R. GORDON & B. H. WESTON.

INTERNAL COMBUSTION MOTOR.

APPLICATION FILED APR. 7, 1914.

1,136,121.

Patented Apr. 20, 1915.

4 SHEETS—SHEET 1.

Fig. 1.

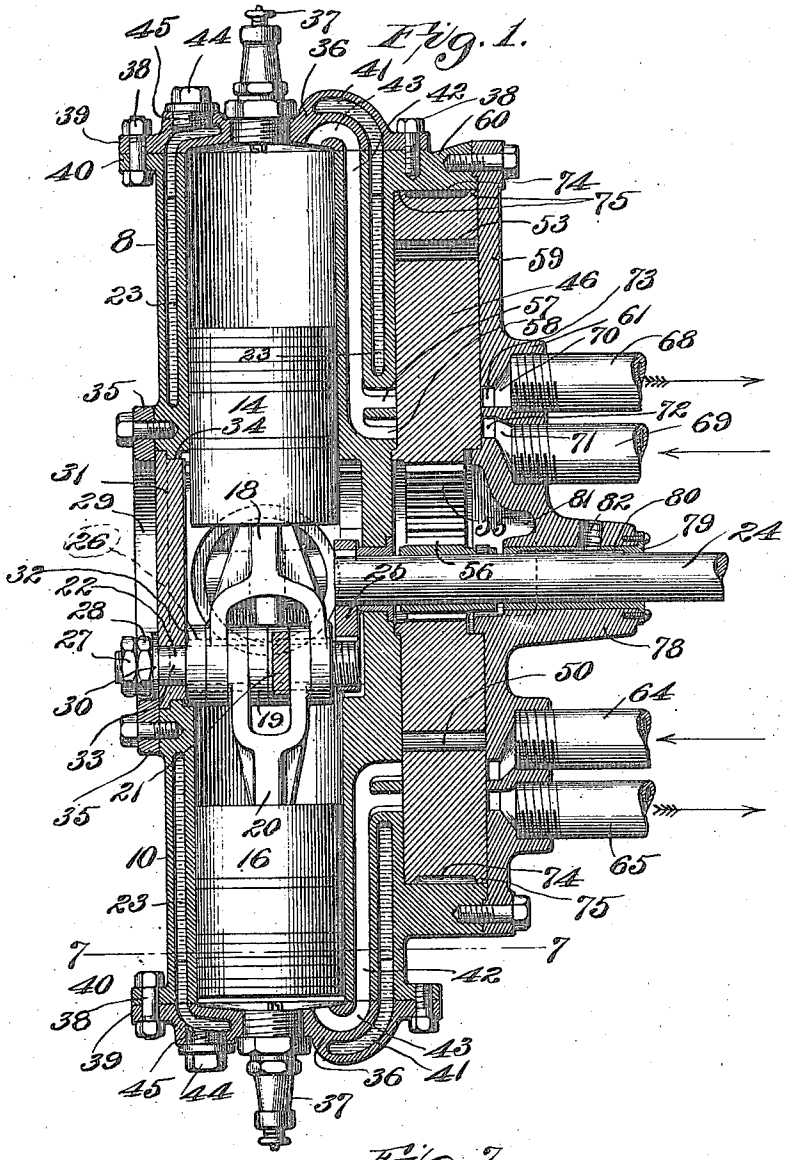
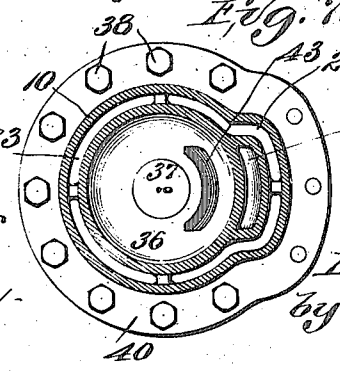


Fig. 7.



Attest:
Wm. H. Scott.
E. L. Wallace.

Inventors:
Robert Gordon,
Burt Horton Weston,
by Arthur C. Eckert,
Atty.

