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CYLINDER FOR DOUBLE ACTING PISTON ENGINES.

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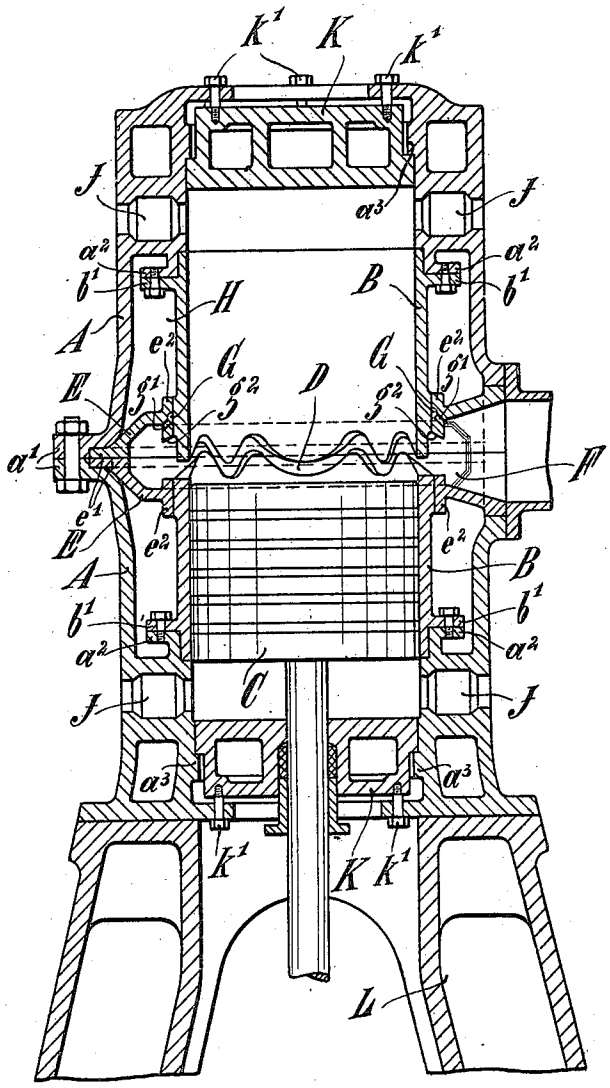


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# UNITED STATES PATENT OFFICE.

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## CYLINDER FOR DOUBLE-ACTING PISTON-ENGINES.

1,045,702. Specification of Letters Patent. Patented Nov. 26, 1912.

Application filed July 23, 1912. Serial No. 711,158.

*To all whom it may concern:*

Be it known that I, CARL GRUNWALD, a citizen of the German Empire, residing at Bredeney, Germany, have invented certain new and useful Improvements in Working Cylinders for Double-Acting Piston-Engines, of which the following is a specification.

This invention relates to double acting uni-directional flow piston engines, in which engines the driving means after each expansion, escapes through slits in the walls of the cylinder governed by the piston, and the object of the invention is to provide a novel arrangement of the working cylinder.

In the drawing is illustrated one embodiment of the invention as applied to a vertical double acting uni-directional flow steam engine, shown in longitudinal section.

The working cylinder is divided at its middle plane at right angles to the axis of the cylinder, and the two halves of the cylinder A abut against each other with flanges, and are held together by bolts. In the two halves of the cylinder A, which in the large machines might be made of cast steel in order to lessen the weight, liners B of cast iron are inserted for the working piston C, and connected, by means of flanges $a^2$ $b^1$ and screws, with the halves of the cylinder A.

The adjacent edges of the liners B have indentations and are so arranged that the teeth in one of the liners engage with gaps in the other one, leaving a space between them, so that between the two liners a wavy exhaust slit D is provided. In order to make the flange connection $a^2$ $b^1$ accessible, the member E of the cylinder, forming the annular exhaust channel F, is likewise made as a casting and divided into two parts along the middle plane parallel to the axis of the cast cylinder. The two halves E of this casting are on the outside provided with flanges $e^1$, which are clamped between the flanges $a^1$ of the cylinder halves A. On the inner side, the castings E lie against the liners B with flanges $e^2$. In order to prevent water coming from the heating space H, to leak between the liner B and the flange $e^2$ into the working cylinder, an annular groove G has been provided in the upper flange $e^2$, which has a number of orifices $g^1$ connecting it with the annular exhaust channel. The lower annular surface of the flange $e^2$ is furthermore shaped as a drip lip $g^2$. The water will consequently be drawn off into the exhaust channel F. Borings J are provided in the upper and lower part of the cylinder for the inlet valves. The cylinder covers K are inserted in the working cylinder from the inside and rest against annular shoulders $a^3$ in the working cylinder. A few screws $k^1$ keep the covers in position. The whole working cylinder stands in known manner on a pedestal L.

The working of the above described power engine is well known and needs here no further explanation.

