

(No Model.)

2 Sheets—Sheet 1.

W. M. FOWLER.
LIQUID METER.

No. 570,748.

Patented Nov. 3, 1896.

Fig. 1.

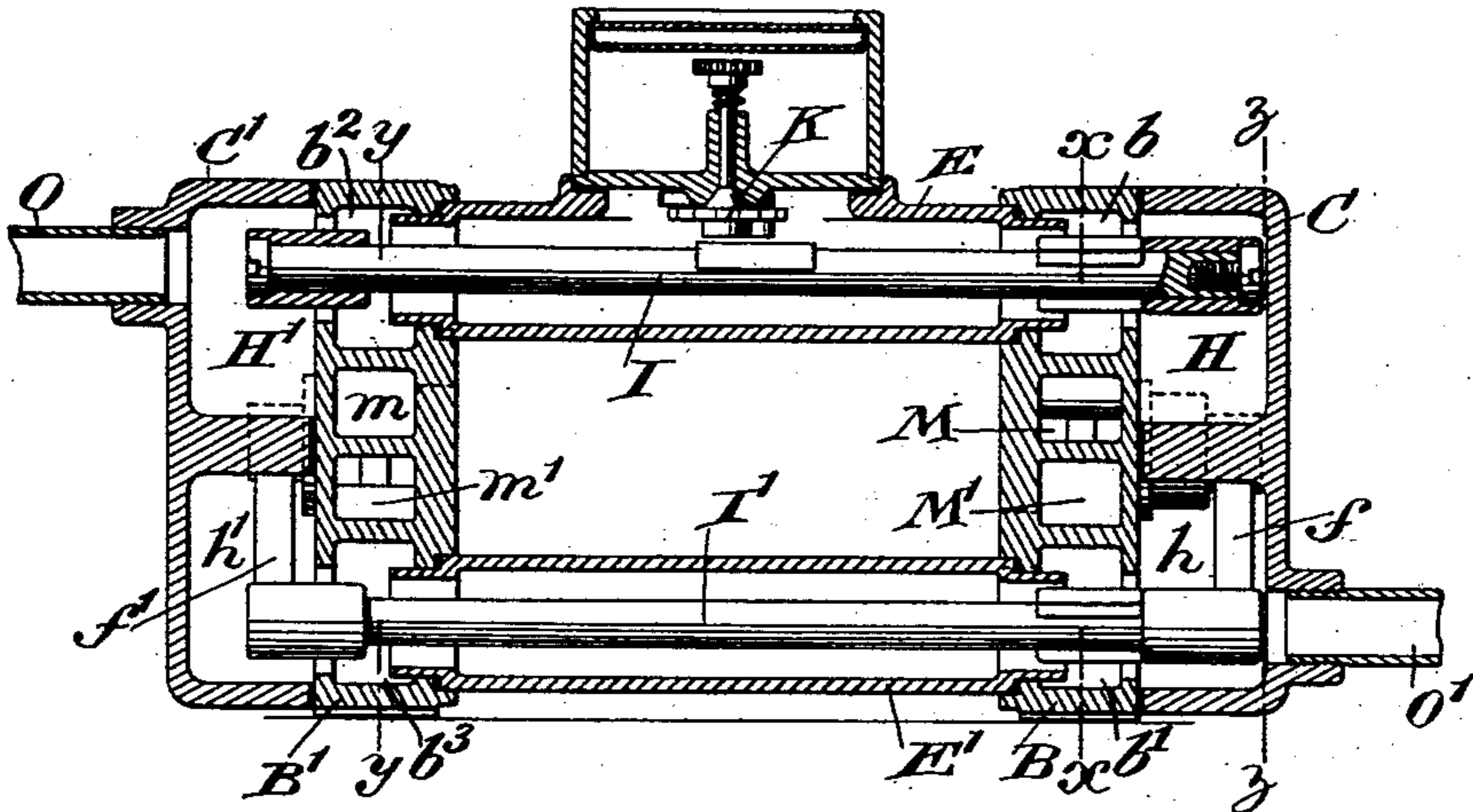


Fig. 2.

