No. 799,146. PATENTED SEPT. 12, 1905.

M. S. CONNER.

CIRCUIT CHANGING APPARATUS.

APPLICATION FILED MAR. 17, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

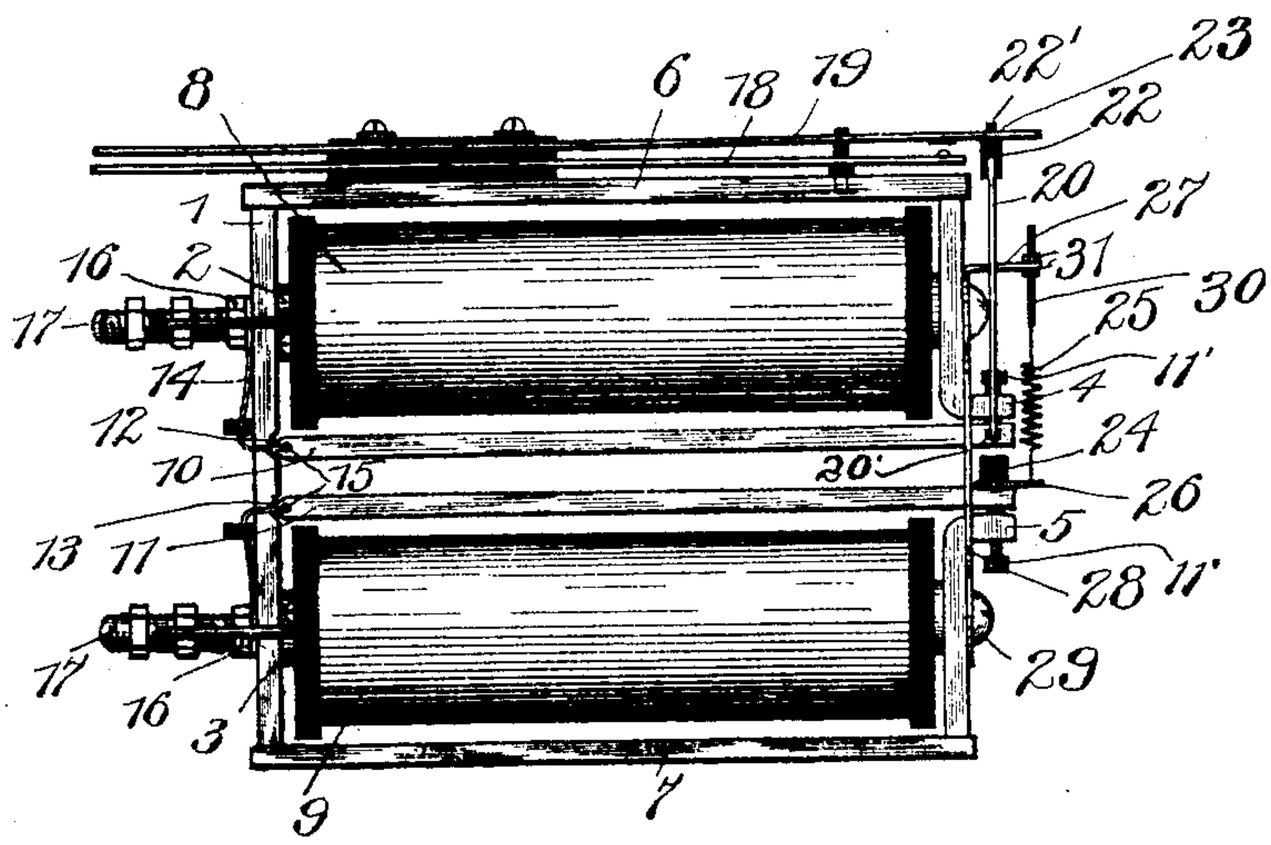
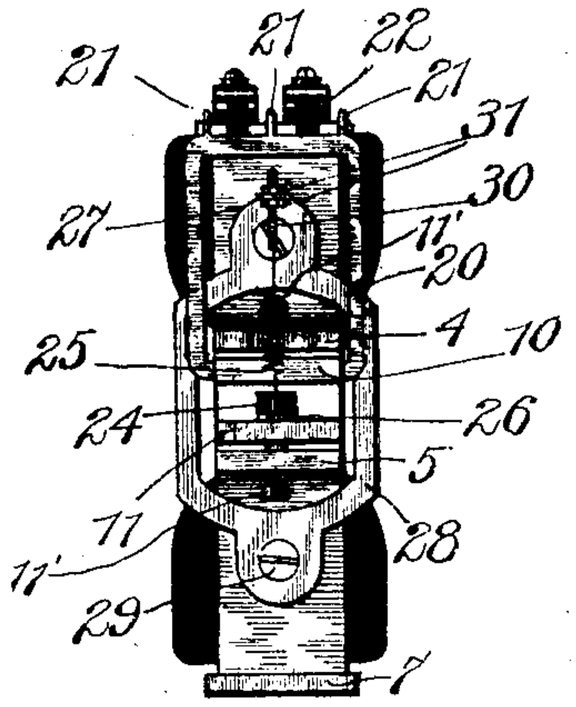


