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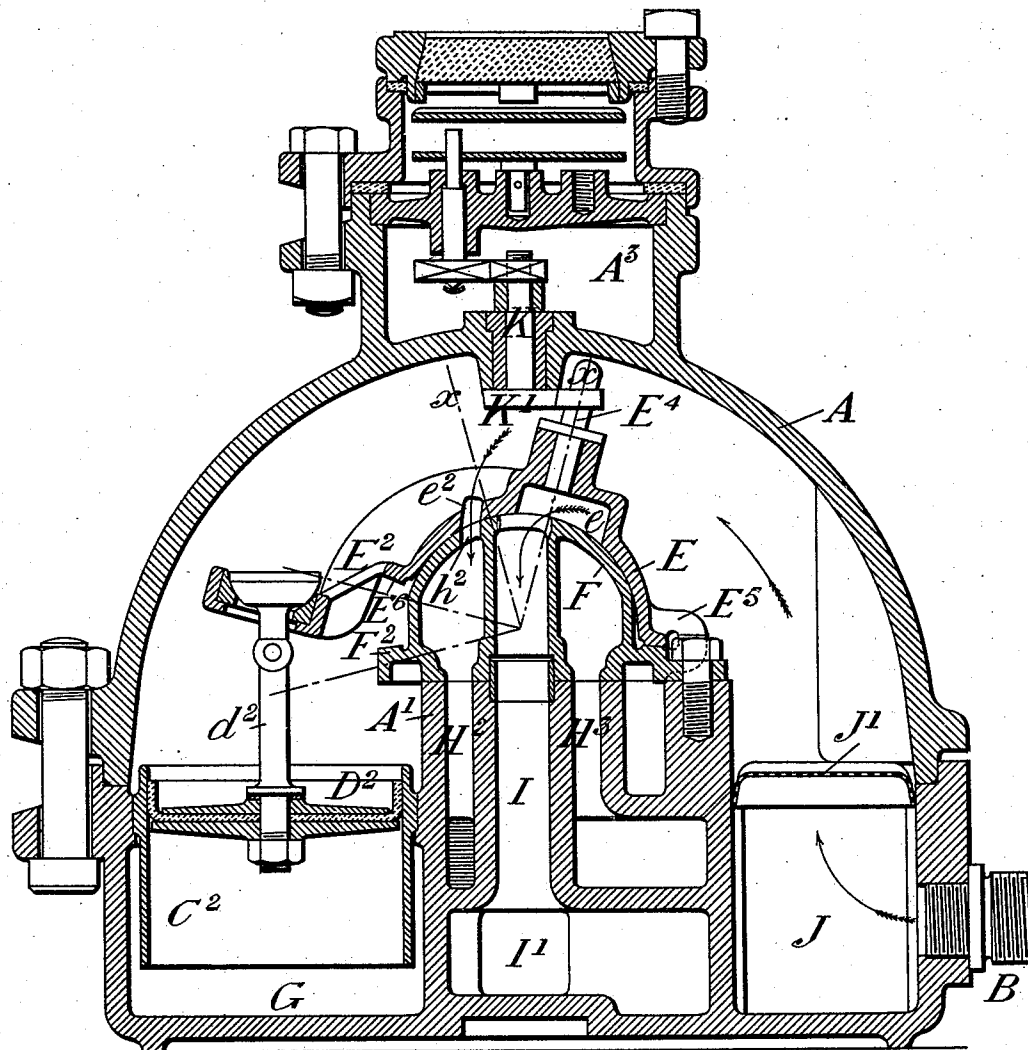
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W. A. G. SCHÖNHEYDER.
FLUID METER.

No. 575,991.

Patented Jan. 26, 1897.

Fig. 1.



