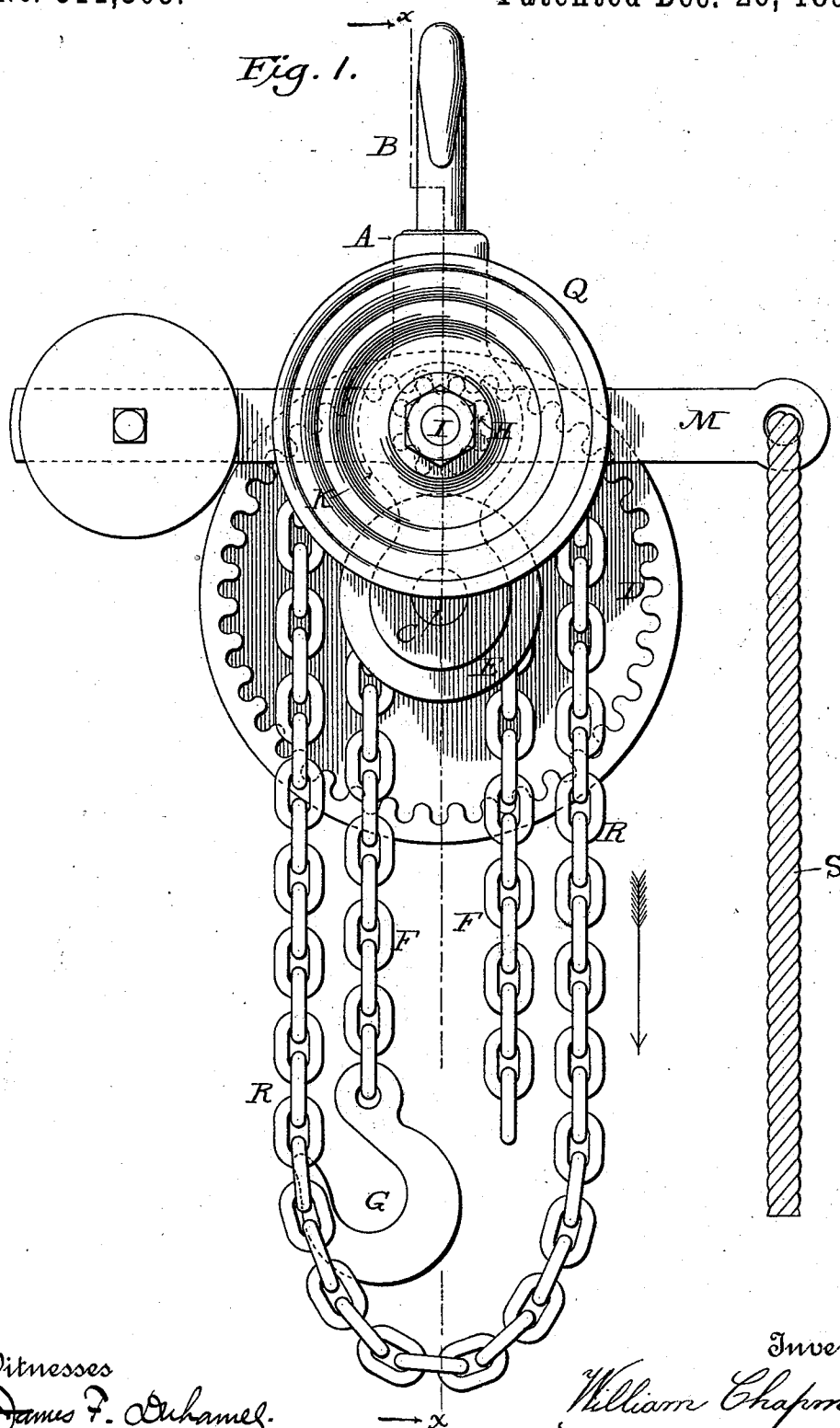


W. CHAPMAN.
DIFFERENTIAL PULLEY.

No. 511,505.

