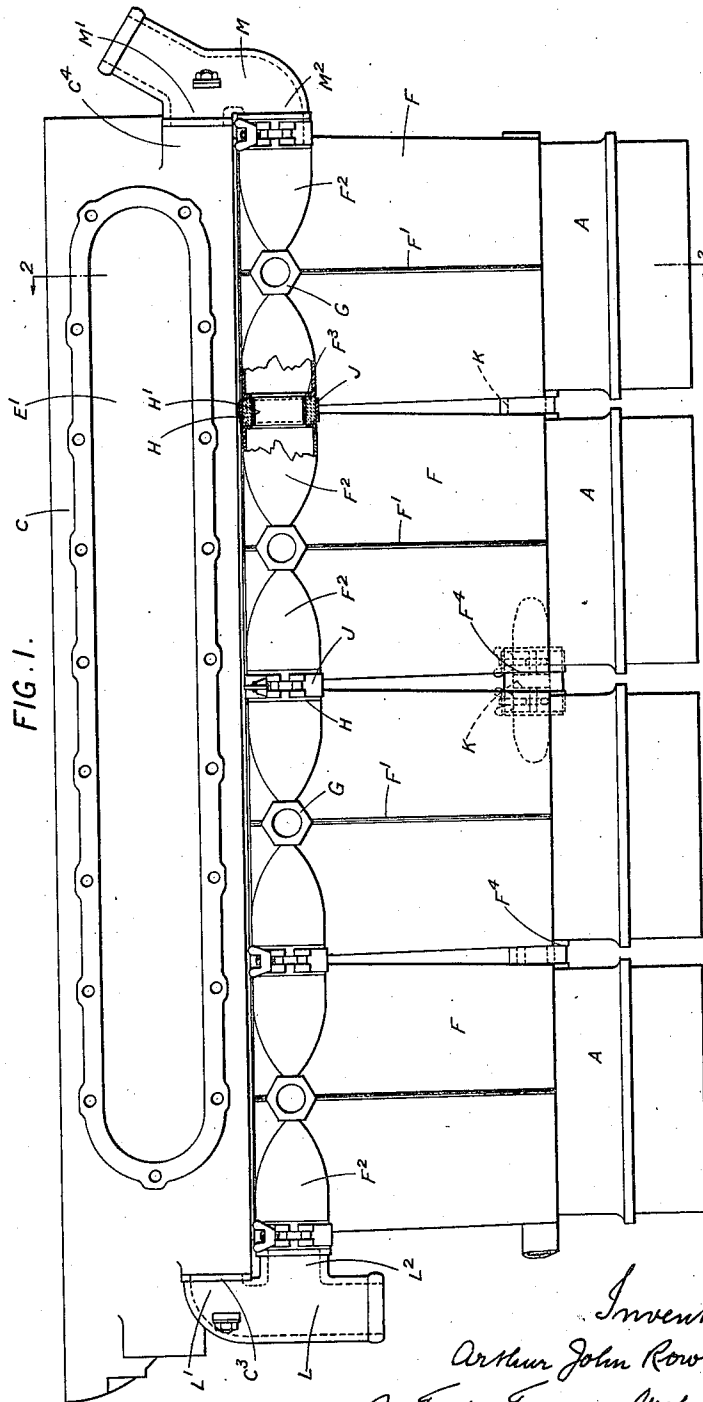


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CYLINDER OF INTERNAL COMBUSTION ENGINES.
APPLICATION FILED NOV. 8, 1918.

1,375,110.

Patented Apr. 19, 1921.

