No. 775,632. PATENTED NOV. 22, 1904.

F. F. NORDEN.

ROTARY ENGINE.

APPLICATION FILED MAR. 2, 1904.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 1.

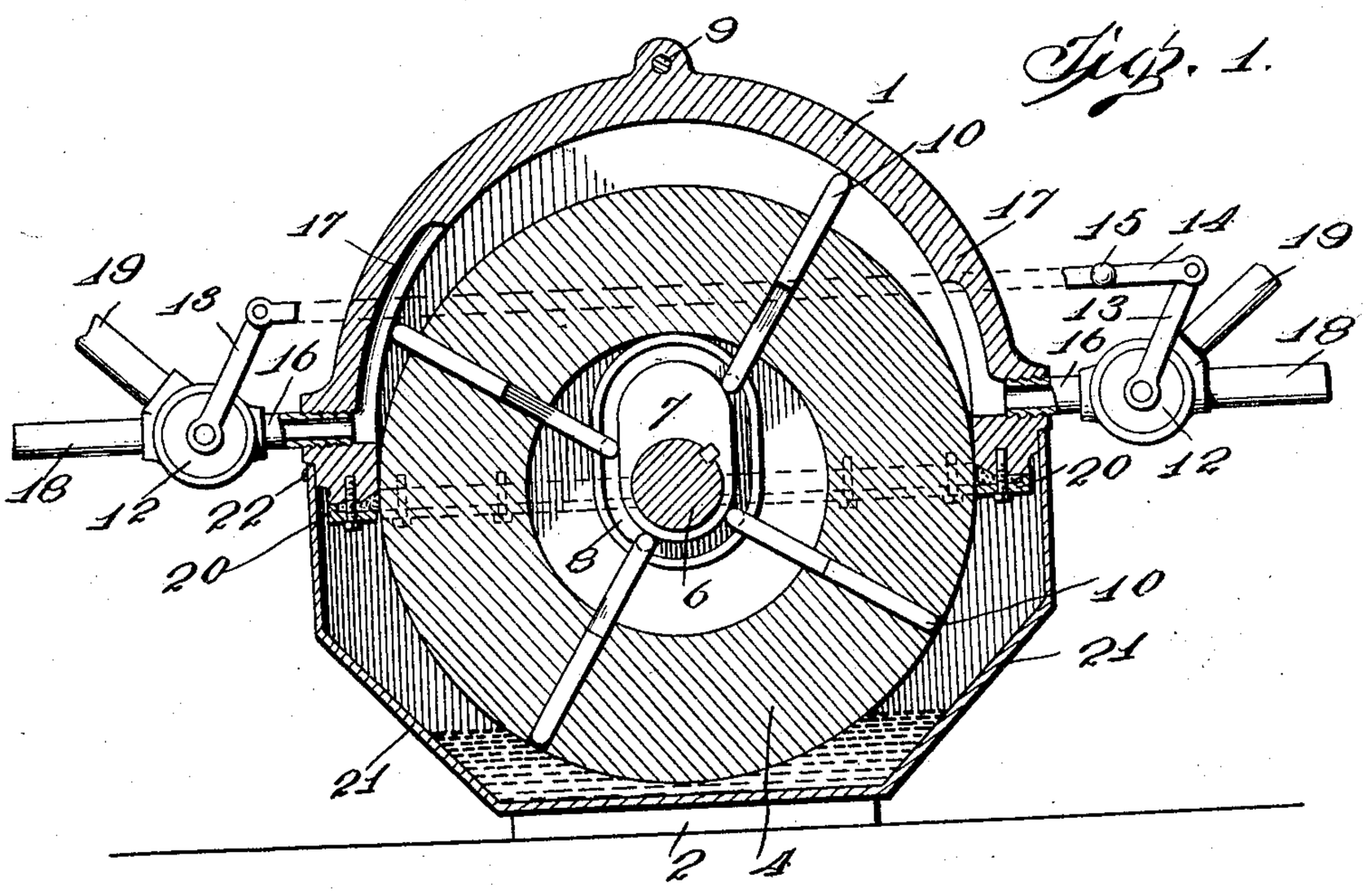
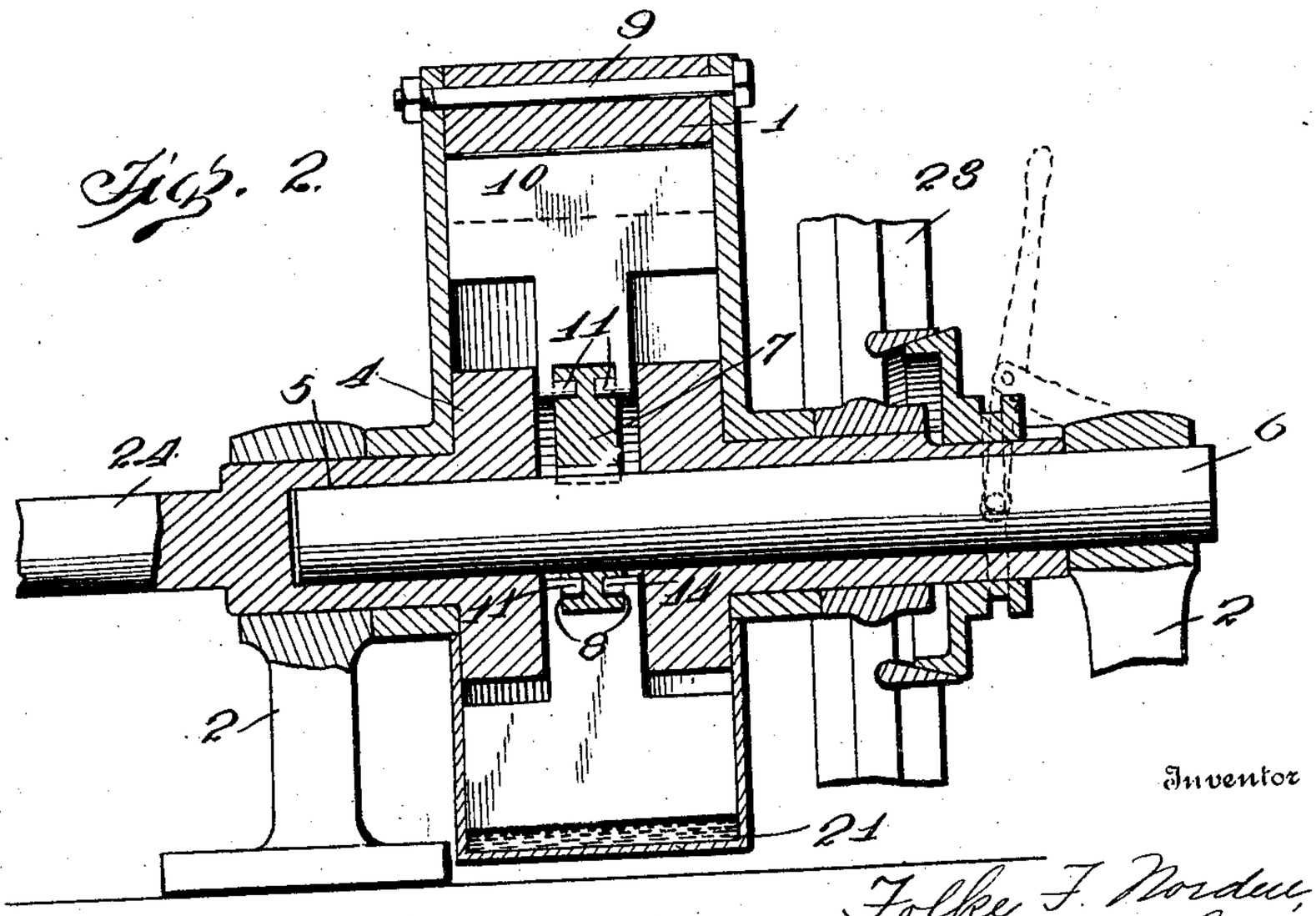


