F. E. NORTON.

GAS ENGINE CYLINDER.

APPLICATION FILED FEB. 11, 1909.

960,385.

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Fig. 1.

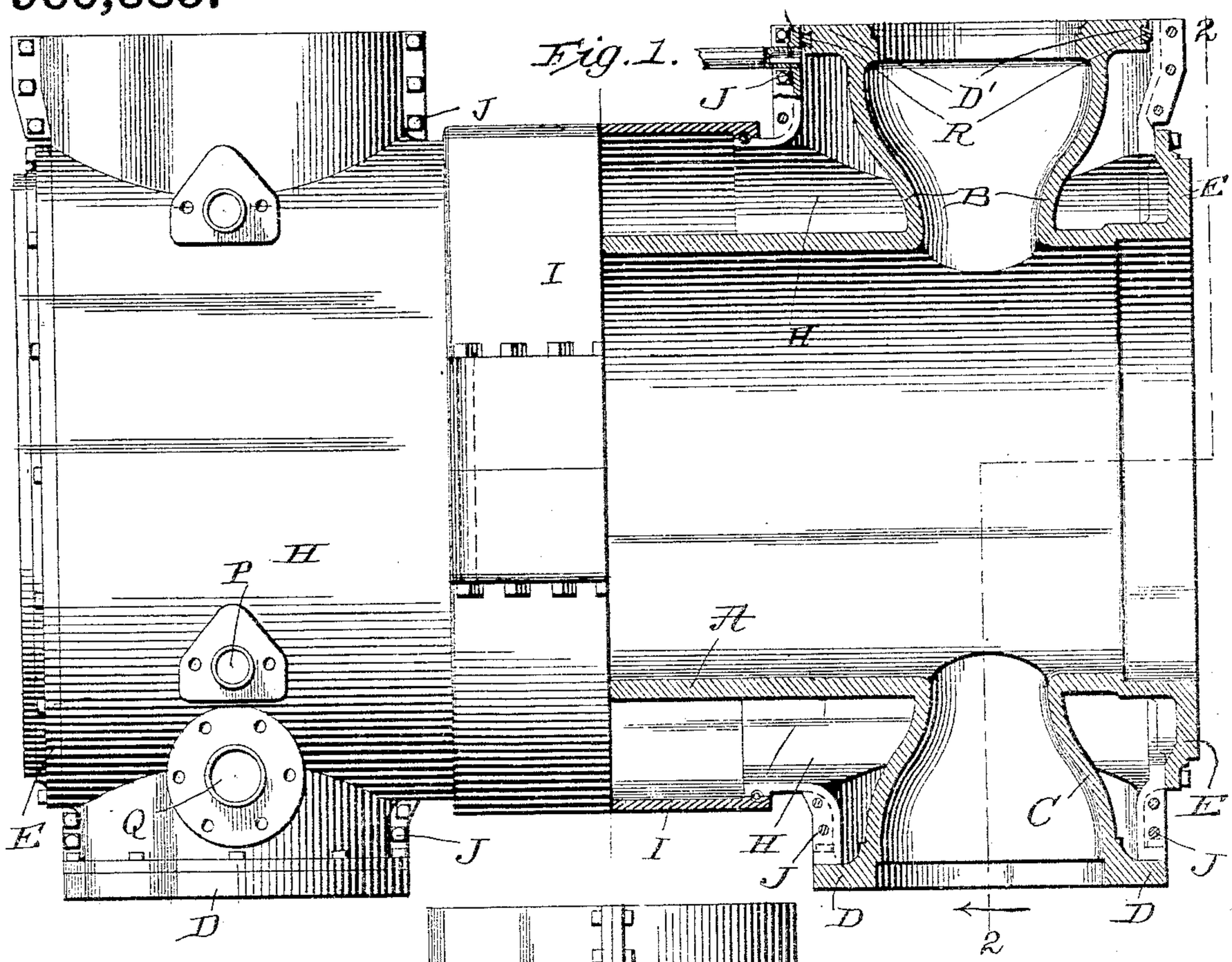
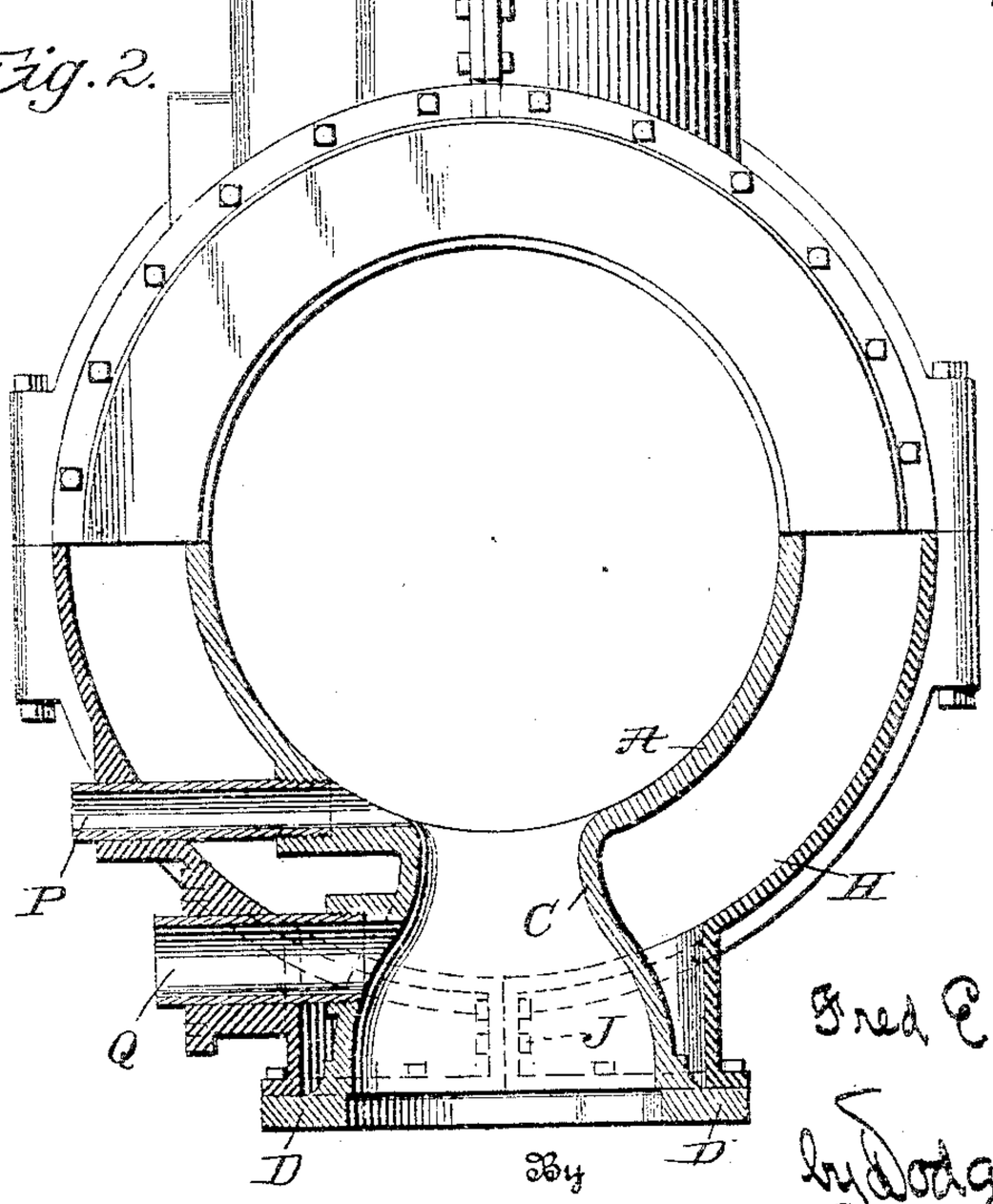


