No. 781,227. PATENTED JAN. 31, 1905.

O. REYNOLDS.

PACKING FOR PISTONS.

APPLICATION FILED JULY 6, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

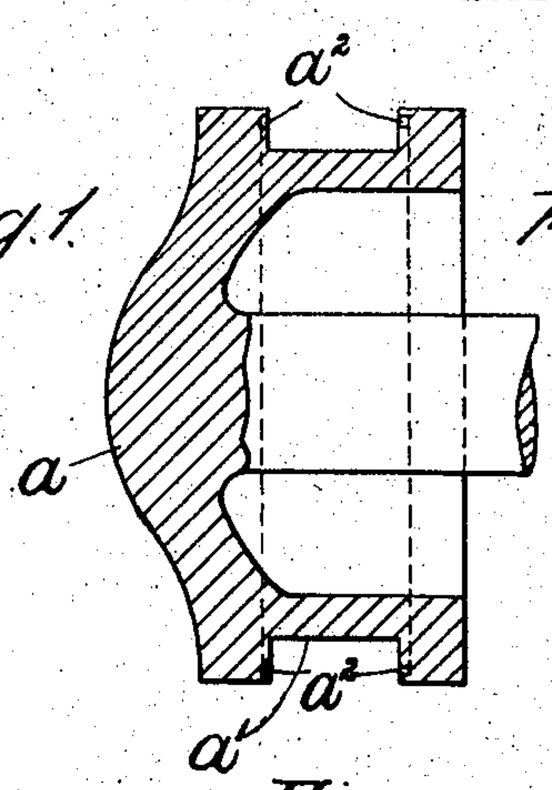

Fig. 2.

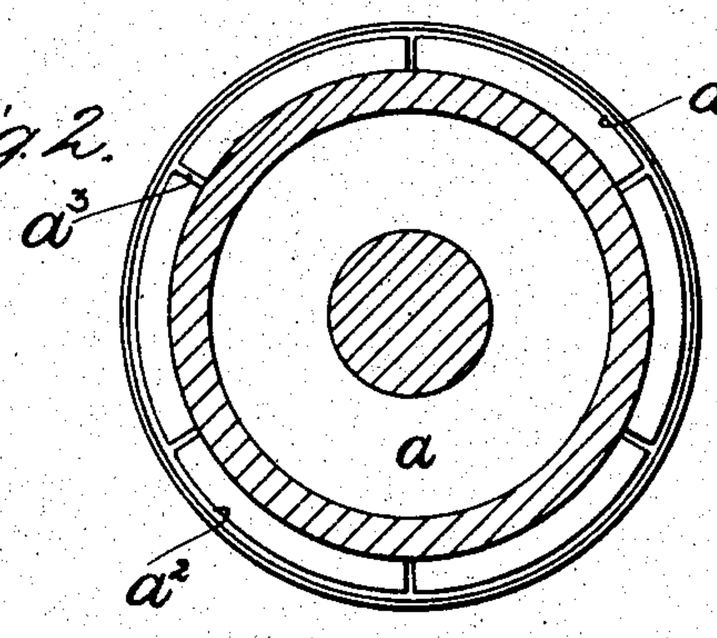

Fig. 3.

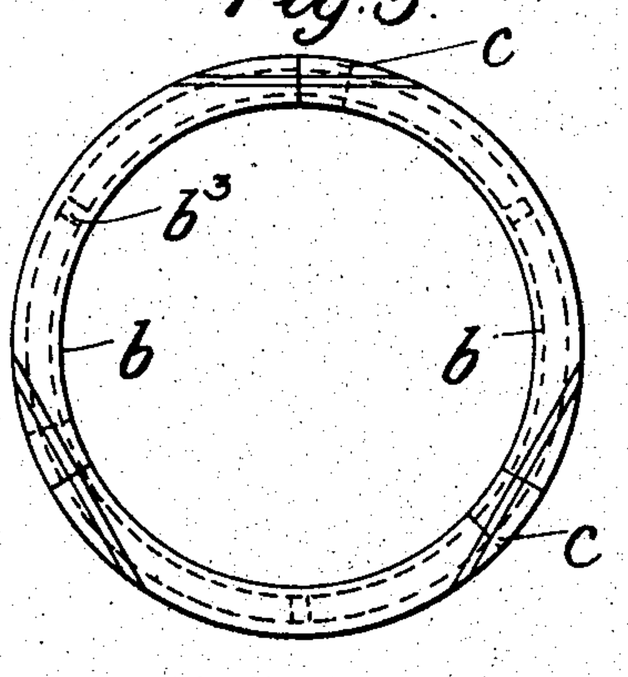

Fig. 4.

