(No Model.) 3 Sheets—Sheet 1.

G. SICKELS.

DOUBLE PISTON WATER METER.

No. 342,140. Patented May 18, 1886.

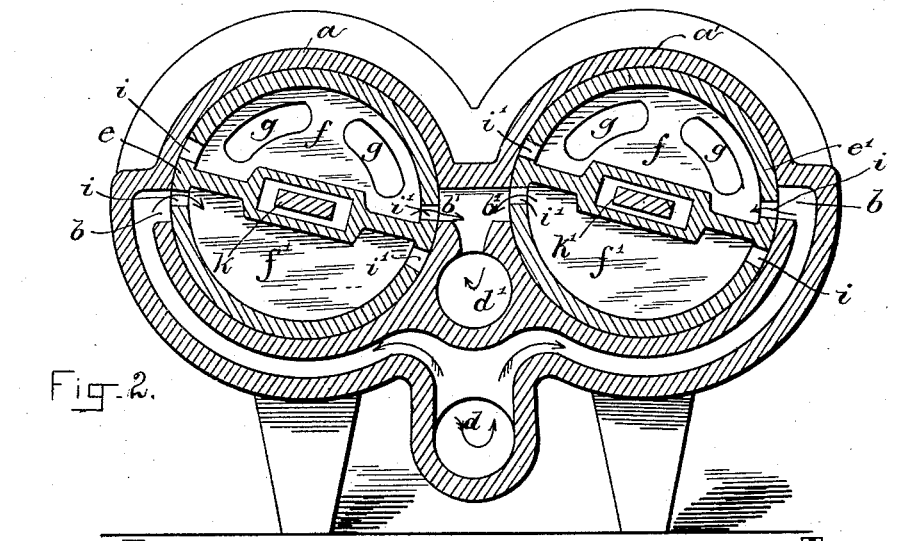

Fig. 2.

