

E. FALCKE.
VALVE.

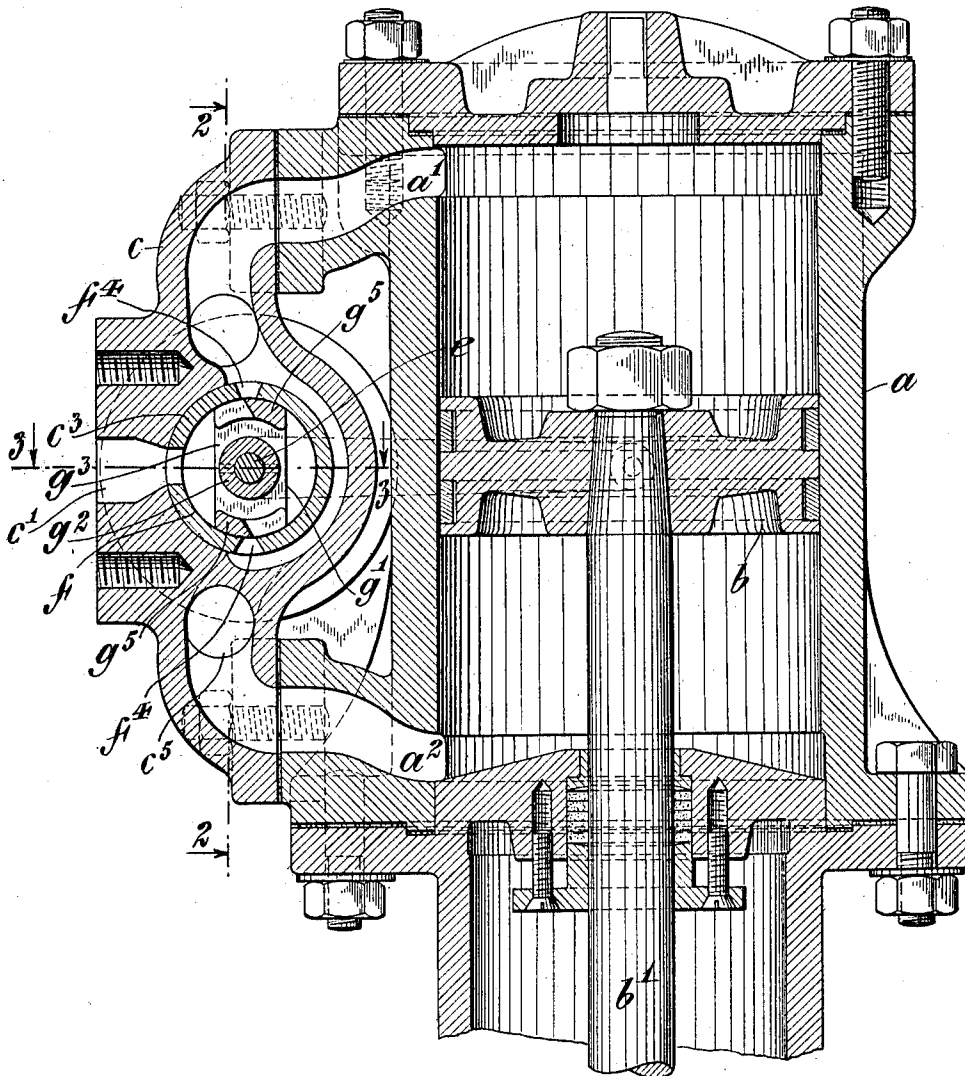
APPLICATION FILED OCT. 26, 1910.

1,048,816.

Patented Dec. 31, 1912.

2 SHEETS—SHEET 1.

Fig. 1.



