The general object of my invention is to provide an improved closure for barrels, casks and similar receptacles. More specifically, the object of my invention is to provide a simple reliable and effective closure for barrels which may be made either of wood or of iron, and which is especially adapted to withstand a high internal pressure.

A further object of my invention is to provide a barrel or other receptacle with tight joints even at a high internal pressure.

Another object of my invention is to provide a closure with interchangeable parts which are easily removable and when once removed may readily be replaced on the cylinder and fixed thereto without damaging any parts of the barrel.

A still further object of my invention is to provide a closure for barrels and like containers which shows the above mentioned properties and which all the same allows the barrel to be easily handled by hand or lifted with a crane. The barrel according to my invention shows a remarkable stability.

These and other objects are attained by providing ties, either tie rods or tie bands co-operating with pressure rings which press the heads on the ends of the cylinder or drum in such a way that the packing, which is preferably a rubber packing, is subjected to a pressure sufficient to close the joint but not exceeding a certain pre-determined amount. This allows the packing to be repeatedly used.

According to my invention the packing is arranged in grooves or recesses protruding therefrom for a certain amount only sufficient to pack the joint tightly by its inherent elasticity when the lid is pressed on the face of the cylinder. It is important that the packing according to my invention has not to stand the entire pressure with which the heads of the barrel are pressed on the cylinder and that its elasticity is not impaired thereby. The packing compensates for possible inaccuracies either of the cylinder or of the heads.

The invention may be embodied in various forms. In one preferred form of my invention means are provided to allow the lid to be removed without removing the bottom pressure ring. The upper pressure ring may be so constructed as to allow the lid to be removed without removing the said pressure ring. Finally the ties, especially if tie rods are used, may be arranged between two concentric jackets which are preferably made of wood. Such a barrel is therefore provided with a double cylinder and an in-built armouring and combines all the known advantages of wooden barrels with those of steel barrels or casks.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification; but for a better understanding of the invention, however, its advantages and specific objects attained with its use, reference should be had to the accompanying drawing and descriptive matter in which I have illustrated and described preferred embodiments of my invention.

Of the drawing:

Fig. 1 is a view of a barrel, partly in section, and

Fig. 2 shows a part of a barrel and especially a part of the lid or cover, the cylinder and the ring disposed on these two parts, also in section;

Fig. 3 shows a further embodiment of the invention, only a part of the barrel being shown in section.

Fig. 4 shows a barrel with double jacket and rod ties disposed between the two cylinders; and

Fig. 5 is a plan view of the barrel shown in Fig. 4.

In the drawing similar references have been used to designate similar parts. In all modifications shown in the drawing 1 designates the cylinder of the barrel, 2 the cover or lid, 3 the bottom end, 4 the upper pressure ring disposed on the cover, 4' the bottom or lower pressure ring, 5 the ties and 6 resilient packings.

Whereas steel bands may also be used as ties it is preferable to use tie rods 5. As shown in Fig. 1 the rings 4 and 4' are T-shaped, the horizontal web resting on the ends 2 and 3. The latter and the cylinder 1 as well are made of wood. The rings 4 and 4' are held together by means of rods 5 the heads 7 of which bear against the web of the lower ring 4' while the upper ends 14 are provided with screw threads adapted to receive nuts 15. These nuts are provided with a head 16 which lies partly in a recess of the ring 4. The vertical flanges of these rings 4 and 4' guide the rods 5 which are thereby exactly concentrically arranged with respect to cylinder 1. The nuts are housed well within the rings 4, 4'. This feature is of considerable importance for the transport of the barrels either by rolling them or by lifting them with a crane. The rings 4 and 4' and therefore also the ends 2 and 3 of the barrel are pressed on the cylinder 1 by means of the screw nuts 15. The latter allow to vary the pressure as may be desired.
Fig. 3 shows a barrel with ties 5 of rectangular cross-section. The bars 5 are not flexible and are adapted to press the rings 4 and 4' on the cylinder 1. The bars 5 are simply passed through their ends 16 and bent over slots in the horizontal webs of the said rings 4 and 4'. If lid 2 has to be removed an end 16 of the bar 5 has to be bent into a vertical position or even to be cut off. As the nuts 15 are the modifications according to the Figs. 1 and 2 are unscrewed or if the ends 16 are bent upwardly (Fig. 3), the bottom end 3 would no longer be pressed on the lower end of the cylinder 1 and liquid contained in the barrel would be lost. To prevent this a projection of the ties 5 might be provided gripping over the upper end of cylinder 1.

