I. KITSEE.

RELAY.

APPLICATION FILED MAR. 31, 1911. RENEWED JAN. 13, 1914.

1,093,702.

Patented Apr. 21, 1914.

4 SHEETS—SHEET 1.

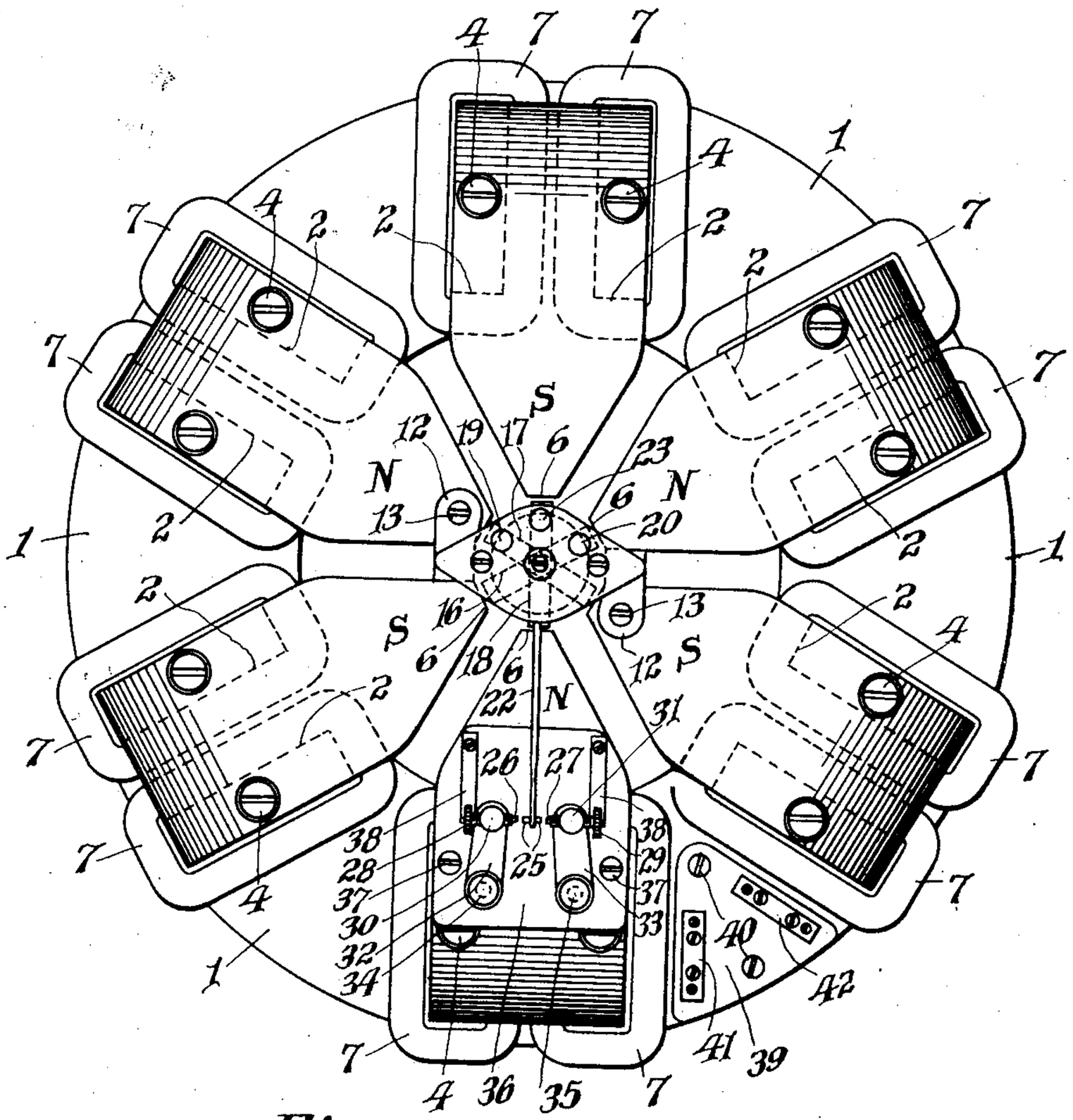

