

No. 685,563.

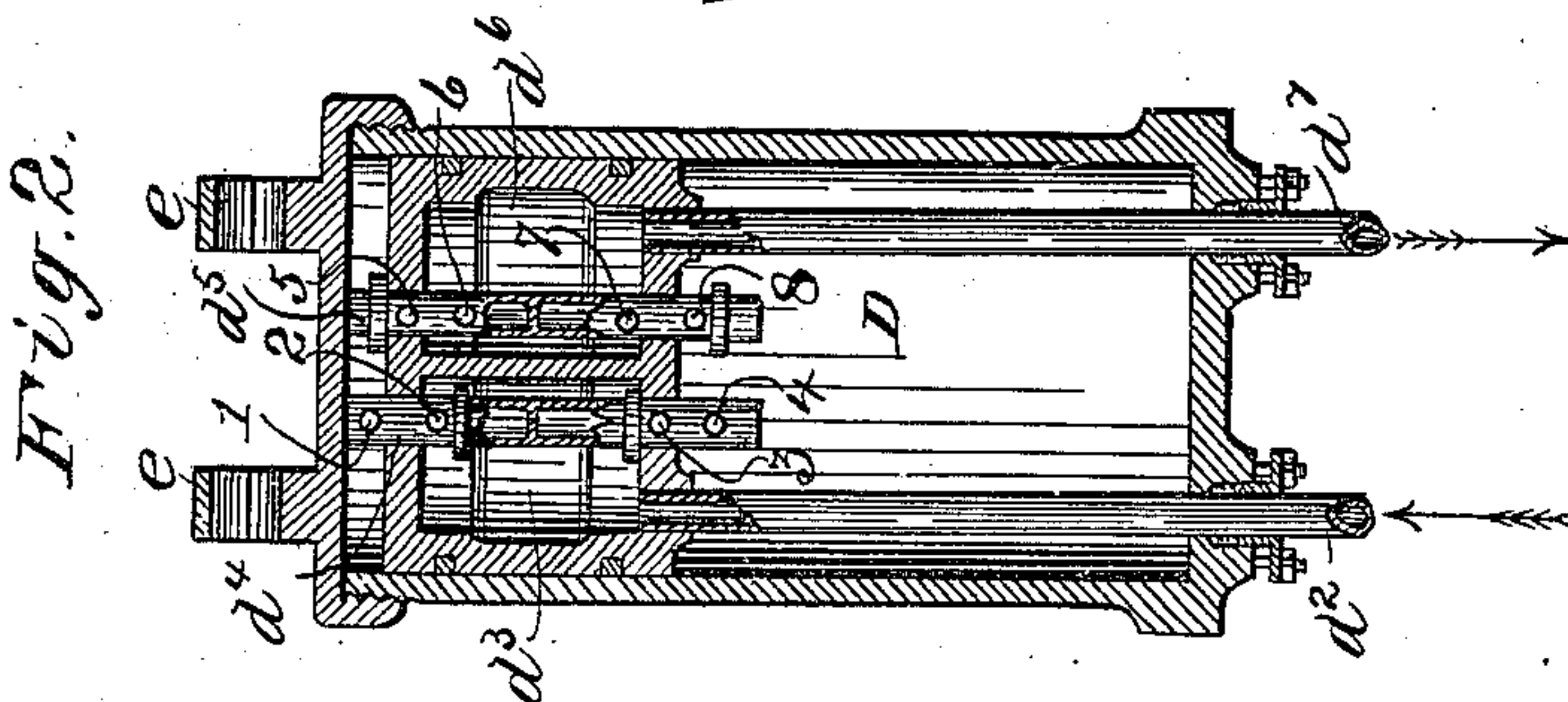
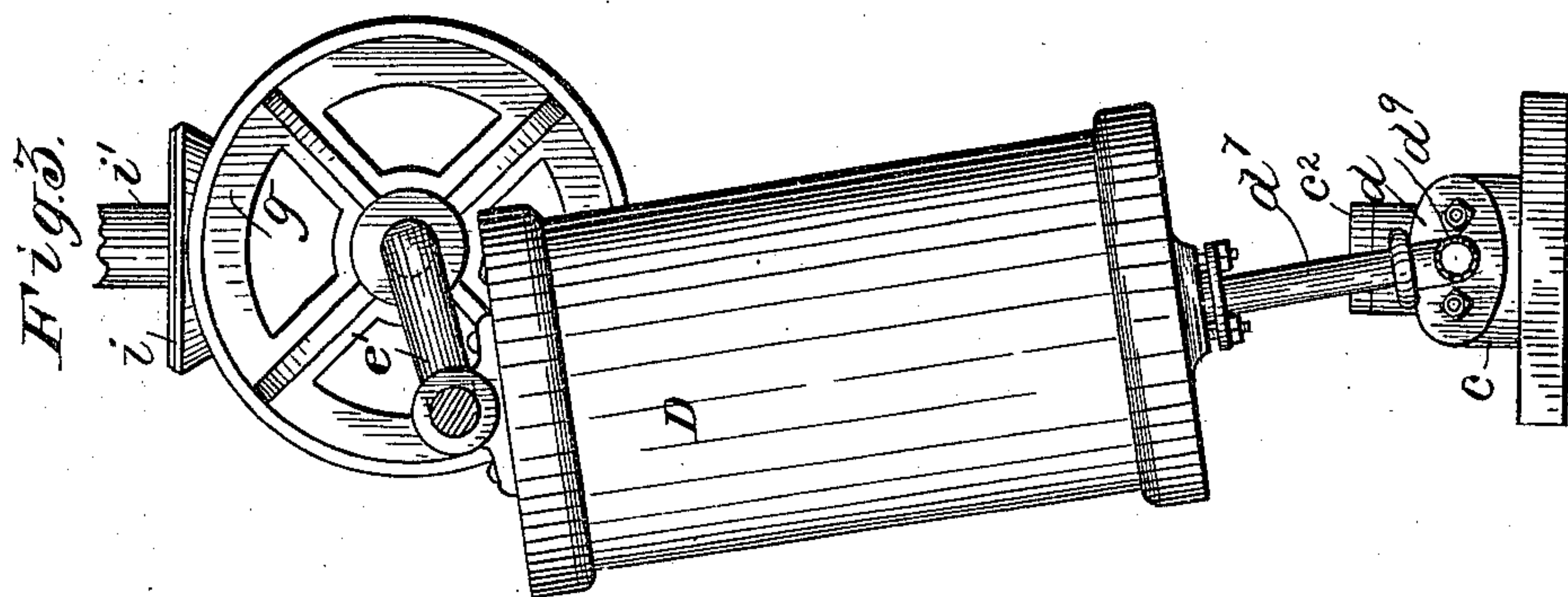
