C. DAY & G. E. WINDELER.

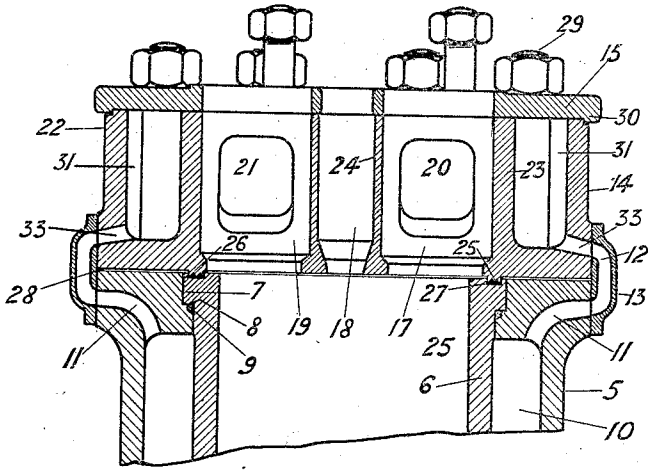
CYLINDER COVER.

APPLICATION FILED JUNE 13, 1912.

1,097,850.

Patented May 26, 1914.

FIG. 1.



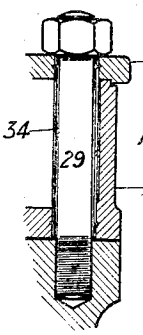


FIG. 3.

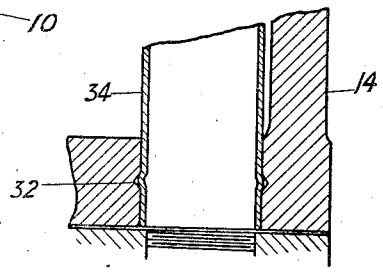
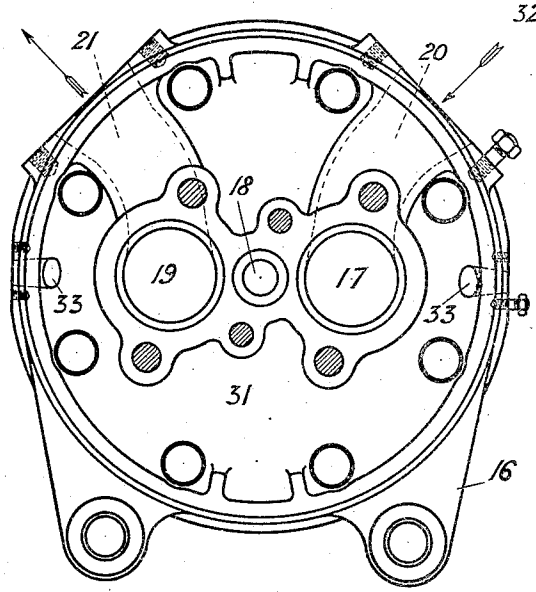


FIG. 4.

FIG. 2.



WITNESSES:

Marcus L. Byng.

J. Ellis Glen

INVENTORS:

CHARLES DAY.

GEORGE E. WINDELER

BY Albert G. Davis

ATTORNEY.

UNITED STATES PATENT OFFICE.

CHARLES DAY AND GEORGE E. WINDELER, OF STOCKPORT, ENGLAND, ASSIGNORS TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

CYLINDER-COVER.

1,097,850. Specification of Letters Patent. Patented May 26, 1914.

Application filed June 13, 1912. Serial No. 703,390.

To all whom it may concern:

Be it known that we, CHARLES DAY and GEORGE E. WINDELER, subjects of the King of Great Britain, and residing at Stockport, county of Cheshire, England, have invented certain new and useful Improvements in Cylinder-Covers, of which the following is a specification.

