J. H. ZIMMER.

ROTARY ENGINE.

APPLICATION FILED JULY 19, 1909.

968,630. Patented Aug. 30, 1910.

2 SHEETS—SHEET 1.

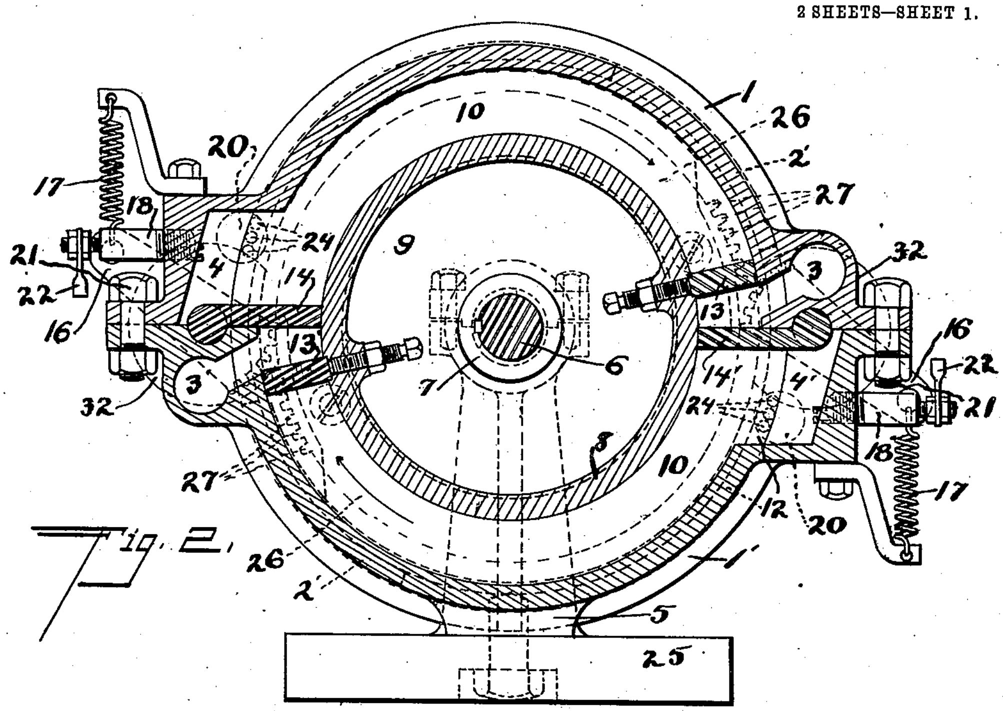

Fig. 2.

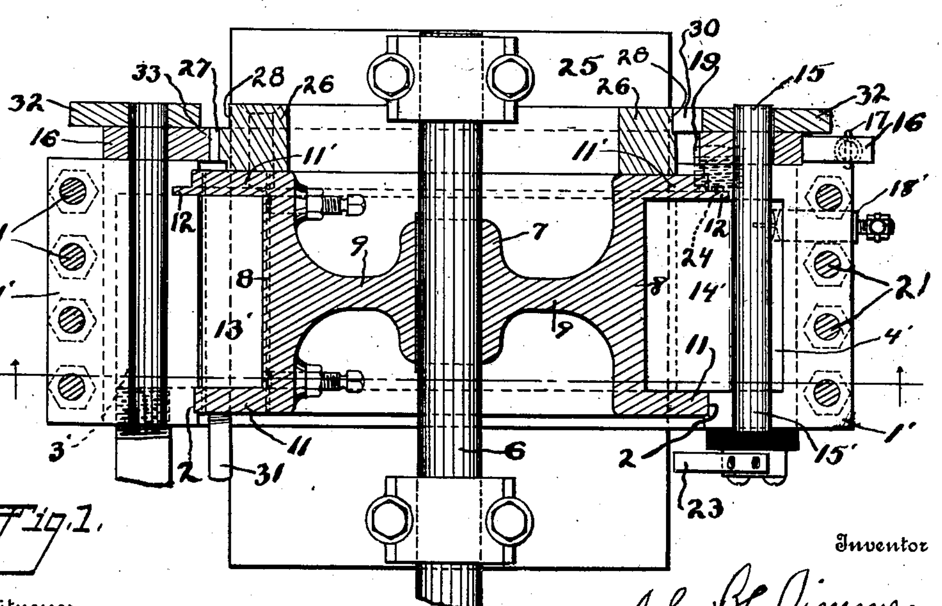

Fig. 1.

