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MEANS FOR CONFINING AN AREA CONTAINING FLUID EXERTING A PRESSURE

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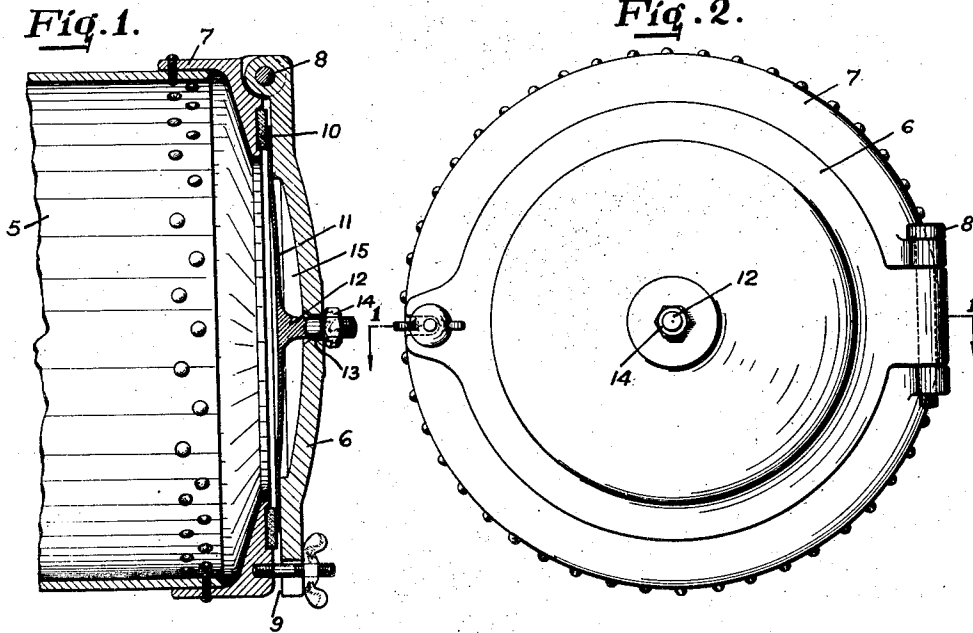


Fig. 3.

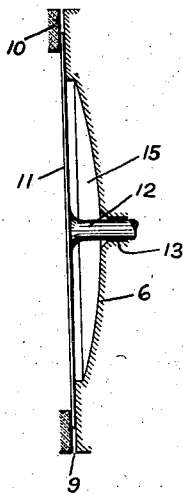
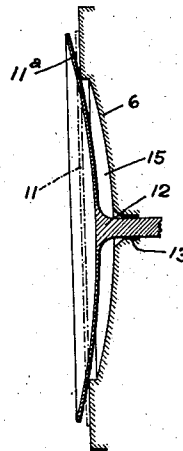


Fig. 4.



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MEANS FOR CONFINING AN AREA CONTAINING FLUID EXERTING A PRESSURE

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This invention relates to means for producing and maintaining a seal, and more particularly to apparatus adapted for use with steam chambers or the like designed to retain internal pressures; or with receptacles for containing fluids such as gases in absolute confinement.

The object of the invention is to provide a structure of simple design adapted to cooperate with a door or partition for sealing an area subjected to pressure.

In order to provide a steam or air tight joint between contiguous surfaces, it is usual to employ a gasket of suitable material and by applying pressure to one of the surfaces a seal between the gasket and the other surface may be produced. Various arrangements have been utilized for the application of pressure to preserve such a seal, and often take the form of a series of nuts and bolts or pressure applicators of various sorts positioned about the door, plate or other surface abutting the gasket. The generic principle on which such structures are founded resides in the application of force or pressure to the gasket by means operable from without the chamber or area in which confinement is desired.

Applicant, however, provides primarily for the application of sealing pressure on such a gasket or the like by means independent of human agency or tightening devices operable from without the confined area.

A feature of the invention, therefore, resides in the provision of a tensile diaphragm cooperatively associated with a door whereby the production of a pressure within a chamber served by the door will cause said diaphragm to seal the chamber.

A further feature covers the provision of means in combination with said diaphragm whereby the diaphragm will exert a uniform pressure on every part of a sealing gasket regardless of the existence or non-existence of pressure against the diaphragm.

Another feature is found in the structural design of a door arranged to confine a given area; whereby a diaphragm supported thereon is flexed by the door itself and actuated

to exert a pressure in a desired direction at a plurality of given points.

