J. HUTCHINSON.

OPPOSED REVOLVING CYLINDER INTERNAL COMBUSTION MOTOR.

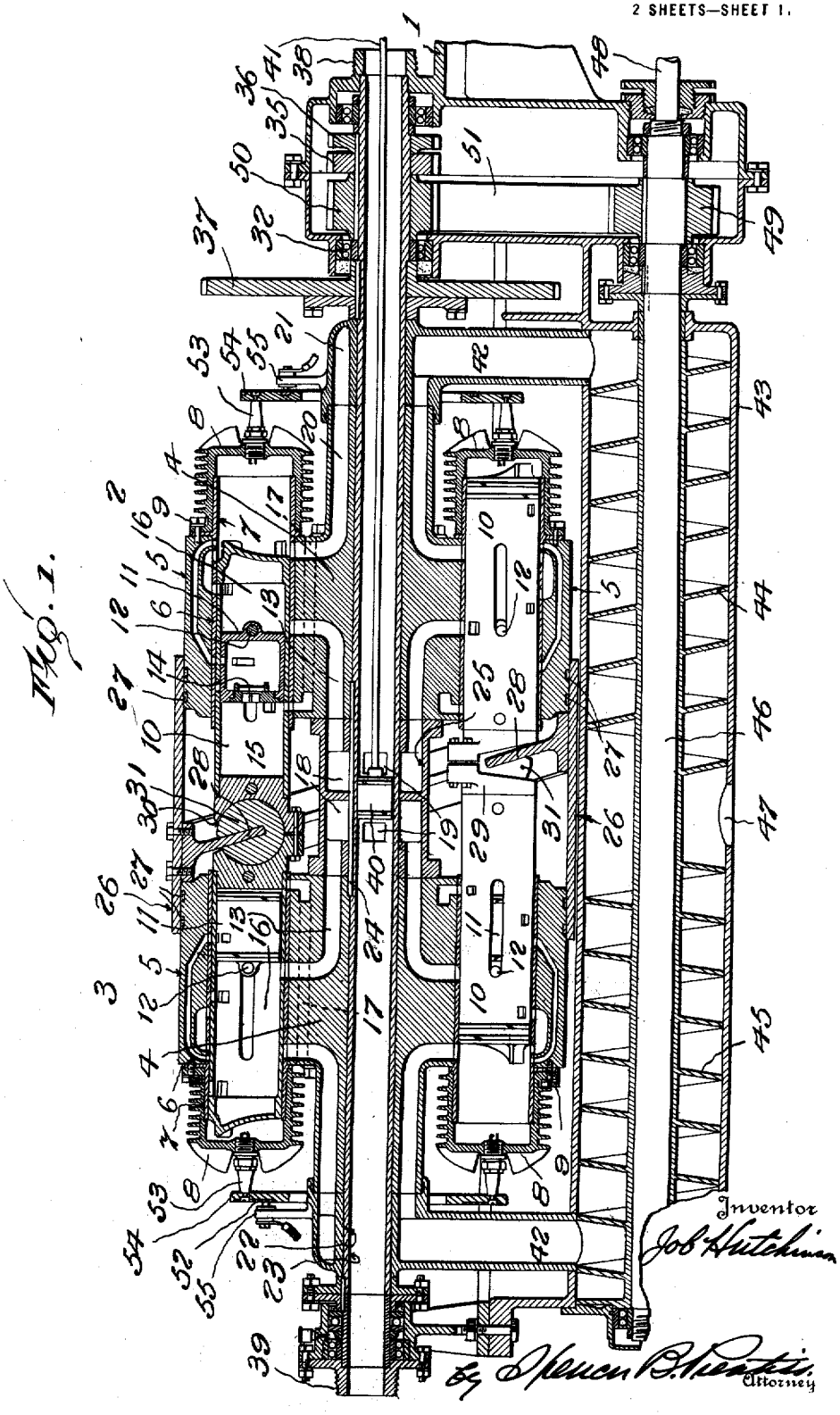
APPLICATION FILED AUG. 21, 1917.

1,321,045.

Patented Nov. 4, 1919.

2 SHEETS—SHEET 1.

Fig. 1.



