July 24, 1934. L. OCHTMAN, JR 1,967,682

INTERNAL COMBUSTION ENGINE

Filed May 16, 1933 2 Sheets-Sheet 1

Fig. 1.

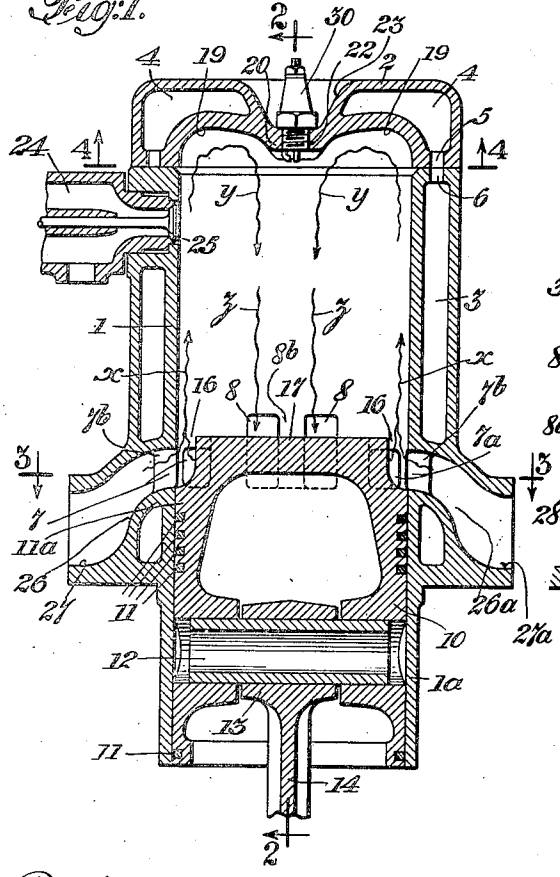


Fig. 2.

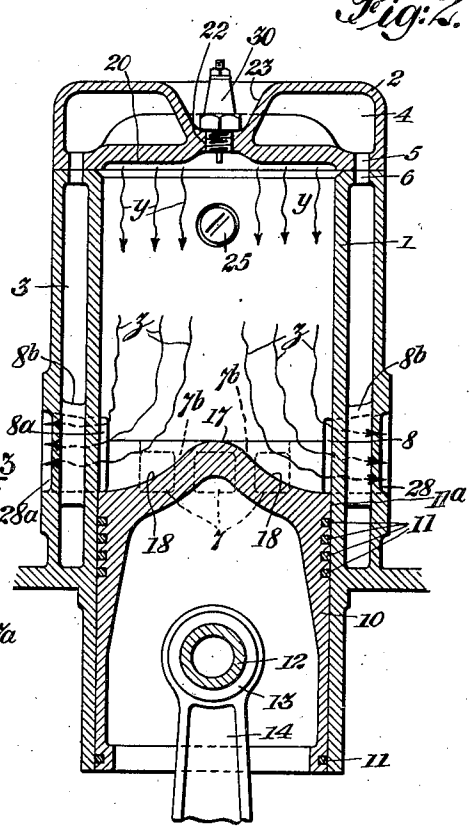


Fig. 3.

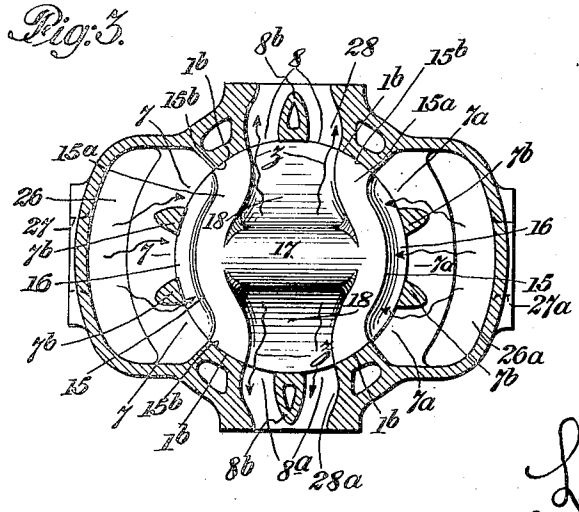
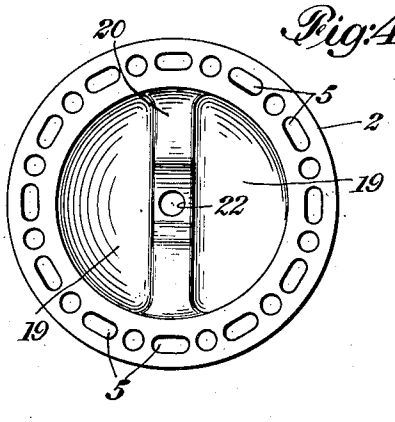


Fig. 4.



