(No Model.) 3 Sheets—Sheet 1

W. BAXTER, Jr.

ELECTRIC ELEVATOR.

No. 464,470. Patented Dec. 1, 1891.

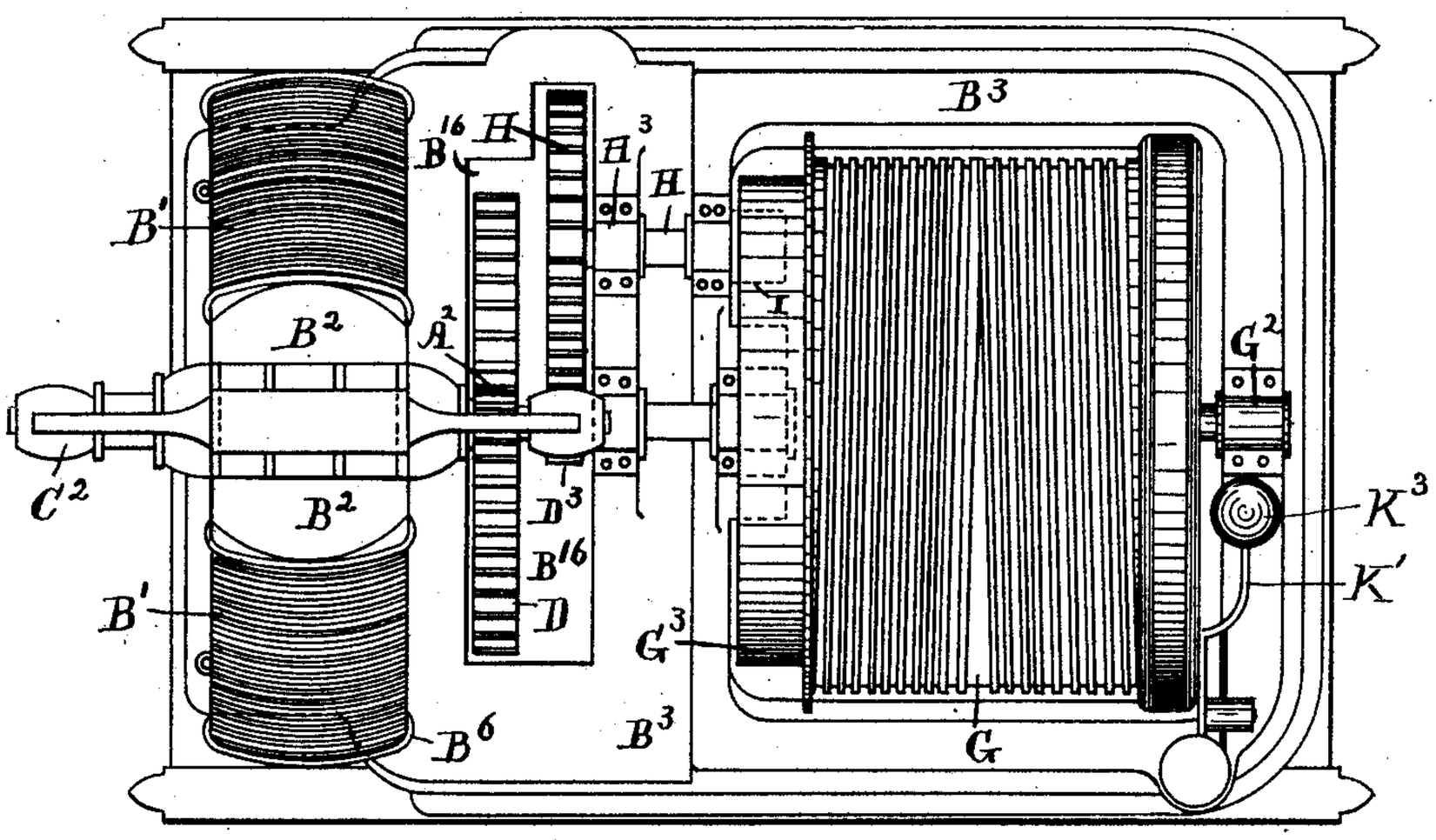

Fig. 1.

