No. 111,060. PATENTED JAN. 17, 1871.

F. G. HESSE.

WATER METER.

3 SHEETS—SHEET 1.

Fig. 2

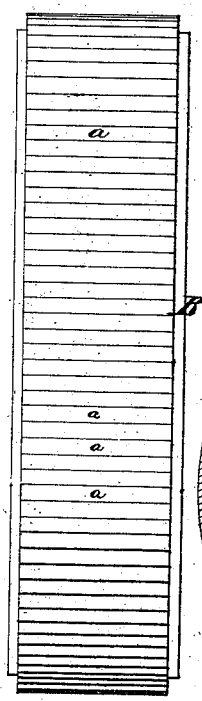


Fig. 1

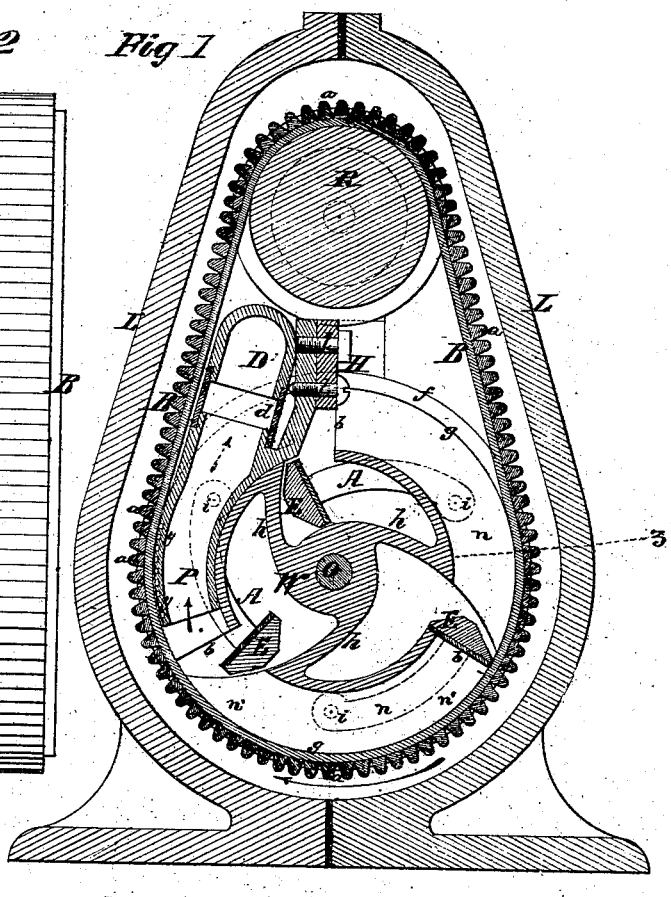
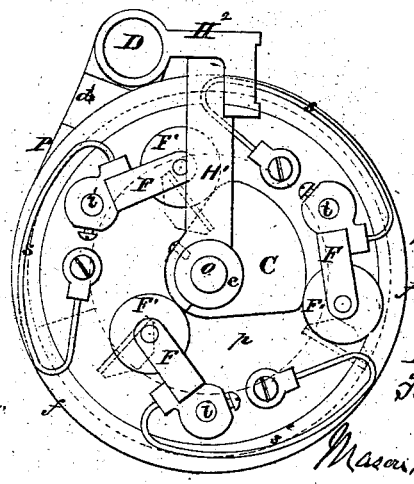


Fig. 3



Witnesses.
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J. N. Campbell.

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No. 111,060. PATENTED JAN. 17, 1871.

