(No Model.) 3 Sheets—Sheet 1.

J. DOW.

DUPLEX PUMP OR BLOWER.

No. 378,042. Patented Feb. 14, 1888.

Fig. 1.

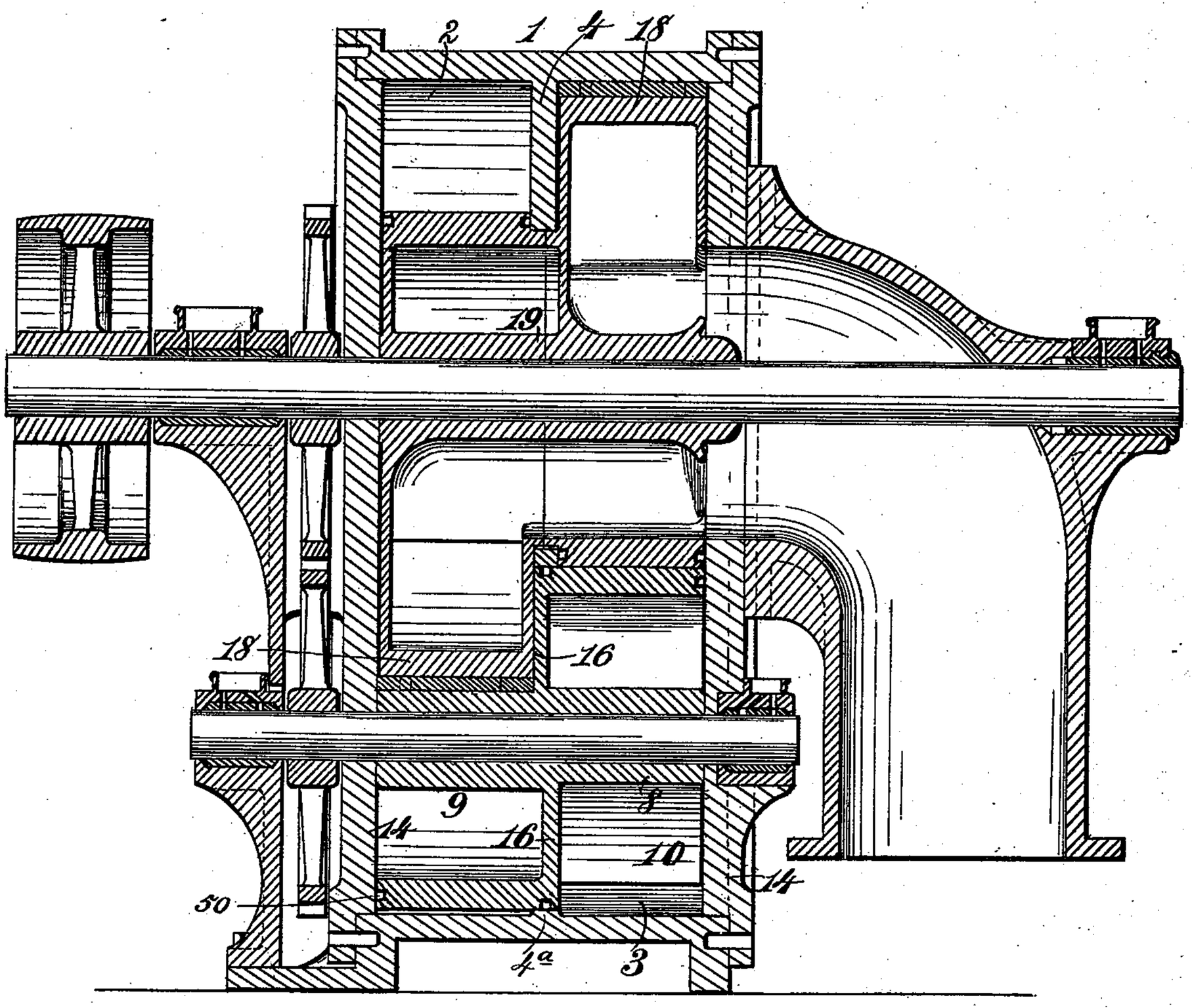

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Fig. 3.

