Z. McD. MILLER.

TELEGRAPH RELAY.

APPLICATION FILED SEPT. 8, 1904. RENEWED NOV. 9, 1905.

989,792.

Patented Apr. 18, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

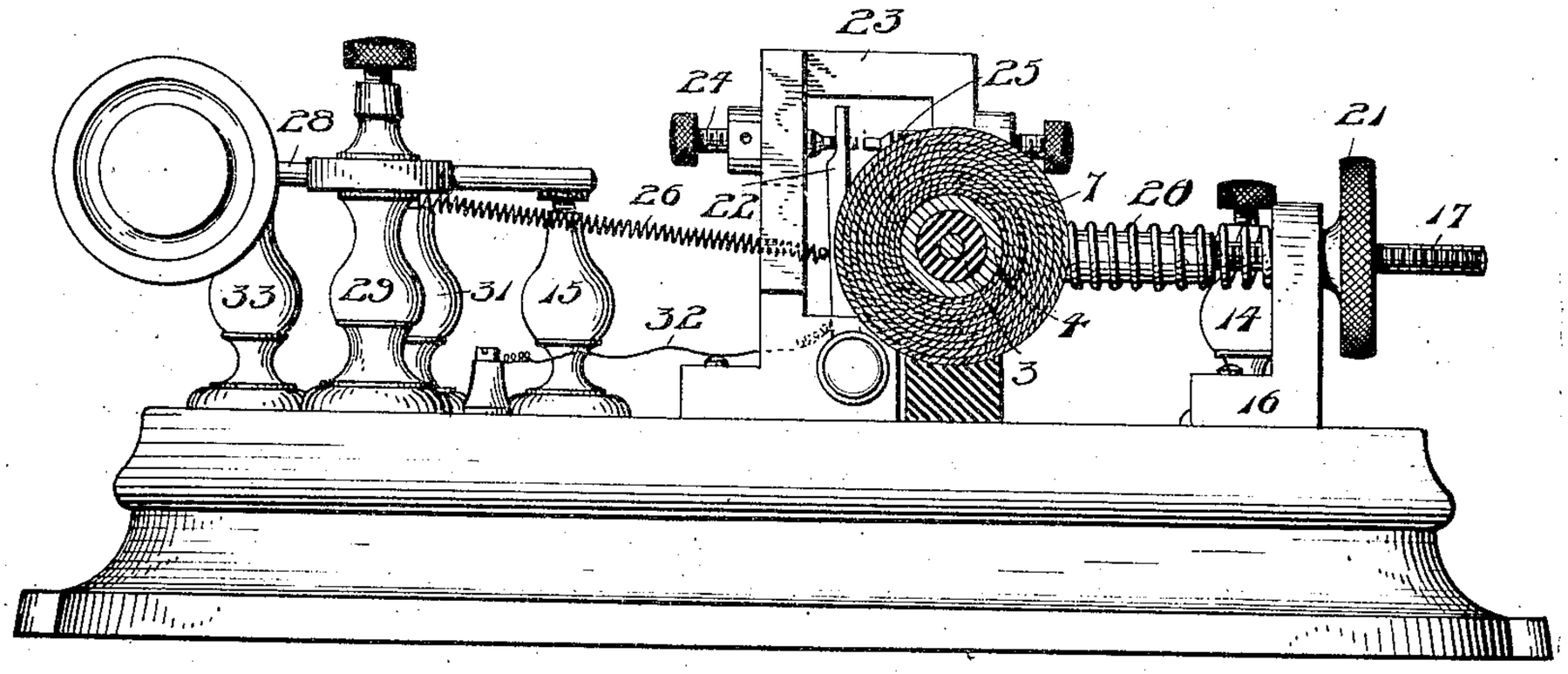
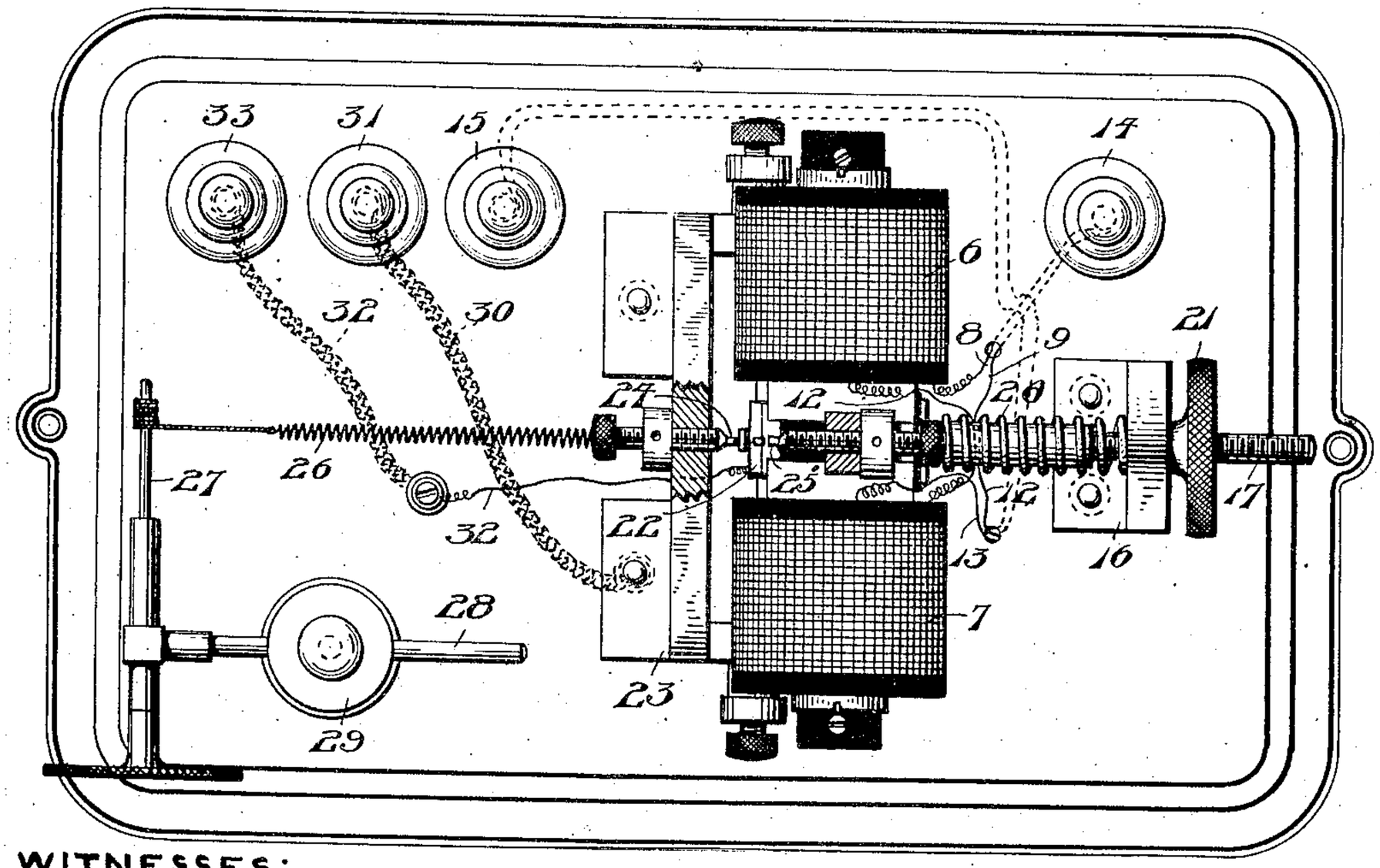


