No. 845,731. PATENTED FEB. 26, 1907.

T. ESKILSSON.

CURTAIN HOISTING APPARATUS.

APPLICATION FILED APR. 23, 1906.

5 SHEETS—SHEET 1.

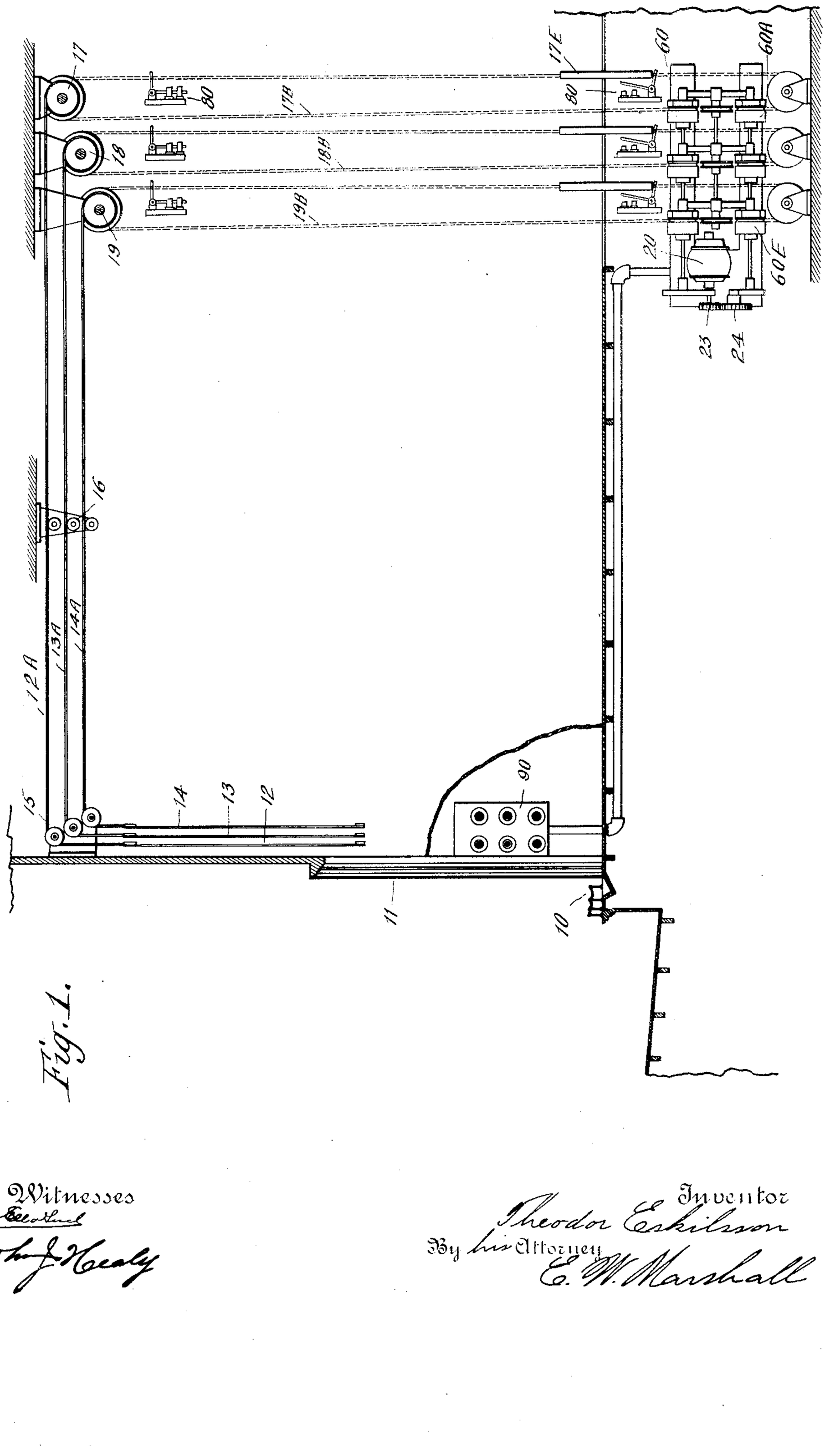

Fig. 1.

