(No Model.) 3 Sheets—Sheet 1.

S. G. BROSIUS.

ROTATING CYLINDER ENGINE.

No. 492,859. Patented Mar. 7, 1893.

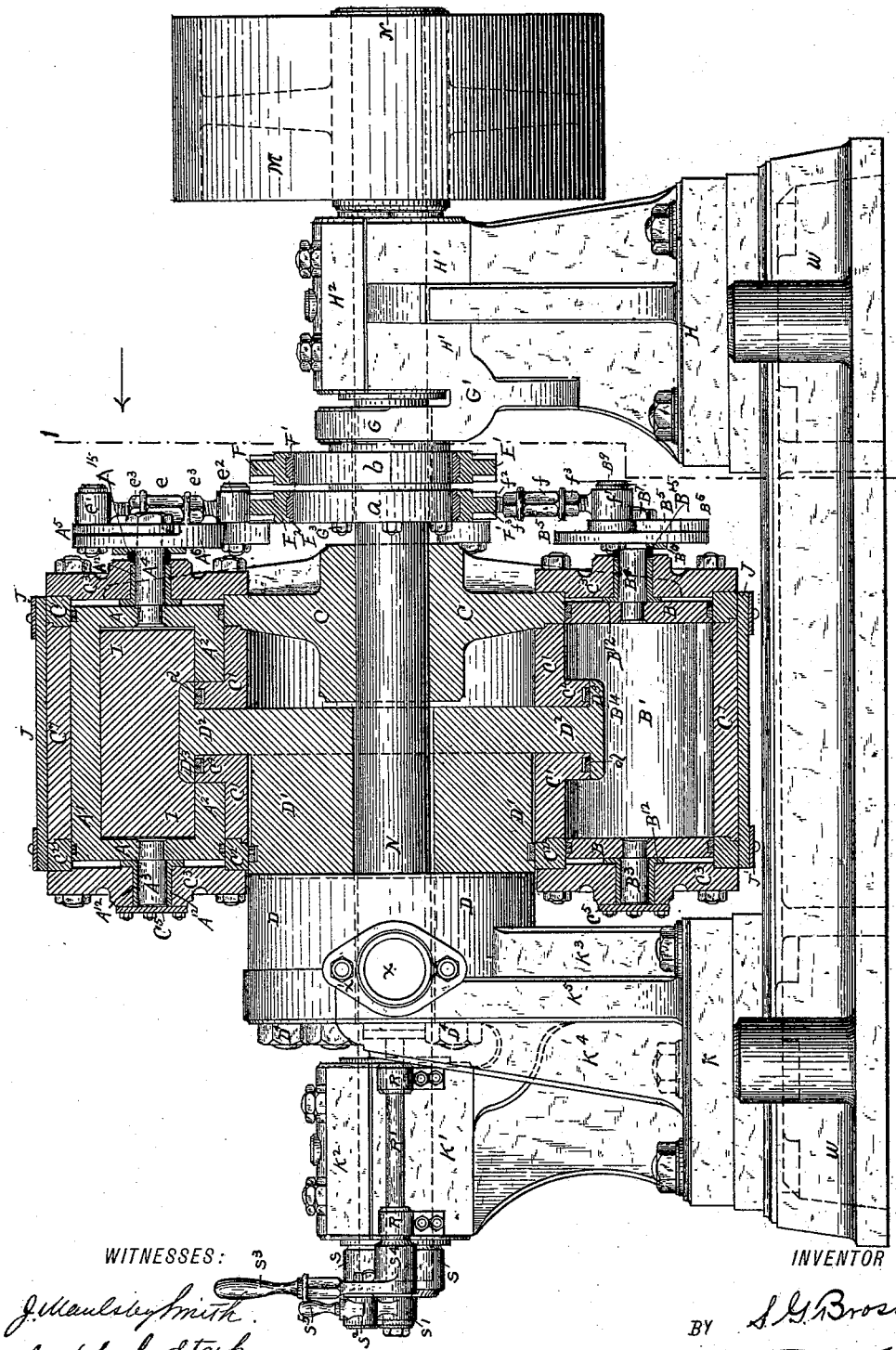

Fig. 1.

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(No Model.) 3 Sheets—Sheet 2.

