No. 784,074. PATENTED MAR. 7, 1905.

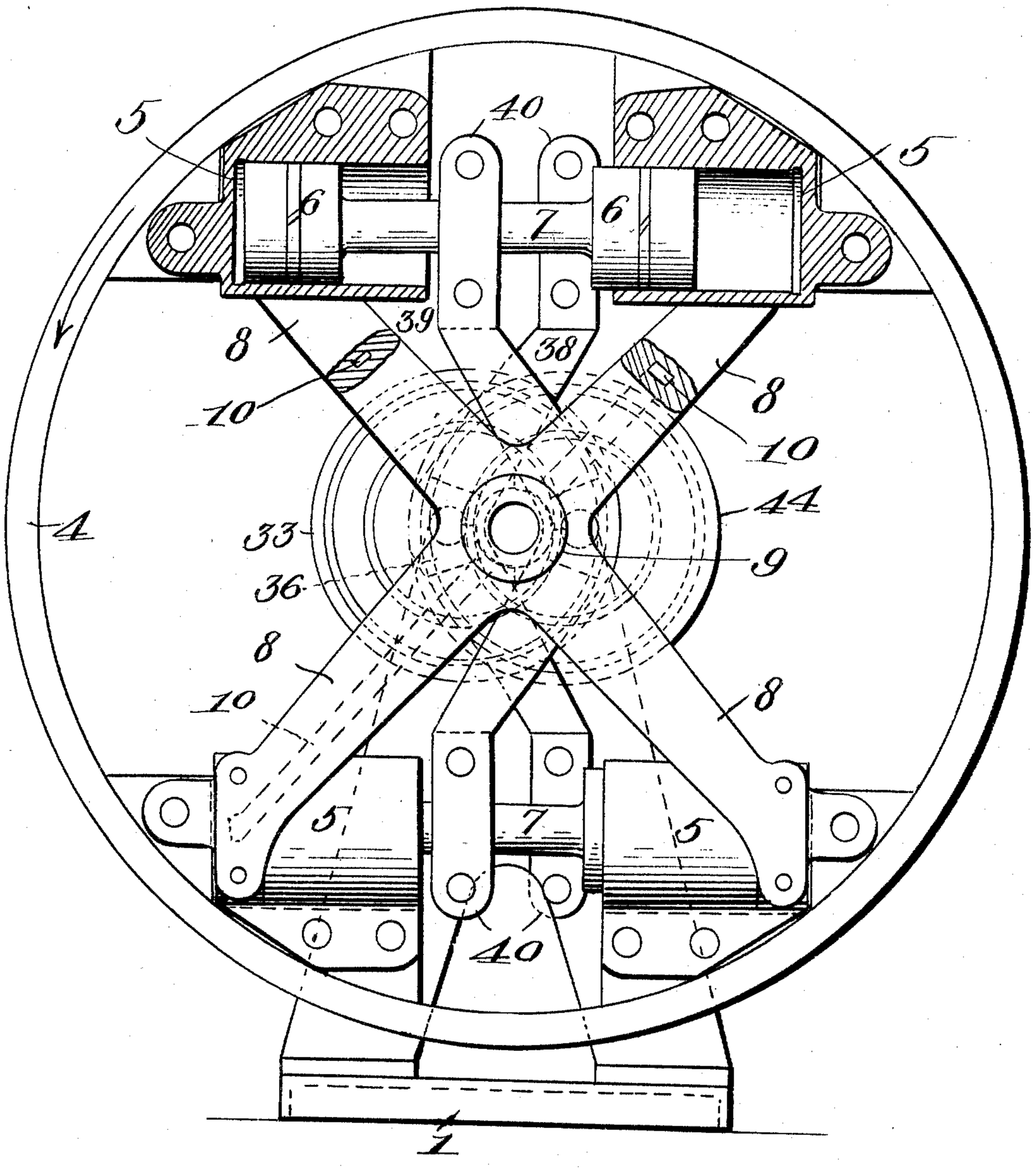
T. G. SAXTON.

ROTARY MOTOR.

APPLICATION FILED JULY 14, 1904.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
C. D. Kesler.
J. B. Keelan

Inventor
Thomas G. Saxton
By
James L. Norris.
Atty.

No. 784,074. PATENTED MAR. 7, 1905.

