(No Model.)

2 Sheets—Sheet 1.

S. GIL.

PUMP.

No. 356,997. Patented Feb. 1, 1887.

Fig. 4.

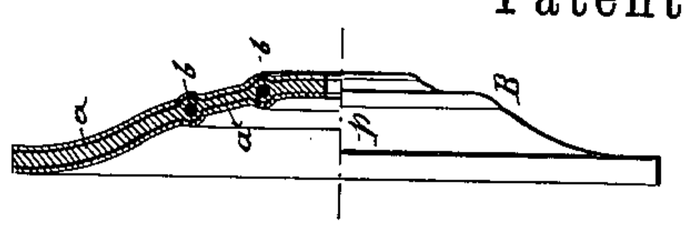


Fig. 1.

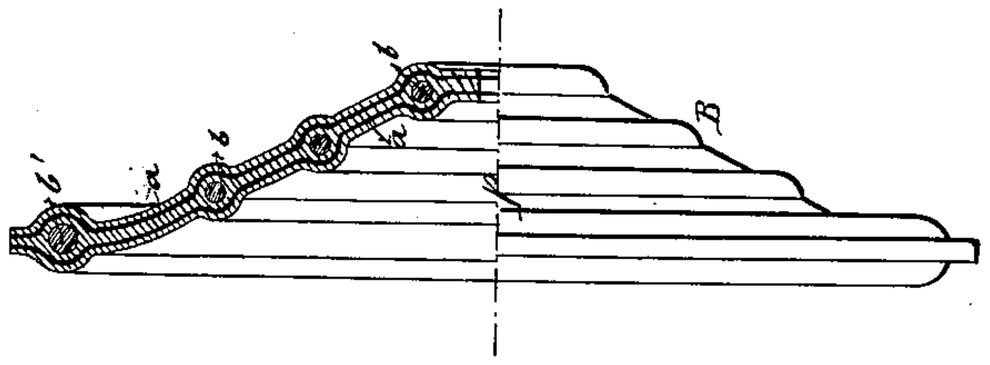


Fig. 3.

