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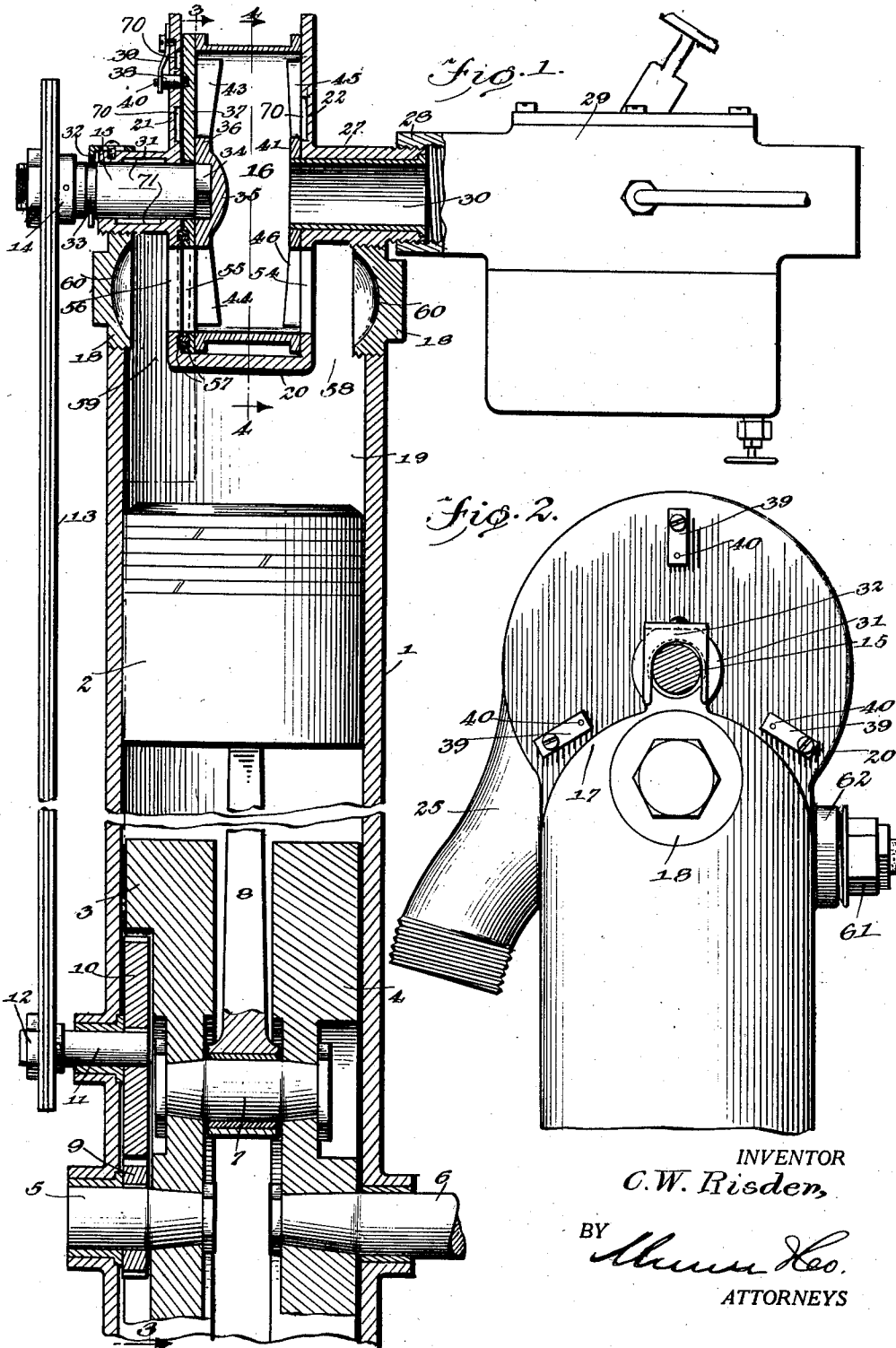
1,572,085

C. W. RILDEN

VALVE

Filed Nov. 22, 1923

2 Sheets-Sheet 1



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VALVE

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2 Sheets-Sheet 2

Fig. 3.