R. GORDON & B. H. WESTON.

INTERNAL COMBUSTION MOTOR.

APPLICATION FILED APR. 7, 1914.

1,136,121.

Patented Apr. 20, 1915.

4 SHEETS—SHEET 2.

Fig. 2.

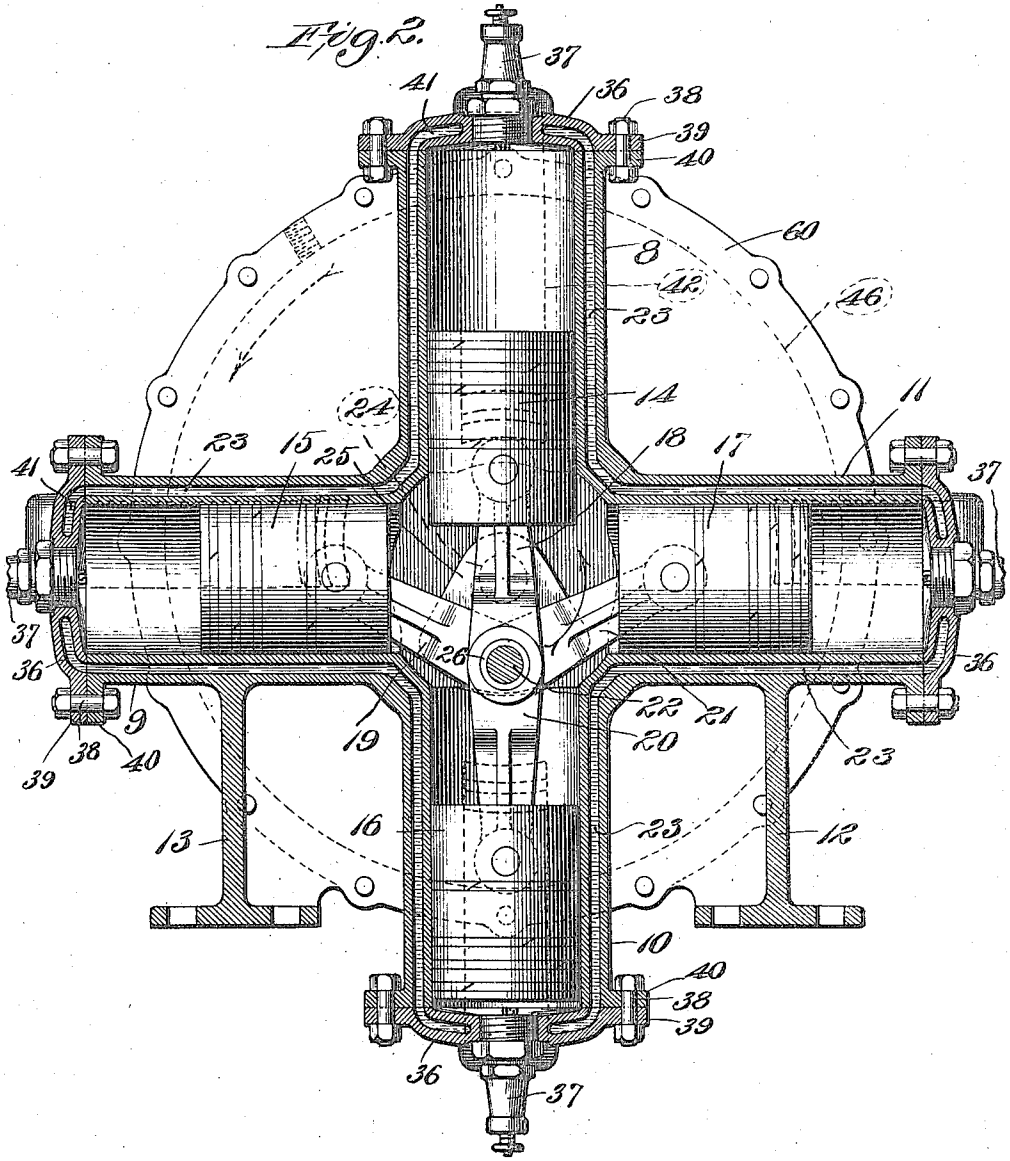
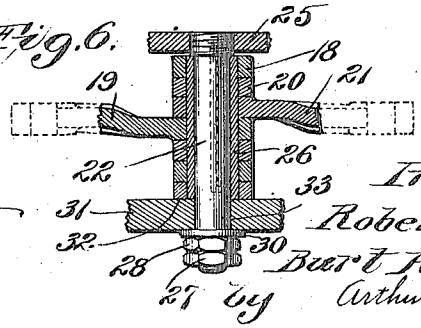