Fig. 1

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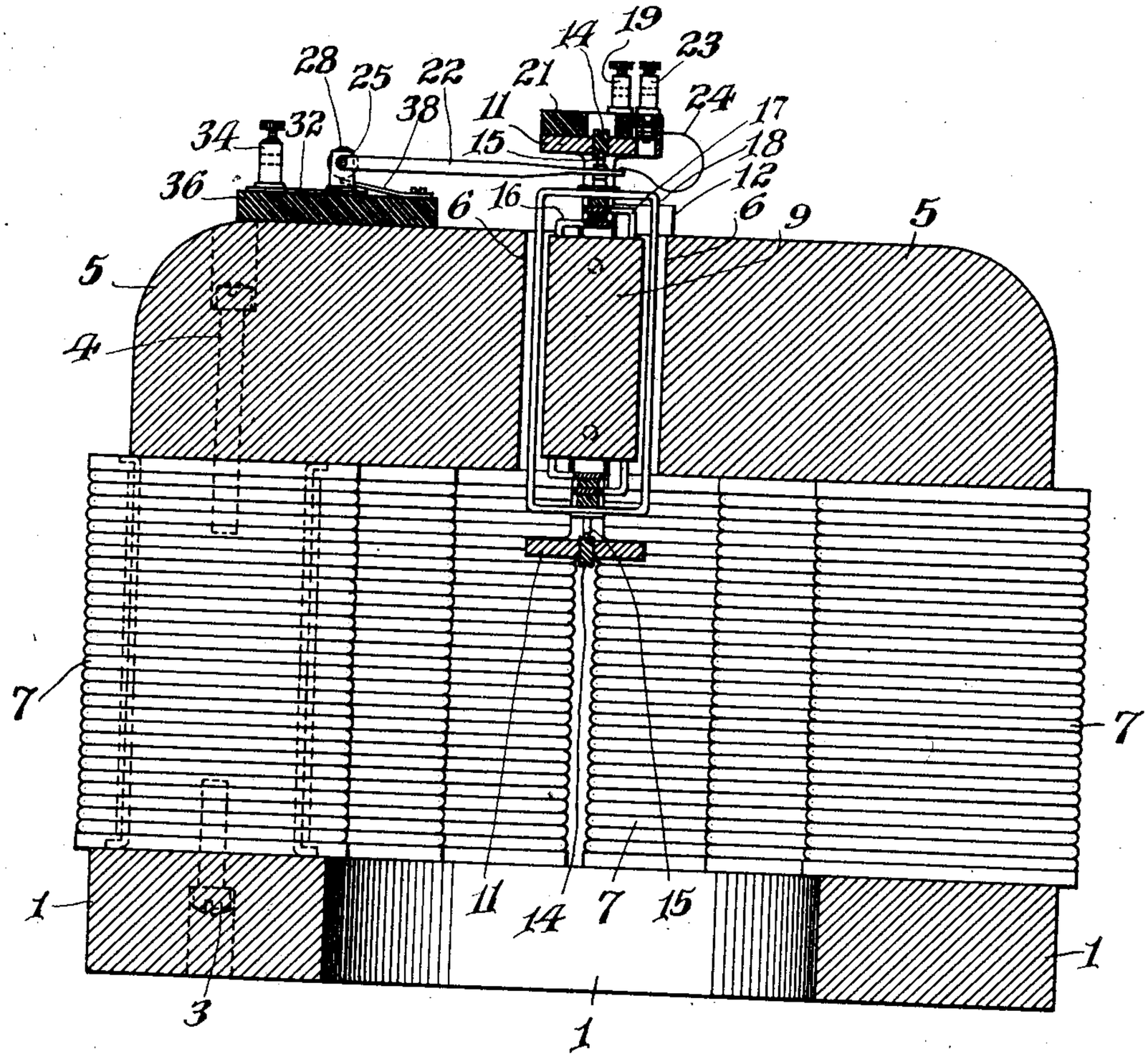

Fig. 2

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4 SHEETS—SHEET 3.

