K. HIEHLE.

CYLINDER FOR COMBUSTION ENGINES.

APPLICATION FILED OCT. 7, 1913.

1,087,492.

Patented Feb. 17, 1914.

Fig. 1

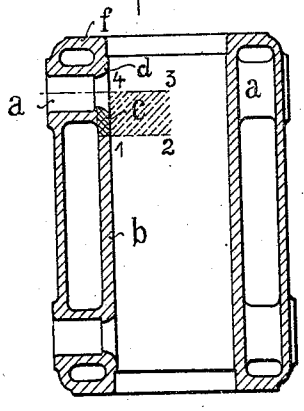


Fig. 2

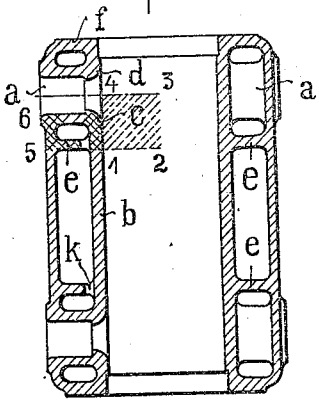


Fig. 3

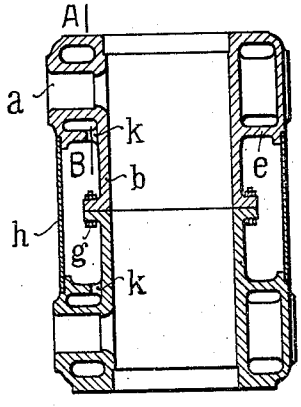


Fig. 4

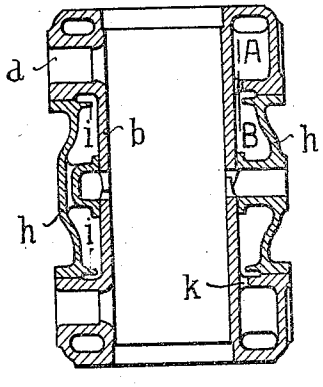


Fig. 6

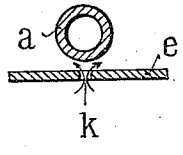
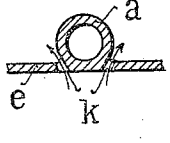


Fig. 5



Witnesses:

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UNITED STATES PATENT OFFICE.

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CYLINDER FOR COMBUSTION-ENGINES.

1,087,492. Specification of Letters Patent. Patented Feb. 17, 1914.

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To all whom it may concern:

Be it known that I, KURT HIEHLE, engineer, whose post-office address is No. 3 Haslerstrasse, at Nuremberg, Bavaria, in the Empire of Germany, have invented certain new and useful Improvements in Cylinders for Combustion-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to power cylinders for internal combustion engines, in which the valves are entirely or partly arranged in the cylinder in a plane vertical to its axis. In such cylinders, the basal form of which is illustrated in Figure 1 of the drawing, at those points, at which the valve connections *a* communicate with the cylinder *b*, corner pieces *c* arise, which are badly cooled as well as very highly strained by tensile stresses and therefore easily crack. A strengthening of these parts by accumulation of material would lead to a further decrease in the cooling and thus would increase the danger of formation of heat cracks. The strengthening of the endangered point by the insertion of bolts or the casting in of special resistant material, for instance ingot iron rings, is only possible in a limited degree, without harmfully influencing the cooling and producing dangerous local strains. Also the casting in of special water pipes into these parts offers no satisfactory solution, on account of the difficulties and complications, which arise during the manufacture and operation, especially in large cylinders with numerous valves.

My invention has for its object to radically remove the source of danger by transferring the tensile strains, which in combination with the heat strains, are very dangerous, from the endangered corner pieces into a well cooled region having a cross section of any desirable strength and at the same time by abundantly cooling the danger point by directing the entire cooling water past said point.

My invention consists in arranging beneath the valve connection, an annular rib, which connects the inner cylinder with the outer shell.

