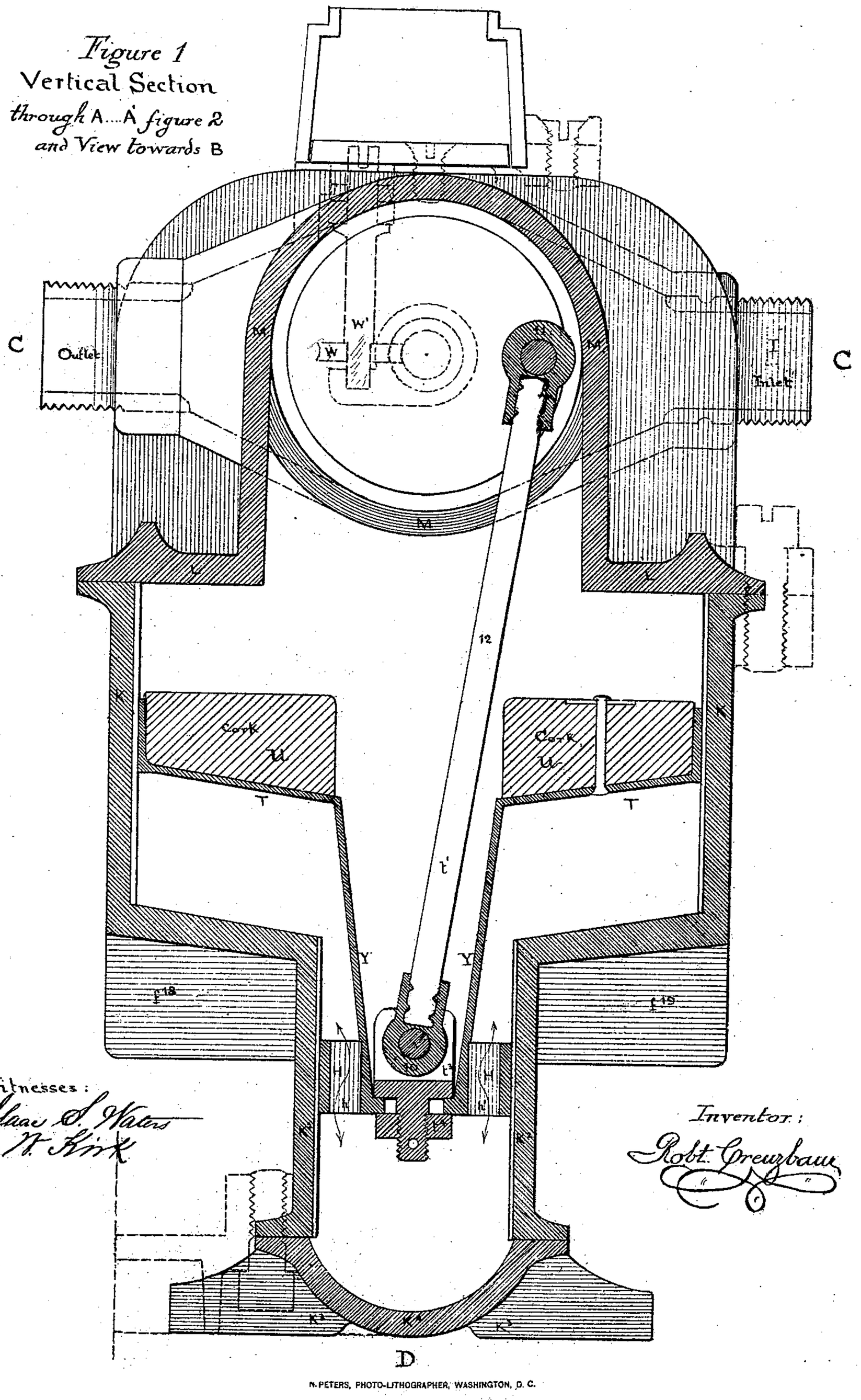
4. Sheets. Sheet. 1.

R. Creuzbaur,

Fluid Meter.

No. 111,179. Patented Jan. 24. 1871.

Figure 1
Vertical Section
through A....A *figure 2*
and View towards B



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4. Sheets. Sheet 2.

