No. 816,806. PATENTED APR. 3, 1906.

A. MAGNUSON.

ELECTRIC TRACTION ELEVATOR.

APPLICATION FILED NOV. 17, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

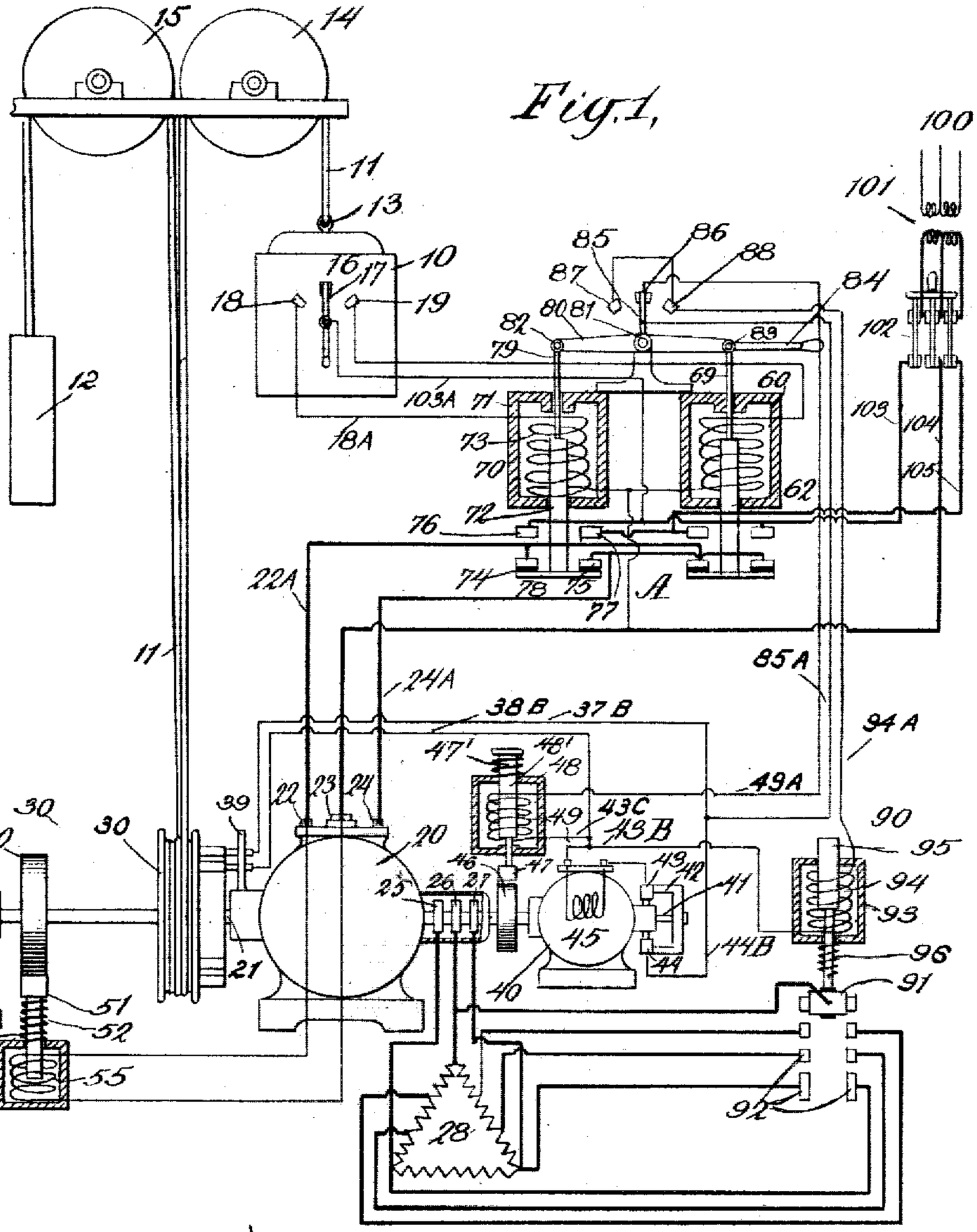
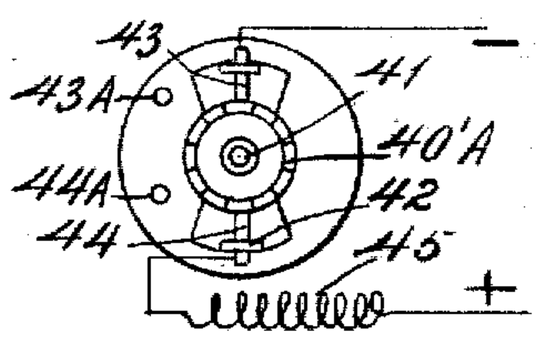


