No. 628,906. Patented July 11, 1899.

J. GRINDROD.

ROTARY PUMP OR MOTOR.

(Application filed Sept. 14, 1898.

(No Model.)

2 Sheets—Sheet 1.

Fig 1

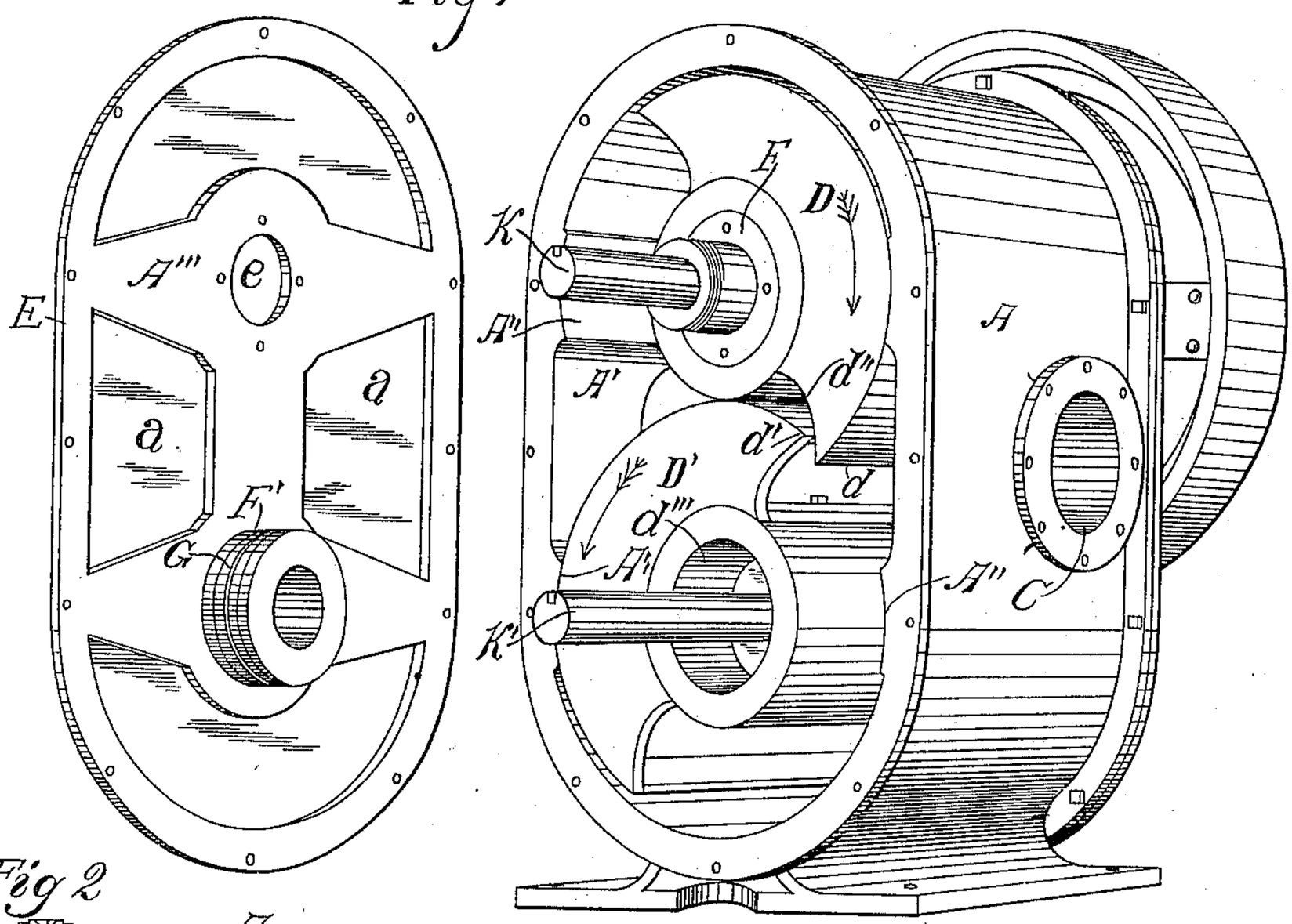

Fig 2

