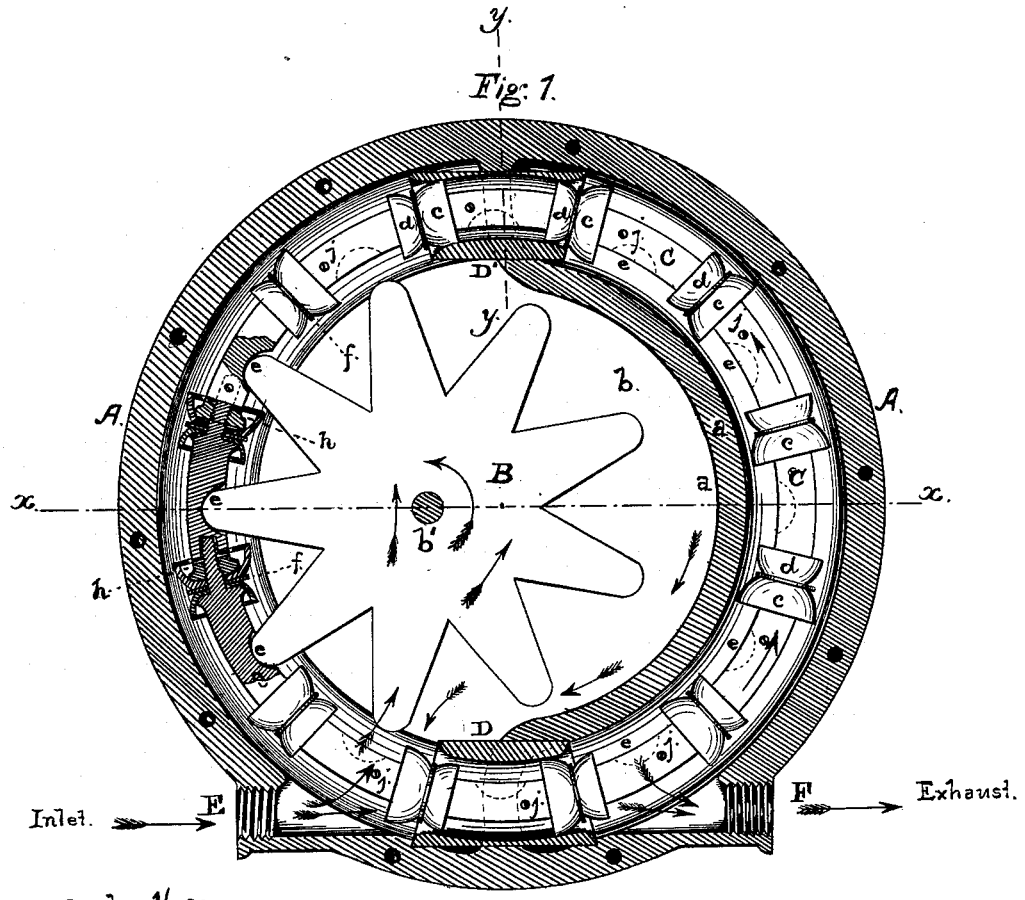
W. SMITH.

WATER-METERS OR ENGINES.

No. 190,920. Patented May 15, 1877.

Fig: 1.



Scale.—½ Size.

Fig: 2.

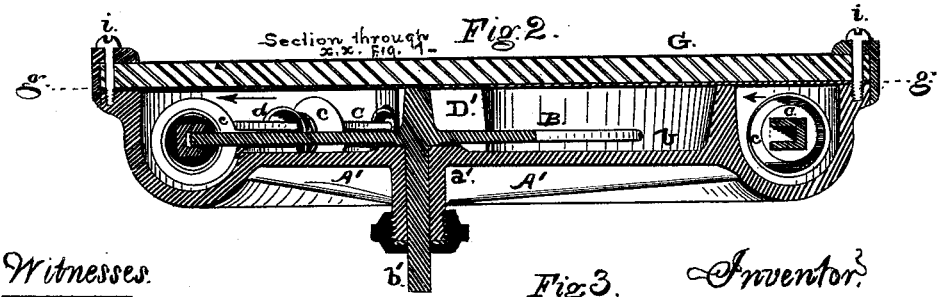
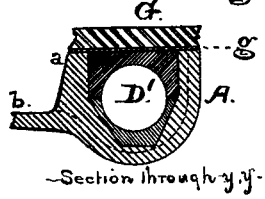


Fig: 3.



