

No. 799,615.

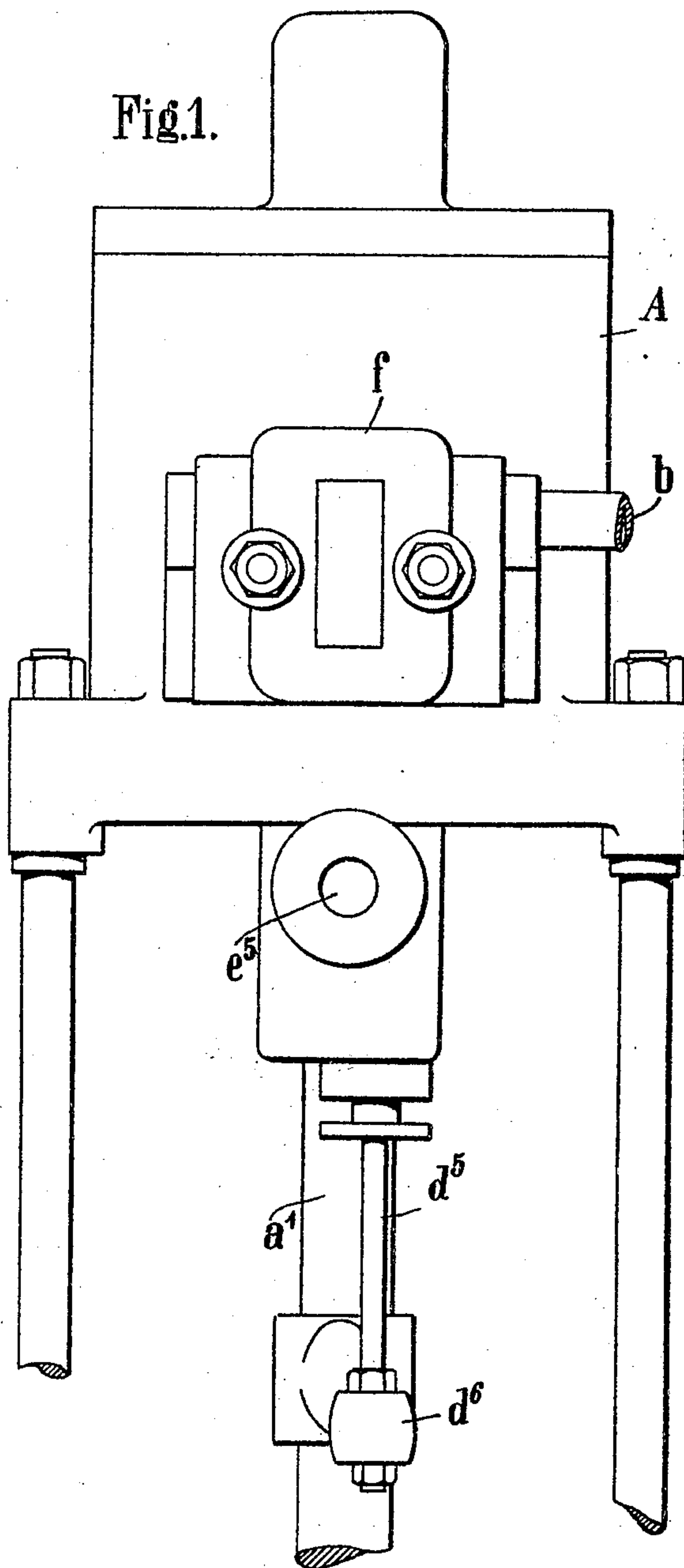
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P. F. ODDIE.
PUMPING ENGINE.

APPLICATION FILED AUG. 16, 1904.

4 SHEETS—SHEET 1.

Fig.1.



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4 SHEETS—SHEET 2.

Fig. 2.

