

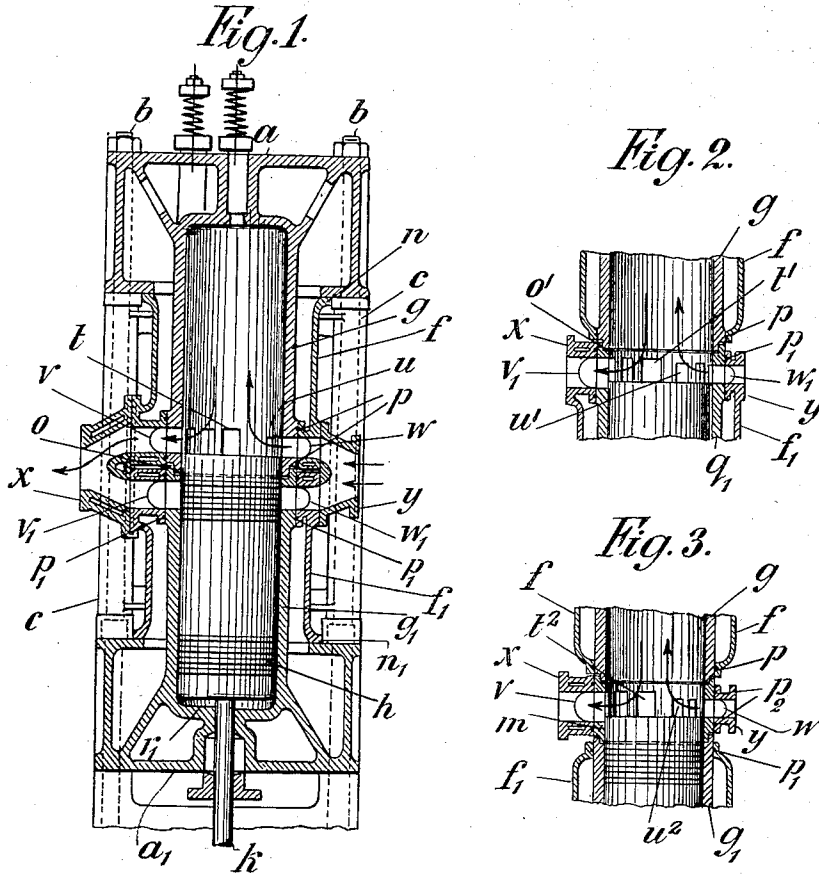
Jan. 9, 1934.

O. PETERSEN

1,943,143

DOUBLE ACTING INTERNAL COMBUSTION ENGINE

Original Filed Oct. 3, 1928



Inventor
Ove Petersen
by *marks & co*
Attorneys

UNITED STATES PATENT OFFICE

1,943,143

DOUBLE ACTING INTERNAL COMBUSTION ENGINE

Ove Petersen, Copenhagen, Denmark

Original application October 3, 1928, Serial No. 310,062, and in Denmark October 14, 1927.
Divided and this application July 17, 1930.
Serial No. 468,704

6 Claims. (Cl. 123—61)

The invention relates to improvements in vertical double-acting internal combustion engines, two-stroke as well as four-stroke cycle engines and is a division of my prior application filed October 3, 1928, now identified as Patent No. 1,792,444, dated February 10, 1931. The invention has for its object the production of an engine, in which the inner parts and more especially the piston and piston rings are as easily accessible for inspection, cleaning and repair as possible, without the construction thereby becoming inefficient in other respects. Thus the various parts forming the engine—such as the cylinder, cylinder covers, frame and the like—must not be more heavily dimensioned than strictly necessary, but they should however, be capable of withstanding the stresses they are exposed to, more especially resulting from the influence of weight, pressure of the gases and changes in temperature. Any stresses due to pressure of the gases and weight of the various parts should be transmitted in as direct a manner as possible to the base plate of the engine, while the stresses arising from changes in temperature and different heating of the various parts of the machine should preferably be avoided. The present invention aims at the production of a design capable of meeting the above-mentioned demands. The design according to the invention is of the kind in which the cylinder liner is divided into an upper and a lower part, and is chiefly characterized by the fact that the said two parts of the liner are each cast integral with the upper and lower cylinder cover respectively said covers being interconnected by long bolts serving to clamp the cylinder liner parts together. Hereby is obtained first the best possible security of tightness between the cylinder liner and cover, namely due to their being cast integral, which tightness is of great importance, as the highest pressure in the cylinder even occurs at said place. Secondly is obtained that the forces rising from gas pressures in the cylinder, heat expansions and the like are transferred as directly as possible to the frame of the engine, viz directly through the covers and their long connecting bolts.

The invention is illustrated in the drawing which shows various different constructional forms. Fig. 1 is a longitudinal sectional view of a portion of a multiple cylinder two-stroke cycle engine. Fig. 2 is a partial sectional view showing a modification of the construction drawn in Fig. 1. Fig. 3 is a partial sectional view

of a further modification of the construction shown in Fig. 1.

