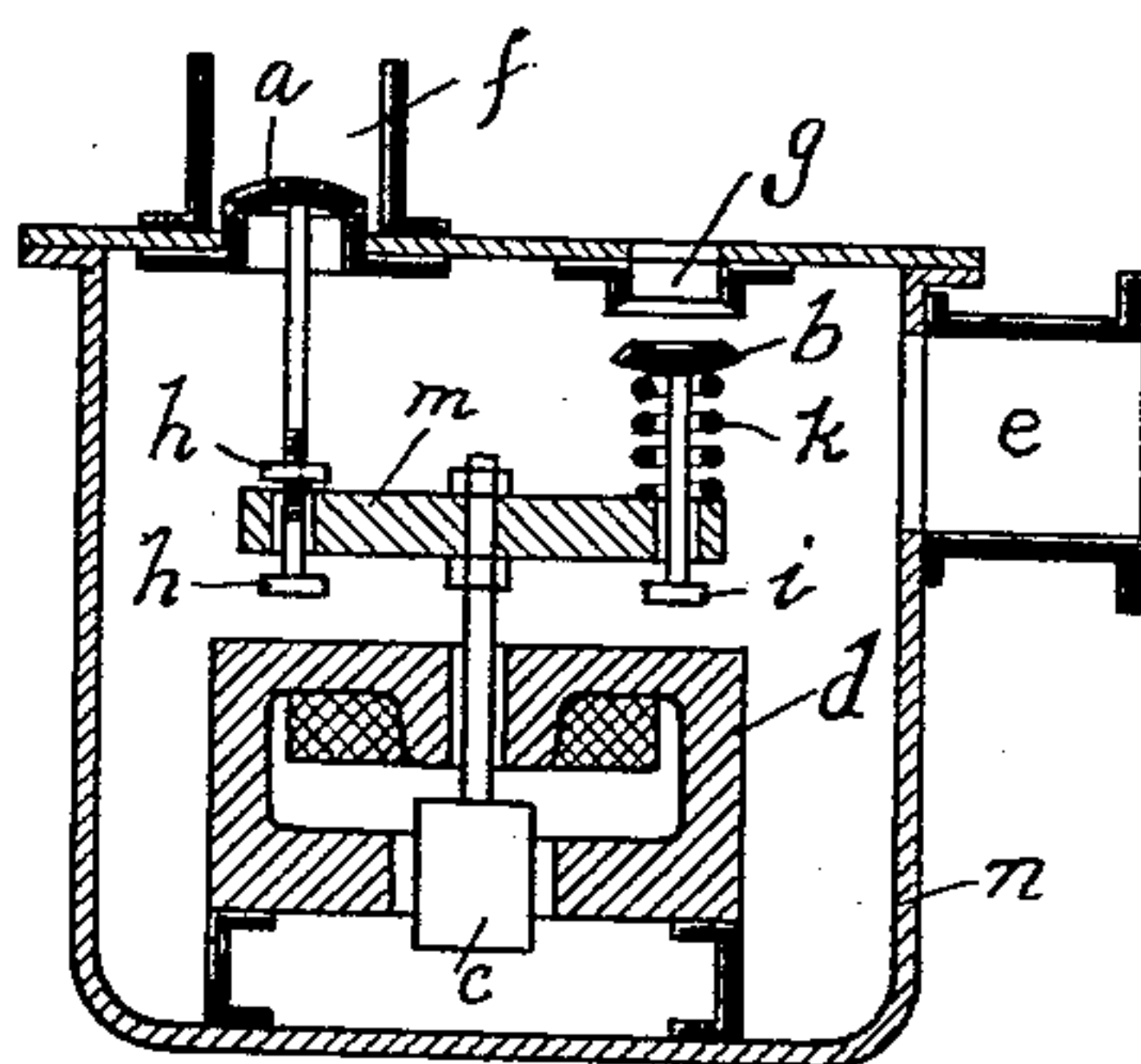


No. 896,120.

PATENTED AUG. 18, 1908.

C. KRÄMER.  
ELECTRICALLY OPERATED VALVE.  
APPLICATION FILED MAY 2, 1906.



Witnesses:  
B.C. Rust  
J.J. McCarthy.

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# UNITED STATES PATENT OFFICE.

CHRISTIAN KRÄMER, OF FRANKFORT-ON-THE-MAIN, GERMANY, ASSIGNOR TO FELTEN & GUILLEAUME-LAHMEYERWERKE ACTIEN-GESELLSCHAFT, OF FRANKFORT-ON-THE-MAIN, GERMANY.