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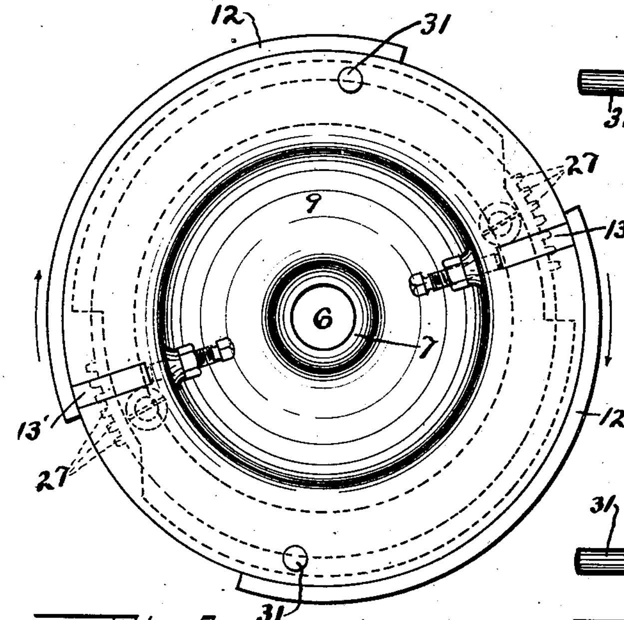

Fig. 3.

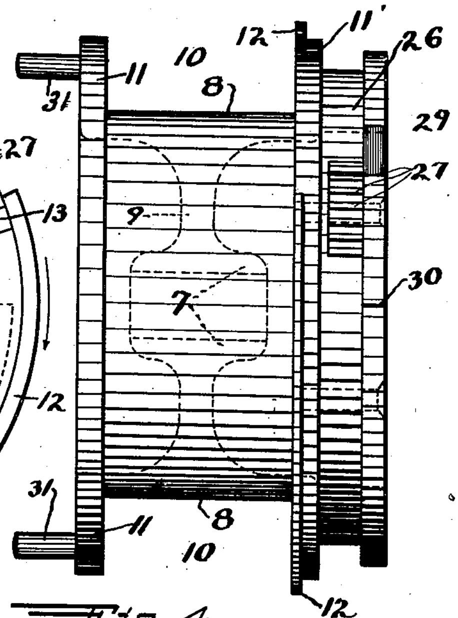

Fig. 4.

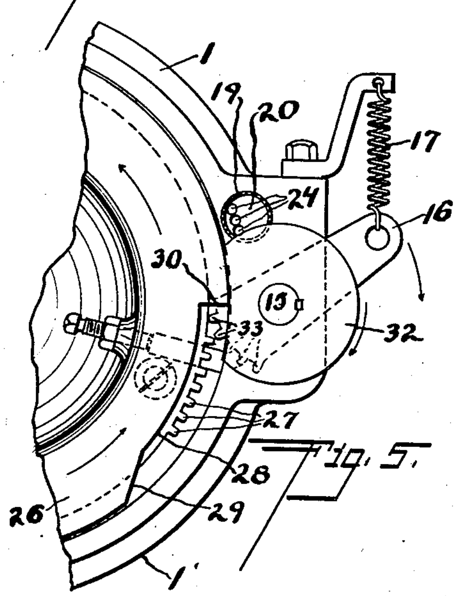

Fig. 5.

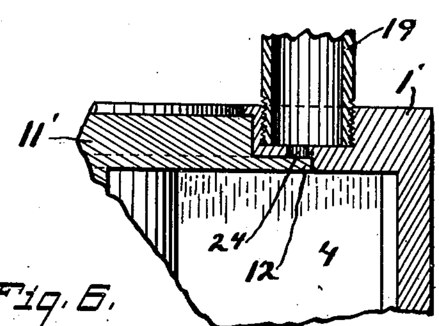

Fig. 6.

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JOHN H. ZIMMER, OF OMAHA, NEBRASKA.

ROTARY ENGINE.

968,630. Specification of Letters Patent. Patented Aug. 30, 1910.

Application filed July 19, 1909. Serial No. 508,428.