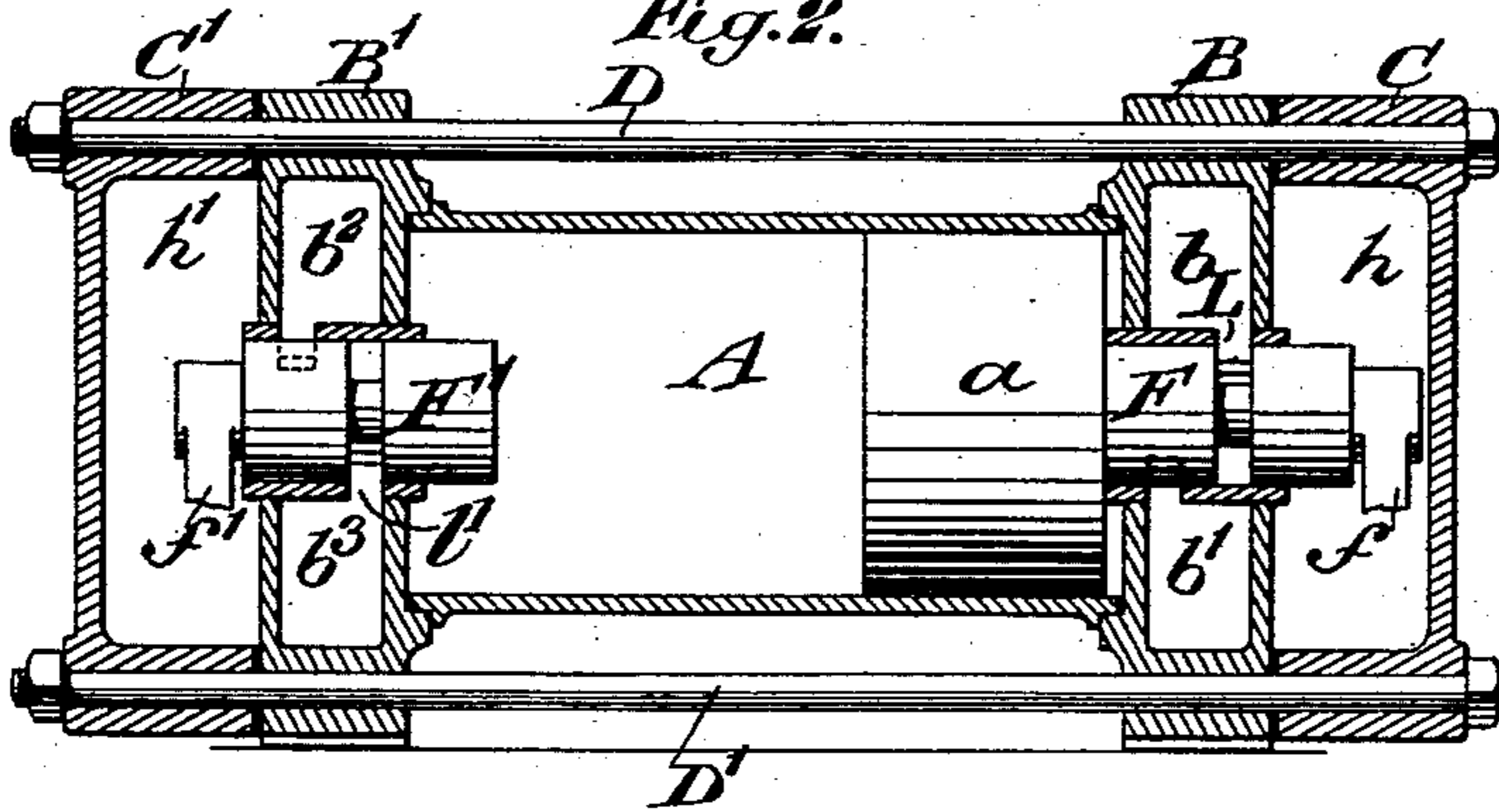
