

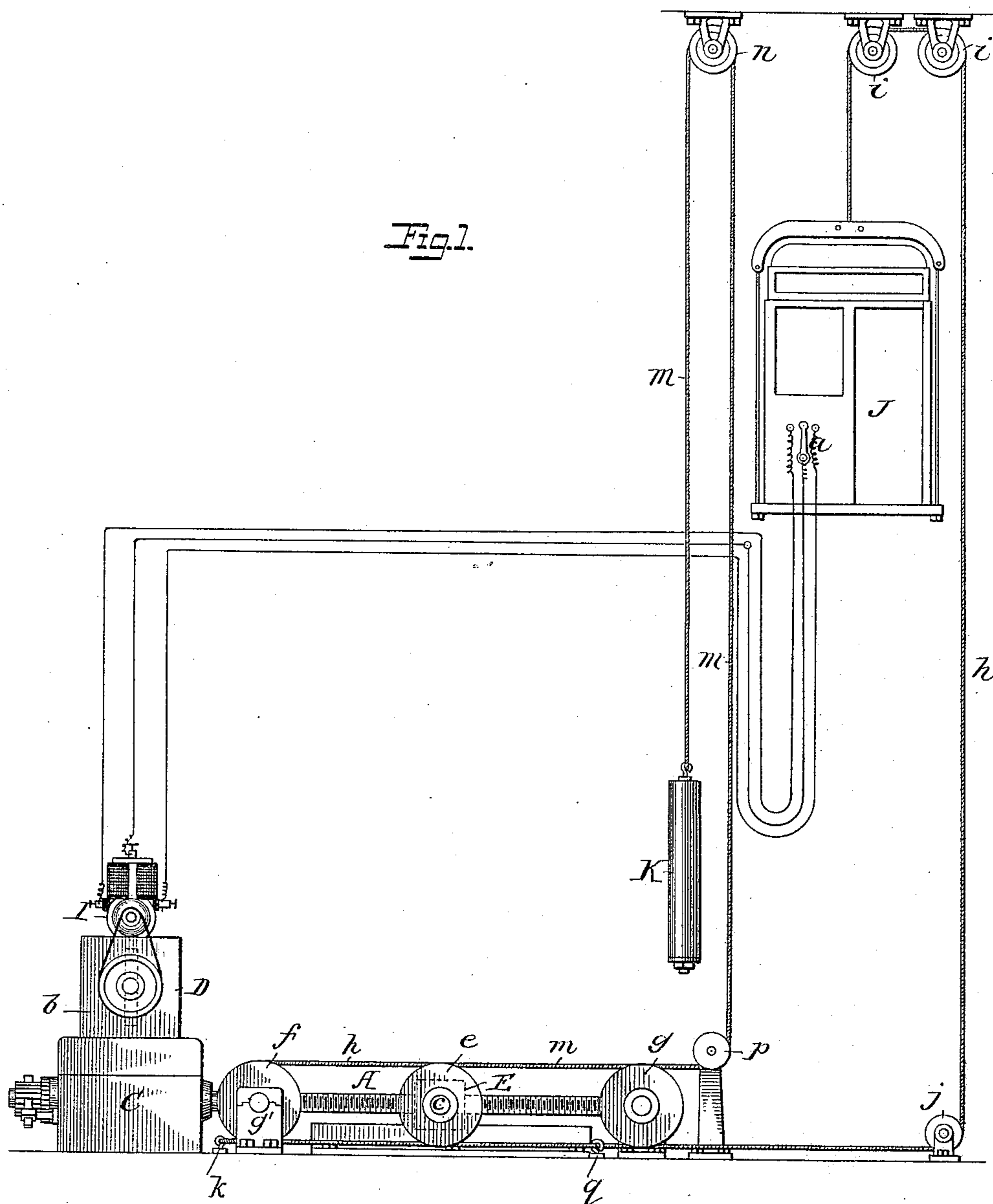
(No Model.)

2 Sheets—Sheet 1.

N. P. OTIS.
ELEVATOR.

No. 447,899.

Patented Mar. 10, 1891.



WITNESSES

Jno. G. Hinkel
Ch. S. McArthur

INVENTOR

Worton P. Bliss
By Foster & Freeman
Attorneys

(No Model.)

2 Sheets—Sheet 2.

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Fig. 2.