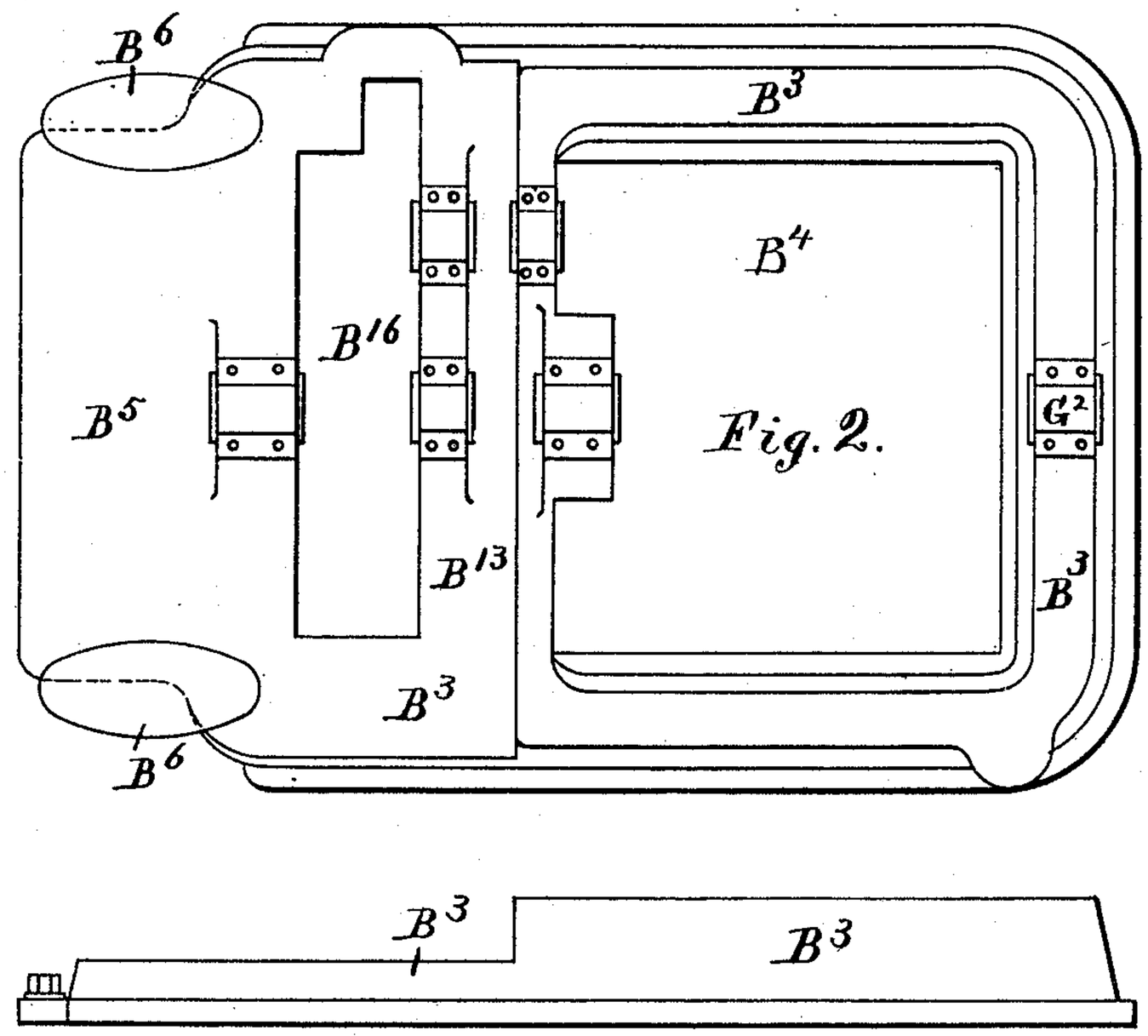

Fig. 2.

Fig. 3.

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Fig. 4.