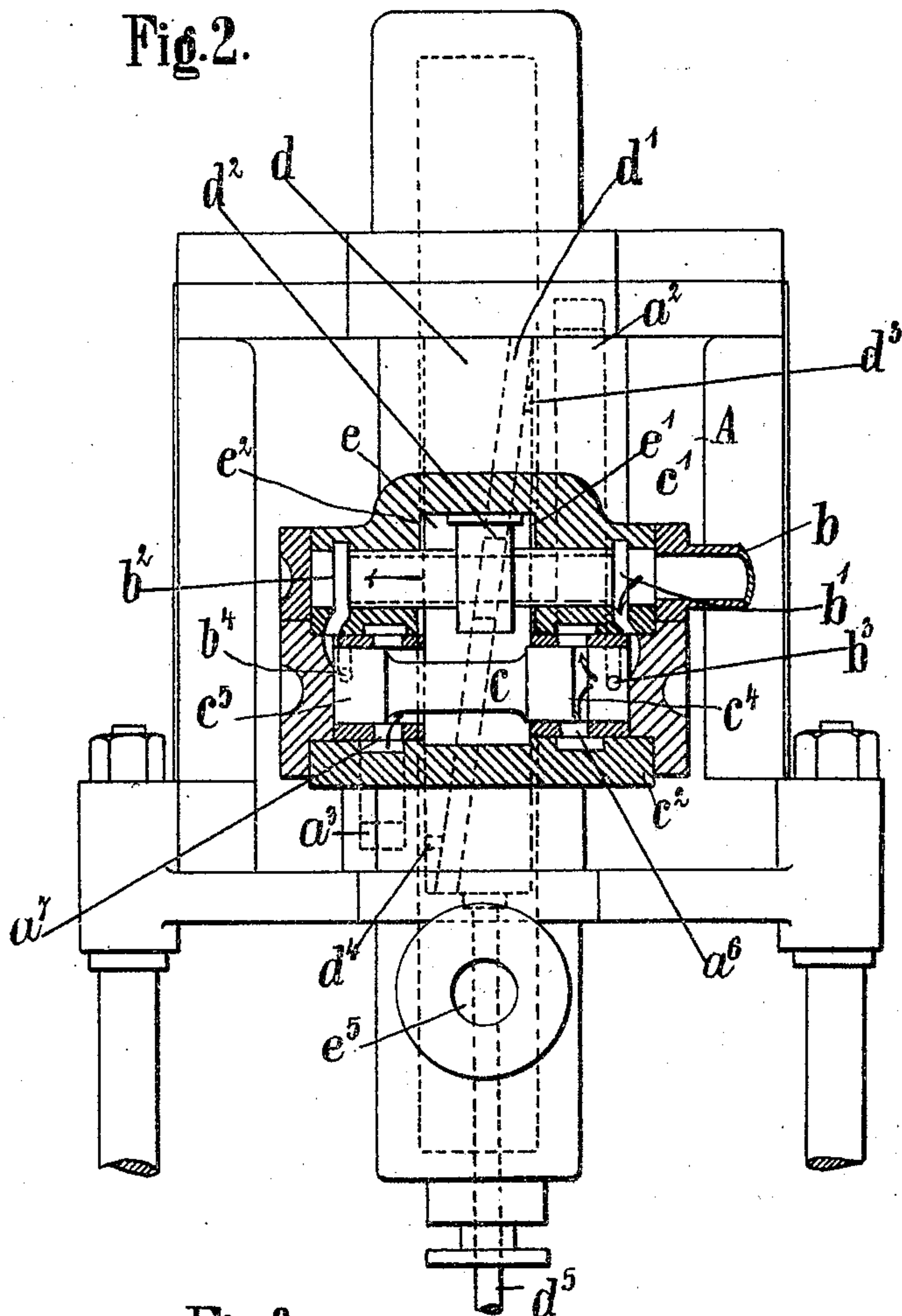