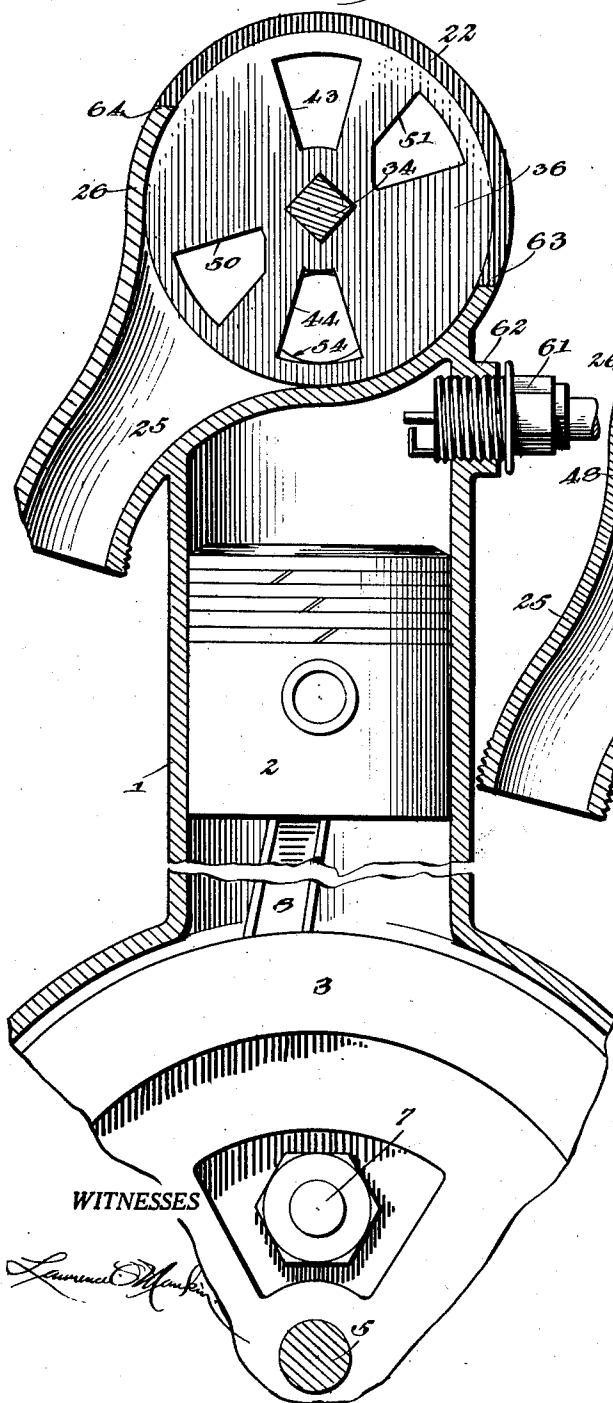
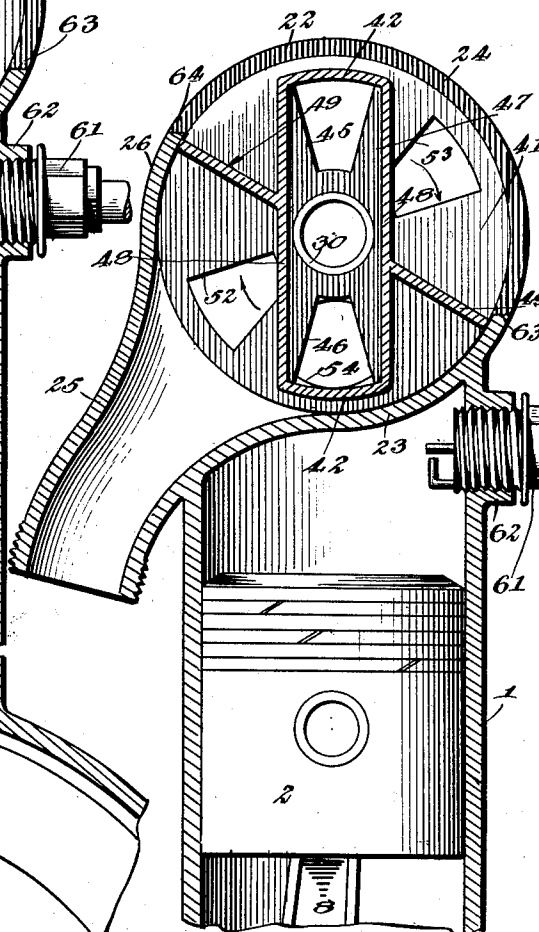