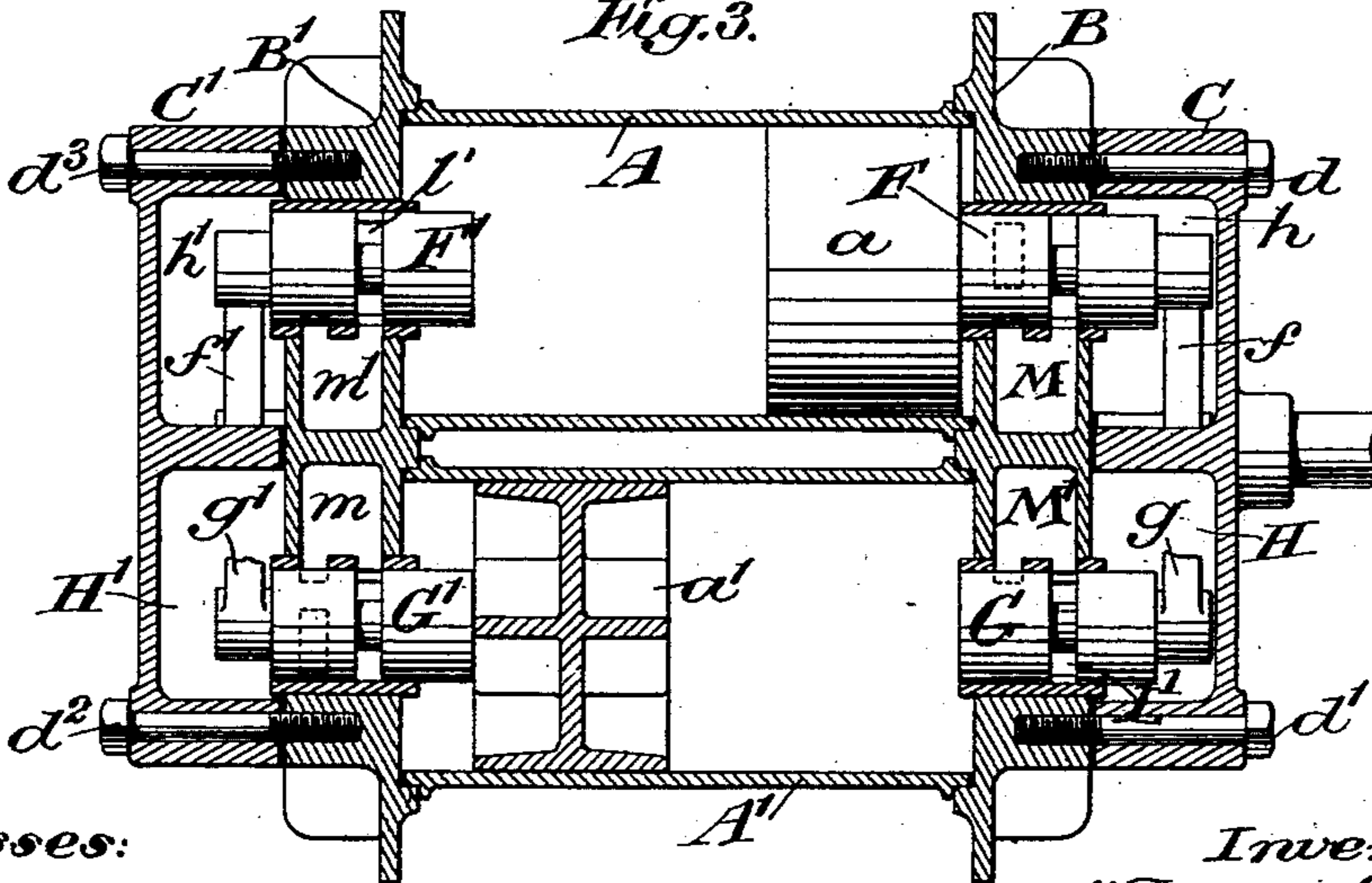


