

March 29, 1927.

M. S. NAPIER ET AL

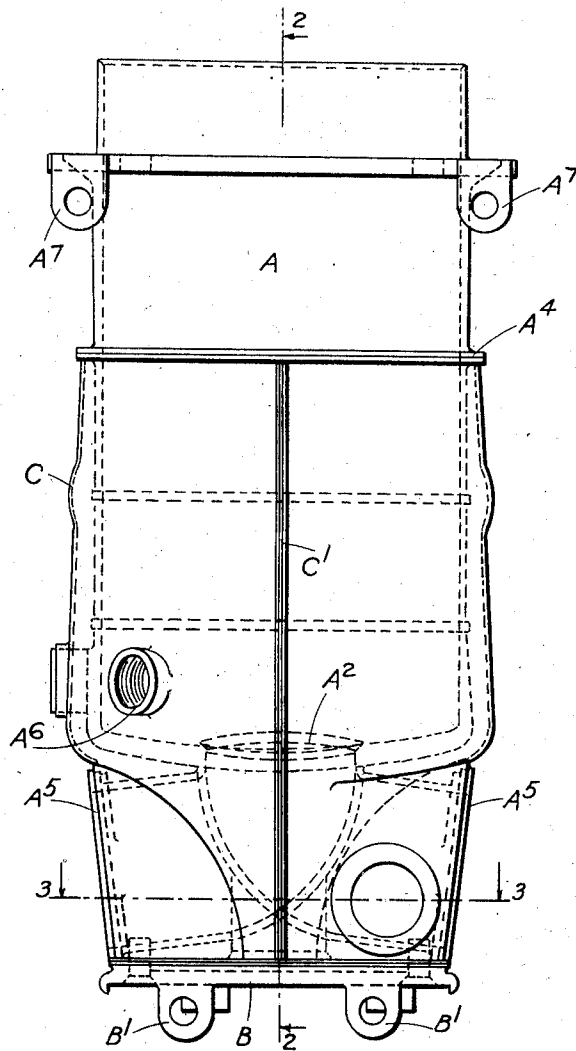
1,622,965

CYLINDER FOR INTERNAL COMBUSTION ENGINES

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3 Sheets-Sheet 1

FIG. 1.



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FIG. 2.

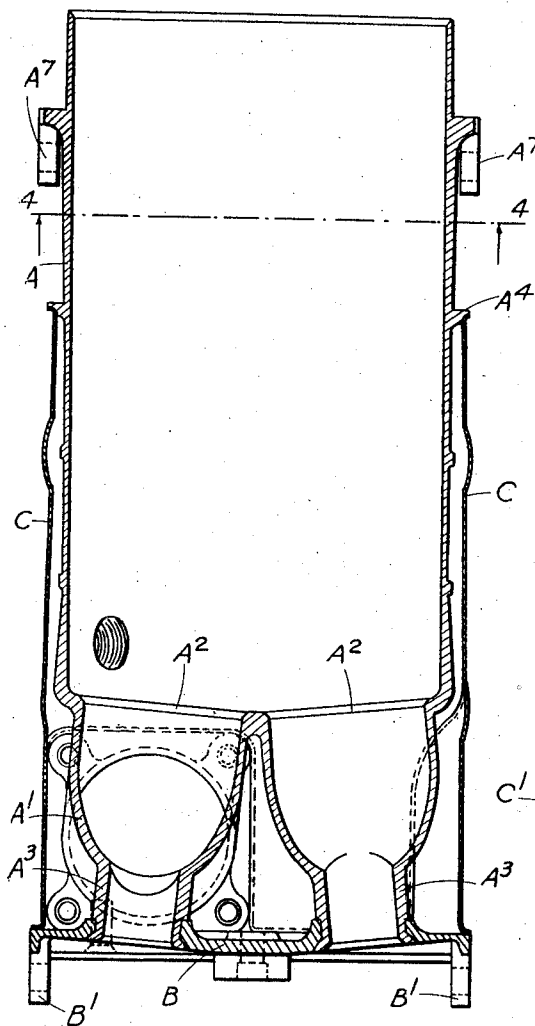


FIG. 4.