Section through y.y. Fig. 1.

Witnesses.

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UNITED STATES PATENT OFFICE.

WILLIAM SMITH, OF SAN FRANCISCO, CALIFORNIA.

IMPROVEMENT IN WATER METERS OR ENGINES.

Specification forming part of Letters Patent No. **190,920**, dated May 15, 1877; application filed May 22, 1876.

To all whom it may concern:

Be it known that I, WILLIAM SMITH, of San Francisco, State of California, have invented an Improved Water Meter or Engine, of which the following is a specification:

My invention relates to an improvement in fluid-meters or mechanism applicable to measuring water or obtaining power from the fluid passing through, the construction of which enables them to be used either as meters, pumps, or engines.

It consists of a continuous series of collapsing flexible pistons arranged in a circle within a partitioned inclosing-case that has segmental or other suitably arranged cylinders within it, and an inlet and exhaust passage for the fluid, so that the pressure of the fluid passing through the case from one side to the other will force the pistons through the cylinders, and thus give motion to the wheel meshing or engaging with the ring or segments that unite the pistons together.

Figure 1 of the accompanying drawing is a top view of the meter with the case and cylinders in section. Fig. 2 is a transverse section through the line *x x*, Fig. 1, but with the plate or cover of the case secured in place. Fig. 3 is a section of the case and smaller cylinder through the line *y y*, Fig. 1.

A A is the case or shell of the meter, composed of a circular casting with a circular channel extending around the edge, and a chamber, *b*, within the space surrounded by the channel. The bed of this channel is somewhat below the level of the chamber *b*, and the entire case is strengthened by the web A′ A′ beneath it.

One-half of the channel communicates with the chamber *b*, while the other part is separated from it by the partition *a*, and connection between these two parts of the case is had only through the cylinders D D′, at the top and bottom of the case.

Two openings are provided in the case in line with the lower cylinder D, one constituting the inlet E, and opening into the pressure side of the case, and the other, the exhaust F, leading from the exhaust side of the channel.

These parts are covered and rendered water-tight by a cover or plate, G, of glass or metal, with a rubber gasket, *g g*, laid between it and the rim of the case, and the partition *a*.

A series of flexible cup-shaped pistons, *c c d d*, are arranged in a ring having the same center as the circular channel. They are placed in pairs and connected together by the curved metal segments C C.

One set of these pistons, *c c*, are larger than the others, *d d*, and they are arranged back to back, the cavity of the larger ones, *c c*, facing in one direction, or toward the inlet E, and the others, *d d*, turned in the opposite direction.

This ring is composed of a series of segments, C C, that are portions of a circle, whose center is the same as that of the channel of the case. They are made of glass, porcelain, or metal, with a hole or socket at one end and a screw-bolt at the other, and are provided with a cavity or recess, *e e*, in the inner side, to receive the ends of the teeth of the motion-wheel B.

These segments are put together in the manner illustrated in Fig. 1, where two of the segments and their pistons are shown in section. The bolt of one segment passes through the pistons *c d*, that are held securely in place by means of the nut *h*, a washer, *f*, being inserted between them; and the end is received into the socket of the next segment, where it is held by a screw, *j*, that passes through from the top.

The motion-wheel B is pivoted to one side of the center of the case A, so that the line of intimate gear between the wheel and the ring C shall be nearly equidistant between the two cylinders, as the thrust due to the pressure on the area of both cylinders D D′ is thereby taken on the axis of the motion-wheel.