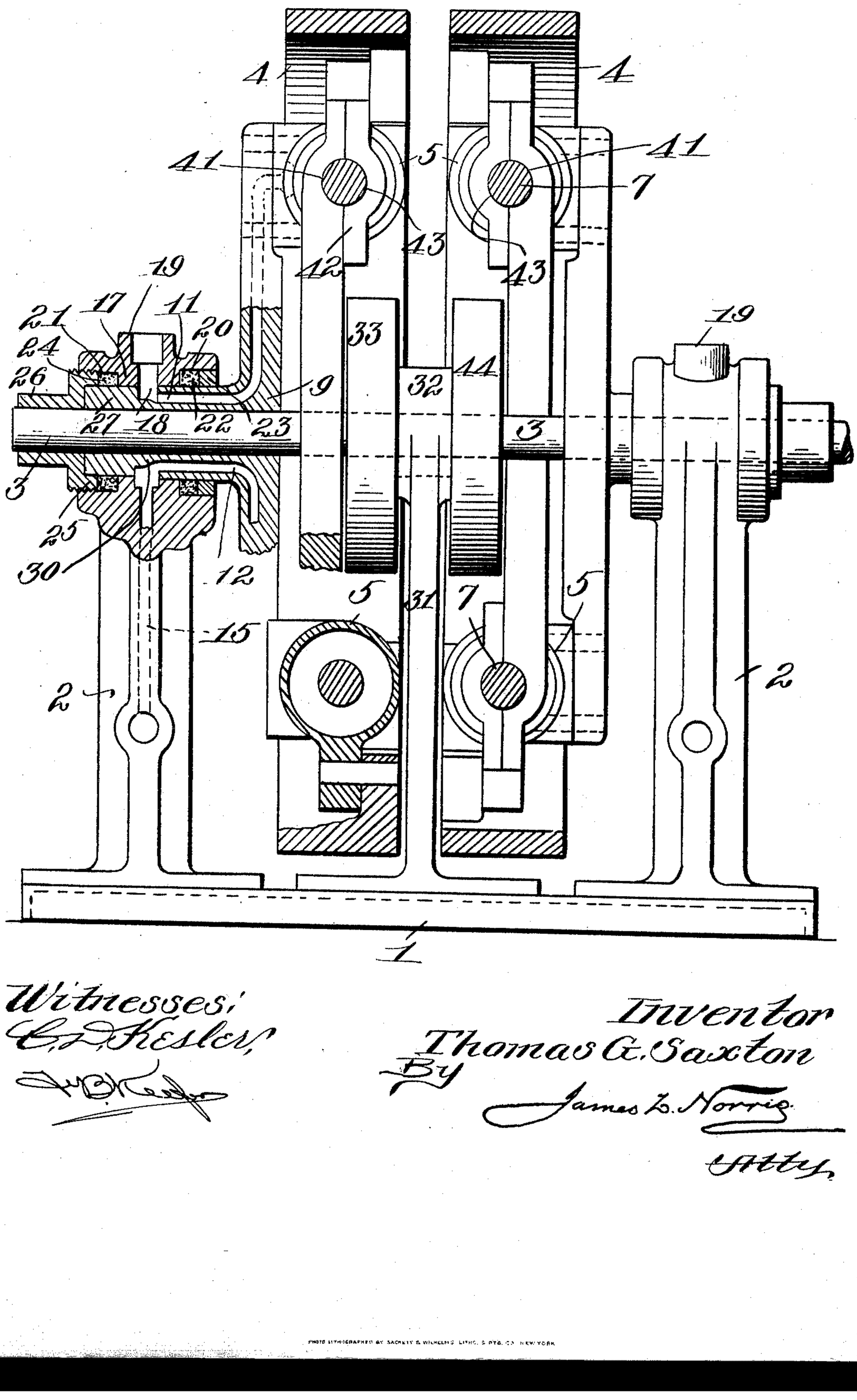
T. G. SAXTON.

ROTARY MOTOR.

APPLICATION FILED JULY 14, 1904.

3 SHEETS—SHEET 2.

Fig. 2.



Witnesses:
C. F. Kesler,
J. B. Kesler

Inventor
Thomas G. Saxton
By
James L. Norris.
Atty.

No. 784,074. PATENTED MAR. 7, 1905.

T. G. SAXTON.

ROTARY MOTOR.

APPLICATION FILED JULY 14, 1904.

3 SHEETS—SHEET 3.

Fig. 3.

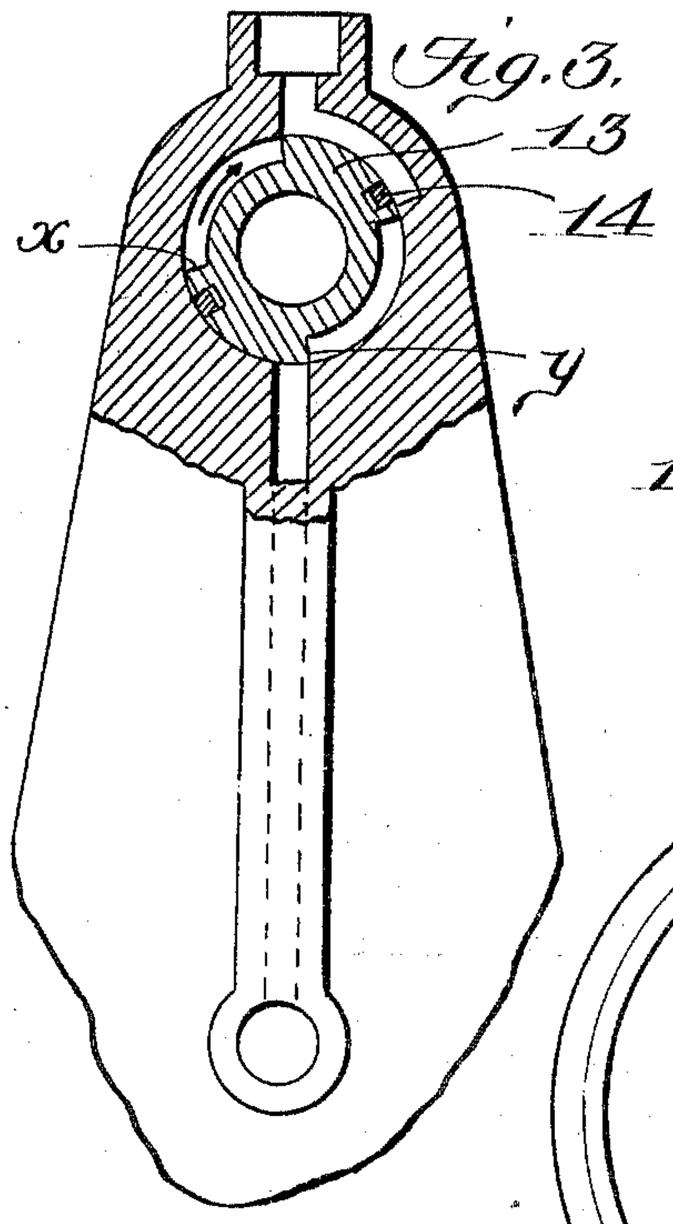


Fig. 5.

