

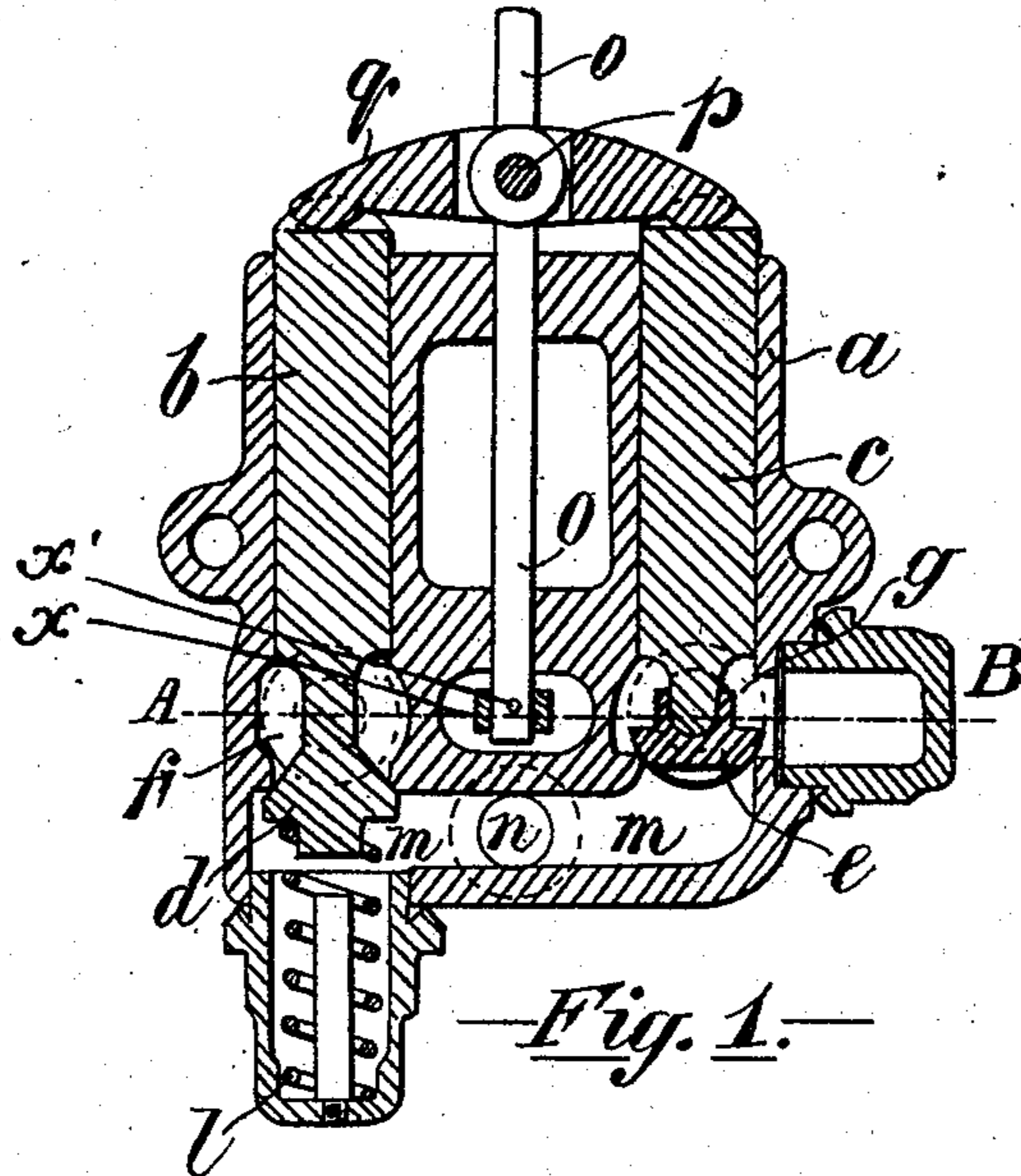
No. 721,499.

PATENTED FEB. 24, 1903.

