(No Model.)

F. W. DICK.

PISTON WATER METER.

No. 382,145. Patented May 1, 1888.

FIG. 1.

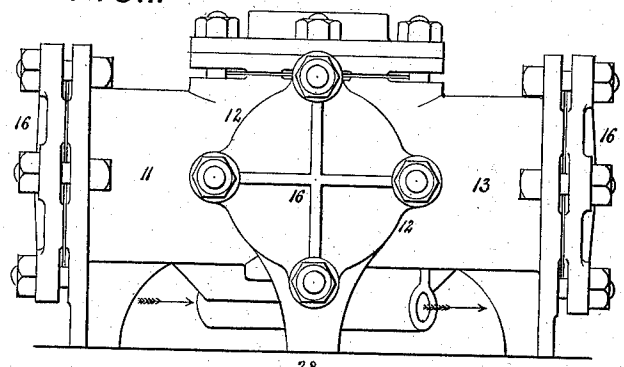


FIG. 2.

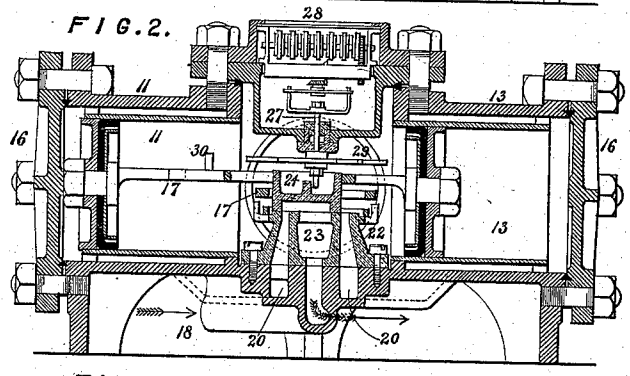


FIG. 3.

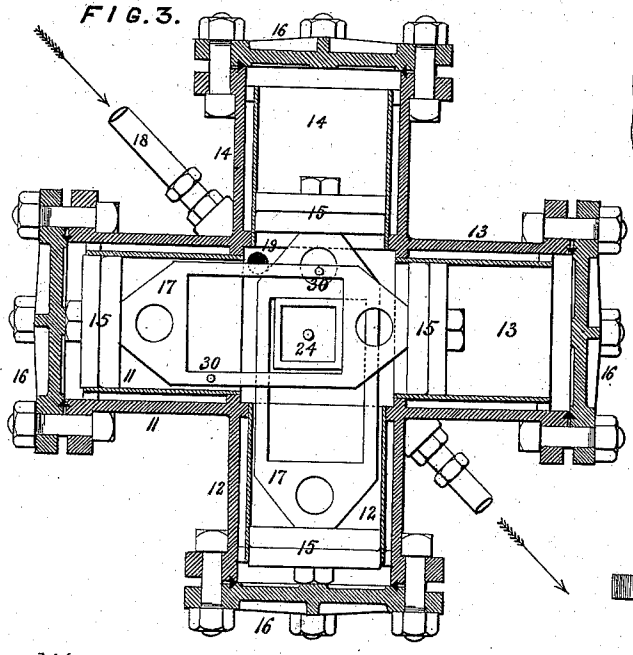


FIG. 4.

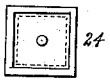


FIG. 5.

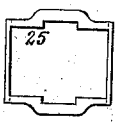


FIG. 6.

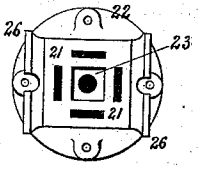


FIG. 7.

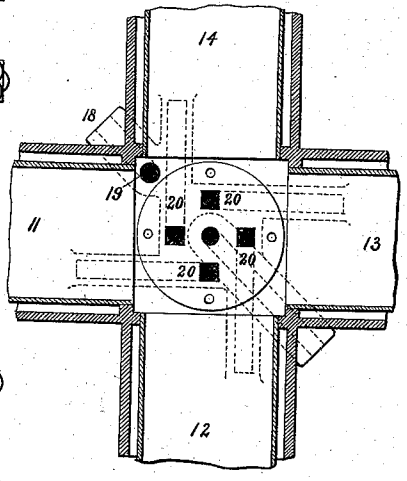
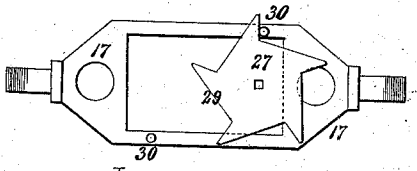


FIG. 8.



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by his Attorneys,

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UNITED STATES PATENT OFFICE.

FRANK W. DICK, OF GLASGOW, COUNTY OF LANARK, SCOTLAND.

PISTON WATER-METER.

SPECIFICATION forming part of Letters Patent No. 382,145, dated May 1, 1888.

Application filed October 19, 1887. Serial No. 252,805. (No model.) Patented in England October 9, 1886, No. 12,859.

To all whom it may concern:

Be it known that I, FRANK WESLEY DICK, a subject of the Queen of Great Britain and Ireland, and a resident of Glasgow, in the county of Lanark, Scotland, have invented certain Improvements in Apparatus Usable as a Meter or Motor, (for which a British patent has been applied for, to be dated October 9, 1886, No. 12,859,) of which the following is a specification.

