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D. LARSON.

ALTERNATING CURRENT MAGNETIC APPARATUS.

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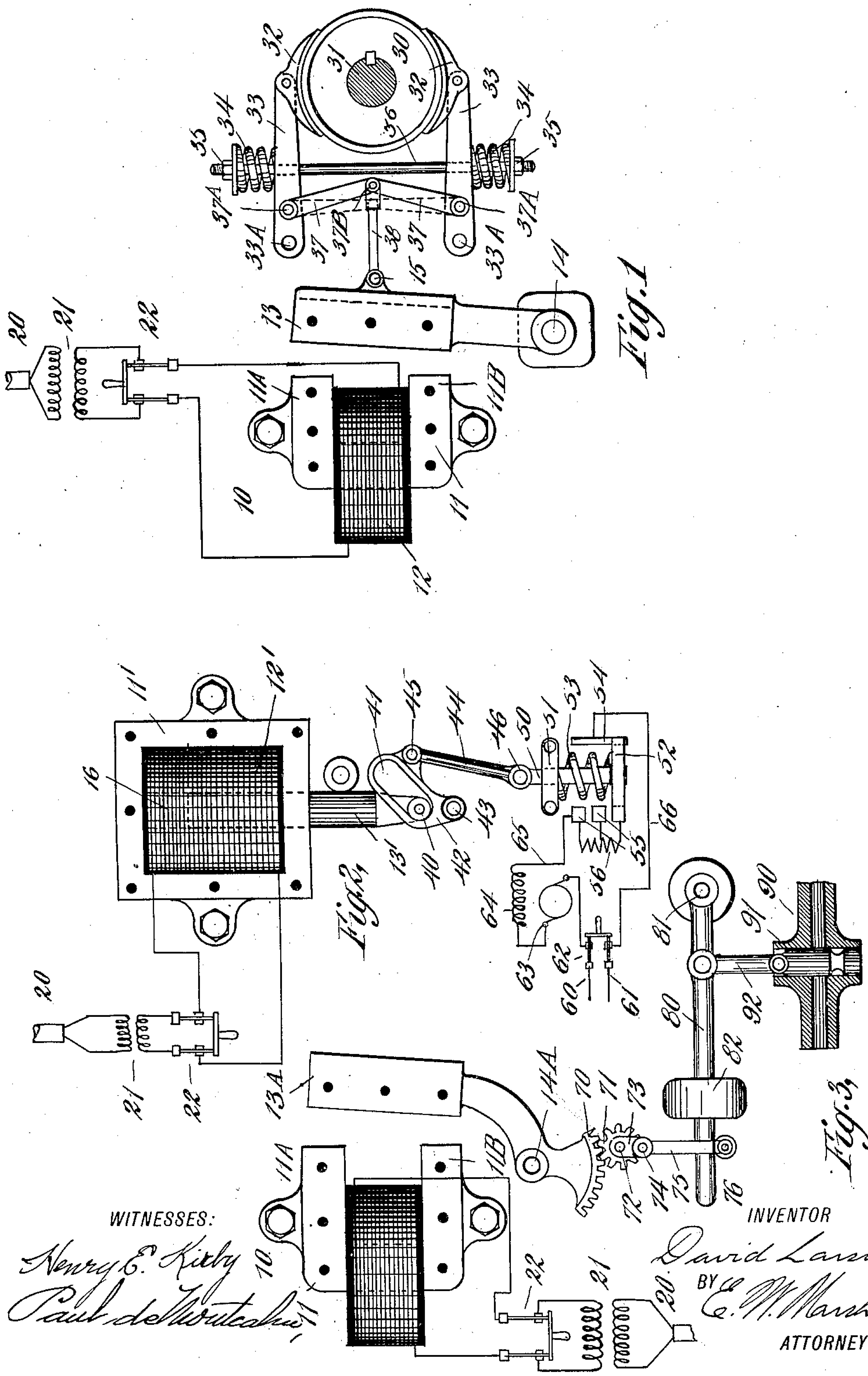

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ALTERNATING-CURRENT MAGNETIC APPARATUS.

No. 837,853. Specification of Letters Patent. Patented Dec. 4, 1906.