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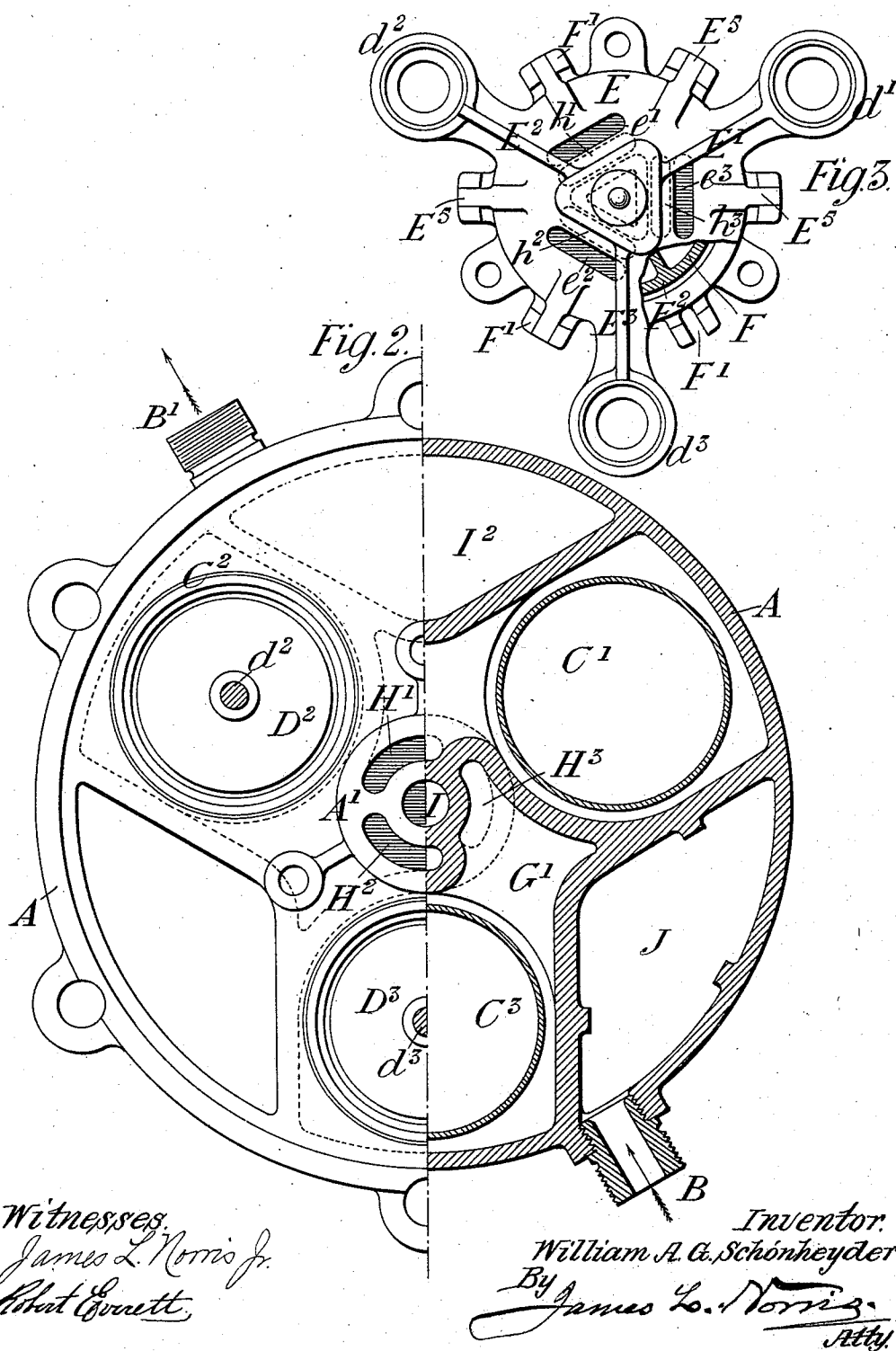
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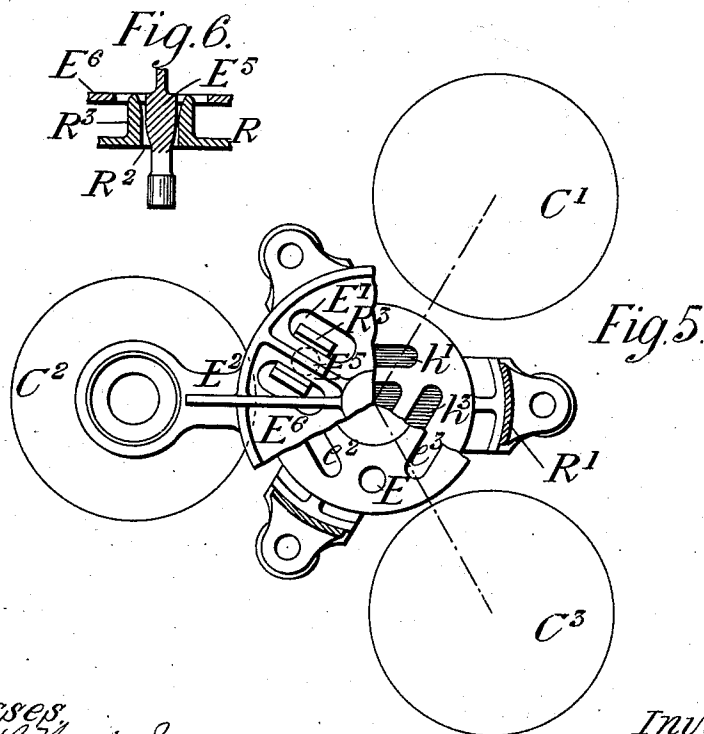
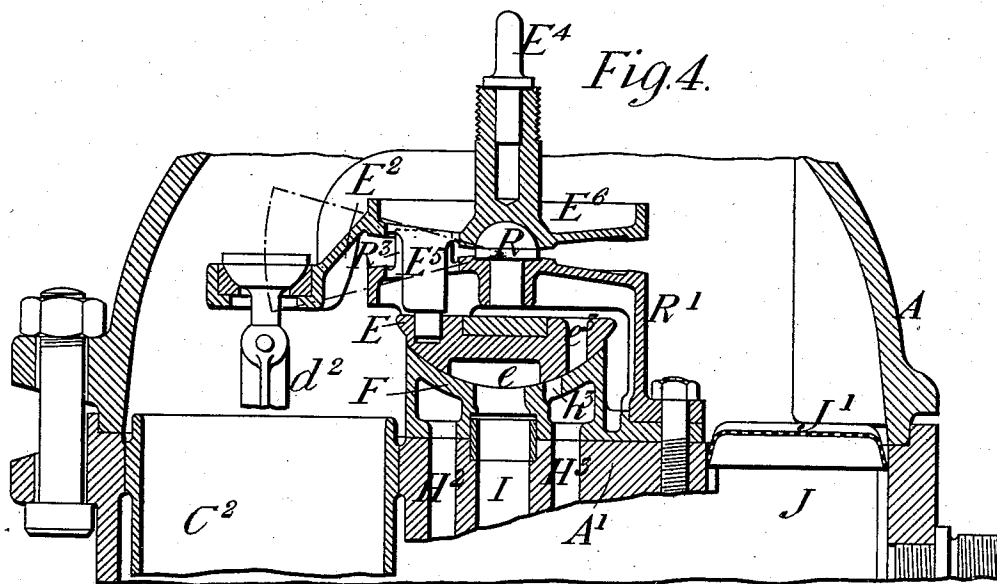
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UNITED STATES PATENT OFFICE.

