No. 676,719. Patented June 18, 1901.

J. G. A. KITCHEN.

PISTON.

(Application filed June 23, 1899.)

(No Model.)

Fig. 1.

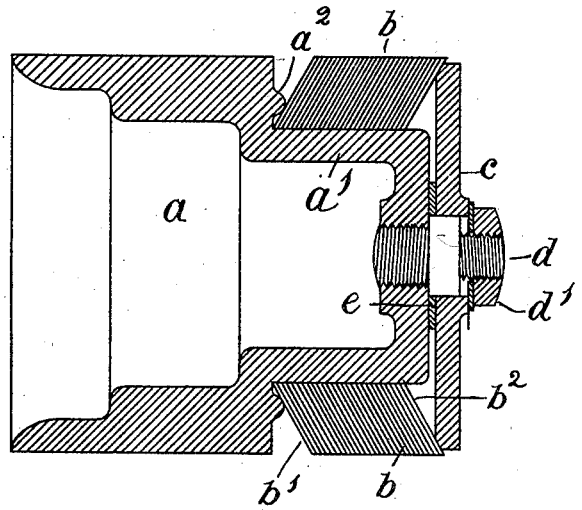


Fig. 2.

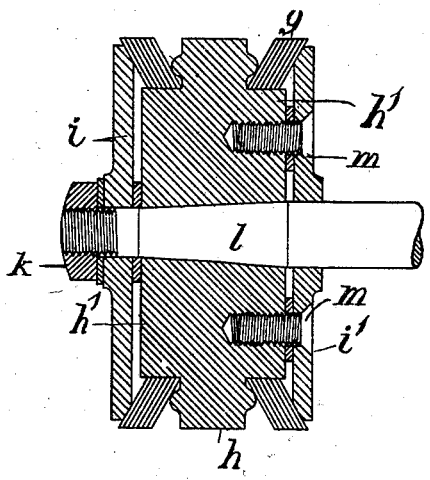
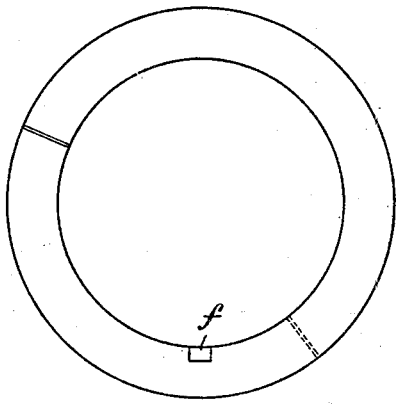


Fig. 3.



Witnesses

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UNITED STATES PATENT OFFICE.

JOHN GEORGE AULSEBROOK KITCHEN, OF MANCHESTER, ENGLAND.

PISTON.

SPECIFICATION forming part of Letters Patent No. 676,719, dated June 18, 1901.

Application filed June 23, 1899. Serial No. 721,584. (No model.)

To all whom it may concern:

Be it known that I, JOHN GEORGE AULSEBROOK KITCHEN, a subject of the Queen of Great Britain, residing at Manchester, in the county of Lancaster, England, have invented certain new and useful Improvements in Pistons, of which the following is a specification.

An application for patent has been filed in Great Britain, dated November 26, 1898, and numbered 24,976.

This invention relates to pistons for fluid-pressure engines and the like; and it consists in an improved construction of the same and of the packing-rings therefor, my improvements being more particularly intended for pistons for small gas and oil engines, but also applicable to pistons for steam-engines, pumps, and the like.

On the drawings annexed hereunto, Figure 1 shows a piston for a single-acting engine with my improvement applied thereto, and Fig. 2 a piston for a double-acting engine, both in section along the axis of the pistons; and Fig. 3, a plan of the piston plates or rings.

Referring first to Fig. 1, I form the piston-body a with a boss or extension a', of less diameter than the body a, and place around the said boss a' a series or packet of thin metal plates b, dished so as to form frustrated cones, preferably with an obtuse angle at the apex, fitting one into the other and slit open on one side, as shown on Fig. 3. These plates are preferably placed with their smaller ends toward the piston-body and fit the boss a', and the end plate b' bears with its convex side against a bead or rounded shoulder a^2 of the piston-body at about the middle of the surface or somewhat nearer to the inner edge. The bead a^2 serves as a fulcrum, bearing against the convex end of the packet of rings b. Against the concave side of the other end plate b^2 a disk c bears near to the outer edge of the plate, the edge of the disk being rounded or coned. The disk is fixed to the piston-body by means of a stud d and nut d' or by equivalent means and adjusted in its position relatively to the coned plates by means of a washer e, which can be readily replaced by a thinner one. The disk c in being fixed and drawn into the packet of coned plates expands the end plate b^2, and this plate expands the next one, and so on as the plates are divided on one side. At the same time, in consequence of this division and the thinness of the plates, the cones are flattened out, the plates being tilted on the bead or shoulder a^2, and thus enlarged at their circumference and pressed against the boss a' at their inner edges. In this way the diameter of the packet of plates can be enlarged to take up the wear of the cylinder and the latter rebored and the plates expanded and turned or ground again to the enlarged size of the cylinder several times before they have to be renewed. The fluid-pressure, which will get under the end plate b^2, has the same effect of expanding the plates and flattening them, and thus keeps the piston tight.