The present invention relates to chambered cylinder covers or heads for high compression internal combustion oil engines and has for its object to improve their construction. In engines of this character, particularly those having cylinders of relatively large diameter, the chambered cylinder covers are subjected to relatively heavy stresses while in operation. As a result of this, the covers must be made strong and rigid. Such covers have been cast in a single piece and while they possess the advantage of being relatively cheap to make, they are open to some very serious objections for the reason that it is very difficult to make a cast chambered metal cover in one piece which is entirely free from internal or what are commonly called casting stresses. That is to say one part may be under a compression stress and another under tension. Or one part may be of a different texture than another which may necessitate discarding the cover. Another difficulty resides in the fact that the thickness of the metal walls cannot be accurately determined and hence a cover may be completely machined only to discover a weakness while undergoing hydraulic or other test that renders it worthless. The variation in thickness of the walls is due principally to the shifting or changing in position of the core in the mold during the casting operation. This difficulty is greatly enhanced if the cover has to be provided with one or more cored passages or chambers for the cooling water, as is the case under consideration.

Having outlined the principal difficulties encountered with single piece cast metal covers, we will now proceed to describe our improved construction in connection with the accompanying drawing wherein—

Figure 1 illustrates an axial section of a part of a cylinder and its cover; Fig. 2 is a top plan view of the cover with the top plate removed; Fig. 3 is a detail view showing the arrangement of the attaching studs and the means for preventing the cooling water from escaping around them, and Fig. 4 is an enlarged detail view showing the means for securing in place the tubes which surround the studs.

5 indicates the main cylinder casting which is supported from the bed plate of the engine by any suitable means. Located within it is a liner 6 made out of good tough cast iron. The liner is flanged externally at 7 and said flange is seated on an internal shoulder 8 formed on the cylinder.

9 indicates a suitable packing that will withstand high temperatures, as asbestos for example.

Between the liner and cylinder is a chamber 10 through which the cooling water circulates. This chamber is connected with that in the cylinder cover by means of passages 11 which register with passage 12 formed in detachable fittings 13 that are bolted to the cylinder and cover.

The cover is made in two principal parts, a main chambered portion 14 and a removable top plate 15 which is bolted into place. The main portion is substantially circular in form and is provided with two lugs 16 for supporting the columns that carry the fulcrums of the valve actuating levers. It is also provided with three principal openings 17, 18 and 19, the walls of which terminate in the same plane as the outer circumferential wall and support valve casings. The first of these openings receives the casing of the air admitting valve, the second the casing of the fuel admitting valve and pulverizer which admits fuel to the combustion space, and the third the casing of the exhaust valve. Formed in the base portion is an air admitting conduit 20 which communicates with the opening 17 and a suitable port or ports in the air valve casing. There is also formed in the base an exhaust conduit 21 that receives the exhaust products of combustion from the opening 19 and exhaust valve casing.

By casting the base portion separately from the top plate any defect in the casting such as blow holes, failure of the metal to flow properly or a thin wall due to shifting of the core can at once be detected and the casting discarded if necessary before any machine work is done. By having the upper end of the outer circumferential wall 22 free as are also the walls 23 and 24 that surround and support the valve casings.

they will be free from internal stresses of any substantial magnitude. The arrangement also permits the casting to be fully cleaned of sand and core material which is a difficult and unsatisfactory operation where the top plate is made integral.

The under side of the base portion is machined and a downwardly extending annular shoulder 25 provided which has small V-shaped concentric grooves 26 formed therein. This shoulder makes a snug fit in a groove formed in the upper surface of the liner. Between the shoulder and the bottom of the groove is located a soft copper ring 27 to insure a tight joint at this point. It will be noted that a small clearance space 28 is provided between the outer and under portion of the cover and the cylinder so that all the downward pressure due to the retaining bolts or studs 29 is brought to bear directly on the copper ring.

