

F. CEDERGREN.
UNDULATING CURRENT APPARATUS.
APPLICATION FILED OCT. 7, 1907.

913,104.

Patented Feb. 23, 1909.
2 SHEETS—SHEET 1.

Fig. 2.

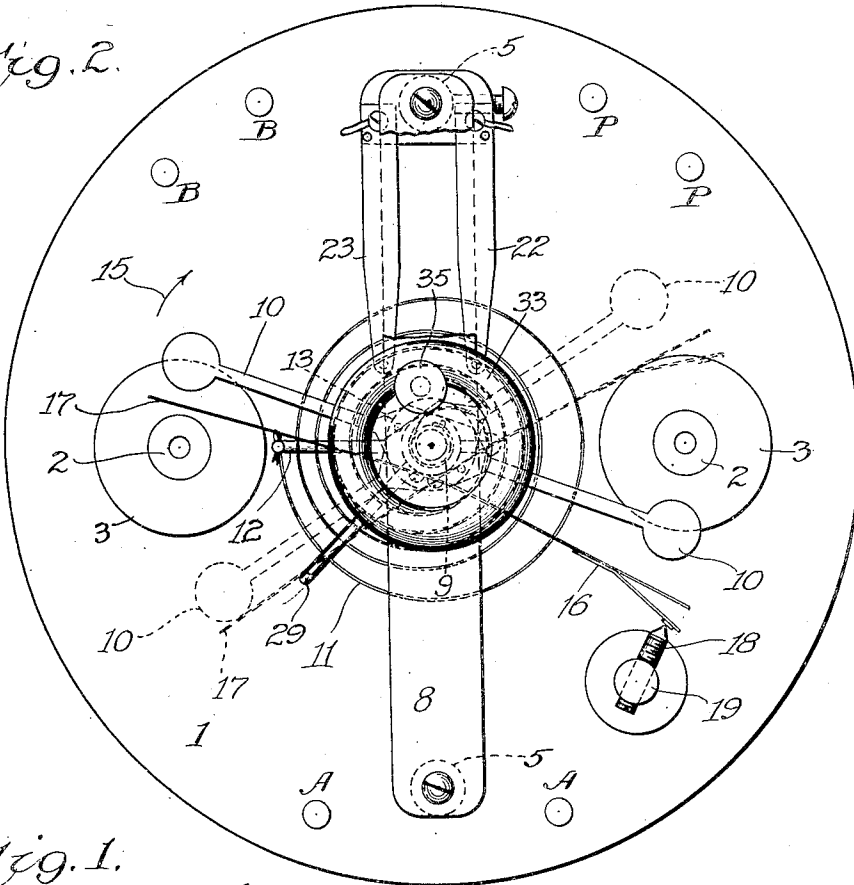
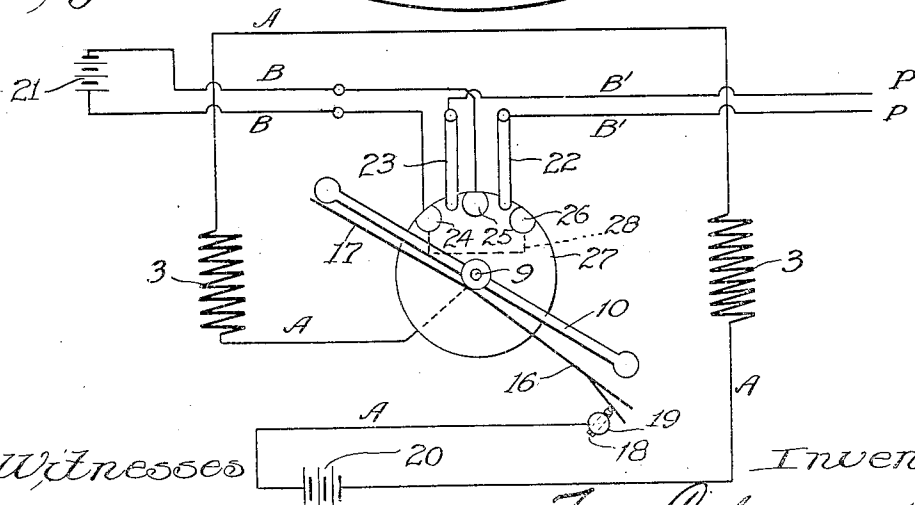


Fig. 1.