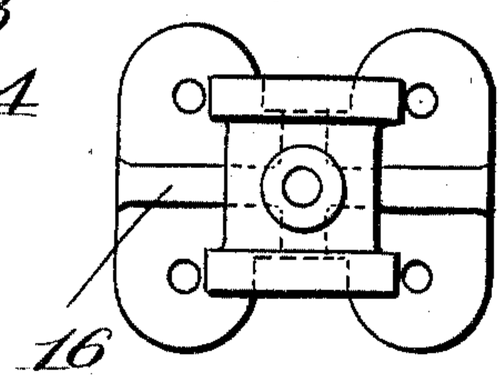


Fig. 4.

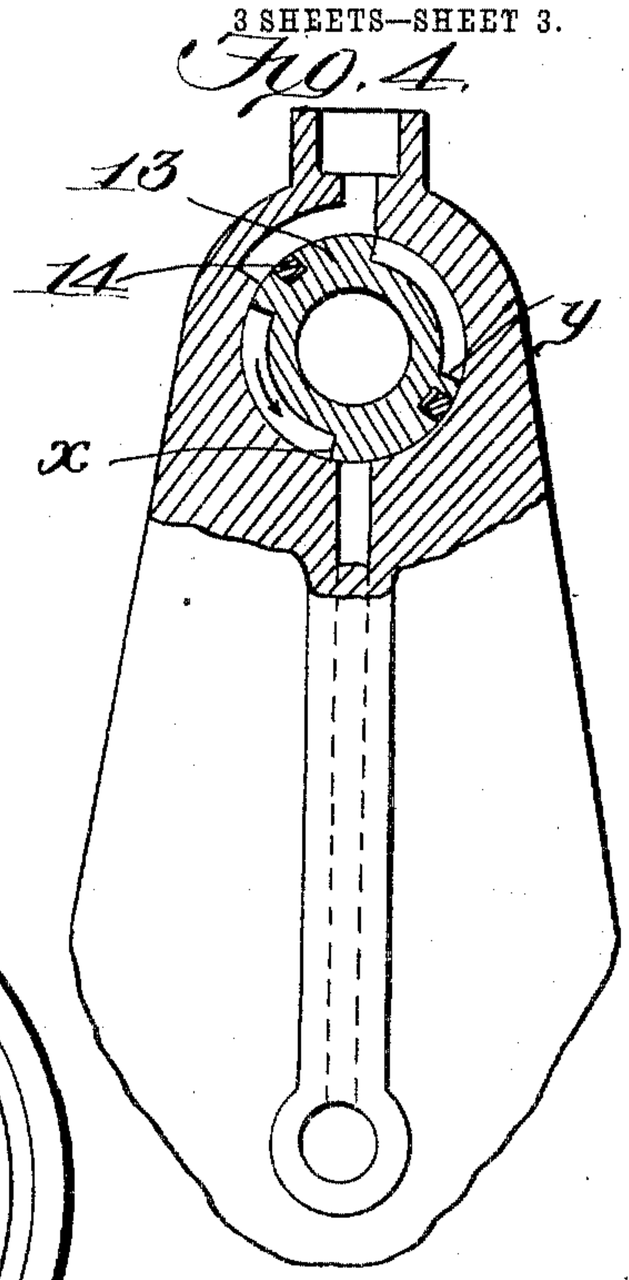


Fig. 6.

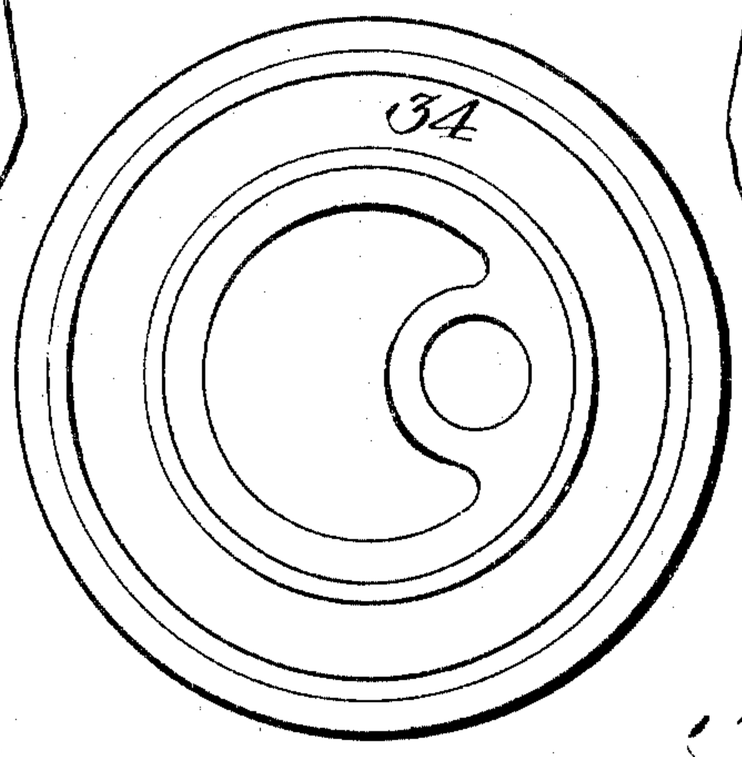


Fig. 8

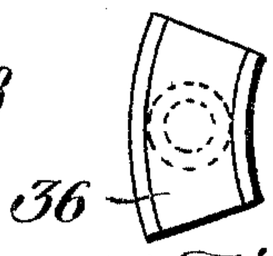


Fig. 9.