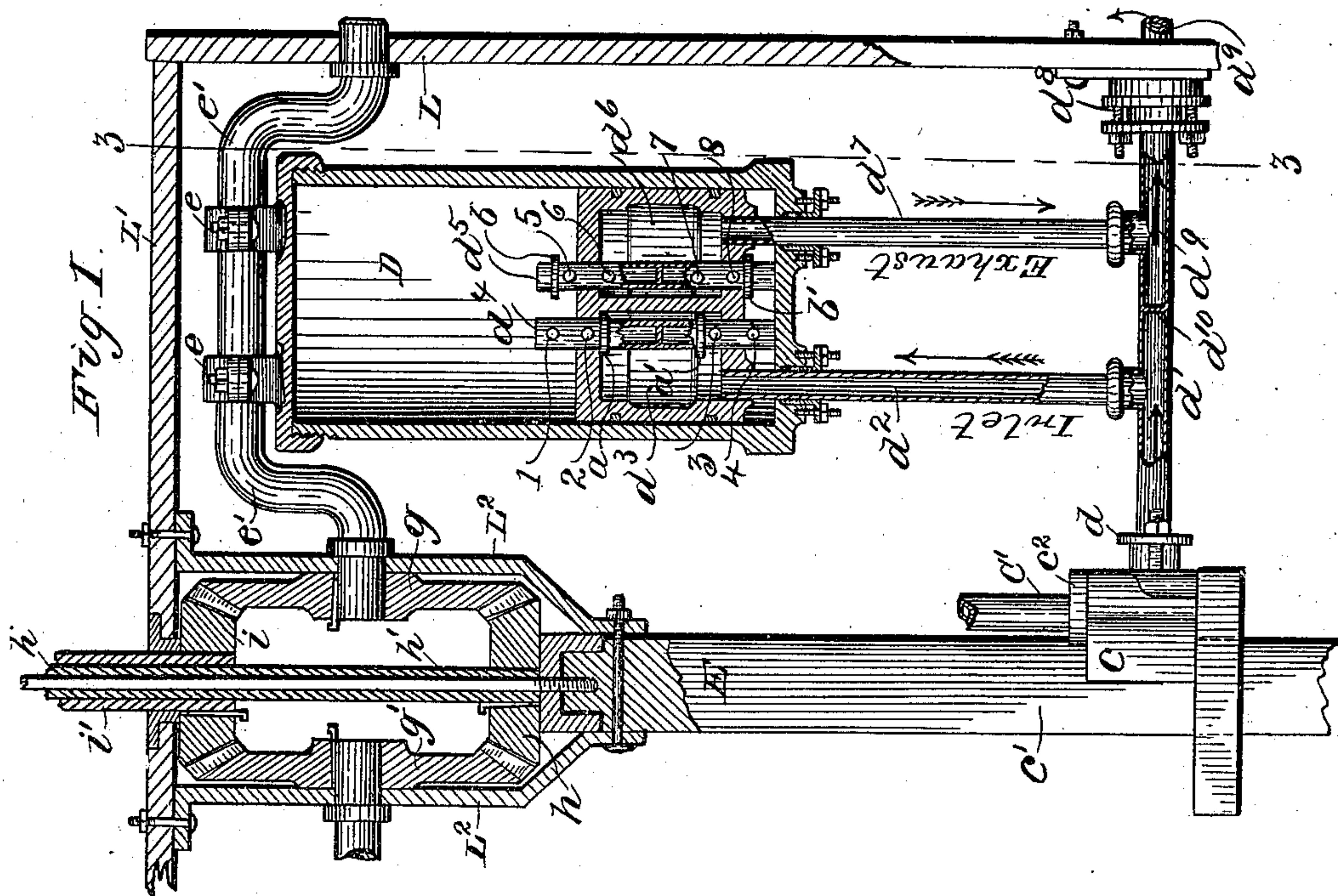
Patented Oct. 29, 1901.