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Fig. 6.

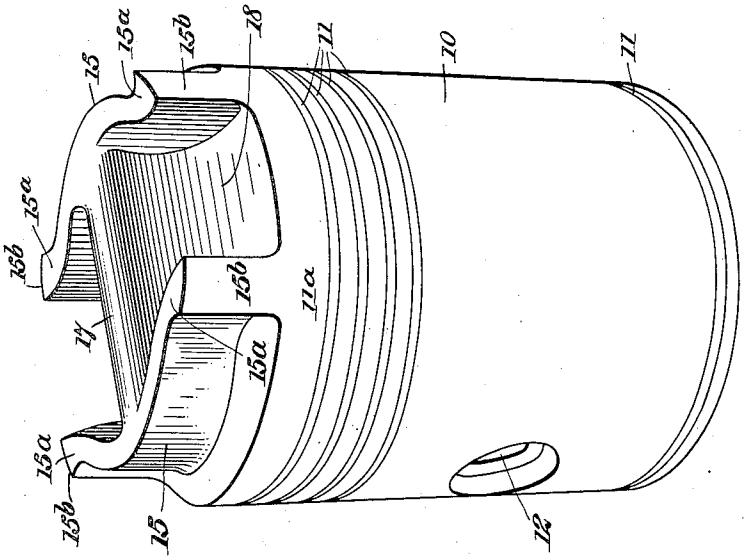
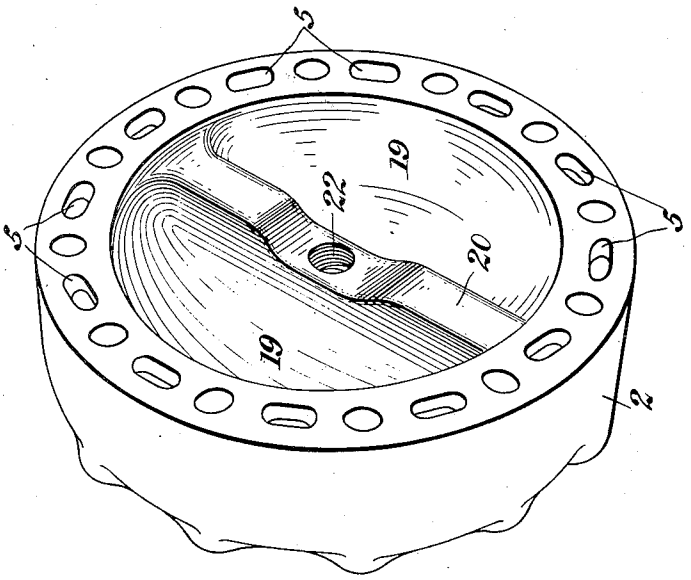


Fig. 5.



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UNITED STATES PATENT OFFICE

1,967,682

INTERNAL COMBUSTION ENGINE

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Application May 16, 1933, Serial No. 671,290

11 Claims. (Cl. 123—65)

My invention consists in the novel features hereinafter described, reference being had to the accompanying drawings, which illustrate one embodiment of my invention selected by me for purposes of illustration and the said invention is fully disclosed in the following description and claims.

The usual two-cycle internal combustion engine, having piston-controlled ports in the cylinder wall for inlet and exhaust means, is provided with a single group of inlet ports and a single group of exhaust ports on opposite sides of the cylinder. When the piston is articulated directly with the connecting rod, the piston pin has its ends in line with unperforated portions of the cylinder wall lying between the two groups of ports. The total circumferential width of each group is thus limited, and sufficient port area cannot be obtained to permit a material increase in rotative and piston speeds. The general experience with engines of this type is that the power developed falls off very rapidly as the speed is increased beyond a certain point, due to the restriction of gas flow through the limited port areas.

