C. H. VOM BAUR.

ROTARY EXPLOSIVE ENGINE.

APPLICATION FILED JUNE 7, 1910.

991,933. Patented May 9, 1911.

Fig. 1

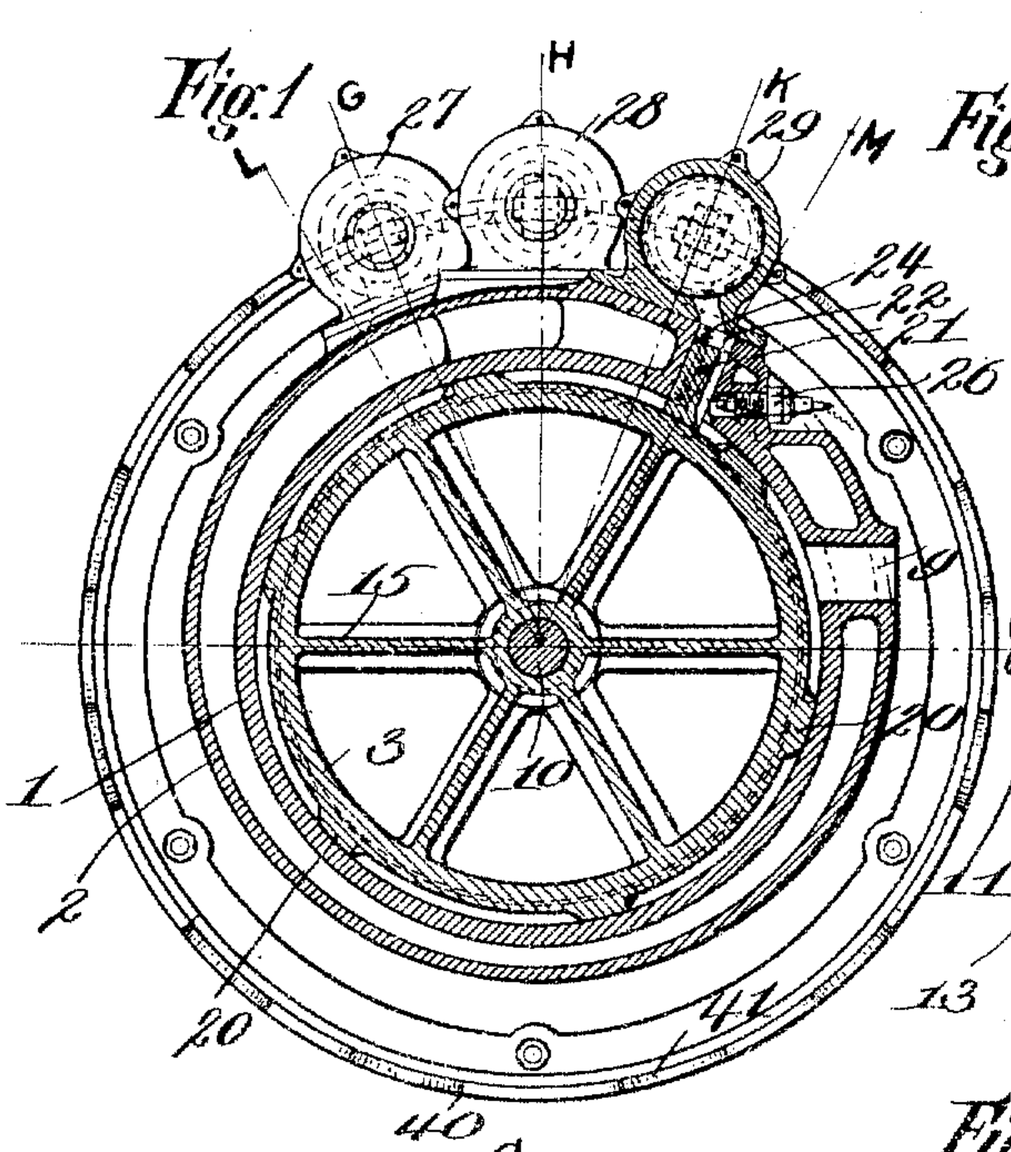


Fig. 2

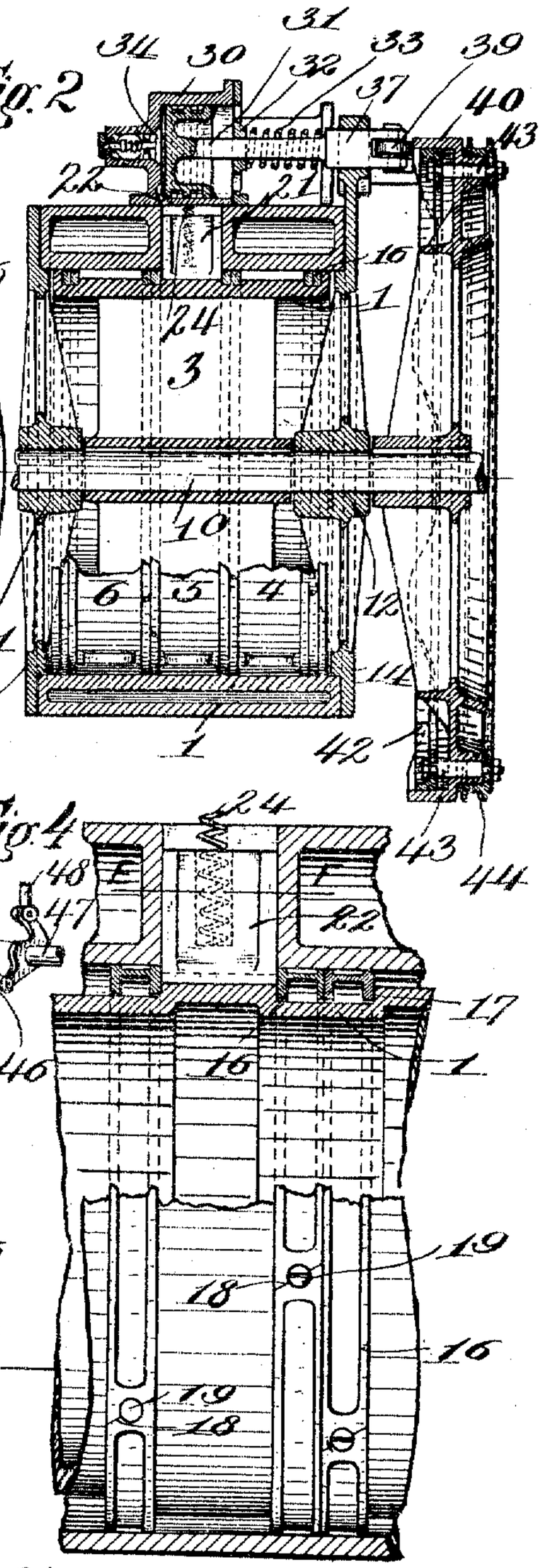
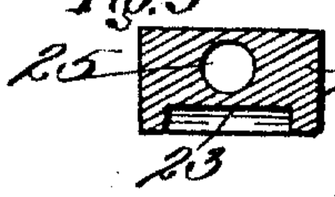


Fig. 3

Fig. 4

Fig. 5



WITNESSES

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ROTARY EXPLOSIVE-ENGINE.

991,933. Specification of Letters Patent. Patented May 9, 1911.

Application filed June 7, 1910. Serial No. 565,477.

To all whom it may concern:

Be it known that I, CARL HANS VOM BAUR, a citizen of the United States, residing at New York, in the county and State of New York, have invented certain new and useful Improvements in Rotary Explosive-Engines, of which the following is a specification.

My present invention relates to improvements in explosive engines of the rotary type, and it has for its object primarily to provide a relatively simple, improved and more efficient engine of this character wherein the rotary piston is divided axially into a plurality of gas expansion chambers and each gas expansion chamber is divided by a plurality of circumferentially spaced abutments on the piston, the charges of exploded gas being compressed exteriorly of the engine cylinder and are successively introduced into and exploded within the respective expansion chambers formed between the piston and cylinder, starting of the engine being thereby facilitated and, in operation, smooth and even running of the engine is insured.

Another object of the invention is to provide an engine of the class above described wherein a set of compressors for the explosive charges is placed in different angular relation upon the engine cylinder, one of these compressors being provided for each gas expansion chamber of the revoluble piston and they are operated in predetermined order from a cam turnable with the engine shaft.

A further object of the invention is to provide means for varying the volumes of explosive gas compressed and introduced into the combustion chamber whereby the speed and power of the engine may be controlled and regulated.

To these and other ends, the invention consists in certain improvements, and combinations and arrangements of parts, all as will be hereinafter more fully described, the novel features being pointed out particularly in the claims at the end of the specification.