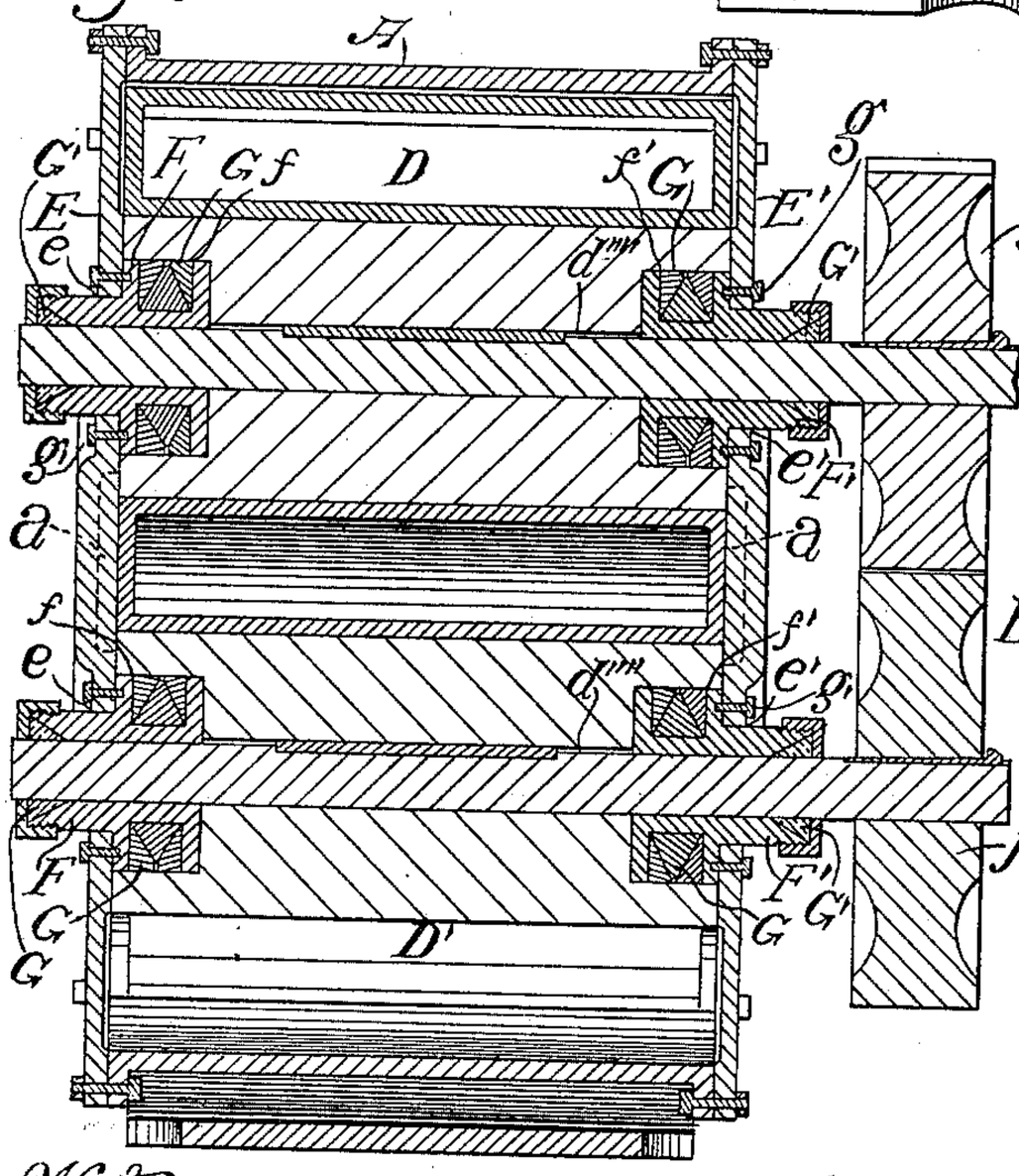

Fig 3

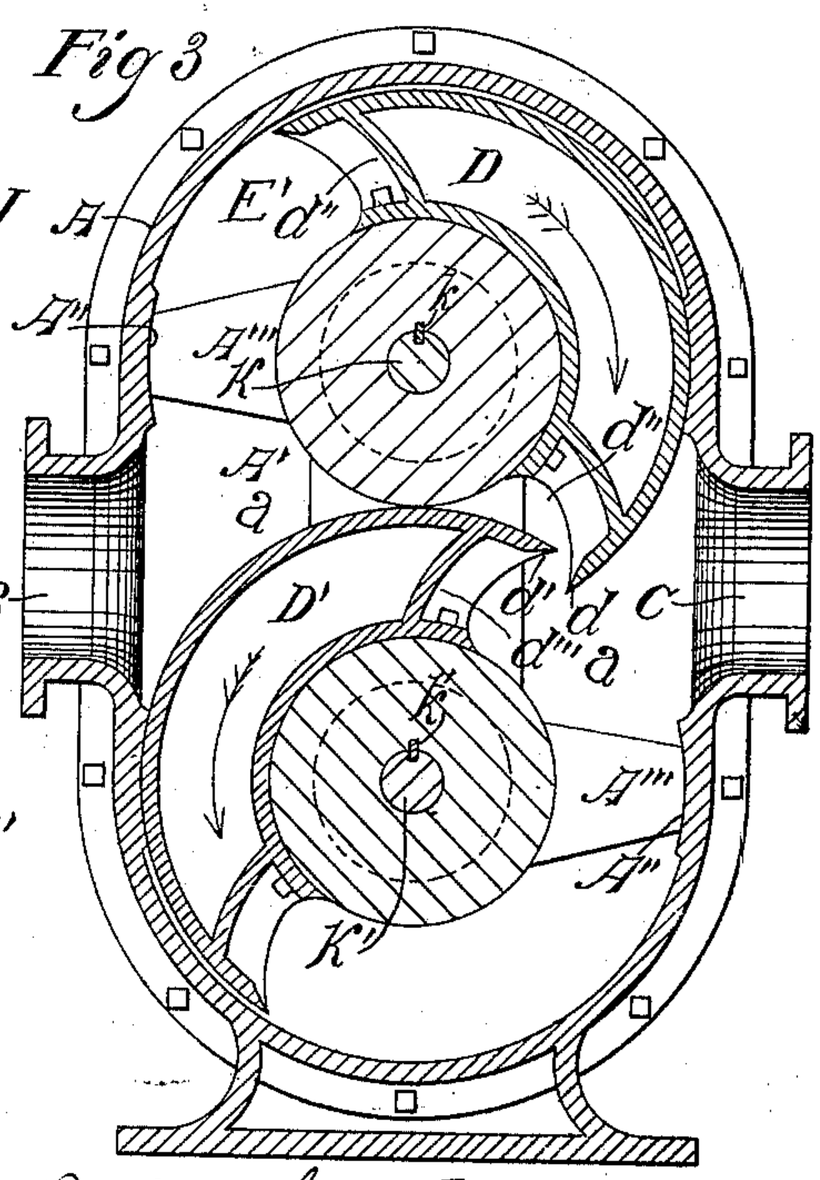

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