E. W. ROBERTS.

CONSTRUCTION OF CYLINDERS OF INTERNAL COMBUSTION ENGINES.

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1,210,537.

Patented Jan. 2, 1917.

Fig. 1,

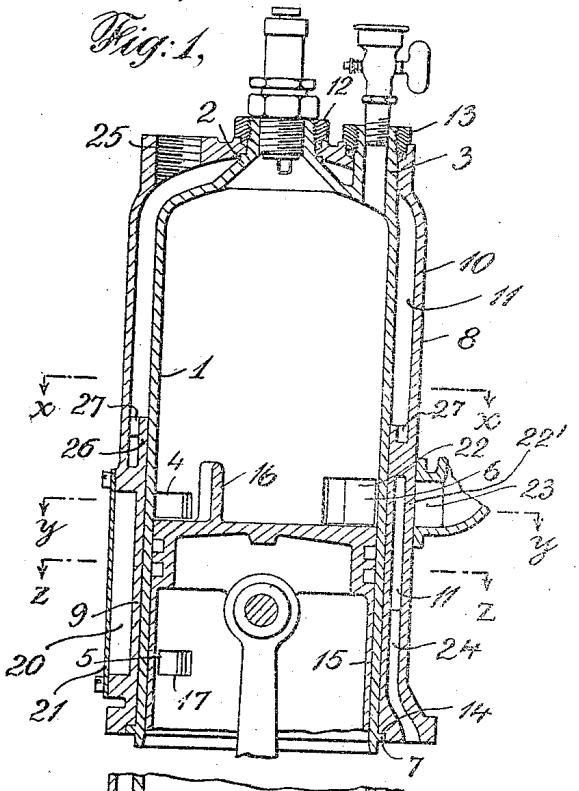


Fig. 2,

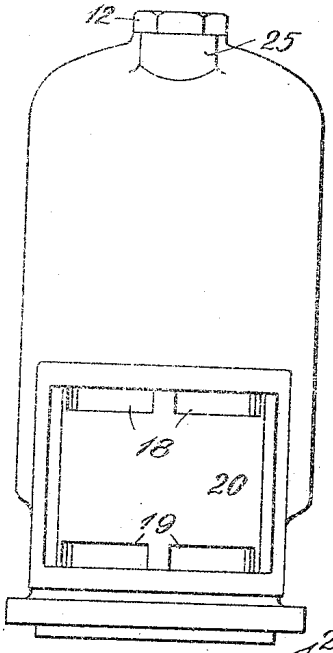


Fig. 3.

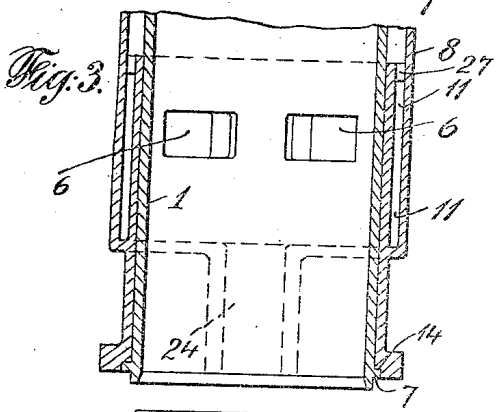


Fig. 4,

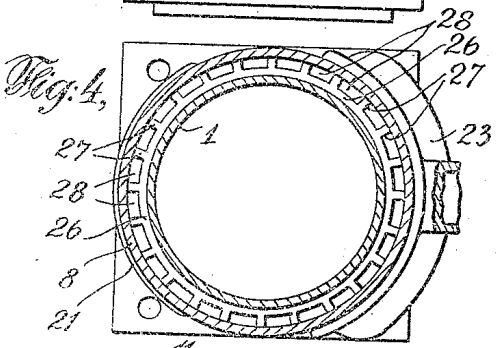


Fig. 6,

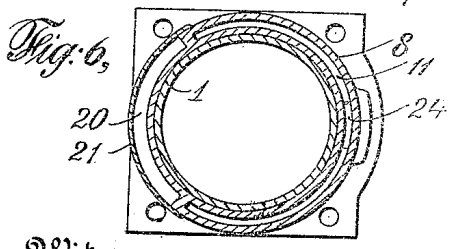
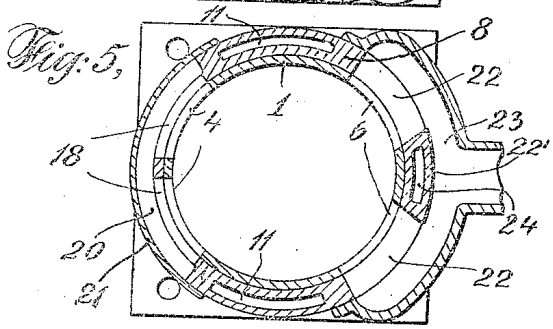


Fig. 5,



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UNITED STATES PATENT OFFICE.