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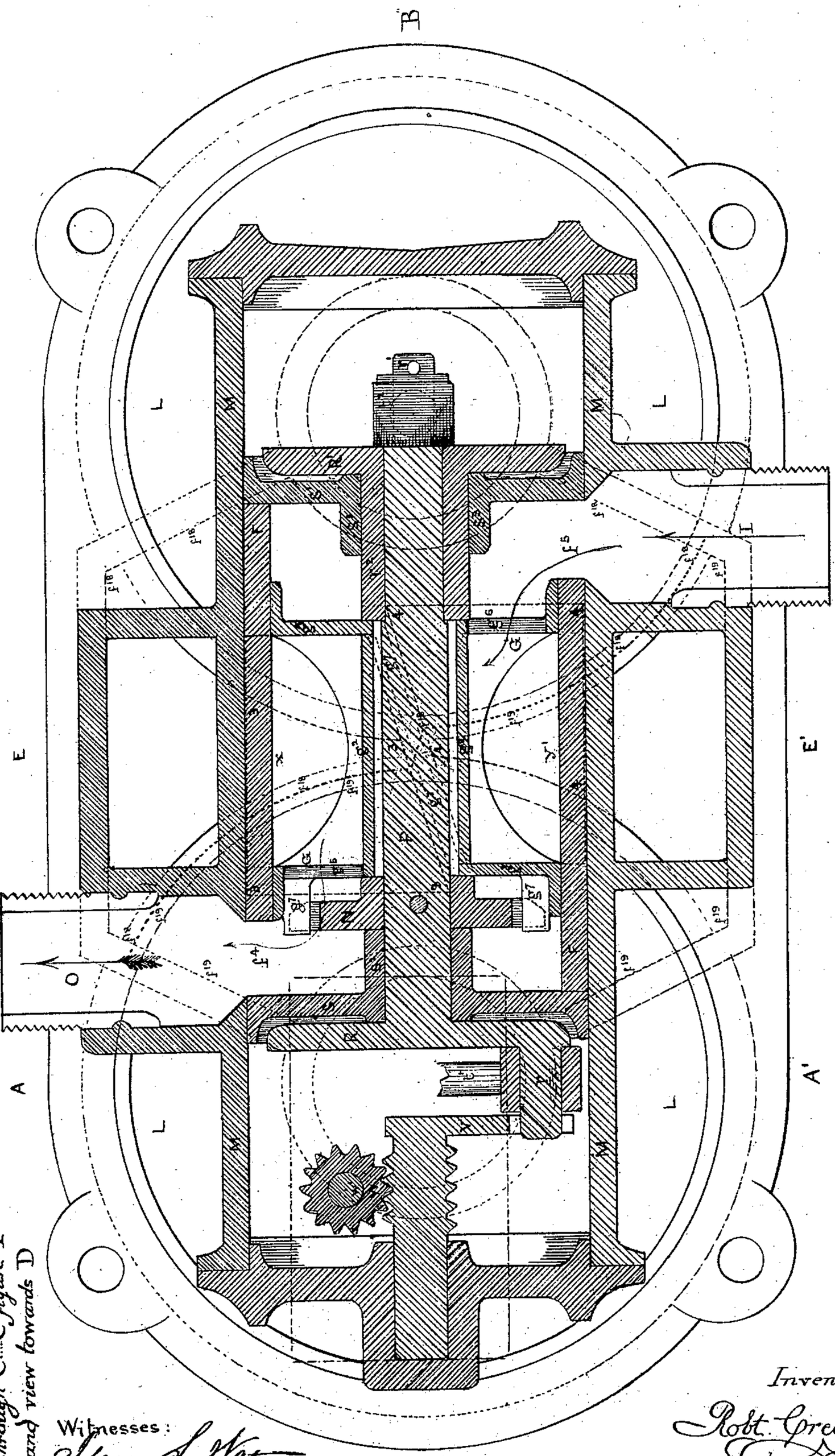