Fig. 2.



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NO MODEL. 3 SHEETS—SHEET 2.

Fig. 3.

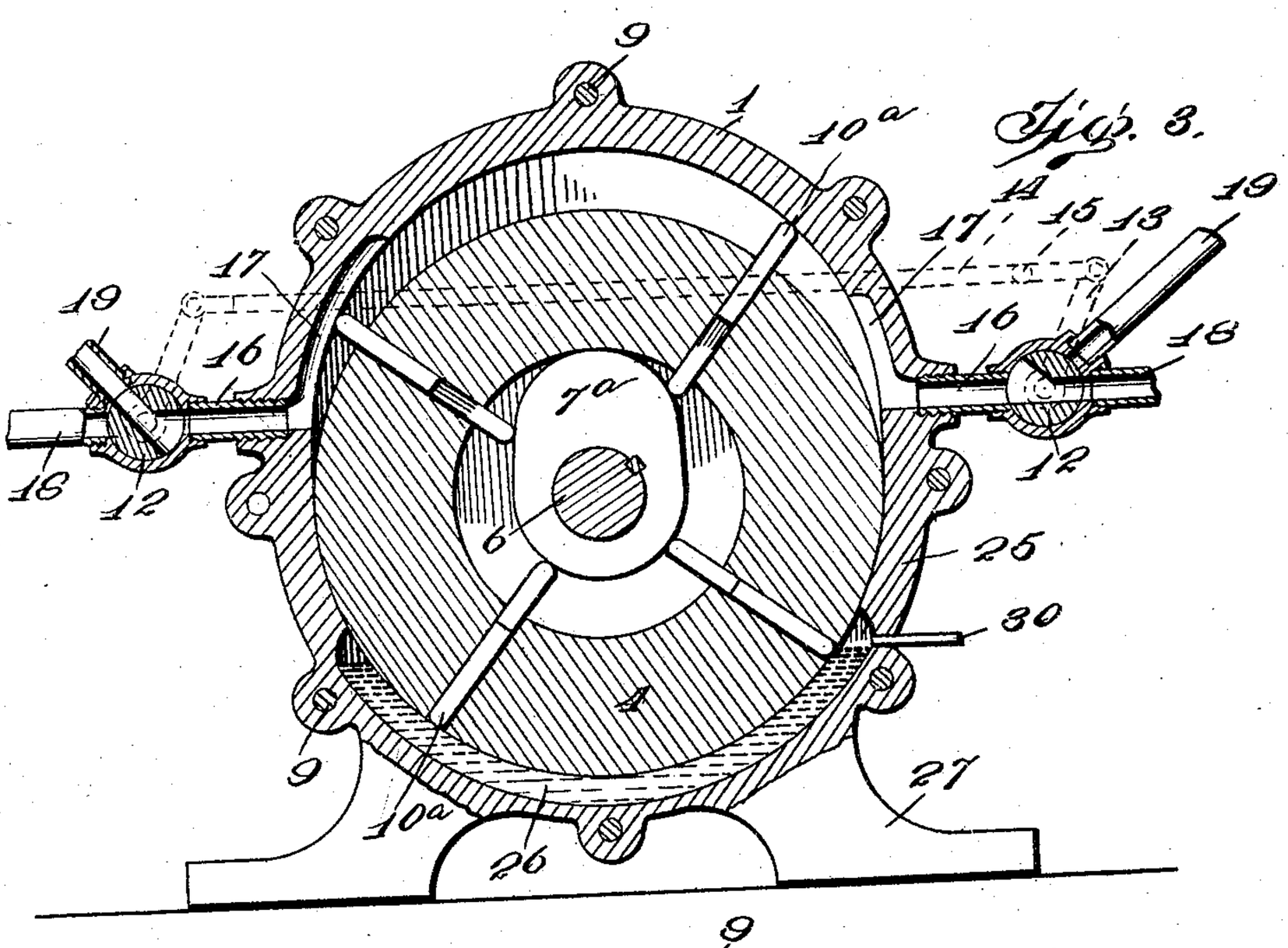
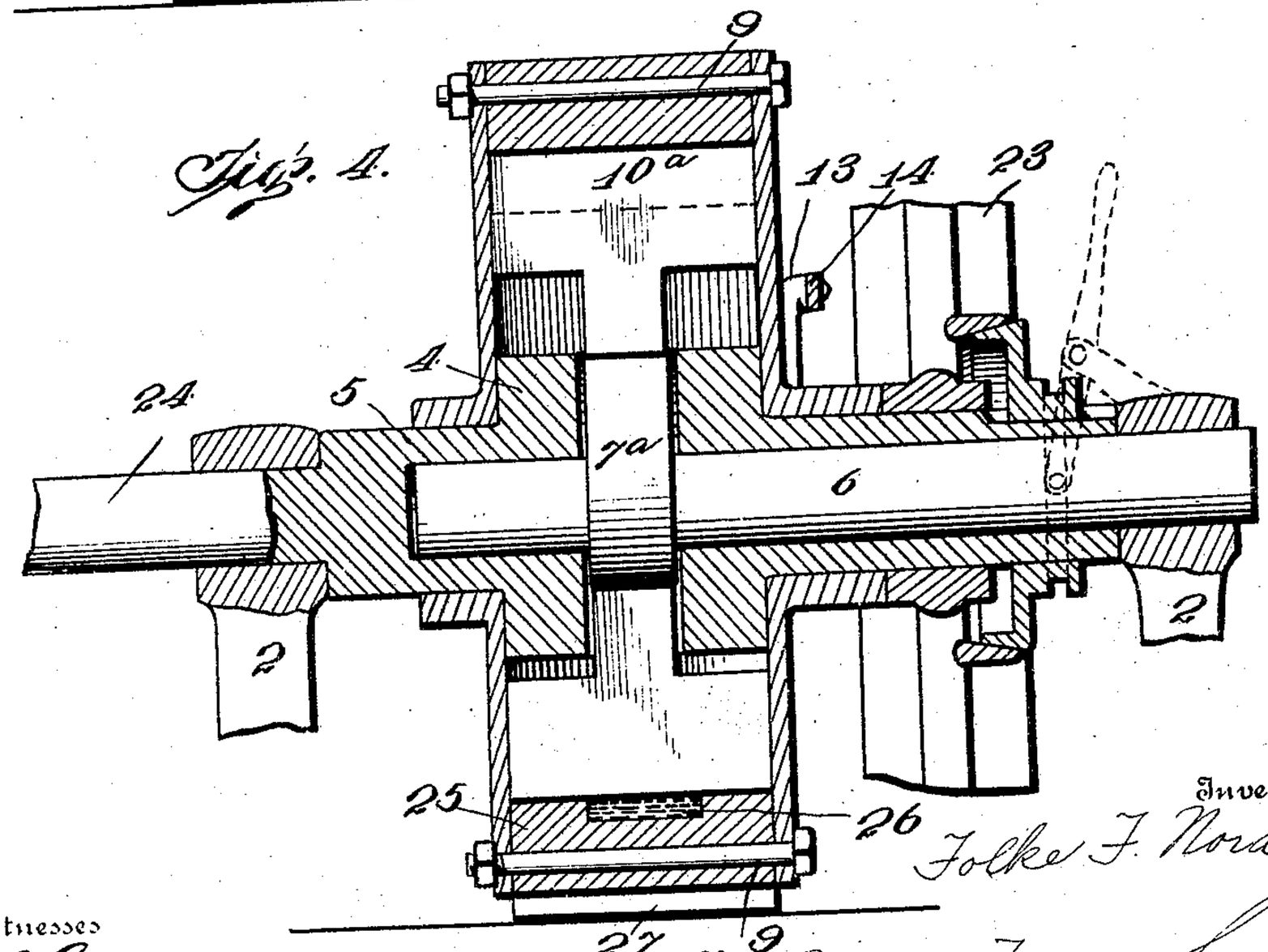


Fig. 4.