Fig. 6.



Attest:

Wm. H. Scott.

E. L. Wallace.

Inventors:

Robert Gordon,

Burt Horton Weston,

by Arthur C. Eckert.

Atty.

R. GORDON & B. H. WESTON.

INTERNAL COMBUSTION MOTOR.

APPLICATION FILED APR. 7, 1914.

1,136,121.

Patented Apr. 20, 1915.

4 SHEETS—SHEET 3.

Fig. 4.

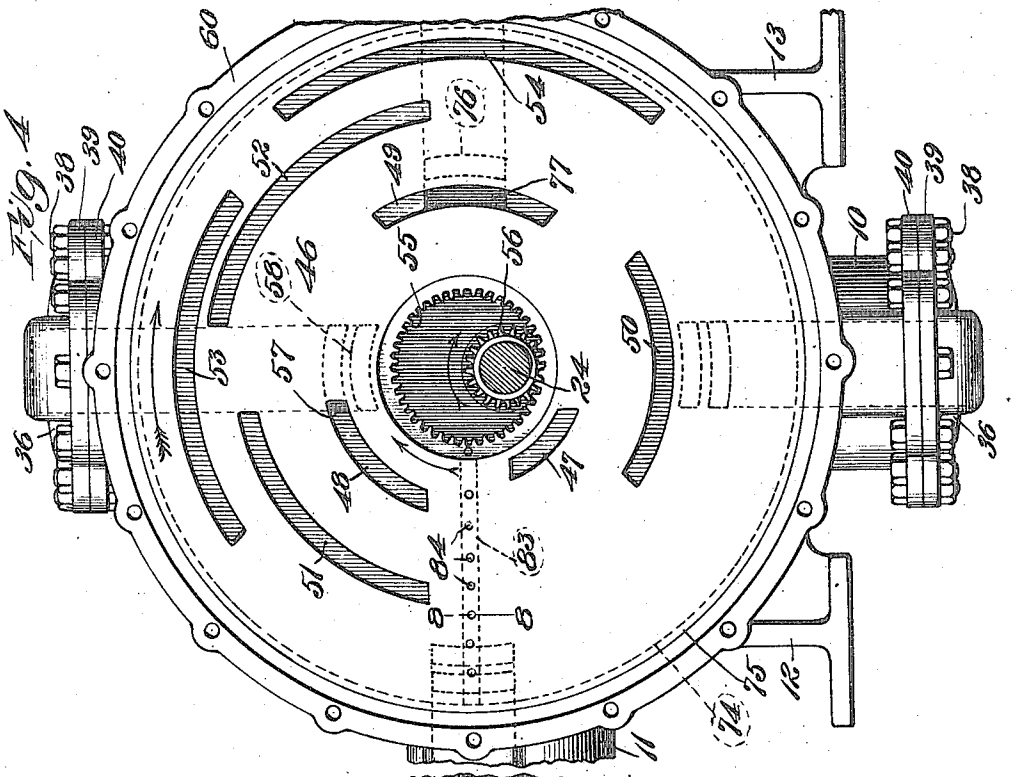
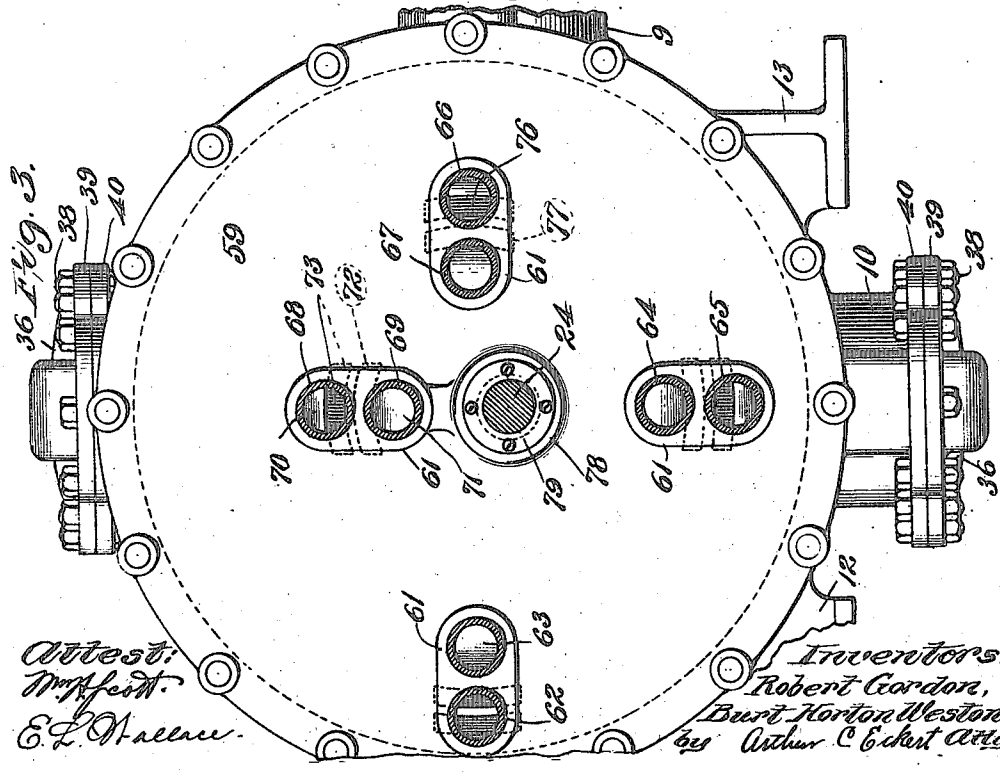