Fig. 2.



WITNESSES:

J. C. Hazelton,

F. N. Barber

INVENTOR

Z. M. Miller.

by Wm L. Pierce,

his ATTORNEY

Z. McD. MILLER.

TELEGRAPH RELAY.

APPLICATION FILED SEPT. 8, 1904. RENEWED NOV. 9, 1905.

989,792. Patented Apr. 18, 1911.

2 SHEETS—SHEET 2.

Fig. 3.

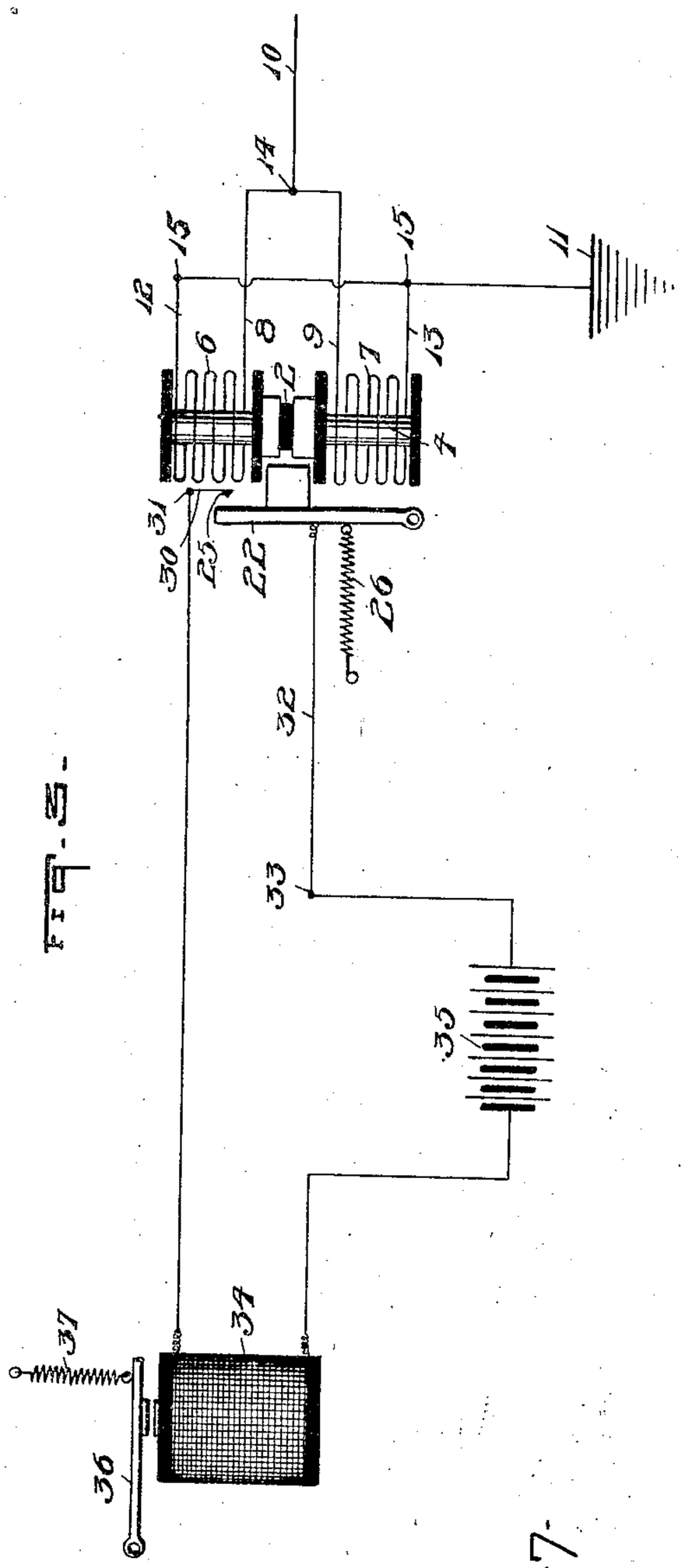


Fig. 5.

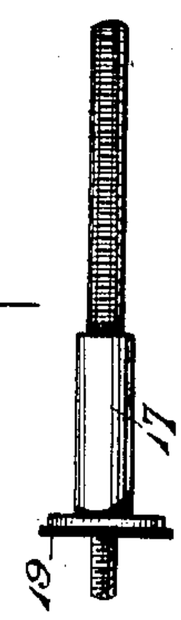


Fig. 6.

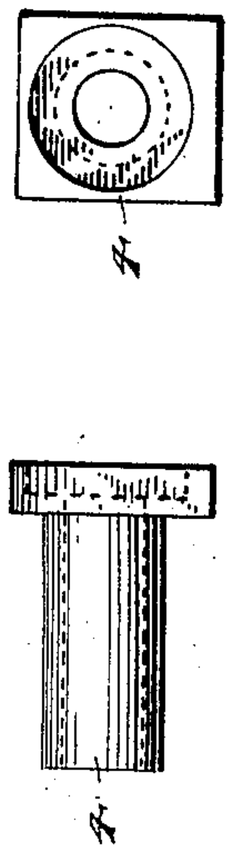


Fig. 4.

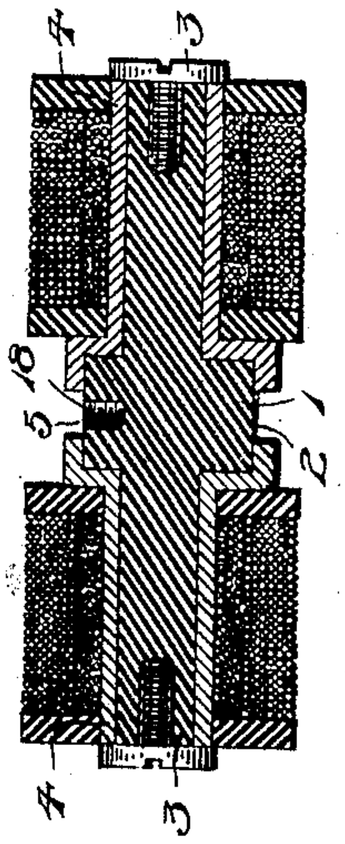
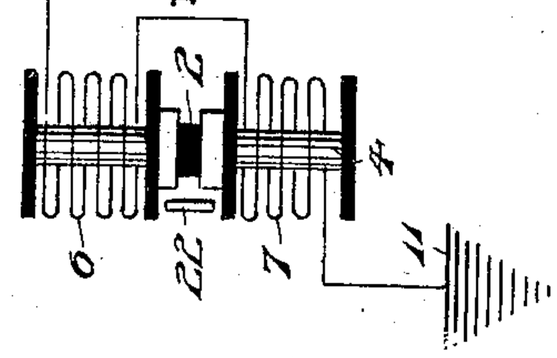


Fig. 7.



