No. 630,977. Patented Aug. 15, 1899.

V. E. EMGARTH.

ROTARY RECIPROCATING PUMPING APPARATUS.

(Application filed Oct. 10, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

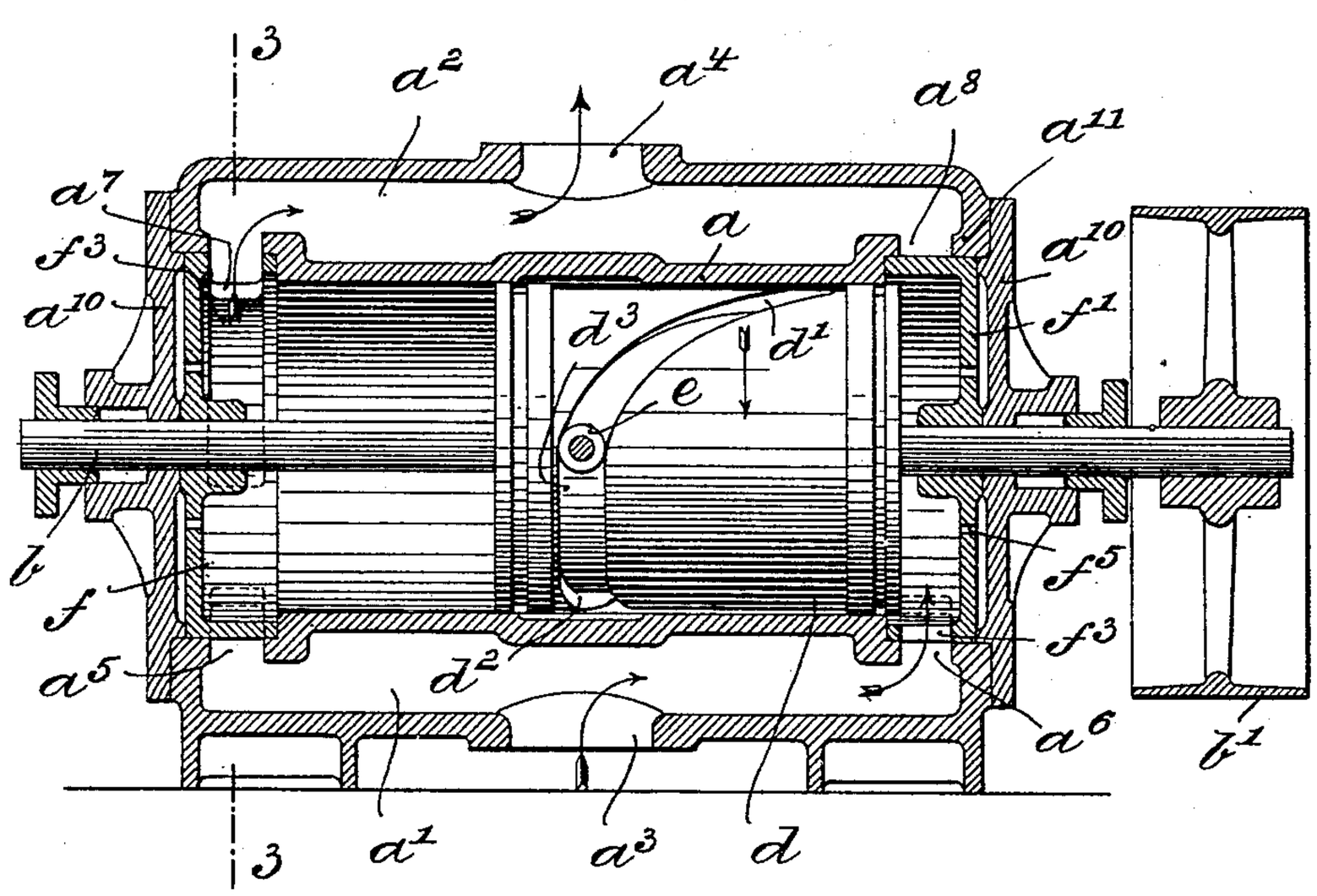

Fig. 2.

