

J. F. D. HOGE.
 ALTERNATING CURRENT RELAY.
 APPLICATION FILED SEPT. 23, 1910

Patented Oct. 17, 1911.

1,006,091.

Fig. 1,

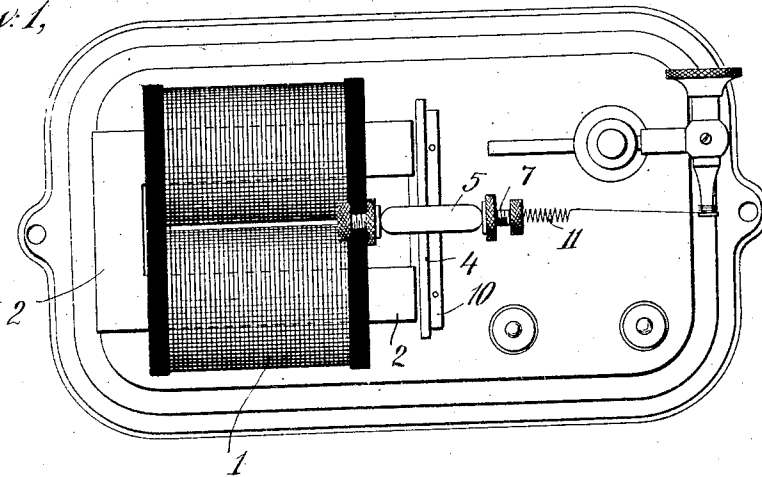


Fig. 2,

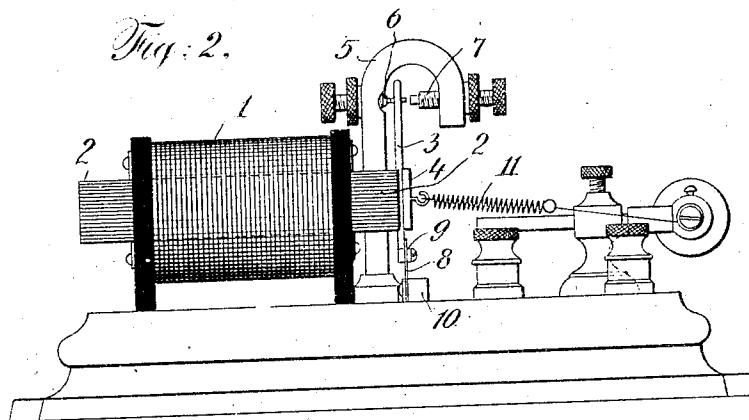


Fig. 3,

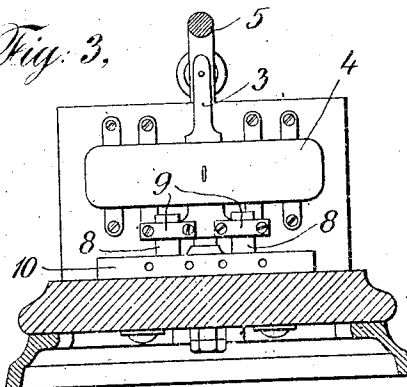
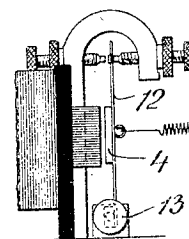


Fig. 4,



Witnesses
 Max B. A. Doring
 Paul H. Frank

Inventor
 Joseph F. D. Hoge
 By Attorney
 H. M. Marble

UNITED STATES PATENT OFFICE.

JOSEPH F. D. HOGE, OF NEW YORK, N. Y., ASSIGNOR TO AMERICAN DISTRICT
TELEGRAPH COMPANY, A CORPORATION OF NEW JERSEY.

ALTERNATING-CURRENT RELAY.

1,006,091

Specification of Letters Patent.

Patented Oct. 17, 1911.

Application filed September 23, 1910. Serial No. 583,443.

To all whom it may concern:

Be it known that I, JOSEPH F. D. HOGE, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Alternating-Current Relays, of which the following is a specification.

My invention relates to improvements in relays adapted to be operated by alternating or pulsating currents of definite frequency and comprises an improved type of vibrating armature, as hereinafter described and particularly pointed out in the appended claims.