Patented Dec. 26, 1893.



Witnesses

James F. Duhamel.

Horace A. Dodge.

Inventor

William Chapman.

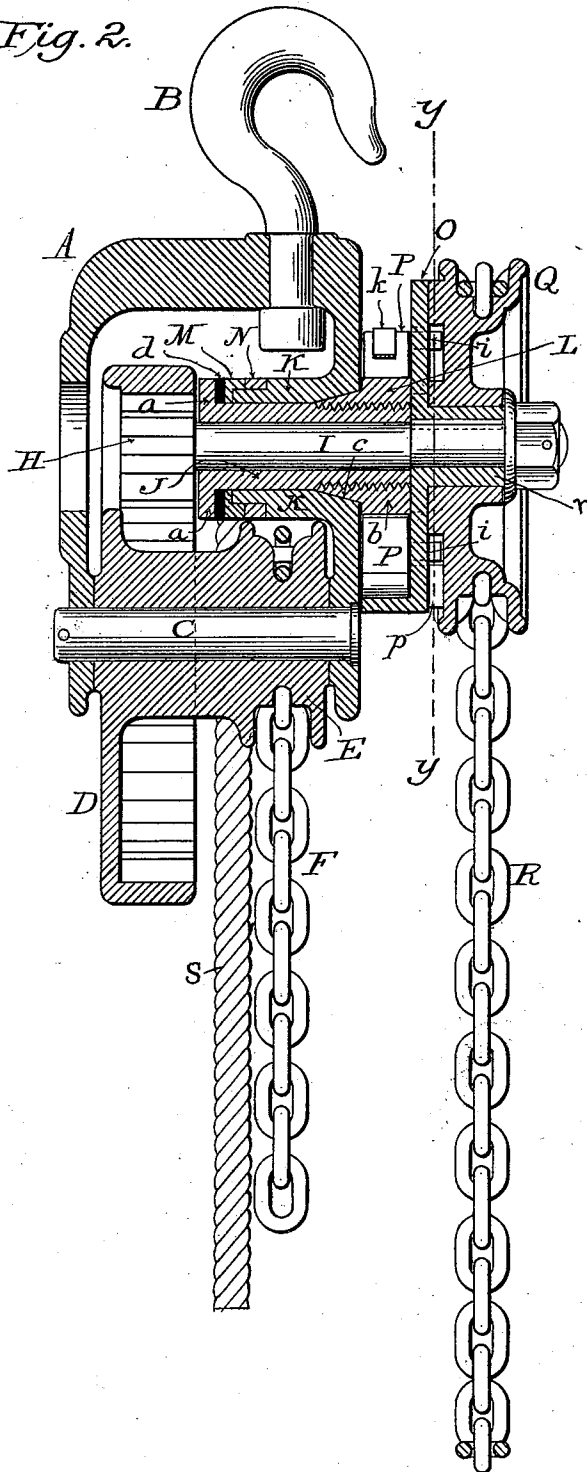
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Fig. 2.