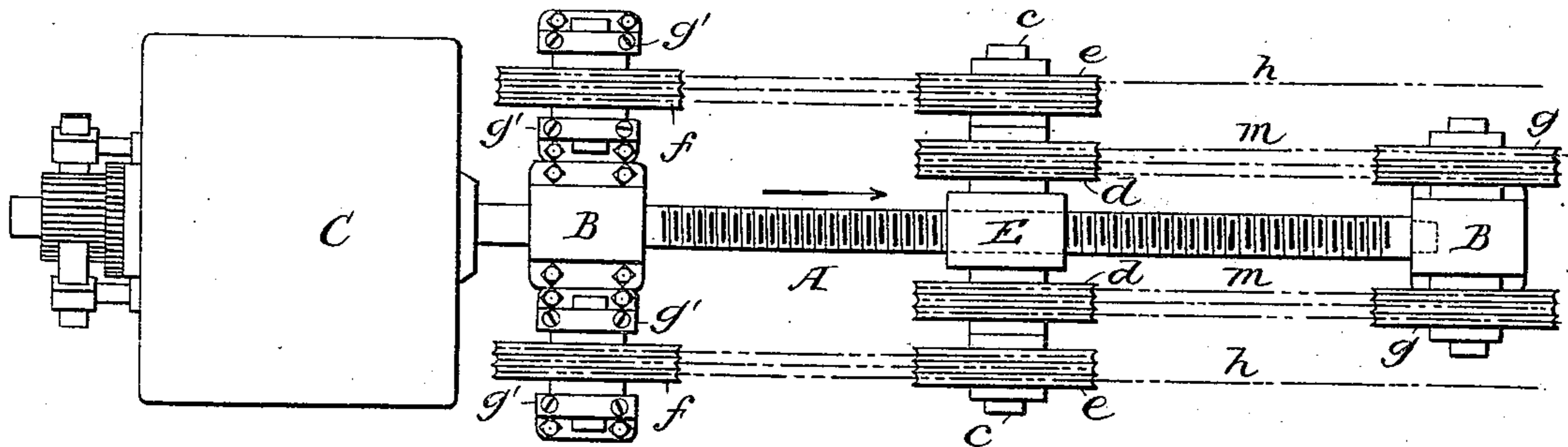


Fig. 3.

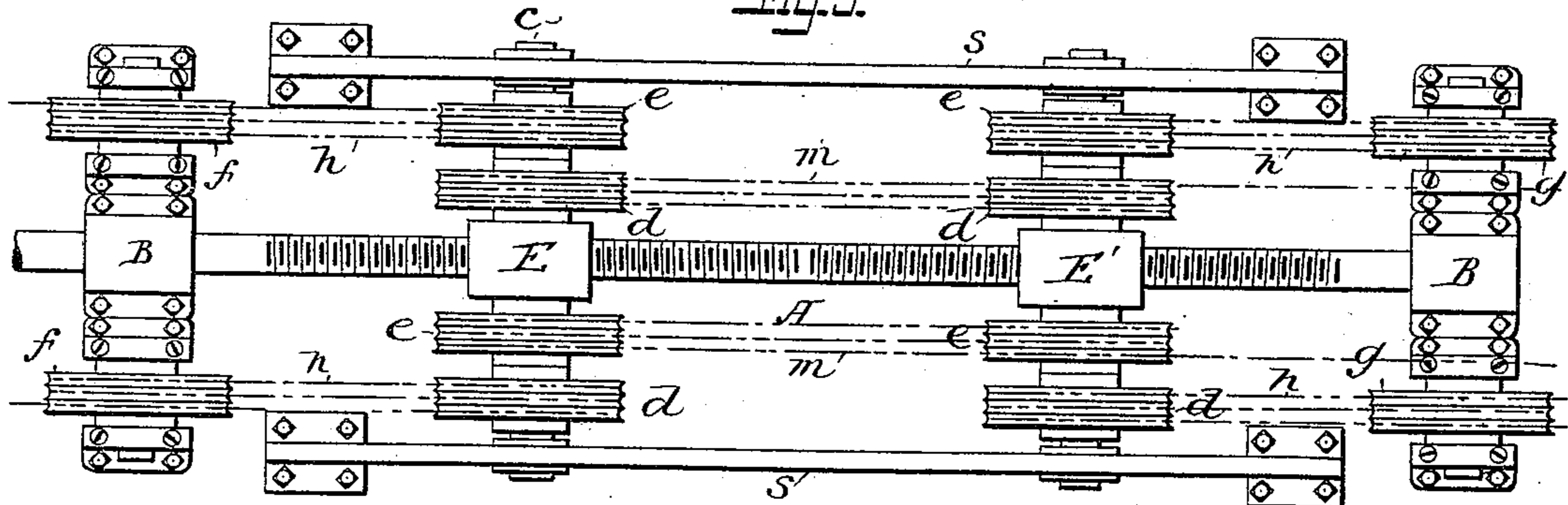
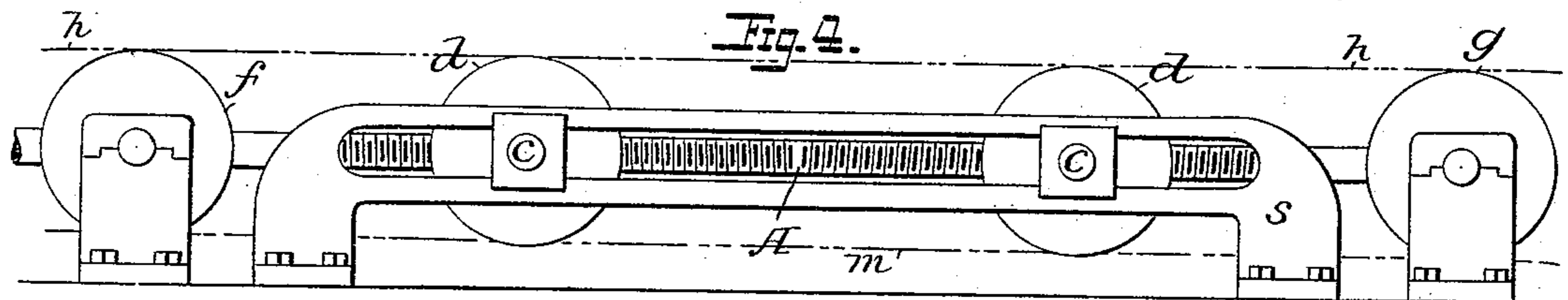