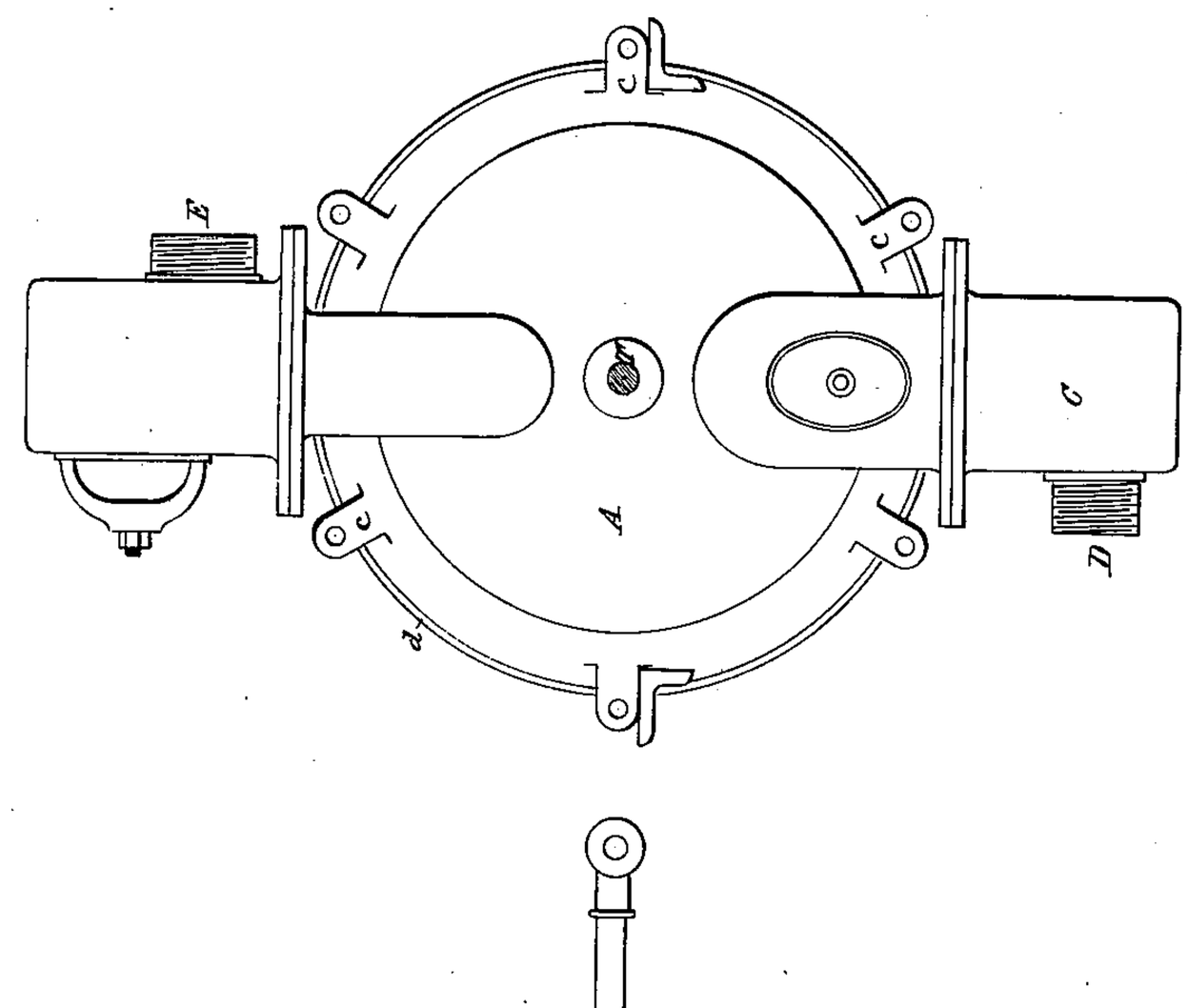