F. G. HESSE.
WATER METER.

3 SHEETS—SHEET 2.

Fig. 4

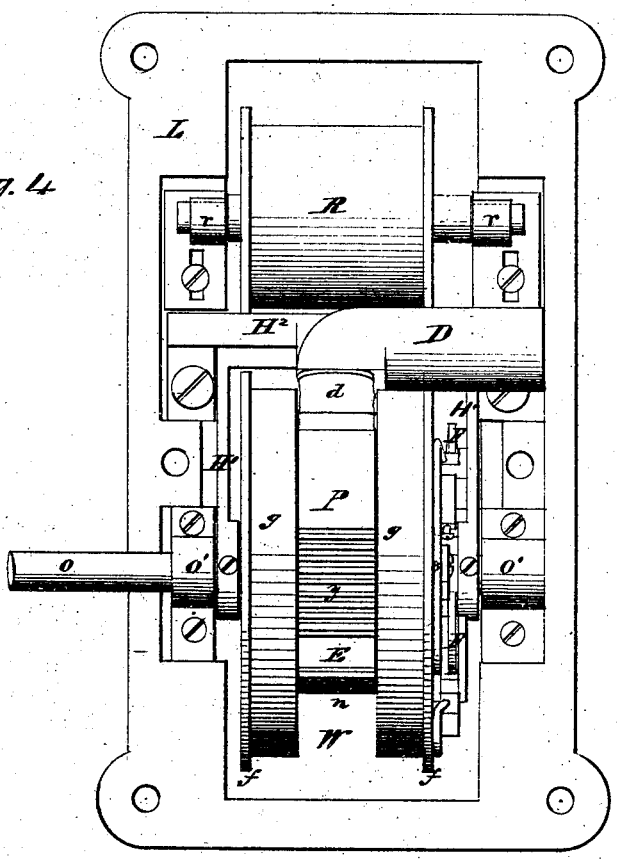
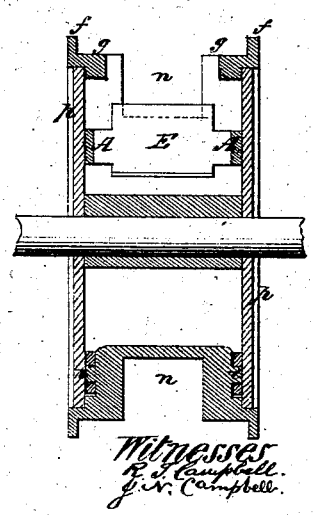


Fig. 6



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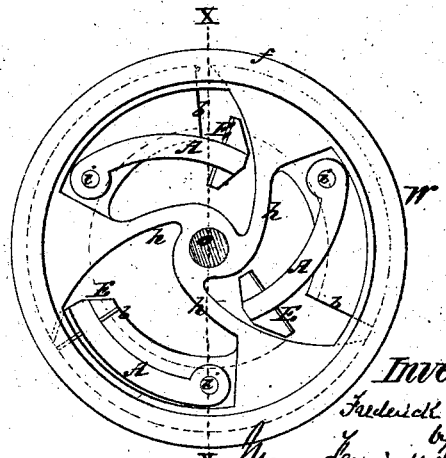
G. N. Campbell.

Fig. 5



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No. 111,060. PATENTED JAN. 17, 1871.

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WATER METER.

3 SHEETS—SHEET 3.

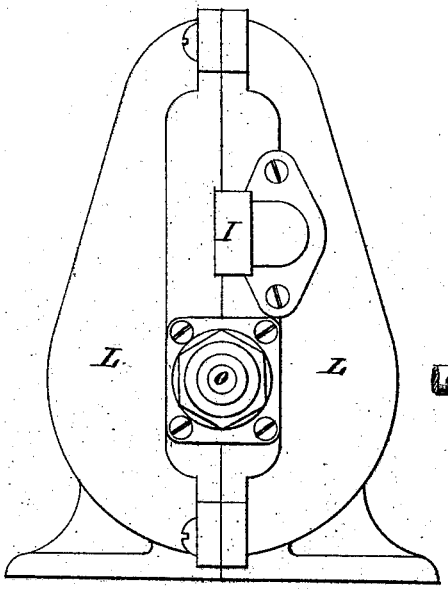


Fig. 10

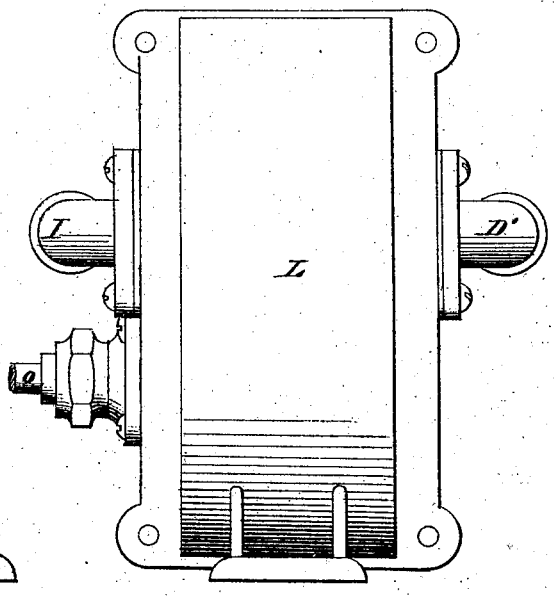
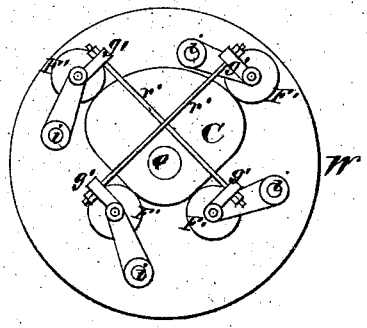
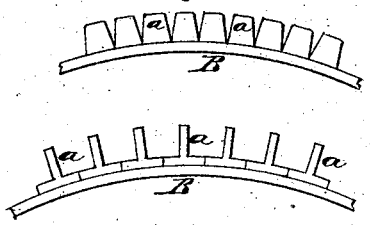


Fig. 9





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United States Patent Office.