WITNESSES:

J. P. Appleman,

F. N. Barber

INVENTOR

Z. M. Miller

by Wm. L. Pierce,

his ATTORNEY.

UNITED STATES PATENT OFFICE.

ZANTZINGER MCDONALD MILLER, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO PREMIER RELAY COMPANY, OF PITTSBURG, PENNSYLVANIA, A CORPORATION OF WEST VIRGINIA.

TELEGRAPH-RELAY.

989,792. Specification of Letters Patent. Patented Apr. 18, 1911.

Application filed September 8, 1904, Serial No. 223,711. Renewed November 9, 1905. Serial No. 286,496.

To all whom it may concern:

Be it known that I, ZANTZINGER MCDONALD MILLER, a citizen of the United States of America, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered new and useful Improvements in Telegraph-Relays, of which the following is a specification.

My invention relates to relays for telegraph circuits, and it has for its object to provide a relay which shall be simple and compact in construction and effective and durable in service.

Relays, as usually constructed, are of the horseshoe type and consist of two parallel spools of wire wound on two soft iron cores connected by a bar of iron known as a yoke. Such spools are so wound that the free ends of the cores are oppositely magnetized, one being a north pole and the other a south pole. In relays for telegraphy it is desirable that the armature be able to respond correctly to the most rapid and varied action to which the line may be subjected, and to do this irrespective of the atmospheric conditions. That relay is best which will most quickly attract its armature after the circuit is closed and most quickly release the same when the circuit is opened. The magnets of the relay must, therefore, be so constructed as to attract the armature as quickly as possible and to also release it as quickly as possible. The core of a magnet having a closed or nearly closed magnetic circuit retains a small amount of residual magnetism for some time after the energizing circuit has been broken, and, since the ideal electro-magnet for telegraph work is one which will discharge all its magnetism with the cessation of the current and will attract the armature quickly, when energized, I have devised a relay provided with two oppositely wound magnet coils so disposed that the adjacent poles of the same sign will act simultaneously and equally upon an armature, and thus exert a strong and quick pull. In order to insure a certain and prompt release of the armature when the circuit of the magnets is opened, I provide no external magnetic circuit and, consequently, there is substantially no residual magnetism to impose a drag upon the armature.

With my invention, the armature is able to respond at all rates of telegraph transmission, whether the current be strong or weak, and without continual adjustments of the tension of the armature spring or the distance between the armature and the pole pieces of the magnets. By means of my invention I am able also to telegraph during wet weather as well as dry and, in tests made, I have found my instrument would work perfectly during storms, when the instruments of usual construction wholly failed to respond properly to the key.

My invention is shown on the accompanying two sheets of drawings, in which:

Figure 1 is a side elevation thereof, one of the electro-magnets being shown in cross-section; Fig. 2 a plan view thereof with connected circuits; Fig. 3, a diagrammatic view thereof with connected circuits; Fig. 4 a longitudinal section of the magnet; Fig. 5 an elevation of the supporting connection for the magnet; Fig. 6 a side and an end view of one of the cores and pole pieces of the magnet, and Fig. 7 a diagram of a modification of my invention, the magnets being shown series wound.

Referring now to Figs. 1 to 6, each magnet has a central support 1, composed preferably of insulating fiber. This support has a central portion 2, of a larger diameter than its end portions 3. Sleeved on the end portions 3 are tubular soft iron cores 4, which have their inner ends expanded to fit the enlarged portion 2 of the support 1. The adjacent ends of the cores do not entirely touch each other, but are separated by the narrow air space or gap 5. On the reduced portions of the cores are the windings 6 and 7 wound in opposite directions, as shown in Fig. 3. The inner ends of the windings are shown connected to the line wire 10 by means of the wires 8 and 9 and the outer ends to ground 11 by the wires 12 and 13. The wires 8 and 9 are connected to the binding post 14, and the wires 12 and 13 to the binding post 15. As the incoming current passes right and left and in opposite directions, adjacent pole