Fig. 3.



Witnesses:
M. M. Scott.
E. L. Wallace.

Inventors:
Robert Gordon,
Brent Norton Weston,
by Arthur C. Eckart Atty.

R. GORDON & B. H. WESTON.

INTERNAL COMBUSTION MOTOR.

APPLICATION FILED APR. 7, 1914.

1,136,121.

Patented Apr. 20, 1915.

4 SHEETS—SHEET 4.

Fig. 5.

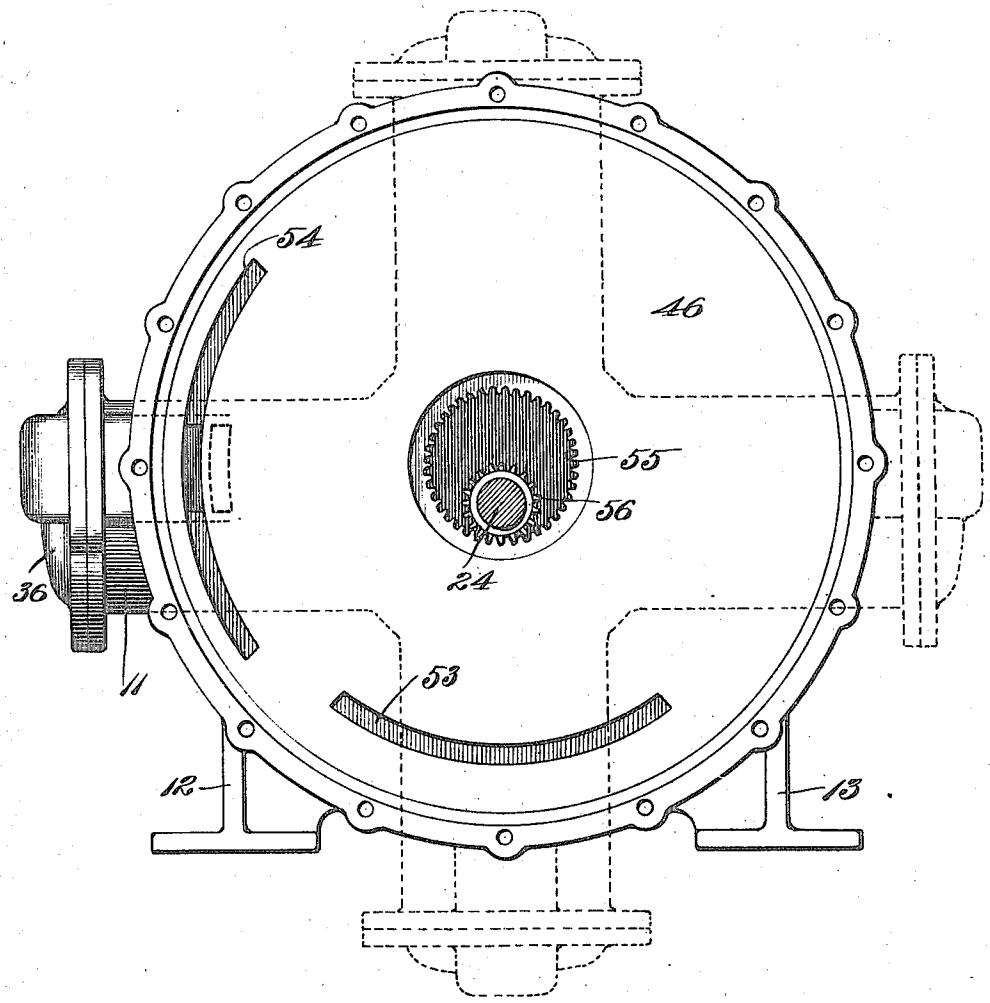
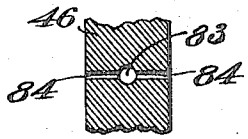


Fig. 8.



Attest:

Wm. H. Scott.

E. L. Wallace.

Inventors:

Robert Gordon

Burt Horton Weston,

by Arthur C. Eckert.

atty.

UNITED STATES PATENT OFFICE.

ROBERT GORDON AND BURT HORTON WESTON, OF ST. LOUIS, MISSOURI.

INTERNAL-COMBUSTION MOTOR.

1,136,121. Specification of Letters Patent. Patented Apr. 20, 1915.

Application filed April 7, 1914. Serial No. 830,254.

To all whom it may concern:

Be it known that we, ROBERT GORDON and BURT HORTON WESTON, citizens of the United States, and residents of St. Louis, Missouri, have invented certain new and useful Improvements in Internal-Combustion Motors, of which the following is a specification containing a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

Our invention relates to improvements in internal combustion motors, and is specially directed to the four cycle type.

The object of our invention is to provide a motor of said class which shall be lighter, cheaper in construction, have fewer parts and be more perfectly balanced mechanically and more efficient in operation than motors of said type heretofore constructed.