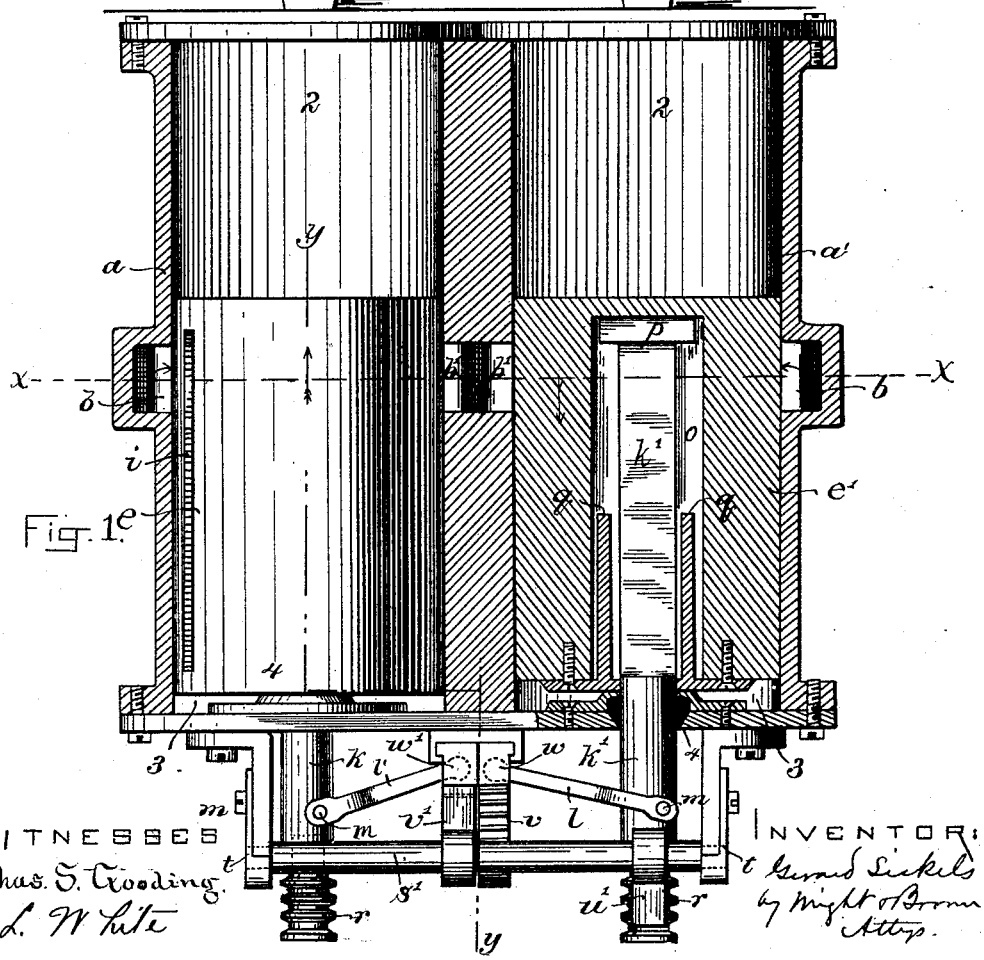

Fig. 1.

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Fig. 6.

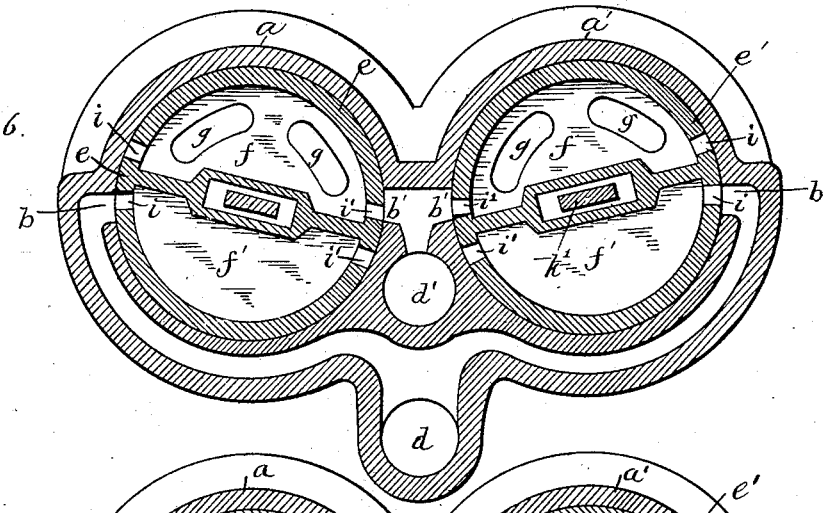


Fig. 7.

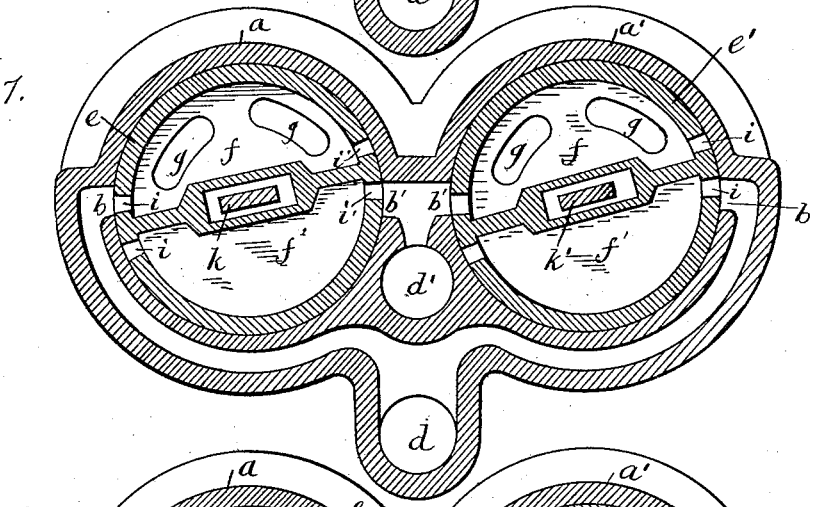
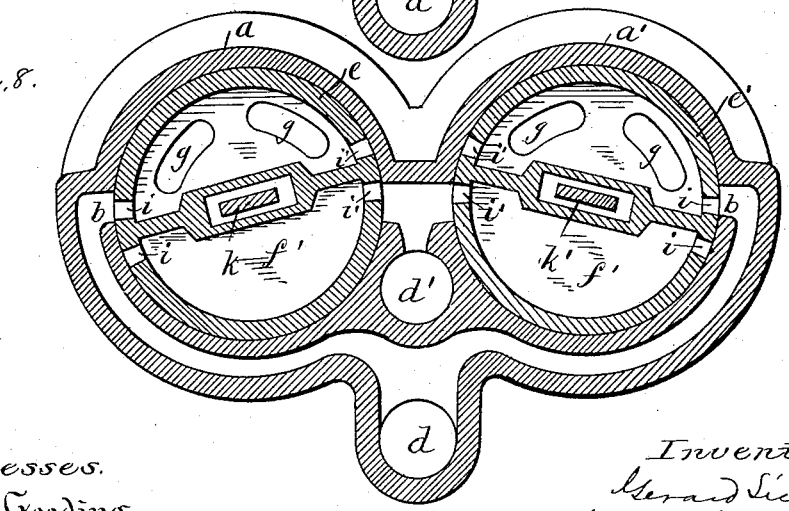