pieces of the magnet will have the same polarity and will act upon the armature independently and simultaneously. Since the walls of the tubular cores and pole pieces are thin, a small amount of iron is utilized to conduct the magnetic flux and, at the same time, cores of convenient size for the coils are provided. The magnets are supported by a bracket 16 by means of a stem 17 which is screwed into a hole 18 in the support 1 and is provided with a fiber washer 19 to engage the pole pieces. A coil-spring 20 is placed on the stem 17 between the magnet and the bracket 16 and a nut 21 on the stem may be utilized to adjust the magnet relatively to the armature 22. A bracket 23 supports a back-stop 24 having a non-conducting front end and also a front contact stop 25 for the armature 22 which is normally held against the back-stop by a spring 26, the outer end of which is connected to a rotary thumb shaft 27, by which the tension of the spring may be adjusted. The shaft 27 is mounted in a T-rod 28 which is adjustably mounted in a post 29. The bracket 23 is connected by a wire 30 to a binding post 31, and the armature 22 is connected by a wire 32 to a binding post 33. The front and back stops are in the form of screws, whereby they may be adjusted. The binding posts 31 and 33 are in series with a sounder magnet 34 and a battery 35. The armature 36 of the sounder is retracted by a spring 37 and may be used as an element of a repeater, if desired.

The wiring shown on the drawings is merely illustrative of one way of connecting up the apparatus, but it may be varied to suit the ideas of different persons. In Fig. 3, I have shown the windings of the magnet connected in multiple, but they may be connected in series, if preferred, as shown in Fig. 7.

I have shown my magnets with their cores in alinement, which is the arrangement I prefer, though I would not be limited thereto in claims which do not specify the same. Where magnets have their cores parallel, they usually have a T-shaped armature the head of which is broad enough to cover both cores, thus necessitating a larger or heavier armature than can have its inertia overcome by weak currents. It is an advantage to make the armature as light as possible, not only because its inertia will be overcome more quickly, but also because the current will have less iron to magnetize, thereby making and breaking the circuit more quickly. I prefer also to provide my magnets with tubular cores having thin walls, as shown, since the amount of metal is small and advantageously disposed for effective service, but I do not desire to limit my invention to cores of any specified form or dimensions or, in fact, to the employment of magnetizable cores of any kind, though the operation of the relay will probably be found more satisfactory if the coils are provided with some magnetizable material to conduct the magnetic flux to the armature.

I do not desire to be limited to the precise construction shown and described but claim protection on all fair equivalents.

I claim as my invention:

1. In a relay, the combination with a pair of electro-magnets provided with cores having substantially alined axes, of a neutral armature having movement in response to the magnetization of said cores in a plane transverse to their axes.

2. In a relay, a pair of electro-magnets provided with cores having substantially alined axes and provided with adjacent pole pieces, in combination with an armature having movement in response to the magnetization of said cores in a plane transverse to their axes.

3. In a relay, a pair of electro-magnets provided with cores having alined axes and provided with adjacent spaced pole pieces, in combination with an armature having movement in response to the magnetization of said cores in a plane transverse to their axes.

4. In a relay, the combination with a pair of oppositely wound electro-magnets having alined axes and provided with tubular cores and adjacent pole pieces, of an armature pivoted upon an axis parallel to the axes of said magnets and located in proximity to said pole pieces.

5. In a relay, the combination with a pair of oppositely wound electro-magnets having tubular cores in axial alinement, of an armature located in proximity to the adjacent poles of said magnets and pivoted upon an axis parallel to the axes of said cores.

6. In a relay, the combination with a pair of electro-magnet coils having open magnetic circuits and adjacent poles of the same polarity, of a circuit-making and breaking armature actuated in one direction by both coils, and means for moving it in the opposite direction when the coils are deënergized.

7. In a relay, the combination with a pair of simultaneously and equally energized electro-magnet coils having open magnetic circuits and adjacent poles of the same polarity, of a single pivoted armature adjacent to said poles and operated to open and close an electric circuit.

8. In a relay, the combination with a pair of electro-magnet coils having open magnetic circuits and adjacent poles of the same polarity, of a single pivoted armature subjected to the influence of both of said poles

and to an opposing force and movable laterally with reference to the axes of said coils to open and close an electric circuit.

9. In a relay, the combination with a pair of electro-magnet coils having open magnetic circuits and adjacent poles of the same polarity, of a single armature pivoted to move laterally with reference to the axes of said coils and acted upon equally and independently by said coils.

Signed at Pittsburg this 5th day of Sept., A. D. 1904.

ZANTZINGER MCDONALD MILLER.

Witnesses:

ALICE E. DUFF,

ELVA STANIEK.