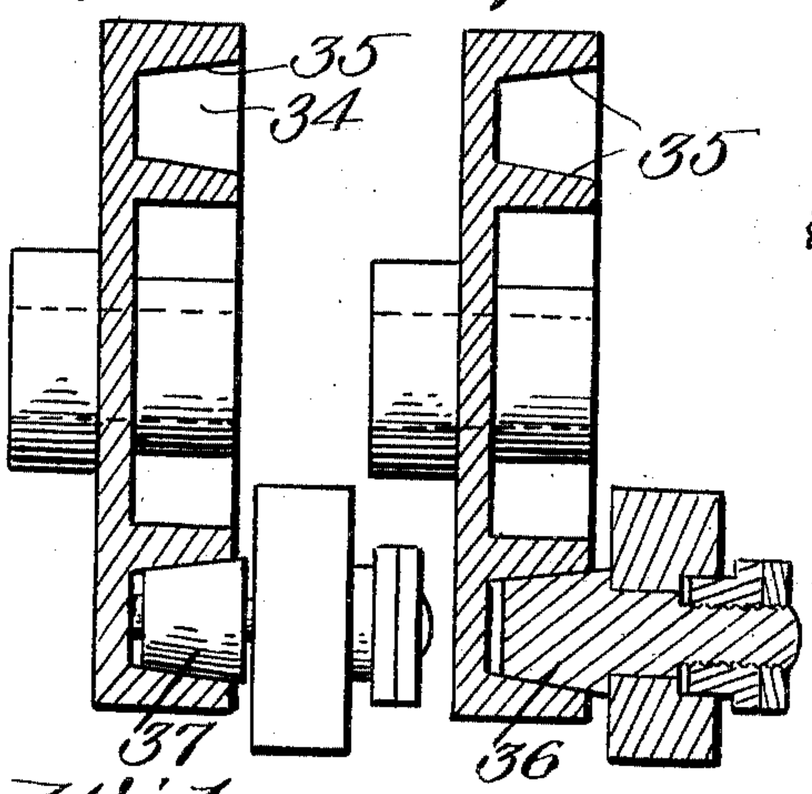
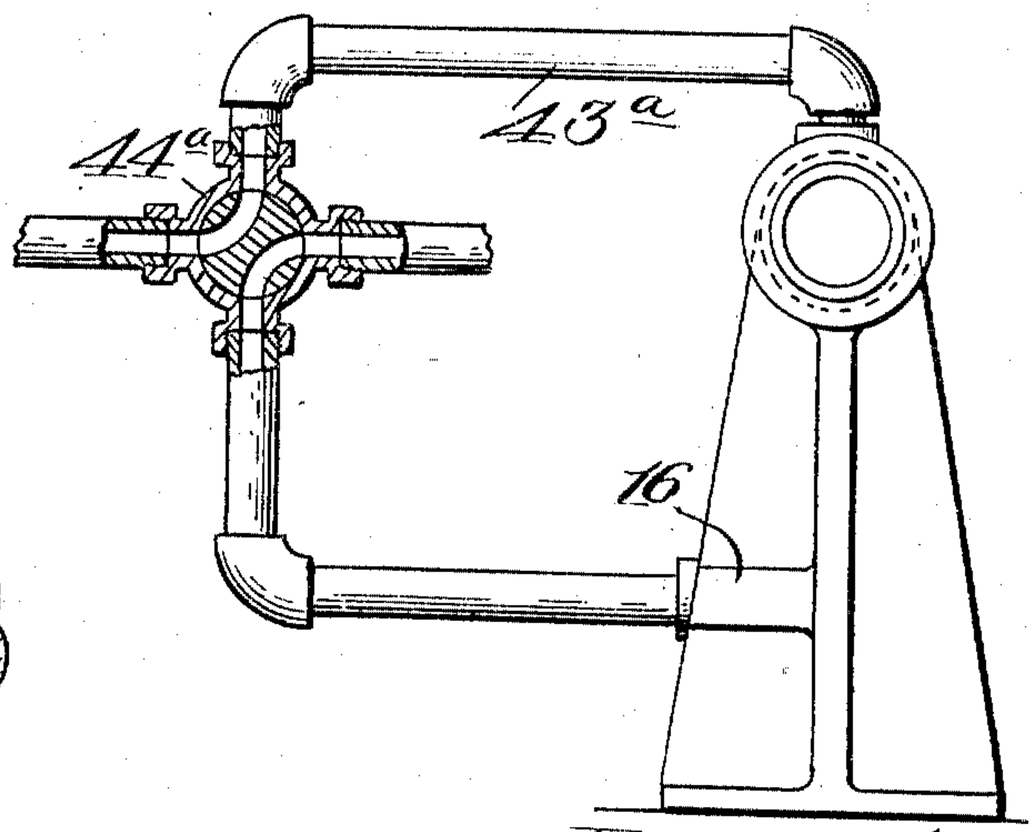


Fig. 7.

Fig. 10.



Witnesses:
C. L. Kesler,
J. B. Taylor

Inventor
Thomas G. Saxton
By
James L. Norris
Atty.

PHOTO-LITHOGRAPHED BY SACHETT & WILHELMS LITHO. & PTG. CO. NEW YORK.

No. 784,074. Patented March 7, 1905.

UNITED STATES PATENT OFFICE.

THOMAS G. SAXTON, OF LEXINGTON, KENTUCKY, ASSIGNOR OF ONE-THIRD TO ELIJAH HAWKINS AND ONE-THIRD TO W. B. HAWKINS, OF FAYETTE COUNTY, KENTUCKY.