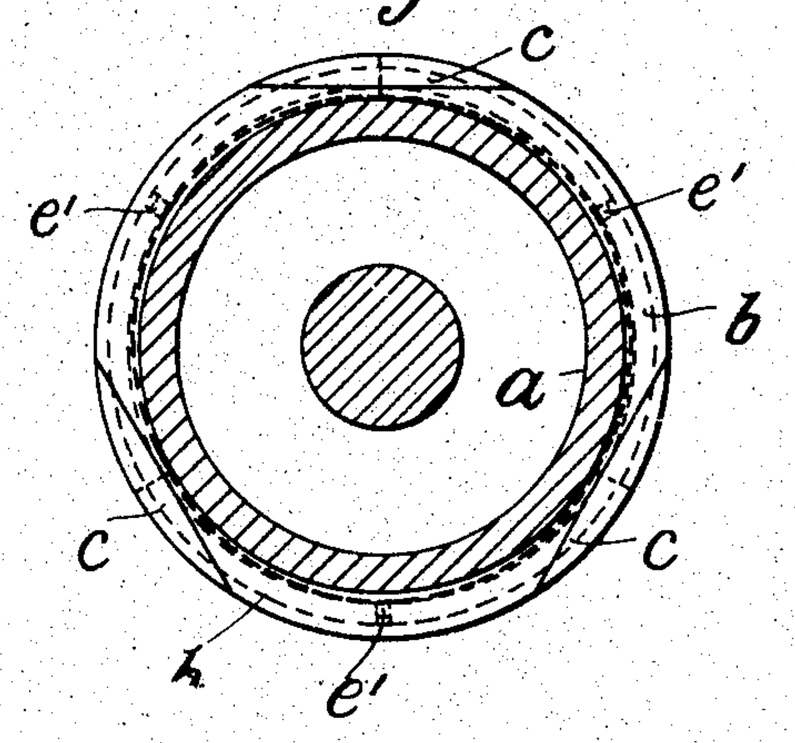

Fig. 5.

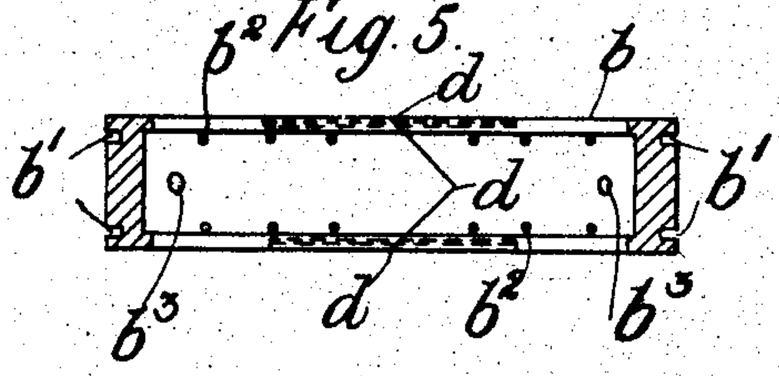

Fig. 6.

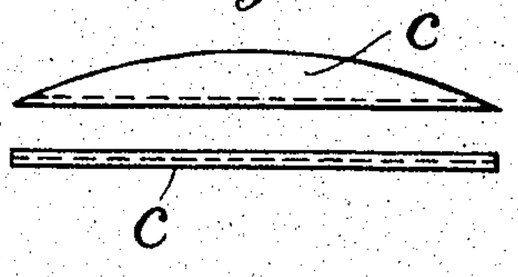

Fig. 7.

Fig. 8.

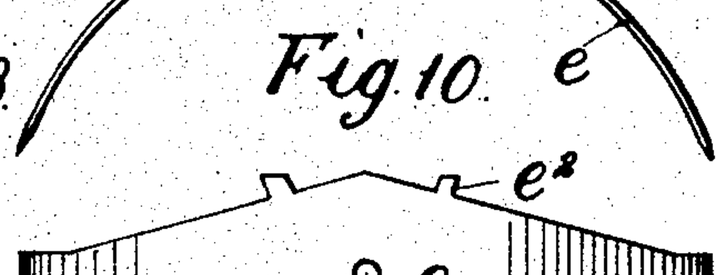

Fig. 9.

Fig. 10.

WITNESSES

A. W. White

John A. Percival.

INVENTOR

Osborne Reynolds

By Richards & Co.

ATTORNEYS

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2 SHEETS—SHEET 2.

Fig 11.