Referring now to Fig. 1 the constructional form shown here shows the cylinder consisting in the main of two cylinder covers a and a_1 kept together by means of four through-going bolts b and spaced correctly apart by means of two distance pieces c , so that the cylinder construction forms a rigid unit. The bolts b extend downwards through the frame parts to the foundation or bed which is not shown in the drawing. The upper or top cover a is according to the invention cast integral with the upper liner g and correspondingly the bottom cover is cast integral with the lower liner g_1 , the said liners being otherwise suspended freely. The cooling jacket f is secured to the flat bottom face of the cylinder cover a by means of bolts, and abutting the cylinder cover is a flange n . As to the bottom part of the cylinder the mounting of the cylinder liner g_1 and of the cooling jacket f_1 with its flange n_1 exactly correspond to what has been described with regard to the top cover. The piston is formed as a double-acting piston h , serving for both ends of the cylinder, k is the piston rod. The admission of air and the exhaust takes place through scavenging ports u and exhaust ports t respectively, which ports may be arranged in any suitable manner in the cylinder. The fuel valve, and, if desired, also the starting valve or the like are preferably mounted in the upper cover. Near the central portion of the cylinder the cooling jackets f and f_1 are widened in such a manner as to make room for annular belt spaces w , w_1 and v , v_1 serving to convey fresh air and exhaust gases respectively. The fresh air is admitted through a pipe connection y , from which the fresh air is distributed to the scavenging belt spaces w , w_1 , of the upper and lower part respectively and from these spaces the air is admitted into the cylinder through the scavenging ports u in the cylinder liner. In the constructional form shown the two parts of the cylinder liner each has a set of ports, those belonging to the upper part only being shown in the drawing. The combustion products flow through the exhaust port t to the belt spaces v and v_1 which converge into a pipe connection x at the side of the cylinder opposite to the pipe connection y . As indicated in the drawing the pipe connection x leading to the exhaust pipe is water-cooled. The cooling jackets f and f_1 join the parts g and g_1 of the cylinder liner along two cylindrical tightening joints, one above the other, p and p_1 re-

spectively. The two parts of the liner are guided in relation to each other and an expansion slot *o* is provided between them. The cylinder covers may be bolted together along abutting vertical faces by means of horizontal bolts. In the constructional form illustrated in Fig. 2, the cylinder is provided with a single set of scavenging and exhaust ports *u'* and *t'* respectively serving both ends of the cylinder. In this constructional form the expansion slot *o'* is arranged above the apertures *t'*, *u'*, so that the scavenging and exhaust belt spaces *w₁* and *v₁* are only provided in the lower part *f₁* of the cooling jacket. This design permits of the upper portion of the cylinder (cover and cooling jacket) being removed without it being necessary to detach the pipe connections for scavenging air and exhaust gases. In the constructional form illustrated in Fig. 3 only a single set of apertures in the liner is provided, common to both ends of the cylinder and similar to the construction shown in Fig. 2, but according to Fig. 3 the said apertures or ports, *t₂* and *u₂* are situated in a separate part *m* inserted between the upper part *g* and the lower part *g₁*, this intermediary part *m* being provided with belt spaces *v* and *w* and pipe connections *x* and *y* in a way corresponding to that indicated in Figs. 1 and 2. In the constructional forms illustrated in Figs. 1 to 3, the great advantage is to be found that the piston as a whole is fully accessible for inspection when the upper portion of the cylinder construction, consisting of the upper cylinder cover and the upper parts of the cylinder liner and the cooling jacket, is removed after the nuts on the top ends of the clamping bolts *b* have been unscrewed. The invention as above described and set forth is not bound to any particular arrangement of injection, scavenging, or the like, or to any special process of combustion, and, the invention may be employed with equal results in both two-stroke and four-stroke cycle and in engines working with any other cycle. Similarly the invention is not limited to comprise only the constructions shown in the drawing with regard to the manner of placing and the positions of valves and apertures leading to the inner hollow space of the cylinder. Also the cylinder covers, liners, cooling jackets and the like units may be shaped in accordance with any known or particularly adapted arrangements of apertures or ports, valves, combustion chambers, injecting nozzles and the like.

I claim:

1. Improvements in vertical, double-acting internal combustion engines comprising a cylinder liner divided into an upper and lower part, an upper cover and a lower cover cast integral with said liner parts, said covers being interconnected by long throughgoing bolts serving to clamp the cylinder liner parts together.

2. An improved cylinder construction according to claim 1 characterized by the provision of means for securing the top cover and bottom cover in their proper places in relation to each other, said means comprising distance pieces inserted between the covers whereby the covers are directly clamped against them, by said long bolts and being of a length to provide a slot of a suitable width between the upper part and lower part of the cylinder liner for the purpose of allowing the parts to expand freely under the influence of heat and the like.

3. An improved cylinder construction according to claim 1 characterized in that the top cover and bottom cover of the cylinder are secured in their proper places in relation to each other by the upper part and lower part of the cylinder liner, these latter parts serving in themselves as distance pieces.

4. An improved cylinder construction as claimed in claim 1 characterized in that the free ends of the two parts of the cylinder liner are shaped with cylindrical grooves complementary to each other and by which the two parts are mutually guided.

5. An improved cylinder construction as claimed in claim 1 characterized by the provision of a cooling jacket divided into an upper part and a lower part, which two parts of said jacket are fastened directly to the upper cover and the lower cover respectively by means of bolts or the like and the free ends of said jacket fit the cylinder liner enclosing the same along a cylindrical tightening joint.

6. In a vertical, double acting internal combustion engine, a cylinder liner divided into upper and lower parts, upper and lower terminal members cast integral with said liner parts, and securing means connecting the terminal members and acting to clamp the cylinder liner parts together.

OVE PETERSEN. 125

55 130

60 135

65 140

70 145

75 150