A more specific object is to operate a plurality of cylinders by means of a single valve disk, to have the disk act as a flywheel, and to prevent loss of gas compression.

A further object of our invention is to provide a system of lubrication for the above recited valve disk.

A still further object is to replace the conventional crank shaft with a pin, and sleeve protection for said pin.

With the above purposes in view, our invention consists in certain novel features of construction and arrangement of parts as will be hereinafter more fully described, pointed out in the claims and illustrated by the accompanying drawings, in which:

Figure 1 shows a vertical section through the center of the motor; Fig. 2 is a vertical section through the center of the motor, taken at right angles to Fig. 1; Fig. 3 is an end elevation showing the location of inlet and exhaust pipes, the shaft and pipes being shown in section; Fig. 4 shows an end elevation, with cheek removed, the shaft being shown in section; Fig. 5, which is the same as Fig. 4, with the exception that it shows only one set of apertures, is an end elevation with cheek removed, the shaft being shown in section, with the exhaust and admission ports of one cylinder shown for the purpose of facilitating the disclosure; Fig. 6 shows a section through the crank pin and sleeve around it, showing the means of connecting the piston rod to said sleeve; Fig. 7 shows a sectional plan taken on the line 7—7 of Fig. 1, the piston being removed; and Fig. 8 is a fragmentary section taken on the line 8—8 of Fig. 4.

