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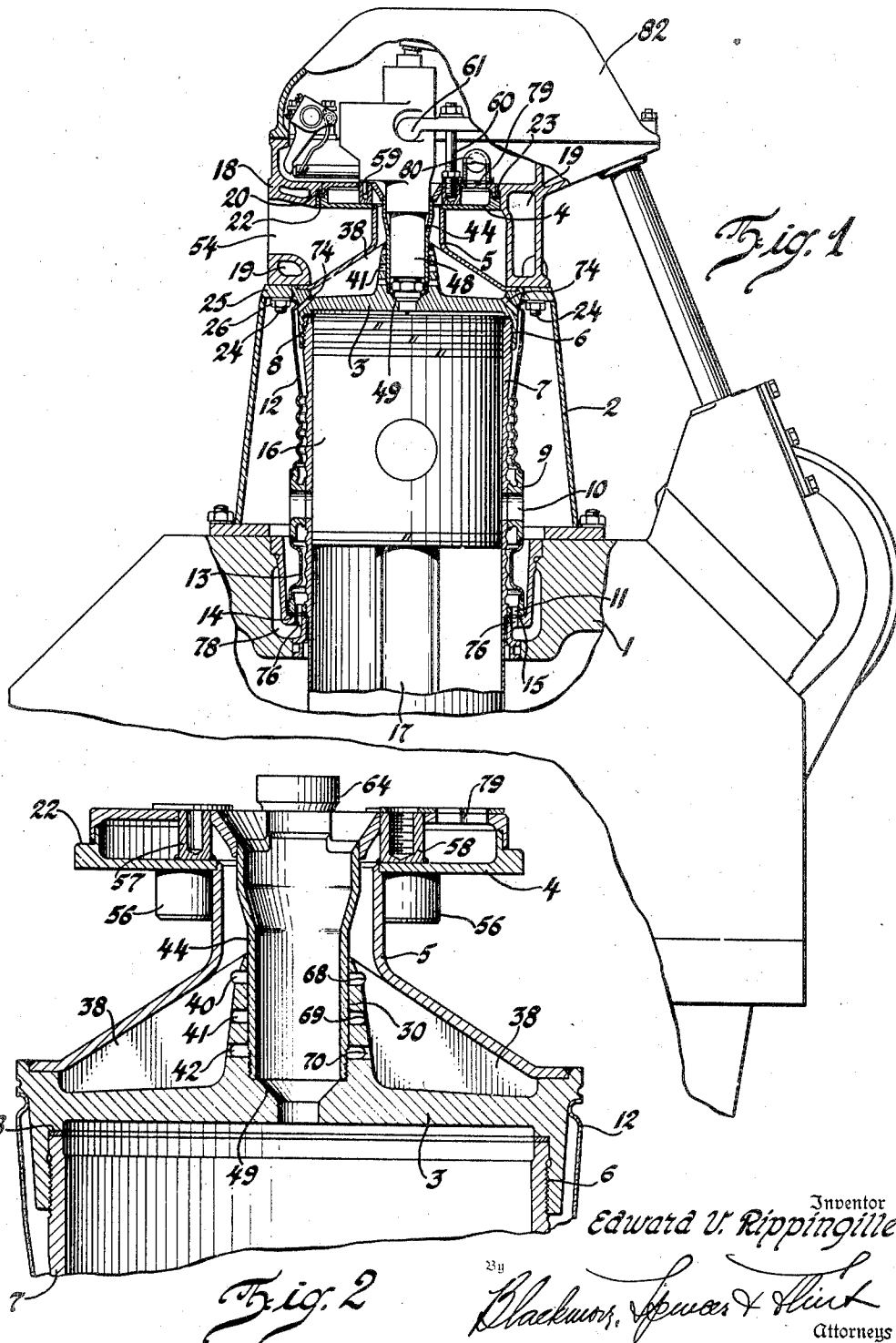
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2,234,780