In my invention I make use of a port arrangement which comprises two groups of inlet ports, arranged diametrically opposite one another, and two groups of exhaust ports, located in the remaining portions of the cylinder wall between the inlet port groups. With a piston articulated directly with the connecting rod, the piston pin has its ends in line with the two groups of inlet ports, and it is thus not subjected to the detrimental effects of exhaust heat. A much greater utilization of the circumference of the cylinder may thus be made for port openings, increasing the port areas to a point where material increases in rotative and piston speeds will result in an increase rather than a reduction in the power developed.

It is recognized that this port arrangement is not new, but its commercial development appears to have been retarded by the difficulty of obtaining good scavenging of the cylinder. I have made many experiments with cylinders having this port arrangement, with the object of overcoming this deficiency, and have succeeded in devising means whereby it is completely overcome. The performance obtained with my improved construction is far superior to the usual two-cycle engine performance. This is accomplished principally by means of an improved form of piston head, hereinafter described particularly.

My experiments have shown that for good scavenging with this port arrangement, the incoming charge must be caused to flow rapidly from the two groups of inlet ports in concentrated form close to the cylinder wall, to the cylinder head. There the two bodies of gas are turned toward each other and combine in a single body which moves down through the center or core of the cylinder. In this movement they displace the burned gases, which are divided and the separated portions are guided in their flow to the oppositely disposed exhaust ports by the form of the piston head in such a way that this flow is accomplished with a minimum of eddying. In this manner a serious admixture of the fresh charge and the burned gases is avoided, and a greater proportion of the fresh charge remains in the cylinder, resulting in the development of higher power per cycle of operation. My experiments have shown that this non-turbulent flow of the burned gases results in good scavenging even at speeds materially higher than are customary in conventional two-cycle engines.

I have further found that after the exhaust period has been completed, and the piston has covered the exhaust ports, the fresh charge in the cylinder persists in its movement, initiated by the upward flow from the inlet ports to the cylinder head, and taking the general form of two rapidly rotating bodies of gas. This rapid movement continues during the compression stroke, and when ignition occurs assists in the rapid propagation of the flame throughout the compressed charge. Thus rapid and complete combustion is obtained, which is essential for high speed operation.

When air alone comprises the fresh charge, and the fuel is admitted into the cylinder separately at some suitable period in the compression stroke of the engine, this rapid and orderly movement of the air charge effects a thorough mixing with the fuel. I have found that by this means the time of admission of fuel alone to the cylinder may be delayed to such an extent that substantially none is lost through the exhaust ports, and with this delayed admission, the rapidity of mixing is such that complete combustion is obtained even at high engine speeds.

The use of the twin groups of inlet and exhaust ports, which is made practical by my invention, has a further advantage in that the hot gases are expelled from ports located on opposite sides of the cylinder, resulting in substantially uniform expansion of the cylinder and piston. Conventional constructions having only one group of ex-

haust ports are of necessity subjected to uneven expansion and consequent warpage.

An engine constructed in accordance with and embodying my invention as hereinafter described, for a stated power output per cylinder, will be found capable of operating satisfactorily at materially higher rotative and piston speeds than conventional engines of similar power capacity per cylinder. It will thus be smaller in bulk and weight, and there will result a considerable saving not only in first cost, but in cost of handling, installation, housing and upkeep.

Referring to accompanying drawings,

Fig. 1 represents a central vertical section through the cylinder and piston, of a two-cycle internal combustion engine embodying my invention, the section being taken through the oppositely disposed inlet ports.

Fig. 2 is a vertical central section of the same parts taken in a plane perpendicular to the plane of section of Fig. 1.

Fig. 3 is a horizontal sectional view of the cylinder on the line 3—3 of Fig. 1, showing the raised portions of the piston head.

Fig. 4 represents a section on line 4—4 of Fig. 1, looking in the direction of the arrow, and presenting the lower surface of the cylinder head.

Fig. 5 is a perspective view of the cylinder head in inverted position, showing the under surface thereof.

Fig. 6 is a perspective view of the piston showing particularly the construction of the raised portions of the piston head.