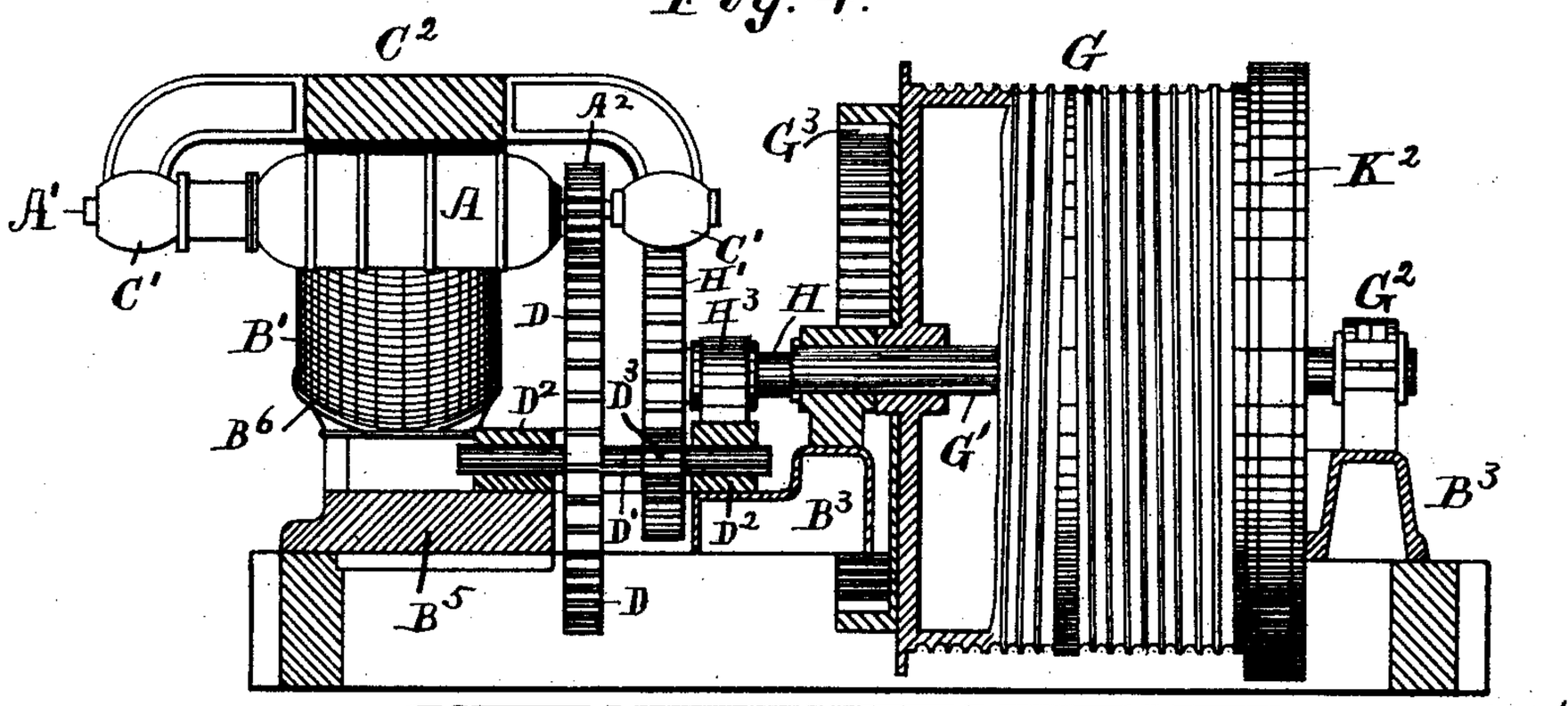
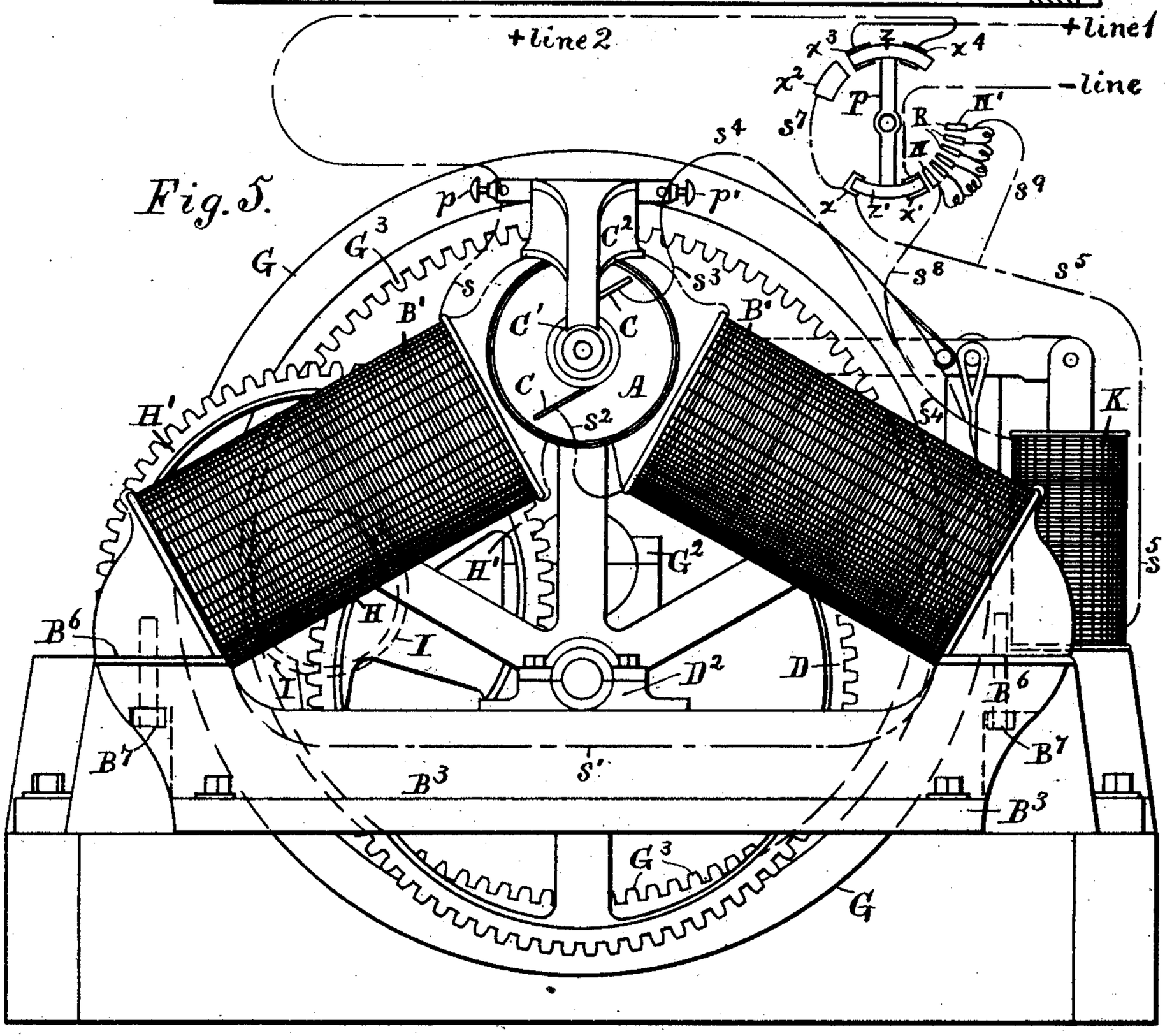