Figure 2
Horizontal Section
through C....C' figure 1
and view towards D

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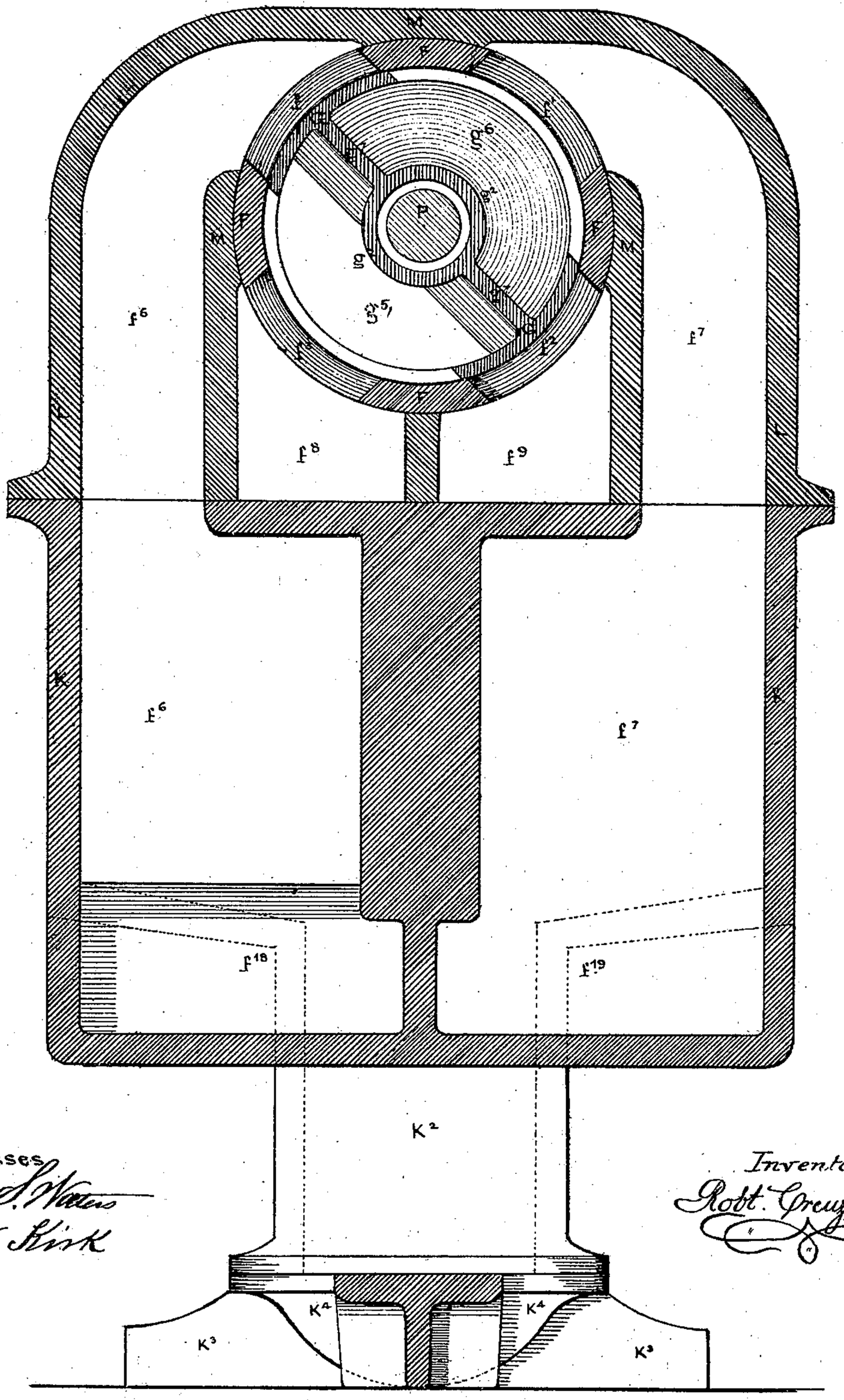
4 Sheets. Sheet 3.

Fluid Meter.

No. 111,179. Patented Jan. 24. 1871.

Vertical Section
through E.....E' fig. 2
and View towards B



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Fluid Meter.