Fig. 4.



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VALVE.

Application filed November 22, 1923. Serial No. 676,377.

To all whom it may concern:

Be it known that I, CHARLES WILLIS RISDEN, a citizen of the United States, and a resident of Hollywood, in the county of Los Angeles and State of California, have invented certain new and useful Improvements in Valves, of which the following is a specification.

This invention relates to valves and more particularly to a rotary valve for use in internal combustion engines.

An object of the invention is the provision of a rotary valve through which the exhaust gases are discharged and through which the combustible mixture is drawn to the combustion chamber whereby the temperature of the mixture is raised by the absorption of heat by the valve with the consequent cooling of said valve.

Another object of the invention is the provision of a rotary valve which controls the exhaust and the flow of combustible mixture to the engine, the valve being so constructed as to operate as a fan to scavenge the valve casing and the combustion chamber, and to introduce fresh air to the burning gases before they are discharged, thereby lessening the noise in the exhaust and eliminating the use of a muffler.

A further object of the invention is the provision of a rotary valve which is partially exposed to the atmosphere and which operates as a fan whereby said valve is cooled.

A still further object of the invention is the provision of a hollow rotary valve partially enclosed within a casing and having ports varying in sizes with the ports in the casing for effecting a differential balancing of the valve under varying conditions of the forces acting on said valve.

Another object of the invention is the provision of a rotary valve and a baffle plate cooperating with a side wall of the valve to aid in maintaining the valve leak-proof and for aiding in balancing the valve under varying conditions of the forces acting on the valve.

This invention will be best understood from a consideration of the following detailed description, in view of the accompanying drawings forming a part of the specification; nevertheless it is to be understood that the invention is not confined to the disclosure, being susceptible of such changes and modifications which shall define no material departure from the salient features of

the invention as expressed in the appended claims.

In the drawings:

Figure 1 is a vertical section of an engine showing my improved valve applied to the same.

Figure 2 is a fragmentary view in side elevation of the valve as applied to an engine.

Figure 3 is a vertical section of the engine and valve taken along the line 3—3 of Figure 1.

Figure 4 is a vertical section of the valve and engine taken along the line 4—4 of Figure 1.

Referring more particularly to the drawings, 1 designates an engine cylinder in which is reciprocated a piston 2. A pair of fly wheels 3 and 4 are connected respectively with shafts 5 and 6. A crank pin 7 connects the piston rod 8 with the fly wheels 3 and 4, the pin being eccentrically mounted relative to the shaft 6.

A gear 9 keyed to shaft 5 is in mesh with a gear 10 mounted on a countershaft 11. A sprocket 12 rigidly secured to the shaft 11 drives a chain 13 which in turn drives a second sprocket 14. Sprocket 14 is rigidly connected on the outer projecting end of a counter shaft 15 adapted to drive a valve generally designated by the numeral 16.

The upper end of the cylinder 1 is closed by a curved head 17 and is provided with diametrically disposed threaded openings in which are screwed plugs 18 for the ready inspection of the interior of the combustion chamber 19.

