No. 835,483. PATENTED NOV. 6, 1906.

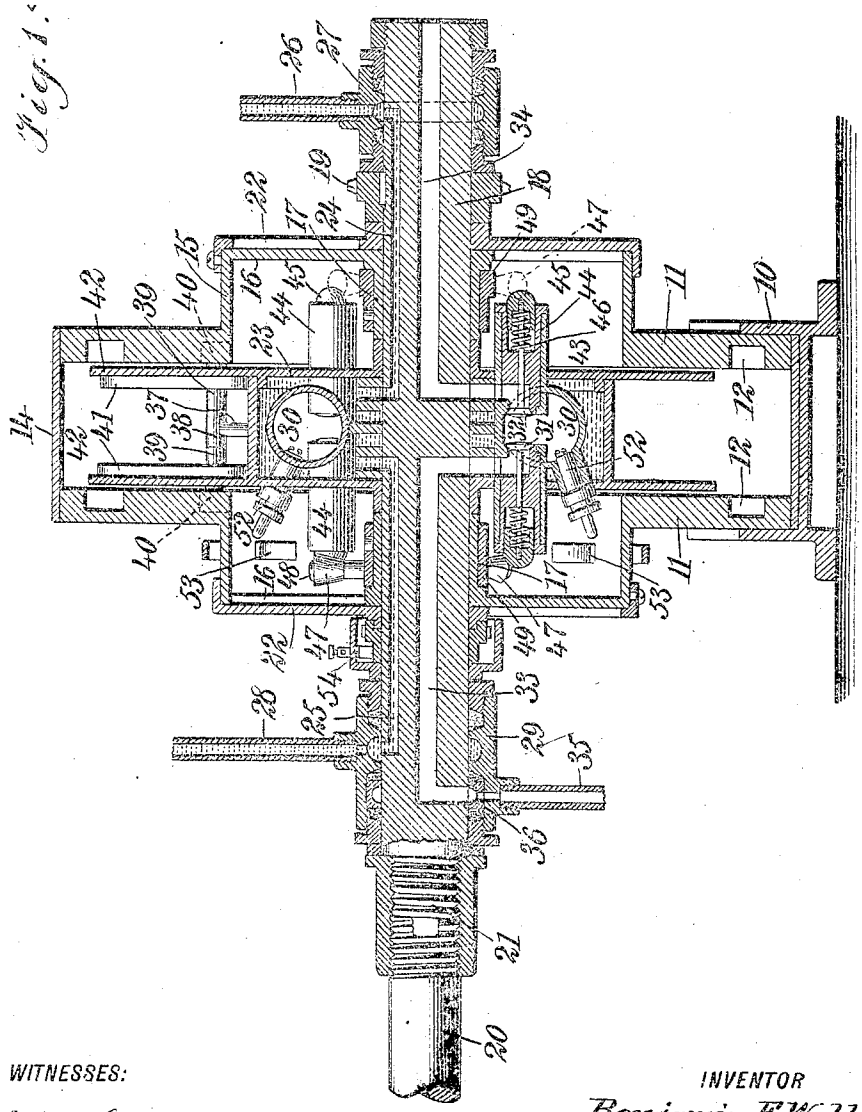
B. F. WALKER.

ROTARY EXPLOSIVE ENGINE.

APPLICATION FILED DEC. 20, 1904.

4 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

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4 SHEETS—SHEET 2.

Fig. 3.

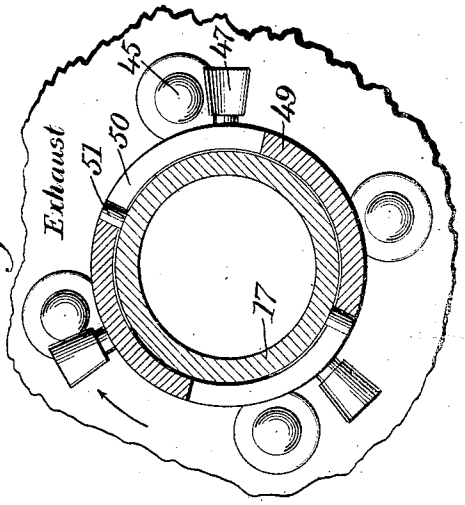


Fig. 5.