In another application for Letters Patent filed April 11, 1910 Ser. No. 554667, I have illustrated, described and claimed an alternating current relay comprising an armature mounted to vibrate in unison with the alternating current energizing the relay magnet, and which has a fixed nodal point opposite the contact point of the relay with which such armature should make contact during closed-circuit condition of the energizing circuit; said armature having, in addition to such vibratory movement, a bodily movement toward such contact point when the energizing circuit is closed and a bodily movement away from such contact point when the energizing circuit is broken. The said armature, which has the form of a light rod, extends beyond the said contact point, and, in the form shown in the drawings of the said application, carries, on its so extended portion, an adjustable weight by adjustment of which the normal frequency of vibration of the armature may be adjusted within considerable limits, to correspond with variation of frequency of the energizing current.

In another application filed July 27, 1910, Ser. No. 574202, an alternative form of such relay is shown, wherein the extended portion of the armature carries, instead of an adjustable weight, a paddle adapted to move in liquid contained in a suitable dashpot; and by adjusting the depth of immersion of said paddle in the liquid in such dashpot the normal rate of vibration of the armature may be adjusted within considerable limits. The relays of the two patent applications mentioned both respond, physically, to currents of frequency widely different from those to which the relays are adjusted; but since, when the frequency of the energizing current does not correspond reasonably

closely to the frequency for which the armature is adjusted, that armature does not have a nodal point opposite the contact point of the relay, the contact formed between the said armature and the contact point, is, in such cases, so poor as to offer very great resistance to the passage of the current, so that in effect the relay does not respond to currents of frequencies differing greatly from that for which the relay is adjusted, even though as a physical fact the armature is deflected toward its contact point.

I have discovered that it is not necessary, in many cases at least, in relays of the type illustrated and described in my two prior applications, to extend the armature past the contact point of the relay and to provide on such extended portion an adjustable weight, or a paddle, or like device for adjusting the armature to varying frequencies of the energizing current, but that if a suitable weight mass be mounted on the armature lever between the support for said lever and the contact point, such armature lever will vibrate in unison with the energizing current, and with a stationary node in contact with the front contact point of the relay, over a considerable frequency range of the energizing current. Such weight mass may, with advantage, constitute the true armature of the magnet and may be an armature plate corresponding closely to the armature plates commonly employed in ordinary neutral relays. The resulting relay, as shown in the accompanying drawings, resembles closely in appearance an ordinary neutral relay, the most noticeable difference being in the support of the armature lever; for whereas the armature lever of an ordinary neutral relay has a pivotal support by means of trunnion screws, theory and practice indicate that such a pivotal support is not practicable in an alternating current relay such as herein described, and that the form of support used for the armature lever must be one permitting a considerable degree of vibration of the armature lever near its point of support; whereas the armature when supported by trunnion screws, as in the case of the ordinary neutral relay, is not permitted material vibration near its point of pivotal support. The most suitable support for the armature of my improved relay which I have as yet found comprises a plu-

5 rality of flexible strips, clamped to the arma-
 ture and also to a fixed point of support;
 such strips permitting a considerable degree
 of vibration of the armature near its point
 10 of support, besides permitting motion of the
 armature between contact points similar to
 the motion of the armature of an ordinary
 neutral relay. The resulting relay is obvi-
 ously more simple and compact, as compared
 15 with the relays of my above-mentioned ap-
 plications, and is also more easy to construct.
 A relay such as illustrated in the accom-
 panying drawings has been found to have a
 frequency range of from 230 to 400 cycles
 20 per second, with slight adjustment of the
 effective length of the flexible supporting
 strips, and without adjustment has been
 found to have a frequency range of from
 230 to 300 cycles per second. By employing
 25 supporting strips of proper elasticity and by
 varying the mass of the weight and its posi-
 tion on the armature lever relays such as
 herein described may be adapted for other
 frequencies.

25 The objects of my invention are to im-
 prove and simplify alternating current re-
 lays of the type illustrated and described in
 my above-mentioned applications, to make
 the relay adaptable for operation, without
 30 adjustment, over a considerable frequency
 range, and applicable, with slight adjust-
 ment, to a much greater frequency range;
 and generally to make the relays simple,
 compact, and easy to construct and adjust.

35 I will now proceed to describe my inven-
 tion with reference to the accompanying
 drawings, and will then point out the novel
 features in claims.

40 In the drawings, Figure 1 shows a top
 view of my improved relay. Fig. 2 shows a
 side elevation thereof; and Fig. 3 shows a
 front elevation and partial section of the re-
 lay. Fig. 4 is a detailed side elevation of an
 alternative form of relay.

