(No Model.) 2 Sheets—Sheet 1.

P. MURRAY, Jr.

DIFFERENTIAL HOISTING GEAR.

No. 348,684. Patented Sept. 7, 1886.

Fig: 1.

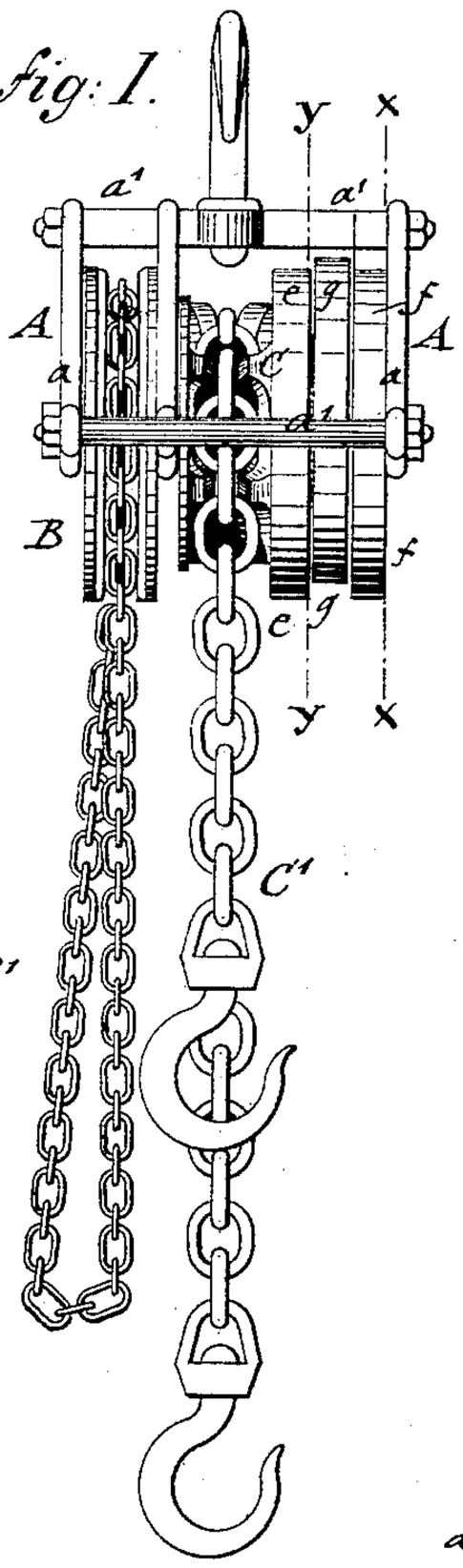


Fig: 3.

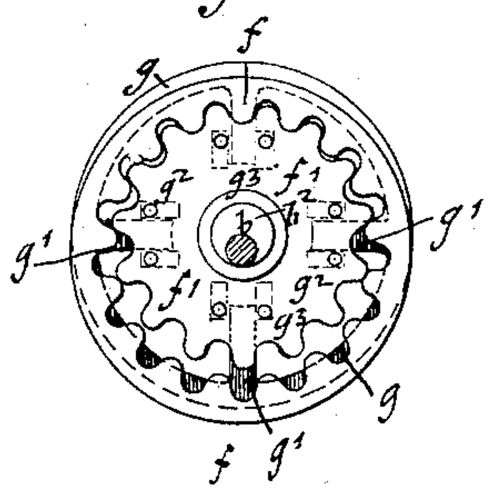


Fig: 4.

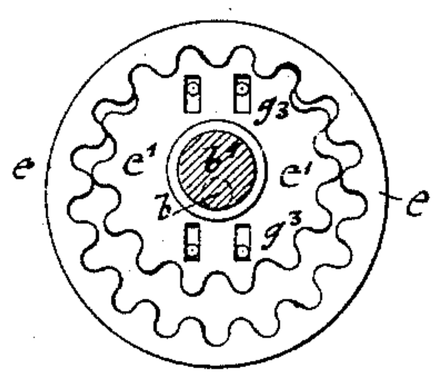


Fig: 5.

