

Aug. 21, 1934.

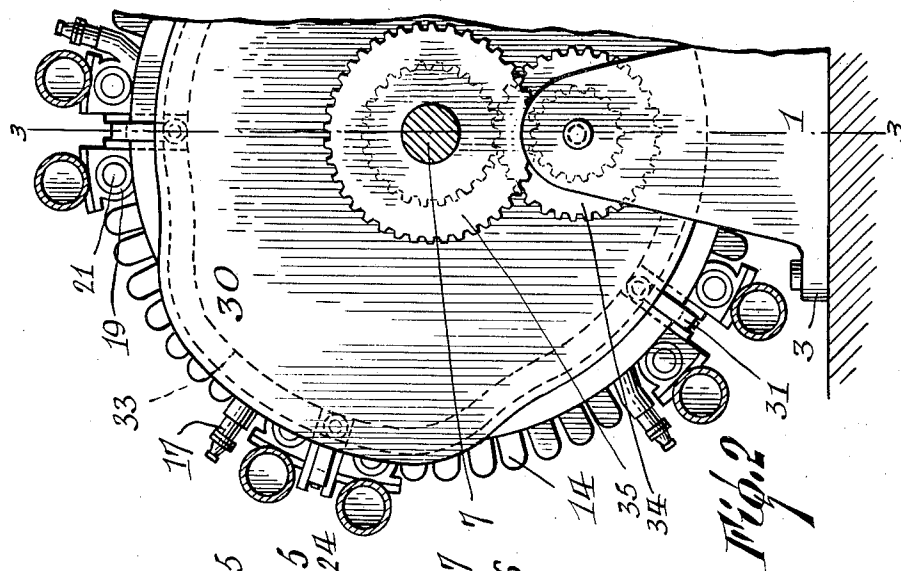
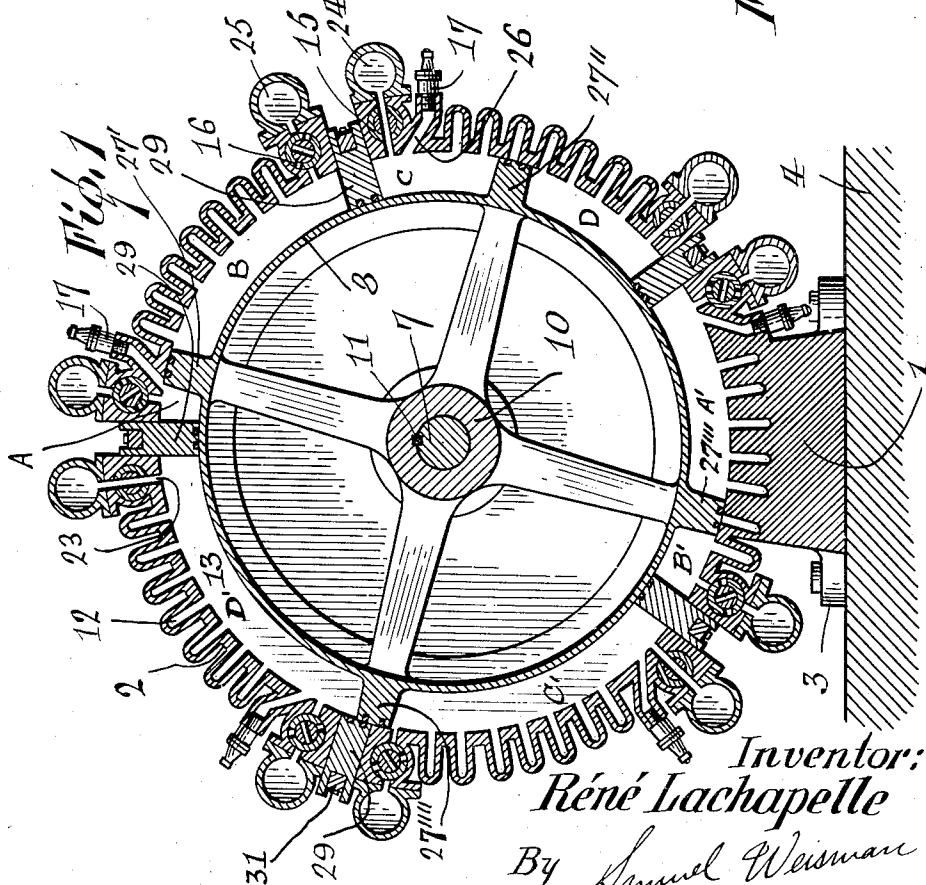
R. LACHAPELLE

