A. F. F. GILSON AND O. A. SHANN.

STEP-BY-STEP CIRCUIT CLOSING DEVICE.

APPLICATION FILED JULY 12, 1917.

1,378,945. Patented May 24, 1921.

Fig. 1.

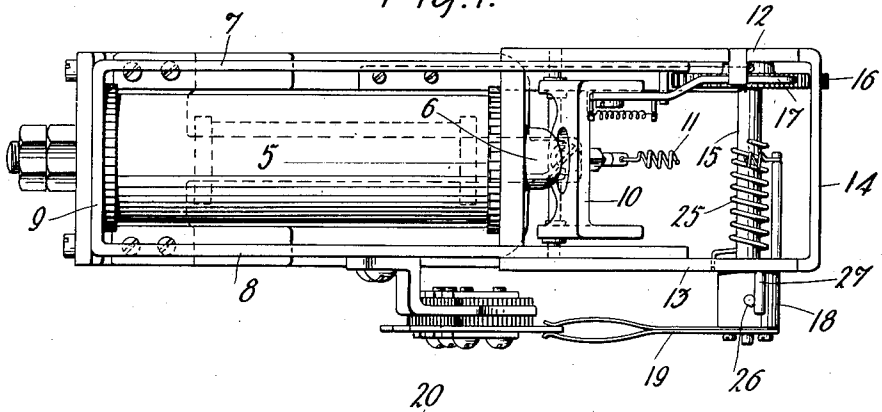


Fig. 2.

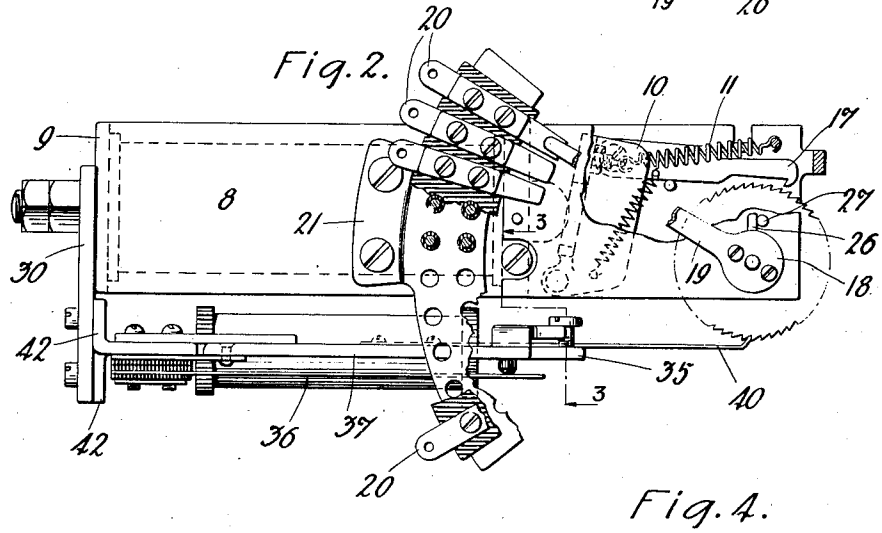


Fig. 4.

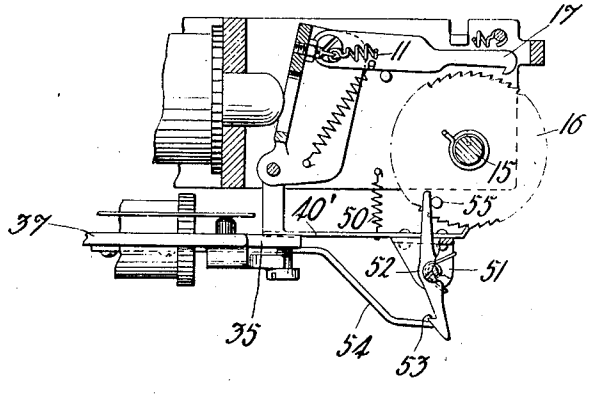
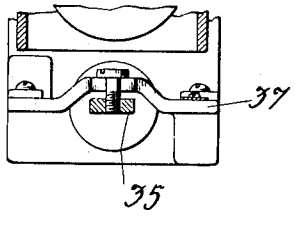


Fig. 3.



Inventors.
Albert F. F. Gilson.
Oscar A. Shann.

by J. H. Roberts Att'y.

UNITED STATES PATENT OFFICE.