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NO MODEL. 3 SHEETS—SHEET 3.

Fig. 5.

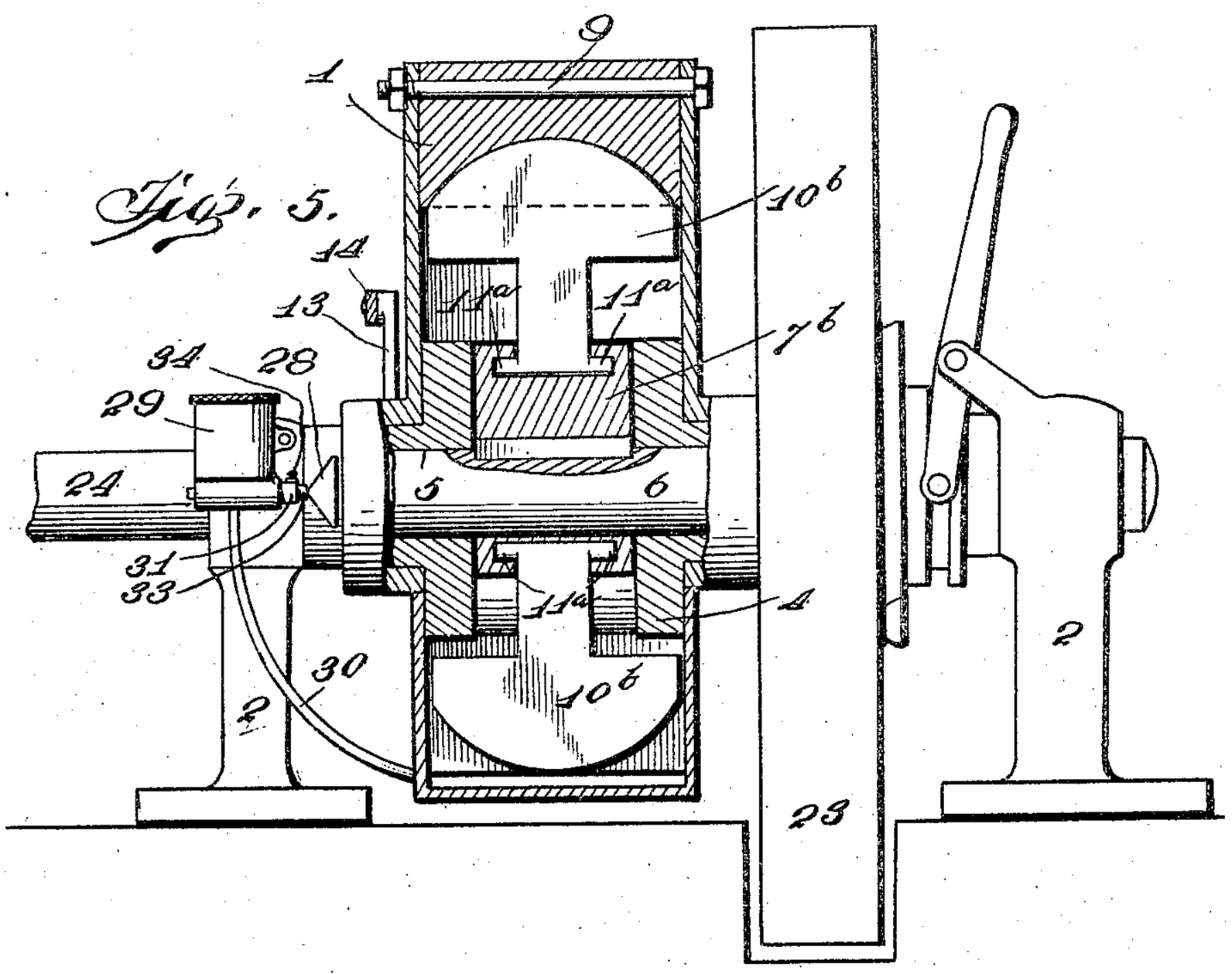
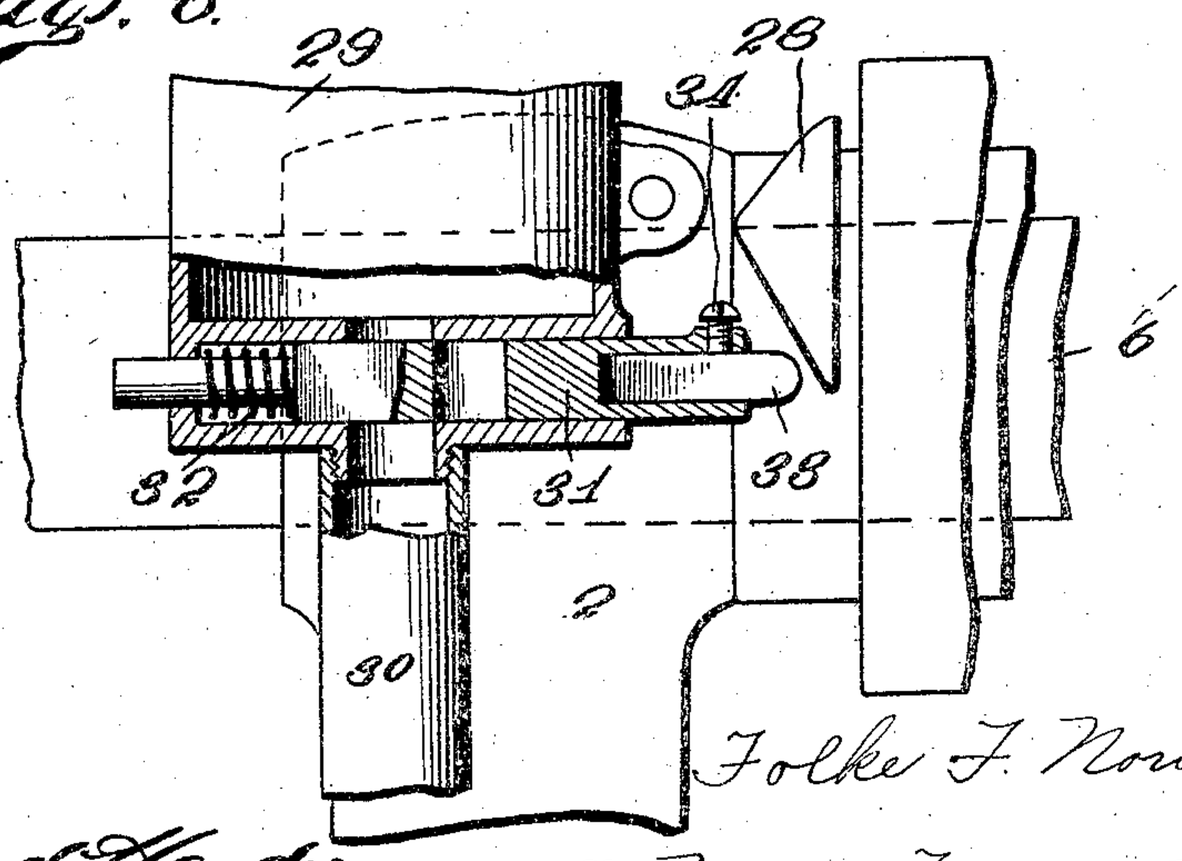