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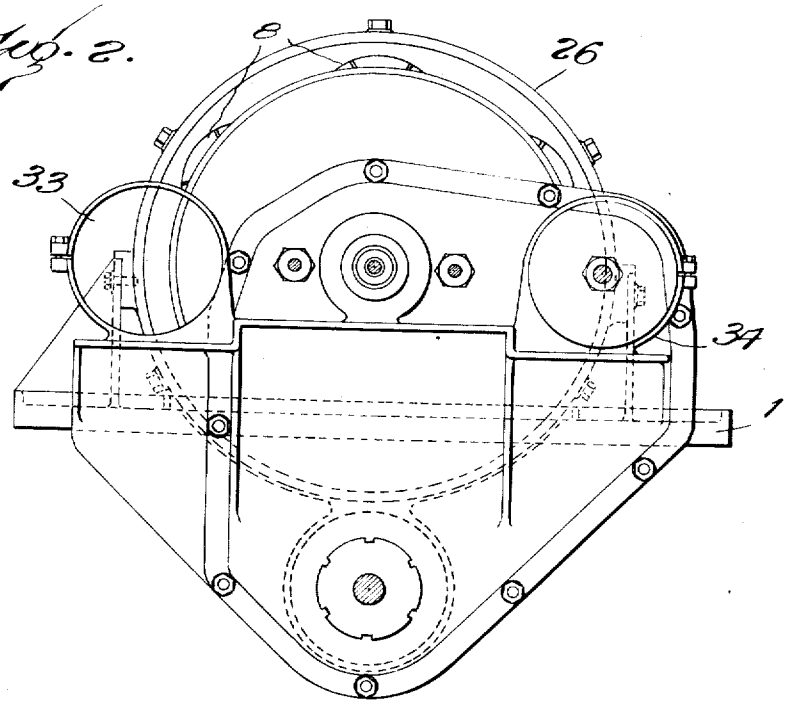
2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

JOB HUTCHINSON, OF BROOKLYN, NEW YORK.

OPPOSED REVOLVING-CYLINDER INTERNAL-COMBUSTION MOTOR.

1,321,045. Specification of Letters Patent. Patented Nov. 4, 1919.

Application filed August 21, 1917. Serial No. 187,433.

To all whom it may concern:

Be it known that I, JOB HUTCHINSON, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented new and useful Improvements in Opposed Revolving-Cylinder Internal-Combustion Motors, of which the following is a specification.

My invention relates to internal combustion motors, and particularly to that type known as revolving cylinder motors in which a plurality of cylinders are mounted for common revoluble movement.

The objects of the invention are to utilize the principle of my new two-cycle motor, fully described in my application for patent filed July 28, 1917, S. No. 183,229, in the construction of a revolving cylinder motor having none of the objectionable features of this type of motor heretofore produced; to eliminate many of the structural complications of the present motor plants; to provide a motor which has no water cooling apparatus, no crank shaft, no timing gears, and no exhaust and intake manifolds in the generally understood meaning of these terms. Further, to provide a revolving cylinder motor having a plurality of cylinders and operating on the two-cycle principle in which an impulse occurs at each reciprocation of the piston in a given direction; in which the cylinders are cooled partly by the radiation of heat from the outer surfaces to the surrounding air, and partly by fresh air supplied under pressure to the combustion chamber of each cylinder at the end of the forward stroke of the piston for the purpose of scavenging and aiding in the cooling of the cylinder; in which there are no valves to be operated, and consequently no cams or cam shaft are necessary; in which the motor as a whole with the accessory parts is mounted in a compact and efficient organization the various parts of which are readily accessible for the purpose of adjustment and for repairs to and replacement of parts; in which the revolving cylinder construction is perfectly balanced and the cylinders of the construction are arranged in sets individual units of which are opposed to each other so that vibration due to the cylinder impulses is reduced to a minimum; in which the incoming charge for the cylinders will be warmed by the exhaust gases; and in which the exhaust gases are disposed of in such a manner that the exhaust is muffled and at the same time back pressure in the cylinder is reduced.

With these and other objects which will more fully hereinafter appear, the invention consists in the novel construction and arrangement and combination of parts of an internal combustion motor hereinafter described and claimed, and illustrated in the accompanying drawings, in which drawings—

Figure 1 is a central longitudinal section through the motor, one of the cylinders in the upper portion of the figure being shown in full section and the other cylinder in the upper portion of the figure being shown in part section, with respect to the piston, while the cylinders shown in the lower portion of the figure are shown in section but the pistons are in elevation;

Fig. 2 is a view in end elevation, looking in the direction from right to left in Fig. 1.

Referring to the drawings, 1 represents the base upon which the various parts are mounted. Mounted for common revoluble movement upon the base are a plurality of motor units arranged in two sets, designated respectively 2 and 3, the units of each set being disposed parallel to the axis of revolution and arranged symmetrically about said axis. I have illustrated each set as comprising six units so that the motor is a twelve-cylinder motor, the axis of rotation being horizontal. As the construction and grouping of each set of motor units is the same, a description of one set will apply to both.

