No. 782,731. PATENTED FEB. 14, 1905.

A. C. EASTWOOD.

MAGNETIC CONTROLLING MECHANISM.

APPLICATION FILED AUG. 27, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

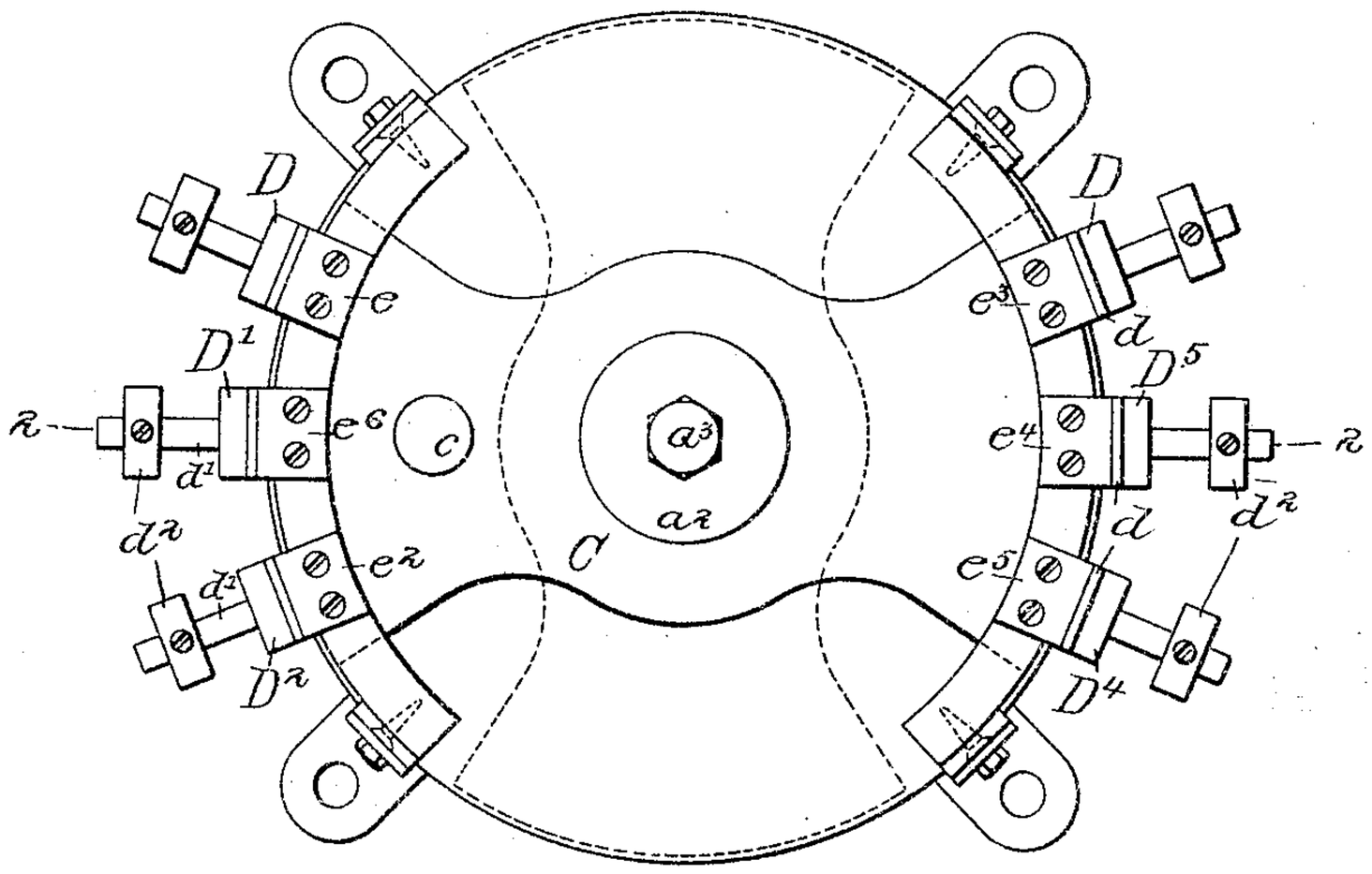
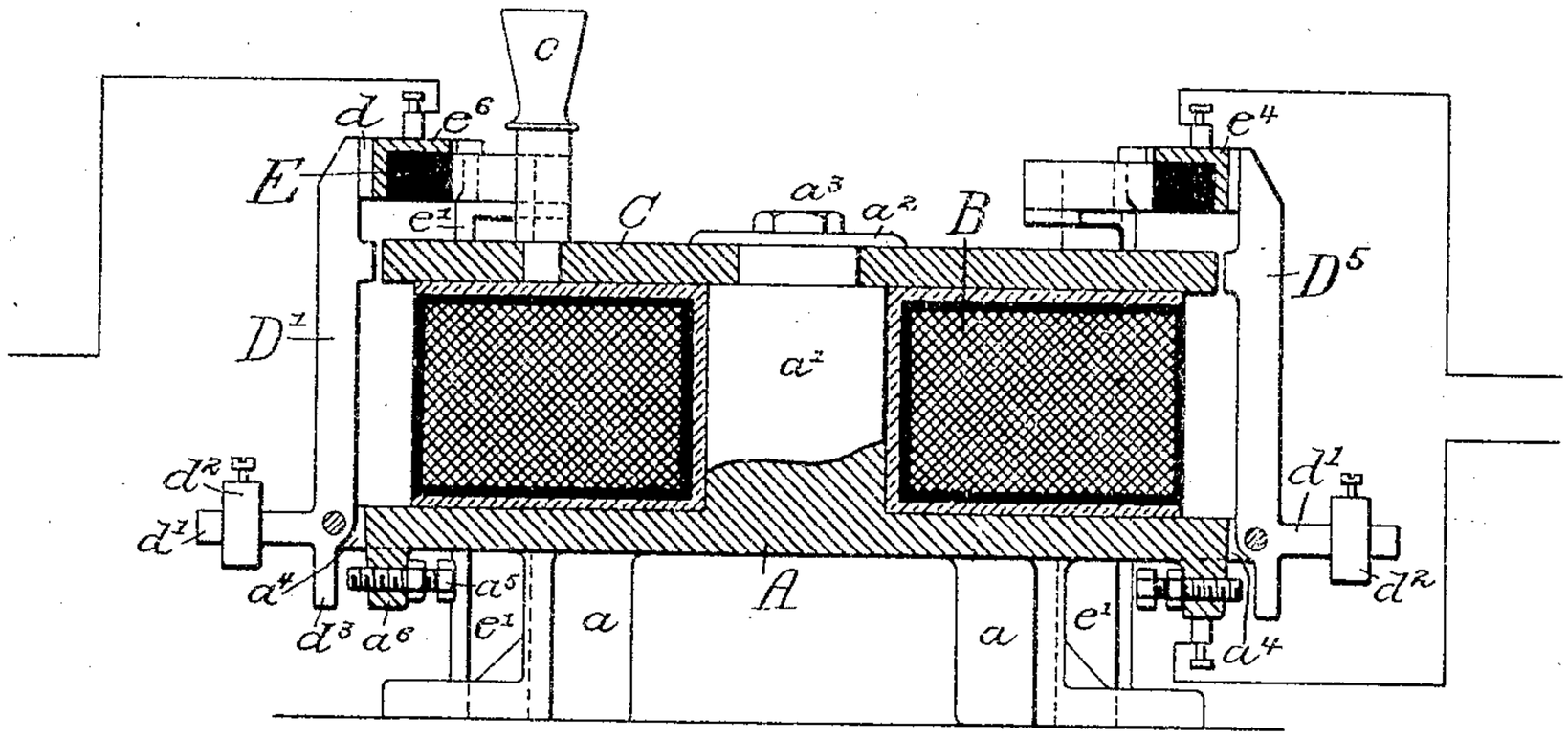


