

No. 694,078.

Patented Feb. 25, 1902.

A. F. RITCHIE.
PISTON AND PISTON ROD.

(Application filed Mar. 7, 1901.)

(No Model.)

Fig. 1.

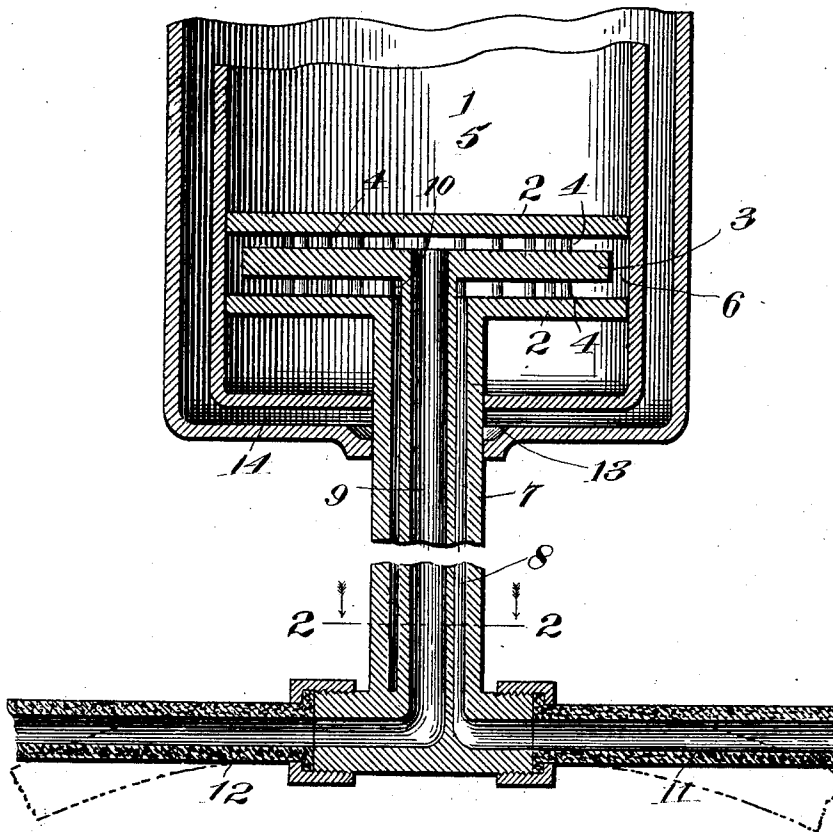
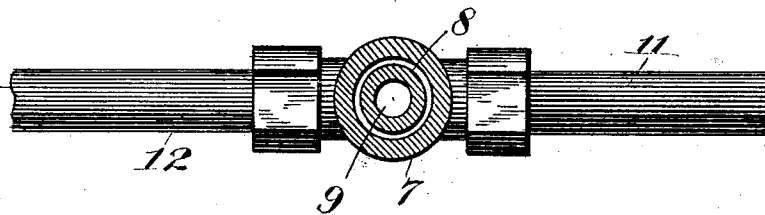


Fig. 2.



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PISTON AND PISTON-ROD.

SPECIFICATION forming part of Letters Patent No. 694,078, dated February 25, 1902.

Application filed March 7, 1901. Serial No. 50,241. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR F. RITCHIE, a citizen of the United States, residing at Duluth, in the county of St. Louis and State of Minnesota, have invented certain new and useful Improvements in Pistons and Piston-Rods; 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.

My invention relates to improvements in pistons and piston-rods which may be adapted for use and movement in cylinders of suitable construction.

It consists in a piston provided with walls or face-plates forming the pressure-surfaces of the piston, the same being spaced apart to form a fluid receiving and containing chamber, the said chamber being open at the edges of the piston, so that a fluid within the same would impinge upon the inner surface of the cylinder in which the piston moves.

It further consists in a piston of suitable construction provided with an interior chamber for receiving a cooling and packing fluid and a piston-rod connected with the said piston and provided with passages through which a fluid may be caused to circulate to and from the piston, the said fluid also serving to keep the piston-rod as well as the piston at a proper temperature.

It further consists in certain other novel constructions, combinations, and arrangements of parts, as will be hereinafter fully described and claimed.

In the accompanying drawings, Figure 1 is a vertical central section through a portion of a cylinder and through a piston and piston-rod located therein. Fig. 2 is a detail cross-section taken upon the line 2 2 of Fig. 1.

The present invention is designed to provide pistons for cylinders, which pistons shall be so constructed that their temperature may be maintained at any desired point and the walls of the cylinder within which the said piston moves may also have their temperature regulated, the means for regulating the temperature of the said piston and the said cylinder-walls being also used as a packing interposed between the moving piston and the walls of the cylinder.