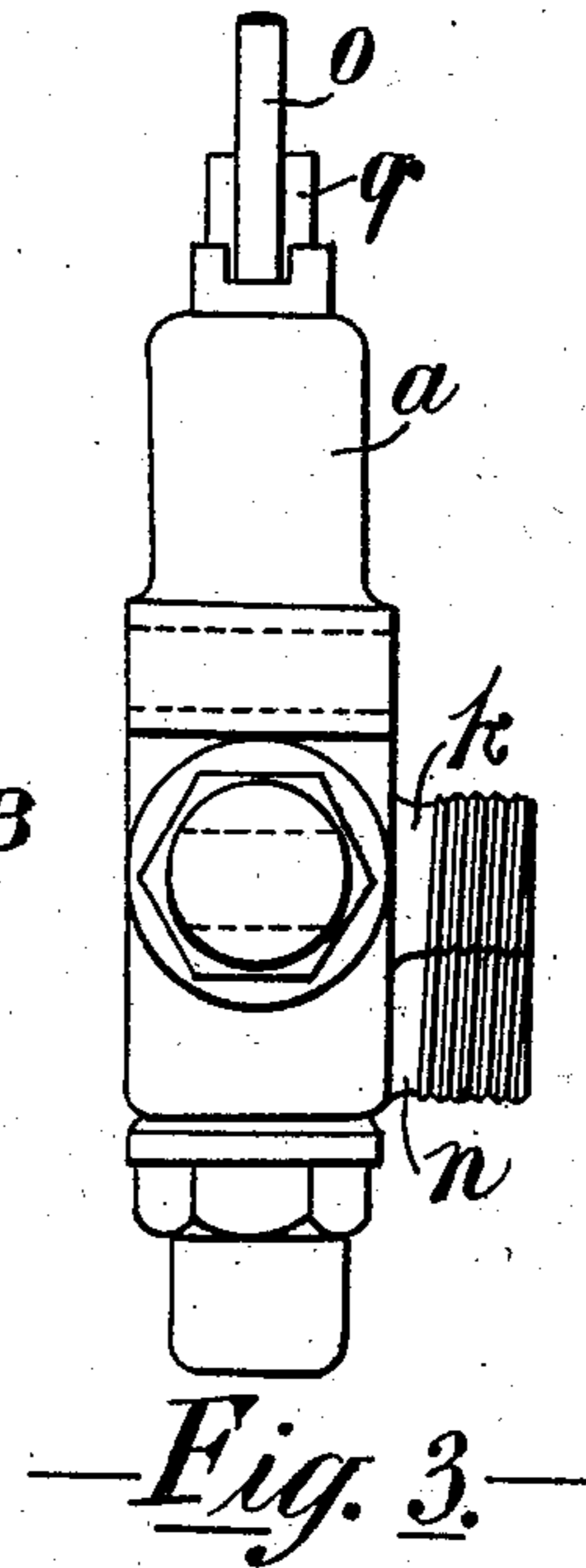
L. BRENNAN.  
REDUCING VALVE.

APPLICATION FILED MAY 16, 1902.

