No. 784,052. PATENTED MAR. 7, 1905.

W. KAISLING.

ELECTROMAGNETIC DEVICE.

APPLICATION FILED OCT. 17, 1901.

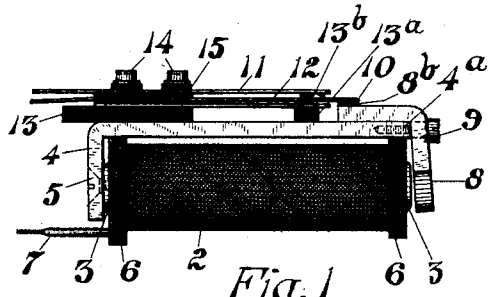

Fig. 1

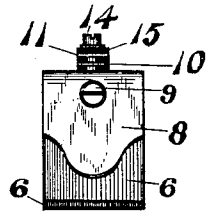

Fig. 2

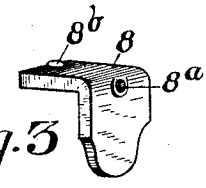

Fig. 3

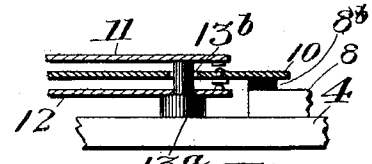

Fig. 8.

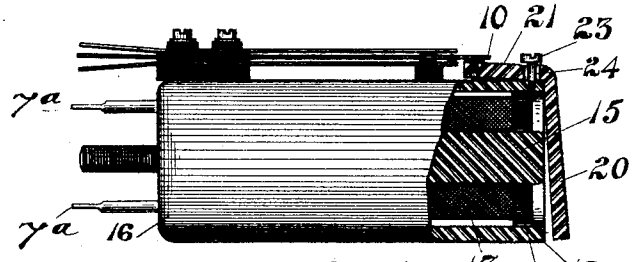

Fig. 4

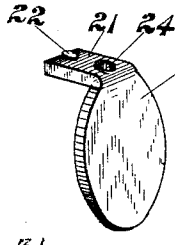

Fig. 5

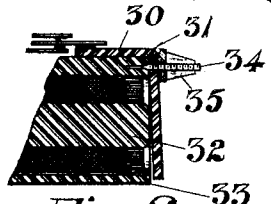

Fig. 6

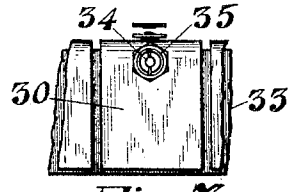

Fig. 7

Witnesses.
M. E. Dodge
E. D. Ames.

Inventor:
William Kaisling
by Robert Lewis Ames.
Attorney.

No. 784,052. Patented March 7, 1905.

UNITED STATES PATENT OFFICE.

WILLIAM KAISLING, OF CHICAGO, ILLINOIS, ASSIGNOR TO KELLOGG SWITCHBOARD AND SUPPLY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

ELECTROMAGNETIC DEVICE.

SPECIFICATION forming part of Letters Patent No. 784,052, dated March 7, 1905.

Application filed October 17, 1901. Serial No. 78,994.

To all whom it may concern

Be it known that I, WILLIAM KAISLING, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Electromagnetic Devices, of which the following is a specification.

My invention relates to improvements in electromagnetic devices, and more particularly to the class in which pivoted armatures are used.

It has for its object the reduction of the number of parts of the device and their simplification, whereby a more economical, durable, and efficient construction is obtained.

In the accompanying drawings, which illustrate my invention, Figure 1 is a side elevation of one form of the invention. Fig. 2 is a front elevation of the same. Fig. 3 is a perspective view of the armature. Fig. 4 is a side elevation of a modification of the invention. Fig. 5 is a perspective view of the armature employed in such modified form. Fig. 6 is a sectional elevation of a slightly-different form, and Fig. 7 is a front elevation of the same. Fig. 8 is a detailed view.