FREDERICK G. HESSE, OF OAKLAND, CALIFORNIA.

Letters Patent No. 111,060, dated January 17, 1871.

IMPROVEMENT IN WATER-METERS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, FREDERICK G. HESSE, of Oakland, in the county of Alameda and State of California, have invented a Machine for Measuring Fluids, which I denominate a Fluid-Meter; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing making part of this specification, in which—

Figure 1, plate 1, is a section taken vertically and transversely through the machine.

Figure 2, plate 1, is a view of the belt and its stiffening-rods.

Figure 3, plate 1, is a view of one end of the main wheel and its attachments.

Figure 4, plate 2, is a view exposing the interior of the machine, with the belt removed from the wheels.

Figure 5, plate 2, is an end view of the main wheel, with a head removed to expose its interior arrangement.

Figure 6, plate 2, is a diametrical section through the main wheel.

Figure 7, plate 3, is a front elevation of the machine.

Figure 8, plate 3, is a side elevation of the machine.

Figures 9, plate 3, show two modes of applying stiffening-bars to the belt.

Figure 10, plate 3, is a modification of the mode of operating the valves or pistons.

Similar letters of reference indicate corresponding parts in the several figures.

This invention relates to machines which are designed for measuring water and other fluids.

It consists—

First, in a rotary and annularly-grooved or flanged wheel, which is arranged inside of a suitable casing, and provided with radially-reciprocating valves, an endless belt, and a stationary outlet-conduit, said parts being so constructed and arranged that, during the passage of water through the casing, the current will operate on the valves of said wheel within a succession of chambers which are formed circumferentially by said endless belt, and cause the wheel to rotate with very little friction and at a uniform rate of speed, as will be hereinafter explained.

Second, in the employment for the grooved wheel of an endless belt, which is armed with stiffening-bars so applied as to afford all the required degree of flexibility necessary to allow the belt freedom to pass around with the wheel at the same time to afford the required resistance to the water passing upon it, as will be hereinafter explained.

Third, in a stationary cam, in combination with vibrating arms and with valves which are applied to the rotary wheel, whereby the rotary motion given to this wheel will actuate the valves at proper times with reference to the mouth of the outlet-conduit, as will be hereinafter explained.

To enable others skilled in the art to understand my invention, I will describe its construction and operation.

The casing which incloses the mechanism consists of two vertically-divided sections, L L, properly packed and bolted together, with an inlet-pipe, I, and an outlet, D', for the fluid passing through the case. These pipes may be arranged opposite one another, as shown in fig. 8, or they may be arranged in any other suitable manner.

Inside of this case are two flanged wheels, W and R, around which passes an endless belt, B, armed with transverse stiffening-bars *a*, hereafter more particularly explained.

The wheel R has journal-supports *r r*, which are adjustable vertically for putting on and taking off the belt B and for tightening this belt.

The wheel W has a shaft, *o*, running centrally through it, which shaft is supported by bearings *o' o'*, and one end of it extends through the casing to operate the indicating mechanism.

This indicating mechanism may be constructed in any well-known manner which will indicate the rotations of wheel W. It will be inclosed with its dial in a box which will be bolted to the case L.

The wheel W has its circumference formed by flanges *f f*, annular belt-supports *g g*, and an intermediate annular channel, *n*, which are united to the hub by means of partitions *h h h*. This wheel presents interiorly three chambers, which are closed by heads *p p*, as shown in fig. 6.

Parts of the sides of the channel *n* are cored out at equal distances, so as to leave radial valve-seats *b b b*, shown in figs. 1 and 5, for receiving against them valves E E E.

Each valve E is secured to two arms, A A, which are properly curved and pivoted at *i i*, so as to swing freely toward and from the axis of the wheel W.

The pivot-pins *i* of the arms, on one side of the wheel W, extend through the plate or head *p*, (see fig. 3,) and have arms F secured to them, which latter are provided with anti-friction rollers F', that are held by springs *s* against the perimeter of a stationary cam, C.

Cam C is of a segment form, and is secured by its hub *c* to stationary arms H', which prevent the cam from turning with wheel W. The arms H' are bolted fast to one-half of the casing L.

On one side of the wheel W, and nicely fitted into its channel *n*, is an outlet-conduit, P, which is segmental in form, and is connected to a horizontal out-

let pipe, D, either rigidly or by means of a flexible tube, *d*.

By means of two set-screws, *t t*, the conduit P is connected to the cross-head H of the arms H^1 H^1, which screws allow the conduit to be adjusted and properly set up to the wheel W, and, by means of the cross-head H^2, the pipe D is secured to the casing L.