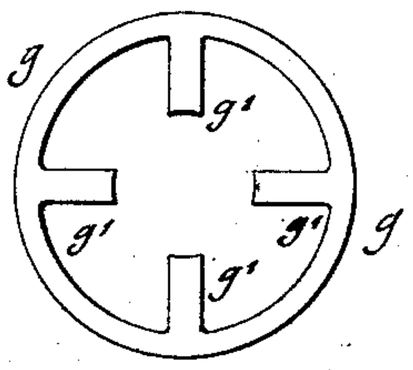


Fig: 6.

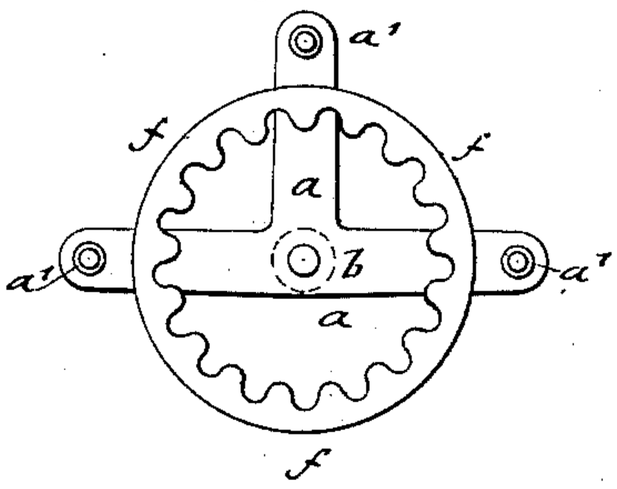
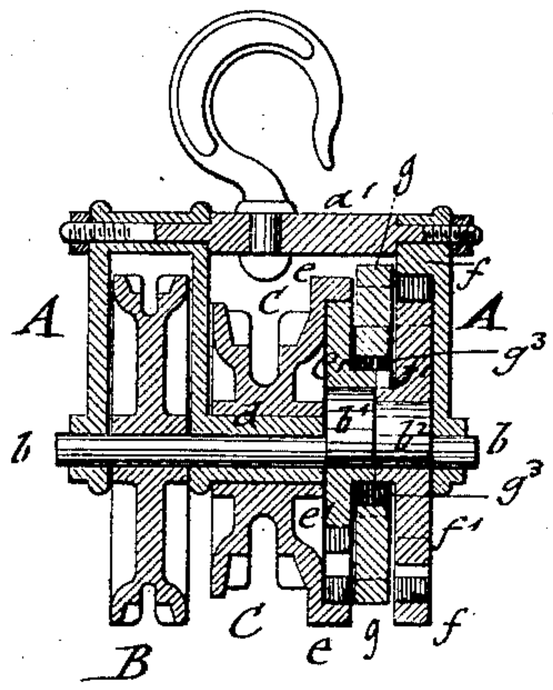


Fig: 2.



