

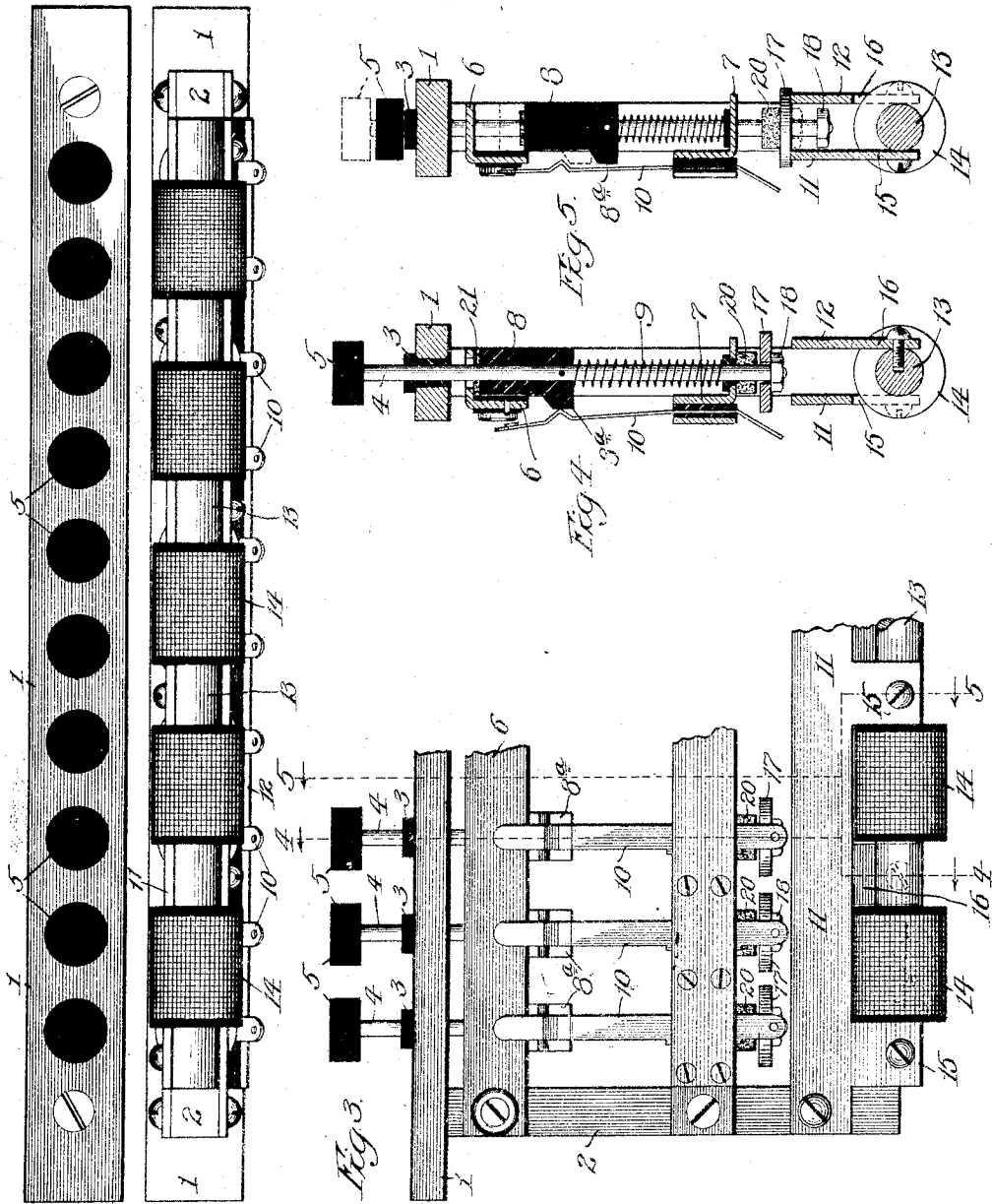
F. R. McBERTY.

LOCKING KEY.

APPLICATION FILED SEPT. 5, 1908. RENEWED AUG. 2, 1910.

987,637.

Patented Mar. 21, 1911.