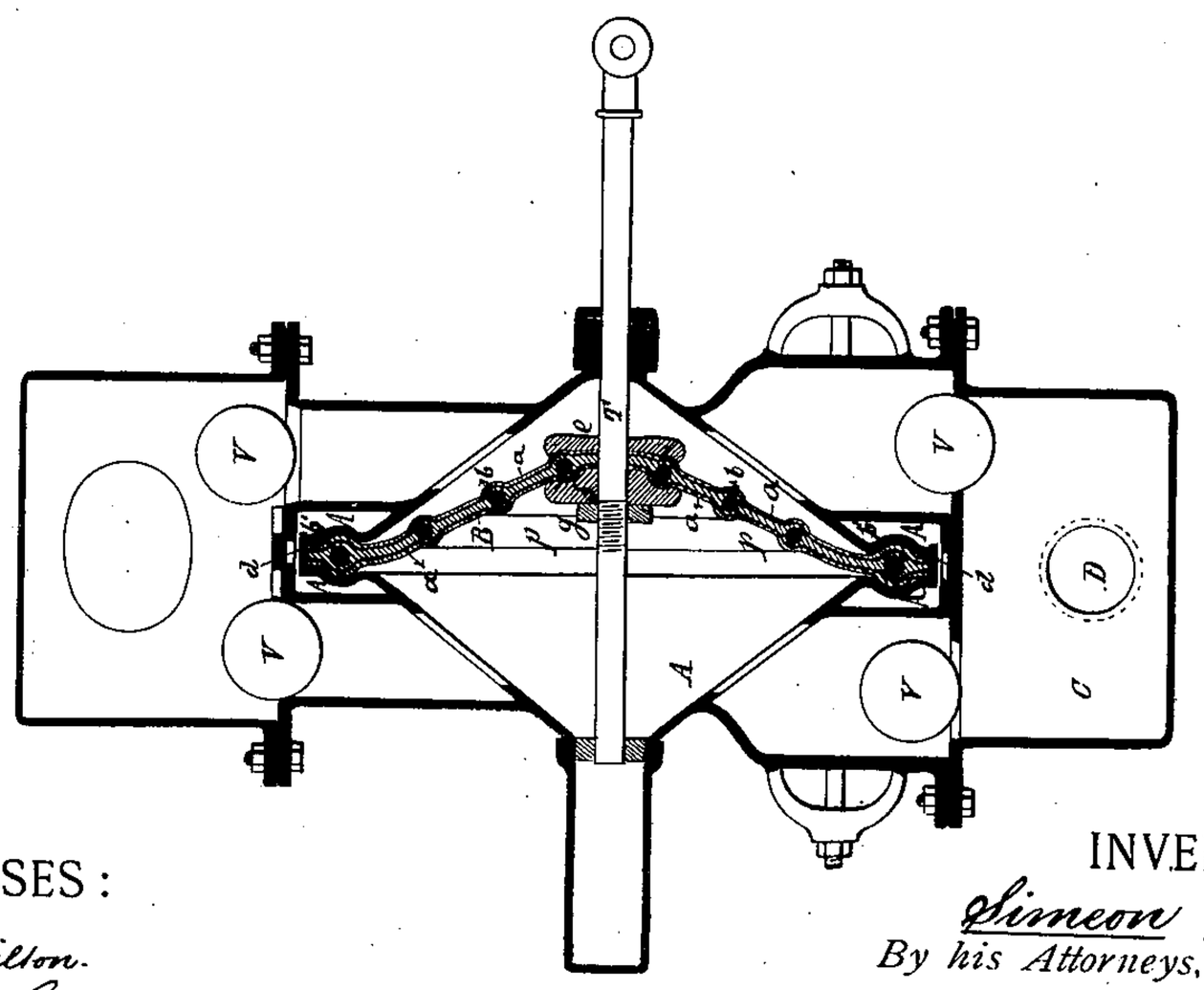