Fig. 8.



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(No Model.) 3 Sheets—Sheet 3.

G. SICKELS.

DOUBLE PISTON WATER METER.

No. 342,140. Patented May 18, 1886.

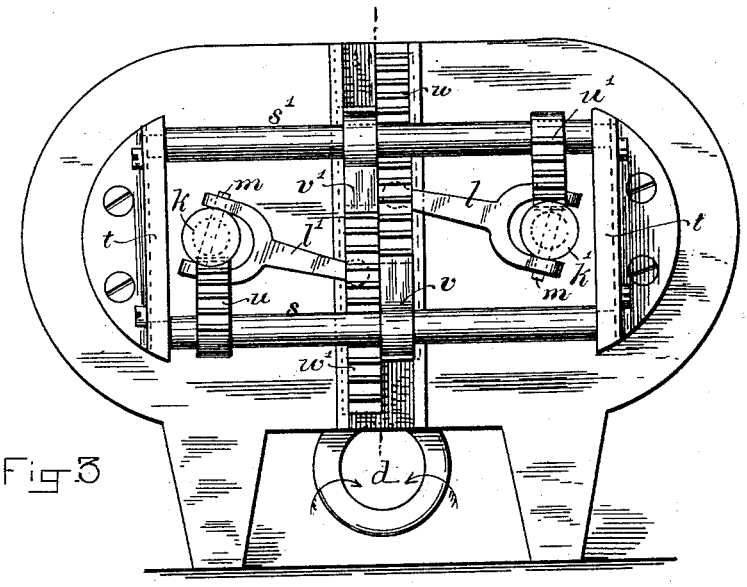

Fig. 3

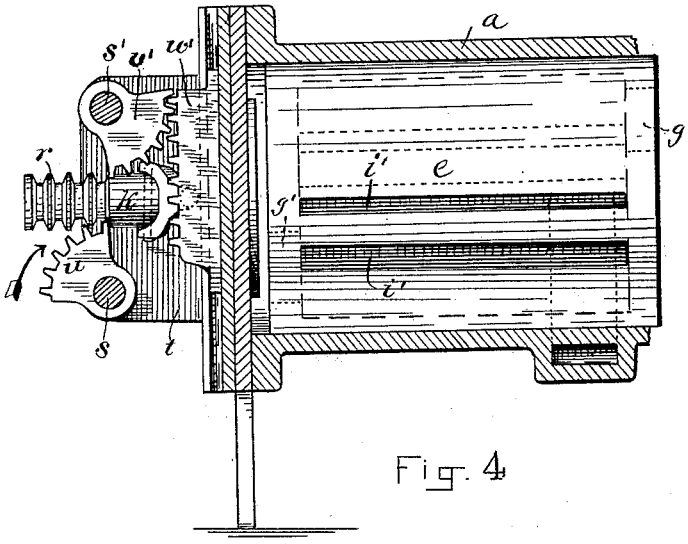

Fig. 4

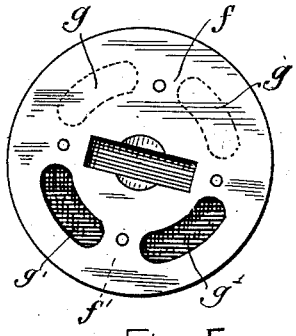

Fig. 5.

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UNITED STATES PATENT OFFICE.

GERARD SICKELS, OF BOSTON, ASSIGNOR OF ONE-HALF TO E. B. WELCH, OF CAMBRIDGE, MASSACHUSETTS.

DOUBLE-PISTON WATER-METER.

SPECIFICATION forming part of Letters Patent No. 342,140, dated May 18, 1886.

Application filed April 20, 1885. Renewed March 22, 1886. Serial No. 196,846. (No model.)