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ROTARY INTERNAL COMBUSTION ENGINE

Filed Sept. 26, 1929

2 Sheets-Sheet 1



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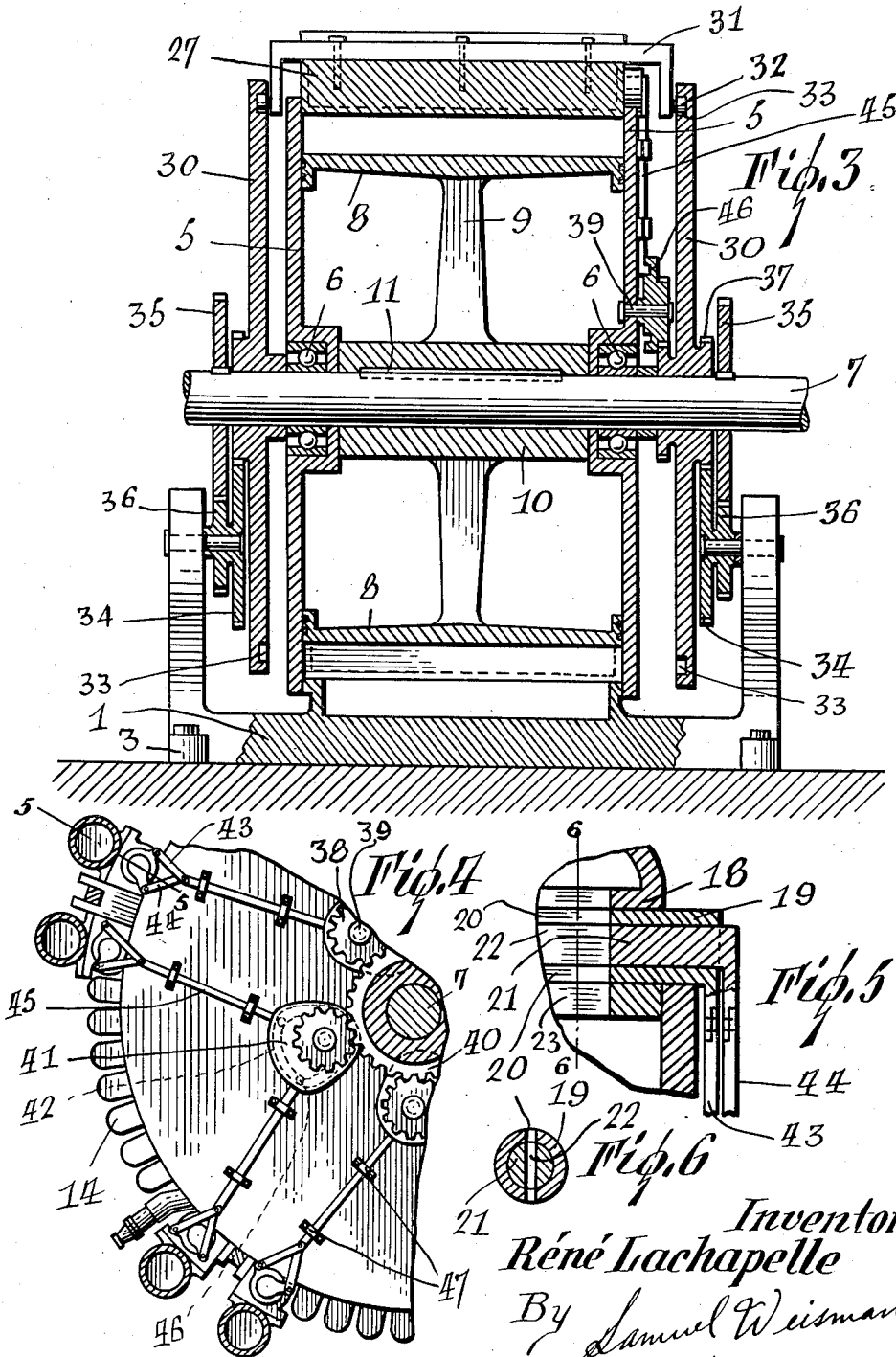
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UNITED STATES PATENT OFFICE