In the first form of my invention, 2 designates the magnet-coil, which is mounted upon a core 3, secured at its rear end to the plate 4 by means of a screw 5. This plate 4 extends upwardly and then forwardly parallel with the coil and core to the front end of the same and serves in this case to extend one pole of the magnet to the front end of the device. End pieces or blocks 6 6 are provided for the coil 2, upon the upper edge of which the longer portion of said plate 4 rests. The terminals of the magnet-winding, consisting of short pieces of heavy wire 7, are mounted near the lower edge of the face of the back end piece or block 6. The armature in this form of the invention is shown in Fig. 3, and it comprises a plate 8 of the desired contour bent intermediate of its ends at an angle a trifle larger than a right angle, though it will be understood that the two arms may extend at any other angle desired, according to the arrangement with which it is to be used. This armature is poised so as to rock upon the end of the plate 4 and is adapted to pivot or vibrate upon the corner 4^a of said plate as a fulcrum. In the position shown in Fig. 1 the downwardly-extended arm stands slightly away from the end of the core 3; but when the magnet-coil 2 is energized the said arm is drawn toward the end of the core 3, thus lifting the horizontal arm. In order to secure the armature in place, a screw 9 is inserted loosely through an aperture 8^a in the armature and is threaded into the forward end of the plate 4. This screw prevents the armature from being displaced and lost. The rearwardly-extending arm of the armature is conveniently employed to shift the springs of a relay, so as to change the circuits therethrough. For this purpose it is provided with an insulating-stud 8^b upon its upper surface, which is adapted to engage the end of spring 10, projecting beyond the ends of other springs 11 and 12, located, respectively, above and beneath the said spring 10. In order to effectually insulate the front ends of these springs from each other and the support 4 and hold them in their proper relative positions, an insulating-pin is provided. This pin has an enlarged head 13^a, adapted to rest upon the metallic plate 4, while its shank 13^b extends through an aperture in the spring 12, the said aperture being too small to permit the said pin-head to pass through. The spring 10 is provided with an enlarged aperture, through which the shank of the pin extends, while spring 11 is adapted to rest upon the end of said shank. The inner and outer springs being given a normal tension or trend toward the support the pin holds them in proper normal position, while the middle spring is permitted to freely vibrate between. At the same time the pin itself is secured in place by the inner spring 12 pressing against its head. The said springs are secured at their rear ends to the plate 4, a strip of insulation 13 being placed between the lowest spring and the plate 4 and other strips being located between the springs. Screws, such as 14, may be provided with insulating-bushings 15 and are then extended through the several springs and insulating-strips and threaded into the plate 4 to

secure the set to the plate 4. The circuit-wires are adapted to be soldered or otherwise connected to the rearwardly-extending rigid ends of the said springs. Only one set of springs is shown applied to this relay; but it is obvious that as many sets as desired may be placed thereon and that any number of springs may occur in each set. The usual platinum contacts are provided for the ends of the springs. In the operation of the device the attraction of the lower limb of the armature causes its insulating-block 8^b to throw the metallic spring 10 from contact with the lower spring 12 into contact with the upper spring 11, and thus change the circuit through the set, or to simply make contact between springs 10 and 11 in case spring 12 carries no contact, as is shown in Fig, 1. The depending arm of the armature 4 may be of any shape or form desired, that shown in Fig. 1 being suitable for the relay shown in Figs. 1 and 2.

A different form of the invention is shown in Figs. 4 and 5, where the device is applied to an inclosed shell tubular relay, the core of which is indicated at 15 and the tubular shell by 16, these parts being secured together at their rear ends in the usual manner, so as to complete the magnetic circuit. The spool or coil is indicated at 17, and an insulating-washer 18 is carried by the core 15 within the shell 16. The armature consists of a depending disk-like portion 20, forming the attracted limb and having a rearwardly-extending arm 21, in which an insulating block or stud 22 is secured to operate a spring, such as 10, as before described. This set of springs is mounted, as before described, by means of insulating-strips between them and the shell 16, as well as between each other, with screws bushed with insulation to clamp them to the shell. The front ends are supported as before. Wires may be connected with their fixed ends. The angle between the disk 20 and arm 21 is slightly larger than a right angle; but any other suitable angle could be employed. When in position, the armature is poised upon the edge of the shell upon which as a fulcrum it is adapted to rock. The screw 23, threading into the shell 16, and the aperture 24 in the armature through which the screw passes are in this instance located in the upper arm of the armature, though it will be apparent that they could be located, as before, in the attracted limb or disk-like portion 20. When the coil 17 is energized, the magnetic circuit is completed through the arm 20, with the result that the springs are shifted by the horizontal arm, as before described. The usual fixed terminals 7^a are provided for the relay, which are insulated from the shell 16 and to which the ends of the magnet-coil 17 are connected in the usual manner.

Figs. 6 and 7 show still another example of the invention. In this case it is applied to a magnet in which the inclosing shells of a series of magnets are formed in a single cast-iron bar having a flat face 30 and a sharp corner 31. The armature consists of a rectangular piece of metal bent intermediate of its ends to form the depending limb, which is attracted by the core 32 and shell 33 of the magnet, and the horizontal arm which operates the switch-springs, located, as before, on the top of the bar. In this case to prevent the armature from being displaced a pin 34 is driven into the shell 33 or is otherwise secured therein and is threaded at its outer end. A nut 35 is threaded thereon and is provided with outwardly-extending spring-jaws which grip the pin 34, whereby a locking of the nut upon the pin is secured.