Referring to the drawings, 1 represents the cylinder, which is closed at its upper end by a cylinder head 2, preferably formed separately therefrom and connected therewith in any usual or preferred manner, the cylinder being provided with the usual water jacket, indicated at 3, and the cylinder head being also provided with water jacket, indicated at 4, the water jackets being preferably connected as shown by registering apertures, 5 and 6, in the cylinder head and cylinder respectively. For convenience of reference I will term the end of the cylinder adjacent to the cylinder head, the inner end of the cylinder, and the end of the cylinder nearer the crank shaft (not shown) the outer end of the cylinder. The cylinder, 1, is provided at points diametrically opposite one another with two groups of inlet ports, indicated at 7 and 7*a*, each group preferably encompassing more than one quarter of the circumference of the cylinder, the said ports being arranged at such a position lengthwise of the cylinder as to be uncovered by the piston when it reaches the end of its outward stroke, that is to say, the end of its stroke nearer the crank shaft. In the present instance I have shown three inlet ports 7 and three inlet ports 7*a* the said ports being separated by partitions 7*b*. The cylinder is also provided with two diametrically opposite groups of exhaust ports, indicated at 8 and 8*a*, each group of exhaust ports being located between the adjacent ends of the groups of inlet ports and separated therefrom by partitions 1*b*. In this instance I have shown two exhaust ports in each group, separated from each other by partitions 8*b*. The partitions 1*b* and 8*b* are preferably provided with water cooling passages in communication with the water jacket of the cylinder. The exhaust ports 8 and 8*a* are also located so as to be completely uncovered when the piston reaches the outer end of its stroke, and said exhaust ports extend a greater distance toward the head of the cylinder than the inlet ports, as clearly shown in Figs. 1 and 2. That is to say, they are of greater length than the inlet ports, in a direction lengthwise of the axis of the cylinder. The cylinder is so arranged with respect to the remaining portions of the engine that the two groups of inlet ports are opposite the ends of the piston pin 12, when the piston is articulated directly with the connecting rod, so as to protect said pin from the effects of exhaust heat. It will be understood that the partitions 7*b*, 8*b* and 1*b* are all of sufficient circumferential width at their inner edges to form adequate bridges for the guidance of the piston rings as they pass over the ports, and the partitions 7*b*, and 8*b* are preferably reduced in thickness at their outer edges to facilitate the passage of the gases.

10 represents the piston provided with the usual piston rings, indicated at 11, and in this instance shown with the piston pin 12 directly engaged by a bearing 13 in one end of the connecting rod 14 the other end of which is connected similarly to the crank shaft, in the usual manner. The piston head is provided with raised portions, which extend above the normal top plane of the piston trunk, which plane is at the upper edge of the "land" 11*a* above the topmost piston ring. This plane extends substantially in line with the bottom edges of the opposed groups of inlet and exhaust ports in the cylinder when the piston is at the outer end of its stroke, as indicated in Figs. 1 and 2. At diametrically opposite points corresponding with the location of the oppositely disposed ports, 7, 7*a*, the head of the piston is provided with longitudinally disposed curved baffle walls, indicated at 15, the major portions of which are formed concentric with the piston and cylinder, but set back a short distance from the cylinder wall. The walls 15 are each provided at opposite ends thereof with oppositely extending curved elements 15*a* terminating in end faces 15*b* adjacent to the cylinder wall, as clearly shown in Fig. 6, and which are located at the inner faces of the partitions 1*b* of the cylinder, as clearly shown in Fig. 3. The outer faces of the baffle walls are substantially parallel to the cylinder wall in a lengthwise direction. The effect of this construction is to provide two substantially segment shaped passages, indicated at 16, which extend vertically above the normal top plane of the piston. Each of said passages preferably encompasses more than a quarter of the circumference of the cylinder and communicates with all of the inlet ports of one group when the piston is at the outer end of the stroke. It will also be understood that the walls 15 are of slightly greater height than the inlet ports 7, 7*a* as clearly shown in Figs. 1 and 2, and are curved outwardly at their lower ends adjacent to the normal top plane of the piston, thus serving as deflectors to direct the incoming air or combustible mixture entering through the inlet ports, toward the cylinder head 2 in the form of a curved concentrated and laterally extended sheet, lying close to the adjacent portions of the cylinder wall, as indicated by the arrows, *x*—*x* in Fig. 1. The central portions of the curved walls 15 are connected by a transversely disposed raised portion or deflecting means, indicated at 17, of substantially the same vertical height as the walls 15 and the piston head is provided at each side of this transverse portion with sloping shoulders 18, 18 which curve downwardly and outwardly to opposite sides of the outer edge of the piston to substantially the normal top plane thereof, as clearly shown in Figs. 2, 3 and 6, and between the adjacent curved ele-