WILLIAM A. G. SCHÖNHEYDER, OF LONDON, ENGLAND.

FLUID-METER.

SPECIFICATION forming part of Letters Patent No. 575,991, dated January 26, 1897.

Application filed June 15, 1896. Serial No. 595,647. (No model.) Patented in England March 6, 1894, No. 4,702.

To all whom it may concern:

Be it known that I, WILLIAM ANTON GOTTLIEB SCHÖNHEYDER, a citizen of Denmark, residing at No. 4 Rosebery Road, Clapham Park, London, in the county of Surrey, England, have invented an Improved Construction of Fluid-Meters, (for which I have obtained Letters Patent in Great Britain, No. 4,702, dated March 6, 1894,) of which the following is a specification.

According to my invention I construct a fluid-meter as follows:

Within a closed chamber that communicates with the supply of fluid under pressure are three cylinders with pistons arranged at equal distances around a central pillar containing ports and passages, as will be presently described. These cylinders are by preference open at both ends, and are fixed in seatings in the chamber in such manner as to form below the one end of each cylinder an inclosed space that only communicates with the other part of the chamber and the discharge-passage through ports and passages in the central pillar. The other end of the cylinders is in open communication with the chamber, so as to be always subject to the pressure of the liquid therein. The upper end of the pillar has a hemispherical head, and on the accurately-prepared spherical surface of this fits a corresponding hemispherical cap. This cap, which constitutes a slide-valve, is connected to and actuated by three arms, to which are connected the piston-rods of the three cylinders by ball-and-socket joints.