Fig. 2.



Witnesses

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UNITED STATES PATENT OFFICE.

FRED ELMER NORTON, OF YOUNGSTOWN, OHIO.

GAS-ENGINE CYLINDER.

960,385. Specification of Letters Patent. **Patented June 7, 1910.**

Application filed February 11, 1909. Serial No. 477,353.

To all whom it may concern:

Be it known that I, FRED ELMER NORTON, a citizen of the United States, residing at Youngstown, in the county of Mahoning and State of Ohio, have invented certain new and useful Improvements in Gas-Engine Cylinders, of which the following is a specification.

My invention applies to that class of engine in which the cylinder is inclosed in a case or jacket, for the purpose of bringing a fluid medium into contact with the external walls of said cylinder, and thereby controlling the cylinder's temperature; and is more particularly applicable to engines of the internal combustion type, which are commonly cooled by water passing through jackets surrounding the cylinder.

By my invention the cylinder is constructed in such a form that steel, or other metal difficult to cast into complicated forms, may be used for the pressure parts of the cylinder; while cast iron, or other easily cast metal, may be used for the complicated parts.

The usual construction of large gas engine cylinders is to cast them with water jackets integral with the cylinder barrel, in whole or in part. The castings are consequently complicated, difficult to make, and expensive; besides being subject to severe strains due to unequal cooling after casting and to unequal heating while in service. It is highly desirable that the explosion chamber be made of as tough and dense material as possible, but all such materials now in common use are difficult to cast into complicated forms.

According to my invention, the inner or pressure part of the cylinder may be made of simple shape, so that it may be easily cast of steel; and so that, regardless of what metal is used, it will be of such form that contraction and expansion strains are almost entirely eliminated.

The invention also makes possible the easy and cheap manufacture of the complete cylinders, greatly reduces the expense of replacing worn out cylinders, and secures an increased efficiency for the engine.

It has been common to bush the internal bores of gas engine cylinders with steel, in order to secure a good wearing surface, and also it has been attempted to cast the outer part of the cylinder of steel and then bush the bore with cast iron. The first construction is disadvantageous, in that the walls of the explosion chamber must be unduly thick, and that the liner greatly increases the thickness of the cylinder walls just where they require the maximum cooling effect. The second construction is expensive on account of the complicated forms resulting and the consequent difficulty in securing sound castings of a tough material. It may, however, be followed in connection with my invention, but is open to the objection that the liner retards the proper cooling of the cylinder walls by increasing their thickness.

The invention forming the basis of the application is illustrated in the annexed drawings, wherein:

Figure 1 is a sectional elevation of a cylinder embodying my invention; and Fig. 2 a sectional end elevation on the line 2—2 of Fig. 1.

Referring to the letters on the accompanying drawing, A is the cylinder wall, B is the wall of the inlet chamber, C is the wall of the exhaust chamber, D is a flange on the exhaust chamber, D′ is a flange on the inlet chamber, and E is a flange on the end of the cylinder walls.

In the embodiment illustrated, a double acting cylinder is shown, the inlet and exhaust ports for the head end and crank end being identical. The enumerated parts are simple in form, and since they should all be of a tough dense material, I can conveniently cast them in one piece, thus securing the strength of integral construction, combined with simplicity. To this casting is bolted a jacket consisting of two mantles or shells H, one at each end of the cylinder, and each consisting of two flanged parts bolted together, as at J, and also bolted to the flanges D and E, all these joints being fluid tight. It is obvious that a similar construction might be adopted with regard to the joint with the flange D′, but I find it preferable to so form this flange and the two parts of the mantle that the latter close around the periphery of the former, a packing ring R being inserted for the purpose of securing a tight joint. It will also be noted that the flanges D and E are in planes substantially perpendicular to each other, the purpose of which construction is to se-

cure ease and convenience in assembling the mantles, for by setting up the bolts in the flanges D and E gradually and in alternation, the joints with these flanges will gradually yield transversely to the bolts thereof, thus avoiding undue strain upon the castings. At the same time, the joint with the flange D′ will act as a slip joint, particularly if the bolts J adjacent to this flange be tightened last. Consequently the mantle castings are bolted in place without being subjected to excessive strains during the process. The interval between the two mantles is then closed by a sectional closing ring or sleeve I, made in pieces bolted together, as shown.

