(No Model.) 4 Sheets—Sheet 1.

J. E. BYRNE.

ELECTRICALLY CONTROLLED ENGINE.

No. 405,010. Patented June 11, 1889.

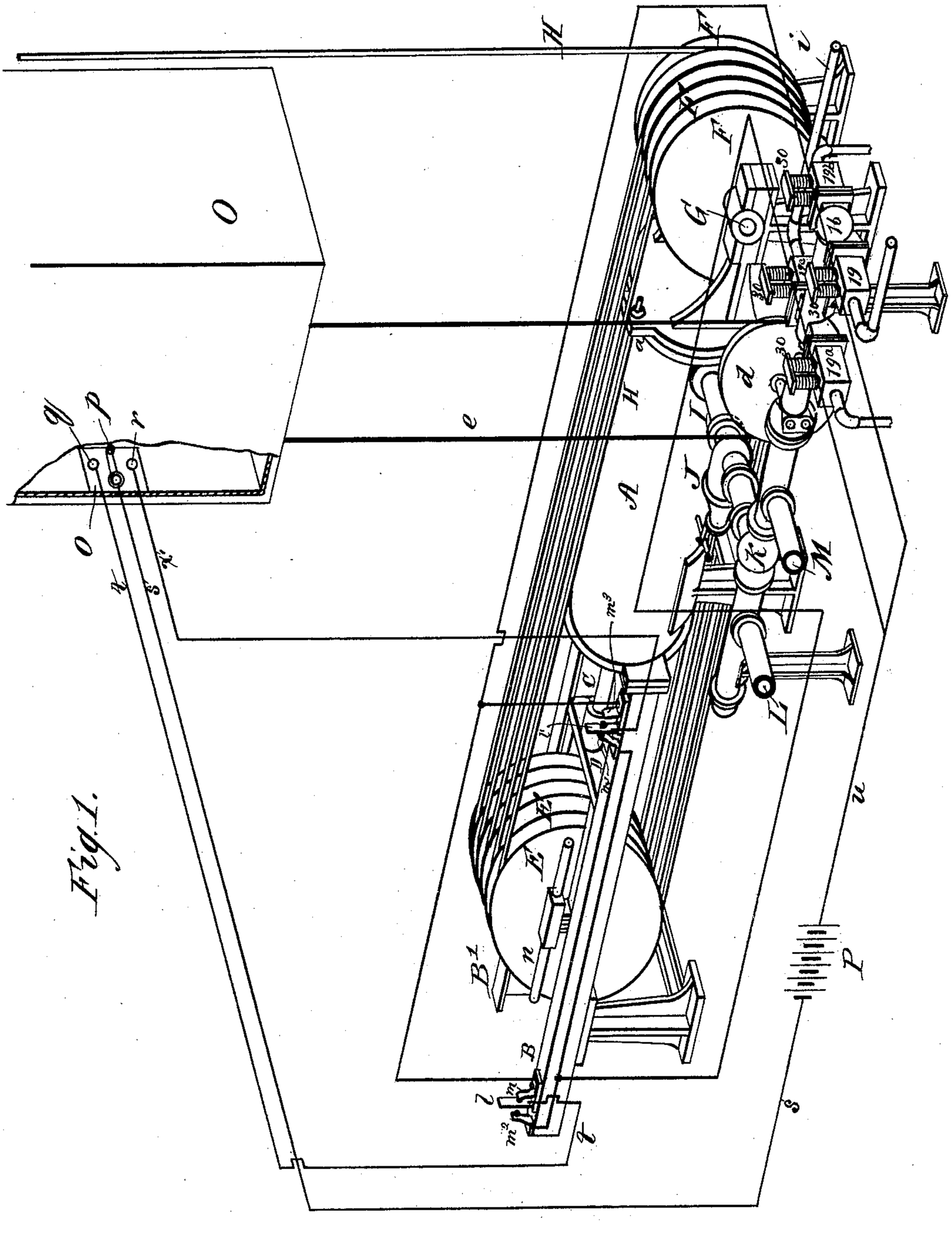

Fig. 1.

