(No Model.)

V. F. CARPENTER.

ROTARY MACHINE.

No. 548,112. Patented Oct. 15, 1895.

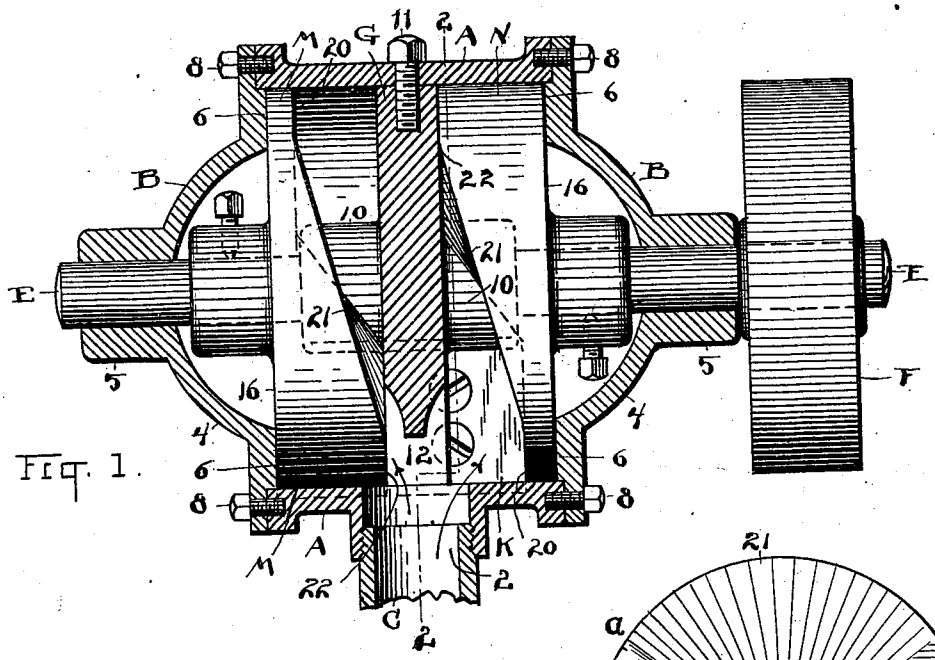

Fig. 1.

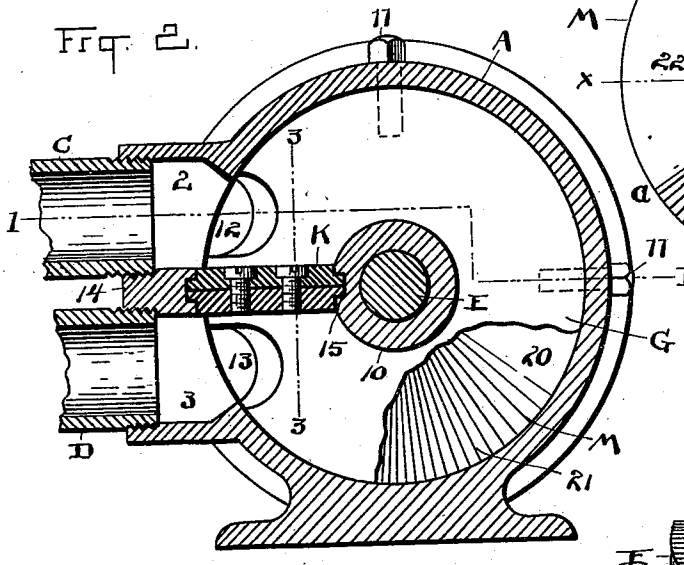

Fig. 2.

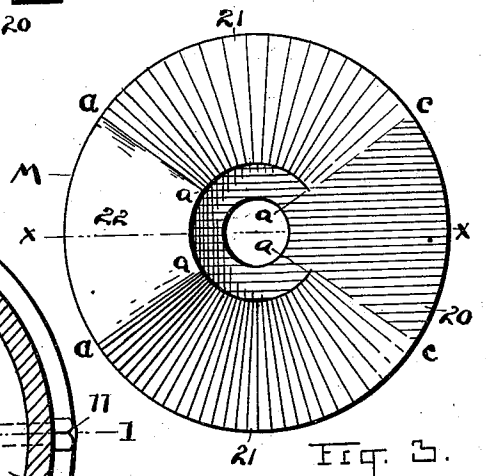

Fig. 3.

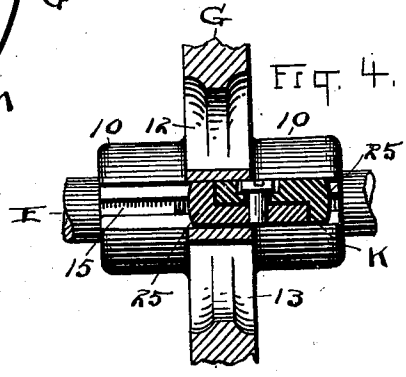

Fig. 4.