Fig. 6.



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No. 775,632. Patented November 22, 1904.

UNITED STATES PATENT OFFICE.

FOLKE F. NORDEN, OF BROOKLYN, NEW YORK, ASSIGNOR OF TWO-THIRDS TO ANDREW J. MURPHY, OF NEW YORK, N. Y.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 775,632, dated November 22, 1904.

Application filed March 2, 1904. Serial No. 196,207. (No model.)

To all whom it may concern:

Be it known that I, FOLKE F. NORDEN, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Rotary 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 rotary engines.

The object of the invention is to construct an engine of a minimum number of parts of high efficiency and simple in operation.

Another object of the invention is to provide a mechanism with means for automatically reversing the mechanism when the same is in operation.

Another object of the invention is to provide the mechanism with means for automatically lubricating a portion of the same and means assembled with said lubricating means for feeding a lubricant to the same.

Another object of the invention is to provide an engine with a casing partially surrounding its piston and removable means carried by said casing for entirely inclosing the unsurrounded portion of the piston.

With these and other objects in view the invention consists in the novel construction, combination, and arrangement of parts, as will be hereinafter fully described, illustrated in the accompanying drawings, and more particularly pointed out in the claims hereto appended.

In the drawings, Figure 1 is a vertical sectional view of the mechanism. Fig. 2 is a transverse sectional view of the mechanism. Fig. 3 is a vertical sectional view of another embodiment of my invention. Fig. 4 is a transverse sectional view of the embodiment shown in Fig. 3. Fig. 5 is a transverse sectional view of another embodiment of my invention. Fig. 6 is a fragmentary view of an automatic lubricating mechanism.

Referring to the drawings by reference-numerals, 1 designates a casing which is secured in a fixed position upon suitable standards or frameworks 2. A rotary piston 4 is provided with hollow extensions or sleeves 5, which are journaled in the standards 2. A stationary support or shaft is mounted within the sleeves or extensions 5 of the piston 4, and upon said shaft 6 is keyed an eccentric or cam member 7, which is provided with a groove 8, formed upon each of its sides. The piston 4 is concentric to the shaft 6, which supports the cam member 7, and is adapted to partially rotate within the casing 1, which partly surrounds the said rotary piston 4.

The casing 1 is constructed of a plurality of sections, which are retained in a fixed assembled position by any suitable means, as a bolt 9 or the like. A plurality of slots are formed in the cylindrical casing comprising the rotary piston, and within these slots are mounted radially-extending abutments 10, which are adapted to slide freely within said slots formed in the piston when the engine is in operation. Each of the abutments or wings 10 is provided with an extension which is formed with a pair of lugs or inwardly-extending projections 11, which are normally retained within the grooves 8, formed upon each side of the eccentric or cam member 7. It will be seen upon carefully considering the drawings that the slots within which the abutments slide are not of the same shape of construction for the entire depth of the piston, as the slots do not extend the entire width of the piston to the shaft 6, but terminate near the shaft, and a narrow annular compartment is formed within the piston 4, within which is mounted the eccentric or cam member 7.