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Geo. Hand
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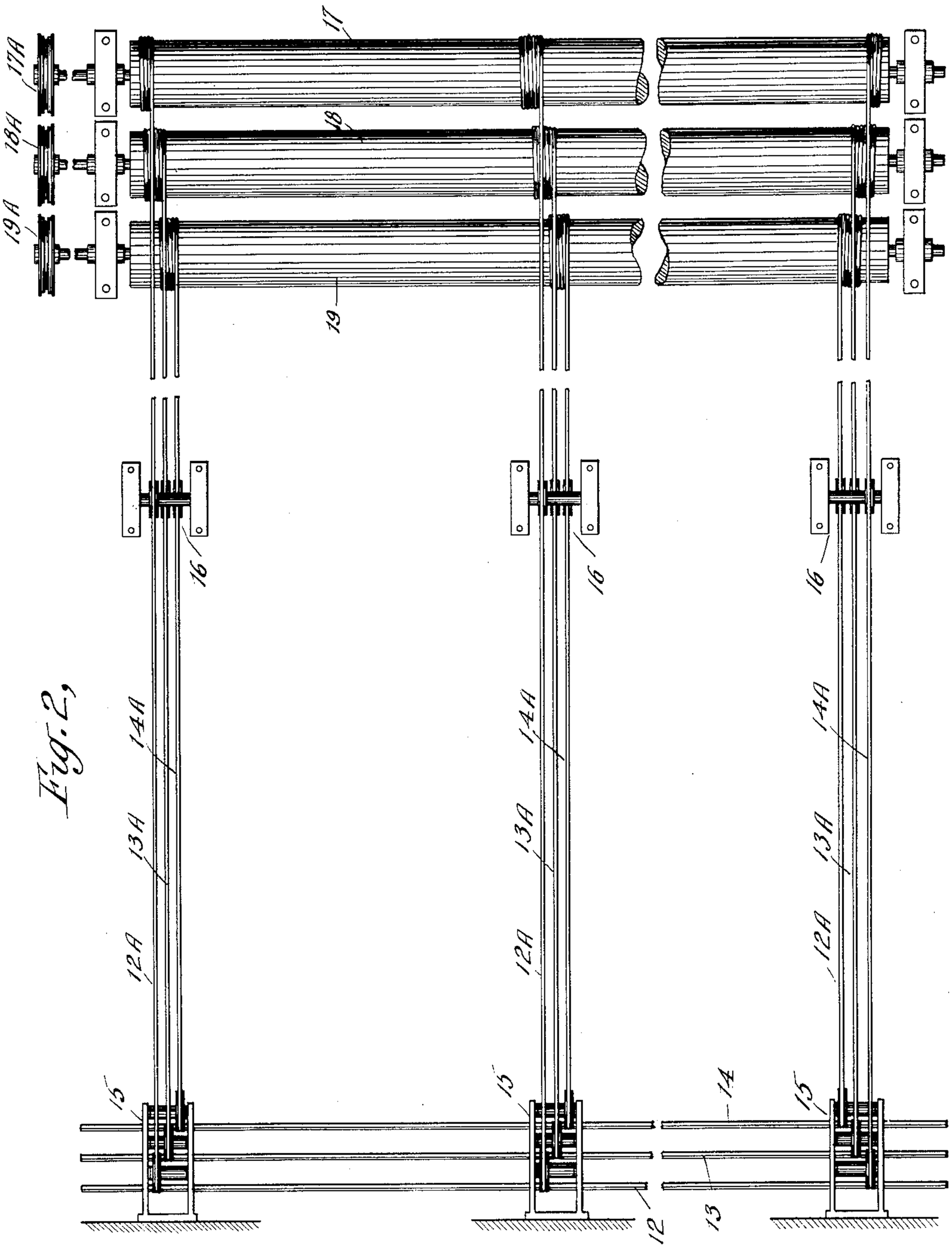

Fig. 2.

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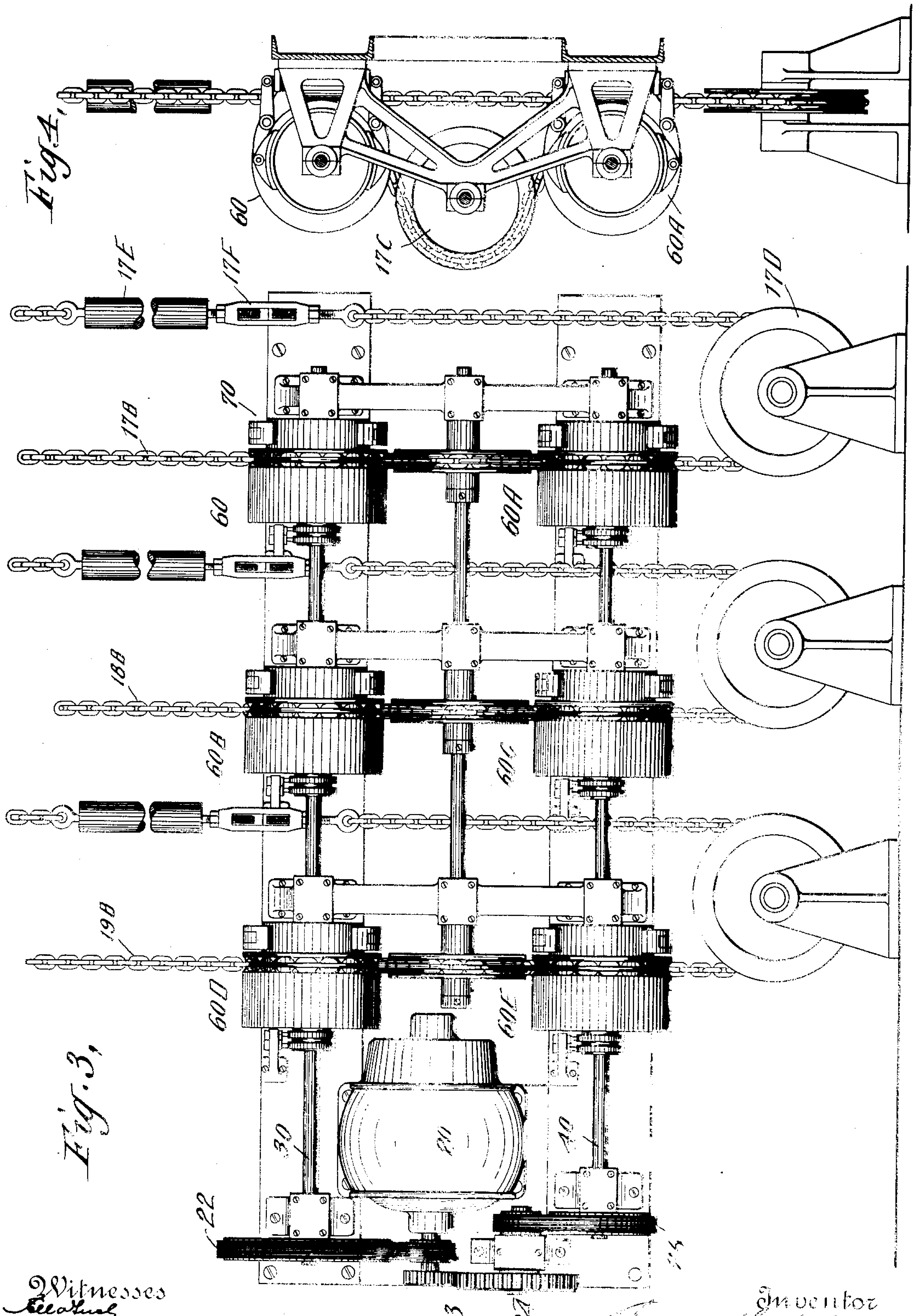

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5 SHEETS—SHEET 4.