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 4.

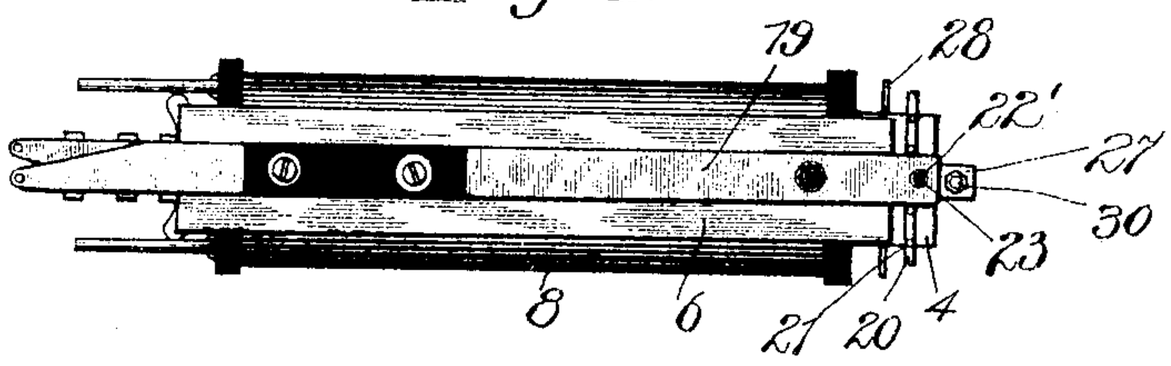


Fig. 3

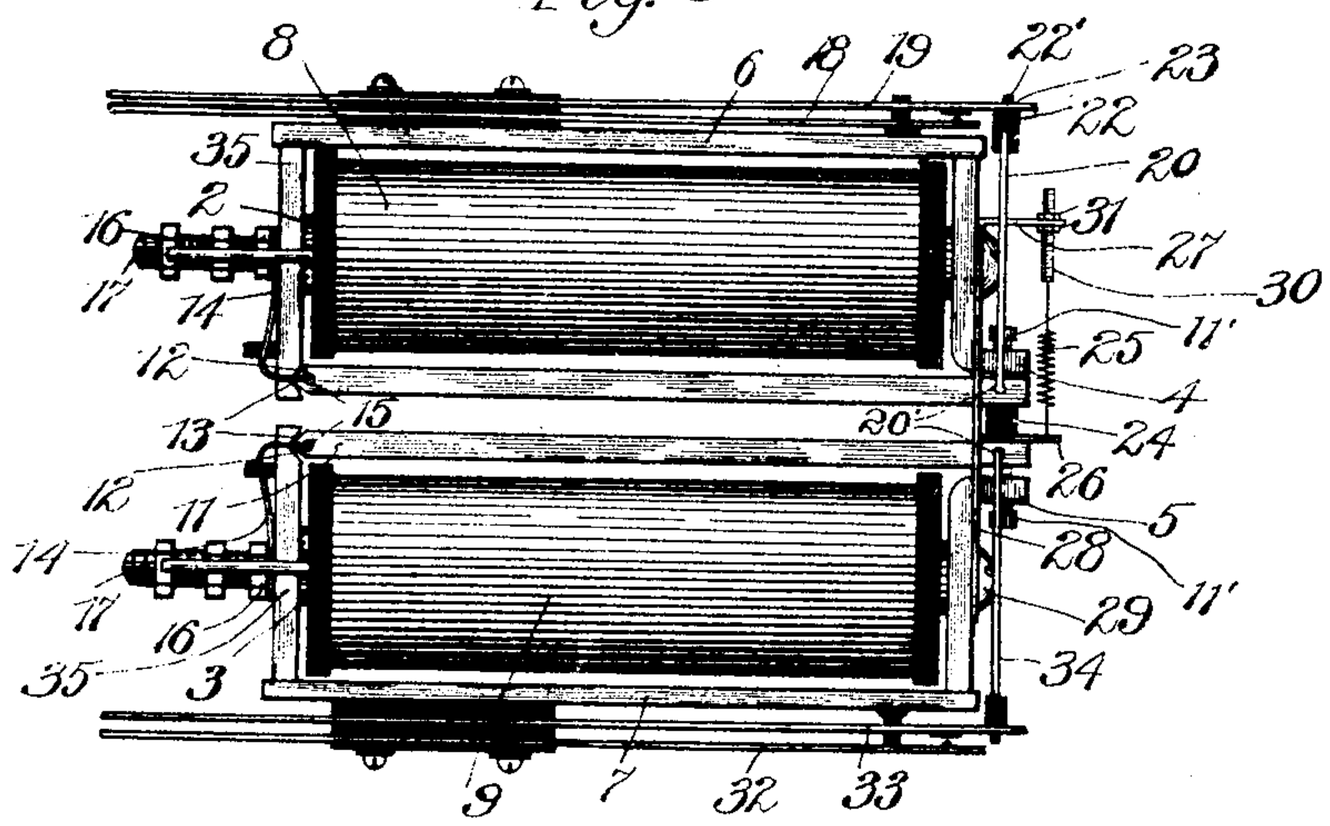


Fig. 5

