

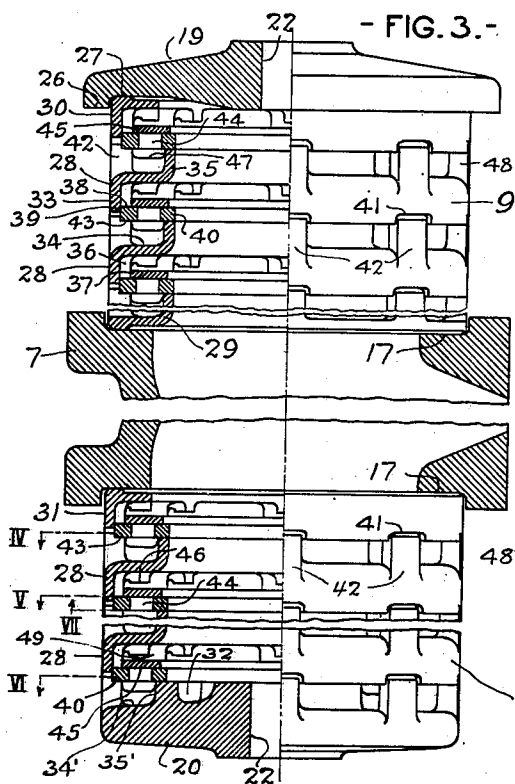
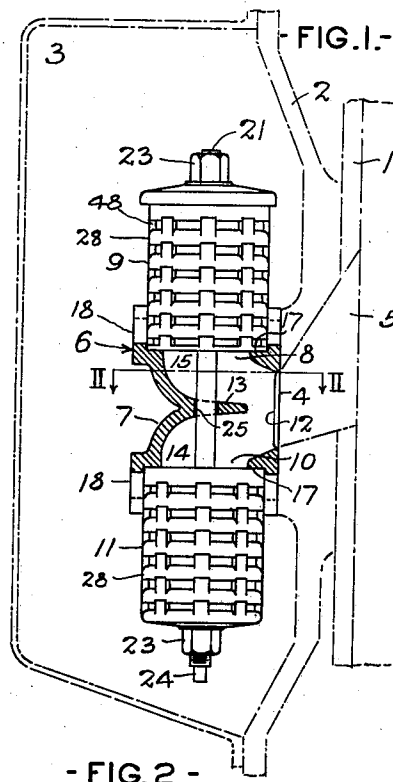
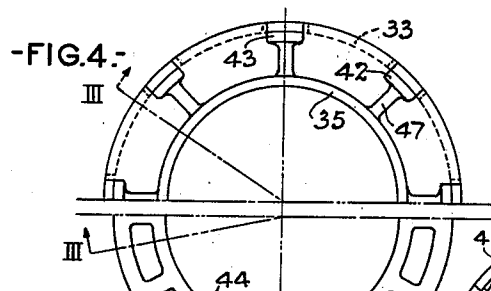
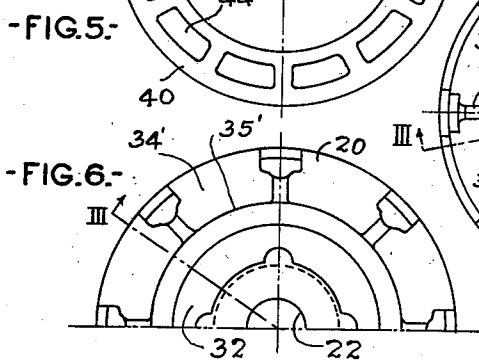
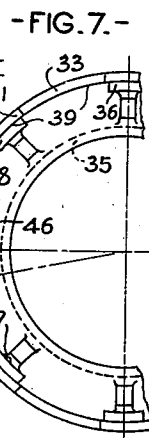
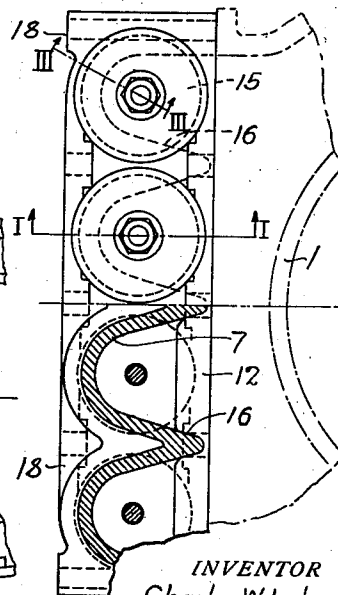
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VALVE

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VALVE

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This invention relates to a valve and more particularly to a scavenging air intake valve for a two-cycle internal combustion engine.

