E. E. CLEMENT.

ELECTRICAL RELAY.

APPLICATION FILED DEC. 23, 1905.

990,032. Patented Apr. 18, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

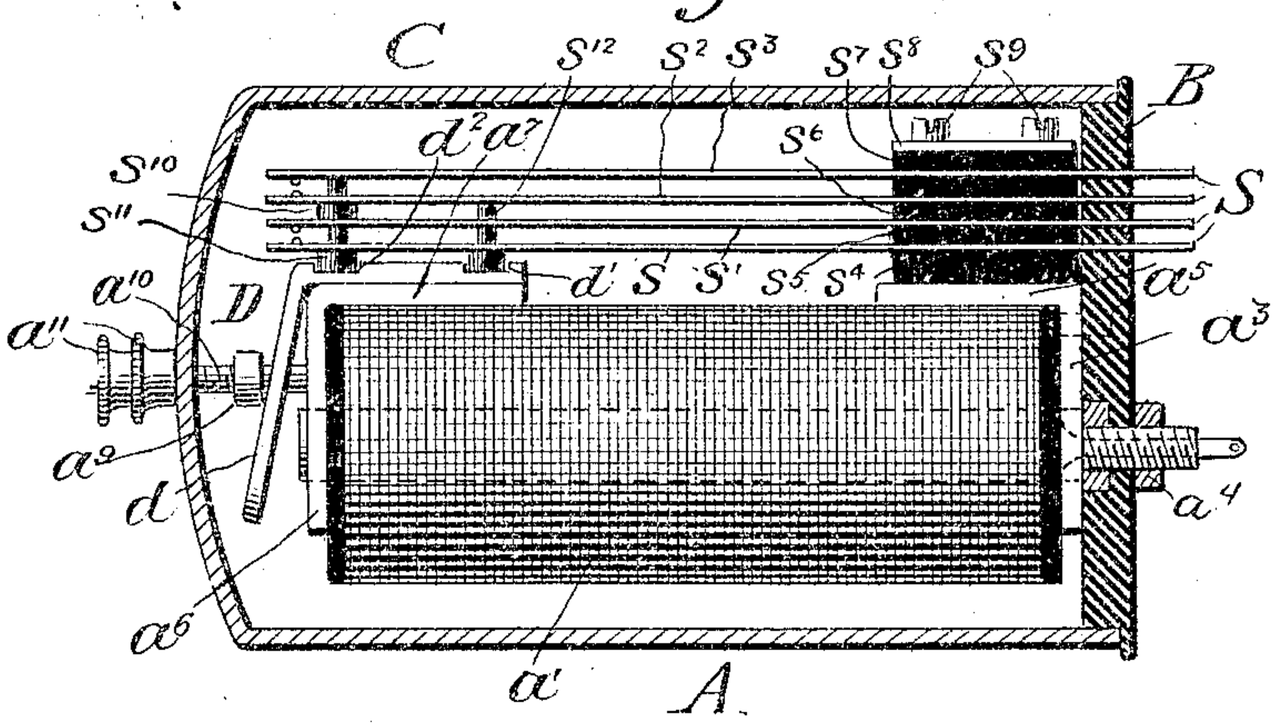
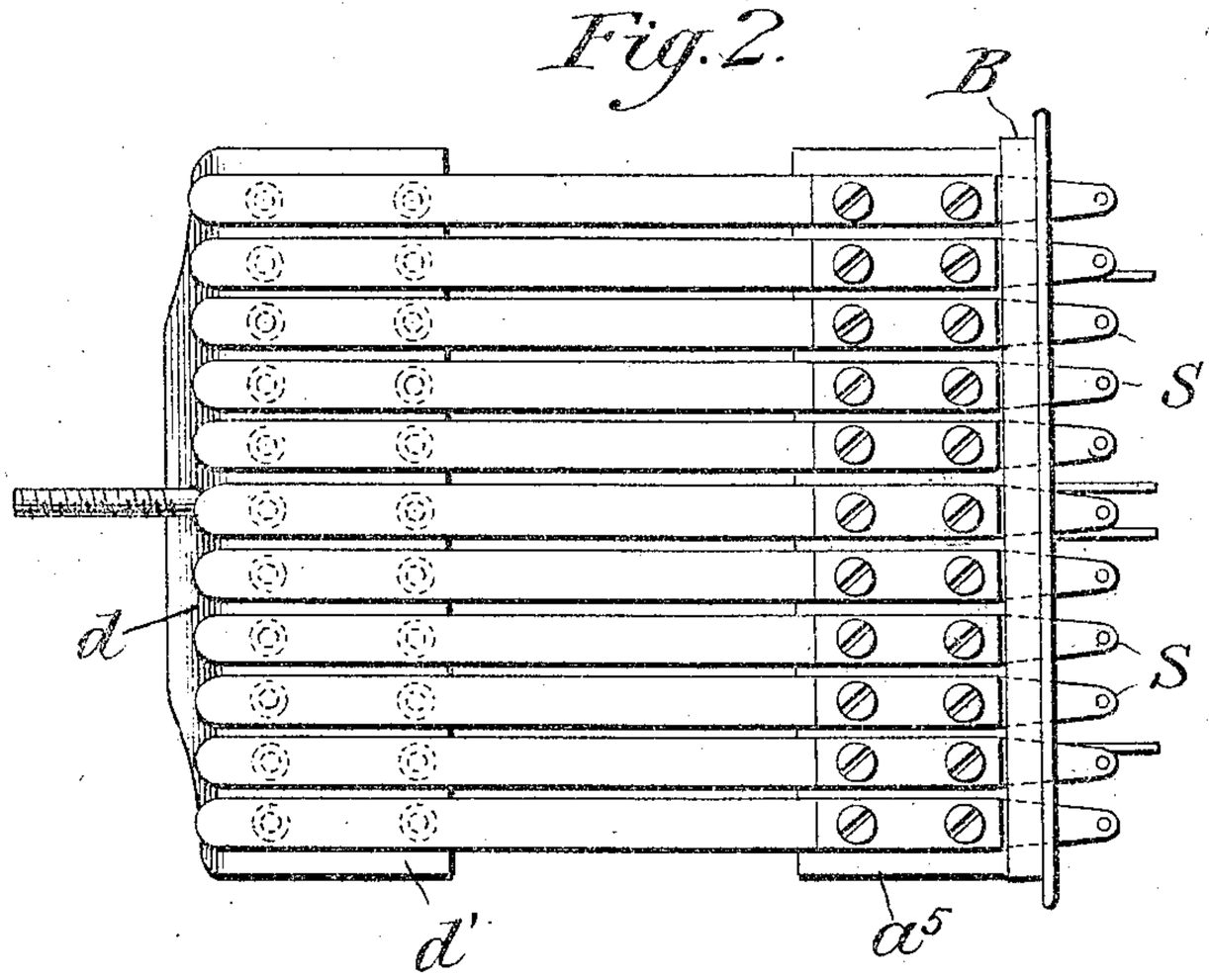