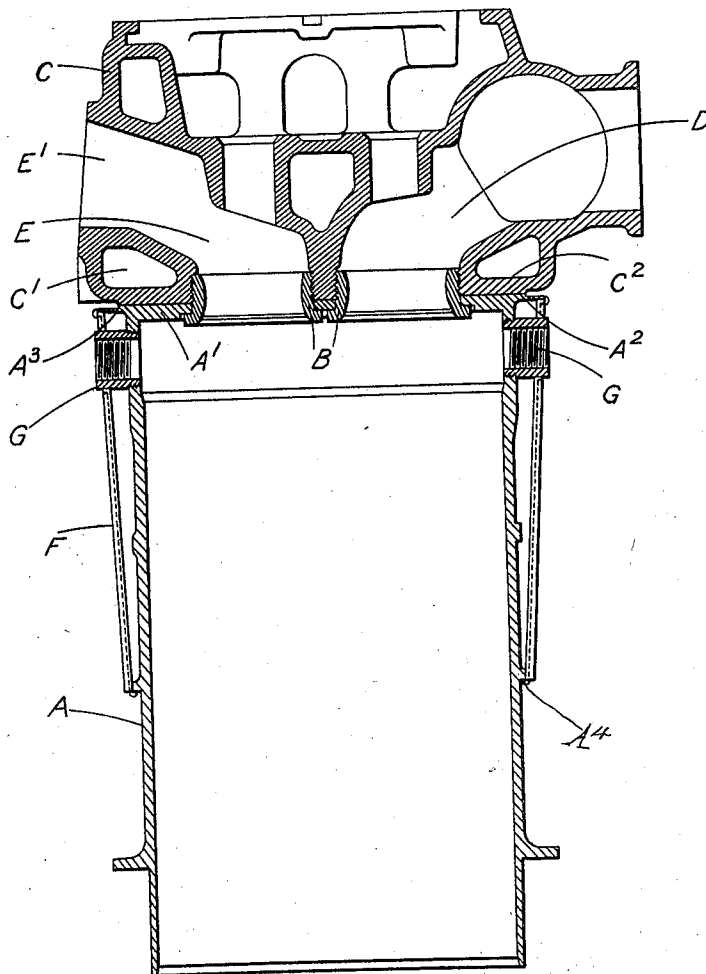
2 SHEETS—SHEET 1.



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FIG. 2.



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UNITED STATES PATENT OFFICE.

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CYLINDER OF INTERNAL-COMBUSTION ENGINES.

1,375,110.

Specification of Letters Patent.

Patented Apr. 19, 1921.

Application filed November 8, 1918. Serial No. 261,754.

To all whom it may concern:

Be it known that I, ARTHUR JOHN ROWLEDGE, a subject of the King of England and residing at London, in England, have
5 invented certain new and useful Improvements in the Cylinders of Internal-Combustion Engines, of which the following is a specification.

This invention relates to the cylinders of
10 internal combustion engines more particularly multicylinder engines and has for its object to effect certain improvements in the construction of the water-jackets thereof.

In cylinders of the type having overhead
15 valves and detachable heads or in which the water-jacket on the head of the cylinder is formed separate from the jacket surrounding the body of the cylinder leakage is apt to occur at the junction between the head
20 and body portions of the water-jacket. Further, it is necessary to avoid leakage from the water-jacket at the place where the sparking plug is inserted in the cylinder. In obviating these difficulties it is
25 moreover desirable to avoid as far as possible unnecessary weight in the construction of the parts, particularly where the engine is intended for use on aircraft. The present improvements are directed to providing
30 a light and simple construction of cylinder in which leakage from the water-jacket will not occur.

According to this invention the cylinder
has an integral head and the water-jacket
35 on the head of the cylinder is formed separate from the water-jacket which surrounds the body of the cylinder no direct communication being provided for the flow of water between the adjacent portions of these parts.
40 The head portion of the water-jacket is formed as a casting with its lower part closed in so as to provide no communication through that part with the water-jacket surrounding the cylinder body. The cylinder
45 has an outwardly directed flange formed around its head and another flange formed at some point in its length at a convenient distance from the crank case. A cylindrical casing constructed, for example, of thin
50 sheet steel or of aluminium or aluminium alloy in sheet form and made in either one or two pieces is applied to the cylinder and welded or otherwise attached in a watertight manner to the flanges on the exterior
55 of the cylinder which is thus incased in a

water-jacket which is entirely separate from the water-jacket on the head. The cylinder is formed with a boss of suitable shape and dimensions to receive the sparking plug and this boss extends outwardly through an
60 opening in the jacket casing which is welded or otherwise connected to the boss.

The inlet and exhaust openings are formed in the head of the cylinder which is flat to receive the flat underface of the casting constituting the water-jacket for the
65 cylinder head and this casting has a continuous bottom wall which closes in the underside of the water space therein. The water-jacket head casting may be connected
70 to the cylinder head either in a known manner by employing sleeves which constitute valve seats each of which is passed through an opening in the cylinder head and
75 screwed into the casting, or the valve seats may be formed in the openings in the cylinder head and bolts may be passed through the cylinder head into the head casting.