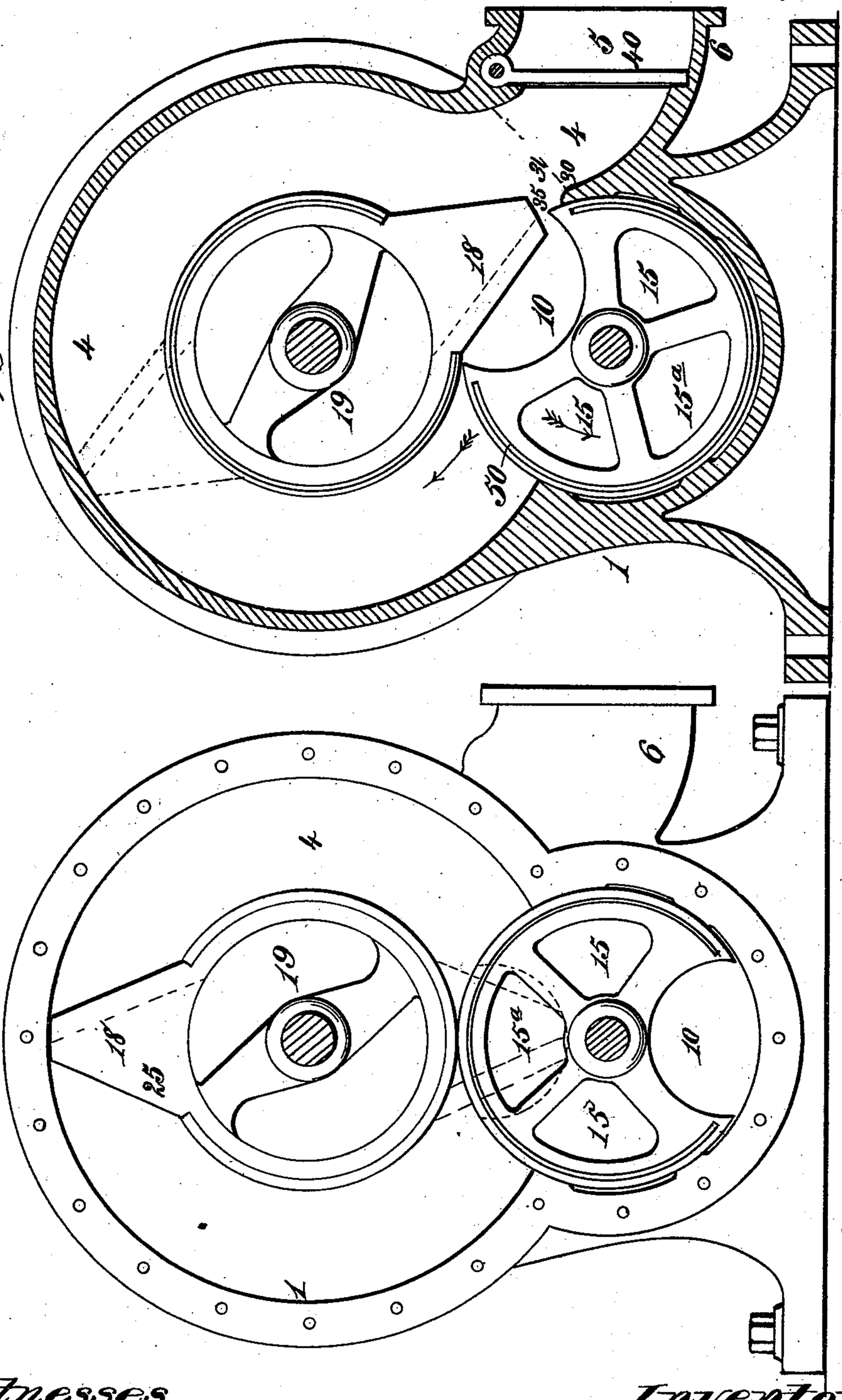

Fig. 4.

