

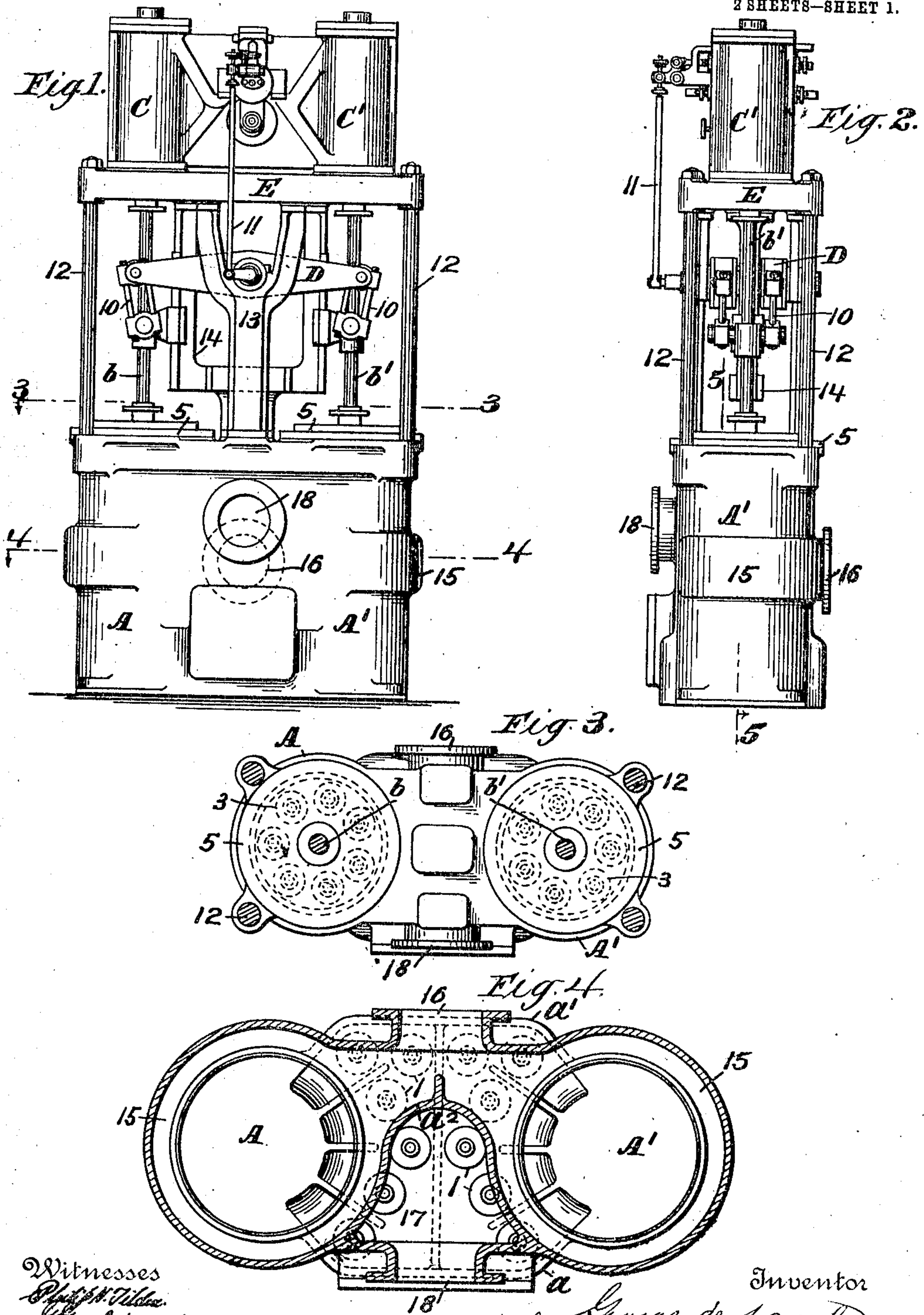
No. 871,349.

PATENTED NOV. 19, 1907.


G. DE LAVAL.
AIR PUMP.

APPLICATION FILED MAY 28, 1906.

