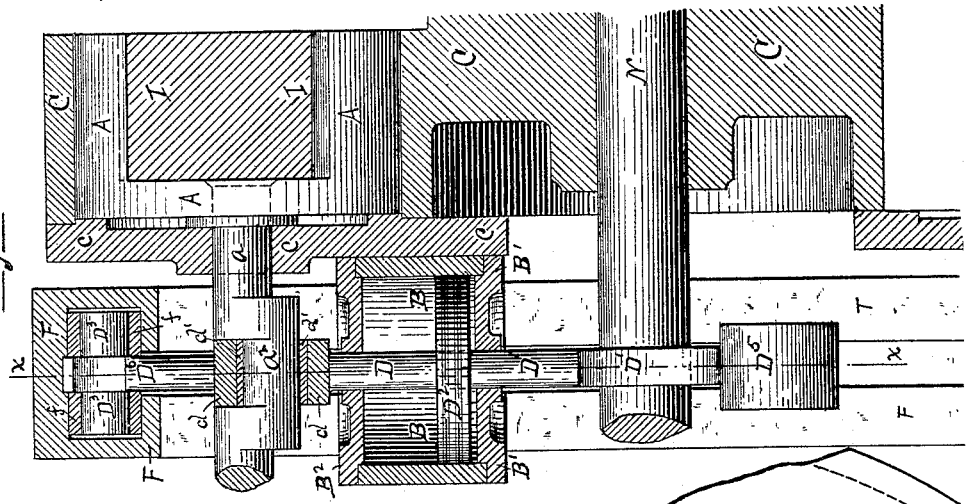
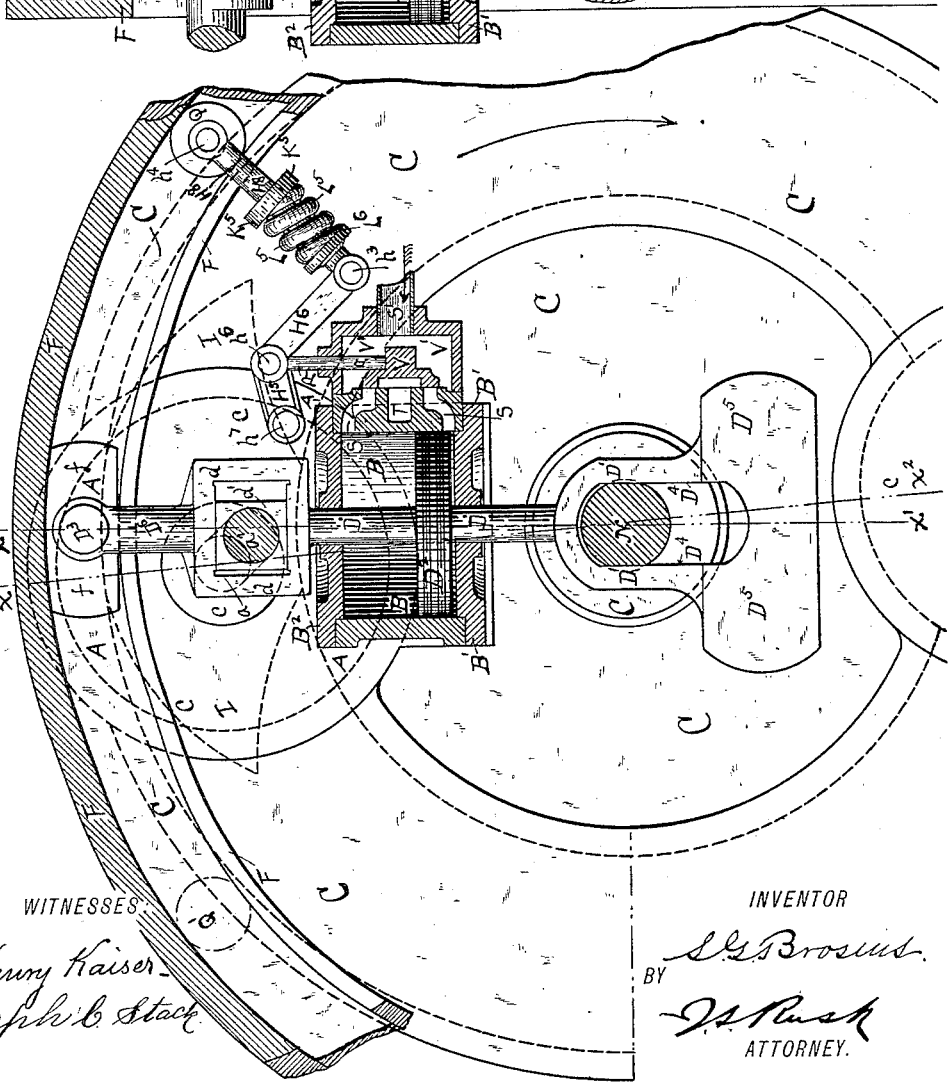


Fig. 2.