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ROTARY INTERNAL COMBUSTION ENGINE

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Application September 26, 1929, Serial No. 395,318

1 Claim. (Cl. 123—14)

The present invention pertains to a novel engine of the rotary type, and the principal object is to provide a device of this character in which the force applied to the rotor shall be substantially continuous rather than in the nature of successive impacts as in present machines of this character. In other words the frequency of the impacts in the present invention is greatly multiplied or subdivided, and a series of secondary impacts is set up without the use of separate firing means for each such secondary impact.

The invention includes a cylindrical stator in which the rotor is suitably mounted. An annular space is formed between the stator and rotor, and suitable devices are carried by the stator for dividing this space into compartments and device carried by said rotor for dividing said compartments into chambers. These chambers have intake and exhaust valves and firing means which operate successively in proper sequence after the first ignition. On operation of the firing means, the major impacts are successively produced. These correspond to the successive impacts in any type of internal combustion engine.

The above mentioned minor or secondary impacts follow the main impacts but without the use of separate firing devices. Between the spark plugs, the cylindrical wall of the stator is formed with successive small pockets communicating with the space between the stator and rotor. The above mentioned compartments are defined in part by pistons extending from the rotor and communicating with the wall of the stator. While opposite pistons effect compression and power strokes respectively, the intervening pistons effect suction and exhaust strokes respectively, in a four piston rotor. The rotor may however have any even number of pistons. When the compartment at one side of a given piston is expanded after firing, the compartment at the opposite side of the piston is under compression. When the pistons pass the pockets containing compressed fuel, the contents of these pockets is delivered to the expanding chamber, and the charges in these pockets are successively fired as they are emptied into the expanding chamber, due to the high temperature of the exploded gas in the latter. The secondary explosions thus produced impart a substantially continuous pressure on the rotor, resulting in smoother operation, less vibration and less wear on the machine.

The invention is fully disclosed by way of example in the following description and in the accompanying drawings, in which

Figure 1 is a vertical transverse section of the device;

Fig. 2 is a fragmentary end view thereof;

Fig. 3 is a vertical longitudinal section;

Fig. 4 is a fragmentary section in a plane parallel to that of Figure 1;

Fig. 5 is a detail longitudinal section of one of the valves, and

Fig. 6 is a transverse section of one of the valves.

Reference to these views will now be made by use of like characters which are employed to designate corresponding parts throughout.

As shown more clearly in Figs. 1 and 3, the device includes a base 1 having a cylindrical wall 2 formed integral therewith. The base also has lugs 3 which are suitably secured to a supporting member 4.

The cylindrical wall 2 is a part of the stator of the machine, which is completed by end plates 5 at the ends of the wall and forming a cylindrical enclosure. The end plates 5 carry the bearings 6 in which is journaled the shaft 7 of the machine. Between the end plates 5, the shaft carries a rotor formed by a drum 8 having internal radial arms 9 emanating from a hub 10 which in turn is secured to the shaft by a key 11. It will be obvious that the drum is positioned prior to the assembly of one of the end plates 5.