ments 15*a* of the vertical baffle walls 15. These downwardly and outwardly curved faces 18 as clearly shown in Figs. 2 and 3, particularly, lead directly to and have a continuity with the outer edges of the exhaust ports, 8 and 8*a* respectively, when the piston is at the outer end of its stroke, and form in conjunction with the adjacent portions of the walls 15 discharge passages to facilitate the discharge of the burned gases, as hereinafter described. These curved faces 18 are so formed as to be a continuation of the line of the lower faces of the exhaust ports, 8 and 8*a*, to avoid an abrupt change in direction of the exhausting gases at the entrance to the exhaust ports. The width of each of these discharge passages should be substantially the same as the over-all width of the group of exhaust ports which it serves, and a substantial portion of the cylinder wall remains between each passage on each side and the next adjacent inlet port on the opposite sides of the baffle walls 15 as indicated at 1*b*, 1*b*. It will be seen that the curved elements 15*a* at each end of the baffle walls 15 have their end faces 15*b* engaging these segmental portions 1*b* of the cylinder wall, and their opposite edges in alignment with the corresponding edges of said segmental portions 1*b* as indicated in Fig. 3.

The cylinder head, which in this instance is shown separate from the cylinder, in its preferred form, has its inner face hollowed out or recessed, as at 19, on opposite sides of a transversely disposed ridge 20, see Figs. 1, 2, 4 and 5, said ridge being disposed transversely with respect to the raised portion 17 on the piston head, and therefore at right angles to a line passing through the centers of the two groups of inlet ports. The outer edges of the recesses 19 may be curved as shown in Fig. 1, for example, so as substantially to meet the edges of the cylinder in such manner that a line in continuation of the cylinder wall would be approximately tangential to the surface of the recess adjacent to the upper end of the cylinder. A spark plug is preferably inserted in a threaded aperture 22 extending from the outside of the cylinder head at the bottom of a recess 23 in the water jacketed portion thereof, as indicated in Figs. 1 and 2, at 30. The inner surface of the head may be formed to permit the incoming combustible charge to impinge readily upon the points of said plug. It will be understood that the recessed portions 19, 19 of the cylinder head form portions of the combustion chamber of the cylinder, and the transversely disposed ridge 20 may be of sufficient width to permit the provision of a channel therethrough, for cooling water on the jacketed side when the cylinder and head are water cooled. While I have found by experiment that the preferred form of cylinder head previously described has certain advantages in assisting the return flow of the fresh charge by positively directing it through the center or core of the cylinder, this invention is not limited to the use of that form.

The fuel may be either mixed with a fresh charge of air before it enters the inlet ports, or it may be introduced directly into the cylinder during a suitable portion of the compression stroke of the piston, in which case air alone will enter the inlet ports. Both methods are well known and need not be particularly described. In the drawings, Figs. 1 and 2, I have shown the cylinder equipped with a separate fuel inlet 24 provided with a valve 25 for controlling the same, as this method leads to more economical operation. The particular operation of this valve, however, is not important, and it may be located either in the cylinder or in the cylinder head, and may be of any desired form suitable for the introduction of gaseous or liquid fuel, without departing from the spirit of my present invention it being understood that this inlet valve would not be applied when the cylinder is scavenged by a mixture of air and fuel. The air for the fresh charges may be supplied by any well known means within the engine structure, or by a separate pump or blower. The latter method is preferable when it is desired to supply a volume of air per cycle greater than the engine piston displacement, to effect a more complete scavenging of the cylinder. By this means, also, a more uniform air pressure may be maintained, and this is my preferred practice in connection with the cylinder and piston construction previously described. In either case the air is supplied to both groups of inlet ports 7, 7*a* conveniently by means of lateral chambers 26, 26*a* provided with suitable inlet apertures 27, 27*a*. The groups of exhaust ports will also communicate with exhaust chambers 28, 28*a* which are connected by suitable exhaust pipes or passages to conduct the exhaust products to any desired point where they are discharged into the atmosphere.