I am aware that closing rings have been used with mantles cast integrally with the cylinder, but it will be noted that in my construction the mantles are cast independently and in segments, the construction resulting in greater accessibility of the interior of the jacket, cheaper construction, and greater ease of repair. A further advantage of my construction is that I can adopt a highly advantageous form for the casting composing the cylinder walls, and the inlet and exhaust chambers, in that the walls of these chambers are non-interconnected, that is the walls of the chambers are separate and independent, and free from webs or similar connections, so that a perfectly free circulation of the water about these chambers is had. Moreover, the extremities of these chambers and of the cylinder walls are free extremities. By this I mean that they are not included within the jacket, but are free and independent of the jacket, so that connection of suitable piping or of other parts of the engine to these chambers may be effected without affecting the jacket or its parts.

Additional openings for igniter plugs and for other parts of the mechanism may be made in the cylinder by means of steel tubes P and Q screwed into the cylinder walls and made tight also at the jacket or shell by any of the means in common use. This latter joint is made readily tight by the low water pressure customary in engine cooling.

In the following claims the term "bolts" is used for convenience, and in the absence of a better word to express any suitable clamping or fastening means, and is intended to embrace studs or any similar arrangement to accomplish the purpose of binding the contacting edges firmly in contact with each other.

Having thus described the invention, what I claim is:—

1. In a cylinder for engines, the combination of an integral casting comprising the inlet chamber, exhaust chamber and cylinder walls; longitudinally divided and separately formed mantles surrounding the end portions of the cylinder and making fluid tight joints with the extremities of the inlet chamber, exhaust chamber and cylinder walls; and a sectional closing ring or sleeve closing the interval between and making fluid tight joints with said mantles.

2. In combination with a cylinder comprising cylinder walls, inlet and exhaust chambers; longitudinally divided and separately formed mantles surrounding the end portions of the cylinder and making fluid tight joints with the extremities of the inlet chamber, exhaust chamber and cylinder walls; bolts for said joints, said joints being arranged in planes substantially perpendicular one to another so that each joint may yield in a direction transverse to its own bolts as the bolts of another are tightened; and a sectional closing ring or sleeve closing the interval between and making fluid tight joints with said mantles.

3. In combination with a cylinder comprising cylinder walls, inlet and exhaust chambers; longitudinally divided and separately formed mantles surrounding the end portions of the cylinder and making fluid tight joints with the extremities of the inlet chamber, exhaust chamber and cylinder walls; bolts for said joints, said joints being arranged in planes substantially perpendicular one to another so that each joint may yield in a direction transverse to its own bolts as the bolts of another are tightened; and a closing ring or sleeve closing the interval between and making fluid tight joints with said mantles.

4. In a cylinder for engines, the combination of an integral casting comprising the inlet chamber, exhaust chamber and cylinder walls, having non-interconnected walls and having free extremities throughout; longitudinally divided and separately formed mantles surrounding the end portions of the cylinder and making fluid tight joints with the extremities of the inlet chamber; exhaust chamber and cylinder walls; and a sectional closing ring or sleeve closing the interval between and making fluid tight joints with the said mantles.

5. In a cylinder for engines, the combination of an integral casting comprising the inlet chamber, exhaust chamber and cylinder walls, having non-interconnected walls and having free extremities throughout; longitudinally divided and separately formed mantles surrounding the end portions of the cylinder and making fluid tight joints with the extremities of the inlet chamber, exhaust chamber and cylinder walls; bolts for said joints, the said joints being arranged in planes substantially perpendicular one to another so that each joint will yield in a direction transverse to its own

bolts as the bolts of another are tightened; and a sectional closing ring or sleeve closing the interval between and making fluid tight joints with the said mantles.

6. In a cylinder for engines, the combination of an integral casting comprising the inlet chamber, exhaust chamber and cylinder walls; longitudinally divided mantles surrounding the end portions of the cylinder and making fluid tight joints with the extremities of the inlet chamber, exhaust chamber and cylinder walls; and suitable means for closing the interval between said mantles.