The wall 2 is formed with a series of pockets 12 which communicate with the space 13 between this wall and the drum 8. The pockets extend longitudinally of the wall 2 and are closed at their ends as indicated by the numeral 14 in Fig. 4. These pockets serve a purpose which will presently appear.

Formed on the wall 2 in peripherally spaced relation are sets of intake, exhaust and firing means. Each such set includes an intake valve 15, an exhaust valve 16, and a spark plug 17. Although five such sets are illustrated in Figure 1, it will be understood that any number of such sets may be employed.

The intake and exhaust valves are of like formation throughout, and a detailed description of only one such valve need therefore be given. Each valve includes a block 18 formed longitudinally of the wall 2, and having a sleeve 19 journaled therein as shown more clearly in Figures 5 and 6. The sleeve is formed with diametrically opposite ports 20 and in the sleeve is journaled a plug 21 having a diametrical port 22, the ends of which are adapted to register with the ports 20. The block likewise is slotted or ported at 23 to permit passage through the valve when in the open position illustrated in Figs. 1 and 6. Over

the intake and exhaust valves are mounted intake and exhaust pipes 24 and 25 respectively, and it will be apparent that these pipes may communicate with intake and exhaust manifolds respectively. From each spark plug 17 there extends a duct 26 communicating with the space 13.

The drum 8 is formed exteriorly with four radial pistons 27', 27'', 27''', 27'''' adapted to ride along the mouths of the pockets 12 as shown in Fig. 1. Moreover, at each set of intake and exhaust valves, the wall 2 is slotted between these valves and in the slot is slidably mounted a sliding abutment 29 adapted to move inwardly to engage the drum 8 and to move outwardly to permit passage of the pistons, by a mechanism which will presently be described.

For the timed actuation of the sliding abutments, large cams 30 are journaled on the shaft 7 outwardly of the plates 5 as illustrated in Figures 2 and 3. Each sliding abutment has secured thereto a yoke or carrier 31 equipped at its end with rollers 32 which ride in the grooves 33 of the respective cams. The grooves are formed to open and close the sliding abutments at the proper intervals with respect to the movement of the pistons. The speed of the cams is stepped up with relation to the speed of the shaft by means of a train of gearing 34 including a prime mover 35 keyed to the shaft and operating through intermediate gears 36 to drive a small gear 37 formed integral with the cam. As shown in Fig. 3, one set of such gearing is provided for each cam.

The valves are operated by the mechanism which is shown more clearly in Fig. 4. For each set of gears there is provided a pinion 38 journaled on one of the plates 5 by means of a stub shaft 39. All of these pinions mesh with the driving pinion 40 formed integral with the adjacent cam 30 as shown in Fig. 3. Each of the pinions 38 is formed with a cam 41 having a cam groove 42.

The ends of the sleeves 19 and valve plugs 21 are joined to links 43 and 44 respectively. Each such pair of links is joined to one end of a slide rod 45, the other end of which is received in one of the cam grooves 42 as indicated by the numeral 46 in Fig. 4. Each rod 45 is guided in a pair of straps 47 secured to the adjacent end plate 5. Obviously the cams 41 are constructed to operate the valves at the proper intervals with regard to the operation of the motor, and a suitable timing mechanism is provided for firing the spark plugs 17.

In the operation of the device, it will be seen that a small space A is formed at the uppermost intake valve in Fig. 1. This space is defined laterally by the corresponding piston 27' and sliding abutment 29 and is in communication with the corresponding spark plug 17. The cams 41 are constructed to close the corresponding intake valve at this instant, and the firing mechanism is timed to fire the corresponding spark plug 17 at the same instant. The piston 27' will be moved in a clockwise direction by the explosion, and the gas in the space B at the advance side of the piston, defined laterally by the piston and next sliding abutment 29, will be compressed. The exhaust valve communicating with this space has been open but is now obstructed by the first mentioned piston 27' so that the gas trapped in the space B will be compressed and prepared for ignition in the manner described.