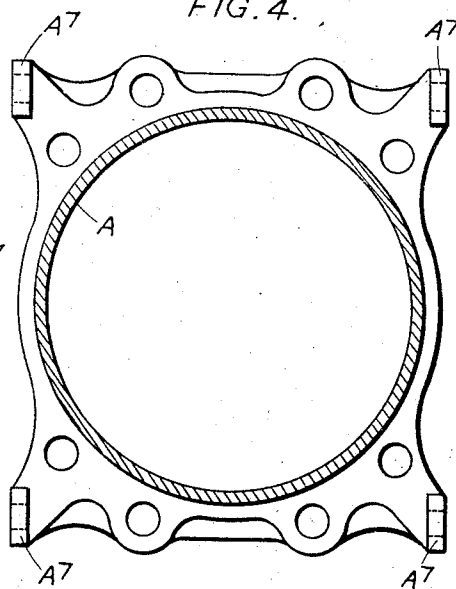
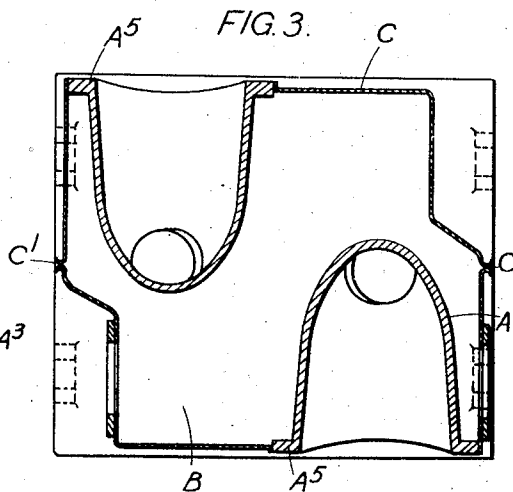


FIG. 3.



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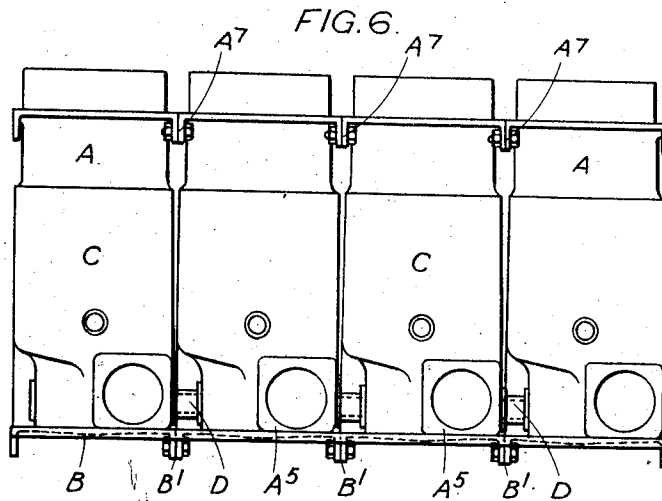
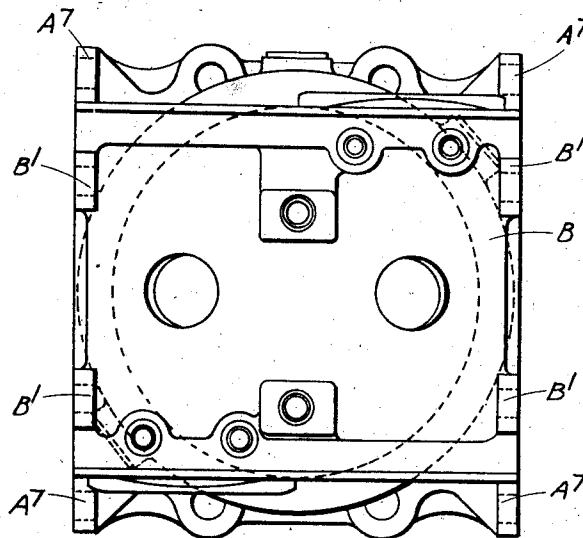


FIG. 5.

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CYLINDER FOR INTERNAL-COMBUSTION ENGINES.

Application filed February 2, 1925, Serial No. 6,499, and in Great Britain June 18, 1924.

This invention relates to water-cooled cylinders for internal combustion engines of the kind comprising a cylinder barrel provided at its ends with lugs by means of which it can be detachably secured to one or more similar cylinder barrels to form a cylinder block.

The object of the present invention is to provide an engine particularly suitable for use with aircraft, which though built up from a number of independent cylinders each having its own water jacket yet forms a rigid block or unit of light construction.

According to this invention each cylinder comprises a head and a barrel formed as a unit preferably by forging and surrounded by a thin metal casing welded or otherwise connected thereto in a watertight manner to form a water jacket, lugs being provided on the cylinders outside or beyond the limits of the jacket by means of which each individual cylinder can be bolted to one or more similar cylinders to form a block.

Such a block can be treated as a whole or any individual unit cylinder can be detached at will, there being separate short bolts for connecting each pair of adjacent lugs and hence no tendency for the structure as a whole to lose its rigidity. Further such a construction not only limits the surfaces which need be machined to ensure a close and permanent fit between the various cylinders but also enables circulation of water through the several jackets to be obtained by means of simple pipe connections comprising tubes extending from adjacent water jackets and connected by means of a short length of rubber or other flexible tubing so that there are no rigid watertight joints to be maintained such as have been necessary with previous constructions. By employing separate short bolts for connecting each pair of adjacent lugs these bolts can be withdrawn and any cylinder removed from the block without disturbing the remaining cylinders as was necessary when long bolts passing through the whole cylinder block were employed.