Fig. 2



WITNESSES:

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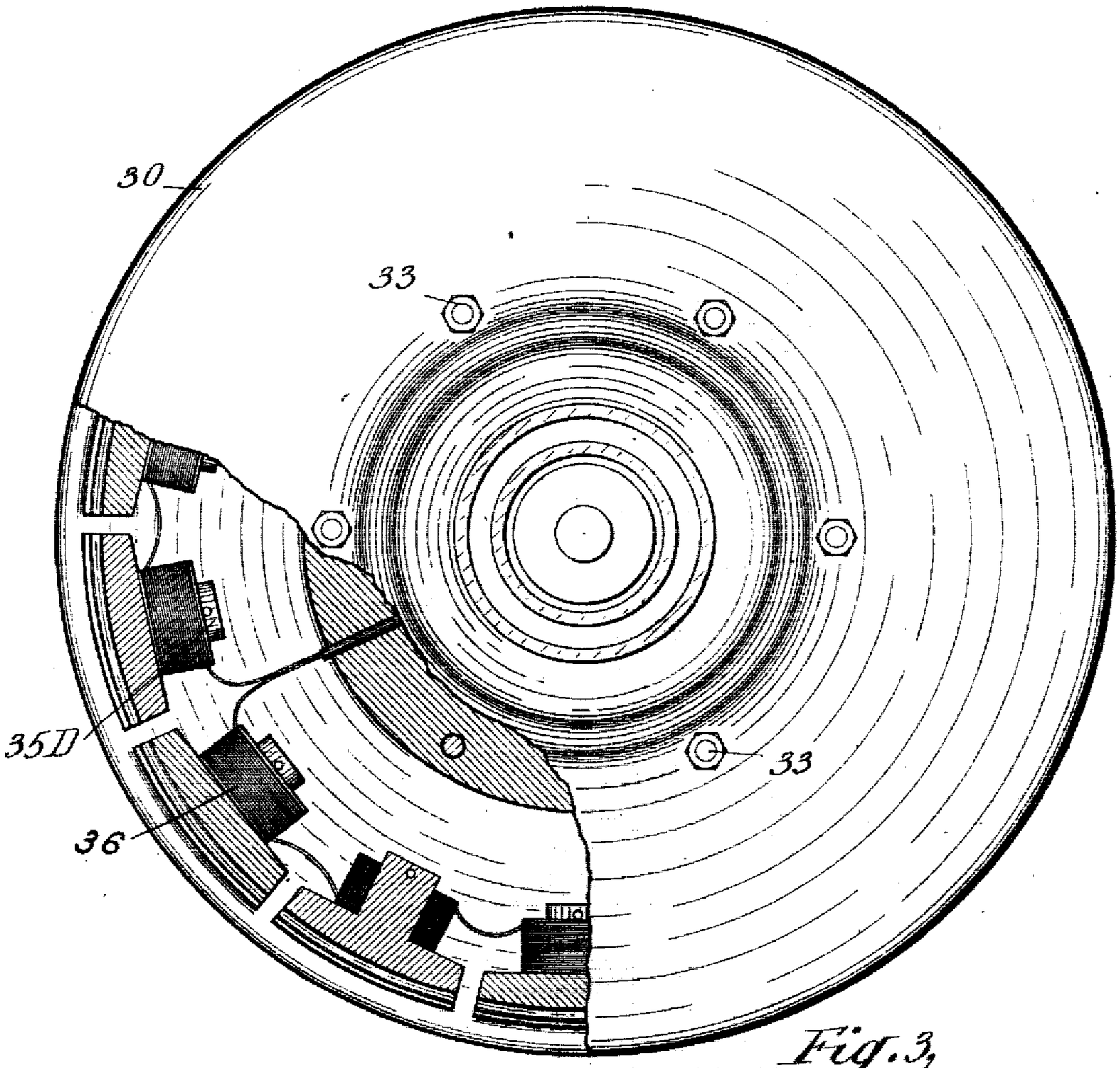