R. H. BOTTS.
STEAM ENGINE.

(Application filed June 5, 1901.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:

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Fig. 5.

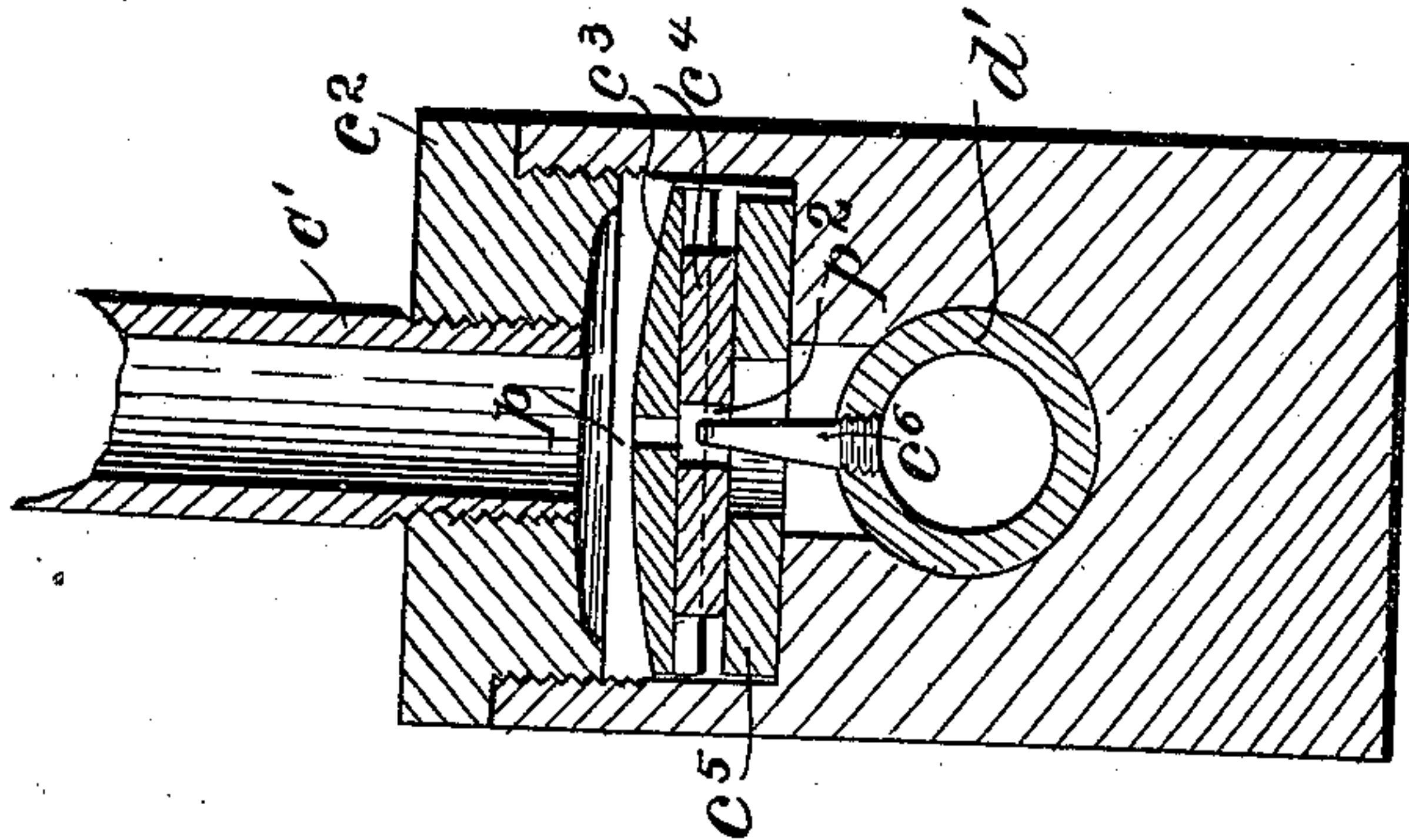
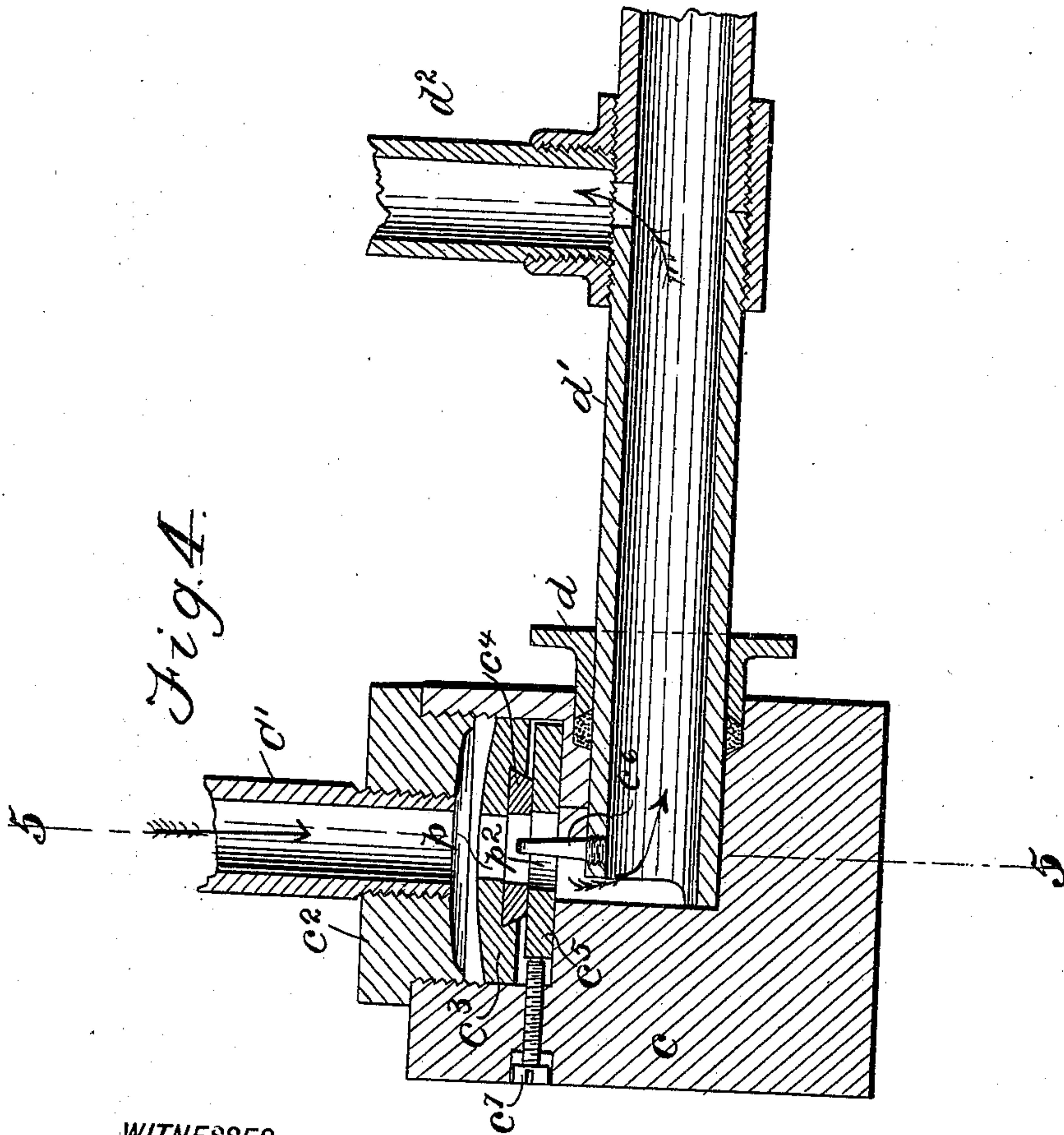