Referring by numerals to the accompanying drawings: 8—9—10—11 designate four cylinders cast *en bloc*, the entire motor being supported on the stands 12 and 13. The pistons 14—15—16—17 are shown in position with their respective piston rods 18—19—20—21 connected to the crank pin 22. The cylinders are water jacketed in the conventional manner by the jacket 23.

24 designates the shaft and 25 the crank which is keyed or otherwise firmly secured to the shaft 24, and also to the crank pin 22. The crank pin 22 is surrounded on its bearing portion by a sleeve 26. To this sleeve, the crank ends of the piston rods are revolubly attached.

It will be seen that our motor obviates the necessity of using a crank shaft of the conventional type in which the wearing of one journal or point of motional contact necessitates the replacing of the entire expensive drop forging which constitutes the prevalent crank shaft. All our piston rods rotate on a sleeve covering one crank pin, the sleeve bearing the entire wear. Whenever this sleeve becomes worn, it may be simply and inexpensively replaced, and at no time is the crank pin subjected to wear.

To prevent the crank pin 22 from whipping in space and pounding on the side opposite crank 25, the pin 22 is journaled on this side. Pin 22 terminates in threads on this side on which are screwed two nuts 27 and 28. With the circular movement of the pin 22, nut 28 moves in a circular race way 29, a washer 30 separating it from the disk 31. By means of these nuts and washer and the shoulder 32, the journal end 33 of pin 22 moves in a vertical plane during its entire circular orbit. The disk 31 revolves in the seat 34, the disk being held in position by the flange or ring 35. 33 is free to rotate in its journal in disk 31.

The cylinder heads 36, with the conventional spark plugs 37, screwed in the center, are secured to the ends of the cylinders by means of bolts 38 passing through the flanges 39 and 40 of the cylinder head and cylinder body respectively. The water jacket 41 of the head is made to register with the water jacket 23 of the cylinder. The passage 42 in the cylinder registers with the passage 43 in the cylinder head.

44 is a plug screwed into the water jacket of the cylinder head.

Through the opening 45, the water jacket is supplied with water.

46 designates a disk valve with arcuated apertures 47—48—49—50—51—52—53—54. The disk is connected to the shaft 24 by means of the internal gear 55 and the pinion 56, the pinion being non-rotatively secured to the shaft 24, as shown, its teeth meshing with the teeth of the internal gear 55, which is made integral with the disk 46. With the rotation of the shaft 24 the pinion 56 rotates with it, causing gear 55 and hence disk 46 to rotate. The gear ratio between gears 55 and 56 can be made any desired value. In the gears shown this ratio is made ½; *i. e.*, the disk rotates half as fast as the shaft.

42 designate passage ways, which place the cylinders in communication with the ports 57 and 58, which lead to the face of the disk 46.

59 designates a cheek or plate secured to the annular rim 60 of the cylinder casting. Into the flanges 61 on this cheek are screwed pipes 62—63—64—65—66—67—68—69. These pipes are placed in communication with the passage ways 70 and 71 which terminate in the ports 72 and 73 at the face of the disk 46.

74 designates a continuous groove in the periphery of the disk 46, arranged to contain lubricant as later described. 75 designate shoulders on the sides of said groove.