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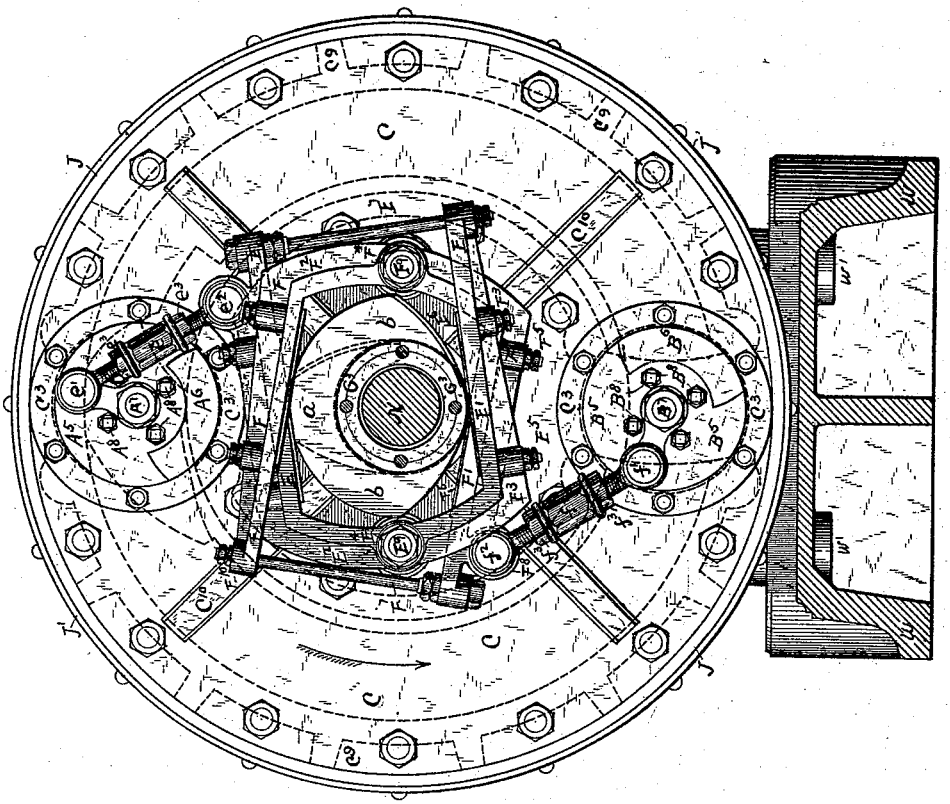

Fig. 2.

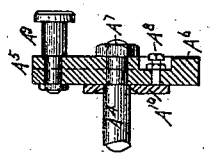

Fig. 4.

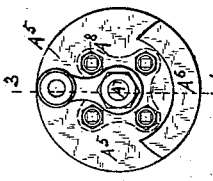

Fig. 3.

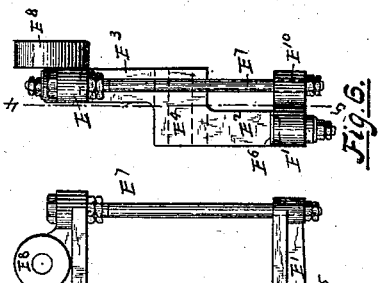

Fig. 6.

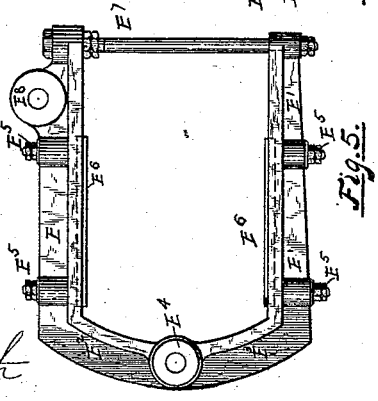

Fig. 5.

Fig. 8.

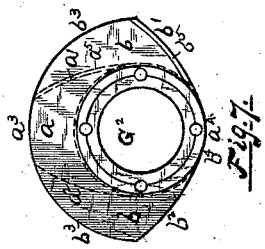

Fig. 7.

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(No Model.) 3 Sheets—Sheet 3.

