J. W. WATKINS.

ENGINE.

APPLICATION FILED NOV. 23, 1906.

900,806.

Patented Oct. 13, 1908.

2 SHEETS—SHEET 1.

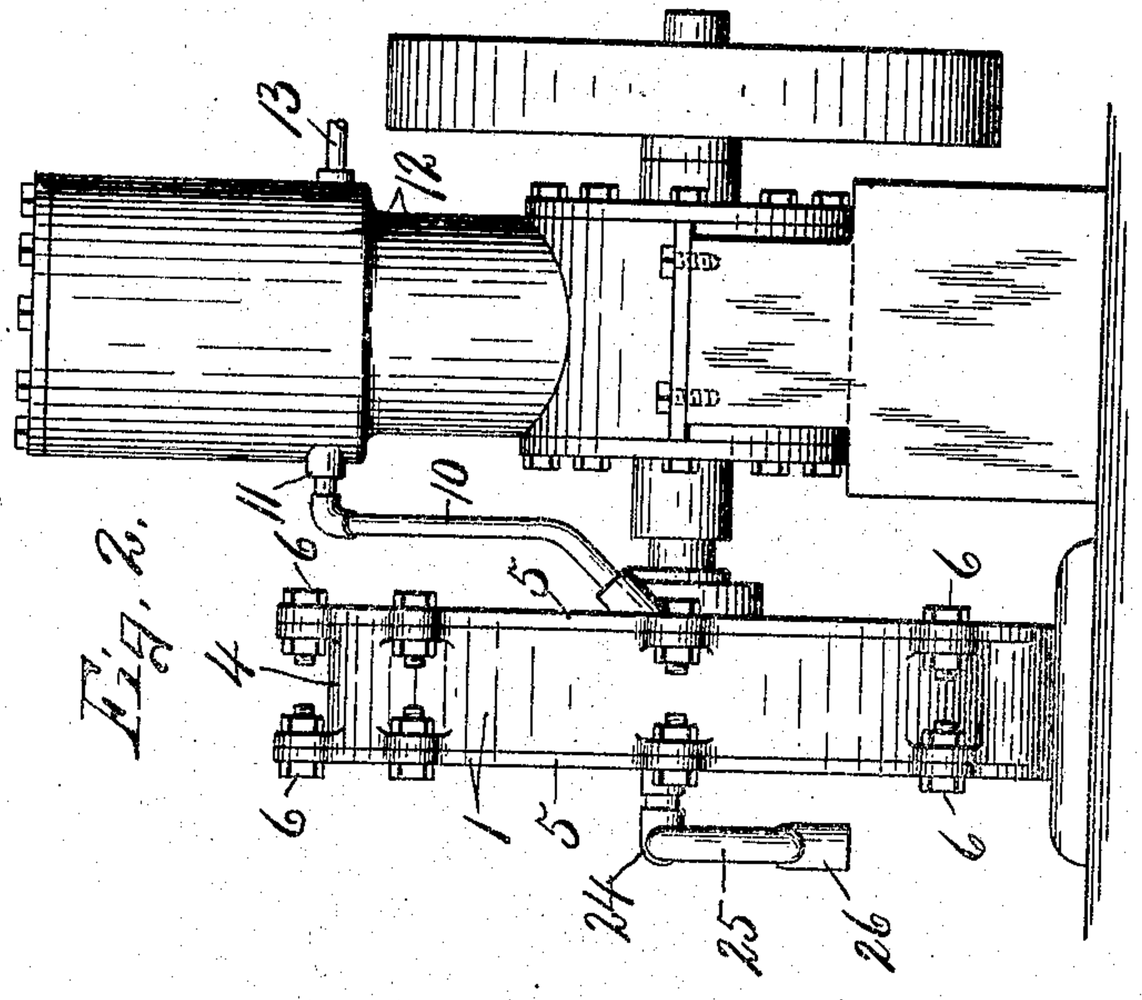


Fig. 2.