In the accompanying drawing: Figure 1 represents a sectional view of a rotary explosive engine constructed in accordance with my present invention, the section being taken on the line A—B of Fig. 3; Fig. 2 represents a section on the line C—D of Fig. 3; Fig. 3 is a top plan view of the engine as shown in the preceding figures; Fig. 4 is an enlarged sectional view of portions of the piston and cylinder showing the rings for dividing the piston axially into a plurality of expansion chambers; and Fig. 5 represents a section of one of the gates, the section being taken on the line E—F of Fig. 4.

Similar parts are designated by the same reference characters in the several views.

The engine as shown in the present instance comprises a cylinder 1 which may be provided with a water-jacket 2, the cylinder having a concentric bore which forms a fluid-tight fit with a revoluble piston 3. In the present embodiment of the invention, the engine has a set of three piston sections 4, 5 and 6, and the cylinder is provided with a corresponding set of three exhaust ports 7, 8 and 9. The revoluble piston 3 is keyed or otherwise secured to a shaft 10, the shaft being journaled at opposite sides of the piston in bearings 11 and 12 which are formed as hubs in frames 13 and 14. These frames 13 and 14 are secured to the opposite ends of the cylinder 1 and serve to support the cylinder as well as to maintain the piston on its proper axis of rotation within the cylinder. In the present instance, the piston 3 is formed substantially hollow, it having however supporting spokes 15 between its periphery and the hub portion which is keyed to the shaft, the hollow formation of the piston serving to ventilate it and thereby prevent its overheating. The frames 13 and 14 attached to the ends of the cylinder are also preferably spoked or formed with openings to permit a flow of air through these frames and the piston.

The circumference of the piston is divided in an axial direction into the three sections 4, 5 and 6 by packing rings 16 which extend circumferentially of the piston, and these rings are preferably arranged in pairs, each pair being seated in a circumferential groove 17 formed in the piston. In order to effectually prevent leakage of fluid between one circumferential section of the piston and the adjacent section or sections, the abutting ends of each packing ring are preferably beveled or cut diagonally as at 18, and a screw 19 may be used, the head of which overlaps the ends of the ring and thereby securely holds the same in position. Each of the piston sections 4, 5 and 6 is provided with a set of piston abutments 20 which are

suitably spaced circumferentially of the piston. In the present instance, a set of six abutments is provided for each of the piston sections 4, 5 and 6. A gate 21 is also provided for each of the piston sections, this gate being fitted to reciprocate in a groove 22 formed in the cylinder wall. Each gate is provided with a groove 23 which serves to conduct the explosive gas from the respective compressor to the corresponding piston section. The forward face of each piston abutment 20 is beveled and when such abutment engages the inner end of the gate 21 it will lift or deflect the latter from the path of the piston abutment and will thereby permit such abutment to pass the gate. The gate, however, is immediately returned to a position that will enable it to coöperate with the concentric portion of the piston by a compression spring 24 one end of which may be seated in an aperture 25 formed in the gate, and the opposite end of this spring may bear upon a suitable part of the engine casing. A spark plug 26 may be fitted into the engine cylinder at a point in proximity to each groove 22 which contains the respective gate. The grooves 22 and the gates 21 for the piston sections 4, 5 and 6 are preferably spaced diagonally upon the engine cylinder and at an angle of twenty degrees. A set of three compressors 27, 28 and 29 is provided for the piston sections 4, 5 and 6, these compressors being spaced in the same manner as the grooves 22 and the gates 21. In the present instance, each of these compressors is in the form of a cylinder 30 one side of which is faced off and secured flatwise upon a suitable boss formed on the engine cylinder, and the axis of the compressor cylinder is parallel to the axis of the engine shaft. Each compressor cylinder contains a reciprocatory piston 31 which operates through a perforated guiding head 32 and is equipped with a compression spring 33 which normally acts to draw the piston out of the compressor cylinder and thereby operate the piston upon its suction stroke. Each compressor cylinder is provided with an inlet valve 34, the several cylinders being connected by branch pipes 35 to a common carbureter 36 or other means for supplying an explosive gas. The head 37 on the outer end of each piston rod is guided to operate through a guide 38 which may be formed as a part of the end frame 14, and each head 37 is provided with an operating roller or projection 39.