The central pillar has, first, a central passage communicating at bottom with a discharge-passage and at top with a central port on the hemispherical head, and it has three other passages arranged round the central one, each of which communicates at the lower end with the space below one of the cylinders and at the upper end with a port on the hemispherical head, which ports are arranged symmetrically round the before-mentioned central port. The cap, which constitutes a slide-valve controlling these ports, has a central cavity of such a form that it can establish a communication between the central port and any one or two of the three other ports, thereby putting such port and consequently the space below the corresponding cylinder in commu-

nication with the discharge-passage. Round this cavity three ports are formed in the slide-valve corresponding in position to the three above-mentioned ports in the head, and so arranged that when the slide-valve is in a position to connect the central discharge-port of the head with one of the cylinder-ports, by means of the central cavity, the other two cylinder-ports are more or less uncovered by their corresponding slide-ports, so that the bottom spaces of the corresponding cylinders are receiving pressure fluid from the meter-chamber.

Having thus generally set forth the main features of my invention, I will now proceed to more particularly describe the same with reference to the accompanying drawings, in which—

Figure 1 shows a vertical section of one construction of the said fluid-meter. Fig. 2 is a sectional plan, and Fig. 3 is a plan, of the slide-valve. Fig. 4 is a part vertical section of a modified arrangement. Fig. 5 is a sectional plan thereof, and Fig. 6 shows a sectional detail.

Referring to Figs. 1 to 3, A is the closed casing or chamber, communicating at B with the supply of fluid and at B' with the discharge.

C¹ C² C³ are three cylinders fixed in the casing so as to form an inclosed space beneath them, as shown at the left-hand side of Fig. 1, and arranged at equal distances apart round the center. In these cylinders work pistons D¹ D² D³, whose rods d¹ d² d³ have spherical heads fitting in corresponding sockets in arms E¹ E² E³ of the hemispherical slide-valve E, that rests upon the hemispherical head F, fixed on the top of the central pillar A' of the casing A, which pillar contains ports and passages communicating with the several cylinders, as will be presently described.

The inclosed space G below each cylinder communicates by a lateral passage G', Fig. 2, with one of three passages H¹ H² H³, leading up through the pillar and through the spherical head, where they terminate in corresponding ports h¹ h² h³, as shown in dotted lines at Fig. 3. The pillar and head have also a central exhaust-passage I, communicating at bottom by a passage I' and closed chamber I² with the discharge B'. The inlet B commu-

nicates with a space J, preferably inclosed by a strainer J', through which the liquid under pressure flows into the upper part of the casing A.

5 The hemispherical slide-valve E fits fluid-tight upon the hemispherical head F and has three ports e' e^2 e^3 corresponding in position to the ports h' h^2 h^3 , and it also has a central cavity e , adapted to establish a communication between the ports h and the central exhaust-port I. When the valve is in the central position shown at Fig. 3, all three of the ports h' h^2 h^3 are covered thereby, the ports e' e^2 e^3 being then in such a position relative
10 thereto that a slight inclination of the slide-valve to the one side or the other would cause one of its ports to uncover one of the ports h and its cavity e to establish a communication with another of the ports. Practically when
15 the meter is in a state of rest the slide-valve is always in a more or less inclined position, so that one or other of the ports h would be uncovered and another one put in communication with I by the cavity e . Assuming
20 this to be the case and that the port h^2 is in communication with cavity e , and consequently the space G of cylinder C² in communication through II² h^2 I I' with the discharge B', then the fluid-pressure in A will
25 force down piston D², expelling the liquid from the space G and at the same time drawing downward the arm E² of the slide-valve E, so that this is inclined to a greater extent upon the cap F toward C². By this motion
30 the slide-valve is made gradually to close the communication between port h^2 and the exhaust I and to establish the communication between port h' and I, so that the space G below piston D', which has previously become
35 filled with liquid through the open port h' by the upward motion of that piston caused by the motion of the slide-valve, is now put in communication with the exhaust, and piston D' is consequently forced downward by the
40 liquid under pressure in A, whereby the slide-valve is moved over toward C', gradually closing the exhaust of that cylinder and opening that of C², and so on in continuous rotation. By this consecutive action of the pistons upon
45 the slide-valve this will receive a kind of rolling motion upon the hemispherical head F, causing a finger E⁴, projecting up from its apex, to describe a conical path, as indicated by the dotted lines $x x$, round the vertical
50 axial line, whereby it is able to rotate a radial arm K' on a spindle K, passing through the casing A into a chamber A³ above, where its motion is communicated by any suitable known gear to a counter fixed upon such
55 chamber, and which is consequently made to register at each revolution of spindle the volumes of liquid represented by the strokes of each of the three cylinders, such strokes being made to constitute a definite capacity.