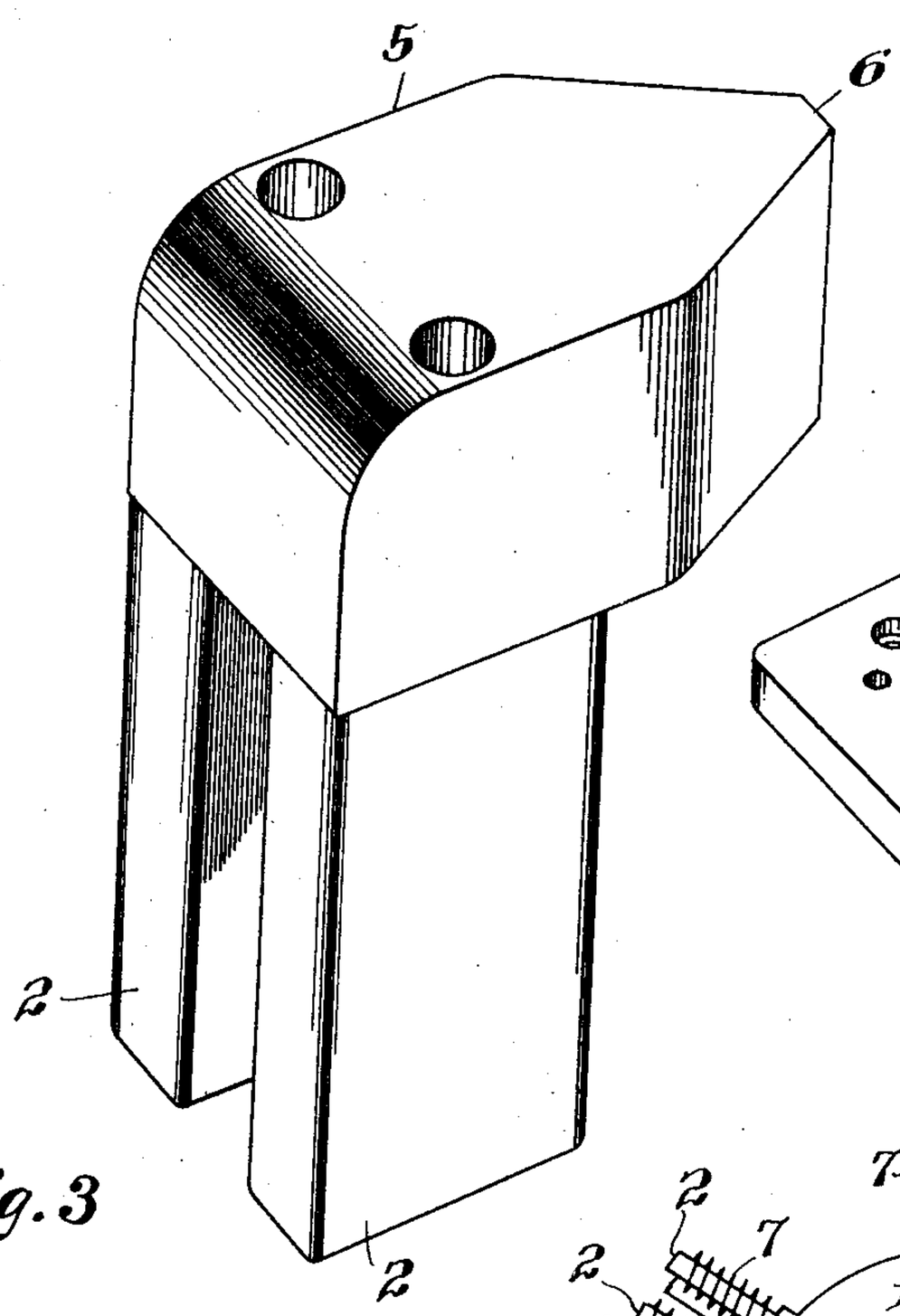

Fig. 3

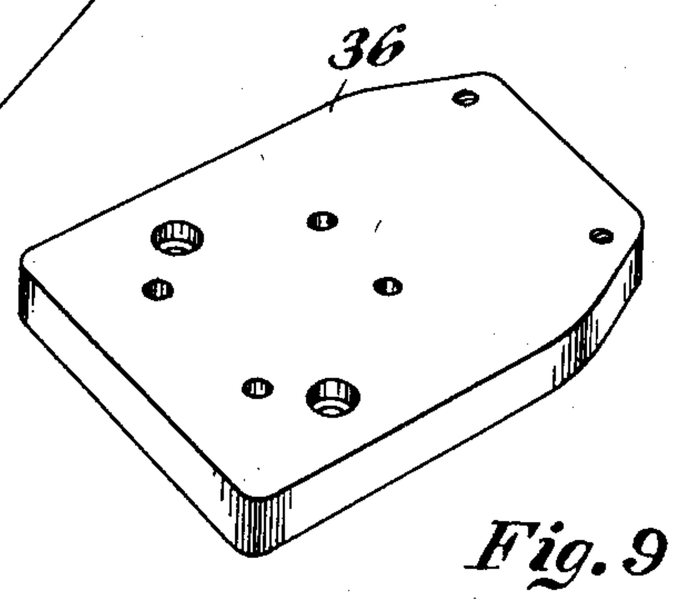

Fig. 9

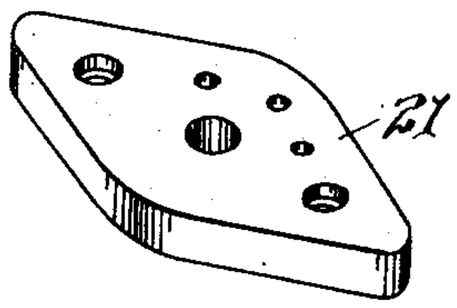

Fig. 8

Fig. 12

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4 SHEETS—SHEET 4.