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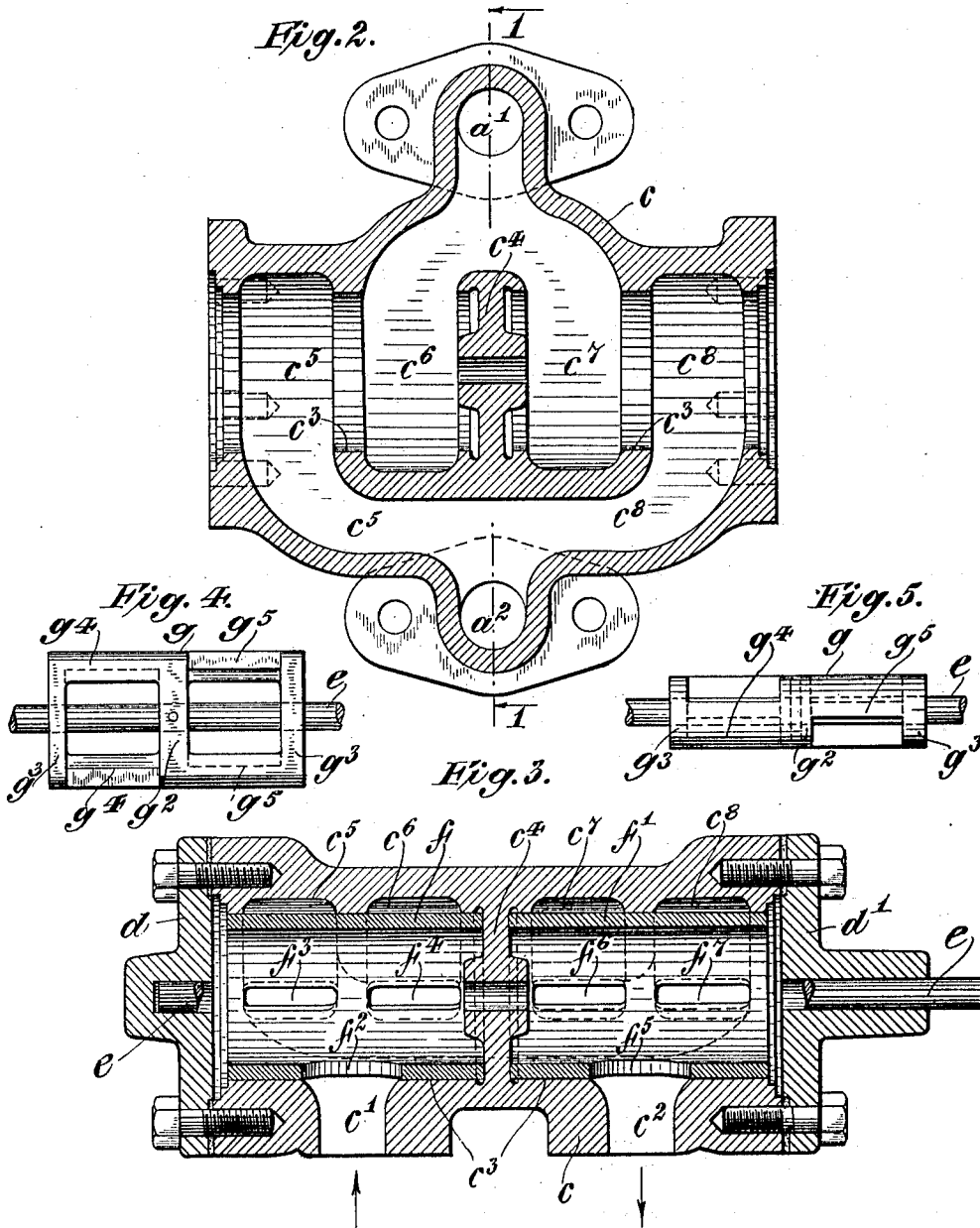
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2 SHEETS-SHEET 2.



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UNITED STATES PATENT OFFICE.

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VALVE.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, EMIL FALCKE, a subject of the German Emperor, residing in the city of Dresden, Germany, have invented certain new and useful Improvements in Valves, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

This invention relates to the construction of valves which are adapted to open or to close simultaneously either partly or wholly the inlet and the outlet at opposite ends of a power cylinder for the admission of fluid under pressure on one side of the piston in the cylinder and the simultaneous discharge of the fluid from the cylinder on the other side of the piston for the purpose of producing a pressure differential.

The object of the invention is to improve the construction of such valves and particularly to render them exceedingly sensitive in operation so that a very slight movement of the movable valve body will be sufficient to increase the pressure at one end of the cylinder and to decrease the pressure at the other end, or vice versa, while the passages for the fluid may also be opened more or less widely according to the external resistance to the movement of the piston or the velocity of the piston or both.

