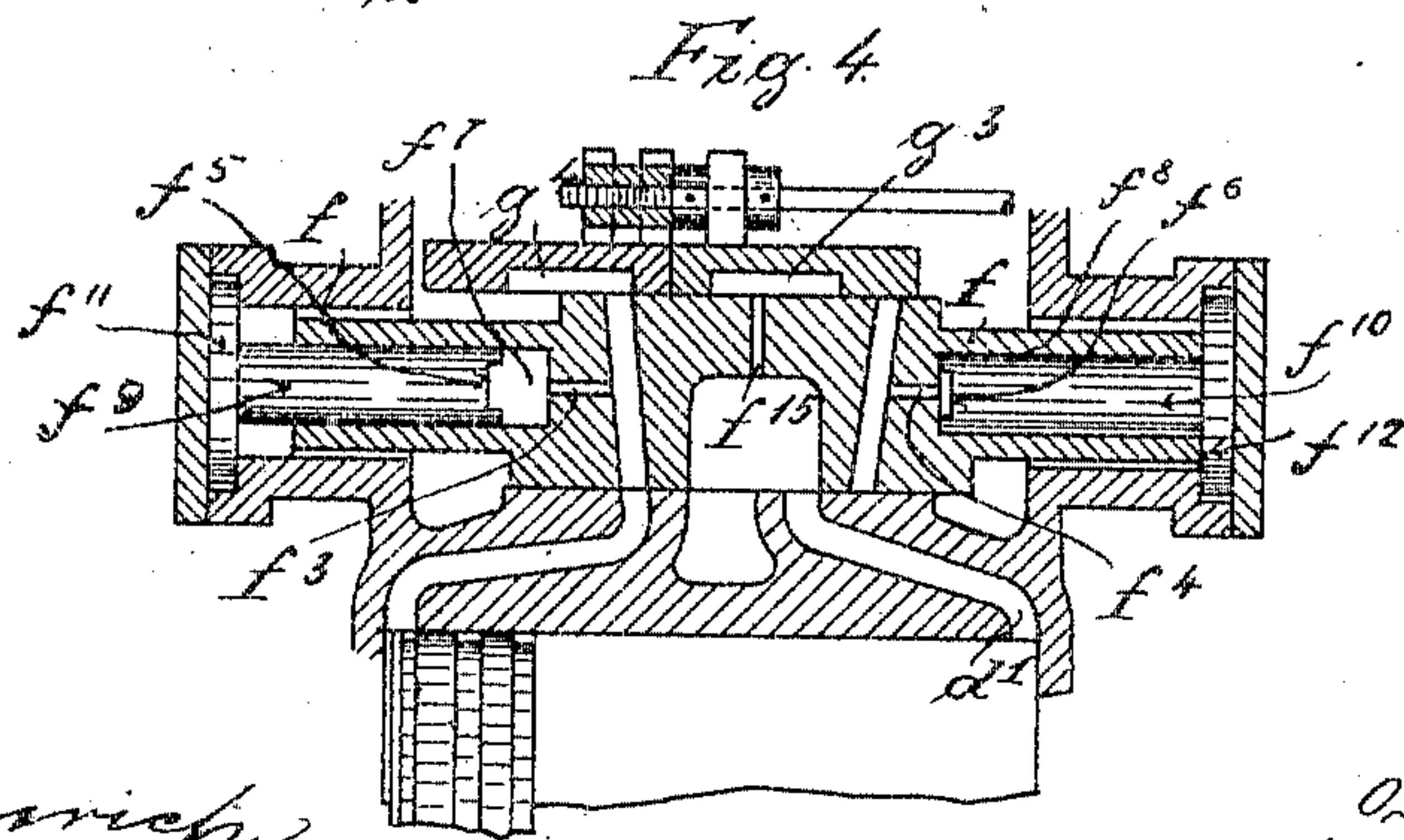
