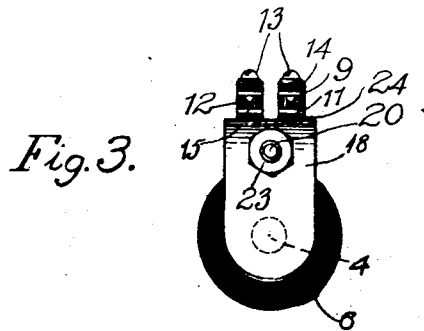
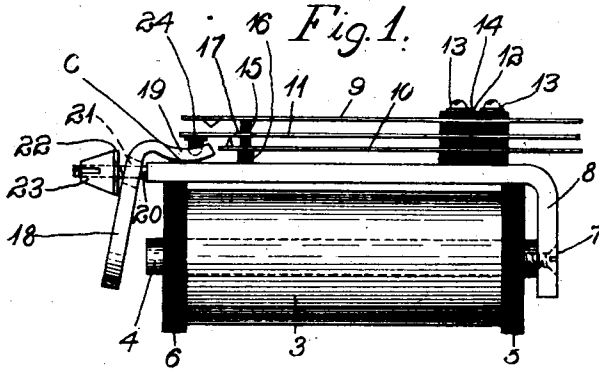
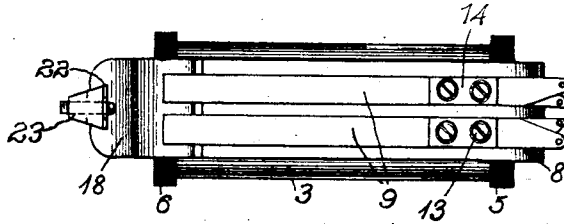


L. A. WILLIAMS.
ELECTRICAL RELAY.
APPLICATION FILED JULY 16, 1909.

972,424.

Patented Oct. 11, 1910.

Fig. 2.



Witnesses
D. M. J. Shaler
George E. Higham

Inventor
Lynn A. Williams
By Brown & Williams
Attorneys

UNITED STATES PATENT OFFICE.

LYNN A. WILLIAMS, OF EVANSTON, ILLINOIS.

ELECTRICAL RELAY.

972,424.

Specification of Letters Patent.

Patented Oct. 11, 1910.

Application filed July 16, 1909. Serial No. 507,908.

To all whom it may concern:

Be it known that I, LYNN A. WILLIAMS, a citizen of the United States, residing at Evanston, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Electrical Relays, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to electrical relays, and is particularly adaptable to spring contact relays wherein the armature is connected mechanically with contact springs to effect their actuation and does not necessarily form part of the electrical circuit.

The object of my invention is to secure more efficient operation than has heretofore been possible, particularly in the manner of transmitting the power of the magnetic pull to the spring or springs to be actuated, and to this end I contemplate a device in which, as the same is energized to actuate the contact springs, the working leverage of the armature automatically adjusts itself to the varying magnetic pull. In other words, during the actuation of a relay, the magnetic pull varies inversely as the air gap in the magnetic circuit, and my invention purposes to provide means whereby the mechanical advantages of the power and of the load are relatively changed to meet the varying magnetic pull and to maintain a substantially constant effect upon the actuating spring. The armature of the relay of my invention is in the form of a lever, and in the embodiment herein illustrated and particularly described is of the type wherein the fulcrum is between the load and the power. Since the power varies considerably as compared with the substantially constant load, I secure a compensating arrangement wherein the fulcrum shifts to change the relative lengths of the power and load arms.

The device of my invention is illustrated in the accompanying drawings, in which

Figure 1 is an elevational view thereof; Fig. 2 is a plan view of the same; and Fig. 3 is an end elevational view thereof.

I have illustrated at 3 the electromagnet winding mounted upon the iron core 4 and provided, as is common in the art, with the

heads 5 and 6 of insulating material. Secured to the end of the core 4 by means of a screw 7 is an extension piece 8 of magnetic material, which is formed to pass along the top of the electromagnet and to be mounted upon the heads 5 and 6, as clearly indicated in Fig. 1. This extension piece 8 forms part of the magnetic circuit, and conveniently forms supporting means for the contact springs 9 and 10 and the actuating spring 11 mounted in the insulating block 12, which in turn is secured to the extension piece 8 by means of screws 13, 13 passing through the clamping plate 14, through the insulating block, and into the member 8. An insulating stud 15 is provided upon the member 8 near the free end of the contact springs, and upon the shoulder 16 of this stud the contact spring 10 is arranged to rest. The stud 15 extends through an enlarged opening 17 in the actuating spring 11, and extends to engage the contact spring 9 to properly space the spring 10 therefrom, thus to provide means whereby the actuating springs 11 may be alone in contact with either one or the other of the contact springs 9 and 10.