Fig. 3,

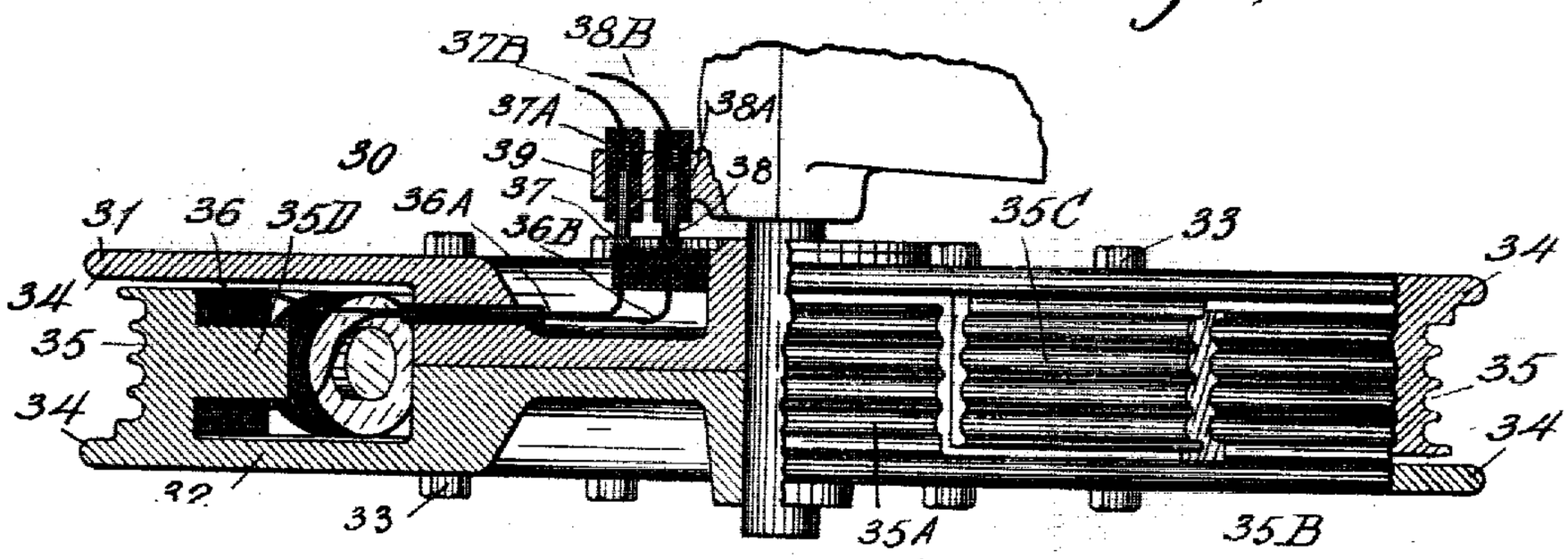

Fig. 4,

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ELECTRIC TRACTION-ELEVATOR.

No. 816,806. Specification of Letters Patent. Patented April 3, 1906.

Application filed November 17, 1905. Serial No. 287,770.

To all whom it may concern:

Be it known that I, AXEL MAGNUSON, a citizen of the United States, and a resident of New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Electric Traction-Elevators, of which the following is a specification.

My invention relates to that type of electric elevators in which the movement of an electric motor is transmitted to a car or platform through a traction sheave or pulley and a metallic rope or cable.

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 diagrammatic representation of an electric elevator system and shows a hoisting-machine, a connected car, various switches and other apparatus, and certain electrical circuits which I use in carrying out my invention. Fig. 2 is a detail of construction of one part of the apparatus shown in Fig. 1. Fig. 3 is a side elevation, partly in section, of a magnetic sheave which is a part of the present invention; and Fig. 4 is a plan view, also partly in section, of the same magnetic sheave.

