P. Ball & B. Fitts.

Fluid Meter.

No. 92691. Patented Jul. 20. 1869.

Fig. 6.

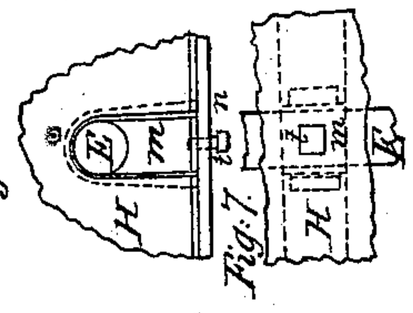


Fig. 7.

Fig. 8.

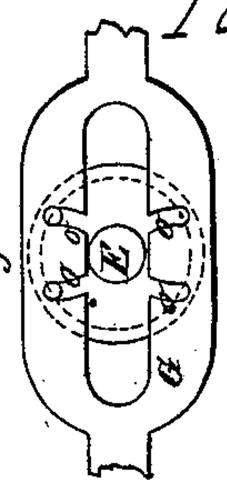


Fig. 5.

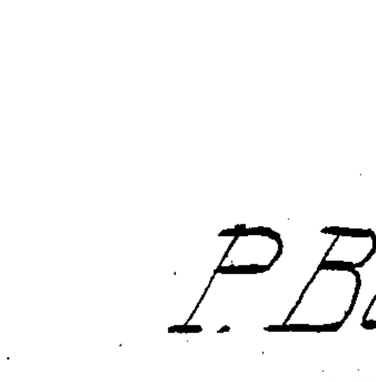


Fig. 1.