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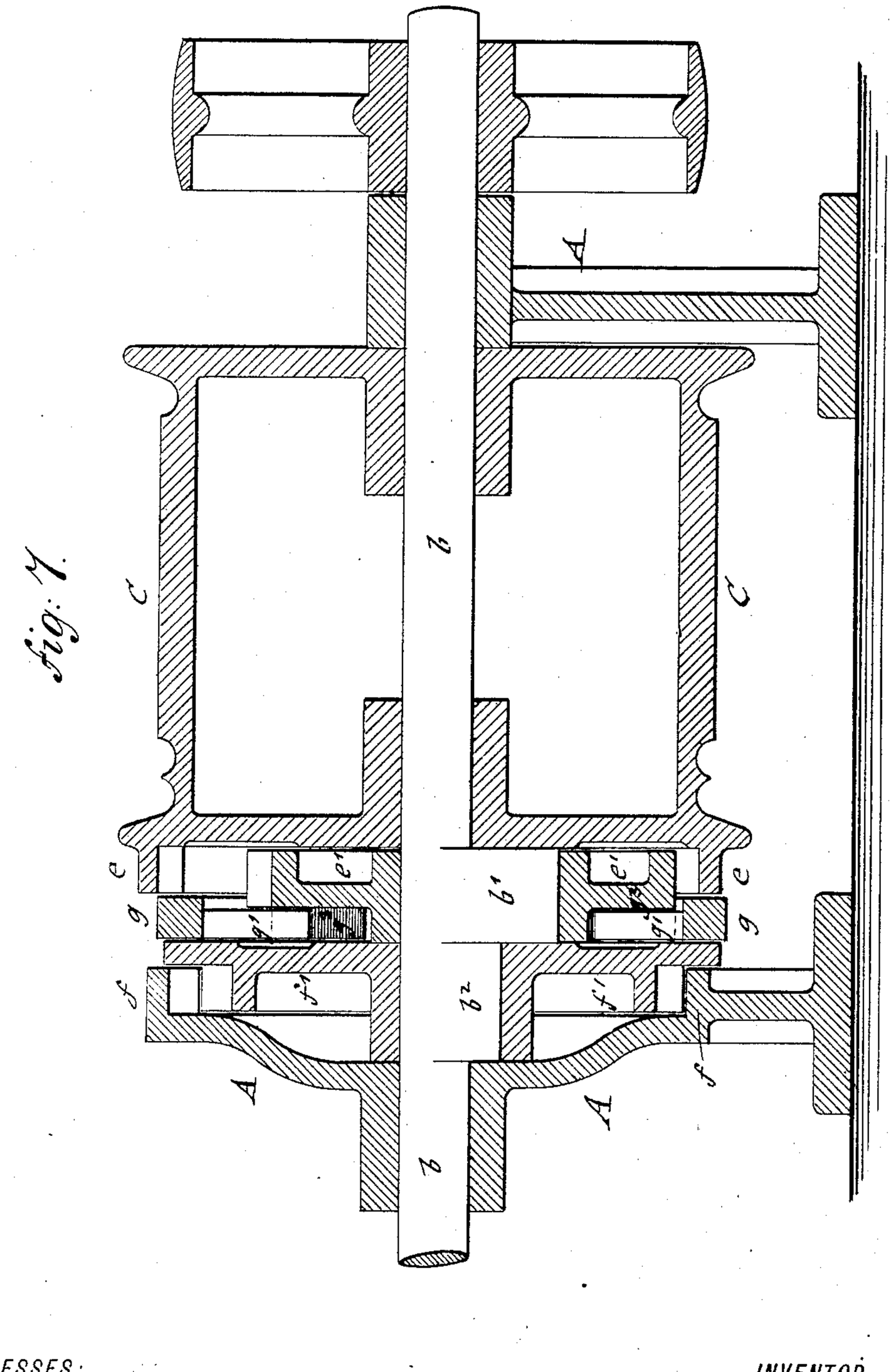
(No Model.) 2 Sheets—Sheet 2.

P. MURRAY, Jr.

DIFFERENTIAL HOISTING GEAR.

No. 348,684. Patented Sept. 7, 1886.



WITNESSES:

A. Schehl.

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UNITED STATES PATENT OFFICE.

PETER MURRAY, JR., OF NEWARK, NEW JERSEY, ASSIGNOR TO THE BACKUS MANUFACTURING COMPANY, OF SAME PLACE.

DIFFERENTIAL HOISTING-GEAR.

SPECIFICATION forming part of Letters Patent No. 348,684, dated September 7, 1886.

Application filed May 12, 1886. Serial No. 201,934. (No model.)

To all whom it may concern:

Be it known that I, PETER MURRAY, Jr., of Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Differential Hoisting-Gear, of which the following is a specification.

This invention relates to improved differential hoisting-gear by which heavy loads can be lifted with increased efficiency, the construction employed being also applicable to wedges, capstans, screw-jacks, and other apparatus for moving heavy bodies.

