No. 881,428. PATENTED MAR. 10, 1908.

C. V. MARTIN.

ENGINE.

APPLICATION FILED FEB. 26, 1906.

3 SHEETS—SHEET 1.

Fig. 1.

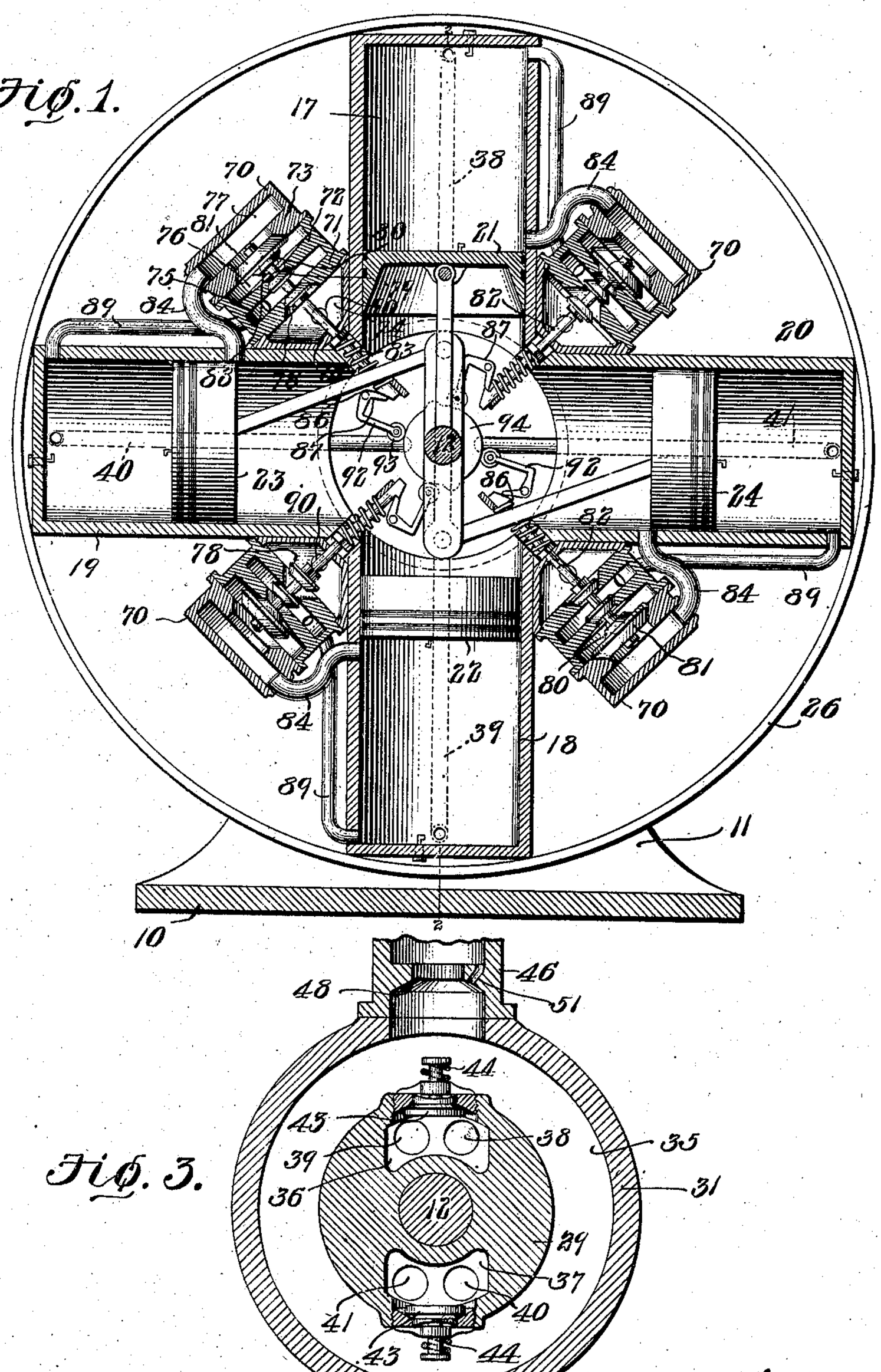


Fig. 3.

WITNESSES:

E. F. Clement.

Jno. C. Parker

Charles V. Martin,

INVENTOR.

By Church & Co.

ATTORNEYS

No. 881,428. PATENTED MAR. 10, 1908.

