

Aug. 22, 1933.

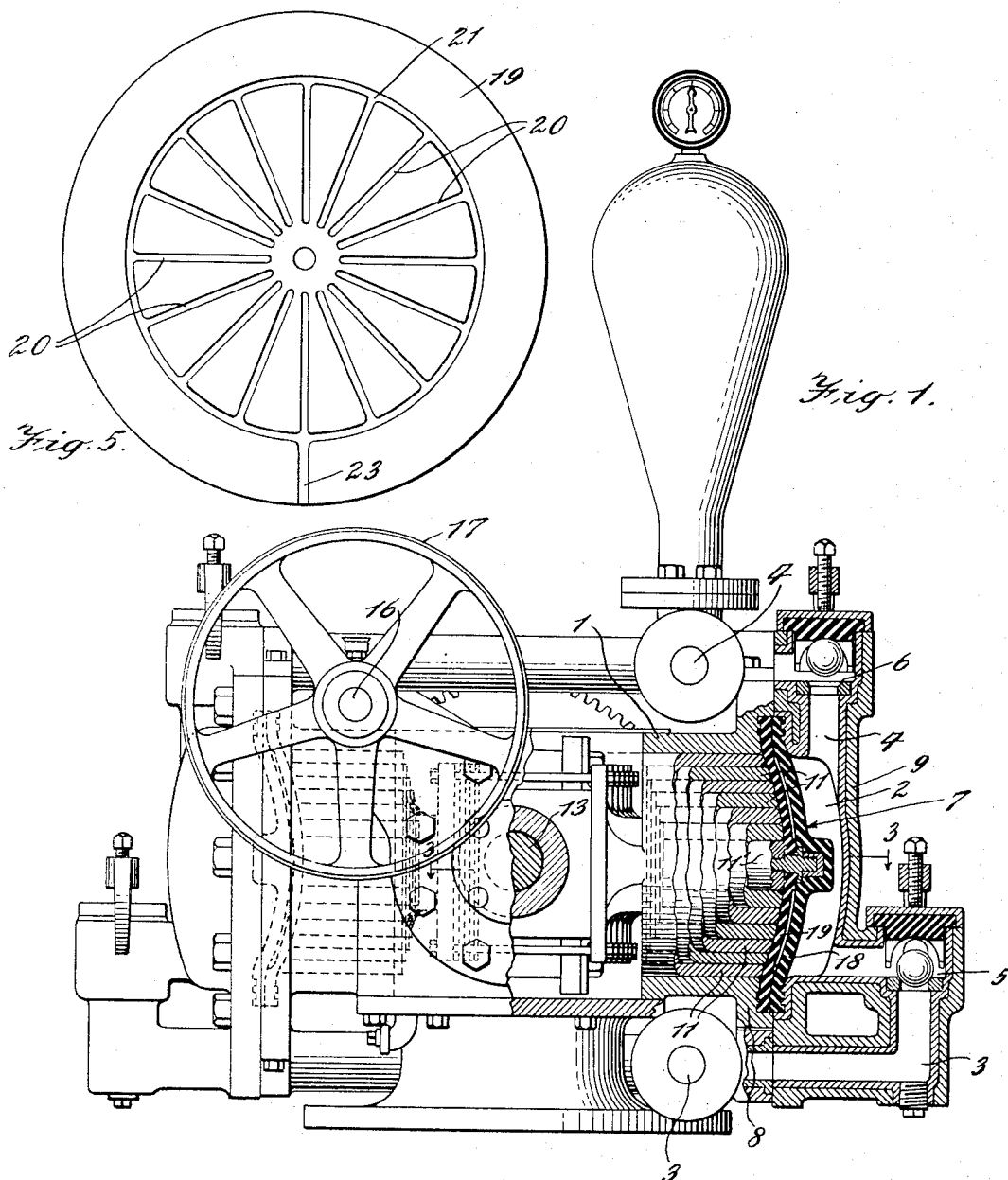
C. MUESER

1,923,740

PUMP DIAPHRAGM

Filed Aug. 1, 1931

3 Sheets-Sheet 1



INVENTOR.