The operation of the engine will be as follows. As the piston moves toward the crank shaft, under the influence of the pressure created by the combustion of fuel, it uncovers the exhaust ports 8, 8*a* permitting the escape of part of the burned gases and resulting in a considerable reduction of the pressure within the cylinder. As the piston moves further down, it uncovers the inlet ports, permitting the fresh charge to enter. I have found that it is not essential that the pressure within the cylinder be reduced to that of the incoming charge at the moment the inlet ports begin to open, as no injurious effect will result if the cylinder pressure be materially higher at that moment. In such case a small part of the burned gases will blow through the inlet ports into the fresh charge and retard the beginning of admission of the fresh charge into the cylinder until the piston has moved far enough outwardly to effect a more complete reduction of pressure within the cylinder. The relative lengths of inlet and exhaust ports must of necessity be calculated for each individual engine design, as the relative lengths of these ports are affected by a number of design factors.

The fresh charge entering through the inlet ports in deflected, as previously described, by the vertical baffle walls 15 toward the piston head in a curved sheet on opposite sides of the cylinder, as indicated by the arrows *x*—*x*. The baffle walls 15 being substantially parallel to the cylinder wall, direct the incoming streams of the air or mixture closely along the cylinder wall, so that they will not be easily or quickly dispersed or diffused, and follow, the burned gases. These two streams moving rapidly upward along the cylinder wall from the two groups of inlet ports, encounter the oppositely curved walls of the recesses 19, 19 in the cylinder head, which deflect them toward the central transversely disposed ridge 20 by which they are in turn deflected downwardly, the two streams uniting and flowing downwardly through the center or core of the cylinder, as indicated by the arrows *y* between the upwardly moving streams indicated by the arrows *x* this fresh incoming charge following the burned gases. As the body of burned gases moves toward the piston head, it is divided by the transversely disposed

deflecting means 17 on the piston head, into two streams, as indicated clearly in Fig. 2, which pass out respectively through one or the other group of exhaust ports 8 or 8*a* as indicated by the arrows *z* in Figs. 1, 2 and 3. The inertia of the burned gases starts a scavenging action, which continues between the closing of the inlet ports and the closing of the exhaust ports, as the piston moves inwardly in the cylinder away from the crank shaft to compress and fire the charge, in the usual manner. The inertia of the fresh charge effects a continuing movement thereof in the general form of two rapidly rotating bodies of gas, which increase the velocity of propagation of the flame throughout the compressed charge after ignition, and thus result in the rapid and complete combustion required for high speed operation. The fuel for the charge may be mixed with the air previous to its admission through the inlet ports, or admitted by the opening of the valve 25 at any suitable point in the inward stroke of the piston. When the fuel is separately admitted, the said continuing movement of the fresh charge of air effects a rapid and thorough mixing of the fuel with the air previous to ignition.

What I claim and desire to secure by Letters Patent is :

1. In a two cycle internal combustion engine, the combination with a cylinder having substantially diametrically opposite portions of its wall provided with inlet ports, and substantially diametrically opposite portions of its wall between the said first mentioned portions and in substantially the same transverse plane therewith provided with exhaust ports, of a piston having its head provided with baffle walls, major portions of the outer faces of said baffle walls being outwardly curved and substantially concentric with the cylinder wall and substantially parallel thereto in a lengthwise direction, said faces being located respectively opposite said inlet ports and provided with outwardly extending portions at each end terminating in substantial alignment with lateral edges of adjacent inlet ports when the piston is at the outer end of its stroke.

2. In a two cycle internal combustion engine, the combination with a cylinder having substantially diametrically opposite portions of its wall provided with separated groups of inlet ports, each group encompassing more than one quarter of the circumference of the cylinder, and substantially diametrically opposite portions of its wall between said groups of inlet ports and in substantially the same transverse plane therewith provided with exhaust ports, of a piston having its head provided with diametrically opposite baffle walls, the major portions of the outer faces of said baffle walls being outwardly curved and substantially concentric with the cylinder wall and substantially parallel thereto in a lengthwise direction, each of said faces being located opposite to and embracing one of said groups of inlet ports and being provided at each end with outwardly extending portions terminating in substantial alignment with lateral edges of adjacent inlet ports of said group when the piston is at the outer end of its stroke.