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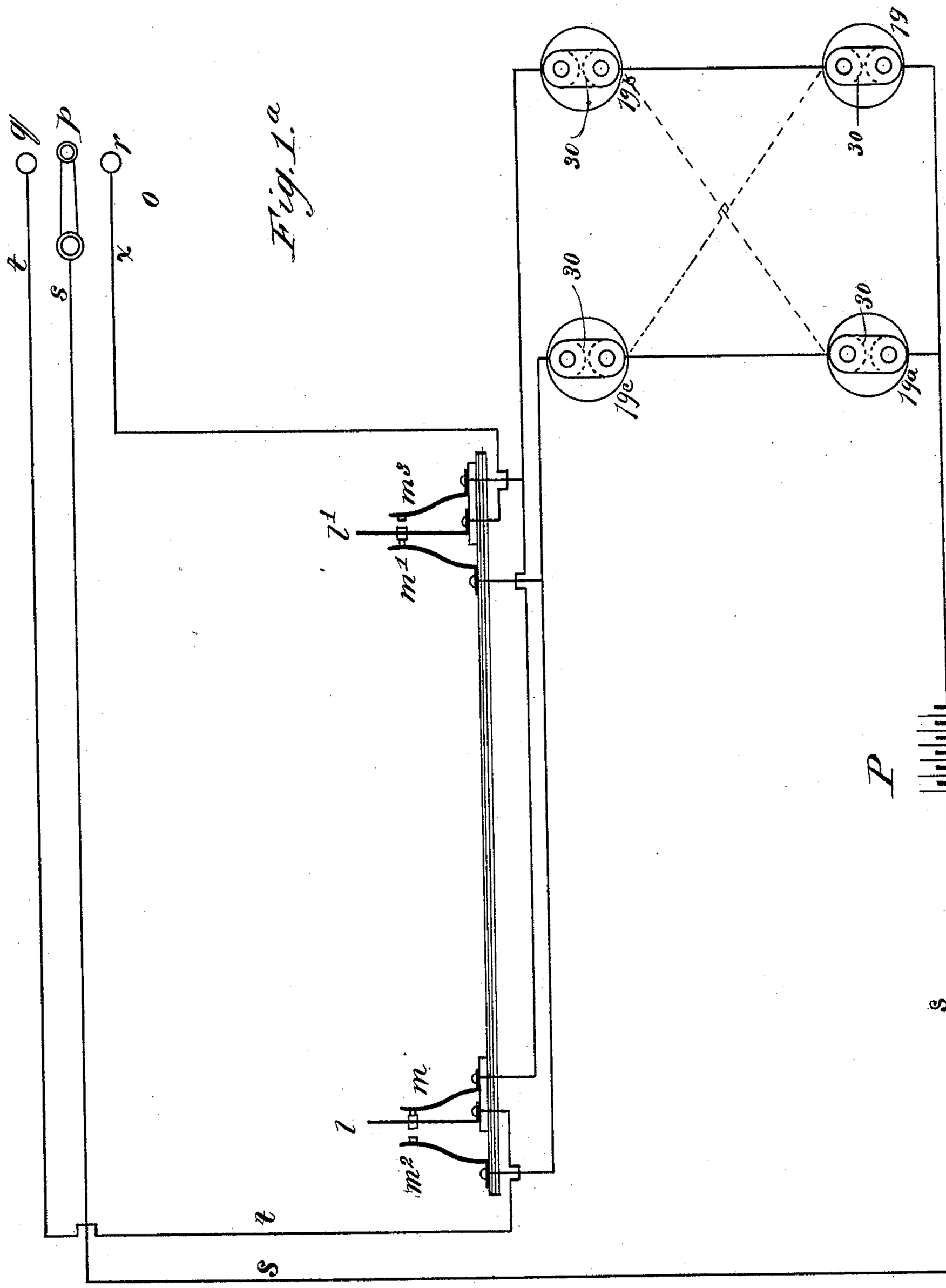

