Oct. 8, 1929. I. THOMAS ET AL 1,730,905

PUMP LINER

Filed Jan. 19, 1927

FIG. 1

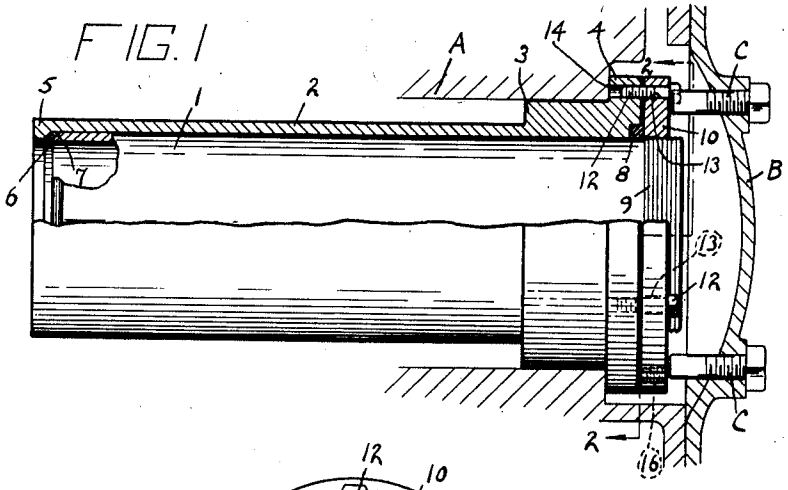



FIG. 2

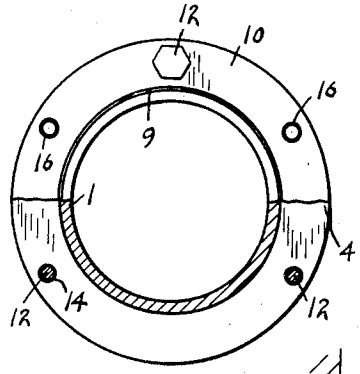
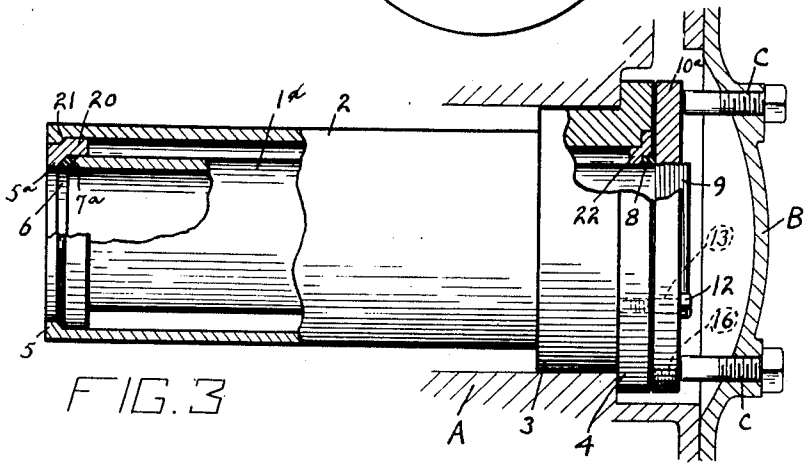



FIG. 3




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# UNITED STATES PATENT OFFICE

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## PUMP LINER

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This invention is a liner for the cylinder of a pump or the like, and it is the object of the invention to provide a liner of wear resisting material such as steel, which is readily replaceable in a usual cylinder structure which may include a usual shell of cast-iron or the like mounted in a pump in accordance with the present "liner" practice.

It is a further object of the invention to provide an arrangement wherein all of the wearing action is at the steel liner so that the cylinder structure may remain in constant use with replacement of only the liner necessary in order to renew the cylinder.

It is a still further object of the invention to provide retaining means for the replaceable steel liner which permits it being readily mounted and adjusted in position for use; and which also provides for its quick and positive withdrawal, irrespective of any tendency to stick, when such replacement becomes necessary as a result of wear.

It is a still further object of the invention to provide for packing-off between the liner proper and the cylinder structure; and to tighten the packing means at the same time that the liner is fixed in operative position.

Further objects of the invention will be readily understood from the following description of the accompanying drawings, in which:

Fig. 1 is a side elevation of the liner, partly in axial section, showing it in operative position.

Fig. 2 is a transverse section on the line 2—2 of Fig. 1.

Fig. 3 is a view similar to Fig. 1 but showing a modified construction.