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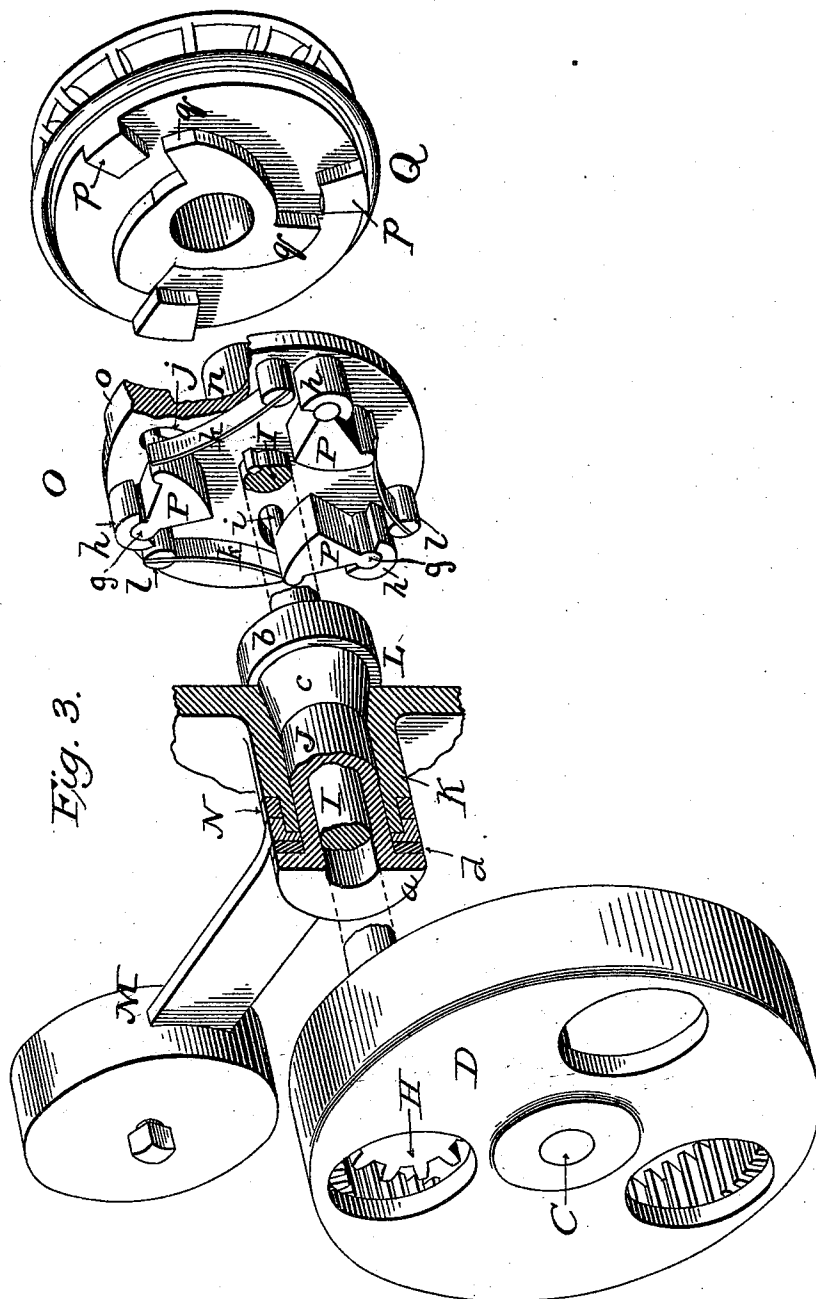
(No Model.)

