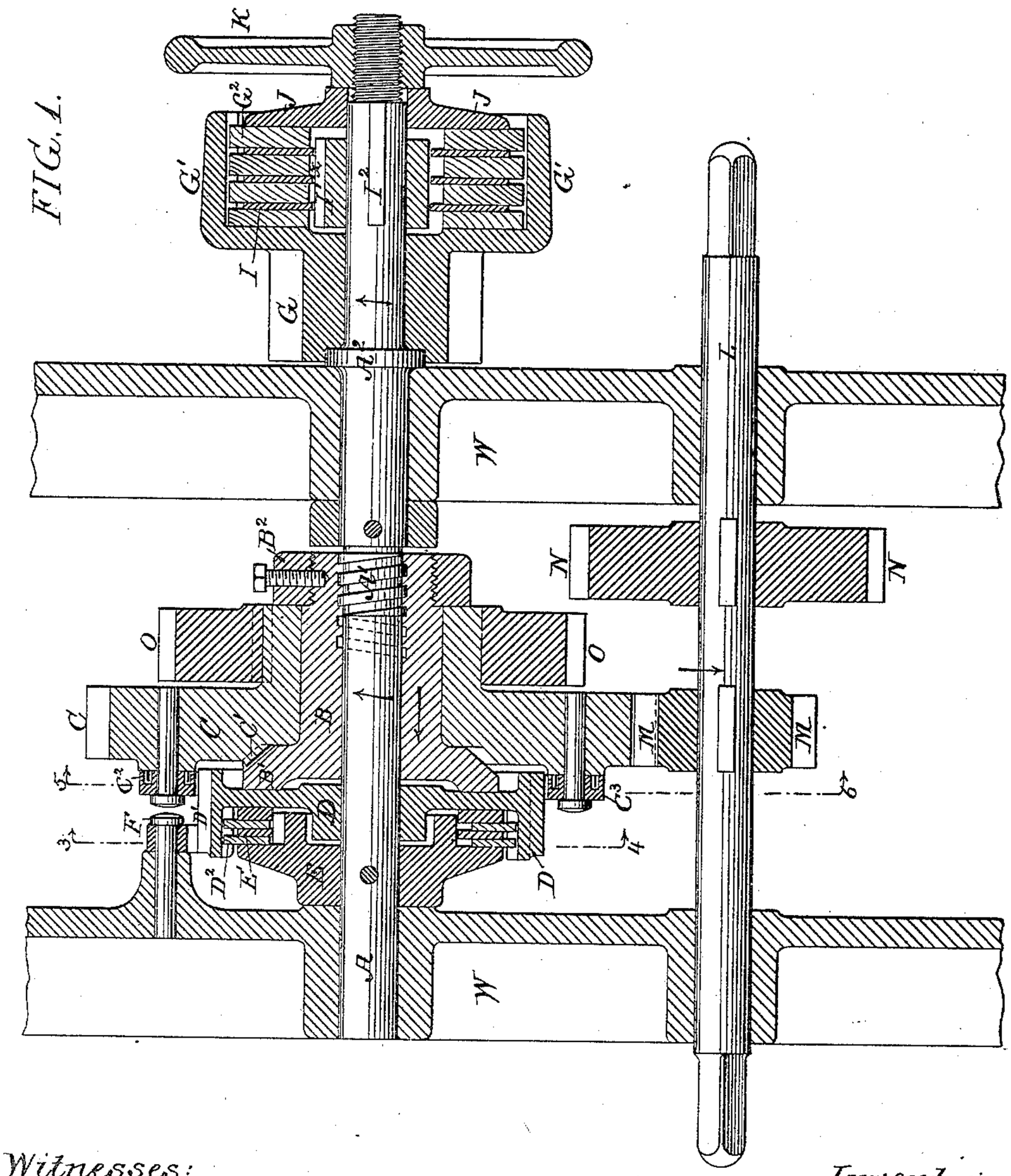
(No Model.) 3 Sheets—Sheet 1.

T. A. WESTON.

HOISTING MECHANISM.

No. 442,469. Patented Dec. 9, 1890.

FIG. 1.



Witnesses:
Alex. Barkoff
David L. Williams

Inventor:
Thomas A. Weston
by his Attorneys
Howson & Howson

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 3 Sheets—Sheet 2.

T. A. WESTON.

HOISTING MECHANISM.

No. 442,469. Patented Dec. 9, 1890.

FIG. 4.