In the modification shown in Fig. 2 an iron ring 17 of angular cross section rests on the upper end of the cylinder 17. The tie rods 5 are welded or otherwise connected to the said ring 17. Therefore the bottom end 3 is still pressed against the lower face of cylinder 1 even if the lid 2 has been removed.

The rings 4 and 4' are so shaped as to allow the barrels to be rolled and to be lifted by a crane. They strengthen the lid and protect the edges of the cylinder. The packing 6 is on the upper part of the pressure ring 4 protect the nuts 15 so as to prevent them from being damaged during transport etc.

As the nuts do not project outwardly of the vertical flanges of the rings 4 and 4' the barrels when stored stand firmly on the ring 4' or 4.

The barrel according to Figs. 4 and 5 differs from the above described embodiments in that two concentric jackets 1 and 18 are provided. Both jackets are made of wood, preferably of plywood. As in the other embodiments above referred to rings 4 and 4' are kept together by means of tie rods 5. The outer jacket protects the tie rods 5 whereas a rolling ring 19 allows an easy rolling of the barrel.

This construction combines the advantages of the known wooden barrels with those of the steel barrels.

In all the modifications shown in the drawing the bottom end of the container might also be fixedly connected to cylinder 1.

The packing 6 shown in the Figs. 1 to 6 has not to withstand the extreme pressures by which the pressure rings 4 and 4' are pulled together. This lengthens considerably the life of such a packing. The dimensions of the parts above referred to are such as to impart to the packing 6 a pressure sufficient to ensure a tight joint but not high enough to impair a ready working of the packing 6.

The packing 6 of all the modifications shown in the drawing lies in recesses either of the lid, or of the bottom end 3 or of the cylinder 4.

The pressure by which the lid and the bottom end are pressed on the faces of the cylinder is mostly very considerable. If the pressure within the barrel varies between 1 to 5 atmospheres the pressure exerted on the lid will vary between 1000 to 5000 kilograms by an inside diameter of 367 meters of the cylinder. The inside pressure tends to lift the lid and the bottom end from the respective faces of the cylinder. A small gap of about 0.1 millimeter will be produced between the lid, the bottom end and the cylinder. The whole pressure of 5 atm. in the barrel will now act on the packing and will press the latter in the said gap ensuring thereby automatically a most perfectly tight joint.

To attain a perfect seating of the joint even with no or little pressure within the barrel packing material is to be used which by its inherent elasticity closes the joint between the ends of the barrel and the cylinder. The cross section of the packing ring has to be sufficiently large and the recess in which the packing is lodged appropriately dimensioned to obviate a pressure on the packing exceeding its elasticity limit when the ends of the barrel are fully pressed on the faces of the cylinder. The recesses in which the packing is housed retain its cross section even at the very highest tension of the ties, therefore the packing material cannot be subjected at too high a pressure which would destroy its elasticity.

In the modification shown in the Fig. 1 to 3 the tie rods 5 are disposed well within the periphery of the pressure rings on which the barrel can be easily rolled and the same therefore do not hamper the rolling of the barrels.

While in accordance with the provisions of the statutes, I have illustrated and described the best forms of my invention now known to me, it will be apparent to those skilled in the art that changes in form may be made without departing from the spirit of my invention as set forth in the appended claims, and some features of my invention may be combined with the ends of the cylinder and having another non-contacting area in line with a portion of the adjacent end area of the cylinder, and a flexible packing located between the cylinder and said non-contacting area, said packing being of a thickness to hold said head out of engagement with said cylinder when under no pressure, means to force the head and cylinder end together until the contacting areas of the head and cylinder meet, said means comprising pressure rings located at each end of the barrel and projecting outwardly from the heads thereof, and means located within the compass of said rings and connecting them together for purposes described.

In a thin-wall wooden barrel-like receptacle having a body and wooden heads for closing the ends of the body, at least one head being removable, an elastic packing ring located between said removable head and the adjacent end face of the body, said packing ring being of an area less than that of said end face, means to hold said removable head in place with sufficient pressure partly to compress said packing and bring the head into direct contact with the remaining area of said end face of the barrel as a rigid abutment, said means comprising flanged rings of greater diameter than that of the barrel body and its heads, the inner faces of the outer faces of the barrel heads adjacent and overlying the peripheries thereof, and a series of tensioned rods passed through apertures in the flanges of the rings and lying within the compass of the rings and outside the body of the barrel.