An object of the invention is to provide a valve of simple design so that most of the parts have defining lines permitting them to be die cast.

Referring to the drawing forming a part of this application, Figure 1 is a side elevation of a device including the valve of the present invention, the ported casting of the device being shown in section on the line I—I of Fig. 2, and shows the manifold and fragmental engine parts with which the device is associated, in dot and dash line; Fig. 2 is a plan view of the structure of Fig. 1, partly in section on the line II—II of Fig. 1, parts being broken away and others omitted; Fig. 3 is an enlarged fragmental view of the valve device shown in Fig. 1, at the right being similar to the right side of Fig. 1, and at the left a section on the line III—III of Fig. 2; Figs. 4 to 7 are half plan views of sections of the sectional valve casing side wall and one of the end walls, and as they would appear from the corresponding respective section lines indicated by IV, V, VI and VII in Fig. 3, and as viewed in the direction of the arrows there appearing, Fig. 7 being an inverted plan view of the portion shown in Fig. 4, and Fig. 6 being the end wall; sections of these portions taken on the lines III thereof are similar to the corresponding sections shown in Fig. 3.

Referring to Figs. 1 and 2 of the drawing, there is shown diagrammatically a portion of a cylinder 1 of an internal combustion engine, such for instance as the cylinder of a two-cycle Diesel engine. The cylinder is secured in an engine casting 2 to which is secured, by any desirable means, a scavenging air manifold 3. A port 4 in the casting leads to a scavenging air inlet port 5 in the cylinder. Disposed entirely within the manifold is a scavenging air intake valve device, indicated generally by the reference numeral 6. This device consists of a hollow member or casting 7 extending transversely of the cylinder and provided, in the present instance, with four upwardly directed openings 8 in each of which is disposed a valve 9, and four downwardly directed openings 10 in each of which is disposed a valve 11, the openings 8 and 10 forming outlet means for their respective valves. The valves 9 and 11 comprise the present invention and the portion of the casting 7 adjacent each valve serves as one of the end walls for the valve. Four ports 12, all opening into the port 4 and having communication therethrough with the port 5 are

formed in the side of the casting 7 adjacent the cylinder. The manifold 3 contains compressed scavenging air supplied thereto in the usual manner (not shown) for the valves and where there is more than one power cylinder in the engine, the manifold extends throughout the length of the engine to include all cylinders. There is also a valve device consisting of a casting 7 and eight valves for each cylinder.

Each pair of openings 8 and 10 is partially separated by a deflecting fin 13 which directs the air passing through each valve toward the adjacent port 12. The fin 13 thus provides an air passage 14 for the lower valve and an air passage 15 for the upper valve of a vertically aligned pair of valves. Each pair of passages 14 and 15 is separated from each adjacent pair by a wall 16 formed integrally with the casting 7.

Around each of the openings 8 and 10 is formed an annular shouldered seat 17 in which the valve side wall is disposed. The casting has upwardly and downwardly directed lugs 18 provided, above and below each wall 16 and at either end of the casting, with aligned orifices through which bolts (not shown) pass, securing the casting 7 to the engine casting 2.