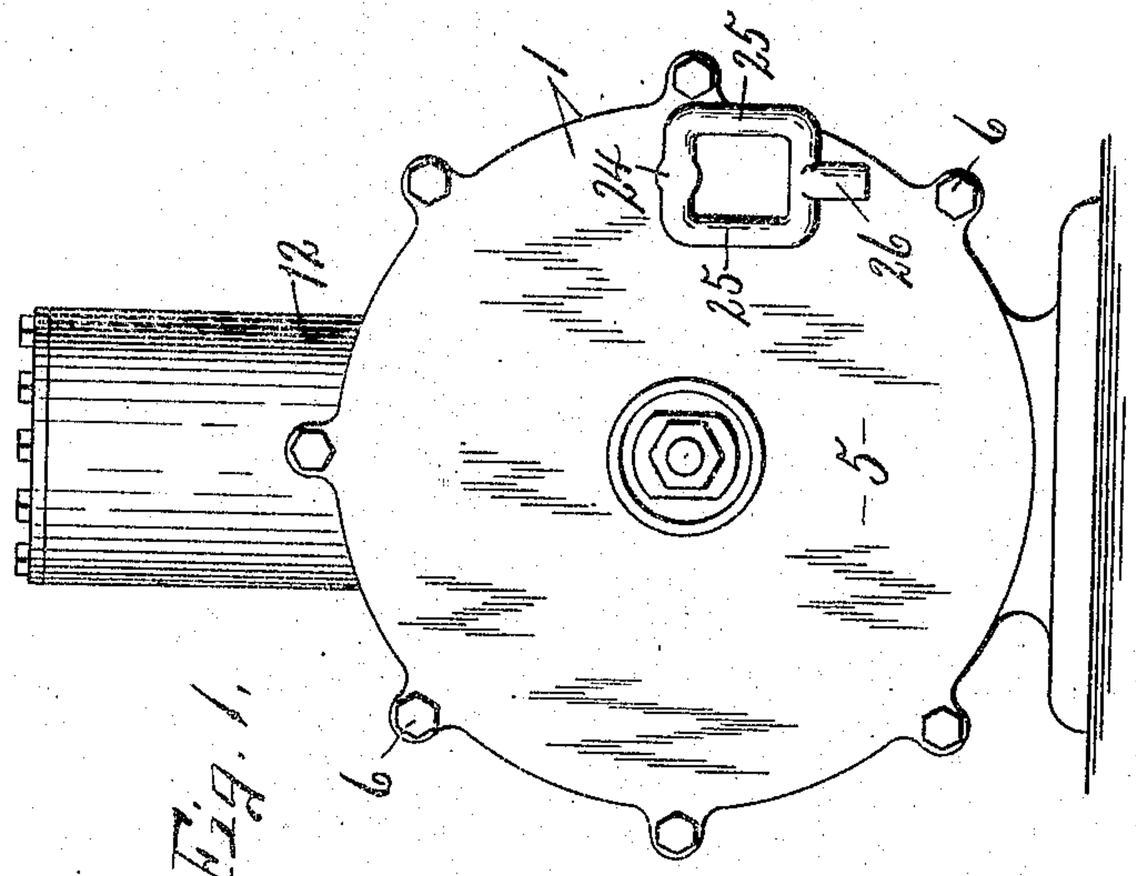


Fig. 1.

Witnesses.
F. C. Thomas
H. E. Chase

Inventor.
J. W. Watkins
By.
Edward P. Thurston
Attorney

J. W. WATKINS.

ENGINE.

APPLICATION FILED NOV. 23, 1906.

900,806.

Patented Oct. 13, 1908.

2 SHEETS—SHEET 2.

Fig. 3.