Application filed November 15, 1905. Serial No. 287,478.

To all whom it may concern:

Be it known that I, DAVID LARSON, a subject of the King of Sweden, and a resident of Yonkers, New York, have invented certain new and useful Improvements in Alternating-Current Magnetic Apparatus, of which the following is a specification.

My invention relates to alternating-current magnetic apparatus for use in conjunction with alternating intermittent or pulsating current; and its object is to provide simple and efficient apparatus of this kind which will be free from the chattering noise which is usually found in alternating-current apparatus.

I will describe my invention in the following specification and point out the novel features thereof in claims.

Referring to the drawings, Figure 1 is a diagrammmatic representation in side elevation of an electromagnetic apparatus made according to my invention and applied to an electrically-actuated brake. Fig. 2 shows a modification of my invention, applied in this case to actuate a motor-starting rheostat; and Fig. 3 is another modification of my invention, in this case applied to actuate a valve.

Like characters of reference designate corresponding parts in all of the figures.

10 designates an electromagnet, which comprises a frame 11, preferably constructed of laminated magnetic material, a winding or coil 12, arranged to energize this frame, and an armature 13, also constructed of laminated magnetic material. This armature may be pivoted, as shown in Fig. 1, at 14.

20 designates the mains from a suitable source of an electrical supply, which, after passing through a transformer 21, may be connected, by means of a manually-operated switch 22, to the coil or winding 12 of magnet 10.

Referring now to Fig. 1, 30 designates a brake-pulley rigidly mounted upon a shaft 31. Brake-shoes 32 32 are arranged to be supported upon levers 33 33, which are pivoted at 33^A 33^A and are arranged to be pressed against the pulley 30 by means of springs 34 34. These springs are arranged to press upon the outside of levers 33 33, and their tension may be regulated by means of nuts 35 35, which are on the outside ends of a rod 36, which extends through both of the levers 33 33. The levers 33 33 are connected together by means of two other levers 37 37, which are connected to levers 33 33 by pivots 37^A 37^A, and are connected together at their other ends by pivot 37^B and are in the position shown by full lines in the drawings when the brake-shoes 32 32 are applied to the brake-pulley. The pivoted connection 37^B is connected to the armature 13 at the point 15 by a rod 38. The strength of the magnetic lines in the magnet-frame 11 will be used first to move the toggle connections and release brake-shoes 32 32; but after these mechanical parts have been moved the opposing effect of the mechanical parts upon armature 13 will, nearly all of it, be removed. Consequently nearly the total strength of magnet 10 will be expended upon keeping the armature 13 against the pole-pieces 11^A and 11^B. This will cause the parts to be firmly held together and will obviate the chattering noise which such parts usually have.

Before describing the other figures I will point out the operation of the apparatus above described.

When the various parts are at rest, they are in the relative positions in which they are shown by the full lines of Fig. 1, except that in this case the switch 22 will be open. Now if the switch 22 is closed and the magnet-winding 12 is thereby connected to the source of supply a current will flow through this winding and will energize magnet-frame 11. This will cause the pivoted armature 13 to be drawn up against the poles 11^A and 11^B of the magnet-frame. The movement of pivoted armature 13 will be opposed by the springs 34 34 through the mechanical connections above described and will thus make a load upon armature 13. This load will be of maximum strength at the beginning of this operation and will be gradually reduced as the armature 13 moves. When armature 13 has completed its movement, so that it is abutting against the pole-pieces 11^A and 11^B, and thereby closes the magnetic lines which are set up in magnetic frame 11 and closes the magnetic circuit, the connecting-levers 37 37 will be nearly in alinement with each other. In other words, the connections of the levers are so arranged that they corstitute a toggle-joint. It may be seen, therefore, that as armature 13 is moved the load which it controls will be gradually shifted from the armature onto the supports of the various levers. The movement of armature 13 through the mechanical connections will release brake-shoes 32 32 from the brake-pulley 30.

It is desirable to arrange the parts so that the connecting-levers 37 37 will not be quite in alinement with each other after the magnet-armature 13 has been moved, so that when switch 22 is opened and the magnet 10 is deënergized the force of the springs 34 34 will cause the parts to move back again into their original positions and apply brake-shoes 32 32 to the brake-pulley 30 with maximum strength.