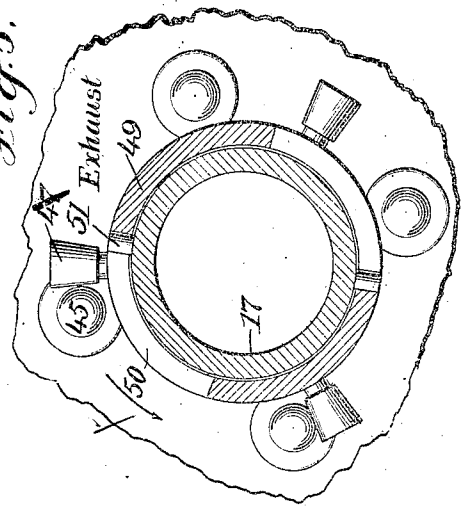


Fig. 2.

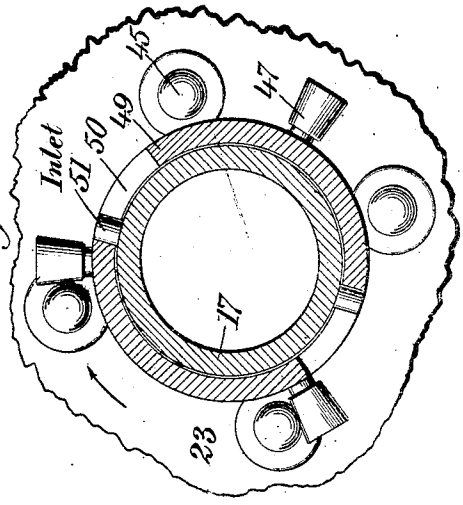
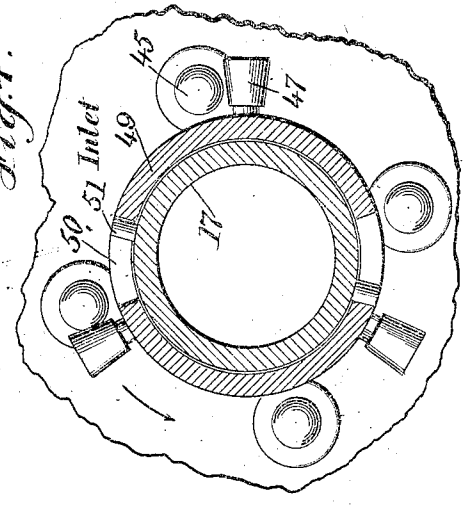


Fig. 4.



WITNESSES:

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APPLICATION FILED DEC. 20, 1904.

4 SHEETS—SHEET 3.

Fig. 7.