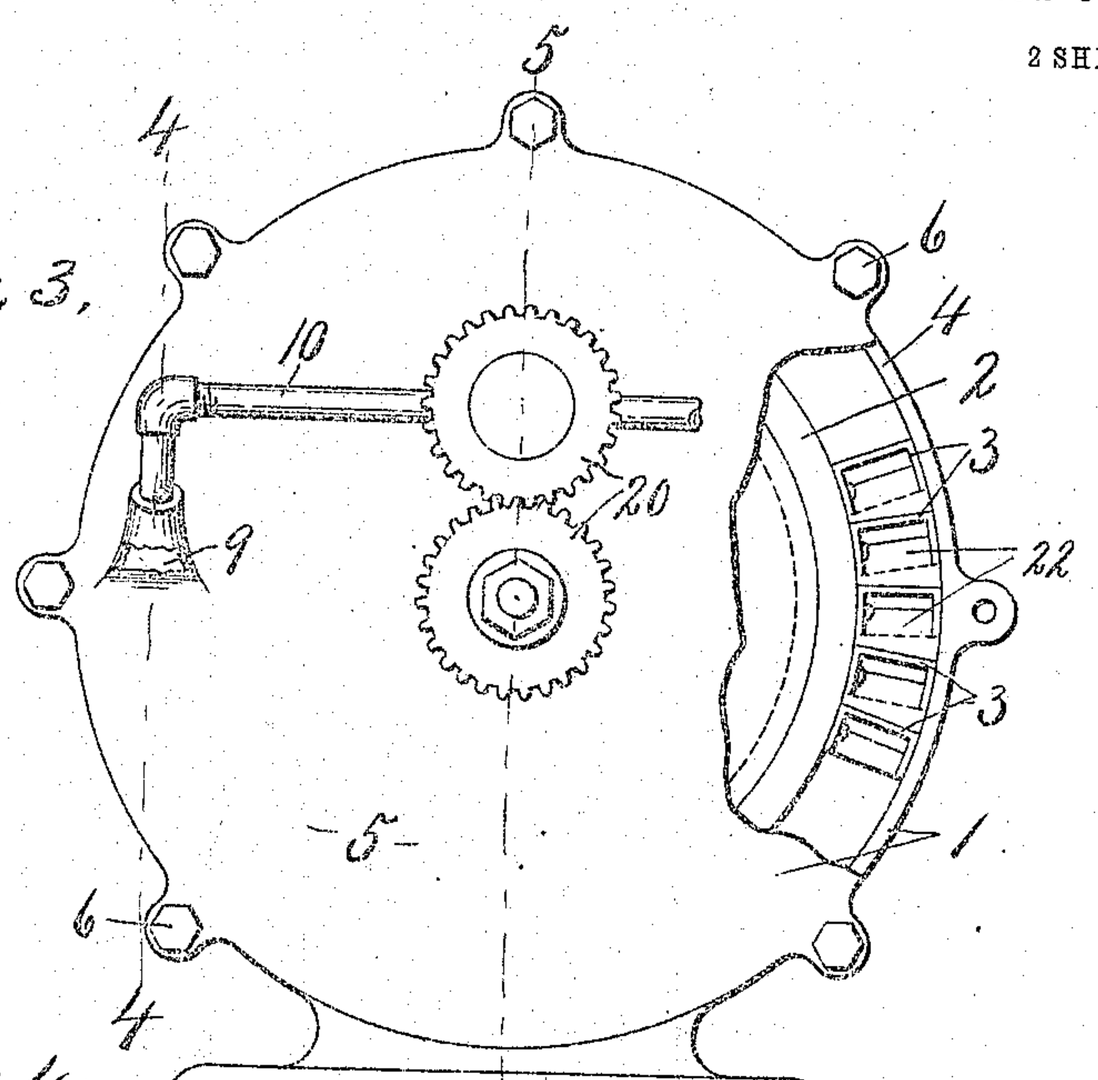


Fig. 4.