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(No Model.) 3 Sheets—Sheet 3.

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Fig. 4.

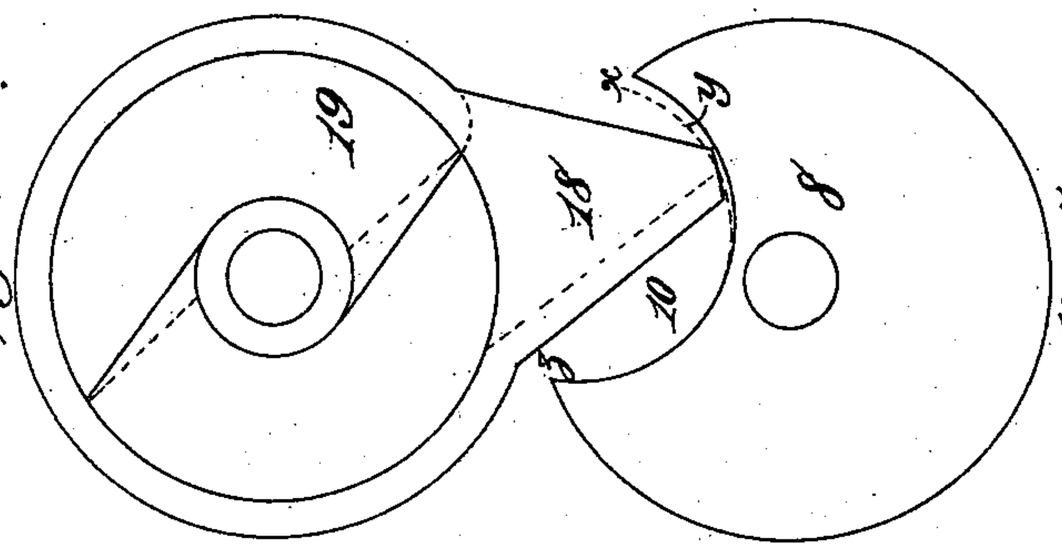


Fig. 5.