The liner is adapted for use in a usual pump or the like which is indicated at A and which is provided with a usual head B. The liner 1 is of steel or other suitable wear resisting material and is removably mounted in a cylinder structure, which in the present instance is shown as comprising a usual shell 2 which may be of cast-iron or the like since it is not subject to wearing action. The shell is mounted in the pump in accordance with usual practice so as to form a usual cylinder structure, and for this purpose may be flanged as shown at 3 to form an abutment for packing (not shown) which is adapted to be placed between the shell 2 and the bore of pump A, with a flange 4 at the end of the shell adapted for abutment against the end of the pump in order to properly position the shell.

The inner end of the bore of shell 2 has an interior flange 5 forming a seat for the inner end of liner 1; and a packing ring 6 is preferably mounted between the cooperating seat and liner end, with said cooperating surfaces inclined as shown at 7. The outer end of the bore of shell 2 is preferably counter-sunk for reception of a packing ring 8 between shell 2 and liner 1; and the outer end of the liner which projects beyond the shell is threaded as shown at 9 to receive a flange 10 which abuts against packing 8 and the flanged outer end of the shell.

The steel liner is fixed in its shell by detachable means shown as bolts 12 received through openings 13 in flange 10 and adapted for threaded engagement in tapped bores 14 in the flanged outer end of shell 2; and by this arrangement flange 10 may be threaded onto liner 1 to the desired adjustment, and connected to the flanged outer end of shell 2 by tightening bolts 12, thereby compressing packing 6 and 8 to form a fluid-tight connection between the liner and its shell and positively fixing the steel liner in operative position. With liner 1 secured in adjusted position, the head B may be fixed in place by usual bolts C which are threaded through the head and adapted to engage flange 10 so that flange 4 abuts against the end of the pump.

The steel liner being subject to all the wearing action, it is the only part which need be replaced when renewing the pump cylinder; and for the purpose of such replacement the head B is removed in usual manner so as to release bolts C, and the bolts 12 are withdrawn so that the steel liner is no longer positively fixed relative to its shell. Liner 1 is then readily withdrawn and replaced without disturbing shell 2, any tendency of the steel liner to stick being overcome by a positive operating engagement.

As an instance of this arrangement the flange 10 may be tapped as shown at 16 for

threaded reception of bolts 12 intermediate of the openings 13, so that after withdrawal of the bolts to release liner 1, the bolts may be threaded through the tapped bores 16 for abutment against the flanged outer end of shell 2, thereby positively withdrawing flange 10 and the steel liner which is connected thereto, by screwing-up the bolts so as to increase their pressure against the shell.

The invention contemplates interchangeable use of wear-resisting liners of different diameter, the modification of the invention shown in Fig. 3 illustrating the use of a replaceable liner $1^a$ which is of smaller diameter than the bore of the cylinder structure. For this purpose an annulus 20 is mounted in the cylinder structure and is shown as seating at 21 on the flange 5 of shell 2, and the bore of the annulus forms a flange $5^a$ adapted to seat the inner end of liner $1^a$ by means of cooperating inclined surfaces $7^a$ as previously described. An annulus 22 preferably seats in the counter-sunk outer end of shell 2 and is adapted to receive the outer end of the reduced liner $1^a$, and the annulus 22 may be counter-sunk for reception of packing 8 as previously described. The flange $10^a$ is of the proper internal diameter to engage the replaceable liner and overlie the annulus 22 and the flanged end of shell 2; and the parts are fixed relative to one another, with liner $1^a$ adapted for positive withdrawal, as previously described.

We have thus provided extremely simple and inexpensive means for replacing wear-resisting liners in a cylinder structure, the construction permitting use of liners of different diameter and positively fixing the liner in place by a fluid-tight connection, with means provided for positively withdrawing the replaceable liner should it tend to stick, and the arrangement also particularly adapting the replaceable liner for mounting in a usual removable shell, although it will be obvious that the liner may also be employed in various other cylinder structures.

We claim:

1. In combination, a replaceable liner for a cylinder structure, operating means, means engageable by the operating means for detachably securing the replaceable liner in the cylinder structure, and means engageable by the operating means for positively withdrawing the liner from the cylinder structure.

2. In combination, a shell adapted for mounting in a cylinder, a replaceable liner adapted for reception in the shell and having a flange at its outer end adapted to overlie the outer end of the shell, bolts received through said flange and threaded into the outer end of the shell for fixing the replaceable liner in the shell, and threaded bores opening through the flange and adapted for threaded reception of said bolts with the latter abutting against the end of the shell to positively withdraw the replaceable liner from the shell.

3. In combination, a replaceable liner for a cylinder structure, a flange on said liner, and bolts adapted for threaded reception through the flange for abutment against a part of the cylinder structure so as to positively withdraw the replaceable liner from the cylinder structure.