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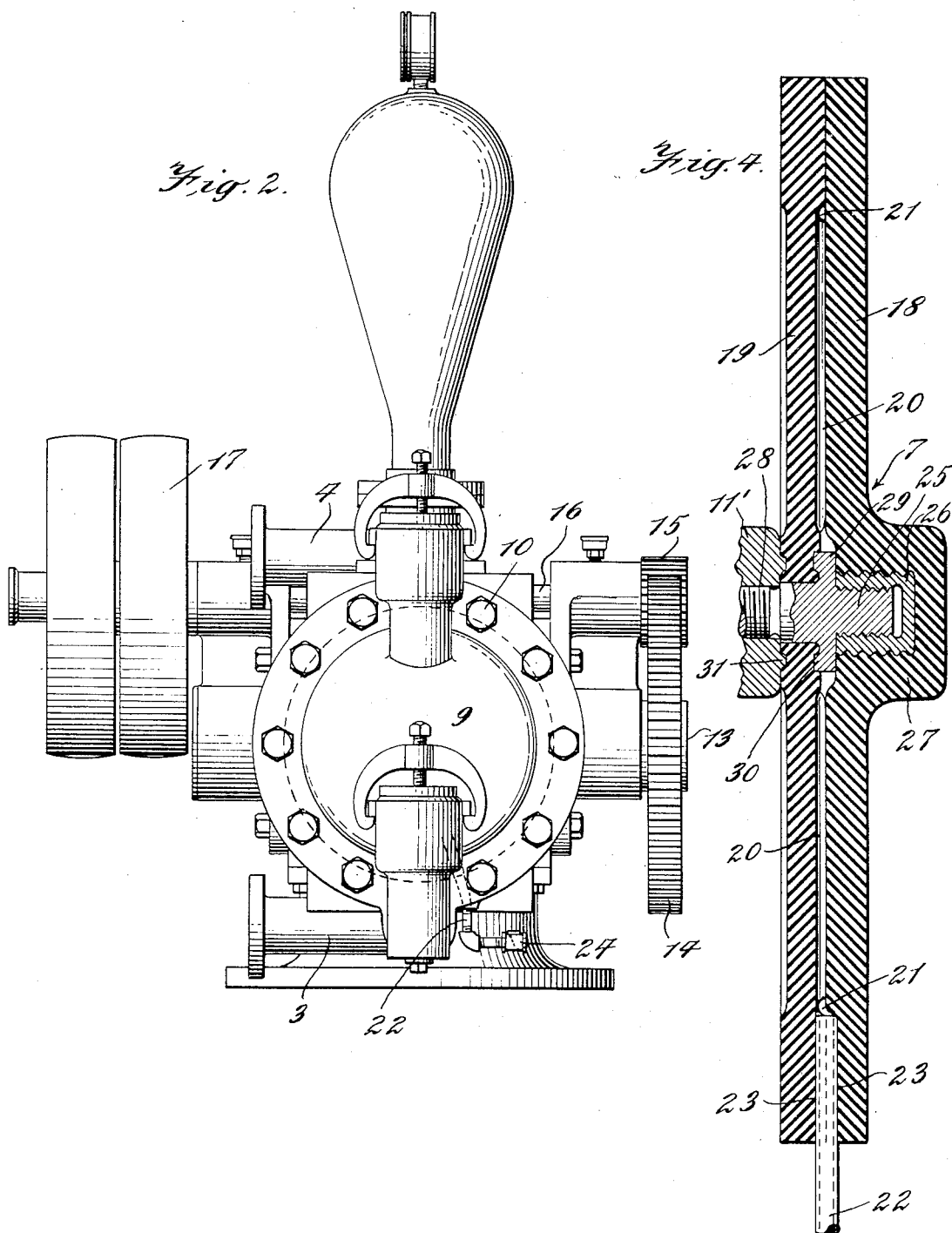
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PUMP DIAPHRAGM