Each set of units is made up of or comprises a casting block 4 which is formed cylindrical upon its outer surface 5 and is provided with cylinder chambers each of which constitutes the greater portion of its cylinder. The cylinder chamber is provided with a cylinder lining sleeve 6 which snugly fits the chamber and extends outwardly

therefrom as shown at 7. A detachable head 8 provided with heat radiating fins fits over the projecting end of the sleeve 6 and both are secured to the casting block 4 by means of bolts 9.

These motor units upon the revolving casting block are those disclosed in my pending application S. No. 183,229 filed July 28, 1917, where the construction is fully described. This construction will however be briefly described here for a better understanding of the combination as a whole. Within the cylinder as thus constituted is located a hollow piston 10 which is of sufficient capacity to provide a space for a fixed abutment 11 within the same, this abutment being anchored to the casting by pin 12. This fixed abutment 11 is hollow and constitutes an initial air compression chamber which communicates by a port 13 having a check valve 14 with the confined space 15 below the abutment which constitutes the initial air compressing chamber. Above the abutment within the hollow piston is the initial charge compression chamber 16. The casting block 4 is formed with suitable inlet and exhaust conduits, these comprising a charge inlet conduit 17 which communicates with annular charge chamber 18 to which the charge is admitted through ports 19. The exhaust conduits 20 communicate with an annular exhaust chamber 21.

Centrally the casting block 4 is provided with a charge admission conduit 22 within which is located the hollow shaft 23, to which shaft both of the casting blocks are secured by a key 24, or in any other suitable manner.

The casting blocks are connected together by a central casting 25 which is also keyed to the hollow shaft and in which is formed the annular chambers 18, these chambers communicating through channels registering with inlet channels 13 with the cylinders of their respective set of units.

Mounted upon the base 1, and surrounding and engaging the adjacent ends of the casting blocks is a connecting shell 26 within which the opposed pistons are connected and operate, and which form the oil chamber of the motor. Felt washers 27 or any other suitable means may be provided for packing the joints between the shell 26 and the respective casting blocks, these joints being merely to prevent the wasting of the oil employed for lubricating the pistons.

Upon the inner surface of the inclosing shell 26 is mounted a fixed abutment which is shown as a flange 28 extending around the interior of the shell and extending into proximity to the pistons. This fixed abutment is inclined at an angle to the axis of rotation so as to provide an oblique surface for the sliding engagement of the pistons therewith. This sliding engagement is preferably effected by means of a ball and socket joint, the socket member of this joint connects the opposing pistons of the respective sets of units as shown at 29, an opening or space 30 in said socket being provided of sufficient width to admit said fixed abutment in all positions of the pistons during their travel around the axis of rotation. The fixed abutment is shown as consisting of a flange or ring extending into said opening or space 30, and having a sliding connection with the ball member 31 of the ball and socket joint which ball member is provided with a slot within which said flange or ring fits. It will thus be seen that the opposed pistons reciprocate together, and as the structure revolves as a whole about the axis of revolution the ball members 31 will oscillate but will always make an efficient sliding engagement with the fixed abutment ring.

The hollow shaft is mounted upon the base by means of suitable roller bearings 32, and the usual auxiliary apparatus may be mounted in any suitable manner such as shown in the drawing, 33 being the mounting for the starter and 34 the mounting for the generator or magneto. 35 and 36 are the gears for operating the magneto and generator, and 37 is the starting gear.

The charge for the set of cylinder units 2 is admitted through connection 38, and the charge for the set of cylinders 3 is admitted through connection 39, these connections being arranged to communicate with two separate carbureters, preferably. The admission of the charge to the respective sets of cylinders is controlled by a valve 40 which controls the ports 19 leading to the respective inlet chambers 18, and this valve is operated by rod 41 to partly or entirely close either set of ports.

The exhaust chambers 21 communicate through conduits 42 with a muffler chamber 43, preferably at each end thereof as shown, reverse spiral conveyers 44 and 45 being arranged within said muffler chamber and mounted upon a common shaft 46 so that when shaft is rotated the progress of exhaust gases from each set of cylinders is hastened toward exhaust outlet 47.

48 indicates the drive shaft of the motor which is to be connected to the clutch if the motor is installed upon an automobile, or to any load to be driven. This shaft is connected by gears 49 and 50 with the hollow shaft 23, and a silent flexible connection 51. When the motor is to be used for a flying machine it may be directly connected to the propeller shaft, and shaft 48 eliminated.

The ignition of the cylinders is effected by means of contact segments 52 connected respectively to spark plugs 53, and mount-

ed upon a ring support 54. Contact brush 55 engages these contact segments 52 and supplies ignition current thereto.