To all whom it may concern:

Be it known that I, JOHN H. ZIMMER, of the city of Omaha, county of Douglas, and State of Nebraska, have invented certain new and useful Improvements in Rotary Engines, which improvements are described in the following specification and are illustrated by the accompanying drawings.

My engine is primarily designed to be operated by the method of internal combustion, and to be used for the purpose of driving motor vehicles; but can be operated by steam or other externally compressed medium, and also can be used as motive power for other purposes generally.

The main object of my invention, is to simplify the construction of the engine, and to increase its industrial practicability. To accomplish this object, I use in the construction of the engine, an external shell, or casing, which is cylindrical and stationary, an internal piston carrier, or rotary drum, which is concentric with such shell, a number of pistons, revolving orbitally in an annular space, which is inclosed by and between such stationary shell and rotary drum, and a corresponding number of pivoted valves, working into and out of such inclosed annular space.

The best manner in which I have contemplated applying the principles of my invention, is illustrated by the said drawings which accompany this specification.

Figure 1 of the drawings is a horizontal axial section of an internal combustion engine which is constructed in accordance with these principles. Fig. 2 is a vertical section on the section line of Fig. 1. Fig. 3 is an end elevation of the drum, or rotary member, of the engine. Fig. 4 is a side elevation of the same drum. Fig. 5. is a partial end elevation of the engine. Fig. 6 is a detail.

In Figs. 1, 2 and 5 the numerals 1 and 1′ denote respectively the duplicate semicylindrical half shells, which being united by bolts 21, constitute the external case or hollow cylindrical frame of the engine. This case has two inside, parallel, annular grooves, 2 and 2′, near its opposite ends; two exhaust passages, 3 and 3′, leading through the wall of the case in diametrically opposite positions; two duplicate, radially opposite valve chambers, 4 and 4′, formed in the thickened wall of the case and opening inwardly toward its axis; and a foot 5, which is attached to a base 25.

The internal drum, or rotary member of the engine, consists of a hub 7, a rim 8, and a web or other integrally formed connection 9 between such hub and rim. Hub 7 is keyed to power-shaft 6, which is journaled in suitable standards rising from base 25. In the periphery of rim 8 is formed an annular piston channel 10, between lateral walls, or flanges, 11 and 11′. These flanges extend radially outward into grooves 2 and 2′, of the external case, and are adapted respectively to rotate by sliding therein. The peripheral edge portion 12 of flange 11′, being discontinuous and incompletely annular, as shown in Figs. 3 and 4, does not at any time occupy groove 2′ throughout the entire circuit of that groove; but leaves diametrically apposite vacant spaces in the deeper portion of that groove between the separated parts of edge 12. At one end of this drum a flat ring 26 is fastened by screws to wall 11′. That part of this ring which is next to the drum, and is of least diameter, carries, on diametrically opposite parts of its periphery respectively, two curved racks, or series of gear teeth, 27, which are shown in Figs. 4 and 5; while that part of the same ring which is farthest from the body of the drum is peripherally cut away so as to form, in diametrically opposite positions, two long and shallow notches 28, having each an inclined side 29, and a radially directed side 30, as shown in Fig. 5.

Two orbitally revolving pistons, 13 and 13′, duplicates of each other, are adjustably fastened to rim 8 of the drum, and occupy diametrically opposite portions of the inclosed annular piston channel 10. For the purpose of intermittently dividing that channel into separate chambers, as the due operation of the engine may require, I provide duplicate hinged or disappearing valves, 14 and 14′, mounted on pivots 15, which are journaled through the walls of valve chambers 4 and 4′. Each of these valves is adapted to swing in one direction to a position within its own valve chamber and without channel 10, and in the opposite direction to a position across and partly within that channel, which is then closed thereby, as shown in Fig. 1. When in the position last described, each of these valves, being partly within the valve chamber and partly within the piston-channel 10, abuts against the engine case at the edge of that chamber, as shown in Fig. 2, and so has a solid back seat along the middle of the valve, from end to end of the same, and from wall to wall of that channel. In that position, the free edge of the valve, in its sliding contact with the floor of channel 10, creates no binding friction. To one end of each pivot 15 are keyed a rock-arm or lever 16 and a stop disk 32. This arm is provided with a spring 17, which operates through pivot 15 to swing the pivoted valve into channel 10, and retain the same in the position shown in Fig. 1. The same arm is also provided with terminal gear-teeth 33, which are adapted to engage the groups of gear-teeth 27 on ring 26. The stop disk 32, being cut away on one edge, as shown in Fig. 3, and making successive sliding engagements with the outer unnotched portion of the edge of ring 26, stops for the time being all rotation of piston-pivot 15, and thus holds the valves immovable in the position shown, during each of those engagements. Spark plugs 18 and 18′ for the ignition of the charge are inserted in the walls of valve chambers 4 and 4′ respectively, as shown in Figs. 1 and 2. Contact pins 31, from the drum of the engine, and an insulated electric brush 23, which is mounted on the casing of the engine, as shown in Fig. 1, are electrically connected with these plugs and with the source of current in the usual manner. A carbureter 19, which is partly shown in horizontal section in Fig. 6, is seated in each of two holes 20, in the casing of the engine, and opens through apertures 24 into the deeper portion of groove 2′.