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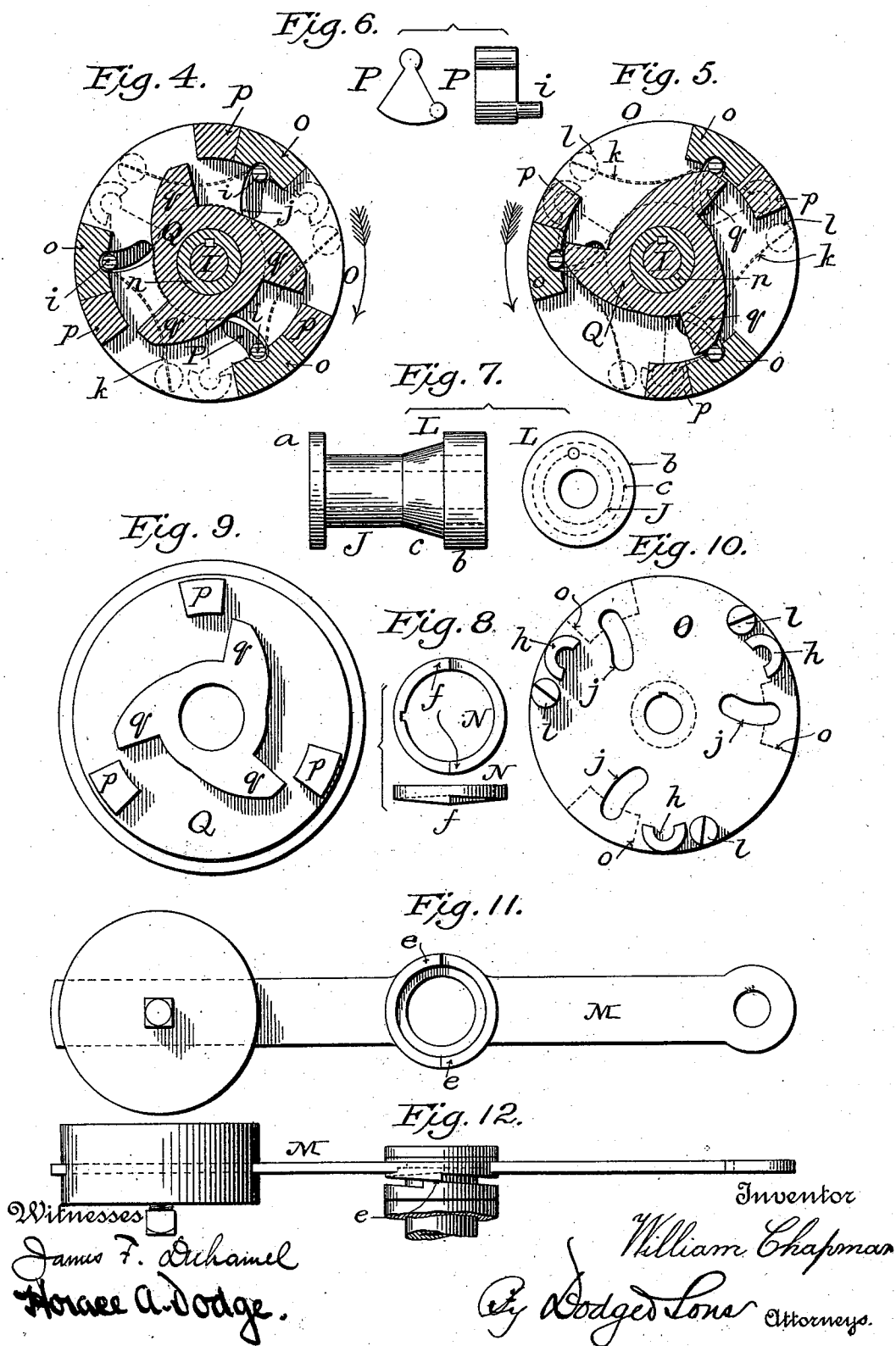
William Chapman
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UNITED STATES PATENT OFFICE.

WILLIAM CHAPMAN, OF WASHINGTON, DISTRICT OF COLUMBIA.

DIFFERENTIAL PULLEY.

SPECIFICATION forming part of Letters Patent No. 511,505, dated December 26, 1893.

Application filed March 8, 1893. Serial No. 465,121. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM CHAPMAN, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Pulley-Blocks, of which the following is a specification.

My invention relates to that class of pulley blocks in which motion is transmitted from a hand-chain pulley to a lifting chain pulley through intermediate gearing, and the improvements consists in certain features, details and combinations hereinafter set forth, but pertaining more particularly to means for holding the load in its elevated position or controlling its descent, as required.

In the accompanying drawings,—Figure 1 is a side or face elevation of the device complete. Fig. 2 is a vertical section on the line *x—x* of Fig. 1; Fig. 3, a partly sectional perspective view, showing the parts separated; and Figs. 4 to 12 inclusive, detail views of parts, hereinafter referred to.

The purpose of my invention is to produce a simple, cheap and efficient differential pulley block, which shall afford adequate power, and give perfect control over the load, both in raising and lowering the same. To this end I adopt the construction shown in the drawings, in which—

A indicates a suitable frame or bail, advantageably of metal, and provided with the customary swiveled suspending hook B.