Fig. 2.



Witnesses

O. W. Edelin.

J. L. Wright

Inventor

Edward E. Clement

E. E. CLEMENT.

ELECTRICAL RELAY.

APPLICATION FILED DEC. 23, 1905.

990,032.

Patented Apr. 18, 1911.

2 SHEETS—SHEET 2.

Fig. 3.

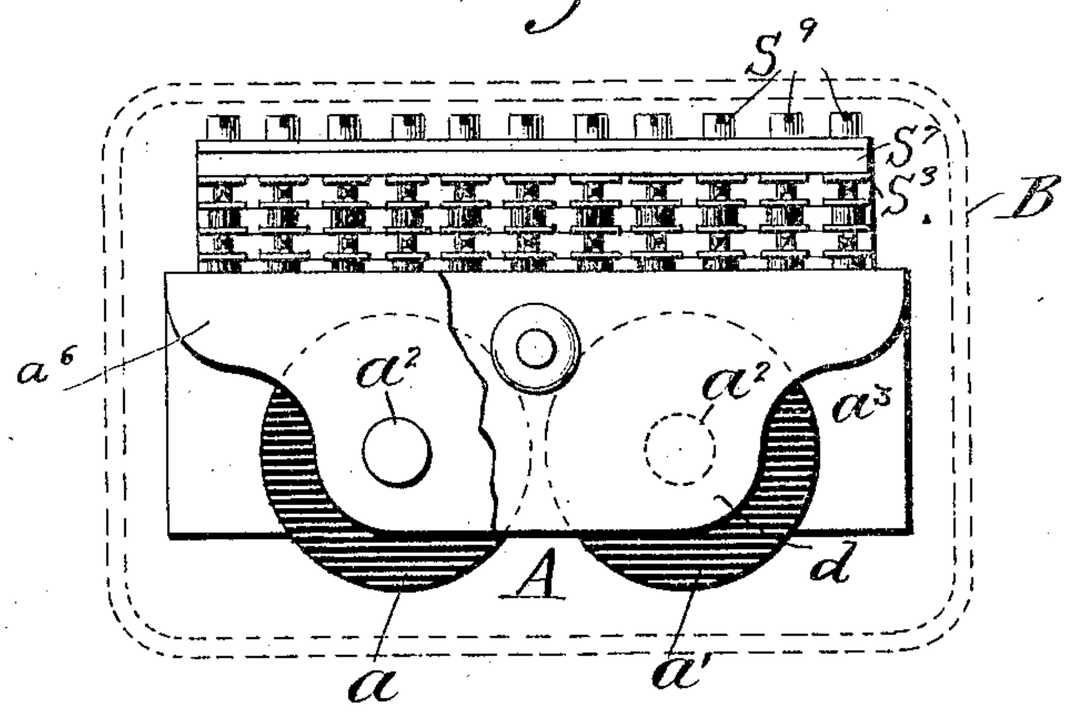
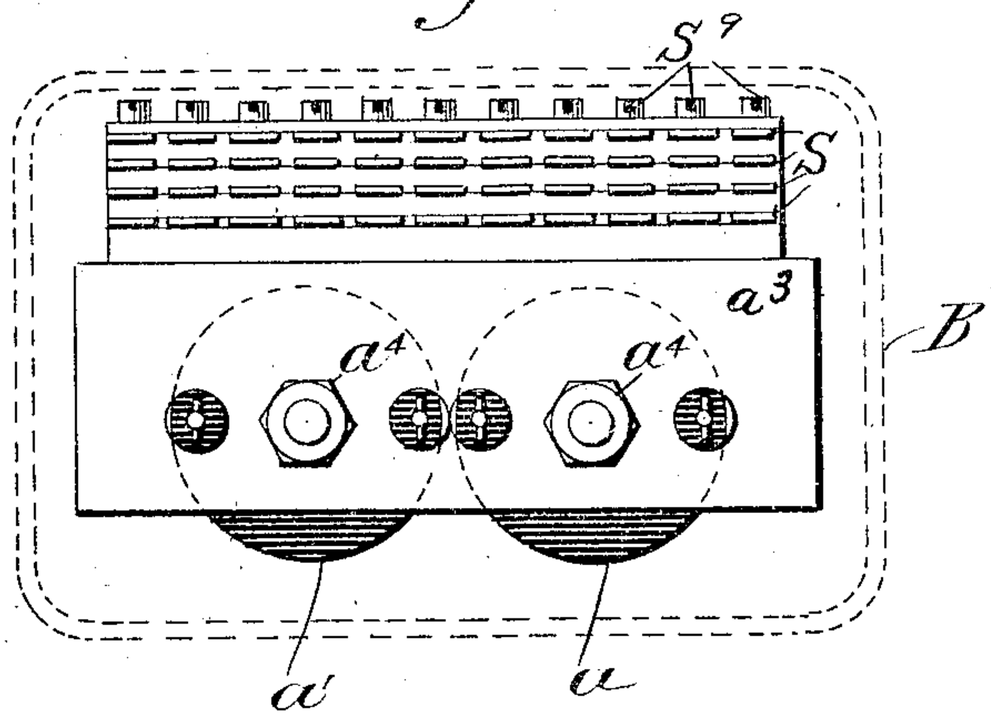


Fig. 4.