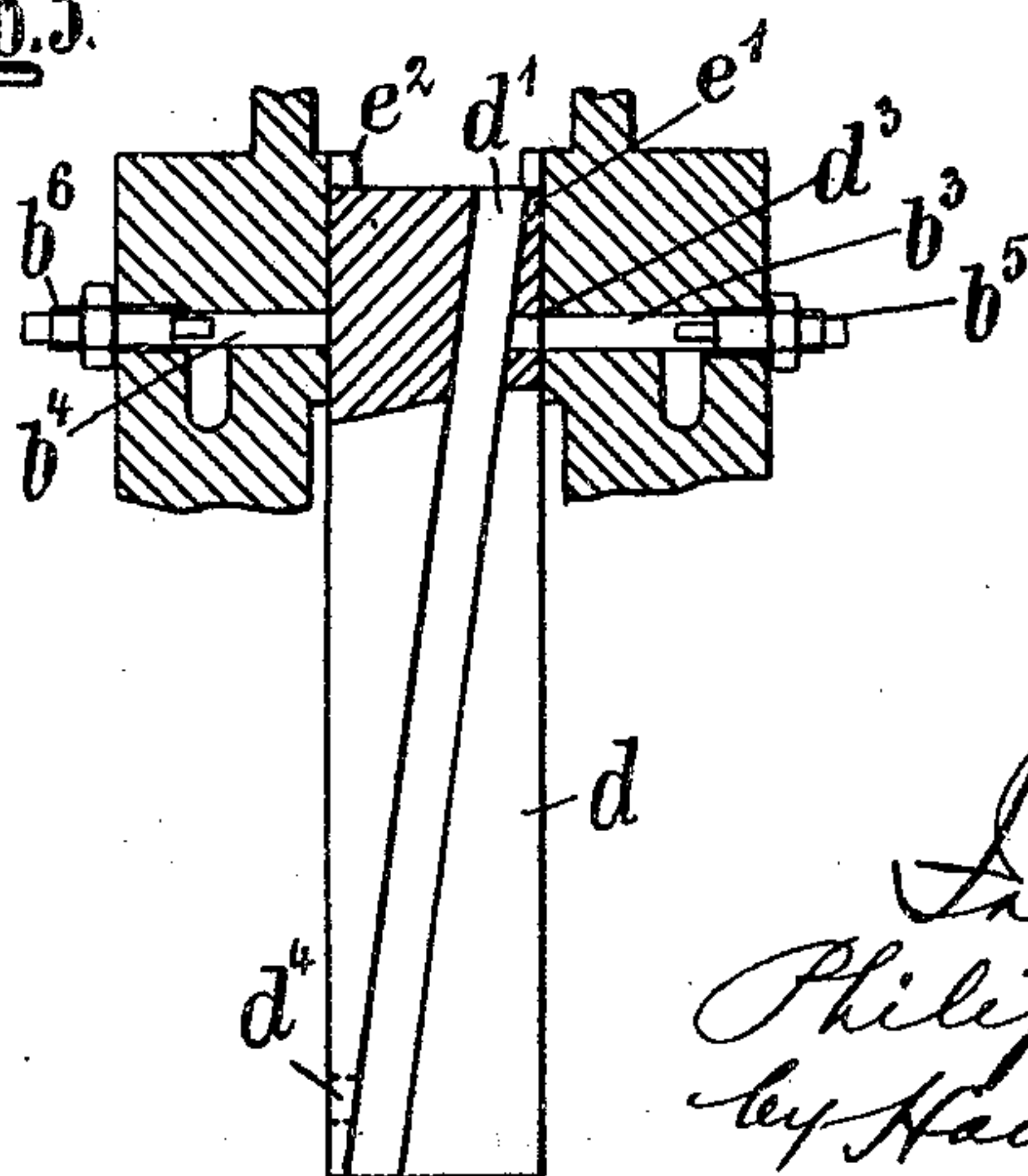


