Improvements in diaphragms / [Philipp Hermann Rosenkranz].

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PROVISIONAL SPECIFICATION.

Improvements in Diaphragms.

I, Philipp Hermann Rosenkranz, of 22, Sedanstrasse, Hanover, in the Empire of Germany, Engineer, do hereby declare the nature of this invention to be as follows:—

Diaphragms are employed for many purposes in practical work and more particularly in connection with machines and consist of plates or sheets of comparatively small thickness and of a yielding or elastic material suitable for the particular purpose for which they are to be employed. For instance, diaphragms are often used in place of pistons in connection with valves as, for example in pressure regulators for steam, water, carbonic acid, air, *etc.*, in which regulators the diaphragm has for object to effect the closing of the passage of the steam, water, *etc.*, when it is subjected to a predetermined pressure on one face. In so called diaphragm-pumps or diaphragm water-meters and in other apparatus the diaphragm serves directly as a piston, in certain valves the stuffing-box is replaced by a diaphragm and in many cases the said diaphragm is used directly for making a joint, as for instance in india-rubber cocks.

Diaphragms are, when made of metal such as brass, copper, or steel, for the most part provided with ring shaped or circular corrugations for the purpose of increasing the extent of their movement. Yet even diaphragms having these corrugations possess the disadvantage that their movement is very slight and moreover they fracture at the corrugations, after having been in use for a short time, in consequence of the repeated movement or alteration of form. Diaphragms made of india-rubber, which are employed both with straight and with curved surfaces, only allow of a comparatively small movement. Such diaphragms are often employed in combination with metal plates laid upon them, which metal plates transmit the movement of the diaphragm to other parts such for instance as lever valves, auxiliary valves, *etc.* Between the edges of these plates and the box or case the diaphragm is subjected to injurious action. The movement increases at this part very considerably and in many cases the diaphragm does not return to its original position. It also very commonly occurs that the india-rubber plate is held fast at the said part. In all cases, however, the diaphragm very soon loses its elasticity.

These disadvantages are not present in the diaphragm forming the subject of the present invention. My diaphragm can be caused to move through a considerable distance and possesses a high efficiency. It can be made from any yielding material but is preferably formed of india-rubber, leather, varnished silk or the like and is provided with spaces or chambers of suitable shapes. In one form of my diaphragm the said spaces or chambers are circular in form so that there remains a central solid portion in which a hole is provided for the purpose of connecting the diaphragm with metal plates by means of bolts or the like. The diaphragm is held between two flanges which are so curved inwards against the box or case that the space extends into the space between the flanges in such

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a manner that the diaphragm conforms to the shape of the curve of the flanges whereby when any movement of the same occurs no sharp bend takes place.

The spaces or chambers which are filled with air, cause the diaphragm after employment to return to its original position. The permissible movement of my diaphragm is, however, considerably greater than that of ordinary india-rubber sheets and its durability is also considerably higher.

When the diaphragm is operated by steam and is composed of india-rubber it is necessary to cool it with water or any other suitable material. The water is preferably by means of a water sealed pipe, filled into the space in which the steam would otherwise come in contact with the india-rubber diaphragm.

The space or chamber instead of being filled with ordinary air can be filled with any other suitable gas or liquid for instance, glycerine, water, mercury, *etc.* The filling material can also, if desirable, be filled in under high pressure.

In a modified form of my diaphragm the central solid portion of the same is dispensed with so that a single continuous space or chamber is provided. The space or chamber instead of having in plan a circular form can be, according to the use to which the diaphragm is to be put, oval or polygonal in shape. The space or chamber can be formed with circular or helical corrugations or it can be divided up by partitions which may be for instance radial.

In connection with air vessels several of my cushion diaphragms may be employed superposed upon one another. Such an arrangement possesses the advantage that a permanent yielding mass is present in the air chamber. This is of great importance because, as is well known, the air in the air chambers contains or is soaked with water and contracts with time.

The above described cushion diaphragm can find extensive use, more particularly for all purposes in which ordinary diaphragms are used for instance in hydrants, meters, valves and the like. In many cases, for instance when employing india-rubber screw down valves it is advantageous to form the cushion diaphragm of two parts and to provide washers between the surfaces which would otherwise be in contact with one another.

Dated the 27th day of November 1896.

G. F. REDFERN & Co.,
4, South Street, Finsbury, London, Agents for the Applicant.

COMPLETE SPECIFICATION.