Witnesses

O. W. Collier.

J. L. Wright

Inventor

Edward E. Clement

UNITED STATES PATENT OFFICE.

EDWARD E. CLEMENT, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR TO THE NORTH ELECTRIC COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

ELECTRICAL RELAY.

990,032. Specification of Letters Patent. Patented Apr. 18, 1911.

Application filed December 23, 1905. Serial No. 293,149.

To all whom it may concern:

Be it known that I, EDWARD E. CLEMENT, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Electrical Relays, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to electrical relays and has for its object the provision of a relay suitable for use in certain types of telephone exchange systems as well as in other systems, requiring a multiplicity of contacts to be made and broken.

Heretofore it has been difficult to design a relay which would make and break more than one or two pairs of contacts satisfactorily, and so far as I know it has never been possible to have an ordinary relay, working in the ordinary way as such directly control a considerable number of circuits. The principal reason for this has lain in the difficulty of adjusting many contacts so that one movement of a common part would make or break them all satisfactorily. Some might make and others not, and vice versa.

According to the present invention I make all the contacts self-adjusting, so that the armature which is common to and operates them all need not be adjusted to them, but they adjust themselves individually to it as well as to each other.

Certain advantages will appear in details of construction, as I proceed with my description, and the claims appended thereto.

My invention is illustrated in the accompanying drawings in which—

Figure 1 is a side view of the relay with the inclosing shell in section, Fig. 2 is a top plan view of the same with the shell removed, Fig. 3 is a front view of the same, and Fig. 4 is a rear view with the back plate removed.

Referring to the figures, A is an electromagnet comprising a pair of spools a—a', whose cores a^2 are secured to the rear yoke a^3 by means of nuts a^4, or in any other suitable manner. This back yoke a^3 has a return portion or flange a^5 extending across the rear end of the magnet windings, and carrying the contact springs. The ends of the cores, being reduced so as to make shoulders to abut against the back plate, project through the same beyond the nuts a^4 a sufficient distance to enable them to be used to secure the entire structure upon the usual frame or rack. Upon the yoke, and covering the entire back of the magnet structure is an insulating back plate or base B flanged around its edge, and serving to receive and support the shell or cover C, which incloses the entire structure within a dust and moisture-proof chamber. This shell is formed or drawn up out of sheet metal, continuous except for the open mouth, and is slid over the relay from the outer end until its edges engage the back plate B.

Across the front of the electro-magnet is a second yoke a^6 having a return portion or flange a^7 extending across the front end and on top of the electro-magnet. I may state here that the rear yoke a^3 is of soft iron, and the front yoke a^7 is preferably of brass. In case quickness of action is desired in the relay this brass is slit between the two pole-pieces, and radially around them, as well understood in the art, in order to prevent eddy currents, and consequent magnetic retardation.

Mounted upon the front edge of the flange a^6, so as to rock thereon, is the bell-crank armature D, whose lower member d and upper member d' form a somewhat obtuse angle, the member d extending across in front of the pole-pieces of the magnet and the member d' lying above the flange a^7 of the yoke a^6.

