(No Model.) 2 Sheets—Sheet 1.

H. R. WELLMAN.

ELEVATOR MECHANISM.

No. 568,506. Patented Sept. 29, 1896.

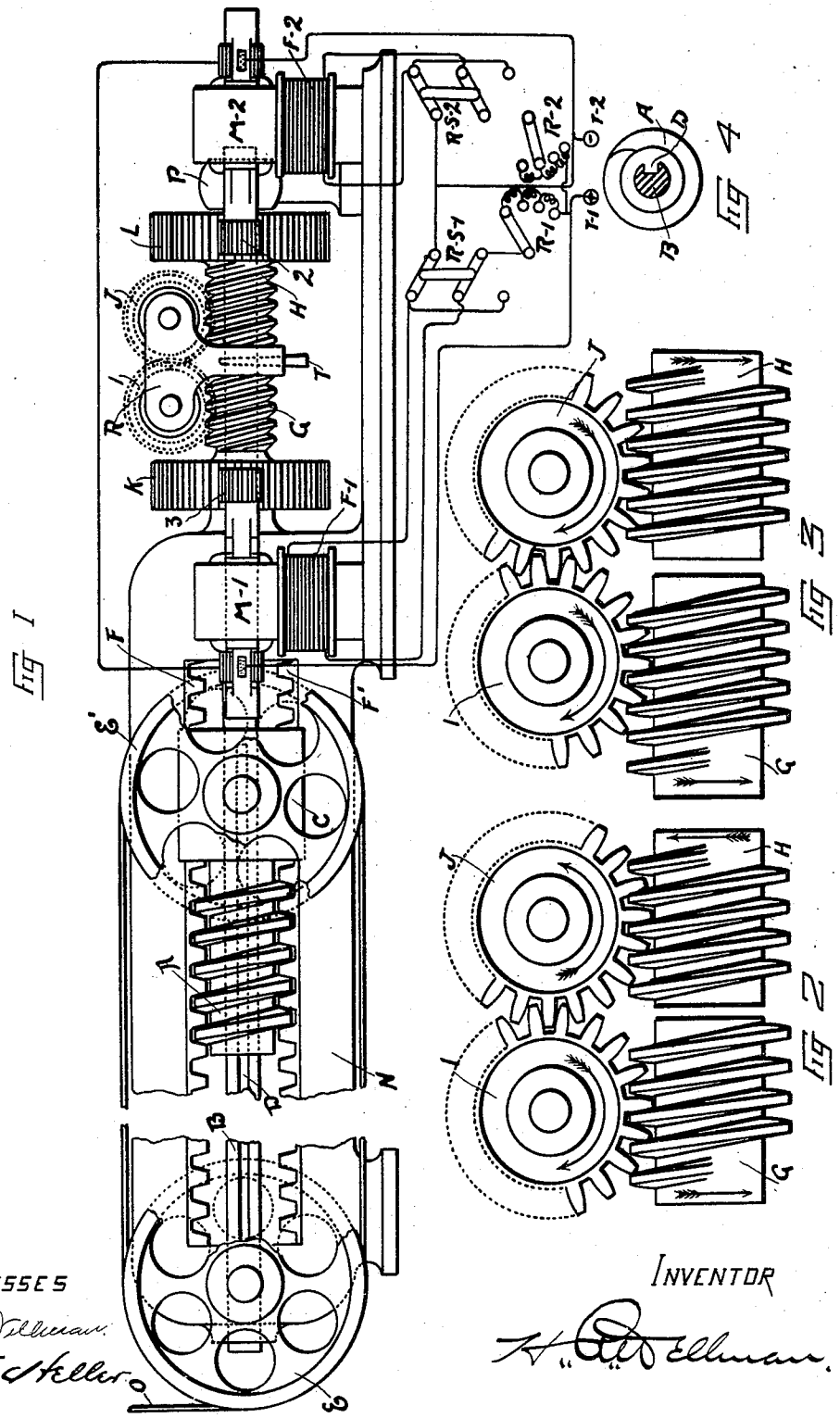

FIG 1 FIG 4 FIG 3 FIG 2

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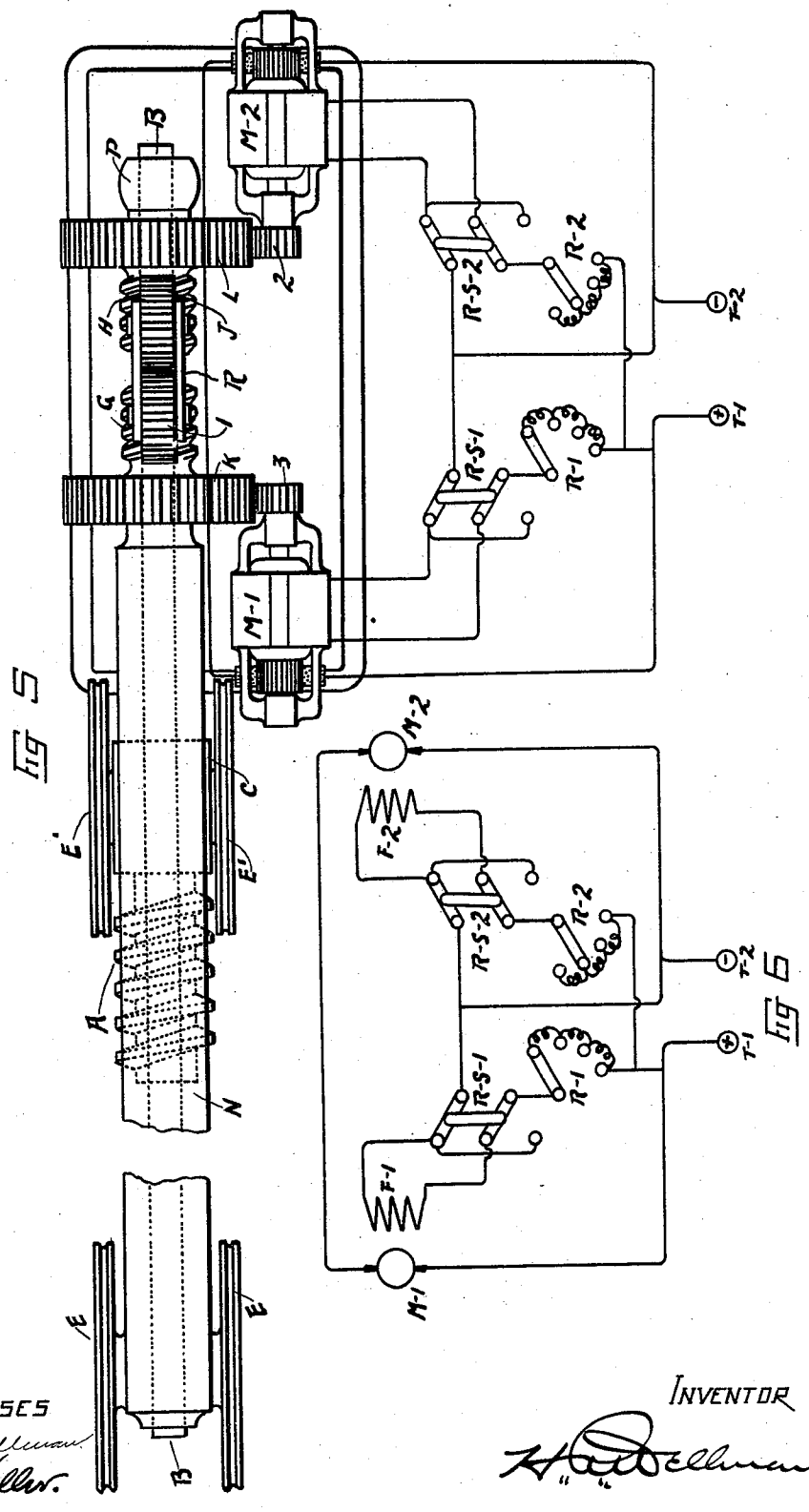

FIG 5

FIG 6

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UNITED STATES PATENT OFFICE.

HAROLD R. WELLMAN, OF NORTH TONAWANDA, NEW YORK.

ELEVATOR MECHANISM.

SPECIFICATION forming part of Letters Patent No. 568,506, dated September 29, 1896.

Application filed January 13, 1896. Serial No. 575,249. (No model.)

To all whom it may concern:

Be it known that I, HAROLD R. WELLMAN, a citizen of the United States, residing at North Tonawanda, in the county of Niagara and State of New York, have invented a new and useful Improvement in Elevator Mechanisms, of which the following is a specification.