Fig: 4

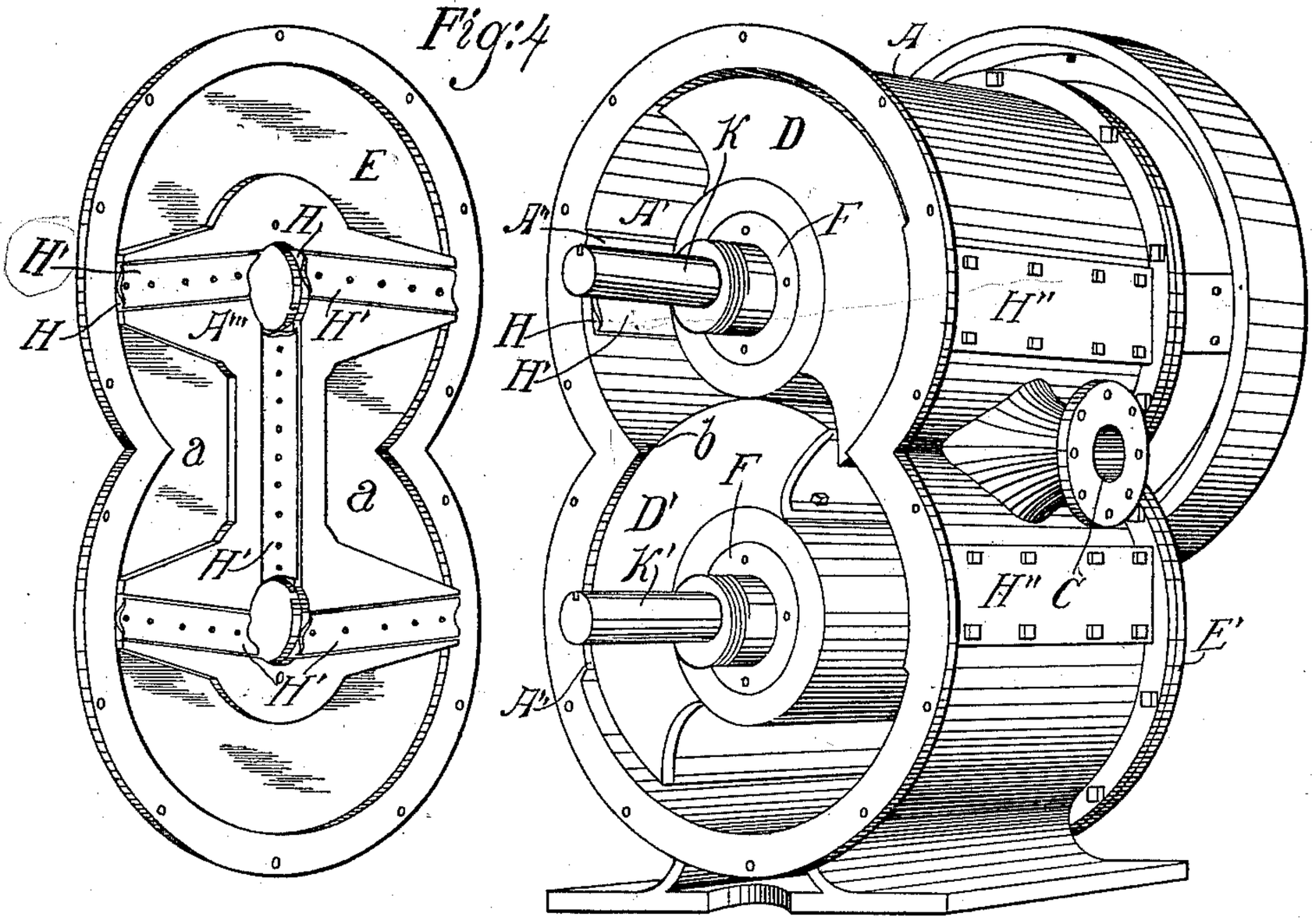
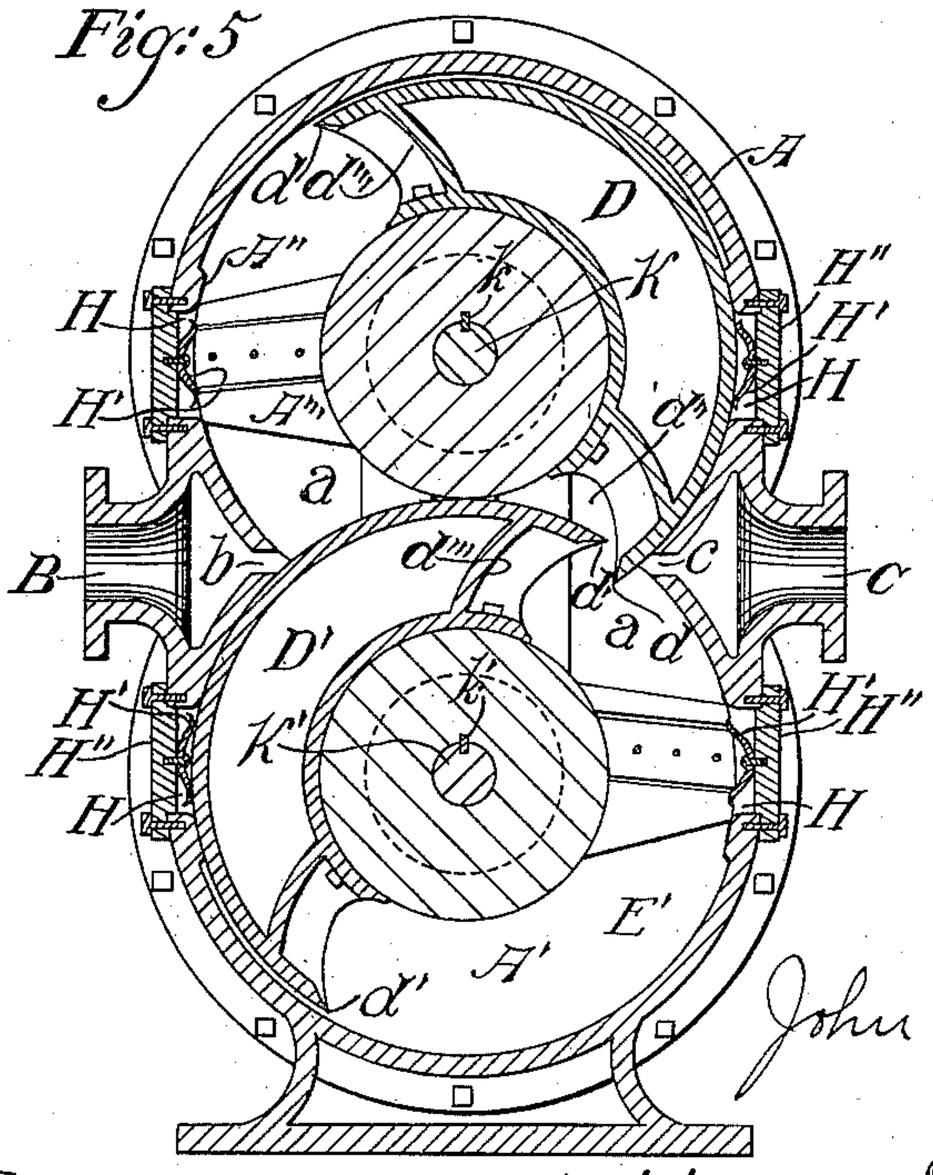