2 SHEETS—SHEET 1.



Witnesses
Philip H. Tilden
G. Caliani


Inventor
 By his Attorneys,
Philip Sawyer Rice & Kennedy

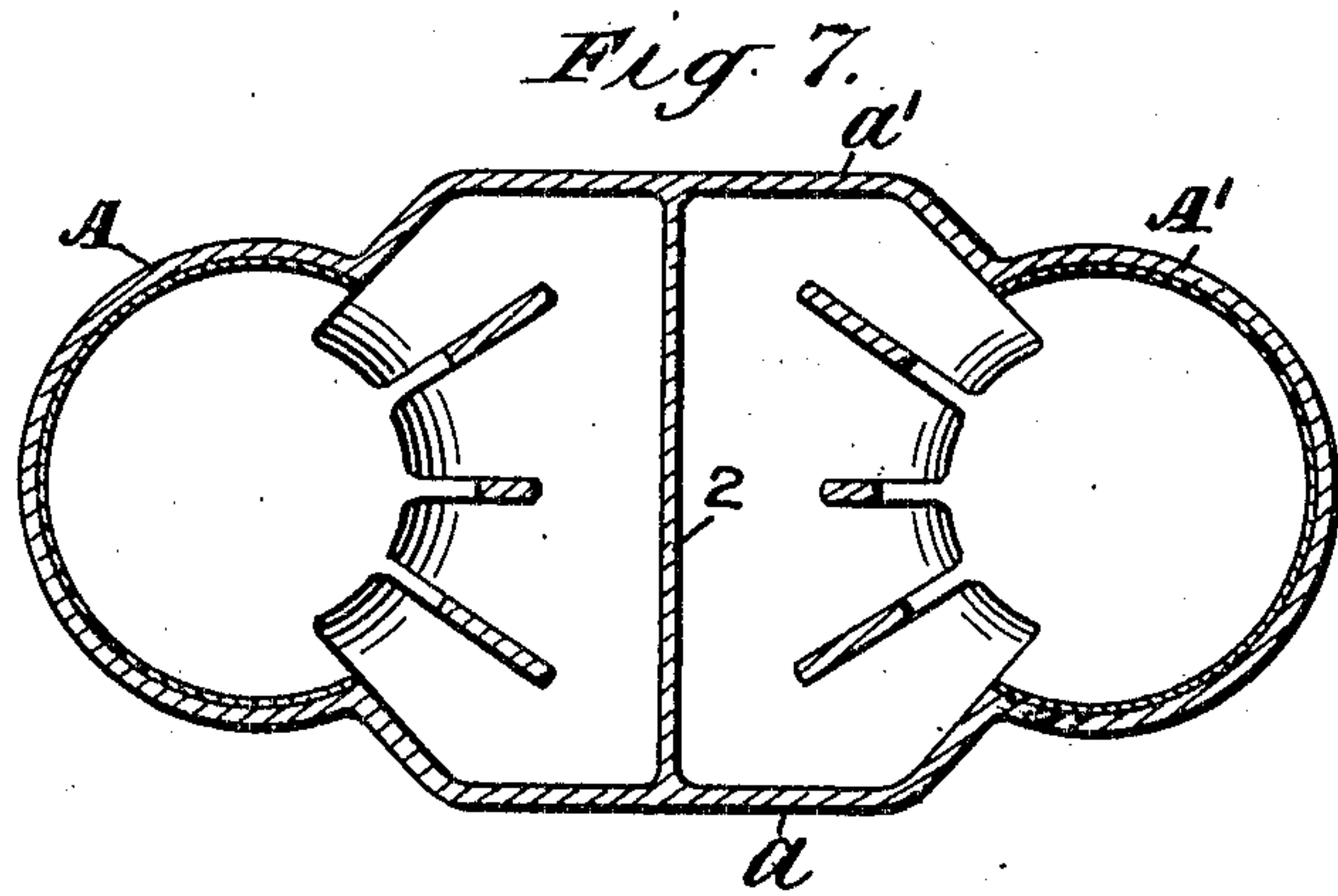
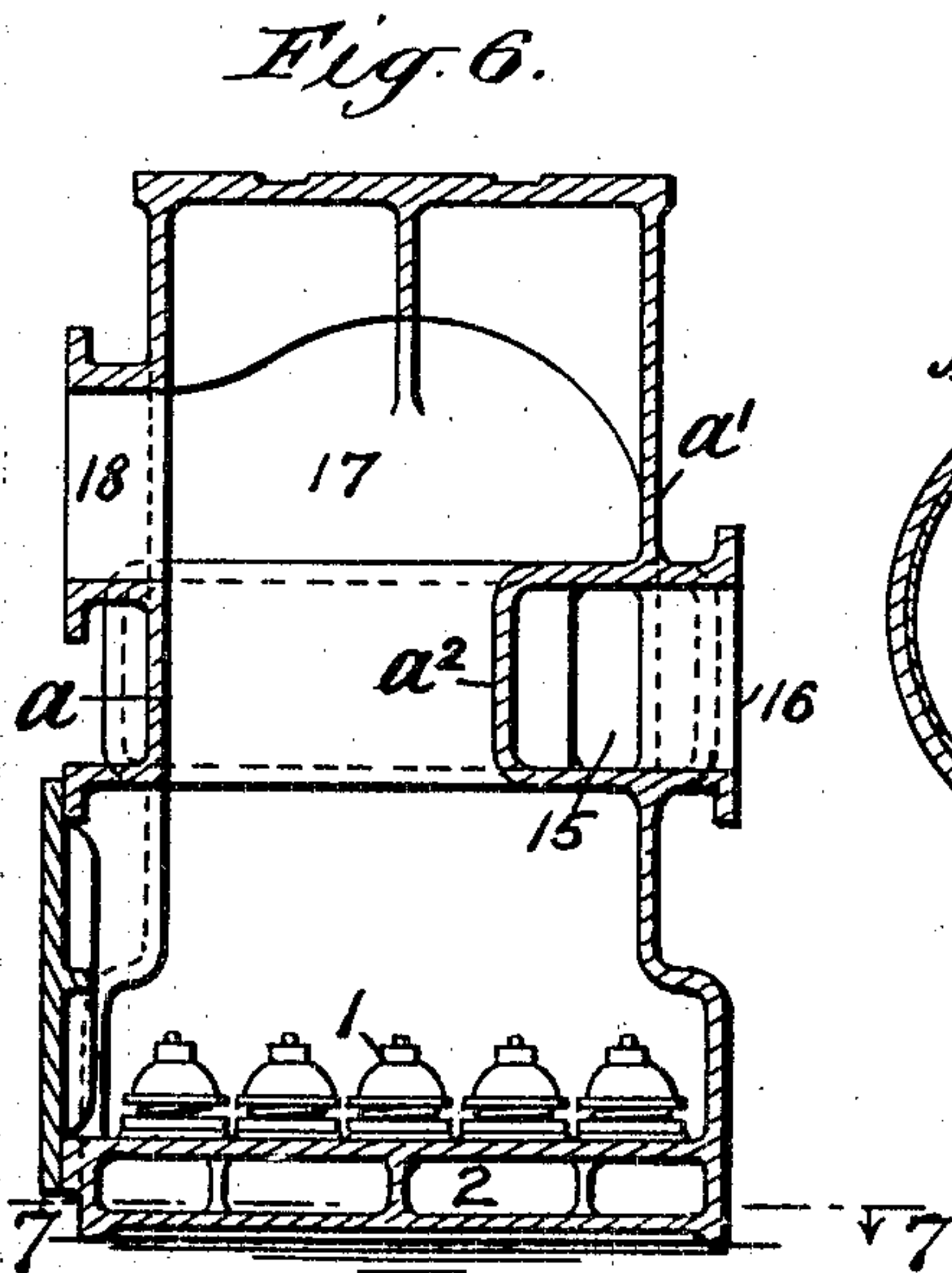
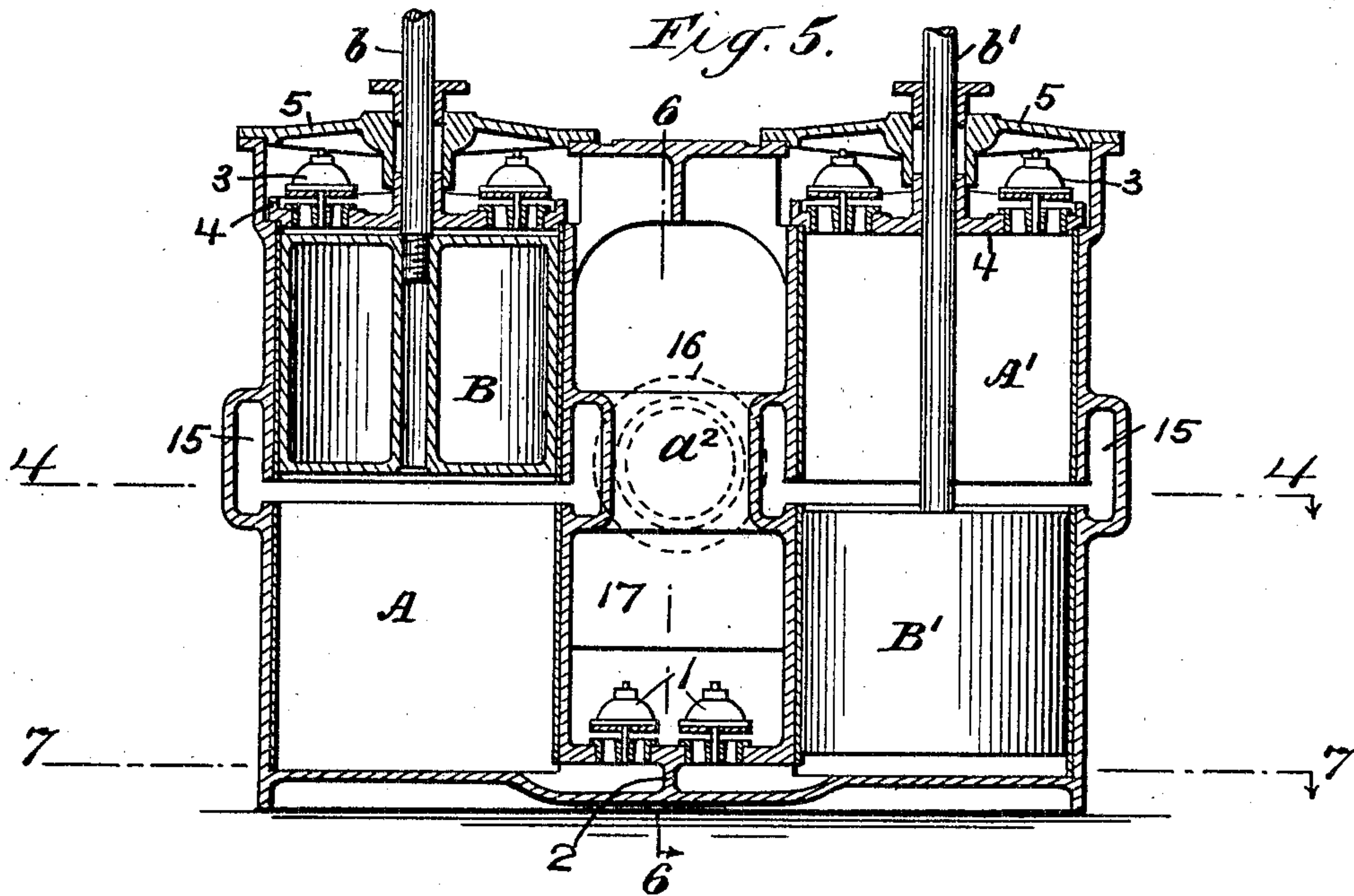
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George de Laval
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UNITED STATES PATENT OFFICE.