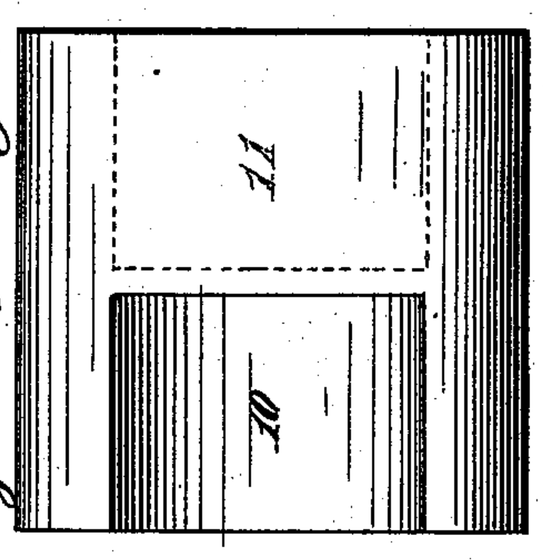
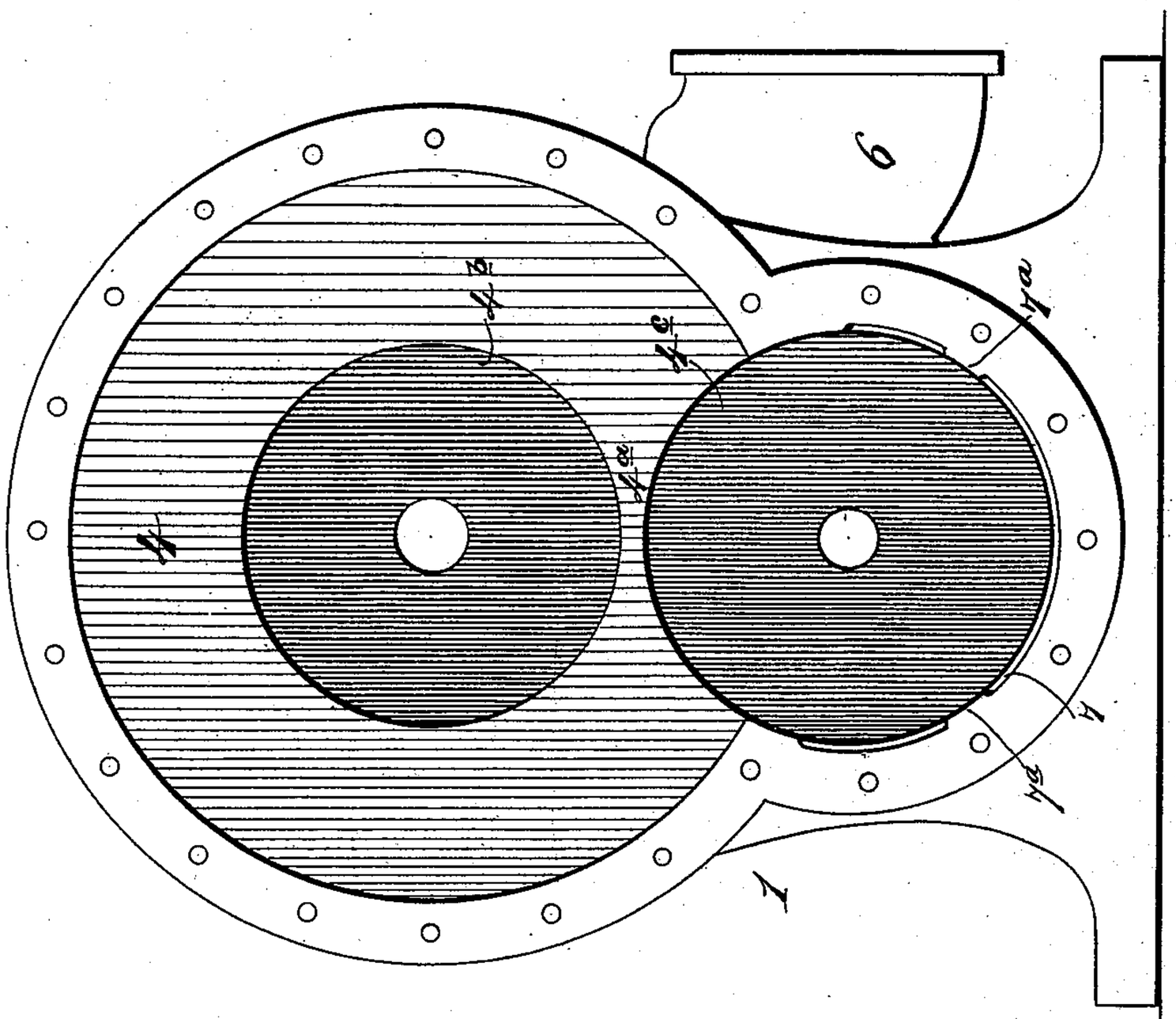


Fig. 6.



Witnesses.
Robt Ewett.
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Josiah Dow.
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UNITED STATES PATENT OFFICE.

JOSIAH DOW, OF LOWELL, MASSACHUSETTS.

DUPLEX PUMP OR BLOWER.

SPECIFICATION forming part of Letters Patent No. 378,042, dated February 14, 1888.

Application filed October 28, 1886. Serial No. 217,442. (No model.)