Fig: 5



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UNITED STATES PATENT OFFICE.

JOHN GRINDROD, OF LOS ANGELES, CALIFORNIA.

ROTARY PUMP OR MOTOR.

SPECIFICATION forming part of Letters Patent No. 628,906, dated July 11, 1899.

Application filed September 14, 1896. Serial No. 605,828. (No model.)

To all whom it may concern:

Be it known that I, JOHN GRINDROD, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Rotary Pumps or Motors, of which the following is a specification.

My invention relates particularly to that class of pumps or motors in which segmental pistons are arranged within a chamber and by their rotation are alternately brought into action to draw water into and discharge it from the pump-chamber or are alternately operated upon by pressure of falling water or of expanding gases or steam to convert power.

One object of my invention is to reduce the friction upon the pistons and at the same time provide effectual means for preventing the slip or accidental escape between the pistons and the walls of the chamber of water when the device is used as a pump or of water, steam, or gas when the device is used as a motor. My device is also adapted for use as a blower and as such is positive in its action.

A further object of my invention is to provide an improved bearing for devices of this kind and to so arrange the bearing that the pistons may be supported by means of a comparatively thin casing, and yet a bearing of great strength and length be secured.

My invention comprises the various features of construction and combinations of parts hereinafter fully set forth and claimed.

The accompanying drawings illustrate my invention.

Figure 1 is a perspective view of a device embodying my invention. In this view one end of the casing is removed in order to expose the construction. The device as shown is especially adapted to operate as a water-pump or a water-motor. Fig. 2 is a vertical longitudinal mid-section of the same. Fig. 3 is a vertical cross-section of the same. Fig. 4 is a perspective view of a device embodying my invention and particularly designed for use as a steam or gas motor. The end of the casing is removed, as in Fig. 1. Fig. 5 is a vertical cross-section of Fig. 4.

In Figs. 1, 2, and 3 of the drawings I have shown my invention as applied to a pump or water-motor, the device being applicable to either use.

In Figs. 4 and 5 I have shown my invention adapted for use as a gas or steam engine and have also shown improved devices for adapting the device to work under high pressure with small loss of power.