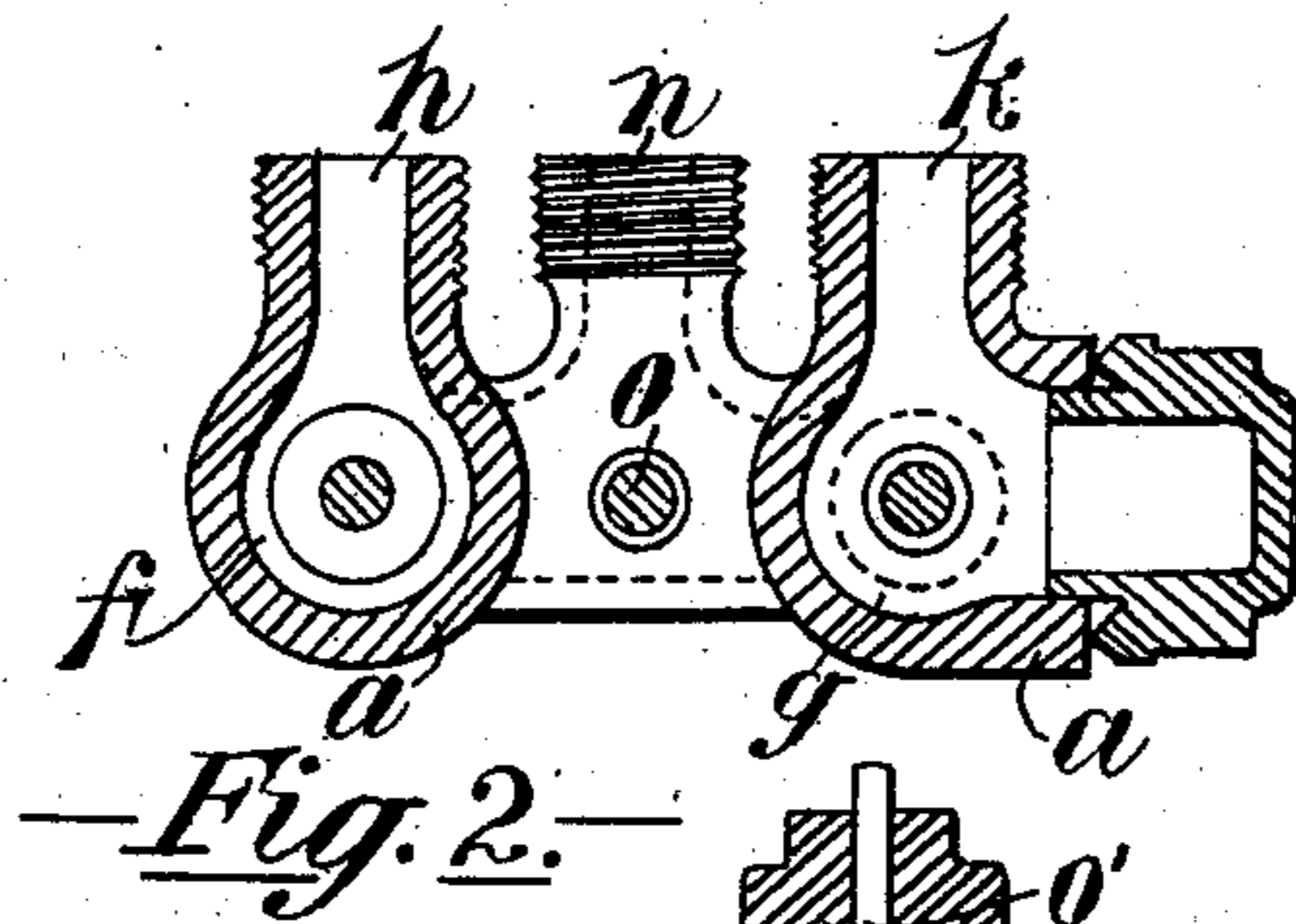
NO MODEL.