Further features providing for the production of a "dead" air space within the door when the diaphragm functions, so that heat losses are minimized; and providing for a compact unit assembly of door and sealing diaphragm that is simple and economical to construct, satisfactory in operation, and desirable for adaptation to many purposes, will be more particularly set forth in the following description to be read in connection with the accompanying drawings in which:

Fig. 1 is a sectional view of a door construction incorporating the invention, and applied to a steam chamber or the like. This view is taken on line 1-1 of Fig. 2 in the direction indicated;

Fig. 2 is a plan view of the door shown in Fig. 1;

Fig. 3 is a detail of the diaphragm structure mounted on a door of suitable design; and

Fig. 4 shows an exaggerated view of the diaphragm when in sealing position.

Considering all the figures, similar designations referring to similar parts, numeral 5 designates a steam chamber or the like in which a pressure is to be produced and maintained. In different applications of the invention the numeral 5 could be illustrative of any confined area in which a fluid or a gas is intended to be retained in a sealed area of any character. Door 6 is hinged on a suitable frame or casting 7 mounted on the steam chamber in any suitable manner, as by rivets. If desired, the door is hinged at 8 and locked to the casting at 9, as by the nut and bolt arrangement illustrated. It is understood that any fastening means such as a plurality of nuts and bolts positioned about the periphery of the door, as is usually employed, could be used if expediency demanded. Gasket 10 is positioned in the customary manner on the casting between the outer surface thereof and the door. The structure of the gasket itself, or its manner of positioning, forms no part of this invention. Diaphragm 11 is made of tensile material and attached, either integrally or sepa-

rably, to abutting arm 12. As illustrated, the door is provided with an opening 13 in which arm 12 fits and through which it projects to a desired distance. The projecting portion is preferably threaded so that nut 14 may be adjusted thereon to hold it in place and control the action of diaphragm 11 under certain conditions. The door is formed so that air pocket 15 is situated between the diaphragm and the central portion of the door which is formed to bulge or extend outwardly from the peripheral portion. As a result, the point where the pocket begins forms a line with the peripheral portion against which the diaphragm presses if pressure is applied thereon from within the chamber. Also, if the diaphragm is pulled outwardly, as would be the case if nut 14 were manipulated to draw arm 12 without the chamber, it would also be flexed. This would be due to the circular extremity of the pocket forming a continuous pivot or ledge against which the abutting diaphragm would tend to flex. The portion of the diaphragm over the pocket would accordingly tend to move toward the door while the remainder of the diaphragm would correspondingly tend to move toward the chamber. This movement could be brought about by the manipulation of nut 14 or by the production of a pressure within the chamber itself. Gasket 10 is positioned so that the extremity of the diaphragm rests against it and exerts a pressure thereon whenever the diaphragm is flexed as aforesaid.

In heating and drying systems, applicant has discovered that material to be dried can efficiently be handled and the moisture therefrom expeditiously removed by subjecting the material to a pressure at a given temperature and then releasing the pressure at a predetermined rate. The subjection of wet material to such a process requires steam-tight chambers. Since the process for certain materials proceeds very rapidly, the opening and closing of the chambers for the accommodation of materials therein and the production of pressures without losses, demands doors or similar parts which can readily be manipulated to provide sealing confinement almost instantaneously. The usual methods of providing seals by gaskets to which pressure is applied at a plurality of points, entail considerable labor and a nicety of adjustment at all points in order that uniform pressure be applied to the whole of the gasket. It is evident that such ideal results are rarely, if ever, obtained. Application of uniform pressure under such circumstances depends upon human judgment, to a great extent liable to error.

In applicant's system, as more particularly illustrated in Figs. 3 and 4, confinement is obtained by merely closing the door and fastening it in any desired manner at one point. Any usual locking means suffices. The sub-

sequent production of a pressure within the chamber automatically exerts a uniform pressure on every point of the diaphragm subjected to the conditions within the chamber. As a result, the diaphragm will respond to the pressure and flex outwardly. The greater the pressure, the more will be the tendency of the center portion of the diaphragm to flex toward the door. Due to the pocket construction, the outer extremity of the diaphragm will press against the gasket. Since the pressure on the diaphragm is uniform, the pressure at all points on the gasket will be uniform. Since the diaphragm will tend to flex to a greater degree upon increase of pressure within the chamber, so also will a greater pressure be exerted on the gasket corresponding to increased pressure within the chamber.