Fig. 6.

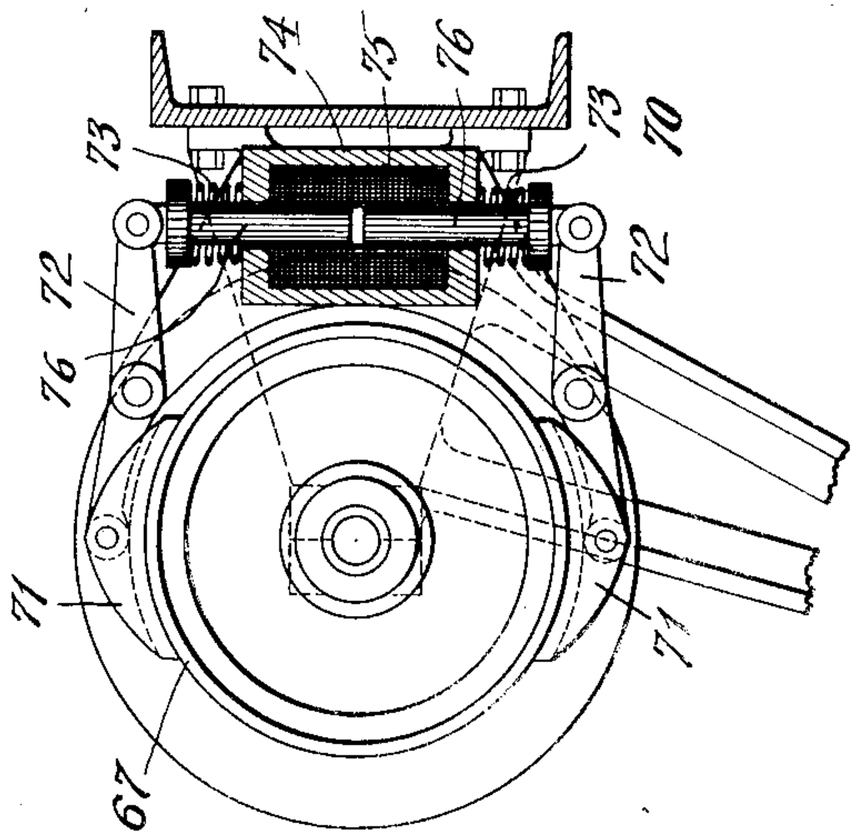


Fig. 7.

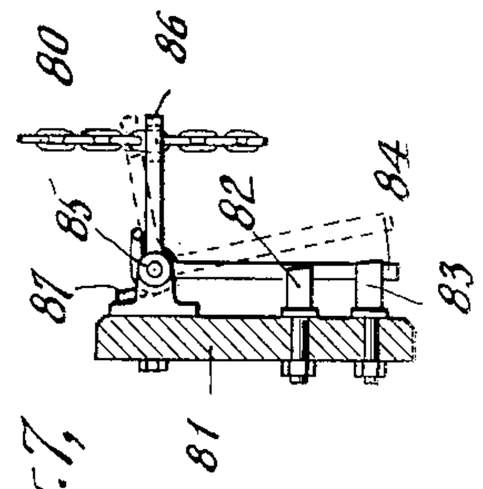
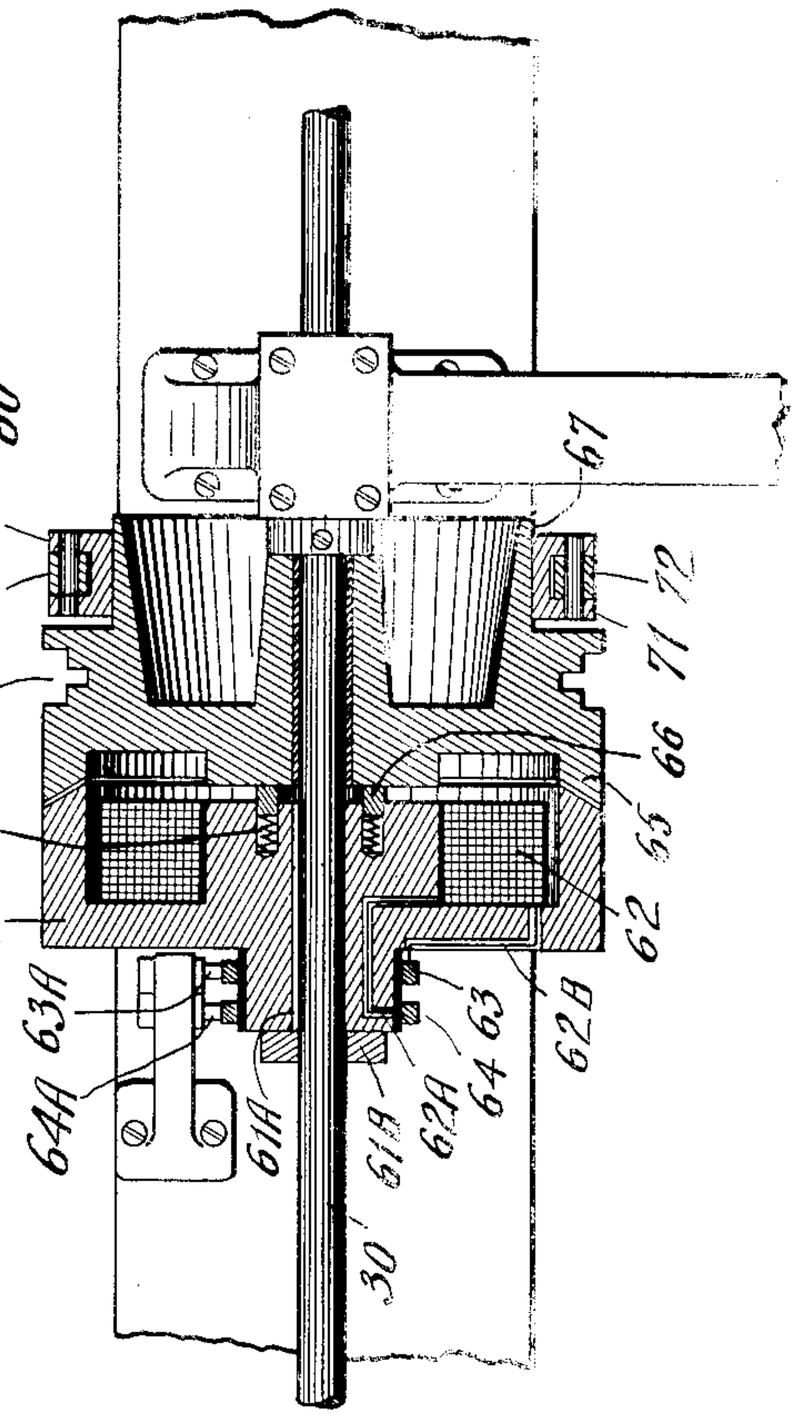