A valve casing 20 is mounted centrally of the head 17 and has a portion projecting downwardly into the combustion chamber 19. The side walls 21 and 22 are connected respectively by a curved rim 23 as shown more particularly in Figures 3 and 4. The upper end of the valve casing is shown as having an open top whereby the portion of the valve which is located adjacent this portion is exposed to the atmosphere.

The valve casing 20 is in open communication with an exhaust pipe 25 which is integrally formed with the casing and extends downwardly therefrom and at the rear of the cylinder 1. One end of the exhaust conduit merges into the curved portion 26 which is integrally formed with the walls 21 and 22 of the casing and forms the rear exposed wall of said casing. The valve casing 22 is

provided with an axial and tubular extension 27 having a threaded outer end projecting beyond the wall of the cylinder 1 and engaged by a threaded union 28 connected with the carbureter 29. Located within the tubular member 27 is a sleeve 30 which extends from the outer end of the tubular member 27 and projects into the valve 16.

The wall 21 is provided with a tubular extension 31 which forms a bearing for the shaft 15. A fork 32 engaging a groove 33 in the shaft 15 is rigidly connected with the sleeve 31 and maintains the shaft 15 within its bearing but permits a slight play of the shaft longitudinally of the bearing 31.

The inner end of the shaft 15 is squared as shown at 34 and received in a squared opening in a hub 35 formed on the inner face of one side 36 of the valve 16.

The shaft 15 extends through a central opening in a baffle 37, said baffle being spaced at least a 32nd of an inch from the inner face of the wall 21 of the casing 20 and is maintained against rotation by means of spring pressed lugs 38 passing through perforations in the side wall 21 and engaging notches in the outer face of the baffle 37. Springs 39 secured to the outer face of the wall 21 are perforated to receive the outer reduced ends 40 of the lugs 38. As shown in Figure 2, these springs and lugs are spaced at predetermined points adjacent the periphery of the wall 21 of the casing 20.

The valve 16 has a second wall 41 spaced from the wall 36. It will be noted from Figure 1 that wall 36 of the valve has a greater thickness than wall 41. The valve 16 is substantially rectangular in cross section and is provided at its upper end with a valve port 43 in the wall 36 and a valve port 44 at the bottom of said wall. The wall 41 of the valve 16 is provided with a port 45 at its upper end and a port 46 at its lower end.

An elongated chamber 47 is formed centrally of the valve and is embraced between the two side walls 36 and 41, two transverse walls integrally connected with the side walls and top and bottom walls 42 connected to the walls 48 and the side walls 36 and 41. These walls form the intake chamber 47 of the valve which is in communication with the sleeve 30 and the carbureter 29. Ribs or vanes 49 are integrally formed with the transverse walls 48 and the side walls 36 and 41 and are located in a diameter of the circular valve 16. These vanes are located at an acute angle to the plane running longitudinally centrally of the chamber 47 and divide the valve into two portions forming the exhaust chambers of the valve. The side wall 36 of the valve 16 in the lower portion of the exhaust chamber of said valve, is provided with a port 50 while the upper portion is provided with a

port 51. The side wall 41 of said valve is provided with an exhaust port 52 in its lower portion and an exhaust port 53 in its upper portion.

The intake ports 46 and 45 and exhaust ports 52 and 53 in the side wall 41 are adapted to aline with a port 54 in the side wall 22 of the valve casing 20 while intake ports 43 and 44 and exhaust ports 50 and 51 are adapted to aline at certain times with the port 55 in the lower portion of the baffle 37 and with a port 56 in the lower end of the side 21 of the valve casing. The ports 55 and 56, respectively, of the baffle and the side 21 of the casing are in continuous alinement.