In the drawings, A represents a casing, which is provided with chamber A′, having an inlet B and an outlet C. The inlet and outlet are preferably arranged upon opposite sides of the chamber and in the same horizontal plane, as shown in the drawings, so as to allow for the ready escape from the chamber of any heavy sand, gravel, or other matter drawn into the chamber when the device is used as a pump. This will be more fully explained hereinafter. Within this chamber are arranged two segmental rotary pistons D D′, which are of the form usually employed in devices of this kind. In order to be thoroughly effective in operation, it is essential that the points $d\,d'$ of the pistons be fitted to closely pass each other, and when this is done when the points come together there is formed between the pistons a chamber d'', as indicated in Fig. 3, in which the pistons are shown in the position they assume after the points have passed each other. In order to allow for the escape from the chamber d'' of the fluid thus confined, I provide recesses a in the ends of the chamber opposite the point at which the points of the pistons pass each other, so that a communication exists between the chamber A′ and the chamber d'', through which the fluid may escape.

In order to provide means for giving to the pistons a long and tightly-fitting bearing without the necessity of handling large and heavy castings for the purpose of turning fixed bearings, I provide the ends E E′ with journal-openings $e\,e'$ and I provide journal-boxes F F′ to fit within the openings. Each piston has a longitudinal shaft-opening d'''' and is provided in each end with a cylindrical journal-opening d''', in which the cylindrical ends of the journal-boxes fit, as clearly shown in the drawings. Packing composed of expansible rings G fitting in grooves $f\,f'$ in the journal-boxes forms a hermetical closure between the journals and the pistons. Packing

G′ is arranged on the outer end of each journal-box to further guard against leakage from the chamber. These journal-boxes may be made of brass or any other suitable material and may be easily and conveniently turned and then fitted in the journal-openings in the casing, where they are secured by means of cap-screws g'. I find in practice that this feature is of the highest importance, it enabling me to produce my pump with much less expense than is otherwise possible and to accurately fit the bearings by use of machines found in ordinary machine-shops. Where the journals are made integral with the cover, it becomes necessary to provide a lathe which will receive and turn the entire cover, and such lathes are not commonly available in ordinary machine-shops, and consequently the price of such work is much more than that of work done by smaller machines. When the journal-blocks are made integral with the cover or casing, it is extremely difficult to turn the blocks and face the cover upon the inside and to drill the holes through the journal-blocks so that the bearing-faces of the journals will be exactly at right angles with the inner face of the cover. By my improved construction the cover being devoid of projections upon the inside is placed in a planing-machine and quickly and cheaply dressed to an even face. Then the openings for the journal-blocks may be drilled by an ordinary drilling-machine, it not being essential that they be perfectly straight and true with relation to the face of the cover. The journal-blocks may be dressed or turned in a small lathe and at slight expense, and when placed within the openings in the cover the shoulder upon the journal-blocks will rest square upon the flat face of the cover, and thus the axis of the journal-opening and the cylindrical outer wall of the journal-block will be brought into exact right-angle position with relation to the inner face of the cover. The bolts which secure the blocks to the cover insure that the blocks will fit closely and accurately against the inner face thereof.

I found that in practical operation in endeavoring to turn the bearings integral with the cover the cover had to be so secured at first as to turn one journal-block and the cover released and again set in order to turn the other journal-block. It is practically impossible to reset the cover so that the two journal-blocks will be turned exactly parallel with each other and the journal-openings therethrough drilled in the same relation. If this is not done, the bearings will bind and cause great friction and loss of power. Furthermore, by providing an opening through the cover to receive the block the journal-block is so arranged that its engagement with the cover by which it is supported is substantially near the mid-line of the journal-block, and therefore, although the cover may be very thin, the bearing between the shaft and the journal-block is very long and adapted for sustaining without excessive wear the severe strains and thrusts to which such devices are subjected when working under heavy pressure. This result cannot be accomplished unless the journal-blocks extend through the openings in the casings, and those devices which have removable blocks fitted into the ends of the cylinders, but terminating in line with the inner wall of the cover of the casing, will not perform the functions which are performed by my improved bearing. Another great advantage to be derived from my improved bearing is the ease with which the bearings may be renewed when worn. Where the bearing is made integral with the cover, the entire cover or end of the casing must be discarded and a new one substituted therefor when the journals become worn. It must also be borne in mind that in my device the piston is journaled upon the journal-blocks and that in order for any water or steam to escape through the journals it must pass between the journal-block and the piston to the shaft and then through the entire length of the bearing between the shaft and the journal-block. If the block does not extend into the piston, this effect cannot be secured, and if it extends into the piston and not into the cover or end of the casing so much strain falls upon the fastenings which secure the journals to the casing as to quickly work them loose. The only alternative is to make the journals integral with the covers or ends, and this is not possible without great expense of manufacture and much additional expense for renewing the journals when worn.