EDMUND W. ROBERTS, OF SANDUSKY, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE ROBERTS MOTOR MANUFACTURING COMPANY, OF SANDUSKY, OHIO, A CORPORATION OF OHIO.

CONSTRUCTION OF CYLINDERS OF INTERNAL-COMBUSTION ENGINES.

1,210,537. Specification of Letters Patent. Patented Jan. 2, 1917.

Application filed December 2, 1913. Serial No. 804,191.

To all whom it may concern:

Be it known that I, EDMUND W. ROBERTS, a citizen of the United States of America, and a resident of Sandusky, in the county of Erie and State of Ohio, have invented certain new and useful Improvements in the Construction of Cylinders of Internal-Combustion Engines, of which the following is a specification.

My invention relates to improvements in the construction of cylinders and water jackets of internal combustion engines, particularly the cylinders of aeronautical engines and of engines of light weight and high speed generally; and my invention comprises a novel construction of cylinder, wherein the cylinder is surrounded by a cast jacket formed separately from the cylinder itself, and applied to the cylinder. In practice, the cylinder itself is usually of cast iron or steel, and the jacket is of aluminum or aluminum alloy or other very light metal, and is shrunk on to the cylinder.

The object of my invention is to provide a relatively light jacketed cylinder having ample strength to resist the pressures and other stresses to which it is subjected, and having a wearing surface of hard and durable metal, and having a jacket of very light metal, there being ample provision for the cooling of the cylinder.

I will now proceed to describe my invention with reference to the accompanying drawings, and will then point out the novel features in claims.

In the drawings: Figure 1 shows a longitudinal section of the cylinder and applied jacket thereof, and of the upper portion of the piston. Fig. 2 shows a front elevation of the cylinder, the view being taken looking from the left of Fig. 1. Fig. 3 shows a fragmentary vertical section of the cylinder and applied jacket, the section being taken on a plane at right angles to the plane of section of Fig. 1. Fig. 4 shows a transverse section of the cylinder and jacket on the line *x*—*x* of Fig. 1. Fig. 5 shows a similar transverse section on the line *y*—*y* of Fig. 1. Fig. 6 shows a transverse section on the line *z*—*z* of Fig. 1, the scale of Fig. 6 being somewhat smaller than that of the previous figures.

In the drawings, 1 designates the cylinder proper, customarily formed of cast iron and provided at its upper end with two upwardly extending bosses, 2 and 3, the purpose of which will be stated hereinafter. This cylinder is intended for two cycle engines, and hence is provided with ports 4, 5 and 6 in its sides. At its lower end, the cylinder is provided with a projecting flange 7.

8 designates the jacket casting, customarily formed of aluminum or aluminum alloy. The lower portion 9 of this jacket casting fits the cylinder 1 closely, while the upper portion 10 of the jacket casting is spaced away from the cylinder 1 so as to provide a water jacket space 11. As indicated particularly in Figs. 3 and 6, this jacket space 11 extends downward along the cylinder to a point well below the exhaust port, 6, and well below the lower limit of stroke of the piston, thereby insuring adequate cooling of the cylinder.

The jacket casting is provided at its upper end with apertures to receive the bosses 2 and 3, of the cylinder, these bosses being threaded externally, to receive screw nuts 12 and 13, the said screw nuts serving to hold the cylinder and the jacket casting together. The jacket casting 8 is further provided at its lower end with a recess 14 to receive the ring 7 of the cylinder, the said screw nuts serving to draw the ring 7 of the cylinder up against the shoulder 14 of the jacket casting.

15 designates the piston, which in itself forms no portion of the invention herein claimed, but is illustrated only in order that the function of various ports of the cylinder and jacket casting may be apparent. The piston is provided with a deflector 16 as is common in two cycle engines. The piston is further provided with a port 17, which registers with the port 5 of the cylinder 1 when the piston is at about the lower limit of its travel, (the position in which the piston is shown in Fig. 1). The jacket casting is provided with a port 18 registering with the port 4 of the cylinder, and is provided with a port 19 registering with the port 5 of the cylinder, these ports 18 and 19 of the jacket casting communicating with a recess space 20 provided in the exterior of the jacket casting, which recess 20 is closed by a cover plate 21 (Fig. 1), such recess 20 therefore forming the

customary transfer port to convey the gases compressed in the crank case of the engine (such crank case not being shown in the drawings but being a customary feature of two cycle engines) from port 5 of the cylinder and port 19 of the jacket casting to port 18 of the jacket casting and port 4 of the cylinder, when port 17 of the piston registers with port 5 of the cylinder, and when the piston has uncovered port 4 of the cylinder. The jacket casting is further provided with an exhaust port 22 (Figs. 1 and 5) registering with the exhaust port 6 of the cylinder; to which exhaust port 22 the usual exhaust offtake 23 is connected. As indicated particularly in Figs. 1 and 5, the exhaust port 22 is in two parts, divided by a bridge of metal 22′ in which is located duct 24 for the supply of water to the jacket space 11. In the top of the jacket casting 8 there is a water discharge connection 25.