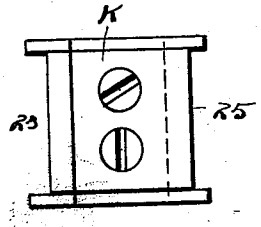

Fig. 5.

Attest
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ROTARY MACHINE.

SPECIFICATION forming part of Letters Patent No. 548,112, dated October 15, 1895.

Application filed September 8, 1894. Serial No. 522,504. (No model.)

To all whom it may concern:

Be it known that I, VARNUM F. CARPENTER, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Rotary Machines; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to rotary machines; and the invention consists in a rotary machine having cam-faced pistons of special and novel construction and of a compartment-cylinder with a piston in each compartment and adapted to pump water, air, gas, or any other kind of fluid or liquid, all substantially as shown and described, and particularly pointed out in the claim.

In the accompanying drawings, Figure 1 is a horizontal sectional plan view of the casing on a line corresponding to 1 1, Fig. 2, but showing a full edge view of the pistons. Fig. 2 is a cross-section of the machine on a line corresponding substantially to 2 2, Fig. 1, and having the middle wall or partition between the chambers broken away at one side and showing part of the piston in the opposite chamber. Fig. 3 is a face view of one of the pistons. Fig. 4 is a view of a section of the shaft at the center of the machine and showing the middle stationary hub thereon having a longitudinal groove, in which the piston-slide is supported along one edge, and revealing, also, a cross-section of said slide and of the middle partition on a line corresponding substantially to 3 3, Fig. 2, but omitting the casing and the pistons. Fig. 5 is a plan view of the piston-slide alone.

The machine herein shown and described is comprised, first, of a suitable casing for the pump, consisting of the central cylindrical section A and the similar caps or heads B. The cylinder A has centrally-arranged inlet and outlet openings 2 and 3 side by side but separated so as to prevent any interflow whatever between them, and pipes C and D are shown here as connected with said openings. The heads or caps B of the casing are shown as having concave portions 4, in which the hubs of the respective pistons are accommodated, and bearings 5 for the shaft outside of the said concave portions. They likewise have a flat inner surface 6, extending entirely around near to or at their outer edge, which forms a close connection with the correspondingly-flat surface of the adjacent piston, and the said cylinder A and caps B are separably and tightly united with screws 8. The shaft E is the power-shaft and has a pulley F, through which it is driven. At the center of the said casing and midway between what may be termed the "ends" thereof covered by caps B is a partition or wall G. This partition is a wholly separate piece, so far as the casing is concerned, and is set therein before the caps B are put in place. It has a central hub 10, fitting closely upon the shaft E, so as to prevent the passage of water from one chamber to another, but yet leaving the shaft free to turn therein, and at its edge it fits snugly about the inside of cylinder A and is fastened at two or more places by screws 11 to keep it in its proper place in the casing. At what may be called the "front" of the machine the said partition bisects the inlet and outlet openings 2 and 3, so as to serve equally well as a divider for both piston-chambers, and to further accommodate itself to the inflow and outflow of fluid or liquid the said partition is formed with scarfed recesses 12 and 13 in its edge opposite the respective openings 2 and 3. These recesses or notches are of just sufficient depth and width to meet the needs of uninterrupted flow, so far as uniformity or evenness of volume is concerned, and the relative depth is clearly seen in Figs. 1 and 2. This recess has a further relative depth in connection with the pistons, as will appear farther on. A web 14 separates the inlet and outlet openings 2 and 3, and in the face of this web there is a groove corresponding to the groove 15 in sleeve 10 of the partition. The piston-slide K is entered into these grooves and is adapted to slide back and forth therein between the pistons and through a slot in the partition E corresponding nicely to the thickness of the said slide, so as to make it watertight. It will be noticed that the said slide is square and that it bears against the pistons at its opposite edges and along the entire edge at each side at the same time that it is supported in and moves back and forth in the

grooves along its other edges. The said slide is shown here as made in two pieces screwed together, but it may be made in one or more pieces, and the parts thereof may be adjustable in respect to each other to take up wear.