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

10 is an elevator-car connected by one or more ropes or cables 11 to a counterweight 12. This rope or cable 11 may be attached to the car 10 at 13. It then runs up to and over a stationary sheave 14, situated above the upper limit of the car's travel, thence down and under traction-sheave 30, then up over another stationary sheave 15, and down to counterweight 12, to which it is attached. This is a simple arrangement of ropes; but the ropes and sheaves may be arranged in any of the well-known ways in use in elevators of this type.

20 designates an electric motor. It is here shown as a motor of the alternating-current type, and I have shown with it a controlling system which I have invented for this type of motor; but I do not wish to limit myself to the use of an alternating-current motor, as many other forms and types of motors may be used for the same purpose.

21 is the motor-shaft, to one end of which the traction-sheave 30 is attached. A direct-current generator 40 is attached to the other end of this shaft 21, as shown, or it may be connected to run with motor 20 in any other desired manner. 41 designates the shaft of this generator; 42, a yoke which carries its brushes 43 and 44 and which is arranged to automatically shift them in a manner which will be described hereinafter.

45 designates a series field-winding for generator 40.

46 is a brake-pulley upon shaft 21. It may also serve as a coupling between shafts 21 and 41. 47 is a brake-shoe arranged to coact with brake-pulley 46. It is arranged to be electrically actuated by an electromagnet 48, which pulls down upon its core 48' whenever its winding 49 is energized. The brake-shoe is normally raised from pulley 46 by means of a spring 47' when winding 49 is not energized. 50 is another brake-pulley on shaft 21. 51 is a brake-shoe normally applied to this brake-pulley 50 by a spring 52. It may be released by magnet 53 attracting its core 54 when its winding 55 is energized.

A is an electrically-actuated starting-switch or reversing-switch for starting motor 20 in either direction. It comprises two electromagnets 60 and 70. Magnet 70 comprises a frame 71, preferably constructed of laminated magnetic material, and a core 72 of similar material. A coil or winding 73 is provided for the purpose of energizing the frame and core when a current of electricity is passed through it. Movable contacts 74 and 75 are connected to, but insulated from, a cross-bar 78, which is attached to the core 72. These contacts are arranged to be moved up against stationary contacts 76 and 77. Magnet 60 comprises similar parts. Above magnets 60 and 70 is a three-armed lever 80, pivoted at 81 and connected at 82 and 83 to cores 72 and 62, respectively, by rods 79 and 69. A handle 84 may be provided for the purpose of moving lever 80 and its connected parts by hand. The third arm 85 of lever 80 is a contact-arm, arranged to rest upon stationary contact 86 when the parts are in their central position, upon contact 87 when the contacts under magnet 60 are closed, and upon contact 88 when the contacts under magnet 70 are closed.

90 designates an electroresponsive device

the function of which is to automatically move a contact 91 over a set of stationary contacts 92 and to thereby short-circuit an opposition element 28, which is shown as a delta-connected resistance connected in the rotor-circuit of the motor and to the contacts 91 92. This movement may be accomplished in many ways—for example, by an electromagnet 93 attracting its core 95 when its winding 94 is energized. The core 95 may be normally held in raised position by means of a spring 96.

100 designates a source of alternating-current supply, which after passing through a transformer 101 and a main-line switch 102 passes to various parts of the apparatus, as will be pointed out in the description of the operation of the invention.

The magnetic sheave (shown in Figs. 3 and 4) is constructed of two side pieces 31 and 32 of magnetic material, such as iron. These are of similar construction and may be secured together by means of bolts 33. The completed structure is preferably in the form of a sheave or pulley having rims 34 34 and grooves 35 35 on its outer periphery. It may be seen from the right-hand portion of Fig. 4 that these grooves are upon projections which are alternately upon side 31 and upon side 32. For example, the portions 35^A and 35^B are integral parts of the side portion 32, while the portion 35^C is an integral part of the side 31. Directly back of each of these portions is a circular lug, such as that shown at 35 in Figs. 3 and 4. Around each of these lugs is placed a winding 36, and these windings may be connected by conductors 36^A and 36^B to collector-rings 37 and 38 on one side of the sheave 30. Brushes 37^A and 38^A may be arranged to bear upon these collector-rings. These brushes may be supported by an arm or bracket 39, which is attached to a portion of motor 20. A manually-operated switch 16 is shown in the elevator-car 10. It comprises a pivoted lever 17 and two stationary contacts 18 and 19.