ALBERT F. F. GILSON, OF CLOSTER, NEW JERSEY, AND OSCAR A. SHANN, OF BROOKLYN, NEW YORK, ASSIGNORS TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

STEP-BY-STEP CIRCUIT-CLOSING DEVICE.

1,378,945. Specification of Letters Patent. Patented May 24, 1921.

Application filed July 12, 1917. Serial No. 180,161.

To all whom it may concern:

Be it known that we, ALBERT F. F. GILSON and OSCAR A. SHANN, citizens of the United States, residing at Closter, in the county of Bergen and State of New Jersey, and at Brooklyn, in the county of Kings and State of New York, respectively, have invented certain new and useful Improvements in Step-by-Step Circuit-Closing Devices, of which the following is a full, clear, concise, and exact description.

This invention relates to step-by-step circuit controlling devices and has for its object in general the provision of a simple step-by-step circuit closing device, compact and sturdy in structure and efficient in its operation.

A device embodying the features of this invention comprises in general a step-by-step element carrying a movable contact and operated by means of a stepping magnet over a plurality of stationary contacts and against the tension of a spring. A holding pawl normally in engagement with the step-by-step device prevents reverse movement of said step-by-step device until released therefrom by operation of a releasing magnet.

In accordance with the features of this invention, the stepping magnet comprises a winding mounted upon a core and supported between the legs of a U-shaped frame, which also constitute return pole pieces for the magnet. A step-by-step element mounted between extensions of the U-shaped member controls a contact arm adapted to wipe over stationary contacts mounted upon the U-shaped frame. A release magnet of a compact flat type is mounted upon the same mounting plate as the stepping magnet and closely adjacent thereto to form with the stepping magnet a compact structure.

In the drawings illustrating this invention, Figure 1 is a plan view of a device embodying features of this invention; Fig. 2 is a view in side elevation of the device illustrated in Fig. 1; Fig. 3 is a fragmentary cross-sectional view taken upon line 3—3 of Fig. 2; and Fig. 4 illustrates a modification of the device shown in Figs. 1, 2 and 3.

The stepping magnet of this device is essentially the same in form as the service-meter magnet shown and described in the Scribner and McBerty Patent 765,255 issued July 19, 1904, and consists in general of an electromagnet 5 having a core 6, and mounted between the legs 7 and 8 of a U-shaped member 9 of magnetic material. The legs 7 and 8 of said U-shaped member 9 extend forwardly beyond and have pivotally supported between them an armature 10, adapted to be attracted against the tension of a spring 11. Rotatably mounted between legs 12 and 13 of a second U-shaped member 14, which is an extension of the U-shaped member 9, is a shaft 15 upon which is mounted a ratchet wheel 16. Coöperating with the ratchet wheel 16 and adapted to drive the latter step-by-step is a pawl 17 carried by the armature 10. Secured to one end of the shaft 15 and rotatable therewith is a hub member 18, upon which is carried a movable contact set 19, adapted to coöperate with a plurality of stationary contact members 20, 20 mounted upon a supporting plate 21, which is secured to the leg 8 of the U-shaped member 9. A spring 25 surrounding the shaft 15 normally holds said shaft 15 in a position where a stop pin 26 in the hub member 18 engages a stop pin 27 extending from the leg 13 of the U-shaped member 14 and returns said shaft to normal position after operation and release. The stepping magnet is secured to a base or mounting plate 30.

The releasing magnet utilized in this invention is the same in form as the flat type relay shown and described in the patent to E. B. Craft 1,156,671, issued October 12, 1915. In general, this magnet comprises a flat core 35, a winding 36 thereon, and a U-shaped armature 37 which is secured to the rear end of the core and extends along both sides of the winding 36 in the plane of the core 35. In the form of the device illustrated in Figs. 1, 2 and 3, a spring-holding pawl 40 secured to the armature 37 extends forwardly into engagement with the teeth of the ratchet wheel 16 to retain it in advanced position. The operation of the armature 37, responsive to the energization of the winding 36, withdraws the pawl 40 from the ratchet wheel 16 and permits the return of

said ratchet wheel to normal position. The core 35 is provided with lugs 42, 42 by means of which the holding magnet is secured to the base or mounting plate 30, closely adjacent the stepping magnet. The releasing magnet is made slow to release either by means of a winding comprising a number of layers of bare copper wire on the core, or by any well-known expedient.

