

R. ESNAULT-PELTERIE.
 PISTON PACKING.
 APPLICATION FILED JULY 6, 1917.

1,292,392.

Patented Jan. 21, 1919.
 2 SHEETS—SHEET 1.

Fig. 1.

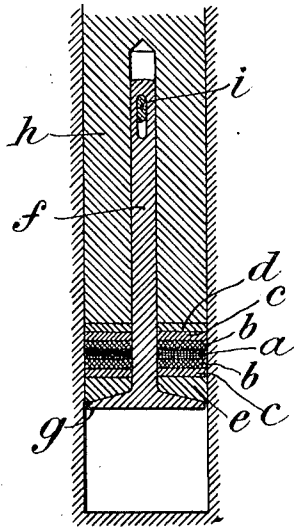


Fig. 2.

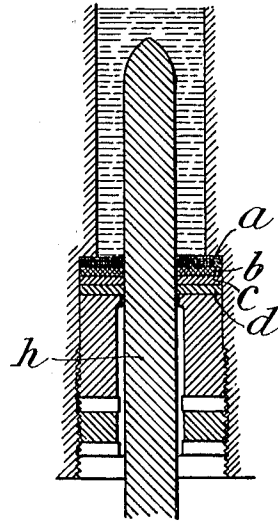


Fig. 4.

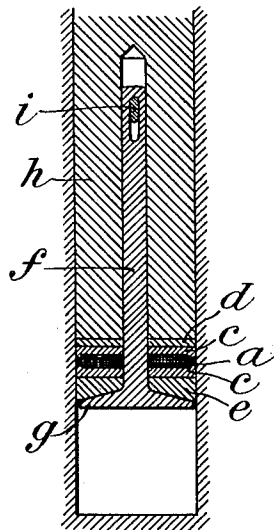
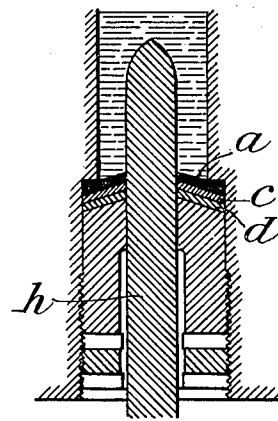


Fig. 5.



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Fig. 3.

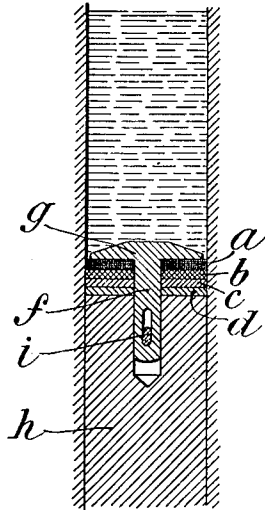


Fig. 7.

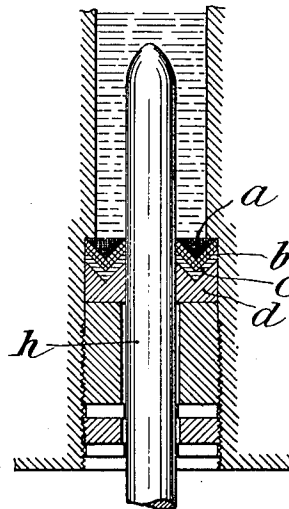
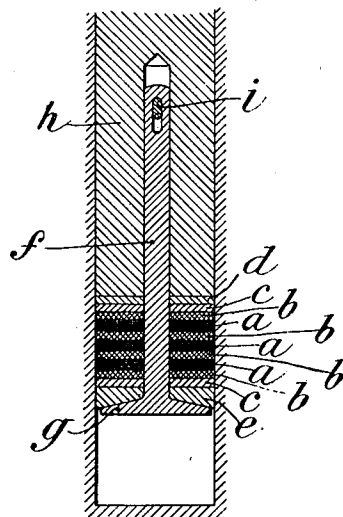


Fig. 6.



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UNITED STATES PATENT OFFICE.

ROBERT ESNAULT-PELTERIE, OF PARIS, FRANCE.

PISTON-PACKING.

1,292,392.

Specification of Letters Patent.

Patented Jan. 21, 1919.

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To all whom it may concern:

Be it known that I, ROBERT ESNAULT-PELTERIE, a citizen of the Republic of France, residing in Paris, France, have invented certain new and useful Improvements in Piston-Packings, of which the following is a specification.

The present invention relates to a piston packing device, specially intended for work at very high pressures.

The principle of the packing forming the subject-matter of the present invention consists in utilizing, for the purpose of obtaining fluidtightness, rings or washers of extremely soft metal, which crush under pressure and become fitted with great exactness to the walls of the cylinder.

It is necessary however to point out that this arrangement is not by itself sufficient to be applied to very high pressures, for it may bring about losses of power which in certain instances would render the arrangement inapplicable.

In fact if it is desired to make a packing consisting solely of one soft metal, arranged in such a way that the pressure crushes it and applies it against the walls of the cylinder, one finds oneself caught between two opposite conditions:—

On the one hand it is necessary in order that the fluidtightness may become "primed," for the elastic limit of the metal to be far below the pressure that it is desired to obtain, but in that case, when the pressure reaches its maximum, the metal is crushed to such an extent that it works its way in between the cylinder and the hard-metal parts that are compressing it.

From this there results a jamming, a heating and a loss of power, which render certain applications impracticable.

The chief object of the present invention is to obviate this disadvantage, and it consists essentially of arranging on both sides of the soft metal, two washers of metal slightly harder, and then, on both sides of these two washers, two others of metal a little harder still, and so on, right up to the piston proper, which may be of bronze, cast iron or steel.