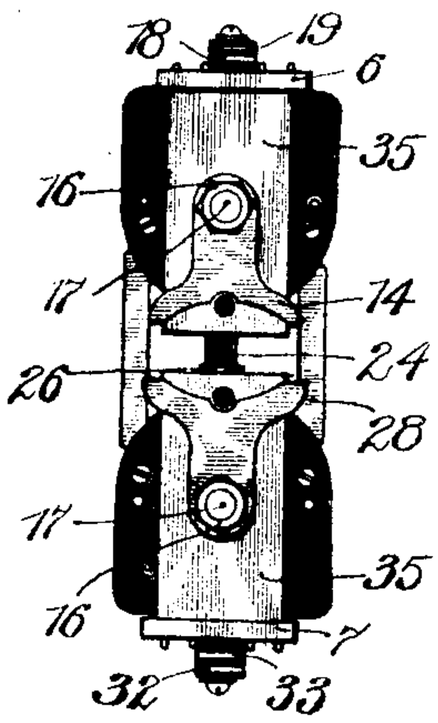
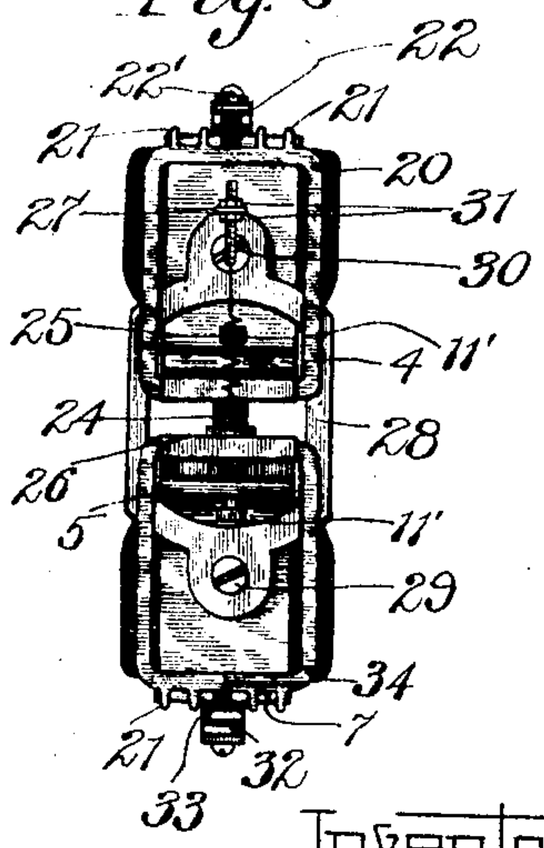


Fig. 6



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UNITED STATES PATENT OFFICE.