Improvements in Diaphragms.

I, PHILIPP HERMANN ROSENKRANZ, of 22, Sedanstrasse, Hanover, in the Empire of Germany, Engineer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

Diaphragms are employed for many purposes in practical work and more particularly in connection with machines and consist of plates or sheets of comparatively small thickness and of a yielding or elastic material suitable for the particular purpose for which they are to be employed. For instance, diaphragms are often used in place of pistons in connection with valves as, for example in pressure regulators for steam, water, carbonic acid, air, *etc.*, in which regulators the diaphragm has for object to effect the closing of the passage of the steam, water, *etc.*, when it is subjected to a predetermined pressure on one face. In so called diaphragm-pumps or diaphragm water-meters and in other apparatus the diaphragm serves directly as a piston, in certain valves the stuffing-box is

replaced by a diaphragm and in many cases the said diaphragm is used directly for making a joint, as for instance in india-rubber cocks.

Diaphragms, when made of metal such as brass, copper, or steel, are for the most part provided with ring shaped or circular corrugations for the purpose of increasing the extent of their movement. Yet even diaphragms having these corrugations possess the disadvantage that the extent of their movement is very slight and furthermore such diaphragms fracture at the corrugations, after having been in use for a short time, in consequence of the repeated movement or alteration of form. Diaphragms made of india-rubber, which are employed both with straight and with curved surfaces, only allow of a comparatively small movement. Such diaphragms are often employed in combination with metal plates laid upon them, which metal plates transmit the movement of the diaphragm to other parts such for instance as lever valves, auxiliary valves, *etc.* Between the edges of these plates and the box or case the diaphragm is injuriously affected. The movement increases at this part very considerably and in many cases the diaphragm does not return to its original position. It also very commonly occurs that the india-rubber plate is held fast at the said part and in all cases, the diaphragm very soon loses its elasticity.

These disadvantages are obviated in the diaphragm forming the subject of this invention. My diaphragm can move through a considerable distance and possesses a high efficiency. It can be made from any yielding material but is preferably formed of india-rubber, leather, varnished silk or the like and is provided with spaces or chambers of suitable shapes as hereinafter described.

To enable my invention to be fully understood I will describe it by reference to the accompanying drawing, in which:—

Figure 1 is a cross section of a diaphragm made according to my invention and shewn fitted in a casing.

Figure 1^A is a plan thereof drawn to a smaller scale.

Figure 2 is a transverse section of a modified form of my diaphragm.

Figure 3 is a similar view of another construction of diaphragm.

Figure 3^A is a plan drawn to a smaller scale of a slightly different construction.

Figure 4 is a cross section of a further modification; and,

Figure 5 is a section of a tap having a diaphragm made according to my invention.

In the form of my diaphragm shewn in Figures 1 and 1^A the space or chamber H is circular in form so that there remains a central solid portion in which a hole *a* is provided for the purpose of connecting the diaphragm to metal plates by means of bolts or the like. The diaphragm is held between two flanges *f*, *f* which are so curved inwards against the box or case that the space H extends, as shewn at *p*, into the space between the flanges *f*, *f* that is to say, beyond the line *o*—*o* in such a manner that the diaphragm conforms to the shape of the curve of the flanges whereby when any movement of the same occurs no sharp bend takes place.

The space or chamber H which is filled with air, causes the diaphragm after employment to return to its original position. The permissible movement of my diaphragm is, however, considerably greater than that of ordinary india-rubber sheets and its durability is also considerably higher.

When the diaphragm is operated by steam and is composed of india-rubber it is necessary to cool it with water or any other suitable material. The water is filled, preferably by means of a water sealed pipe, into the space in which the steam would otherwise come into direct contact with the india-rubber diaphragm.

The space or chamber H instead of being filled with ordinary air can be filled with any other suitable gas or liquid for instance, glycerine, water, mercury, *etc.* The filling material can also, if desirable, be filled in under high pressure.

In the modified form of my diaphragm shewn in Figure 2 the central solid portion of the same is dispensed with so that a single-continuous space or chamber H is provided. The space or chamber H instead of having in plan a circular form can be, according to the use to which the diaphragm is to be put,

oval or polygonal in shape. The space or chamber H can be formed with circular or helical corrugations as shewn in Figure 3 or it can be divided up by partitions which may be for instance radial as shewn in Figure 3A.