It will thus be apparent that I have provided a magnet in which the armature is adapted to vibrate or oscillate in a manner similar to the ordinary pivoted armatures, but in which the number of the parts is greatly reduced and those that remain are much simplified. The usual pivot-support, with its lugs, pivot-pins or screws, beside the delicate mounting and adjusting of such parts, are entirely dispensed with, thus resulting in a much cheaper article than usual and one that is more efficient and durable in operation and is less liable to get out of order.

It will be noticed that in either of the styles of relays which I have described the free ends of the springs—that is, the ends which are not fixed in position by means of clamping-screws—are supported so that they will remain in permanent adjustment. By means of this method of support the adjustment of the springs will not be altered even should the hard-rubber blocks at the opposite ends of the springs warp or otherwise change in position. In the absence of such support at the free ends of the springs the adjustment would be altered by any material change in these hard-rubber insulating-blocks or clamping-screws. An additional advantage which I secure by relays of this structure is that the armature-springs and spring-supports are all carried on a rigid metal support. The initial adjustment of the relays is therefore rendered easy, and there is little or no tendency for the relay parts to alter in their adjustment through use or temperature or moisture variations. A further advantage of this construction is that close working in the shop is unnecessary, since the length of the support 4 may vary several thousandths of an inch from the given dimension and still not affect the assembling of the device or its proper working when so assembled. Cheaper labor and quicker methods may therefore be employed than when delicate and accurate working is required.

While I have described the invention with particular reference to the details of construction, it is apparent that various modifications, alterations, and substitutions may be made therein and still come within its principle.

The armature, for example, is shown having its arms integral, and they extend at substantially right angles from each other, and one arm is itself employed to directly operate switch-springs; but it is evident that the scope of the invention is in no wise so limited, for various mechanical changes may be made and still come within its purview.

What I therefore claim, and desire to secure by Letters Patent, is—

1. The combination with a magnet, of an armature therefor having two arms extending at an angle to each other, a support having a knife-edge adapted to fit into the apex of the said angle and to form a support for the armature upon which as a fulcrum it may rock, one of said arms of the armature serving to complete the magnetic circuit of the magnet, and parts adapted to be operated by said armature when it is actuated, substantially as described.

2. The combination with a magnet, of an armature therefor comprising two arms at an angle to each other, a support having an edge upon which as a fulcrum said armature is supported intermediate of its ends and may rock, one of the arms of said armature extending transversely of the magnet and the other longitudinally thereof, said armature serving when the magnet is energized to shorten the path for the magnet-lines, and parts adapted to be operated by said armature, substantially as described.

3. The combination with a magnet having a core and suitable parts affixed thereto to bring the magnetic poles thereof close together, an armature for the magnet having two arms extending at an angle to each other, said armature being supported to rock upon an edge as a fulcrum formed on one of said poles, and one of its arms being attracted by the other of said poles, and parts adapted to be actuated by said armature, substantially as described.

4. The combination with a magnet, of an armature therefor having two arms at an angle to each other, a member having an edge upon which as a fulcrum said armature is supported intermediate of its ends and may rock, one of said arms being transversely disposed with reference to the magnet, and the other longitudinally disposed and extending alongside the magnet, and switch-contacts controlled by said latter part, substantially as described.

5. The combination with a magnet, of an armature therefor having two arms extending at an angle to each other, a support for the armature having an edge upon which as a fulcrum said armature is supported intermediate of its ends and may rock, one of said arms of the armature being in position to be attracted by the magnet, and switch-contacts controlled by the said armature, substantially as described.

6. The combination with a magnet-coil, of a core therefor provided with metallic parts forming an external magnetic circuit normally open at one portion, a bent armature of magnetic material having two arms at an angle to each other so supported as to close the normally open portion or gap in the external magnetic circuit or shorten its path for the lines of force when the core is magnetized, a support for said armature having an edge upon which it rocks as a fulcrum, and a bunched set of flat superposed contact-springs operated by said armature, said set being supported by and secured to a rigid portion of the said parts forming external magnetic circuit, substantially as described.

7. The combination with a magnet-coil, of a core therefor provided with metallic parts forming an external magnetic circuit normally open at one portion, a bent armature having two arms at an angle to each other and supported upon an edge as a fulcrum in a manner so that one of said arms will close said normally open portion or gap in the external magnetic circuit or shorten its path for the lines of force when the core is magnetized, and a bunched set of flat superposed contact-springs carried by the framework of the electromagnet and operated by said other arm, substantially as described.