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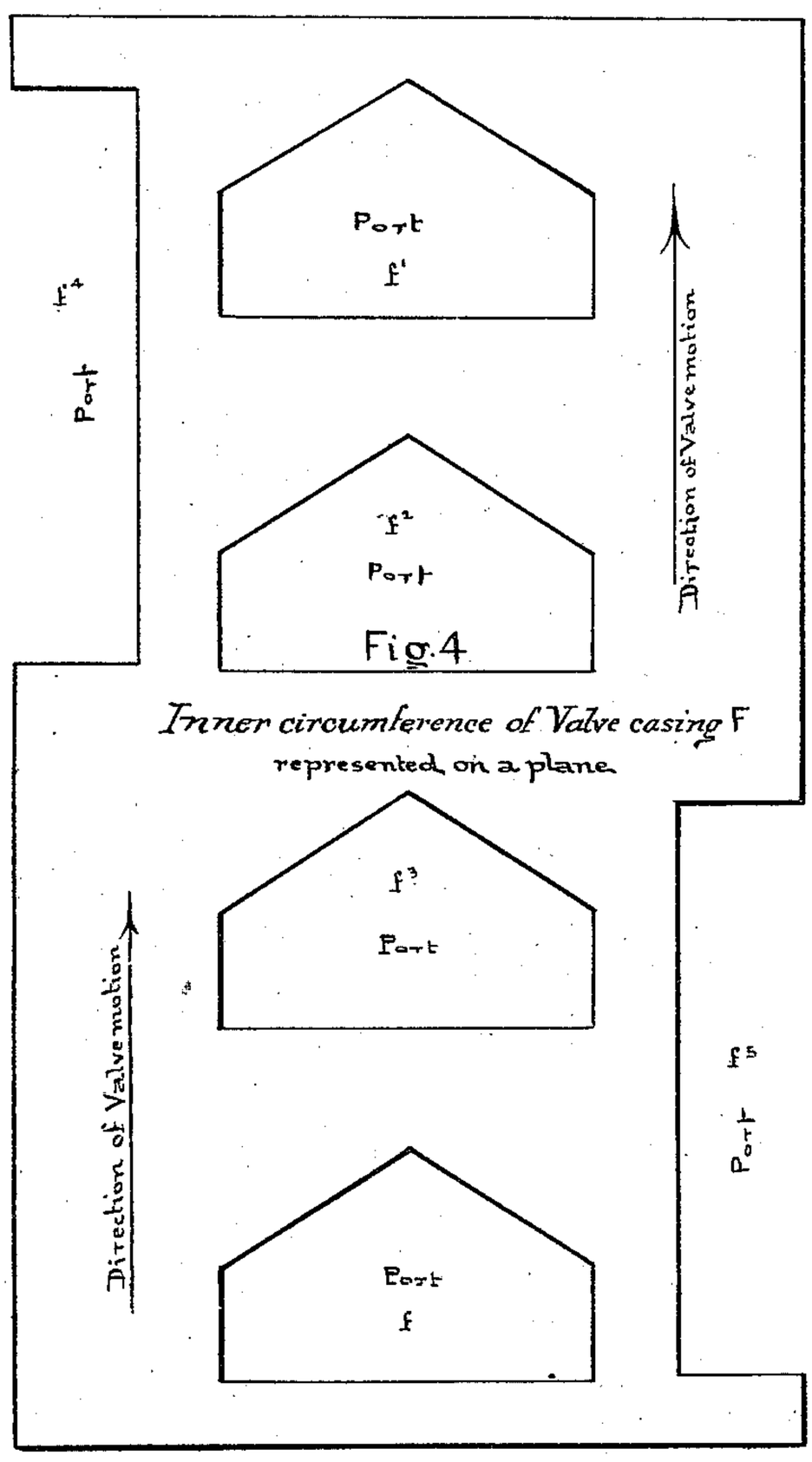