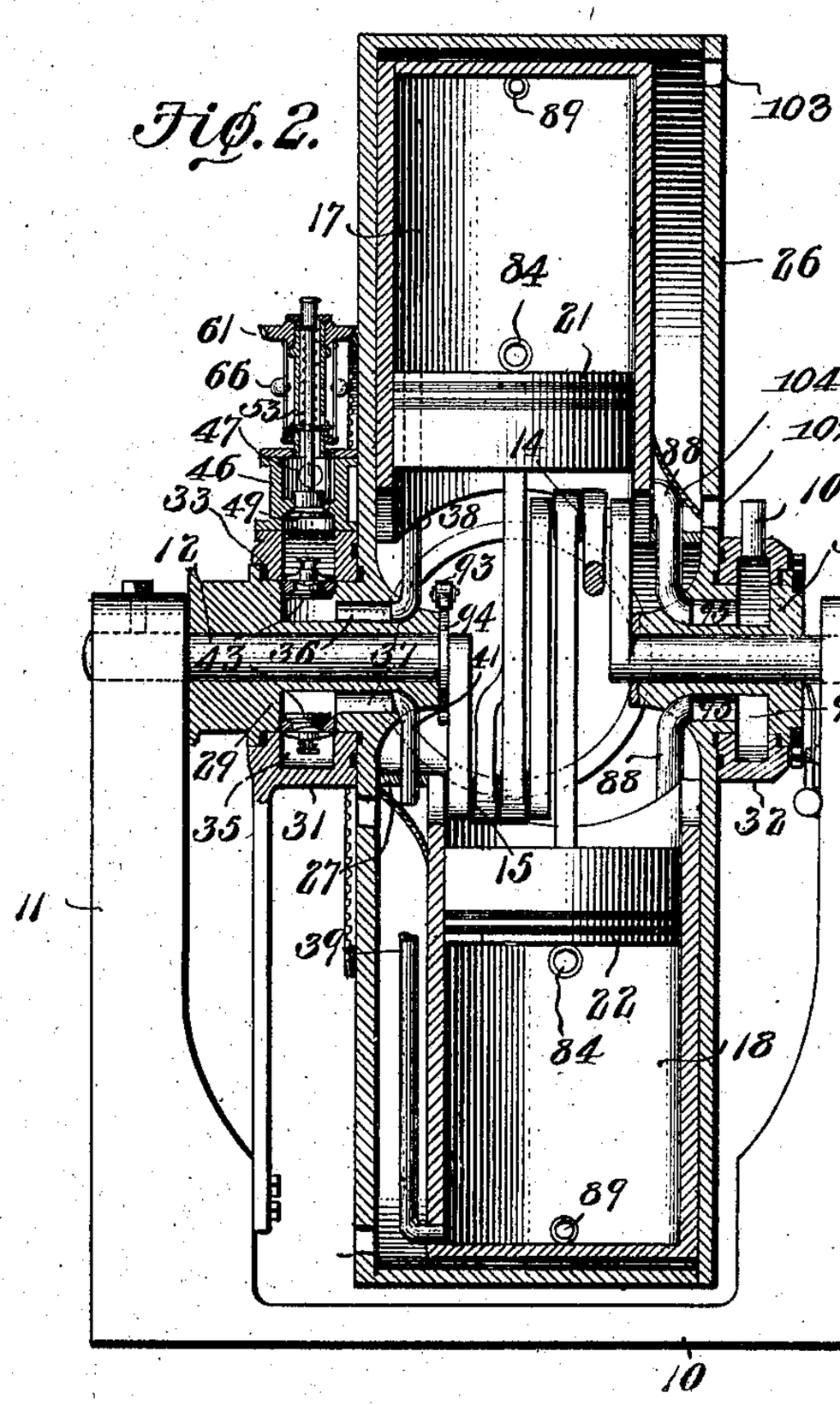
C. V. MARTIN.

ENGINE.

APPLICATION FILED FEB. 26, 1906.

3 SHEETS—SHEET 2.

Fig. 2.



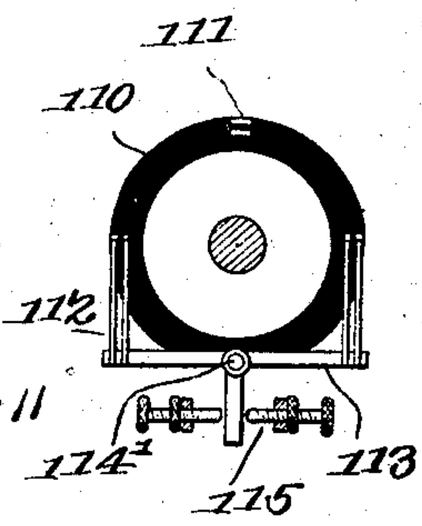


Fig. 8.