A conductor 103^A is connected to the main-line conductor 103 and to the pivoted lever 17. Now if an operator moves pivoted lever 17 so that it comes in contact with stationary contact 18 a circuit is closed thereby from main-line conductor 103 through conductor 103^A, switch 16, conductor 18^A to and through magnet-winding 73 and conductor 104^A to main-line conductor 104. The circuit which is thus completed will connect magnet-winding 73 across two of the main-line conductors, and it will be energized thereby. It will then raise core 72 and its connected parts, so that movable contacts 74 and 75 will be closed against the stationary contacts 76 and 77, respectively, and the switch-arm 85 will be moved off of stationary contact 86 and onto stationary contact 88. Main-line conductor 103 will thus be closed to motor-terminal 22 through contacts 76 and 74 and conductor 22^A. The central main-line conductor 104 is permanently connected to the central motor-terminal 23. Main-line conductor 105 will be connected through contacts 77 and 75 and conductor 24^A to the other motor-terminal 24. Winding 55 is connected to motor-terminals 22 and 23, so that when the motor receives current from the line brake-magnet 53 will be energized and will attract its core, and thereby draw brake-shoe 51 away from the brake-pulley 50 against the compression of spring 52. After the reversing-switch A has been operated in the manner just described the motor will receive current from the source of supply 100, the brake 50 51 will be released, and the motor will begin to rotate in one direction. At the same time generator 40 will rotate in the same direction and it will generate a current proportional in strength to the speed of the motor 20. When it rotates in one direction—for example, to the left—the friction of its brushes 43 44 upon commutator 40^A will cause them and the yoke 42, which supports them, to move over to the left until they strike against stop 43^A. If the generator rotates in the opposite direction, it will carry brushes 43 44 and the yoke 42, which supports them, in the opposite direction until the yoke strikes against stop-piece 44^A. In this manner the current generated by the generator 40 will always flow through its series field 45 and the conductors 43^B and 44^B, which are connected to it in the same direction, regardless of the direction of rotation of the generator.

The current from generator 40 will be led through conductors 43^B and 44^B to various parts of the apparatus, as I will now point out. The conductor 43^B is connected to the brush 38 of magnetic sheave 30 by means of a conductor 38^B. A circuit is completed through the various windings 36 of this magnetic sheave out through brush 37 and through conductor 37^B back to the other lead 44^B from generator 40. The circuit through windings 36 is arranged to pass around one of said windings in one direction and through the next of said windings in the opposite direction, and so on, so that the various sections which these coils excite will be energized with opposite polarities. It may be seen, therefore, that the current generated by generator 40 will energize the magnetic sheave 30, so that the latter will have a magnetic attraction for the rope or cable 11, which passes over its magnetically-polarized sections. Another circuit from generator 40 passes through conductor 43^B to the lower end of magnet-winding 94; thence through conductor 94^A to the stationary contacts 88 and 87. Switch-arm 85 is now resting upon stationary contact 88, and a circuit is closed thereby through conductor 85^A to conductor

44[B], and thence back to generator 40. Consequently the current passing through magnet-winding 94 will energize magnet 93 and cause the latter to move the sliding contact 94 over stationary contacts 92 and to thus short-circuit the resistance 28, which is connected in the roller-circuit by motor 20 through slip-rings 25, 26, and 27. The magnet 93 may be arranged to move contact 91 an amount proportional to the voltage generated by generator 40, which, as has been shown, is proportional to the speed of motor 20. This has already been described fully in my prior application before referred to, and therefore will not be more fully described here.

As the rope or cable 11 is driven by magnetic sheaves 30, it is evident that as the motor 20 rotates its motion will be imparted through rope or cable 11 to the elevator-car 10.