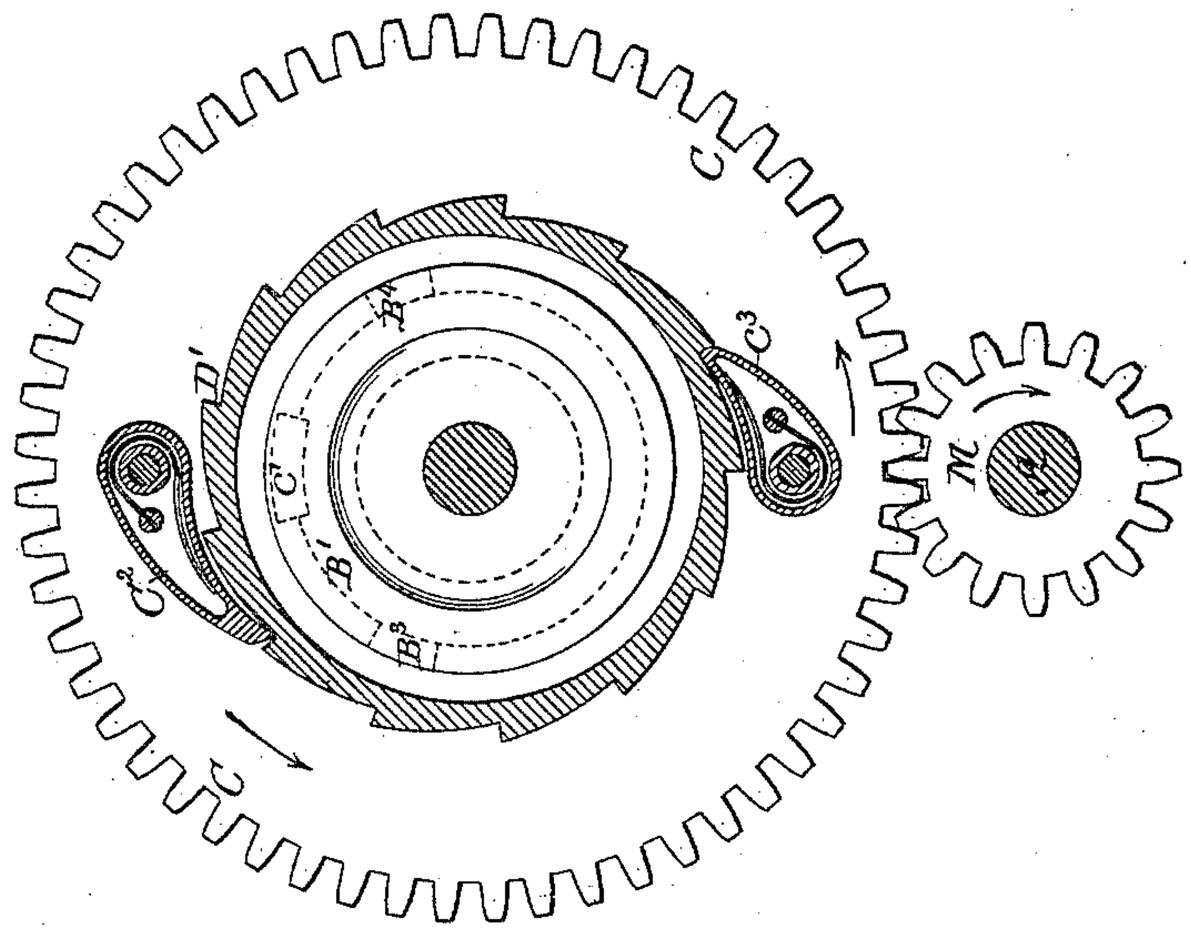


FIG. 3.