WITNESSES:
E. F. Stewart
Jno. E. Parker

Charles V. Martin,
INVENTOR.
By Church & Co.
ATTORNEYS

No. 881,428. PATENTED MAR. 10, 1908.

C. V. MARTIN.

ENGINE.

APPLICATION FILED FEB. 26, 1906.

3 SHEETS—SHEET 3.

Fig. 6.

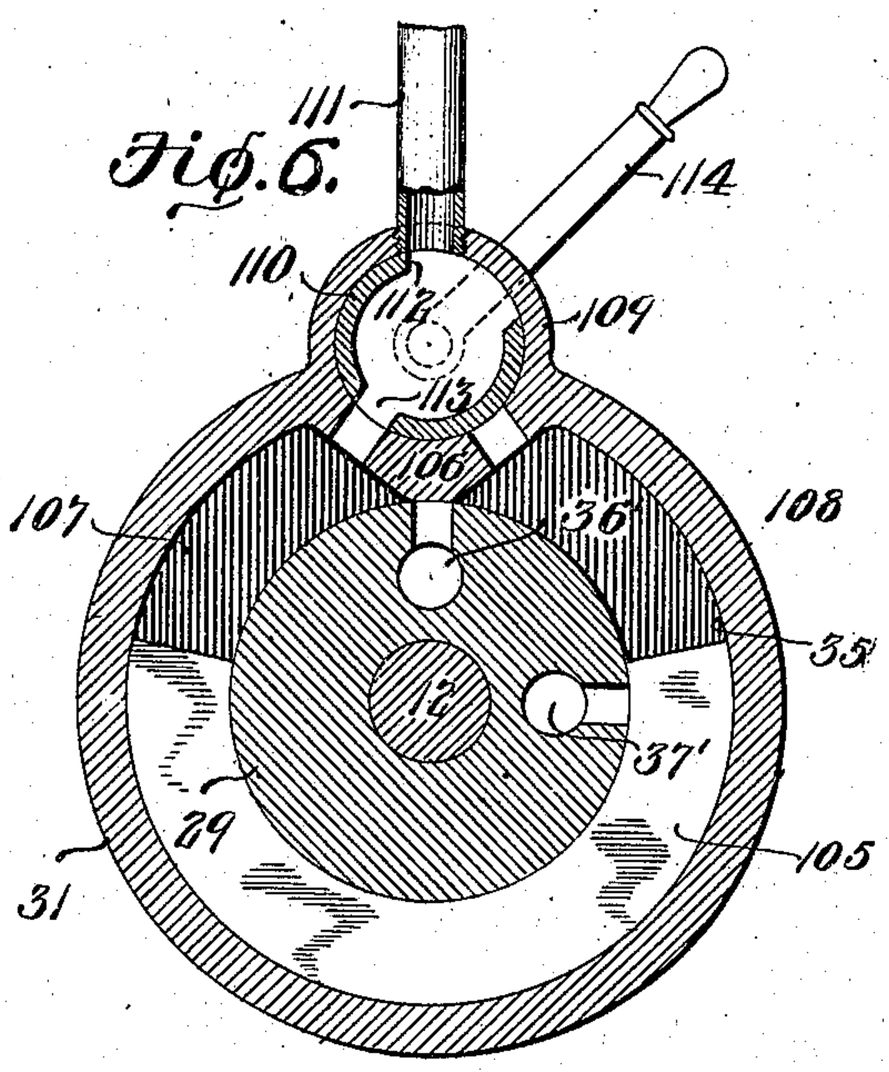


Fig. 7.