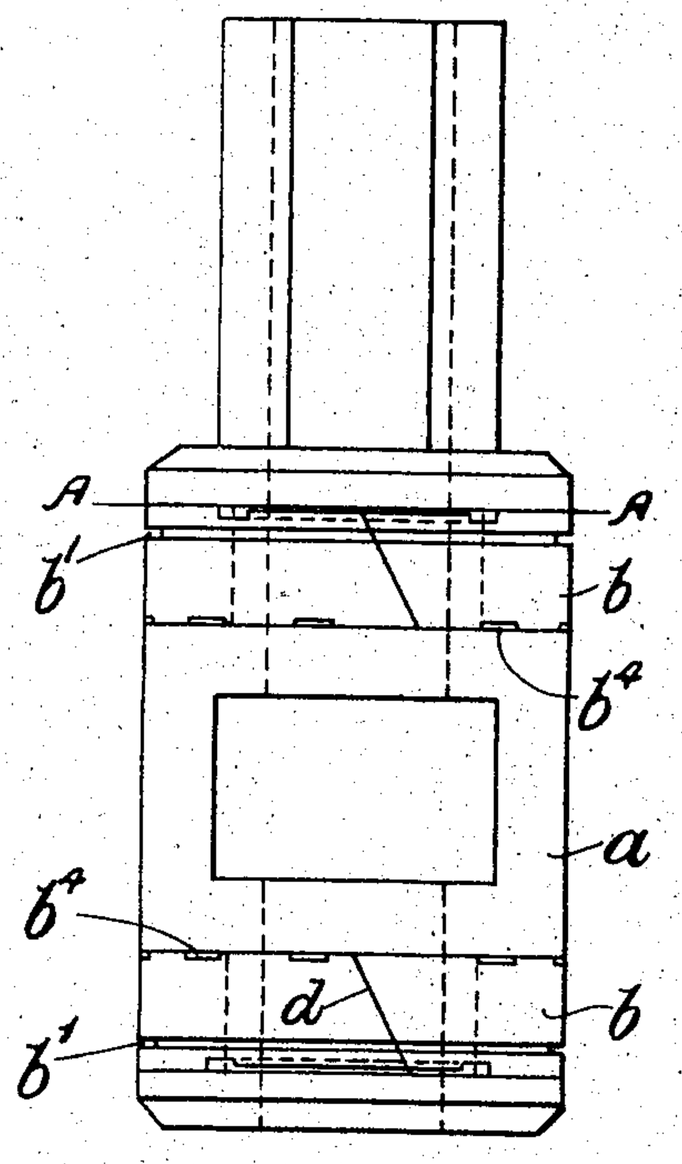

Fig 12.

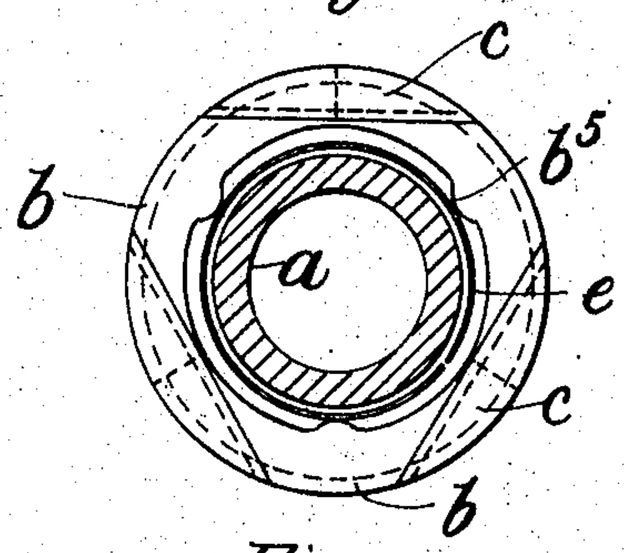

Fig 13.

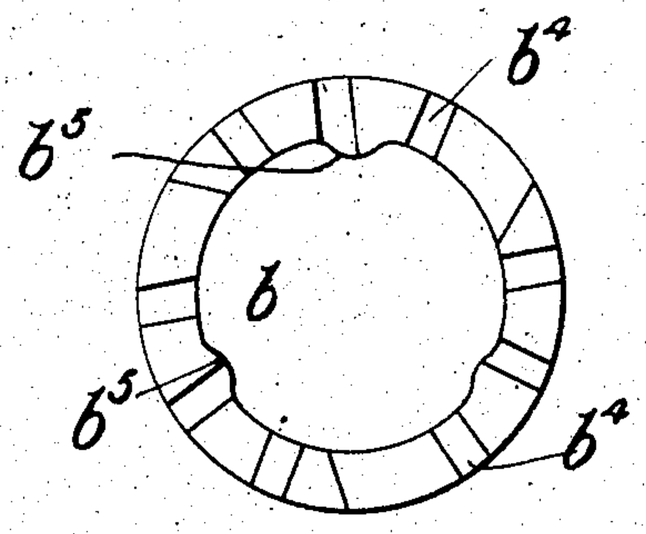

Fig 14.