Fig. 5.



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(No Model.) 3 Sheets—Sheet 3.

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Fig. 7.

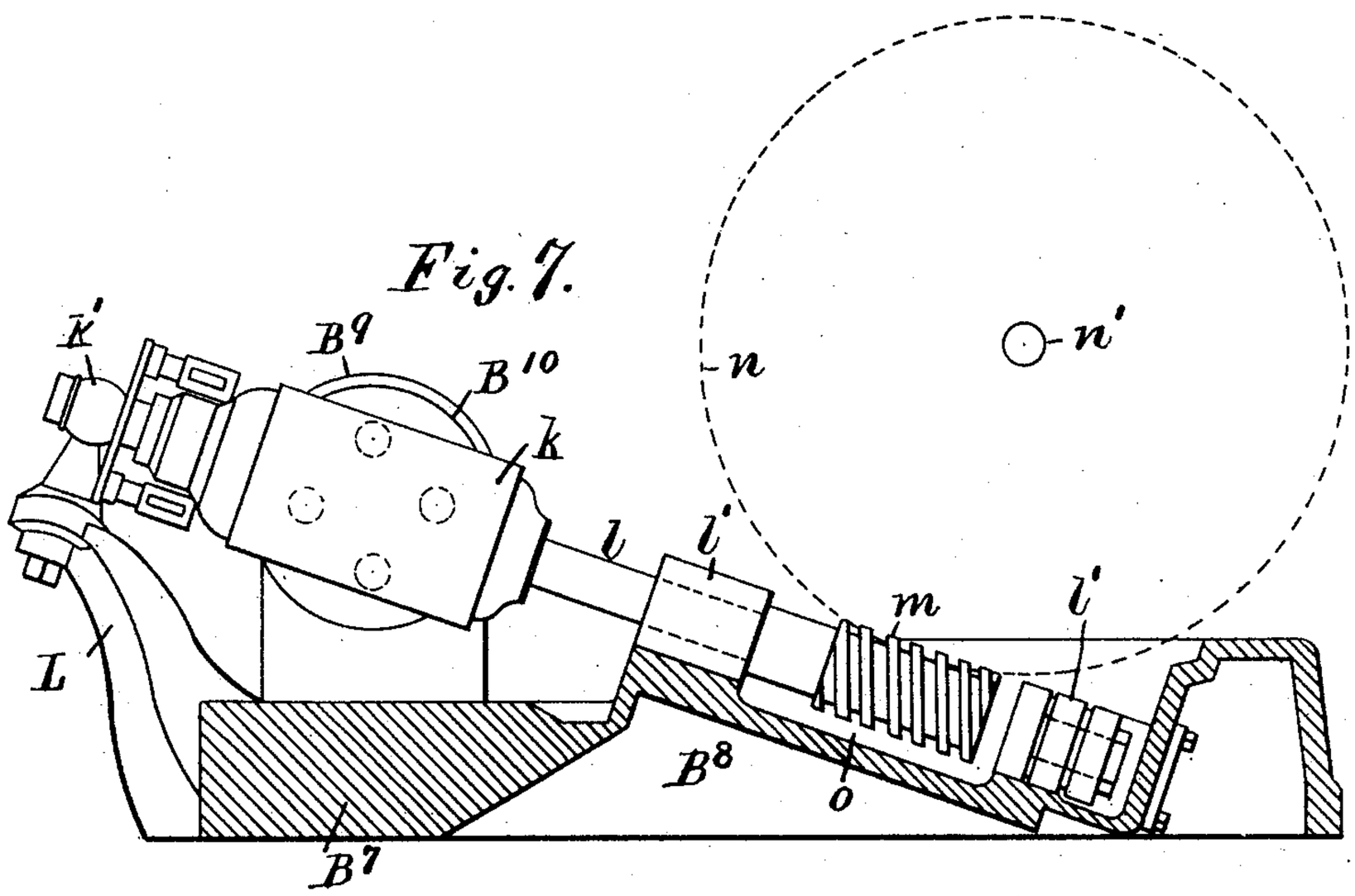
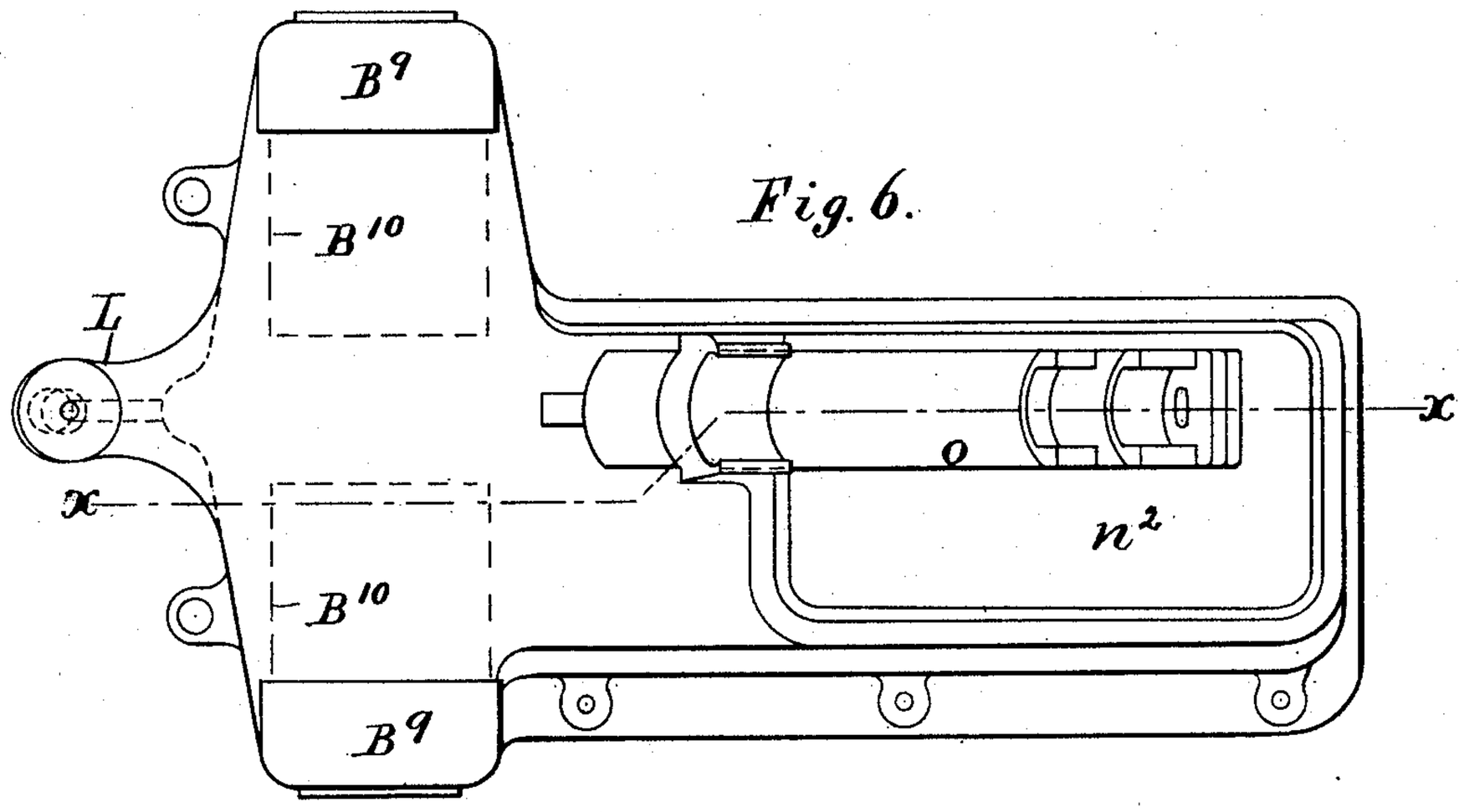


Fig. 6.



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UNITED STATES PATENT OFFICE.

WILLIAM BAXTER, JR., OF BALTIMORE, MARYLAND.

ELECTRIC ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 464,470, dated December 1, 1891.