Fig. 2.



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(No Model.)

2 Sheets—Sheet 2.

S. GIL.

PUMP.

No. 356,997.

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Fig. 5.

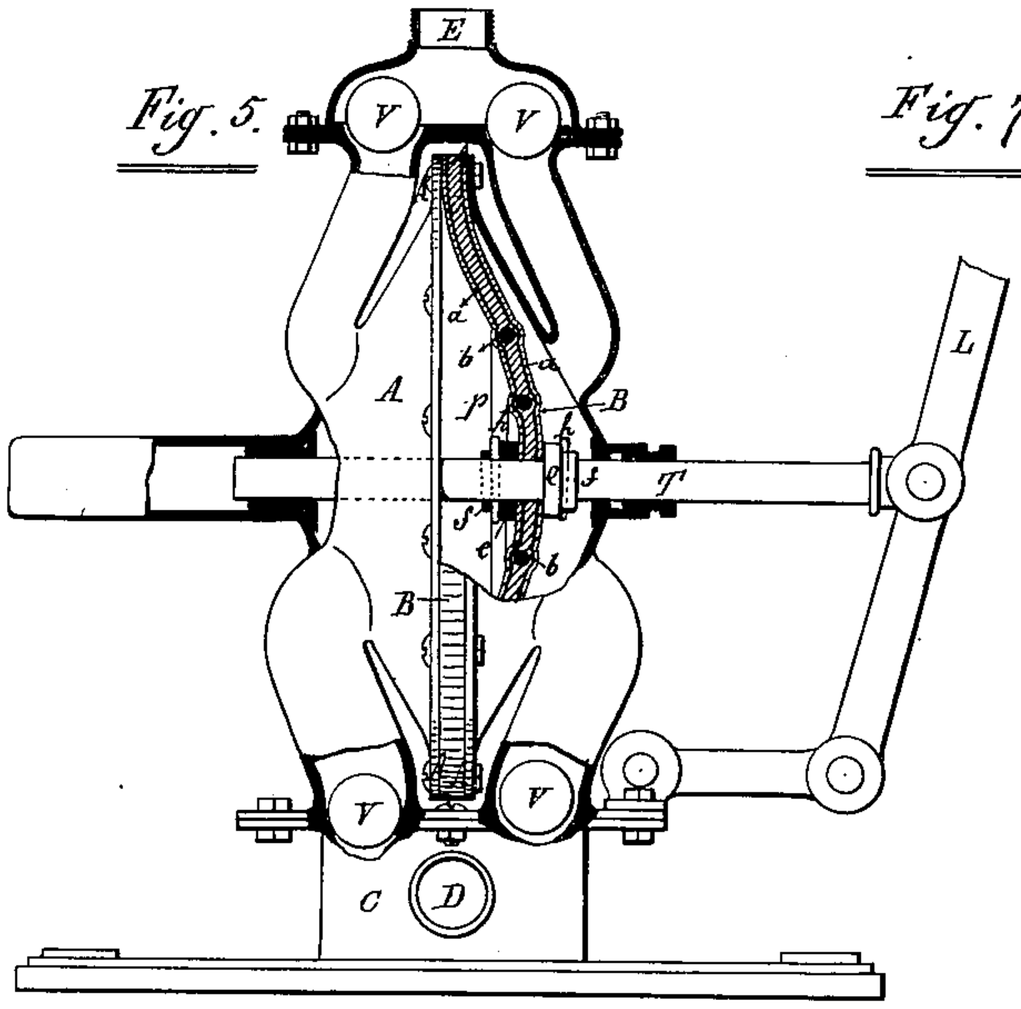


Fig. 7.