My said invention has for its object to improve the construction of apparatus usable as a meter or motor, to simplify the valve details of such apparatus, and to render the apparatus certain and accurate in action.

An example of my improved apparatus arranged as a water-meter is shown on an accompanying sheet of explanatory drawings.

Figure 1 is a side elevation; Fig. 2, a vertical section; Fig. 3, a horizontal section; Fig. 4, a plan of the valve; Fig. 5, a plan of a frame for guiding the valve; Fig. 6, a plan of the piece in which the port-face and ports are formed; Fig. 7, a horizontal section of the middle of the meter as with the part shown in Fig. 6 removed, and Fig. 8 a plan showing the device for acting on the counting mechanism.

In the drawings the same reference-numerals are used to mark the same or like parts wherever they are repeated.

In carrying out my invention I employ four single-acting cylinders, 11 12 13 14, placed with their axes radiating from a center. These cylinders—which, for convenience, are fitted with inner or lining shells having pistons 15 working in them—have their outer ends closed by covers 16, while their inner ends are open to the central part of a casting in which they are formed. The pistons 15 are connected in pairs by diametrically-placed plates 17, serving as piston-rods, which are flat at the parts that pass each other and serve mutually along with other guiding parts to support each other and prevent the pistons 15 from turning. The water has access by the inlet-pipe 18 and port 19 to the central part of the casing and proceeds to the cylinder ends by passages 20, having ports 21 in a port-face formed on a piece, 22, (shown separately in Fig. 6,) the port-face being parallel to the plane containing the axes of the cylinders, while the water leaves the meter by an exhaust-port, 23, in the center of the port-face. There is a single valve, 24, for all the cylinders, and this valve is of a square form in the modification shown in the drawings. An important peculiarity of the valve is that it always exposes two of the four ports and always covers the other two. The valve 24 is moved by the piston-rod plates 17, which are formed with rectangular openings, within which the valve is placed, the openings being longer and broader than the valve. The breadth of each opening in plate 17 exceeds that of the valve by the extent of stroke intended to be given to the valve, while the length exceeds the breadth of the valve by the length of stroke of the pistons less the stroke of the valve. The valve 24 is consequently moved when the outward stroke of each piston is being completed, its center being moved in succession along the sides of a square; or, in other words, it travels in a rectangular path, and it may consequently be termed a "four-motion valve." The valve 24 is prevented from turning by a frame or bridle, 25, Fig. 5, which fits two of its sides, this bridle 25 being itself guided between guide-flanges 26, formed on the port-face piece 22. The bridle 25 can move in one direction between the guides 26, but cannot turn, while the valve 24 can move in a direction at right angles to that of the bridle's motion, but cannot turn; and, further, to prevent displacement of the valve 24, it is provided with a central pin on its upper side, and a pin or spindle, 27, projects downward, so as to prevent the valve from getting into a central position. With this arrangement of the valve 24 and of the parts acting on it it can never be left in a position in which it will prevent the restarting of the meter, as the movements which each pair of pistons imparts to the valve do not close or open the passages of the cylinders of that pair of pistons. Should the water be shut off when a valve movement is only partly effected, then on the water being let on again the pistons that were moving the valve must go to the end of their stroke and complete the valve's movement.

The valve may be of a circular form, but will in that case require to be larger for the same area of port. The valve, if circular, may be left free to turn on its center, so that it will

be continually changing its contacts with the port-face and will consequently tend to wear truer rather than the reverse.

The movements of the pistons are made to act on the counting mechanism 28, which may be of any convenient kind, through the spindle 27, which has fixed on it a star-wheel, 29, in a position just above the upper piston-rod plate, 17. This plate has fixed in it two pins, 30, which as the pistons reciprocate act alternately on opposite sides of the star-wheel 29, and thereby make the spindle rotate step by step.

Two or more double acting cylinders or two or more pairs of single acting cylinders may be arranged with a single valve operated substantially as hereinbefore described; and such sets of cylinders with single valves may be arranged to be worked with steam or other fluid under pressure, as motors for working pumps or other reciprocating apparatus, the power being transmitted by piston-rods extended through stuffing-boxes in the cylinder ends or covers.

What I claim as my invention is—

1. A meter or motor consisting of cylinders radiating from a center, pistons working in the cylinders and attached to piston-rod plates formed with rectangular openings, a four-motion valve in the openings of the piston-rod plates and working on a port-face, two pins fixed on the upper piston-rod plate, and a star-wheel acted on by the said two pins and fixed on a spindle of the counting mechanism, substantially as and for the purposes herein set forth.

2. A meter or motor having, in combination, cylinders radiating from a center, pistons working in the cylinders and attached to piston-rod plates formed with rectangular openings, and a four-motion valve in the openings of the piston-rod plates and working on a port-face in a rectangular path, substantially as and for the purposes herein set forth.

3. A four-motion valve for a meter or motor in combination with plates or rods moved by pistons and arranged to separately and successively move the valve in directions corresponding to the four sides of a square, substantially as and for the purposes herein set forth.

4. A four-motion valve for a meter or motor, a center pin on the upper side of said valve, and a downwardly-projecting stationary spindle or pin placed centrally to keep away the center pin of the valve, substantially as herein set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FRANK W. DICK.

Witnesses:
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R. B. KINNIBURGH.