S. G. BROSIUS.

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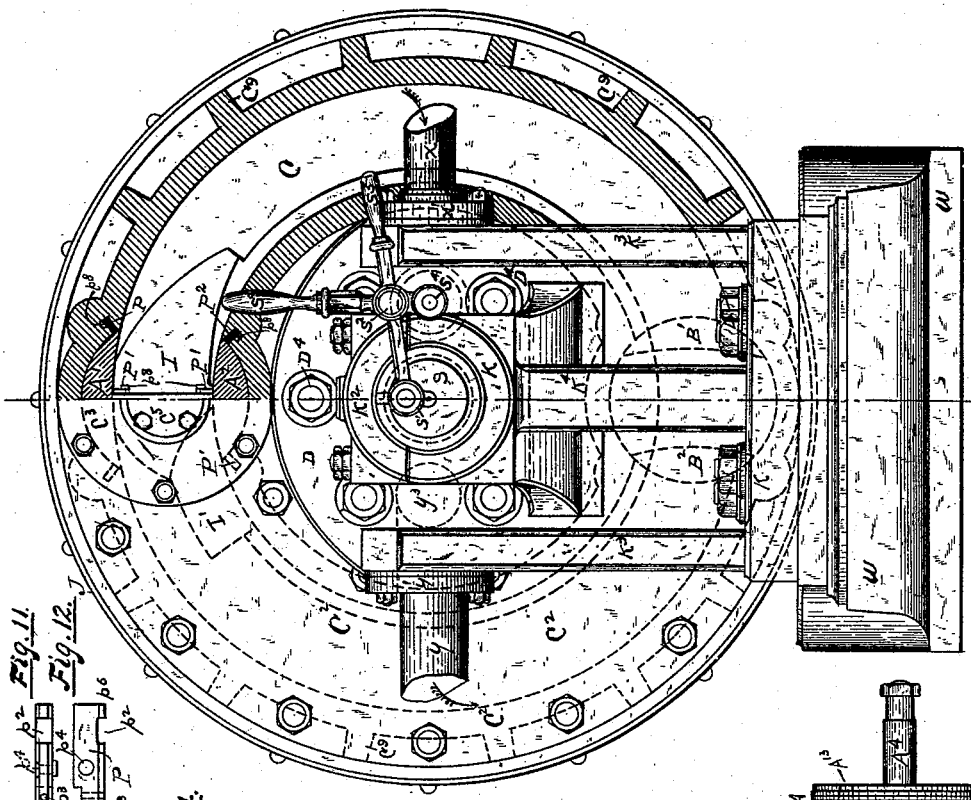

Fig. 9.

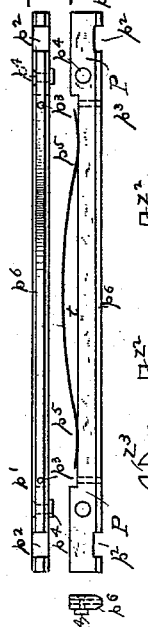

Fig. 11.

Fig. 12.

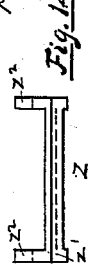

Fig. 14.

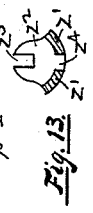

Fig. 13.

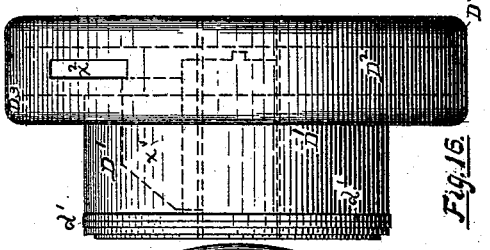

Fig. 16.

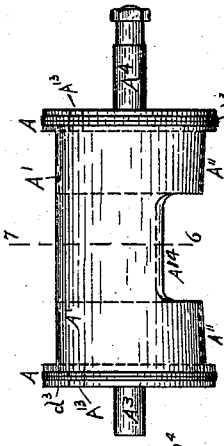

Fig. 18.