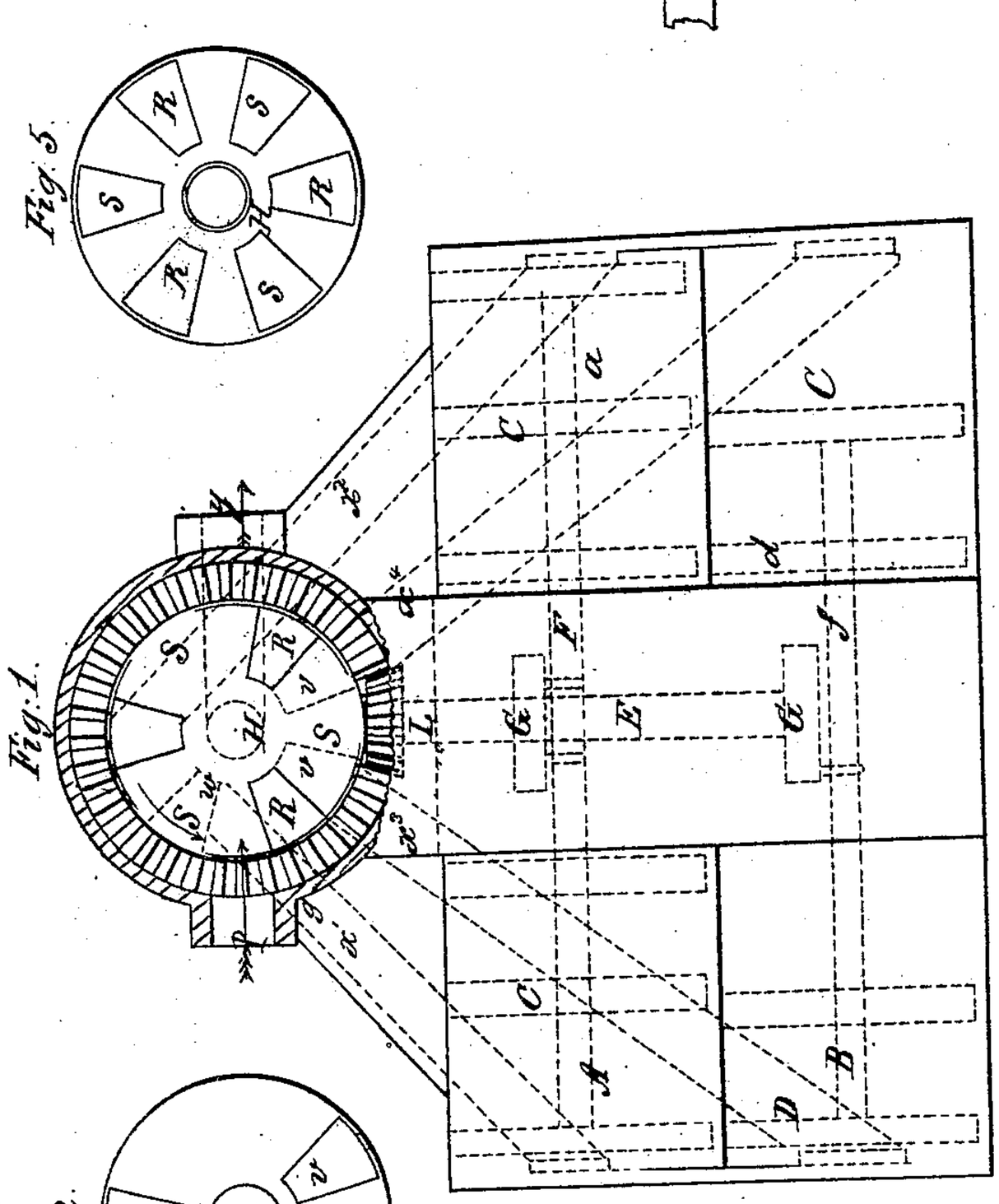


Fig. 2.

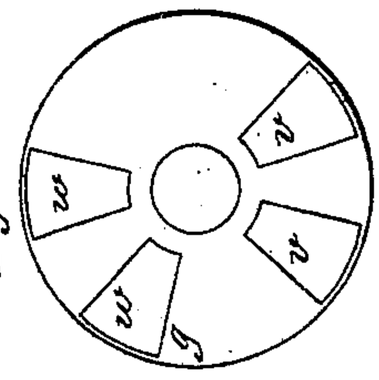


Fig. 3.

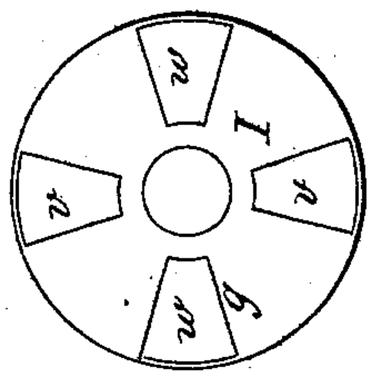
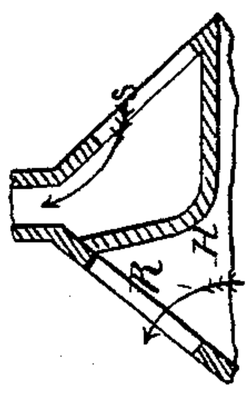


Fig. 4.



Witnesses.

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UNITED STATES PATENT OFFICE.

PHINEHAS BALL AND BENAIAH FITTS, OF WORCESTER, MASSACHUSETTS.

IMPROVEMENT IN FLUID-METERS.

Specification forming part of Letters Patent No. **92,691**, dated July 20, 1869.

To whom it may concern:

Be it known that we, PHINEHAS BALL and BENAIAH FITTS, of the city and county of Worcester and State of Massachusetts, have invented a new and useful Improvement in Fluid-Meters; and we do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawing making a part of this specification, in which—

Figure 1 represents a plan view of the meter, with a portion of the shell or cap removed to show the valve. Fig. 2 represents the face of the valve-seat, showing the location of the ports. Fig. 3 represents the face of a valve-seat with the ports located differently from Fig. 2, but producing the same result. Fig. 4 represents a vertical section of the valve inverted, showing the receiving and discharge ports. Fig. 5 represents the face of a valve, showing the location of the ports or the manner of dividing up the valve. Figs. 6 and 7 represent the device used for securing a tight joint where the shaft passes through a bearing. Fig. 8 represents a portion of the piston-rods, showing slots in which crank-pins move, by which motion is communicated to the crank-shaft similar to the crank-motion, the same letters referring to the same parts in all.

It will be seen that this meter in its movements is similar to a double-cylinder engine, the cylinders being measuring-cylinders, charging and discharging at both ends of each cylinder at every revolution of the crank-shaft, the valve and the means of operating the valve and the general arrangement being peculiar and novel.

The construction is as follows: A *a* B *b* are two measuring-cylinders, in which are pistons C *c* D *d*, the pistons being shown by dotted lines, and in two positions. E is a revolving shaft. F *f* are rods connecting pistons B to *b* and C to *c*. In these rods are slots through which the shaft E passes; also, crank-pins. (Shown in Fig. 8.) On the shaft there are two disks, G G. In each of these disks there are two pins (crank-pins) placed sixty degrees from each other, and projecting through rods F *f* in slots *o o o o*. The slots in F *f* are so formed that when the rods pass back and forth the pins move freely through the slots *o o o o*, giving to the shaft a rotating motion similar to the crank-motion. H is a conical valve constructed with ports, passages, &c., as shown in Figs. 1, 4, and 5.