Furthermore, the production of a dead air space in pocket 15 effectively cuts down heat losses inasmuch as conduction losses are held to a minimum through possible heat passage from the diaphragm through arm 12. The greater part of the door is shielded from the chamber by the air pocket, and the diaphragm is sufficiently thin to hold losses to a minimum. It may be noted that, as illustrated in Fig. 3, diaphragm 11 normally assumes a flat condition. Its plane surface, however, readily assumes a spherical characteristic as shown in the exaggerated view of Fig. 4, whenever pressure is applied thereagainst in the direction of the door. This, of course, may be accomplished by manipulating the nut or by the action of pressure within the confined area.

Applicant does not limit himself to the precise structure shown but considers within the purview of this invention any arrangement wherein a diaphragm, or the like, is adapted to produce and maintain a seal upon being flexed by means without a confining area, or responsive to conditions produced in the area.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

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

1. A pressure tight seal comprising a door having a pocket, an imperforate diaphragm mounted to abut the extremity of said pocket, a chamber served by the door, a gasket between the door and chamber, said diaphragm being adapted to abut the extremity of said pocket and apply a pressure to said gasket, the pocket forming a space between the diaphragm and door.

2. A pressure tight seal including, in combination a receptacle formed with an opening

a closure plate covering said opening, a support for said plate and to retain the latter interposed between its body and said receptacle, said plate being flexible and imperforate and coacting with said support under the action of pressure within said receptacle to bear against said support to cause the outer edges of said plate to flex inwardly towards said receptacle.

3. A pressure tight seal including, in combination, a receptacle formed with an opening, a closure plate covering said opening, a support for said plate and to retain the latter interposed between its body and said receptacle, said plate being flexible and imperforate and coacting with said support under the action of pressure within said receptacle to bear against said support to cause the outer edges of said plate to flex inwardly towards said receptacle, and a gasket interposed between the edges of said plate and said receptacle to form in conjunction with said plate an air tight seal.

4. A pressure tight seal including, in combination, a receptacle formed with an opening, a support associated with said receptacle and beyond said opening, said support providing a relatively raised portion of an area less than said opening; a plate interposed between said support and receptacle and bearing against said relatively raised portion, said plate being imperforate and flexible under the action of pressure to cause portions of the same in contact with said raised portion to tend to rock with respect to the same, whereby to force the edge portions of said plate towards said receptacle.

5. A pressure tight seal including, in combination, a receptacle formed with an opening, a support associated with said receptacle and beyond said opening, said support providing a relatively raised portion of an area less than said opening; a plate interposed between said support and receptacle and bearing against said relatively raised portion, said plate being imperforate and flexible under the action of pressure to cause portions of the same in contact with said raised portion to tend to rock with respect to the same, whereby to force the edge portions of said plate towards said receptacle, said support being extended centrally of said plate and being spaced therefrom to permit flexion of the central plate portion and to provide an air space between its inner face and the outer face of said plate.

6. A pressure tight seal including, in combination, a receptacle formed with an opening, a support associated with said receptacle and beyond said opening, said support providing a relatively raised portion of an area less than said opening, a plate interposed between said support and receptacle and bearing against said relatively raised portion, said plate being imperforate and

flexible under the action of pressure to cause portions of the same in contact with said raised portion to tend to rock with respect to the same, whereby to force the edge portions of said plate towards said receptacle, said support being extended centrally of said plate and being spaced therefrom to permit flexion of the central plate portion and to provide an air space between its inner face and the outer face of said plate, and means extending from said plate and connected to said support to have movement with respect thereto to secure said plate normally in association with said support.

7. A seal including, in combination, a receptacle formed with an opening, a support associated with said receptacle and beyond said opening, said support providing a relatively raised portion of an area less than said opening, a plate interposed between said support and receptacle and bearing against said relatively raised portion, said plate being imperforate and flexible under the action of pressure to cause portions of the same in contact with said raised portion to tend to rock with respect to the same, whereby to force the edge portions of said plate towards said receptacle, and means extending from said plate and coupled to said support to normally retain said plate from detachment from said support.

8. A pressure tight seal including, in combination, a receptacle member formed with an opening, an imperforate closure plate overlying said opening and being flexible, a sealing member cooperating with said plate, one of said members defining a supporting portion in contact with said plate, and around which portions of said plate tend to fulcrum under the action of pressure different from the atmosphere and within said receptacle, and said plate when so flexed having its edge portion moving towards the second member to effect sealing contact with respect to the same.

In testimony whereof I affix my signature.
WILLIAM J. PLEWS.