Fig. 5.



Witnesses
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By his Attorney
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5 SHEETS—SHEET 5.

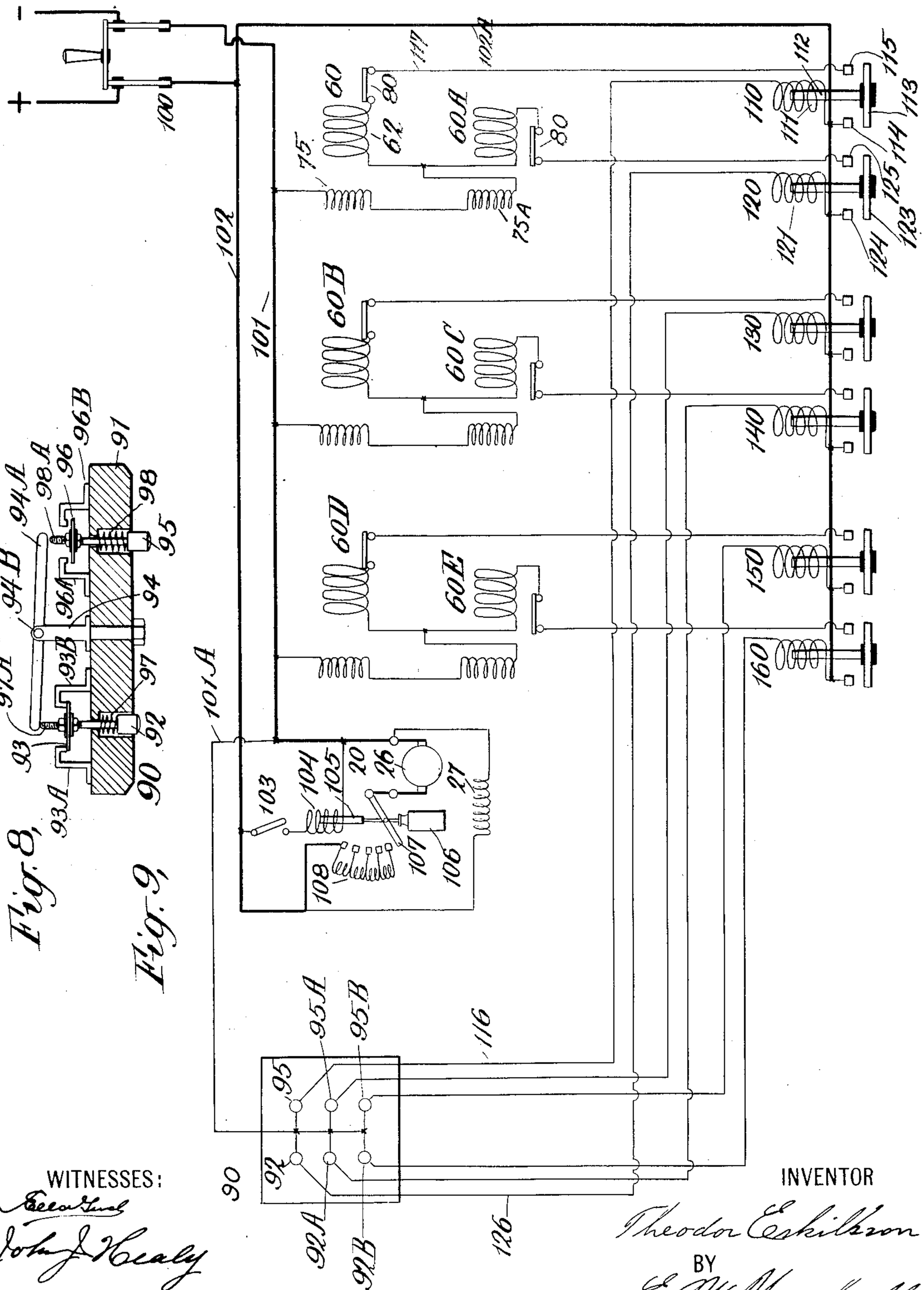

Fig. 8,

Fig. 9,

WITNESSES:

Edward Lund

John L. Healy

INVENTOR

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BY

C. W. Marshall

ATTORNEY

UNITED STATES PATENT OFFICE.