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

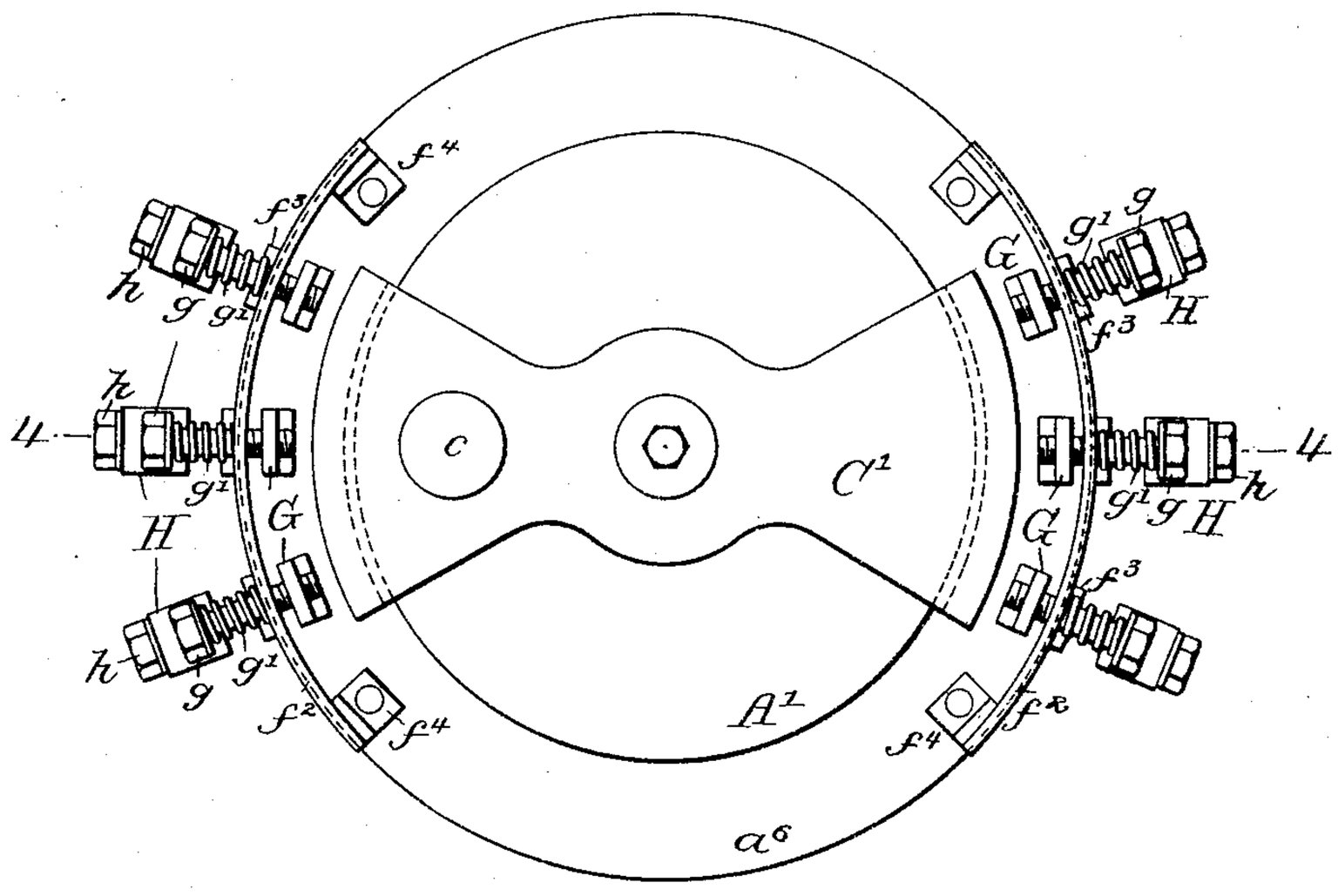
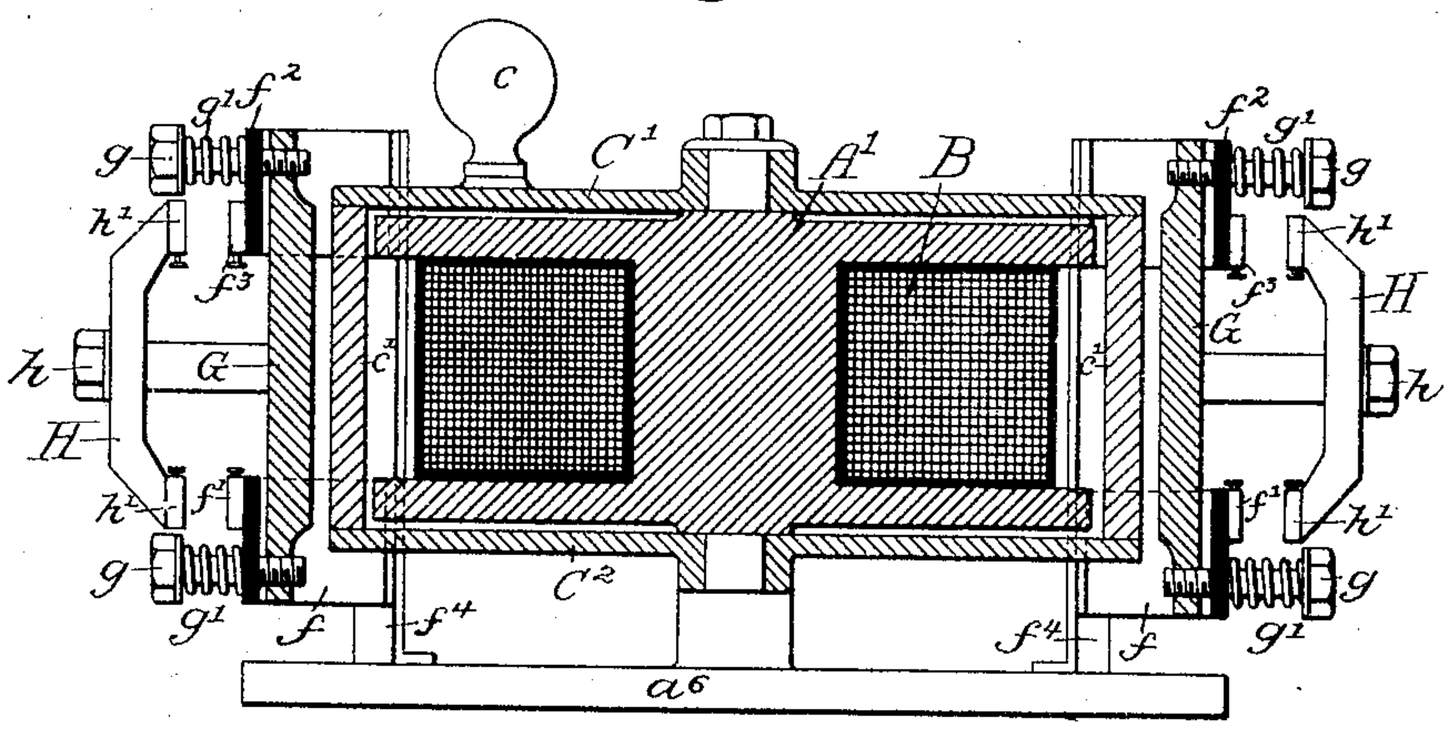