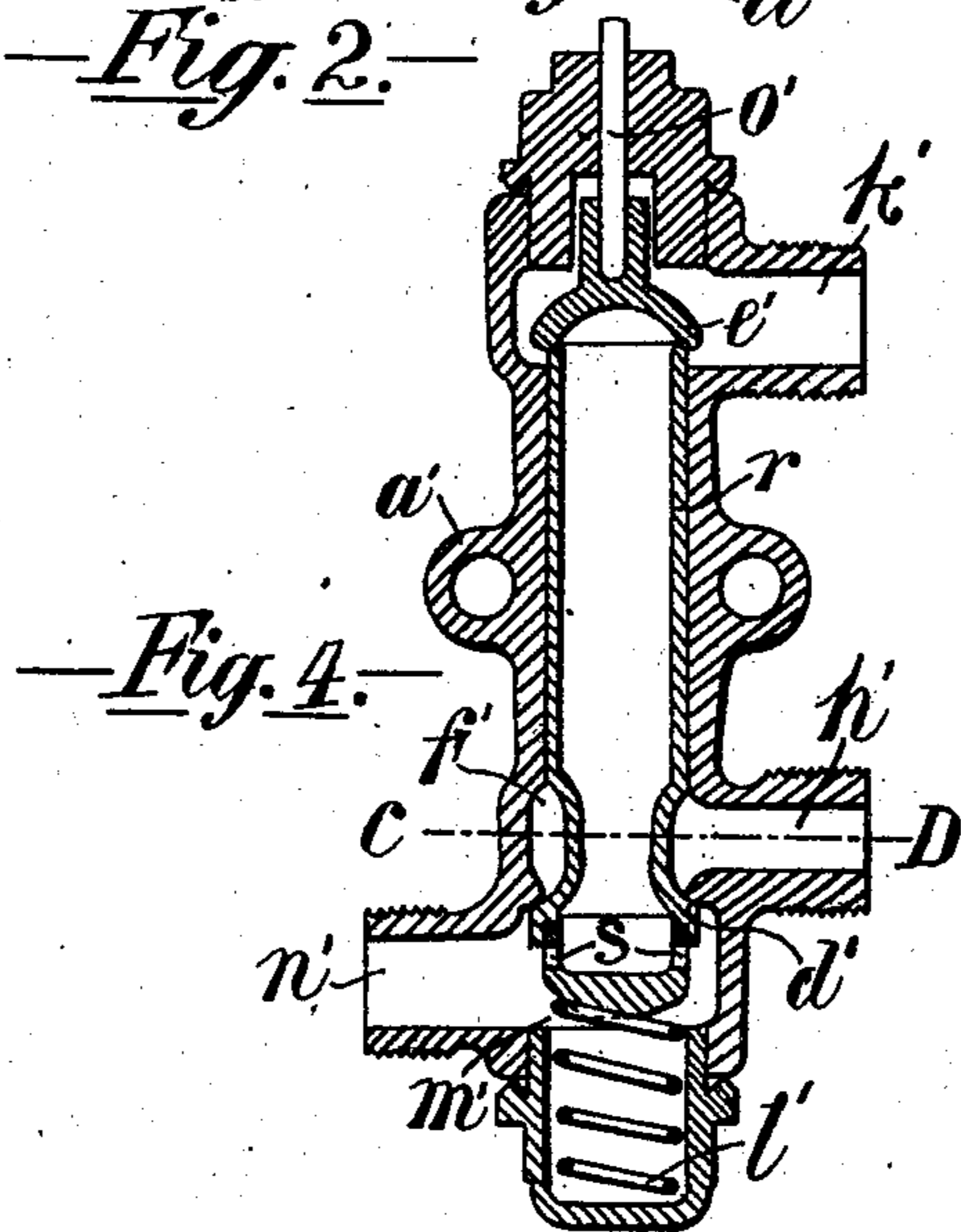
—Fig. 1.—



—Fig. 3.—



—Fig. 2.—



—Fig. 4.—

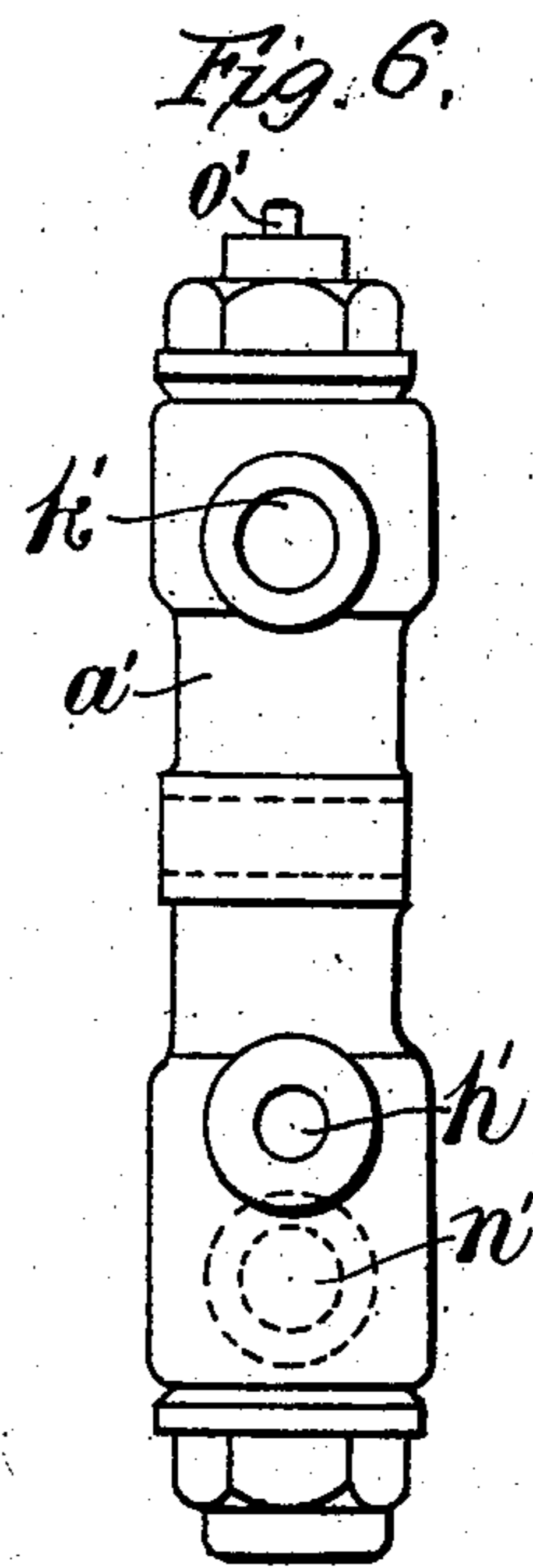