The invention consists of a differential hoisting-gear provided with a power-pulley that is keyed to a spindle which turns in bearings of the supporting-frame, while a load-pulley turns loosely on a fixed sleeve of the supporting-frame. The power-pulley is operated by an endless chain, while the load-pulley is arranged for supporting the load-carrying chain. The load-pulley is provided with an internally-geared rim that meshes with an intermediate gear-wheel placed on an eccentric portion of the spindle, while a second gear-wheel, that is also placed on the eccentric portion of the spindle, meshes with a fixed internally-geared wheel attached to the frame of the pulley-block. The intermediate gear-wheels are each provided at diametrically-opposite points with two sets of guide-lugs at their adjoining faces, the guide-lugs of one gear-wheel being located at right angles to those of the other gear-wheel and locked together by the radial lugs of a ring, so as to transmit the motion of the spindle to the load-pulley.

In the accompanying drawings, Figure 1 represents a side elevation of my improved differential hoisting-gear. Fig. 2 is a vertical longitudinal section of the same. Figs. 3 and 4 are vertical transverse sections, respectively on line *x x* and *y y*, Fig. 1, showing the motion-transmitting gear-wheels and their interlocking mechanism. Fig. 5 is a detail side view of the locking-ring for the motion-transmitting gear-wheels. Fig. 6 is a detail side view of the fixed internally-geared wheel of the hoisting-gear, and Fig. 7 represents a vertical longitudinal section of a hoisting-drum for elevators with my improved differential hoisting-gear applied thereto.

Similar letters of reference indicate corresponding parts.

In the drawings, A represents the frame of my improved differential hoisting-gear, which frame is composed of two inverted T-pieces, *a a*, which are connected by three bolts, *a'*, said T-pieces supporting in central bearings a spindle, *b*. To the uppermost connecting-bolt *a'* is attached a strong suspension hook or ring by which the hoisting-gear can be suspended. To one end of the spindle *b* is keyed a pulley, B, which is termed the "power-pulley," and which is arranged in such a manner that it meshes with the links of an endless chain, B', by means of which the actuating force is communicated. A second pulley, C, is placed on a fixed sleeve, *d*, that incloses the spindle and forms an integral part of the frame A of the hoisting-gear. This pulley is termed the "load-pulley," and is arranged for meshing with the links of a second or load-carrying chain, C'. The load-pulley C is provided at one side with an internally-toothed wheel or rim, *e*, which is made integral therewith, and which gears with an externally-toothed intermediate wheel, *e'*, that is placed loosely on an eccentric, *b'*, of the spindle *b*. A second externally-toothed wheel, *f'*, is placed on a second eccentric, b^2, having a diameter smaller than the diameter of the eccentric *b'* and made to gear with an internally-toothed fixed rim or wheel, *f*, that is permanently attached to one of the T-shaped pieces of the frame A.

Between the externally-toothed intermediate wheels, *e'* and *f'*, is interposed a rim-shaped locking device, *g*, which is provided with four inwardly-extending radial lugs, *g'*, Fig. 5, that are arranged equidistantly from each other and that engage, respectively, two pairs of parallel guide-lugs, g^2, on the gear-wheel *f'*, and two pairs of parallel lugs, g^3, on the gear-wheel *e'*, as shown, respectively, in Figs. 3 and 4. The guide-lugs g^2 of the gear-wheel *f'* are located at right angles to the guide-lugs g^3 of the gear-wheel *e'*. The intermediate locking-ring, *g*, serves to transmit the motion imparted by the power-pulley to the spindle *b* by means of the fixed gear-wheel *f*, intermediate gear-wheels, *f' e'*, and internally-toothed rim *e* of the load-