To all whom it may concern:

Be it known that I, GERARD SICKELS, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Fluid-Meters, of which the following is a specification.

This invention has for its object to provide a simple, accurate, and easily-operated fluid-meter of that class in which reciprocating pistons are employed; and it consists, as a whole, in a meter composed of two cylinders having inlet and outlet ports, two pistons adapted to reciprocate in said cylinders, and each divided longitudinally into two chambers having inlet and outlet ports, and communicating with the ends of the cylinders, rods extending from the pistons through the ends of the cylinders, and connecting devices, through which longitudinal movement of each rod is caused to rock or partly rotate the other piston, and thereby adapt it to be moved by the entering water, the arrangement being such that the water entering each cylinder will pass through one chamber of the piston therein to one end of the cylinder and move said piston endwise, while the water displaced by said movement passes through the other chamber to the outlet, the course of the water through each chamber being reversed by the rocking or partial rotation given the piston by the movement of the other piston, all of which I will now proceed to describe.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a partial longitudinal section and partial top view of my improved meter. Fig. 2 represents a section on line *x x*, Fig. 1. Fig. 3 represents an end elevation. Fig. 4 represents a section on line *y y*, Fig. 1. Fig. 5 represents an end view of one of the pistons. Figs. 6, 7, and 8 represent transverse sections showing the pistons in different positions.

The same letters of reference indicate the same parts in all the figures.

In the drawings, *a a'* represent the two cylinders, each having an induction-port, *b*, and an outlet-port, *b'*, said ports being at opposite sides of the cylinders.

d represents the induction-passage, communicating with the ports *b b*, and *d'* represents the outlet-passage, communicating with the ports *b' b'*.

e e' represent hollow pistons, which fit the cylinders accurately, and are adapted both to move lengthwise and to rock or partly rotate therein. Each piston is divided longitudinally by a partition into two chambers, *f f'*. The chambers *f f* communicate through openings *g g* in the ends of the pistons with the ends 2 2 of the cylinders, while the chambers *f' f'* communicate with the ends 3 3 of the casing through openings *g' g'* in the opposite ends of the pistons from the openings *g g*. (See Fig. 5.) Each of said chambers has an inlet-port, *i*, and an outlet-port, *i'*, which are of greater length than the ports *b b'* of the cylinders, and are adapted to coincide with said ports, as hereinafter described.

k k' represent rods which project from the pistons *e e'* through the cylinder ends or heads at one end of the casing. Each rod is moved endwise by its piston during the latter part of stroke of said piston, the rods being inserted in longitudinal sockets or cavities *o*, formed in the piston and provided with enlarged inner ends or heads, *p*, which are struck alternately by the ends of said sockets, and flanges or sleeves *q*, affixed to the pistons and projecting into the sockets, so that each rod moves with its pistons only during the latter part of the longitudinal movement of the piston. On the outer ends of the rods *k k'* are formed peripheral rack-teeth *r*.

s s' represent rock-shafts journaled in fixed ears or brackets *t t*. Each rock-shaft is provided near its ends with two rack-segments, *v v'*, meshing, respectively, with the rack-teeth of the rod *k* and of the rod *k'*. To the rock-shafts near their centers are affixed two rack-segments, *v v'*, meshing, respectively, with rack-teeth on a slide, *w*, and a slide, *w'*, said slides being adapted to move side by side in fixed guides. The slide *w* is connected by a link, *l*, with the rod *k'*, and the slide *w'* is connected by a link, *l'*, with the rod *k*, said links being connected to the slides by balls or enlargements on their inner ends fitting in sockets in the slides, and to the rods by pivot-pins *m*, passing through said rods and the bifurcated ends of the links. (See Figs. 1 and 3.)

