(Model.)

L. H. NASH.

WATER METER.

No. 280,221. Patented June 26, 1883.

Fig. 1.

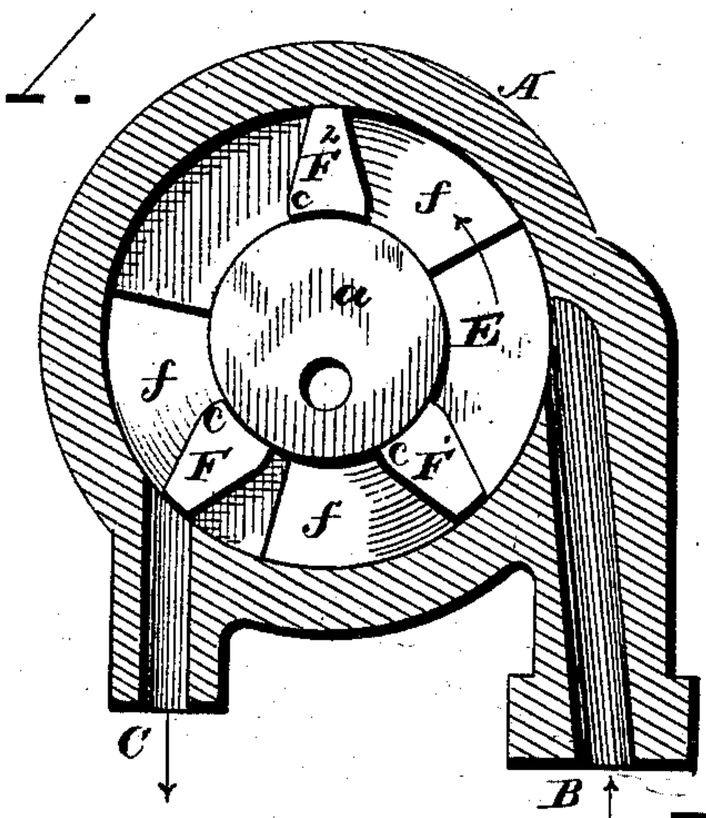


Fig. 2.

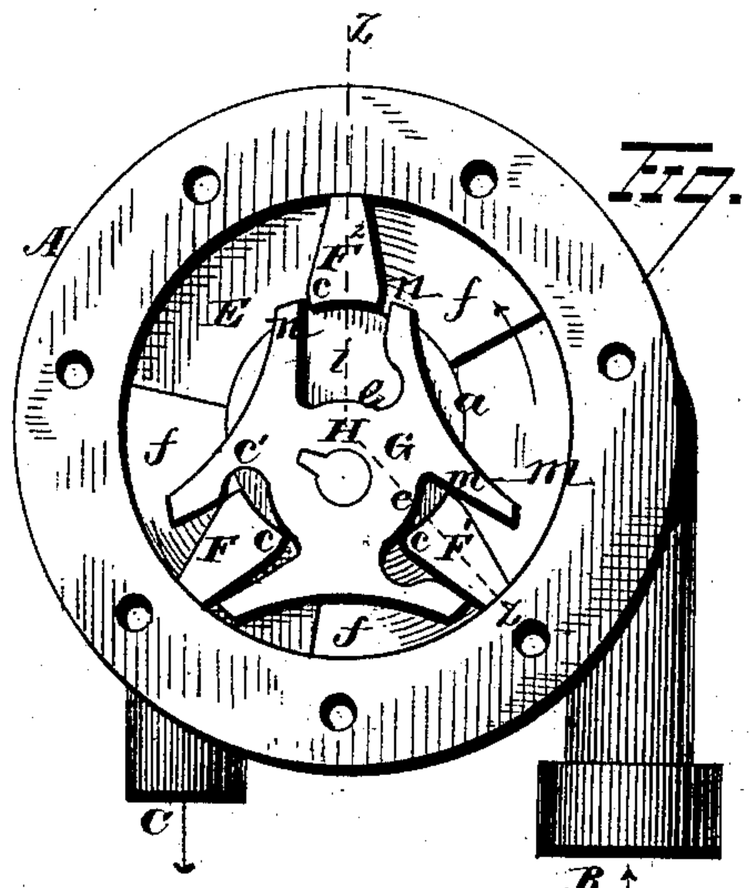


Fig. 3.