The baffle 37 and the side plate 21 of the casing 20 are provided with alined annular grooves surrounding the ports 55 and 56 and are equipped with a pair of packing rings 57 in order to seal the ports against escape of fluid. Connected with the port 54 of the side 22 of the valve casing is a tubular member 58 formed integrally with the inner wall of the head 17 of the cylinder 1, the passage therethrough being oval-shaped in cross section. A second conduit 59 similar in shape and construction to the conduit 58 is in open communication with the ports 56 and 55 and is also formed integrally with the cylinder head.

The plugs 18, as shown in Figure 1, extends sufficiently inward of the cylinder walls of the engine in order to be screwed into a threaded opening in the conduits 58 and 59. The inner ends of the plugs 18 are dished out in order to provide sufficient space in the conduits 58 and 59 to permit the ready flow of the exhaust gases from the combustion chamber and the flow of combustible mixture to said chamber. The dished shaped portions 60 of the plugs will tend to cause the combustible mixture, when entering the engine, to be directed towards the center of the combustion chamber past the lower end of the valve casing 20.

The area of the ports 44, 43 and 55 is greater than the area of the housing ports 54 and 56 and the valve ports 45 and 46. The difference in the areas will tend to reduce the pull on valve 16 towards the left during the intake or suction stroke since the greater area of the surface of the side 41 will be exposed to port 54 than of the surface of wall 36 of the valve through port 56. The action of the negative pressure on the wall 41 will tend to cause said wall to hug the inner face of the wall 22 of the housing while during the compression cycle the limited space between the wall 21 of the housing and the baffle 37 embraced by the rings 57 exposes a greater area of the baffle 36 to the compression chamber which will have the effect of forcing the baffle plate in snug engagement with the wall 36 of

the valve and likewise tending to cause the wall 41 of the valve to have a snug engagement with the inner face of the wall 22 of the housing. During the neutral period in which neither the compression nor the suction stroke are in evidence the springs 39 will tend to force the lugs 38 inwardly and raise the baffle plate 37 to engage the side wall 36 of the valve. It will be seen by the differential construction of the areas of the various ports and the area of the surface of the baffle 37 embraced by the rings 57 which is exposed to the pressure within the combustion chamber, that an unbalanced condition is provided for the valve for a proper operation of said valve.

The operation of my device is as follows:

When the piston 2 is reciprocated within the cylinder 1 on the suction stroke, the mixture is drawn from the carbureter 29 through the sleeve 30 to the interior of the valve which is embraced in the elongated chamber 47. The valve is rotated through the chain 13 and countershaft 15 in the ratio 1:4. In other words, the valve is rotated once to every four revolutions of the crank shaft. When port 44 aligns with ports 55 and 56, respectively, in the baffle and housing and simultaneously with the alinement of the port 46 with the port 54 in the housing, the mixture is drawn into the combustion chamber 19 upon the downward stroke of the piston 2. Upon the up stroke of the piston the rotation of the valve has closed ports 54 and 56 and the mixture is compressed. At the end of the compression stroke the mixture is fired by means of the usual spark plug 61 threaded into an opening in a boss 62. Adjacent the ends of the firing stroke, the port 53 aligns with a port 54 while port 51 aligns with ports 55 and 56 and upon the up stroke of the piston 2 the burnt gases are forced upwardly through the conduits 58, and 59 through the respective ports and into the exhaust portions of the chamber in the valve 16. The side walls 48, and the vanes 49 being open to the atmosphere at the time of the intake stroke are exposed to the atmosphere and are thereby cooled. As soon as the lower vane 49 passes the end 63 of the lower portion 23 of the valve casing, the lower vane 49 and the side wall 48 tend to force fresh air into the valve casing and which is mixed with the burnt gases when the lower vane 49 opens into said exhaust conduit 25. The vanes 49 and the side walls 48 of the chamber 47 act as a fan for constantly driving fresh air into the exhaust conduit 25 to be mixed with the burnt gases and thereby eliminate noise during the exhaust period. Furthermore, the valve with its variously exposed parts not only operates as a fan for driving fresh air into the exhaust conduit 25 but aids in cooling

the valve. The upper portion of the valve housing, as shown at Figure 4, is cut off at 64 so that at least one-half of the valve is always exposed to the atmosphere between the points 63 and 64 on the housing.