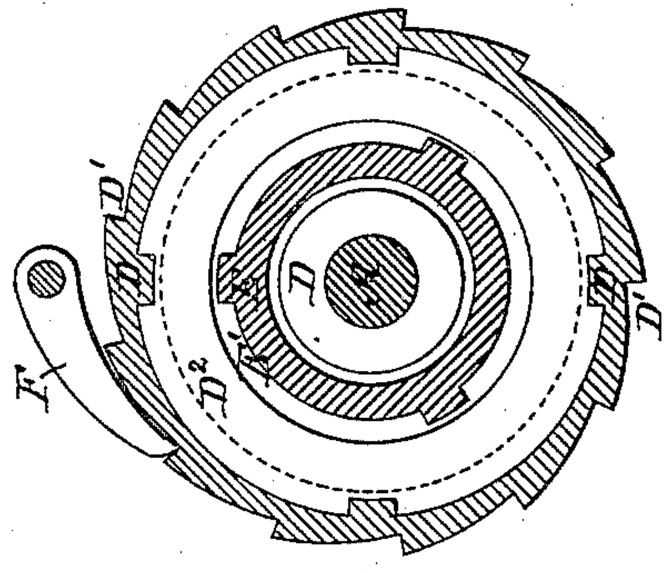
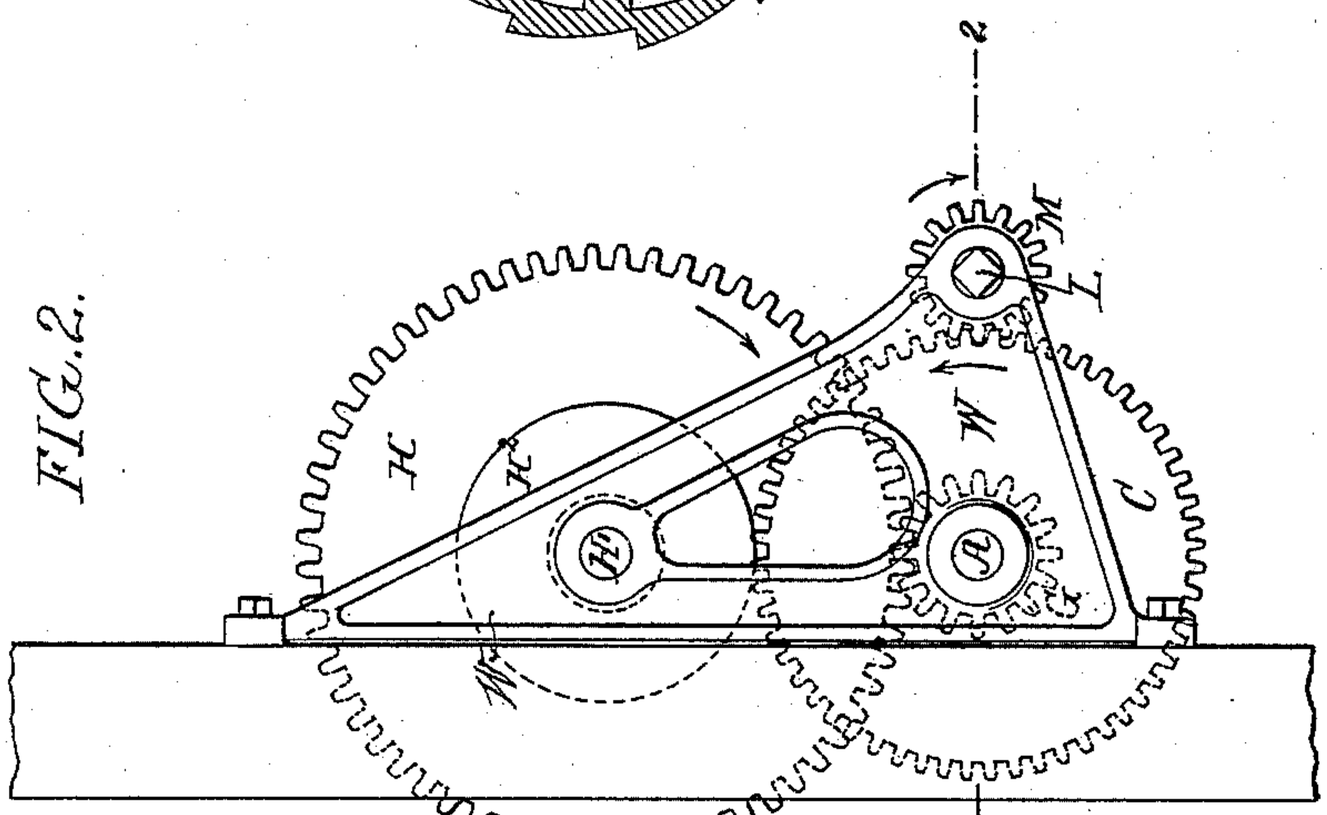


FIG. 2.



Witnesses:
Alex. Bakoff
David S. Williams

Inventor
Thomas A. Weston
by his Attorneys
Howson & Howson

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 3 Sheets—Sheet 3.

T. A. WESTON.

HOISTING MECHANISM.

No. 442,469. Patented Dec. 9, 1890.