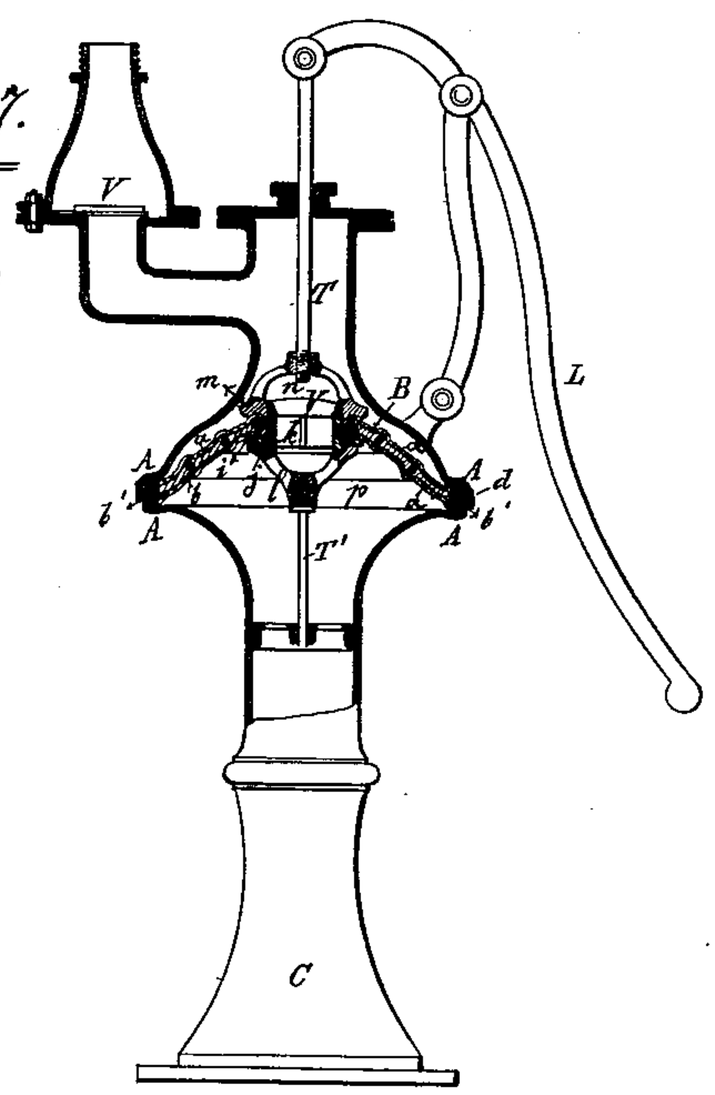
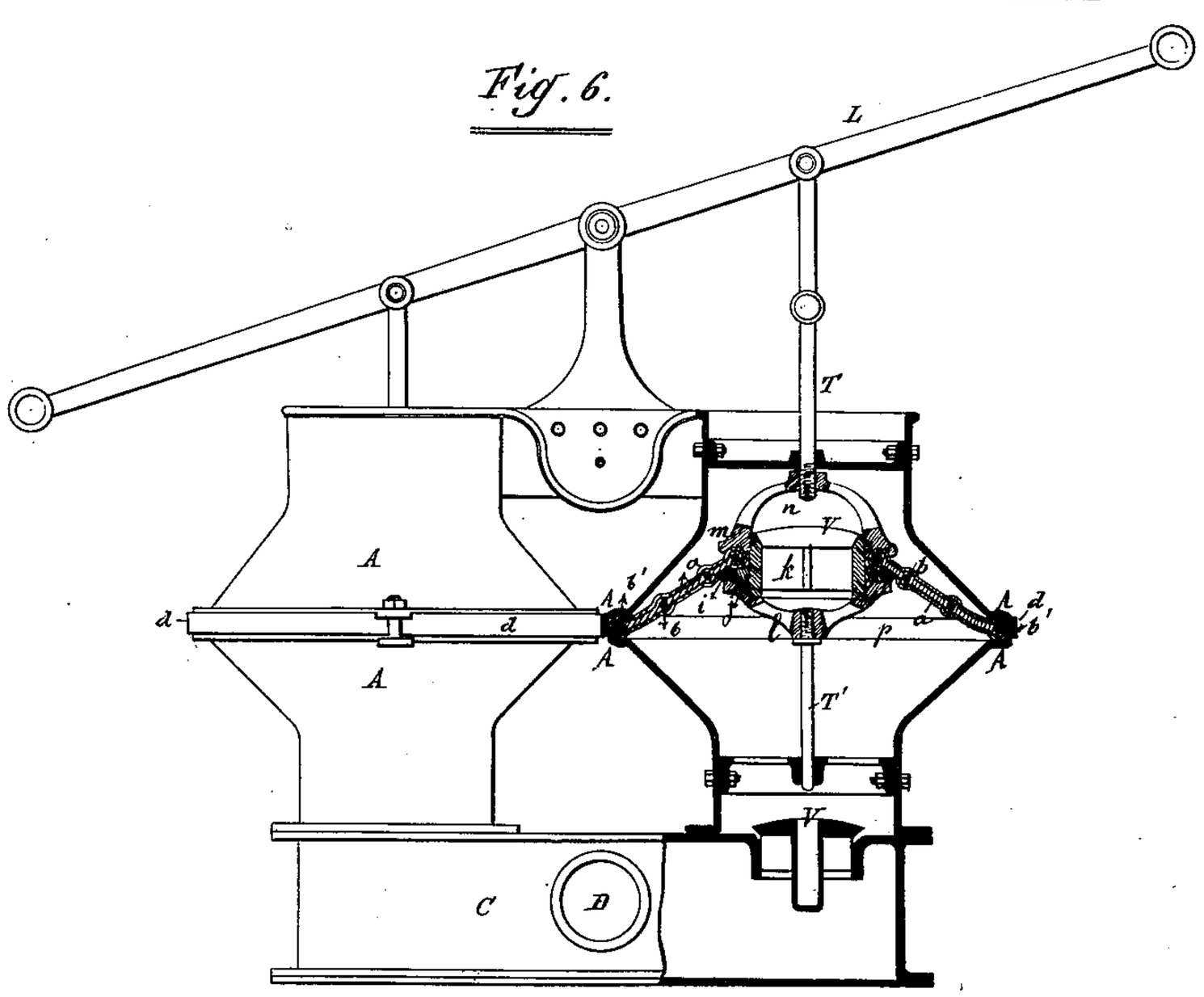


Fig. 6.



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UNITED STATES PATENT OFFICE.

SIMÉON GIL, OF BORDEAUX, GIRONDE, ASSIGNOR TO THE SOCIÉTÉ CASTANON, MENENDEZ & GIL, OF PARIS, FRANCE.

PUMP.

SPECIFICATION forming part of Letters Patent No. 356,997 dated February 1, 1887.

Application filed September 4, 1886. Serial No. 212,701. (No model.) Patented in France February 17, 1886, No. 174,133.