It will be seen by Fig. 5 that there are six ports, R R R and S S S, and six intervening spaces, the spaces being as large or a little larger than the ports. R R R are receiving-ports, receiving the water through the base of the cone. S S S are discharge-ports, discharging the water through a tube at the apex of the cone. (See Fig. 4.) Around the base of the cone is a gear, *s*, (see Fig. 1,) by which motion is given to the valve by a gear on the crank-shaft E, the crank-shaft performing three revolutions to the valve one. I is the valve-seat, to which the valve K is fitted, and through which are ports *w w v v* opening into passages *x x x x* to the cylinders.

The ports are located in the valve-seat, as shown in Fig. 1 and 2, or may be, and produce the same result, as shown in Fig. 3, *w w* opening to the opposite ends of one cylinder, *v v* opening to the opposite ends of the other. At L, Fig. 1, the shaft E passes through a bearing. To keep this water-tight, as it may be desirable to do, it is constructed as shown, Figs. 6 and 7, Fig. 6 being an elevation, Fig. 7 a plan view.

K is a portion of the frame in which the bearing is formed, being cast in shell form, as is usual, for lining with soft metal, with the space for the metal extending outward to the cap *n*, as shown by the dotted lines. *m* is a cap fitted to the shaft. The shaft E and cap *m* are put in position. Then the space in frame K around shaft E and cap *m* is filled with soft metal or other substance in the usual manner of filling soft-metal bearings. The frame K, cap *m*, and soft metal being reduced to one level, cap *n* may be packed on with rubber or other substance in the usual manner of packing flat surfaces. If the bearing wears, the set-screw *t* may be turned to force the cap *m* down, and more packing may be put between caps *m* and *n*, making it tight again. *p* is the receiving-pipe. *y* is the discharge-pipe.

The operation is as follows: The valve and cranks being set so that when ports *v v* are closed piston D *d* should be at one end of the cylinder, ports *w w* will then be open, one through the receiving-port R of the valve, the other through the discharge-port S, and piston

C *c* should be at the center of the cylinder A *a*. The water then flows into cylinder *a* through passage x^2 and out of A through x^1, the pressure of the water moving the piston, and, with it, the valve, in the direction of the arrow, opening ports S S and allowing the water to flow into cylinder B through x^3 and out of *b* through x^2. By the time piston C gets to the end of the cylinder A the valve will have closed ports *w w*, and as the valve is moved on by piston D *d* ports *w w* commence opening to the opposite ports of the valve, allowing the water to flow in at x^1 and out at x^2. Also, when piston D *d* reaches the end of the cylinder the valve changes the flow of water to the other end of the piston, and so on, giving to the valve a constant rotating motion, and as one or more ports are always open, and never more nor less than equivalent to one port, whatever the position of the valve, we always have a constant steady flow of water.

It will be seen that by the peculiar form of the slots *o o o o*, in combination with the crank-pins, the pistons have a velocity as compared with the valve just in proportion to the opening of the ports that charge and discharge the cylinder—that is, when the ports commence to open the pistons are at the end of cylinder, and move very slow; when the ports are half open the piston moves much faster, and when the port is wide open it moves twice as fast as when half open, and so on through the whole stroke. It will also be seen that, though the valve divides the measured from the unmeasured fluid, there is always equivalent to one pair of ports open. There consequently can be but little pressure on the valve—that is, the valve is nearly balanced.

By knowing the amount the cylinder discharges a register may be constructed and attached to the gear or any convenient part.

Thus having set forth our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The rotating valve H, with its charge and discharge ports and beveled gear, substantially as described.

2. The valve-seat with its ports *w w v v* and passages x^1 x^2 x^3 x^4, in combination with the valve H, and operating substantially as set forth and described.

3. The cap *m*, secured by soft-metal and other packing and by cap *n* and set-screw *t*, all combined, arranged, and operating as set forth.

4. The disks G, having projecting pins, in combination with the slotted connecting-rods F *f*, the slots *o o o o* being so formed as to give to the piston a varying velocity in proportion to the opening through the ports, substantially as described.

5. In combination with the cylinders and their pistons, piston-rods, and disks, substantially as shown, the rotary shaft so constructed as to receive its motion from the piston-rods, communicating it to the valve, substantially as shown and described.

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