Mounted upon the flange a^5 at the rear of the magnet are the contact springs S, comprising individual members s s' s^2 s^3. The springs are separated by the insulating strips s^4 s^5 s^6 and s^7, and are secured to the flange a^5 by the through bolts s^9 whose heads rest on the metal cap plate or strip s^8. These springs are in sets, those shown in Fig. 1 constituting one complete set. In the use to which I apply this relay at present, that of cutting on a metallic circuit to its extensions, it is requisite to have two pairs of contacts, one pair for each side of the metallic circuit in each set. Both of these are made and broken at once, and there may be as many sets as there are circuits to be controlled. In each set the springs s and s^2 are the movable or working springs, and the springs s' s^3 are the fixed or anvil

springs. As shown in Fig. 1 I make all these springs self-adjusting by a very simple expedient, that is by the use of two little studs s^{10} and s^{11}, one for each pair. The stud s^{11} rests with its base in a notch d^2 formed in the flange d', as nearly as possible over the pivot edge of the armature. Its reduced portion or stem extends through a hole in the spring s, and supports upon it the spring s'. The stud s^{10} has its base resting on the spring s' and its reduced portion or stem extending through a hole in the spring s^2 and supporting upon it the spring s^3. The bases of all the studs s^{11} in the sets of springs across the top of the relay lie within the notch d^2, which is a channel or gain cut across the arm d' from side to side, the armature being thus held in place by the springs and studs, without other fastening means.

A rod a^{10} which extends outwardly from the yoke a^6 passes through a hole in the armature b and is threaded at its end to receive a nut a^9 whereby the air gap between the armature and the core may be adjusted. This rod serves also to prevent lateral displacement of the armature and to secure the inclosing shell in place by the nuts a^{11}.

At a point near the end of the flange d', in Fig. 1, another notch is cut across the face from side to side, and in this notch rest the bases of the operating studs s^{12}, which however can rest on the flat surface of the armature arm, without the notch. Each stud is shouldered, and its stem or reduced portion passes up through holes in the springs s—s' into contact with the under side of spring s^2. The springs s—s^2 rest therefore upon the shoulder and the top respectively of the studs s^{12}, and when the armature is tilted by having its arm d drawn into the poles of the magnet, all the studs s^{12} are lifted, lifting all the springs s—s^2 into contact with their companion springs s'—s^3. By noting the shape and arrangement of the studs, it will be observed that each set of springs is self-adjusting, all the springs having a downward set or tendency toward the magnet.

It is not absolutely necessary to use a pair of electro-magnets in the manner illustrated, as a single spool, with an iron return circuit over its top might do the work. I prefer the pair however as the operation is much more certain, and the magnetic circuit is shorter.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. An electrical relay comprising a pair of electro-magnets having their cores united at their rear end, an L-shaped supporting yoke carried upon the front end of the cores, a bent armature pivoted on the angle of said supporting yoke and having a depending portion extending in front of and across the ends of the cores, and a substantially horizontal portion extending over the tops of the magnet spools, and a plurality of contact springs secured upon the rear yoke of the electro-magnets and extending forward with their ends resting over and adapted to be controlled by the horizontal portion of the armature, substantially as described.

2. An electrical relay comprising a pair of electro-magnets having their cores united at their rear end, an L-shaped supporting yoke carried upon the front end of the cores, a bent armature pivoted on the angle of said supporting yoke and having a depending portion extending in front of and across the ends of the cores, and a substantially horizontal portion extending over the tops of the magnet spools, and a plurality of contact springs secured upon the rear yoke of the electro-magnets and extending forward with their ends resting over and adapted to be controlled by the horizontal portion of the armature, together with means whereby the springs may hold the armature in its place, substantially as described.

3. An electrical relay comprising the following instrumentalities: a pair of cores carrying windings, a magnetic yoke across the rear ends of said cores, a return portion on said yoke extending over the tops of the windings, an angular rigid support carried upon the front ends of the cores, a broad armature bent so as to have a dependent portion extending across and in front of both cores and a horizontal operating portion extending completely across and overlying the magnet windings, said armature fulcrumed upon the angle of said rigid support, and a plurality of sets of contact springs having relatively fixed and movable members in each set, individual means for maintaining the relative adjustment in each set and for maintaining individual engagement of the working members and the armature, together with means to retain the armature against displacement, substantially as described.