The improved construction has been devised with special reference to its use in connection with servomotors, such as are employed for the regulation of turbines and for the control of the force applied to gyrostats in the application of gyrostats to the equilibrating of bodies in unstable equilibrium.

The invention will be more fully explained hereinafter with reference to the accompanying drawings in which it is illustrated, and in which—

Figure 1 is a view in section of a servomotor cylinder with its piston to which the improved valve is applied, the plane of section being indicated by the line 1—1 of Fig. 2. Fig. 2 is a view of the valve casing in section on the plane indicated by the line 2—2 of Fig. 1, the sleeves and the movable valve bodies being removed. Fig. 3 is a view in section on the plane indicated by the line 3—3 of Fig. 1, the sleeves being in position while the movable valve bodies are

removed. Figs. 4 and 5 are detail side and edge views of one of the movable valve bodies, showing also the shaft upon which both are mounted.

In Fig. 1 of the drawings is shown a cylinder *a* with a piston *b* having a piston rod *b'* through which the movement of the piston may be imparted to the gyrostat or other body which is to be moved by the servomotor. The cylinder is provided at its ends with ports *a'* and *a''* through which the fluid under pressure may be admitted or discharged as the piston is moved in one direction or the other. Suitably connected with the cylinder *a* is a valve casing *c* which is provided with an inlet port *c'* for connection with the source of fluid under pressure and with a discharge opening *c''* for the return of the fluid to its source or its discharge elsewhere. The casing *c*, in the construction shown, has a substantially cylindrical bore *c'''* which is divided centrally by a partition *c''''* and the ends of the casing are closed by suitable caps *d* and *d'*, thus forming two separate chambers within the casing. Through the caps and through the central partition *c''''* is extended a shaft *e* which carries the movable valve bodies hereinafter referred to and may be oscillated by any suitable connections for the purpose of changing the position of the valve bodies.

For convenience in manufacture, especially for the formation of the passages hereinafter referred to, as well as to permit the renewal of the wearing surface when required, there is tightly secured in the bore *c'''* of the valve casing *c*, at each side of the partition wall *c''''*, a sleeve *f* or *f'*. The sleeve *f* is provided with a port *f''* for registration with the port *c'* in the casing, constituting a supply port, and with ports *f'''* and *f''''*, constituting delivery ports. Similarly the sleeve *f'* is provided with a port *f''* for registration with the port *c''* of the casing, constituting a discharge port, and with ports *f'''* and *f''''*, constituting receiving ports. In the wall of the casing *c* are formed a channel *c'''''*, which forms a passage for the fluid from the port *f'''* to the port *a''*; a channel *c''''''*, which forms a passage for the fluid from the port *f''''* to the port *a'*; a channel *c'''''''*, which forms a passage for the fluid from the port *a'* to the port *f'''*; and a channel *c''''''''*

which forms a passage for the fluid from the port a^2 to the port f^7 . The channels c^5 , c^6 , c^7 and c^8 are distinct, one from another, being formed by internal ribs of the casing c which fit tightly upon the sleeves f and f^7 .

Upon the shaft e are secured two movable valve bodies g and g' . These two movable valve bodies are similar in construction and description and illustration of one will suffice for both. To a hub g^2 adapted to be secured to the shaft e are secured end plates g^3 which support gates g^4 g^4 and g^5 g^5 . The gates g^4 g^4 are diametrically opposite and coöperate with the ports f^3 , while the gates g^5 g^5 are also diametrically opposite and coöperate with the ports f^4 , but the gates g^4 g^5 are oppositely placed with their opposite proximate edges offset, so that as the ports f^3 are closed the ports f^4 are opened by a continued movement of the movable valve body in the same direction, and vice versa. The gates of the two valve bodies are similarly positioned, so that as the ports f^3 and f^6 are opened, the ports f^4 and f^7 are closed by a movement of the valve bodies in the same direction, and vice versa.