Fig. 3.



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George Barry,

Inventor:

William M. Fowler
by attorneys

Brown & Sewall

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2 Sheets—Sheet 2.

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Fig. 4.

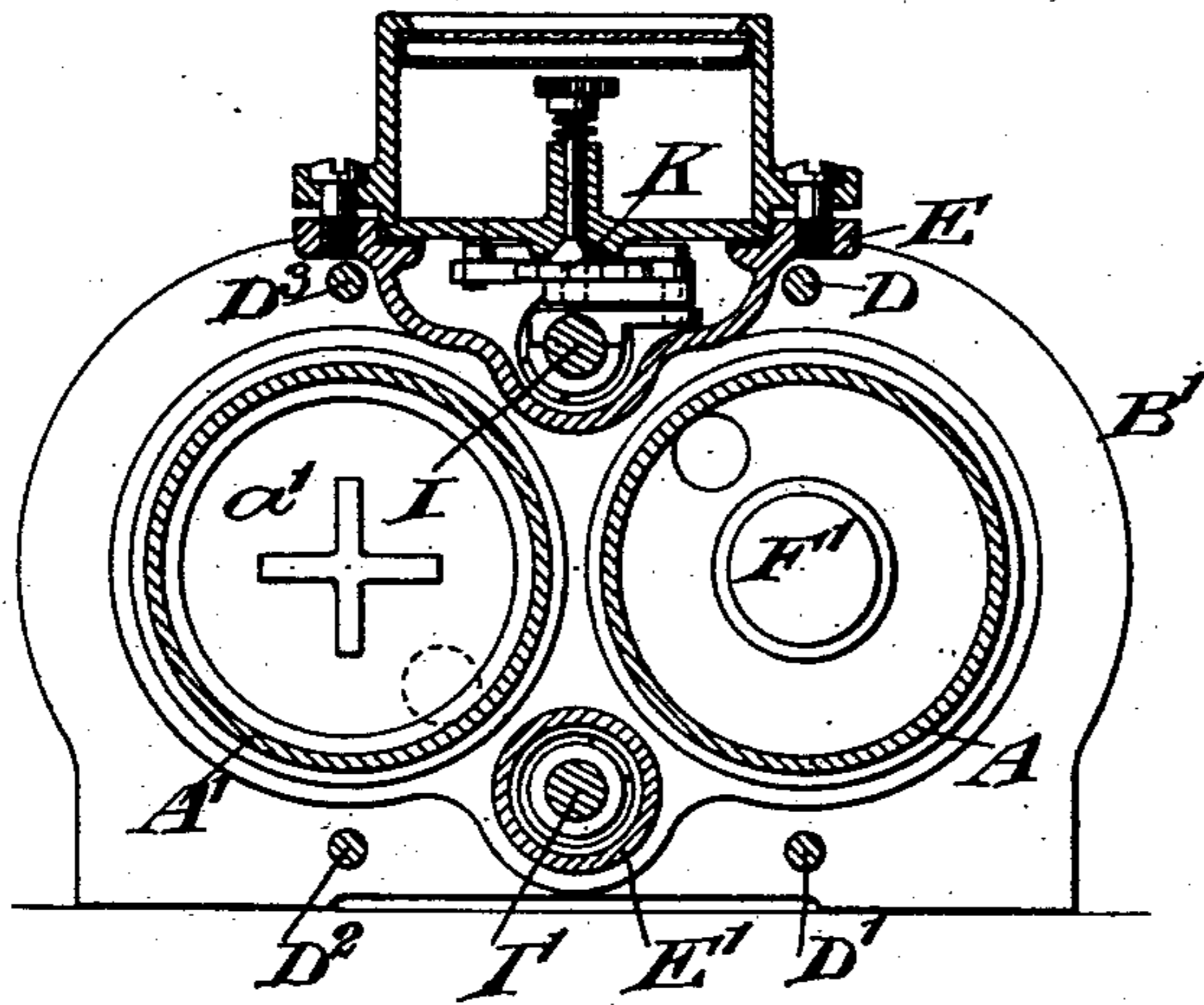


Fig. 5.