The cycle of operation for one cylinder is as follows: Consider cylinder 9 and piston 15. Start with the piston at the head end. As the piston moves toward the crank end, aperture 49 registers with port 77 admitting the fuel mixture into the cylinder; port 76 is now closed. When the piston returns on its compression stroke, both apertures 49 and 50 have moved in a clock-wise direction through an arc of 90°; both exhaust port 76 and admission port 77 are now therefore closed. The piston having now reached its head end on the compression stroke, the explosive mixture is ignited by a spark from the spark plug 37. Both exhaust and admission ports still remain closed. As the piston moves to the crank end on its power stroke, the disk rotates through ninety additional degrees, both exhaust and admission ports remaining closed. When the piston again starts back on the fourth phase of its cycle, aperture 50 registers with port 76, port 77 remains closed, the burnt gases are forced out of the cylinder through port 76 and the cylinder is thoroughly scaveneged. The gases in their ingress and egress from the disk apertures pass through the pipes 63 and 62 respectively. The pipe farthest from the horizontal center line of the motor is always the exhaust pipe for the particular cylinder with which it communicates, in the form of motor shown.

All cylinders operate on the above described cycle. The cylinders shown are of the opposed type. The direction of revolution of the crank pin is indicated by the arrow in Fig. 2.

The relative movement of pistons may be explained as follows: When piston 14 is at the crank end of the stroke pistons 15 and 17 are half way to the ends of their stroke, and piston 16 is at the head end of its stroke. The order in which the explosions take place is 14, 16, 17, 15.

It is to be noted that the arcuated apertures in the valve disk are at varying distances from the center of the disk, as are the cylinder ports from the center of the motor. This must necessarily be so, since two apertures are needed for each cylinder, each cylinder operating by a separate set of apertures. Since the outer portion of the disk moves more rapidly than the inner portion, the arcuated apertures near the periphery must be longer than those near the center in order to have each phase of the cycle of each cylinder to take place in the same time interval, and to secure correct timing of the cylinders with respect to each other.

It will be observed that the cheek or plate 59 forms a unitary housing for each set of exhaust and inlet pipes for all the cylinders. In its center and surrounding the shaft 24 is a hub 78. A sleeve 79 with a cavity 80 is placed between hub 78 and shaft 24.

81 represents an oil well and 82 a filling opening which is internally threaded and adapted to receive an oil cup. 82 communicates with cavity 80.

The lubrication of the motor is of the force feed centrifugal type, the valve disk continually running in oil, the path of the lubricant being as follows: The oil enters through the filling opening 82, passes to the cavity 80, thence to the oil well 81, then toward the periphery of the disk through the bore 83 and thence through the oil holes 84 to the disk faces. This valve disk being thoroughly lubricated, all portions being subjected to approximately the same amount of heat, will not warp or lose its shape, and hence the cylinders will not lose their compression due to leakage around the disk. The disk being geared to the main shaft acts as a flywheel for the motor, and if made of sufficient weight may entirely supplant the conventional flywheel or substantially decrease both the size and weight of a flywheel, if a flywheel is deemed necessary.

We do not wish to be limited to the position or type of cylinders shown, since our valve will act equally well if the cylinders are all placed in a row or rows, the cylinder ports being then connected to the disk by means of pipes or manifolds.

This valve can be used in place of an ordinary D slide valve on a steam chest or as a valve in a pump.

Our disk valve divides the valve trouble on a motor of the conventional type by the number of cylinders and can be used efficiently with any number of cylinders.

We claim:

1. An engine comprising cylinders having intake and exhaust ports, supply and exhaust pipes of like number with said ports, and a valve interposed between said ports and pipes having openings therethrough of like number with said ports and pipes, said openings and said ports so arranged that each valve opening registers with but one inlet or exhaust port, and to cause all the established communications to be of equal time lengths.

2. In combination with a plurality of cylinders in arcual arrangement, each cylinder having an intake and an exhaust port and each port being spaced from a common center differently from the remaining ports, a plurality of supply and exhaust pipes of like number and arrangement with said intake and exhaust ports and a disk revolubly mounted between said ports and pipes, and having therein a plurality of openings of unequal arcual lengths and each opening being spaced differently from a common center whereby the duration of communication between the various ports and pipes is equalized and each port is in direct communication with but one inlet or exhaust pipe.

In testimony whereof, we have signed our names to this specification, in presence of two subscribing witnesses.

ROBERT GORDON.
BURT HORTON WESTON.

Witnesses:
E. L. Wallach,
R. G. Orwig.