The valves 9 and 11 are each in the form of a hollow casing, each upper valve having, as parts thereof, a bottom end wall formed by the casting 7, an oppositely disposed upper end wall formed by a head 19, and a side wall formed by a plurality of separate parts, extending axially from end wall to end wall. Each bottom valve has, as parts thereof, an upper end wall formed by the casting 7, an oppositely disposed bottom end wall formed by a head 20, and a side wall formed by a plurality of separate parts, extending axially from end wall to end wall. These parts of two vertically aligned valves are all held together by a bolt 21 which passes through the centers thereof, the heads containing orifices 22 for this purpose. A nut 23, by which means the parts may be drawn into snug engagement with each other, is threaded on the bolt at either end thereof, and a square head 24 is formed on one end of the bolt for the application of a wrench. The bolt passes through the fin 13 by means of an orifice 25 formed therein.

The head 19 is of a design to serve merely as a cover for the upper valve 9. It has a downwardly depending peripheral flange 26 which overhangs the adjacent parts of the valve, the head, adjacent the peripheral flange, being provided with a seat 27.

The upper valve is shown as formed of five similar parts or sections 28, a lowermost part 29 disposed in the adjacent seat 17, and an uppermost part 30 disposed in the seat 27. The part 29 is similar to the top portion of the part 28, and the part 30 is similar to the bottom portion of the part 28. Similarly the bottom valve is shown as formed of five similar parts or sections 28, which are also similar to the parts 29 of the upper valve, and an uppermost part 31, similar to the part 30, and disposed in the adjacent seat 17. The head 20 has formed integrally therein the features provided in the upper valve by the part 29 and therefore this part is not needed in the lower valve. It will be understood, however, that the head 20 may be plain if desired, similar to the head 19, and a part 29 utilized therewith. The head 20 is provided with a weight-reducing groove 32.

There may be more or less parts 28 to each valve, and more or less valves for each cylinder, as desired. No further description of the parts 29, 30 and 31, nor of the features of head 20 is deemed necessary as a detailed description of part 28 is considered sufficient in view of the similarity of these parts.

Each part or section 28 is imperforate and consists of an outer longitudinal side wall portion 33, a transverse side wall portion 34 connected integrally at its outer edge with the upper edge of portion 33, and an inner longitudinal side wall portion 35 connected integrally at its lower end to the inner edge of the portion 34 and extending in an opposite direction from the portion 33. The section 28 is ring-shaped and each of the portions thereof is in the form of a plain annular ring which extends continuously about the axis of the valve, the plane of each ring portion being at a right angle to the plane of any adjacent ring portion, the section being thus Z-shaped in cross section.

Lugs 36 extend inwardly from the portion 33 at regular intervals for a short distance, each lug being integral with and somewhat shorter than the adjacent wall of the portion 33. The inner surfaces 37 of these lugs 36 form a valve guide. The surfaces 38 at the ends of the lugs and extending at right angles to the surfaces 37 are flat and the annular portion 39 of the inner wall of the portion 33 between the free edge of the portion 33 and the lugs 36 is smooth, the surfaces 38 and portion 39 forming a seat. A separate transverse ring-shaped section 40, extending continuously about the axis of the valve, is disposed in snug engagement with the seat provided by the surfaces 38 and portion 39, in opposed spaced relation to the portion 34 of the section 28 thereabove.

The portion 33, at its free end, is provided with recesses 41, one adjacent each lug 36. Lugs 42, in substantially axial alignment with the lugs 36, are integrally formed with and extend from the portion 34 in opposed spaced relation to the portion 35. The free end of each lug 42 has formed thereon a shoulder providing a seat 43 having a transverse face in the same plane as the free edge of the portion 35, and an axial face in line with the inner surface of the portion 33.

Section 40 is supported at one face on the seats 43 and free edge of the portion 35 of the section therebeneath, and supports on its other face, the adjacent section thereabove by engagement around its margin with the lugs 36 thereof. The section 40 contains a plurality of orifices 44, each of which is disposed at least in part between ad-

jacent lugs 36, thereby providing a plurality of air inlet ports leading into the interior of the valve. A valve element 45 disposed between the section 40 and the opposite portion 34 thereabove, and seated on the inner face of the section 40, closes these ports. The valve element peripheral edge has working clearance with the valve guide formed by the lugs 36. Valve stops 45, integral with the portion 34 extend toward the valve element a predetermined extent to limit the movement of the valve element.

