Sept. 13, 1927. 1,642,293

P. P. BOURNE ET AL

INTERNAL COMBUSTION ENGINE

Filed May 17, 1924

Fig. 1.

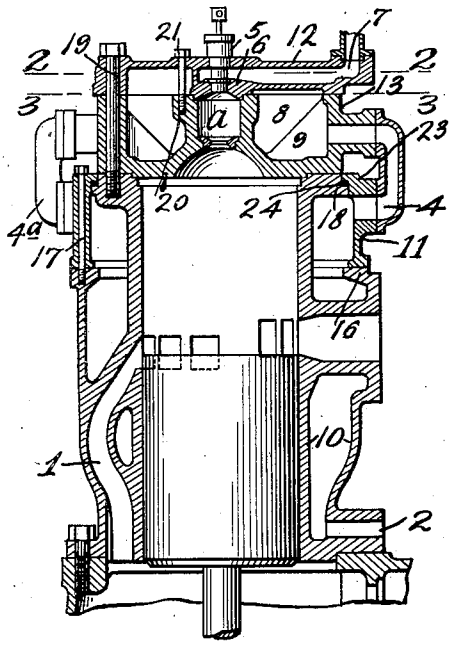


Fig. 2.

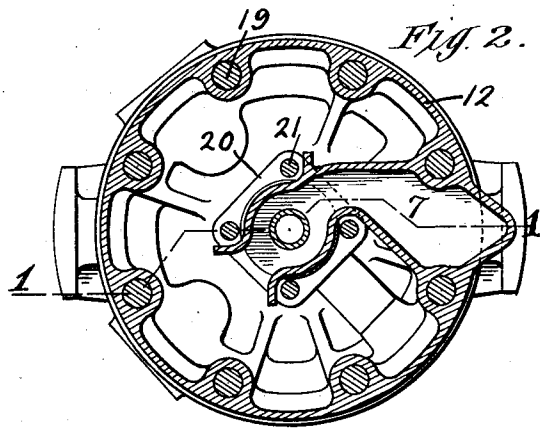


Fig. 3.

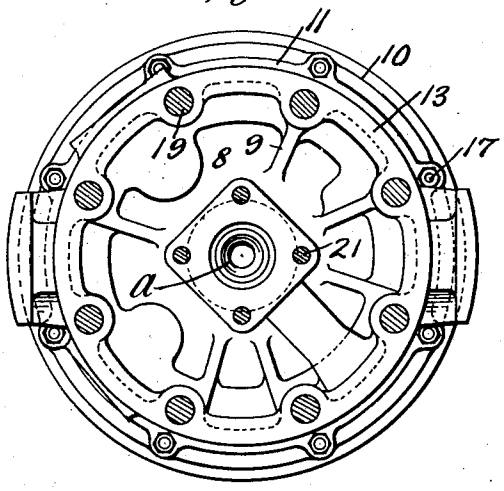


Fig. 4.

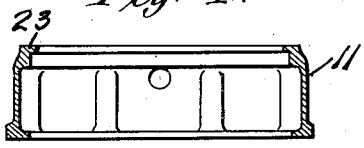


Fig. 6.

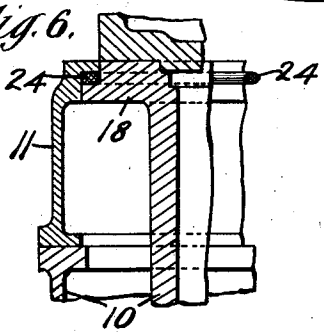
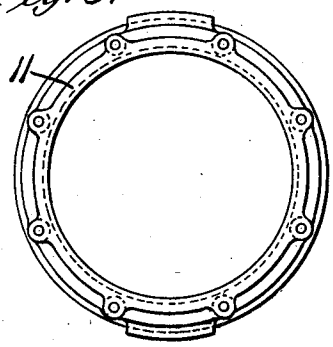


Fig. 5.



Inventors

Phillips P. Bourne and Otto Mouneebruck

By their Attorneys

Phillips Savoy & Rice & Kennedy

Patented Sept. 13, 1927. 1,642,293

UNITED STATES PATENT OFFICE.

PHILLIPS P. BOURNE, OF WINCHESTER, AND OTTO NONNENBRUCH, OF BOSTON, MASSACHUSETTS, ASSIGNORS TO WORTHINGTON PUMP AND MACHINERY CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF VIRGINIA.

