J. F. DE NAVARRO & H. C. SERGEANT.

Liquid-Meters.

Patented May 2, 1871.

No. 114,420.

Fig. 1.

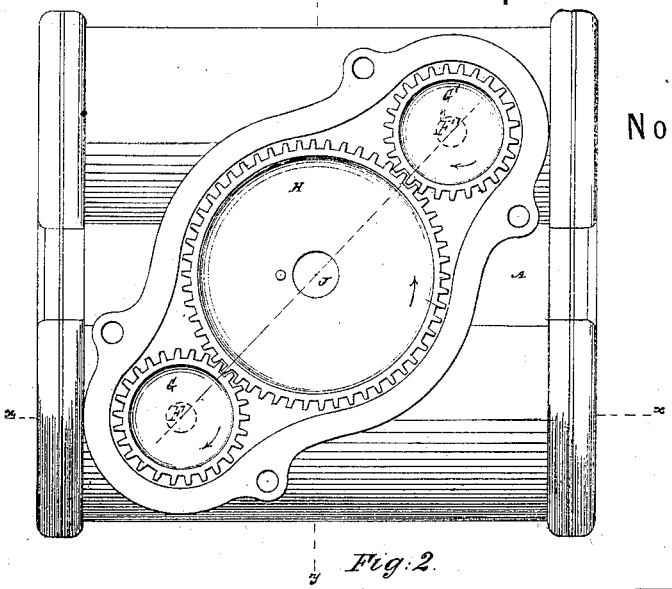


Fig. 2.

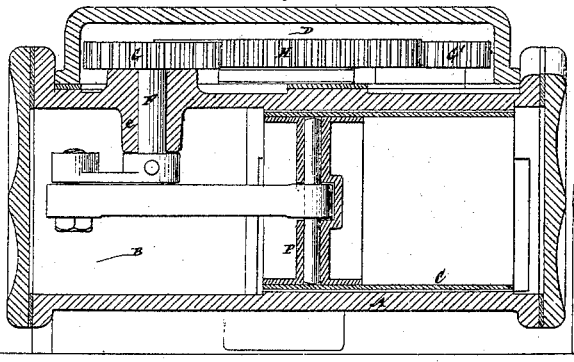
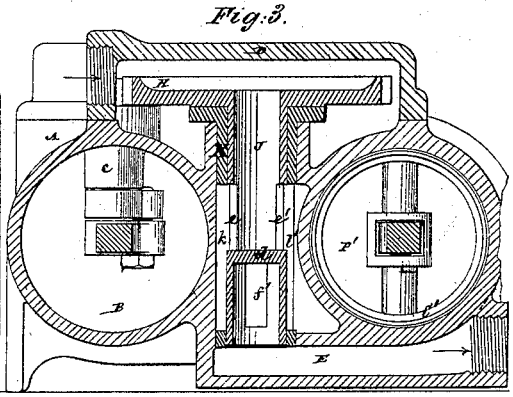


Fig. 3.



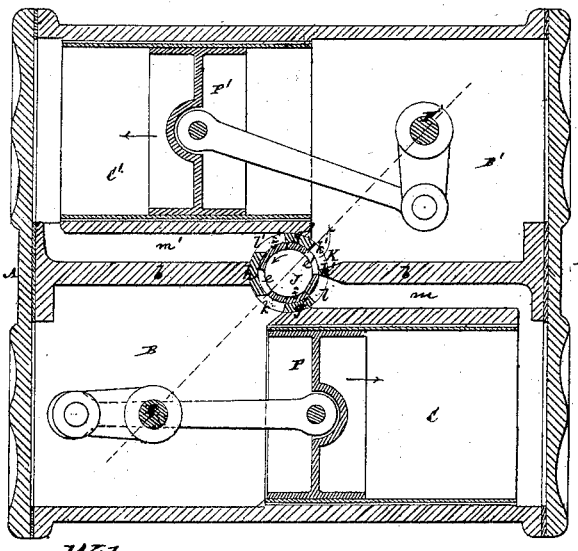
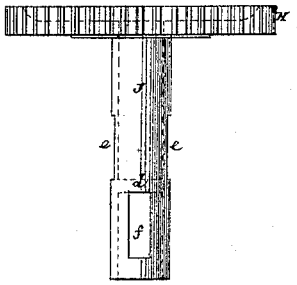


Fig. 4.

Fig. 5.



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IMPROVEMENT IN LIQUID-METERS.

Specification forming part of Letters Patent No. **114,420**, dated May 2, 1871.

To all whom it may concern:

Be it known that we, JOSÉ F. DE NAVARRO, of the city, county, and State of New York, and HENRY C. SERGEANT, of Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Liquid-Meters, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing, forming part of this specification, and in which—

Figure 1 represents a plan of our improved meter, with its inlet cap or bonnet that incloses the valve and connecting gearing removed. Fig. 2 is a longitudinal vertical section through the line *x x* in Fig. 1; Fig. 3, a transverse section through the line *y y*, and Fig. 4 a horizontal section through the axial lines of the cylinders of the meter. Fig. 5 is a longitudinal view of the valve detached.

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

Our invention relates to double-cylinder meters, the reciprocating pistons of which are controlled by a rotary valve common to both.