Fig. 6.

Attest:

Committed to  
Edw. L. Reed.

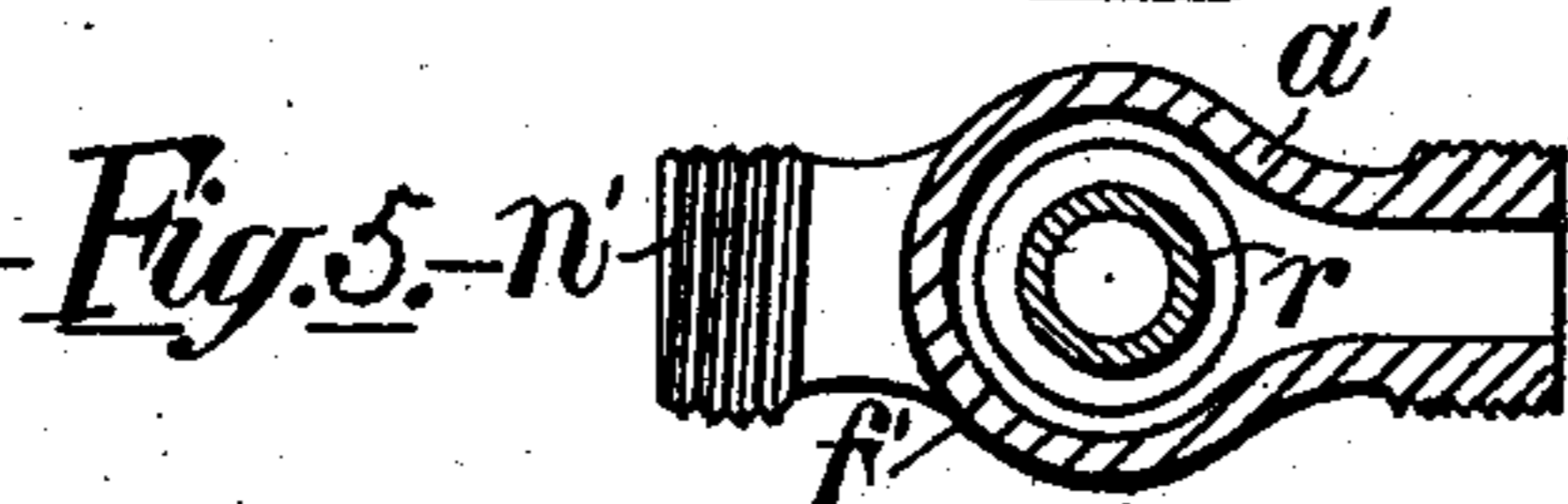


Fig. 5.