GEORGE DE LAVAL, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO THE BLAKE & KNOWLES STEAM PUMP WORKS, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

AIR-PUMP.

No. 871,349.

Specification of Letters Patent.

Patented Nov. 19, 1907.

Application filed May 28, 1906. Serial No. 319,131.

To all whom it may concern:

Be it known that I, GEORGE DE LAVAL, a citizen of the United States, residing at East Orange, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Air-Pumps, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

10 The object of the present invention is to provide a simple and compact direct acting air pump which shall be of high efficiency and large capacity while occupying the minimum floor space.

15 I secure the desired results by combining two double acting air pumps of the class known as valveless suction pumps, with a common delivery chamber and a common suction, in such a manner as to produce a very compact structure, while by the two double acting air cylinders with their pistons moving in opposite directions a very high efficiency and large capacity is secured with small cylinders.

25 For a full understanding of the invention, a detailed description of a construction embodying the same in its preferred form will now be given in connection with the accompanying drawings forming a part of this specification, and the features forming the invention then specifically pointed out in the claims.

30 In the drawings—Figure 1 is a front elevation of my improved air pump. Fig. 2 is a side elevation of the same. Fig. 3 is a horizontal section on the line 3 of Fig. 1. Fig. 4 is a horizontal section on the line 4 of Figs. 1 and 5. Fig. 5 is a vertical section on the line 5 of Fig. 2. Fig. 6 is a vertical section on the line 6 of Fig. 5. Fig. 7 is a horizontal section on the line 7 of Figs. 5 and 6.

Referring to said drawings, A, A' are the pump cylinders, having the pistons B, B' which are connected by piston rods b, b' to the steam pistons in the steam cylinders C, C', the two rods b, b' being connected between the steam and pump ends by beam D through links 10, from which beam a steam valve mechanism of any suitable character is operated through the tappet rod 11. The entablature E carrying the steam cylinders is supported by columns 12 from the pump end, and the beam D is supported in bracket 13 connected to the entablature and pump end. The frame 14

extending between the steam and pump ends provides cross head guides for the piston rods.

Referring now to the pump end, the cylinders A, A' are preferably formed in a single casting, with the front and rear walls a, a' inclosing the space between the cylinders, central valveless inlet or suction passages 15 surrounding the central portion of each cylinder and uniting to form a single suction chamber between the cylinders, inclosed by wall a' and suction chamber wall a², with the central suction connection 16 on the rear side of the pump. The space between the cylinders A, A' and the walls a, a', except the part occupied by the suction chamber forms a delivery chamber 17 having the central delivery connection 18 on the front side of the pump, this delivery chamber extending throughout the full height of the pump end. The suction chamber is arranged at one side of the space between the cylinders so that it does not divide the upper and lower parts of the delivery chamber from each other.

The cylinders A, A' deliver to the delivery chamber 17 at the lower ends of the cylinders through sets of delivery valves 1 divided for the two cylinders by partition 2, and from the upper ends of the cylinders through delivery valves 3. The valve plates 4 carrying the valves 3 and the cylinder heads 5 are removable for convenient access to the valves and pistons.

It will be understood that the pump end may be used with other steam ends and framing, or be driven otherwise than by a beam steam engine, but the best results are secured by the beam connection between the piston rods of the two valveless suction pumps and their operation by one or more direct acting steam cylinders, forming a direct acting beam pump, and such a construction forms a specific feature of the invention, although the broader claims are not limited thereto. While the pump end is preferably made in a single casting, and one of the advantages of the specific arrangement of the pump and chambers and passages is that it permits this, such single casting construction is not essential to the invention.

What I claim is:—

1. A pump having two double acting valveless suction pump cylinders with a common delivery chamber formed by the

space between the cylinders and front and rear inclosing walls.

2. A pump having two double acting valveless suction pump cylinders with a common delivery chamber formed by the space between the cylinders and front and rear inclosing walls, and a common suction chamber between the cylinders.

3. A pump having two double acting valveless suction pump cylinders with a common delivery chamber formed by the space between the cylinders and front and rear inclosing walls, a common suction chamber between the cylinders, a central suction connection on one side of the pump, and a delivery connection on the opposite side of the pump.

4. The combination with two double acting valveless suction pumps having common delivery and suction chambers between the cylinders formed by the space between the cylinders and front and rear inclosing walls, of a beam above the cylinders connecting the pump rods, and one or more direct acting steam cylinders above the beam for operating the pump.

5. The combination with two double act-

ing valveless suction pumps having common delivery and suction chambers between the cylinders formed by the space between the cylinders and front and rear inclosing walls, of a beam above the cylinders connecting the pump rods, an entablature above the beam, and one or more direct acting steam cylinders mounted directly on the entablature.

6. A pump having the pump cylinders A, A', suction valveless passages extending about the cylinders and uniting in a single suction chamber between the cylinders, common delivery chamber between the cylinders extending longitudinally of the cylinders on both sides of the suction chamber and inclosed by the cylinder walls and front and rear walls *a, a'*, lower delivery valves between the cylinders; and upper delivery valves 3 above the cylinders.

In testimony whereof I have hereunto set my hand, in the presence of two subscribing witnesses.

GEORGE DE LAVAL.

Witnesses:

A. H. BRAIDWOOD,

B. M. SANDERS.