8. The combination with a magnet-coil, of a core therefor provided with metallic parts forming an external magnetic circuit for the coil normally open at one portion, a bent armature of magnetic material having two arms at an angle to each other adapted to close said normally open portion or shorten the path for the lines of force when the core is magnetized, a support for said armature having an edge upon which it rocks as a fulcrum, a bunched set of flat superposed switch-springs firmly secured at one end to a rigid portion of the framework of the electromagnet, the free ends of said springs terminating adjacent the said armature, and an insulating-stud carried by one of said arms and engaging an intermediate spring of the set to change it from one position to another when the magnet is energized, substantially as described.

9. The combination with a magnet, of an armature therefor comprising two arms extending at an angle to each other, a support having a corner or edge fitting within the apex of said angle and forming a support for the armature and upon which as a fulcrum it may rock, and switch-contacts, one of said arms of the armature being in position to be attracted by the magnet and the other to operate the switch-contacts, substantially as described.

10. The combination with a magnet, of an armature therefor having two arms extending at an angle to each other, a support having a knife-edge adapted to fit into the apex of said angle and to form a support for the armature upon which as a fulcrum it may rock, one of said arms standing before the end of the mag-

net in position to be attracted thereby and the other being substantially parallel with the magnet, and devices controlled by the said latter part, substantially as described.

11. The combination with a magnet having a core, of a supporting member extending to a point adjacent the end of the core and having an edge, an armature having two arms at an angle to each other and supported to rock upon said edge as a fulcrum, one arm extending across the end of the magnet in position to be attracted by the core, and the other arm extending substantially parallel with the support, means to secure the armature in place upon said edge and at the same time permitting it to rock thereon, and devices actuated by the said latter part, substantially as described.

12. The combination with a magnet having a core, of a member to extend the magnetic circuit from one end of the core to a point adjacent the opposite end and having an edge formed across the latter end, an armature consisting of two arms bent at an angle to each other and supported at the apex of said angle by said edge as a fulcrum, one of said arms being opposite the end of the core and member in position to be attracted thereby, and the other arm extending back over said member, and switch-contacts actuated thereby, substantially as described.

13. The combination with a magnet, of a support having an edge, an armature for the magnet formed of a single piece of metal bent intermediate its ends into two arms substantially at right angles to each other, said armature being carried upon said edge as a fulcrum and to rock thereon with one arm in position before the pole of the magnet and the other over the support, and switch-contacts actuated by the armature, substantially as described.

14. The combination with a magnet, of a supporting member extending along the sides thereof, an armature having two arms at an angle to each other supported to rock upon the forward edge of said member as a fulcrum, one arm thereof extending in front of a pole of the magnet in position to be attracted thereby and the other arm extending back over said member, a set of switch-springs mounted upon said member and extending forwardly in position to be actuated by the second-mentioned portion of said armature, substantially as described.

15. The combination with a magnet-coil and a core, a magnetic member secured to the core at the rear end and extending above the side of the coil to its forward end to extend the magnetic circuit of the device to said forward end, an armature having two arms at an angle to each other loosely supported to rock upon the forward end of member as a fulcrum with one arm extending in front of the poles of the magnet, a set of superposed switch contact-springs mounted upon the rear end of said member and extending toward the armature, said springs being insulated from each other and from said member and one of the springs extending forward and engaging the said second part of the armature by which the said set is actuated, substantially as described.

16. The combination with a magnet-coil and a core therefor, of a support of magnetic material forming a portion of the external circuit of said magnet, a set of contact-springs, said springs being secured to and carried by one end of said support, an insulated stop or adjusting-post carried by the support and independently supporting the free ends of a plurality of said contact-springs whereby the supported springs are maintained in permanent adjustment, and an armature adapted to operate said springs, substantially as described.

17. The combination with a magnet-coil and core therefor, of a support of magnetic material forming a portion of the external magnetic circuit of said magnet, a bunched set of superposed contact-springs secured at their rear ends to said support, an insulating-post carried at the forward portion of said support and independently supporting the free ends of said springs to permanently adjust them with reference to the support and to insulate them therefrom, and a bent armature pivoted at the forward end of said support and having one portion extending across in front of the end of the coil in position to be attracted thereby and the other extending back over the support to suitably actuate said set of springs, substantially as described.