Upon the opposite side of the casing 1 is arranged a valve mechanism for the purpose of controlling the supply of steam fed to the compartment formed between the piston and the casing 1. The said mechanism comprises in its construction a rotary valve 12, to which is secured an arm 13, and to said arm 13 is detachably secured a connecting horizontal bar or arm 14, which extends and connects to a corresponding arm 13, carried by a similar valve 12 upon the other side of the engine. A suitable grip 15 is secured to the horizontal bar 14. The casing within which the valves

12 are mounted is provided with a pipe 16, which is removably mounted within an aperture of the casing, and said pipe provides communication with grooves 17, formed upon the inner surface of the casing and upon opposite sides thereof. To the casing within which the valve 12 is mounted is also connected communicating pipes, which are respectively supply-pipe 18 and exhaust-pipe 19. The grooves 17, formed upon the inner surface of the casing 1, are extended toward the top of the casing for the purpose of facilitating the operation of the engine, as will be hereinafter described.

The construction of the valve mechanism enables the engine to be reversed when the same is in operation. It will be apparent upon considering the foregoing description and the drawings that by rotating the valves 12 by operating the connecting extensions or arms secured to said valves the supply-pipe upon one side of the engine will be automatically closed and the pipe upon the opposite side opened, and the auxiliary pipe formed upon the side of the casing which formerly contained the opened inlet-pipe will be opened, and the exhaust-pipe on the opposite side of the engine will be closed.

Around the lower face or edge of the partially-surrounded casing 1 is secured a detachable member 20, which is secured in an assembled position with the casing 1 by any suitable removable means. Interposed between the lower edge of the casing and the inner face of the member 20 is a suitable packing which normally impinges against the sides and periphery of the rotary piston, thereby preventing the escape of steam from the steam-chest.

Removably mounted upon the casing 1 is an auxiliary casing 21, which is secured in an assembled position with the primary casing by means of screws 22 or the like. This casing 21 is so constructed as to receive a suitable lubricant within which the rotary piston is partly submerged. The lubricant materially assists in the positive operation of the piston; but while I have shown in the drawings, Figs. 1, 2, and 5, the detachable lubricant-containing casing 21 it will be obvious that, if it is desired, the said casing 21 may be removed entirely from the partially-surrounding primary casing 1 and the operation of the mechanism will be practically the same as when the same is secured in an assembled position with the other parts of the mechanism.

Upon one of the annular sleeves 5 of the rotary piston 4 is loosely mounted a balance-wheel 23, which materially assists the engine in its operation. The said wheel 23 is provided with a clutch mechanism, which is keyed to the sleeve 5 upon which the balance-wheel is mounted. The clutch mechanism is necessarily slidably mounted upon the sleeve and is provided with the ordinary lever structure for the actuation of the same. An integral shaft 24 is formed upon the sleeve 5, which is not provided with the balance-wheel 23, and said shaft 24 may be connected by any suitable means with a belt-wheel, a crank mechanism, or any suitable means for the purpose of imparting motion to the machinery which is to be operated.

In Figs. 3 and 4 the general construction of the engine is the same, except that the outer casing or framework 25 is formed of a plurality of annular sections which entirely surround the piston 4, and upon one of the sections of the encircling casing is formed a compartment or groove 26, which is adapted to receive a suitable lubricant. Another modification shown in the structures disclosed in Figs. 3 and 4 is that of the eccentric or cam member 7^a. Said member 7^a is not provided with grooves 8 formed upon its sides, as shown in Figs. 1 and 2. The abutments or wings 10^a are adapted to engage the periphery of the cam member 7^a instead of the said abutments 10^a having means for engaging the grooved portion of a member, as shown in Figs. 1 and 2. Upon the frame or casing 25 is secured a plurality of integral extensions 27, which form suitable supporting means for the engine.

Referring to Fig. 5 of the drawings, in the construction of the eccentric or cam member 7^b, the abutments or wings 10^b, and the inner wall or face of the partially-surrounding casing 1 is different from the disclosure contained in the other drawings. The eccentric or cam member 7^b is provided with a peripheral slot or groove, and said groove is constructed with undercut portions which are adapted to receive the projections 11^a formed upon the extension of the abutments, which are adapted to project into the peripheral groove of the cam member. The abutments 10^b are provided with a convexed or curved outer surface which is adapted to engage a concaved or curved surface formed upon the annular section of the casing 1. Mounted upon the engine is an automatic supplying mechanism for furnishing the lubricating-compartment 26 or the casing 21 with a suitable lubricant. The said mechanism comprises in its construction an integral beveled extension 28, which is carried by one of the hollow sleeves 5 of the rotary piston. Secured to the standards or framework 2 is a suitable receptacle 29, forming a reservoir for receiving and retaining the lubricating material for the purpose of supplying the same to the receiving-compartment formed upon the casing of the engine. A removable cap is carried by the said receptacle 29. A removable pipe 30 is detachably secured to the bottom of the receptacle 29 and communicates with the oil-receiving compartment 26, formed upon the casing 25, or communicates with the removable lubricating-casing 21, secured to