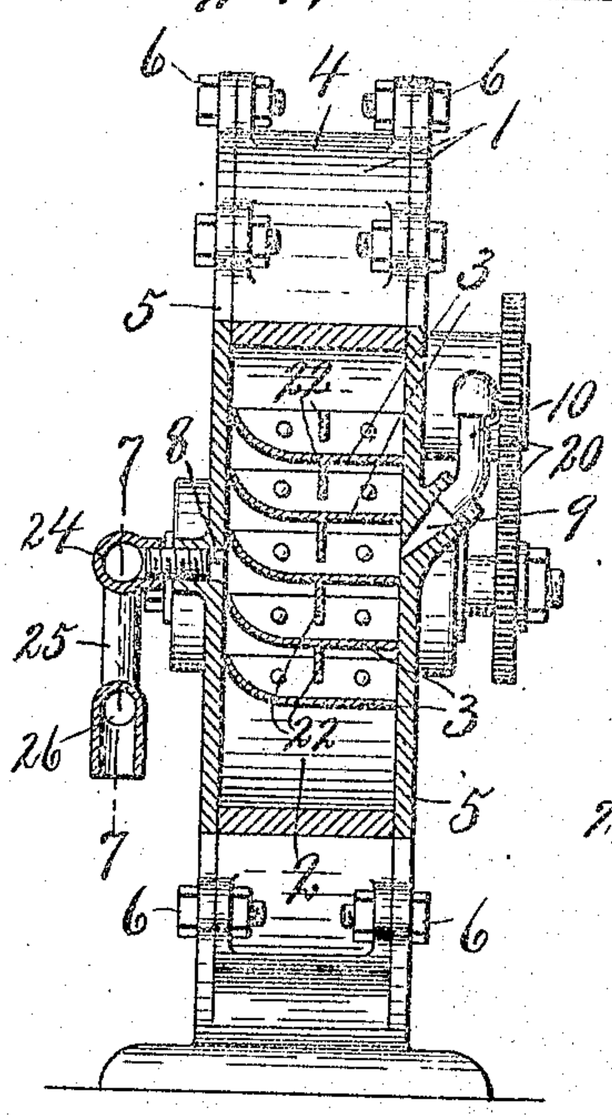


Fig. 6.

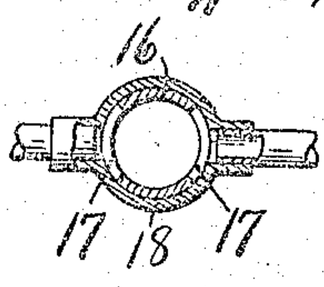


Fig. 7

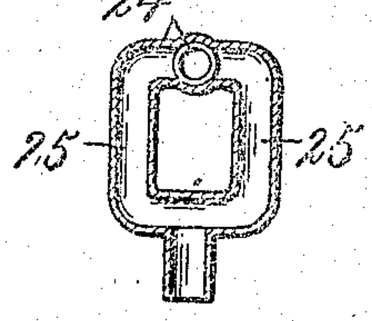
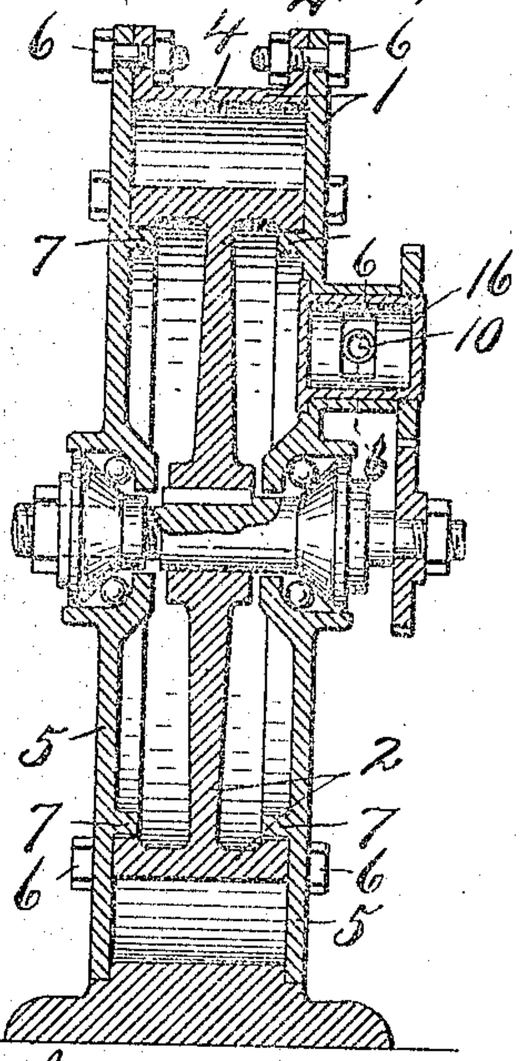


Fig. 5.



Witnesses.

H. C. Thomas

V. E. Ohare

Inventor.

J. W. Watkins

By.