The operation of the motor will be readily understood from the foregoing, but may be briefly described as follows:

In the position shown in Fig. 1 the right-hand upper cylinder and the lefthand lower cylinder are in their extreme outward positions, the combustion chamber of each cylinder being connected to its exhaust conduit 20, and initial compression chamber 16 being connected to the combustion chamber to supply a fresh charge to the latter. As each of these pistons starts upon its inward stroke, air which had been admitted to initial compressing chamber 15 through conduit 56 will be compressed within the initial compression air chamber in fixed abutment 11 by passing the check valve 14, and at the same time the charge will be compressed in the combustion chamber. When the piston reaches the inward limit of its stroke, as illustrated in the upper lefthand cylinder and the lower righthand cylinder in Fig. 1, the charge will be fired by the proper segment 52 coming opposite contact brush 55, and the piston will start upon its outward travel, the air compressed in the air compression chamber in abutment 11 being retained by the check valve. As the piston nears the outward limit of its travel and begins to uncover the exhaust port, it first uncovers the port which admits the air compressed in abutment 11 to the combustion chamber to scavenge and cool said chamber, and it then uncovers the port communicating with the initial charge compression chamber 15 to supply a fresh charge to the combustion chamber as before. It will thus be seen that the motor units operate upon the two-cycle principle and that an explosion or impulse occurs at each revolution of the revoluble member. No compression in the oil chamber is necessary as in the case of the ordinary two-cycle motor, and hence a common chamber for all the cylinders may be employed. The revolving member as a whole is smooth running and practically free from vibration owing to the fact that simultaneous impulses occur in the two sets of cylinders, and the thrust of these being in opposite direction is equalized. Moreover, owing to this feature also there is substantially no longitudinal thrust upon the shaft in either direction.

It will be observed that by providing two carbureters and their connections so that each one may supply its own set of cylinders and controlled as usual, I am enabled to cause the idling or the checking of speed by providing a piston valve inside the hollow shaft to shut off the port supplying either set of cylinders so that the set shut off may idle without wasting gas. Inasmuch as both sets of cylinders are directly connected to each other, the set which is still working will necessarily keep the revolving element in motion.

Inasmuch as the exhaust for each set of cylinders surrounds the supply conduit of the charge, initial heating of the charge is effected which renders it possible to employ kerosene successfully.

As the individual units of each set are fired by current received by their respective contacts at the proper moment, no timing device as ordinarily employed is necessary.

The motor is so mounted upon the base that the entire structure may be readily removed by disconnecting two flanges and without disturbing any of the accessory apparatus. By this arrangement also I am able to operate the rotating exhaust muffler which is conveniently located. With this rotating exhaust muffler, which creates a partial vacuum at the exhaust and thus reduces the back pressure, in combination with the feature of scavenging the cylinders with fresh air, it would seem impossible for the cylinders to choke up at high speed as is the case with the ordinary two-cycle motor.

It is believed that many other features of advantage will be found in the practical use of this motor, one of them being that when employed for driving an automobile the motor is located high in the hood where the parts are readily and conveniently accessible.

While I have described an embodiment of my invention for the purpose of illustration, I do not wish to be understood as limiting myself to the exact details of construction set forth, as many changes may be made without departing from the scope of the invention and all such changes I aim to cover within the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is:—

1. A revolving cylinder motor comprising a base, a shaft journaled in said base, a pair of rotary cylinder units keyed to said shaft whereby the latter acts as a drive shaft, opposed pistons carried by said cylinder units, a shell surrounding the inner ends of said units, and forming a housing for the inner ends of the opposed pistons, and an inclined abutment ring carried by the inner face of said shell and engaged by said pistons.

2. A revolving cylinder motor comprising a base, a shaft journaled in said base, a pair of rotary cylinder units keyed to said shaft, a fixed inclined abutment ring arranged therebetween, opposed pistons carried by said cylinder units, and means for connecting said pistons consisting of a two part connector block having complemental sockets

on the inner face of each member thereof, and a ball mounted in said sockets and having a slot engaging over the edge of said fixed abutment ring.

3. A revolving cylinder motor including a base, a hollow shaft journaled in said base and adapted to constitute a drive shaft and fuel supply conduit, a pair of casting blocks, each including a plurality of cylinder elements, opposed pistons in said blocks, means for connecting said pistons, an abutment ring arranged in an inclined position between said blocks and engaged by said means for connecting the pistons, a driven shaft journaled in said base parallel to said hollow shaft and a driving connection between said two shafts.