Each valve port is in the shape of the sector of a circle and is equal to substantially 25° so that during rotation of the valve the valve must move through substantially 25° to fully open the intake ports while the valve rotates to 25° more to close the ports. Each pair of the alined exhaust ports 52 and 53, 50 and 51 require 57° to open and close the same. The compression stroke extends through the period covered by 37° of rotation while the power impulse extends over 34° . The other pairs of alined exhaust ports and intake ports require a similar degree of revolution for opening and closing, together with the compression and power impulses to complete the second half of the revolution of the valve.

A positive oiling system is eliminated by the employment of graphite inlays 71 and 70 in the bearing surfaces of the respective driving shaft and valve for lubrication purposes and which under normal conditions will outlast the construction of the engine.

What I claim is:

1. In an internal combustion engine, the combination of a cylinder having an integrally formed head, a valve housing formed integrally with the head and having its lower end projecting into the combustion chamber of the cylinder, an exhaust conduit in open communication with the housing, said valve housing where projected beyond the cylinder head being open to the atmosphere and provided with ports in the side walls of the housing where projecting into the combustion chamber, a rotary valve mounted in the housing and having a pair of annular side walls spaced from each other, an elongated intake chamber formed centrally and integrally with the walls and connecting the walls together, vanes connected to the side walls and to the walls of the intake chamber and located radially of the circular valve, a hollow sleeve connecting the interior of the intake chamber with the exterior of the cylinder, pairs of diametrically disposed ports through the side walls of the valve and opening into the intake chamber, and pairs of diametrically disposed exhaust ports formed in the spaced walls of the valve and located exteriorly of the intake chamber, the exhaust ports and the intake ports adapted to align with the alined ports in the bottom of the valve housing, and a baffle plate disposed between one wall of the housing and a wall of the valve and provided with a port alined with the adjacent port in the wall of the housing, a shaft connected with one wall of the valve, and means adapted to be rotated for

rotating the valve, the valve housing being open at its outer end whereby the valve is exposed directly to the atmosphere.

2. In an internal combustion engine, a cylinder provided with a cylindrical valve casing, said casing having a portion exposed directly to the atmosphere and a portion projecting into the combustion chamber of the cylinder and provided with ports opening into the cylinder, a hollow valve mounted for rotation within the casing and provided with spaced ports in its walls adapted to align at predetermined intervals with the ports in the casing, said casing having its upper exposed end open whereby the valve is exposed directly to the atmosphere.

3. In an internal combustion engine, a cylinder provided with a cylindrical valve casing, said casing having a portion exposed to the atmosphere and a portion projecting into the combustion chamber of the cylinder and provided with ports opening into the cylinder, a hollow valve mounted for rotation within the casing and provided with spaced ports in its walls adapted to align at predetermined intervals with the ports in the casing, certain of the ports in the casing having a greater area than the ports in the valve aligning with said ports in the casing, said casing having its upper exposed end open whereby the valve is exposed directly to the atmosphere.

4. In an internal combustion engine, a cylinder provided with a cylindrical valve casing, said casing having a portion exposed to the atmosphere and a portion projecting into the combustion chamber of the cylinder and provided with ports opening into the interior of the cylinder, a circular baffle plate having port alining with the ports in the casing and in juxtaposition with one end of the cylindrical casing, a valve mounted in the casing and having ports adapted to align with the ports in the casing and the baffle plate, said casing having its upper exposed end open whereby the valve is exposed directly to the atmosphere.

