This invention relates to the portion of a pump structure which holds in place a liner in a pump cylinder and prevents sliding of the liner lengthwise of the cylinder. In certain types of pumps in which a piston is employed, it is desirable to employ a removable liner for the bore of the pump chamber. As the liner becomes worn in use, a new one may be substituted and a reboring of the pump cylinder avoided. This liner must be rigidly held against movement in the pump chamber for several reasons. In the first place, the liner would conflict with the proper operation of the valves if it became displaced; and, moreover, there would be wear between the liner and the cylinder itself. In the second place, the liner must also be sealed around the outside to prevent leakage between the liner and the chamber. A flexible packing, such as rubber, hemp or flax, may be used; and this packing must be compressed in order to make the seal around the liner.

One object of my invention is to provide means cooperating with the liner and engaging the cylinder for holding the liner securely in position. A further object of my invention is to secure the liner in position without interfering with removal of a cover plate for an opening in the cylinder, and the sliding of the piston out through this opening. A more specific object of my invention is to provide a device for holding a liner in position in a pump cylinder, this liner being insertable through an opening in the cylinder and engaging, not against the cover plate for this opening, but against a seat within the cylinder. In the drawings, in which there is shown for purposes of illustration, and not as limiting my invention, one embodiment which my invention may assume.

Fig. 1 is a side view principally in longitudinal central vertical section of a pump. The section is shown as being all in one plane for purposes of simplicity; although, as shown in Fig. 2, the discharge valves are offset from the axis of the pump cylinder; Fig. 2 is an end elevation of an opening in the cylinder of the pump, this view being indicated by the line II—II of Fig. 1;

Fig. 3 is a horizontal section on the line III—III of Fig. 2. Various members of the pump, such as the valves, the piston, etc. may be varied in their specific structure. In the embodiment disclosed herein, for the purpose of illustrating my invention, I have shown a pump having a cylinder 6 terminating in two end portions 7 and 8. A piston 9, actuated by a rod 10, reciprocates within a liner 11 arranged within the cylinder 6.

The liner 11 is, in the embodiment shown, cylindrical and formed at one end only with a collar or flange 12. A counter-bore 13 having a shoulder 14 is formed within the cylinder bore; and a packing 15 is arranged in the counter-bore, so that when the collar 12 of the liner 11 is pressed tightly into engagement with the shoulder 16, the packing 15 is compressed to prevent leakage. A chamber 18 in the end portion 8 communicates with passages to and from the discharge and inlet valves respectively; and the shoulder 16 is formed at the entrance to the cylinder bore from chamber 18. The valve mechanisms at the two ends 7 and 8 of the pump may be substantially identical; and since the precise structure of the valves is not material to my invention, I have merely shown a poppet valve 19 for controlling discharge from the chamber 18. The flow of fluid into the chamber 18 is indicated in Fig. 2 by the arrow 31, and the flow of fluid from the chamber 18 to and past the valve 19 is indicated in Fig. 2 by the arrow 32.

My improved means for positioning the liner includes a device 20. This device may take various forms, but as shown in Fig. 2, is substantially ring shaped. On opposite sides of the ring 20 are formed projecting portions 21. An opening 23 is formed in the end portion 8 of the cylinder 6, this opening being slightly larger than the periphery of the flange or collar 12 on the liner 11, so that the liner may be removed through the opening 23. The projecting portions 21 extend further from the axis of the ring 20 than the length of a radius of the opening 23. Within the end portion 8 and facing inwardly toward the chamber 18 are formed seats 24.
(see Fig. 3) upon which the projections 21 of the ring 20 may seat. Inasmuch as the seating surfaces 24 face inwardly the ring 20, when seated, resists pressure tending to move it out of the cylinder. A plurality (herein 4) of adjustable spacing elements, such as threaded bolts or screws, are mounted in the ring 20. As will be noted from Fig. 2, the diameter of the opening in the ring 20 is slightly larger than the diameter of the bore of the liner 11. The ends of the bolts or screws 25, therefore, engage the flange or collar 12; and by turning the elements 25, the flange 12 may be pressed tight against the shoulder 16.

The opening 23 is larger than the outer diameter of the major portion of the ring 20. In the embodiment disclosed herein, the opening 23 is cylindrical although enlargements thereof at one or more points might be provided for the purpose of receiving or permitting the passage of elements of the pump. Such enlargements would be arranged so as to be out of alignment with the projections 21 when the ring 21 engages the seats 24. With the cylindrical form of opening 23 shown, the projections 21 prevent removal of the ring unless the same be tilted so that one of the projecting portions 21 may precede the other as the ring is withdrawn through said opening 23. In order to tilt the ring 20, I prefer to back the screws 25 on one side of the ring slightly away from the liner and to withdraw entirely the other elements 25 on the other side of the ring, so that the inner ends of these elements do not interfere with the tilting of the ring 20. The cylindrical opening 23 is the preferred forms for certain installations, but in certain cases where it is convenient to form the opening 23 other than cylindrical, I may cause the same to deviate outwardly from the true cylindrical form as above mentioned. When the ring 20 is to be withdrawn, it is rotated until the projecting portions 21 register with the enlarged portions of the opening 23, when the ring 20 may be moved directly outwardly.

As the opening 23 is in any case considerably larger than the bore of the liner 11, it is clear that the piston 9 may be removed from the pump without even loosening the elements 25. It is clearly apparent from Fig. 2 that the ring 20 will not interfere with such removal of the piston 9. To cover the opening 23 during normal operation of the pump, I provide a suitable cover member or cylinder head 27, held in position by screws 28 engaging the end portion 8. A usual packing 29 prevents leakage between the cylinder end portion 8 and the cover 27, or cylinder head.