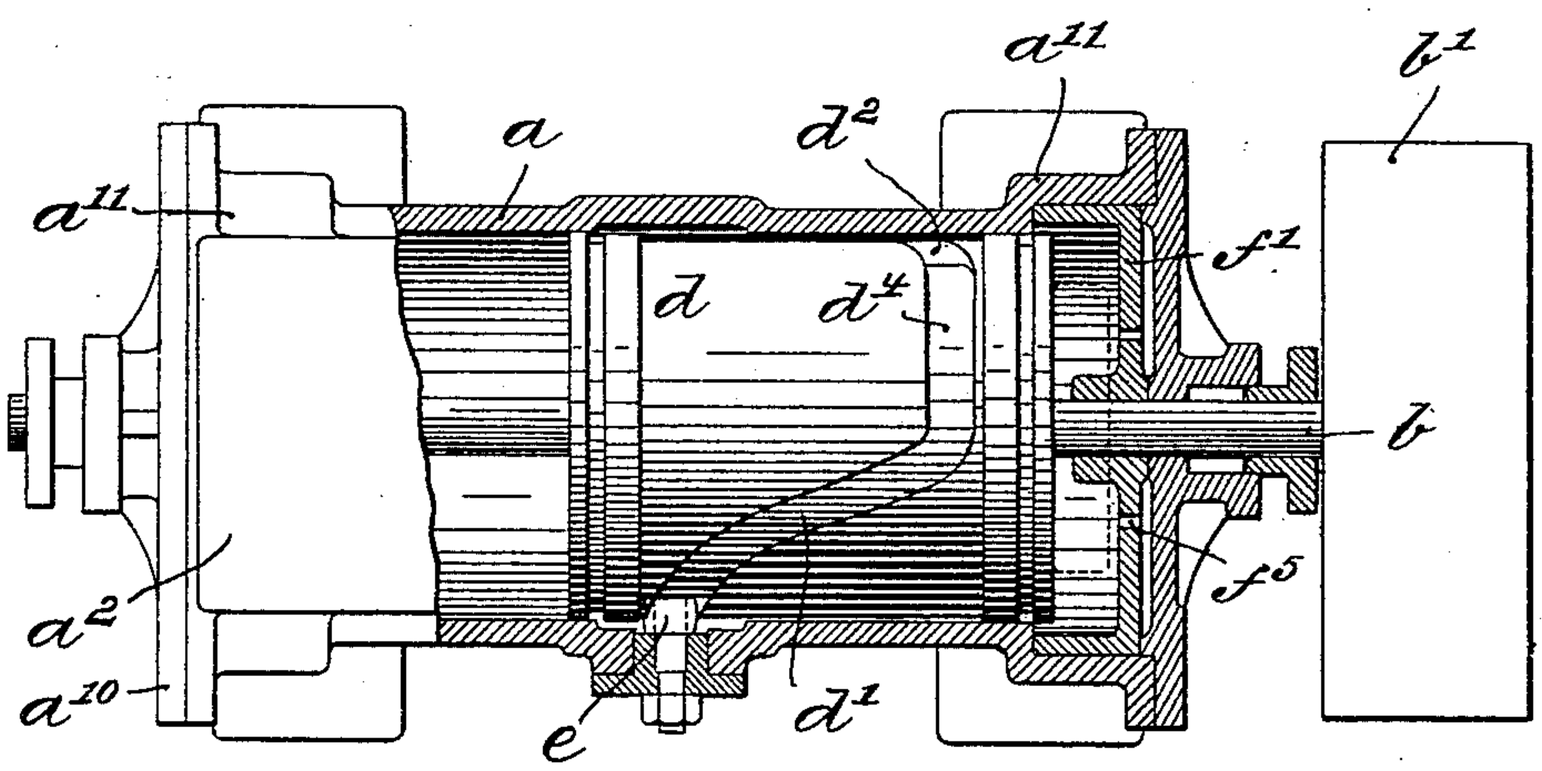

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Fig. 3.