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CIRCUIT-CHANGING APPARATUS.

No. 799,146. Specification of Letters Patent. Patented Sept. 12, 1905.

Application filed March 17, 1904. Serial No. 198,591.

To all whom it may concern:

Be it known that I, MERRITT S. CONNER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Circuit-Changing Apparatus, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to circuit-changing apparatus, and particularly to improved relay mechanism to be used in telephone systems, and in this application I describe and claim the mechanical arrangement and construction of a relay mechanism of this kind.

In the accompanying drawings, Figure 1 is a side elevation of one form of such relay. Fig. 2 is a front view thereof. Fig. 3 is a modified form of relay, Fig. 4 being a top view thereof, Fig. 5 being a rear view thereof, and Fig. 6 being a front view thereof.

Like characters of reference refer to like parts throughout the figures.

A yoke 1 supports two parallel cores 2 and 3, extending forwardly and terminating in pole-pieces 4 and 5, respectively, facing each other. Supporting-plates 6 and 7, preferably of non-magnetic material, connect between the yoke 1 and the corresponding pole-piece. A winding 8 is disposed about the core 2, and a winding 9 is disposed about the core 3. An armature 10 is associated with the core 2, and an armature 11 is associated with the core 3, these armatures being adapted to close a magnetic circuit through the corresponding pole-piece, the core, and the yoke upon energization of the corresponding winding. The air-gaps for the various armatures may be adjusted by means of screws 11′, passing through the pole-pieces.

Each armature has a wedge-shaped end 12, which pivots in a slot 13, each armature being held in the slot by a fork-shaped spring 14, the points of this spring extending into apertures 15 15 in the edges of the armature, the other end of the springs being clamped by means of nuts 16 engaging threaded studs 17. These studs serve also to fasten the relay to a supporting frame or rack.

As shown in Fig. 1, contact-springs 18 and 19 are secured to the top of the plate 6, being insulated therefrom and from each other.

A U-shaped distance-frame 20 pivots at the ends of its limbs in apertures 20′ in the edges of the armature at the front end thereof, and at its other end is provided with pins 21 21. These pins are adapted for the reception of buttons 22 22, preferably of insulating material, which sleeve over the pins 21, and are provided each with a neck portion 22′ for engaging an aperture 23 through an actuating-spring 19. Any number of pins may be employed for the accommodation of any number of springs, and I preferably provide an uneven number of such pins, which enables the springs to be placed at a uniform distance from the center of the plate 6. For instance, where one set of springs is used the center pin would be employed, as shown in Fig. 6, and where two sets of springs are employed the pins either side of the center pin would be utilized, as shown in Fig. 2. The actuating-springs 19 are sprung so as to give them a tendency to engage the springs 18.

A stud 24, which may be of insulating material, is secured to the front end of the armature 11 and normally rests against the end of the armature 10. A tension-spring 25 connects between the extension 26 from the armature 11 and the supporting-finger 27, extending from a frame 28, this frame 28 being secured to the pole-pieces by means of screws 29 and serving to maintain the poles in relative adjustment. By means of a threaded stem 30 and adjusting-nuts 31 the tension of the spring 25 may be varied. Thus normally by virtue of the spring 25 the armature 11 is drawn away from its pole-piece, the stud 24 engaging the armature 10, which is brought into engagement with its pole-piece, and the springs 19 are disengaged from the springs 18, and any local circuit containing the springs 18 and 19 is opened.

Fig. 1 shows the relative disposition of the various parts upon the passage of current through both windings. Energization of winding 9 will cause attraction of the armature 11 to disengage the stud from the armature 10, and by virtue of the pressure of the springs 19 the armature 10 will follow the stud 24 and engage the springs 18. Simultaneously current through winding 8, however, will attract the armature 10 to again break contact between the springs.

Figs. 3, 4, 5, and 6 show a relay which is

similar in all respects to the relay shown in Fig. 1, but having additional contact-springs 32 and 33 secured to the under side of the plate 7. A distance-frame 34, similar to the distance-frame 20, is pivoted at the front end of the armature 11 and also terminates in pins 21, adapted to be associated with the springs, as before explained. These springs may be included in a local circuit, which is normally open, but upon attraction of the armature 11 will be in contact to close the local circuit. Instead of having a common yoke, as shown in Fig. 1, each core may be provided with a separate yoke 35.