Application filed December 8, 1890. Serial No. 373,873. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM BAXTER, Jr., a citizen of the United States, residing at Baltimore, State of Maryland, have invented certain new and useful Improvements in Electrical Hoisting-Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to an electric hoisting-machine adapted to move one or more cars or platforms by imparting motion to an attached rope or band. The rope or band may be gradually wound upon a drum, or it may be wrapped around a wheel sufficiently to obtain the necessary traction by the resulting friction. In the present specification the term "drum" is used to designate the winding agent, whether the rope be wound upon the same or simply wrapped partly about it and driven by friction.

The primary object of this invention is to furnish in an organized machine a means of closely connecting an electric motor with a hoisting pulley and gearing without injuriously affecting the action of the motor magnetic field; and this means consists in my invention in constructing the motor-magnet with only two cores and uniting them by a heavy bar formed integral with an iron frame or bed to which the gearing and drum are also attached, thus making the whole machine portable and securing a rigid connection between the several parts, while a direct path for the magnetism is provided in the heavy bar, and the electrical efficiency of the motor is thus promoted. The proximity to the motor of heavy iron pieces, as the drum, gearing, and frame or bed, tends to greatly disturb the action of the magnetic field upon the armature of the motor. To obviate this defect and secure the greatest electrical efficiency in a motor thus situated, I connect the iron supporting frame or bed of the machine magnetically with the field and also arrange the hoisting-drum and intermediate gearing in magnetic connection with the bed, so as to form a neutral part of the field. The highest electrical efficiency is thus secured, while additional mechanical perfection and completeness may be attained in the construction of the hoisting apparatus. In my invention I use only two magnet-cores, and they are so connected with the bed of the machine that the latter forms the true bridge or yoke of the magnet and is preferably included, with all the iron parts in magnetic connection upon it, in the magnetic field.

My invention therefore consists in the combination, in an electric hoisting-machine, of an electric motor, a hoisting-drum, and intermediate gearing, all sustained upon a single metallic frame or bed and all in magnetic connection with the cores of the field-magnet.

It also consists in a brake applied to the hoisting-drum and operated by a magnet arranged in a shunt of the motor-circuit, with a switch adapted to shunt the current into the brake-magnet, and in a certain modification, in a switch provided with a series of resistances adapted to shunt more or less of the current into the brake-magnet.

My invention also consists in certain details of construction hereinafter set forth and claimed.

Figure 1 is a plan of an electric hoisting-machine with a drum having two bearings, both sustained upon the bed and the armature connected with the drum by toothed gearing. Fig. 2 is a plan of the bed detached from the other parts, and Fig. 3 is an edge view of such bed. Fig. 4 is a vertical elevation, partly in section where attached, on the center lines of the bed and drum. Fig. 5 is an elevation of the apparatus at the end where the motor is shown.

The commutator-brushes are shown without any holders in Fig. 5 and are omitted from Figs. 1 and 4.

In Figs. 1 to 5, inclusive, B^3 is the bed or frame for the operative parts. G is the hoisting-drum, G′ its shaft, and G^2 its bearings. The bed is formed with a thick mass or plate of metal B^5, extending across one end, and is formed in the opposite end with a rectangular opening B^4, Fig. 2, in which the drum is swung.

To avoid raising the shafts of the armature and of the intermediate gearing high above the bed, a transverse opening B^{16} is shown in the bed between the bar or plate B^5 and the opening B^4, and a cross-piece B^{13} is provided between the openings B^4 and B^{16} to sustain certain of the bearings. The drum-bearings

are supported at opposite edges of the opening B^4, and the magnet-cores B are attached to the opposite ends of the bar B^5 and inclined upwardly and inwardly with the armature sustained upon their pole-pieces.

A is the motor-armature with its shaft A′ supported in bearings C′, which are formed upon the opposite ends of the double bracket C^2, attached to the upper sides of the pole-pieces B^2. The pole-pieces are united upon their upper sides by the brackets C^2, and the magnet-cores are thus braced in their inclined position and the armature held in its proper relation thereto.

To transmit the required low speed to the pulley G, two intermediate shafts are mounted upon the bed with gear-wheels hanging in the aperture B^{16}, formed through the bed between the bar B^5 and cross-piece B^{13}.

The armature-shaft is provided with a pinion A^2, which meshes in a large cog-wheel D, applied to the first intermediate shaft D′, and a pinion D^3 upon the same shaft meshes with a large wheel H′ upon the second intermediate shaft H, and the said shaft carries a pinion (indicated by dotted circle I in Fig. 5) adapted to rotate the drum G by contact with the teeth of an internal gear G^3, affixed to one end of the pulley G. The shafts D′ and H are fitted, respectively, to bearings D^2 and H^3 upon the bed, and the rapid motion of the armature is thus converted into the slow speed required in the hoisting-drum, which is shown grooved to receive two winding-ropes for hoisting an elevator car or platform.