THEODOR ESKILSSON, OF NEW YORK, N. Y.

CURTAIN-HOISTING APPARATUS.

No. 845,731. Specification of Letters Patent. Patented Feb. 26, 1907.

Application filed April 23, 1906. Serial No. 313,137.

To all whom it may concern:

Be it known that I, THEODOR ESKILSSON, a citizen of the United States, and a resident of the city of New York, in the county and State of New York, United States of America, have invented certain new and useful Improvements in Curtain-Hoisting Apparatus, of which the following is a specification.

My invention relates to a hoisting apparatus, and is especially adaptable for use in raising and lowering curtains in theaters.

It consists in novel construction and arrangement of parts, which will be fully described in the following specification, and the novel features thereof pointed out in claims.

Referring to the drawings, Figure 1 is a sectional side elevation of a stage, showing my improved hoisting apparatus used in conjunction therewith. Fig. 2 is a plan view of some of the parts shown in Fig. 1. Fig. 3 shows my improved apparatus in side elevation, and Fig. 4 is an end elevation of the parts shown in Fig. 2. Fig. 5 is a sectional view of an electromagnetic clutch which I use in carrying out my invention. Fig. 6 is an end elevation, partly in section, of an electric brake, also used in carrying out my invention. Fig. 7 is a side elevation, partially in section, of an automatic cut-off or stop-motion switch. Fig. 8 is a sectional plan view of a push-button controller-switch for controlling the apparatus, and Fig. 9 is a wiring-diagram of a preferred form of electrical circuits.

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

10 designates a stage.

11 is a proscenium.

12, 13, and 14 designate curtains which are adapted to be moved up and down in front of the proscenium. These curtains are connected, by means of ropes or cables 12^A, 13^A, and 14^A, to rollers 17, 18, and 19, after passing over supporting-sheaves at 15 and guiding-sheaves at 16. The chain-wheels 17^A, 18^A, and 19^A are rigidly connected to the shafts of the rollers 17, 18, and 19 and arranged to rotate with the rollers. Chains 17^B, 18^B, and 19^B are arranged to pass over these chain-wheels and down to the hoisting apparatus, which I will now describe.

Referring to Figs. 3 and 4, 20 designates an electric motor, the shaft 21 of which is arranged to drive a shaft 30 in one direction by being suitably connected to it by means of a belt or chain 22 and to drive a shaft 40 in the opposite direction by being connected to it by gears 23, a counter-shaft 24, and a chain or belt 25. The gears 23 may be so proportioned as to cause the shaft 40 to rotate at the same rate of speed as that of the shaft 30, or, if desired, they may be arranged to cause the rotation of shaft 40 to be greater or less than that of shaft 30. Mounted upon the shafts 30 and 40 are a series of electromagnetic clutches, (designated in the drawings by 60, 60^A, 60^B 60^C, 60^D, and 60^E.) One of these magnetic clutches is shown somewhat in detail in Fig. 5. Let us, for example, consider this the clutch designated in Fig. 3 by 60. All of these clutches are of substantially the same construction, so that a description of one of them will be sufficient to fully explain this part of the invention. A magnet member 61 is rigidly mounted upon the shaft 30. This member may be held in place by means of a key 61^A and a collar 61^B. The magnet member 61 is of course composed of a magnetic material, such as iron. A coil or winding is placed within this magnet member, and its terminals 62^A and 62^B are connected to collector-rings 63 and 64, upon which brushes 63^A and 64^A bear. A secondary member 65 is loosely mounted upon the shaft 30 in close proximity to the magnet member 61, and this portion 65 constitutes an armature for the magnet 61. The parts 61 and 65 may be arranged to be held apart by means of a slip-ring 66, which may be pressed outward by springs 66^A. When the parts are thus pressed apart, the magnet member 61 will rotate with shaft 30, but the secondary or armature member 65 will remain at rest. To insure this part 65 remaining at rest during certain parts of the operation of this device, a brake 70 is provided. This brake 70 is shown somewhat in detail in Fig. 6. It comprises brake-shoes 71 71, which are mounted upon pivoted levers 72 72 and which are pressed against a portion 67 of the secondary member 65 by means of springs 73 73. A magnet 74 is provided for the purpose of releasing this brake. This magnet comprises a winding 75 and two magnetic cores 76 76, which are connected to the pivoted brake-arms 72 72, as shown. When a current is passed through the solenoid-winding 75, the magnet 74 is energized thereby, and the cores 76 76 are attracted toward each other against the action of the springs 73 73. This will cause the pivoted brake-arms 72 72

to be moved in such a manner as to release the brake-shoes 71 71 from the portion 67 of the secondary member 65 of the magnetic clutch 60. If a current is sent through the winding 62 of the magnet member 65, the latter will be energized thereby and will cause lines of force to be set up in the magnet member. The magnetic path for these lines will be completed through the secondary or armature member 65, and this will cause the latter to be strongly attracted to and drawn toward the magnet member 61. The two parts 61 and 65 will then have a tendency to move together, and the secondary portion 65 will therefore be driven by the magnet member 61. The electrical circuits are arranged, as will appear later, so that the brake 70 and the magnet member 61 will be energized at the same time. As soon as the current is cut off from the windings 62 and 75 the magnet member will become deënergized and the brake will be applied. This will cause the driving force to be removed from the secondary member 65 and the brake to be applied to it, so that the member 65 will come to rest. The secondary member 65 is provided with a groove 68, as shown, for the purpose of receiving a chain which passes partly around this member. The chain 17^B passes over this chain-groove in the clutch 60, as is shown in Figs. 3 and 4. It has already been pointed out that the chain 17^B passes over a chain-pulley 17^A, which is attached to the roller 17. It then extends down to the clutch 60 and around a portion of the chain-groove in this clutch 60, thence over a portion of an idler 17^C, thence across a chain-groove in clutch 60^A, similar to that just described, and thence down and under a second idler 17^D, which is rigidly supported to the floor or other portion of the building. The chain 17^B thence passes up to the chain-sheave 17^A. Interposed in the portion of this chain which lies between the sheave 17^D and the sheave 17^A may be a counterweight 17^E, arranged to balance or partially balance the weight of the curtain 12, and a turnbuckle 17^F, arranged to take up the slack in chain 17^B.