When it is desired to stop motor 20 and elevator-car 10, the operator may bring back the lever 17 of switch 16 to its central position, when the magnet 70 will become deenergized and will allow the movable contacts 74 and 75 to drop away from the stationary contacts 76 and 77. The current will therefore be cut off the motor 20 and from brake-magnet 53. The brake-shoe 51 will therefore be applied by spring 52 to brake-pulley 50 and will cause the motor and the car to come to rest. At the same time contact-arm 85 will be moved onto stationary contact 86 and a circuit will be closed thereby from generator 40 through conductor 43[B] and conductor 43[C] to the lower end of magnet-winding 49, through conductor 49[A], stationary contact 86, switch-arm 85, conductors 85[A] and 44[B], back to generator 40. Magnet 48 will thus be energized by the current of generator 40 and will apply brake-shoe 47 to brake-pulley 46 with a pressure proportional to the speed of the motor 20. If the operator had moved the lever 17 of switch 16 in the opposite direction, so that it came in contact with stationary contact 19, magnet 60 would have been energized and would have raised its core 62, and closed the contacts which it controls. The main-line current would have then been closed to motor 20 in the opposite direction and its rotation would have been opposite to that previously described.

It is evident that the reversing-switch A may be manually operated by means of the handle 84; but the operation of the various parts would be in this case similar to that above described.

While I have shown one form of motor-controlling systems in combination with my present invention, it is applicable as well to many other forms of elevator-controllers, and I therefore do not limit myself to the specific system herein shown and described.

I have shown my magnetic sheave 30 constructed in a preferred manner; but this of course may be varied without departing from the spirit of this invention.

What I claim is—

1. An electric motor, a magnetic sheave arranged to be driven thereby, a car, a cable connecting the sheave and the car, and a generator connected to run with the motor and arranged to energize the sheave.

2. An electric motor, a magnetic sheave arranged to be driven thereby, a winding for the sheave, a car, a cable connecting the sheave and the car, and a generator connected to run with the motor and connected to the winding.

3. An electric motor, a magnetic sheave arranged to be driven thereby, said sheave comprising sections along its periphery arranged to be alternately magnetized with opposite polarities, a car, a cable connecting the sheave and the car, and a generator connected to run with the motor and arranged to energize the sheave.

4. An electric motor, a magnetic sheave arranged to be driven thereby, said sheave having two side pieces, each of which forms a rim and carries upon it alternately-projecting portions which form its periphery, said portions being arranged to be alternately magnetized with opposite polarities, a car, a cable connecting the sheave and the car, and a generator connected to run with the motor and arranged to energize the sheave.

5. An electric motor, a magnetic sheave arranged to be driven thereby, said sheave having two side pieces, each of which forms a rim and carries upon it alternately-projecting portions which form its periphery, a winding for each of said portions, a car, a cable connecting the sheave and the car, and a generator connected to run with the motor and arranged to energize the sheave.

6. An alternating-current motor, a magnetic sheave arranged to be driven thereby, a car, a cable connecting the sheave and the car, and a direct-current generator connected to run with the motor and arranged to energize the sheave.

7. An alternating-current motor, a starting-switch therefor, a magnetic sheave arranged to be driven thereby, a car, a cable connecting the sheave and the car, and a direct-current generator connected to run with the motor and arranged to energize the sheave.

8. An alternating-current motor, a reversing-switch for the motor, a magnetic sheave arranged to be driven thereby, a car, a cable connecting the sheave and the car, and a direct-current generator connected to run with the motor and arranged to energize the sheave.

9. An alternating-current motor, an electrically-actuated reversing-switch for the motor, a magnetic sheave arranged to be driven

thereby, a car, a cable connecting the sheave and the car, and a direct-current generator connected to run with the motor and arranged to energize the sheave.

10. An alternating-current motor, an electrically-actuated reversing-switch therefor, a magnetic sheave arranged to be driven thereby, a car, a cable connecting the sheave and the car, a direct-current generator connected to run with the motor and arranged to energize the sheave, and means for operating the reversing-switch from the car.

11. An alternating-current motor, a brake for the motor, a magnetic sheave arranged to be driven by the motor, a car, a cable connecting the sheave and the car, and a direct-current generator connected to run with the motor and arranged to energize the sheave

12. An alternating-current motor, an electrically-actuated reversing-switch therefor, an electrically-actuated brake for the motor, a magnetic sheave arranged to be driven by the motor, a car, a cable connecting the sheave and the car, a direct-current generator connected to run with the motor and arranged to energize the sheave and means for operating the reversing-switch and the brake from the car.