45 In the drawings, 1 designates the relay
 magnet, which in the construction shown is
 an ordinary horse-shoe electromagnet, ex-
 cept that the core 2 of the magnet is highly
 laminated, as indicated particularly in
 50 Fig. 2.

3 designates the armature lever and 4 the
 armature, the latter being a soft iron plate
 arranged transversely with respect to the
 armature lever, at an intermediate point
 55 thereon, and constituting, with respect to
 said armature lever, a weight mass as pre-
 viously described.

5 designates the usual bracket for carry-
 ing contact points and stops, and 6 desig-
 60 nates the usual front contact screw, and 7
 the usual rear stop.

As previously explained, the armature has
 no trunnion screws, as is the case with the
 ordinary neutral relay, but instead is sup-
 65 ported by flexible strips 8, to which strips

the armature is secured by clamps 9; the said
 strips being themselves clamped to a rigid
 support 10.

11 designates the usual retractile spring.

In effect, the behavior of this relay upon
 the opening or closing of an alternating cir- 70
 cuit of a frequency corresponding to that
 for which the relay is designed, is the same
 as the operation of an ordinary neutral re-
 lay upon a direct current; that is to say, the 75
 armature lever 3 is deflected so as to make
 contact with screw 6, upon the closing of the
 energizing circuit, and is retracted from
 such contact screw upon the opening of such
 energizing circuit. But in actual operation 80
 the relay is quite different from an ordinary
 neutral relay, in that the armature vibrates
 in unison with the alternations of the ener-
 gizing current, the point of contact of the
 armature lever with the screw 6 being, how- 85
 ever, a fixed node during such vibration, so
 that the vibration does not prevent the ex-
 istence of a good electrical contact between
 the armature lever and screw 6.

Observations indicate that at the point of 90
 connection of the armature lever to the flexi-
 ble strips 8 said lever has a considerable
 amplitude of vibration, with respect to the
 amplitude of vibration at other points. It
 is for the reason that the armature lever 95
 must, apparently, be free to vibrate at its
 point of support, that trunnion screws, such
 as employed in an ordinary relay, do not
 form a satisfactory support for the arma- 100
 ture. If, however, the armature were made
 flexible, so that it could bend back and forth
 between the contact point and the point of
 support, trunnion screws might be em-
 ployed, since then the armature lever would
 be a spring vibrating between two points of 105
 support. Fig. 4 shows such a relay, 12
 designating the spring armature lever, 4 the
 armature, and 13 the supporting trunnion
 screws.

What I claim is:

1. The combination, with an electromag- 110
 net, an armature therefor, and a contact
 point adapted to make contact with said
 armature when the latter is attracted to-
 ward its magnet, of a support for said 115
 armature, connected thereto at a point dis-
 tant from such contact point, and adapted
 to permit both bodily movement of the
 armature toward and from said magnet,
 and vibratory movement of the armature, 120
 said armature, having, intermediate such
 point of support and contact point, a weight
 mass, said contact point located opposite a
 node of said armature.

2. The combination, with an electromag- 125
 net, of an armature, a contact point adapted
 to make contact with such armature when
 the latter is attracted toward the magnet,
 and a supporting strip secured to said arma-
 ture at a point distant from such contact 130

point, and supporting the same, and of such flexibility as to permit bodily movement of the armature toward and from the magnet in the immediate vicinity of the point of connection of the armature to said strip, said armature having intermediate said contact point and supporting strip, a weight mass, said contact point located opposite a node of said armature.

10 3. The combination, with a two pole electromagnet, an armature therefor, comprising an armature plate arranged to coact with the poles of said magnet, and an armature lever secured thereto, and arranged transversely with respect thereto, and a contact point adapted to make contact with said armature when the latter is attracted toward its magnet, of a support for said armature comprising a plurality of flexible strips

15 20 spaced apart laterally and connected to the

armature at points distant from said contact point, and adapted to permit both bodily movement of the armature toward and from said magnet, and a vibratory movement of the armature, and of such flexibility as to permit bodily movement of the armature toward and from the magnet in the immediate vicinity of the point of connection of the armature to said strips, said armature plate constituting a weight mass affecting the normal rate of vibration of the armature, said contact point located opposite a node of said armature.

In testimony whereof I affix my signature, in the presence of two witnesses.

JOSEPH F. D! HOGE.

Witnesses:

H. M. MARBLE,
D. A. DAVIES.