To all whom it may concern:

Be it known that I, JOSIAH DOW, a citizen of the United States, residing at Lowell, in the county of Middlesex and State of Massachusetts, have invented new and useful Improvements in Duplex Pumps or Blowers, of which the following is a specification.

The present invention relates to improvements upon the duplex rotary piston pump or blower for force or exhaust purposes for which I have procured Letters Patent dated June 2, 1885, No. 318,968. In said patent the pump-cylinder is cast with a vertical division-wall extending from top to bottom, except as to an opening receiving the piston-cylinders, thereby rendering it necessary to construct the two abutment-valves in separate parts independently mounted on their central shaft, in order that they may be separately introduced into the piston-cylinder from opposite sides thereof. In the present invention the partition is of a special form, and the abutment-valves are made in one piece, and can be fitted into place from either end of the casing, so as to cover both compartments of the piston-cylinder. In my former patent the fluids forced or drawn through the pump are liable to be retained in the cut-away portion of the abutment-valve and to produce a pocketing which effects a concussive action of the piston. These objections it is the object of the present invention to avoid. Furthermore, in my former patent it was not possible to establish suction and to sustain high pressures with air, water, or fluids, whereas in the present invention, by a simple disposition of a valve or valves placed in the discharge-pipe, I am enabled to avoid the objections stated.

The invention will first be fully described in connection with the accompanying drawings, and then clearly set forth in the claims.

Figure 1 is a longitudinal sectional view of a duplex rotary piston-pump embodying my improvements. Fig. 2 is a transverse section representing in front view the rotary piston and abutment-valve. Fig. 3 is a transverse sectional view representing the relative positions of the piston and abutment-valve when the former is about to enter the latter. Fig. 4 is a detail view showing the piston entered within the abutment-valve. Fig. 5 is a detail view of the abutment-valves constituting an integral member or body. Fig. 6 is a view of the pump-casing, showing the partition in elevation.

The reference-numeral 1 designates the shell or casing of my pump, which is divided into two parallel chambers, 2 and 3, by means of a vertical partition, 4. This partition commences at the top of the casing 1, and is continued through the pipe 6 to the seat of the valve or valves 5, which are placed in or near the opening of a pipe, 6, extending from the side of the shell 1. Below the main part of the partition located above the discharge-opening 5 the partition is continued in the form of a rim or ridge, 4^a, which extends around the circumference of the shell 1 and joins the upper part of the partition. Referring to Fig. 6, the shape of the partition 4 is clearly seen, and it will be apparent that it has an upper circular opening, 4^b, which serves for the reception of the duplex cylinder, and a lower opening, 4^c, constituting, in connection with the rim or ridge 4^a and bottom of the shell 1, a seat for the revolving abutments.

The rim or ridge 4^a, extending around the inner wall of the shell 1, is provided with recesses or grooves 7, which serve for the reception of a water or liquid packing, as will be hereinafter fully set forth. The revolving abutments (designated by the numerals 8 9) are constructed in one piece, as is seen in Figs. 1 and 5. They are made in the form of a cylinder, which is of a uniform diameter throughout its entire length, and has cut-away portions 10 and 11 formed therein in diametrically-opposite directions. The cut-away portions constitute piston-openings which do not extend beyond the surface-line of the partition 4, and the central portion of the cylinder is also continuous in its circumference and fits closely against the partition and against the rim 4^a, forming a continuation of said partition. In this manner there is a perfect joint against the abutment-cylinder, so that no communication is possible from one parallel chamber to the other around the abutment-cylinder. The ends of the latter fit closely against the parts 14 of the case or shell at either end. Openings 15, made through the abutment-cylinder, pass from end to end, and other openings, marked 15^a, on opposite sides of the center, stop at a partition, 16, in the center of the

cylinder, said partition thus forming the inner wall of the piston-openings. These two piston-openings or cut away portions of the abutment-cylinder end at the opposite sides of the partition 4, and form, in connection with the surface of said partition, a continuous bearing for the sides of the pistons 18 next to the center of the pump. The other sides of said pistons bear upon the heads of the case.