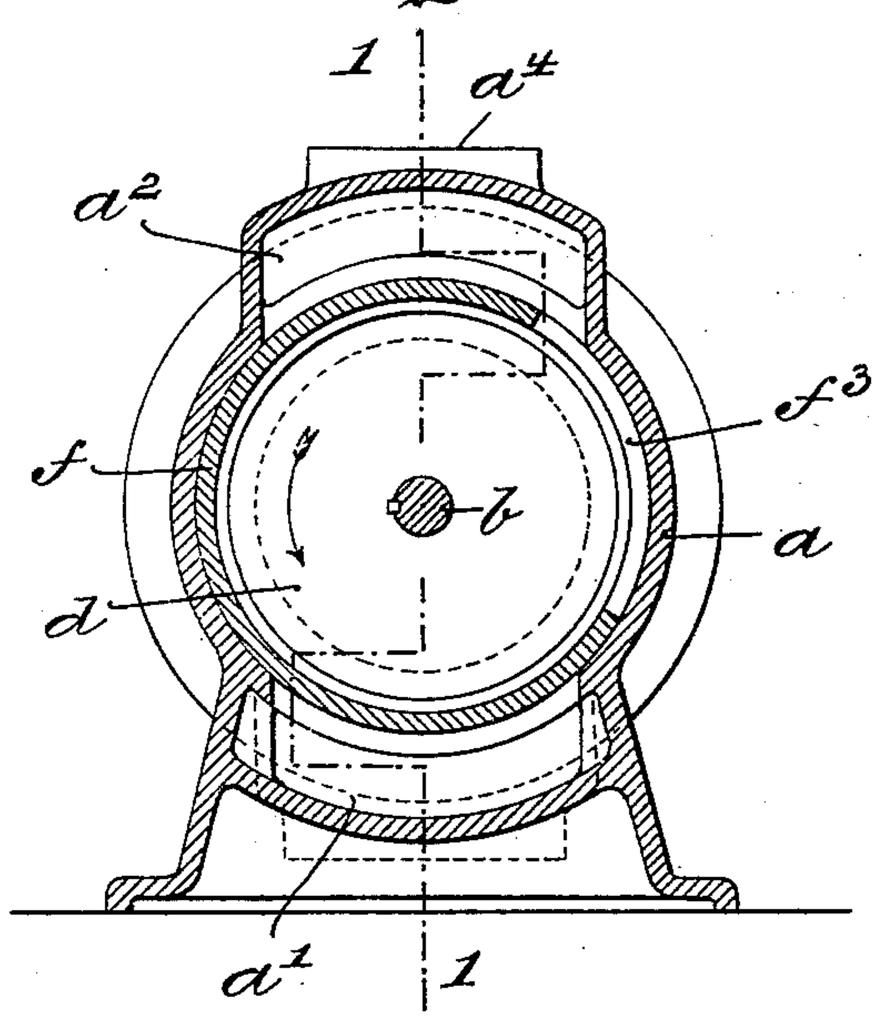


Fig. 4.

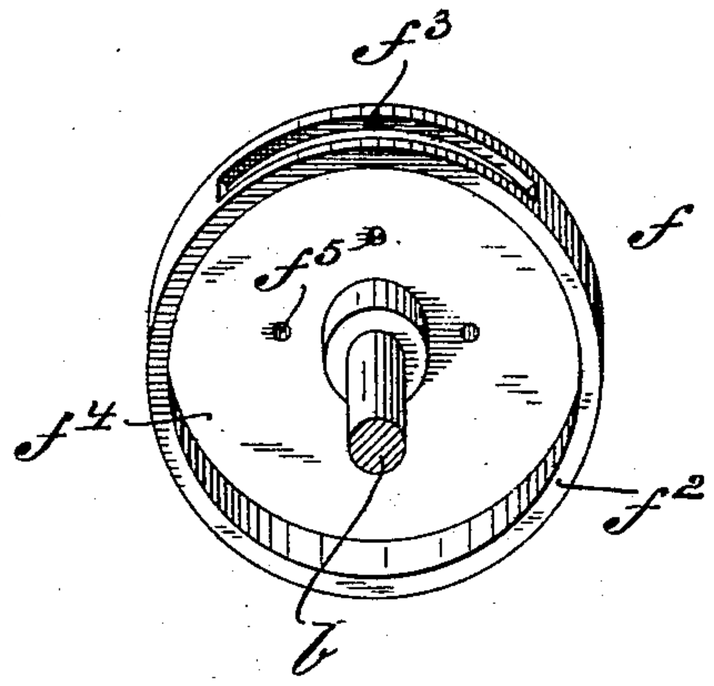
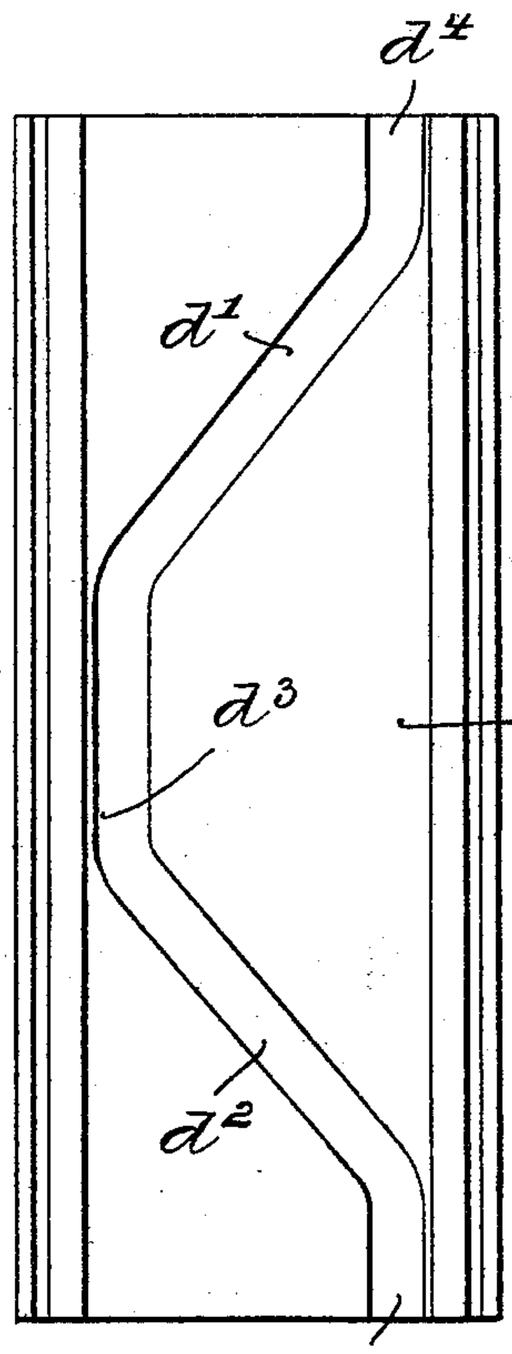