To all whom it may concern:

Be it known that I, SIMÉON GIL, a citizen of the French Republic, residing in Bordeaux, Department of Gironde, France, have invented certain new and useful Improvements in Pumps, of which the following is a specification.

This invention relates to pumps wherein a flexible diaphragm is used in place of a piston. It is the subject of French Patent No. 174,133, dated February 17, 1886.

According to my invention I make the diaphragm of embossed india-rubber, preferably in conical form, and stiffened by rings of metal or other material embedded in it. The rubber is also strengthened by layers of cloth or other textile fabric applied to its surface, or interiorly. At its margin or circumference is embedded a ring or pad, which facilitates the making of a tight joint around the diaphragm. This diaphragm is clamped between the edges of the two opposite shells or parts of the pump-chamber, which are preferably of approximately conical form, and the center of the diaphragm is connected to a piston-rod, by the reciprocation of which the diaphragm is displaced to one side or the other. A valve may be placed in the center of the diaphragm.

The accompanying drawings show my invention as applied to several different kinds of pumps.

Figure 1 is a side elevation, partly in transverse section, of my improved diaphragm or flexible piston in its preferred construction. Fig. 2 is a vertical section of a double-acting force-pump constructed according to my invention, and Fig. 3 is a front elevation thereof. Fig. 4 is a view similar to Fig. 1, showing a modified construction of diaphragm. Fig. 5 is a side elevation, partly in vertical section, of a double-acting force-pump fitted with the diaphragm shown in Fig. 4. Fig. 6 is a side elevation, partly in section, of a fire-pump having two chambers, each provided with a single-acting diaphragm constructed with a valve at its center; and Fig. 7 is an elevation, partly in vertical section, of a single-acting suction or force pump.

Referring to the several figures, the pump-chambers are each constructed of two parts or shells, A A, which fit together at their edges, clamping the diaphragm B between them. The shells are, by preference, of conical form, or approximately so.

C is the standard or base of the pump, which may be in one piece with one of the shells A, or be separate therefrom.

D is the inlet, and E the discharge.

T is the piston-rod, and L the operating-lever.

V V are the valves.

Referring especially to Fig. 1, the diaphragm B is made of india-rubber, with concentric or annular corrugations or ribs. Its center is preferably in a different plane from its edges, thus giving it a conical form, or approximately so. When pressed out of this shape, it tends somewhat forcibly to return thereto. Embedded in the rubber are one, two, three, or more stiffening-rings *b*, *b*, of metal or other suitable material. Around these rings the rubber is thickened or ribbed, and between them it is comparatively thin and flexible. The rubber is toughened by one or more layers of strong cloth or other woven or textile fabric, *a a*. Two such layers are shown embedded in the rubber near its opposite surfaces. They may, however, be upon the exterior of the rubber, and they may be one or more in number.

The margin or circumference of the diaphragm is provided with a ring, *b'*, embedded in it, and around this ring the rubber is thickened or ribbed. The ring is preferably of metal, in which case it not only thickens the rubber, but also forms a stiffening for the circumference of the diaphragm.

The thickening or enlargement of the rubber near the edge of the diaphragm facilitates the retaining of the latter in place when clamped between the two shells A A of the pump-chamber. These shells have grooves or annular indentations extending around their flanged edges, and coinciding with the ribs on the diaphragm occasioned by the ring *b'*, so that the edge of the diaphragm cannot be pulled out from between the shells A A by any pressure that may be brought to bear on the diaphragm in the pump-chamber. Thus the diaphragm is held securely without the necessity of passing bolts through the rubber. The shells A A are forced together by means of bolts or screws passed through perforated ears *c c*, formed on

the shells. The soft edge of the diaphragm forms a pad or cushion for making a tight joint between the flanges of the shells A A. In the pumps shown in Figs. 2, 3, and 6 one of the shells A has a flange, *d*, which extends over and incloses the edge of the diaphragm, thus concealing it.