Now referring to the pistons M and N we have two members which are exact duplicates of one another, but in reverse position, so as to make them work together with the same inlet and outlet openings. Otherwise they might be set alike on the shaft and each have its own inlet and outlet. That would produce a slightly interrupted or intermittent flow in each pump, because there would be a time in each at every revolution in which both passages 2 and 3 would be momentarily closed; but by making the pistons work together and setting them on the shaft reversely in all particulars I am enabled to bring the closing-point of one piston opposite the freest opening or inlet-space of the other, and thus not only avoid a dead point, but maintain a uniform flow. The said pistons have a perfectly-flat exterior 16, which fits closely on the flat surface 6 of the casing, and their peripheries also fit closely upon the inner surface of the cylinder A. These surfaces are of course all formed to be perfectly true one to the other, and they are so close that I can run the pump successfully and with very little leakage without either of the end caps or heads B.

The pistons have what I call double or reverse cam-surfaces on their face. These cam-surfaces or cams have a common starting-point, which is indicated by 20 and clearly seen in edge view, Fig. 1, and in the face view, Fig. 3. From this narrow portion of the piston, covered by the flat surface 20 and representing about one-fifth of the working face, the cams or inclines 21 begin to rise and extend to the full-depth flat-surface portion 22 of the piston. These inclines are formed on perfectly-straight lines on all measurements by the radial lines shown in Fig. 3 and extending between *a* and *c*; but since these lines have a common center at the axis of the piston and each cam or incline extends over nearly or quite one-third of the face of the piston it necessarily takes on the peculiar spiral form and appearance seen in Fig. 1. To this construction also is due the remarkable power and capacity of the pump, for it gives to the piston something of the peculiar action of the screw in discharging the fluid which makes it easy and noiseless.

The operation of piston-plate K in conjunction with the pistons now becomes clear. Since all the lines of the cam-surfaces are radial the said surfaces are perfectly straight at all points and adapted to work with or upon the straight sides 25 of the said plate. The same is true of the flat surfaces 20 and 22, which cover exactly equal areas, and so when the said plate is in contact with the flat surface 20 of either piston it is at the same time in contact with the flat surface 22 of the other piston. By this construction and arrangement of pistons, therefore, it may be said that a perfectly-uniform channel is formed between the two pistons corresponding to the width and depth of the plate K, and this is true theoretically, though, of course, the division-wall G comes in to participate in the work of forcing the liquid carried in said channel forward as desired. However, the channel is nevertheless uniform for inlet and outlet purposes, and it carries forward an even volume of the fluid by the very reason of the construction described. Thus in Fig. 1 the full depths of inlet and outlet are opposite flat portion 20 at the right, while portion 22 covers both ports momentarily at the left. Then as both pistons the next instant move forward as one incline 21 comes and narrows the inlet the reverse incline at the other side correspondingly opens the inlet, and the same is true of the outlets. Hence the perfect uniformity of the flow.

The plate K is caused to play back and forth under the action of the pistons and accommodates itself to both, so as always to form a barrier between the inlet and outlet. Its full area is constantly exposed on both sides, first to the inlet volume and then on the other side to the discharge volume.

The power of the pump of course resides in its inclined cam-surfaces running to a closing-point 20, which sweeps the entire contents of the pump forward into the discharge. The capacity of the pump is only limited by its size and the depth of its pistons from back to face, so as to make pockets of greater or less capacity. As here shown, the pump is double-acting. Each piston also has a double operation of its own, whereby it is made to discharge and take in a load at the same time. Thus assuming that the pistons are traveling in the direction of the arrows, Fig. 1, we see that the fluid-space is divided by the horizontal plate K into two equal subdivisions on a center line corresponding to *x x*, Fig. 3. This piston is therefore discharging from one subdivision while it is loading in the other, and the only interruption of this double action or operation occurs when the full portion 22 of the piston is passing the ports 2 and 3.

Each piston has a recess at its center on the face side, which is entered by the end of the hub or sleeve 10 of the middle partition G.

It will be noticed that the sliding division-plate K is composed of two sections lying flat one upon the other and adjustable laterally, as described, to take up wear by the pistons, and each section or part has its edge 25 of the full width of both sections overlapping the other section with a lateral extension or enlargement upon which all the wear at that side comes.

Having thus described my invention, what I claim is—

The machine described consisting of the casing having inlet and outlet openings, side by side, the central partition G forming the casing into two chambers and having a hub

—10— integral therewith on each side and a transverse slot at its front between said inlet and outlet openings in the casing and terminating in a groove or channel longitudinally in said hubs, a piston in each chamber having on its face two reverse inclines —21— and two opposite flat surfaces —20— and —22— at different elevations on said face, and a sliding division plate between said pistons having its opposite edges engaging the faces of said pistons, said plate consisting of two parts adjustable on each other to take up wear at their edges and the edge of each part overlapping the edge of the opposite part at one side and constituting the wearing surface at that side, and the drive shaft through said pistons, substantially as set forth.

Witness my hand to the foregoing specification.

VARNUM F. CARPENTER.

Witnesses:
H. T. FISHER,
GEORGIA SCHAEFFER.