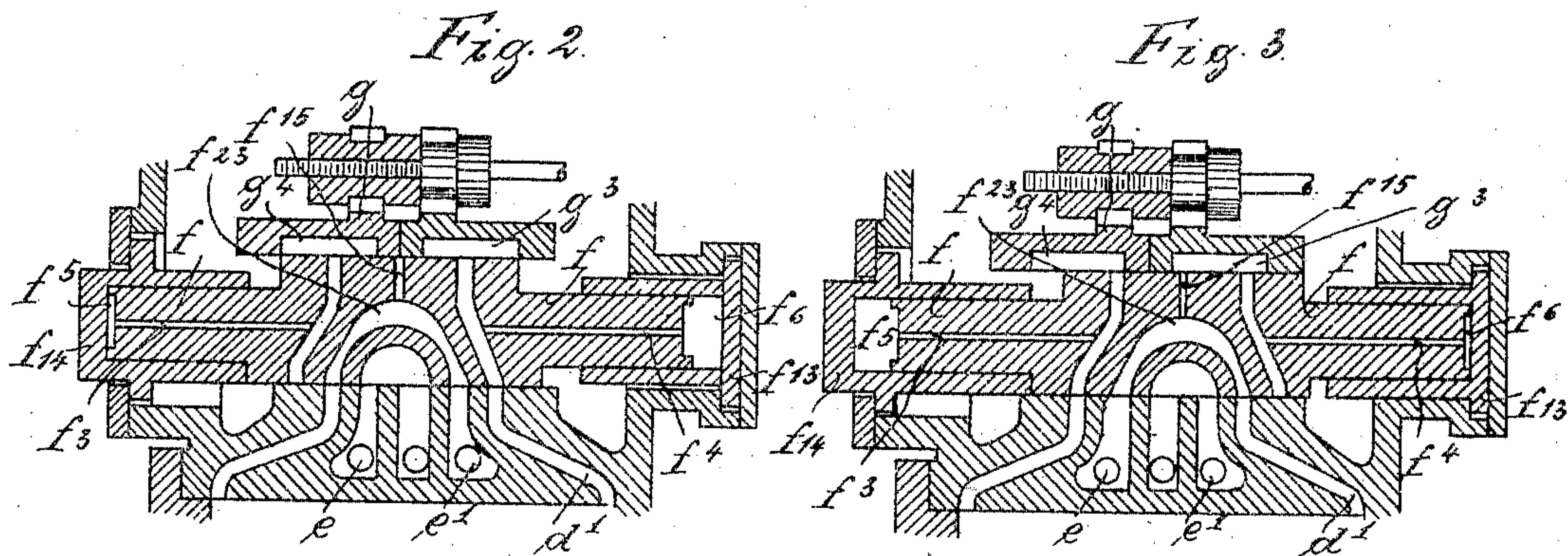