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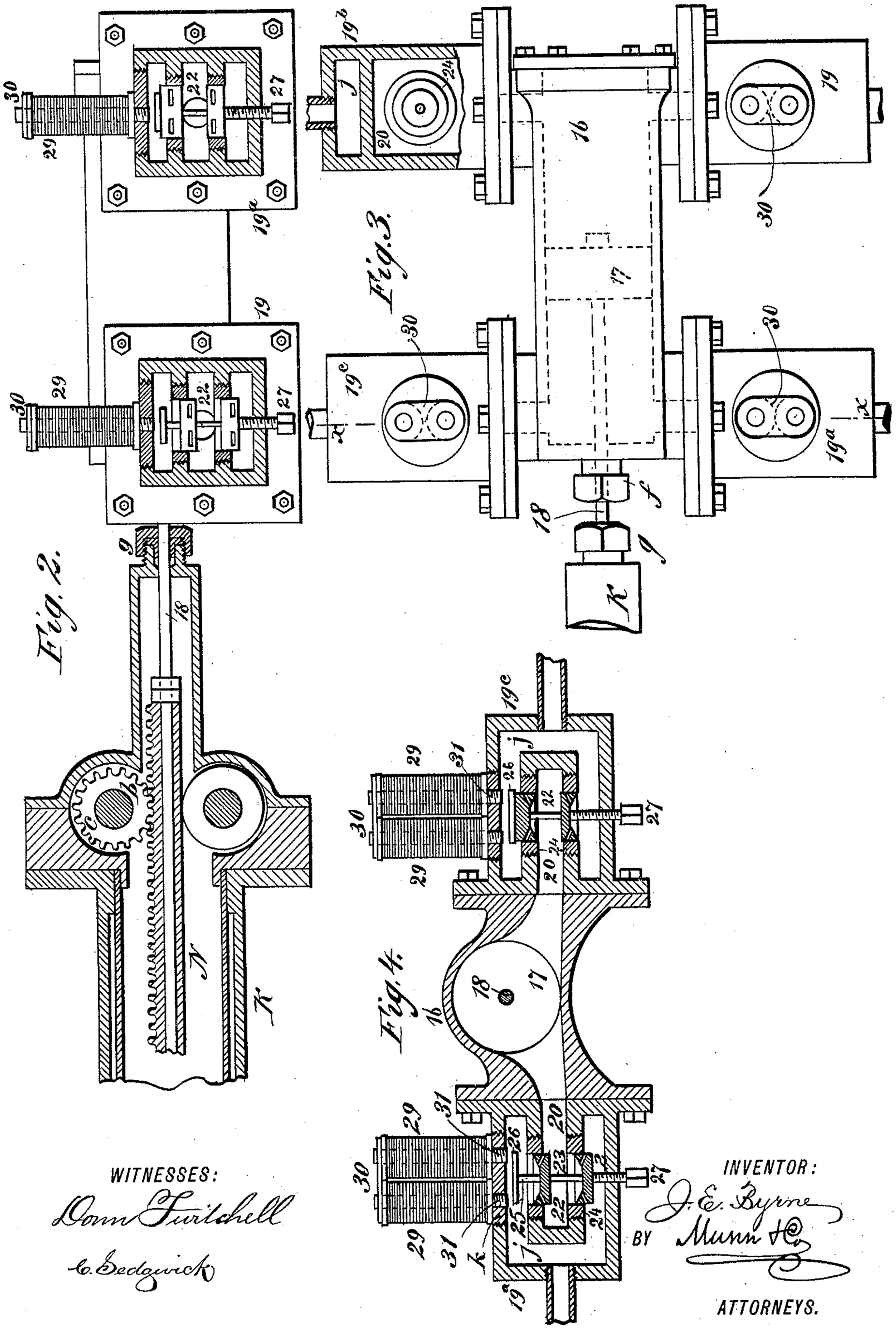

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Fig. 5.