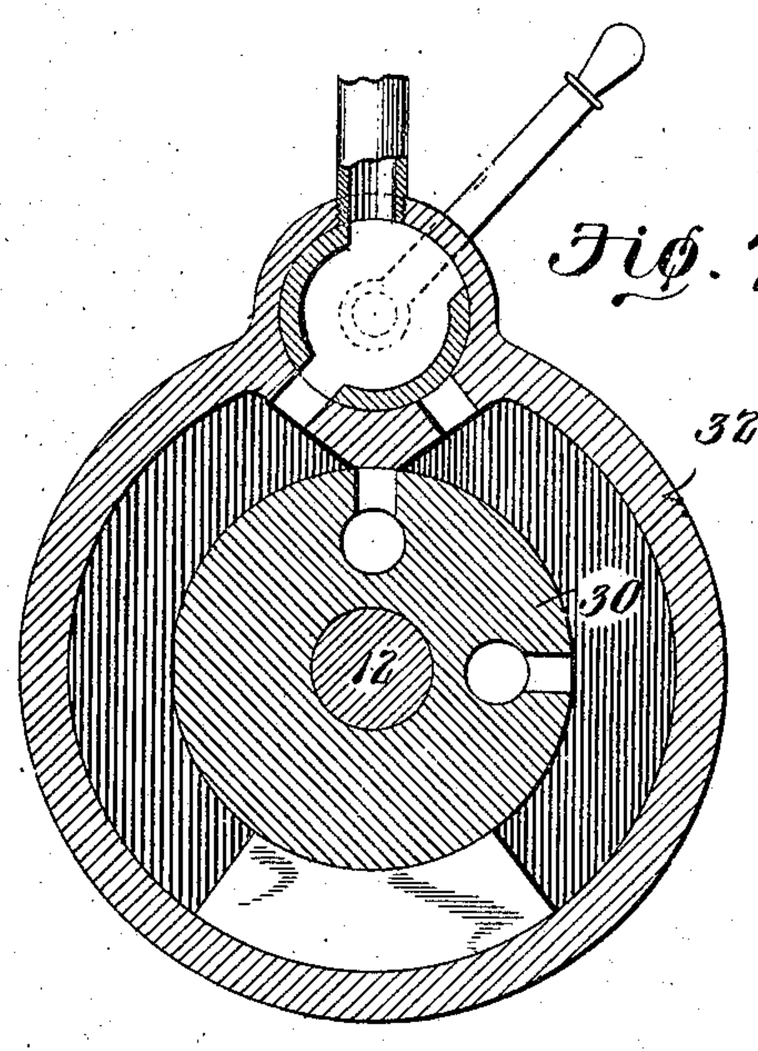


Fig. 4.

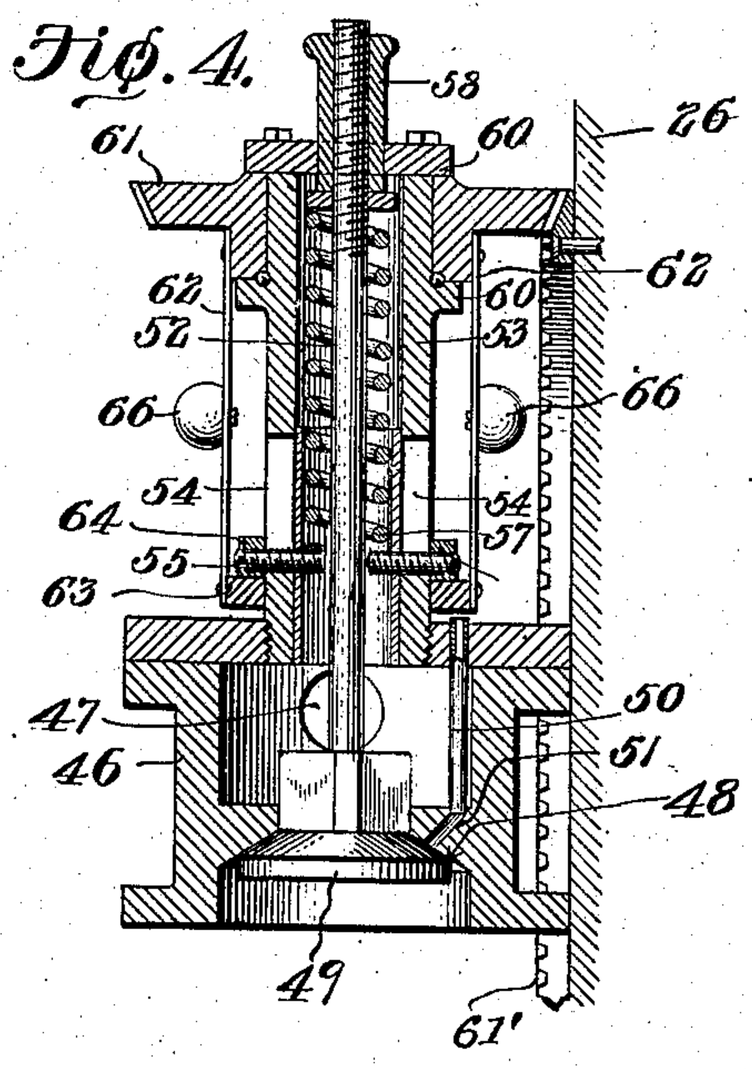
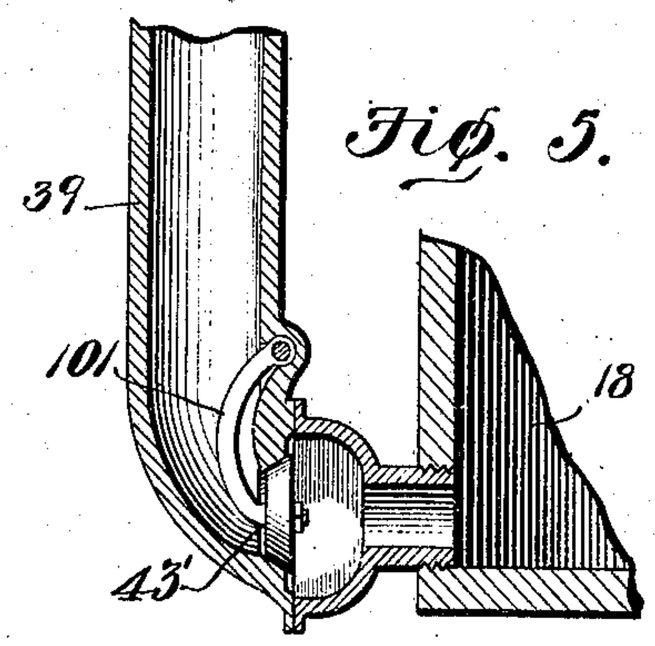