Witnesses:
 Irving Mac Donald
 McCalland Young.

Inventor:
 Frank R. McBerty.
 By Barton Tanner & Co.
 Attys

UNITED STATES PATENT OFFICE.

FRANK R. McBERTY, OF NEW ROCHELLE, NEW YORK, ASSIGNOR TO WESTERN ELECTRIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

LOCKING-KEY.

987,637.

Specification of Letters Patent.

Patented Mar. 21, 1911.

Application filed September 5, 1908, Serial No. 451,871. Renewed August 2, 1910. Serial No. 575,183.

To all whom it may concern:

Be it known that I, FRANK R. McBERTY, a citizen of the United States, residing at New Rochelle, in the county of Westchester and State of New York, have invented a certain new and useful Improvement in Locking-Keys, of which the following is a full, clear, concise, and exact description.

My invention relates to key construction for controlling electric circuits, and its object is to provide a simplified arrangement of keys and associated contacts in which each key when operated is held electrically in its operated position until the electric holding circuit is opened.

My invention contemplates a group of keys each controlling one or more pairs of contacts and each provided with an armature adapted when the key is operated to be pressed into engagement with the poles of an electromagnet, and thus to be held in its operated position until said electromagnet is deenergized.

The several features of my invention may be more readily understood by reference to the accompanying drawing, in which—

Figure 1 is a top plan view of a group of plunger keys embodying my invention; Fig. 2 is a bottom plan view thereof; Fig. 3 is a fragmentary view in side elevation; Fig. 4 is a section on the line 4—4 of Fig. 3; and Fig. 5 is a section on the line 5—5 of Fig. 3.

Similar reference characters designate similar parts wherever shown.

The face plate 1 may consist of a longitudinal bar or plate mounted at its ends upon standards 2, 2. The face plate is provided with a series of holes in which are placed insulated bushings 3 through which the plunger rods 4 extend. The rods 4 are surmounted with the usual heads or buttons 5. Beneath the face-plate 1, and having their sides likewise secured to the standards 2, are two angle plates 6, 7, the former near the upper end and the latter near the lower ends of the standards. The horizontally extending flanges of said angle-plates 6 and 7 are provided with holes in alinement with the holes in the plate 1 for receiving the plunger-rods 4. Affixed to each plunger rod, beneath the angle-plate 6, is a contact-controlling plunger 8, which is normally held in an elevated position against the plate 6 by means of a coiled spring 9 surrounding the plunger-rod between the plun-

ger 8 and the plate 7. The vertical flange of the angle-plate 7 may serve as a mounting plate for the contact springs 10, said springs being mounted thereon and insulated from the plate and from each other in any suitable manner. The contact springs may be arranged to close with contacts carried upon the plate 6, as shown in the drawings. The closure of the springs 10 is controlled by the plunger 8, said plunger being provided with an enlarged portion 8^a against which the free ends of said springs are adapted to ride, and thus to be actuated to open or close the contacts. It is obvious that other forms of plungers accomplishing the same function may be employed. While I have shown only one contact spring for each plunger, it is obvious that a plurality of springs can be controlled by each plunger in the usual manner.

Secured near the lower ends of the standards 2, 2, are two plates 11, 12, of soft iron or other magnetic material, said plates being secured upon opposite sides of the standards and spaced apart thereby. Beneath the plates 11, 12, and between the lower ends of the standards 2, 2, is mounted a core 13 which projects through a series of electromagnet spools 14. The plates 11 and 12 have lateral flanges 15, 16, respectively, depending therefrom and secured to the core 13 at alternate ends of the spools 14. The spools 14 are so arranged that the adjacent ends of two spools are of the same polarity. Hence consequent positive and negative poles are produced in the core. The plates 11 being connected to one series of such poles and the plates 12 to the other series, it follows that the plates 11 and 12 constitute, as a whole, opposite pole pieces of the electromagnets 14.