INTERNAL-COMBUSTION ENGINE.

Application filed May 17, 1924. Serial No. 713,933.

This invention relates to improvements in internal combustion engines.

It is the object of the present invention to provide a novel cylinder construction for engines of the above type, whereby the cooling water passages and chambers associated with the cylinder wall and head may be formed in a plurality of sections. An important advantage of the present construction consists in avoiding danger of distortion of the jacket wall at its points of attachment to the cylinder wall, which in prior constructions has been caused by the greater longitudinal expansion of the cylinder wall than the jacket wall, because of the higher degrees of heat to which it is subjected during engine operation. In addition to the above, this sectional construction permits ready access to the interior of the cylinder jacket for cleaning the chambers and passages therein, and at the same time, in engines of the precombustion chamber type, permits ready access to the precombustion chamber by providing a sectional cylinder head in which the section carrying the spray nozzle and top of the precombustion chamber may be easily removed without disturbing the other cylinder parts, thus enabling ready access to the interior of the precombustion chamber to be had, as well as the cooling chamber and passages in the head, for inspection, cleaning, etc.

In the accompanying drawings forming a part of this specification, there is shown for purpose of illustration a construction embodying all the features of the invention in a preferred form, and this construction will now be described in detail in connection with said drawings, and the novel features forming the invention then be specifically pointed out in the claims.

In the drawings—

Figure 1 is an irregular vertical section of a precombustion chamber internal combustion engine, the section being taken on the line 1—1 of Fig. 2;

Figures 2 and 3 are sections on the lines 2—2 and 3—3 of Fig. 1;

Figure 4 is a detail view showing in central section one of the cast cylinder sections;

Figure 5 is a plan view of the section shown in Fig. 4; and

Figure 6 is a detail view, showing the joint between the cylinder sections and its packing.

Referring now to the drawings, and particularly to Fig. 1, the complete cylinder with its head is made up of four separate castings 10, 11, 12 and 13. The casting 10 includes the cylinder wall in which are formed the usual exhaust and scavenging ports, scavenging air passage 1, and part of the cooling water jacket with inlet 2 therefor; the casting 11 includes a part of the cylinder wall jacket and parts of two passages 4, 4^a leading into the head, while the castings 12, 13 indicate a split or two-part head construction, the part 12 thereof carrying the usual spray nozzle 5, the top 6 of a precombustion chamber, and a cooling water outlet 7 communicating with chamber 8 surrounding the precombustion chamber *a*, which is formed integral with the ribs 9 extending to the outer wall of the section 13, as shown. The ring 11, above referred to, is mounted on a flange 16 on the wall of the jacketed section 10, and the sections 10, 11 are secured together by screw bolts 17 having threaded engagement with such flange. The split cylinder head, consisting of the sections 12, 13, above described, is mounted on top of the cylinder, the casting 13 being mounted on a flange 18 formed on the cylinder wall, and the section 12 of such head being mounted on section 13. These two parts 12, 13 are secured to the flange 18 above referred to by bolts 19 passing through alined holes therein, and the part 12 may be further secured to a flange 20, on the precombustion chamber *a*, by bolts 21.

As thus far described, it will be seen that a cylinder consisting of the four cast sections 10, 11, 12 and 13, secured together as above described, will include the complete cylinder jacket wall. The jacket chambers are supplied with cooling liquid through inlet 2, and are in communication by passages 4, 4^a with chamber 8 in the section 13, and with outlet passage 7 from such chamber formed in section 12. While it will be obvious that a cylinder thus constructed will be as durable in use as cylinders heretofore constructed, and in addition have the advantages above pointed out as to accessibility, the parts will, of course, be subjected to different degrees of heat in engine operation

which will set up torsional stresses. To prevent danger of distortion of the jacket wall, therefore, due to longitudinal expansion of the cylinder wall in excess of that of the jacket wall or other parts, a certain degree of excess expansion of such cylinder wall is provided for in the present arrangement by providing a resilient packing between the flange 18 and a flange 23 formed on the section 11. Although other packing material may be used with equal advantage, a rubber packing ring 24, of circular or other form, is preferred, which when compressed will assume the shape shown in Fig. 6. As the parts between which this packing is interposed are cooled by the circulating cooling water, injury thereof due to heat will not occur for a considerable time, and in any event such packing may readily be replaced.