Fig. 5.



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UNITED STATES PATENT OFFICE.

VICTOR EMIL EMGARTH, OF PHILADELPHIA, PENNSYLVANIA.

ROTARY RECIPROCATING PUMPING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 630,977, dated August 15, 1899.

Application filed October 10, 1898. Serial No. 693,070. (No model.)

To all whom it may concern:

Be it known that I, VICTOR EMIL EMGARTH, a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Rotary Reciprocating Pumping Apparatus, of which the following is a specification.

My invention has relation to a rotary pumping apparatus, and in such connection it relates more particularly to the general construction and arrangement of the several parts, hereinafter enumerated, of such an apparatus.

The principal object of my invention is to provide a rotary pumping apparatus consisting of a casing, a cylinder traversed by a shaft, a piston slidable on said shaft and adapted when said shaft is actuated to reciprocate and revolve within said cylinder or casing, and a valve adapted to control the inlet and outlet ports of said cylinder or casing, said valve being keyed or otherwise secured to said shaft and rotating therewith in said cylinder or casing.

My invention, stated in general terms, consists of a rotary pumping apparatus when constructed and arranged in substantially the manner hereinafter described and claimed.

The nature and scope of my present invention will be more fully understood from the following description, taken in connection with the accompanying drawings, forming part hereof, in which—

Figure 1 is a vertical sectional view on the line 1 1 of Fig. 3, illustrating a pumping apparatus embodying main features of my invention. Fig. 2 is a top or plan view thereof, partly broken away and sectioned to more clearly illustrate the construction and arrangement of the piston and the valve. Fig. 3 is a cross-sectional view on the line 3 3 of Fig. 1. Fig. 4 is a perspective view of the valve detached from the cylinder or casing, and Fig. 5 is a diagrammatic view illustrating the periphery of the piston projected upon a flat surface to more clearly illustrate the cam-groove therein.

In the drawings the invention has been illustrated as a double-stroke pump, although it is clear that with suitable changes my invention may be readily employed as a single-stroke pump.

Referring to the drawings, a represents the casing or cylinder of the pump, provided with external casings or boxes a' and a^2, respectively forming the water-inlet and water-outlet for the pump. The box a' extends longitudinally along the lower edge of the cylinder a and is provided with an inlet a^3, connected in any suitable manner with the source of supply, and the box a^2 extends similarly along the upper edge of the cylinder a and has an outlet a^4, which is connected by a pipe or otherwise with the point or place where the liquid is to be delivered. The inlet-box a' has inlets a^5 and a^6 extending through the cylinder a at opposite ends thereof and the outlet-box a^2 has similar outlet-openings a^7 and a^8 extending through the cylinder a at its opposite ends, as clearly illustrated in Fig. 1 of the drawings.