Fig. 4.



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Jno. G. Hinkel
W. S. McArthur

INVENTOR

Norton P. Otis.

By *Foster & Freeman*
Attorneys

UNITED STATES PATENT OFFICE.

NORTON P. OTIS, OF YONKERS, NEW YORK.

ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 447,899, dated March 10, 1891.

Application filed July 14, 1890. Serial No. 358,633. (No model.)

To all whom it may concern:

Be it known that I, NORTON P. OTIS, a citizen of the United States, residing at Yonkers, Westchester county, New York, have invented certain new and useful Improvements in Elevators, of which the following is a specification.

My invention relates to that class of elevator apparatus in which the cage is supported by flexible suspensories passing around multiplying drums carried to and from each other by means of one or more screw-shafts, upon which slides the carriage of the movable or running drum; and my invention consists in combining an apparatus of the description specified and a counter-weight supported by flexible suspensories passing around another set of drums in such manner as to neutralize the strains resulting from the weight of the cage, and secure other advantages, as fully set forth hereinafter, and as illustrated in the accompanying drawings, in which—

Figure 1 is an elevation illustrating sufficient of an elevator to show my improvement. Fig. 2 is an enlarged plan of the elevator-engine, showing two sets of stationary and one set of movable sheaves. Fig. 3 is an enlarged plan of an elevator-engine, showing two sets of movable and two sets of stationary sheaves. Fig. 4 is a side view of Fig. 3.

In the class of machines illustrated in Figs. 1 and 2 there is a single screw-shaft A, having a continuous screw-thread running in one direction, mounted in suitable bearings B B to turn freely therein and driven from a suitable motor C, which may be of any usual or suitable construction capable of rotating the shaft in one direction or the other, accordingly as the cage is to be raised or lowered, and with said motor is combined a stopping and starting device D, which may be set to different positions, so as to start the motor in one direction or another or bring it to rest, and such stopping and starting device is connected in any suitable manner with an operating-lever or other device *a* upon the cage.

For the purpose of illustrating my invention I have shown in outline a motor C, consisting of an electromotor, with a stopping and starting device D of suitable character to control the currents to the motor—as, for

instance, having a switch *b* (shown in dotted lines) capable of being turned to throw in or cut out resistances or break the circuit and to reverse the current to the base of the motor. A practical construction in such case would be that illustrated in the application of Otis and Smith, Serial No. 338,770.

With the shaft carrying the switch *b* may be combined an electromotor I, from the shaft of which the shaft of the switch may be driven, the current to the electromotor being controlled by the device *a* upon the cage, as in the apparatus described in the Letters Patent to C. G. Otis, No. 365,018. I do not more particularly describe the details of the motor and stopping and starting device, inasmuch as these two details constitute no part of my present invention, and as any suitable motor, either a steam-motor, electric motor, or hydraulic motor provided with any suitable stopping, starting, and reversing device, as a valve, belt-shifter, or switch, may be employed in a manner too well known to those familiar with the art to need further illustration or description. The screw A passes through a nut constituting the part of a carriage E, guided by a guide *s* and supporting or provided with studs *c c*, each of which supports grooved wheels or drums *d e*, and adjacent to the motor C, in line with the drums *e e*, are similar drums *f f*, supported to turn in fixed bearings *g'*, while in line with the drums *d d*, adjacent to the outer bearing B of the shaft A, revolve upon fixed supports to similar drums *g g*. The cage J is supported and operated by flexible suspensories in the form of a cable or cables *h*, two cables being shown, each passing over upper guide-pulleys *i*, downward and under a lower guide-pulley *j*, alternately around one pair of drums *e* and *f*, the multiple windings corresponding to the number of grooves in the drums, the ends being secured to a fixed stud or eye *k*. It will be evident that the movement of the carriage E in the direction of its arrow, Fig. 2, separating the drums *e f*, will take up the cable *h*, raising the cage with a rapidity depending upon the number of whips or turns of the cable around the standing sheaves F and running sheaves *e*. It will be seen, further, that the weight of the cage, acting through the cable and drums, will tend to bring the