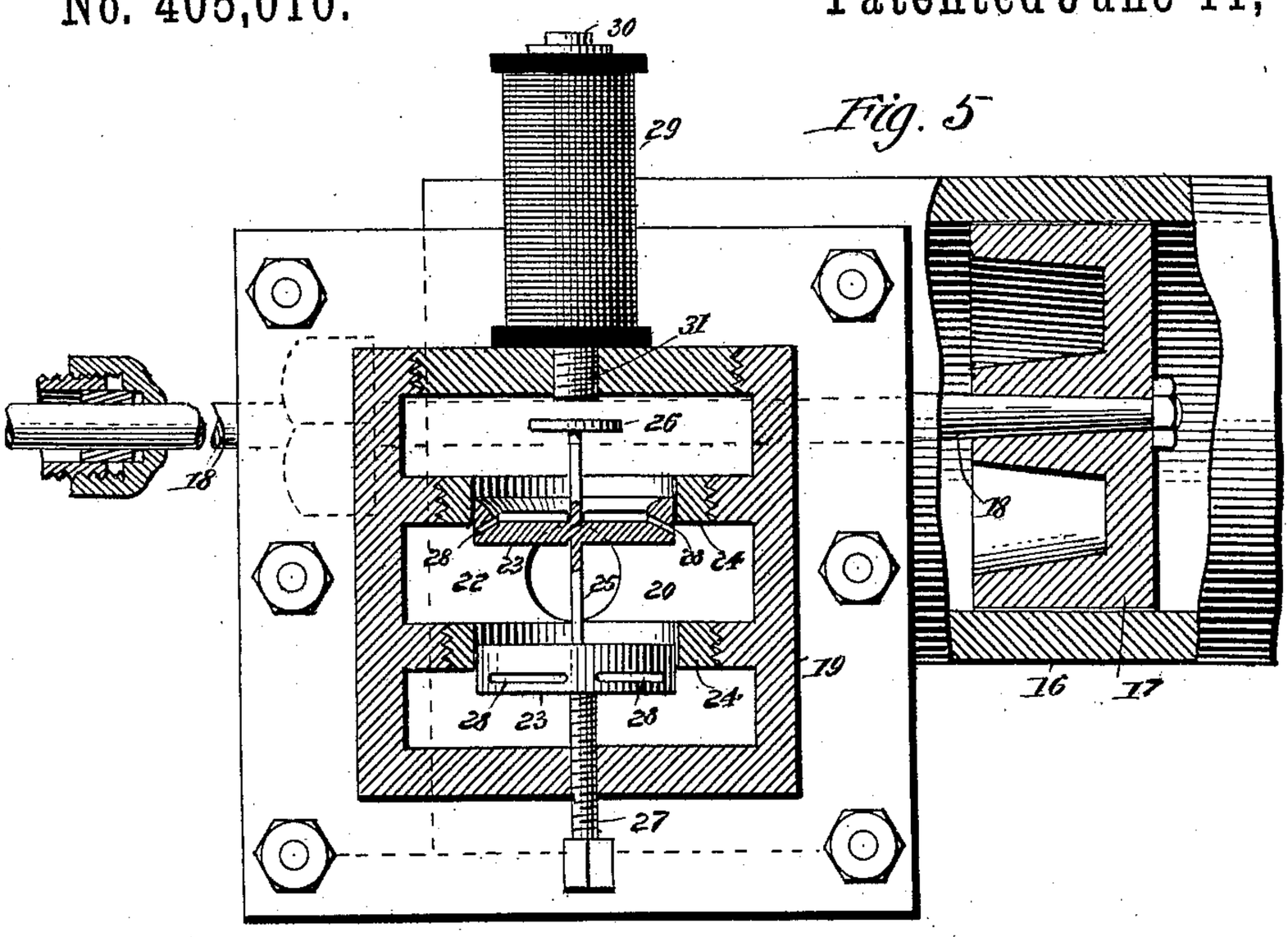


Fig. 6.