In order to lessen the friction of the pistons against the walls of the chamber A′, I provide narrow bearing-faces A″ projecting from the side walls of the chamber and fit such bearing-faces to the pistons. Thus the friction upon the pistons is reduced to a minimum, while the escape of fluid is practically prevented. Furthermore, this construction greatly reduces the surface to be dressed by machinery to fit the surface of the pistons, and the expense of construction is much less than where the entire face of the chamber is turned to conform to the pistons. Bearing-faces A‴ also project from the end walls of the chamber, so that the friction upon the ends of the pistons is also reduced.

In Figs. 4 and 5 I have shown my invention adapted for use as a gas or steam engine. In working under high pressure there is liability of the steam or gas pressure escaping unless a suitable packing be used between the walls of the chamber and the pistons. One important feature of my invention is the simple and effective manner in which I provide pressure-packings which are operated by the pressure within the chamber A′ to form a tight packing as long as the packings are sub-

jected to pressure, but will be released as soon as the pressure is removed from the packings.

H represents chambers formed in the bearing-faces of the chamber A′, and H′ represents pressure-operative devices located in such chambers. These are preferably adapted to receive pressure from either side, so that they will operate no matter in which direction the pistons may be rotated; but in case the pistons always rotate in one direction the pressure-operated devices need work only in one direction. As shown in the drawings, these chambers H are slots extending from the outside of the casing into the chamber A′, and the slots are closed by means of cap-plates H″. The pressure devices H′ are secured to the cap-plates, so that when the cap-plates are fastened in place upon the casing the devices will be chambered in the chambers H′ and will contact with the pistons.

In order to allow the casing A to be cast in one piece, the slots or chambers H′, as shown in Figs. 4 and 5, do not extend entirely to the ends of the casing, but leave flanges connecting the various sections of the casing, as shown in Figs. 4 and 5. The pressure-packings H′ are formed of leather when the device is used for water, or when used for gas or steam of spring metal, such as brass or steel or other suitable material, formed into U shape, as shown, having the ends slightly bent or curved to slide easily upon the piston, the base of each U-shaped flange being secured to one of the cap-plates H″. The pistons are of the same length as are the slots H, and the U-shaped springs H′ are of sufficient length to extend entirely across the piston-chamber. The end pieces or covers E and E′ both have their bearing-faces A‴ raised so they will project into the chamber, as shown in Fig. 4, to fit closely against the ends of the piston when the ends of the casing are secured in place.

In Figs. 4 and 5 I have shown the inlet and outlet to the chamber A′ arranged in the form of long narrow slots *b* and *c*, respectively, and have continued the bearing-faces A″ up to the mouths of the slots, so that the pistons will cut off the supply and exhaust quicker than they will in the form shown in Figs. 1, 2, and 3. This will give a greater uniformity of motion when the device is used as a motor; but this construction may be omitted, if desired, without departing from the spirit of my invention.

It is to be understood that the form shown in Figs. 1, 2, and 3 may be provided with the U-shaped springs H′ if it is desired to work the pump or water-motor under heavy pressure. This construction, however, will not be necessary when the device is used for lifting water moderate heights.

By arranging the casing with the inlet B and outlet C upon opposite sides thereof and in the same horizontal plane the tendency of the current of water and of the force of gravity is to carry toward the outlet all gravel, sand, or other light material which may be drawn into the pump through the inlet. If the device is arranged with the axes of its pistons in the same horizontal plane, the inlet at the bottom and the discharge at the top, the tendency of gravity will carry all heavy matter down between the pistons, where it will be caught and will grind and wear the surface of the pistons.