Witnesses

Harry R. Lovlie
M. H. Olsen

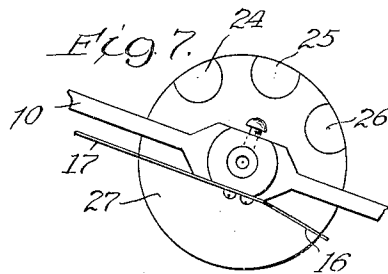
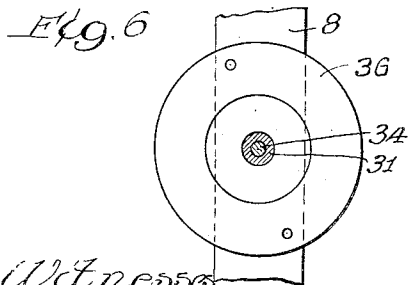
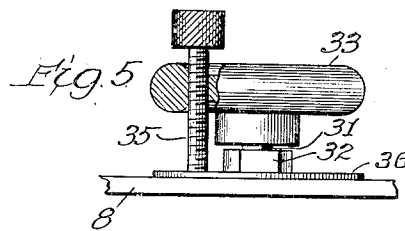
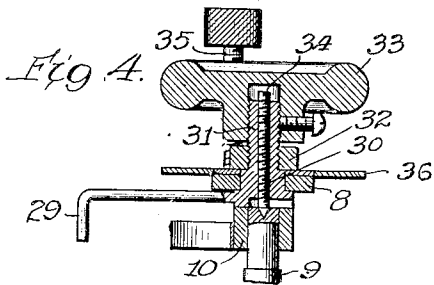
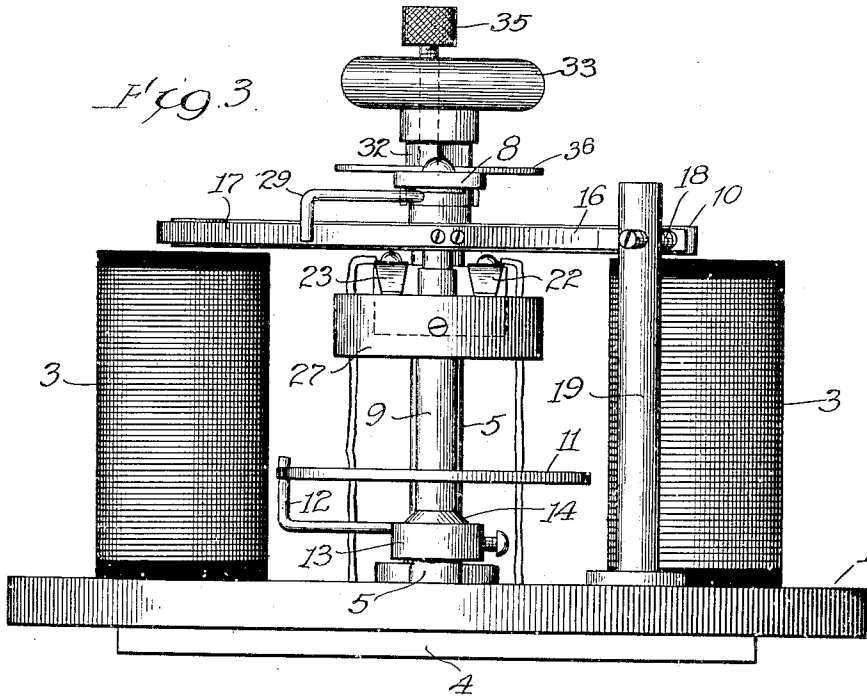
Inventor

Fred Cedergren,
By Hummel & Hummel,
Attys.

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UNDULATING CURRENT APPARATUS.
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2 SHEETS—SHEET 2.



Witness
Harry R. White
M. H. Olsen.

Inventor:
Fred Cedergren,
By Rummel & Rummel,
Attys

UNITED STATES PATENT OFFICE.

FRED CEDERGREN, OF HAMMOND, INDIANA, ASSIGNOR OF ONE-HALF TO FRANK S. BETZ, OF HAMMOND, INDIANA.

UNDULATING-CURRENT APPARATUS.

No. 913,104.

Specification of Letters Patent.

Patented Feb. 23, 1909.

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To all whom it may concern:

Be it known that I, FRED CEDERGREN, a citizen of the United States of America, and a resident of Hammond, Lake county, Indiana, have invented certain new and useful Improvements in Undulating-Current Apparatus, of which the following is a specification.