Fig. 4.



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UNITED STATES PATENT OFFICE.

ROBERT HENRY BOTTS, OF RICHMOND, CALIFORNIA.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 685,563, dated October 29, 1901.

Application filed June 5, 1901. Serial No. 63,257. (No model.)

To all whom it may concern:

Be it known that I, ROBERT HENRY BOTTS, formerly of Albuquerque, Bernalillo county, Territory of New Mexico, but now of Richmond, Contra Costa county, California, have invented a new and useful Improvement in Steam-Engines, of which the following is a specification.

The object of my invention is to provide a very light and simple form of steam-engine designed primarily to be used on an air-ship, for which I have filed a separate application, Serial No. 56,109, dated April 16, 1901, but which engine is applicable also to any uses for which a steam-engine may be employed.

It consists in the peculiar construction and arrangement of the piston and cylinder and the valves in the piston and also the general arrangement of these parts in relation to the induction and exhaust pipes and the driven gears, as will be hereinafter fully described with reference to the drawings, in which—

Figure 1 is a vertical section through the engine cylinder and piston and showing their relation to the driven gears and the induction and exhaust pipes. Fig. 2 is a sectional view of the piston and cylinder, showing a different position of the said cylinder-piston and valves. Fig. 3 is a vertical section on line 3 3 of Fig. 1. Fig. 4 is a longitudinal section through the cut-off valve, and Fig. 5 is a section at right angles thereto on line 5 5 of Fig. 4.