5. In an internal combustion engine, a cylinder provided with a cylindrical valve casing, said casing having a portion exposed to the atmosphere and a portion projecting into the combustion chamber of the cylinder and provided with ports opening into the interior of the cylinder, a circular baffle plate having port alining with the ports in the casing and in juxtaposition with one end of the cylindrical casing, a valve mounted in the casing and having ports adapted to align with the ports in the casing and the baffle plate, and means for maintaining the baffle plate against rotation and for causing said baffle plate to snugly engage one side of the valve, said casing having its upper exposed end open whereby the valve is exposed directly to the atmosphere.

6. In an internal combustion engine, a cylinder provided with a cylindrical valve casing, said casing having a portion exposed to the atmosphere and a portion projecting into the combustion chamber of the cylinder and provided with ports opening into the interior of the cylinder, a circular baffle plate having port alining with the ports in the casing and in juxtaposition with one end of the cylindrical casing, a valve mounted in the casing and having ports adapted to align with the ports in the casing and the baffle plate, the baffle plate and one end of the casing being provided with aligned annular grooves embracing the periphery of the aligned ports in the baffle plate and casing, and packing rings mounted in said grooves, a portion of the baffle plate and the valve being exposed directly to the atmosphere.

7. In an internal combustion engine, a cylinder provided with a cylindrical valve casing, said casing having a portion exposed to the atmosphere and a portion projecting into the combustion chamber of the cylinder and provided with ports opening into the interior of the cylinder, a circular baffle plate having port alining with the ports in the casing and in juxtaposition with one end of the cylindrical casing, a valve mounted in the casing and the baffle plate, the baffle plate and one end of the casing being provided with aligned annular grooves embracing the periphery of the aligned ports in the baffle plate and casing, and packing rings mounted in said grooves, the port in the baffle plate being of greater area than the aligned ports in the valve, the casing being open at one end whereby the valve is exposed directly to the atmosphere.

8. In an internal combustion engine, a cylinder provided with a cylindrical valve casing, said casing having a portion exposed to the atmosphere and a portion projecting into the combustion chamber of the cylinder and having ports affording communication between the casing and the combustion chamber, a hollow valve mounted for rotation within the casing provided with ports adapted to align with the ports in the casing, a baffle interposed between one side of the valve and an end of the casing and provided with a port alining with one of the ports in the casing, the end wall of the casing adjacent the baffle being provided with spaced perforations, pins mounted for reciprocation within the perforations, springs for forcing the pins inwardly, the baffle being provided with sockets adjacent the perforations in the end wall of the casing adapted to receive the inner end of the pins, said casing having an opening whereby the valve is exposed directly to the atmosphere.

9. In an internal combustion engine, a cylinder provided with a cylindrical valve

casing, said casing having a portion cut away and exposed to the atmosphere and a portion projecting into the combustion chamber of the cylinder, said casing being provided with ports affording a communication between the combustion chamber and the interior of the casing, a hollow elongated valve mounted for rotation in the casing and having its opposite ends curved to conform to the curvature of the periphery of the casing, the side walls of the valve being provided with ports adapted to aline with the ports in the valve casing, said casing having an opening whereby the valve is exposed directly to the atmosphere.

10. In an internal combustion engine, a cylinder provided with a cylindrical valve casing, said casing having a portion cut away and exposed to the atmosphere and a portion projecting into the combustion chamber of the cylinder, said casing being provided with ports affording a communication between the combustion chamber and the interior of the casing, a hollow elongated valve mounted for rotation in the casing and having its opposite ends curved to conform to the curvature of the periphery of the casing, the side walls of the valve being provided with ports adapted to aline with the ports in the valve casing, the cut-away portion of the casing exposing portions of the valve to the atmosphere for cooling, means for rotating said valve, said valve being adapted to force fresh air into portions of the valve casing, said casing having an opening whereby the valve is exposed directly to the atmosphere.