4. A revolving cylinder motor including a base, provided with opposite journal portions, a hollow horizontally disposed shaft mounted in said journals and adapted to constitute a fuel supply conduit, said shaft having separate centrally located outlet ports, cylinder blocks keyed to said shaft and having fuel distributing passages, a chambered element arranged between said blocks and establishing communication between said ports in the shaft and said fuel distributing passages, an abutment ring between the blocks, opposed pistons in said blocks and having a connection slidably engaging said ring, and a valve in said hollow shaft for closing one or the other of said ports therein to shut off the fuel supply to all of the cylinders of one block.

5. A revolving cylinder motor including opposed cylinder units having pistons adapted to work against an intermediate abutment ring, and also provided with passages for supplying fuel to the pistons, a hollow shaft supporting said units and having posts for supplying fuel to said fuel passages of the units, and a valve in said shaft for controlling the fuel supply to said units through the ports of the shaft.

6. A revolving cylinder motor including opposed cylinder units having pistons adapted to work against an intermediate abutment ring and also provided with annular fuel supply and exhaust passages, a hollow shaft for supporting said units and keyed therewith, said shaft having ports and adapted to supply fuel therethrough to the said annular fuel supply passages of the units, a valve in said shaft for controlling the ports thereof, and a common exhaust conduit for both units arranged parallel to said shaft and having angularly disposed pipe connections with the exhaust passages of the said units.

7. A revolving cylinder motor including opposed cylinder units having pistons adapted to work against an intermediate abutment ring, a hollow fuel supply shaft keyed to said cylinder units to rotate therewith and constitute the support therefor, an exhaust conduit connected with opposite ends of said units and having a central outlet, a shaft disposed in said conduit and having opposing conveyer flights thereon, and a driving connection between said latter shaft and the rotatable hollow fuel supply shaft.

8. A revolving cylinder motor comprising a base, a plurality of cylinders mounted thereon for common revoluble movement and disposed in two sets, the units of each set being parallel to the axis of revolution and opposed to corresponding units of the other set, inlet and exhaust conduits for said cylinders, a charge supply conduit coincident with the axis of rotation and connected with said inlet conduits to the cylinders, an exhaust chamber for each set of cylinders surrounding said supply conduit and connected with the exhaust conduits of the cylinders, said supply conduit being provided with ports to admit the charge to each set of cylinders, and means for controlling said ports to cut off or restrict the supply of charge to either set of cylinders.

9. A revolving cylinder motor comprising a base, a pair of cylinder blocks revolubly mounted thereon and formed each with a set of cylinder chambers and coöperating inlet and exhaust conduits, the cylinder chambers of one set being opposed to those of the other set, pistons for said cylinders, the pistons of the opposed cylinders respectively being connected together, an inclined fixed abutment between said sets of cylinders for coöperation with said connected pistons, a sliding engagement between the connected pistons and said abutment, said casting blocks being formed with a charge supply conduit communicating with said cylinder inlet conduits, a hollow shaft for said casting blocks forming a continuation of said charge supply conduit, suitable bearings upon the base for said hollow shaft, an exhaust chamber for each set of cylinders communicating with said exhaust conduits, a muffler chamber communicating with said exhaust chambers, and a spiral conveyer within said muffler chamber driven from said hollow shaft for accelerating the exhaust.

10. A revolving cylinder motor comprising a base, a pair of cylinder blocks revolubly mounted thereon and formed each with a set of cylinder chambers and coöperating inlet and exhaust conduits, said cylinder chambers of one set being opposed to those of the other set, said casting blocks being also formed with a central charge supply conduit communicating with said cylinder inlet conduits, a hollow shaft for said casting blocks forming a continuation of said charge supply conduit, suitable bearings upon said base for said hollow shaft, a

driven shaft mounted upon said base below said hollow shaft and designed to be connected to a load, and a flexible drive connection between said hollow shaft and said driven shaft, pistons for said cylinders, the pistons of the opposed cylinders respectively being connected together, an inclined fixed abutment between said sets of cylinders for coöperation with said connected pistons, and a sliding engagement between the connected pistons and the said abutment.

In testimony whereof I have hereunto set my hand.

JOB HUTCHINSON.

Correction in Letters Patent No. 1,321,045.

It is hereby certified that in Letters Patent No. 1,321,045, granted November 4, 1919, upon the application of Job Hutchinson, of Brooklyn, New York, for an improvement in "Opposed Revolving-Cylinder Internal-Combustion Motors," an error appears in the printed specification requiring correction as follows: Page 4, line 42, claim 5, for the word "posts" read *ports;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 17th day of February, A. D., 1920.

[SEAL.] M. H. COULSTON,

Acting Commissioner of Patents.

Cl. 123—43