3. In a two cycle internal combustion engine, the combination with a cylinder having substantially diametrically opposite portions of its wall provided with inlet ports, and substantially diametrically opposite portions of its wall between the said first mentioned portions and in substantially the same transverse plane therewith provided with exhaust ports, of a piston having its head provided with baffle walls, major portions of the outer faces of said baffle walls being outwardly curved and substantially concentric with the cylinder wall and substantially parallel thereto in a lengthwise direction, said faces being located respectively opposite said inlet ports and provided with outwardly extending portions at each end terminating in substantial alignment with lateral edges of adjacent inlet ports when the piston is at the outer end of its stroke, said piston head being provided between said baffle walls with deflecting means comprising oppositely sloping shoulders extending respectively in a direction toward the exhaust ports from a plane substantially coincident with the top faces of said baffle walls to a plane substantially coincident with the outer edges of the exhaust ports when the piston is at the outer end of its stroke.

4. In a two cycle internal combustion engine, the combination with a cylinder having substantially diametrically opposite portions of its wall provided with inlet ports, and substantially diametrically opposite portions of its wall between the said first mentioned portions and in substantially the same transverse plane therewith provided with exhaust ports, of a piston having its head provided with baffle walls, major portions of the outer faces of said baffle walls being outwardly curved and substantially concentric with the cylinder wall and substantially parallel thereto in a lengthwise direction, said faces being located respectively opposite said inlet ports and provided with outwardly extending portions at each end terminating in substantial alignment with lateral edges of adjacent inlet ports when the piston is at the outer end of its stroke, said pistcn head being provided with deflecting means comprising a raised portion connecting the central portions of said baffle walls and having on opposite sides thereof curved shoulders extending substantially to the plane of the outer edges of said exhaust ports when the piston is at the outer end of its stroke.

5. In a two cycle internal combustion engine, the combination with a cylinder having substantially diametrically opposite portions of its wall provided with separated groups of inlet ports, each group encompassing more than one quarter of the circumference of the cylinder, and substantially diametrically opposite portions of its wall between said groups of inlet ports and in substantially the same transverse plane therewith provided with exhaust ports, of a piston having its head provided with diametrically opposite baffle walls, the major portions of the outer faces of said baffle walls being outwardly curved and substantially concentric with the cylinder wall and substantially parallel thereto in a lengthwise direction, each of said faces being located opposite to and embracing one of said groups of inlet ports and being provided at each end with outwardly extending portions terminating in substantial alignment with lateral edges of adjacent inlet ports of said group when the piston is at the outer end of its stroke, said piston head being provided with a deflecting means comprising a raised portion connecting the central portions of said baffle walls, and having on opposite sides thereof curved shoulders lying between said baffle walls and extending substantially to the plane of the outer edges of said exhaust ports when the piston is at the outer end of its stroke.

6. In a two cycle internal combustion engine, the combination with a cylinder having substan-

tially diametrically opposite portions of its wall provided with inlet ports, and substantially diametrically opposite portions of its wall between the said first mentioned portions and in substantially the same transverse plane therewith provided with exhaust ports, of a piston having its head provided with baffle walls, major portions of the outer faces of said baffle walls being outwardly curved and substantially concentric with the cylinder wall and substantially parallel thereto in a lengthwise direction, said faces being located respectively opposite said inlet ports and provided with outwardly extending portions at each end terminating in substantial alignment with lateral edges of adjacent inlet ports when the piston is at the outer end of its stroke, said cylinder having the inner face of its head provided with oppositely disposed concave portions in substantial alignment longitudinally of the cylinder with said baffle walls.

7. In a two cycle internal combustion engine, the combination with a cylinder having substantially diametrically opposite portions of its wall provided with inlet ports, and substantially diametrically opposite portions of its wall between the said first mentioned portions and in substantially the same transverse plane therewith provided with exhaust ports, of a piston having its head provided with baffle walls, major portions of the outer faces of said baffle walls being outwardly curved and substantially concentric with the cylinder wall and substantially parallel thereto in a lengthwise direction, said faces being located respectively opposite said inlet ports and provided with outwardly extending portions at each end terminating in substantial alignment with lateral edges of adjacent inlet ports when the piston is at the outer end of its stroke, said piston head being provided between said baffle walls with deflecting means comprising oppositely sloping shoulders extending respectively in a direction toward the exhaust ports from a plane substantially coincident with the top faces of said baffle walls to a plane substantially coincident with the outer edges of the exhaust ports when the piston is at the outer end of its stroke, said cylinder having the inner face of its head provided with oppositely disposed concave portions in substantial alignment longitudinally of the cylinder with said baffle walls.