The various openings to receive the valve casings are carefully machined to size and the upper surfaces of the walls 22, 23 and 24 carefully finished to terminate in the same plane. The top plate 15 is carefully finished on its under side to make a good joint with the walls to form a water seal. It has a peripheral flange 30 that engages an annular shoulder formed on the annular or boundary wall 22, said flange serving to center the top plate and strengthen the cover as a whole. In assembling the parts we find it desirable to coat the meeting surfaces of the base portion and the top plate with red lead or equivalent material to insure a water-tight joint or seal.

The interior of the base is cored out to form a cooling chamber 31 which occupies the entire space not filled by the walls surrounding the valve casings.

In order to prevent the cooling water from leaking out around the studs 29 and also to avoid casting bosses for the studs, a special arrangement is provided. The base portion and the top plate are provided with as many alined holes as there are studs, the latter being screwed into the metal of the cylinder. Each hole is provided with a V-shaped groove 32, Fig. 4. Extending through the holes and closely fitting them are thin brass or copper tubes 34 which are anchored in place by forcing the metal forming them into said grooves by means of a suitable tool. This arrangement insures a water-tight joint, and as the tubes are very light, very little weight is added. The tubes are slightly larger in diameter than the studs. Water from the chamber 31 in the cover is in constant communication with that in the chamber 10 around the liner through the passages 33 and those in the fittings 12 and passages 11. By taking off the fittings the condition of the cooling system can readily be ascertained.

Instead of making the liner removable, it may, for certain small or cheaper classes of work, be cast integral with the cylinder, as may also the base portion of the cover. In this case the opened ended arrangement of the cover would of course be preserved. This would greatly facilitate the casting operation and facilitate the cleaning and inspection of the cylinder portion as well as the cover.

What we claim as new and desire to secure by Letters Patent of the United States is:—

1. In combination, a cylinder having a cooling chamber, a cover therefor comprising a base portion having a circumferential wall and walls rising from the base to form supports for valve casings, all of said walls terminating in the same plane, a removable plate that has a peripheral shoulder surrounding the said circumferential wall, said plate engaging and sealing the ends of the walls and coöperating with the base portion to form a water containing chamber, outwardly opening passages in the cylinder and circumferential wall, and removable fittings that cover the ends of said passages and convey water from one to the other.

2. In combination, a cylinder having a cooling chamber, a cover therefor comprising a base portion having a circumferential wall and walls rising from the base to form supports for valve casings, all of said walls terminating in the same plane, a removable plate that engages and seals the ends of all of said walls to form a water chamber, there being alined holes in the plate and base portion having grooved walls, tubes which enter said holes and are expanded into said grooves to form water tight joints, said tubes serving to hold the plate on the base portion, and retaining bolts that pass through the tubes for securing the cover on the cylinder.

3. In combination, a cylinder, a liner supported therein which has an annular groove in one end, a chambered cover for the cylinder which comprises a base portion having an annular projection on its under side that fits into said groove, a circumferential wall formed on said base portion, other walls integral with the base that form supports for valve casings, a removable plate that is shouldered to the circumferential wall and engages and forms a seal for this and the other walls, tubes that extend through the base and plate and have water-tight joints therewith, and bolts that unite the plate and said base portion and extend through the tubes and enter the cylinder to hold the cover in place.

4. In combination, a cylinder, a liner supported therein which has an annular groove in one end, a chambered cover for the cylinder which comprises a base portion having

a circumferential wall and an annular projection on its under side that fits into said groove, there being a clearance space between the opposing surfaces of the cylinder and cover, a packing in said groove, a plate which rests on the circumferential wall of the cover and acts as a seal therefor, there being alined openings in the plate and base portion, the walls of which are grooved, tubes that extend through said openings and are expanded into said grooves to form water tight joints, and retaining bolts that extend through the plate and cover and across the clearance space into the cylinder to hold the cover in place.

In witness whereof, we have hereunto set our hands this 23rd day of May, 1912.

CHARLES DAY. [L. S.]
GEORGE E. WINDELER. [L. S.]

Witnesses:
ALEX. F. MACDONALD,
JOHN W. GILL.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."