65 Although the slide-valve has the above-described rolling motion, it has no rotary motion round the axial line, and in order to in-

sure that it shall be perfectly stationary in this respect its edge is provided with a series of projecting fingers E⁵, which, as the slide-valve rolls round, slide in and out of slotted guide-pieces F', projecting from the head F. The rotation of the valve may also be prevented by combining therewith the well-known gimbal-ring device, the valve being
70 connected by opposite pivots to a gimbal-ring, which is connected by pivots at right angles to a fixed support.

In order to control the length of the stroke of the pistons, a conical flange F² is formed
75 round the head F and a similar one E⁶ on the head, so that as the valve rolls round the flange E⁶ thereof rolls upon F², thus giving the slide-valve, together with the arms E' E² E³ and the piston connected thereto, a definite extent of motion.

Although I have described the slide-valve as having the arms for attachment to the piston-rods formed in one therewith, they may for facility of manufacture and adjustment
80 be made part of a separate frame fitted onto the slide-valve, so as to cause this to move in the described manner when actuated by the pistons.

It will be evident that instead of making
85 the pillar-head convex and the slide-valve concave the head may be concave and the valve convex; also that there might be a greater number than three cylinders with a corresponding number of ports and passages.

100 Figs. 4 to 6 show a modified construction in which the arms E², that serve to connect the spherical slide E to the pistons of the cylinders C, are formed on a disk E⁶ separate from the valve itself and rocking on a separate
105 spherical support R, the disk E⁶ being connected to the valve E by pins E⁵, fitting into recesses in the valve, so as to impart its motion thereto. By this arrangement any wear between the disk E⁶ and its support R will
110 not affect the action of the valve, and also any wear of the latter on its seat will not affect the correct action of the disk E⁶, arms E², &c., and pistons. Should the support R wear materially, it can be readily removed and re-
115 placed by a new one. It is carried by a tripod-stand R', having slots R², through which the pins E⁵ of the disk E⁶ pass, guide-pieces R³ being formed on each side of the slots, which thus take the place of the guides F' of
120 the first-described construction in preventing the rotation of the disk E⁶ and valve E, and which project through holes E⁷ of the disk E⁶ as this rocks. The other parts of the meter are the same as previously described
125 and are designated by the same letters of reference, and need therefore not be further referred to.

The valve E is in this case made with a convex working face and its seat concave.

130 Having thus described the nature of my invention and the best means I know for carrying the same into practical effect, I claim—

1. In a fluid-meter, a slide-valve with spher-

ical working face working on a spherical valve-seat, within a closed chamber supplied with fluid, cylinders with pistons arranged around such valve and seat, ports and passages leading from such cylinders to the valve-seat, arms connected on the one hand to the said slide-valve and on the other hand to the pistons of the cylinders and adapted to receive a rolling motion from the latter which motion is imparted to the slide-valve so as to alternately cover and uncover the ports in the seat and thereby to control the passage of liquid to and from the cylinders, and a counter receiving motion from the said arms, substantially as described.

2. In a fluid-meter, the combination of three or more cylinders with pistons arranged within a closed casing round a central pillar having ports and passages leading to and from the said cylinders and having a hemispherical head on which fits a hemispherical slide-valve, actuated by arms connected to the pistons of the said cylinders, which slide-valve governs the ports leading to the cylinders whereby these are put successively in communication with a discharge-passage the fluid-pressure supplied to the casing being made to move the pistons so as to successively discharge the fluid previously admit-

ted and to admit a fresh charge, while the motion of the pistons and the slide-valve is imparted by suitable means to a counter, substantially as described.

3. In a fluid-meter, the combination of a casing A, supplied with fluid-pressure cylinders C' C² C³ with pistons D' D² D³ arranged round a central pillar A having passages H' H² H³ leading to and from the cylinders, an exhaust-passage I communicating with a discharge B', a hemispherical head F having ports h' h² h³ communicating with the passages in the pillar, a hemispherical slide-valve E connected by arms E' to the rods of the pistons D, said slide-valve receiving a rolling motion upon the head F whereby it is made to control the supply of liquid to and its discharge from the cylinders, while a rotary motion is imparted thereby to a shaft K substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 1st day of June, A. D. 1896.

WILLIAM A. G. SCHÖNHEYDER.

Witnesses:

OLIVER IMRAY,
JNO. P. M. MILLARD.