The next space C between the next gate and blade 27'' is expanding and the corresponding

intake valve is open for the admission of gas thereto by suction through the valve 24. The following space D, however, is diminishing, and the exhaust valve in communication therewith is open for exhaust purposes. The remaining valves are timed to open or close with respect to the condition of the compartments communicating therewith, and it will also be understood that the spark plugs are fired when the motor is started.

In following the movement of the several blades it will be seen that the blade 27' on entering the chamber C, which has previously been filled with gas by the admission stroke of the blade 27'', commences a compression action towards the next following gate 29 in the chamber D. When the blade 27', lying in the chamber C, is slightly spaced from the gate 29 therein, an explosion occurs in this space, as formerly in the space A. The gas in advance of the blade 27'' in the chamber D is thus compressed and delivered by degrees from the pockets 12 to the chamber C where it is successively ignited in the manner described. The blade 27'' is now in the chamber A' where it is effecting exhaust between its advancing face and the next forward gate 29, while effecting admission at its rear face. By thus following the action of each blade, it will be seen that the blades 27' and 27'' are always directly in advance of a chamber undergoing ignition and are always effecting a compression against the next forward gate 29; while the blades 27'' and 27''' effect admission at the rear face and exhaust at the forward face.

Referring again to the position shown in Fig. 1, it will be seen that the chambers A', B', C', and D' are respectively in the same condition as the chambers A, B, C and D. In other words, ignition occurring in chamber A causes compression in chamber B', while the blade 27'''' induces admission into chamber C' and exhaust from chamber D'. It will also be seen that the gas undergoing ignition in chamber A was previously drawn into chambers A and B by the preceding passage of the blade 27'' therethrough, this blade effecting admission at its rear face as already stated.

Referring again to the explosion occurring in the space A, the function of the pockets 12 will now be described. As the uppermost blade 27' moves in clockwise direction it successively uncovers certain of the pockets. In this manner the gas compressed in compartment B and contained also in the communicating pockets is transferred by degrees to the expanding compartment A as the pockets are successively passed by the uppermost blade 27'. As these pockets come into communication with the compartment A, the gas therein is successively fired by coming into contact with the hot exploded gas in the expanding compartment A, setting up a number of minor explosions as a given blade 27', 27'', 27''' or 27'''' passes from one compartment to another. These successive explosions provide continuing impacts on the blade, so that the rotor is turned by an almost continuous force caused by explosions occurring with much greater frequency than sparks firing. In this manner the rotor is imparted a smooth and steady propulsion which reduces the amount of vibration and hence increases the life of the motor. Although a specific embodiment of the invention has been illustrated and described, it will be understood that various alterations in the details of construction may be made without

departing from the scope of the invention as indicated by the appended claim.

What I claim is:—

5 A rotary internal combustion engine comprising a cylindrical stator, a rotor journaled concentrically therein and of less diameter than said stator thus leaving a space, said stator having fixed pockets at close intervals in communication with said space, sliding abutments carried by said rotor for dividing at certain periods the said space into compartments said compartments being between an abutment and a piston, said pistons carried by said rotor to vary the volume of said compartments, said pistons being 10 by pairs, one of said pistons continuously dividing said compartments into explosion and compression chambers while the next said piston continuously divides the next said compartment into admission and exhaust chambers, firing means exposed to said explosion chambers, and means geared to said rotor for moving said sliding abutments towards and from said rotor, and intake and exhaust valves communicating with said intake and exhaust chambers, each such valve including a rotary sleeve and a plug journaled therein, links extending from said sleeves and plugs, a slide rod for each valve and connected to the links extending from the sleeve and plug of such valve, and cams adapted to reciprocate said rods and keyed to said rotor.

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60	135
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75	150