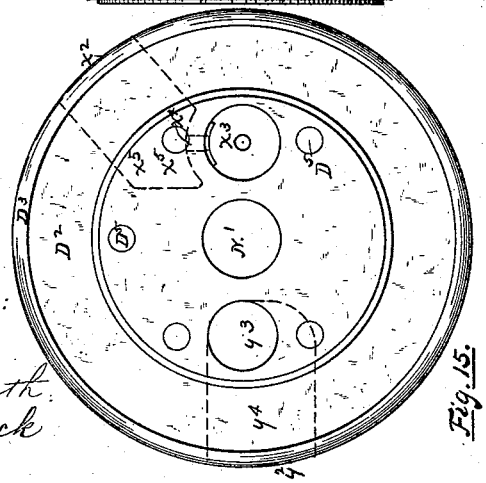

Fig. 15.

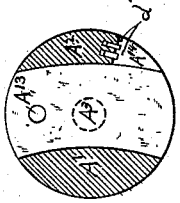

Fig. 17.

Fig. 10.

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UNITED STATES PATENT OFFICE.

SAMUEL GLENVILLE BROSIUS, OF SAVANNAH, GEORGIA.

ROTATING-CYLINDER ENGINE.

SPECIFICATION forming part of Letters Patent No. 492,859, dated March 7, 1893.

Application filed July 30, 1891. Serial No. 401,208. (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 Rotating-Cylinder Engines; and I do hereby 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.

This invention relates to improvements in rotating cylinder engines, of the class as shown in United States Patents Nos. 453,612, 453,613, 453,614, and 453,615, granted to me, and has for its objects to make a simple and an economically constructed and operative rotating cylinder engine.

In the drawings which illustrate my invention—Figure 1 is a side elevation, the cylinder, pistons and abutment disks and links being shown in cross section. Fig. 2 is an end view on lines 1—2 of Fig. 1, looking in the direction of the arrow. Figs. 3 and 4 are detail views of the piston crank, Fig. 4 being a cross section on lines 3—4 of Fig. 3. Figs. 5 and 6 are respectively end and side elevations of the link. Figs. 7 and 8 are respectively end and side elevations of the cam. Fig. 9 is a front elevation of the engine, the cylinder and one piston being shown partly in cross section. Figs. 10, 11 and 12 are respectively end, plan and side views of the packing strips. Figs. 13 and 14 are end and side elevations of the cut-off valve. Figs. 15 and 16 are end and side elevations of the abutment disk, with the abutment detached. Fig. 17 is a cross section of the piston on lines 6—7 of Fig. 18. Fig. 18 is a side elevation of the piston.

To the base plate W are attached the pillow blocks K and H, which are constructed respectively with the journal boxes K′ and H′ having the journal caps K^2 and H^2. In these journals is mounted the shaft N, to which is secured the cylinder disk C concentric with it. The rotating cylinder is constructed of the said disk and the inner ring C′ and the outer ring C^7, respectively and the disk C^2, securely bolted together; between these rings and disks is formed the annular cavity into which the steam is admitted, acting against the abutment I and the pistons A and B. The inner rings C′ are provided with packing rings *d* which pack against the flanges D^3, of the abutment disk hereinafter described. Said rings are provided with flanges C^4 at the piston seats which complete the circles of the rings, allowing complete ring packing to be used. The disk C and outer ring C^7, of rotating cylinder are provided respectively with ribs C^{10} and C^9, which brace and strengthen the rotating cylinder. The cylinder is also provided with the removable heads C^8, which are constructed so as to have journal boxes A^{12} and B^{12} to receive the piston shafts A^3 and A^4, and B^3 and B^4, as shown in Fig. 1.

Describing the piston A and its co-operating parts:—The head C^8 which receives the shaft A^3 of the piston has the cap C^5, which prevents loss of steam through the journal. The piston shaft A^4 is provided with the crank disk A^5 which has the wrist pin A^9, and the counterbalance A^6, and is also constructed so as to receive the packing disk A^{10}, which is adjusted by means of set screws A^8, against the head C^8, which receives the journal shaft A^4 of said piston; suitable packing is placed between said packing disk and said head and prevents leakage of steam around said shaft. The piston shaft A^4, is provided with nut A^7, which holds crank disk A^5, in place, and allows ready removal of same. The piston is mounted on the shaft A^3, and A^4, and is constructed of disks A and the outer wing A′ and the inner wings A^2. The disks A are provided with packing rings d^3. The piston wing A^2 is provided with cavity A^{14}, and packing strips d^4, packing against abutment D^2 and its flanges D^3. The edges A″ are slightly angled so that their action on the packing strips in pushing them into place when they protrude too far, is that of a shear. The piston disks A are also provided with openings A^{13}, through which steam passes and balances them endwise.