18. The combination with a magnet-coil, of a core therefor, metallic parts forming an external magnetic circuit of the coil normally open at one portion, a bent armature of magnetic material having two arms at an angle to each other and supported to close the normally open portion or gap in the external magnetic circuit or to shorten the path for the lines of force when the core is magnetized, a bunched set of flat superposed switch contact-springs secured to said parts forming the external magnetic circuit and extending forwardly with their free ends adjacent to said armature, said springs being operatively insulated from each other, and an insulating-stop for the free ends of said springs to independently support the ends of a plurality of said springs in permanent adjustment with reference to said parts forming the external magnetic circuit, the intermediate spring or springs of each set being operated by the armature to change the set from normal to an alternate position, substantially as described.

19. The combination with a magnet-coil, of a core therefor provided with an external magnetic circuit normally open at one portion, a bent armature of magnetic material having two arms at an angle to each other and supported so as to close the normally open por-

tion in the said circuit when the magnet is energized, a bunched set of flat superposed resilient contact-springs secured at one end to a support forming a portion of said external magnetic circuit, and an independent stop for the free ends of said springs to permanently and independently adjust a plurality of the same with reference to said supporting external magnetic circuit, said springs being operated by one of the arms of the armature, substantially as described.

20. The combination with a magnet-coil, of a bunched set of flat superposed resilient switch-springs and alternately-disposed strips of insulation secured flatwise to said support and extending longitudinally of the coil, an armature for the coil having two arms, one arm extending transversly across the end of said magnet and adapted to be attracted thereby, and the other arm extending longitudinally of the magnet and to the free ends of said springs and serving to actuate said set to change them from normal position to an alternative position when the magnet is energized, and a support for said armature having an edge upon which it rocks as a fulcrum, said armature acting as a bell-crank lever in such actuation of the springs, substantially as described.

21. The combination with a magnet, of a supporting member at the side of said magnet, a bunched set of flat superposed resilient switch-springs mounted upon said member and secured to its rear end and extending parallel with said magnet to its forward end, an armature mounted at the forward end of the support and having an arm extending transversely across the end of said magnet and adapted to be attracted thereby, a support for said armature having an edge upon which it rocks as a fulcrum, and a second arm of said armature extending back over said support and normally supported thereby, said set of springs being operatively insulated from said support and from each other and having their free ends in position to be actuated by said second arm of the armature, substantially as described.

22. The combination with a magnet-coil having a core, of a member secured to the rear end of the core and serving to extend the magnetic circuit thereof to a point adjacent to its forward end, an armature supported at the latter end of the magnet and having a transverse arm extending across the magnet and in front of said core, said armature having a second arm extending longitudinally back over said member, a support for said armature having an edge upon which it rocks as a fulcrum, and a bunched set of flat superposed resilient switch-springs mounted upon said member and fixedly secured thereto at the rear end, said springs being operatively insulated and extending forwardly to the front end of said member and having their free ends terminating adjacent said second arm and in position to be actuated thereby, substantially as described.

23. The combination with a magnet, of a member extending alongside the same, an armature for the magnet having two arms at an angle to each other, one arm extending transversely across the end of the magnet and in front of its pole and the other arm extending back over said member, a set of flat superposed switch-springs secured to said member, said springs being insulated from each other and from the support, an intermediate spring of the set extending forward and terminating over the end of the second arm of the armature, whereby when the magnet is energized the armature acts as a bell-crank lever to shift the said intermediate spring from one position to another.

24. The combination with a magnet, of a member extending alongside the same, an armature for the magnet having two arms at an angle to each other, one arm extending transversely across the magnet and in front of its pole and the other arm extending back over said member, a set of flat superposed switch-springs secured to said member and insulated from each other and from the support, an intermediate spring of the set extending forward and terminating over the end of the second arm of the armature, an insulating-stop for the forward ends of said springs to permanently adjust them with reference to the said member, and an insulating-stud between the extended end of said intermediate spring and the second arm of the armature, substantially as described.

25. The combination with a magnet-coil, of a member extending longitudinally thereof, an armature for the magnet having two arms extending at an angle to each other, one arm passing transversely across the end of the magnet in front of its pole so as to be actuated thereby while the other arm extends back over the said member, a set of superposed switch-springs and alternately-disposed strips of insulation, screws passing through said springs and strips to clamp them together and to the said member, the free ends of said springs terminating adjacent the said second arm of the armature, and one of said springs extending beyond the others to the said second arm of the armature, an insulating-stud between the said spring and arm of the armature and an insulating-stop for the free ends of the springs to support them in permanent adjustment with reference to each other and to the member, substantially as described.

In witness whereof I hereunto subscribe my name in the presence of two witnesses.

WILLIAM KAISLING.

Witnesses:
C. P. BELDEN,
JOSEPH C. BELDEN.