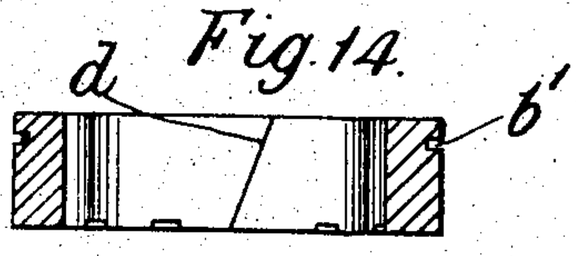

Fig 15.

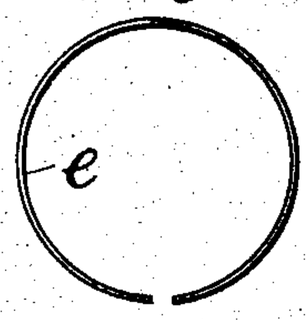

Fig 16

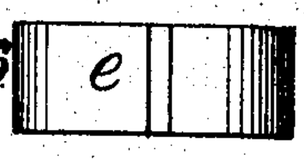

Fig 17

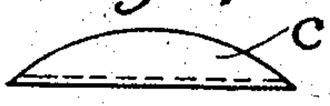

Fig 18

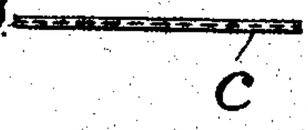

Fig 19

WITNESSES

A. W. White

John A. Percival.

INVENTOR

Osborne Reynolds

By Richards & Co.

ATTORNEYS

No. 781,227. Patented January 31, 1905.

UNITED STATES PATENT OFFICE.

OSBORNE REYNOLDS, OF MANCHESTER, ENGLAND.

PACKING FOR PISTONS.

SPECIFICATION forming part of Letters Patent No. 781,227, dated January 31, 1905.

Application filed July 6, 1904. Serial No. 215,506.

To all whom it may concern:

Be it known that I, OSBORNE REYNOLDS, professor of engineering, of Owen's College, Manchester, in the county of Lancaster, England, have invented certain new and useful Improvements in Packing for Pistons, of which the following is a specification.

My invention relates to improvements in pistons and piston-valves employed in steam-engines.

When pistons of the ordinary type are at work, the higher pressure of the steam or other elastic fluid which exists on one side gets behind the piston ring or rings and presses them with undue force against the inner surface of the cylinder, thus producing unnecessary friction and wear.

The objects of my improvements are, in the first place, to prevent this undue pressure between the piston-ring and the walls of the cylinder and to replace it by a known definite force in the form of a spring, and, in the second place, to enable the ring or rings more freely to adjust themselves to any variation in the diameter of the cylinder, and, in the third place, to cause the wear to be more even by imparting to the ring a slow revolving motion. I accomplish these objects by the construction and arrangement illustrated in the accompanying two sheets of drawings, in which—

Figure 1 is a sectional elevation of an ordinary piston to which my improvements are applied. Fig. 2 is a transverse section taken between the flanges of the piston-block and showing the grooves which I make therein for the purposes of my invention. Fig. 3 is a view of the piston-ring and stopping-pieces. Fig. 4 is a similar view to Fig. 2, but showing the piston-ring in position on the block. Fig. 5 is a sectional view of the piston-ring, showing the grooves therein. Figs. 6, 7, and 8 are three detail views, on a larger scale, of one of the stopping-pieces which are fitted over and under the joints of the divided piston-ring to prevent the passage of steam. Figs. 9 and 10 are views, also on an enlarged scale, of one form of spring for the piston-ring. Fig. 11 is an elevation of another form of piston as applied to a piston-valve with two rings. Fig. 12 is a sectional plan on the line A A, Fig. 11. Fig. 13 is a plan of the inner side of one of the rings. Fig. 14 is a sectional elevation of the same. Figs. 15 and 16 are detail views of the preferred form of spring in this construction. Figs. 17, 18, and 19 are detail views of one of the stopping-pieces for the rings.