The lower cylinder D is made of such diameter with reference to the pistons *c c* that these pistons shall pass readily through it when expanded by the pressure of the fluid, while the upper cylinder D′ is of the same size as the smaller pistons *d*. Thus the pistons *c* can pass through the lower cylinder in an expanded state; but to pass through the upper cylinder they must become compressed or collapsed.

As the pressure of the fluid within the case

and outside of the partition *a* is equal, both at the upper and lower part, the ring C can move only when one portion receives a greater pressure than the other; and one set of pistons are therefore made of larger surface than the other set, that they may receive the pressure of the current entering the inlet E. The direction of the motion of the wheel B is, therefore, from right to left, as indicated by the arrow, as no fluid can enter the exhaust side of the case through the upper cylinder D′, because the pistons *c* are in a compressed state within the cylinder, the distance between two of the larger pistons *c c* being equal to the length of the cylinder; and the pressure of the fluid is greater upon the larger pistons at the bottom than upon the smaller pistons at the top of the case.

The bottom of the case A is provided with a stuffing-box, *a′*, to receive the axle *b′* of the motion-wheel; and suitable gearing and index wheels can be connected with this wheel to register the revolutions of the ring C.

The cylinders D D′ are made in segments, after the manner shown in Fig. 3, the face or lower part of the bottom portion being made angular, or of conical section, and set into the bed of the channel, while the upper part is planed smooth, to receive the rubber gasket *g*.

The pistons *c d* may be made either circular or square, or corrugated in their sectional area, and I do not confine myself to the precise form shown.

As thus constructed and operated, my invention will be a correct indicator of the quantity of fluid passing through it, and this will be equal to a stream passing through the exhaust F that agrees with the difference between the diameter of the smaller pistons *d* and the diameter of the cylinder D, and that quantity can pass through the cylinder only by carrying with it the larger pistons *c c*, and moving the ring C in its channel.

My invention can be also employed as a pump by using a driving-wheel that meshes into the piston wheel or ring C on the outside of the periphery, and giving a rotary motion to the ring and its pistons.

The cap or cover G is secured to the case by means of the screws and clamp *i i*, and is either of glass or of metal.

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

1. A fluid meter or engine constructed of a series of flexible and collapsing pistons, arranged in a circle within a partitioned inclosing-case having an exhaust and a pressure side, and having cylinders of different diameters within it, after the manner shown and described, so that the pressure of the fluid, in passing through the inlet and outlet passages provided in the case, will at the same time force the pistons through one cylinder and draw them through the other, and thus give motion to the ring and its motion-wheel, as and for the purpose set forth and specified.

2. In a fluid meter or engine, constructed as described, a series of expanding and collapsing pistons, *c c d d*, of different diameters, arranged in pairs, and united together by the segments C C, combined with cylinders D D′, of different diameters, in the manner and for the purpose set forth and specified.

3. In a fluid meter or engine, constructed as described, the segmental cylinders D D′, one of larger diameter than the other, arranged within the case, and combined with the piston-ring, in the manner and for the purpose substantially as set forth and specified.

4. In a fluid meter or engine, the combination, with the piston-ring C, of the motion-wheel B, constructed and arranged with it and with the inclosing-case A, in the manner and for the purpose described and shown.

5. The circular case A, with its channel, and the partition *a*, dividing it into pressure and exhaust chambers; with inlet and outlet passages E F, and with a bearing, *a′*, for the axis of the motion-wheel B, all constructed and arranged as described and specified, for the purpose set forth.

6. The combination, with the case A, of the two cylinders D D′, of different diameters, connecting the exhaust with the pressure side of the case, in the manner and for the purpose described and specified.

7. The segmental cylinders D D′, constructed in two parts, in the manner shown and described, and having the same length as the distance between any two of the pistons *c c* or *d d*, for the purpose set forth.

In testimony that I claim the foregoing I have hereunto set my hand and seal this 10th day of May, 1876.

WM. SMITH. [L. S.]

Witnesses:
C. W. M. SMITH,
PHILIP MAHLER.