In Fig. 7 I have shown an automatic cut-off or stop-motion switch 80. This comprises a base 81, of slate or other suitable insulating material, two stationary contacts 82 and 83, and a contact-arm 84, which is pivoted at 85 and from which an arm 86 extends. A spring 87 is arranged in such a way that it tends to hold the contact-arm 84 in contact with stationary contacts 82 and 83. The arm 86 is placed in the path of travel of the counterweight and is so arranged that when the counterweight approaches the limit of its travel it will strike the arm 86 and cause the pivoted contact-arm 84 to be moved out of contact with the stationary contacts 82 and 83. Two of these automatic stop-motion switches may be used in connection with each counterweight and may be placed in relation to the counterweights and their connected parts, as is shown in Fig. 1. In this case the lower stop-motion switches are shown in their opened position and the upper stop-motion switches are shown in their closed position.

The operation of this device is obvious for it may be seen by referring to Fig. 1 that when the counterweight 17^E is at its lowest position it will open the stop-motion switch 80, which is in its path of travel. When the counterweight 17^E reaches the upper limit of its travel, it will strike the projecting arm of the stop-motion switch 80, which is there placed in its path of travel and will cause the latter switch to be opened.

In Fig. 8 I have shown a portion of a manually-operated switch or push-button device 90. This comprises a base 91, of slate or other suitable insulating material. The push-button 92 at the left-hand portion of this figure is shown in its depressed position, in which case it has compressed a spring 97 and caused a contact-plate 93, which is connected to but insulated from a stem 97^A, which is connected to the push-button 92, to be moved into contact with two stationary contacts 93^A and 93^B. 94 designates a stationary bracket to which an arm 94^A is pivoted at 94^B. When the push-button 92 is depressed, as is shown in Fig. 8, the stem or rod 97^A, to which the push-button 92 and its movable parts are connected, is in contact with the pivoted arm 94^A and is arranged to swing the latter arm about its pivot into the position in which it is shown in the drawing. 95 designates another push-button similar to that just described; but in this case its contact-plate 96 is moved away by spring 98 from the stationary contacts 96^A and 96^B with which it is adapted to coact. It may be seen that this push-button cannot be depressed a sufficient amount to allow the contact-plate 96 to be brought into contact with the stationary contacts 96^A and 96^B as long as the contact-plate 93 is held against the stationary contacts 93^A and 93^B on account of the relative position of the pivoted arm 94^A to the stem 97^A and the stem 98^A. The portion of the push-button device 90, which is shown in Fig. 8, is merely that of one pair of buttons. As many pairs of these buttons as desired may be used in carrying out my invention as the number of curtains or similar devices to be operated by this device.

Referring now to Fig. 9, I will describe the various electrical circuits there shown and at the same time point out the operation of such parts of my invention as has not already been fully described. + and − designate mains from a suitable source of electrical supply, which after passing through a main-line switch 100 are connected to va-

rious parts of the apparatus. The armature of the motor 20 is designated by 26 and its shunt-field by 27. The negative main is shown directly connected by a conductor 101 to one of the brushes of the armature 26 and to the right-hand portion of the shunt-field 27. The positive main is shown connected by a conductor 102 to the left-hand portion of the shunt-field 27. 103 designates a manually-operated switch, which when closed is arranged to connect a solenoid 104 directly across the two mains. This solenoid is arranged when energized to attract its core 105 against the action of a dashpot 106 and to move a switch-arm 107 onto and across the contacts of a variable rheostat 108. The armature 26 is connected to the switch-arm 107, so that when the operation just described takes place the motor-armature will receive current from the main lines, which current will be gradually increased as the switch-arm 107 is moved across the contacts of the rheostat 108. The motor may be started in any desired manner or by any other arrangement of parts; but as this constitutes no part of my invention I will not describe it more fully.

The push-button device 90 may be situated at any convenient place—as, for example, near the proscenium of a stage, as is shown in Fig. 1. In Fig. 9 it is shown as comprising three pairs of push-buttons. One terminal of each of these buttons is connected by conductors 101^A and 101 to the negative main. Now if an operator pushes the button 95 he will complete a circuit thereby from the negative main through the conductor 116, solenoid-winding 111 of an electromagnetic relay 110, and to the positive main through conductor 102^A, which is connected to the other end of this solenoid. The solenoid 111 will thereby be energized and will raise its core 112 and a contact-plate 113, which is connected to it. The contact-plate 113 will thereby be brought into contact with and will bridge stationary contacts 114 and 115. The contact 114 is connected to the positive main by means of the conductor 102^A, and contact 115 is connected by conductor 117 through stop-motion switch 80, magnet-winding 62, and brake-windings 75^A and 75 to the negative main. In this manner the brakes 70 of the clutches 60^A and 60 will be released and the magnet member 61 of the clutch 60 will be energized. As this magnet member is positively driven by the motor 20 in one direction the secondary member 65 will now be driven in the same direction and will cause the chain 17^B to be driven thereby in one direction. This movement of chain 17^B will be transmitted through the parts previously described to the curtain 12 and will continue as long as the circuit through the electromagnetic relay 110 is completed. This circuit may be broken either by the operator releasing the push-button 95 or by the counterweight 17^E, striking against and opening stop-motion switch 80. When it is desired to move the curtain 12 in the opposite direction, the operator will press the button 92. A circuit will then be closed through conductor 126 and solenoid-winding 121 of electromagnetic relay 120. The stationary contacts 124 and 125 will then be connected by contact-plate 123, and a circuit will be completed through the winding of the magnet member of the clutch 60^A and through the brake-magnets 75^A and 75. This clutch 60^A is on the shaft 40, and is therefore rotated in the opposite direction and will cause the chain 17^B and its connected parts to be driven in the opposite direction to that previously described. This movement will be continued until the current through the clutch 60^A and the brakes is discontinued either by releasing the push-button 92 or by the counterweight 17^E striking the stop-motion switch 80, which is in circuit with the winding of clutch 60^A and which is at the other end of its path of travel. These operations can be repeated indefinitely without stopping the motor 20.