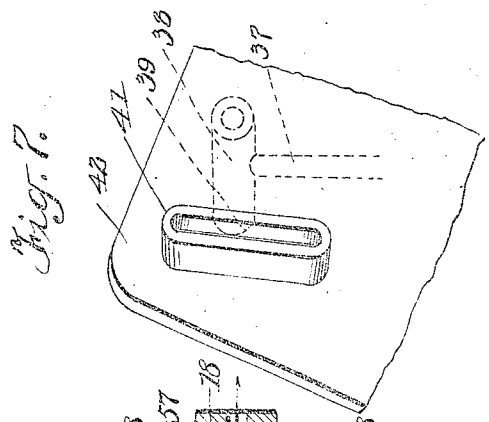
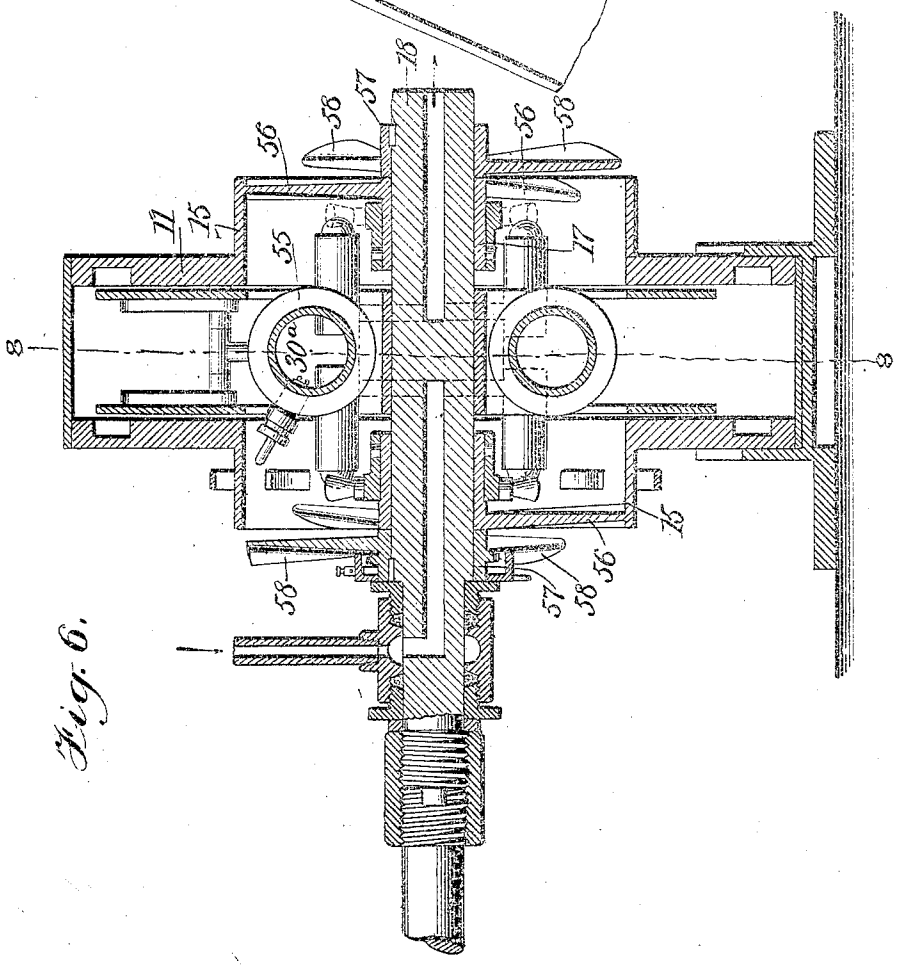


Fig. 6.



WITNESSES:

Geo. M. Naylor.

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No. 835,483. PATENTED NOV. 6, 1906.

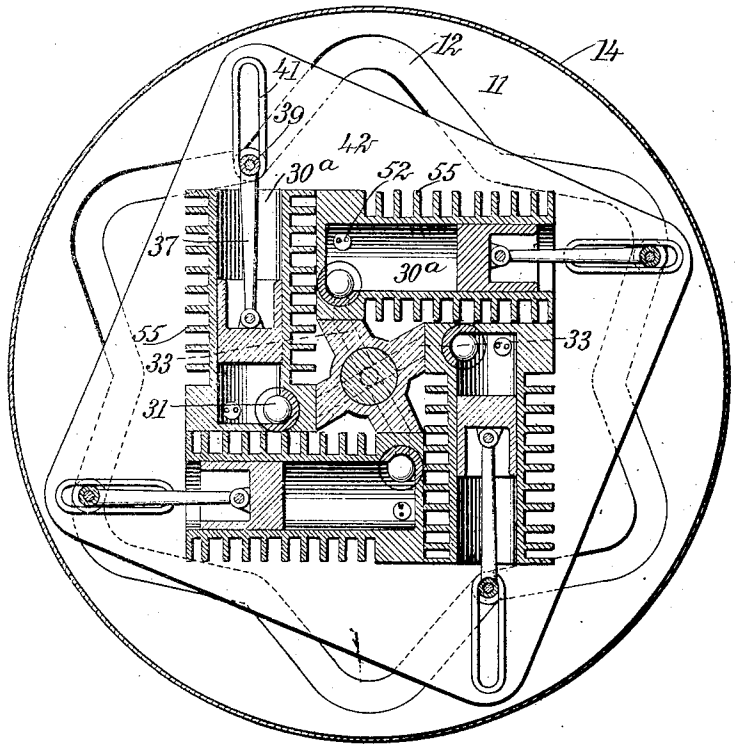
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ROTARY EXPLOSIVE ENGINE.