Fig. 4

Inner circumference of Valve casing F represented on a plane

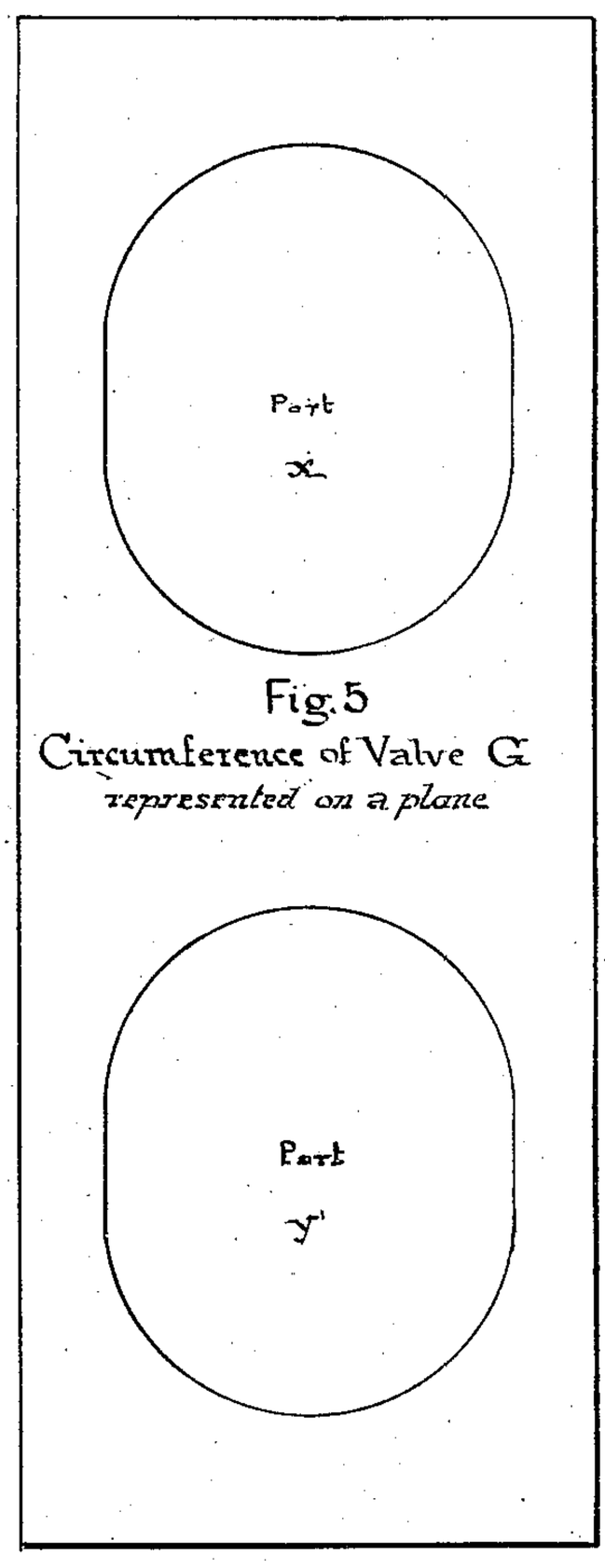
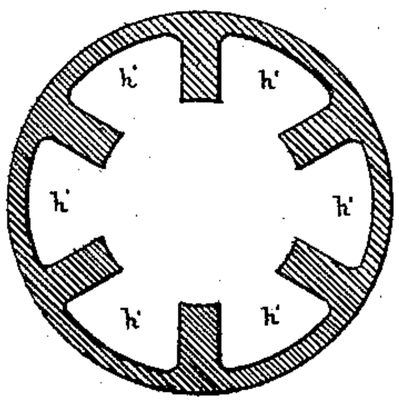


Fig. 5

Circumference of Valve G *represented on a plane*

Fig. 6

Section of Guide Ring H



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ROBERT CREUZBAUR, OF WILLIAMSBURG, NEW YORK.

Letters Patent No. 111,179, dated January 24, 1871.

IMPROVEMENT IN FLUID-METERS.

The Schedule referred to in these Letters Patent and making part of the same.

I, ROBERT CREUZBAUR, of Williamsburg, in the county of Kings and State of New York, have invented an Improved Fluid-Meter, of which the following is a specification.

Nature and Objects of the Invention.

The general arrangement of the meter is upon the old plan of two pistons, reciprocating in separate cylinders, and operating, by connecting-rods, a crank-shaft, and a revolving valve which is common to both.

The first part of my invention relates to the arrangement of the crank-shaft relative to the valve which revolves with it, and has for its object to prevent the transmission upon the valve of any strain suffered by the shaft.

The second part of my invention relates to an arrangement which admits of the application of proper journals to the shaft without interfering with the functions required of the valve, and without the use of extra parts.

The third part of my invention relates to an arrangement of the ports in the valve and in the valve casing, or in either, which approximately proportions the variable openings for the passage of the fluid to the motions of the pistons and the quantity displaced by the same; with the principal object of avoiding any pressures upon the pistons to which they cannot yield by reason of their path being prescribed by the crank-shaft.

The fourth part of my invention relates to the shaping of the ports in the valve and valve-casing in such manner that the transverse edges thereof will not cross each other in parallel lines, but obliquely, as the cutting edges of scissors. The object of this is to better preserve the edges of the ports, and the better to displace any obstructing particles lodging between the said edges.

The fifth part of my invention relates to such a construction of pistons as will give an ample distance between the guiding surfaces without separating the fluid on the two sides of the smaller guide-bearing, together with a long connecting-rod, and a shape to the piston admitting easy manufacture; and the improvements consist in increasing the area of the end ports of the valve by sloping the central partition in the same; also, in providing chambers into which the lower channels open for the purpose of more evenly diffusing the impact of the fluid upon the pistons and to avoid side strains; also, in the arrangement of the connecting-rods with the view of obtaining light weight with strength; and in the general arrangement and shape of the machine.