The cylinder a has the heads a^{10} of usual construction and is traversed by a shaft b, to which rotary motion is conveyed through the pulley b' or other suitable means and on which is slidably mounted a piston d. This piston d has on its periphery a cam-groove divided for the purposes of a double-stroke pump, as illustrated in the drawings forming part hereof, into two oppositely-arranged thrust portions d' and d^2 and two dwells d^3 and d^4, interposed between the thrust portions d' and d^2, as clearly illustrated in Fig. 5. On the interior of the casing a midway of its ends is secured an inwardly-projecting roll e, fitting into the cam-groove of the piston, the object being to thereby convey to the piston d when the same is rotated by the shaft b a rotary movement combined with a reciprocating movement, for the purpose hereinafter specified. The thrust portions d' and d^2 of the groove permit the piston d to travel in one direction or the other while rotating; but the dwells d^3 and d^4 permit of rotary movement only to said piston. Within the cylinder a and between its heads a^{10} and an annular shoulder a^{11}, formed on the cylinder a, are arranged the two disk or cup shaped valves f and f', each suitably secured to and rotating with the shaft b and having an edge or rim f^2 in alinement with the inlet and outlet openings

from the cylinder to the inlet and outlet boxes of the pump. This edge or rim f^2 is partially cut away, as at f^3, so as to form when in alinement with either inlet-opening a^5 or a^6 or outlet a^7 or a^8 a passage for the water either into the cylinder a or from the same. The bases f^4 of the disk or cup shaped valves f and f' are preferably perforated, as at f^5, to permit water or liquid to enter between the valves and cylinder-heads, and thereby form a lubricating or antifriction fluid packing between the valves and heads and also a counterbalancing influence of the valves and shaft with respect to the heads of the cylinder, thereby providing a reliable balance-valve for the pumping apparatus.

The operation of a double-stroke pump is as follows: When the piston d is adjacent to either of the heads of the cylinder, the roll e is in one or the other of the dwells d^3 or d^4 of the cam-groove of the piston. In this position the two valves f and f' are so turned by the shaft b as to completely close all four openings a^5, a^6, a^7, and a^8 from the cylinder a to the boxes a' and a^2. The two valves f and f' are so arranged on the shaft b that their openings or cut-away portions f^3 are diametrically opposite to each other. The further rotation of the shaft b now turns the piston d without moving it longitudinally until the roll e is about to enter one of the thrust portions d' or d^2 of the cam-groove. If the piston d is to be forced longitudinally to the left by the thrust d', for instance, as indicated in Fig. 1, then during the movement of the piston to clear the roll from the dwell the two valves f and f' rotate with the shaft, so as to present at the instant the piston moves to the left a small portion of the opening f^3 of the valve f' to the outlet-opening a^7 from the cylinder a to the box a^2 and a small portion f^3 of the valve f' to the inlet-opening a^6 from the box a' to the cylinder a, thus partially opening the water-inlet to the cylinder and the water-outlet from the cylinder. As the piston continues to move longitudinally as well as in a rotary direction the valves f and f' continue to rotate until at a point when the piston is midway between the ends of the cylinder and the roll is about midway between the two dwells the openings a^6 and a^7 are at their widest extent and begin to decrease as the piston travels toward the left-hand end of the cylinder. When the roll enters the second dwell of the cam-groove, the piston is adjacent to the left-hand head of the cylinder, and the inlet a^6 and outlet a^7 are both completely closed. The further movement of the shaft causes merely a rotary movement of the piston and also turns the valves f and f' so as to present at the moment the roll enters the thrust d^3 and the piston begins to travel to the right the openings f^3 to respectively the inlet a^5 and outlet a^8.

Having thus described the nature and object of my invention, what I claim as new, and desire to secure by Letters Patent, is—

In a rotary pumping apparatus, a cylinder provided at each end with an inlet and an outlet opening, a casing surrounding said cylinder and forming water inlet and outlet boxes adjacent to the inlet and outlet openings at each end of the cylinder, a driving-shaft traversing the cylinder, disk-shaped valves secured to the shaft and rotating therewith within the cylinder at either end thereof, each valve having a peripheral opening adapted to alternately come into alinement with the inlet and outlet openings of the cylinder, a piston splined to the shaft and provided on its external surface, a cam-groove having alternate thrust and dwell portions and a roll or projection located on the interior of the cylinder and adapted to engage said cam-groove, substantially as and for the purposes described.

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

VICTOR EMIL EMGARTH.

Witnesses:
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THOMAS M. SMITH.