Fig. 3.

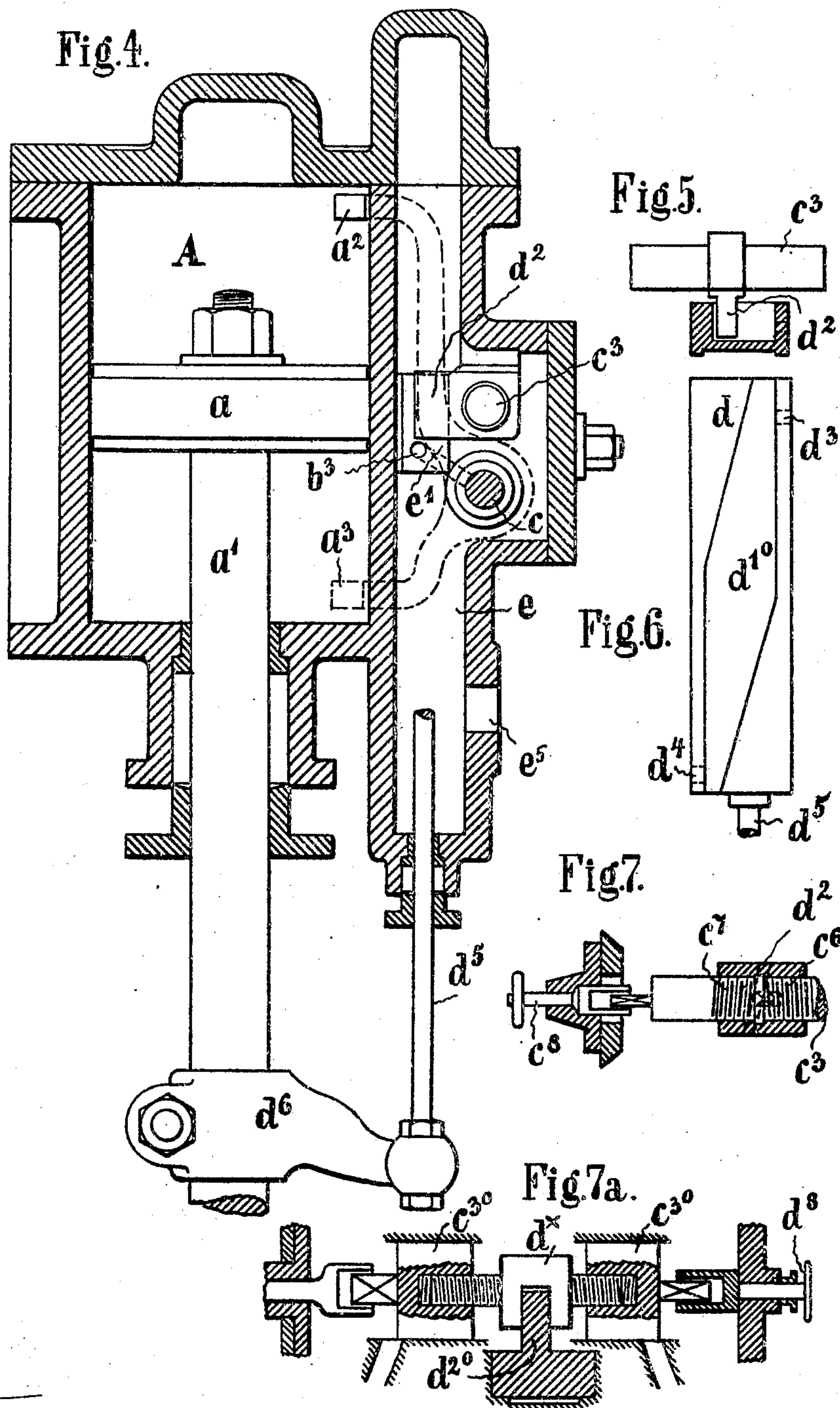


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4 SHEETS—SHEET 3.