13. An alternating-current motor, a magnetic sheave arranged to be driven thereby, a car, a cable connecting the car and the sheave, a direct-current generator connected to run with the motor and arranged to generate a voltage proportional in strength to the speed of the motor, said voltage being arranged to energize the sheave.

14. An alternating-current motor, a magnetic sheave arranged to be driven thereby, an opposition element in the motor-circuit, a car, a cable connecting the car and the sheave, a direct-current generator connected to run with the motor and arranged to generate a voltage proportional in strength to the speed of the motor, said voltage arranged to energize the sheave, and means actuated by said variable voltage for automatically cutting the opposition element out of the motor-circuit.

15. An alternating-current motor, a magnetic sheave arranged to be driven thereby, an opposition element in the motor-circuit, a car, a cable connecting the car and the sheave, a direct-current generator connected to run with the motor and arranged to generate a voltage proportional in strength to the speed of the motor, a brake applied by the variable voltage in stopping, said voltage being arranged to energize the sheave, and means actuated by said variable voltage for automatically cutting the opposition element out of the motor-circuit.

16. An electric motor, a magnetic sheave arranged to be driven thereby, a car, a cable of magnetic material connecting the sheave and the car and a generator connected to run with the motor and arranged to energize the sheave.

17. An electric motor, a magnetic sheave arranged to be driven thereby, a car, a counterweight, a cable of magnetic material running on the sheave and connecting the car and the counterweight and a generator connected to run with the motor and arranged to energize the sheave.

18. An alternating-current motor, a magnetic sheave arranged to be driven thereby, a reversing-switch for the motor, an opposition element in the motor-circuit, a car, a cable connecting the car and the sheave, a direct-current generator connected to run with the motor and arranged to generate a voltage proportional in strength to the speed of the motor, said voltage arranged to energize the sheave, and an electroresponsive device actuated by said variable voltage for automatically cutting the opposition element out of the motor-circuit.

19. An alternating-current motor, a magnetic sheave arranged to be driven thereby, an electrically-actuated reversing-switch for the motor, an electrically-actuated brake for the motor, an opposition element in the motor-circuit, a car, a cable connecting the car and the sheave, a direct-current generator connected to run with the motor and arranged to generate a voltage proportional in strength to the speed of the motor, said voltage arranged to energize the sheave, an electroresponsive device actuated by said variable voltage for automatically cutting the opposition element out of the motor-circuit and manually-operated circuit-closer for operating the reversing-switch and the brake.

20. An alternating-current motor, a magnetic sheave arranged to be driven thereby, an electrically-actuated reversing-switch for the motor, an electrically-actuated brake arranged to be released when the motor is energized, an opposition element in the motor-circuit, a car, a counterweight, a cable of magnetic material connecting the car and the counterweight and running on the sheave, a direct-current generator connected to run with the motor and arranged to generate a voltage proportional in strength to the speed of the motor, a second brake arranged to be applied to the motor by the variable voltage in stopping, said voltage being arranged to energize the sheave, an electroresponsive device actuated by said variable voltage for automatically cutting the opposition element out of the motor-circuit and a car-switch arranged to control the movement of the motor.

21. A motor, a magnetic sheave arranged to be driven thereby, a car, a cable connecting the sheave and the car, and a generator connected to run with the motor and arranged to energize the sheave.

22. A motor, a magnetic sheave arranged

to be driven thereby, said sheave comprising sections along its periphery arranged to be alternately magnetized with opposite polarities, a car, a cable connecting the sheave and the car, and a generator connected to run with the motor and arranged to energize the sheave.

23. A motor, a magnetic sheave arranged to be driven thereby, a car, a counterweight, a cable of magnetic material running over the sheave and connecting the car and the counterweight and a generator connected to run with the motor and arranged to energize the sheave.

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

AXEL MAGNUSON.

Witnesses:
JOSEPH E. CAVANAUGH,
ERNEST W. MARSHALL.