I do not wish to be limited to the exact construction of my improved compound relays as herein shown, as changes may readily be made therein without affecting the scope of the invention, and

I claim as new and desire to secure by Letters Patent—

1. In a relay, the combination with a yoke, of two cores extending therefrom and terminating in pole-pieces, a winding for each core, an armature associated with each core, said armatures being pivoted at said yoke and extending forwardly therefrom, circuit-changing springs associated with one of said armatures and normally disposed to be out of engagement, and mechanical means associated with said other armature for associating said armature with the aforesaid armature to maintain said springs out of engagement.

2. In a compound unitary relay, the combination of two cores terminating in pole-pieces, an energizing-winding for each core, an armature associated with each core, circuit-changing springs associated with one armature and normally disposed to be out of engagement, mechanical means associated with the second armature for normally associating said second armature with the first armature to maintain said springs out of connection, and means upon energization of the corresponding winding for attracting said second armature away from said first armature to allow said springs to engage each other.

3. In a compound unitary relay, the combination of two cores terminating in pole-pieces, an energizing-winding for each core, an armature associated with each core, circuit-changing springs associated with one armature and normally tending to engage each other, means associated with the second armature for normally associating said armature with said first armature to disconnect said springs from each other, and means upon energization of the corresponding winding for releasing said second armature from said first armature whereby said springs may again engage each other.

4. In a compound unitary relay, the combination with two cores terminating in pole-pieces, of a winding for each core, an independent armature associated with each core, circuit-changing springs having a tendency to be disposed in one operative position and associated with one of said armatures, means for normally mechanically associating the second armature with the first armature to maintain the springs in another operative position, and means for disassociating said second armature from said first armature, whereby said springs may assume their first operative position.

5. In a compound unitary relay, the combination with two cores terminating in pole-pieces, of an energizing-winding for each core, an armature associated with each core, circuit-changing springs associated with one armature and having a tendency to be disposed in one operative position, and spring means for holding the second armature away from its pole and against the first armature to maintain the springs in another operative position, energization of the corresponding winding causing attraction of the second armature away from the first armature to allow the switch-springs to return to their former operative position.

6. In a compound unitary relay, the combination with a yoke, of two cores extending forwardly therefrom and terminating in pole-pieces, a winding for each core, an independent armature for each core and pole-piece, said armatures being pivoted at said yoke and extending forwardly in association with their respective pole-pieces, and switching-springs associated with one of said armatures normally having a tendency to be disposed in one operative position, and a spring for holding the second armature away from its pole-piece and against the first armature to change the operative position of said switching-springs, energization of the corresponding winding causing said second armature to be attracted away from the first armature whereby the switch-springs associated therewith may assume their normal position.

7. In a unitary compound relay, the combination with a common yoke, of cores extending forwardly therefrom and terminating in pole-pieces, a winding for each core, an independent armature-tongue for each core, said armatures being pivoted at said yoke and extending forwardly in association with their respective pole-piece, circuit-changing springs connected with one armature, said armature being normally away from its pole-piece, whereby the switch-springs may assume one position, and a spring for normally holding the second armature away from its pole-piece and against the first armature to bring said first armature into contact with its pole-piece and thereby to change the normal position of said switching-springs, energization of the corresponding winding causing attraction of said second armature away from the first armature, whereby said first armature and the switching-springs connected therewith may return to their normal position.

8. In a relay, the combination with a yoke, of two cores extending forwardly therefrom and terminating in pole-pieces facing each other, a winding for each core, an independent armature-tongue for each core, said armatures being pivoted at said yoke and extending forwardly in association with their respective pole-piece, a stud secured to the forward end of one of said armatures, circuit-changing springs disposed above one armature and mechanically connected therewith but insulated therefrom, said springs having a tendency to retain the associated armature away from its pole-piece and to assume one position, a spring normally holding the second armature away from its pole-piece and against the first armature, whereby said first armature is held against its pole-piece and the associated springs caused to assume another position, and means for causing a movement of said second armature toward its pole-piece to release the first armature, whereby the springs may assume their former position.