threads of the carriage E to bear upon those of the screw A in a direction reverse of the arrow, Fig. 2, whereby the entire weight of the cage is thus received upon the screw-threads of the shaft A as a bearing. It will also be seen that the dead-weight of the cage must be lifted every time the cage is raised.

In order to reduce the thrust, friction, and wear and to secure other advantages, I combine with the motor-screw and multiplying sheaves and cable the counter-weight K, connected with a flexible suspensory shown in the form of a double cable *m*, each section of which passes from the counter-weight over an upper guide-pulley *n*, under a lower guide-pulley *p*, and around one of the pairs of drums *g d*, with its end fixed to an eyebolt or other fixture *q*. As thus arranged the counter-weight, through the medium of its supporting-cable and multiplying sheaves, is operated to move in a direction the reverse of that of the cage and exerts a force upon the carriage E, tending to counteract the draft of the cage-cables, so that the thrust of the carriage E against the screw-threads of the carriage A as a bearing is overcome to the extent to which the weight *k* counterbalances the weight of the cage, thereby reducing the friction between the shaft and the carriage and the thrust and friction of the shaft A upon its bearings, and further reducing the strains and shocks resulting from the sudden starting and stopping of the apparatus. It will also be seen that inasmuch as the cage is counterbalanced the power of the engine is employed simply to lift the load upon the cage, instead of raising the dead-weight of the cage itself, and in order to increase the efficiency of the engine I make the weight *k* much heavier than the weight of the car, so that when the loaded car descends and the weight *k* is raised with the exertion of but little or any power derived from the engine the said weight serves as an auxiliary power or motor to lift up the next upward trip a load greater than the capacity of the motor to lift.

In the construction illustrated in Figs. 3 and 4 I have shown my invention in connection with two sets of movable sheaves and two sets of stationary sheaves, serving to support and multiply the movement of the cables *h n*, supporting the cage and counter-weight. In this case the shaft A turns in end bearings B B and has reverse-screws passing through and operating two carriages E E'.

If desired, two or more parallel screw-shafts A, geared to turn together, may be used in connection with the same carriage or carriages as in multiplying-sheave-screw machines heretofore made.

I claim—

1. The combination, with the standing and

running multiplying sheaves and operating screw-shaft and cable passing around said sheaves and cage connected with the cable, of a second set of standing and running multiplying sheaves, a second cable passing around the same, and a counter-weight supported by said cable, substantially as set forth.

2. The combination, with the operating screw-shaft, of standing sheaves, a carriage moved by said shaft and carrying running sheaves, an elevator-cage suspended from a cable passing around one set of standing and running sheaves, and a counter-weight exceeding the weight of the cage and suspended from a cable passing around another set of standing and running sheaves, substantially as set forth.

3. The combination, with an elevator-cage and counter-weight, of standing sheaves, the carriage supporting the running sheaves, a screw-shaft for moving said carriage, and cables extending from the cage and from the counter-weight around said sheaves, substantially as described, whereby the draft upon the carriage exerted by one cable is counterbalanced by that exerted by the other, substantially as set forth.

4. The combination, with the cage, counter-weight, screw-shaft, carriage, and running sheaves, and with the stationary sheaves and cage and counter-weight-supporting cables, of a motor connected to drive said shaft, and a stopping, starting, and reversing device for said motor, and an operating device within the cage connected with the said stopping, starting, and reversing device, substantially as set forth.

5. The combination, with the screw-shaft and standing sheaves supported near the opposite end of said shaft, of a carriage driven by said shaft and supporting two sets of running sheaves, independent cables passing each around one of the standing sheaves and around one of the running sheaves, a cage supported by one of the cables, and the counter-weight supported by the other, substantially as set forth.

6. The combination of standing sheaves and two sets of running sheaves movable to and from each other, a screw-shaft connected to move both sets of running sheaves, and cables connected with the cage and with a counterbalance-weight and arranged on the sheaves, substantially as and for the purpose set forth.

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

NORTON P. OTIS.

Witnesses:

HENRY L. BRANT,
W. W. WHITE, Jr.