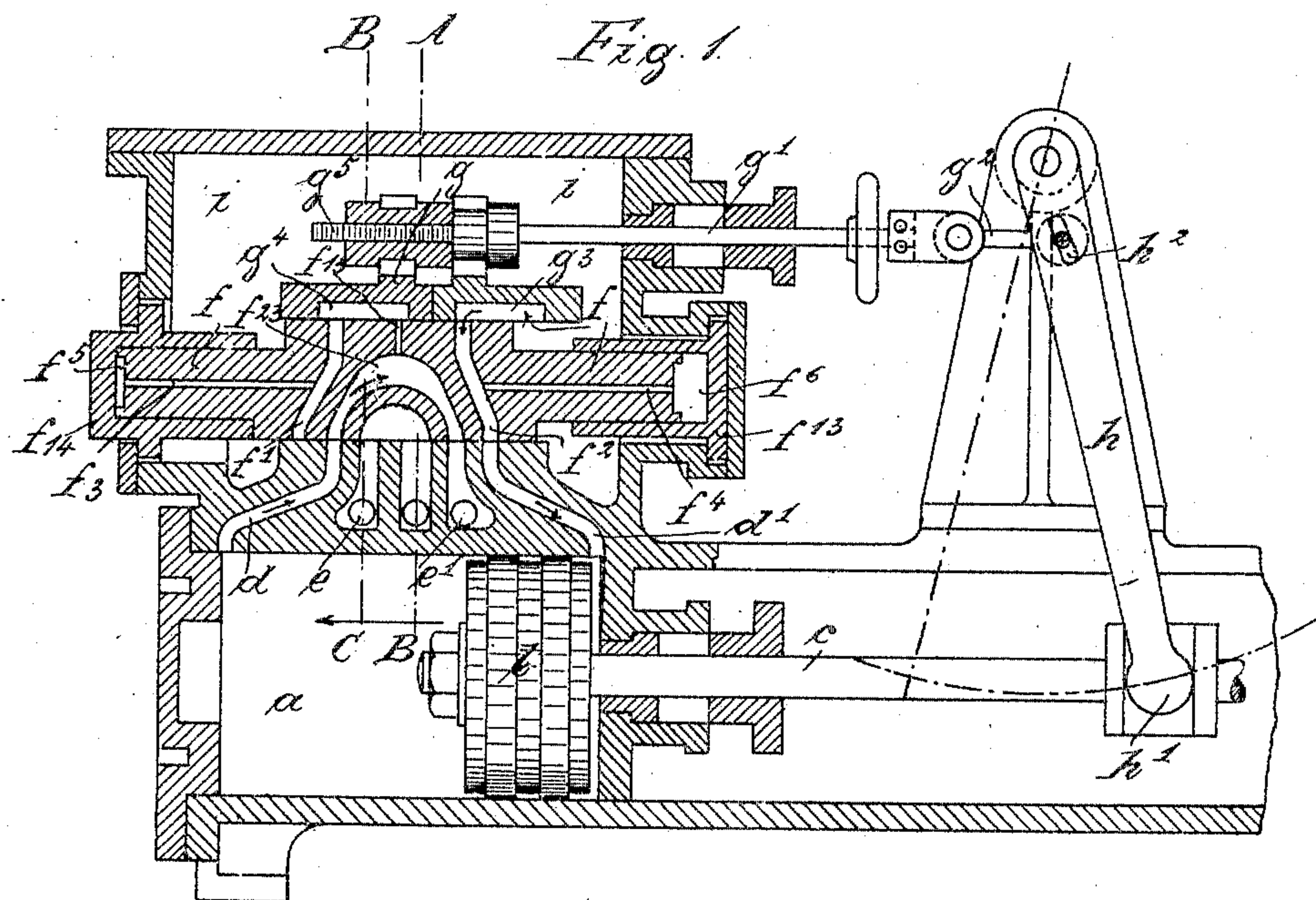