Near the lower end of the bail or frame A is a horizontal pin or bolt C, which constitutes the axle of a combined gear and chain wheel D, E, the gear wheel D being internally-toothed, and the chain wheel E having the customary link seats or sprockets to receive or engage the load chain F. The chain F may be of any approved pattern, single or double, and may carry merely a hook G, or may have one end made fast to the bail or frame A, and a running block carried in the loop or fold of the chain, as is common and well understood.

Motion is imparted to the combined gear and chain wheel D, E, by a pinion H carried by a spindle or arbor I parallel with, and preferably directly over the pin or axle C. The spindle or arbor I passes axially through

a tubular sleeve J, which is nicely fitted within a tubular neck K of frame or bail A. The sleeve J is formed with a radial flange *a* at one end, and has screwed or otherwise made fast upon its other end a collar L, comprising a cylindrical boss *b*, and a conical neck *c*, which latter is turned true, and fits a corresponding seat in the tubular neck K of the frame or bail A. To prevent the collar L from working loose, it is advisable to key or pin it, as indicated.

M indicates a lever, pivotally supported upon the sleeve J, at a point between the flange *a* of said sleeve, and the end of the tubular neck K, as shown in Figs. 2 and 3, a washer *d*, of leather or other suitable material being advantageably interposed between the side face of the lever and the flange *a*, as shown. On the face of the lever next the tubular neck K there is formed an incline or cam face, *e*, which bears against a similar incline or cam *f* formed upon the neck K, or more conveniently, upon a ring or collar N fitted and made fast upon the neck, as shown in Figs. 2 and 3. The cam faces or inclines *e* and *f* are so set that when the lever M is in its normal horizontal position, to which it is carried and in which it is held by a counterweight *g*, they shall act to throw the lever outward or toward flange *a* of sleeve J. This outward pressure being transmitted to the flange and consequently to the sleeve J, moves the latter longitudinally, and draws the conical neck *c* of collar L firmly into its seat, thereby producing friction sufficient to preclude the turning of the sleeve or collar, even under considerable force tending to that end. There may of course be either a single incline, or a series thereof on the opposing faces of the lever and ring or collar N, two being shown in the drawings.

O indicates a disk, formed with a tubular hub or sleeve *n*, which closely fits upon and is keyed or otherwise made fast to spindle or arbor I, as indicated in Fig. 2. The disk O carries on its face toward the frame or bail A, a series of eccentric pawls P, which are conveniently formed with cylindrical pivotal ribs *g* to rest in semicircular seats or bearings in posts *h*, projecting from the face of the disk, as best shown in Fig. 3.

The pawls are limited in their play or movements by projecting studs *i*, working in slots *j* in the disk *O*, concentric with the pivots of the pawls, and each pawl is pressed lightly inward or toward the collar *L*, by a spring *k*, one end of which is made fast in a stud or post *l*, projecting from the face of disk *O*.

Q indicates a hand-chain wheel, loosely mounted and free to turn a limited distance upon and independently of the sleeve *n*, of disk *O*, the extent of play being determined by the spacing of interlocking lugs *o* and *p*, projecting from the face of the disk and the face of the hand-chain wheel respectively. The hand-chain wheel is further provided with a series of arms *q*, projecting from the same face as the lugs *p*, and curved on one face, as shown in Figs. 3, 4, 5 and 9. Under a certain relative adjustment of the disk and the hand-chain wheel hereinafter explained, the outer extremities of the arms *q* ride beneath the studs *i* of pawls *P*, which studs project through and beyond the disk as shown in Fig. 2,—and lift said pawls out of contact with collar *L*. The usual endless hand-chain *R* passes over wheel *Q*, and a rope *S*, a chain, or other flexible band is attached to and hangs down from the end of lever *M* opposite that which carries the counterweight.