9. In a compound unitary relay, the combination with a yoke, of two cores extending forwardly therefrom and terminating in pole-pieces facing each other, an energizing-winding for each core, an independent armature-tongue for each core, said armature-tongues being pivoted in slots in the yoke and extending forwardly in position before their respective pole-pieces, a spring for retaining said armatures in said pivot-slots, actuating and contact springs disposed above one armature, a frame connecting the end of said armature with said actuating-springs, said actuating-springs tending normally to engage the contact-springs and to force the armature away from its pole-piece, a spring engaging the second armature to normally hold said armature away from its pole-piece and against the first armature whereby said first armature is held against its pole-face and the actuating-springs forced out of engagement with the contact-springs, and means for causing movement of said second armature toward its pole-face to release the first armature, whereby said actuating-springs may again engage the contact-springs.

10. In a compound unitary relay, the combination with a yoke, of cores extending forwardly from said yoke and terminating in pole-pieces facing each other, a winding for each core, an independent armature for each core, said armatures being disposed between said cores and extending forwardly from said yoke to their corresponding pole-pieces, slots in said yoke in which said armatures are pivoted, switching mechanism consisting of actuating and contact springs disposed above one armature, a distance-frame engaging the end of said armature and extending upwardly to engage the actuating-springs, means for insulating said actuating-springs from said frame, said actuating-springs being disposed to normally engage the contact-springs and to force the armature away from its pole-piece, a tension-spring engaging the end of the second armature to withdraw said armature from its pole-piece and against the first armature, whereby the distance-frame is caused to move the actuating-springs out of connection with the contact-springs, and means for moving said second armature toward its pole-piece, whereby said actuating-springs may again engage the contact-springs.

11. In a compound unitary relay, the combination with a yoke, of two cores extending forwardly therefrom and terminating in pole-pieces facing each other, a winding for each core, an independent armature for each core, said armatures being disposed between said cores and extending forwardly to the pole-pieces, slots in said yoke wherein said armatures are pivoted, springs for retaining said armatures in said pivot-slots, a frame engaging the forward end of one armature, a pin extending upwardly from said frame, an insulating-collar engaging said pin, an actuating-spring engaging said collar, said actuating-spring being normally disposed to force the armature away from its pole-piece and to engage a contact-spring, a tension-spring for normally withdrawing the second armature away from its pole-piece and against the first armature, whereby said frame is raised to carry the actuating-spring away from the contact-spring, energization of the corresponding winding causing attraction of the second armature away from the first armature, whereby said actuating-spring may again engage the contact-spring, energization of the other winding causing attraction of the first armature, whereby said frame is raised to disengage the actuating-spring from the contact-spring.

12. In a relay, the combination with a yoke, of a core extending forwardly therefrom and terminating in a pole-piece, an energizing winding for said core, an armature extending from said yoke to said pole-piece, switching mechanism consisting of actuating and contact springs disposed above said armature, a frame secured to the end of said armature, a plurality of pins extending from said armature, a collar of insulating material for each pin, the actuating-springs engaging said collars and normally disposed to force said armature away from its pole-piece to cause one condition of the switching mechanism, energization of the winding causing attraction of the armature, whereby said actuating-springs are moved to change the condition of said switching mechanism.

13. In a compound unitary relay, the combination with a yoke, of two cores extending forwardly therefrom and terminating in pole-pieces facing each other, an energizing-winding for each core, an independent armature for each core, said armatures being disposed between said cores and extending forwardly

from the yoke to the pole-pieces, slots in said core in which said armatures are pivoted, switching mechanism for each armature consisting of actuating and contact springs, a frame secured to the end of each armature, a plurality of pins extending from each frame, and collars of insulating material for each pin, said actuating-springs engaging said collars and normally tending to force the respective armatures away from their pole-pieces, energization of either winding causing the attraction of the corresponding armature to move said actuating-springs to change the condition of the switching mechanism.

14. In a compound unitary relay, the combination with a yoke, of two cores extending forwardly therefrom and terminating in pole-pieces facing each other, an energizing-winding for each core, an independent armature for each core, said armatures being disposed between said cores and extending forwardly from said yoke to the respective pole-piece, slots in said yoke in which said armatures are pivoted, spring means for retaining said armatures in said slots, switching mechanism consisting of actuating and contact springs disposed opposite each armature, a frame secured to the end of each armature and extending therefrom toward the respective actuating-springs, a plurality of pins extending from said frames, collars of insulating material for engaging said pins, said actuating-springs engaging said collars and normally tending to force the respective armature away from its pole-piece, a stud disposed between the ends of said armatures, and a tension-spring engaging one armature to withdraw said armature from its pole-piece to change the condition of the corresponding switching mechanism and to force the other armature toward its pole-piece against the tendency of the actuating-spring to change the condition of the corresponding switching mechanism.