Fig. 5 shows the relation of the bar B^5 to the magnet-cores, the bar forming a direct connection between the bases of the cores, the latter being made removable from the bar for convenience of winding and attached to seats B^6 upon the bar by means of bolts B^7. These seats are parallel with the bed and formed upon upturned lugs at opposite ends of the bar B^5. The bed extends laterally from the ends of the bar to support the cog-wheels and pulley G, but is made of much lighter section than the bar, as is shown in Fig. 4, and the cores of the magnet are connected with the seats B^6, so as to include the entire bed in the magnetic field and to make such bed a neutral part of the magnet. The cores are projected or inclined toward one another from their bases, and the arrangement of the armature-shaft at right angles to their inner ends places the line of the shaft at right angles to the line of the bar B^5.

The bearings for the drum and the intermediate shafts may be readily placed in magnetic connection with the bed, when desired, as they are commonly made of iron and may be bolted thereto with clean joints, and the drum and intermediate gearing would be thus placed in magnetic connection with the bed, and form, like the bed, a neutral part of the magnet. The bar B^5, which forms the direct connection between the magnet-cores, is made heavier than the attached portions of the bed, so as to make the magnetic connection between the cores as effective as possible in a direct line, and to thus concentrate the lines of force in the magnetic field in a normal manner.

By providing the drum with an internal gear G^3 the intermediate gearing may be placed closer to the center of the bed, and the lateral dimensions of the bed may thus be confined as closely as possible to the width of the drum.

By the use of two intermediate shafts D′ and H, with two pinions and spur-wheels in addition to the pinion I, which actuates the gear G^3, I am enabled to greatly reduce the speed of the drum and to simultaneously augment the force transmitted thereto by the motor.

To avoid raising the center of the shaft D′ and of the entire armature and motor too high above the bed, it is necessary to construct the bed with the opening B^{16} to receive the gears D and H′. The bar B^{13} is necessary to sustain the bearings for the drum and intermediate shafts between the openings B^4 and B^{13}. These constructive features enable me to make the entire hoisting-machine very compact and to avoid raising the motor-armature high above the bed.

In Fig. 5 a switch is shown connected with the + and − line wires and provided with resistances connected with a shunt-circuit around the brake. The brake-strap K^2 is pressed against the drum by the lever K′ and weight K^3, and as the magnet K operates to remove such pressure it is evident that by varying the force of the current through the magnet the pressure may be regulated in any desired degree.

In the electrical connection shown in connection with the switch in Fig. 5 the main-circuit wires are shown at + line 1 and − line, and the switch-lever P is arranged to connect the same and is provided with other contacts to close the circuit through the motor to set it in operation. The line-wires are connected with the contacts x^3 and x'. These contacts are adjacent to opposite ends of the switch-lever, which ends are furnished with segmental leaves z and z', adapted to connect the contact x^3 with a contact x^4 leading to the motor, and the contact x' with a contact x, connected to the brake-magnet coils by wire s^5. Adjacent to the contact x^3 is located a contact x^2, to which the leaf z may be shifted without leaving the contact x^4, and which is adapted to form a shunt around the motor through the brake-magnet by a connection s^7 with the contact x. A series of resistances is provided adjacent to the contact x' and connected with contacts R in the path of the leaf z', and the ends of the series are connected with contacts N N′, the former of which is close to the contact x'. The contact N is connected with the brake-magnet coils at the opposite end from the wire s^5, and the contact N′ is connected with the wire s^5 by wire s^9. The switch is arranged, as shown in Fig. 5,

to operate the motor with full force, the brake-magnet being fully energized at the same time to lift the weight K^3 and wholly remove the pressure of the brake-strap from the drum. The current is conducted through the motor by a wire marked "+ line 2," connecting the contact x^4 with one of the binding-posts p. The current thence passes through the wire s, one of the field-magnet coils, the wire s', then through the other coil, and by wire s^3 to the other binding-post p', which is connected by wire s^4 with the brake-magnet coil upon the end opposite to the wire s^5. With the switch in the position shown the whole current would pass through the motor-coils and also through the brake-magnet coil, reaching the "— line" through the wire s^5, contact x, leaf z', and contact x'. The brake-magnet is thus energized with the force of the same current that energizes the motor.