130 designates a relay, which may be controlled by push-button 95^A to energize clutch 60^B. 140 designates an electromagnetic relay, which may be controlled by push-button 92^A to energize clutch 60^C. 150 designates an electromagnetic relay which may be controlled by push-button 95^B to energize clutch 60^D, and 160 designates an electromagnet-relay which may be controlled by push-button 92^B to energize clutch 60^E. It is evident that any desired number of units may be controlled by this system, and I have selected three to illustrate this use.

The speed of the motor 20 may be varied at will, and it is often desirable to have the motor running at a slow speed for the purpose of obtaining certain effects with drop-curtains. I have already shown that the shafts 30 and 40 may run at different speeds, so that the curtains may be raised at one rate of speed and lowered at another rate of speed.

This invention has been shown in combination with the curtains in a theater, because this is one of its most advantageous uses. It may, however, be arranged to actuate other movable bodies—such, for example, as dumb-waiters. In fact, it is applicable to nearly any case where it is desired to control, both manually and automatically, a plurality of parts which are to be moved in opposite directions from one common source of motive power, and therefore I do not wish to limit myself to the specific use to which it is shown applied in this application.

It may be seen that a bar 94^A between each pair of push-buttons makes it impossible to energize the magnet member of but one of each pair of magnetic clutches at the same

time. This is a desirable feature, as it makes it impossible for an operator to press two buttons at once which might otherwise interfere with each other.

While I have shown one brake for the secondary member of each clutch, it is evident that it is not necessary to have more than one brake for each pair of clutches.

What I claim is—

1. A pair of shafts driven in opposite directions, a magnetic clutch on each of said shafts, a movable member associated with the clutches and arranged to be moved by one shaft when one of the clutches is energized and by the other shaft when the other clutch is energized, and means for holding the movable member when neither of the clutches is energized.

2. A pair of driven shafts, a magnetic clutch for each of said shafts, a portion of each of said clutches being constructed to form a chain-groove, and a driving-chain associated with the clutches and arranged to be moved in one direction when one clutch is energized and in the opposite direction when the other clutch is energized.

3. A pair of shafts driven in opposite directions, a magnetic clutch on each of said shafts, both of said clutches being constructed to form a chain-groove on their outer peripheries, and a driving-chain arranged to take into the chain-grooves on the clutches and to be moved by one shaft when one of the clutches is energized and by the other shaft when the other clutch is energized.

4. A pair of shafts driven in opposite directions, a magnetic clutch on each of said shafts, a movable member associated with the clutches and arranged to be moved by one shaft when one of the clutches is energized and by the other shaft when the other clutch is energized, a brake for holding the movable member, and means for releasing the brake when either of the clutches is energized.

5. A pair of shafts driven in opposite directions, a magnetic clutch on each of said shafts, a movable member associated with the clutches and arranged to be moved by one shaft when one of the clutches is energized and by the other shaft when the other clutch is energized, a brake for holding the movable member, electromagnetic means for releasing the brake when either of the clutches is energized, circuits for the clutches and the brake-releasing means, and a manually-operated switch for controlling the circuits.

6. A pair of shafts driven in opposite directions, a magnetic clutch on each of said shafts, a movable member associated with the clutches and arranged to be moved by one shaft when one of the clutches is energized and by the other shaft when the other clutch is energized, a brake for holding the movable member, electromagnetic means for releasing the brake when either of the clutches is energized, circuits for the clutches and the brake-releasing means, a manually-operated switch for controlling the circuits, and means in said switch for preventing the energization of but one of the clutches at the same time.

7. An electric motor, a pair of shafts connected to be driven thereby, a magnetic clutch for each of said shafts, a movable member associated with the clutches and arranged to be moved in one direction by one shaft when one of the clutches is energized and by the other shaft when the other clutch is energized, a brake for holding the movable member, electromagnetic means for releasing the brake when either of the clutches is energized, circuits for the clutches and the brake-releasing means, a manually-operated switch for controlling the circuits, and means in said switch for preventing the energization of but one of the clutches at the same time.

8. A driven shaft, a magnetic clutch, said clutch comprising a magnet member attached to the shaft and a secondary member loosely mounted upon the shaft; a second driven shaft, a second magnetic clutch comprising a magnet member attached to the second shaft and a secondary member loosely mounted upon the second shaft; and a movable member associated with said secondary members and arranged to be moved in one direction when one of the clutches is energized and in the opposite direction when the other clutch is energized.

9. A driven shaft, a magnetic clutch, said clutch comprising a magnet member attached to the shaft and a secondary member loosely mounted upon the shaft; a second driven shaft, a second magnetic clutch comprising a magnetic member attached to the second shaft, and a secondary member loosely mounted upon the second shaft; a brake for each of the secondary members and means for releasing both of said brakes when either of the clutches is energized.