It will be obvious from the above description that I have provided an improved means for positioning the liner 11 and preventing sliding or displacement thereof lengthwise of the cylinder 6. It will furthermore be apparent that I have accomplished this purpose without making the positioning means dependent upon the cylinder head 27 in any manner. The cylinder head 27 may be freely removed at any time without getting any of the elements 25 out of adjustment. It is possible, moreover, to remove the piston 9 without disarranging the ring 20 or any of the elements 25. The free flow of the liquid or fluid which is being pumped may take place to and from the bore of the pump, (as shown by the arrows in Fig. 2) since the elements 25 interfere none at all with the movement of the fluid from the inlet valve (not shown) to the pump bore (see arrow 31 in Fig. 2), and from the pump bore to the discharge valve 19 (see arrow 32 in Fig. 2). A further advantage of my improved spacing or positioning means is that it need not be formed as an integral part of a pump, but may be removed through the opening 23.

While I have illustrated and described one specific form of my invention, it will be understood that the invention is not restricted to the particular construction and arrangement shown, but may be variously modified within the contemplation of the invention and under the scope of the following claims.

I claim:

1. In combination, a pump cylinder having an opening and an inwardly facing seat adjacent said opening, a liner for the pump cylinder, and spacing means for retaining the liner in position comprising an annular element engaging said seat, said spacing means including the annular element being removable through said opening.

2. In combination, a pump cylinder having an opening and an inwardly facing seat adjacent said opening, a liner for the cylinder, and spacing means for retaining the liner in position comprising an annular element engaging said seat and an adjusting element engaging the liner, said spacing means being removable through the opening in the cylinder.

3. In combination, a pump cylinder having an opening in one end thereof, a piston, a liner for the cylinder, and means seating within the cylinder for positioning the liner, said positioning means having an opening aligned with the opening in the cylinder, both openings being of cross section permitting the piston to pass through.

4. In combination, a pump cylinder having an opening in one end thereof and an inwardly facing seat adjacent said opening, a piston, a liner for the cylinder, and spacing means engaging the seat and the liner, said spacing means having an opening aligned with the axis of the liner and of cross section permitting the piston to pass through.

5. In combination, a pump cylinder having an end opening and an inwardly facing seat adjacent said opening, a liner for the cylin-
der, and means for retaining the liner in position, said means comprising an annular element engaging said seat, said annular element being removable through the end opening in the cylinder, but being of larger cross section than the opening when arranged in operative position transversely of the cylinder so as to be held against movement directly longitudinally of the cylinder.

6. In combination, a pump cylinder having an opening, a liner for the cylinder, and adjustable means for positioning the liner, said positioning means comprising an annular element engaging said seat and removable through the opening in the cylinder.

7. In combination, a pump cylinder having an opening, and an inwardly facing seat adjacent said opening, a liner for the cylinder, a ring insertable through the opening and engaging the seat, and adjustable spacing means carried by the ring for engaging the liner.

8. In combination, a pump cylinder having an opening and an inwardly facing seat adjacent said opening, a liner for the cylinder, a ring formed with external eccentric portions, said ring being insertible through the opening and engaging the seat, and adjustable spacing means carried by the ring for engaging the liner.

9. In combination, a pump cylinder, a piston, a liner for the cylinder, said cylinder having an opening aligned with the axis of the liner and of cross section permitting the piston to pass through, said cylinder having also an inwardly facing seat adjacent said opening, and spacing means engaging said seat and liner, said spacing means having an opening aligned with the axis of the liner and of cross section permitting the piston to pass through.

10. In combination, a pump cylinder, a piston, a liner for the cylinder, said cylinder having an opening aligned with the axis of the liner and an inwardly facing seat adjacent said opening, and spacing means for retaining the liner in position comprising an annular element engaging said seat, said spacing means including the annular element being removable through the opening in the cylinder.

11. In combination, a pump cylinder having an opening in one end thereof, a piston, a liner for the cylinder, and means seating upon a seat within the cylinder for positioning the liner, said positioning means comprising an annular element seating upon said seat within the cylinder and removable through the opening in the cylinder when moved out of alignment with said seat.

12. In combination, a pump cylinder having an opening, a piston, a liner for the cylinder, and means seating upon a seat within the cylinder for positioning the liner, said positioning means comprising an annular element seating upon said seat within the cylinder and removable through the opening in the cylinder.

13. In combination, a pump cylinder having an opening in one end thereof and an inwardly facing seat adjacent said opening, a liner for the pump cylinder, and spacing means for retaining the liner in position comprising a unitary seat-engaging member surrounding said opening, said spacing means including the unitary seat-engaging member being removable through said end opening.

14. In combination, a pump cylinder having an end opening and an inwardly facing seat adjacent said opening, a liner for the cylinder, and means for retaining the liner in position, said means comprising a unitary seat-engaging member surrounding said opening and adjusting means carried by said member for engaging the liner, said member being of larger cross section than the opening when arranged in operative position transversely of the cylinder, said retaining means including said unitary seat-engaging member being removable through the end opening in the cylinder.

15. In combination, a pump cylinder having an opening in one end thereof and an inwardly facing seat adjacent said opening, a liner for the pump cylinder, and spacing means comprising mechanism engaging the liner for retaining the liner in position and a single unitary member engaging said seat and carrying said retaining mechanism, said spacing means including said unitary seat-engaging member being removable through said opening.

In testimony whereof I have hereunto set my hand.

JOHN M. SHIMER.