ROTARY MOTOR.

SPECIFICATION forming part of Letters Patent No. 784,074, dated March 7, 1905.

Application filed July 14, 1904. Serial No. 216,574.

To all whom it may concern:

Be it known that I, THOMAS G. SAXTON, a citizen of the United States, residing at Lexington, in the county of Fayette and State of Kentucky, have invented new and useful Improvements in Rotary Motors, of which the following is a specification.

This invention pertains to rotary motors wherein the prime motive agent is admitted at intervals to distinct compartments or chambers and exerts an expansive or forceful influence against movable elements to induce reciprocating movement, which is converted through adjunctive constituents into rotary movement.

The principle involved in the present motor is similar to that of a turbine; but the blades of the latter are replaced by cylinders and piston-heads moving in directions opposite to the rotary supporting element. In the present construction it is desired to avoid the high velocity of the turbine, but at the same time retain power or efficiency in driving by having the motive agent act on or as near as possible to the periphery of the rotary element carrying the cylinders and piston-heads, and thus gain an increased fulcrum or leverage. It is also proposed to utilize the expansive force of steam or gas or the forceful impact of any other motive agent economically in smaller volume in each cylinder than in ordinary rotary motors within corresponding proportions, which will result in the reduction of speed, but a maintenance of approximately the same or greater power. This economy in the use of the motive agent is rendered effective to maintain a maximum power within predetermined proportions by unifying the operation of opposed piston-heads by an intermediate connection having a compensating movement during the rotation of the element supporting the cylinders and piston-heads through the medium of a fixed eccentric means. In analogous motors or those embodying what is known as "revolving cylinders," wherein each cylinder is fixed to and rotatable with a fly-wheel or other similar element, the rotation of the fly-wheel or like device is instituted by radially disposing the cylinders and pistons and relying on centrifugal influence; but in the present construction the piston heads or valves move back to cause the fly-wheel or analogous device to rotate forwardly, the impelling force being applied simultaneously at opposite portions of the fly-wheel or other like device by a part of the piston-heads, while a remaining number of the latter are propulsively inactive or exhausting, this operation being effected at each half-revolution of the fly-wheel or similar rotary element and regularly ensuing in succession at predetermined timed intervals. It is proposed to arrange or install a plurality or battery of cylinders and piston-heads or piston-valves in a rotary element, such as a fly-wheel, which coöperates with and actuates a shaft or analogous driven element, the cylinders and piston-heads being located in contiguous pairs and each pair of heads connected by a piston-rod or rigid coupling for a simultaneous operation or movement. The pairs of cylinders and piston-heads are disposed in the rotary element tangentially with respect to the center or axis of the latter and as near as possible to the periphery of the element. The pairs of tangentially-disposed cylinders and connected piston heads or valves are supplied with the motive agent at regular intervals through tubular arms concentrating at the center of the rotary element and having ports at opposite points coöperating with a feed and an exhaust means, the coupling for the piston-heads at opposite portions of the rotary element having a member movably projecting into a fixed eccentric means. The shaft or driven element may be actuated by a single rotary element embodying the tangentially-disposed cylinders and connected piston-heads; but to increase the power of the shaft it is preferred that more than one rotary element be used in connection with the shaft and having the cylinders and connected piston-heads thereof supplied with the motive agent at such intervals that one set of cylinders and piston-heads at opposite points in the respective rotary

elements will simultaneously operate to give the shaft or driven element a half-revolution and become inactive, when the remaining cylinders and piston-heads of the rotary element will be immediately rendered active to complete the revolution, thereby materially increasing the power of the shaft. It is also intended to multiply the number of rotary elements carrying the cylinders and piston-heads, arranged as set forth; but the movable members connecting the opposite pairs of piston-heads of each rotary element coöperate with independent or distinct eccentric means, and the eccentric means of two rotary elements will be reversely directed with respect to the shaft.

The invention also contemplates the simplification of motor structures and the avoidance of complex association of the parts and also to so proportion the several parts, and especially the cylinders and piston-heads, that the weight will not preponderate the actuating pressure; but, on the contrary, the total pressure acting on the piston-heads will be materially in excess of the weight resistance and render the movement of the rotary element or elements exceptionally sensitive or responsive to the expansive influence or forceful impact of the motive agent, particularly in starting the motor and before a regular impetus has been established.

In the drawings, Figure 1 is an end elevation of the motor, showing portions thereof broken away and in section. Fig. 2 is a partial longitudinal vertical section of the motor, the shaft or driven element being broken off at one extremity. Fig. 3 is an enlarged elevation of a portion of the right standard or pillar for the driven element, showing the head and the controlling means for the feed and exhaust of the motive agent in cross-section. Fig. 4 is a view similar to Fig. 3 of the left standard or pillar for the driven element. Fig. 5 is a top plan view of one of the standards or pillars for the driven element. Fig. 6 is an elevation of one of the fixed eccentric devices, looking toward the outer side thereof. Fig. 7 is a transverse vertical section on the line 7 7, Fig. 6, showing a portion of one of the piston head or valve connecting or coupling means and the shoe carried thereby in section, the shoe being in engagement with the friction device. Fig. 8 is an end elevation of the shoe carried by the coupling means for the piston heads or valves. Fig. 9 is a view similar to Fig. 7, showing a part only of the fixed eccentric and the shoe replaced by a roller. Fig. 10 is a side elevation of one of the pillars for the driven element, showing the steam supply and exhaust means in connection therewith partially in section.

Similar numerals of reference are employed to indicate corresponding parts in the several views.