Referring first to the construction illustrated on Sheet 1 of the drawings, *a* designates the piston block or head, in which I turn a groove *a'* to receive the piston-ring *b*. The piston-ring *b* is turned to the exact diameter of the cylinder in which it is to be fitted and of sufficient depth to make a close working fit between the flanges of the groove *a'* in the piston-block. I turn two annular grooves *b'* in the ring *b* about one-sixteenth of an inch wide and about three-sixteenths of an inch deep and about three-sixteenths of an inch from each edge of the ring, suitable for a piston of twelve inches in diameter, as shown in Fig. 5. From the bottom of these grooves I drill small holes b^2, about, say, one-sixteenth of an inch in diameter, through to the inside of the ring at regular intervals—say two or three inches apart. I next prepare beds on both the top and bottom of the ring *b* to receive the stopping-pieces *c*, one of which is shown on a larger scale in the three detail views, Figs. 6, 7, and 8. I employ two stopping-pieces *c*, one above and one below each joint or division in the ring *b*, to prevent the passage of steam, and I next divide the ring into three or four parts (preferably three equal parts, as shown) by cutting the same with a fine saw along oppositely-inclined lines, as shown at *d d d*, Fig. 5. I also form in the piston-block *a* in each of the flanges of the groove *a'* a concentric annular groove a^2, from which I make, say, six equidistant radial grooves a^3. The piston-ring *b* is now placed in the groove *a'* upon springs, which may be of any suitable form, such as the spring *e* shown in Figs. 9 and 10, where a separate spring *e* is employed for each segment into which the ring is divided, and the ends of these springs *e* rest against the body of the piston, while the center presses against the middle of its respective segment, being held in place by a pin *e'*,

entering a corresponding hole b^3 in the ring, and by projections e^2, which bear against the internal flanges of the ring for keeping it in position. By this construction and arrangement the high pressure of the steam or other elastic fluid behind the ring b passes through the holes b^2 and is communicated freely to the two annular grooves b', and therefore the pressure between the internal wall of the cylinder and the fitting part of the piston-ring b, between the two grooves b', must be equal to the pressure behind the ring, while of the pressure between the cylinder-wall and the two small portions of the ring outside the grooves b' one will be above and the other below the pressure between the cylinder and the main fitting part of the ring. Having thus taken off all the steam-pressure which forced the ring b against the cylinder-wall, it follows that the only force by which a steam-tight joint is made is that exerted by the springs e, and thus friction is diminished and undue wear of the cylinder and piston-ring obviated.

The second object of my improvements—namely, to enable the ring to freely adjust itself to slight inequalities in the diameter or alinement of the cylinder—is accomplished by means of the annular and radial grooves a^2 a^3 in the flanges of the piston-block, which insures that the steam-pressure which exists between that part of the ring b which lies within the annular groove a^2 shall be equal on both sides, thus preventing jamming of the ring b against either flange of the piston-block, which must otherwise ensue when the pressure on one side of the piston is much greater than on the other.

Referring now to the alternative construction and arrangement illustrated by Figs. 11 to 19, the piston or piston-valve block a has two grooves in it, and in these grooves are fitted two piston-rings b of substantially the same construction as in the first arrangement, but with the following differences in detail: In this case each ring b has only one annular groove b' and if for very small rings need have no small holes b^2 communicating with the space behind the ring, the saw-cuts d permitting sufficient steam to pass into the groove b'. The flanges of the grooves in the piston-block a are left plain and radial grooves b^4 (corresponding to the radial grooves a^3 in the first arrangement) are made on the inner side only of each ring b, as clearly shown in Figs. 11, 13, and 14. I also employ any suitable type of spring, preferably a circular spring e, as shown in Figs. 12, 15, and 16, and these springs press upon lugs b^5, formed on the inside of the ring, and press it outward to form a steam-tight joint. In this case also I show each ring b divided into three segmental parts by diagonal saw-cuts d d.

It will be readily understood that instead of making the radial grooves b^4 on the inner sides of the rings b, as shown, they might be made on the faces of the inner flanges only of the piston-block a.

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

In combination, a piston-block having an annular groove providing annular flanges, said flanges having concentric and radial grooves, a piston-ring comprising a plurality of segments fitted in said annular groove, stopping-pieces overlapping the joints between the segments for preventing the passage of steam therethrough, said ring having annular grooves and passages leading from the grooves to the spaces between the piston-block and ring, and springs located between the ring-segments and piston-block, and exerting outward pressure on the segments, substantially as described.

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

OSBORNE REYNOLDS.

Witnesses:

S. W. GILLETT,

HERBERT ROWLAND ABBEY.