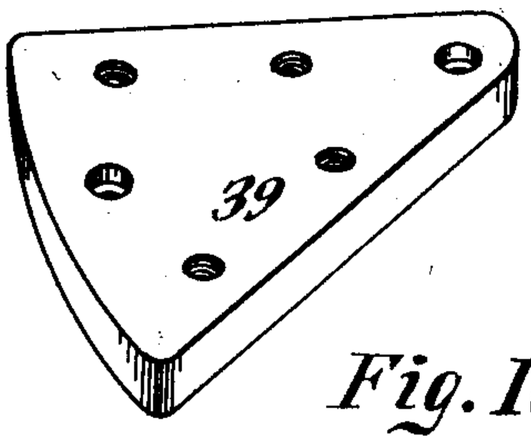

Fig. 10

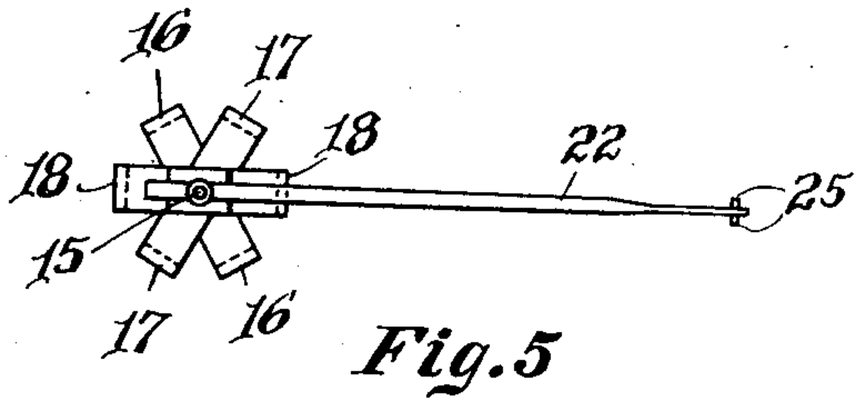

Fig. 5

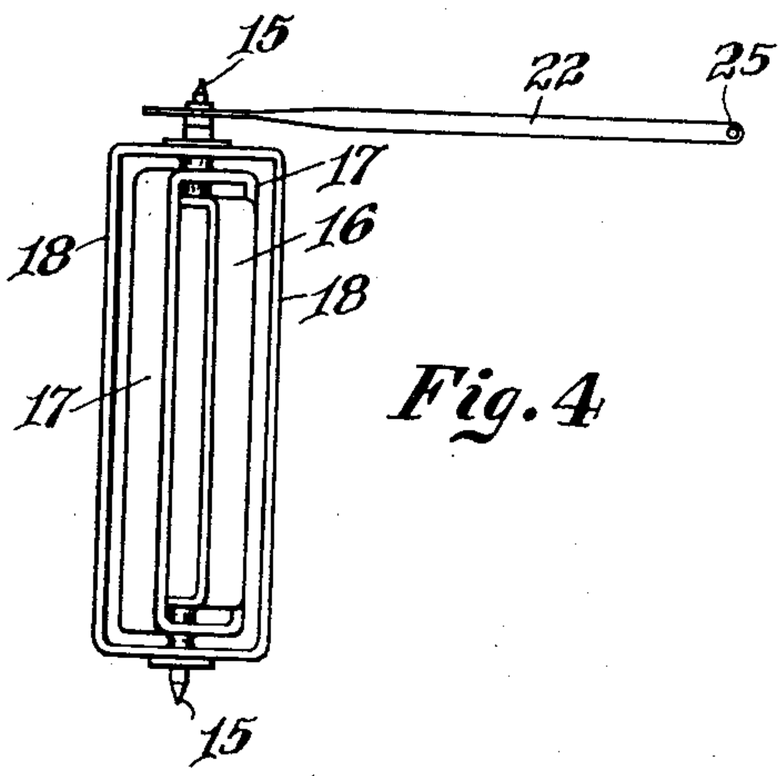

Fig. 4

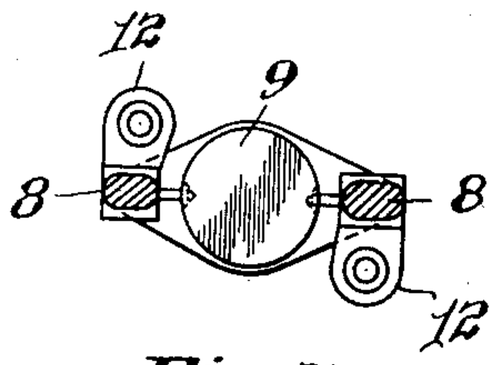

Fig. 7

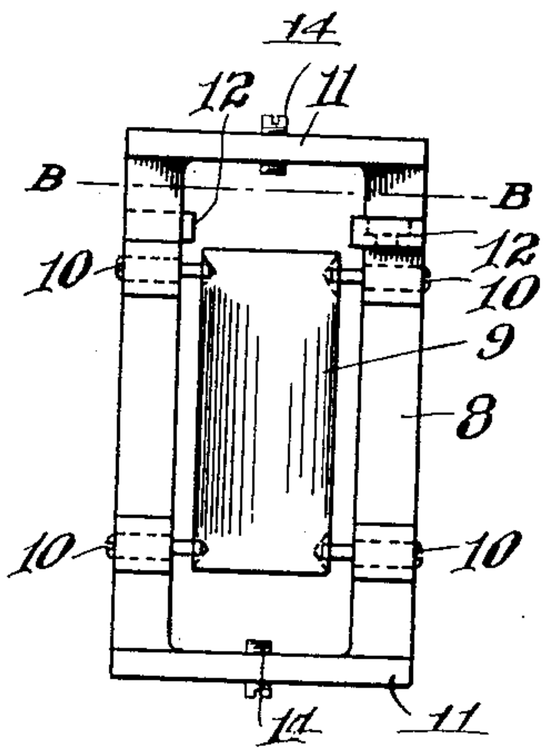

Fig. 6

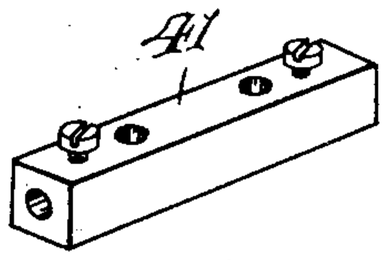

Fig. 11

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UNITED STATES PATENT OFFICE.

ISIDOR KITSEE, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

RELAY.