No. 780,100.

PATENTED JAN. 17, 1905.

O. GRÄSSLER.  
STEAM ACTUATED VALVE.  
APPLICATION FILED JUNE 26, 1903.

2 SHEETS—SHEET 1.



Witnesses:

*Paul Heinrich*  
*Paul Wollenberg*

Inventor:

Oswald Grässler

*Robert Decker*  
Attorney



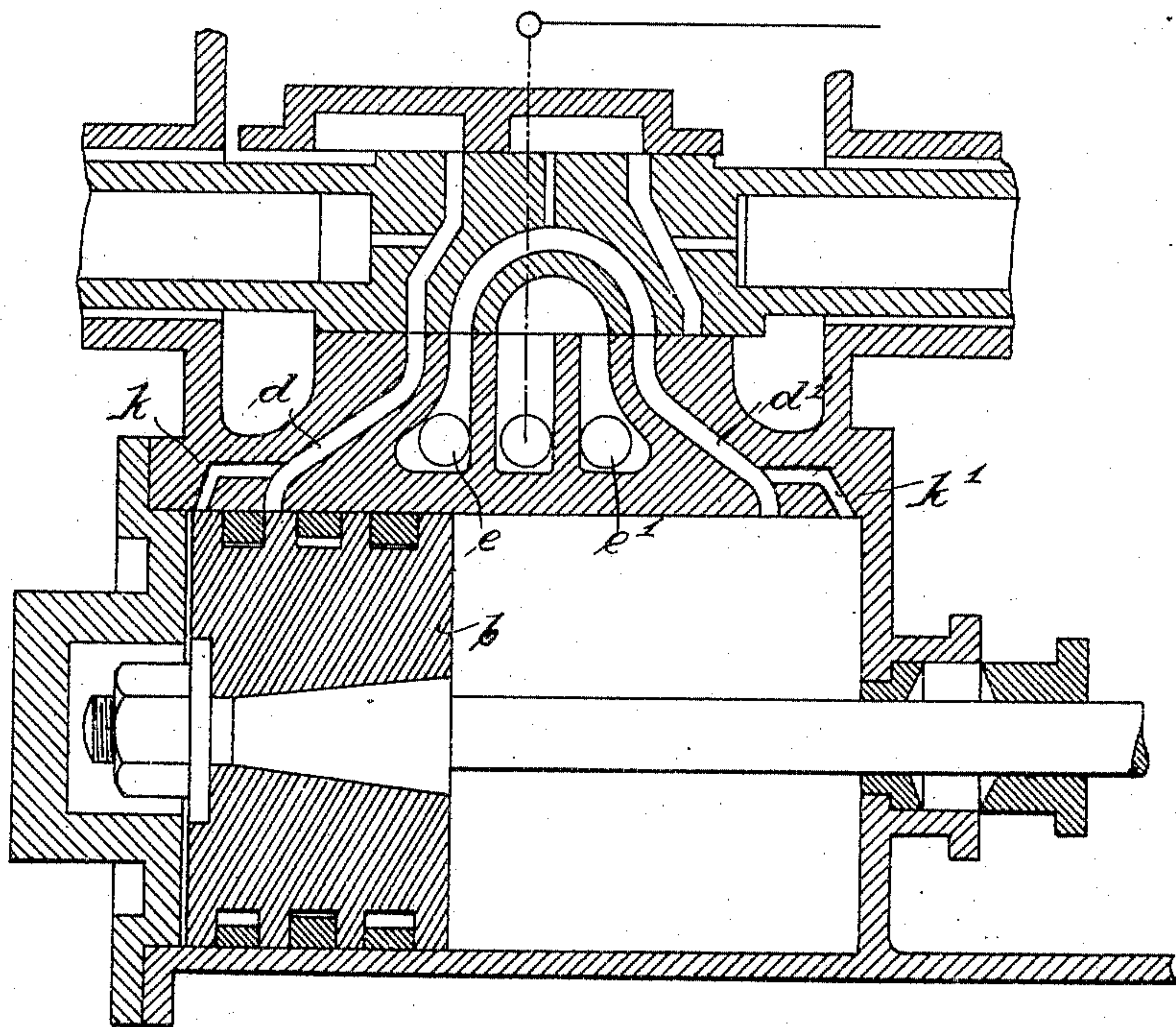
No. 780,100.

PATENTED JAN. 17, 1905.