CYLINDER HEAD CONSTRUCTION

Filed Dec. 16, 1938

2 Sheets-Sheet 1



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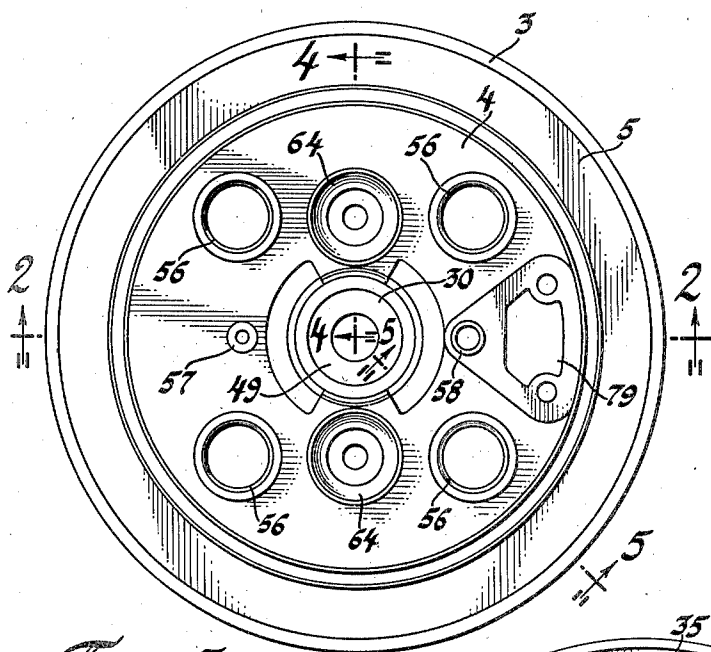


Fig. 3

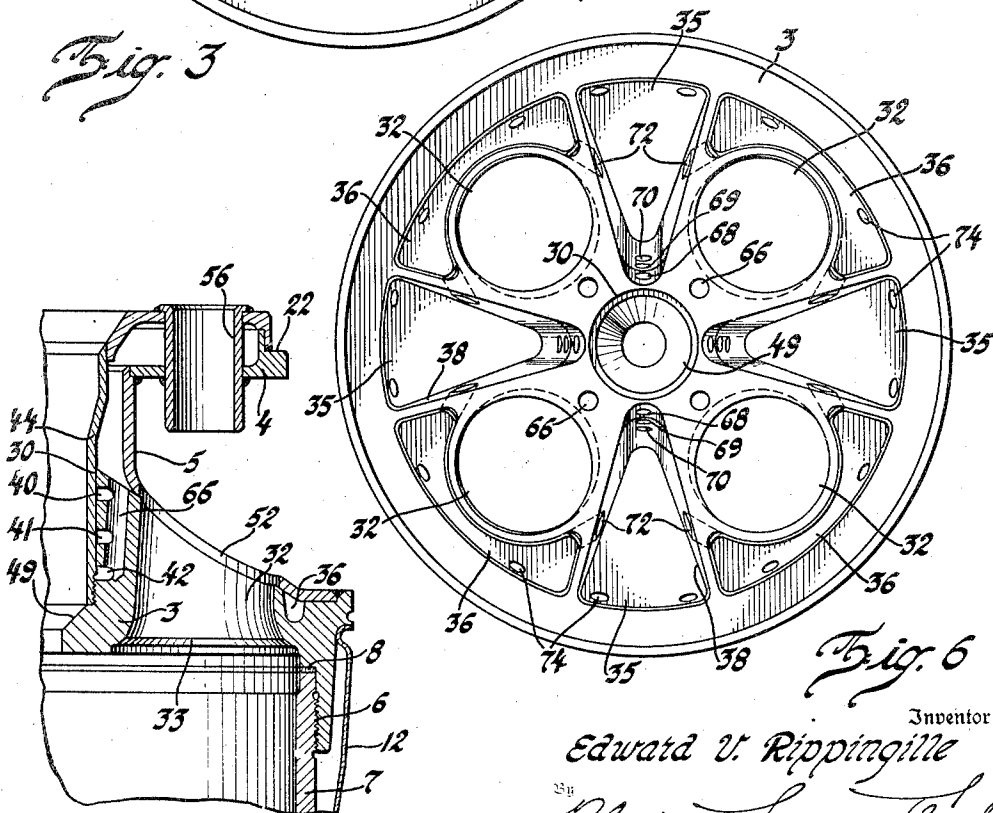


Fig. 5

Fig. 6

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CYLINDER HEAD CONSTRUCTION

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7 Claims. (Cl. 123—173)

This invention relates to a cylinder head construction for an internal combustion engine.

More especially it relates to a cylinder head comprising an inner water cooled portion provided with apertures for valves, which is enclosed, and free to expand, within a housing providing a passage for the flow of gases to or from the valves.

The object of the invention is an improved cylinder head construction which is lighter and stronger and better able to resist the varying strains due to expansion and contraction occurring during running of the engine, than those heretofore in use.

Another object of the invention is a cylinder head including an inner portion which takes the load of the explosions and is free to expand independently of its enclosing housing, through which it is secured to the engine frame.

A further object of the invention is a cylinder head having a water cooled inner portion in which valves may be both seated and guided.