Fig. 4.



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No. 782,731. Patented February 14, 1905.

UNITED STATES PATENT OFFICE.

ARTHUR C. EASTWOOD, OF CLEVELAND, OHIO.

MAGNETIC CONTROLLING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 782,731, dated February 14, 1905.

Application filed August 27, 1904. Serial No. 222,472.

To all whom it may concern:

Be it known that I, ARTHUR C. EASTWOOD, a citizen of the United States, residing in Cleveland, Ohio, have invented certain Improvements in Magnetic Controlling Mechanism, of which the following is a specification.

One object of my invention is to provide an improved circuit-controlling device which shall be of relatively simple and inexpensive construction and of such a nature as to be available in many forms for use in governing the flow of current in a circuit or circuits including various forms of electrical apparatus.

A further object of the invention is to provide a controller including a number of independent switches so designed and arranged that they are necessarily closed in rotation without requiring the auxiliary contacts and connections ordinarily considered necessary for this purpose.

It is also desired to provide a controller which shall do away with the necessity for sliding contacts and in which there is consequently no friction except that of the bearings of the operating members.

It is further desired to produce a device of the character noted which may be manually operated with a minimum of physical effort and which shall therefore be be better adapted to automatic operation than any other device with which I am at present acquainted.

My invention consists, broadly, in providing a series of switches for effecting any desired circuit connections, which switches are normally held either open or closed by springs or gravitational means. Each of these switches has an armature of magnetic material, in addition to which there is a single magnet and some form of device for causing the field of said magnet to successively act upon the armatures of the switches, so as to effect their operation.

In the drawings, Figure 1 is a plan view of one form of my invention. Fig. 2 is a sectional elevation taken on the line 2 2, Fig. 1, illustrating the detail construction of the device. Fig. 3 is a plan view of a special form of the invention, and Fig. 4 is a sectional elevation taken on the line 4 4 of the device shown in Fig. 3.

In the above drawings, A is both the supporting-frame for my improved controller and the core of a magnet, preferably of the annular type, whose winding is illustrated at B, it being of magnetic material and provided with supporting-feet a. Said frame is provided with a portion a', extending through the magnet B and so formed at its upper end as to provide a bearing for a pivotally-supported plate C, in the present instance formed as a flat segment extending on both sides of said bearing and projecting beyond the edge of the magnet-winding, as does also the circular supporting structure A. A washer a^2 and a stud-bolt a^3 normally serve to retain the plate C in position, and this latter is provided with an operating-handle c, whereby it may be conveniently turned on its bearing or pivot.