the partially-surrounding casing of the mechanism. An auxiliary compartment is formed in the bottom of the receptacle 29 and is provided with a plunger 31, which is normally pressed outward by means of a spring 32, carried upon an integral extension formed upon one end of said plunger. Said receptacle 29 and plunger 31 are formed with an aperture for the purpose of permitting the passage of the lubricant contained in the receptacle 29 through the bottom of said receptacle and thence through the apertured portion of the cushioned sliding plunger 31 to the communicating pipe 30. The plunger 31 is provided upon one of its ends with a hollow integral extension, within which is mounted an adjustable member 33. Said member 33 is adapted to be adjusted longitudinally within the hollow portion of the plunger 31 for the purpose of controlling the supply of the oil fed from the receptacle 29 to the lubricating-compartment of the engine. When the mechanism is in operation, the integral beveled extension 28 of the piston 4 is caused to revolve and intermittingly engages the adjustable member 33, which is retained in a fixed position by means of an adjusting-screw 34, and as the said member 33 rides over one of the beveled faces of the extension 28 the plunger is forced inward, causing the aperture formed therein to come into a parallel position with the opening of the pipe and the aperture formed in the bottom of receptacle 29, thereby permitting of the discharge of lubricating material through the communicating pipe to the lubricating-compartment. It will be obvious that the quantity of lubricant to be discharged to the lubricating casing or compartment may be controlled by adjusting the member 33, thereby limiting the size of the discharge-openings formed, respectively, in the receptacle 29 and the plunger 31. As soon as the integral extension 28 disengages the inner face of the reciprocating plunger 31 the spring will automatically throw the plunger into the path of the extension 28, thereby cutting off the flow of the lubricant in the receptacle 29 and placing the plunger again in position whereby the same will be actuated upon the entire rotation of the sleeve upon which the extension 28 is formed.

In operation the valves are automatically thrown to the position whereby the engine will operate in a desired manner, and the steam is passed through the supply-pipe to the steam-chest, and if an abutment is in comparatively the same horizontal plane within which the inlet-pipe is formed the same will bear against the said abutment continuously until it extends at an acute angle to the plane within which the inlet-pipe is formed. I have found that by forming the groove 17 upon the casing the expansive powers of the steam are greater than if the inlet-pipe extended to the periphery of the rotary piston and discharged directly upon the piston and an abutment. In the construction shown in the present invention the steam not only acts upon the abutment in a position adjacent to the horizontal opening of the supply-pipe, but a groove is formed upon the inner face of the casing permitting of the expansive powers of the steam to act upon the abutment while said abutment is within the upper surrounding casing. The said groove 17 also permits of the exhaust of the steam between two of the abutments before the same would be exhausted, provided the exhaust did not have a communicating groove formed upon the inner wall of the casing. By moving the connecting-link 14 and rotating the valves 12 the reversing of the engine will be obtained, as the steam will be cut off from one of the inlet-pipes of one of the valve mechanisms and the exhaust-pipe of the same valve mechanism will be opened, while in the other valve mechanism the exhaust-valve will be closed and the inlet-pipe opened.

It will be apparent from the foregoing description and the accompanying drawings that certain other modifications, alterations, and changes may be made in the construction of an engine in accordance with my invention by one skilled in the art to which the same relates, and I therefore reserve the right to make such alterations, modifications, and changes as shall fairly fall within the scope of the invention without sacrificing any of my rights and interests therein.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A rotary engine, comprising a support, a piston mounted thereon, a primary casing partially inclosing said piston, valve means carried by said primary casing, and lubricating means entirely inclosing a portion of said piston.

2. A rotary engine, comprising a primary semicylindrical casing and a rotatable member assembled therewith, abutments carried by said rotatable member, a cam member secured within said rotatable member, a lubricating-casing partly encircling said piston and removably secured to said semicylindrical casing, and reversing means carried by said primary casing for controlling the movement of said rotatable member.

3. A rotary engine, comprising a piston, a primary casing partially inclosing said piston, a packing secured upon the edge of said casing, an auxiliary removable casing secured to said primary casing, and means for automatically supplying liquids to said auxiliary removable casing.

4. A rotary engine, comprising a casing having grooves formed upon its inner face, a rotatable piston provided with reciprocating abutments assembled with said casing, an ec-

centric mounted within said piston and normally engaging said abutments, a valve mechanism secured to said casing upon opposite sides thereof, and lubricating means secured to said casing near the lowest portion thereof.

5. A rotary engine, comprising a support, a sectional casing carried thereby, a rotary piston journaled within said casing, reciprocating abutments carried by said piston, reversing means secured to said casing, automatic lubricating means for supplying a lubricant to the lower section of said casing, and means carried by said piston for actuating said lubricating means.

6. A rotary engine, comprising a support, a piston secured thereto, a surrounding casing partially inclosing said piston, reciprocating means carried by said piston, a removable lower casing secured to said surrounding casing, a receptacle assembled with said casing, means assembled with said receptacle and communicating with said lower casing, and means carried by said piston for controlling the discharge of liquids from said receptacle to said lower casing.

7. A rotary engine, comprising a plurality of standards, a casing carried by said standards, comprising an upper primary section and a removable auxilary section, a rotatable piston provided with sliding abutments assembled with said casing, a packing secured around the edge of said primary section and normally engaging said piston, and automatic means for controlling the supply of liquids to said lower removable section.

8. In a device of the character described, the combination with a support, a rotary piston carried thereby, said piston provided with integral, hollowed right-angled extensions, stationary means carried within said hollow extensions, a cam member keyed to said stationary means, reciprocating abutments assembled with said piston and normally engaging said cam member, a casing partly surrounding said piston, a packing removably mounted on the edge of said casing, valve means controlling the operation of said piston, a removable lower casing secured to said casing partly surrounding said piston, and a receptacle provided with automatic means for controlling the supply of liquids to said lower casing.