A single engine of this kind requires a flywheel, which is not shown in the drawings, but several such engines may be combined to drive a single power-shaft with multicylinder effect, and in that case no flywheel is necessary. In the same case, some one of the single engines will be charged at all times; the battery of such engines, therefore, will begin to work whenever the proper electrical contacts are made, and without the aid of any external starting impulse.

As respects operation, Fig. 2 shows parts of the engine in the relative positions which they occupy just before piston 13 passes the opening into exhaust 3. At this juncture valve 14′ stands closed across channel 10, while ports 24, from the carbureter 19, are closed by flange 12, as shown in Figs. 1 and 6. At the same time, the gear-teeth 33 of lever arm 16 are disengaged from the gear-teeth 27 on ring 26; and the stop disk 32, by its sliding engagement with ring 26, holds the valve-pivot 15 immovable, as shown in Fig. 5. In this position of affairs, piston 13, advancing from the position shown, in the direction indicated by the arrow, compresses as a cushion, between that piston and valve 14, all such gas, fumes, or products of preceding explosion, as are present between those members, or have not escaped by exhaust 3. At the same time, stop disk 32, registering with notch 28, releases valve pivot 15. The pressure of this cushion now initiates the opening of this valve, swinging on its pivot 15. By the mutual engagement of said gear-teeth 27 and 33, which causes a further rotation of this pivot, the opening movement of said valve is uninterruptedly continued, until the latter is swung wide open, wholly out of channel 10, and into the mouth of chamber 4′. In this way the valve is opened without any hammering or metallic bumping. But if said gear-teeth and the stop disk 32 were omitted from the structure, or inoperative, the opening of this valve, initiated as described, would be completed by a push from the advancing piston. The piston, still advancing, then passes the valve without obstruction, and the latter, actuated by spring 17, immediately resumes its former position, shown in the drawings, and thus closes channel 10 behind the piston. Simultaneously with the described advancing movement of the piston, a corresponding rotation of the connected annular flange 12 takes place in channel 2, so that when valve 14′ is closed behind the piston, as described, a cut-away portion of that flange registers with ports 24, and the latter stand open. As the forward movement of the piston continues, the resulting suction, between that piston and valve 14′, draws the explosive mixture continuously through ports 24, into chamber 4′ and into that increasing portion of channel 10 which lies between the valve and piston, until those ports are closed by the further rotation of flange 12, acting as a slide valve. The combustion chamber which is thus closed includes the whole of valve chamber 4′ together with the described portion of channel 10. Thereupon pin 31 makes electrical contact with brush 23, and the resulting explosion drives the piston on to pass the opposite valve 14 in like manner and with similar effect. When this explosion occurs, the valve 14′, in the role of a cylinder head, by abutting, as above described, against the casing 1, at the edge of valve chamber 4′, is supported, against the resulting pressure, centrally along the middle line, and from end to end, of said valve, and being so supported cannot produce any binding friction between itself and said rotary drum.

During the described operation of valve and piston 14′ and 13, the duplicate valve and piston 14 and 13′, shown in the other side of the engine, are operating, in the same manner, in unison therewith.