1,093,702. Specification of Letters Patent. Patented Apr. 21, 1914.

Application filed March 31, 1911, Serial No. 618,096. Renewed January 13, 1914. Serial No. 811,902.

To all whom it may concern:

Be it known that I, ISIDOR KITSEE, a citizen of the United States, residing in the city of Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented certain new and useful Improvements in Relays, of which the following is a specification.

My invention relates to relays, and more particularly to polarized relays of the moving coil type.

The relay herein disclosed and claimed is of the type disclosed and claimed in my prior U. S. Patent No. 963,374, granted July 5, 1910.

The relay herein disclosed is of general application, but it is particularly useful where an extremely sensitive relay is required, and is particularly useful in the receiving apparatus associated with a long line or cable, such as a submarine cable, or any other line or circuit having relatively great capacity; and when used in connection with such a line or circuit or submarine cable, I have been able to transmit thereover at high rate of speed telegraphic messages represented by Morse characters, and have been able to translate these characters by an application of the relay herein disclosed into Morse characters on an ordinary sounder, it being remembered that the practice heretofore on submarine cables has been to use a siphon recorder or other device, and so far as I am aware, the transmission of Morse characters over a long submarine cable and translation into Morse characters by an ordinary sounder has not been accomplished.

Similar to the relay of my aforesaid patent, my present relay has for its moving element a plurality of coils disposed at an angle with respect to each other and moving as a unit disposed in a suitable magnetic field.

My present invention relates to features of construction hereinafter described and claimed.

For an illustration of one of the forms my invention may take, reference is to be had to the accompanying drawings, in which:

Figure 1 is a top plan view of my relay. Fig. 2 is a cross sectional view, some parts being shown in elevation. Fig. 3 is a perspective view of a pair of field poles with their pole pieces. Fig. 4 is a side elevational view of the moving system comprising a plurality of coils. Fig. 5 is a top plan view of the same. Fig. 6 is a side elevational view of the central core and its supporting means, and the means for supporting the moving system. Fig. 7 is a horizontal sectional view taken on the line B—B, of Fig. 6. Fig. 8 is a perspective view of a member, preferably of insulating material, for supporting the stationary terminals of the moving system. Fig. 9 is a perspective view of a similar member for holding the stationary relay contacts. Fig. 10 is a perspective view of a similar member for holding the field magnet terminals. Fig. 11 is a perspective view of one of the field magnet terminals. Fig. 12 is a diagrammatic view illustrating the circuits of the relay.

A yoke or field ring 1, of iron, steel, or other highly magnetizable material, which may be continuous, and take a circular or other suitable form, has secured thereto the upwardly extending field cores 2, held to the ring or yoke 1 by screws 3. Upon the upper ends of each pair of field poles 2 is secured by screws 4 a pole piece 5, common to them. These pole pieces 5 are tapered to pole tips 6. Surrounding each field pole 2 is a magnetizing coil 7. As shown by way of example in Fig. 12, all these coils may be connected in series with each other. Or they may be otherwise wound and connected, so long as the poles 2 of each pair are similarly magnetized to conjointly magnetize the pole pieces 5, and neighboring pole pieces being of opposite signs as indicated by N and S (north, south), Fig. 1.

Within the central space between the pole tips 6 is disposed a supporting member 8 for the central core 9, here shown cylindrical, and of soft iron or other easily magnetizable material, and for the moving system. The core 9 is supported by screws 10 to the vertical legs of the supporting member 8 and bridge pieces 11 connect the ends of these vertical legs. Upon each of these vertical legs is an ear or lug 12 resting upon two of the pole tips 6 and secured thereto by screws 13. Extending vertically through the bridges 11, 11, are pivot screws 14 supporting and inclosing the pivots 15 of the moving system. This moving system comprises the three coils 16, 17 and 18, here shown as rectangular in shape, secured at