Fig. 1 shows a normal cylinder in vertical central cross-section. Fig. 2 is a similar view of a cylinder constructed in accordance with my invention. Fig. 3 shows a modified construction of a cylinder for a double-acting 4-cycle engine, also in section. Fig. 4 is a similar view of a modification for a double acting 2-cycle engine. Fig. 5 is a section along A—B in Fig. 3, and Fig. 6 a section along A^1—B^1 in Fig. 4.

Whereas in a normal cylinder (Fig. 1) the explosion or combustion pressure affecting the surfaces 1, 2, 3 and 4 is received by the double-shaded small surface of the corner piece *c* in Fig. 1, in a cylinder as illustrated in Fig. 2, the tension produced by said pressure, is distributed according to my invention to the corner piece *c* as well as the whole section of the annular rib *e*, that is, to the double-shaded sectional surface *c* 1, 5, 6 of Fig. 2. The tensile strains will then be so distributed in the sections *c* 1, 5, 6, that they are least in the endangered corner piece; for the said annular rib, which remains cool and counteracts the heat expansion of the hot inner cylinder, exercising thereby a pressure which by the amount of its own strength reduces the tensile strain to which the corner piece *c* is subjected on account of the explosion. In the same manner, the outer flange *f* of the cylinder releases the corner piece *d* from its strain. The said continuous annular rib however does not only remove the cause for the production of cracks, namely, a too high tensile strain, but it also effectually prevents the insufficient cooling of the endangered point. The separation of the space for the cooling water at the ends of the cylinder, due to the said rib, permits the whole quantity of cooling water to be directed straight to the valve connections through holes arranged close to the inner wall of the cylinder, and a thoroughly effective cooling of the endangered point *c* is obtained by the high speed of flow and the water striking against the valve connections. Since, in this case, the entire quantity of cooling water is driven forward, the effect is considerably greater than if the endangered points were squirted with special water, in the well known manner.

According to Fig. 3 the inner cylinder, through which the forces are preferably directed, is divided in the middle and screwed together with the screws *g*. The outer jacket is formed of a light plate.

In Fig. 4 the axial forces are transmitted by the outer jacket, which is therefore more strongly constructed. The annular rib *e* is formed as a flange for securing the outer jacket. In order to be able to guide the cooling water close to the inner shell of the cylinder, a special guiding rib *i* is provided on the jacket *h*. The passage holes *k* for the cooling water are so arranged in the annular rib *e*, that they lie directly beneath the valve connections *a*.

According to Fig. 6 the annular rib *e* lies so close beneath the valve connections *a* that same partly merge with the annular flange. The water is then directed through two holes on each side of the connections.

In Fig. 5 the annular rib *e* does not touch the supports. In this case one hole *k* is sufficient for the passage of the cooling water.

What I claim as my invention and desire to secure by Letters Patent is:

1. In a device of the kind described, an inner cylinder, an outer cylinder, said cylinders being provided with tubular connections forming ports adjacent each end, and a rib extending around said inner cylinder intermediate the ends between the port at one end and the port at the other end and connecting the two cylinders, said rib being integral with both of said cylinders and being provided with openings adjacent said ports.

2. In a device of the kind described, an inner cylinder, an outer cylinder, said cylinders being provided with tubular connections forming ports adjacent each end, and a rib extending around said inner cylinder intermediate the ends between the port at one end and the port at the other end and connecting the two cylinders, said rib being provided with a series of openings adjacent said ports.

3. In a device of the kind described, an inner cylinder, an outer cylinder, said cylinders being provided with tubular connections forming ports adjacent each end, and ribs each extending entirely around said inner cylinder intermediate the ends between the port at one end and the port at the other end and connecting the two cylinders, each of said ribs lying closely adjacent a respective port, each of said ribs being provided with openings adjacent the respective ports.

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

KURT HIEHLE.

Witnesses:
OSCAR BOCK,
HANS KÖRBER.