Inventor:  
Louis Brennan.

By: *Wm. L. Reed*

# UNITED STATES PATENT OFFICE.

LOUIS BRENNAN, OF GILLINGHAM, ENGLAND.

## REDUCING-VALVE.

SPECIFICATION forming part of Letters Patent No. 721,499, dated February 24, 1903.

Application filed May 16, 1902. Serial No. 107,676. (No model.)

*To all whom it may concern:*

Be it known that I, LOUIS BRENNAN, a subject of the King of Great Britain and Ireland, and a resident of Woodlands, Gillingham, in the county of Kent, England, have invented certain new and useful Improvements in Reducing-Valves, of which the following is a specification.

My invention relates to reducing-valves; and its object is to enable the fluid-pressure in a chamber to be varied either by rising or falling, the rise or fall following the application of increased or diminished mechanical force or pressure to a portion of my new compound reducing-valve.

In ordinary reducing-valves a valve is operated by a piston or diaphragm resisted by a spring or weight. The valve is opened to the source of superior fluid-pressure by the spring or weight and is closed by the fluid-pressure admitted to the piston or diaphragm, the pressure in the chamber thus being kept constant at that intensity which is necessary to move the piston or diaphragm against the spring. If the spring resistance be great in proportion to the area of the piston or diaphragm, then the constant pressure is high. If it be small, then the constant pressure is low. If the pressure on the spring be increased, the reduced pressure in the chamber will increase; but if the pressure be reduced the pressure in the chamber will not fall till the fluid has been discharged by feeding the apparatus which it is supplying.

My invention consists in a combination of reducing and discharging valve which enables me to maintain a chamber at a varying pressure, which rises and falls as the mechanical force applied to the valves increases or diminishes.

In the accompanying drawings, in which similar letters denote similar parts, Figure 1 is a sectional elevation of one form of my invention. Fig. 2 is a sectional plan on the line A B, Fig. 1. Fig. 3 is a side elevation of Fig. 1. Fig. 4 is a sectional elevation of another form of my invention. Fig. 5 is a sectional plan on the line C D, Fig. 4. Fig. 6 is a side elevation of Fig. 4.

In carrying my invention into effect according to the form illustrated in Figs. 1 to 3 I construct a valve-casing *a*, inside which are

two parallel cylinders equal in area and each fitted with a piston *b* and *c*. At corresponding ends of each piston I attach valves *d* and *e*, respectively. These valves close on seats as nearly as possible the same diameter as the pistons. These valves, which are reversed, open and close in opposite directions, and each has between its seat and its piston an annular channel *f* and *g*, respectively, leading in the case of valve *d* to a pipe *h*, Fig. 2, communicating with the fluid-supply reservoir, and in the case of valve *e* to a pipe *k*, Fig. 2, communicating with the atmosphere or an exhaust-chamber. Admission-valve *d*, which may be held on its seat by a light spring, such as *l*, is the reducing-valve, and it opens into a passage *m*, from which a pipe *n* leads to the chamber to be supplied with the compressed fluid. Discharge-valve *e* opens from this passage *m* and allows the fluid to be discharged from the chamber through pipe *k* into the exhaust-chamber or the atmosphere. The two pistons *b* and *c* project from the casing and may be operated by means of pressure applied by the hand or otherwise directly or indirectly to the rod *o*, which acts on the central pivot *p* of an equal-ended lever *q*. Whatever pressure be applied to the rod *o* is thus divided practically equally (the resistance of the light spring *l* being negligible) between the two pistons—that is, both pistons are equally pressed, *d*, the reducing-valve, away from its seat, and *e*, the discharge-valve, onto its seat. The effect of this arrangement is to hold the reducing-valve open with exactly the same force as the discharge-valve is held closed. The reducing-valve *d* is forced onto its seat as soon as the pressure in the chamber supplied and the passage *m* rises to very slightly exceed the pressure with which the rod is thrust down. If the pressure on the central rod is lessened, the pressure on the discharge-valve will also be lessened and the fluid contents of the chamber at once discharge till the pressure equals that closing the valve. In this manner an increase of mechanical pressure on the central rod *o* causes pressure to rise (within the limits of the source of high-pressure supply) and a diminution of pressure causes the fluid-pressure to fall. The rod *O* moves vertically and is provided with

a collar  $x$ , secured by a pin  $x'$  on its lower end, by which the rod is held against being pulled out vertically.