15. In a unitary compound relay, the combination with two pole-pieces, of an independent armature associated with each pole-piece, electromagnetic means for independently controlling each armature, spring means for independently controlling each armature, and additional spring means for jointly controlling both armatures.

16. In a compound unitary relay, the combination with two pole-pieces, of an independent armature associated with each pole-piece, switch-springs associated with each armature adapted to force each armature away from its pole-piece, electromagnetic means for each armature for attracting said armature toward its pole-piece, and a spring maintaining one of said armatures away from its pole-piece and the other armature against its pole-piece.

17. In a relay, the combination with a yoke, of two cores extending therefrom and terminating in pole-pieces, a winding for each core, an armature disposed between said cores, a slot in said yoke, said armature having a knife-edge for pivotally engaging said slot, and mechanical means for holding said armature toward one pole-piece, magnetic energization of the other pole-piece causing attraction of said armature away from the aforesaid pole-piece.

18. In a relay, the combination with a yoke, of two cores extending therefrom and terminating in pole-pieces, a winding for each core, a slot in said yoke between said cores, an armature having a knife-edge for engaging said slot and extending forwardly to be disposed between said pole-pieces, and a spring pivoted in the lower end of said armature for holding said armature in said slot.

19. In a relay, the combination with a yoke, of two cores extending therefrom and terminating in pole-pieces, a winding for each core, a slot in said yoke between said cores, an armature having a knife-edge for pivotally engaging said slot and extending forwardly therefrom to be disposed between the pole-pieces, a spring pivoted in the lower end of said armature for holding said armature in said slot, switching mechanism associated with one core, and mechanism disposed between said armature and said switching mechanism to normally hold said switching mechanism in one operative position, energization of the other core causing attraction of said armature to release said switching mechanism.

20. In a compound unitary relay, the combination with two cores terminating in pole-pieces, of an energizing-winding for each core, an armature pivoted between said cores and extending forwardly between said pole-pieces, switching mechanism associated with one core, and mechanism intervening between said armature and said switching mechanism for normally retaining said switching mechanism in one operative position, energization of said other core causing attraction of said armature to allow said switching mechanism to assume another operative position.

21. In a relay, the combination with a yoke, of a core extending forwardly therefrom and terminating in a pole-piece, an energizing-winding for said core, an armature extending from said core to said pole-piece, a support of non-magnetic material disposed between said yoke and said pole-piece at the opposite side of said armature, switch-springs mounted on said support, and a frame extending from the free end of said armature and engaging with said switch-springs, said armature being normally held away from the pole-piece by said springs, energization of said core causing attraction of said armature to change the operative position of said switch-springs.

22. In a relay, the combination with a yoke, of a core extending forwardly therefrom and terminating in a pole-piece, an energizing-winding for said core, an armature pivoted in

said core and extending forwardly to said pole-piece, a support of non-magnetic material extending between said yoke and said pole-piece at the opposite side of said armature, actuating and contact springs mounted on said support, a frame pivoting in the forward end of said armature and engaging said actuating-springs, and means for insulating said actuating-springs from said armature, said actuating-springs serving to normally maintain said armature away from the pole-piece, an energization of said core causing attraction of said armature to move said actuating-springs to another operative position.

23. In a relay, the combination with a yoke, of a core extending forwardly therefrom and terminating in a pole-piece, an energizing-winding for said core, an armature extending from said yoke to said pole-piece, a support at the opposite side of said armature connecting between said yoke and said pole-piece, actuating and contact springs mounted on said support, a frame pivoted at the forward end of said armature and engaging at its other end with said actuating-springs, means for insulating said actuating-springs from said frame, and an adjusting-screw for adjusting the air-gap between said armature and pole-piece.

24. In a relay, the combination with a yoke, of a core extending forwardly therefrom and terminating in a pole-piece, an energizing-winding for said core, an armature for completing the magnetic circuit through said core, said yoke and said pole-piece, a knife-edge at the rear end of said armature, a slot on said yoke in which said knife-edge pivotally rests, a spring pivoted in the end of said armature for holding said knife-edge in said slot, switch-springs having connection with the free end of said armature, and an adjusting-screw for adjusting the air-gap between said armature and said pole-piece.