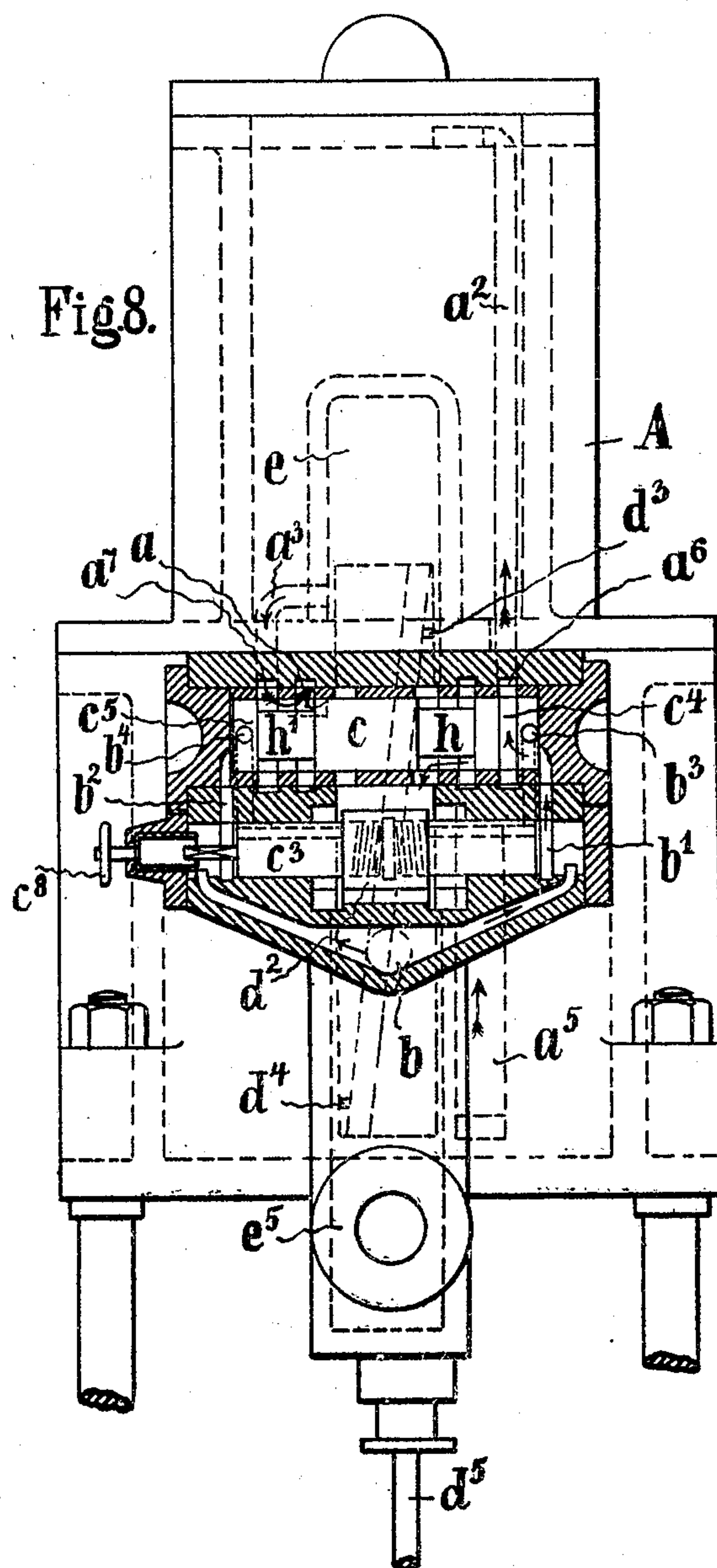


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UNITED STATES PATENT OFFICE.

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PUMPING-ENGINE.

No. 799,615.

Specification of Letters Patent.

Patented Sept. 12, 1905.

Application filed August 16, 1904. Serial No. 220,926.

To all whom it may concern:

Be it known that I, PHILIP FRANCIS ODDIE, a subject of the King of Great Britain and Ireland, residing in Wimbledon, London, England, have invented Improvements in Pumping-Engines, of which the following is a specification.

The object of this invention is to improve the construction of a simplex pumping-engine, particularly its valve-gear, so as to make it possible to readily and expeditiously vary and control the time of "cut off" for either or both ends of the cylinder, to insure a constant stroke of the piston, and to increase the economy of steam consumption.