Each of the lugs 42 is connected to the opposite portion 35 by a web 47 which increases the strength of the portions 34 and 35, and the lugs 36, being also integral with the portion 34 similarly strengthen portion 33, so that the nuts 23 may be drawn sufficiently tight to draw all of the valve casing parts into tight engagement with each other.

Adjacent valve sections are held in interlocked fixed relation by the lugs 42 and recesses 41 against relative rotative movement, a lug interfitting with each recess. Similarly the parts are held against transverse displacement by the interfit between the sections of the side wall and between the end walls and the adjacent side wall sections as previously described.

Each part 28 together with its section 40 therebeneath and valve element 45 forms a unit, and as aforesaid, as many of these units may be combined together as is desired. When the valve is completely assembled as shown in Fig. 1, there are provided six annular recesses 48 opening to the exterior for each valve. Each of these recesses is provided for by the shoulder formed by the right-angular relation of the adjacent portions 34 and 35, and in the case of the head 20 by the parts thereof similar to the portions 34 and 35, namely parts 34' and 35', and the adjacent section 40. Each of these shoulders is open from side to side opposite the portion 34 (or part 34') in an axial direction, each opening being closed by the adjacent section 40. Similarly there are six other annular recesses 49 opening to the interior for each valve 28. Each of these other recesses is provided for by the shoulder formed by the right-angular relation of the adjacent portions 33 and 34 and the adjacent section 40. Each of these shoulders is open from side to side opposite the portion 34 in an axial direction, each opening being closed by the adjacent section 40. The recesses 48 are open to the exterior from top to bottom opposite the portions 35 (and 35') and the recesses 49 are open to the interior from top to bottom opposite the portions 33. Thus at each section 40 there is a lower recess opening to the exterior, and an upper recess opening to the interior. These recesses are for the passage of the air from the exterior of the casing to the interior thereof through the orifices in the section 40.

The operation of the valve is automatically produced by a differential of pressure between the inside of the cylinder and the manifold. When the pressure in the casing is lower than the pressure in the manifold, due to the operation of the engine, the air in the manifold raises the valve elements and enters the valve, passing through the casting into the cylinder. Similarly when the pressure in the casing is sufficiently high, due to the operation of the engine, the valve elements automatically close the orifices 44.

As aforesaid, it is an object of this invention to provide a sectional air intake valve which can be

made by the die casting method. That is to say, it is desirable to make all the parts of the valve except the casting 7 by die casting, and particularly the intricate sections 28, instead of by the usual method of employing destructible molds which must be made up at each casting of a part. To this end, the parts, and particularly those of intricate configuration, are designed to permit their free removal from the dies.

A main advantage of the instant die cast parts is their low manufacturing cost, which is due to the fact that a small number of dies is required, a low cost metal may be employed, the parts can be manufactured rapidly, and there is a minimum of defective castings that must be scrapped.

While the valve elements have been described as disposed within the casing because the travel of the air is from the exterior to the interior, it is within the scope of the invention to dispose the valve elements on the opposite side of the transverse sections 40 for a reverse flow of the air, and if desired, the orifices instead of being in the sections 40 may be made in the transverse portions 34 and the valve inverted if found necessary in such events. Other changes may be made, for instance the stops 46 could be made integral with the valve elements.

While there has been hereinbefore described an approved embodiment of this invention, it will be understood that many and various changes and modifications in form, arrangement of parts, and details of construction thereof may be made without departing from the spirit of the invention and that all such changes and modifications as fall within the scope of the appended claims are contemplated as a part of this invention.