an angle to each other and supported by said pivots 15. These coils are disposed in the air gap between the pole tips 6 and the central core 9. As seen in Fig. 12 these coils may be connected in series with each other and have their terminals at binding posts 19 and 20 upon the block of insulating material 21, see Fig. 8, which latter is mounted upon the upper bridge piece 11. The electrical connections from the coils to these binding posts 19 and 20 are by delicate flexible conductors exercising no mechanical control upon the moving system. Carried by and movable with the moving system is a tongue or pointer 22 electrically connected to binding post 23 by delicate flexible conductor 24 exercising no mechanical control upon the moving system. At its outer end the tongue 22 carries a contact 25 adapted to engage, when the moving system moves, the stationary contacts 26 and 27 carried respectively by the screws 28 and 29 extending through posts 30 and 31 in electrical connection through conductors 32 and 33 with the binding posts 34 and 35 respectively. These posts 30, 31, and binding posts 34 and 35 are supported upon the block of insulating material 36, see Fig. 9, secured by screws 37 upon one of the pole pieces 5. The heads of the screws 28 and 29 are notched and in these notches are adapted to engage the upwardly extending tips of the leaf springs 38 to keep the screws 28 and 29 and, therefore, the contacts carried by them, in any position to which they may be adjusted.

On the ring or yoke 1 there is secured by screws 40 a block 39, see Figs. 1 and 10, of insulating material, disposed between field windings 7 of neighboring pairs of poles. Upon this block 39 are secured the binding post members 41, 42, see Figs. 1 and 11, forming the terminals of the field winding circuit.

As herein disclosed, the moving system has no "control" for biasing it toward any given position or movement in any direction. That is, no spring "control" or other "control" is shown for the moving system. It is to be understood, however, that such spring or other control may be supplied, if desired, as illustrated in my aforementioned patent. With the moving system having no "control" or bias, the relay is a neutral polarized relay, that is, a relay whose moving member has no bias, but whose moving member will move in the one direction or the other depending upon the direction of current through the coils.

By providing a plurality of field cores and windings for each pole piece 5, as here shown, the radiating surface of the field winding is greater than where a single pole and coil per pole piece is employed. By this arrangement for a given magnetizing effect of the field coils, the field coils will remain cooler and will change less in temperature, and, therefore, in resistance. From this fact of a cooler running, and more constant resistance in the field circuit, when a constant potential source of energy is employed for the field circuit, the field strength will vary less than where the temperature of the field winding greatly increases. Since the field strength varies less, the response of the moving system to a current of given strength through the moving coils, will vary less.

By a relay constructed in accordance with the disclosure herein, the field coils change in temperature but slightly, and with the field cores 2 preferably magnetically saturated, the slight change in resistance due to the slight change in temperature produces practically no change in the field in which the moving coils are disposed. While the field cores 2 are magnetically saturated, the pole pieces 5 are of very great cross section and are not saturated, thus reducing tendency to magnetic leakage between neighboring pole pieces. Nevertheless, the magnetic lines of each pole piece are concentrated in the gap in front of the pole tips 6. In the aforementioned apparatus which I have constructed in accordance with the disclosure herein, with a series connection of the field windings as disclosed, I have used a magnetizing current of nine (9) amperes.

While I have herein shown only two field poles 2 per pole piece 5, it is to be understood that the number may be increased and that the radiating surface of the magnetizing coils will be increased with a still greater reduction in the variations above referred to, and it is to be understood that my invention is not limited to two pole field cores per pole piece.

In operation, the field terminals 41 and 42 are connected to a source of current for magnetizing the field. The binding posts 19 and 20 are connected to conductors associated with or forming a part of any circuit, as a submarine cable circuit. When current passes through these coils in one direction, the tongue 22 is moved in a certain direction to bring contact 25 into engagement with contact 26, for example. When the current passes through the coils in opposite direction, the tongue 22 is moved in opposite direction to bring contact 25 into engagement with contact 27. The binding post 23 and binding posts 34 and 35 are then connected to conductors forming part of a controlled circuit or circuits.

What I claim is:

1. A relay comprising a plurality of pairs of pole pieces, circumferentially narrow coils associated therewith and having restricted rotary movement, the pole faces of said pole pieces being circumferentially narrow, each pole piece enlarging as it recedes

from its pole face, a plurality of field poles common to each pole piece and engaging the same at its enlarged portion, and a yoke common to said field poles.