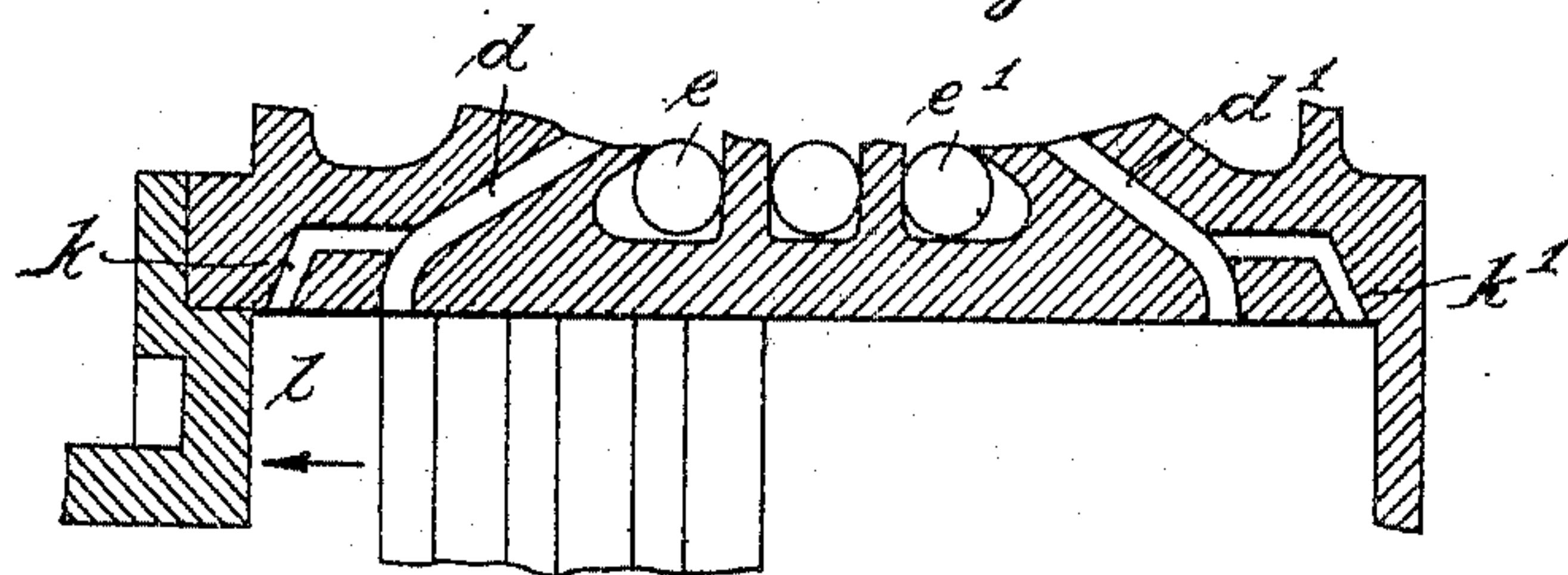
O. GRÄSSLER.  
STEAM ACTUATED VALVE.  
APPLICATION FILED JUNE 26, 1903.

2 SHEETS—SHEET 2.

*Fig. 5.*



*Fig. 6.*



Witnesses:  
Paul Kollenberg  
Paul Feinwisch

Inventor:  
Oswald Grässer  
by Robert Reipke  
Attorney.



# UNITED STATES PATENT OFFICE.

OSWALD GRÄSSLER, OF LEIPSIC-SCHLEUSSIG, GERMANY.

## STEAM-ACTUATED VALVE.

SPECIFICATION forming part of Letters Patent No. 780,100, dated January 17, 1905.

Application filed June 26, 1903. Serial No. 163,272.

*To all whom it may concern:*

Be it known that I, OSWALD GRÄSSLER, a subject of the King of Saxony, and a resident of 1 Quandstrasse, Leipsic-Schleussig, in the Kingdom of Saxony, German Empire, have invented certain new and useful Improvements in Steam-Actuated Valves, of which the following is an exact specification.

My invention relates to improvements in steam-actuated valves for engines without fly-wheels, and more especially to engines possessing two slide-valves, one of which is moved by means of the engine itself, whereas the other one is moved directly by means of the steam, the movement of this second slide being governed by means of the first one.

The purpose of the invention is to provide a construction by means of which it is attained that the moment of the beginning of the steam admission, as well as the moment of closing the same—that is to say, the moment of the beginning of the expansion of the same—can be changed at will, thereby creating an engine which can be easily governed.

In order to make my invention more clear, I refer to the accompanying drawings, in which—

Figure 1 is a longitudinal section of the working parts of the engine. Figs. 2 and 3 show the same parts in another position. Fig. 4 shows a modification of the construction shown in the preceding figures. Figs. 5 and 6 show the device for effecting that the valves of the pump driven by means of the engine have sufficient time to close.