APPLICATION FILED DEC. 20, 1904.

4 SHEETS—SHEET 4.

Fig. 8.



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UNITED STATES PATENT OFFICE.

BENJAMIN FRANKLIN WALKER, OF BRIDGEPORT, CONNECTICUT.

ROTARY EXPLOSIVE-ENGINE.

No. 835,463. Specification of Letters Patent. Patented Nov. 6, 1906.

Application filed December 20, 1904. Serial No. 237,313.

To all whom it may concern:

Be it known that I, BENJAMIN FRANKLIN WALKER, a citizen of the United States, and a resident of Bridgeport, in the county of Fairfield and State of Connecticut, have invented a new and Improved Rotary Explosive-Engine, of which the following is a full, clear, and exact description.

The present invention relates to a specific form of the rotary engine covered, broadly, in my copending application for engines, Serial No. 237,612, filed December 20, 1904.

The invention also relates to a novel means for air-cooling the cylinders of the engine.

In its present form the invention comprises a stationary cammed member of circular undulating form, this member sustaining revolubly a central shaft with a cylinder or cylinders, which turn with the shaft and which have their pistons connected with a part running in or against the cammed part, so that by the reaction of the piston movement on the cam a continuous rotary movement is imparted to the cylinder and shaft.

The invention is adapted particularly to internal-combustion engines. The cylinders may be cooled either by air or water; but in the present case I prefer to employ a novel air-cooled arrangement which will be fully set forth hereinafter.

Reference is had to the accompanying drawings, which illustrate several forms of my invention, in which drawings like characters of reference indicate like parts in the several views, and in which—

Figure 1 is a vertical longitudinal section of the form of the invention in which the working cylinders are cooled by water circulated around them. Figs. 2 and 3 are detail sectional views showing the inlet and exhaust valve stems and devices for operating them, these views showing the parts in the position which they assume when the engine is running ahead. Figs. 4 and 5 are similar views showing the parts in the position in which the direction in which the engine is running is reversed, and Fig. 6 is a vertical longitudinal section of a second form of the invention in which the working cylinders are air-cooled. Fig. 7 is a fragmentary perspective of one of the extension-walls, showing the guide or slot therein; and Fig. 8 is a sectional view on the line 8 8 of Fig. 6.

Referring to Figs. 1 to 5, 10 indicates the base of the engine which supports two annular members 11, each having on its inner face a circular undulatory cammed groove 12. The outer peripheries of these members 11 are joined by a band 14, and said members are provided at their inner peripheries or edges with outwardly-extending walls 15, to which inwardly-extending webs 16 are joined. Said webs 16 are in turn joined to bearings 17, which support revolubly the main or central shaft 18 of the engine. From this shaft the motive power of the engine is taken either through a sprocket or other gear 19, fastened to the shaft, or through a line-shafting 20, joined to the engine-shaft by a suitable coupling 21.

22 indicates suitable closures commanding an opening in the webs 16, so that access may be had to the interior parts at will.