The piston disk B, wings B′ and B^2, shafts B^3 and B^4, with their crank disk B^5, counterbalance B^6, nut B^7, and journals B^{12}, and all parts are identical in construction and operation to piston disk A and all its co-operating parts.

The link is constructed of the arms E and

E′, placed on opposite sides of the cross central line 4—5, and connected to the hub E^4 by flanged ribs E^2 and E^3 respectively as shown in Figs. 5 and 6. The arms E and E′ are provided with wearing strips E^6, held in place by bolts E^5, said arms are also connected by bolts E^7, which pass through the outer end of arm E and the lug E^8, at the outer end of arm E′. The bolt E^9, is securely attached to the rotating cylinder and forms the journal on which said link oscillates. Bolt E^7, clears the hub and flanged ribs of the opposite link. The said link by its lug E^8, is attached to the connecting rod e by the journal e^2, the other end of the rod is connected to the wrist pin A^9, of the crank disk A^5, by the journal e'; said connecting rod is made adjustable in length by the right and left nuts e^3. The said connecting rod transmits the motion given the link by the double cam, to the pistons, so that the pistons make their oscillations at the proper intervals as hereinafter described.

The link arms F, F′ and flanged arms F^2 and F^3, hub F^4, wearing strips f^6, bolts F^5 and F^7, journal bolt F^9 and lug F^{10}, and connecting rod f, with its journals f' and f^2 and right and left nuts f^3 are identical in construction and operation to arms E, E′ and connecting rod e and their co-operating parts, respectively.

The stationary double cam a and b is constructed so that the curve a^2 of cam a and curve b' of cam b, form a true cam, the same is true of curve a' of came a and curve b^2, of cam b. These curves a' and a^2, b^2 and b' may be eccentric tangential curves to the inner curves a^4 and b^4, intersecting the outer curves a^3 and b^3, respectively. The curves a^3, b^3, a^4 and b^4, are concentric to the center of revolution of the rotating cylinder. The curves a^3, a^4, b^3, and b^4, and a^2, b' and a', b^2 produce respectively periods of rest and throw in the operation of the links; said cam is attached by bolts G^3 to cam disk G, which is firmly secured to the pillow block H, by lug G′; said cam has also the hole G^2, through which the rotary shaft N passes, but is not necessarily in contact with it.

Referring to Figs. 1, 2, 5 to 8 inclusive, the link is attached to the cylinder by journal bolt E^9, and oscillates about said bolt. The arm E is in contact with cam a at a^3, and arm E′ is in contact with cam b at b^4. Revolving the link with the rotary cylinder, arm E′ is thrown by the curve b' of cam b, curve a^2, of cam a allowing E to follow. Arm E′ passes to curve b^3, of cam b and arm E to curve a^4 of cam a and is held stationary during substantially half the revolution. The arm E comes in contact with a' of cam a, and is thrown, and curve b^2 of cam b allows arm E′ to follow it. Arm E passes to curve a^3 of cam a and E′ to curve b^4 of cam b. The link is stationary until curve b' of cam b again throws arm E′ which completes the revolution. Referring to Fig. 7, particularly, it will be seen that the period of rest a^3 and b^4, is much shorter than the periods of rest a^4 and b^3; during said long period of rest which is substantially half the stroke, the steam is acting on the pistons, and during the short period, the pistons are passing the abutment. As before stated the curve a^2 of cam a, and curve b' of cam b, form a true cam, the same is true of curve a' of cam a and curve b^2 of cam b.

As will be seen in Figs. 1, 2 and 6, the link is constructed so that the arm E travels on cam a, and arm E′ on cam b. The curves of the throw and rest of the cams are so constructed that while the link takes the motion imparted to it by the double cam, no loose play is allowed between the link and the said cam; the links are reversed in position and appear to interlock, but in reality clear each other; that is, the arm E of one link and the corresponding arm F of the other, are on opposite sides of the cam a, the same is true of arms E′ and F′ being on opposite sides of cam b. The cams a and b are provided with wearing strips a^5 and b^5, respectively.