The piston-cylinder 19 is made in two sections, one carrying each piston 18, and they are joined together at the center of the partition 4, as is seen in Fig. 1. The joining or abutting ends of the sections comprising the piston cylinder are cut away from the outer circumference, and lap over the partition sufficiently to allow them to pass into the opening in the partition. As already stated, the abutment-cylinder can be placed into position from either end of the seat; but the piston-cylinder must be placed half-way from either end, not only on account of the presence of the pistons, but also by reason of the bearing of the piston-cylinder in the partition 4. The pistons 18 project from the periphery of the piston-cylinder in diametrically-opposite directions, and co-operate with the corresponding cavities or openings in the abutment-cylinder in the same manner as in my former patent. The construction or shape of the pistons is, however, varied in the present instance in the following manner, viz: A thin wing, 25, passes back to the cylinder 19 from either lateral extremity of the face of the piston 18. The latter completely closes the annular chamber between the external or piston cylinder and shell 1, and is in thickness only about one-half of the end of the piston and wing, whereas in my former patent this thickness was co-equal with the whole end, which was narrower and rounded to fit more continuously in the piston-recess in the abutment-cylinder. When the end of the piston passes through the "cut-away" in the abutment, as is seen in Fig. 4, although the end of the wing as it enters said cut-away will fit its surface, as seen at *x*, the solid portion of the face will be at a short distance from it, and will follow the dotted line *y*. At this time the other end of the cut-away, as at *z*, is about to open from contact with the piston-cylinder, the two revolving in opposite directions, as in my former patent. Before this opening takes place and until it is sufficient to prevent it there would be a closed pocket for the contained fluid within the recess or cut-away and a hard impact of the piston would take place against it. These objectionable results are prevented, first, when the piston is in the position seen in Fig. 3 by leaving an opening, 35, at the top of a bridge, 30, located between the abutment-seat and the discharge, as at 31, for an outflow of the pocketed fluid into the discharge-pipe, and, second, after the piston has passed into the cut-away, as in Fig. 4, the opening around its end subserves the same purpose, commencing with space enough to permit a considerable outflow, and decreasing until the opening at *z* is sufficiently large and the solid face of the piston comes to a bearing on the last half of the surface of the cut-away. It will be understood that as soon as the solid portion or head of the piston passes up and out of the cut-away in the abutment-cylinder toward the point *z* it bears fully and begins its work again in forcing the water from the annular chamber, gradually working up to its full forcing as the opening increases at *z*. The operations just described prevent hard impacts, jarrings, and sudden changes of volume within the pump. It should be observed that the construction of the outer ends of both pistons 18 is the same, and also the bridge at 35 for both chambers.

In order to establish suction and sustain high pressures with air, water, or other fluid, I locate a valve or valves within the beginning of the discharge-pipe 6. This valve 40 may be a simple gate or flap-valve, which opens outwardly and bears against a seat located at the termination of the extension of the partition 4 within the discharge-pipe 6, said partition coming down to the valve-seat. Instead of the valve shown, a flat partition provided with one or more disks or other suitable valve or valves may be arranged as seen by the dotted line in Fig. 3. This latter form of valve would usually be the construction when the machine is used for an air-compressor or air-pump, in order to permit a closer compression. In either event each chamber of the piston-cylinder would have its separate valve or set of valves, as one side operates independently of the other, and would take from the other when the open side of its piston was presented to the discharge-opening, the pistons being opposed in position.