In connection with the air chambers of pumps or fire engines or the like several of my cushion diaphragms may be employed superposed upon one another. Such an arrangement (shewn in Figure 4) possesses the advantage that a permanent yielding mass is present in the air chamber. This is of great importance because, as is well known, the air in the air chambers is carried or sucked away by the water and is gradually lost.

The above described cushion diaphragm can find extensive use, more particularly for all purposes in which ordinary diaphragms are used for instance in hydrants, meters, valves and the like. In many cases, for instance in that of india-rubber screw-down valves as shewn in Figure 5 it is advantageous to form the cushion diaphragm of two parts and to provide washers M and M1 between the surfaces which would otherwise be in contact with one another.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. Diaphragms having in their thickness one or more spaces filled with air, gas or a suitable liquid, substantially as hereinbefore described.

2. The improved diaphragms hereinbefore described and illustrated respectively in Figures 1 and 1A; 2; 3; 3A; 4 and 5 of the accompanying drawing.

Dated this 18th day of August, 1897.

G. F. REDFERN & Co.,
4, South Street, Finsbury, London, Agents for the Applicant.

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Fig. 1a

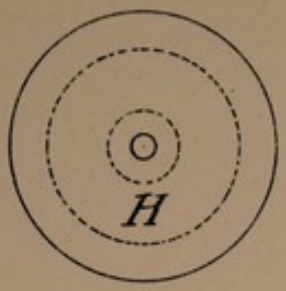


Fig. 3a

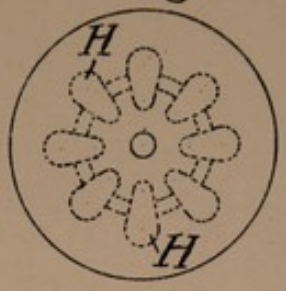


Fig. 1

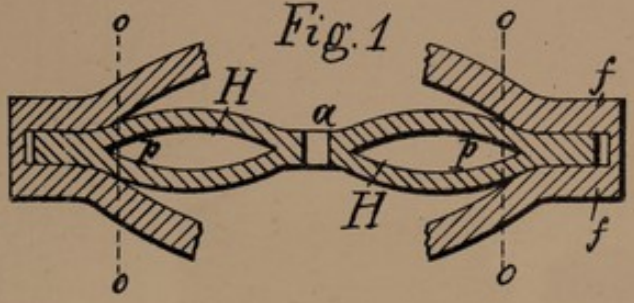


Fig. 2

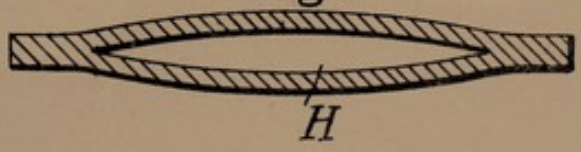


Fig. 3

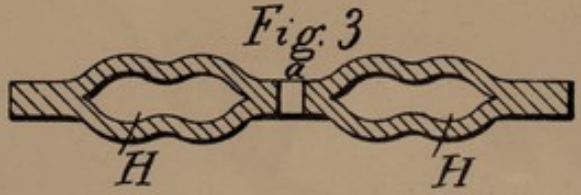


Fig. 4

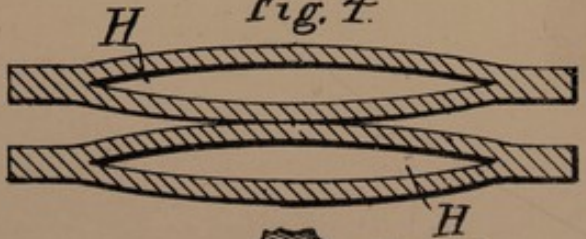
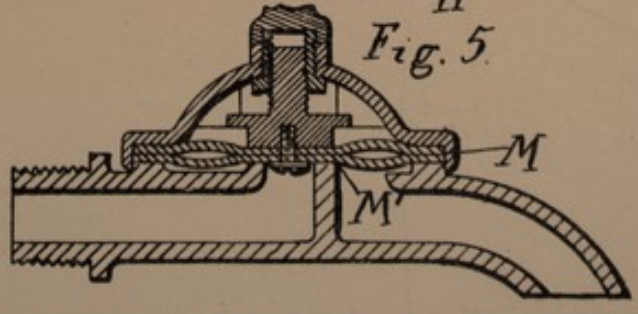


Fig. 5



[This Drawing is a reproduction of the Original on a reduced scale.]

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