The packing strips P in the piston seats are constructed with the cavity t, in which is placed the spring p^5, said strips are beveled as shown at p^6, to allow them to be pushed back into place by the piston wings should they protrude too far. The keys p^4, which fit in grooves p^8, prevent the packing strips from protruding too far. Said packing strips at their ends are provided with cavity p^2, which gives play to packing rings d^3 of the piston disks A and B and allows them to pack against the piston seats without interference. The openings p^3, are located so that the steam may pass through and balance the strips under steam pressure. Packings P′, except the cavity p^2, are identical in construction to packings P above described. Packings P^2, are constructed with a cavity p^2, at one end only. The packings are of such length as required by the construction.

Extending into the central annular cavity formed by inner rings C′ of the rotating cylinder, is the abutment disk D′, D^2, provided with the flanges D^3, on which is mounted abutment I, provided with packing strips P′; said disk may be made in parts or integral as shown, and bolted to the abutment stand D by bolts D^4, said stand D, as shown, may be made integral with the pillow block K, by the web K^5, and the ribs K^4 and K^3, if desired; however, it may be made separate. The abutment disk contains the steam and exhaust ports X^2 and y^2 respectively. The steam chest X^3, is located in said abutment disk and connects with the steam port by the passages X^4 and X^5. Within said steam chest X^3 is the oscillating valve z, provided with the central port z^4, and formed of the lips z' z', and flanges z^2, provided with the cavity z^3, for the reception of the rocker shaft R′; said valve controls the introduction of the steam into the cylinder. The exhaust port y^2, is connected to the exhaust y^3, by passage y^4, the steam and exhaust pass through the passages x' and

y', which connect with their respective ports. The steam enters at pipe x, and exhausts at pipe y, as indicated by the arrows. Said abutment disk is also provided with the bolt holes D^5, to receive the bolts D^4, which attach it to pillow block K. The hub of the abutment disk is provided with packing rings d', which pack against the inner periphery of the inner ring of the rotating cylinder, (and prevents the leakage of any steam that may have escaped past packing rings d;) said disk has also the hole N', through which the shaft N passes, but said shaft is not necessarily in contact with it.

The cut-off valve Z is operated by the rocker shaft R', which is mounted in journal boxes R. The lever formed by the hand bar S^3, and the hub S^4, is secured to the rocker shaft R', and is connected to the crank disk S, by the end S' of the connecting bar S^5, which is connected to the lever formed by the bar S^3 and hub S^4, by journal pin S^2; it is evident that the crank disk S, operating as an eccentric, controls the cut-off.

M represents the driving pulley on shaft N.

In locomotives or other engines requiring it, crank disk S may be dispensed with and suitable cut off devices provided, and the shaft N extended as shown, on both sides of the pillow blocks.

The operation is as follows:—The steam enters through pipe X, and is controlled by the cut-off in its introduction into the cylinder. It is confined between the abutment I, and the pistons A and B, respectively, during the revolutions of the engine. The oscillations of the pistons pass abutment l, are controlled by the links E and F, through the connecting rods e and f, and the crank disks A^5 and B^5. The periods of rest and throw in the stationary double cams are so arranged that the oscillations of the pistons occur when they are balanced, *i. e.*, when under exhaust, or when steam pressure surrounds them. The pistons are stationary, with regard to the cylinder, during substantially half of their respective strokes when they are under steam pressure, and are propelling and rotating with the cylinder. The pistons after passing port y^2, allow the steam to escape through the exhaust pipe Y. The operation of the steam in the cylinder is similar to that in engines shown in letters above mentioned.

I do not limit myself to the constructions shown, as the same may be varied 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 of the United States, is—

1. In an engine a cylinder, pistons controlled through links by a double cam whose peripheries are constructed of concentric inner and outer curves, and eccentric curves tangentially to the inner concentric curves intersecting the outer concentric curves, and whose alternate faces taken in conjunction form a true cam, in combination with a link operated by said cam, substantially as set forth.

2. In a rotating cylinder engine a rotating cylinder, pistons controlled through links by a double cam whose peripheries are constructed to the curves a', a^2, a^3, a^4 and b' b^2 b^3 b^4 and respectively control the opposite arms of the links, producing in said links consecutively a rest lasting through substantially half the revolution, and through the balance a throw, a rest and a throw, thereby operating the pistons at the required intervals, substantially as set forth.