4. An electrical relay structure comprising the following instrumentalities: a pair of cores carrying windings, a magnetic yoke across the rear ends of said cores, a return portion on said yoke extending over the tops of the windings, an angular rigid support carried upon the front ends of the cores, a broad armature bent so as to have a dependent portion extending across and in front of both cores and a horizontal operating portion extending completely across and overlying the magnet windings, said angular armature fulcrumed upon the said rigid support, and a plurality of sets of contact springs having relatively fixed and movable members in each set, individual

means for maintaining the relative adjustment in each set and for maintaining individual engagement of the working members and the armature, the contact points of all the sets of springs extending forward beyond the operating and adjusting means so as to be entirely unobstructed and visible from the front of the relay, substantially as described.

5. An electrical relay comprising a pair of parallel cores united at their rear ends by a magnetic yoke having a return portion extending across and parallel to the cores, connected windings upon said cores, an angular armature supported upon and extending across the front ends of both cores, a plurality of sets of contact springs secured upon the return portion of the rear yoke and extending forwardly parallel with the cores into position to be engaged and operated by the armature, and means whereby said springs will hold the armature against lateral displacement, substantially as described.

6. In an electrical relay comprising an electromagnet, a rear yoke or support, a front support, both carried on the core, contact springs secured upon the rear yoke and extending forwardly over the front support, an angular armature carried directly on the latter, and normally with one member lying flat thereon and the other extending down in front of the core end, and operating means for the springs engaging the armature and holding it positively against longitudinal displacement, substantially as described.

7. An electrical relay having a core, a yoke, contact springs and a bell crank armature, a support for the armature, operating studs for the springs, and means whereby said studs will positively engage one member of the armature and hold the same normally flat upon the support against longitudinal displacement, substantially as described.

8. An electrical relay having a plurality of contact springs, an angular armature with a portion underlying the springs to operate the same, said portion being partly cut away to form an opening or openings, and studs for operating the contact springs removably seated in said openings and positively engaging the springs to communicate motion thereto from the armature, substantially as described.

9. In an electrical relay, an electro-magnet, a broad armature for the same, a plurality of sets of contact springs resting thereover, each set of springs having a plurality of pairs of springs and resting and adjusting studs, one for each pair of springs, maintaining the relative relation thereof, and one or more operating studs carried by the armature and also engaging the working springs of each set, substantially as described.

10. In an electrical relay, the combination of a support, an electromagnet mounted thereon, an armature and contact springs operated thereby, an inclosing shell for said relay, means carried by the support for securing said shell over the relay, said means engaging the armature and preventing lateral displacement thereof, and means for preventing longitudinal displacement of the armature, substantially as described.

11. In an electrical relay structure the combination of the following instrumentalities: a base or support, an electromagnet with parallel cores and windings and an end yoke connected to said base, an armature mounted over and extending across the core-ends of the magnet, contact springs adapted to be worked by said armature, a shell adapted to inclose the entire structure, and securing means comprising a rod extending between the magnet cores and windings, at one end secured to the base and at the other adapted to pass through openings in the armature and shell and threaded to receive a clamping nut on the outside of the latter.

12. In an electrical relay, the combination with an electromagnet, contact springs and an armature for operating the same, of means for securing an inclosing shell over said magnet which comprises a threaded rod and a clamp nut, and means carried by said securing means for adjusting the air gap of the armature, substantially as described.

13. In an electrical relay, the combination with an electromagnet, contact springs and an armature for operating the same, of means for securing an inclosing shell over said magnet which comprises a threaded rod and a clamp nut, and a nut threaded upon said rod adapted to engage the armature whereby the air gap between the core and the armature may be adjusted, substantially as described.

14. In combination, a relay, an inclosing shell therefor, and means for securing the same over the relay comprising a rod extending through an opening in the armature of the relay and through the face of the shell and provided with nuts for holding said shell rigidly in position, said rod also preventing lateral displacement of the armature of said relay.

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

EDWARD E. CLEMENT.

Witnesses:
E. EDMONSTON, Jr.,
JAMES H. MARR.