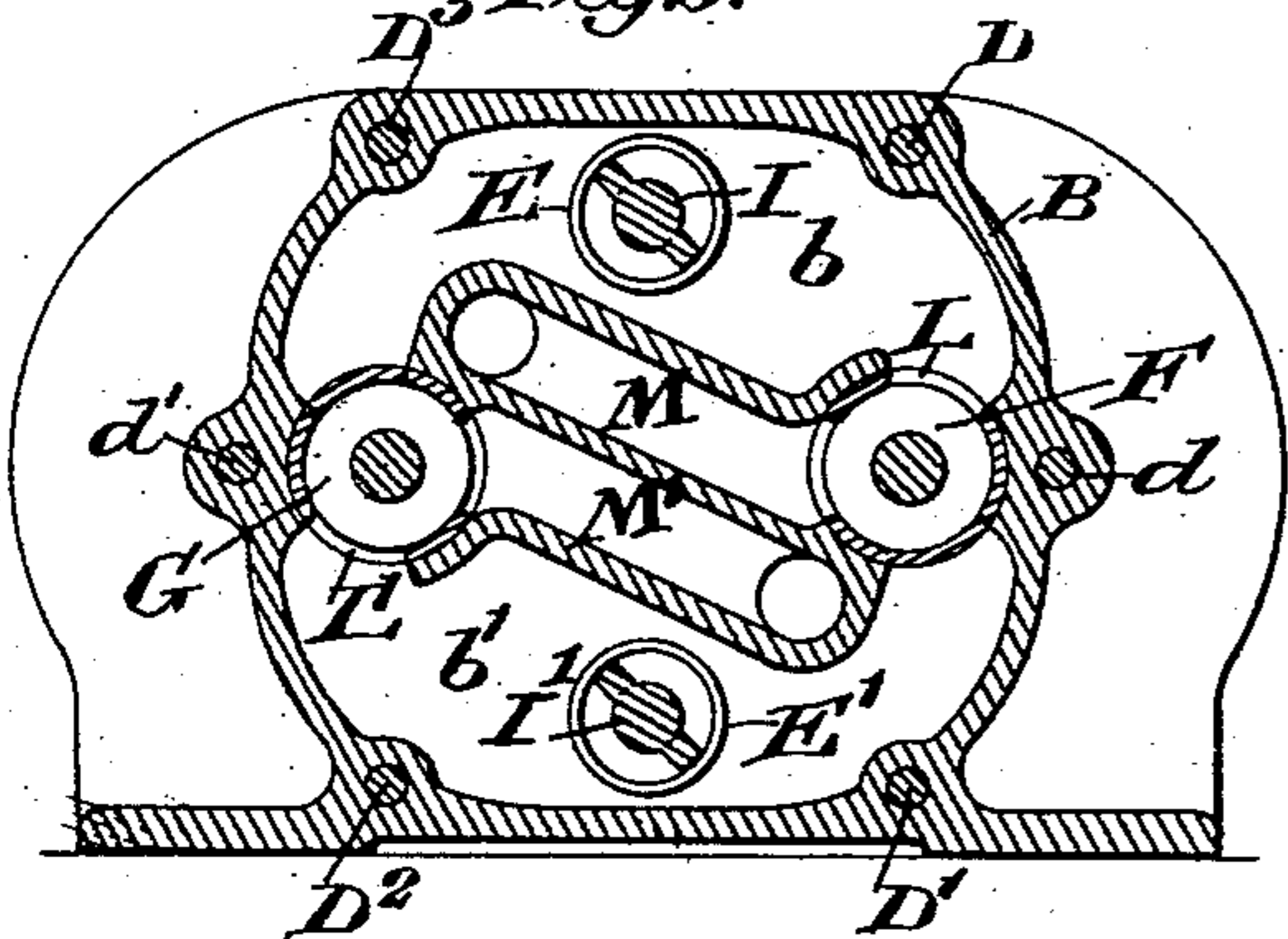


Fig. 6.