The conduit P is made of sufficient length to close the channel during the passage of the open spaces containing the valve-seats, and the outer face of this conduit should recede about two one-hundredths of an inch from the face *g*, to prevent contact with the belt B.

The belt B, which passes around pulley or wheel R and wheel W, is made preferably of vulcanized rubber, and provided on its outer side with bars or ribs *a* running transversely, and of sufficient length to lap over and rest on the surfaces *g g*. The bars or ribs *a* may be made with beveled sides, or they may be made of T-shaped pieces, as shown in fig. 9.

As the wheel W revolves in the direction of the arrow in fig. 1, each valve E will be closed or brought to its seat *b* just before it reaches the point *z*, where the belt B closes around the wheel, and each valve remains closed until the next valve has reached a little beyond said point *z*, when it opens, passes under the conduit P, and then closes again after emerging from it. The belt and the valve thus form the channel *n'*, which communicates only with the discharge-pipe D' through the conduit P and pipe D.

The casing L being filled and supplied with fluid under a head by inlet-pipe I, the pressure will act without intermission and perfectly uniform against a closed valve, thus producing rotation of wheel W in the direction indicated in fig. 1.

The opening of a valve, E, as it recedes into its chamber in wheel W, only displaces the fluid without interfering with the current, since valve, belt, and wheel have the same regular velocity.

One revolution of wheel W will thus discharge a quantity of fluid equal in volume to the contents of the channel *n* throughout the entire circumference, and without reference to the position of the valves or the openings for their reception.

The fluid, under such a head as is necessary to revolve the wheel W, presses upon that portion of the belt B which covers channel *n'*.

To resist this pressure the ribs *a*, above described, are employed. The material and form of the ribs may be varied according to pressure and width of the annular channel *n*, but under all circumstances those portions of the ribs in contact with the belt should cover or nearly cover the same. The ribs may be fastened to the belt in various ways. I find India-rubber cement to answer a good purpose. The main object in fastening the ribs to the belt is the exclusion of fluid from between ribs and belt, so that the whole pressure of the fluid may act upon the ribs, which in turn press against the annular surfaces *g g*. The pressure of the fluid on the belt completely prevents leakage between the latter and the surfaces *g g*, without exposing the belt to injurious strain.

The belt offers another great advantage in that it causes the pressure of the fluid on the wheel and its bearings to be balanced, since said pressure is transmitted from the belt to the wheel and shaft in opposite directions to the pressure exerted on the opposite portion of the wheel. The shaft of wheel W therefore receives only that pressure which is the resultant of the power applied and of the resistance offered.

The pulley or wheel R is used to prevent swinging and a consequent rubbing of the belt B against the sides of the casing L.

To lessen leakage between the belt and outer surface of conduit P, the latter may be grooved transversely, as shown at *y y*, figs. 1 and 4.

In fig. 10 I have represented a modification of the mode above described of operating valves E. It illustrates the use of four valves, each opposite pair being connected by a rod, *r'*, and arms *g' g'*, which are pivoted on the projecting pins of the anti-friction rollers. The cam C is so constructed as to embrace these two conditions, viz., required motion of the valves and unvarying distance of the pins of each opposite pair of anti-friction rollers. The arms *g' g'* are made of sufficient length to allow the rods *r'* to yield under their elasticity in order to admit of a slight variation in the distance between the pins on account of any imperfection in the cam or the introduction of any foreign substance that might get between the cam and rollers.

By my invention which I have above described I overcome many of the difficulties hitherto encountered in the construction and operation of fluid-meters on the rotary principle; such, for instance, I secure a uniform flow of the fluid at a very high degree of speed, and a consequent reduction in the dimensions of the meters. I dispense with all packing, and have no friction of sliding surfaces; and I obtain accuracy, durability, and cheapness.

It is obvious that, by applying power to the large flanged wheel, the machine hereinbefore described may be used as a pump.

Having described my invention,

What I claim as new, and desire to secure by Letters Patent, is—

1. The rotary flanged wheel W, channeled, provided with valves E and a conduit, P, and arranged in a suitable casing, in combination with an endless belt, B, substantially as described.

2. The endless belt B, armed with stiffening-bars *a*, in combination with wheel W, substantially as described.

3. Stationary cam C, in combination with valves E, the intermediate connections, and the wheel W, substantially as described.

4. The annularly-grooved and flanged wheel W, constructed with valve-seats *b*, and adapted to operate, in conjunction with an endless belt, B, within a close case, substantially as described.

5. The apparatus having belt-pulley R and wheel W arranged within casing L, and adapted to operate with belt B, all substantially as described.

F. G. HESSE.

Witnesses:

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