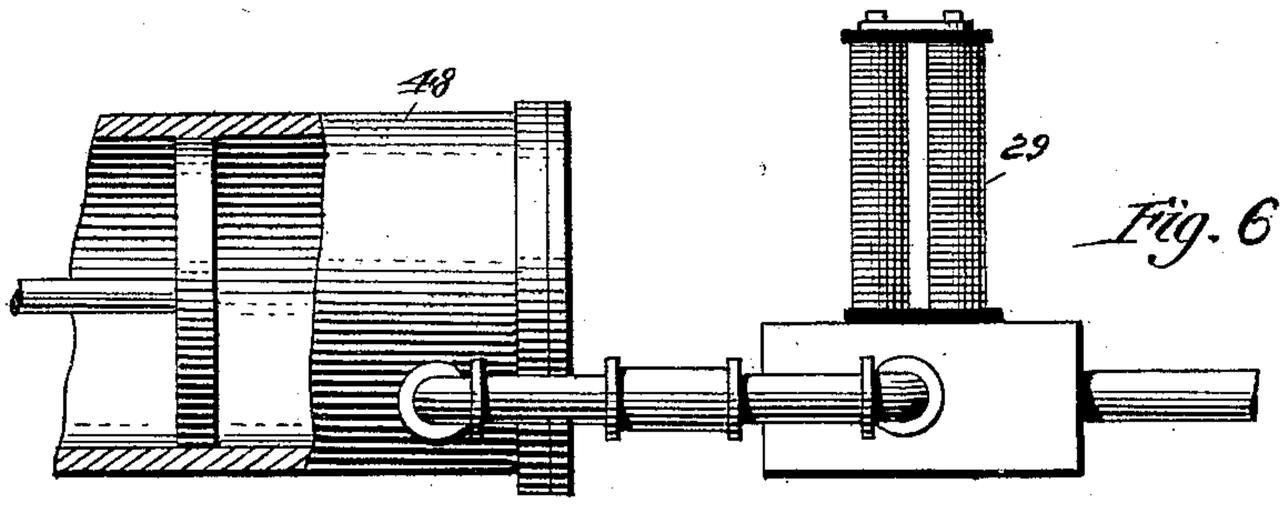
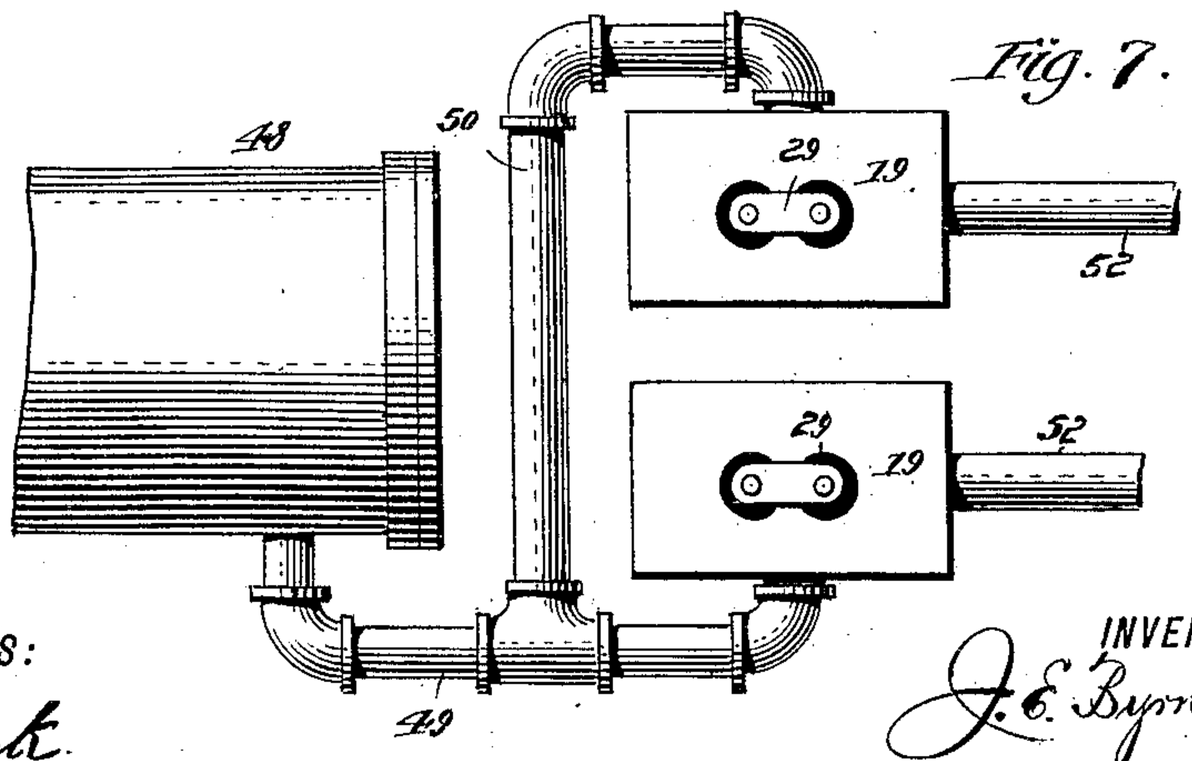


Fig. 7.



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UNITED STATES PATENT OFFICE.

JAMES E. BYRNE, OF BROOKLYN, NEW YORK.

ELECTRICALLY-CONTROLLED ENGINE.

SPECIFICATION forming part of Letters Patent No. 405,010, dated June 11, 1889.

Application filed April 19, 1888. Serial No. 271,183. (No model.)

To all whom it may concern:

Be it known that I, JAMES E. BYRNE, of Brooklyn, in the county of Kings and State of New York, have invented a new and Improved Electrically-Controlled Engine, of which the following is a full, clear, and exact description.

This invention relates to an apparatus by means of which the starting and stopping of an engine may be controlled by electricity; and it consists in a mechanism for this purpose and in details thereof constructed and arranged as hereinafter described and claimed.

