

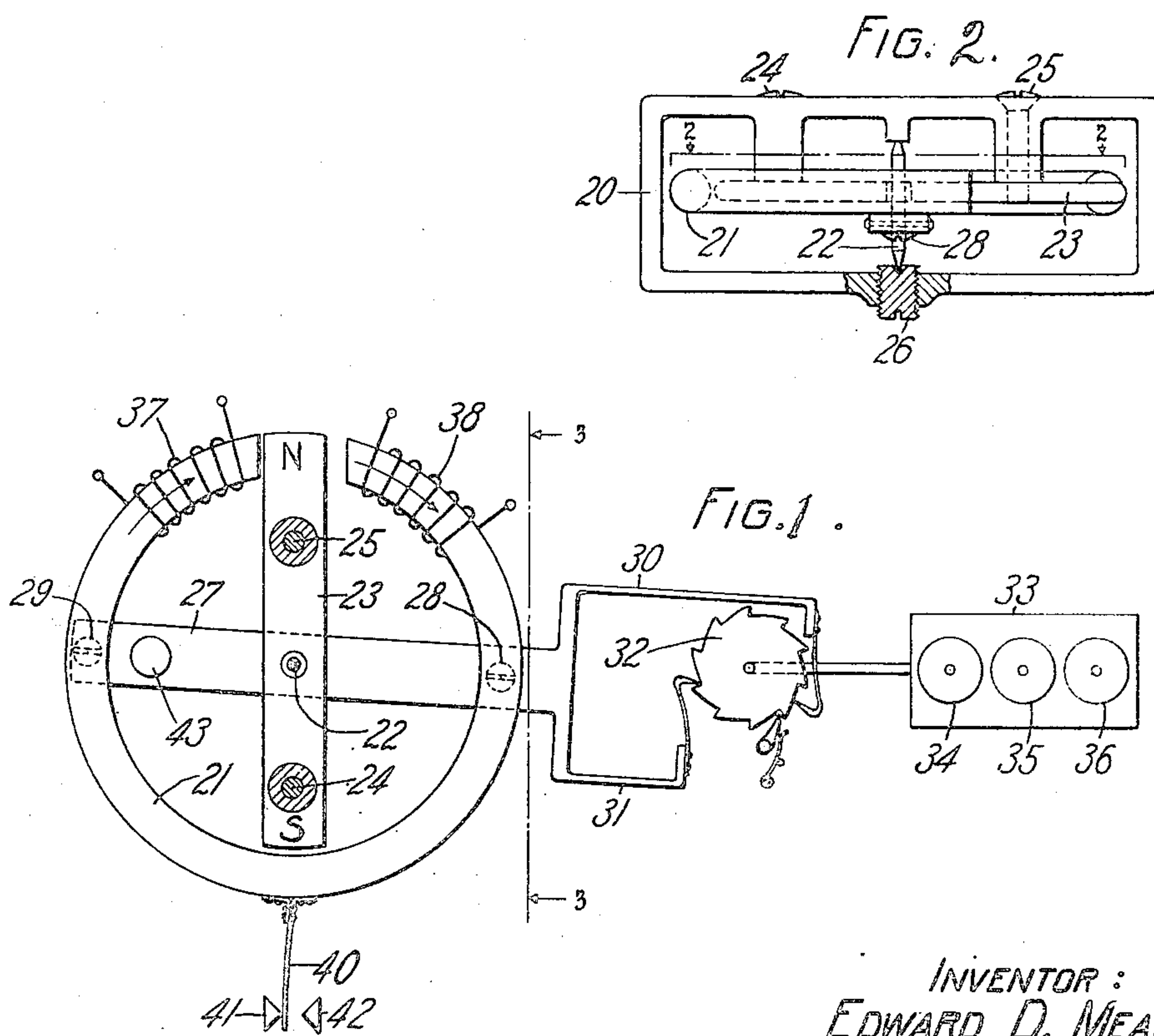
Jan. 14, 1930.

E. D. MEAD

1,743,470

MAGNETIC DEVICE

Filed Oct. 21, 1927



INVENTOR :
EDWARD D. MEAD
By *W. B. McKenney*
ATTORNEY

UNITED STATES PATENT OFFICE

EDWARD D. MEAD, OF CALDWELL, NEW JERSEY, ASSIGNOR TO BELL TELEPHONE LABORATORIES, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

MAGNETIC DEVICE

Application filed October 21, 1927. Serial No. 227,710.

This invention relates to magnetic actuating devices and particularly to such devices when applied to service meters for telephone systems.

5 Its object is to secure compactness and simplicity and to otherwise improve the construction and operation of devices of this character.

It has been the practice, heretofore, in
10 constructing the magnetic actuating devices for telephone substation meters, to employ permanent magnets which are so shaped as to provide a substantially closed magnetic circuit in order to secure the required magnetic
15 strength and to prevent too rapid deterioration. This necessitates a complicated and expensive construction and a disadvantageous arrangement of parts.

According to the present invention an in-
20 expensive and compact construction is secured by employing a simple form of permanent magnet enclosed by the oscillating armature of the electromagnet in such a manner that said armature serves as the return
25 path for the permanent magnet flux in addition to coacting therewith to furnish the necessary movement to actuate the driven element.

30 Figs. 1 and 2 of the drawing show the detailed construction of a device embodying the features of the invention.

A detailed description will now be given of the construction and operation of the device. The device comprises a stationary
35 frame and housing 20 within which is mounted the oscillating member 21. The member 21 is circular in shape and is supported on the pivot 22 to oscillate through a small arc. It may consist of some magnetic material
40 such as soft iron and serves as the armature for the stationary coils 37 and 38. These coils form a solenoid through which the armature 21 oscillates.