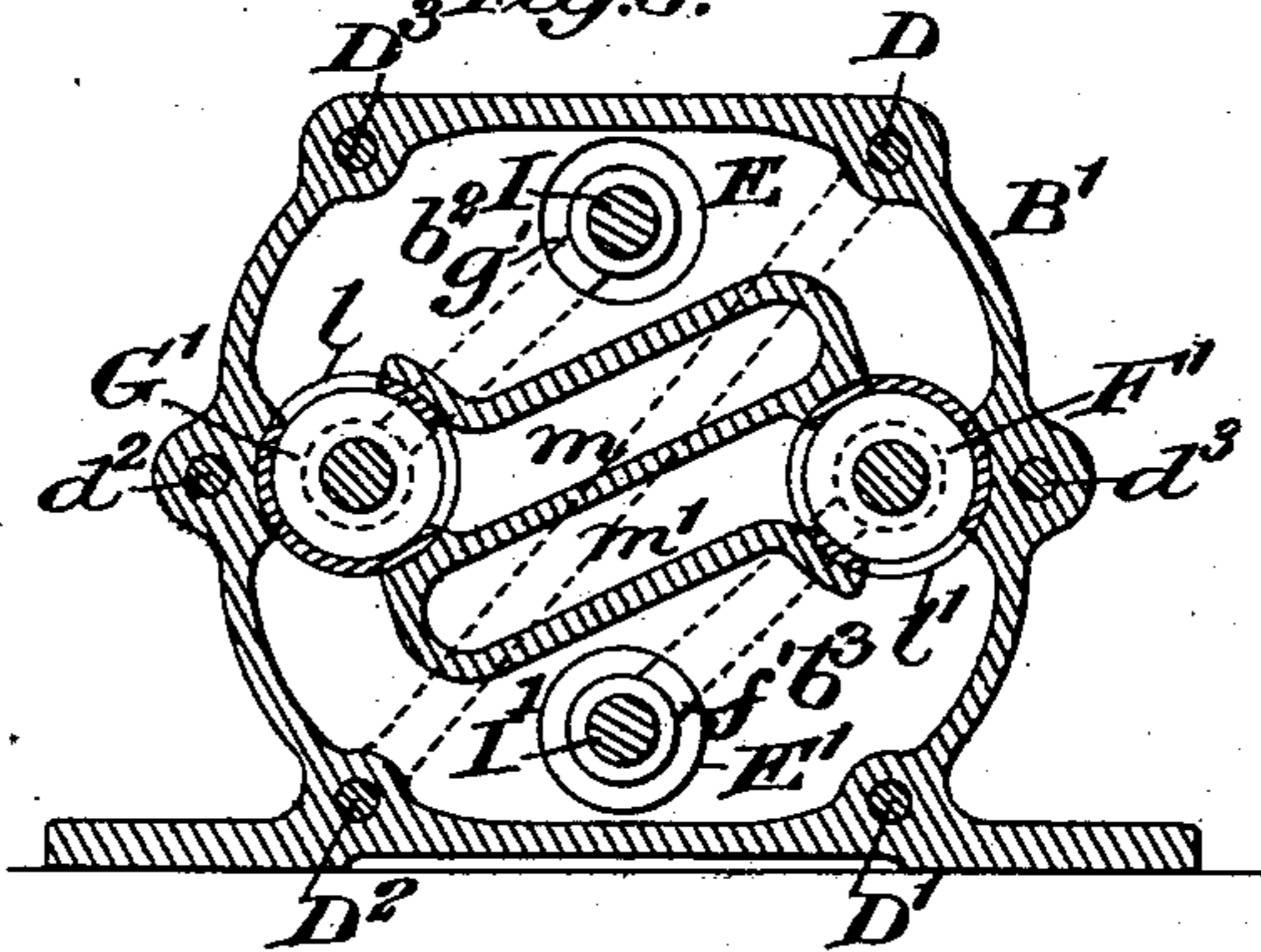
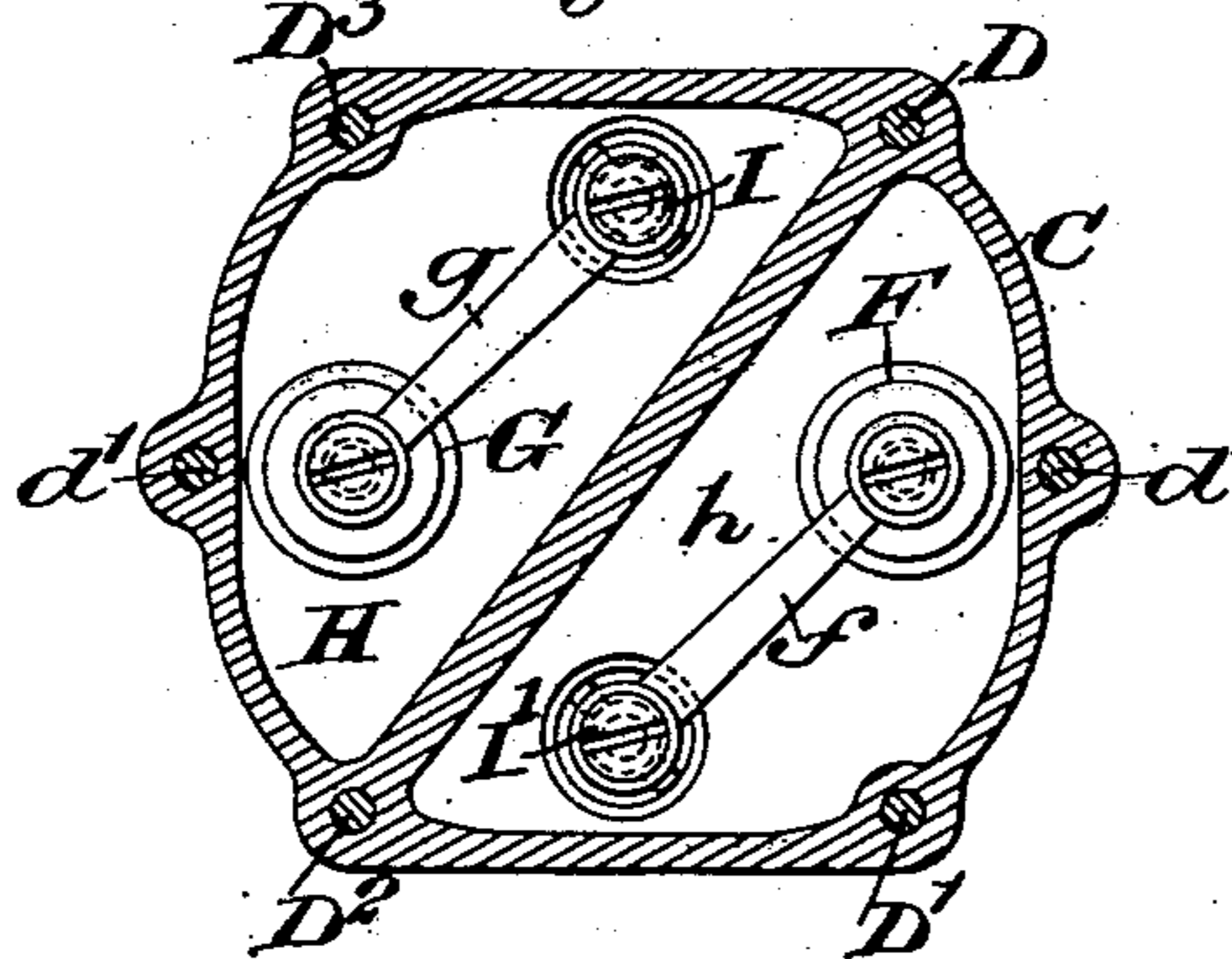


Fig. 7.