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UNITED STATES PATENT OFFICE.

SAMUEL GLENVILLE BROSIUS, OF SAVANNAH, GEORGIA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 453,614, dated June 9, 1891.

Application filed April 4, 1891. Serial No. 387,624. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL GLENVILLE BROSIUS, a citizen of the United States, residing at Savannah, in the county of Chatham and State of Georgia, have invented certain new and useful Improvements in Rotary Engines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in rotary engines shown in my applications Serial Nos. 386,871 and 386,872, filed March 28, 1891; but it is also equally well adapted to any class of rotary engines having oscillating or reciprocating pistons.

This invention consists in certain broad and novel features hereinafter described.

The lever which operates the pistons of the rotary engines through their shafts is reduced so as to form a piston-rod, which is provided with a piston-head working in a steam-cylinder, to which steam is admitted alternately to opposite sides of the piston-head to operate said lever. Said lever is extended through the cylinder and past the center of the driving-shaft, and is provided with a counterbalance to overcome centrifugal force. The other end is provided with journals and cam-blocks, which operate in a cam. The oscillations of the pistons of the rotary engine are controlled by the piston-head on said lever in conjunction with a cam. Said cam positively operates the said piston; but the steam-cylinder by the action of its piston eliminates or reduces the jar with its consequent wear and friction by anticipating the action of the cam. The steam is admitted by a valve controlled by a compound lever, which is governed by a cam. Said cam may be identical with the cam controlling the piston-lever. The cylinder in which the piston-head of the piston-lever operates is attached to the rotating cylinder, and consequently rotates with it.

The invention has for its objects to overcome the jar incident to the use of cams in operating the pistons in a rotary engine in passing the abutments; to oscillate or control the pistons in a rotary engine in passing the abutments; to oscillate or control the pistons in a rotary engine in passing the abutments by means of a steam-cylinder; to oscillate or control the piston in a rotary engine in passing the abutments by means of a steam-cylinder acting in conjunction with a cam which governs the oscillations of the piston; to admit and cut off steam to the steam-cylinder, so as to operate the pistons in passing the abutment; to admit and cut off steam to the steam-cylinder by a compound lever operated by a cam; to overcome the centrifugal force of the compound lever by means of a spring or counterbalance. These and other objects are accomplished by the mechanism hereinafter described, and shown in the drawings.

Like letters of reference refer to like parts in all the drawings.

Figure 1 is a cross-section on line x' x' of Fig. 2 and shows the abutment, oscillating piston, steam-cylinder, lever, cam, and a portion of the rotating cylinder in their relations to each other. Fig. 2 is a cross-section through the steam-cylinder on line $x\,x$ of Fig. 1, showing the same parts as in Fig. 1 and the steam-chest with valve and its compound lever.

Referring to the figures in the drawings, the rotating cylinder C is mounted on the shaft N, and is provided with a piston A, which is journaled by its shaft a in the piston-heads c, to which is securely attached a steam-cylinder B, which is provided with the piston D^2 on the piston-rod D, which passes through said cylinder. Said piston-rod is enlarged to form the link d, which receives the link-block d'. Said link-block is provided with a journal-box to receive the crank-shaft a^2 of shaft a of the piston A. The said link is connected to the cam-block by journal D^3 and the cam-block rod D^6. Said cam-block travels in the cam F and is controlled by it. The opposite end of said piston-rod D extends past the center of the rotating cylinder C, and is provided with the counter-balance D^5, and is connected to said rod by the bars D′, which are constructed with the guideways D^4 bearing against shaft N. The steam is admitted through pipe S′ to the steam-chest V′, and thence into the steam-cylinder through the steam-ports S, and exhausted through the exhaust-port T. The steam inlet and exhaust is controlled by

the valve V through the valve-rod R, which is operated by the compound lever H^5 H^6, which is pivoted at h^7 and H^8, being connected to the valve-rod R at h^6. The levers H^5, H^6, and H^8 are connected by the journal-pin h^3. The opposite end of H^8 is connected to the cam-block Q by the journal h^4 and works in the guide K^5, which is securely attached to the rotating cylinder C. H^8 is also provided with the flange L^6. The spring L^5 is placed between flange L^6 and the guide K^5. Said spring should be of such tension as to just overcome the centrifugal force of the compound levers H^5, H^6, and H^8.

As shown in the drawings, the rotating cylinder revolves, as indicated by the arrow. The cam-block Q, which operates the cut-off, leads the lever D by a distance hereinafter described in the operation. To reverse the engine, connection should be made with the cam-block Q′.

The line x' x' and x^2 x^2 respectively represent the center line of the lever D and the rotating cylinder.