The lower end of each of the plunger-rods 4 carries an armature 17 which is adapted to span the pole pieces 11 and 12. Said armature is preferably in the form of an iron disk having a central opening through which the plunger-rod loosely passes, a nut 18 on the end of the rod serving to retain the armature on the rod. Cushioning washers 20, 21, of felt or other suitable material, may be placed upon the rod above the armature 17 and the plunger 8, respectively. The attraction of the pole pieces 11 and 12 for the armature 17 is normally insufficient to move said armature against the tension of the

spring 9, but when a plunger is depressed so that the armature is moved into engagement with the pole pieces, as shown in Fig. 5, the magnetic flux is sufficient to hold said armature against said pole pieces, and thereby to hold the plunger 8 depressed sufficiently to retain the contact spring in its actuated condition.

By having the rod 4 pass loosely through the armature 17, it is possible to provide a positive stop for the plunger beyond the point of depression necessary to actuate the contact springs controlled by the plunger 8, and thus to insure the actuation of said springs. The plunger-rod, when released after depression, returns under the tension of the spring 9 until the nut 18 engages with the washer 17. The position of the spring in its actuated position after pressure of the operator's finger has been removed from the button 5 is shown in dotted lines in Fig. 5. After a key has been depressed and electromagnetically locked in its actuated position, its restoration to its unoperated position is of course dependent upon the deenergization of the electromagnets 14.

I have not deemed it necessary to show any circuit arrangement with which the key structure is designed to be used. Obviously, such keys are capable of a variety of uses, as for example, in a telephone system, for controlling ringing circuits, or in an automatic telephone system for governing the operation of an automatic sending or transmitting mechanism which controls selector switches.

I claim:

1. The combination with a bar of magnetizable material, means for inducing a plurality of positive and negative poles therein, a plurality of pole pieces adapted to cooperate with said poles, and a plurality of keys having armatures movable in the field of said pole pieces.
2. The combination with a bar of magnetizable material, means for inducing consequent alternate poles therein, pole pieces cooperating therewith, armatures adapted to be acted upon by said pole pieces, and a plurality of keys having armatures adapted to be moved into the field of said pole pieces.
3. The combination with a bar of magnetic material, of means for producing a series of consequent positive and negative poles therein, pole pieces each cooperating with a plurality of the positive and negative poles, respectively, and a plurality of keys provided with armatures movable in the field of the pole pieces.
4. The combination with a bar of magnetizable material, of a plurality of energizing winding thereon arranged to induce consequent positive and negative poles therein, pole pieces each cooperating with a plurality of the positive and negative poles re-

spectively, and a plurality of keys provided with armatures movable in the field of the pole pieces.

5. In a telephone switch key, the combination with a bar of magnetizable material, of a plurality of windings thereon each successive winding being oppositely wound, to produce opposite poles in succession, pole pieces each cooperating with a plurality of like poles and a plurality of manually actuated keys provided with armatures movable by said keys in the field of the pole pieces.

6. In a telephone switch key, the combination with a plurality of electromagnet spools mounted at intervals upon a common core and arranged to produce consequent positive and negative poles alternately between the adjacent ends of the spools, pole pieces cooperating each with a plurality of positive and negative poles respectively, a plurality of keys and armatures therefor movable into contact with said pole pieces by said keys.

7. The combination with a plurality of electromagnet spools mounted at intervals upon a common core and arranged to produce consequent positive and negative poles alternately between the adjacent ends of the spools, and two pole pieces connected to said core at the positive and negative poles thereof, respectively, of a plurality of contact controlling keys, contacts controlled by said keys, and an armature carried by each key, said armatures cooperating with said pole pieces to maintain said keys in their actuated positions.

8. The combination with a plurality of electromagnet spools mounted at intervals upon a common core and arranged to produce consequent positive and negative poles alternately between the adjacent ends of the spools, and two pole pieces connected to said core at the positive and negative poles thereof, respectively, of a plurality of spring retracted plungers, contacts controlled by said plungers, and armatures carried by said plungers and arranged to span said pole pieces upon the depression of said keys.

9. In a strip of locking keys, the combination with a frame, of a plurality of electromagnet spools mounted at intervals upon a common core and arranged to produce consequent positive and negative poles alternately between the adjacent ends of the spools, two plates of magnetic material mounted on the frame and secured to said core at the positive and negative poles thereof, respectively, said plates thereby forming opposite pole pieces for the electromagnets, a plurality of contact-controlling keys mounted in the frame, contacts controlled by said keys, and an armature carried by each key, said armatures cooperating with said pole pieces to maintain said keys in their actuated positions.