The armature 18 of the device is bent into angle form, one side of the angle being curved, as shown at 19, and resting upon the extension member 8, and the other side extending downwardly in front of the free end of the core 4. A screw threaded extension 20 may extend from the end of the extension member 8 through an opening 21 in the armature, and be provided with an adjusting nut 22 and lock nut 23 to define the movement of the armature. The fulcrum or centro between the curved part of the armature 18 and the extension member 8 is at *c*, and it is apparent that the armature may roll or rock upon the extension member to secure the lateral shifting of this fulcrum or centro. Near the end of the curved portion 19 of the armature, a stud 24, preferably of insulating material, is provided to mechanically connect the armature with the actuating spring 11, this connection being a short distance from the fulcrum *c*. This connection assists in maintaining the armature in proper alinement, and the spring 11 is effective in maintaining the armature in its released position. The load arm of the

lever armature is, therefore, from the point *c* to the point 24, while the power arm is from the point *c* to that part of the armature before the end of the core 4.

- 5 The arrangement is such that the fulcrum or centro *c*, when the armature is in its normal position, that is, when the coil is deenergized, is quite close to the stud 24—the point of application of the load.
- 10 The magnetic pull is, of course, least when the armature is most remote from the pole piece, and it is apparent from Fig. 1 that in such case the power arm greatly exceeds the load arm in length, and thus this limited
- 15 magnetic pull may effectually initiate movement of the actuating spring 11. As the power arm of the armature 18 is attracted to the core 4, the air gap becomes smaller and the magnetic pull is correspondingly in-
- 20 creased. At the same time, the curved base of the side 19 of the armature rolls upon the extension member 8 and the fulcrum or centro *c* naturally shifts away from the point 24, thus increasing the length of the load
- 25 arm and decreasing the length of the power arm. Here, the magnetic pull being increased, the lost lever advantage is compensated for, and it is apparent that throughout the entire movement of the armature the
- 30 gradual increase in magnetic pull as the air gap is closed meets the gradual shortening of the power arm and lengthening of the load arm. By this arrangement, great mechanical advantage is provided, and, the
- 35 most mechanical advantage being given when needed and the advantage being adjusted to the need at all times, it follows that this efficient operation is secured without having too great a range of movement of
- 40 the armature or having the initial position of the armature too remote from the end of the core.

I claim as new and desire to secure by Letters Patent:

- 45 1. In a relay, in combination, an electromagnet, a rigid armature lever therefor, a spring contact connected with and forming a load upon said armature, and means whereby the mechanical advantage of the arma-
- 50 ture is decreased as the armature is attracted.

2. In a relay, in combination, an electromagnet, a rigid lever armature therefor, a spring contact connected with and forming a load upon said armature, and means where-
- 55 by the mechanical advantage of the armature is decreased as the armature is attracted.

3. In a relay, in combination, an electromagnet, a lever armature therefor, contact mechanism connected with said armature,
- 60 and means whereby the fulcrum of said lever armature may be shifted to decrease the mechanical advantage as the armature is attracted.

4. In a relay, in combination, an electromagnet, a rigid armature lever therefor, a 65 spring contact mechanically connected with and forming a load upon said armature, said spring contact being operated by the movement of said armature, and means whereby the mechanical advantage of the armature is 70 decreased as the armature is attracted.

5. In a relay, in combination, an electromagnet, a rigid lever armature therefor, contact mechanism connected with said armature, and means whereby the load arm of 75 said lever armature may be increased as the armature is attracted.

6. In a relay, in combination, an electromagnet, a supporting member, an armature mounted upon said supporting piece so as 80 to rock, said armature being affected by said electromagnet upon one side of the contact line between said armature and said supporting frame, and contact mechanism connected with said armature upon the opposite 85 side of said contact line.

7. In a relay, in combination, an electromagnet, a frame member, an armature mounted upon said frame member through 90 the medium of a curved surface to enable said armature to roll, and contact mechanism connected with said armature.

8. In a relay, in combination, an electromagnet, a frame member, and an armature for said electromagnet mounted upon said 95 frame through the medium of a rigid extension having a curved surface resting upon said frame, and contact mechanism mechanically connected with said extension at one side of the contact between said extension 100 and said frame.

9. In a relay, in combination, an electromagnet, a frame, a lever armature mounted upon said frame through the medium of a 105 curved surface whereby the lever armature may roll to shift its fulcrum.

10. In a relay, in combination, an electromagnet, an L-shaped lever armature having a curved surface on one of the legs thereof 110 mounted in contact with a plane surface, the other leg being disposed before the core of said electromagnet, and a spring contact mechanically associated with the first named leg so as to be lifted when said second named 115 leg is attracted to said core.

11. In a relay, in combination, an electromagnet, a lever armature therefor, means whereby the fulcrum of said lever armature may be shifted to decrease the mechanical 120 advantage as the armature is attracted, and contact mechanism connected with said armature to be operated thereby and to hold said armature in place.

12. In a relay, in combination, an electromagnet, a rigid armature lever therefor, contact 125 mechanism mechanically associated

with said armature, and means whereby the mechanical advantage of the armature is decreased as the armature is attracted.

13. In a relay, in combination, an electro-
5 magnet, a rigid lever armature therefor, means whereby the mechanical advantage of the armature is decreased as the armature is attracted, and contact mechanism connected

with said armature to be operated thereby and to hold said armature in place. 10

In witness whereof, I hereunto subscribe my name this 13th day of July A. D. 1909.

LYNN A. WILLIAMS.

Witnesses:

ARTHUR H. BOETTCHER,
HARVEY L. HANSON.