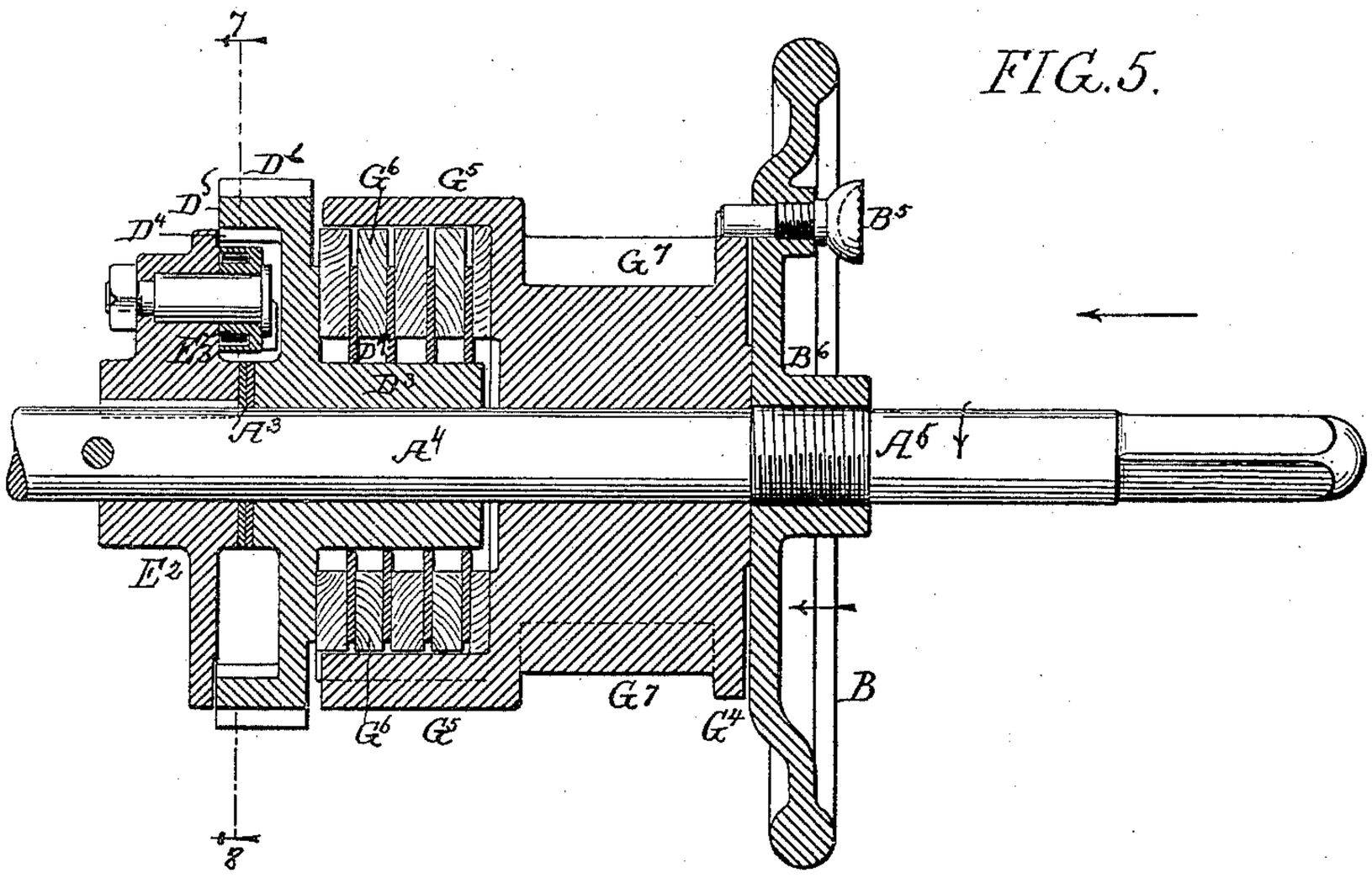


FIG. 5.

FIG. 6.