Description of the Accompanying Drawing.

Figure 1 represents a vertical section of my improved fluid-meter through A A′, fig. 2, and a view toward B.

Figure 2 is a horizontal section through C C′, fig. 1, and a view toward D.

Figure 3 is a vertical section through E E′, fig. 2, and a view toward B.

Figure 4 represents the inner circumference of valve-casing F, shown on a plane.

Figure 5 represents the circumference of valve G, shown on a plane.

Figure 6 is a section of the guide-ring H.

General Description.

K K, fig. 1, is one of the two cylinders which lie side by side, as indicated in fig. 2.

Each cylinder has a neck, K^2, as shown in figs. 1 and 3, in which a piston-guide ring, H, operates. This neck is cast with an open end so as to facilitate the molding and boring of the cylinder.

The spurs K^3, on the cylinder end K^4, serve as feet upon which the meter is to stand.

L L is the cover to the cylinders, in one piece with valve-cylinder M M.

F F is the valve-casing which has the four ports f f^1 f^2 f^3, figs. 3 and 4, and the two inlet and outlet-ports f^4 f^5, which are represented in figs. 2, 3, and 4.

G G′ is the valve. It is composed of the circumference or outer sleeve with its ports, as represented in fig. 5, of the central open sleeve g^2, the two end plates g^3 g^4, each with a semi-annular opening, g^5 g^6, on opposite sides, as shown in figs. 2 and 3, and of the longitudinal diagonal partition g^1, figs. 2 and 3, which divides the inside of the valve into two tapering chambers, each embracing one of the end openings g^5 g^6, which are larger than a half-annular circle.

The valve is revolved by the carrier N, which is firmly fastened upon shaft P.

The ends of this carrier are formed into forks in which the two knobs g^7 g^7, fast on valve G, are carried in such manner that both knobs are equally engaged when the valve is being revolved, but with some play, so that any yield in the shaft cannot transmit strain to the valve.

Upon the two ends of the shaft P are the disks R R′, with the crank-pins T T′.

The disk R is in one piece with the shaft, and the disk R^1 is fastened upon the shaft by hub R^2.

S S^1 are two stationary disks, with journal hubs S^2 S^3, in which the shaft revolves.

These disks are made to fit into the valve-cylinder M, and to abut against the ends of the valve-casing F.

The inlet I and the outlet O connect through passages f^4 and f^5, and through openings g^5 and g^6 with the two partitions in the valve, and, by the motion of

the latter, with the front and rear of the two pistons in rotative order.

T, fig. 1, is one of the pistons.

t^1 t^2, fig. 2, the connecting-rods.

t^3, fig. 1, one of the forked connecting-rod pivots fastened to the piston by nut t^4.

H is one of the guide-rings, which is cast with or firmly fastened upon the small end of the piston, and has a cross-section, as shown in fig. 6; the openings h' therein allow the fluid free passage through the same, and equalize the pressure on the two sides thereof.

This combination of a large main bearing of the piston, with a small guide-bearing to the neck of the piston, as shown, secures a good parallel motion of the piston, together with a long connecting-rod, with consequent reduction of strain upon the shaft and piston-guid bearing.

The cork U U is placed into the pistons to assist in floating the same, and to reduce the weight of the reciprocating mass.

The two ports $f f^1$, in the valve casing F, fig. 3, connect with the lowest ends of the two cylinders K K through the channels f^6 f^7, and the ports f^3 f^2 connect with the front or nearest ends of the two cylinders through ports 3 3 3 and 4 4 4, fig. 2, in such manner that two opposite ports, f f^2 or f^1 f^3, fig. 3, govern the same cylinder. Thus the valve is made to cover and uncover two opposite ports corresponding to the two ends of a cylinder simultaneously; the valve and the piston being so set in relation to each other that, when a piston has arrived at the end of a stroke, its corresponding ports will be covered by the valve, and uncovered so as to reverse the course of the fluid through the same, with the result of driving the piston in the reverse direction.