3. In a rotating cylinder engine, a rotating cylinder, pistons controlled through the link by a double cam a and b constructed to the curves a', a^2, a^3, a^4 and b', b^2, b^3, and b^4, controlling respectively the links by their respective arms E and F and E' and F', thereby operating the pistons at the required intervals, substantially as set forth.

4. In an engine, a cylinder, pistons controlled through a link having arms secured to a hub, said arms being located on opposite sides of the cross-center line of the hub, in combination with a cam for operating said link, substantially as set forth.

5. In an engine, a cylinder, pistons controlled through a link having arms secured to a hub by flanged ribs, said link arms being located on opposite sides of the cross-center line of the hub, in combination with a cam controlling said link, substantially as set forth.

6. In an engine, a cylinder, pistons controlled through a link having arms secured to a hub, said arms being located on opposite sides of said hub and having their outer ends connected by suitable means, in combination with a cam for controlling said link, substantially as set forth.

7. In an engine, a cylinder, pistons controlled through a link having arms secured to a hub, said arms being located on opposite sides of the cross-center line of said hub, and a lug at the outer end of one arm directly under the lug of the other arm, and a connection extending between said lugs substantially parallel to the cross-center line, and a cam controlling said link, substantially as set forth.

8. In an engine a rotating cylinder, pistons controlled by a crank and link operated by a cam, and a connecting rod joining said crank and link, said link being operated with a lug to which one end of the said connecting rod is attached.

9. In an engine, a rotating cylinder, pistons controlled by a crank and link operated by a cam, a connecting rod joining said crank and link, said connecting rod being adjusted by means of right and left screws and lock nuts, substantially as set forth.

10. A rotating cylinder engine having a rotating cylinder, pistons oscillating therein, said cylinder being formed by inner and outer rings and connecting heads between said rings, forming thereby an annular cavity, the

inner ring having packing flanges around a groove in which is located a flanged abutment disk secured to a stationary stand, substantially as set forth.

11. A rotating cylinder engine having a rotating cylinder, pistons oscillating therein, said cylinder being formed by inner and outer rings and connecting heads between said rings, forming thereby an annular cavity, the inner ring having packing flanges around a groove in which is located an abutment disk secured to a journal box of the engine, substantially as set forth.

12. In a rotating cylinder engine a rotating cylinder, provided with movable heads, oscillating pistons, crank disks operated from the driving shaft by a cam and link, and packing disks on the piston shafts between the movable heads and crank disks, and suitable packing between the packing disks and the movable heads, substantially as set forth.

13. A rotating cylinder engine having a rotating cylinder, pistons controlled by a counterbalance, crank, disk and link operated by a cam, and a connecting rod joining said crank and link, for the purpose set forth.

14. A rotating cylinder engine having a rotating cylinder, pistons oscillating therein, said cylinder being formed by inner and outer rings and connecting heads between said rings, forming thereby an annular cavity, the inner ring having packing flanges around a groove in which is located an abutment disk provided with steam and exhaust ports, and an annular flange, and abutments extending into said cavity, and secured to said abutment disk, substantially as set forth.

15. A rotating cylinder engine having a rotating cylinder, pistons oscillating therein, said cylinder being formed by inner and outer rings and connecting heads between said rings, forming thereby an annular cavity the inner ring having packing flanges around a groove in which is located an abutment disk, said abutment disk being provided with a steam chest and valves controlling the admission of steam from the chest to the cylinder, substantially as set forth.

16. A rotating cylinder engine having a rotating cylinder, pistons oscillating therein, said cylinder being formed by inner and outer rings and connecting heads between said rings, forming thereby an annular cavity, the inner ring having a groove in which is located an abutment disk provided with a steam chest, and valves controlling the admission of steam from the chest of the cylinder, said valves having a central opening through which steam passes to the cylinder, substantially as set forth.

17. A rotating cylinder engine having a rotating cylinder, pistons oscillating therein, said cylinder being formed by inner and outer rings and connecting heads between said rings, forming thereby an annular cavity, the inner ring having a groove in which is located an abutment disk provided with a steam chest, and valves controlling the admission of steam from the chest to the cylinder, said valves having a central opening and lips on each side of the central opening, and flanges connecting said lips, said flanges having a cavity for the reception of a rocker shaft, for the purpose set forth.