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3 Sheets-Sheet 2



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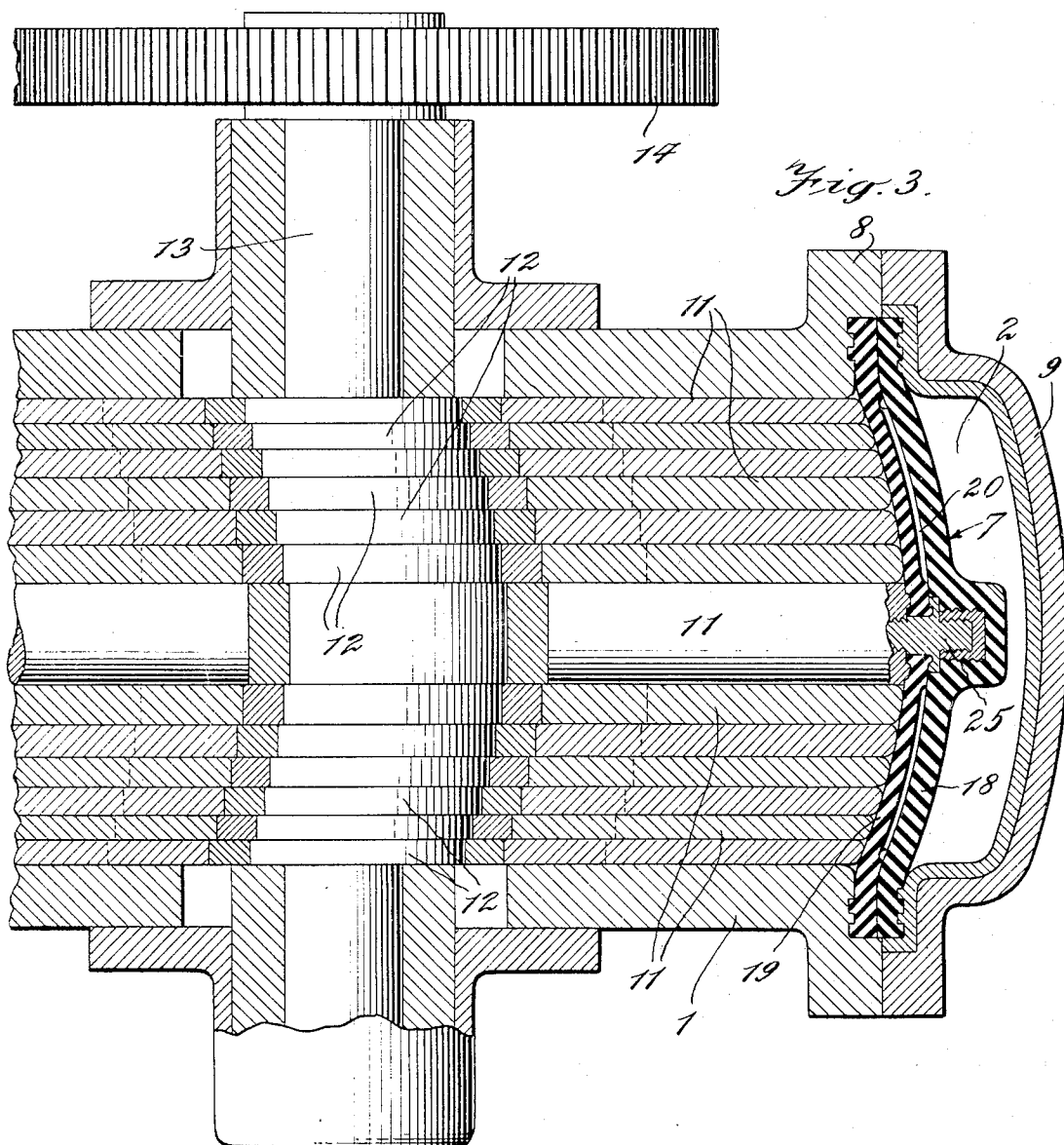
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PUMP DIAPHRAGM

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

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PUMP DIAPHRAGM

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Application August 1, 1931. Serial No. 554,407

10 Claims. (Cl. 103—150)

This invention relates to a novel and improved pump, and more particularly to a diaphragm for use therein, the novel features of which will be best understood from the following description and the annexed drawings, in which I have shown a selected embodiment of the invention, and in which:

Fig. 1 is a view, partly in elevation and partly in section, showing a pump having my invention applied thereto.