25. In a relay, the combination with a yoke, of an armature-core extending therefrom and terminating in a pole-piece, a winding for said core, an armature disposed between said yoke and said pole-piece, mechanical means for normally holding said armature against its pole-piece, and additional electromagnetic means adapted upon energization to withdraw said armature from its pole-piece.

26. In a relay, the combination with a core, of a coil thereon, a yoke at one end of said core, a pole-piece at the other end thereof, an armature extending between said yoke and said pole-piece, spring switching mechanism for said relay, mechanical means for normally retaining said armature against its pole-piece and to normally maintain said switching mechanism in one position, and additional electromagnetic means adapted upon energization to release said armature from said mechanical means, whereby said switching mechanism may assume another position.

27. In a relay, the combination with a core, of a coil thereon, a yoke at one end of said core, a pole-piece at the other end thereof, an armature extending between said yoke and said pole-piece, spring switching mechanism for said relay, mechanical means for normally retaining said armature against its pole-piece and to normally maintain said switching mechanism in one position, and additional electromagnetic means adapted upon energization to release said armature from said mechanical means, whereby said switching mechanism may assume another position, current-flow through said coil upon release of said mechanical means causing attraction of said armature whereby said switching mechanism is returned to its normal position.

28. In a relay, the combination with two cores, of a coil on each core, a yoke-piece and a pole-piece for each core, an armature extending between each yoke-piece and pole-piece, switching mechanism associated with one armature, mechanical means associated with both armatures for normally retaining the switching mechanism in a normal position, current-flow through the other coil causing release of the mechanical connection, whereby the switching mechanism may assume another position, and simultaneous current-flow through both coils causing said switching mechanism to be returned to its normal position.

29. In a relay, the combination with a yoke, of a core extending therefrom and terminating in a pole-piece, an energizing-winding for said core, a slot in said yoke, an armature having a knife-edge for engaging in said slot, a spring for retaining said armature in said pivot-slot, switch-springs for said armature, and a frame disposed between the free end of said armature and said switching mechanism, said switching mechanism being normally in one position and serving to retain the armature away from the pole-piece, current-flow through said winding causing attraction of the armature to move the switching apparatus to a different position.

30. In a relay, the combination with a core, of a coil thereon, a yoke-piece at one end of the core, a pole-piece at the other end of the core, a slot in said yoke-piece, an armature having a knife-edge for engaging in said slot, a spring for retaining said armature within said slot, switch-springs mounted on said relay, a sheet-metal frame pivoted to the front end of the armature, and insulating-studs at the other end of said frame engaging said switching-springs, said springs being normally in one position and serving to hold the armature away from the pole-piece, current-flow through the coil causing attraction of the armature whereby the switch-springs assume another position.

31. In a relay, the combination with a core, of a coil thereon, a yoke-piece at one end of

the core, a pole-piece at the other end of the core, an armature pivoted on said yoke-piece and extending forwardly with its free end opposite the pole-piece, switch-springs for the relay, a sheet-metal frame pivoted to the free end of the armature, pins extending from the front end of said frame, and insulating-studs engaging said pins and said springs, said springs serving normally to retain the armature away from the pole-piece.

32. In a relay, the combination with a core, of a coil thereon, a yoke-piece at one end of the core, a pole-piece at the other end of the core, an armature pivoted on said yoke-piece and extending forwardly with its free end opposite the pole-piece, switch-springs for the relay, a sheet-metal frame pivoted to the free end of the armature, pins extending from the front end of said frame, insulating-studs engaging said pins and said springs, said springs serving normally to retain the armature away from the pole-piece, current-flow through said coil causing attraction of the armature whereby the springs assume another position, and an adjusting-screw extending through the pole-piece for adjusting the air-gap between said pole-piece and armature.

33. In a relay, the combination with a core, of a coil thereon, a yoke-piece at one end of the core, a pole-piece at the other end thereof, a slot in said yoke-piece, an armature having a knife-edge engaging in said slot, a bifurcated spring secured to the yoke-piece and pivoted to the pivot end of the armature to hold said armature within said slot, and switch-springs actuated by said armature.

In witness whereof I hereunto subscribe my name this 24th day of Febuary, A. D. 1904.

MERRITT S. CONNER.

Witnesses:

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JOHN STAHR.