In a thin-wall wooden barrel-like receptacle having a body and heads for closing the ends of the body, at least one head being removable, an elastic packing ring located between
said removable head and the adjacent end face of the body, said packing ring being of an area less than that of said end face, means to hold said removable head in place with sufficient pressure partly to compress said packing and bring the head into direct contact with the remaining area of said end face of the barrel as a rigid abutment, said means comprising flanged rings of greater diameter than that of the barrel body and its heads, the flanges of which rings rest against the outer faces of the barrel heads adjacent and overlying the peripheries thereof, and a series of tensioned rods passed through apertures in the flanges of the rings and lying within the compass of the rings and outside the body of the barrel, said flanged rings extending beyond the receptacle sufficiently beyond the ends of said rods so that the receptacle will stand even on either end.

7. In a thin-wall wooden barrel-like receptacle having a body and wooden heads for closing the ends of the body, at least one head being removable, an elastic packing ring located between said removable head and the adjacent end face of the body, said packing ring being of an area less than that of said end face, means to hold said removable head in place with sufficient pressure partly to compress said packing and bring the head into direct contact with the remaining area of said end face of the barrel as a rigid abutment, said means comprising flanged rings of greater diameter than that of the barrel body and its heads, the flanges of which rings rest against the outer faces of the barrel heads adjacent and overlying the peripheries thereof, and a series of tensioned rods passed through apertures in the flanges of the rings and lying within the compass of the rings and outside the body of the barrel, said flanged rings extending beyond the receptacle sufficiently beyond the ends of said rods so that the receptacle will stand even on either end.

4. In a thin-wall wooden barrel-like receptacle having a body and wooden heads for closing the ends of the body, at least one head being removable, an elastic packing ring located between said removable head and the adjacent end face of the body, said packing ring being of an area less than that of said end face, means to hold said removable head in place with sufficient pressure partly to compress said packing and bring the head into direct contact with the remaining area of said end face of the barrel as a rigid abutment, said means comprising flanged rings of greater diameter than that of the barrel body and its heads, the flanges of which rings rest against the outer faces of the barrel heads adjacent and overlying the peripheries thereof, and a series of tensioned rods passed through apertures in the flanges of the rings and lying within the compass of the rings and outside the body of the barrel, said packing ring being of an area less than that of said end face, means to hold said removable head in place with sufficient pressure partly to compress said packing and bring the head into direct contact with the remaining area of said end face of the barrel as a rigid abutment, said means comprising flanged rings of greater diameter than that of the barrel body and its heads, the flanges of which rings rest against the outer faces of the barrel heads adjacent and overlying the peripheries thereof, and a series of tensioned rods passed through apertures in the flanges of the rings and lying within the compass of the rings and outside the body of the barrel, said flanged rings extending beyond the receptacle sufficiently beyond the ends of said rods so that the receptacle will stand even on either end.

5. In a thin-wall wooden barrel-like receptacle having a body and wooden heads for closing the ends of the body, at least one head being removable, an elastic packing ring located between said removable head and the adjacent end face of the body, said packing ring being of an area less than that of said end face, means to hold said removable head in place with sufficient pressure partly to compress said packing and bring the head into direct contact with the remaining area of said end face of the barrel as a rigid abutment, said means comprising flanged rings of greater diameter than that of the barrel body and its heads, the flanges of which rings rest against the outer faces of the barrel heads adjacent and overlying the peripheries thereof, and a series of tensioned rods passed through apertures in the flanges of the rings and lying within the compass of the rings and outside the body of the barrel, said packing ring being of an area less than that of said end face, means to hold said removable head in place with sufficient pressure partly to compress said packing and bring the head into direct contact with the remaining area of said end face of the barrel as a rigid abutment, said means comprising flanged rings of greater diameter than that of the barrel body and its heads, the flanges of which rings rest against the outer faces of the barrel heads adjacent and overlying the peripheries thereof, and a series of tensioned rods passed through apertures in the flanges of the rings and lying within the compass of the rings and outside the body of the barrel, said flanged rings extending beyond the receptacle sufficiently beyond the ends of said rods so that the receptacle will stand even on either end.

5. In a thin-wall wooden barrel-like receptacle having a body and wooden heads for closing the ends of the body, at least one head being removable, an elastic packing ring located between said removable head and the adjacent end face of the body, said packing ring being of an area less than that of said end face, means to hold said removable head in place with sufficient pressure partly to compress said packing and bring the head into direct contact with the remaining area of said end face of the barrel as a rigid abutment, said means comprising flanged rings of greater diameter than that of the barrel body and its heads, the flanges of which rings rest against the outer faces of the barrel heads adjacent and overlying the peripheries thereof, and a series of tensioned rods passed through apertures in the flanges of the rings and lying within the compass of the rings and outside the body of the barrel, said flanged rings extending beyond the receptacle sufficiently beyond the ends of said rods so that the receptacle will stand even on either end.

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