In the construction shown in Figs. 1 and 2,  $a$  is the steam-cylinder.  $b$  is a piston situated within the same.  $c$  is the piston-rod.  $d, d'$  are the steam-inlet ports.  $e, e'$  are the steam-outlet ports.  $f$  is a slide-valve provided with channels  $f', f''$  for the steam admission and a channel  $f'''$  for the exhaust-steam. The slide-valve  $f$  is moved by means of a second slide-valve  $g$ , which, as may be seen from the drawings, is E-shaped. The slide  $g$  is moved by means of the slide-valve rod  $g'$ . The slide-valve rod  $g'$  is connected, by means of a link  $g''$ , to a lever  $h$ , connected at  $h'$  to the piston-rod  $c$ . For changing the movement of the slide-valve  $g$  the point in which the link  $g''$  is connected to the lever  $h$  may be adjusted by the ar-

range-ment of a slot  $h''$ . The slide  $g$  consists, as may be seen from the drawings, of two separate parts—that is to say, the part  $g^3$  and the part  $g^4$ . These parts are both connected, by means of threads, to the slide-valve rod  $g'$  in such manner that by turning this slide-valve rod by means of a hand-wheel (shown in Fig. 1 of the drawings) the distance between the parts  $g^3$  and  $g^4$  can be changed.

The effect of the device is as follows: If steam is admitted into the valve-chest  $i$ , the steam will in the position shown in Fig. 1 flow through the part  $g^3$  of the slide  $g$  and the channels  $f''$  and  $d'$  into the cylinder  $a$  and will move the piston  $b$  in the direction of the arrow. As the slide  $g$  is connected, by means of the valve-rod  $g'$ , the link  $g''$ , and the lever  $h$ , to the piston-rod  $c$ , this slide-valve  $g$  will follow the movement of the piston  $b$ . As soon as the slide  $g$  arrives in the position shown in Fig. 2 the steam admission is cut off, and the steam in the cylinder  $a$  begins to expand. If the slide  $g$  arrives in the position shown in Fig. 3, the steam will flow through the part  $g^4$  of the slide  $g$  into the channel  $f'$ . As this channel  $f'$  is in this position with the slide  $f$  closed on its lower side, as may be seen from Fig. 1, the steam cannot flow into the cylinder. In the slide  $f$  small channels  $f^3, f^4$  are provided, which connect the channels  $f', f''$  with small spaces  $f^5$  and  $f^6$ . If now the steam enters the channel  $f'$ , it will flow through the channel  $f^3$  into the space  $f^5$ , and will consequently press the slide  $f$  to the right-hand side, so that the same adopts the position shown in Fig. 3. In this position the steam flows from the admission-chamber through the part  $g^4$  of the slide  $g$ , the channel  $f'$ , and the channel  $d$  behind the piston  $b$  and drives the same forward in the direction of the arrow shown in Fig. 1. During this forward movement the slide  $g$  moves also forward until the part  $g^3$  of the same arrives in the position in which the steam can flow into the same. As soon as the steam is admitted to the part  $g^3$  the steam will flow through the channel  $f^4$  to the space  $f^6$  and will bring the slide  $f$  into the position shown in Fig. 1. If the cylinder  $b$  moves in the direction indicated by the arrow in Fig. 1, the exhaust-steam flows through the channels  $d$  and  $f'''$  to the exhaust  $e'$ , while if the piston



moves in the opposite direction the exhaust flows through the channel  $d'$  and  $f^{23}$  to the exhaust  $e$ . In one cylinder-engine in which the steam exhausts it is not necessary to arrange two exhaust-ports  $e$  and  $e'$ ; but it is sufficient to arrange only one exhaust, as shown in the modification in Fig. 4. In this modification the slide  $f$  is provided with bores  $f^7, f^8$ , into which pistons  $f^9, f^{10}$  are fitted. The spaces  $f^5$  and  $f^6$ , into which flows the steam for moving the slide  $f$ , are in this construction situated at the end of the pistons  $f^9$  and  $f^{10}$ . It will be seen from the drawings that the base-plates  $f^{11}$  and  $f^{12}$ , as well as the ends of the slide  $f$ , are not exactly fitted into the valve-chest, but have sufficient play for allowing an adjusting of the same in case of the sliding surfaces wearing out. In the construction shown in Fig. 1 special cylinders  $f^{13}$  and  $f^{14}$ , having some play in the valve-chest, are provided for allowing of wearing out. If the expansion shall be changed, this can be easily effected by adjusting the point in which the link  $g^2$  is fixed to the lever  $h$ , which changing is effected by means of the slot  $h^2$ . A further change of the admission can be attained by changing the position of the slide  $g$  by means of the screw  $g^5$ .