The ports in the valve-casing and valve are so shaped as to control the transmission of the fluid to and from the pistons in such a manner as to harmonize the flow and pressure of the fluid with the path prescribed to the pistons by the crank-shaft, and so that the motion or impact of the pistons will harmonize with the motion of the crank-shaft without transmitting any strain upon the latter.

To accomplish this those parts of the ports through which the pistons receive a new direction are much larger than the ends of the ports corresponding to the last part of the pistons' motion in one direction prior to a change therein; the object being to counteract the inertia of the moving parts by checking the flow of the fluid so as to bring them to a rest without strain upon the shaft, and, at the beginning of a stroke, when the inertia of rest must be overcome, to throw the requisite amount of fluid and pressure upon the parts to be set in motion.

V, fig. 2, is a drag-crank with a worm upon its shaft, into which plays the worm-wheel W.

The shaft W', of the latter, extends through a usual stuffing-box and gives motion to the registering-wheels.

The chambers f^{18} f^{19}, through which channels f^6 f^7 communicate with the lower ends of the pistons, serve to reduce the local impact of the fluid and to diffuse it upon a greater surface so as to avoid side strains upon the pistons.

The valve G, and its seat in the casing F, may with advantage be tapering.

The manner, described, of carrying this valve, with avoidance of all strain upon the same, insures a minimum of resistance and great durability in the tightness of the same.

And by the use of the journal-hubs S^2 S^3 the shaft moves freely, as in contradistinction from the old arrangement, in which the valve itself forms the bearing for the shaft, with consequent rapid wear of the valve and great frictional resistance.

The connecting-rods are formed of a steel rod, 12, upon the ends of which the brass eyes 10 11 are cast. This arrangement gives brass for the frictional surfaces, steel for the part under greatest strain, and light weight, as well as cheap construction.

The construction of the connecting-rod, with one or both of the eye-pieces 10 and 11, separate from the central rod, and screwed upon the latter, gives a ready mode for adjusting the length of the rod, as well as a cheap and serviceable connection between the crank-pin and the piston.

The adjustment is made by giving the eye-piece which forms the nut one or more turns upon the screw formed at the end of the rod.

Claims.

I claim as my invention—

1. The combination, with a valve, G, of the crank-shaft P and the carrier N, substantially as and for the purpose hereinbefore set forth.

2. The combination of two or more reciprocating pistons with connecting-rods t^1 and a crank-shaft or shafts P, with one or more rotating valves and shaft-bearings S S^1, for the purpose named.

3. The ports f f^1 f^2 f^3 of valve-casing F, in combination with the ports x y of valve G, when the construction of the ports enables them to operate to proportion the quantity of fluid passing through them to the requirements of the pistons, substantially in the manner described.

4. The valve-casing ports f f^1 f^2 f^3 and valve-ports x and y, either or all of them, with their closing edges in an oblique or curved direction, so as to close upon each other as the blades of scissors, substantially as and for the purpose hereinbefore set forth.

5. The combination, with the main body, of the piston T and its neck y of the guide-ring H with the fluid passages h' h', substantially as and for the purpose hereinbefore set forth.

6. The combination, with a cylinder, K, and its piston T with guide-ring H, of the cylinder-neck K^2, substantially as and for the purpose hereinbefore set forth.

7. The combination of the valve G and the valve-casing F, and their ports, with the passages f^8 f^9, fig. 3, and openings 3 3 and 4 4, fig. 2, leading directly to the front of the pistons, and passages f^6 and f^7 leading to the rear thereof, for the purpose named.

8. The connecting-rod t^1, composed of the two soft-metal eye-pieces 10 and 11, and the central hard-metal piece 12, the said pieces being constructed so as to be connected together in the manner shown, and to be adjusted so as to shorten or lengthen the rod, as set forth.

9. The longitudinal diaphragm g^7 g^7, arranged in a valve, G, so as to run at an angle with the axis of the same in order to enlarge the two end openings g^5 and g^6 of the valve, substantially as described.

10. The combination of two cylinders K K, pistons T T, connecting-rods t^1 t^1, and a crank-shaft P, with a transverse rotary valve, G, and its corresponding ports and channels, substantially as and for the purpose hereinbefore set forth.

11. The combination, with the shell of each of the pistons T, of a fluid-displacing piece, u u, provided with a central eye through which the connecting-rod t^1 operates, substantially as and for the pnrpose hereinbefore set forth.

12. The combination, with the cylinders K K and channels f^6 f^7, of diffusing chambers f^{18} f^{19}, for the purpose named.

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