Broadly, my invention consists of three movable valves, one partaking of the reciprocating motion of the piston, which I will term the "actuating-valve," one a cut-off valve, which is operated mechanically by said actuating-valve, and a third valve—the reversing-valve—actuated by steam-pressure, but such pressure controlled by, first, said actuating-valve through suitable ports, which it covers and uncovers.

In the accompanying drawings, Figure 1 is a side elevation of so much of a pumping-engine as is necessary to illustrate my invention. Fig. 2 is a view similar to Fig. 1, with the valve-box shown in section. Fig. 3 is a view of a detail of the actuating-valve and its guides, partly in section, to show the ports therein. Fig. 4 is a central sectional side elevation of Fig. 1 with the actuating-valve removed. Fig. 5 is a detailed view of the cut-off valve and the actuating-valve. Fig. 6 is a side elevation of a modified form of actuating-valve. Fig. 7 is a detail, partly in section, of a cut-off-regulating means. Fig. 7^a is a view similar to Fig. 7, but showing a modified form of regulating means; and Fig. 8 is a view, similar to Fig. 2, of a tandem compound engine fitted with my improved valve mechanism.

As shown in Figs. 1 to 5, inclusive, A is the steam-cylinder, a the piston on the piston-rod a', while e is the exhaust-chamber, provided with an exhaust-port e⁵ and in which, between suitable guides e' e², (see Fig. 3,) the actuating slide or valve d reciprocates, being connected by a rod d⁵ and coupling d⁶ with the piston-rod a'. The sides of the guide-surface e' e² are perforated by ports b³ b⁴, provided with adjustable throttling-screws b⁵ b⁶, and the opposite sides of the slide at opposite ends are provided with ports d³ d⁴, adapted at the

proper time to register with the aforesaid ports b³ b⁴, as will be hereinafter set forth. A vertical groove d' is formed in one face of the slide. Within the exhaust-chamber e there are provided two additional valve-casings. I have shown them as cylinders at right angles to the travel of the actuating-piston. One of these casings I provide with a hollow cylindrical cut-off valve c³, provided with a centrally-located pin d², engaging within the groove d' of the actuating-slide d. A steam-inlet b is located at one end of one casing, while communicating ports b' and b², one at each end of the casing, open into opposite ends of the second casing, now to be described, which contains the reversing-valve c. Near each end of the casing of the reversing-valve there is a port b³ or b⁴, these ports being continuations of the ports before described as located in the side of the guide-surfaces for the actuating-slide. Inside of these ports b³ b⁴ ports a⁶ and a⁷ are located, the port a⁶ connecting with the port a², leading into the top of the steam-cylinder and a⁷ leading to port a³ at the bottom of said cylinder. The valve c is dumb-bell-shaped, being provided with enlarged ends c⁴ c⁵.

In operation steam is admitted by passage b to both sides of the cut-off valve or slide c³, and supposing the piston to be near the top of its cylinder steam passes through ports b' b² to balance the piston c by acting on both its end faces c⁴ c⁵ equally. The steam passes through port b', enters the ports a⁶ a² to above the piston, which it forces down with direct steam-pressure until the groove of the actuating-slide moves the pin and cut-off slide to the right to cut off the port b'. The slide c is not affected by this cut-off until the port d³ of the actuating-slide d coincides with the port b³ on its guide-surface. After the cut-off has been accomplished and before the coincidence of the port b³ with the port d³ the steam within the cylinder works expansively. When said coincidence takes place, the steam from the cylinder-ports a² a⁶ passes out through the port b³ into the exhaust-chamber, reducing the pressure on the right-hand end of the casing of the reversing-valve, which is forced to the right by the pressure acting against its end c⁵. The speed with which this diminution of pressure is obtained depends upon the position of the throttling-screw b⁵, (see Fig. 3,) which obviously also allows the piston to delay more or less at the end of the stroke until the reversing-slide c has been moved to

the right. When the reversing-slide has moved to the right, port a^6 is connected with the exhaust-chamber e and port a^7 with the live-steam supply through port b^2 and pipe b , and a similar operation repeated in the reverse direction.