The invention may be put into practice in various ways but a convenient construction
80 is illustrated by way of example in the accompanying drawings in which,

Figure 1 is a side elevation of the cylinders of a four-cylinder engine to which the present invention is applied, part of one of
85 the water connections between the jackets of two cylinders being shown in section.

Fig. 2 is a sectional elevation on the line 2—2 of Fig. 1 looking in the direction of the
90 arrows.

Like letters indicate like parts throughout the drawings.

Each cylinder A is formed with an integral head A' in which are inlet and exhaust
95 openings, either two or four in number, which in the construction illustrated are of sufficient size to allow of the insertion in these openings of sleeves or tubes B each of which constitutes a valve seat. The head
100 A' of the cylinder is ground flat and the flat surface extends slightly beyond the margin of the head as at A² on to an outwardly directed flange which surrounds the head. There is thus provided an ample area for
105 contact between the water-jacket casting and the head A' of the cylinder itself. The detachable casting C which is mounted on the cylinder head is constructed integral as shown in Fig. 1 for all the four cylinders.
110 In this casting are formed the inlet and ex-

haust ports and passages D and E, the exhaust passage E' leading into a common opening E' as shown in Fig. 1. A water-jacket space C' surrounds these ports and lies behind the flat face C² which is adapted to be in contact with the face of the cylinder head A'. The face C² of the casting C is uninterrupted except by the openings of the inlet and exhaust ports and there is no water opening or communication through this face. The sleeves B as shown in Fig. 2 are screwed into the ports and serve to connect the casting C rigidly to the cylinder head. Intimate contact is thus provided between the head A' of the cylinder and the underside C² of the casting C so as to permit heat to be freely conducted away through the contiguous walls of the cylinder and casting while ample water circulation in the space C' is provided at those parts.

The flange A² which as mentioned is formed on the exterior around the cylinder head is extended as at A³ beyond the place where this flange is in contact with the face C² of the casting C. At a suitable distance along the cylinder A and toward its open end there is formed an external rib or flange A⁴ preferably of less width than the flange A³. To these flanges A³ A⁴ there is connected either by welding or otherwise a water-jacket casing F composed of thin sheet steel and conveniently formed in two parts welded or otherwise connected together as at F'. This casing F when thus rigidly connected to the flanges A³ and A⁴ forms a closed water-jacket surrounding the cylinder A. Two sparking plug bosses G are preferably provided and oppositely positioned in the cylinder and these project through corresponding openings formed in the water-jacket casing F which is suitably connected to these bosses.

In a multicylinder engine such as illustrated each cylinder is provided with an entirely separate jacket F surrounding the body of the cylinder A and except for the inlet and outlet openings which lead from the sides this jacket is completely closed at the head of the cylinder and at its lower end the connection between the jacket and the cylinder being preferably a permanent one. The single block water-jacket head casting C serves for all the cylinders in the set and there is no direct communication between the water space C' in this head casting and the water-jacket within the casing F. Thus risk of leakage between the detachable head casting C and the jacket F is obviated as also the difficulty of making and maintaining watertight joints between these parts and consequently the removal and attachment of the head casting is facilitated and further the construction and arrangement of the sparking plug bosses is simplified

and all risk of leakage around these bosses is prevented.

The pipe connections between the water-jackets F of the several cylinder bodies and the connections from these jackets as also from the water space in the casting C to the water inlet and delivery may be variously arranged. As shown in Fig. 1 of the drawing each casing F is provided at its upper part with two tubular openings or sockets F² suitably formed in the sheet metal parts of the casing. As shown in the sectional part of Fig. 1 a small inturned flange F³ is arranged at the end of each of these sockets and the openings in the corresponding passages in two adjacent cylinder jackets are arranged to face each other. Between these openings there is then inserted a thick rubber ring H having a steel tube liner H' the rubber ring H being surrounded by a metal band or clamp J which can be tightened in some convenient manner. When this band J is tightened the ring H is compressed and extended at its ends against the opposite faces of the flanges F³ and a water tight joint is thus formed. This joint can readily be broken by releasing the band J when the ring H can be lifted out. At the lower end of each water-jacket casing F and preferably on the opposite side thereof to the sockets F² there are formed two outwardly directed pipe connections F⁴ so arranged that the pipes of two adjacent cylinders will face each other. These pipes F² are then connected by a rubber tube K in some convenient manner.