The main objects of this invention are to provide an improved form of apparatus for producing from one source intermittent, alternating and undulatory electric currents having different characteristics; to provide a device of this character in which by simple adjustment the rapidity of the pulsations of the current may be readily adjusted; to provide an improved device in which the making and breaking of an electric current, due to the movement of a vibrating armature of a magnet, may be utilized for producing an alternating or undulating current in another electric circuit; to provide an improved construction for electro-magnets having oscillating armatures, and to provide in such devices improved means for limiting the amplitude of the oscillations of the armature, and an improved form of stop for controlling such oscillations. These objects are accomplished by the device shown in the accompanying drawings, in which—

Figure 1 is a diagrammatic representation of an apparatus constructed according to this invention for producing intermittent alternating and undulating electric currents. Fig. 2 is a top plan of the same, omitting the electrical connections. Fig. 3 is a side elevation of the device shown in Fig. 2. Fig. 4 is a detail, partly in section, of the mechanism for adjusting the stop for the vibrating armature. Fig. 5 is a detail showing the locking screw which clamps the adjustment shown in Fig. 4 so as to prevent shifting of the stop. Fig. 6 is a detail of the plate upon which the locking screw shown in Fig. 5 bears. Fig. 7 is a top plan, partly broken away, of the armature and the contact disk or commutator.

The device shown in the drawings comprises a base 1, having mounted thereon an electro-magnet, the poles of which are designated 2 in Fig. 2, the coils being designated 3.

4 of Fig. 3 represents the yoke connecting the cores of the coils 3. The supporting

frame comprises a pair of uprights 5 mounted on the base 1, and connected at their upper ends by a cross-piece 8.

A spindle 9, pivotally mounted between the base 1 and the cross-bar 8 midway between the cores of the magnet, carries at its upper end the armature 10. The armature 10 is rigid on the spindle 9, and said spindle is connected with the inner end of a spiral spring 11, whose outer end is connected with an arm 12 carried by an adjustable collar 13 on the lower bearing 14 of the spindle 9. The spring 11 normally urges the armature 10 in the direction of the arrow 15 of Fig. 2, and when the magnet is energized it draws the armature in the opposite direction against the action of said spring. A flat spring secured to one side of the armature 10 provides the spring stop arms 16 and 17, which yieldingly stop and reverse the movement of the armature in each direction. The arm 16 is provided with a platinum contact adapted to make electrical connection with an adjustable contact screw 18 mounted on the upright 19.

The conductors of the actuating circuit are designated A in Fig. 1, and include the windings 3 of the magnet, the spring arm 16 of the armature, and a source of current which is indicated as a battery 20. The conductors of the circuit whose current is to be varied are indicated at B in the drawings, and include, in the device shown, the patient's binding posts P, the battery 21, the brushes 22 and 23, and the contacts 24, 25 and 26 of the commutator 27. The commutator 27 has a series of contact points, upon which the brushes bear, and alternate contact points are connected with opposite leads of the battery circuit B, so that an oscillating movement of the commutator will cause successive reversals of the current in the patient's circuit B', as will be readily understood from Fig. 1.

The swinging of the armature 10 in the direction opposite that of the arrow 15 is limited through contact of the spring arm 17 with the stop arm 29. The stop arm 29 has a journal 30 rotatably mounted in the cross-bar 8, as shown in Fig. 4, and provided with upwardly disposed threaded extension 31 upon which is mounted a nut 32 and a handle 33. The handle 33 is rigidly secured to the

extension 31, and serves for adjusting the position of the arm 29 about the axis of its journal. The upper bearing of the spindle 9 comprises a screw 34, which extends longitudinally through the journal 30 and has a conical point seated in a socket in the upper end of spindle 9. A disk or washer 36 is mounted on the bar 8 concentrically of the journal 30, and serves as a surface against which the locking screw 35 bears for locking the handle 33 in any desired position. The locking screw 35 is provided with a knurled head, so that it may be readily rotated.

The operation of the device shown is as follows: When the circuit A is closed, the magnet will be energized, and the armature thereof will be swung in a counter-clockwise direction. This movement of the armature breaks the circuit at the contact 18 and de-energizes the magnet, but the momentum of the armature causes it to swing until stopped by the engagement of the spring arm 17 with the stop arm 29. The spring 11 then returns the armature to its initial position, again completing the circuit A, and thereby causing the energizing of the magnet and so on, the armature oscillating between the stop arm 29 and the contact 18. The oscillation of the armature 10 causes intermittent changes in the direction of the current in the circuit B', or alternate making and breaking of said circuit, or any desired combination of changes in direction and breaks in the current, depending upon the arrangement and spacing of the contacts of the commutator, and also depending upon the amplitude of the oscillations of the armature 10. The stop 29 may be adjusted so that the vibration of the armature will be fast and of short amplitude, or of long amplitude and slow. This adjustment of the stop 29 is made by loosening the lock screw 35, and turning the handle 33 to bring the stop 29 to the desired angular position. The stop arm 29 may be adjusted so that the amplitude of the vibration of the armature 10 is just sufficient to shift the brushes one contact space, thereby producing an alternating current in the patient's circuit B', or it may be adjusted so that the amplitude of oscillation is so great that there will be intervals in which the circuit is broken between successive reversals of the current. The position of the stop 29, therefore, determines the frequency of the alternation and the character of the undulations in the patient's circuit.