E L L' L² is a framework so constructed as to accommodate two engines one on each side of the central standard E. Each engine consists of a cylinder D, which both reciprocates and oscillates, and a two-compartment piston $d^3 d^6$, which oscillates about an axis below, but does not reciprocate. This piston has two hollow piston-rods $d^2 d^7$, opening, respectively, into the two compartments $d^3 d^6$ of the piston and connecting below to the pipes $d^1 d^9$, which rock in stuffing-boxes d and d^8 and have a partition d^{10} between the two hollow piston-rods $d^2 d^7$. Tubular valves $d^4 d^5$, with suitable openings in them, slide in the chambers $d^3 d^6$ of the piston and alternately open these chambers to the cylinder on opposite sides of the piston, the tubular valves being shifted by impact against the heads of the cylinders. Steam comes through the pipes c' from the boiler to steam-chest c

and passes in pipe d' to hollow piston-rod d^2 into chamber d^3 , and thence by valve d^4 to one side or the other of the piston and escapes through valve d^5 , chamber d^6 , and hollow piston-rod d^7 to exhaust-pipe d^9 . This makes a very simple and self-contained engine well adapted to an air-ship. The cylinder D as it reciprocates is connected by straps $e e$ with the crank-shaft e' and turns it with its attached bevel gear-wheel g . This latter is in mesh below with a bevel-gear h , rigidly connected to a hollow shaft h' , and at the upper side said gear-wheel g meshes with bevel-gear i , rigidly connected to a concentric hollow shaft i' . These two hollow shafts h' and i' are connected to and made to rotate two concentric propeller-wheels in my air-ship, which turn in opposite directions, so that the rotary twist of one on the air-ship may be balanced by the other. I wish it understood, however, that my steam-engine may be used either singly or in pairs.

In explaining more in detail the exact action of the valves I would state that each tubular valve d^4 and d^5 has its ends closed and has also a partition in its middle. On one side of this partition the valve d^4 has two openings 1 2, and on the other side it has two openings 3 4. The other valve d^5 has corresponding openings 5 6 and 7 8. Each of these pairs of openings has the two openings so spaced as to have in one position of the valve one opening of each pair on one side of the thickness of the piston-wall and the other opening on the other side, so as to establish communication between the chambers in the piston and the chamber of the cylinder. In another position of the valves one of these openings of each pair passes into the plane of the thickness of the wall of the piston and is closed thereby. The operation of these valves is as follows: In Fig. 1 the cylinder has reached its highest point and has struck the lower ends of the valves and lifted them to the position shown, ready to bring down the cylinder. Steam now comes from steam-chest c and pipe d' to hollow piston-rod d^2 and piston-chamber d^3 and passes by ports 3 and 4 to the lower end of the cylinder to bring it down, the upper ports 1 and 2 being out of action, for the reason that 2 is closed in the wall of the piston. At the same time the steam above the piston passes by ports 5

and 6 to piston-chamber d^6 and hollow piston-rod d^7 to exhaust-pipe d^9 . After the cylinder descends its upper head strikes the tops of the valves and shifts them to the position shown in Fig. 2. The live steam now passes from hollow piston-rod d^2 to chamber d^3 and ports 1 2 to the top of the piston again, ready to lift the cylinder, and the exhaust-steam below the piston passes out ports 7 8 to the hollow piston-rod d^7 and the exhaust. To limit the throw of the valves, collars $a a'$ are fastened to valve-tube d^4 , and similar collars $b b'$ are fastened to the valve-tube d^5 . These valves slide with sufficient friction in their seats to maintain the position to which they are adjusted by impact with the heads of the cylinder.