Fig. 2 is a view taken from the right of Fig. 1.

Fig. 3 is a section taken on the line 3—3 of Fig. 1.

Fig. 4 is a section through a diaphragm showing the drainage conduit therefrom.

Fig. 5 is a face view of one part of the diaphragm.

The diaphragm forming the subject matter of this invention is one which may be used conveniently in a type of pump described in my Patent No. 1,445,844, granted February 20, 1923, and the invention has been illustrated as used with that kind of pump, although it is to be understood that other suitable pumps may be employed.

The pump is shown as comprising a casing 1, at one end of which is shown a chamber 2 having an inlet 3 and an outlet 4. A similar chamber may be disposed at the other end of the pump as described in the aforesaid patent, but for the sake of simplicity I will refer only to the single chamber. The inlet and outlet are provided with any usual and suitable valves, here illustrated at 5 and 6.

One wall of the chamber 2 is formed by a diaphragm indicated generally at 7, and is fastened at its edges between the end of the wall 8 of the casing and the head 9 secured to the casing as by bolts 10. Means is provided for flexing the diaphragm, and this means is shown as similar to what is disclosed in the aforesaid patent. This means may be briefly described as a series of concentric plungers 11 actuated by eccentrics 12 operated by a shaft 13, which rotation may be provided as by a gear 14. This gear is shown as meshing with a pinion 15 on a shaft 16 operated by a pulley 17 from any suitable source of power. The ends of the plungers 11 are closely adjacent each other and serve to flex the diaphragm, without undue distortion or strain, in the manner described in the aforesaid pump.

This type of pump is one which is peculiarly adapted for use in pumping acid or other substances which are injurious to the working parts

of a pump. It will be seen that the plungers and, in fact, all of the moving parts, with the exception of a few valves, are out of contact with the fluid being pumped. During operation of a pump, however, the diaphragm will ultimately wear out, and the fluid will then get access to the moving parts of the pump and rapidly damage them. In order to prevent this damage, I have provided a novel form of diaphragm with an interior space communicating with the exterior of the pump. The part of the diaphragm which wears out first is normally the part in contact with the acid or other fluid, and as this part wears, a leak will ultimately develop. By providing the space interiorly of the diaphragm, the fluid will be intercepted in its passage through the diaphragm and may drain out to the exterior of the pump, thus giving an indication that the diaphragm is failing, in time so that a new diaphragm may be put in place. In like manner, if the part of the diaphragm adjacent the plungers should break first, oil from the moving parts of the pump may enter the space and pass to the exterior of the pump, this also giving an indication that something is wrong.

The diaphragm is shown as formed of two sheets 18 and 19, and the space therebetween may be formed of grooves 20 as best shown in Fig. 5. These grooves are shown as formed in one of the contacting faces of the sheets and as radially extending, and terminating in an annular recess 21. Communicating with the recess 21 is shown a conduit 22, which may be received in mating grooves 23 in the adjacent faces of the sheets 18 and 19. The conduit 22 may lead to a one-way valve 24 through which the fluid may discharge, thus giving a warning to the operator. This valve is substantially fluid-tight when closed so that, while it will permit fluid to run freely from the conduit 22, it will not let air enter the conduit and thus reach the space between the two sheets of the diaphragm. This will avoid any possibility of sucking air into the space.

The central plunger 11' is preferably secured to the diaphragm, and this may be done by the means indicated, which comprise a stainless steel crosshead stud 25 threaded into a bronze bushing 26 secured in a hub 27 on the sheet 18. The stud may be threaded into the plunger 11' as indicated at 28, and may have a flange 29 disposed in a space between the two sheets and holding the sheets 19 against the end of the plunger 11'. By this arrangement, the two sheets, being secured together at their edges and at their centers, will function as one dia-

phragm. The flange 29 may be provided with an annular projection 30 and the plunger 11' with a similar projection 31, which may be forced into the material of the sheet 19 to prevent leakage along the crosshead.