10. In a strip of locking keys, the combi-

nation with a frame, of a plurality of electromagnet spools mounted at intervals upon a common core and arranged to produce consequent positive and negative poles alternately between the adjacent ends of the spools, two plates of magnetic material mounted on the frame and secured to said core at the positive and negative poles thereof, respectively, said plates thereby forming opposite pole pieces for the electromagnets, a plurality of spring retracted plungers mounted in the frame, contacts controlled by said plungers, and an armature carried by each plunger, said armatures cooperating with said pole pieces to maintain said keys, when depressed, in their actuated positions.

11. In a strip of locking keys, the combination with a frame, of a plurality of electromagnet spools mounted at intervals upon a common core and arranged to produce consequent positive and negative poles alternately between the adjacent ends of the spools, two plates of magnetic material mounted on the frame above said spools and upon opposite sides of said core, said plates each having depending flanges, the flanges of one plate being secured to the positive poles of said core and those of the other plate to the negative poles thereof, said plates thereby constituting opposite pole pieces for said electromagnets, a plurality of spring retracted plungers mounted in the frame, contacts controlled by said plungers, and an armature carried by each plunger above the upper edges of said pole pieces to electromagnetically lock said plungers in a depressed position.

12. Circuit controlling means comprising a frame, an electromagnet mounted thereon, a key movable in said frame and adapted to actuate electrical contacts, and an armature mounted upon said key and movable along the same adapted to maintain said key actuated when moved into contact with said electromagnet.

13. Circuit controlling means comprising a spring retracted key, contacts controlled thereby, an armature movable along said key and adapted to limit the retractile movement of said key, and an electromagnet adapted upon the actuation of said key to attract and hold said armature and thereby maintain said key actuated.

14. Circuit controlling means comprising a frame, an electromagnet mounted thereon, a spring retracted plunger adapted to reciprocate in said frame and actuate electrical contacts, an armature movable along said plunger, and normally held by said retracted plunger against a stop carried upon the frame, said armature being adapted to be moved by said plunger into contact with

said electromagnet whereupon said plunger is maintained depressed.

15. Circuit controlling mechanism comprising a spring retracted plunger-rod, a plunger carried by said rod, contacts controlled by said plunger, an armature mounted upon the end of said rod and longitudinally slidable thereon, and electromagnet poles mounted in position to attract said armature upon the depression of said plunger-rod, and thereby to hold said plunger in its actuated position.

16. Circuit controlling mechanism comprising a spring retracted plunger-rod, a plunger carried by said rod, contacts controlled by said plunger, an iron disk loosely secured upon the plunger-rod, and electromagnet poles mounted in position to be spanned by said disk upon the depression of said plunger-rod.

17. Circuit controlling mechanism comprising a spring retracted plunger, contacts controlled thereby, an iron disk movable longitudinally of said plunger and limiting its retractile movement, an electromagnet having its pole pieces in the form of a channel between which the end of said plunger passes when depressed and upon the sides of which said iron disk impinges and is held, whereby said plunger upon the release of pressure therefrom, is retracted through said disk for a limited distance and is then held in its actuated position thereby until released by the deenergization of said electromagnet.

18. In a strip of locking keys, the combination with a frame, of a plurality of electromagnet spools mounted at intervals upon a common core and arranged to produce consequent positive and negative poles alternately between the adjacent ends of the spools, two plates of magnetic material mounted on the frame and secured to said core at the positive and negative poles thereof, respectively, said plates thereby forming opposite pole pieces for the electromagnets, a plurality of spring-retracted plunger-rods mounted in the frame, plungers carried by said rods, contacts controlled by said plungers, an armature for each plunger-rod mounted on the end of said rod and longitudinally slidable thereon, said armatures cooperating with said pole pieces to electromagnetically lock said keys in their depressed position.

In witness whereof, I hereunto subscribe my name this first day of September, A. D., 1908.

FRANK R. McBERTY.

Witnesses:

D. C. TANNER,
A. H. MOORE.