Howard P. Denison

Attorney.

UNITED STATES PATENT OFFICE.

JOSEPH W. WATKINS, OF SYRACUSE, NEW YORK.

ENGINE.

No. 900,806. Specification of Letters Patent. Patented Oct. 13, 1908.

Application filed November 23, 1906. Serial No. 344,725.

To all whom it may concern:

Be it known that I, JOSEPH W. WATKINS, of Syracuse, in the county of Onondaga, in the State of New York, have invented new and useful Improvements in Liquid Hydro-carbon-Engines, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to certain improvements in liquid hydro-carbon engines of the reciprocatory piston type having a balance wheel provided with suitable buckets and adapted to be operated by the exhaust from the explosion chamber of the engine as an auxiliary motor for the purpose of utilizing practically the entire expansive force of the exploded gases before final liberation to atmosphere.

The specific invention lies more particularly in the construction and arrangement of the blades or buckets against which the impelling fluid is projected, and also in the relative arrangement of the inlet and exhaust so as to relieve, as far as practicable back pressure or retarding action of the fluid in its transit from the inlet to the exhaust of the auxiliary motor.

My objects, therefore, are first, to provide any steam or vapor engine with an auxiliary motor actuated solely by the exhaust of said vapor engine; second, to construct the buckets or blades in such manner as to deflect the impelling fluid transversely across the face of the runner to which the buckets are attached, and to enter the impelling fluid at one side of the casing substantially tangential to the periphery of the runner upon which the buckets are secured and to locate the exhaust in the opposite side of the casing directly opposite the inlet, so that as soon as the impelling fluid strikes the bottoms of the buckets or blades successively, it is immediately deflected transversely through the exhaust without being allowed to travel any appreciable distance circumferentially of the runner.

Other objects and uses will appear in the following description.

Figures 1 and 2 are respectively an end view and side elevation of my improved auxiliary motor as connected to the exhaust of a gas engine. Fig. 3 is an opposite face view, somewhat enlarged, of the auxiliary motor seen in Fig. 1, except that I have shown an automatic cut-off valve in the supply-pipe. Figs. 4 and 5 are sectional views taken respectively on lines 4—4, and 5—5, Fig. 3. Figs. 6 and 7 are detail sectional views taken respectively on lines 6—6, Fig. 5, and 7—7, Fig. 4.

In order to clearly demonstrate the practicability and utility of my improved motor, I have shown it in Figs. 1 and 2, as operated by the exhaust from a gas engine, while in Figs. 3 to 5 inclusive, I have shown the same motor as adapted for individual operation independently of any other motor and capable of being operated by water, steam or any other expansive fluid. This motor comprises essentially an outer case —1—, a runner or rotary element —2— carrying upon its periphery a series of buckets —3— of special construction hereinafter described.

The casing preferably consists of a circular hollow central section or ring —4— and opposite end heads —5— which are secured to the opposite ends of the rings —4— by suitable clamping bolts —6—.

The interior dimensions of the casing are just sufficiently large to receive the runner —2— and its buckets or blades —3—, the opposite ends of said casing being formed with annular flanges —7—, preferably within the periphery of the runner —2— which has an easy running fit within the casing, and around the flange —7—.

One of the end heads —5— is provided with an inlet —9— which is connected by a pipe —10— to the exhaust, as —11—, of a gas engine —12— having an inlet —13—. The inlet —9— is disposed at an angle with the axis of the casing and runner —2— some distance therefrom so as to discharge nearly tangential to, but across the face of said runner and against the blades or buckets —3— to impart rotary motion to the runner. The opposite end head —5— is provided with an exhaust port —8— directly opposite the inlet —9—, and therefore, in line with the opposite sides of the buckets —3— which are disposed in a substantially horizontal plane or parallel with the axis, while the inlet is disposed in an oblique position or at an angle with the axis, and nearly tangential to the plane of rotation of the buckets so that the impelling fluid is driven obliquely against the blades or buckets as they are successively presented to the inlet, such impelling fluid being deflected by said buckets

transversely across the face of the runner and directly through the exhaust port.