A straight permanent magnet 23 is secured
45 to the frame 20 by screws 24 and 25 and lies in the plane including the armature 21. The armature 21 is separated to provide a double air gap at one end of the stationary permanent magnet 23.

50 By energizing the coils 37 and 38 with cur-

rent flowing in a given direction a polarity is established in the tips of the electromagnetic armature 21 such that the action between the armature 21 and the permanent magnet 23 causes the armature to rotate in one direc-
55 tion. When current is reversed in the windings 37 and 38 the opposite polarity is established and the armature rotates in the other direction.

A member 27 having the extensions 30 and
60 31 is attached to the oscillating armature 21 by means of screws 28 and 29. The extensions 30 and 31 carry pawls which act upon the ratchet 32 to advance the recording elements 34, 35 and 36 of the meter 33. The
65 pawls act upon the ratchet 32 in such a way that it is advanced on each movement of the armature 21.

For a detailed explanation of a suitable method of reversing the flow of current to
70 cause the successive actuations of the device, reference is made to the patent to Beattie, No. 912,268, granted February 9, 1909.

It will be seen that the device described
herein is of a simple and compact design re-
75 quiring a small amount of space. Since the armature 21 encloses and surrounds the permanent magnet it serves as an efficient return path for the permanent magnet flux. This construction enables the use of a simple bar
80 permanent magnet which is preserved against deterioration.

In order to compensate for the variable force between the magnet 23 and the arma-
85 ture 21, a flexible spring 40 is attached to said armature and arranged to engage the stops 41 and 42 as the free ends of the armature approach the magnet 23.

To insure an accurate balance for the arma-
90 ture 21, a counter-weight may be provided to compensate for the weight of the pawl mechanism 30 and 31. This may be done by an insert 43 of some heavy material.

It will be understood that various modifica-
95 tions in the construction of the device may be made. For example, the permanent magnet 23 may be pivoted to oscillate while the electromagnetic armature 21 is made stationary. It will also be understood that any
100 suitable type of controlling mechanism may

be employed for energizing the coils 37 and 38.

What is claimed is:

1. The combination in a magnetic device of a permanent magnet, an electromagnetic winding, an armature movable in response to the energization of said winding, said armature surrounding said permanent magnet and coacting therewith, and a driven element operated by said armature.

2. The combination in a magnetic device of a bar permanently magnetized, an electromagnetic winding, a rotatable armature responsive to the energization of said winding, said armature surrounding said bar and serving as a return path for its flux, and means actuated by said armature.

3. The combination in a magnetic device of a permanent magnet, an electromagnetic winding, a circular armature for said winding enclosing said permanent magnet and pivoted to rotate about its center in response to energizations of said winding, said armature serving as a return path for the flux of said permanent magnet, and an element operated by said armature.

4. The combination in a magnetic device of a permanently magnetized bar, a solenoid, an armature for said solenoid enclosing said bar and serving as a return path for its flux, said armature arranged to oscillate from one position to another in response to energizations of said solenoid, and a driven element actuated by said armature.

5. The combination in a magnetic device of an electromagnetic armature comprising a substantially closed ring, a stationary permanent bar magnet surrounded by and having one end projecting into the space formed by the opposing ends of said armature, windings loosely surrounding said armature and serving when energized to cause it to oscillate between two extreme positions, said armature arranged to remain in either extreme position until moved to the other said position, a driving element secured to said armature, and a housing for said armature and stationary magnet.

6. In combination, an armature of electromagnetic material so shaped as to form a substantially closed ring with the opposing ends thereof serving as electromagnetic pole-pieces, said armature being pivoted at the center of the ring and arranged to oscillate through a small arc between two extreme positions and to remain in either of said positions until moved to the other, a stationary permanent bar magnet surrounded by said ring and diametrically disposed in the plane thereof with one of its poles projecting into the space formed by the opposing ends of said armature, stationary windings encircling said armature near its poles and serving when energized to cause it to oscillate, and

a driving element secured diametrically across said ring-shaped armature.

7. In combination, an electromagnetic armature so shaped as to form a substantially closed ring with the opposing ends thereof serving as pole-pieces, said armature being pivoted at the center of the ring and arranged to oscillate through an arc between two extreme positions and to remain in either position until moved to the other, a stationary bar-shaped permanent magnet diametrically disposed in the plane of said ring with one end adjacent to the continuous portion of the ring and forming therewith a low reactance air-gap, the other end of said permanent magnet projecting into the space between the opposing ends of said armature and forming air-gaps therewith, stationary solenoid windings surrounding said armature near its poles and serving when energized by current flowing in different directions to cause the armature to oscillate, and a driving element secured diametrically across said ring-shaped armature at right angles to the stationary permanent magnet.

In witness whereof, I hereunto subscribe my name this 17th day of October, A. D. 1927.

EDWARD D. MEAD.

DISCLAIMER

1,743,470.—*Edward D. Mead*, Caldwell, N. J. MAGNETIC DEVICE. Patent dated January 14, 1930. Disclaimer filed August 4, 1930, by the assignee, *Bell Telephone Laboratories, Incorporated*.

Hereby enters this disclaimer to the said claim of said Letters Patent which is in the following words, to wit:

"1. The combination in a magnetic device of a permanent magnet, an electromagnetic winding, an armature movable in response to the energization of said winding, said armature surrounding said permanent magnet and coacting therewith, and a driven element operated by said armature."

[*Official Gazette August 26, 1930.*]