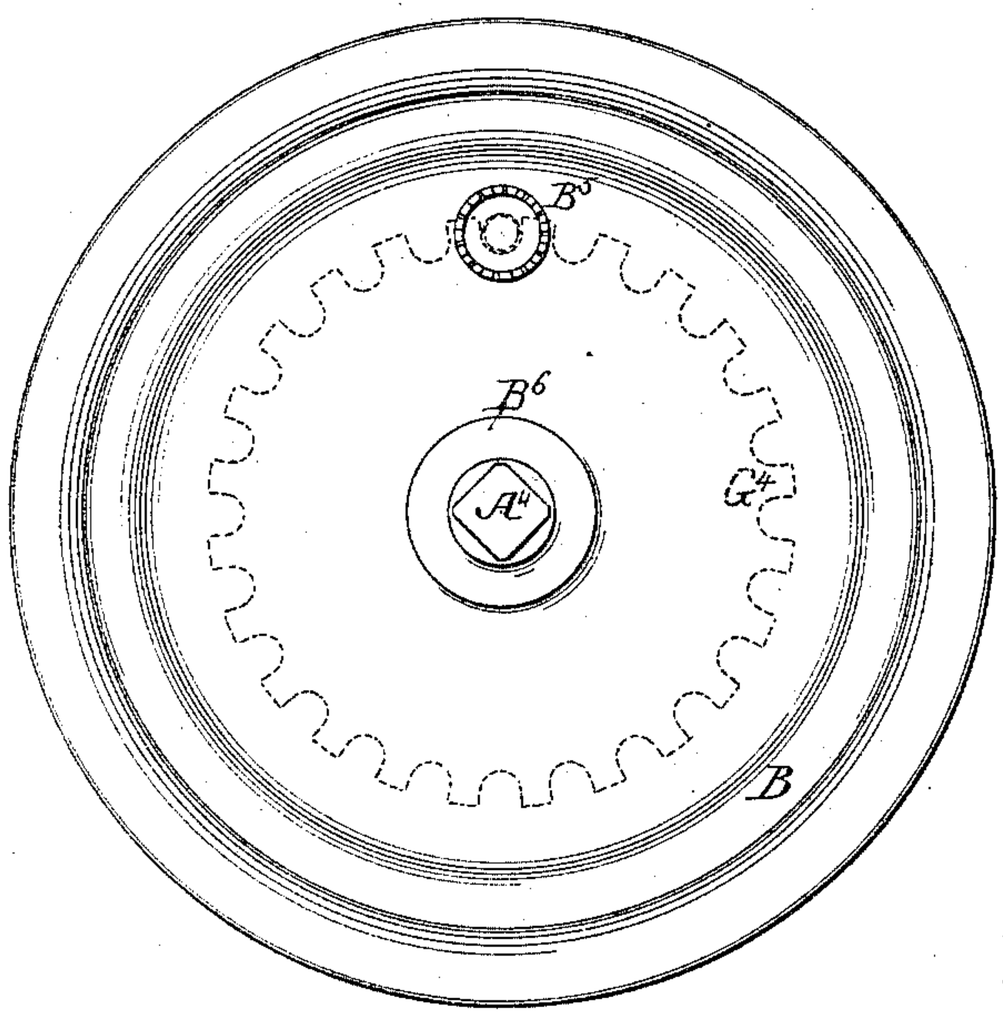
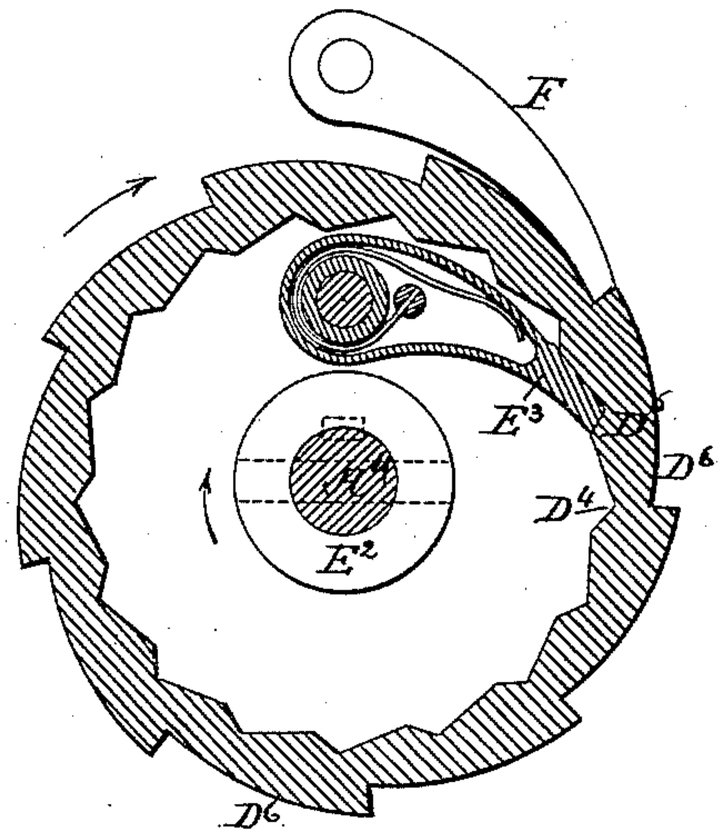


FIG. 7.



Witnesses:
David S. Williams
Alex. Barkoff

Inventor:
Thomas A. Weston
by his Attorneys
Howson & Howson

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

THOMAS A. WESTON, OF STAMFORD, CONNECTICUT, ASSIGNOR TO THE YALE & TOWNE MANUFACTURING COMPANY, OF SAME PLACE.

HOISTING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 442,469, dated December 9, 1890.

Application filed May 11, 1888. Serial No. 273,569. (No model.)

To all whom it may concern.

Be it known that I, THOMAS A. WESTON, a citizen of the United States, and a resident of Stamford, Fairfield county, Connecticut, have invented certain Improvements in Hoisting Mechanism, of which the following is a specification.

The object of my invention is to render the safety lowering device shown and described in the United States patent granted to me on the 14th day of December, 1869, No. 98,000, self-regulating as to the degree of compression applied to the friction-coupling faces thereof—that is to say, the amount of coupling pressure applied thereto in the act of hoisting is automatically limited to what is just sufficient to lift the load and sustain it, and at the same time the clutch is operative both for hoisting and lowering from the same common driver.

In all friction-clutches there are driving and driven faces. My before-named safety device clamps or couples the said faces by screw action against the load resistance with excessive compression and more than is required to effectively couple them to retain the load. Thus nearly all the driving force is transmitted through the screw-threads of the said device, the strain thereon being multiplied many fold, according to the pitch of the screw-thread.