The cylinder head is preferably provided with a cover plate, in itself known, engaged by and welded to one end of the thin metal casing which surrounds the cylinder the other end of this casing being welded to a

point intermediate in the length of the cylinder barrel.

The invention may be applied to internal combustion engines having vertical, inclined, horizontal or inverted cylinders but one construction according to this invention as applied to cylinders of the inverted type is illustrated by way of example in the accompanying drawings, in which—

Figure 1 is a side elevation.

Figure 2 is a section on the line 2—2 of Figure 1.

Figure 3 is a section on the line 3—3 of Figure 1.

Figure 4 is a section on the line 4—4 of Figure 2.

Figure 5 is a bottom plan view of the construction shown in Figure 1.

Figure 6 is a side elevation on a reduced scale showing four cylinders of the kind shown in Figures 1, 2, 3, 4 and 5 united to form a block of cylinders.

In the construction illustrated the cylinder comprises a barrel A formed as a unit with the cylinder head A' in which are inlet and exhaust ports A², the cylinder and cylinder head being formed for example by machining from a solid steel forging. Secured to the cylinder head, for example to the sockets A³ for the valve guides, is a cover plate B which is secured in position either by riveting as shown or by welding or by nuts engaging screwthreaded extensions of the valve guide sockets A³ or by a combination of riveting and welding so as to form a watertight joint. Surrounding the cylinder is a sheet metal casing C one end of which is connected by welding or in some other suitable manner to the cover plate B while the other end is similarly connected to a flange A⁴ on the cylinder barrel at a point intermediate in its length.

The casing C is arranged to fit closely around the flanges A⁵ to which the inlet and exhaust passages are connected and is welded to these flanges and also to the boss A⁶ for the sparking plug as shown. To facilitate manufacture the casing is conveniently formed in two halves which are welded together as at C', after assembly.

The cylinder has a flange adjacent to its open end by means of which it is connected to the crank case and this flange carries drilled lugs A⁷. The cover plate B also has

similar drilled lugs B' by means of which adjacent cylinders can be connected together to form a block of cylinders as shown in Figure 6. In this arrangement the water jackets of adjacent cylinders communicate with one another by means of short lengths of flexible tubing D uniting the ends of short metal tubes projecting from the water jackets.

If desired the cover plate B may be formed integral with the cylinder head and it is to be understood that other means than welding may be employed for connecting the casing C to the cover plate and to the cylinder barrel and that considerable constructional modifications may be made without departing from this invention. Further the invention is equally applicable to engines having more than two ports, for example engines having two inlet ports and one exhaust port, two exhaust ports and one inlet port, or two inlet and two exhaust ports.

It will be seen that with a construction according to this invention the cylinders can be connected together to form a rigid cylinder block which can be removed as a unit from the crank case and another similar block substituted therefor in the event of the block becoming damaged without interfering with any of the welded joints of the water jackets in either block or necessitating the breaking of any separate pipe couplings, the same bolts serving to clamp the cylinders together and to maintain the water connections D in engagement while any individual cylinder can be removed from the crank case without disturbing the other cylinders if desired.

It is to be understood that, although the invention is described as particularly applicable to the cylinders of internal combustion engines operating on the four-stroke cycle for use on aircraft, it may be applied to the cylinders of engines operating on the two-stroke or any other cycle whether such engines are for use on aircraft or for other purposes and have vertical, inclined, horizontal or inverted cylinders.

What we claim as our invention and desire to secure by Letters Patent is:—

1. In a multicylinder internal combustion engine of the water-cooled type, the combination of a plurality of cylinders each comprising a cylinder barrel and cylinder head formed as a unit and a thin metal casing surrounding the cylinder and welded thereto in a watertight manner to form a water jacket, lugs formed on each cylinder beyond the limits of the water jacket, means for connecting the lugs of adjacent cylinders together to form a block of cylinders, hollow bosses extending from the water jackets of adjacent cylinders so as to lie opposite to one another and a flexible tube connecting said bosses and adapted to be inserted in place when the cylinders are being assembled and retained in place when they are so assembled without additional securing means.

2. In a multicylinder internal combustion engine of the water-cooled type, the combination of a plurality of cylinders each comprising a cylinder barrel and cylinder head formed as a unit, valve guide sockets formed integral with each cylinder head, a cover plate for each cylinder head engaging these sockets in a watertight manner and a thin metal casing surrounding each cylinder and welded at its ends respectively to the cover plate and to the cylinder barrel to form a water jacket, lugs formed on the cylinder barrel and cover plate beyond the limits of the water jacket, short bolts for connecting the lugs of adjacent cylinders together to form a block of cylinders, tubular bosses extending from the water jackets of adjacent cylinders so as to lie opposite to one another and a flexible tube connecting each pair of adjacent bosses, said tubes being interposed between the bosses when the cylinders are being assembled and thereafter retained in place without additional securing means.

In testimony whereof we have signed our names to this specification.

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