7. In a cylinder for engines, the combination of an integral casting comprising the inlet chamber, exhaust chamber and cylinder walls; longitudinally divided mantles surrounding the end portions of the cylinder and making fluid tight joints with the extremities of the inlet chamber, exhaust chamber and cylinder walls; bolts for said joints; and suitable means for closing the interval between said mantles, the joints of the mantles with the extremities of the inlet passage, exhaust passage and cylinder walls being arranged in planes substantially perpendicular to each other, so that each may yield in a direction transverse to its own bolts as the bolts of another are tightened.

8. In a cylinder for engines, the combination of an integral casting forming the inlet chamber, exhaust chamber and cylinder walls, having non-interconnected walls and having free extremities throughout; longitudinally divided mantles surrounding the end portions of the cylinder and making fluid tight joints with the extremities of the inlet chamber, exhaust chamber and cylinder walls; and suitable means for closing the interval between the mantles.

9. In a cylinder for engines, the combination of an integral casting forming the inlet chamber, exhaust chamber and cylinder walls, having non-interconnected walls and having free extremities throughout; longitudinally divided mantles surrounding the end portions of the cylinder and making fluid tight joints with the extremities of the inlet chamber, exhaust chamber and cylinder walls; bolts for said joints; and suitable means for closing the interval between the mantles, the joints of the mantles with the extremities of the inlet passage, exhaust passage and cylinder walls being arranged in planes substantially perpendicular to each other, so that each may yield in a direction transverse to its own bolts as the bolts of another are tightened.

10. In combination with a cylinder casting comprising cylinder walls, inlet chamber and exhaust chamber; an external sectional jacket encompassing said walls and chambers and making fluid tight joints with the extremities of the inlet chamber, exhaust chamber and cylinder walls; bolts for said joints, the joints being arranged in planes substantially perpendicular with one another so that each may yield to another as the bolts of that other are tightened.

11. In combination with a cylinder comprising inlet chamber, exhaust chamber and cylinder walls; longitudinally divided and separately formed mantles surrounding the end portions of the cylinder and making fluid tight joints with the extremities of the inlet chamber, exhaust chamber and cylinder walls; and suitable means for closing the interval between said mantles.

12. In combination with a cylinder comprising inlet chamber, exhaust chamber and cylinder walls; longitudinally divided and separately formed mantles surrounding the end portions of the cylinder, and making fluid tight joints with the extremities of the inlet chamber, exhaust chamber and cylinder walls; bolts for said joints, said joints being arranged in planes substantially perpendicular one to another so that each joint may yield to another in a direction transverse to its own bolts as the bolts of the other are tightened; and suitable means for closing the interval between said mantles.

13. In a cylinder for engines, the combination of an integral casting comprising the inlet chamber, exhaust chamber and cylinder walls; longitudinally divided and separately cast mantles surrounding the end portions of the cylinder and making fluid tight joints with the extremities of the inlet chamber, exhaust chamber and cylinder walls, the said divided mantles having flanges for the reception of bolts along their lines of division; bolts for said flanges; and means for closing the interval between said mantles.

14. In a cylinder for engines, the combination of an integral casting comprising the inlet chamber, exhaust chamber and cylinder walls, and an external jacket cast in sections having connecting flanges and making fluid tight joints with the extremities of the inlet chamber, exhaust chamber and cylinder walls; bolts for said flanges, the joints between said flanges and the joints with the various extremities named being arranged in planes substantially perpendicular one to another so that each may yield in a direction transverse to its own bolts as the bolts of another are tightened.

15. In a cylinder for engines, the combination of an integral casting comprising the inlet chamber, exhaust chamber and cylinder walls, having non-interconnected walls, and having free extremities throughout; longitudinally divided and separately formed mantles surrounding the end portions of the cylinder; flanged connections between said

mantles and the extremities of the cylinder walls and between said mantles and one of said chambers; a yielding joint between the mantles and the extremities of the other chamber; and a closing ring closing the interval between and making fluid tight joints with the said mantles.

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

FRED ELMER NORTON.

Witnesses:

WALTER B. JENKINS,

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