By changing the movement of the slide  $g$  and simultaneously changing the distance between the parts  $g^3$  and  $g^4$  of the slide  $g$  an exact adjusting of the expansion can take place, which was not the case in the constructions hitherto known. The combination of these two adjusting means therefore forms the main part of the invention.

In order to attain that the steam in the spaces  $f^5$  and  $f^6$  can escape if the slide  $f$  is moved a small channel  $f^{15}$  is provided. This channel connects in the position shown in Fig. 1 the space  $f^5$ , by means of the channels  $f^3$  and  $f'$ , the passage  $g^4$ , and the channel  $f^{23}$ , to the exhaust  $e'$ . The construction is, however, such that this connection is interrupted before the slide  $f$  arrives in its end position, so that the steam still contained in the spaces  $f^5$  and  $f^6$  forms a buffer for the slide  $f$ , hereby avoiding shocks in the movement of the same.

In Figs. 5 and 6 an arrangement is shown for avoiding that the piston  $b$  can push against the cylinder-covers and for attaining that the piston moves slowly at the end and beginning of the stroke, which is very important in case the engine is used for driving pumps, as by this means the valves have sufficient time to close.

As will be seen from the drawings, the ends of the admission-channels  $d$  and  $d'$  are situated in a certain distance from the cylinder-covers.  $h, h'$  are branch channels connected to the channels  $d, d'$ , the ends of which channels are situated directly at the cylinder-covers. In the position shown in Fig. 6 the piston  $b$  just closes the channel  $d$ . If the piston now moves in the direction of the arrow, the steam in the space  $l$  must flow out through the chan-

nel  $h$ . Now this channel is made so narrow that the steam can only slowly escape, hereby effecting that the piston moves slowly near its dead-point. In consequence hereof the valves of the pump driven by means of the engine have sufficient time to close, and the piston will never push against the cylinder-cover. If now the valve  $f$  has been moved, the steam must at first enter through the small channel  $h$ , and the backward movement of the same will therefore also begin slowly until the piston  $b$  has passed the end of the channel  $d$ .

Having thus fully described the nature of my invention, what I desire to secure by Letters Patent of the United States is—

1. In a steam-engine, the combination of a cylinder, a piston situated within the cylinder, a slide-valve provided with two steam-admission channels, means for moving this slide-valve by the steam in the steam-chest, a second slide-valve situated upon the first one, said second slide-valve consisting of two parts, one of which is situated so as to open and close during the movement of this slide-valve one of the steam-admission channels of the first slide-valve, the second part being situated so as to open and close during the movement of the slide-valve the second steam-admission channel of the first slide-valve, with means for changing the distance between these two parts, means for moving the second slide-valve from the piston-rod of the engine, and means for changing the movement of the second slide-valve, substantially as described and for the purpose set forth.

2. In a steam-engine, the combination of a cylinder, a piston situated within the cylinder, a slide-valve provided with two steam-admission channels, means for moving this slide-valve by the steam in the steam-chest, a second slide-valve situated upon the first one, said second slide-valve consisting of two parts, one of which is situated so as to open and close during the movement of this slide-valve one of the steam-admission channels of the first slide-valve, the second part being situated so as to open and close during the movement of the slide-valve the second steam-admission channel of the first slide-valve, with means for changing the distance between these two parts, means for moving the second slide-valve from the piston-rod of the engine, means for changing the movement of the second slide-valve, and means for retarding the movement of the steam-piston near the end of each stroke, substantially as described and for the purpose set forth.

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

OSWALD GRÄSSLER.

Witnesses:

RICHARD SCHUHMAN,  
GEORG ALBRECHT.