Fig. 2 shows a modification of this invention. In this case magnet-frame 11′ is arranged to inclose a solenoid-winding 12′, which when energized will attract and raise a core 13′. An antifriction-roller 40 may be provided at the end of this core 13′ and arranged to work in the slot 41 of a cam-lever 42, which is pivoted at 43. A connecting-rod 44 is connected to the cam-lever 42 at 45 and to a vertically-sliding rod 50 at 46. This rod 50 is supported by a stationary bracket 51 and carries at its lower end a sliding contact-piece 52, which is connected to but insulated from the sliding rod 50. The parts above described may normally remain in the positions shown under the force of gravity, or a spring 53 may be added for the purpose of returning the parts to their initial positions after they have been operated. The sliding contact-piece 52 is arranged to be moved up over a stationary contact-piece 54 and a plurality of stationary contacts 55, to which a resistance 56 may be connected. In this view, Fig. 2, 60 and 61 designate two mains from a secondary source of supply, which may be connected, by means of a manually-operated switch 62, to the armature 63 and series field 64 of an electric motor through conductor 65, resistance 56, and conductor 66. Thus a circuit will be completed whenever switch 62 is closed from the mains 60 and 61 through the motor and resistance. Now if switch 22 is closed, so that solenoid-winding 12′ is energized thereby, the core 13′ will be raised, and its roller 40, acting upon the inside of slot 41, will raise the sliding rod 50 and movable contact 52, so that the latter will cut out resistance 56 in a series of steps. It may be seen that after solenoid 13′ and its connected parts have been raised the inside of slot 41 of the cam member 42 will be in a nearly vertical position, so that nearly all of the strength of the magnetic lines in frame 11′ may be expended in holding core 13′ against a projecting core 16, which is a part of magnet-frame 11′. In this way the core 13′ will be held firmly against the projecting core 16 and be prevented thereby from chattering.

In Fig. 3 the electrical connections and magnet 10 are shown similar to those already described in Fig. 1. The armature 13^A is pivoted at 14^B, as before described; but in this case the arm which supports the armature is provided with gear-teeth 70. These mesh with the teeth of a pinion 71, which is pivoted at 72. Attached to pivot 72 is an arm 73, to which is connected at 74 a rod 75. This rod is connected at 76 to a lever 80. This lever is pivoted at 81 and is weighted by a sliding weight 82. The valve 90 has its piston 91 connected by a rod 92 to this pivoted arm 80. The weight 82 may keep the valve 90 in closed position, and the magnet 10, through the connecting mechanism which is described, may raise the valve, and thereby open it. It may be seen that in this case as the magnet 10 attracts its armature 13^A, and thereby raises pivoted arm 80, the load upon the armature will be the arm 80, and it is connected to valve 90, and that as pivoted arm 73 is moved about pivot 72 until it proximates an upright position the load upon magnet 10 will be reduced to a minimum, so that the strength of the magnet may be utilized to firmly hold the armature 13 against its pole-pieces 11^A and 11^B.

I have shown that this invention is applicable to several forms of apparatus; but it is by no means limited to those herein described. It is believed that the means herein shown and described for reducing the load upon an alternating-current magnet from a maximum to a minimum during the movement of the magnet's armature or core, so that after the load which it is adapted to move has been moved, nearly the entire strength of the magnet may be utilized for holding the parts firmly together and for thus preventing chattering noises, is broadly new.

It is a well-known fact that the chattering noise accompanies alternating-current magnets, especially when such magnets are energized by a single-phase current, and especially when they are arranged to lift a load. This is obviously due to the alternations of the current and the intermittent variations of magnetic strength.

In the present invention the magnet's armature is placed within reach of the magnetic attraction of the magnet, so that when the magnet is energized it will attract its armature and allow the latter to accomplish the work for which it is intended. The mechanical connections are such as to give the armature a comparatively small movement and to allow the load upon the armature to be diminished from a maximum to a minimum, so that the armature may be held tightly against the magnet to close the magnet-lines and to be held firmly against the magnet. They are also such that upon returning to their original position the effective load will again be increased to its maximum.