11. In an internal combustion engine, a cylinder provided with a cylindrical valve casing, said casing having a portion cut away and exposed to the atmosphere and a portion projecting into the combustion chamber of the cylinder, said casing being provided with ports affording a communication between the combustion chamber and the interior of the casing, a hollow elongated valve mounted for rotation in the casing and having its opposite ends curved to conform to the curvature of the periphery of the casing, the side walls of the valve being provided with ports adapted to aline with the ports in the valve casing, said valve being provided with diametrically disposed blades which cooperate with the body of the valve to form a fan for forcing fresh air into the casing to be mixed with the exhaust gases from the engine, said casing having an opening whereby the valve is exposed directly to the atmosphere.

12. In an internal combustion engine, a cylinder provided with a cylindrical valve casing, said casing having a portion exposed to the atmosphere and a portion projecting into the combustion chamber and provided with ports in its opposite ends

where said casing projects into the combustion chamber to form alternately exhaust and intake ports, a hollow valve mounted for rotation within the casing and provided with exhaust and intake ports adapted to aline with the ports in the casing, an intake conduit connected with the hollow valve axially of the casing, an exhaust conduit connected with the casing and extending tangentially from the same, said casing having an opening whereby the valve is exposed directly to the atmosphere.

13. In an internal combustion engine, a cylinder provided with a cylindrical valve casing, said casing having a portion exposed to the atmosphere and a portion projecting into the combustion chamber and provided with ports in its opposite ends where said casing projects into the combustion chamber to form alternately exhaust and intake ports, a hollow valve mounted for rotation within the casing and provided with exhaust and intake ports adapted to aline with the ports in the casing, an intake conduit connected with the hollow valve axially of the casing, an exhaust conduit connected with the casing and extending tangentially from the same, and conduits within the cylinder and upon opposite sides of the valve casing and connecting the cylinder with the ports in the casing, said casing having its exposed end open whereby the valve is exposed directly to the atmosphere.

14. In an internal combustion engine, a cylinder provided with a cylindrical valve casing, said casing having a portion exposed to the atmosphere and a portion projecting into the combustion chamber and provided with ports in its opposite ends where said casing projects into the combustion chamber to form alternately exhaust and intake ports, a hollow valve mounted for rotation within the casing and provided with exhaust and intake ports adapted to aline with the ports in the casing, an intake conduit connected with the hollow valve axially of the casing, an exhaust conduit connected with the casing and extending tangentially from the same, and conduits within the cylinder and upon opposite sides of the valve casing and connecting the cylinder with the ports in the casing, said conduits and cylinder being provided with threaded alined openings, and a plug adapted to be screwed into said openings for closing the same, said casing having its exposed end open whereby the valve is exposed directly to the atmosphere.

15. In an internal combustion engine, a cylinder provided with a cylindrical valve casing, said casing having a portion exposed to the atmosphere and a portion projecting into the combustion chamber of the cylinder, a hollow rotary valve mounted within the casing, one side of the valve be-

ing provided with a hub having a socket therein, a shaft mounted on the cylinder and connected with a moving member of the engine for causing rotation of the same, one end of the shaft projecting into the socket within the hub of the valve whereby the shaft will cause rotation of the valve and may be readily disconnected therefrom, said casing having an opening whereby the valve is exposed directly to the atmosphere.

16. In an internal combustion engine, a cylinder provided with a cylindrical valve casing, said casing having a portion exposed to the atmosphere and a portion projecting into the combustion chamber of the cylinder, a hollow rotary valve mounted within the casing, one side of the valve being provided

with a hub having a socket therein, a shaft mounted on the cylinder and connected with a moving part of the engine for causing rotation of the same, one end of the shaft projecting into the socket within the hub of the valve whereby the shaft will cause rotation of the valve and may be readily disconnected therefrom, and means to maintain the inner end of the shaft in engagement with the socket in the hub while permitting a longitudinal play of the shaft and a slight transverse movement of the valve within the casing, said casing having an opening whereby the valve is exposed directly to the atmosphere.

CHARLES WILLIS RISDEN.