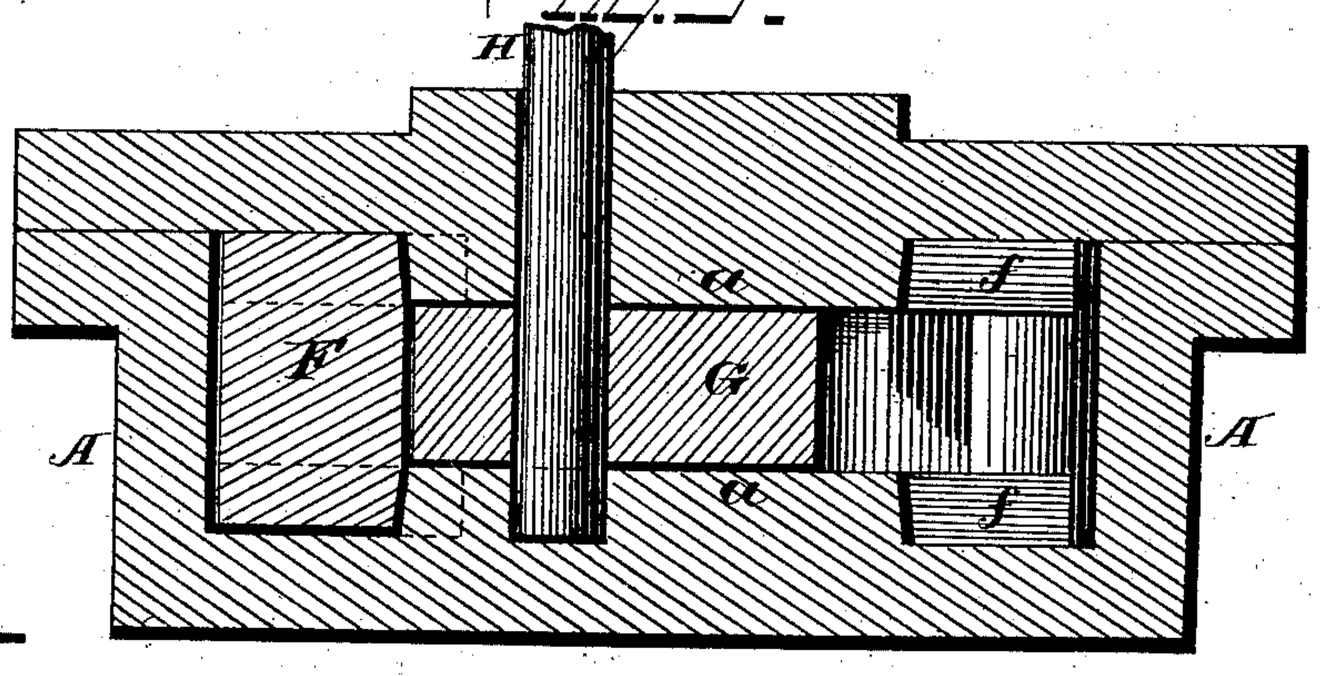


Fig. 5.

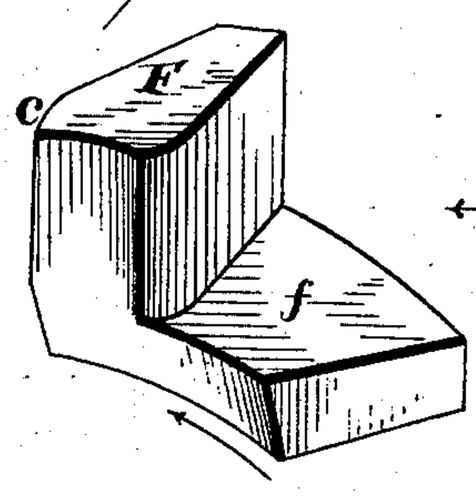


Fig. 6.