8. In a two cycle internal combustion engine, the combination with a cylinder having substantially diametrically opposite portions of its wall provided with inlet ports, and substantially diametrically opposite portions of its wall between the said first mentioned portions and in substantially the same transverse plane therewith provided with exhaust ports, of a piston having its head provided with baffle walls, major portions of the outer faces of said baffle walls being outwardly curved and substantially concentric with the cylinder wall and substantially parallel thereto in a lengthwise direction, said faces being located respectively opposite said inlet ports and provided with outwardly extending portions at each end terminating in substantial alignment with lateral edges of adjacent inlet ports when the piston is at the outer end of its stroke, said piston head being provided with deflecting means comprising a raised portion connecting the central portions of said baffle walls and having on opposite sides thereof curved shoulders extending substantially to the plane of the outer edges of said exhaust ports when the piston is at the outer end of its stroke, said cylinder having the inner face of its head provided with a centrally disposed ridge, the line of said transverse ridge being at right angles to the line of said raised portion of the piston head and having concave portions on opposite sides of said ridge in substantial alignment longitudinally of the cylinder with said baffle walls.

9. In a two cycle internal combustion engine, the combination with a cylinder having substantially diametrically opposite portions of its wall provided with separated groups of inlet ports, each group encompassing more than one quarter of the circumference of the cylinder, and substantially diametrically opposite portions of its wall between said groups of inlet ports and in substantially the same transverse plane therewith provided with exhaust ports, of a piston having its head provided with diametrically opposite baffle walls, the major portions of the outer faces of said baffle walls being outwardly curved and substantially concentric with the cylinder wall and substantially parallel thereto in a lengthwise direction, each of said faces being located opposite to and embracing one of said groups of inlet ports and being provided at each end with outwardly extending portions terminating in substantial alignment with lateral edges of adjacent inlet ports of said group when the piston is at the outer end of its stroke, said piston head being provided with a deflecting means comprising a raised portion connecting the central portions of said baffle walls, and having on opposite sides thereof curved shoulders lying between said baffle walls and extending substantially to the plane of the outer edges of said exhaust ports when the piston is at the outer end of its stroke, said cylinder having the inner face of its head provided with a centrally disposed transverse ridge, the line of said transverse ridge being at right angles to the line of said raised portion of the piston head and having on opposite sides of said ridge concave portions in substantial alignment longitudinally of the cylinder with said baffle walls and inlet ports.

10. In a two cycle internal combustion engine, the combination with a cylinder having substantially diametrically opposite portions of its wall provided with inlet ports, and substantially diametrically opposite portions of its wall between the said first mentioned portions and in substantially the same transverse plane therewith provided with exhaust ports, of a piston having its head provided with baffle walls, major portions of the outer faces of said baffle walls being outwardly curved and substantially concentric with the cylinder wall and substantially parallel thereto in a lengthwise direction, said faces being located respectively opposite said inlet ports and provided with outwardly extending portions at each end terminating in substantial alignment with lateral edges of adjacent inlet ports when the piston is at the outer end of its stroke, said piston being provided with a piston pin having its ends in alignment longitudinally of the cylinder with the oppositely disposed inlet ports.

11. In a two cycle internal combustion engine, the combination with a cylinder having substantially diametrically opposite portions of its wall provided with inlet ports, and substantially diametrically opposite portions of its wall between the said first mentioned portions and in substantially the same transverse plane therewith provided with exhaust ports, of a piston having its head provided with baffle walls, major portions of the outer faces of said baffle walls being outwardly

curved and substantially concentric with the cylinder wall and substantially parallel thereto in a lengthwise direction, said faces being located respectively opposite said inlet ports and provided with outwardly extending portions at each end terminating in substantial alignment with lateral edges of adjacent inlet ports when the piston is at the outer end of its stroke, said piston head being provided between said baffle walls with exhaust deflecting means having a contour in continuity with that of the associated exhaust passages in the cylinder when the piston is at the outer end of its stroke.

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