Experience proves that if the scale of hardness is sufficiently graduated, there no longer occurs any spreading of the metals between the rubbing surfaces, and that under these conditions the operation is satisfactory.

In the event of the piston having to work in both directions, as for instance, a piston which is compressing a gas and which is subject to pressure not only during the compression stroke but also during a part of the expansion stroke, it is necessary that there should be on each side, starting from the soft metal, a range of metals gradually becoming harder.

Referring to the drawings:—

Figure 1 illustrates such a packing device, designed for working in both directions.

Fig. 2, a packing designed for working in one direction only, with a plunger piston.

Fig. 3, a packing intended for working in one direction with a non-plunger piston.

Fig. 4, a modification of the packing of Fig. 1.

Fig. 5, a modification of Fig. 2.

Fig. 6, another modification of Fig. 1.

Fig. 7, an improved modification of Fig. 5.

In the arrangement that is illustrated in Fig. 1, the soft metal may consist for instance of a sheet of lead *a*, comprised between two sheets of tin or antifriction metal *b*, *b*, which are themselves comprised between two sheets of silver or gold *c*, *c*, which in turn are comprised between a sheet and a piece of copper or bronze *d*, *e*.

The whole of these washers are threaded upon a rod *f*, which retains them by means of its cap *g*, and which is itself comprised in the axis of the piston *h*, where it is maintained by a transverse cotter *i*.

It goes without saying that to enable the packing to act the slot in the rod *f* through which the cotter *i* passes should allow sufficient play or clearance for the cap *g* to be able to compress the washers under the force of the pressure.

It also goes without saying that the depth of the central cylindrical cavity in the piston *h*, which receives the rod *f*, should be greater than the length of the said rod, for the same purpose.

In view of the fact that the present packing device offers a frictional resistance which is greater in proportion as its surface of contact with the cylinder is itself greater, it is expedient, when applying it to a pump for liquid acting in one direction only, to reduce the said rubbing surface by arranging only one of the two sets of washers of decreasing hardness. This is what is shown in Fig. 2, in which the same letters designate

the same washers and consequently do not require any fresh explanation, the only difference consisting in the fact that the piston *h* is of the plunger type.

5 In Fig. 3 the same arrangement is illustrated for a pump for liquid, having a non-plunger piston, and this also does not call for any further explanation.

10 In applying the present device there may however arise a special case, viz: one in which the conditions of temperature or the chemical conditions do not leave such a well graduated scale of hardnesses available as might be desired.

15 In this case, in order to prevent the soft metal from working between the harder metal and the cylinder wall, it is desirable to utilize the arrangement illustrated in Fig. 4, which consists in not making the ob-
20 turating washers flat but of arranging them in such a way that the washer of the hardest metal meets to join against the face of the cylinder at an acute angle, the soft metal meeting at an obtuse angle equal to the supplement of the preceding angle, these two
25 angles being further removed from 90° according as the difference in hardness between the two metals is greater.

This is what is illustrated in Fig. 4, for a
30 piston arranged as in Fig. 1, assuming that one has been compelled to include the lead washer directly between two silver washers.

Fig. 5 illustrates an arrangement equivalent to the preceding, applied to the arrange-
35 ment of Fig. 2.

In the event of it being desired to compress a gas up to an exceptionally high pressure it is advantageous not to put a single soft metal washer in the center of the pack-
40 ing but to arrange several soft metal washers separated from one another by slightly harder washers.

In Fig. 6 a piston similar to that of Fig. 1 is outlined, but comprising at its center
45 a series of three lead washers separated by two washers of tin or antifriction metal for instance.

Fig. 7 relates to an improved constructional form of the packing of Fig. 5, enabling a packing to be obtained which is
50 more compact and more homogeneous and therefore more capable of resisting wear and less fragile.

The various superposed washers *a*, *b*, *c*,
55 *d* have the faces that are intended to come into contact with one another cut to a V-shape all having the same degree of open-

ing, in such a way that the said washers can fit exactly into one another. The upper surface of the first washer *a*, formed of the
60 softest metal, may be plain, and is preferably almost flush with the upper edge of the next washer *b*.

The inclination of the faces of the washers that are in contact with one another, and
65 consequently the angle they make with the wall of the piston *h*, are determined as before according to the difference in hardness between the metals employed.

The various washers may advantageously
70 be united to another by welding so as to increase the compactness of the packing.

What I claim and desire to secure by Letters Patent of the United States is:—

1. A piston packing for high pressure apparatus, said packing comprising several
75 layers of metal of different hardness, the layer of softest metal having adjacent thereto the layers of metal in the order of their increasing hardness, the metal of said layer
80 of softest metal being adapted to be crushed against the sliding part against which the packing bears.

2. A piston packing according to claim 1 further characterized by the layer of soft-
85 est metal being on the pressure side of the packing.

3. A piston packing according to claim 1 further characterized by the layer of soft-
90 est metal meeting the sliding part against which it bears at an obtuse angle and the metal layers immediately adjacent said softest metal layer meeting said sliding part
95 at an acute angle forming the supplement of the obtuse angle referred to.

4. A piston packing according to claim 1 further characterized by plural layers of
softest metal and its immediately adjacent layer.

5. A piston packing according to claim 100 1 further characterized by the layers of metal being V-shaped in cross-section.

6. A piston packing according to claim 1 further characterized by the layers of
105 metal being superposed in series on either side of said layer of softest metal.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

ROBERT ESNAULT-PELTERIE.

Witnesses:

CHAS. P. PRESSLY,
HENRI CARTIER.