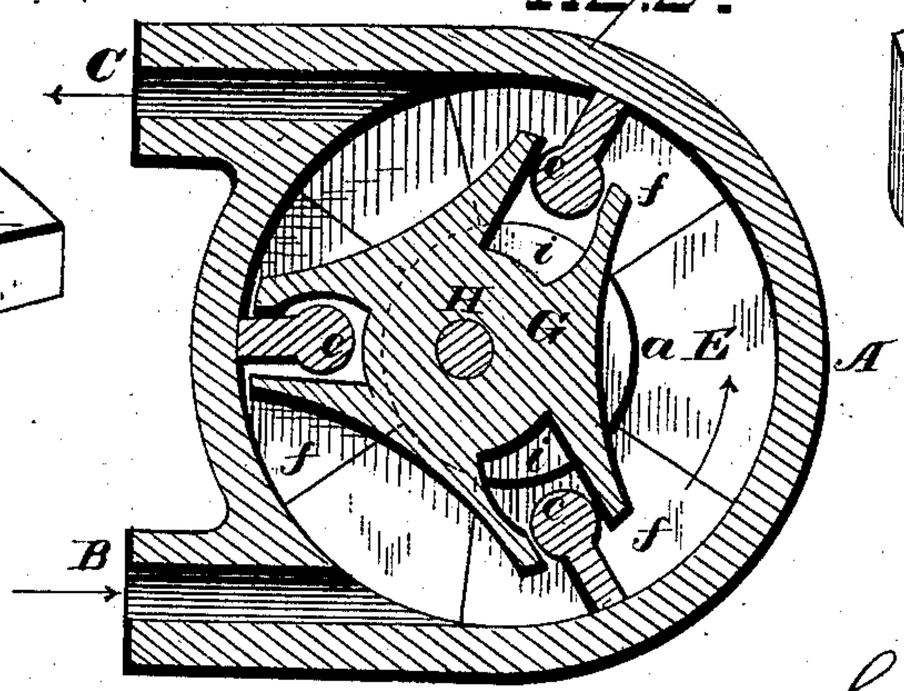
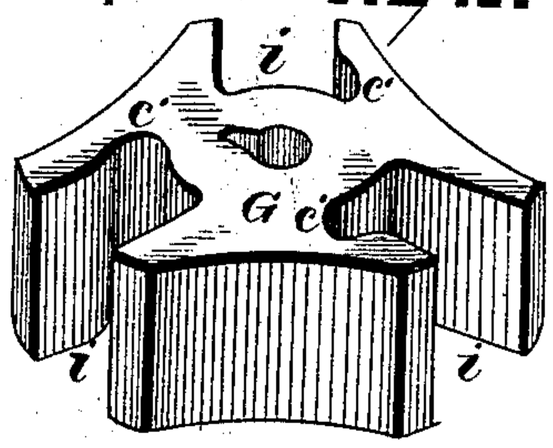


Fig. 4.



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LEWIS H. NASH, OF BROOKLYN, ASSIGNOR TO NATIONAL METER COMPANY, OF NEW YORK, N. Y.

WATER-METER.

SPECIFICATION forming part of Letters Patent No. 280,221, dated June 26, 1883.

Application filed January 24, 1881. Renewed January 30, 1883. (Model.)

To all whom it may concern:

Be it known that I, LEWIS HALLOCK NASH, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented new and useful Improvements in Water-Meters, of which the following is a specification.

My invention relates to improvements in water-meters in which radially-arranged pistons adapted to travel in a case are controlled entirely in a circular path of rotation by the chamber within which they rotate, and in which their dividing positions with respect to the center of the case or the wall of said chamber are not changed during any part of their revolution. With the pistons thus adapted for operation I combine an armed lever eccentrically fulcrumed within the chamber, and which forms the transmitter for the pistons, the positions of which pistons will always be radial to the center of the chamber, and not to the center of the lever. The lever is constructed with three arms, giving large intervening spaces for the passage of the water and to lighten the moving parts. It serves to confine the pistons in their relative positions within the case, to control the relative velocities of the pistons, and to transmit their motion to the dial mechanism by means of the shaft upon which it is mounted. The pistons are fitted loosely within slots of the lever-arms, the form of contact being such as to allow freedom of motion to these parts within the case, and also to leave between the bearing-edges of the pistons a passage for the water into the slots, as the lever-arms, by their eccentric rotation, expose and inclose the pistons, the object of which water-passage is to extend the pressure of the water upon the arms of the lever within the slots by forcing the piston-bearings against one side of the slot, so as to make a tight joint at the driving side of each lever-arm. The advantage of this construction is that the wearing of the joints does not cause any leakage, as the piston always takes up its wear and maintains a tight joint at the bearing. To maintain the proper relative positions of the pistons within the chamber and the slots of the lever-arms, the pistons are formed with end segmental bearings which travel within the chamber, between its walls and a concentric hub on each head of said chamber, whereby only sufficient contact of the pistons with the lever-arms is required to transmit the power applied to said lever by the pistons. It is important that these segmental bearings should follow the pistons, and thereby reduce the friction of the moving parts to a minimum and avoid oblique pressure upon the bearing-surfaces of the lever-arms and the pistons.