Fig. 5.



WITNESSES:

E. J. Stewart

Jno. E. Parker

Charles V. Martin,

INVENTOR.

By Church & Co

ATTORNEYS

UNITED STATES PATENT OFFICE.

CHARLES V. MARTIN, OF CHARLESTON, WEST VIRGINIA.

ENGINE.

No. 881,428. Specification of Letters Patent. Patented March 10, 1908.

Application filed February 26, 1906. Serial No. 303,036.

To all whom it may concern:

Be it known that I, CHARLES V. MARTIN, a citizen of the United States, residing at Charleston, in the county of Kanawha and State of West Virginia, have invented a new and useful Engine, of which the following is a specification.

This invention relates to rotary engines, and has for its principal object to provide a novel form of engine in which the force exerted by the propelling medium, either a fluid under pressure, or an explosive mixture, may be utilized to the best advantage, and in which the engine may be made compact, and of a weight much less than that of ordinary engines of the same horse-power.

A further object of the invention is to provide an engine in which vibration is reduced to a minimum, and in which the revoluble member may be in the form of a belt wheel or similar transmission device, and which may be perfectly controlled and run at uniform speed without the necessity of employing heavy balance-wheels or similar members, such as are usually found necessary in all engines.

A still further object of the invention is to provide a rotary engine in which the crank shaft and cranks are stationary, and a plurality of cylinders have their pistons connected to the crank pins, and are carried by a casing that is free to revolve, and is moved around the stationary crank shaft.

A still further object of the invention is to provide a rotary engine of this type in which provision is made for supplying and exhausting the power element, and for controlling the speed of the engine.

With these and other objects in view, as will more fully hereinafter appear, the invention consists in certain novel features of construction and arrangement of parts, hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings:—Figure 1 is a sectional elevation of a rotary engine constructed in accordance with the invention and designed to be utilized as an internal combustion engine. Fig. 2 is a transverse sectional view of the same on the line 2—2 of Fig. 1. Fig. 3 is a transverse sectional view on an enlarged scale through the inlet casing and ported inlet hub. Fig. 4 is a sectional view on an enlarged scale of the governing device. Fig. 5 is a modification of one of the suction inlet valves. Fig. 6 is a sectional view illustrating the construction of the inlet casing and hub employed where a fluid under pressure is used for driving the engine. Fig. 7 is a similar view of the exhaust hub. Fig. 8 is an elevation of the circuit closing device for the igniters.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