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UNITED STATES PATENT OFFICE.

WILLIAM MILES FOWLER, OF STAMFORD, CONNECTICUT.

LIQUID-METER.

SPECIFICATION forming part of Letters Patent No. 570,748, dated November 3, 1896.

Application filed March 28, 1895. Serial No. 543,452. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM MILES FOWLER, of Stamford, in the county of Fairfield and State of Connecticut, have invented a new and useful Improvement in Liquid-Meters, of which the following is a specification.

My invention relates to an improvement in liquid-meters in which a plurality of cylinders are provided with valves at their ends under the control of independently-moving pistons within the cylinders to keep the flow of water constant from one or the other of the cylinders; the movement of one of the valve-rods serving to register the passage of a predetermined quantity taken as a unit of measure.

The present invention is in its general operation and structure in many respects similar to that shown, described, and claimed in my Patent No. 546,317, filed September 24, 1894, issued September 17, 1895, the essential distinguishing feature being that the valves at the ends of the cylinders are in my present application connected by valve-rods exterior to the cylinders themselves and extending along the inlet and outlet passages which conduct the liquid to and from the opposite ends of the cylinders.

In the accompanying drawings, Figure 1 is a longitudinal section along the plane intermediate of two companion cylinders. Fig. 2 is a longitudinal section taken vertically through one of the cylinders. Fig. 3 is a horizontal longitudinal section through the companion cylinders. Fig. 4 is a transverse central vertical section. Fig. 5 is a transverse vertical section through line *xx* of Fig. 1. Fig. 6 is a transverse vertical section through line *yy* of Fig. 1. Fig. 7 is a transverse vertical section through line *zz* of Fig. 1. In each of the transverse sections the observer is supposed to be looking toward the left as the figures stand on Sheet 1.

The cylinders are represented by A and A'. They are unbroken throughout their interior concave surface by any port or projection, and may be made of glass, metal, or any other suitable material. They are closed at their opposite ends by heads B B', the heads B forming a closure for the corresponding ends of the two cylinders A A' and the head B' forming a closure for the opposite corresponding ends of the said cylinders. These

heads B B' contain ports and passage-ways which will be hereinafter more particularly referred to. Exterior to the heads B B' chambered cap-pieces C C' are located. The heads, the cap-pieces, and the cylinders are held securely in assembled adjustment by through-bolts D D' D² D³, their positions being clearly shown in Figs. 4, 5, 6, and 7, and two of them being shown in elevation in Fig. 2. In addition to these bolts the caps C C' are secured to the heads B B' by bolts *d d' d² d³*, tapped into the heads.

Intermediate of the cylinders A A' and extending longitudinally thereof there is located an upper tube E and a lower tube E', having their corresponding ends connected by heads B B', which connect the cylinders A A', as above noted.

Centrally at the opposite ends of each of the cylinders A A', and seated in the heads B B', are piston-valves. The piston-valves at the opposite ends of the cylinder A are denoted by F F' and those at the opposite ends of the cylinder A' by G G'. The valves G G' are connected to move together by means of arms *g g'*, which extend from their outer ends, through chambers H H' in the caps C C', to a connecting-rod I, located within the upper tube E. The valves F F' are similarly connected by arms *f f'*, located in the chambers *h h'*, formed in the caps C C', with a rod I' in the tube E'. In position to be operated by the rod I there is a registering mechanism K of any well-known or approved form.

A piston *a* within the cylinder A is free to travel from end to end of said cylinder, and a similar piston *a'* is free to travel from end to end of the cylinder A'.

In the head B there is an upper chamber *b*, always in communication with the interior of the upper tube E and with the chamber H in the cap C, and a lower chamber *b'*, always in communication with the interior of the lower tube E' and with the chamber *h* in the cap C. In the head B' there is an upper chamber *b²*, always in communication with the interior of the upper tube E and with the chamber H' in the cap C', and a lower chamber *b³*, always in communication with the interior of the lower tube E' and with the chamber *h'* in the cap C'.