10. A driven shaft, a magnetic clutch, said clutch comprising a magnet member attached to the shaft and a secondary member loosely mounted upon the shaft, and a winding; a second driven shaft, a second magnetic clutch comprising a magnet member attached to the second shaft and a secondary member loosely mounted upon the second shaft, and a winding; a brake for each of the secondary members, an electromagnet for each brake arranged to release said brakes, and means for energizing both brake-magnets and either of the clutch-windings.

11. A driven shaft, a magnetic clutch, said clutch comprising a magnet member attached to the shaft and a secondary member loosely mounted upon the shaft, and a winding; a second driven shaft, a second magnetic clutch comprising a magnet member attached to

the second shaft and a secondary member loosely mounted upon the second shaft, and a winding; a brake for each of the secondary members, an electromagnet for each brake arranged to release said brakes, circuits for the clutch-windings and the brake-magnets, a manually-operated switch in said circuits arranged to control the energization of both brake-magnets and either of the clutch-windings.

12. An electric motor, a pair of shafts connected to be driven thereby, a magnetic clutch on one of said shafts, said clutch comprising a magnet member attached to the shaft, a secondary member loosely mounted upon the shaft, and a winding; a second magnetic clutch on the other of said shafts, said second clutch comprising a magnet member attached to the second shaft, a secondary member loosely mounted upon the second shaft, and a winding; a brake for each of the secondary members, an electromagnet for each brake arranged to release said brakes, circuits for the clutch-windings and the brake-magnets, a manually-operated switch in said circuits arranged to control the energization of both brake-magnets and either of the clutch-windings, and means in said switch for preventing the energization of but one of the clutch-windings at the same time.

13. A pair of shafts driven in opposite directions, a plurality of pairs of magnetic clutches on said shafts, one of each pair of clutches being on one shaft and the other clutch of each pair being on the other shaft, a movable member associated with each pair of clutches and arranged to be moved by one shaft when one of its associated clutches is energized and by the other clutch when the other of its associated clutches is energized.

14. A pair of shafts driven in opposite directions, a plurality of pairs of magnetic clutches on said shafts, one of each pair of clutches being on one shaft and the other clutch of each pair being on the other shaft, a movable member associated with each pair of clutches and arranged to be moved by one shaft when one of its associated clutches is energized and by the other clutch when the other of its associated clutches is energized, a brake for holding each of the movable members and means for releasing the brake for any of the movable members when either of its associated clutches is energized.

15. A pair of shafts driven in opposite directions, a plurality of pairs of magnetic clutches on said shafts, one of each pair of clutches being on one shaft and the other clutch of each pair being on the other shaft, a movable member associated with each pair of clutches and arranged to be moved by one shaft when one of its associated clutches is energized and by the other clutch when the other of its associated clutches is energized, a brake for holding each of the movable members, electromagnetic means for releasing the brake for any of the movable members when either of its associated clutches is energized, circuits for the clutches and the brake-releasing means, and a manually-operated switch for controlling the circuits.

16. A pair of shafts driven in opposite directions, a plurality of pairs of magnetic clutches on said shafts, one of each pair of clutches being on one shaft and the other clutch of each pair being on the other shaft, a movable member associated with each pair of clutches and arranged to be moved by one shaft when one of its associated clutches is energized and by the other shaft when the other of its associated clutches is energized, a brake for holding each of the movable members, electromagnetic means for releasing the brake for any of the movable members when either of its associated clutches is energized, circuits for the clutches and the brake-releasing means, a manually-operated switch for controlling the circuits and means for preventing the energization of but one of each pair of clutches at the same time.

17. An electric motor, a pair of shafts connected to be driven thereby, a plurality of pairs of magnetic clutches on said shafts, one of each pair of clutches being on one shaft and the other clutch of each pair being on the other shaft, a movable member associated with each pair of clutches and arranged to be moved by one shaft when one of its associated clutches is energized, and by the other shaft when the other of its associated clutches is energized, a brake for holding each of the movable members, a releasing-magnet for each brake, circuits for the clutches and the brake-magnets, a manually-operated switch in the circuits arranged to control the energization of the clutches and brake-magnets, and means in said switch for preventing the energization of but one of each pair of clutches at the same time.

18. A driven shaft, a magnetic clutch, said clutch comprising a magnet member attached to the shaft, and a secondary member loosely mounted upon the shaft; a second driven shaft, a second magnetic clutch comprising a magnetic member attached to the second shaft, and a secondary member loosely mounted upon the second shaft; a movable member, intermediate mechanism associating the movable member with both of said clutches and arranged to cause the movable member to be moved in one direction when one clutch is energized, and in the opposite direction when the other clutch is energized.

19. A pair of driven shafts, a plurality of pairs of magnetic clutches on said shafts, one of each pair of clutches being on one shaft and the other clutch of each pair being on the other shaft, a plurality of movable bodies, intermediate mechanism associating one of

each of said movable bodies with each pair of clutches, and so arranged that the movable bodies are moved by one shaft when one of its associated clutches is energized, and by the other shaft when the other of its associated clutches is energized.

20. An electric motor, a pair of shafts connected to be driven thereby, a plurality of pairs of magnetic clutches on said shafts, one of each pair of clutches being on one shaft and the other clutch of each pair being on the other shaft, each of said clutches comprising a magnet member attached to its respective shaft, a secondary member loosely mounted upon its shaft, and a winding; a plurality of movable bodies, intermediate mechanism associating each of the movable bodies with the secondary members of one pair of clutches, a brake for each of the secondary members, an electromagnet for each brake arranged to release said brakes, circuits for the clutch-windings and the brake-magnets, a manually-operated switch in the circuits arranged to control the energization of the clutch-windings and the brake-magnets, and means in said switch for preventing the energization of but one of the clutch-windings of each pair of clutches at the same time.

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

THEODOR ESKILSSON.

Witnesses:
JOSEPH E. CAVANAUGH,
ELLA TUCH.