pulley to the latter, so as to impart motion to the load. The locking-ring *g* follows the motion of the gear-wheel *f'* by the eccentric portion on the spindle, and compels the gear-wheel *e'* to follow and adjust itself, by means of its eccentric on the spindle, to the relative position of the locking-ring. The number of teeth of the gear-wheel *f'* is smaller than the number of teeth of the fixed gear-wheel *f*, and the number of teeth of the second gear-wheel smaller than the number of teeth of the internally-geared rim of the load-pulley; consequently the advance of the load-pulley at each revolution of the power-pulley will be equal to the difference between the number of teeth of the fixed gear-wheel and its intermediate transmitting gear-wheel plus the difference in the number of teeth of the second intermediate gear-wheel and the toothed rim of the load-pulley; consequently there will be a corresponding inverse leverage between the power applied and the load. It will thus be seen that by the quick rotation of the power-pulley a slow motion of the load-pulley is produced by which a greater load can be lifted by the application of a given power but at a proportionately diminished speed.

My improved differential hoisting-gear can also be applied to hoisting-drums for elevators and other hoisting apparatus, as shown in Fig. 7, in which the drum C represents the load-pulley, while the shaft *b* receives rotary motion by a belt-and-pulley transmission, which takes the place of the power-pulley. The shaft *b* is provided, like the spindle of the hoisting-pulley, with eccentric portions $b' b^2$, that carry loose intermediate gear-wheels, *f'* and *e'*, the former meshing with a fixed internally-toothed wheel or rim, *f*, that forms a part of the supporting-frame A of the hoisting-drum, while the latter meshes with the internally-toothed rim *e* of the drum itself. The intermediate wheels are connected by the locking-ring *g* in the same manner as described and shown for the hoisting-pulley block. A quick motion of the shaft produces a slow motion of the load pulley or drum, which is thereby enabled to lift great weights but at a diminished speed. The load is started and raised or lowered whenever the power-pulley is set in motion. As soon as the power-pulley is stopped, the load is also stopped and held rigidly in position by the engagement of all the wheels at one and the same side of the center spindle or shaft, whereby a brake device is dispensed with.

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

1. In a differential hoisting-gear, the combination of a power-pulley, a spindle having two eccentrics of different diameters, a fixed internally-toothed wheel attached to the frame of the hoisting-gear, a load-pulley having an internally-toothed rim, two intermediate externally-toothed wheels placed loosely on said eccentrics and meshing, respectively, with the fixed gear-wheel of the pulley-block and the rim of the load-pulley, and a locking device that is adapted to interlock and travel with said intermediate gear-wheels, and to change the quick motion of the power-pulley into a slow motion of the load-pulley, substantially as set forth.

2. In a differential hoisting-gear, the combination of a power-pulley, a spindle having two eccentrics of different diameter, a fixed internally-toothed wheel attached to the frame of the pulley-block, a load-pulley having an internally-toothed rim, intermediate externally-toothed gear-wheels placed on the eccentrics of the spindle and meshing, respectively, with the fixed internally-toothed rim of the pulley-block and the rim of the load-pulley, and a locking-ring interposed between the two intermediate gear-wheels and provided with radial lugs, said lugs engaging guide-lugs or projections of the gear-wheels, so as to change the quick motion of the power-pulley to a slow motion of the load-pulley, substantially as set forth.

3. In differential hoisting-gear, the combination of the supporting-frame having a fixed sleeve, a spindle passing through said sleeve and turning in bearings of the frame, a power-pulley keyed to said spindle, two eccentrics of different diameters located on said spindle, a fixed internally-toothed wheel attached to the supporting-frame, a load-pulley having an internally-toothed rim, two intermediate externally-toothed wheels placed loosely on the eccentrics and meshing, respectively, with the fixed wheel of the frame and the rim of the load-pulley, and a locking-ring interposed between the intermediate gear-wheels and provided with radial lugs, said lugs engaging guide-lugs on the adjoining faces of the gear-wheels, the lugs of one gear-wheel being located at right angles to the lugs of the other gear-wheel, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

PETER MURRAY, JR.

Witnesses:
PAUL GOEPEL,
SIDNEY MANN.