As indicated particularly in Fig. 1, the jacket casting fits the cylinder 1 closely from the shoulder 14 which receives the shoulder 7 of the cylinder, to a point sufficiently far above the exhaust port 6 and admission port 4 to insure a good joint which will exclude both the charge gases and the exhaust gases from the water jacket space 11. To stiffen the inner wall 26 of the jacket casting above the admission and exhaust ports 4 and 6, a number of webs 27 connecting the inner and outer walls of the jacket casting are provided, near the top of such inner wall 26, as indicated particularly in Figs. 1 and 4; spaces 28 being provided between these webs to connect the upper and lower portions of the jacket space 11. By this construction the portion of the jacket casting which is required to have a close fit with the cylinder is so stiffened and strengthened that, notwithstanding that such jacket casting is formed of a relatively soft metal, such as aluminum, it is unnecessary to continue the inner wall of the jacket casting, along the upper portion of the cylinder 1; and therefore the water in the upper portion of the jacket space 11 is in direct contact with the cylinder 1 itself; for which reason, and also because the cylinder 1 may be made quite thin, the cooling of the cylinder by the water in the upper portion of the jacket space is particularly efficient.

In practice, the jacket casting 8 is bored out to a diameter very slightly less than the external diameter of the cylinder 1, and then said jacket casting is heated and thereby expanded so that its internal diameter is greater than the external diameter of the cylinder 1. The cylinder 1 is then inserted and drawn home, and the jacket casting allowed to cool and shrink onto the cylinder. Thereby excessive stress on the metal of the jacket casting, such as would be occasioned if the cylinder were forced into the cold jacket casting, is avoided, and danger of cracking the jacket is obviated.

What I claim is:—

1. A jacketed cylinder comprising in combination a cylinder proper, having at one end a projecting boss and at the other end a shoulder, a separately formed jacket fitting over said cylinder and having at one end an aperture through which said boss projects, and at the other end a shoulder engaging the said shoulder of said cylinder, said jacket having, near its said shoulder, a long sleeve portion embracing and fitting tightly a corresponding portion of said cylinder and forming a tight joint therewith, and securing means on said boss securing the cylinder and jacket together.

2. A jacketed cylinder comprising in combination a cylinder proper and a separately formed jacket fitting thereover, one portion of said jacket being double-walled, with its inner wall fitting the cylinder closely, another portion of said jacket being single-walled, such single-wall spaced away from the cylinder, the space between such single-walled portion of the jacket and the cylinder constituting a jacket space, said single-walled and double-walled portions of the jacket being integral.

3. A jacketed cylinder comprising in combination a cylinder proper and a separately formed jacket fitting thereover, one portion of said jacket being double-walled, with its inner wall fitting the cylinder closely, another portion of said jacket being single-walled, such single-wall spaced away from the cylinder, the space between such single-walled portion of the jacket and the cylinder constituting a jacket space, said jacket space in communication with the space between the walls of the double-walled portion of the jacket, said single-walled and double-walled portions of the jacket being integral.

4. A jacketed cylinder comprising in combination a cylinder proper and a jacket fitting thereover, one portion of such jacket being double-walled and having between its walls a jacket space, the inner wall of such double-walled portion fitting the cylinder closely, another portion of such jacket being single-walled, and spaced away from said cylinder, the space between such single-wall and the cylinder constituting a jacket space, said jacket provided with webs connecting the inner and outer walls at points near the end of the inner wall of the double-walled portion of the jacket, said single-walled and double-walled portions of the jacket being integral.

5. A jacketed cylinder for two-cycle internal combustion engines, comprising in combination a cylinder proper having in its sides admission and exhaust ports and a separately formed jacket fitting over said cylinder and having admission and exhaust ports

registering with the corresponding ports of said cylinder, a portion of said jacket being double-walled, with its inner wall fitting the cylinder closely, the said ports of the jacket being located in such double-walled portion of the jacket, said double-walled portion extending beyond the region of said ports a distance sufficient to insure a tight joint between the cylinder and jacket, a further portion of said jacket being single-walled, and spaced away from the cylinder, said single-walled and double-walled portions of the jacket being integral.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

EDMUND W. ROBERTS.

Witnesses:

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