In its simplified form the motor structurally embodies a base 1, having standards or pillars 2, rising from opposite extremities thereof to receive a driven element or shaft 3. Fixed to the driven element or shaft 3 is a rotary element or fly-wheel 4, having pairs of cylinders 5 secured as close as possible to the periphery thereof and tangential to the axis or center of the said rotary element. Four cylinders are shown in the present instance, and the number may be increased, if desired; but irrespective of the number of cylinders used the contiguous pairs thereof have inner open opposing ends, and working therein are piston heads or valves 6, connected by a piston-rod 7, common to both heads or valves, to cause the latter to have equal simultaneous movement in opposite directions. The rotary element or fly-wheel 4 is held on the shaft 3 through the medium of radial arms 8, connecting with the cylinders 5 adjacent to the closed ends of the latter and concentrating at the center around the shaft in a hub 9, which is projected outwardly over the shaft and enters the upper end of one standard or pillar 2. Each of the arms has a port or passage 10 extending longitudinally therethrough and opening into the closed end of the cylinder with which it connects, all of the ports or passages 10 leading to the hub 9. The ports or passages 10 of two of the arms 8 merge or continue into a longitudinal feed-port 11 in the hub 9, and the ports or passages of the remaining arms continue into a similar feed-port 12 at a diametrically opposite point in the hub, the ports 11 and 12 being separated by segmental partitions 13, produced on the hubs by the formation of the said feed-ports 11 and 12. Each of the partitions has a packing member 14 seated therein near one edge, the packing members in the opposite partitions being reversely disposed with respect to opposite edges of the partitions.

The standard or pillar 2, into which the hub 9 projects, has a vertical bore 15 extending upwardly therethrough and communicating at its lower terminal with an outwardly-projecting tubular connection 16, which is adapted to have a conveying-pipe or analogous device attached thereto for exhausting and feeding the motive agent to the machine in accordance with the direction of movement of the machine. The upper end of the standard or pillar 2 is enlarged to form a bearing-head 17, and centrally therein a circular receiving-chamber 18 is vertically disposed and has communication with the bore 15 of the standard at its lower portion and with a feed and exhaust nipple 19 at its upper portion. At its inner and outer sides the bearing-head 17 is also formed with circular sockets 20 and 21, the socket 20 having a suitable fibrous or other packing 22 therein and a packing-ring 23, and the socket 21 is provided with a fibrous packing 24, against which is inserted the flange 25 of a

bearing-cap 26, which surrounds the projecting end of the shaft or driven element 3. The fibrous packings 22 and 24 and the ring 23 and cap 26, with its flange, will be of such materials as are best adapted for the purpose to insure the formation of a tight joint around the hub 9 within the head 17 of the standard or pillar and to resist wear to such an extent as to prolong a trueness of operation of the hub and shaft extremity within the head. The outer terminal 27 of the hub is solid, the hub being circumferentially reduced, as at 30, to form the head-terminal, as set forth, and also give sufficient clearance within the chamber 18 for effective communication with the latter of the longitudinal feed-ports 11 and 12.

Rising from an intermediate portion of the base 1 as an upright 31, having a head 32, through the center of which the shaft or driven element 3 movably extends, and secured to one side of the head is an eccentric device 33, which consists of a disk through which the shaft or driven element 3 movably passes to one side of the center, as clearly shown by Fig. 6. In the present construction of this eccentric device an outwardly-opening circular groove 34 is formed and has inwardly-converging side walls 35. The contour of this groove 34 may, however, be varied, and in view of the eccentric relation of the shaft or driven element 3 to this eccentric device the latter is projected laterally a greater distance at one side of the machine than at the other. In the preferred construction of the motor the groove 34 is movably engaged by a segmental shoe 36, which has its upper and lower sides inclined in directions corresponding to the opposite walls 35 of the groove. The segmental shoe 36 is of such dimensions as to be only partially projected into the groove 34 to reduce the friction as much as possible and avoid jamming or sticking of the shoe during its traverse of the groove. It will be observed from the detail view of the shoe, as shown by Fig. 8, that it has a longitudinal curvature corresponding to that of the groove, the opposite or upper and lower sides of the shoe being, respectively, concave and convex to render the movement thereof within the groove free of retardation as much as possible and also to reduce the tendency of wear on the engaging parts. Instead of the shoe 36 a roller 37, Fig. 9, may be used for the same purpose with equal efficiency; but it is preferred that the shoe be employed in view of its longer bearing, and consequently more positive engagement and movement with respect to the eccentric device. The shoe or roller is carried by the central portion of the deflected intermediate member 38 of a coupling 39 for the piston-rods 7 of the head 6. The coupling 39 has outwardly-directed straight terminals 40, with inner semicircular seats 41 to partially embrace the piston-rods, the terminals 40 being held in operative connection to the piston-rods by coupling-clips 42, bolted or otherwise attached to said terminals 40 and having outer semicircular seats 43, which coincide with the seats 41. The terminals 40 and their clips 42 snugly and tightly embrace the piston-rods 7 to avoid the least lost motion or slipping movement of the coupling-terminals on the piston-rods to insure a simultaneous actuation of the terminals of the coupling of equal extent in opposite directions under all conditions and in consonance with the movements of the piston-rods.