Within the head B there are ports, one, L, leading from the outer chamber *b* through

the valve-seat of the valve F and thence to the passage-way M to the end of the cylinder A', and another, L', opening from the chamber b' through the valve-seat of the valve G and thence to a passage-way M', leading to the end of the cylinder A.

In the head B' there are ports l and l', leading, respectively, from the chambers b² b³ through the valve-seats of the valves G' and F', and thence along passages m and m', respectively, to the cylinders A A'.

The inlet is through a pipe O in communication with the chamber H' of the cap C', and thence through the tube E with the chamber H of the cap C, and with the upper chambers b and b² of the heads B B'. The outlet is through a pipe O' in communication with the chamber h of the cap C, and thence through the tube E' with the chamber h' of the cap C', and with the lower chambers b' b³ of the heads B B'.

In operation the piston a, Fig. 3, by its engagement with the valve F, has shifted the valve and opened the port L from the chamber b in the head B to the passage M, thereby admitting the flow of the liquid from the inlet to the cylinder A', and the piston a' has started on its course from right to left and is represented in Fig. 3 as just having reached the point where it engages the valve G'. The same movement of the valve F simultaneously moves the valve F', because of the connection between the two, into position to open communication through the chamber b³ by way of the passage-way m' (see Fig. 6) and thence to the outlet, so that the liquid in advance of the piston a' has been discharged while the cylinder A' was being filled. As the piston a' completes its movement to the left it will operate the valve G', and hence the valve G connected therewith. The movement of the valve G will open communication between the inlet-chamber b (see Fig. 5) and the passage-way M', leading to the cylinder A, and while the pressure still remains upon the piston a' in the cylinder A', tending to hold it to the left, the liquid will enter the cylinder A and move its piston a from right to left, discharging the contents of the cylinder A through passage-way m (see Fig. 6) and into the outletting-chamber b³, the valve G', which moved simultaneously with the valve G, having closed the port l, leading to the chamber b², and opened communication with the outlet-chamber b³. As the piston a completes its stroke to the left it will engage the valve F' and move it, together with the valve F, into position to open communication between the inlet-chamber b² (see Fig. 6) and the passage-way m', leading to the left-hand end of the cylinder A', and the piston a' will begin its movement to the right, discharging the liquid therein through the passage-way M (see Fig. 5) and into the outlet-chamber b', with which it is now in open communication. As the piston a' reaches the limit of its stroke to the right it will engage the valve G and

move it, together with the valve G', so as to open communication between the inlet-chamber b² (see Fig. 6) and the passage-way m, leading to the cylinder A. The piston a will then begin its travel to the right, discharging the liquid in advance of it through the passage-way M' into the outlet-chamber b', as first above named. From this point the operation will repeat itself, as above described, until the flow of liquid is stopped. At each stroke of the connecting-rod I in one direction it will operate the registering mechanism and the record of four cylinders full of liquid discharged will be noted.

It is obvious that knowing the contents of each cylinder the number of units registered will indicate the quantity of liquid which has been discharged.

It will be observed that the valves and their connecting-rods are at all times water-sealed and lubricated and that there is no joint or bearing for the movable part which requires packing excepting the slight connection for communicating the strokes of one of the valve-rods to the registering mechanism.

What I claim is—

1. A liquid-meter, comprising a plurality of cylinders, a piston for each cylinder free to move within said cylinder, valves at the opposite ends of each cylinder, an inlet-conduit in communication with the opposite ends of each cylinder, an outlet-conduit in communication with the opposite ends of each cylinder, a connection between the valves and the opposite end of one cylinder and extending along the inlet-conduit, a connection between the valves of a companion cylinder, the said connection extending along the outlet-conduit, the valves at the ends of each cylinder being under the control of the piston in that cylinder to admit liquid to the companion cylinder and means for recording the strokes of the pistons, substantially as set forth.

2. A liquid-meter comprising a plurality of cylinders each provided with a piston free to move within the cylinder, cylinder-heads provided with ports and passage-ways for interconnecting the ends of the cylinders, chambered caps exterior to the heads and having their interiors in communication with the said interconnecting passage-ways in the heads, an inlet-conduit in communication with said chambered caps and heads, an outlet-conduit in communication with said chambered caps and heads, valves at the opposite ends of one of the cylinders, a connection between said valves extending along the inlet-conduit, valves at the opposite ends of the companion cylinder, a connection between said valves extending along the outlet-conduit and a registering device engaged with one of said valve connections, substantially as set forth.

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Witnesses:

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