In my engine it will be seen that while the cylinder, piston, and valves all move the inlet and exhaust connections remain stationary, the pipes $d' d^9$ rocking in stuffing-box d at the inlet-point and in stuffing-box d^8 at the exhaust-point. Beside the stuffing-box d and in the steam-chest c there is a cut-off valve which is operated by the rocking of the pipes $d' d^9$, as will now be described with reference to Figs. 4 and 5. The end of the pipe d' which enters the steam-chest c has attached to it a pin c^6 , extending upwardly at right angles to the longitudinal axis of the pipe d' . On a shoulder in the steam-chest is arranged a perforated washer or bearing-plate c^5 , held firmly by a screw c^7 . On the bearing-plate is arranged a valve-plate c^3 , having on its under side a dovetail valve-slide c^4 . Both the valve-slide c^4 and valve-plate c^3 have slots through them, the plate c^3 having slot p and the valve-slide c^4 having slot p^2 , which two slots form steam-ports which are in registration or out of registration according to the position of slide c^4 in relation to plate c^3 . To work the slide c^4 , the pin c^6 on the end of pipe d' extends up through the washer-plate c^5 and into the slot p^2 of slide c^4 , and as the pipe d' rocks in its stuffing-box it regulates the opening and closing of the ports $p^2 p$ to effect the cut-off. The top of the steam-chest is closed by a screw-cap c^2 , and through the screw-cap the supply-pipe c' opens and delivers steam from the boiler. The relation between the ports p and p^2 and the pin c^6 is such that when the cylinder is at its highest or lowest points the pin c^6 is in the position shown in Fig. 5 and admits steam to either end of the cylinder, and when the cylinder has ascended or descended half-way its stroke and stands at an angle to the vertical the opening in slide c^4 is thrown out of registration with that in c^3 and steam is cut off at half the stroke. The steam passes from pipe c' through ports p and p^2 to the open end of pipe d' in the steam-chest and thence to the cylinder and its valves, as heretofore described.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A steam-engine comprising a crank-shaft, a cylinder connected directly to the crank-shaft, a non-reciprocating piston with valves arranged in the cylinder, hollow piston-rods connecting therewith and forming induction and exhaust pipes, and right-angular connections for said pipes, and stationary stuffing-boxes forming axes of oscillation substantially as and for the purpose described.

2. A steam-engine comprising a crank-shaft, a cylinder connected directly to the crank-shaft, a non-reciprocating piston with valves arranged in the cylinder, hollow piston-rods connecting therewith and forming induction and exhaust pipes, a pipe at right angles to said hollow piston-rods and connected therewith and having a partition between the points of connection, a stationary stuffing-box at one end of said pipe in communication with the live-steam supply, and a stationary stuffing-box at the other end of said pipe in communication with the exhaust substantially as and for the purpose described.

3. The combination with a cylinder; of a relatively stationary piston having two chambers therein and hollow piston-rods communicating therewith, and two sliding valves arranged respectively in the piston-chamber and extending through the piston and having each four ports adapted to alternately open communication between the piston-chambers and the opposite ends of the cylinder substantially as described.

4. The combination with a cylinder; of a relatively stationary piston having two chambers therein, and hollow piston-rods communicating therewith, and two tubular valves having each closed ends and a middle partition and four ports and stop-collars, said valves projecting through both sides of the piston to be acted upon by contact with the cylinder-heads substantially as described.

5. A steam-engine comprising a crank, a movable cylinder connected to the crank, a non-reciprocating piston arranged in the cylinder and having valves as described, two hollow piston-rods connected to the piston, a hollow rock-shaft attached to the piston-rods and entering the steam-chest, and a stuffing-box, steam-chest, and cut-off valve arranged in the steam-chest and operated by the rocking of said hollow shaft substantially as described.

6. The combination of a rocking steam-pipe having a right-angularly-projecting pin, a steam-chest with stuffing-box inclosing said rocking pipe, a perforated bearing-plate through which the said pin projects, a valve composed of a stationary plate with port through it, and a sliding section with port through it receiving the pin and adapted to register with the port above it, a closing-cap for the steam-chest, and a steam-supply pipe substantially as shown and described.

ROBERT HENRY BOTTS.

Witnesses:

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