What I claim as my invention, and desire to secure by Letters Patent, is:

1. An apparatus of the class described, comprising an electro-magnet, an armature mounted to oscillate at the poles of said magnet, a commutator mounted to oscillate through the oscillation of said armature and having thereon a plurality of contacts, brushes bearing on said contacts and con-

nected in an electric circuit, said contacts being insulated from each other and connected in said circuit so as to cause changes in the direction of the current in the circuit through the oscillation of said commutator, and means for changing the amplitude of the oscillation of said commutator.

2. The combination of an electro-magnet, an actuating circuit therefor, a balanced armature pivotally mounted between the poles of said magnet and free to swing without contact therewith, a contact on said armature connected with one conductor of said circuit, a second contact connected with another conductor in said circuit and adapted to engage with the first contact to close said circuit when the armature is in a certain position away from the poles of the magnet, means normally urging said armature toward said certain position, said circuit being broken when said armature is attracted by the magnet, and an adjustable stop for limiting the movement of said armature away from said second contact, all being arranged to cause said armature to oscillate through a predetermined angular interval and to permit said interval to be varied at the will of an operator.

3. The combination of an electro-magnet, an actuating circuit therefor, a balanced armature pivotally mounted between the poles of said magnet and free to swing without contact therewith, a contact on said armature connected with one conductor of said circuit, a second contact connected with another conductor in said circuit and adapted to engage with the first contact to close said circuit when the armature is in a certain position away from the poles of the magnet, means normally urging said armature toward said certain position, said circuit being broken when said armature is attracted by the magnet, an adjustable stop for limiting the movement of said armature away from said second contact, said stop comprising an arm pivotally mounted in axial alinement with said armature and having a part extending into the path of said armature, and means for clamping said arm in different angular positions.

4. The combination of an electro-magnet, an actuating circuit therefor, a balanced armature pivotally mounted between the poles of said magnet and free to swing without contact therewith, a contact on said armature connected with one conductor of said circuit, a second contact connected with another conductor in said circuit and adapted to engage with the first contact to close said circuit when the armature is in a certain position away from the poles of the magnet, means normally urging said armature toward said certain position, said circuit being broken when said armature is attracted by the magnet, an adjustable stop for limiting

the movement of said armature away from said second contact, said stop comprising an arm pivotally mounted in axial alinement with said armature and having a part extending into the path of said armature, means for clamping said arm in different angular positions, and a spring interposed between said armature and stop and adapted to cushion the contact between them.

5 5. The combination of an electro-magnet, an actuating circuit therefor, a balanced armature pivotally mounted between the poles of said magnet and free to swing without contact therewith, a contact on said armature connected with one conductor of said circuit, a second contact connected with another conductor in said circuit and adapted to engage with the first contact to close said circuit when the armature is in a certain position away from the poles of the magnet, means normally urging said armature toward said certain position, said circuit being broken when said armature is attracted by the magnet, an adjustable stop for limiting the movement of said armature away from said second contact, said stop comprising an arm pivotally mounted in axial alinement with said armature and having a part extending into the path of said armature, a fixed support for said stop arm, and a locking screw bearing between said arm and said

support for locking said arm in different angular positions.

6. The combination of an electro-magnet, an actuating circuit therefor, a balanced armature pivotally mounted between the poles of said magnet and free to swing without contact therewith, a contact on said armature connected with one conductor of said circuit, a second contact connected with another conductor in said circuit and adapted to engage with the first contact to close said circuit when the armature is in a certain position away from the poles of the magnet, means normally urging said armature toward said certain position, said circuit being broken when said armature is attracted by the magnet, an adjustable stop for limiting the movement of said armature away from said second contact, a commutator secured in axial alinement with said armature and rotatable therewith, brushes bearing on said commutator, and an electric circuit including said brushes and commutator and separate from said actuating circuit.

Signed at Chicago this 31st day of August 1907.

FRED CEDERGREN.

Witnesses:

MARY M. DILLMAN,
E. A. RUMMLER.