The described arrangement of the cylinder is above all intended for large engines, and the following advantages will be gained thereby. As the whole cylinder is divided in its middle, the whole upper part A E can be removed sidewise without any considerable raising thereof for the purpose of removing the piston, when the working piston C is in the position shown in the drawing. This is of considerable importance for ship propulsion engines of war ships, wherein a raising of the cylinder is impossible on account of the armor deck situated directly above the cylinder. Furthermore the division of the cylinder into several parts permits of very simple castings. By the use of the flange connections $a^2$ $b^1$ this cylinder construction gives every advantage over the hitherto used cylinders with inserted liners, namely that the liners B do not need to be shrunk in place as has been the practice up to now, and that they for this reason will have no injurious deformation. The liners B which have great facility for expansion between the flanges $e^2$ may furthermore be finished-bored, and thereupon assembled with considerable ease in the cylinder. To this should be added that on account of the wavy shape of the free edges of the liners B, a favorable running-over surface for the piston ring is obtained, as well as an exhaust slit running around the whole circumference of the cylinder. The exhaust steam can therefore run out unchecked, at the whole circumference of the cylinder and thereafter quickly enter the annular channel F; as compared with the exhaust ports in known engines wherein the steam, remaining between the ports, generates field vibrations and resistances.

By the insertion of the cylinder covers from the inside the advantage lastly is attained, that the forces acting on the covers K, which in large engines are very great,

are now transferred to the whole cylinder and need not be taken up by single screws.

The construction of the working cylinder is naturally also suitable for horizontal engines and may particularly be utilized in internal combustion engines working in two stroke cycle, in the latter case, the space H would be used as a chamber for the cooling water.

I claim:

1. Working cylinder for double acting uni-directional flow piston engines having inserted cylinder liners, said cylinder being divided into two halves on its middle plane across the cylinder axis, and said liners having flanged connections with the cylinder halves.

2. Working cylinder for double acting uni-directional flow piston engines having inserted cylinder liners, said cylinder being divided into two halves on its middle plane across the cylinder axis, and said liners having flanged connections with the cylinder halves, and a detachable annular member forming the exhaust channel.

3. Working cylinder for double acting uni-directional flow piston engines having inserted cylinder liners, said cylinder being divided into two halves on its middle plane across the cylinder axis, and said liners having flanged connections with the cylinder halves, a detachable annular member forming the exhaust channel; said annular member inclosing the adjacent ends of said liners and permitting free expansion thereof within said channel.

4. Working cylinder for double acting uni-directional flow piston engines having inserted cylinder liners, said cylinder being divided into two halves on its middle plane across the cylinder axis, and said liners having flanged connections with the cylinder halves, a detachable annular member forming the exhaust channel; said member being cast in two annular halves inclosing the adjacent ends of said liners and permitting free expansion thereof within said chamber.

5. Working cylinder for double acting uni-directional flow piston engines having inserted cylinder liners, said cylinder being divided into two halves on its middle plane across the cylinder axis, and said liners having flanged connections with the cylinder halves, the adjacent ends of said liners having wavy edges forming a continuous wavy slit of uniform width around the periphery.

6. Working cylinder for double acting uni-directional flow piston engines having inserted cylinder liners, said cylinder being divided into two halves on its middle plane across the cylinder axis, and said liners having flanged connections with the cylinder halves, the adjacent ends of said liners having wavy edges forming a continuous wavy slit of uniform width around the periphery, a detachable member forming the exhaust channel, said annular member inclosing the adjacent ends of said liners and permitting free expansion within said channel.

7. Working cylinder for double acting uni-directional flow piston engines having inserted cylinder liners, said cylinder being divided into two halves on its middle plane across the cylinder axis, and said liners having flanged connections with the cylinder halves, a detachable annular member forming the exhaust channel; annular flanges on said member abutting against the outer cylindrical surface of said liners.

8. Working cylinder for vertical double acting uni-directional flow piston engines having inserted cylinder liners, said cylinder being divided into two halves on its middle plane across the cylinder axis, and said liners having flanged connections with the cylinder halves, a detachable annular member forming the exhaust channel; annular flanges on said member abutting against the outer cylindrical surface of said liners; the upper one of said flanges being provided with an annular water collecting groove, and orifices leading from said groove into said channel.

9. Working cylinder for vertical double acting uni-directional flow piston engines having inserted cylinder liners, said cylinder being divided into two halves on its middle plane across the cylinder axis, and said liners having flanged connections with the cylinder halves, a detachable annular member forming the exhaust channel; annular flanges on said member abutting against the outer cylindrical surface of said liners; the upper one of said flanges being provided with an annular water collecting groove, and orifices leading from said groove into said channel; the lower edge of said upper flange forming a drip edge.

10. Working cylinder for double acting uni-directional flow piston engines having inserted liners, said cylinder being divided into two halves on its middle plane across the cylinder axis, and said liners having flanged connections with the cylinder halves, a detachable annular member forming the exhaust channel; covers for said cylinder inserted from the inside of the cylinder and an abutment shoulder at each end of said cylinder retaining said covers in position.

11. Working cylinder for double acting power engines, comprising an outer casing, a pair of liners, a pair of cylinder covers and an exhaust channel casting; said outer casing being divided in two halves at a plane across its axis and held together by flanges and bolts; all of said inner parts being assembled inside the outer casing before said casing halves are bolted together.

12. Working cylinder for double acting

power engines, comprising an outer casing, a pair of liners, a pair of cylinder covers and an exhaust channel casting; said outer casing being divided in two halves at a plane across its axis and held together by flanges and bolts; a heating chamber formed between said casing and said liners; flanges on said liners for holding them in position in the casing; the adjacent edges of said liners forming a wavy circumferential passage from the inside of the liners to said exhaust channel.

In testimony whereof I have affixed my signature in presence of two witnesses.

CARL GRUNWALD.

LOUIS VANDORY,
G. THROMBEREND.