Projecting from the edge of the supporting structure A are a series of lugs a^4, on which are provided upwardly-extending bars D, of magnetic material, carrying at their upper ends contacts d, arranged to engage a contact suitably supported upon a block E of insulating material carried by standards e', fixed to the supporting structure A. In the present instance I have shown six of the bars D, having corresponding contacts e^2, e^3, e^4, e^5, and e^6 divided into two oppositely-placed groups of three each. Each of the bars has a projecting arm d', upon which is carried a slidable weight d^2, held in any desired position by means of a set-screw, as shown. In addition there is a second arm d^3, extending downwardly and having opposite to it a set-screw d^5, movable in a lug d^6 on the supporting structure A, whereby the amount of opening or separation between the bar D and its corresponding contact e may be regulated, it being noted that the weight d^2 normally maintains the bar in such a position that these contacts are separated. If now the winding B be supplied with current and the plate C be moved from the position indicated in dotted lines in Fig. 1, the first two of the bars D and D' to which the edge of said plate becomes adjacent will be attracted, since the said plate completes the magnetic circuit through them. This causes the contacts carried by said bars to engage their respective fixed contacts e and

e^5. Similarly as the plate C is further turned on its bearings in the direction of the arrow on Fig. 1 the bars D′ and D^5 will be attracted and caused to close the switches of which they form a part. Finally the bars D^2 and D^3 will be attracted so that their contacts engage the fixed contacts e^2 and e^3. It will be seen that at this time when the plate C is in the position shown in full lines in Fig. 1 all of the switches are maintained in a closed position after having been closed in their predetermined order, while as the plate C is moved in the opposite direction from this position said switches are successively opened in pairs as the edge of said plate moves out of that portion of the magnetic circuit of which the switch-bars form a part. It will be noted that since the contacts lie in a relatively strong magnetic field any arc that may form between them will be immediately blown out.

In the form of my invention shown in Figs. 1 and 2 the frame A is connected to one side of the line, the current flowing from it through the various bars D to the several contacts e e^2 e^3, &c., and so to the various circuits or parts of circuits connected thereto.

If desired, I may construct my device as shown in Figs. 3 and 4, in which the magnet B is wound upon a spool-shaped supporting structure A′ and provided with pivotally-supported segmental plates C′ and C^2, adjacent, respectively, to its upper and lower faces. The edges of these plates, which, as before, are of magnetic material, are united by curved pieces c', also of magnetic material. On opposite portions of the base-plate a^6 of the device are carried two sets of insulating-pieces f and f^2, on which are fixed a series of terminal contacts f' and f^3. Said pieces f and f^2 are arranged in pairs vertically over one another, being carried on standards f^4 and each having through it a series of openings, through each of which passes a bolt g, threaded into a bar G of magnetic material, which extends parallel to the vertical elements of the curved piece c'. In Fig. 4 it will be seen that each of said pieces G has fixed to it two of the bolts g, which have springs g' confined between their heads and the insulating-pieces f and f^2, respectively, there being also fixed to each piece G an arm H, held in place by means of a bolt h and having upon it contacts f' and f^3. As long as the revoluble member of the device comprised by the plates C and C′ and the curved pieces c' is in the position shown in Figs. 3 and 4 the magnetic flux of the winding B passes through the core A′ and the parts of said movable element. If, however, this latter be turned on its pivot by means of its handle c into a position at right angles to that shown, the various bars G will be attracted toward the core A′ and will thereby bring the contacts h' into engagement with the contacts f' and f^3, this operation of the switches occurring successively as the movable element is turned from one position to another, while as said movable element is turned into the position shown in Figs. 3 and 4 the switches will successively be brought to an open position by the action of their springs g', since, as before noted, the curved pieces c' of magnetic material short-circuit the magnetic field and permit the bars G to be moved outward.

In the case of that form of my invention shown in Figs. 1 and 2 it will be seen that the closure of the switches is effected by so moving the piece of magnetic material as to complete a magnetic circuit including an armature upon or forming part of the movable element of the switch, whereas in the case of the device shown in Figs. 3 and 4 the movement of the body of magnetic material short-circuits a portion of the magnetic field, so as to permit the opening of the switches under the influence of springs moving an armature attached to the movable element of the switch and otherwise included in the magnetic circuit of the magnet.

From the above it will be appreciated that my improved controller will, as compared with the apparatus at present employed to do the same work, save much material and complication, since only a single magnet is required for the operation of a large number of switches, where otherwise individual magnet-coils are necessarily used for each switch, with a large number of corresponding connections.