4. In combination, a replaceable liner for a cylinder structure, a flange on said liner, bolts extending through the flange and threaded into a part of the cylinder structure for fixing the replaceable liner in the cylinder structure, and threaded bores opening through the flange and adapted for threaded reception of bolts with the latter abutting against a part of the cylinder structure to positively withdraw the replaceable liner from the cylinder structure.

5. In combination, a shell adapted for reception in a cylinder, a replaceable liner adapted for reception in the shell, packing between the liner and the shell, a flange axially adjustably fixed on the liner, and means cooperating with the flange adapted to fix the liner in the shell so as to tighten the packing.

6. In combination, a shell adapted for reception in a cylinder and having an internal seat, a replaceable liner adapted for reception in the shell, packing between said seat and liner, a flange on the liner, packing between said flange and the shell, and means for fixing the liner in the shell so as to tighten both of said packing means.

7. In combination, a replaceable liner for a cylinder structure which includes an internal seat, a spacing annulus adapted for reception in the cylinder structure against said seat, said annulus forming an internal seat for the replaceable liner, a flange axially adjustably fixed on the liner, and means cooperating with the flange adapted to fix the liner in the cylinder structure so as to engage the liner with the seat of said annulus.

8. In combination, a replaceable liner for a cylinder structure, an external flange on the liner, and operating means engageable with the flange and adapted for abutment against a part of the cylinder structure for positively withdrawing the liner from the cylinder structure.

9. In combination, a shell adapted for reception in a cylinder, a replaceable liner adapted for reception in the shell, a flange axially adjustably fixed on the liner, and means cooperating with the flange for fixing the liner in the shell.

10. In combination, a shell adapted for reception in a cylinder and having an internal seat, a replaceable liner adapted for reception in the shell against the seat, a flange axially adjustably fixed on the liner, and means cooperating with the flange for fixing the liner in the shell against the seat.

11. In combination, a replaceable liner adapted for reception in a cylinder structure, a flange axially adjustable on the liner, and operating means engageable with the flange for fixing the liner in the cylinder structure, the said flange having means engageable by the operating means and adapting said operating means for abutment against the cylinder structure for positively withdrawing the liner from the cylinder structure.

12. In combination, a replaceable liner for a cylinder structure which includes an internal seat for the liner, a flange axially adjustable on the liner, and operating means engageable with the flange for fixing the liner in the cylinder structure against the seat, the said flange having means engageable by the operating means and adapting said operating means for abutment against the cylinder structure for positively withdrawing the liner from the cylinder structure.

13. In combination, a cylinder structure, an internal shoulder at one end of the cylinder structure, a replaceable liner adapted for insertion in the opposite end of the cylinder structure for abutment by the inner end of the liner against the internal shoulder, a flange axially adjustably fixed on the opposite outer end of the liner, and means cooperating with the flange for fixing the liner in the cylinder structure and axially drawing the liner toward the internal shoulder.

14. In combination, a replaceable liner for a cylinder structure which includes an internal seat, a spacing annulus adapted for reception in the cylinder structure against said seat, said annulus forming an internal seat for the replaceable liner, a flange on the liner, and operating means engageable with the flange for fixing the liner in the cylinder structure, the said flange having means engageable by the operating means and adapting said operating means for abutment against the cylinder structure for positively withdrawing the liner from the cylinder structure.

15. In combination, a cylinder structure, an internal shoulder at one end of the cylinder structure, a replaceable liner adapted for insertion in the opposite end of the cylinder structure for abutment by the inner end of the liner against the internal shoulder, a flange axially adjustably fixed on the opposite outer end of the liner, packing between the flange and the cylinder structure, and means cooperating with the flange for fixing the liner in the cylinder structure and tightening the packing and axially drawing the liner toward the internal shoulder.

16. In combination, a cylinder structure, an internal shoulder at one end of the cylinder structure, packing abutting against said internal shoulder, a replaceable liner adapted for insertion in the opposite end of the cylinder structure for abutment by the inner end of the liner against the packing, a flange axially adjustably fixed on the opposite outer end of the liner, and means cooperating with the flange for fixing the liner in the cylinder structure and axially drawing the liner toward the packing.

17. In combination, a cylinder structure, an internal shoulder at one end of the cylinder structure, a replaceable liner adapted for insertion in the opposite end of the cylinder structure for abutment by the inner end of the liner against the internal shoulder, a flange axially adjustably fixed on the opposite outer end of the liner, packing between the liner and the cylinder structure, and means cooperating with the flange for fixing the liner in the cylinder structure and tightening the packing and axially drawing the liner toward the internal shoulder.

In testimony whereof they have affixed their signatures to this specification.

IDRIS THOMAS.
MARTIN L. KINNEY.