2. A relay comprising a plurality of pairs of pole pieces having circumferentially narrow pole faces, circumferentially narrow coils having restricted rotary movement with respect to said pole pieces, each pole piece enlarging as it recedes from its pole face, a plurality of field poles for each pole piece and engaging the same at its enlarged portion, a yoke common to all said field poles, and a field winding for each field pole.

3. A relay comprising a yoke, a plurality of sets of field poles secured and common thereto, a pole piece common to each set of field poles, a magnetizing coil for each pair of said field poles, and a circumferentially narrow coil for each of said pole pieces having restricted rotary movement, each pole piece having a circumferentially narrow pole face.

4. In a relay, a yoke, a plurality of pairs of pole pieces, adjacent pole pieces being oppositely magnetized, a plurality of field poles common to each pole piece, a magnetizing coil for each field pole, and a movable coil for each pair of pole pieces.

5. In a relay, a yoke, a plurality of pairs of pole pieces, adjacent pole pieces being oppositely magnetized, a plurality of field poles common to each pole piece, a magnetizing coil for each field pole, and a movable coil for each pair of pole pieces, said coils being secured together and moving as a unit.

6. In a relay, a yoke, a plurality of pairs of pole pieces, adjacent pole pieces being oppositely magnetized, a plurality of field poles common to each pole piece, a magnetizing coil for each field pole, and a movable coil for each pair of pole pieces, said coils being secured together at an angle with respect to each other and movable as a unit with respect to said pole pieces.

7. In a relay, a yoke, a plurality of pairs of pole pieces, adjacent pole pieces being oppositely magnetized, a plurality of field poles common to each pole piece, a magnetizing coil for each field pole, and a movable coil for each pair of pole pieces, said field poles being magnetically saturated.

8. In a relay, a yoke, a plurality of pairs of pole pieces, adjacent pole pieces being oppositely magnetized, a plurality of field poles common to each pole piece, a magnetizing coil for each field pole, and a movable coil for each pair of pole pieces, said coils being secured together and moving as a unit, said field poles being magnetically saturated.

9. In a relay, a yoke, a plurality of pairs of pole pieces, adjacent pole pieces being oppositely magnetized, a plurality of field poles common to each pole piece, a magnetizing coil for each field pole, and a movable coil for each pair of pole pieces, said coils being secured together at an angle with respect to each other and movable as a unit with respect to said pole pieces, said field poles being magnetically saturated.

10. In a relay, a plurality of pairs of pole pieces, a moving coil system, a support for said moving coil system having legs extending between neighboring pole pieces, means for supporting said legs upon pole pieces, a magnetizable core supported upon said legs, and bridge pieces supporting said moving coils secured to said legs.

11. In a relay, a plurality of pairs of pole pieces, a plurality of field poles common to each pole piece, a yoke, said field poles of all said pole pieces secured to said yoke, and a plural coil system movable between said pole pieces.

12. In a relay, a plurality of pairs of pole pieces, a plurality of field poles common to each pole piece, a magnetizing coil for each field pole, a yoke, said field poles of all said pole pieces secured to said yoke, and a plural coil system movable between said pole pieces.

13. In a relay, a plurality of pole pieces converging toward a common polar space, a plurality of field poles for each pole piece, and a magnetizing coil for each field pole, said pole pieces overhanging said polar space.

14. A telegraphic relay comprising a yoke, a series of field poles secured to and supported by said yoke, a series of pole pieces each secured to and supported by two field poles, said pole pieces having tips converging toward a common center, and movable coils and a stationary core disposed in the space toward which said pole tips converge.

15. A telegraphic relay comprising a circular flat yoke, a series of upright field poles secured to said yoke, a magnetizing coil for each field pole, a pole piece common to each pair of field poles, said pole pieces having tips converging toward a common center, a plurality of coils supported in the space toward which said pole tips converge, and a core common to all said coils in said space.

In testimony whereof I have hereunto affixed my signature in the presence of the two subscribing witnesses.

ISIDOR KITSEE.

Witnesses:

ANNA E. STEINBOCK,

ELEANOR T. MCCALL.