In some cases the washer e is replaced by a spring-washer or dispensed with, in which case the fluid-pressure on the disk forces it at each stroke into the coned plates and tightens them against the cylinder-wall. The amount of this tightening can be varied by reducing the angle and increasing the thickness of the plates for higher pressure and increasing the angle and reducing the thickness of the plates for lower pressure.

The plates are so placed upon each other that the slit in one plate does not come opposite that in the next plate, as shown on Fig. 3. In order to insure this, a keyway may be cut into the plates in different positions relatively to the slit and a key f placed into the slot, either loosely or fixed to the boss a'. Where the number of plates is large, this precaution may be omitted.

Fig. 2 shows the improved conical packing-plates applied to a double-acting piston, the piston-body h being formed with two reduced parts or bosses h', each of which receives a packet of conically-dished rings or plates g, preferably placed as shown, with their larger ends toward the pressure side, and expanded and flattened by means of the disks i and i', the former of which is fixed by the nut k, securing the piston-rod l in the body h, and the latter by set-screws m.

The plates may be made of steel, brass, or other elastic metal, according to the fluid acting upon them.

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

1. The combination with a piston-body, of

a packet of slit annular plates dished to form frustrated cones parallel to each other and at an angle to the axis of said piston-body, a fulcrum bearing against the convex end of the packet of plates near its inner periphery, the other end being freely exposed to the action of fluid-pressure, and said packet being free to turn within predetermined limits into a more flattened shape with a larger diameter about said fulcrum.

2. The combination with a piston-body, of a packet of slit annular plates dished to form frustrated cones parallel to each other and at an angle to the axis of said piston-body on which the inner peripheries of said plates rest, a fulcrum bearing against the convex end of the packet, and means movable by the action of fluid-pressure longitudinally of the axis of said body and bearing against the concave end of said packet and nearer than the fulcrum is to the outer periphery of said packet.

3. The combination with a piston-body, of a packet of slit annular plates dished to form frustrated cones parallel to each other and at an angle to the axis of said piston-body on which the inner peripheries of said plates rest, a fulcrum bearing against the convex end of the packet, means movable longitudinally of the axis of said body and bearing against the concave end of said packet and nearer than the fulcrum is to the outer periphery of said packet, said plates being so relatively located that their successive slits are not opposite each other, and means for preventing said plates from rotating.

4. The combination with a piston-body, of a packet of slit annular plates dished to form frustrated cones parallel to each other and at an angle to the axis of said piston-body on which the inner peripheries of said plates rest, a fulcrum bearing against the convex end of the packet, means movable longitudinally of the axis of said body and bearing against the concave end of said packet and nearer than the fulcrum is to the outer periphery of said packet, said packet being provided with a slot longitudinally of the inner periphery of the packet, and a key running through said slot, the plates being so arranged that their successive slits are not opposite each other.

5. The combination with a piston-body, of a packet of slit annular plates dished to form frustrated cones parallel to each other and at an angle to the axis of said piston-body on which the inner peripheries of said plates rest, a fulcrum bearing against the convex end of the packet, and means movable longitudinally of the axis of said body and bearing against the concave end of said packet and nearer than the fulcrum is to the outer periphery of said packet, said means consisting of a disk supported to be free to move to and from said body within predetermined limits, the portion of the disk bearing upon the packet being its rim, and a nut or the like for pressing said disk against said packet.

6. The combination with a piston-body formed with a part reduced in diameter, a packet of annular plates dished to form frustrated cones and slit on one side and placed around said reduced part, means for preventing rotation of said plates and consisting of a key passing through notches in said plates, a bead on the shoulder of the piston-body and bearing upon the packet of plates on its convex side near to the center thereof, a disk bearing upon the concave side of the packet of plates and near its outer periphery, a spring between said body and said disk adapted to permit said disk to move toward said body, and means for adjusting said disk against the action of said spring.

7. The combination of a piston-body formed with a part reduced in diameter, a packet of annular plates dished to form frustrated cones and slit at one side placed around said reduced part, a bead on the shoulder of the piston-body bearing upon the packet of plates on its convex side near to the center thereof, a disk bearing upon the concave side of the packet of plates near to its periphery, and means for adjusting and attaching the disk to the piston-body.

8. The combination of a piston-body formed with a part reduced in diameter on each side, a packet of annular plates dished to form frustrated cones, and slit at one side placed around each of said reduced parts, a bead on each shoulder of the piston-body bearing upon the respective packet of plates on its convex side near to the center thereof, a disk on each side of the piston-body attached thereto and bearing upon the concave side of the packet of plates near to its periphery.

In testimony whereof I have hereunto set my hand in the presence of two witnesses.

JOHN GEORGE AULSEBROOK KITCHEN.

Witnesses:
R. J. URQUHART,
GEO. F. JEPSON.