It will be seen from the foregoing that a complete engine cylinder, with water jacket, including the inlet and outlet passages therein, as well as the scavenging air passage, exhaust ports, etc. may be made up of but four separate main castings separable on a line transverse to the axis of the cylinder, while each of the castings may be readily formed so that when the parts are assembled they will accurately fit together to form a complete operative structure, with the cylinder wall carrying the head independently of the jacket section, while the resilient packing interposed between the cylinder wall and its adjacent jacket section will permit sufficient longitudinal expansion of the former to prevent danger of distortion of the jacket or cylinder wall. The split head and sectional cylinder construction will permit of ready access to the precombustion or injection chamber and the cooling chambers and passages in the head and cylinder, for inspection, cleaning, etc.

It will be understood that the number and form of the sections may be varied in carrying out the invention, and various other changes made in the construction of the parts herein shown and described, while still retaining the invention defined by the claims.

What is claimed is:

1. A cylinder for internal combustion engines consisting of a section including the cylinder wall and a part of the water jacket of the engine, a cylinder head, a separate jacket section intermediate said head and cylinder wall section, and means interposed between the end of the cylinder wall and said intermediate jacket section for permitting longitudinal expansion of the cylinder wall with respect to said intermediate section without distortion.

2. A cylinder for internal combustion engines consisting of a cast section including the cylinder wall and a portion of the jacket of the engine, a two-part head section mounted on the end of the cylinder wall, a separate jacket section intermediate said head and cylinder wall sections, and resilient packing between the cylinder wall and said intermediate jacket section for permitting heat expansion without distortion.

3. In a cylinder for internal combustion engines, a two-part cylinder head and a cooling water chamber therein, the line of separation between said head parts being in a plane transverse to the longitudinal axis of the cylinder and extending through the cooling water chamber within said head.

4. In a cylinder for internal combustion engines, an injection chamber, and a two-part cylinder head, the line of separation between said head parts being a straight line lying in a plane transverse to the longitudinal axis of the cylinder, the inner head part including the injection chamber and the outer part including the top for said chamber.

5. In a cylinder for internal combustion engines, a spray nozzle, a two-part cylinder head, a cooling water chamber therein, and an injection chamber, the line of separation betwen the head parts being in a plane transverse to the longitudinal axis of the cylinder and extending through the cooling water chamber enclosed within said head, the inner head part including an injection chamber, and the outer head part including a top for said chamber and a spray nozzle.

6. In a sectional cylinder for internal combustion engines, a two-part cylinder head, a cooling water chamber, an outlet chamber, and an injection chamber, the line of separation between said head parts being in a plane transverse to the longitudinal axis of the cylinder and extending through the cooling water chamber enclosed within said head, one of said head parts having said injection chamber formed therein, and the other of said head parts having formed therein a top for said injection chamber and the cooling water outlet.

7. A sectional cylinder for internal combustion engines, consisting of a plurality of sections separable on lines transverse to the longitudinal axis of the cylinder, said sections including parts of the cooling water jacket of the engine, a two-part cylinder head for said cylinder, dividing said head into an inner head part and an outer head part, the line of separation between said head parts being transverse to the longitudinal axis of the cylinder and extending through the cooling water chamber enclosed within said head, the inner head part including an injection chamber, and the outer head part including a top for said injection chamber.

8. A sectional cylinder for internal combustion engines, consisting of a plurality of sections separable on lines transverse to the longitudinal axis of the cylinder, said sec-

tions including parts of the cooling water jacket of the engine and a two-part cylinder head divided so that its section of division is a plane section, one of said head parts including an injection chamber and the other head part a top for said chamber, and means for permitting unequal expansion of said cylinder sections with respect to each other without distortion.

9. A sectional cylinder for internal combustion engines, comprising a section including the cylinder wall and part of the water jacket of said engine, a cylinder head, and a removable cylindrical section intermediate said head and cylinder section, the walls of said sections being arranged to register to form a cylinder cooling chamber having water passages communicating therewith, said intermediate section being separable from the cylinder section on a line transverse to the longitudinal axis of the cylinder for access to the cylinder cooling chamber.

In testimony whereof, we have hereunto set our hands.

PHILLIPS P. BOURNE.
OTTO NONNENBRUCH.