## ELECTRICALLY-OPERATED VALVE.

No. 896,120.

Specification of Letters Patent.

Patented Aug. 18, 1908.

Application filed May 2, 1906. Serial No. 314,870.

*To all whom it may concern:*

Be it known that I, CHRISTIAN KRÄMER, a subject of the German Empire, and a resident of Frankfort-on-the-Main, Germany, have invented certain new and useful Improvements in Electrically-Operated Valves, of which the following is a specification.

The valves operated by electricity hitherto known have the disadvantage that they are unsuitable for working by alternating current, as the armature actuating the valve proper vibrates under the action of alternating currents and its vibrations are communicated to the valve proper, so that it does not close properly against its seat.

The object of this invention is to obviate this disadvantage by providing a valvular mechanism capable of being operated either by a direct current, or an alternate current, in which valvular mechanism the armature moved by electrical means is not rigidly attached to the valve proper but a certain amount of play is allowed so that the vibrations of the armature are not communicated to the valve proper.

The accompanying sectional diagram illustrates a distributing valvular mechanism in which two valves proper (*a* and *b*) can be so actuated by one armature *c* of a magnet *d* that the passage *e*, connected for instance with a working cylinder, can be put into communication either with a liquid or compressed air, or gas reservoir through the passage *f*, or with an exhaust passage *g*. The stem of the valve proper *a* can move relatively to the armature *c* to an amount determined by the adjustable stops *h*. The stem of the valve proper *b* is provided with a stop *i*. On the other side the valve proper *b* is sustained on the cross-head *m* of the armature *c* through the medium of a spring *k*.

The cross-head *m* serves as a coupling between the valves *a*, *b*, the stems of which extend through apertures or passages therein; and the several parts of the mechanism are inclosed in a suitable casing *n*.

The operation of this valvular mechanism is as follows: One of the two valves proper is always closed. Let it be presumed that the valve proper *a* is closed, the admission of the fluid from the aforesaid reservoir to the cylinder is therefore cut off. The magnet *d* is then energized so that the armature *c* is attracted and valve proper *b* is pressed onto its seat by the spring *k*. Before the closing

position is reached, the valve proper *b* is energetically urged towards its seat by the pressure of the fluid. The armature of the magnet can now oscillate relatively to the valve stems and in the direction of their motion, without the valve body *b* being affected by such oscillation and therefore an alternating electric current can be used. The stroke of the valve proper *a* may of course be so determined that the play of the valve proper does not unduly reduce the section of efflux of the fluid.

The object of the invention may be attained without any mechanical play, or relative movement between the valve and armature, for instance when the power which acts to cause the armature of the alternating current magnet to oscillate is small when compared with the pressure that holds the valve against its seat, the essential point being that the movement of the valve proper is initiated by the armature, while the closure is secured by the pressure of the fluid independently of the oscillations of the armature.

I claim:

1. The combination with a valve casing having supply and exhaust openings, of an electro-magnet within said casing, and valves for controlling the supply and exhaust openings to the casing both connected with and adapted to be adjusted by the armature of said magnet.

2. The combination of a valve casing having supply and exhaust openings formed in one wall, valves controlling said openings, one of said valves being adapted to be seated within the casing and the other outside the casing, and an electro-magnet having its armature connected with and adapted to move both said valves.

3. The combination of a valve casing having supply and exhaust openings formed in one wall, valves controlling said openings, one of said valves being adapted to be seated within the casing and the other outside the casing, an electro-magnet, and connections between the valves and the armature of the magnet for moving said valves while permitting a limited movement of each valve relative to the armature.

4. The combination of a valve casing having supply and exhaust openings formed in one wall, valves controlling said openings, one of said valves being adapted to be seated within the casing and the other outside the



casing, an electro-magnet, a cross head or  
coupling loosely engaging the stems of the  
valves and connected with the armature of  
the magnet, stops mounted on the stem of  
5 one valve on opposite sides of and adapted to  
be engaged by said cross head, a stop at the  
free end of the other valve stem adapted to  
be engaged by said cross head, and a spring  
surrounding the stem of the last said valve

and bearing on the head thereof and on said 10  
cross head.

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

CHRISTIAN KRÄMER.

Witnesses:

FRANZ HAPLACHER,  
ERWIN PIPPITZ.