The engine shaft 10 has a cam 40 keyed or otherwise fixed to turn therewith, the peripheral portion of the cam being formed as a flange, the edge of which is provided with a series of suitably spaced cam projections 41 which are adapted to successively cooperate with the rollers 39 for the pistons of the several compressors, the cam serving to operate the compressors in a direction to compress the charges of gas and to force such gas under the proper pressure into the respective sections of compartments of the cylinder. The spaces intervening between the projections 41 on the cam permit the pistons to move upon their suction strokes under the action of the springs 33, the compressors thereby receiving fresh charges of explosive gas preparatory to the next series of explosions. The present invention provides means whereby the volume of gas contained in each charge may be varied for the purpose of controlling or governing the speed of revolution and the power of the engine. In the present instance, I accomplish this result by regulating the suction strokes of the compressors, the cam 40 in the present instance containing a governor ring 42 which may lie immediately within the flange on the cam 40, the rollers 39 of the compressors being wide enough to engage the smooth or regular edge of the governor ring 42 as well as the cam projections 41, and this governor ring is provided with a suitable number of studs 43 which reciprocate freely through the web portion of the cam 40 and have a grooved ring 44 attached to their outer ends. By shifting the governor ring 42 axially with respect to the engine shaft, the suction strokes of the compressors can be varied. Any suitable means may be provided for shifting the governor ring as may be desirable or necessary, a crank 45 being shown in the present instance which has a roller or projection 46 which follows the peripheral groove in the ring 44, this crank being mounted to rock on an axis 47, and a rod 48 may be attached to the crank 45 for the purpose of operating it, the rod 48 being manipulated manually or otherwise.

The compressor cylinders are arranged on the radial lines G, H and K, these lines being twenty degrees apart, thus leaving ten degrees between the lines G and L and K and M, the lines L and M representing one-sixth of the circumference of the piston. It is therefore obvious that at each revolution of the piston, if the piston is provided with three axially spaced sections and six piston abutments, there will be eighteen impulses imparted to the piston, the impulses being regularly timed so that an even running of the engine is insured.

I claim as my invention:—

1. In a rotary explosive engine, the combination of a cylinder, a piston revoluble therein and divided axially into a plurality of sections, and a set of compressors for introducing compressed charges of explosive gas to the respective piston sections.

2. In a rotary explosive engine, the combination of a cylinder, a piston revoluble therein and divided axially into a plurality of sections, a set of compressors located at

different angles about the axis of the piston and communicating with the respective piston sections, and means for operating the compressors to successively introduce charges of compressed explosive gas to the respective piston sections.

3. In a rotary explosive engine, the combination of a cylinder, a piston revoluble therein and having sets of abutments spaced circumferentially of its periphery, circumferentially extending packing rings interposed between the periphery of the piston and cylinder and dividing the piston axially into individual sections, and a set of compressors for introducing charges of compressed explosive gas to the respective piston sections.

4. In a rotary explosive engine, the combination of a cylinder, a hollow piston revoluble therein, means for introducing charges of compressed explosive gas to the piston, and bearing frames connected to the ends of the cylinder and forming a support for the piston, the bearing frames having passages to permit the flow of ventilating fluid axially through them and through the hollow piston.

5. In a rotary explosive engine, the combination of a cylinder, a piston revoluble therein, a compressor for introducing charges of compressed explosive gas to the piston, and means capable of operating said compressor to introduce charges of gas of different volumes to the piston.

6. In a rotary explosive engine, the combination of a cylinder, a piston revoluble therein, a compressor for introducing charges of compressed explosive gas to the piston, and operating means driven by the piston and capable of actuating the compressor to deliver compressed explosive charges of different volumes to the piston.

7. In a rotary explosive engine, the combination of a cylinder, a piston revoluble therein, a compressor embodying a cylinder and a reciprocatory piston for introducing charges of explosive gas to the piston, and means for reciprocating the compressor piston to different degrees whereby the volume of gas in each charge may be governed.

8. In a rotary explosive engine, the combination of a cylinder, a piston revoluble therein, a compressor mounted on the cylinder and embodying a compressor cylinder and piston, a cam revoluble with the piston and coöperative with a part of the compressor piston for reciprocating the latter, and a governing ring coöperative with the cam and adjustable to control the strokes of the compressor piston.

9. In a rotary explosive engine, the combination of a cylinder, a piston revoluble therein and divided axially into a plurality of sections, a set of compressors for introducing charges of compressed explosive gas to the respective piston sections, a cam revoluble with the piston and serving as a common actuating means for said set of compressors, and a governing ring coöperative with said cam and adjustable to vary the strokes of said compressors.

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

CARL HANS VOM BAUR.

Witnesses:

CHAS. DE LUKACOEVICS,

MICHAEL N. DELAGI.