I claim as my invention—

1. A circuit-controlling device including a magnet, mechanism to be operated including a piece of magnetic material, and a pole-piece for the magnet movable relatively to said piece of magnetic material and to the magnet-winding, substantially as described.

2. A circuit-controlling device including a magnet, an electric switch having an armature, and a pole-piece for the magnet movable relatively to the armature of the switch and to the magnet-winding, substantially as described.

3. A circuit-controlling device including a magnet, a plurality of electric switches, with a pole-piece for the magnet movable relatively to the switches and to the magnet-winding, said pole-piece being constructed to cause said switches to operate successively, substantially as described.

4. A circuit-controlling device including a stationary magnet, a plurality of electric switches having armatures, and a piece of magnetic material movable relatively to the armatures for controlling the magnetic flux therein, substantially as described.

5. The combination of a magnet, a series of switches, each having an armature of magnetic material, with means supported so as to move upon an axis of the magnet for direct-

ing the field of said magnet relatively to said armatures so as to cause operation of the switches, substantially as described.

6. The combination of a magnet, a switch including an armature of magnetic material, with means rotatable around an axis of the magnet for varying the magnetic flux through said armature and thereby operating the switch, substantially as described.

7. The combination of a constantly-excited magnet, a switch including an armature of magnetic material, with means for varying the flux in different portions of the field of said magnet and thereby operating the switch, substantially as described.

8. The combination of a constantly-energized magnet, a switch including an armature of magnetic material, with a piece of magnetic material movable in the field of the magnet for varying the magnetic flux through said armature and thereby causing the operation of the switch, substantially as described.

9. The combination of a magnet, a switch or switches including a piece of magnetic material fixed to its movable element or elements, with an armature for the magnet and means for guiding the same so as to vary the magnetic flux in the piece of magnetic material fixed to the movable element of the switch, substantially as described.

10. The combination of a core of magnetic material, a magnet-winding thereon, a switch having connected to its movable element a piece of magnetic material adjacent to said core, with an armature for the magnet movable so as to vary the magnetic flux through the piece of magnetic material on the switch, substantially as described.

11. The combination of a magnet, a pivotally-supported armature therefor, a switch having connected to it a piece of magnetic material, with means for guiding the armature of the magnet so as to cause the magnetic material on the switch to be attracted to said magnet and thereby operate the switch, substantially as described.

12. The combination of a magnet, a pivotally-supported plate of magnetic material adjacent thereto, a series of switches, each having a portion of magnetic material and supported adjacent to the magnet, with means for introducing said plate successively into those portions of the field of the magnet including the magnetic pieces on the switches, substantially as described.

13. The combination of a magnet, a switch supported adjacent thereto and including a contact and a bar of magnetic material, a movable plate of magnetic material, said plate and bar being both included in the field of said magnet when said switch is in one position, and means for maintaining said switch in its other position when said plate and bar are relatively distant from one another, substantially as described.

14. The combination of a magnet, a series of switches having their movable elements pivotally supported around said magnet, said movable elements including portions of magnetic material, fixed contacts to the switches, means for normally maintaining the switches in an open position and a pole-piece for the magnet movable relatively to said portions of magnetic material on the switches for successively closing the latter, substantially as described.

15. A controller including a switch provided with an armature of magnetic material, a magnet, and an armature for said magnet for varying the magnetic flux through the switch-armature, the contacts of the switch being within the field of the magnet, substantially as described.

16. A controller including a plurality of switches, with a single stationary magnet having a pole-piece movable relatively to the switches, said pole-piece being directly operative upon but independent of said switches for causing operation of the same, substantially as described.

17. The combination of means for producing a magnetic circuit including a relatively stationary and a movable member, means in addition to said stationary member for operating said latter member, and means independent of the members for increasing the magnetic flux in the circuit simultaneously with the movement of the second member, substantially as described.

18. The combination of a magnet, a switch having a piece of magnetic material, with means for directing the field of said magnet relatively to said piece of magnetic material to cause operation of the switch, said magnet being at a fixed distance from said switch, substantially as described.

19. The combination of a magnet, apparatus to be operated thereby including a piece of magnetic material, mounted adjacent to the magnet upon supports at a constant distance therefrom, with means for directing the field of the magnet relatively to said magnetic material to cause operation of said apparatus, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ARTHUR C. EASTWOOD.

Witnesses:
C. W. COMSTOCK,
J. E. WELLMAN.