9. A rotary engine, comprising a sectional casing, one of said sections provided with a concaved inner surface, a piston mounted within said casing, sliding abutments provided with a convexed outer surface assembled with said piston, a cam member normally engaging said abutments mounted within said piston, a lubricating receiving compartment formed upon said casing near the bottom thereof, and automatic means carried by said casing for supplying liquids to said lubricating-compartment.

10. In a device of the character described, the combination with a sectional casing, a piston mounted therein, one of said sections of said casing provided with a concaved, annular inner wall, abutments carried by said piston, said abutments provided with a convexed outer surface, reversing means for controlling the operation of said piston, an auxiliary stationary receptacle assembled with said casing provided with reciprocating means, communicating means assembled with said auxiliary receptacle and said primary casing, and means carried by said piston for actuating said reciprocating means.

11. In a device of the character described, the combination with a piston, a casing partially inclosing said piston, a plurality of reciprocating abutments carried by said piston, means mounted within said piston normally engaging said abutments for controlling the operation thereof, a lubricant-receptacle assembled with said casing, an automatic lubricating feeding mechanism assembled with said receptacle, communicating means secured to said receptacle and casing, and means for controlling the operation of said feeding mechanism.

12. A rotary engine, comprising a casing formed by assembling an upper and a lower section, a piston carried within said casing, reciprocating means carried by said piston, a packing secured around the lower edge of said upper casing, and means assembled with said casing for automatically controlling the supply of liquids to said lower section.

13. In a device of the character described, the combination with suitable supports, of a rotary piston journaled upon said supports, said piston comprising a cylindrical casing, said casing provided with integral, hollow extensions projecting therefrom at right angles, stationary means journaled in said extensions, reciprocating means carried by said piston, means secured to said stationary means for actuating said reciprocating means, an inclosing casing surrounding said piston, and inlet and outlet valve means assembled with said casing.

14. In a device of the character described, the combination with a casing, a plurality of approximately horizontal extensions assembled with said piston upon opposite sides thereof, each extension provided with a hollow body portion, a stationary shaft journaled within said extensions, an eccentric keyed upon said shaft and within said piston, sliding abutments mounted upon said piston, a casing surrounding said piston, and valve means assembled with said casing.

15. In a device of the character described, the combination with suitable supports, a stationary shaft mounted upon one of said standards, a rotary piston journaled upon one standard and upon said shaft, a stationary casing inclosing said piston, reciprocating means car-

ried by said piston, lubricating means assembled with said casing near the base thereof, a wheel loosely mounted upon said piston, valve means assembled with said casing, and clutch means for locking said wheel in a stationary position upon said piston.

16. In a device of the character described, the combination with a casing, of a piston mounted therein, integral, hollow sleeves secured to said piston and extending beyond the sides of said casing, a stationary shaft extending entirely through one of said sleeves and projecting into the other sleeve, a cam member keyed upon said shaft within said piston, sliding abutments mounted within said piston, a rotary member journaled upon one of said sleeves of said piston, locking means carried by said piston and normally engaging said rotary member, reversing means assembled with said casing for said piston, and means for supplying a lubricant to said piston.

17. In a device of the character described, the combination of a casing, a rotary piston mounted therein, reciprocating means carried by said piston, reversing means assembled with said casing and piston, a stationary receptacle assembled with said casing, communicating means assembled with said stationary receptacle and with said casing, cushioned reciprocating means assembled with said receptacle, and means mounted upon said piston adapted to intermittently engage said reciprocating means mounted upon said receptacle.

18. In a device of the character described, the combination with a plurality of standards, a rotary piston journaled upon said standards, a casing inclosing said piston, reversing means assembled with said casing and piston, a receptacle secured to one of said standards, a removable, hollow, communicating member secured to said receptacle and said casing, reciprocating means mounted within the bottom of said receptacle, and engaging means assembled with said piston for actuating said reciprocating means.

19. In a device of the character described, the combination with supports, of a piston journaled thereon, a casing for said piston, a receptacle secured to one of said supports, said receptacle comprising an apertured, partitioned casing, a removable cover therefor, an apertured reciprocating member mounted within said casing, cushioning means for said member, adjusting means for said reciprocating member, removable communicating means secured to said receptacle and said casing near the base thereof, and a beveled extension formed upon said piston and adapted to engage said reciprocating means.

20. In a device of the character described, the combination with a piston, of a casing therefor, reversing means for said piston assembled upon said casing, a rotary member mounted upon said piston, a clutch mechanism mounted upon said piston, an automatic lubricating mechanism assembled with said casing, comprising a receptacle, communicating means assembled with said receptacle and said casing, adjustable cushioned, reciprocating means for supplying liquids to said casing from said receptacle, and means for intermittently actuating said reciprocating means.

21. A rotary engine, comprising a plurality of standards, a rotary piston journaled upon said standards, an upper casing for said piston provided with means for engaging the periphery of said piston in the same central, horizontal plane, reversing valve means assembled with said casing, and a lubricating-receptacle removably mounted upon the lower portion of said casing.

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

FOLKE F. NORDEN.

Witnesses:
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GEORGE M. BROOKS.