I claim—

1. In a rotary engine, a hollow internally cylindrical outside casing, which is provided with two parallel annular grooves in its inner face, and with two opposite exhaust outlets; two diametrically opposite valve chambers, formed in the wall of said casing, and opening inwardly toward its axis, and provided with supply ports from one of said annular grooves; a power shaft, an internal rotary drum, mounted on said power shaft, and having two parallel annular flanges, extending radially from the rim of said drum, and running in said annular grooves respectively, one of said flanges having an interruptedly annular peripheral extension, which is adapted to operate by rotation as a slide valve for said ports; and two pistons which are attached to the rim of said drum, and are adapted to revolve orbitally in the annular space which is inclosed by and between said drum and casing; in combination with two swinging valves, pivoted in said valve chambers, and working into and out of said annular space.

2. In a rotary engine, a hollow internally cylindrical outside casing, which is provided with two parallel annular grooves in its inner face, and with two opposite exhaust outlets; two diametrically opposite valve chambers, formed in the wall of said casing, and opening inwardly toward its axis, and provided with supply ports from one of said annular grooves; an internal rotary drum, mounted on the power-shaft, and having two parallel annular flanges, extending radially from the rim of said drum, and running in said annular grooves respectively, one of said flanges having an interruptedly annular peripheral extension, which is adapted to operate by rotation as a slide valve for said ports; two pistons which are attached to the rim of said drum, and are adapted to revolve orbitally in the annular space which is inclosed by and between said drum and casing; and two swinging valves, pivoted in said valve chambers, and working into and out of said annular space, in combination with mechanism for actuating said pivoted valves.

3. In a rotary engine, an external casing, valve chambers formed therein, and a piston-carrying drum, revolving in said casing, in combination with swinging valves, pivoted in said chambers, and provided each with a valve gear, consisting of a spring-actuated rock-arm on the valve pivot, gear-teeth on said rock-arm, and gear-teeth carried by said drum, which are adapted to engage said gear-teeth on said arm intermittently.

4. In a rotary engine, a stationary, hollow, cylindrical casing, which is provided with exhaust outlets and with two interior annular grooves; two valve chambers, which are formed in the wall of said casing, and are provided with supply ports, from one of said annular grooves; a power shaft; a rotary drum, which is mounted on said power shaft, is provided with two parallel annular flanges, extending radially from the rim of said drum, and running in said annular grooves respectively, and forms with said casing an intermediate annular channel having inlet ports, one of said flanges having an interruptedly annular peripheral extension, which is adapted to operate by rotation as a slide valve to said inlet ports; and two pistons, which are attached to the rim of said drum, and are adapted to revolve orbitally in said annular channel; in combination with two close-fitting valves, which are adapted to swing from said valve chambers into said channel in advance of said exhaust outlets respectively, and in advance of such revolving pistons, so that closed chambers, and gaseous cushions therein, are formed in said channel by and between said revolving pistons and said swinging valves when closed.

5. In a rotary engine, a hollow internally cylindrical outside casing, which is provided with two parallel annular grooves in its inner face, and with two opposite exhaust outlets; two diametrically opposite valve chambers, formed in the wall of said casing, and opening inwardly toward its axis, and provided with supply ports from one of said annular grooves; an internal rotary drum, mounted on the power-shaft, and having two parallel annular flanges, extending radially from the rim of said drum, and running in said annular grooves respectively, one of said flanges having an interruptedly annular peripheral extension, which is adapted to operate by rotation as a slide valve for said ports; two pistons which are attached to the rim of said drum, and are adapted to revolve orbitally in the annular space which is inclosed by and between said drum and casing; and two swinging valves, which are pivoted in said valve chambers, and are adapted to work into and out of said annular space, in combination with a rock-arm on each valve pivot, a spring, actuating said rock-arm, gear-teeth on said rock-arm, and gear-teeth which are carried by said drum, and are adapted to engage said gear-teeth on said rock-arm intermittently.

6. In a rotary engine, which has a piv-

oted valve, a valve gear, consisting of the following elements, viz:—a spring-actuated rock-arm, which is provided with terminal gear-teeth, and is keyed to the valve pivot, in combination with a stop disk, which is also keyed to said pivot, and a rotary ring, which is provided with groups of gear-teeth and with peripheral notches, and is adapted to engage said terminal gear-teeth and said stop disk alternately.

In testimony whereof, I hereunto set my name in the presence of two witnesses.

JOHN H. ZIMMER.

Witnesses:

WILLARD EDDY,

S. ARION LEWIS.