Attached to and turning with the shaft 18 is a box 23, which communicates with ducts 24 and 25, formed in the shaft and through which a cooling fluid is adapted to be circulated. The duct 24 communicates with a pipe 26 by a water-joint 27, surrounding one end portion of the shaft 18, and the duct 25 communicates with a pipe 28 at the other end of the shaft by means of a water-joint 29, surrounding said end, as shown. Within the box 23 are a number of cylinders 30, which have inlet and exhaust ports, respectively, commanded by valves 31 and 32 and communicating, respectively, with a fuel-feed duct 33 and an exhaust-duct 34 in the shaft 18. The duct 33 communicates with a stationary fuel-supply pipe 35 by means of a joint ring 36, contained in the casing of the water-joint 29 and loosely surrounding the shaft 18, as will be understood from the drawings. The exhaust-duct 34, according to the construction here shown, discharges through the end of the shaft 18.

Within the cylinders 30 suitable pistons (not shown in Fig. 1) operate, and to these pistons are pivotally connected the rods 37, one of which is shown in Fig. 1. Said rods have cross-bars 38 at their outer ends carrying rollers 39 and 40. Of these the rollers 39 operate in guides 41, formed on extension-walls 42, projecting from the box 23 for the purpose of relieving the pistons and cylinders of lateral strain. (See Fig. 7.) Said guides are disposed tangentially to the shaft 18, and the cylinders 30 are correspondingly arranged. The rollers 40 operate in the cammed grooves 12 of the annular members 11, and by this arrangement upon the power-strokes of the pistons in the cylinders 30

these strokes, reacting on the walls of the cammed grooves 12, impart a continuous rotary motion to the shaft 18 and its attachments. Upon this movement of the shaft and its attachments the cammed grooves will force the pistons to perform such negative strokes as may be involved in the cycle under which the internal-combustion engine operates, all of which is more fully set forth in my copending application above referred to.

The valves 31 and 32 have stems 43 attached, these stems operating in stem-guides 44, projecting oppositely from the cylinders, and at their outer ends the valves are provided with projecting knobs 45.

46 indicate springs which keep the valves yieldingly seated.

The projecting knobs 45 are intended to be engaged by tappet-rollers 47, carried on stud-bolts 48, projecting from rings 49. These rings are mounted loosely on the bearings 17 and are provided, as shown best in Figs. 2 to 5, with slots 50, in which fit pins 51, projecting from the bearings 17. This arrangement mounts the tappets on the bearings and allows them a limited independent movement. As the cylinders and valves rotate the knobs 45 are successively engaged with the tappets, and in this manner the valves are opened. As soon as the valves disengage the tappets the valves close under the action of the springs 46. The limited independent movement allowed the tappets is for the purpose of establishing the proper relative position of the parts upon reversing the direction of rotation of the engine.

Figs. 2 and 3 indicate the parts in the position they will assume when, for example, the engine is running ahead, and upon the reversal of the engine the valves and their knobs 45 will move backward, carrying the tappets 47 with them for a distance equal to the length of the slots 50 in the rings 49, whereupon the ends of the walls of the slot 50 reëngage the pins 51, and the valve-tappets become stationary and active. This lost motion allows the parts upon reversal to assume the proper relative position before the renewed operation of the valves takes place.

52 indicates igniters which are provided to ignite the piston charges introduced into the cylinders 30. These igniters are preferably of the jump-spark type. One terminal of the secondary current is suitably ground on the engine, and the other terminal is led by suitable conductors to insulated contact-shoes 53, supported by any desired means—for example, those described in my copending application above referred to on the cammed members 11.

54 indicates a commutator which is arranged to be advanced or reversed at will, so as to regulate the time when the spark is given, all of which is fully set forth in my copending application referred to.

Upon the rotation of the engine-cylinders the igniters 52 will successively engage with the contact-shoes 53, thus completing the circuit to the igniter and causing the spark to be developed at the spark-gap, all of which will be understood from the prior art.