Operation: The pistons being in the positions shown in Figs. 1 and 2, water enters the chamber *f'* of the piston *e* through the inlet-ports *b* and *i*, and passes through the openings *g' g'* into the end 3 of the cylinder *a*, forcing the piston *e* in the direction indicated by the ar-

row in Fig. 1. The water in the end 2 of the cylinder is displaced and passes through the openings *g g* into the chamber *f* and out through the outlet-ports *i' b'*. The rack portion of its rod *k* during the latter part of this movement of the piston turns the rock-shaft *s* in the direction indicated by the arrow in Fig. 4, said rock-shaft being thus caused to depress the slide *w* and, through the link *l* and rod *k'*, rock or partially rotate the piston *e'* to the position shown in Fig. 6, so that when the piston *e* reaches the end of its last-described stroke the incoming water enters the chamber *f'* of piston *e'*, and the outlet-port *i'* of chamber *f* is connected to the outlet-port *b'* of the cylinder *a'*. When this is accomplished the piston *e'* commences to move in the same direction that the piston *e* last moved, and in making this movement causes the water before it to pass through the opening *g' g'*, chambers *f*, and eduction-port *i'*, and also, by the action of its rod *k'* on the connecting mechanism above described, turns or rocks the piston *a* until it stands in the position shown in Fig. 7. The incoming water is thus admitted through chamber *f* of piston *a* to the end 2 of the casing, so that the piston *e* is moved toward the opposite end of the casing, thus expelling the water therein and partially turning the piston *e'*, as shown in Fig. 8. The piston *e'* is now moved by the incoming water, and during its movement turns the piston *e*, as shown in Fig. 2. The operation is thus continued, each endwise movement of the one piston rocking or partly turning the other in quick succession, and each in making its stroke preparing the other to be reversed by the incoming water. Each piston after rotating or turning the other piston cannot be itself turned until the other piston has nearly reached the end of its stroke. Consequently ample time is afforded under all conditions for each piston to complete its stroke before being reversed. There is no opportunity for leakage, excepting between the casing and cylinder, and this fact, taken in connection with the fact that each piston is always compelled to make a full stroke, insures a high degree of accuracy. The rocking of the pistons in a great measure prevents wear of the proximate surfaces of the pistons and cylinders, as there can be no continuous grinding or wear on any parts of said surfaces by sand or grit introduced between them.

I do not limit myself to the details nor the location of the connecting mechanism described and shown, whereby the reciprocating movement of each piston is caused to rock the other piston, as said mechanism may be variously modified in construction or arrangement without departing from the spirit of my invention.

The connecting mechanism may be suitably incased, and the registering mechanism may be operated by the movement of either of the rods *k k* or any part of the external mechanism.

I have shown stuffing-boxes 4 4 at the end of the casing, through which the piston-rods *k k'* pass. If, however, a casing is provided for the connecting mechanism, said stuffing-boxes will not be required, the casing holding any water that may escape around the piston-rods. The resistance which each piston meets with in turning the other piston when nearing the end of its stroke is the equivalent of a cushion or bumper in preventing concussions when the pistons complete their strokes.

I claim—

1. In a fluid-meter, the combination of the two substantially parallel piston-cylinders having inlet and outlet ports, the double chambered or divided pistons adapted to reciprocate and rock in said chambers, and provided with inlet and outlet ports adapted to coincide with the ports of the cylinders, and connecting devices, substantially as described, whereby the endwise movement of each piston is caused to partly rotate the other piston and thereby reverse its connections, as set forth.

2. In a fluid-meter, the combination of the piston-cylinders having inlet and outlet ports, the divided pistons, each having ports arranged as described, piston-rods fitted in longitudinal sockets in the pistons, whereby each piston is enabled to make a part of its stroke without moving its rod, and devices, substantially as described, connecting said rods, whereby the endwise movement of each rod is caused to partly rotate the other rod and its piston, as set forth.

3. The combination of a cylinder having inlet and outlet ports, a piston adapted to reciprocate and rock in said cylinder, and divided longitudinally into two chambers, each having an inlet and an outlet port, the one communicating with one end and the other with the other end of the cylinder, the arrangement being such that the incoming water will pass through one chamber to one end of the cylinder and move the piston endwise, while the water displaced by the piston will pass through the other chamber to the outlet, and means, substantially as described, whereby the piston is partly rotated or rocked, when near the end of its stroke, to reverse its connections and movement, as set forth.

4. The combination of the casing having the cylinders and ports, the pistons in said cylinders, the piston-rods extending through the ends of the cylinders, and provided with rack-teeth at their outer ends, two rock-shafts, each having rack-segments *s* and *s'* and *v v'*, the slides *w w'*, having rack-teeth meshing with the rack-segments *v v'* of the rock-shafts, and the arms or links *l l'*, connecting the slides *w w'* with the piston-rods, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 14th day of April, 1885.

GERARD SICKELS.

Witnesses:
C. F. BROWN,
A. L. WHITE.