The inner end of the inlet —9— is constricted vertically, but broadened radially, thereby producing a fan-shape opening for discharging a sheet of the exploded gases of substantially the same radial width of the blades against the latter for the purpose of increasing the force of the impact and causing the broad jet to be confined more closely within comparatively narrow circumferential limits at its initial entrance into the runner chamber.

I preferably provide the runner with two diametrically opposite sets or series of buckets, as —3—, as best shown in Figs. 3 and 4, the buckets of each series in this instance, five in number, being arranged close together parallel with the axis of the shaft and across the face of the runner, substantially filling the space between the inner faces of the sides —5— so as to cut the inlet and exhaust ports in quick succession.

When used in connection with a two-cycle vapor engine, as shown in Figs. 1 and 2, one set of blades is merely used to counter balance the other set and are so arranged that the first bucket of the series is registered with the inlet port —9— at about the same time that the exhaust port —11— of the gas engine is open, a sufficient number of buckets being provided and so arranged that they will all pass the inlet while the exhaust port of the vapor engine is open, the piston of the vapor engines serving to cut off the exhaust, and therefore, cuts off the supply of the impelling fluid to the motor as soon as the last bucket of the series has passed the inlet —9—. In this case, where the gas engine and motor are combined, as shown in Figs. 1 and 2, the piston acts as a cut off valve, but it is preferably provided with a rotary valve —16— having diametrically opposite ports —17—, said valve being located in a suitable valve case —18— forming a part of the supply pipe —10—, best seen in Figs. 5 and 6. In this instance, both sets of buckets are in action, and the movement of the valve —16— is synchronized with the movement of the runner by connecting the runner shaft to the rotary valve through the medium of suitable gears —20— of substantially the same pitch. This valve —16— is actuated so as to open the ports —17— at the same time that the buckets of each set or series are presented to the inlet —9— and are closed as soon as the last bucket of each series passes said inlet, the runner —2— serving as a balance wheel to carry the buckets through part of the revolution of the runner when the supply of the impelling fluid is cut off.

As best seen in Figs. 3 and 4, the ends of the bucket nearest the inlet —9— are open, while the opposite ends of said buckets nearest the exhaust are deflected in a direction opposite to that of their rotation, or at an angle with the axis of the shaft so as to more easily deflect the steam from said buckets to the exhaust, without materially retarding the action of the runner. In other words, by deflecting the ends of the buckets near the exhaust rearwardly I avoid in a measure, the reaction or recoil of the exhaust gases at the exhaust port, the front faces of the deflected ends of the buckets serving to expel the exhaust gases, while the recoil, or reaction of the exhaust gases from said front faces of the deflected ends of the buckets reacts against the rear face of the preceding bucket, thereby giving the runner additional impetus.

In order to prevent excessive expansion of the exhaust gases between the buckets, I provide each with a substantially central transverse partition —22—, as best seen in Fig. 4, dividing each bucket into two compartments with constricted passage beneath each partition connecting said compartments, to allow said gases to escape from those nearest the inlet to those nearest the outlet, and thence into the exhaust 8.

It is desirable to muffle the sudden discharge of the runner impelling fluid from the exhaust, and for this purpose I provide said exhaust with an outlet conduit —24— divided into two branches —25— leading in opposite directions from the main exhaust pipe —24— and terminating in a single conduit —26— where the force of the impact of the exhaust gases passing through both branches is neutralized by contact with each other so that the exhaust gases finally discharge at nearly atmospheric pressure.

The operation of my invention will now be readily understood upon reference to the foregoing description and the accompanying drawing, and it will be observed that the specific features of invention consist first, in connecting the inlet of the motor directly to the exhaust of a piston engine; second, mounting the runner of the motor upon the same shaft with the piston engine, and timing its movement so that the buckets are presented to the inlet while the exhaust port of the piston engine is open; third, constructing each bucket so that its end nearest the inlet is open, while its end nearest the exhaust is deflected rearwardly; fourth, providing the buckets with transverse partitions terminating a short distance from the bottom of the bucket so as to leave a comparatively narrow or constricted passage between the buckets from the inlet to the exhaust ports, and fifth, locating the inlet and exhaust ports directly opposite each other in the opposite heads or ends of the casing, and sixth, diverting the discharge of the exhaust through opposed branches which merge into a single conduit so that the im-

pact of the impelling fluid passing through said branches against each other, will neutralize the force of the discharge.