My object is to produce a water-meter of simple construction and with the least weight and friction of the moving parts, using an armed lever of hard rubber to transmit the motion of the pistons to the dial mechanism, and forming the pistons and their controlling-bearings of the same material, whereby the surfaces of the moving parts are kept from corroding and free from the collection of sediment, insuring the smooth and free working of the moving parts, and with pistons maintaining tight joints at their contact-bearings with the case, and the lever which transmits its motion to the dial mechanism.

Referring to the accompanying drawings, Figure 1 represents a circular chamber in section, within which the pistons are free to move in a concentric path when force is applied to them; Fig. 2, a similar view, showing the armed lever eccentrically arranged for communicating the motion of the pistons to the shaft of the dial mechanism; Fig. 3, an axial section of the same; Fig. 4, the armed lever; Fig. 5, one of the pistons, showing one of its segmental bearing ends; and Fig. 6 shows a slightly-modified form of piston and lever-slots.

A cylindrical chamber, A, has induction and eduction ports B and C, which communicate with the water-pipes in the usual manner and form the casing of the meter. The heads of this cylinder are formed each with an inward-projecting concentric hub, *a*, of suitable diameter, between the circumference of which and the walls of the chamber E segmental end bearings, *f*, of the pistons are adapted to travel in concentric paths against the inner sides of the cylinder-heads, the pistons spanning the space within the chamber between said end bearings, and occupying radial positions with respect to the center of the chamber.

The pistons F F′ F² are preferably of hard rubber and integral with their segmental bearings *f*, by which the pistons are confined in their movements to a circular path controlled by the case and the hub-bearings.

Within the casing, and eccentric thereto, an armed lever, G, of hard rubber, is mounted upon and secured in any convenient manner to a shaft, H, journaled in bearings in the opposite heads of the cylinder. The arms of the lever G have radial slots *i*, which receive the pistons as they are revolved, being driven by the driving-piston, so as to travel with said driving-piston and carry the driven pistons. In order to provide for the relative changes and free working of the lever and the pistons, the latter are provided with rounded bearings *c* at their inner edges; or the slots may be enlarged, or provided with a curved recess, *c′*, on one of their inner sides, as in Fig. 6, so that the lever may oscillate slightly over the pistons.

I have shown in the drawings, in Fig. 3, segmental bearings *f* at both ends of the pistons; but as the thickness of the lever is equal to the depth of the chamber E, and as the pistons are also equal to such depth of chamber, they will operate with a segmental bearing at one end only. The thickness of the segmental bearings *f* is equal to the projection of the concentric hubs *a*, so that the lever, being placed between such concentric hubs, may operate over and in contact with the inner sides of said segmental bearings. The lever is formed of three equidistant slotted arms, into the slots of which the pistons are received and uncovered as they revolve by the eccentric relation of the lever with the concentric path traversed by said pistons. The lever-arms, while revolving in close proximity to the wall at one side of the case, do not make the joint therewith, but the pistons divide the case at all points, as shown in Fig. 2. The pistons, when on the passage at *n*, engage the lever-arm at a greater distance from the fulcrum than when they are at *m*, so that the piston F² will travel faster than the others, and the space on the inlet side will be continually enlarging, while that on the outlet side will continually decrease in volume. This construction gives two independent sources of power—viz., that due to pressure of the water upon the pistons and that due to its pressure upon the lever-arms. The power due to the pressure upon the pistons will equal the pressure upon the driving-piston multiplied by its velocity, less the pressure upon the driven piston multiplied by its velocity. The power developed by the pressure upon the lever-arms is by reason of the piston F² engaging the lever-arm at *n*, at a greater distance from the fulcrum than F′. At *m* there is a greater area, *n e*, exposed than at *m e*, and the pressure acting, the difference between these areas will give a force tending to rotate the lever in the direction of the pressure upon the longer arm.