Figure 1 is a perspective view showing the application of my improvement. Fig. 1ª is a diagram of the circuits. Fig. 2 is a side sectional elevation of a portion of the valve-operating cylinder, showing a side elevation of the auxiliary valve-operating cylinder with its valve-chests in section. Fig. 3 is a plan view of the auxiliary valve-operating cylinder, showing one of its valves in section. Fig. 4 is a transverse section of the auxiliary valve-operating cylinder and its valves, taken on line *x x* in Fig. 3. Fig. 5 is an enlarged sectional elevation of one of the discharge-valves, showing a portion of the auxiliary valve-operating cylinder in section. Fig. 6 is a side elevation of a modification, and Fig. 7 is a plan view of the same.

Similar figures and letters of reference indicate corresponding parts in all the views.

The object of my invention is to provide means for electrically operating the valves of hydraulic elevators both manually and automatically.

My invention consists in the combination, with the controlling-valve of an ordinary hydraulic elevator, of an auxiliary cylinder provided with electrically-operated valves, an electric generator, a switch arranged in the elevator-car for directing a current through the magnets of the valve, and automatic circuit-controllers attached to the hoisting mechanism of the elevator for shifting the circuits and operating the valves when the elevator-car reaches the upper or lower end of its excursion.

I have shown my improvement in connection with hydraulic-elevator mechanism of well-known construction, and will first briefly describe the elevator mechanism to facilitate the understanding of my improvement.

The hydraulic cylinder A and the ways B B′ are mounted upon suitable supports, and to the cylinder A is fitted a piston whose piston-rod C is connected with a frame D, sliding in the ways B B′. In the frame D is journaled a series of sheaves E upon a transverse rod carried by the frame D, the sheaves being arranged to turn freely and independently of each other. At the opposite end of the cylinder A is journaled a series of sheaves F upon the fixed shaft G, the said sheaves F being free to rotate independently of each other upon the shaft G.

The wire cable H is attached by one of its ends to an ear *a*, projecting from the cylinder A, and extends around the first sheave E of the series carried by the frame D, thence backward around the first sheave F of the stationary series, thence around the second of the movable sheaves E, and so on until it reaches the last sheave F of the stationary series, from which it extends up the elevator-shaft to the sheaves at the top, and thence downward to the car O in the well-known manner.

In the side of the cylinder A, near the closed end and between the end and the piston, is inserted the water-supply and discharge pipe I, which is provided with the stop-valve J, of ordinary construction, and communicates with the controlling-valve K, which is a simple valve constructed to admit water from the supply-pipe L to the cylinder A, and to permit it to escape from the cylinder through the discharge-pipe M. This valve has heretofore been operated by a rack N, worked by a pinion *b* on a shaft *c*, which extends through the valve-casing, and is provided with a sheave *d*, around which extends the endless cable *e*, which passes upward through the elevator-shaft and over a sheave at the top of the shaft, one branch of the endless rope passing through the elevator-car O, to be operated by the conductor, who starts and stops the car by sliding the controlling-valve through the medium of the said cable *e*, the sheave *d*, the pinion *b*, and the rack N. The mechanism thus described is that of one of the ordinary well-known elevators, and forms no part of my

invention, except in so far as it enters into combination with the parts of my improved starting and stopping mechanism.

The auxiliary valve-operating cylinder 16 is supported axially in line with the controlling-valve K, and contains a piston 17, which carries a piston-rod 18, extending through a stuffing-box *f* upon the end of the cylinder 16, also through a stuffing-box *g* upon the end of the casing of the valve K, and is permanently connected with the rack N, which moves the said valve K. Upon one side of the cylinder 16, at opposite ends thereof, are arranged the supply-valve 19 and discharge-valve 19^a, and upon the opposite side are arranged the discharge-valve 19^b and supply-valve 19^c. The supply-valves at opposite ends of the cylinder 16 are arranged diagonally opposite each other, and the discharge-valves are arranged in the same way. The supply-valves 19 and 19^c being of precisely the same construction, a description of one will be sufficient.