My present invention provides a positive driving-connection (say a pawl and ratchet) between the shaft-driving wheel or first mover, which is also reversible for lowering, and the driving faces or disks of the clutch, through which driving device and the driving-disks all the driving-power must pass whenever the driving and driven faces become sufficiently coupled or compressed to transmit the driving-power and lift the load. Then the screw action ceases whenever the driving and driven faces move together from being effectively coupled by mutual friction.

A further feature of my invention consists in combining and organizing together upon one shaft the aforesaid safety or slow lowering device with a separate disk friction coupling and brake, whereby a rapid lowering motion is provided in addition to the combined slow lowering and hoisting device.

In the accompanying drawings, Figure 1 is a longitudinal section on the line 1 2, Fig. 2, of sufficient of a derrick-winch to illustrate my invention. Fig. 2 is a side elevation of a complete winch. Fig. 3 is a transverse sectional view on the line 3 4, Fig. 1. Fig. 4 is a transverse sectional view on the line 5 6, Fig. 1. Fig. 5 is a longitudinal section of a special form of the apparatus. Fig. 6 is a side view, looking in the direction of the arrow, Fig. 5; and Fig. 7 is a transverse section on the line 7 8, Fig. 5.

Referring in the first instance to Figs. 1 to 4, W is the frame of the derrick-winch, to which my invention is applied. H′ is the drum-shaft, mounted in bearings in the frame and carrying the winding-drum H^2 and the main wheel H. A is the brake-shaft, and L is the driving-shaft, both having bearings in the frame. The ends of the shaft L are squared to receive any suitable hand or driving wheel. The shaft L is geared to the shaft A by devices described hereinafter, and a pinion G on the shaft A gears with the wheel H on the drum-shaft H′, and through which motion is imparted to the drum.

The brake-shaft A is provided with a screw-thread A′, engaging with a screw-thread within a sleeve B. This sleeve is provided at one end with a flange B′, and upon said sleeve, between the flange B′ and the collar B^2, is a spur-wheel C, capable of limited circumferential motion thereon. Upon the wheel C is a lug or driver C′, as shown in Fig. 1 and in dotted lines in Fig. 4, which can play in an arc between stops B^3 and B^4 on the flange B′, and to that extent only the wheel C can turn upon the sleeve B. The outer face of the flange B′ is in frictional contact with the flange of the ratchet-wheel D, the latter turning freely on the shaft A, and on its outer rim are ratchet-teeth D′, while within its interior are frictional disks D^2, Figs. 1 and 3, whereby additional frictional adhesion is secured through the intermediate disks E′, with the flange E pinned firmly to the shaft B. The action of the said alternated disks in increasing frictional adhesion between the parts D and E is fully set forth in the specification of my United States patent, No. 75,227, of 1868.

Upon the wheel C are two or more pivoted

pawls C^2 and C^3, each with a contained spring pressing it against the teeth D′ of the ratchet-wheel D, and by which the wheel C can push around or drive the ratchet-wheel, the said pawls C^2 C^3 and ratchet-teeth being the main features of the independent positive driving device already referred to.

Pivoted to the winch-frame W is a pawl F, which by gravity engages with the ratchet-wheel D and checks backward rotation, so that it will be seen that on the rotation of the wheel C the pawls C^2 C^3 will positively turn the ratchet-wheel D; but the movement of this ratchet-wheel will not be communicated to the flange E, which is fast to the shaft A, until the lug C′ comes in contact with the stop B^3 on the sleeve B, thus causing the sleeve to turn also, and as the shaft A is stationary at this time the screw-thread A′ on the shaft will tend to force the sleeve B in the direction of its arrow against the ratchet-wheel D, and as this frictional contact is continued the shaft A will finally be driven through the medium of the applied friction as the sleeve B′ and wheel D are forced toward the flange E, which will be readily understood on reference to Fig. 1.

On the shaft A is the aforesaid pinion G, which engages with the main wheel H of the winch on the shaft H′. The pinion G is provided with a disk-box G′ and friction-disks G^2. The intermediate disks I are engaged by keys X with the hub I′, the latter being fixed to the shaft by a key I^2.

J is a pressure plate or disk sliding on the key I^2.

K is a hand-wheel having within its boss a screw-thread adapted to a screw-thread on the shaft A. By turning the hand-wheel in one direction on the shaft the plate J may be forced against the disks G^2 and I, against the pinion G, and the pinion G against the abutment-collar A^2, formed upon the shaft A, and by reversing the movement of the wheel the friction is released. Thus by the said alternating disks the pinion G may be clutched to or released from the shaft A, as fully described in the specification of my aforesaid Letters Patent, No. 75,227, of 1868.