What I claim:

1. In a rotary engine, a rotary impeller and casing therefor, said impeller having a series of buckets open at one end and provided with transverse partitions terminating a short distance from the bottoms of the buckets leaving an intervening narrow passage, said casing having an inlet in one side and an exhaust port in its opposite side directly opposite the inlet, both the inlet and exhaust ports being disposed in the same circumferential plane as the buckets, the inlet port being disposed at an angle with the axis of the runner at the open end of the buckets.

2. A rotary engine comprising a casing, and a rotary impeller therein having a series of buckets arranged in close proximity, radial partitions extending through but terminating a short distance from the bottom of the buckets leaving an intervening passage, said casing having an inlet in one side and an exhaust port in its opposite side directly opposite the inlet, the inlet and exhaust ports being disposed in the same circumferential plane as the buckets.

3. A rotary engine comprising a casing having an oblique inlet in one side and an exhaust port in the opposite side directly opposite the inlet, opposite branch conduits connected to the exhaust port and reunited some distance from said port whereby the impact of the opposing forces of the exhaust through the branches neutralize each other to muffle the noise of the exhaust, and a rotary impeller in said casing.

4. A rotary engine comprising a casing having an oblique inlet in one side and an exhaust port in its opposite side directly opposite the inlet, an exhaust conduit connected to the exhaust port and provided with diverging branches reunited some distance from the exhaust port, a rotary element in said casing, buckets on said element revolving between the inlet and exhaust port and having their ends nearest the inlet open.

5. In a rotary engine, a rotary element having diametrically opposite sets of buckets upon its periphery, those of one set being spaced some distance apart from those of the other set, an inclosing case for said rotary element having an inlet port in one side and an exhaust port in the opposite side, said ports being located at opposite ends and in the plane of travel of said buckets.

6. In a rotary engine, a rotary element having diametrically opposite sets of buckets upon its periphery, those of one set being spaced some distance apart from those of the other set, an inclosing case for said rotary element, having an inlet port in one side and an exhaust port in the opposite side, said ports being located at opposite ends and in the plane of travel of said buckets, each bucket having its end nearest the inlet open and its opposite end deflected in a direction opposite its rotation.

7. In a rotary engine, a rotary element having diametrically opposite sets of buckets upon its periphery, those of one set being spaced some distance apart from those of the other set, an inclosing case for said rotary element having an inlet port in one side and an exhaust port in the opposite side, said ports being located at opposite ends and in the plane of travel of said buckets, and transverse partitions extending from the bottom of the bucket into the adjacent buckets.

8. A rotary engine comprising a wheel having buckets on its periphery, an inclosing case having an inlet port in one side and having an outlet port on its opposite side, said ports being located at opposite ends and in the plane of rotation of the buckets, a valve casing having an inlet port and an outlet port, the latter being connected to the inlet port of the first named casing, a valve in the valve casing for opening and closing the ports therein, and means for transmitting motion from the bucket wheel to the valve.

9. In a rotary engine a bucket wheel having diametrical opposite sets of buckets upon its periphery, those of one set being spaced apart from those of the other set, an inclosing case for said bucket wheel having an inlet port in one side and an exhaust port in its opposite side, said ports being located at opposite ends and in the plane of rotation of said buckets, each bucket having its end nearest the inlet open, and its opposite end deflected in a direction opposite to that of its rotation and a valve actuated by the engine for controlling the passage of the impelling fluid to the inlet port.

10. In a rotary engine a bucket wheel, having a series of buckets mounted upon its periphery, an inclosing case for the bucket wheel having an inlet port in one side and an exhaust port in its opposite side, said ports being located in the plane of rotation of the buckets, the ends of said buckets nearest the inlet being open and an exhaust conduit connected to the exhaust port and having branch passages reunited some distance from said port.

In witness whereof I have hereunto set my hand this 20th day of November 1906.

JOSEPH W. WATKINS.

Witnesses:

H. E. Chase,

Mildred M. Nott.