In Fig. 2 I have shown, by dotted lines *z z*, the radial positions of the pistons in relation to the case, so that they always travel in a circular path. The lever-slots *i* are of a width a little greater than the width of the pistons, so as to leave a passage for the water into said slots, thus not only producing and maintaining a tight joint at the contact-point of the lever and piston, but extending the driving-pressure upon the arms within the slots. This contact-point may be formed by enlarging the inner end of the piston, or by recessing one side of the slot back of the point of the lever, as shown in Figs. 2 and 6; but in either case the pressure of the piston upon the lever will be in a direction of the pressure of the water until the piston passes the outlet-point, when the pressure from the inlet upon such piston will be in the opposite direction, so as to form a close joint by the piston with the case between the inlet and the outlet ports, as in Fig. 6, instead of forming such joint by the arms of the lever.

The segmental bearings *f* extend only from one side of the pistons, so as to follow them, and thus prevent any advancing point striking or rubbing against the wall of the cylinder, and the least friction and best results are obtained when the segmental bearings form an arc of ninety degrees. The segmental bearings also avoid oblique pressure of the lever upon the pistons, which would produce an oblique pressure of the piston upon the wall of the cylinder, and to avoid such oblique pressure the sides of the lever-slots which drive the pistons against the pressure are recessed at *c′*, or formed so as to relieve such oblique action by causing the lever to move smoothly over the inner ends or corners of the pistons when they are being forced against the pressure, which occurs while the piston is traveling between the inlet and the outlet ports of the cylinder.

The piston driven by the pressure must of course receive the power to force the returning piston against the pressure, making it necessary to employ a proper connecting device by which this may be accomplished. This connecting device is furnished by the eccentric lever, the pistons being so connected with the slotted arms thereof that the driving-piston shall move through a greater distance than the driven piston, whereby the driving-piston will gain a "purchase," by which the driven piston can be carried forward, leaving a balance of power to be utilized as a motive power. The areas of the pistons exposed to the pressure are not of necessity always the same; but whether they are or not, the power to rotate the lever and its shaft is produced by the driving-piston engaging the lever-arm at a greater distance from the fulcrum than the driven piston. The arms of the lever being free from contact with the walls of the cylinder, and the pressure of the water thereon being the same at every point, the lever is perfectly balanced, and is therefore sensitive to the driving action of the pistons, causing the pistons to run smooth, and making a very accurate meter.

It is obvious that the device shown and described may be used as a water or hot-air motor and as a steam-engine.

I have not shown the dial mechanism, as it is obvious that it may be applied to the lever-shaft to register in the usual manner.

I claim—

1. The combination, in a water meter or motor, of the joint-forming pistons with a lever having arms corresponding with said pistons, eccentrically carried by the power-transmitting shaft, each arm engaging with the inner end of a piston, and forming a radially-sliding joint, which allows of freedom of motion of the parts, substantially as described, for the purpose specified.

2. The combination, with a casing having a central hub or hubs, forming a concentric recess in the head or heads of said casing, and an eccentrically-pivoted lever having slotted arms, of the pistons having a segmental end bearing or bearings adapted to travel in said recess or recesses, and to drive said lever, substantially as described, for the purpose specified.

3. The combination of the cylinder provided with central hubs, and an eccentrically-pivoted lever having slotted arms, with pistons operating independently of each other within the slots of said lever-arms, and provided with segmental end bearings extending from one side only of said pistons and following their circular path, substantially as described, for the purpose specified.

4. The pistons carried radially in the slots of an armed lever revolving eccentrically to the path of said pistons, said pistons having bearings on their inner ends, and of less width than the slots of the lever-arms, to form a passage between each piston and the slot within which it operates, substantially as described, for the purpose specified.

5. The armed lever adapted to revolve eccentrically within a cylinder, and to be driven by pistons revolving concentrically within said cylinder, and operating within slots of said lever-arm, the said slots having a curved recess on one side, at its inner end, and the said pistons having enlarged bearing ends adapted to operate within said recess, substantially as described, for the purpose specified.

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

LEWIS H. NASH.

Witnesses:

WM. M. BROWN,

ED. BARRACLAUGH.