On the driving-shaft L is secured a pinion M, engaging with a spur-wheel C, and also fixed on this shaft is a pinion N, capable of being put into engagement with a spur-wheel O on the hub of the wheel C, the pair of gears N and O being merely a convenience for obtaining a second and faster speed than is afforded by the pair M and C, and by moving the shaft longitudinally in its bearings the pinion M may be moved out of gear and the pinion N into gear with their respective spur-wheels, as fully shown in the accompanying drawings.

The operation of lifting and suspending the load is as follows: The motion of the several parts in the act of hoisting are indicated by the arrows. Upon turning the shaft L in the direction of the arrow the pinion M rotates the wheel C upon the sleeve B until the lug C′ comes in contact with the stop B^3 on the flange of said sleeve, then imparting to it the motion of said wheel C. Simultaneously the wheel C will impart its rotation to the ratchet-wheel D through the medium of the pawls C^2 and C^3. As the sleeve B follows the screw-thread A′ on the shaft A, the shaft, being stationary, tends to force the sleeve B against the ratchet-wheel D and the contained disks against the flange E, the latter being pinned to the shaft. So long as the shaft A is thus held at rest the rotation of the sleeve B will further compress the disks D^2 and E′ against the flange E. When, however, the said compression develops friction sufficient between the disks D^2 and E′ to drive the shaft A, the screwing action and relative motion of the sleeve B on its shaft will cease. Then the driven wheel C will, through the medium of its pawls C^2 and C^3, drive the ratchet-wheel D, and also, through the frictional coupling-disks D^2 and E′, drive the flange E, and consequently the shaft A and coupling-pinion G, and through this pinion the winding-drum H^2 on the shaft H′. The compression and coupling action of the screw-sleeve B upon the disks D^2 and E′ is thus always proportioned to and determined by the load, and is never in excess of what is required to lift and sustain it, rendering easy and smooth the backward or safety lowering motion of the devices set forth in my patent, No. 98,000, of 1869, the excessive strains of the said original devices being thus avoided.

To lower rapidly, the shafts, gearing, and safety lowering devices above described are left at rest, and the hand-wheel K, above described, is turned sufficiently to withdraw its coupling-pressure from the disks in the box G′, allowing the pinion G to turn backward under the load strain independently of the shaft A. The said backward or lowering motion is always under the control of the hand-wheel, and can be arrested by it at any moment. Thus two distinct modes of lowering are provided on the same shaft, either one available at the will of the operator.

In the foregoing example of the brake-shaft said brake-shaft is driven by a spur-wheel through the medium of the improved safety lowering device. The friction-disks of the safety lowering device in this case do not form part of or coact with the rapid lowering device, but I can so combine the two devices that one set of disks may be used for both purposes. This is shown in Figs. 5, 6, and 7. In this case the spur-pinion is driven by its shaft through the intervening safety lowering device and its independent positive driving-connection, but combined therewith is the quick brake lowering mechanism, so arranged that one set of friction-disks serves for both modes of lowering.

A^4 is the shaft, driven by a crank or other suitable mechanism, and at A^5 thereon is a screw-thread, a corresponding thread being

cut within the boss of the hand-wheel B^6. By means of a set-screw B^5 this wheel can be locked to a notched flange G^4 of a pinion G^7 by screwing said set-screw into one of said notches. The pinion G^7 is provided with a disk-box G^5 and friction-disks G^6 therein, adapted to slide on but free to turn with the said box. Loose on the shaft A^4 is a wheel D^5, having ratchet-teeth D^6. On the hub D^3 of this wheel are a series of disks D^7, adapted to slide longitudinally on but free to turn with the hub, and these disks alternate with the disks G^6, above described.

A pawl F, Fig. 7, pivoted to the winch-frame, engages with the ratchet-teeth D′ of the wheel D. The wheel D is provided with internal teeth D^4, with which a pawl E^3, pivoted on a flange E^2, engages, as shown in Fig. 7, the flange E^2 being pinned firmly to the shaft and forming the abutment against which the friction-disks and connected parts are pressed by the screw-boss of the wheel D. The said pawl E^3 and ratchet-wheel D^4 are the main parts of the positive driving device before explained. Steel washers A^3 are inserted between the wheel D and the flange E^2 to compensate for wear and to lessen friction, and can be replaced when necessary.