When it is desired to apply the brake to reduce the speed of the motor, the upper end of the lever P is moved to the left until the leaf z bears upon the contact x^2, and the leaf z' is moved off of the contact x and upon the contact N. The motor is shunted by connecting the contacts x^2 and x^3, as two paths are thus furnished for the current, one through the motor, as before, (owing to the continued connection of the leaf z with the contact x^4,) and the other from the contact x^2 through the wire s^7 and contact x to the wire s^5, through the brake-magnet, and by the wire s^8 into the contact N, leaf z', and contact x' to the— line. A portion of the current, instead of passing through the magnet-coil from the wire s^5, may also pass by the wire s^9 into the contact N′, and thence through the resistances to the contact N and to the — line, the same as the current by the wire s^8. If the resistances are high enough, very little current will pass through the resistances and the energy of the brake-magnet will be but slightly diminished, and the pressure of the brake upon the drum will be very slightly altered. To diminish the power of the brake-magnet still further and thus increase the pressure of the brake upon the drum, the lever P is turned still further to bring the leaf z' successively over the resistance-contacts R. A slight movement in this direction operates to sever the connection between the leaf z with the motor-contact x^4, thus wholly cutting off the current from the motor, while the movement of the leaf z' over the contacts R gradually cuts out the resistance of the circuit from the contact x to the — line through the wire s^9, and thus diminishes the current transmitted to the magnet-coils to the wire s^8. As the power of the brake-magnet is diminished the pressure of the brake upon the drum increases, and the continued movement of the lever P finally cuts out all the resistances, and the current is wholly cut off from the motor and brake-magnet coils, when the leaf z' rests upon the contact N′. In such position the current passes from the + line 1 through the contact x^3, leaf z, contact x^2, wire s^7, contact x, wire s^9, contact N′, leaf z', and contact x' to the — line. The load hoisted by the drum may thus be lowered by its own weight, the brake being applied (by shifting back the lever P) with any required force to limit the rotations of the drum. When it is desired to again raise the load, the switch is rotated until the leaf z covers the contacts x^3 and x^4, as shown in the drawings, and the motor will then rotate free from the pressure of the brake, as before described.

I am aware that it is not new to connect the cores of the field-magnet with the supporting-frame of a motor; but I am not aware that a heavy bar has ever been extended directly between the magnet-cores within the bed transverse to the armature-shaft, and I have therefore made specific claim to a magnet-frame provided with such heavy bar and with a lateral extension to support the drum and intermediate gearing.

Having thus set forth the nature of my invention, what I claim herein is—

1. The combination, in an electric hoisting-machine, of an electric motor having magnet-cores inclined upward and inward from their bridge, a hoisting-drum and intermediate gearing, and a magnetic frame or bed provided with a transverse bar B^5, having upturned lugs at its opposite ends to receive the magnet-cores and provided with a lateral extension to support the drum and intermediate gearing, substantially as herein set forth.

2. The combination, in an electric hoisting-machine having a frame or bed supporting a drum and intermediate gearing, of magnet-cores inclined upwardly and inwardly from the supporting frame or bed, the pole-pieces B^2, attached to the head of the magnet-cores, and the double bracket C^2, secured to the pole-pieces above the armature-shaft and provided at opposite ends with the bearings C′ for the armature-shaft, as and for the purpose set forth.

3. In an electric hoisting-machine, the combination, with the electric motor and electric circuit, of a brake applied to the hoisting-drum, a magnet arranged in a shunt of the motor-circuit and adapted to actuate the brake, and a switch provided with a series of resistances and contacts adapted to shunt more or less of the current into the brake-magnet, as and for the purpose set forth.

4. In an electric hoisting-machine, the combination, with a motor, a drum, and intermediate driving-gearing, of a bed of magnetic material supporting the hoisting-drum and its gearing, with two motor-magnet cores in magnetic connection with the said supporting-bed and inclined from the sides of the bed upward and inward and having the armature sustained by the magnet pole-pieces, as and for the purpose set forth.

5. The combination, in an electric hoisting-machine, of an electric motor, a hoisting-drum and intermediate gearing, and a magnetic

frame or bed connected with the cores of the field-magnet and provided with the bar B^5, extended directly between the magnet-cores, and with a lateral extension having opening B^4 for the admission of the hoisting-drum, opening B^{16} for the admission of the intermediate gearing, and cross-bar B^{13} to sustain certain of the bearings, substantially as herein shown and described.

6. The combination, in an electric hoisting-machine, of an electric motor, a magnetic frame or bed magnetically connected with the cores of the field-magnet and provided with the bar B^5, extended directly between the magnet-cores, and with a lateral extension having openings B^4 and B^{16} and cross-bar B^{13}, a drum hung in the opening B^4 and provided with internal gear B^3, intermediate gear-shaft D′, provided with gears D and D^3, intermediate shaft H, provided with gears H′ and G, and the motor-armature being arranged above the gear D and provided with pinion A^2, the whole arranged and operated substantially as herein set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

WILLIAM BAXTER, JR.

Witnesses:
C. R. GALLAGHER,
ADAM NEUS, Jr.