The center of the diaphragm is pierced with a hole which admits through it the piston-rod T, as shown in Figs. 2 and 5, or with a larger hole in which is set the seat of one of the valves, as shown in Figs. 6 and 7. In Fig. 2 the piston-rod has a flange, *e*, fixed on it, which comes against one side of the diaphragm, and against the other side is placed a washer, *f*, which is forced toward the flange *e* by a nut, *g*, thus clamping the diaphragm firmly on the piston-rod. As the piston-rod is reciprocated back and forth the diaphragm is displaced at its center and moved from one side of the chamber to the other, thus alternately expanding and contracting the spaces or divisions of the chamber on either side of it, as is well understood with reference to diaphragm-pumps.

Pumps of this character have the advantage of absence of friction, and since there is no movement of a piston in a cylinder there is no necessity of the pump-chamber being turned or smoothed interiorly. For the pumping of acids the surface of this chamber may be enameled.

The diaphragm shown in Fig. 4 differs from that already described in having a flat edge—that is, the ring or cushion *b'* is omitted. Fig. 5 shows a pump constructed with this diaphragm, which is clamped at its edges between the two shells A A by means of bolts or screws, which pass through the flanges of the shells, and also through the edge of the diaphragm. It is best when using this kind of diaphragm to make the shells A A with an easily-rounded curve for the outer moving part of the diaphragm to bend over, as shown in Fig. 5. The piston-rod T is here fastened to the diaphragm by collars *e e*, pressed together by wedges *h h*.

In Figs. 6 and 7 the diaphragm is shown with one of the valves V carried in its center. The seat of this valve is formed at one end of a short tube, *k*, which is placed in the hole through the diaphragm. On one side is screwed a ring, *m*, forming part of an open spider, *n*, to which the end of the piston-rod T is screwed. On the other side is placed a washer, *i*, and against it is screwed a ring, *j*, forming part of a spider, *l*, and to this spider is fixed a guide-rod, T', forming a continuation of the piston-rod.

The mechanical details of the several pumps shown will be readily understood from the drawings, and require no description.

Pumps constructed according to my invention may be worked by hand or power, may be arranged at any depth, and, by virtue of my construction of the diaphragm, may work under heavy pressures.

My pumps may be applied either as suction or force pumps, and for the pumping of corrosive chemicals and gritty water, for the forcing of air, and for many different purposes.

I am aware that diaphragms of rigid material—such as metal, celluloid, &c.—have been made with parallel concentric annular crimps or corrugations, and that such diaphragms have had their edges annularly crimped or corrugated for engagement with the shells between which they are clamped.

I am also aware that a diaphragm of soft rubber has had its edge very slightly thickened to facilitate its being clamped between the flanges of the shells; but I am not aware that a rubber diaphragm has been made with annularly-thickened ribs, so that its concentric portions are alternately thick or rigid and thin or flexible; nor am I aware that a rubber diaphragm has been formed with a ribbed or thickened margin, internally stiffened and forming an integral cushion for engagement with coinciding grooves in the flanges of the shells between which it is clamped.

I claim as my invention—

1. A pump-diaphragm of india-rubber, adapted to be clamped at its center and edges, and constructed in its concentric intervening portion of alternate annular stiffening-ribs and flexible portions between said ribs, substantially as described.

2. A pump-diaphragm of india-rubber, constructed with a concentric stiffening-ring embedded in it, substantially as described.

3. A pump-diaphragm of india-rubber, constructed with a middle layer of rubber reenforced by two layers of tough cloth or similar textile fabric on its opposite sides, with a stiffening-ring embedded in said middle layer, and the rubber and cloth ribbed around said ring, whereby the same is cushioned therein, substantially as described.

4. A pump-diaphragm of india-rubber, constructed with an annularly-ribbed and internally-stiffened margin, forming a thickened cushion for engagement between the fastening-flanges, substantially as described.

5. A pump-diaphragm of india-rubber, constructed with a ring embedded in it close to its margin and the rubber ribbed or thickened around said ring, substantially as described.

6. A pump-diaphragm of resilient india-rubber, constructed of approximately conical form and with concentric annular thickening-ribs and intervening portions of greater flexibility, substantially as described, whereby when the middle of the diaphragm is forced to one side it tends to return to the other.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

SIMÉON GIL.

Witnesses:
RAMON MENENDEZ,
AMAND RITTER.