The engine is supported by a small frame including a base 10 and standards 11, and to these standards is rigidly secured a crank shaft 12, having cranks that are connected by a pair of diametrically opposed crank pins 14 and 15, and, as in the present illustration, the engine is provided with four cylinders, the pistons of two of said cylinders being connected to the crank pin 14, and the pistons of the remaining two cylinders are connected to the crank pin 15, said pistons being designed to operate in opposing pairs. The cylinders 17, 18, 19 and 20 are spaced at intervals of ninety-degrees from each other, the cylinder 17 being diametrically opposite the cylinder 18, and the cylinder 19 being diametrically opposite the cylinder 20. The cylinders contain pistons 21, 22, 23, 24, respectively, and the pistons 22 and 23 are connected to crank pin 14, while the pistons 21 and 24 are connected to the crank pin 15, so that while pistons 21 and 22 are at the limit of either inward or outward movement, the pistons 23 and 24 will be at half stroke, or vice versa. The several cylinders are bolted or otherwise secured within a revoluble cylindrical casing 26, that preferably is formed of a number of sections to facilitate the assembling of the parts, suitable spaces being formed around and between the several cylinders to permit the circulation of a cooling medium, such as air or water. The cylindrical casing 26 serves as a balance-wheel, and, also, as a belt wheel from which power may be transmitted directly to any machinery to be driven, and said casing may be of sufficient weight to serve as a regulator, although it may be much lighter than the

usual wheel employed for maintaining uniform action of ordinary single or double cylinder engines. The interior of the cylindrical casing 26 is divided by a circular partition 27 into an inner circular chamber that surrounds the shaft, cranks and other mechanism, while the outer annular space surrounds, or partly surrounds the cylinders, and contains the exhaust valves, this outer space also serving as a jacket through which air, water or other cooling medium may be circulated in order to reduce the temperature of the cylinders.

The casing 26 is provided with two hub members 29 and 30 that are mounted on the fixed crank shaft and are free to rotate thereon, and said hubs are provided with suitable passages for the admission and exhaust of the actuating fluid or explosive mixture, and are surrounded by casings 31 and 32, respectively, suitable packing rings 33 being introduced between the hubs and casings to reduce leakage to a minimum. The casing 31 is connected to a source of supply from which steam, compressed air, or the explosive mixture may be allowed to flow, and from the casing the actuating fluid, whatever its nature, passes to the pressure ends of the several cylinders, and after acting on the pistons therein is allowed to escape by way of the hub 30 and the stationary exhaust casing 32. The casing member 31 entirely surrounds the hub 29, and is provided with an annular chamber 35 through which an explosive mixture is supplied, and the hub has two laterally extending ports 36 and 37 which are in communication with this chamber, and from each port lead two pipes, the pipes 38 and 39 leading to the outer ends of the cylinders 17 and 18, respectively, while the pipes 40 and 41 lead to the outer ends of the cylinders 19 and 20, respectively, and through these pipes the explosive mixture is drawn on the suction strokes of the pistons, two of the cylinders taking the explosive mixture at the same time. In each of the ports 36 and 37 is a suction inlet valve 43 which opens on the suction stroke against the stress of a small spring 44, the valve closing on the compression, working and exhaust strokes.

In order to control the quantity of explosive mixture passing to the engine, a valve casing 46 is interposed between the air or gas supply pipe 47 and the hub casing 31, and in this valve casing is a seating ring 48 adapted for the reception of a spring closed valve 49 which is opened on the suction stroke, and through which a quantity of air is drawn, and at the same time a quantity of gasolene or other hydro-carbon is admitted through a pipe 50 leading to a port 51 which terminates at the valve seat 48, and is also under the control of the valve 49, so that when the valve 49 is opened, both air and liquid hydro-carbon may flow into the annular chamber 35 and be drawn through the ports and inlet pipes to the working ends of the cylinders.