The operation of this device is as follows: Upon turning the shaft A in the direction of its arrow, the flange E^2, pinned thereto, will by its pawl E^3 propel the ratchet-wheel D and its disks in the same direction. The pinion G^7, engaged with the main wheel H, will be held at rest thereby under the load or retarded while the shaft A begins to turn. The hand-wheel K, locked to the pinion G^7 by the set-screw B^5, will also be at rest or retarded along with said pinion. Thus as the hand-wheel B is retarded and as the shaft A is turned the screw A′ thereon will tend to force the wheel B in the direction of its arrow, and consequently will force the pinion G^7 toward the flange E^2, compressing the intervening disks, and as the rotary motion of the shaft A is continued the compression of the disks will continue so long as the pinion is held back by the load; but when the disks D^2 attain sufficient adhesion to the disks C^6 the latter will be driven thereby, as will also the pinion G^7 and the main wheel H, geared thereto. Thus the resistance of the load is made to effect the adequate coupling of the disks for overcoming the load, the compression of the disks being always to the degree required, and nothing over. Consequently the backward or lowering motion, wherein the disks are released from pressure slightly, is an easy one, requiring no severe effort at first to remove the excessive compression formerly put upon the friction surface of the original device of my aforesaid Letters Patent No. 98,000.

When a rapid lowering motion is required, the rim of the hand-wheel is grasped and the set-screw B^5 is removed from the notched flange G^4 of the pinion, thus freeing the wheel, and by turning the wheel the screw-pressure upon the disks can be withdrawn or restored at pleasure, allowing any desired speed of backward rotation of the pinion G^7 or its stoppage at any instant. Two modes of lowering the load are therefore provided for the hoist by the means described.

The making of the screwed boss B^6 of the hand-wheel a separate piece from the pinion B^7 is not here claimed, being so found in the specification of my United States patent, No. 217,031, dated July 1, 1879, and No. 320,315, dated June 16, 1885.

Where the safety or slow lowering action only is required, the internal screw-boss of the wheel B^6 can be made integral with the pinion G^7 and the other portion of the wheel B omitted.

Thus it will be seen that the form of my improved safety device shown in Figs. 5, 6, and 7 is necessary when the same is operated by its shaft, the figures 1 to 4 being suitable when the shaft is driven through the safety device from a driving-wheel, as C.

I claim as my invention—

1. The combination, in a hoist, of frictional clutching-surfaces between the driving and driven parts, screw-formed inclines for pressing said frictional surfaces together, and a positive drive-gear for the friction surfaces, whereby the surface acted upon by the screw is relieved from the duty of rotating the parts, substantially as specified.

2. The combination, in a hoist, of the shaft A, the screw thereon, the flange E, secured to the shaft, a ratchet-wheel, a driving pawl or pawls engaging therewith, a carrier for said pawls, a presser-sleeve driven by said carrier and engaging with the screw and bearing on the ratchet-wheel, and friction-disks between said ratchet-wheel and the flange E, substantially as set forth.

3. The combination, in a hoist, of a screw and disk friction driving device and safety lowering device, a retaining or checking device, and a separate friction driving coupling and brake, and a shaft on which they are organized, substantially as set forth.

4. The combination, in a hoisting mechanism, of a shaft having a screw-thread thereon, friction devices, a ratchet-wheel and driving-pawl therefor, with a sleeve having a thread adapted to engage the screw-thread on the shaft, so that as power is exerted the sleeve will apply the frictional engagement necessary for lifting the load, substantially as described.

5. The combination of the shaft A, having the screw-thread thereon, the sleeve B, having a screw-thread engaging with the screw-thread on the shaft, and a ratchet-wheel D, with friction devices, the flange E, secured to the shaft, a wheel C, adapted to engage with the sleeve B and provided with a pawl adapted to engage with the ratchet-teeth of the wheel D, substantially as and for the purpose described.

6. The combination of the shaft A, having

a screw-thread thereon, with the sleeve B, having a screw-thread engaging with the screw-thread on the shaft, with a ratchet-wheel D, flange E, friction devices between said flange E and wheel D, with a driving-wheel C, having a lug C′, adapted to engage with lugs B^3 and B^4 on the sleeve, and provided with pawls engaging with ratchet-teeth on the wheel D, all substantially as and for the purpose set forth.

7. The combination of the shaft A, having a screw-thread thereon, a sleeve having a thread engaging with the screw-thread on the shaft, with a ratchet-wheel and a driving-pawl therefor, with frictional devices, and a flange E, secured to the shaft A, in combination with a pinion G, loose on the shaft, with a friction-brake secured to the shaft, and with a hand-wheel K, by which the pinion is frictionally secured to the shaft through the medium of the friction-brake, substantially as and for the purpose described.

8. The combination, in a hoist provided with screw-formed inclines and frictional devices, of the driving-shaft whereby hoisting and safety lowering actions are effected, with a hand-wheel incorporated with the screw device, whereby the frictional devices may be independently operated.

9. The combination, in a hoist provided with screw-formed inclines and frictional devices, of the driving-shaft A, a frictionally-driven part G^7, an abutment E^2, a ratchet-wheel D′, a screw-thread upon the shaft, as at A′, a corresponding screw-threaded part B^6, a hand-wheel or rim B therefor, whereby the frictional devices are independently controlled.

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

THOS. A. WESTON.

Witnesses:
SCHUYLER MERRITT,
GEO. E. WHITE.