At each end of the head casting C are formed bosses C³ and C⁴ with openings each of which is adapted to be engaged by a casting forming a connection for the inlet and outflow of water. At the inlet end this casting L is shaped so as to have a part L' adapted to be bolted over the opening in the boss C³ while a branch L² is connected with the socket or opening F² of the water-jacket F surrounding the first cylinder A in the row. The connection between the parts F² and L² is conveniently made in the same way as between the adjacent water jacket sockets F² in the manner above indicated. At the opposite end of the head casting C the connection is formed by a casting M having a part M' adapted to be bolted up against the opening in the boss C⁴ of the head casting. This casting M is also provided with a branch M² which coincides with the adjacent socket F² of the endmost cylinder.

The water-connections may be otherwise arranged if desired as for instance by carrying a pipe past the cylinders with a communication between this pipe and each cylinder water-jacket F, a separate pipe extending from the top of each cylinder jacket to the casting C. These pipe connections

can be so arranged as to be readily accessible with joints that can easily be made water tight.

In the preferred construction of water connections as shown in Fig. 1 it will be seen that if it is desired to remove the head casting C it is only necessary to disconnect the water connection castings L and M from the bosses C² C⁴ without any other water joints having to be broken. Alternatively the joints between the castings L and M and the jacket sockets F² may be disconnected. These connections may be made again easily and without risk of leakage.

The details of construction may be modified to suit requirements and the type of engine to which the invention is applied.

What I claim as my invention and desire to secure by Letters Patent is:—

1. In an internal combustion engine the combination of a cylinder having an integral head in which are inlet and exhaust port openings, a water jacket around the body of the cylinder, passages for the flow of water into and out of this jacket, a detachable casting constituting the water jacket for the cylinder head on to which the casting is adapted to fit closely, said water jackets being independent and non-communicating, passages for the flow of water into and out of the casting, inlet and exhaust passages in the head casting coincident with the port openings in the cylinder head, and means for detachably connecting the head casting to the cylinder as set forth.

2. In an internal combustion engine the combination of a cylinder having an integral head in which are port openings, a water jacket around the body of the cylinder, passages for the flow of water into and out from this jacket, a detachable casting constituting the water jacket for the cylinder head on to which this casting is adapted to fit closely, passages for the flow of water into and out from this casting arranged so that the latter has no direct communication with the jacket around the cylinder body, inlet and exhaust passages in this head casting coincident with the port openings in the cylinder head, sleeve like members which are passed through the port openings in the cylinder head and by engaging the ends of the inlet and exhaust passages in the head casting constitute means for detachably connecting the head casting to the cylinder as set forth.

3. In an internal combustion engine the combination of a cylinder having an integral head in which are port openings, a sheet metal casing inclosing the body of the cylinder and forming a water jacket therefor, passages for the flow of water into and out from this jacket, a detachable casting constituting the water jacket for the cylinder head on to which this casting is adapted to fit closely, passages for the flow of water into and out from this casting arranged so that the latter has no direct communication with the jacket around the cylinder body, inlet and exhaust passages in this head casting coincident with the port openings in the cylinder head, and means for detachably connecting the head casting to the cylinder as set forth.

4. In an internal combustion engine the combination of a cylinder having an integral head in which are port openings, a sheet metal casing inclosing the body of the cylinder and forming a water jacket therefor, passages for the flow of water into and out from this jacket, a detachable casting constituting the water jacket for the cylinder head on to which this casting is adapted to fit closely, passages for the flow of water into and out from this casting arranged so that the latter has no direct communication with the jacket around the cylinder body, inlet and exhaust passages in this head casting coincident with the port openings in the cylinder head, sleeve like members which are passed through the port openings in the cylinder head and by engaging the ends of the inlet and exhaust passages in the head casting constitute means for detachably connecting the head casting to the cylinder as set forth.