The main suction inlet valve 49 is carried by a stem 52 that extends through a cylindrical casing 53 supported by the valve casing 46. The casing 53 is provided with a pair of diametrically opposed slots 54 for the passage of two screws 55 that are carried by a loose ring 64. The screws 55 support the lower end of a helical compression spring 57, the upper end of which bears against an adjustable nut 58 that is carried by the threaded upper end of the stem 52. This spring tends to maintain the valve in closed position, and by turning the nut 58 the resistance offered to the opening movement of the valve may be increased or diminished to any desired extent. The outer face of the casing 53 is provided with a pair of flanges 60 forming an annular groove or recess for the reception of a bevel pinion 61, to the hub of which are secured the upper ends of two spring strips 62, and the lower ends of these strips are secured to a vertically movable collar 63 that is guided on the outer face of the casing 53. This collar 63 supports the ring 64, the latter being held down by the stress of the spring 57. The bevel pinion 61 is engaged and actuated by a gear 61′ on the rotary casing of the engine, and as the speed increases, the strips 62, which carry governor weights 66, will move outward, the springs yielding and effecting upward movement of the collar 63. As the collar moves up, it carries with it the spring supporting screw 55 and the stress of the spring 57 will thereafter be increased, so as to offer increased resistance to the opening movement of the valve on the suction stroke, and if the speed of the engine is increased, the stress of the spring may be so great as to prevent the opening movement of the valve, so that no explosive mixture can pass to the cylinders. This quickly reduces the speed, and the governor weights will move inward, allowing the collar 63 to descend, and the spring resume its normal function. It will thus be seen that the resistance to the opening movement of the valve is proportioned to the speed of the engine, and as the speed increases the quantity of explosive mixture admitted will be lessened, while as the speed decreases, the quantity of explosive mixture admitted will increase. The suction stroke of each cylinder and piston will occupy one-half of a revolution of the casing 26, and as each of the other strokes, compression, working, and exhaust, also occupy one-half of a revolution of the casing 26, it necessarily follows that with the crank pins arranged in the same vertical plane, the explosions must all occur at the same point, *i. e.*, when the pair of cylinders containing compressed charges are in the same vertical plane. The charges are exploded by sparking mech-

anisms of any ordinary construction, these being preferably arranged in the manner hereinafter described.

At suitable points within the annular space of casing 26 are arranged exhaust valve casings 70, these being disposed between the several cylinders and having their axes on lines radiating from the center of the stationary shaft as shown in Fig. 1. Within each casing is a series of three partitions 71, 72, 73, dividing the casing into a number of chambers 74, 75, 76 and 77. All of these partitions are provided with openings, and the walls of the openings are faced to form valve seats, there being a plurality of valves 78, 79, 80 and 81, the latter valve being much larger than the others and constituting the main exhaust valve. All of these valves are carried by the same stem 82, and the stem extends out through a suitable guiding opening in the end of the casing, and carries a helical compression spring 83 that tends to maintain said valve in closed position.

The inner chamber 77 is placed in communication with the cylinder, cylinder 17 for instance, through a pipe 84, and the cylinder port to which said pipe is connected is under the control of the piston 21, said port being opened when the piston arrives at the end of its working stroke, so that the exploded gases may pass through the pipe 84 into the chamber 77, and there act upon the valve 81, said valve being moved outward to open position against the resistance offered by the spring 83, and when so moved, a shoulder 86 near the end of the stem 82 is engaged by a catch 87, and the valve is held in open position. This movement of the valve opens the valves 78 and 79 and closes the valve 80, while the exhaust gases passing through the pipe 84 into chamber 77 are free to pass into the chamber 76, and thence through the pipe 88 to the main exhaust. When the piston starts on its exhaust, or return stroke, or rather when the cylinder 17 in revolving effects the same movement, the gases between the piston and the working end of the cylinder will be forced out through a pipe 89 into the chamber 75, and as valve 78 is opened, these gases pass into chamber 74 and thence through an escape port 90, into the main escape pipe 88, so that all of the exhaust gases will be forced from the cylinder. The catch 87 is pivoted on the inner portion of the hub 29 and it carries an arm 92, on which is mounted a roller 93, and this roller engages a cam 94 that is rigidly secured to the stationary crank shaft, so that as the cylinder 17 moves from position, the roller will engage the cam and catch 87 will be tripped, releasing the shoulder 86 and allowing the spring 83 to again move the exhaust valve to closed position, and said valve will remain closed until the end of the next working stroke, this position not being affected by the gases, or explosive mixture of the cylinder at the end of the suction stroke. The several exhaust pipes 88 extend to ports 95 in the hub 30, and thence pass to an annular chamber 96 in the hub casing 32, and from the latter the gases may flow through a main discharge 100.

Instead of placing the suction inlet valves 43 in the ports 36 and 37, they may be located adjacent to the inner ends of the pipes 38, 39 and 40 and 41, as shown for instance at 43′ in Fig. 5, the valves in this case being carried by arms 101 that are pivoted in recesses in the inner walls of the inlet pipes, so that the valves may be normally held in closed position, and, if necessary, light springs may be used to insure closing when the pressures on the opposite sides of the valve are equal.