The valve-casing is provided with an outer chamber *j* and an inner chamber 20, the upper and lower walls of the said inner chamber being apertured and provided with bushings 24 of non-corrosive material—such as steam metal or bronze—the bushings being bored cylindrically, and to the bushings is fitted the double valve 22. The balanced double valve 22 is formed of two recessed disks 23, mounted upon the spindle 25 and fitting accurately the bushings 24. In the case of the discharge-valve the recess of each disk is in the upper surface, and in the edge of the valve are formed ports 28, communicating with the recess and inclined downwardly, so that when the valve is in its normal position, as shown in Figs. 4 and 5, there will be communication between the chambers *j* and 20 through the said ports. The downward movement of the valve 22 is limited by the screw 27, which passes through the bottom of the valve-casing. The valve-spindle 25 is prolonged above the upper disk 23 and carries an armature 26.

In the top of the casing of the valve 19 is inserted a disk *k*, of non-magnetic material, into which are screwed the polar extremities 31 of the cores of the electro-magnet 30, the said cores being inclosed by bobbins 29 in the usual way. By this construction I am enabled to cause the magnet to act upon the armature 26 without its being in any way affected by the material of the valve-casing, so that when a current is sent through the magnet-coil 29 by means of a conductor *i*, Fig. 1, connected, in practice, with a battery and switch-board, (not here shown,) the valve 22 will be moved upward by the attraction of the armature 26 by the magnet.

The supply-valves 19 19^c are arranged with the recessed sides of the disks 23 downward, and the limit-screws 27 are adjusted so that when no current passes through the magnet the valve will remain closed. When a current is sent through the magnets of the supply and discharge valves at one end of the cylinder, the supply-valve of that end of the cylinder will be opened and the discharge-valve will be closed by the action of the magnets, and the water will enter the open supply-valve and push the piston 17 forward, the discharge-valve of that end of the cylinder remaining closed, the discharge-valve of the opposite end of the cylinder being open. This operation is precisely the same for both ends of the cylinder.

Upon the guide B of the frame D are mounted two contact-springs *l l'*. Opposite and normally in contact with the inner faces of these springs are arranged contact-springs *m m'*. The springs *m m'* are oppositely arranged with respect to each other. Opposite the outer faces of the springs *l l'* are arranged contact-springs m^2 m^3, which are in the path of the said springs *l l'*, and the springs *l l'* are also arranged in the path of a bar *n*, of non-conducting material, carried by the frame D, the bar *n* being arranged with relation to the elevator mechanism and the springs *l l'*, so that when the elevator-car reaches one end of its excursion it will touch one of the contact-springs, and when it reaches the opposite end of its excursion it will touch the other contact-spring.

In the elevator-car is placed a two-point switch *o*, provided with a switch-arm *p* and contact-points *q r*. The pivot of the switch-arm *p* is connected by a wire *s* with one pole of the battery P, the remaining pole being connected by a wire *u* with the magnets 30 upon one side of the cylinder 16, the said magnets 30 being connected in turn with the magnets 30 upon the opposite side of the cylinder. The contact-springs *m'* m^2 are connected electrically with the magnet 30 of the discharge-valve 19^c, and the contact-springs *m* m^3 are connected electrically with the supply-valve 19^b. The contact-spring *l* is connected by the wire *t* with the contact-point *q* of the switch *o*, and the contact-spring *l'* is connected electrically with the contact-point *r* of the switch *o* by the wire *x'*. When the switch-arm *p* is placed upon the contact-point *q*, the circuit of the battery P is closed and the current flows through the conductor *s*, switch-arm *p*, contact-point *q*, wire *t*, spring *l*, contact-spring *m*, magnet 30 of the supply-valve 19^b, magnet 30 of the discharge-valve 19^a, thus closing the discharge and opening the supply, admitting water to the back end of the cylinder 16, moving the piston 17 forward, the water in front of the piston being allowed to escape through the normally-open discharge-valve 19^a, when the piston 17, through the medium of the rod 18, will open the valve K, admitting water to the cylinder A, pushing the piston outward, and

moving the frame D so as to increase the distance between the sheaves E F, thus causing the elevator-car to rise in the shaft.

The car may be stopped at any point by reversing the switch *o*, placing the switch-arm *p* upon the point *r*, thus causing the current to pass from the battery P, through the wire *s*, switch-arm *p*, contact-point *r*, wire *x*, spring *l'*, contact-spring *m'*, magnets 30 of the supply and discharge valves 19^c 19, conductor *u*, to the battery, thus admitting water to the forward end of the cylinder 16, causing the piston 17 to move backward, thus closing the valve K, so that water neither enters the cylinder A nor escapes therefrom when the switch-arm *p* is removed from contact-point *r* and the elevator-car remains stationary until it is again desired to move it, when, if the car is to descend, the switch-arm *p* is replaced upon the point *r* and the valve 19^c is held open, and the valve 19^a is held closed until the piston 17 is carried to the rear end of its stroke, thus opening the valve K, so as to allow the water contained by the cylinder A to escape through the discharge-pipe M, when the car O, descending by its own gravity, takes up the rope H, draws the sheaves E F toward each other, and forces the piston of the cylinder A inward.