5. In an internal combustion engine the combination of a cylinder having an integral head in which are port openings, the exterior of the head being flat, a flange formed around the cylinder head, a flange formed around the cylinder body intermediate in its length, a sheet metal casing inclosing the body of the cylinder and forming a water jacket for the cylinder this casing being attached to the head and intermediate flanges on the cylinder, passages for the flow of water into and out from this jacket, a detachable casting constituting the water jacket for the cylinder head and having a flat underside adapted to fit closely on to the flat cylinder head, said water jackets being entirely independent and non-communicating, passages for the flow of water into and out from the detachable cylinder head casting arranged so that the latter has no direct communication with the jacket around the cylinder body, inlet and exhaust passages in this head casting coincident with the port openings in the cylinder head, and means for detachably connecting the head casting to the cylinder as set forth.

6. In an internal combustion engine the combination of a cylinder having an integral head in which are port openings, the exterior of the head being flat, a flange formed around the cylinder head, a flange formed around the cylinder body intermediate in its length, a sheet metal casing inclosing the body of the cylinder and forming a water jacket for the cylinder this casing being attached to the head and intermediate flanges on the cylinder, passages for the flow of water into and out from this jacket, a detachable casting constituting the water jacket for the cylinder head and having a flat underside adapted to fit closely on to the flat cylinder head, said water jackets being entirely independent and non-communicating, passages for the flow of water into and out from the detachable cylinder head casting arranged so that the latter has no direct communication with the jacket around the cylinder body, inlet and exhaust passages in this head casting coincident with the port openings in the cylinder head, and means for detachably connecting the head casting to the cylinder as set forth.

7. In an internal combustion engine the combination of a cylinder having an integral head in which are port openings, the exterior of the head being flat, a flange formed around the cylinder head, a flange formed around the cylinder body intermediate in its length, a sheet metal casing inclosing the body of the cylinder and forming a water jacket for the cylinder this casing being attached to the head and intermediate flanges on the cylinder, passages for the flow of water into and out from this jacket, a detachable casting constituting the water jacket for the cylinder head and having a flat underside adapted to fit closely on to the flat cylinder head, said water jackets being entirely independent and non-communicating, passages for the flow of water into and out from the detachable cylinder head casting arranged so that the latter has no direct communication with the jacket around the cylinder body, inlet and exhaust passages in this head casting coincident with the port openings in the cylinder head, and means for detachably connecting the head casting to the cylinder as set forth.

formed around the cylinder body intermediate in its length, a sheet metal casing inclosing the body of the cylinder and forming a water jacket for the cylinder this casing
 5 being attached to the head and intermediate flanges on the cylinder, passages for the flow of water into and out from this jacket, a detachable casting constituting the water jacket for the cylinder head and having a
 10 flat underside adapted to fit closely on to the flat cylinder head, passages for the flow of water into and out from this casting arranged so that the latter has no direct communication with the jacket around the cyl-
 15 inder body, inlet and exhaust passages in this head casting coincident with the port openings in the cylinder head, sleeve like members which are passed through the port openings in the cylinder head and by en-
 20 gaging the ends of the inlet and exhaust passages in the head casting constitute means for detachably connecting the head casting to the cylinder as set forth.

7. In an internal combustion engine, the
 25 combination of a cylinder having an integral head, a water jacket around the body of the cylinder, passages for the flow of water into and out from this jacket, a detachable casting constituting the water jacket for the
 30 cylinder head on to which the casting is adapted to fit, said water jackets being independent and non-communicating, for the flow of water into and out of the casting,

and means insertible through the integral head of the cylinder from the inside and ex- 35 tending into and engaging the casting, for detachably securing said casting in position on the cylinder head.

8. In an internal combustion engine the combination of a plurality of cylinders each
 40 having an integral head in which are port openings, a plurality of sheet metal casings separately inclosing the bodies of the cylinders and forming water jackets therefor, passages between these separate jackets for
 45 the flow of water into and out from them, a detachable casting constituting the water jacket for the heads of all the separate cylinders and adapted to fit closely on the
 50 heads of these cylinders, passages for the flow of water into and out from this casting arranged so that the latter has no direct communication with the separate cyl-
 55 inder water jackets, inlet and exhaust passages in this casting for the several cylinders and arranged so as to coincide with the port openings in the cylinder heads, sleeve like members which are passed through the
 60 port openings in the cylinder heads and by engaging the ends of the inlet and exhaust passages in the head casting constitute means for detachably connecting the head casting to all the cylinders as set forth.

In testimony whereof I have signed my name to this specification.

ARTHUR JOHN ROWLEDGE.