It will be obvious that the extent of cut off will depend upon the shape of the groove d' of the actuating-slide. This is shown in Fig. 3 as a straight inclined groove of one dimension. In Fig. 6 I have shown the groove d^{10} as wider at its center, so as to move without affecting the cut-off valve for quite a distance, and to then move suddenly to actuate the cut-off valve.

A simple means of changing the time of cut off in a working pump is illustrated in Figs. 7 and 7^a. It will be readily seen that the longer the cut-off cylinder c^3 is the quicker will the cut off be, and the shorter the cylinder c^3 the longer will be the time of cut off. I have taken advantage of this to secure the regulation, as shown in Fig. 7, in which I have shown a pin or slide d^2 as formed on a right and left handed collar, and a valve-slide c^3 , formed of two threaded cylindrical portions threaded into said collar, slidable one upon the other, but turning together. Outside the cylinder I locate a hand-wheel c^8 , having a forked inner end adapted to engage a squared projection on the slide, so that the slide may be turned by said hand-wheel, and as it rotates within its collar its two halves will be drawn toward or forced away from each other.

The device shown in Fig. 7^a differs from that of Fig. 7 mainly in having each end of the cut-off separably adjustable. In this figure I have shown the actuating-slide as having a rib or pin d^{20} instead of a groove, while a non-rotatable slotted part d^x , having threaded extremities, is engaged by said rib. The two parts of the valve c^{30} are each internally threaded and each provided with a squared projection at one end engaged by a forked end of a hand-wheel d^8 . Thus I may secure a different and separate adjustment of cut off for the upstroke as compared with the downstroke of the piston.

In Fig. 8 I have illustrated an arrangement of actuating-slide, cut-off slide, and reversing-slide as constructed for use on a tandem compound engine. In this case the main difference is in the reversing-slide and casing. This reversing-slide casing is formed on its right with a port a^6 , leading to the upper end of the high-pressure cylinder and a passage a^5 to the bottom of the low-pressure cylinder, while its left hand has a port a^7 leading to a^3 at the bottom of the high-pressure cylinder and a port a^4 leading to the top of the low-pressure cylinder. The reversing-slide is formed with a central cylindrical portion joined to the two end portions $c^4 c^5$ by reduced connections $h h'$. In operation the action is similar to that of a

simple engine, except that the reversing-valve instead of connecting one end of the high pressure with exhaust connects it to one end of the low-pressure cylinders, and it connects from the exhaust side of the low pressure to the exhaust-chamber, as will be obvious to one skilled in the art.

I claim as my invention—

1. In combination with the cylinder and piston of a pumping-engine, a valve mechanism, comprising a steam-actuated reversing-slide, a valve-seat therefor at each end, a cut-off slide, a steam-inlet and passages to the valve-seats, a passage from each valve-seat to the piston-cylinder, said cut-off slide adapted to cut off steam to the ports and passages at one valve-seat upon its movement, and an actuating-slide adapted to move said cut-off slide, said actuating-slide being provided with means for opening one end of the piston-cylinder and one of said valve-seats to the exhaust.

2. In combination with the cylinder and piston of a pumping-engine, a valve mechanism, comprising a steam-actuated reversing-slide, a valve-seat therefor at each end, a cut-off slide, a steam-inlet and passages to the valve-seats, a passage from each valve-seat to the piston-cylinder, said cut-off slide adapted to cut off steam to the ports and passages at one valve-seat upon its movement, and an actuating-slide adapted to move said cut-off slide, said actuating-slide being provided with means for opening one end of the piston-cylinder and one of said valve-seats to the exhaust, said reversing and cut-off slides being balanced pistons.