18. A rotating cylinder engine having rotating cylinder forming annular cavitities by inner and outer rings, and outer disks, said cylinders having seats for oscillating pistons, said seats being formed by the enlargement of said cylinders and having heads provided with journals to receive the shafts of the pistons, and packing strips located in said piston seats, and having openings through them for admitting steam to both sides so as to balance them, substantially as set forth.

19. In a rotating cylinder engine a rotating cylinder formed by inner and outer rings and outer disks, said cylinder having seats for oscillating pistons, said seats being formed by the enlargement of said cylinders, and having heads provided with journals to receive the shafts of the piston, and packing strips having openings through them for the passage of steam, and located in said piston seats, and keys for holding said packing strips in place, substantially as set forth.

20. A rotating cylinder engine having rotating cylinder forming annular cavities by inner and outer rings and outer disks, said cylinders having seats for oscillating pistons, said seats being formed by the enlargement of said cylinders and having heads provided with journals to receive the shafts of the pistons, and packing strips located in said piston seats, and having cavities for allowing the ring of the piston disk to pack against the piston seats, substantially as set forth.

21. A rotating cylinder engine having rotating cylinder provided with seats for oscillating pistons, said pistons constructed of two disks, and wings connecting said disks, the wings having beveled edges, substantially as set forth.

22. A rotating cylinder engine having rotating cylinder provided with seats for oscillating pistons, said pistons constructed of two disks and wings one of which connects said disks one edge of said wing having a cavity provided with packing strips, substantially as set forth.

23. A rotating cylinder engine having rotating cylinder provided with seats for oscillating pistons, said pistons constructed of two disks and inner and outer wings, said outer wing connecting said disks, the inner wing provided with a cavity and packing strips in said cavity, substantially as set forth.

24. A rotating cylinder engine having rotating cylinders provided with seats for oscillating pistons, said pistons constructed of two disks and inner and outer wings, said outer wing connecting said disks, and inner wing provided with a cavity and packing strips in said cavity, and openings in said disks to ad-

mit steam pressure to both sides so as to balance the piston endwise, for the purpose set forth.

25. In an engine a cylinder, pistons controlled through a link operated by a double cam, said cam being constructed of cam-shaped disks, the alternate faces of the peripheries of said disks taken in conjunction form true cams, substantially as set forth.

26. In a rotating cylinder engine, a cylinder, pistons controlled through a link having arms secured to a hub, said arms being located on opposite sides of the cross-center line of the hub, and being provided with adjustable wearing strips, in combination with a cam, substantially as set forth.

27. In a rotating cylinder engine a cylinder, pistons controlled through a link controlled by a cam, said cam being constructed of cam shaped disks, the alternate faces of the peripheries of said disks taken in conjunction form true cams, said cams being provided with adjustable wearing strips, substantially as set forth.

28. In a rotary engine a rotating cylinder having removable heads, oscillating pistons, crank disks operated from the driving shaft by cam and link, an adjustable connecting rod between said link and crank disk, and packing disks around the piston shafts between the removable heads and the crank disks, said packing disks being provided with adjusting screws, substantially as set forth.

29. A rotating cylinder engine having rotating cylinder, oscillating pistons, and abutment, said abutment being provided with packing strips having openings through them for admitting steam to both sides so as to balance them, substantially as set forth.

30. A rotating cylinder engine having rotating cylinder, oscillating pistons and abutments, said abutments being provided with packing strips having keys for holding said packing strips in place, substantially as set forth.

31. In a machine, a shaft, a link attached thereto and operated by a double cam, said cam being constructed of cam-shaped disks, the alternate faces of the peripheries of said disks taken in conjunction forming true cams, and means for driving said shaft, substantially as set forth.

32. In an engine a rotating cylinder, pistons controlled by links pivoted on and revolving with said cylinder, said link being operated by a double cam, substantially as set forth.

33. In an engine, a rotating cylinder, pistons controlled by links, said link being operated by a double cam secured to a pillow block, substantially as set forth.

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

SAMUEL GLENVILLE BROSIUS.

Witnesses:
J. MAULSBY SMITH,
JOSEPH C. STACK.