Should the attendant fail to arrest the motion of the car by the manipulation of the switch-arm *p* when the frame D nears the end of its excursion toward the cylinder A, the bar *n* will strike the spring *l'*, causing it to break contact with the spring *m'*, bringing it into contact with the spring *m*^{3}, when the current will flow through the magnets 30 of the supply and discharge valves 19 19^b, admitting water to the opposite end of the cylinder 16, causing the motion of the piston 17 to be reversed, thus, through the medium of the mechanism already described, reversing the motion of the elevator. The discharge-valves of opposite ends of the cylinder are normally open, so that, if desired, the valve K may be operated by the cable *e* in the usual way.

In Figs. 6 and 7 I have illustrated a modification in which the supply and discharge valves are both connected with the ends of the auxiliary cylinder by means of pipes. In this case the hydraulic-valve mechanism and auxiliary cylinder are omitted. The hydraulic cylinder 48 is connected by means of pipes 49 50 with valve-chest 19. Circuit-wires 52 connect with magnets 29, secured to said valve-chest.

In the above description I have shown the invention as applied to an elevator when the hand-rope is retained. When it is desired to leave the hand-rope off, the four valves (similar to the present supply-valves) are made and placed in their positions, and the wires are led in precisely the same, with the exception that, instead of two opposite valves at the same end of the auxiliary cylinder, as 19 19^b and 19^a 19^c, being in the same circuits, the diagonally-opposite valves, as 19 19^c and 19^a 19^b, are arranged in the same circuits, as shown by dotted lines in Fig. 1, thus causing, when either circuit is closed, a valve at each end of the auxiliary cylinder to open and act, one as a supply and the other as a discharge valve.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination, with the valve-operating mechanism of a hydraulic elevator, of an auxiliary cylinder provided with separate supply and discharge valves, electro-magnets arranged to operate the said valves, and a piston contained by the cylinder and connected with the valve-operating mechanism of the elevator, substantially as described.

2. The combination, with the valve-operating mechanism of an elevator, of a cylinder provided with a piston connected with the elevator-valve, separate supply and discharge balanced valves connected with the cylinder and provided with armatures, and electro-magnets arranged to operate the said valves, the discharge-valves being arranged to remain normally open and the supply-valves normally closed, substantially as described.

3. In valve-operating mechanism for elevators, the combination, with a double cylindrically-bored valve-seat, of a valve formed of two recessed disks, each provided with ports extending from the recess to the periphery, substantially as described.

4. The combination, with the magnet attached to the valve-chest, having chambers and valve-seats, as specified, of the balanced valves arranged in line and having recesses in the upper side, and side ports which communicate with said recesses, and the armatures attached to the valve-stems, as shown and described.

5. The combination, with the valve-operating mechanism of an elevator, of an auxiliary cylinder provided with a piston connected with the valve-operating mechanism, separate supply and discharge valves connected with the auxiliary cylinder and provided with armatures, controlling electro-magnets arranged in the casing of the said valves, an electric generator, (such as a battery,) circuit-wires leading from the generator to the magnets and elevator-car, and a switch for shifting the current from one set of electro-magnets to the other, substantially as described.

6. The combination, with the valve-operating mechanism of a hydraulic elevator, of an auxiliary cylinder provided with a piston and furnished with supply and discharge valves, armatures attached to the supply and discharge valves, electro-magnets arranged to control the supply and discharge valves, an electric generator, a switch attached to the elevator-car, circuit-controlling devices attached to the elevator mechanism and ar-

ranged to be operated thereby when the car reaches the upper or lower part of its excursion, and the circuit-wire, substantially as described.

7. The combination, with the cylinder 16, having the piston 17, of supply-valves 19 19^c and discharge-valves 19^a 19^b, adjusting-screws 27, the valves 19^a and 19^b being constructed to remain normally open, armatures 26, carried by the valves, and electro-magnets 30, arranged adjacent to the armatures, substantially as described.

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