In practice when the device is used as a gas-engine suitable igniting devices will be supplied, but such devices may be of the common and well-known form and are not of my invention. Therefore they do not require illustration or description herein.

In practice to operate the device as a pump the ordinary supply-pipe (not shown) is connected with the inlet of the casing and a suitable discharge-pipe (not shown) is connected with the outlet. Then power is applied to rotate the two pistons, which are geared together by cog-wheels J J′ in the directions indicated by the arrows in Figs. 1 and 3. The pistons alternately operate to draw water into and discharge it from the chamber A′. As the points *d d′* pass each other the fluid confined in the chamber *d″* escapes through the recesses provided in the ends of the chamber, and thus cushioning is prevented. The face *d‴* of each piston below its point recedes out of the path of the point of the other piston, so that immediately after the points pass each other perfectly free and unrestricted escape of all fluid in the chamber is provided for.

When the pressure-operated packings H′ are employed, if enough fluid escapes between one of the pistons and its bearing-face to enter the chamber H the pressure operates the packing and forces it tightly into contact with the piston, thus forming a hermetical closure. The greater the pressure the tighter will the packing be pressed against the piston.

The pistons D D′ are fixed upon the shafts K K′, respectively, by keys *k k′*, and the shafts pass through the journal-boxes F F′, as shown in Fig. 2. Thus the pistons are supported by the shafts resting in the journal-boxes and also by the journal-boxes fitting into the cylindrical openings in the ends of the pistons, and a very effective bearing is provided without necessitating that the ends E E′ of the casing be made thick.

Now, having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a pump or motor, the combination set forth of a casing provided with a chamber having an inlet and an outlet and having in its end walls journal-openings; two rotary segmental pistons arranged in the chamber and each provided in each end with a cylindrical journal-opening, each piston being also provided with a shaft-opening extending longitudinally through the piston; journal-blocks, each adapted to fit within one of the openings in the casing, and each provided with a grooved

cylindrical end adapted to fit within one of the journal-seats in the pistons; a suitable packing arranged in the groove to close the joint between each journal-block and the piston, and supporting-shafts passed through the journal-blocks and each piston and secured to the piston.

2. In a pump or motor, the combination set forth of a casing provided with a chamber having an inlet and an outlet and having in its end walls journal-openings; two rotary segmental pistons arranged in the chamber and each provided in each end with a cylindrical journal-opening, each piston being also provided with a shaft-opening extending longitudinally through the piston; journal-blocks, each adapted to fit within one of the openings in the casing, and each provided with a cylindrical end having a groove therein and adapted to fit within one of the journal-seats in the piston; expansible rings arranged in the groove to form a packing between each journal-block and the piston; and supporting-shafts passed through the journal-blocks and the pistons and secured to the pistons.

3. In a pump or motor, the combination set forth of a casing having a chamber provided with an inlet and an outlet; rotary segmental pistons arranged in said chamber; narrow bearing-faces projecting from the end and side walls of such chamber and fitted to conform to the faces of the pistons; chambers provided in the bearing-faces; and spring-pressure packings located in the chambers and adapted to be operated by the pressure to form packings for the pistons when pressure is applied on either side of the packings.

4. In a rotary pump or motor, the combination set forth of a casing provided with a chamber having an inlet and an outlet; rotary segmental pistons arranged in the chamber; narrow bearing-faces projecting from the walls of the chamber and fitted to conform to the faces of the pistons; slots extending from the outer walls of the casing through the narrow bearing-faces; cap-plates secured to the casing to close the slots and having attached thereto pressure-operated devices adapted to form packings for the piston.

5. In a rotary pump or motor, the combination set forth of a casing having a chamber provided with an inlet and an outlet; rotary segmental pistons arranged in the chamber; narrow bearing-faces projecting from the walls of the chamber and fitted to conform to the faces of the pistons; slots extending from the outside of the casing through the narrow bearing-faces; cap-plates adapted to be secured to the casing to close the slots; pressure-operated packings each composed of a trough-shaped spring-metal plate, one secured to each cap-plate and adapted to project through the slot and to form a packing for the piston.

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