The operation is as follows: The steam is admitted into the steam-cylinder B, so as to operate lever D, which oscillates and controls piston A by its crank a^2 through its shaft a, so that the said piston may pass the abutment. This it must necessarily do during a portion of the revolution of the rotating cylinder. During the remaining portion, piston A is stationary with regard to and propels the rotating cylinder C, as set forth in the applications above referred to. The counter-balance D^5 counteracts the centrifugal force of lever and its moving parts. Said counter-balance may be dispensed with and steam admitted on one side of the piston to act against the centrifugal force. The motion of the lever around the axis of the rotating cylinder generates said centrifugal force which is used to throw the lever out, thereby confining the use of steam to one side of the piston-head. The admission and exhaust of steam into the steam-cylinder is controlled by the valve V, governed by the compound levers H^5, H^6, and H^8, which is controlled in its movement by the cam-block Q′, traveling in cam F, said cam-block Q being placed sufficiently far in advance of cam-block f of the lever D so as to admit steam to the piston-head D^2, which operates lever D at and during the period of a throw, when it is oscillating the piston A to pass the abutment l. The cam F, with its cam-block f, the rod D^2, and its journal D^3 are not necessary to the operation of the lever D, and if found advisable may be dispensed with. In which case the oscillations of piston A will be controlled entirely by piston-head D^2. A cam or some mechanical equivalent controlling the inlet and exhaust to the steam-cylinder B, the counter-balance D^5, and the guide D^4 may also be dispensed with without affecting the operation of the steam-cylinder.

I do not confine myself to this construction, as one or more pistons may be controlled by one steam-cylinder and its accompanying parts, and, furthermore, I do not limit myself to the arrangement shown, as changes may be substituted without departing from the spirit of my invention.

Having thus ascertained the nature and set forth the construction of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a rotary engine, a rotating steam-cylinder and pistons provided with cranks and controlled by a steam-cylinder, for the purpose set forth.

2. In a rotary engine, a rotating steam-cylinder and oscillating pistons provided with cranks and controlled by a steam-cylinder, for the purpose set forth.

3. In a rotary engine, a rotating steam-cylinder, oscillating pistons, a steam-cylinder, and lever forming the piston-rod and the piston-head of the steam-cylinder, said lever being provided with the link for operating the oscillating pistons, for the purpose set forth.

4. In a rotary engine, a rotating steam-cylinder, pistons, a steam-cylinder, and a lever forming the piston-rod of the steam-cylinder piston-head, said lever being provided with a link-block for operating the pistons, substantially as and for the purpose set forth.

5. In a rotary engine, a rotating steam-cylinder, pistons, a steam-cylinder, a cam, a lever provided with a link and forming the piston-rod of the steam-cylinder piston-head, and a cam operating said lever, for the purpose set forth.

6. In a rotary engine, a rotating cylinder, pistons, a steam-cylinder, a cam, a cam-block, and a lever forming the piston-rod of the steam-cylinder piston-head, said lever being provided with a link and a link-block in which the crank of said piston is journaled and controlled by the said cam, for the purpose set forth.

7. In a rotary engine, a rotating cylinder, pistons, a steam-cylinder, and a lever forming the piston-rod of the steam-cylinder piston-head, said rod provided with a link at one end and at the other with a counter-balance, for the purpose set forth.

8. In a rotary engine, a rotating cylinder, pistons, a steam-cylinder provided with two cylinder-heads, and a lever forming the piston-rod of the steam-cylinder piston-head, said rod provided with a link at one end and at the other with a counter-balance and passing through both heads of the said steam-cylinder, for the purpose set forth.

9. In a rotary engine, a rotating cylinder, pistons, a steam-cylinder, and a lever forming the piston-rod of the steam-cylinder piston-head, said rod being provided with guides, for the purpose set forth.

10. In a rotary engine, a rotating cylinder, pistons, a steam-cylinder, and a lever forming

the piston-rod of the steam-cylinder piston-head, said rod provided with a link at one end and at the other with guides around the driving-shaft, for the purpose set forth.

11. In a rotary engine, a rotating cylinder, pistons, a cam, and a steam-cylinder having steam inlet and exhaust ports controlled by levers and operated by a cam, for the purpose set forth.

12. In a rotary engine, a rotating cylinder, pistons, a cam, a steam-cylinder having steam inlet and exhaust ports controlled by levers, and a cam and a spring to overcome the centrifugal force of said levers, for the purpose set forth.

13. In a rotary engine, a rotating cylinder, to which is securely attached a guide, pistons, a cam, and a steam-cylinder having steam inlet and exhaust ports controlled by levers and a cam, said lever passing through said guides, for the purpose set forth.

14. In a rotary engine, pistons, a cam, a steam-cylinder having inlet and exhaust ports controlled by levers and a cam, and a rotating cylinder, to which is securely attached the guide K^5, through which the lever H^8 passes, H^8 being provided with the flanges L^6, between which and guide K^5 is placed the spring L^5 to overcome the centrifugal force of said lever, for the purpose set forth.

15. In a rotary engine, a rotating steam-cylinder and oscillating pistons provided with cranks, oscillating substantially about the central axis controlled by a steam-cylinder, for the purposes set forth.

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

SAMUEL GLENVILLE BROSIUS.

Witnesses:
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JOSEPH C. STACK.