What I claim is—

1. An alternating-current magnet, an armature arranged to be moved thereby, a load connected to and carried by the armature, and means for reducing said load so that it is not all carried by the armature after the armature has been moved by the magnet.

2. An alternating-current magnet, an armature arranged to be moved thereby, a load connected to and carried by the armature and means for reducing said load from a maximum to a minimum as the armature is moved by the magnet.

3. An alternating-current magnet, an armature arranged to be moved thereby, a load for the armature, intermediate mechanism connecting the load to the armature and arranged to diminish the effect of the load upon the armature as the armature is moved by the magnet.

4. An alternating-current magnet, an armature arranged to be moved thereby, a load for the armature, intermediate mechanism connecting the load to the armature, said mechanism being arranged to gradually take the load from the armature as the armature is moved.

5. An alternating-current magnet, an armature arranged to be moved thereby, a load for the armature, levers connecting the load to the armature and arranged to diminish the effect of the load upon the armature as the armature is moved by the magnet.

6. An alternating-current magnet, an armature arranged to be moved thereby, a load for the armature, levers connecting the load to the armature, supports for the levers, said levers being arranged to diminish the effect of the load upon the armature as the armature is moved by the magnet.

7. An alternating-current magnet, an armature arranged to be moved thereby, a load for the armature, levers connecting the load to the armature, supports for the levers and for the armature, said supports being arranged to hold the load after the armature has been moved by the magnet.

8. An alternating-current magnet, an armature arranged to be moved thereby, a load for the armature, levers connecting the load to the armature, supports for the levers and for the armature, said supports being arranged to hold the load after the armature has been moved by the magnet, said levers arranged to diminish the effect of the load on the armature as the armature is moved by the magnet.

9. An alternating-current magnet, an armature arranged to be moved thereby, a load for the armature, levers connecting the load to the armature, supports for said levers and armature, the movement of the armature and the mechanical connection of the levers being arranged to shift the load from the armature onto said supports.

10. An alternating-current magnet, an armature arranged to be moved thereby, a load for the armature, levers connecting the load to the armature, supports for said levers and armature, the movement of the armature and the mechanical connection of the levers being arranged to shift the load from the armature onto said supports as the armature is moved.

11. An alternating-current magnet, an armature and a load arranged to be moved thereby and means for reducing the load on the armature and allowing the magnet to hold the armature with increased force after the armature and load have been moved by the magnet.

12. An alternating-current magnet, constructed of laminated magnetic material, an armature arranged to be moved thereby, said armature also constructed of laminated material, a load for the armature, intermediate mechanism connecting the load to the armature and arranged to diminish the effect of the load upon the armature as the armature is moved by the magnet.

13. An alternating-current magnet, a winding therefor, a source of single-phase alternating-current supply, means for connecting said winding to the source of supply, an armature arranged to be moved by the magnet, and means for mechanically opposing the pull of the magnet, said means being arranged to have less opposition effect to the pull of the magnet after the armature has been moved by the magnet.

14. An alternating-current magnet, a winding therefor, a source of single-phase alternating-current supply, means for connecting said winding to the source of supply, an armature arranged to be moved by the magnet, a load for the armature intermediate mechanism connecting the load to the armature and arranged to diminish the effect of the load upon the armature as the armature is moved by the magnet.

15. An alternating-current magnet constructed of laminated magnetic material, a winding therefor, a source of single-phase alternating-current supply, means for connecting said winding to the source of supply, an armature constructed of laminated magnetic material, intermediate mechanism connecting the load to the armature and arranged to diminish the effect of the load upon the armature as the armature is moved by the magnet.

16. An alternating-current magnet, an armature arranged to be moved thereby, a load connected to and carried by the armature, and means for reducing said load so that it is not all carried by the armature after the armature has been moved by the magnet, and for increasing the load to a maximum after the armature has been released by the magnet.

17. An alternating-current magnet, comprising two parts, one of which is movable and is arranged to be moved by the other part, means for mechanically opposing the movement, said means being arranged to have less opposition effect after said part has been moved.

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

DAVID LARSON.

Witnesses:
ALFRED C. BECHET,
W. H. GARRISON.