The above and other objects of the invention will be apparent as the description proceeds.

According to the invention the inner water cooled portion of the cylinder head is a built up steel construction, comprising a lower deck and an upper deck spaced from each other, but rigidly united together by an inverted funnel shaped strut which forms a water chamber jacket for the parts of the cylinder head exposed to the heat of combustion. Valve pockets and seats are formed in the lower deck, and valve guides for the stems of the valves are provided in the upper deck. There are ports through the conical strut portion, constituting extensions of the valve pockets into a housing which forms a large collecting chamber and passageway for the flow of gases to or from the valves, and which holds the inner part of the cylinder head and the cylinder barrel in position on the engine frame.

The drawings show the application of the invention to a two cycle Diesel engine having four exhaust valves and an injector in the cylinder head, and piston controlled inlet ports in the cylinder wall.

In the drawings:

Fig. 1 is a sectional elevation of one cylinder and cylinder head according to the invention, showing the method of mounting the assembly in the engine frame.

Fig. 2 is an enlarged sectional view of the inner water cooled portion of the cylinder head along with the top end of the cylinder barrel, on line 2—2 of Fig. 3.

Fig. 3 is a plan view of Fig. 2.

Fig. 4 is a view in sectional elevation, of a part on line 4—4 of Fig. 3.

Fig. 5 is a sectional elevation on line 5—5 of Fig. 3.

Fig. 6 is a plan view of the lower deck of the cylinder head.

The engine frame includes the crank casing 1, and a welded steel air box 2, rigidly bolted thereto.

The inner portion of the cylinder head comprises a lower deck 3, and an upper deck 4, united by an inverted funnel shaped strut 5. The lower deck 3 is screw threaded as shown at 6, for attachment to the cylinder barrel 7, a copper gasket 8 serving to effect a seal between these parts.

The cylinder barrel 7 is provided with a port ring 9 for air inlet ports 10, and a lower flange 11.

A water jacket around the cylinder barrel is constituted by the sleeves 12 and 13 which are brazed thereto. Communication between the water jackets formed by the sleeves 12 and 13 is through ducts (not shown), extending through the port ring 9, between the ports 10 thereof. The lower flange 11 of the cylinder barrel rests on a packing ring 14 of resilient material, on a shoulder 15 of the crank casing 1.

Within the cylinder 7, is a piston 16, with a connecting rod 17, to the usual crankshaft (not shown).

The inner portion of the cylinder head is enclosed by a housing 18, having cored passages such as 19, for water cooling. The upper deck 4 of the inner portion of the cylinder head, is piloted in a bore of the housing 18, there being a packing ring 20 of resilient material, between a flange 22 of the upper deck 4 and a shoulder 23, of the bore through the housing 18, through which the upper deck 4 of the inner portion extends.

The outer housing 18 is provided with studs 24, through which it is fastened to a flange 25 on the air box 2, by nuts 26. The outer housing has a plane bottom surface constituting an abutment which bears on the rim of the lower deck 3, and tightening of the nuts 26 compresses the resilient packings 14 and 20, until the abutment on the housing bears also on the flange 25, when the cylinder and cylinder head assembly are held securely in position.

The upper deck 4 consists of two annular, rimmed discs, brazed together at their outer periphery, to form a hollow plate.

The lower deck 3 is of generally conical shape to conform with the part 5, and has a central bore 30, and four symmetrically disposed ports 32, with seatings such as 33, for exhaust valves not shown. Pockets 35 are formed between the ports, and pockets 36 as shown in Figures 5 and 6, are formed between the valve ports and the outer rim of the lower deck 3, to lighten this part and provide water cooling spaces separated by radial ribs 38, to which, to the rim of the lower deck 3, and to the lowermost of the discs of the upper deck, the strut 5 is welded.

Three annular grooves 40, 41 and 42 are machined in the bore 30 of the lower deck 3, and are closed off by a tubular piece 44, which is screwed into the bore, below the grooves, and brazed to the uppermost of the discs of the upper deck, to form a pocket for a fuel pump injector 48, which has a seating 49, in the lower deck 3.

There are ports 52 in the strut 5, coinciding with the ports 32 in the lower deck 3, through which the exhaust gases can flow into the annular space above the strut 5 and below the upper deck 4, which, when the inner portion of the cylinder head is enclosed by the housing 18, provides a chamber with an opening 54 for the flow of gases to or from the valve pockets 32.