The operation of the motor as thus described in its simplified form will be regular, and as steam is admitted to the two cylinders (shown to the left in Fig. 1) above and below the horizontal diameter of the rotary element or fly-wheel 4 the piston-heads 6 in said cylinders will be forced to the right and the piston-heads at the opposite extremities of the piston-rods will move inwardly into their cylinders gradually, and immediately the rotary element or fly-wheel will be rotated in the direction of the arrow shown by Fig. 1. An unequal expenditure of the expansive force of the motive agent on the piston-heads initially engaged, as just explained, will be prevented by the coupling 39 for the piston-rods 7, and consequently the power of the driven element or shaft 3 will be regularly maintained. This restriction to rapid movement of the piston-heads is due to the location of the shoe 36 in the groove 34 of the eccentric device 33, and it will be seen by the dotted lines shown by Fig. 1 that said shoe will be arranged centrally with respect to the horizontal diameter of the rotary element or fly-wheel 4 when the initially-fed cylinders 5 are in the position shown by Fig. 1, or, in other words, the said shoe will be nearer to the driven element or shaft 3 than at any other time during the operation of the motor. As the rotary element or fly-wheel is thrown around the shoe moves upwardly through the groove 34, and gradually the distance between the same and the axis of the motor or the shaft 3 increases, and such increase of distance of the shoe with respect to the axis is equal to the movement of the piston-rods 7 and the piston-heads 6 in the respective cylinders. When the shoe arrives at a point in the eccentric device diametrically opposite that shown by Fig. 1, the piston-heads which have first received the expansive effect or forceful impact of the motive agent will have about reached the terminus of their inward movement and the opposite piston-heads will have moved far enough into their cylinders to be ready to receive a charge of the motive agent to complete the revolution of the rotary element or fly-wheel 4. This simplified construction and operation have been set forth to demonstrate that the motor will be actuated to rotate at least in one direction without any further

auxiliary, and the feed and exhaust will regularly ensue through the position of the partitions 13 of the hub 9, as shown by Fig. 4, the exhaust of the two cylinders first receiving the charge of the motive agent being effected when the remaining cylinders receive such charge, and vice versa. It is possible to reverse this simplified form of the motor by varying the entrance of the motive agent into the opposite cylinders through suitable valve means well understood in this art. It is preferred, however, to equip the driven element or shaft 3 with more than one rotary element or fly-wheel 4, as clearly shown by Fig. 2, the second fly-wheel being provided with the same components and instrumentalities just particularly described in connection with one of said fly-wheels, and in the drawings similar reference-numerals are applied to the like parts. The eccentric device 44, engaged by the shoe of the coupling 39 of the piston-rods of the second fly-wheel, is in reverse position relatively to the eccentric device 33 and projects in an opposite direction with respect to the shaft or driven element 3. Furthermore, the coupling 39 of the second rotary element or fly-wheel 4 has its intermediate arcuate member 38 in reverse position to the similar member of the coupling of the first-described rotary element, and in the initial operation of the motor in its preferred combined fly-wheel or rotary-element arrangement the piston-heads will be in reverse positions in their cylinders in the two rotary elements, or the motive agent will engage the piston-heads and cylinders in reverse order in the two rotary elements. Under this operation the cylinders and piston-heads in one rotary element which are propulsively inactive during the first half of the revolution will have their inactivity counterbalanced by the driving action of the cylinders and piston-heads in like positions in the second rotary element. This operation will become regularly successive in alternation in the batteries of cylinders and piston-heads in the two rotary elements, with a consequent increase in power of the driven element or shaft 3, and it is proposed to increase the number of rotary elements and organization of piston-heads and cylinders explained indefinitely. It will be seen, however, that the disposition of the rotary elements in contiguous pairs having their cylinders and piston-heads in reverse positions, controlled alternately as to activity and inactivity from a propulsive standpoint, will be very effective in concentrating increased driving power within the shaft 3 by means of an economical expenditure of the motive agent, which is fully utilized throughout the extent of its expansive or impacting force without the loss of the least energy.

The reversal of the motor having the dual rotary element and piston-head and cylinder organization will be attained by suitable valve mechanism controlling the admission of the motive agent into the cylinders in opposition to those first receiving the agent when the motor is actuated to rotate in a contrary direction. It will also be understood that the details of the various parts may be modified, as well as the proportions and dimensions of the main parts, in constructing motors embodying the features of the invention having varying horse-powers. It is not essential that the exact mode of attaching the cylinders and of securing the shoes to the couplings, as shown and set forth, should be accurately followed, as such details do not in the least affect the general operation. It is essential, however, that the present form of motor have the cylinders and piston-heads and connecting-rods for the latter arranged tangentially with respect to the axis of the rotary elements and, further, that the admission of the motive agent be controlled at all times to move the piston-heads back or in a direction reverse to the movement of the rotary elements. In supplying the motor with a driving agent the latter when the motor is moving in the direction of the arrow enters the nipple 19, and the exhaust is effected through the tubular connection 16 when the terminal x of the one partition 13 (see Fig. 3) reaches the point y. After admission of the motive agent exhaustion from the cylinders in activity is effected, the partitions in the remaining standard or pillar having a corresponding operation. To reverse the engine, the motive agent is admitted through the tubular connection 16 and exhausts through the nipple 19 in each standard, a suitable two-way cock being one way of arriving at this result, or, in other words, to change the direction of the steam or other motive agent with respect to the tubular connection and nipple. The means for controlling the steam supply, exhaust, and reversal of the motor is clearly shown by Fig. 10 and includes a pipe 43^a, connected at opposite ends, respectively, to the nipple 19 and the connection 16 and provided at an intermediate point with a two-way valve 44^a. By operating said valve in opposite directions the admission and exhaust of the steam or other motive agent may be controlled as just explained.

Having thus fully described the invention, what is claimed as new is—

1. A motor, having a driven element, a rotary element, cylinders and pistons carried by the rotary element and arranged in opposite coöperating pairs, and means for feeding the motive agent to the cylinders in such manner as to cause the pistons to move in a direction reverse to that of the rotary element.