In embodying the invention in a practical form I provide the piston 1 with face-plates 2 2, which are spaced apart a suitable distance with respect to a central plate or piston-head 3. A chamber is thus formed between each of the face-plates and the piston-head 3. The face-plates may be connected with the cylinder-head proper, 3, so as to move therewith and yet always maintain the same distance between them by the use of a series of connecting pins or pieces 4 4. The connecting-pieces 4 4 will be in the nature of a spider, which will hold the face-plates in position and yet will not materially reduce the spaces or chambers between the said face-plates and the piston-head. The face-plates 2 2 are preferably made to fit quite snugly in the bore of the cylinder 5. The piston-head proper, 3, however, is made of less diameter than the inner diameter of the cylinder, so that an annular space of suitable dimensions is left between the edge of the said piston-head and the inner surface of the cylinder 5. A liquid may be thus free to pass from one side of the piston-head 3 to the other side thereof. When the chamber in the piston-head is filled with a liquid, the liquid will be held in place by the face-plates of the piston and the cylinder-walls. It will be apparent, of course, that the face-plates may be spaced apart with respect to each other and also with respect to the piston-head proper by any suitable means—as, for instance, bolts or rivets, legs or projections secured to either the face-plates or the piston-head, or other similar means, all within the spirit of the invention.

In order to introduce and circulate a temperature-modifying liquid to and within the piston, I form the piston-rod 7 of a suitable diameter to accommodate inlet and outlet passages, as 8 and 9. One of the face-plates 2 is preferably connected with the piston-rod 7, and the piston-head proper, 3, is also preferably connected with the piston-rod, the central portion thereof being extended into the piston-chamber, as at 10, for this purpose. The passages 8 and 9 in the piston-rod may be made of any suitable size or shape; but a convenient way to form and arrange them is illustrated in Figs. 1 and 2 of the drawings, in which the passage 8 is an annular one and is arranged outside the passage 9. These

passages are made of approximately the same area, so that a liquid may be forced into the piston through one of them, and the other one will form an adequate outlet for the same. The inlet-passage 8 is connected with any source from which the liquid is to be derived by means of a flexible tube, as 11, while the liquid flowing out through the outlet-passage 9 will be conducted to any suitable point by means of a flexible tube 12. It is desirable to make such connections flexible, especially if the piston and piston-rod be movable parts of a mechanism. Other connections possessed of similar functions could, however, be employed if desired. The construction of the piston and piston-rod is thus of such character that a temperature-modifying liquid may be introduced into the chamber in the piston through the inlet-passage 8, passing between the face-plate 2 and the piston-head proper outwardly against the walls of the cylinder and thence between the other face-plate and the piston-head to the outlet-passage 9. This construction will be found very useful in all constructions employing rapidly-moving pistons, especially in steam-engines, explosive-gas engines, and the like. It will be evident that a continuous circulation of water or other cooling agents may be maintained through the piston-rod and piston and that the same will not only moderate the temperature of the said parts, but, moving continually upon the inner surface of the cylinder, will serve to cool and lubricate the same. The liquid thus contained between the face-plates of the piston will also perform another function—namely, the packing or sealing of the movable joint between the piston-head and the cylinder.

In order to pack the moving joint between the piston-rod and the cylinder, I also contemplate forming a liquid-packing chamber at the point where the piston-rod passes out of the cylinder 5, (indicated at 13 in the drawings.) The cylinder 5 may or may not be provided with a water-jacket, as at 14; but of course where it is desired to reduce the temperature of the cylinder it is well to employ such water-jacket. In such a case it is as easy to supply water or other cooling liquid to the packing-chamber 13, since it is only necessary to form the cylinder-head 14 hollow and connect the chamber formed therein with the water-jacket of the cylinder, as illustrated in Fig. 1, in order to accomplish this purpose. The space formed in the cylinder-head may be somewhat enlarged at the packing-chamber 13, so as to present considerable liquid-surface to the piston-rod at this point. Of course if a water-jacket is not employed in connection with the cylinder the cylinder-

head could still be provided with a suitable packing-chamber to receive the packing liquid and the same could be connected in any suitable manner with a liquid-supplying reservoir. The liquid supplied to said cylinder-head or water-jacket is of course preferably given a proper circulation to prevent the cooling liquid or agent from becoming itself quickly heated.

From the above description it will be apparent that I am enabled by simple means to cool or modify the temperature of a piston and cylinder as well as the piston-rod and that the purpose may be readily accomplished whether the piston and rod are the movable parts or the cylinder moves with respect to the piston and rod, all within the spirit of the present invention.

I wish it understood that my invention is adapted for use in cooling and heating cylinders or working parts, or for mixing or uniting chemicals, or for lubricating, or for any other similar processes, the principal feature of the invention being the introduction of a circulating fluid through a piston-rod and piston.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A piston provided with face-plates forming the pressure-surfaces of the piston, and means for spacing said faces apart to form a liquid receiving and containing chamber in the piston, the said chamber being entirely open from the piston-rod to the cylinder-walls so that the liquid in the said chamber may be permitted to engage the inner surface of a cylinder within which the piston is caused to move, substantially as described.

2. The combination with a cylinder, of a piston within the same formed with a piston-head proper, face-plates arranged upon either side of said head, and means for spacing the face-plates from the said piston-head to form a liquid receiving and containing chamber in the piston, the said chamber being entirely open from the piston-rod to the cylinder-walls so that a fluid may be caused to circulate around the said piston-head between the face-plates, a piston-rod connected with the piston, the said piston-rod being formed with inlet and outlet passages, and flexible means for connecting the passages with a fluid-supply and a fluid-discharge, substantially as described.

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

ARTHUR F. RITCHIE.

Witnesses:

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