The operation of the invention will be apparent from the above description, and all that need be said here is that the diaphragm will operate in the usual manner to pump fluid in at the inlet 3 and out at the outlet 4, and that the sheet 18 of the diaphragm is the part which almost invariably wears out first because of its contact with the fluid being pumped. As this wears out, a leak will ultimately develop which will permit the fluid to pass into the grooves 20 and out at the conduit 22. Similarly, if the sheet 19 should break, oil will pass through the break therein into the grooves 20 and out at the conduit 22. In either case, the operator is thus warned that the diaphragm should be replaced. When replacing the outer sheet 18 only, all that is necessary is to remove it with its bushing, which may be easily done by unscrewing it from the crosshead 25 and putting in place another similar sheet. All this may be done very simply by merely removing the head of the pump. If the sheet 19 is to be replaced, either alone or with the sheet 18, of course the crosshead must be removed, and that can be done by unscrewing it from the plunger 11'. The diaphragm may be made of any usual and suitable material, such as rubber, or a suitable composition.

While I have shown the invention as embodied in a specific form, it is to be understood that various changes in details may be made without departing from the scope of the invention, and I therefore do not intend to limit myself except by the appended claims.

I claim:

1. In a pump, a relatively thin, continuous and flexible diaphragm, means to hold the diaphragm at its edges, means to transversely flex the diaphragm, means forming a small space interiorly of the diaphragm, and a conduit leading from said space to the exterior of the pump.

2. In a pump, a flexible diaphragm formed of two sheets, means holding said sheets together with adjacent faces substantially in contact, one of said faces having a recess therein, and a conduit leading from said recess to the exterior of the pump.

3. In a pump, a flexible diaphragm formed of two sheets, means holding said sheets together with adjacent faces substantially in contact, one of said faces having a plurality of radially extending recesses therein communicating with an annular recess, and a conduit leading from said annular recess to the exterior of the pump.

4. In a pump, a flexible diaphragm formed of two sheets, means holding said sheets together at their edges, a plunger secured to said sheets adjacent their center and holding them together,

means to operate said plunger to flex the diaphragm, one of said sheets having a recess therein facing the other sheet, and a conduit leading from said recess to the exterior of the pump.

5. In a pump, a chamber having an inlet and an outlet, one wall of said chamber being formed by a flexible diaphragm formed of two sheets, means securing the edges of said sheets together and in position in the pump, means holding said sheets substantially in contact with each other, means to flex said diaphragm, means forming a space between said sheets, and a conduit leading from said space to the exterior of the pump.

6. In a pump, a flexible diaphragm formed of two sheets, means holding said sheets together at their edges, a plunger adapted to flex said diaphragm and disposed adjacent the center thereof, a crosshead disposed on said plunger and extending through one of said sheets and secured to the other, and a flange on said crosshead disposed between said sheets and holding the first-named sheet against the end of the plunger.

7. In a pump, a flexible diaphragm formed of two sheets, means holding said sheets together at their edges, a plunger adapted to flex said diaphragm and disposed adjacent the center thereof, a crosshead disposed on said plunger and extending through one of said sheets, a bushing secured in the other sheet and having threaded engagement with said crosshead, and means tightly holding the first sheet against the plunger to prevent leakage therebetween.

8. In a pump, a flexible diaphragm formed of two sheets, means holding said sheets together with adjoining faces substantially parallel and closely adjacent each other, means forming a space between said sheets, a conduit leading from said space to the exterior of the pump, and a one-way valve in said conduit permitting fluid to pass from the space to the exterior of the pump, but substantially preventing entry of air into the conduit.

9. In a pump, a flexible diaphragm formed of two sheets, means holding said sheets together at their edges, a plunger adapted to flex said diaphragm and disposed adjacent the center thereof, a member secured to said plunger and extending through the adjacent sheet, and separate means carried by said member to secure said sheets in place independently of each other, whereby, if one sheet breaks, the other will still be held in place.

10. In a pump, a relatively thin, continuous and flexible diaphragm, means to hold the diaphragm at its edges, means to transversely flex the diaphragm, means forming a small space interiorly of the diaphragm, a conduit leading from said space to the exterior of the pump, and a one-way valve in said conduit permitting fluid to pass from the space to the exterior of the pump but substantially preventing entry of air into the conduit.

CHARLES MUESER.