My invention relates to an improvement in electric elevators, and has for its object to provide a simple and effective means for converting the rotation of a driving-shaft into a rectilinear motion of a cross-head and to provide a means for operating this shaft by means of two motors, by which a large range of leverages is obtained. This I accomplish as will be hereinafter set forth, reference being made to the accompanying figures, in which like notation designate similar parts, and in which—

Figure 1 shows a side view of my invention using two motors. Figs. 2 and 3 are details of the gearing which I may use to connect the two motors to the driven shaft. Fig. 4 is a detail of the driving-shaft. Fig. 5 is a plan view of Fig. 1, while Fig. 6 shows one method of control which I may use, and all of which will be hereinafter more fully set forth and described.

The class of elevators to which my invention relates is that in which the separation of two sets of sheaves around which the hoisting-cable passes is made to take up on this cable, thus raising the car, which is again lowered by bringing these sheaves together.

Referring in detail to Fig. 1, N is the main frame, in which is journaled the shaft B and the sheaves E E. To this frame are secured the racks F and F′, engaging with the screw A, mounted upon the shaft B and engaging therewith by means of the feather-way D. This screw bears against the cross-head C, which carries the sheaves E′ E′. The hoisting-cable O passes around the sheaves E and E′. The operation of this part of this figure is as follows: When the screw A is rotated by means of the shaft B and its feather-way D, as shown in detail in Fig. 4, it will, being in engagement with the racks F and F′, work along the shaft B, and when moving away from the sheaves E E will force the cross-head with it, and when working toward the sheaves E E the weight of the car will make the cross-head follow it. At the right of this figure is shown a means for operating the shaft by means of two motors M′ and M². The shaft B runs through to the bearing *p*, and upon it are journaled the two screws G and H, which are connected to the two gears K and L, respectively, by means of the gears 3 and 2, which are also concentric with this shaft. Upon this shaft and secured to it by any suitable means, as a key 4, is a part R, carrying the two gears I and J, meshing with the two screws G and H, respectively, the two motors M′ and M² being geared to these screws by means of the gears K and L. The operation of this gearing is shown in detail in Figs. 2 and 3, to which I will now refer in connection with Fig. 1.

If the two screws G and H are rotated in opposite directions at equal speeds by means of the two motors, it is evident that the two gears I and J will simply revolve in engagement with each other, and there will be no tendency to rotate the part R in either direction. If, however, the screws are rotated in like directions, then the gears will lock, as they are tending to rotate the gears I and J in the same directions, and this will cause the part R to revolve with the screws G and H, thus driving the shaft B. It is evident, too, from this construction that one motor cannot drive back upon the other. In order to obtain the full benefit of this arrangement, the operation should be as follows: The motors should be first started in opposite directions, which will enable the motors to get up to speed before the load is put upon them. Then, by slowing one motor down, the difference in rotation must be taken up by the part R and the shaft B carrying it. By still further reducing the speed of this motor under control there will be an increase of speed in the shaft B, and by stopping this motor the shaft B will rotate at a speed equal to one-half of the speed of the screw being rotated by the remaining motor. Then, by reversing the motor being controlled, there will be a further increase in the speed of the shaft, which speed will be a maximum when the speed of the motors is equal and in the same direction.

As the speed of the shaft B and the part R

is the algebraical mean of the speeds of the two motors, and as the absolute mean, or the average speeds of the two motors, irrespective of direction, can never be less than one-half of the full speed of each motor, it is evident that there must be a leverage varying as the ratio of the algebraical to the absolute mean speeds—as, for instance, if the screw G is rotating in one direction at a speed of one thousand revolutions per minute and the remaining motor rotates the screw H in the other direction at a speed of nine hundred and ninety-eight, then there will be an algebraical mean of nine hundred and ninety-nine revolutions per minute and an absolute mean of one revolution per minute, which will give a leverage of 999/1; or, instead of manipulating the motors in this manner, one may be first started from a state of rest, when it will have a leverage of 2/1 over the shaft B, and when up to speed will rotate this shaft at one-half speed, after which the remaining motor may be brought up to speed also in the same direction, which will result in a further increase in the speed of the shaft, as in the preceding scheme of manipulation.

In order to control the two motors, I prefer to connect the armatures in series and vary the speed and direction of rotation by manipulating the fields of one or both motors as shown in Fig. 5, in which A′ and A^2 are the two motor-armatures, connected in series across the mains receiving power from the terminals T′ and T^2, the two fields of these motors, F′ and F^2, being in multiple across the same mains and each having a resistance and reversing switch, as R′ and RS′ and R^2 and RS^2, in series with each, respectively.