The invention claimed and desired to be secured by Letters Patent is:

1. A valve comprising a casing having oppositely disposed spaced end walls and a side wall extending in an axial direction from one end wall to the other end wall and continuous about said axis, said side wall having a section formed of a side wall portion extending substantially transversely of said casing and continuous about said axis, and two other side wall portions extending substantially longitudinally of said casing and continuous about said axis, each integral, at an edge thereof, with and extending in opposite directions from said transverse wall portion, one at the outer edge and the other at the inner edge thereof, said transverse wall portion forming with each of said longitudinal wall portions a shoulder affording an opening from side to side at the end of its said longitudinal wall portion opposite said transverse wall portion, said side wall further having two sections, each separate from said shouldered section, extending substantially transversely of said casing and continuous about said axis disposed one at the opposite edge of each of said longitudinal wall portions closing the opening adjacent thereto, said closing sections each having an orifice affording communication between the exterior and interior of said casing, said shoulders being each open from top to bottom at the end of said transverse wall portion opposite its said longitudinal wall portion, said sections providing of each of said shoulders a recess between the adjacent closing section and shouldered section for the passage of fluid passing through the orifice of said adjacent closing section, said recesses opening one inwardly and the other outwardly, each of said closing sections at one face thereof serving as a seat; lugs integrally formed on said shouldered section support-

ingly engaging said closing sections at their outer ends; and a valve element cooperating with each said seat for controlling the adjacent orifice.

2. A valve comprising a casing having two end walls oppositely disposed in spaced relation and a sectional side wall extending in an axial direction from one end wall to the other end wall and continuous about said axis, said side wall having two separate axially spaced sections, one of said sections being formed of a side wall portion extending substantially transversely of said casing and continuous about said axis, an outer side wall portion extending substantially longitudinally of said casing and continuous about said axis, integral, at an edge thereof, with said transverse wall portion at the outer edge thereof, and extending toward the other of said sections, and lugs integrally formed with one of said wall portions, disposed inwardly of and adjacent to said longitudinal wall portion, and said other of said sections having a side wall portion extending substantially transversely of said casing and continuous about said axis, an inner side wall portion extending substantially longitudinally of said casing and continuous about said axis, integral, at one edge thereof, with an inner part of said last mentioned transverse wall portion, and extending toward said first mentioned section, and shouldered lugs disposed at the outer edge of said last mentioned transverse wall portion, integral therewith and extending toward said first mentioned section, said side wall further having a section separate from said spaced sections, extending substantially transversely of said casing and continuous about said axis, seating upon said inner wall portion and having a part of its outer periphery engaging said outer wall portion interiorly thereof, and disposed at its outer margin between the respective lugs of said spaced sections and within said shoulders whereby said three sections are held against relative transverse movement, said transverse section having an inlet orifice for the passage of fluid from the exterior to the interior of said casing and at the face thereof opposite said first mentioned transverse wall portion serving as a seat; a valve element disposed adjacent said seat and cooperating therewith, controlling said orifice; fluid outlet means in said casing; and means for holding said end walls and side wall and its sections against axial relative movement.

3. A valve comprising a casing having two end walls oppositely disposed in spaced relation and a sectional side wall extending in an axial direction from one end wall to the other end wall and continuous about said axis, said side wall having two separate sections, one of said sections being formed of a side wall portion extending substantially transversely of said casing and continuous about said axis and an outer side wall portion extending substantially longitudinally of said casing and continuous about said axis, integral, at an edge thereof, with said transverse wall portion at the outer edge thereof, and extending toward the other of said sections, and said other of said sections having a side wall portion extending substantially transversely of said casing and continuous about said axis and an inner side wall portion extending substantially longitudinally of said casing and continuous about said axis, integral, at one edge thereof, with an inner part of said last mentioned transverse wall portion, and extending toward said first mentioned section, said side wall further having a section separate from said spaced sections, extending substantially transversely of said casing and continuous about said

axis having at an inner portion a face seating upon said inner side wall portion and having at its outer margin an oppositely disposed face seating upon said outer side wall portion, said transverse section further having an inlet orifice for the passage of fluid from the exterior to the interior of said casing and at the face thereof opposite said first mentioned transverse wall portion serving as a seat; a valve element disposed adjacent said seat and cooperating therewith for

controlling said orifice; fluid outlet means in said casing; means for holding said end walls and side wall and its sections against axial relative movement; and supporting lugs extending from said outer margin of said transverse section to the outer margin of said second mentioned transverse portion and integrally connected to one of said margins.

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