When the engine is to be operated by steam, air or other fluid under pressure, the annular chamber 35 surrounding the inlet port is partly filled by a block 105, which, in connection with a second block 106, divides the space 35 into two distinct steamchambers 107 and 108, and these have port communication with a valve chamber 109 in which is arranged a combined throttle and reversing valve 110. The main steam pipe 111 communicates with the valve chamber 109, and the valve 110 is provided with two ports 112 and 113, the port 113 being of much smaller area than the port 112. The valve 110 is carried by a stem that extends outward through a suitable stuffing box at the end of the valve chamber, and is provided with a handle 114, which, if necessary, may be connected to a suitable governing mechanism, so that it may be adjusted in accordance with the speed of the engine. When the parts are in the position shown in Fig. 6, steam will pass from the main pipe 111 through the valve chamber and valve and port 113 to the steam chamber 107, and as the ports 36′ and 37′ of the revoluble hub come opposite the chamber 107, they will receive steam which is directed to the pairs of cylinders. By moving the valve 110, the effective area of the port 113 may be reduced in order to throttle the steam as the speed increases, or by moving the handle 114 to the opposite position, the port 113 may be adjusted in order to allow the steam to pass to the chamber 108, thus reversing the direction of rotation of the engine. The escape ports are preferably arranged in similar manner in order to permit the escape of the exhaust steam or air at the proper time.

Fig. 7 illustrates the construction of the exhaust hub and casing employed where steam or air is used for actuating the engine.

When it is desired to utilize air as a cooling

medium for the internal combustion engine, the wall of the revoluble casing is provided with air inlets 102, at a point adjacent to the annular partition 27, and with air outlets 103 adjacent to the periphery of the casing, and within the casing suitable deflecting plates 104 may be employed for the purpose of directing the air against the cylinders. The air will enter the openings 102, and after circulating around the cylinders, will escape through the openings 103, and, if necessary, the walls of these openings may be inclined in order to facilitate the entrance and discharge of the current of air.

The sparking devices may be supplied with current in any suitable manner, and a controller of the character shown in Fig. 8 may be employed for this purpose. In this case the revoluble disk 110 is carried by the hub of the casing, and on said disk is arranged a plurality of sets of contacts 111 that are arranged to engage contact brushes 112 disposed in pairs and insulated from each other, the brushes being carried by two arms of a T-shaped lever 113 that is pivoted on a pin 114′ carried by the stationary frame. The third arm of this lever is disposed between a pair of adjustable screws 115 which serve to limit its movement and to permit the adjustment necessary for properly timing the spark. The brushes are preferably so arranged that one of each pair is connected to the positive pole of a battery, and the other to the negative pole, while the contact plates 111 of the disk are connected by suitable conductors to the sparking devices at the ends of the explosion chambers. It is obvious that any form of sparking mechanism may be employed, and that the number of contacts and their arrangement will depend on the number of cylinders and the distance which separates them.

In many cases the cylinders instead of being slightly out of alinement, as shown in Fig. 2, may be placed with their axes in the same plane, in order to lessen vibration, and while the pistons have been shown as operating in pairs, it is obvious that they may operate in successive order if desired, so that a number of impulses may be given during each complete rotation of the casing.

I claim:—

1. In a rotary engine, the combination with supports, of a fixed crank shaft carried thereby, a casing having ported inlet and exhaust hubs revolubly mounted on the shaft, an annular partition dividing the interior of the casing into a central crank chamber, and an annular compartment, cylinders supported by the casing and having their inner ends opening into the crank chamber, exhaust valve mechanism arranged in the annular compartment between the cylinders, there being ports or passages through which communication is established between the cylinders and the inlet hub and exhaust valve mechanism, respectively, exhaust valve stems extending into the crank chamber, and means arranged within such crank chamber for engaging and actuating said stems.

2. In an internal combustion engine, a support, a stationary crank shaft carried thereby a revoluble casing mounted on the crank shaft and having ported inlet and exhaust hubs, a stationary inlet chamber surrounding the inlet hub, a governor controlled valve at the entrance port of the inlet chamber, independent suction inlet valves controlling the passage of the explosive charges from the inlet chamber to the ports of the inlet hub, a plurality of cylinders carried by the casing, pistons arranged in the cylinders and connected to the crank shaft, there being ports or passages leading from the inlet hub to the outer ends of said cylinders, exhaust valves arranged in the casing at points between the cylinders, exhaust valve stems extending radially from the valves toward the crank shaft, and means on the crank shaft controlling the operation of said exhaust valves.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

CHARLES V. MARTIN.

Witnesses:
JNO. W. MAIRS,
W. T. CHANDLER.