I have found that if the motors are given equal fields then each will revolve in equal speeds. If, however, this equality is destroyed, then there will be a corresponding difference in the relative speeds, the motor having the weaker field running at the lower speed and that having the stronger field at a higher speed.

No harm can come to the motor under control because of the weakening of the field, for the remaining motor will increase sufficiently in speed to compensate for the loss of counter electromotive force in the first motor, and I have found that one motor may have its field-strength weakened and reversed with perfect success, as the counter electromotive force of the remaining motor will vary inversely as that of the manipulated motor, and so protect it against any excessive current which would naturally result from the weakening of its field.

Having thus described my invention, I claim—

1. In a hoisting mechanism for elevators, the combination with a suitable frame, of a shaft journaled therein, a screw sliding upon this shaft, and rotating therewith, a toothed part upon said frame and engaging with said screw, a cross-head sliding along said frame, and bearing against said screw, sheaves carried by this cross-head, standing sheaves journaled upon the frame, and a means for rotating the shaft, substantially as set forth.

2. In a hoisting mechanism for elevators, the combination with a suitable frame, of a shaft journaled therein, a screw sliding upon this shaft and rotating therewith, two parallel racks upon said frame and engaging with said screw, a cross-head bearing against the worm or screw, sheaves carried by said cross-head, standing sheaves journaled upon the frame and a means for rotating said shaft, substantially as set forth.

3. In combination, a motor-driven shaft, a screw sliding upon and revolving with said shaft, a stationary, toothed, part engaging with said screw, traveling sheaves, a cross-head carrying said sheaves and bearing against said screw, standing sheaves and a cable passing around said traveling and standing sheaves, substantially as set forth.

4. In a hoisting mechanism for elevators the combination with a suitable supporting-frame, of a shaft journaled therein, a screw sliding upon and revolving with said shaft, a toothed part upon said frame and engaging with said screw, a cross-head sliding along said frame and shaft, and bearing against said screw, sheaves carried by said cross-head, standing sheaves journaled upon said frame, two differentially-acting electric motors for operating said shaft and a means for controlling one or both motors, substantially as set forth.

5. In a hoisting mechanism for elevators, the combination with a suitable frame of a shaft journaled therein, a screw sliding upon this shaft, and revolving therewith, two parallel racks upon said frame and engaging with said screw, a cross-head bearing against said screw, sheaves carried by said cross-head, standing sheaves journaled upon said frame, two differentially-acting motors for operating said shaft, and a means for controlling one or both of said motors, substantially as set forth.

6. In combination, a shaft, a screw sliding upon, and revolving with said shaft, a stationary, toothed, part engaging with said screw, running sheaves, a cross-head carrying said sheaves and bearing against said screw, standing sheaves, a cable passing around said standing and running sheaves, two differentially-acting motors operating said shaft, and a means for controlling one or both motors, substantially as set forth.

7. In a differential gearing, the combination of two alined screws, gears meshing with these screws and with each other, and a carrier for these gears, revolving about a common center with them, substantially as set forth.

8. The combination with two electric-motor armatures, of two alined screws driven by said armatures, gears meshing with said screws and with each other, a carrier for said gears revolving about a common center with

them, a driven part operated by said carrier, and a means for controlling one or both armatures, substantially as set forth.

9. The combination with the armatures of two electric motors, connected in series, of two alined screws driven by said armatures, gears meshing with screws, and with each other, a carrier for said gears, and revolving about a common center with them, a driven part operated by said carrier, and a means for controlling the field-strength of one or both motors, substantially as set forth.

10. In combination, two electric-motor armatures, two alined screws operated by said armatures, gears meshing with said screws and with each other, a carrier for said gears and revolving about a common center with them, a shaft operated by said carrier, a screw sliding upon and revolving with said shaft, a stationary, toothed, part engaging with said screw, running sheaves, a crosshead carrying said sheaves and bearing against said screw, standing sheaves, a cable passing around said standing and running sheaves, and a means for controlling one or both armatures, substantially as set forth.

11. The combination, with two electric motors, the armatures of which are connected in series, of two alined screws operated by these armatures, gears meshing with said screws and with each other, a carrier for these gears, and revolving about a common center with them, a grooved shaft operated by said carrier, a screw sliding upon said shaft and engaging therewith by means of a feather in said groove, two stationary racks engaging with said screw, running sheaves, a crosshead carrying these sheaves and bearing against said screw, standing sheaves, a cable passing around the standing and running sheaves, and a means of controlling the field of one or both motors, substantially as set forth.

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Witnesses:
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