The object of the valve or valves is as follows, viz: When the piston 18 is in the position shown in Fig. 3, the channel through it is open for a moment to the discharge-pipe. This causes little or no difficulty after a flow of fluid has been established, except with very high pressures; but when air is in the pump the suction is lost at that moment through its great elasticity. Therefore, in order to maintain the suction at all pressures, to prevent back action from high pressure, and to make it possible to maintain high compression of air, the valves are resorted to. Referring again to the means for packing the abutment-cylinder, I would state that in my former patent two movable packing-strips were located at the upper portion of the seat for the abutment-cylinder and relied upon to prevent the loss of fluid around the cylinder. In the present construction I omit the movable packing-strips and make use of a water-packing confined and utilized as follows:

The abutment-cylinder has a close-fitting seat upon the ridge continuation of the partition 4. As already stated, continuous recesses are formed upon the inner face of the casing,

which are divided into separate chambers, 7, by means of pad 7ª, running parallel to the axis of the abutment-cylinder and extending from each head of the case to the rim or ridge 4ª, into which fluid enters slowly, and whereby by its confinement and inertia it forms a perfect packing, which effectually prevents the fluid flowing from the main chambers around the abutments.

In addition to packing the circumference of the abutment-cylinder with water or liquid, as just stated, I propose to pack the ends thereof in a similar manner, and for such object I provide the open-ended chambers of the abutment-cylinder. These chambers fit against the heads of the case and become filled with fluid, which revolves with the abutment in a direction opposed to the main current in the pump, and thus forms a packing which prevents leakage across the ends of the abutment-cylinder. To still further decrease the liability of leakage, I make grooved channels 50 in the ends of the abutment-cylinder, which channels become filled with water, as will be apparent.

It will be observed that since the abutment-cylinder moves in one direction and the piston-cylinder in another, as is indicated by the arrows in Fig. 3, the action of the fluid used as a packing and that being forced through the pump will not partake of the same revolving motions.

Having thus described my invention, what I claim is—

1. In a pump, the abutment-cylinder, made in a single piece, having opposite alternately-arranged peripheral openings or cavities, and provided with interior chambers the open ends of which lie against the vertical walls of the abutment-seat, substantially as described.

2. In a pump, the combination of the abutment-cylinder, made in one piece, and having recesses or cavities in its periphery, the casing or shell having a vertical partition and a rim-shaped bottom continuation thereof, and the detachable end heads, with the piston-cylinder bearing upon the abutment-cylinder, and having pistons adapted to work in its cavities or recesses, substantially as herein set forth.

3. In a pump, the combination of the abutment-cylinder having peripheral cavities and openings extending from end to end with the casing and heads and the piston-cylinder, substantially as described.

4. In a pump, the combination, with the abutment-cylinder, having alternate and opposite peripheral cavities, and provided with grooves in its ends adapted to hold fluid for the purpose of packing, of the casing having a central packing-rib, the heads, and the piston-cylinder, the grooves in the said abutment-cylinder opening against the vertical walls of the abutment-seat, substantially as described.

5. The combination, with the casing having an abutment seat and a discharge-pipe, of a bridge-piece arranged between the two, the abutment-cylinder having peripheral cavities, and the piston-cylinder having pistons operating in said cavities, a relief-space being provided between the bridge-piece and the said pistons and between the pistons and the entrances of the peripheral openings of the abutment-cylinder, said spaces decreasing as the pistons advance in said openings, and being closed as at or about at the central part thereof, from which point the pistons have a firm bearing, substantially as described.

6. The combination, with the pump-casing having an abutment-seat, and provided with fluid-filled recesses extending from the ends toward the center, of a central packing-rib, and an abutment-cylinder turning upon said rib, said abutment-cylinder having interior chambers the open ends whereof lie against the vertical walls of the abutment-seat, substantially as described.

7. In a pump, the combination, with the casing having a discharge-pipe upon one side, of the abutment-cylinder having peripheral openings, pistons co-operating with the same, and a bridge intermediate between the discharge and the abutment cylinder, a relief-space being provided between said bridge and the piston, substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

JOSIAH DOW.

Witnesses:
JAMES L. NORRIS,
J. A. RUTHERFORD.