Bushings such as 56 for valve guides for each of the exhaust valves, extend through the upper deck 4, and are brazed thereto; bushings 57 and 58 respectively, are brazed in the upper deck, for a dowel pin 59 on the injector, and a bolt 60 which holds the injector 48 on its seating by means of a hold down crab 61.

Ball socket pieces 64 for valve operating gear (not shown) are brazed in the upper deck between each pair of valve guide bushings.

The spaces bounded by the lower deck 3, the strut 5, the tubular piece 44, and the two discs of the upper deck 4, are the water jacket spaces for these parts.

Interconnection between the annular grooves 40, 41 and 42 in the bore 30 and the water space around the tubular piece 44 is effected through drilled holes 66, and each of the annular grooves 40, 41 and 42 communicates with each of the pockets 35 through holes 68, 69 and 70, respectively. The grooves 40, 41 and 42 with their inlets 68, 69 and 70 and outlets 66 provide for an adequate flow of water in contact with the lower part of the sleeve 44 to dissipate heat more directly from the lower part of the injector 48.

Each pocket 35 is connected with its adjacent pockets 36, and vice versa, by drilled holes such as 72, while a plurality of drilled holes 74, connect the pockets 35 and 36, with the water jacket of the cylinder barrel.

The water for cooling purposes enters the bottom of the water jacket of the cylinder barrel through holes 76, which extend through the shoulder 15, the packing ring 14, and the flange 11, from a gallery 78 in the crank casing 1. The water leaves the cylinder head, through a port 79 and a pipe 80 connected to the top deck 4 thereof.

A cover 82 for valve and injector operating gear (not shown), is bolted to the housing 18.

It will be seen, that the inner built up steel cylinder head is a strong but relatively light construction in which the four exhaust valves are both seated and guided, that this has been achieved while leaving space for a centrally disposed injector, with ample water jacketing for the cylinder head, the valves, their guides and the injector, and with valve ports opening directly into a large collecting chamber for the exhaust gases from each of the valves.

When, as shown in the drawings, the cylinder barrel is secured to the cylinder head, there are no bolts and no joints between the cylinder head or the cylinder, and the engine frame, to be sealed against gas pressure leakage.

Furthermore, and since in a two cycle engine there is no reversal of gas pressure stresses, the

single abutment provided by the housing surrounding the cylinder head, at all times transmits the gas pressure thrust on the cylinder head to the engine frame, and permits the cylinder head and cylinder barrel assembly to expand axially in either direction away from the abutment.

I claim:

1. In combination, a cylinder head, a cylinder barrel with a water jacket, and an engine frame, said cylinder head comprising an inner portion, secured to the cylinder barrel, and a separate portion constituting an outer housing bolted to the engine frame, said inner portion extending through the outer housing and said outer housing being the sole means of holding said inner portion and said cylinder barrel with its water jacket in position on the engine frame between a single abutment on the outer housing and a resilient packing ring on the engine frame.

2. In combination, a cylinder head, a cylinder barrel and an engine frame; said cylinder head comprising an inner portion secured to the cylinder barrel, and an outer housing; valve pockets with valve seats and valve guides, and water cooling spaces therefor, within the inner portion, and a chamber for the flow of gases to or from the valve pockets between the inner portion and the outer housing; said outer housing being the sole means of securing the inner portion of the cylinder head and the cylinder barrel to the engine frame.

3. A cylinder head comprising an inner portion and an outer housing, valve pockets with valve seats and valve guides in the inner portion, and a chamber formed between the inner portion and the outer housing, for the flow of gases to or from the valve pockets.

4. The combination according to claim 3, in which the inner portion of the cylinder head comprises a lower deck and an upper deck united by a suitable strut member, the upper deck being piloted in the outer housing and having a shoulder bearing on a resilient packing ring in the outer housing, said housing seating on the lower deck.

5. The combination according to claim 3, in which the inner portion of the cylinder head comprises a lower deck and a hollow upper deck, united by an inverted funnel shaped strut, the hollow upper deck and the space between the strut and the lower deck constituting water cooling chambers for the inner portion of the cylinder head.

6. A cylinder head including a built up steel inner portion comprising a lower deck, an upper deck formed of two rimmed discs united at their outer periphery, and an inverted funnel shaped strut member uniting the lower deck to the lowermost of the two rimmed discs of the upper deck, there being valve pockets through the strut member and the lower deck, valve seats in the lower deck and valve guides in the upper deck.

7. The combination according to claim 6, in which a tubular member connects the uppermost of the two rimmed discs of the upper deck with the lower deck, to form a pocket for an injector; the spaces bounded by the lower deck, the strut, the two discs of the upper deck and the tubular member being water jacket spaces.

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