In the modification of the device shown in Fig. 4 provision is made whereby the holding pawl will be disengaged from the ratchet wheel 16 only upon energization and a subsequent deënergization of the releasing magnet.

In accordance with this modification, a holding pawl 40′ is pivotally mounted upon one leg of the U-shaped extension 14 and is normally held in engagement with the teeth of the ratchet wheel 16 by means of a spring 50. Supported by the holding pawl 40′ is a downwardly extending lug 51 upon which is pivotally supported a spring-pressed dog or latch member 52, one end of which is provided with a notched portion 53, adapted to coöperate with a holding arm 54 carried by the armature 37, the other end of said dog or latch member being adapted to cooperate with a pin 55 in the ratchet wheel 16. Normally the pawl 40′ is in engagement with the ratchet wheel 16. Upon energization of the releasing magnet, the armature 37 will be drawn up to move the holding arm 54 into engagement with the notched portion 53 of the latch member 52 where it will remain so long as the releasing magnet is energized. Upon deënergization of the holding magnet, however, the arm 54 will move the latch member 52 and the holding pawl 40′ downwardly to disengage said holding pawl 40′ from the teeth of the ratchet wheel 16. As the ratchet wheel 16 returns to normal position under pressure of the spring 25, the pin 55 on said ratchet wheel will strike the upper end of the dog or latch member 53 to disengage it from the arm 54 and permit the holding pawl 40′ to reëngage the teeth of the ratchet wheel 16.

What is claimed is:

1. In a step-by-step circuit controlling device, a step-by-step element, a stepping magnet for controlling the advancement of said step-by-step element, a holding pawl for maintaining said step-by-step element in advanced position, a releasing magnet, means controlled by said releasing magnet for disengaging said holding pawl from said step-by-step element upon the energization and deënergization of said releasing magnet, and means controlled by said step-by-step element for causing the engagement of said pawl therewith.

2. In a step-by-step circuit controlling device, a step-by-step element, a stepping magnet for controlling the advancement of said element, a holding pawl normally in engagement with said step-by-step element, a releasing magnet, and means operated upon the energization of said releasing magnet to engage said holding pawl and upon the deenergization of said releasing magnet to withdraw said pawl from engagement with said step-by-step element.

3. In a step-by-step circuit controlling device, a step-by-step element, a stepping magnet for controlling the advancement of said step-by-step element, a holding pawl for maintaining said step-by-step element in advanced position, a releasing magnet, means operable upon one change in magnetization of said releasing magnet to put said holding pawl into operable relation with said releasing magnet, and operable upon a second change in magnetization, to withdraw said pawl from engagement with said step-by-step element.

4. In a step-by-step circuit controlling device, a step-by-step element, a stepping magnet for controlling the advancement of said step-by-step element, a holding pawl for maintaining said step-by-step element in advanced position, a releasing magnet, and means operated by two successive changes in magnetization of said release magnet to withdraw said pawl from engagement with said step-by-step element.

5. In a step-by-step circuit controlling device, a step-by-step element, a stepping magnet for controlling the advancement of said step-by-step element, a holding pawl for maintaining said step-by-step element in advanced position, a releasing magnet controlling said pawl, means controlled by said step-by-step element to restrain said pawl against operation by said release magnet, said means operable by said step-by-step element to release said pawl.

6. In a step-by-step circuit controlling device, a stepping magnet, a U-shaped member between the legs of which said magnet is supported, a supporting plate to which said magnet and said member are secured, an extension carried by the member, a step-by-step element carried by the extension and controlled in its advancement by said magnet, a release magnet secured to the plate adjacent and parallel to the stepping magnet, an armature for the release magnet also secured to the plate and in the plane of the core of the release magnet, and a holding pawl for said element controlled by said armature.

7. In a step-by-step circuit controlling device, a stepping magnet, a U-shaped member between the legs of which said magnet is supported, a supporting plate to which said magnet and said member are secured, an extension carried by the member, a step-by-step element carried by the extension and controlled in its advancement by said mag-

net, a release magnet having a narrow rectangular core secured to the plate adjacent and parallel to the stepping magnet, an armature for the release magnet secured to the supporting plate and in the same plane as the core of the release magnet, and a holding pawl controlled by said armature and normally engaging the step-by-step element.

In witness whereof, we hereunto subscribe our names this 9th day of July, A. D. 1917.

ALBERT F. F. GILSON.
OSCAR A. SHANN.