In the organized operation of the engine a mixture of fuel and air is supplied to the duct 33 by the pipe 35, and upon starting the rotation of the shaft 18 and its attachments the action of the rollers 40 on the walls of the cammed grooves 12 will cause the pistons of the cylinders to go through the various movements incident to the cycle under which the engine may be made to operate, whether it be the two or four cycle action. The structure here shown is particularly adapted to the four-cycle action. When a charge is admitted into and compressed in one of the cylinders upon ignition, the piston of that cylinder will give its power-stroke, causing the rollers 40 to act on the cam and to react on the shaft 18, imparting a rotary movement thereto. This action will then be taken up by all the other cylinders in succession and repeated by each cylinder several times at each revolution of the engine, and when the operation of the engine becomes normal the shaft 18 and the attached cylinders and other parts will turn continuously. The cooling liquid is circulated around the cylinders by the devices shown, so as to maintain the cylinders at the proper temperature, and the valves and igniters, moving with the cylinders periodically, engage their actuating devices, so as to bring about the proper operation of these elements.

In the modified form of the invention shown in Fig. 6 the cylinders 30* are intended to be air-cooled, and to facilitate the radiation of heat therefrom they are provided with radiating projections 55. The webs 16 (shown in Fig. 1) are omitted, and the cammed members 11 are joined to the bearings 17 by means of radial arms 56, which I prefer to give the form of fan-blades. Keyed to the shaft 18 are hubs 57, which carry fan-blades 58, and these blades, rotating with the rotating shaft 18, induce a circulation of air around the cylinders and through the passage inclosed by the outwardly-extending walls 15. This air-cooling device avoids the necessity of providing the box 23 (shown in Fig. 1) and the ducts 24 and 25, also shown in that view. In other respects, however, the construction and operation of the invention is precisely the same as that first described.

Various changes in the form, proportions, and minor details of my invention may be resorted to at will without departing from the spirit and scope thereof. Hence I consider myself entitled to all such variations as may lie within the terms of my claims.

Having thus described the preferred form

of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an engine, the combination of a base, a stationary cammed member carried thereby, an outwardly-projecting wall carried by the cammed member, a bearing, an arm connecting the bearing with the said wall, a shaft revolubly mounted in the bearing, a cylinder carried by and turning with the shaft, a piston operating in the cylinder, a part engaging the cammed member and connected to the piston, and a fan-blade at each side of the cylinder, attached to said shaft and turning therewith.

2. In an engine, the combination of a bed, two stationary undulating circular cams sustained thereby and arranged opposite to each other, a revoluble shaft disposed centrally of the cams, means for mounting said shaft, a cylinder attached to the shaft, extension-walls arranged to turn with the shaft and cylinder and having guides therein, a piston operating in the cylinder, and a part in connection with the piston, said part running in the guides of the extension-walls and engaging the cams.

3. In an engine, the combination of a base, a stationary undulating circular cam sustained thereby, a bearing disposed centrally of said cam, a shaft revolubly carried in the bearing, a fan-blade attached to the shaft, means for sustaining the bearing from the cam, a cylinder attached to and turning with the shaft, a piston operating in the cylinder, and a part having connection with the piston and engaging the cam, for the purpose specified.

4. In an engine, the combination of a base, a stationary undulating circular cam attached thereby, a bearing disposed centrally of the cam, a shaft revolubly carried in the bearing, arms in the form of fan-blades connecting said bearing with said cam and sustaining the bearing, additional fan-blades attached to the shaft adjacent to the first-named blades, a cylinder attached to and turning with the shaft, a piston operating in the cylinder, and a part having connection with the piston and engaging the cam.

5. In an engine, the combination of a bed, two stationary undulatory circular cams sustained thereby and arranged opposite to each other, a revoluble shaft disposed centrally of the cams, outwardly-extending walls carried by the cams, bearings in which the shaft is mounted, means extending between the bearings and said outwardly-extending walls to support the bearings, a cylinder attached to the shaft, valve devices for the cylinder, said valve devices being inclosed by said outwardly-extending walls, a piston operating in the cylinder, a rod in connection with the piston, guides having connection with the cylinder and shaft, and a cross-bar in connection with the piston-rod and running in the guides, said cross-bar having its ends engaged in said cams.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

BENJAMIN FRANKLIN WALKER.

Witnesses:

SAMUEL C. SHAW,

FLORA E. DEW.