In the form illustrated in Figs. 4 to 6 one  
 5 hollow cylindrical piston  $r$  takes the place of the two pistons in the first form. This piston operates in a cylindrical casing  $a'$ , at one end of which is an annular passage  $f'$ , surrounding the piston. This passage is con-  
 10 nected by pipe  $h'$  to the source of high-pressure fluid. A valve-seat is formed at one end of the casing  $a'$ , and a valve  $d'$  to fit it is formed on the cylindrical piston  $r$ . This valve may be held on its seat by a light  
 15 spring  $l'$ . The valve opens into passage  $m'$ , from which fluid at a regulated pressure is supplied to the receiving-chamber through the pipe  $n'$ . The other end of the cylindrical casing contains a lift-valve  $e'$ , which is pressed  
 20 upon a seat formed on the end of the hollow piston  $r$  when pressure is applied to the rod  $o'$ . This valve opens into the discharge pipe or chamber  $k'$ . This construction of valve performs all the functions of the double valve  
 25 hereinbefore described. Assuming that pressure is applied to the exhaust-valve by means of a rod  $o'$  passing through a gland in the end of the casing, this pressure forces the exhaust-  
 30 valve  $e'$  onto its seat on the end of the hollow piston  $r$ , and if the pressure be sufficient the hollow piston will be thrust inward and the valve  $d'$  at the other end be moved off its seat against the pressure of the spring  $l'$  plus whatever pressure may be in the receiv-  
 35 ing-chamber. The fluid under pressure then flows from the supply-pipe  $h'$  and is fed to the receiving-chamber at a regulated pressure. When the pressure in the chamber begins to exceed the mechanical force or  
 40 pressure applied to the discharge-valve, the valve  $d'$  closes, thrusting the hollow piston along and at the same time moving the exhaust-valve  $e'$  with it. So far the action is that of an ordinary reducing-valve. If, how-  
 45 ever, the pressure upon the discharge-valve be further reduced, the fluid contents from the receiving-chamber will flow through the hollow piston  $r$ , entering by way of holes  $s$ , lift the discharge-valve  $e'$ , and escape to the

exhaust-chamber or the atmosphere until the 50  
 pressure in the receiving-chamber just balances the pressure applied to the discharge-valve by the rod  $o'$ . In this manner the pressure within the receiving-chamber rises or falls with the force applied to the spindle 55  
 $o'$ , which controls both the discharge and piston valves. In this form I am also enabled to maintain a chamber at a varying pressure, rising and falling as the force acting on the valve increases or diminishes. 60

The invention may be applied to chambers used for containing fluid under pressure of varying intensity and is applicable to many purposes, such as pneumatic brakes, fluid 65  
 steering-gear, and stair-tractors.

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

1. In combination in a fluid-pressure system, a casing, an admission-valve, a dis- 70  
 charge-valve, a connecting-passage between the valves and means for applying a variable pressure to the valves, said means acting simultaneously and with equal force on the valves to open the admission-valve and close 75  
 the discharge-valve, substantially as described.

2. In combination in a fluid-pressure system, an admission-valve, a discharge-valve and means for applying a variable pressure 80  
 to said valves simultaneously and respectively in opposite directions in relation to their seats.

3. In combination with a fluid-pressure system a valve-casing containing an admission 85  
 and a discharging valve which open in opposite directions, a rod operating both these valves, a passage situated in the path of the fluid between these two valves leading to a receiv- 90  
 ing-chamber and a spring holding the admission-valve on its seat, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

LOUIS BRENNAN.

Witnesses:

ALBERT E. BARKER,  
 FRANCIS J. BIGNELL.