2. A motor, having a driven element, a rotary element, and pairs of propelling devices carried by the rotary element having connected parts actuated by the motive agent and moving back in a direction reverse to the direction of rotation of the said rotary element.

3. A motor, having a driven element, a rotary element coöperating with the driven element, and propulsive devices carried by the rotary element connected in pairs for simultaneous operation and arranged tangentially to the center of the latter.

4. A motor, having a rotary element provided with dependently-operative pairs of propulsive devices arranged tangentially to the center thereof.

5. A motor, having a rotary element carrying simultaneously-operative pairs of propulsive devices arranged tangentially to the center thereof at opposite points.

6. A motor, having a rotary element with pairs of tangential propelling devices arranged at opposite points therein, the said pairs of devices having simultaneous operating elements.

7. A motor, having a driven element, a rotary element coöperating therewith, and pairs of tangentially-arranged propelling devices at opposite points therein, said propelling devices having movable parts connected for simultaneous operation.

8. A motor, having a rotary element provided with pairs of cylinders and piston-heads arranged tangentially with respect to the center, the piston-heads of each pair of cylinders being connected for simultaneous operation.

9. A motor, having a driven element, a rotary element coöperating therewith and provided with tubular arms communicating with a source of supply of the motive agent, and tangentially-disposed propelling devices arranged close to the periphery of the rotary element and connected to the arms.

10. A motor, having a rotary element with tubular arms, a driven element to which said arms extend, and connected pairs of propelling devices disposed close to the periphery of the rotary element and having communication with the said arms.

11. In a motor, a driven element, a rotary element secured to the driven element and having oppositely-disposed tangentially-arranged pairs of propelling devices, a coupling for the opposite pairs of propelling devices, and means for controlling the movement of the coupling during the actuation of the rotary element.

12. In a motor, a driven element, a rotary element for actuating the driven element, pairs of cylinders tangentially disposed in the rotary element at diametrically opposite points and having connected piston-heads, a coupling for the piston-heads of the opposite pairs of cylinders, and a fixed eccentric device with which a portion of the coupling engages.

13. In a motor, a driven element, a rotary element having tangentially-arranged propelling mechanism at diametrically opposite points provided with movable parts, a coupling connecting the said movable parts of the opposite propelling mechanism, and a fixed eccentric device with which a portion of the coupling engages.

14. In a motor, a driven element, two independent rotary elements secured to the driven element, and pairs of propelling devices arranged near the periphery of each rotary element and at diametrically opposite points.

15. In a motor, a driven element, independent rotary elements secured to the driven element, and tangentially-arranged pairs of propelling devices disposed near the periphery of each rotary element at diametrically opposite points.

16. In a motor, a driven element, independent rotary elements secured to the driven element, propelling devices at opposite points in each rotary element, couplings for the propelling devices, and reversely-extending eccentric devices engaged by portions of the couplings.

17. In a motor, tubular standards, a driven element supported by said standards, independent rotary elements secured to the driven element and carrying batteries of propulsive devices and tubular feeding means connecting with the propulsive devices and the standards.

18. In a motor, tubular standards to receive the motive agent, a driven element rotatably held by said standards, rotary elements secured to the driven element and carrying batteries of propulsive devices coupled for simultaneous operation, and tubular connecting means between the batteries of propulsive devices and the standards.

19. In a motor, a driven element, independent rotary elements secured to the driven element, propelling devices arranged at diametrically opposite points and connected to the rotary elements, the propelling devices being positioned tangentially with respect to the driven element, couplings for the propelling devices, reversely-extending eccentric devices engaged by portions of the couplings, and means for feeding and exhausting the propelling devices.

20. In a motor, a driven element, independent rotary elements secured to the driven element, propelling devices at opposite points in each rotary element, couplings for the propelling devices having projecting means, and reversely-arranged eccentric devices engaged by the projecting means of the couplings.

21. In a motor, a driven element, independent rotary elements secured to the driven element, propelling devices arranged in pairs at opposite points in each rotary element, a portion of the pairs of propelling devices in one rotary element being propulsively active while like devices in the other element are propulsively inactive, and means for supplying the motive agent to and exhausting the same from the propelling devices.

22. In a motor, a driven element, independent rotary elements secured to the driven ele-

ment, pairs of propelling devices arranged at opposite points in each rotary element, portions of the propelling devices in the respective rotary elements being alternately propulsively active and inactive, means for obtaining a unitary operation of the pairs of propelling devices, and means for supplying and exhausting the motive agent.

23. In a motor, a driven element, a rotary element having tubular arms concentrating in a central hub on the driven element, propelling devices at opposite points in the rotary element with which the arms communicate, and tubular supporting means for the driven element and hub having means for receiving a supply of a motive agent and exhausting the latter.

24. In a motor, a driven element, a rotary element secured to the driven element, pairs of cylinders carried by the rotary element and having inner open ends and outer closed extremities, piston-heads in the pairs of cylinders, each pair of heads being connected by a single rod, a coupling means between each piston-rod of the opposite pairs of heads, means for controlling the regularity of movement of the coupling means, and means for supplying the motive agent and exhausting the latter.

25. In a motor, a driven element, a rotary element secured to the driven element, pairs of cylinders arranged at opposite points in the rotary element and having inner open ends and outer closed extremities, piston-heads in the cylinders connected for simultaneous operation, tubular arms attached to the outer closed extremities of the cylinders and concentrating at the center in a tubular hub engaging the driven element, and a tubular supporting means to receive and exhaust the motive agent, such tubular supporting means operatively holding the driven element and a portion of the hub.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

THOMAS G. SAXTON.

Witnesses:

J. ENDRY ALLEN,

ELIJAH HAWKINS.