While such is the general description of meter to which our invention relates, it is more particularly designed to be applied to meters in which the pistons are connected with separate crank-shafts geared together to work in concert, and the cranks of which are set at right angles, or thereabout, to each other, similar to the meter described in Letters Patent No. 106,878 of the United States, issued August 30, 1870, to William Tobin as assignee of Henry C. Sergeant, but differing therefrom in the arrangement of the crank-shafts at opposite ends of the cylinders; likewise in the disposition of the latter out of line with each other on opposite sides of a common center instead of side by side, and in the interposition of an intermediate gear between the crank-shafts, none of which features is here separately claimed as new.

The intermediate gear, which is preferably proportioned to revolve only once for every two revolutions of the crank-shafts, also serves to drive or form the valve that, in connection with the ports in the valve-seat, is of peculiar construction and approximately balanced, the disposition of the gearing by the arrangement of the cylinders and crank-shafts also relieving the valve of side-thrust, and a simple and direct connection being established between the valve and the ends of the cylinders.

In the accompanying drawing, A represents an outer case, divided vertically and longitudinally, as at *b b'*, to form separate chambers or spaces B B', and to provide for the arrangement of the cylinders C C' at opposite ends and on opposite sides of the case, or, in other words, out of line with each other transversely, but with their axles parallel to each other, or thereabout.

D is a cap or bonnet, on which the registering mechanism that is operated by the valve or otherwise may be mounted. This bonnet also serves as an inlet-chamber for the liquid in its way to the cylinders or measuring-chambers, and likewise as a cover for the valve and gear that connects the crank-shafts with each other and with the valve.

E is a lower exhaust chamber or passage common to both cylinders.

F F' are the separate revolving crank-shafts, set in motion by the pistons P P', and arranged within the chambers B B' at opposite ends of the case, and projecting through sleeves or bearings *c* up into the bonnet D, where they are connected, as by gear-wheels G, G', and H, the axes of which are arranged to lie in a common plane, or thereabout, intersecting the axes of the cylinders diagonally, as indicated by dotted lines in Figs. 1 and 4.

The intermediate gear-wheel, H, which here also forms a part of the tubular valve J, is proportioned to revolve only once for every two revolutions of the crank-shafts.

Said valve J constitutes a downwardly-projecting tubular shaft to the wheel H, and is open above and below to establish communication with the inlet-chamber or bonnet D, and with the exhaust chamber or passage E, but is divided transversely intermediately of its length, as by a diaphragm, *d*, above which the valve has two oppositely-arranged inlet-ports, *e e'*, and below which two oppositely-arranged exhaust-ports, *f f'*, in intermediate relation or line with the inlet-ports.

This cylindrical or tubular valve revolves

within a cylindrical valve-seat, K, open top and bottom, and divided longitudinally by abutments or surfaces *g g'* and *h h'* into vertical ports or passages *k k'* and *l l'*, over which the valve in rotating sweeps to pass the liquid to and from opposite ends of the cylinders C C', as required, and in timely relation with the position of the cranks, that are set so that when the one piston is at the end of its stroke in one direction the other is half-way, or thereabout, in a reverse direction.

The ports *k k'* and *l l'* communicate, respectively, with the spaces B B', which are open to one end of either cylinder, and with passages *m m'*, which connect with the opposite ends of the cylinders.

The ports are so proportioned and arranged, or the one abutment, *h'*, so reduced in width, that when an inlet-port passes said abutment, also when an exhaust-port in the valve passes the same, communication is established for a brief period through the same inlet or outlet with the two cylinders at their ends with which the two ports *k'* and *l* in the valve-seat connect. This action, which only applies to one end of either cylinder, and which takes place when the cranks are at what may be termed "half-quarter stroke," is necessary to keep up a regular supply by the valve when running only one revolution for every two revolutions of the crank-shafts.

By the construction of the valve and the arrangement of its ports or passages in connection with the ports or passages in the valve-seat the valve becomes approximately balanced, or is only subject to the difference of pressure that exists between the incoming and outgoing liquid.

The arrangement of the crank-shafts, too, and valve causes the connecting-gear to operate with a counteracting pressure on opposite sides of the valve, thus relieving the valve of lateral thrust and making it run free.

This feature of the invention is irrespective of any particular construction of rotary valve, or of the number of revolutions it makes relatively to the crank-shafts; likewise the arrangement of the cylinders relatively with the valve establishes a straight or direct passage for the liquid to and from the cylinders.

What is here claimed, and desired to be secured by Letters Patent, is—

1. The arrangement of the separate but geared revolving crank-shafts F F' and the cylinders C C' of the meter with their pistons, substantially as shown and described.

2. The arrangement of a revolving valve that controls the movement of both pistons, the separate revolving crank-shafts, and the gears that connect the whole to work in concert relatively with each other and the cylinders of the meter, essentially as specified.

3. The tubular revolving valve J, arranged to communicate at its opposite ends with the inlet and exhaust chambers of the meter, and constructed with opposite side inlet and outlet ports *e e'* and *f f'*, arranged in relation with each other and to a cross-partition or diaphragm, *d*, substantially as specified.

4. The combination and arrangement of the ports *k k'* and *l l'* in the valve-seat, the passages or chambers *m m'* and B B', connecting with opposite ends of the cylinders, and the revolving valve J, with its inlets *e e'* and outlets *f f'*, essentially as described.

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