3. In combination with the cylinder and piston of a pumping-engine, a valve mechanism, comprising a steam-actuated reversing-slide, a valve-seat therefor at each end, a cut-off slide, a steam-inlet and passages to the valve-seats, a passage from each valve-seat to the piston-cylinder, said cut-off slide adapted to cut off steam to the ports and passages at one valve-seat upon its movement, and an actuating-slide adapted to move said cut-off slide, said actuating-slide being provided with means for opening one end of the piston-cylinder and one of said valve-seats to the exhaust, and a rigid and permanent connection between said actuating-slide and engine piston-rod, so that both move together.

4. A valve mechanism for a steam pumping-engine, comprising an exhaust-chamber, a steam-actuated reversing-slide, an adjustable cut-off slide and an actuating-slide operating within the exhaust-chamber to operate said cut-off slide, and exhaust-ports controlled by said actuating-slide leading to said reversing-slide.

5. A valve mechanism for a steam pumping-engine, comprising an actuating-slide, a cut-off slide and a steam-operated reversing-slide, a pin, and an inclined slot therefor between the cut-off slide and the actuating-slide, and

ports uncovered by said actuating-slide adapted to unbalance and thereby operate said reversing-slide.

6. A valve mechanism for a steam pumping-engine, comprising an actuating-slide, a cut-off slide and a steam-operated reversing-slide, a pin, and an inclined slot therefor between the cut-off slide and the actuating-slide, and ports uncovered by said actuating-slide adapted to unbalance and thereby operate said reversing-slide, and adjustable throttle means in said ports.

7. A valve mechanism for a steam pumping-engine, comprising an actuating-slide, a steam-actuated reversing-slide, ports therefor controlled by said actuating-slide, a cut-off slide actuated by first said slide, said cut-off slide being adjustable in length.

8. A valve mechanism for steam pumping-engines, comprising an actuating-slide, a steam-actuated reversing-slide, ports therefor controlled by said actuating-slide, a cut-off slide actuated by first said slide, said cut-off slide being of two parts with both parts movable away from their common center.

9. A valve mechanism for a steam pumping-engine, comprising an actuating-slide, a steam-actuated reversing-slide, ports therefor controlled by said actuating-slide, a cut-off slide actuated by first said slide, said cut-off slide being of two parts, with both parts movable away from their common center independently of each other.

10. A valve mechanism for a steam pumping-engine, comprising an exhaust-chamber, an actuating-slide therein, ports in said slide and ports in said exhaust-chamber adapted to be uncovered by said slide, a reversing-valve and casing, a passage from near each end of said casing to said ports in the exhaust-chamber, a cut-off valve and casing, each end of which communicates with one end of said reversing-valve casing, connections between the

actuating-slide and cut-off slide and a steam-inlet to said cut-off-slide casing.

11. A valve mechanism for a steam pumping-engine, comprising an actuating-slide, a cut-off slide and a steam-operated reversing-slide, means carried by the actuating-slide for positively moving said cut-off slide, and ports uncovered by said actuating-slide adapted to unbalance and thereby operate said reversing-slide.

12. A valve mechanism for a steam pumping-engine, comprising an actuating-slide, a cut-off slide and a steam-operated reversing-slide, means carried by the actuating-slide for positively moving said cut-off slide, and ports uncovered by said actuating-slide adapted to unbalance and thereby operate said reversing-slide, said cut-off and said reversing slides being balanced pistons.

13. A valve mechanism for a steam pumping-engine, comprising an actuating-slide, a cut-off slide and a steam-operated reversing-slide, means carried by the actuating-slide for positively moving said cut-off slide, and ports uncovered by said actuating-slide adapted to unbalance and thereby operate said reversing-slide, said actuating-slide being also adapted to open the engine-cylinder to exhaust.

14. A valve mechanism for a steam pumping-engine, comprising an actuating-slide, an adjustable cut-off slide and a steam-operated reversing-slide, means carried by the actuating-slide for positively moving said cut-off slide, and ports uncovered by said actuating-slide adapted to unbalance and thereby operate said reversing-slide.

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

PHILIP FRANCIS ODDIE.

Witnesses:

ALFRED NUTTING,
FREDK. L. RAND.