It will now be seen that when the two valve bodies are so positioned as to admit fluid under pressure through the inlet port c' and the port a' at the upper end of the cylinder a , the lower end of the cylinder a is placed in communication with the port a^2 and with the outlet c^2 , and that when the valve bodies are so positioned as to admit fluid under pressure through the inlet c' , the port f^4 and the port a^2 , to the lower end of the cylinder, the upper end of the cylinder is in communication through the port a' and the port f^7 with the outlet or discharge opening c^2 .

It will be observed that the improved valve is perfectly balanced and that the slightest movement thereof in one direction or the other from the middle position increases the pressure of the fluid at one end of the cylinder and decreases the pressure at the other end of the cylinder, as the case may be and that, the gates g^4 and g^5 being properly positioned with respect to the corresponding ports f^3 and f^4 , and f^6 and f^7 , as the case may be, there is no overlap and consequently no dead position which would require a substantial movement of the valve bodies from their middle position in order to effect the desired movement of the piston b , the opposite, proximate edges of the gates g^4 and g^5 being offset by a distance preferably a little less than the width of the ports f^3 and f^4 , although the same result might be secured by placing the opposite, proximate edges of the gates g^4 and g^5 in alinement and offsetting the ports f^3 and f^4 and f^6 and f^7 correspondingly.

The form and arrangement of the parts obviously may be varied to suit different

conditions of use and the invention, therefore, is not restricted to the precise construction shown.

I claim as my invention:

1. The combination of a valve casing having a supply port and delivery ports with separate channels, and a movable valve body within the casing having gates to coöperate with the delivery ports respectively, the gates and the delivery ports being relatively offset, whereby one of the ports is closed as the other is opened.

2. The combination of a valve casing having a cylindrical bore with a supply port and delivery ports with separate channels, and a rotary oscillating valve body within the casing having gates to coöperate with the delivery ports respectively, the gates and the delivery ports being relatively offset, whereby one of the ports is closed as the other is opened.

3. The combination of a valve casing having two separate chambers, one chamber having an inlet port and delivery ports with separate channels and the other having a discharge port and receiving ports with separate channels, and movable valve bodies within the chambers respectively, each of such valve bodies having gates to coöperate with the corresponding delivery ports and receiving ports, the gates and the coöperating ports in each chamber being relatively offset, whereby one of the delivery ports and one of the receiving ports are closed as the other of the delivery ports and the other of the receiving ports are opened.

4. The combination of a valve casing having two separate cylindrical chambers, one chamber having an inlet port and delivery ports with separate channels, and the other having a discharge port and receiving ports with separate channels, rotary oscillating valve bodies within the chambers respectively, each of such valve bodies having gates to coöperate with the corresponding delivery ports and receiving ports, the gates and the coöperating ports in each chamber being relatively offset, whereby one of the delivery ports and one of the receiving ports are closed as the other of the delivery ports and the other of the receiving ports are opened.

5. The combination with a cylinder having ports in its ends, of a valve casing having separate chambers, one of said chambers having an inlet port and delivery ports communicating respectively with opposite ends of the cylinder, and the other of said chambers having a discharge port and receiving ports communicating respectively with opposite ends of the cylinder, and movable valve bodies within the chambers respectively, each of such valve bodies having gates to coöperate with the corresponding delivery ports and receiving ports, the gates

and the cooperating ports in each chamber being relatively offset, whereby one of the delivery ports and one of the receiving ports are closed as the other of the delivery ports and the other of the receiving ports are opened.

6. The combination with a cylinder having ports in its ends, of a valve casing having two separate cylindrical chambers, one chamber having an inlet port and delivery ports communicating with opposite ends of the cylinder respectively and the other having a discharge port and receiving ports communicating with opposite ends of the cylinder respectively and rotary oscillating valve bodies within the chambers respec-

tively, each of such valve bodies having gates to cooperate with the corresponding delivery ports and receiving ports, the gates and the cooperating ports in each chamber being relatively offset, whereby one of the delivery ports and one of the receiving ports are closed as the other of the delivery ports and the other of the receiving ports are opened.

This specification signed and witnessed this 11th day of October, A. D. 1910.

EMIL FALCKE.

Signed in the presence of—

PAUL ARRAS,
PAUL VOLMER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."