The device being thus constructed, its operation is as follows: The load is made fast to the hoisting chain *F* in any convenient way, and the hand-chain is then drawn down to the right. The hand-chain wheel *Q* is thereby caused to rotate upon the sleeve *n*, until the lugs *p* of said wheel come into contact with the lugs *o* of the disk *O*, whereupon the disk *O*, and consequently the spindle *I* and pinion *H* rotate with the wheel *Q*, and the pinion turns the combined gear and chain wheel *D*, *E*, thereby elevating the load. During the upward movement of the load, the pawls *P*, resting upon the cylindrical boss *b* of the collar *L*, which is normally held against rotation, as explained, ride freely over the face of said collar, the slight friction tending to swing them outward and to bring that portion of the face of each having the shortest radius against the boss *b*, so that they produce no retarding effect. If the strain or force applied to the hand chain be removed, however, the weight of the load immediately operates to turn the parts backward, but the moment such backward rotation begins, and before it becomes appreciable, the pawls *P* bearing upon the collar *L*, bind thereon by reason of their movement being in the direction of their increasing radius. A very slight swing of the pawls in this direction causes them to lock the disk *O* firmly to the collar, and prevent rotation of the disk and the parts controlled thereby. To lower the load it is only necessary to draw down upon the rope or chain *S*, thereby turning the cam face or incline *e* of lever *M* backward upon or relatively to the opposing cam face or incline *f*,—thereby permitting sufficient longitudinal

movement of sleeve *J* to free the conical neck *c* of collar *L* in its seat. This permits the sleeve and collar to turn in the neck *K* of frame *A*, under the weight of the load transmitted through the gear wheel and pinion, the spindle or arbor, the disk and the pawls. The friction may be diminished as little or as much as may be desired, by carefully manipulating the lever *M*, through rope *S*,—the full friction and rigid locking of the sleeve and collar occurring immediately upon release of the rope, by reason of the action of the counterweight. When the load requires to be lowered with more than ordinary care, or to be lowered accurately to a certain point, or when it is desired to lower the unladen hook, the hand-wheel chain is drawn down on the left hand side, causing the rotation of wheel *Q* in the direction indicated by arrow in Fig. 5. When the wheel *Q* is thus rotated, and just before or at the instant that the lugs *p* come into contact with the lugs *o* of disk *O*, the outer extremities of the curved arms *q* of wheel *Q*, ride beneath the studs *i* of pawls *P*, and lift said pawls out of contact with the collar *L*. The backward rotation of wheel *Q* and disk *O*, with their connected parts may therefore be continued indefinitely without hinderance; but if the hand-chain wheel *Q* be turned again slightly forward, the arms *q* will ride from beneath the pawls and leave them free to go into action the instant they are required to do so. During the operation of lowering by the hand chain the load causes the disk and its pawls to follow closely the movements of the hand wheel and to lock the instant the hand chain is released.

It is apparent that the number of lugs *o*, *p*, the number of pawls, the manner of pivoting or mounting the latter, the configuration of the several friction surfaces, and other details may be varied without departing from or affecting the spirit or scope of my invention.

Having thus described my invention, what I claim is—

1. The herein described pulley block, comprising the following elements in combination: a bail or frame; a combined gear and chain wheel mounted in said frame; a pinion meshing with said gear wheel; a spindle carrying said pinion and provided with a disk; a rotatable sleeve encircling the spindle and mounted in the bail or frame; pawls carried by the disk, adapted to engage with the sleeve and prevent backward rotation of the disk and spindle; a hand-chain wheel adapted to engage with and rotate the disk; and a weighted cam lever serving to move the sleeve longitudinally and to hold it normally in firm frictional engagement with the bail or frame.

2. In combination with bail or frame *A* having tubular neck *K*; sleeve *J* mounted and adapted to rotate in said neck, and provided with flange *a* and collar *b*; spindle *I* passing through sleeve *J* and provided with pinion *H* and slotted disk *O*; pawls *P* carried by disk *O*,

provided with studs *i*, and arranged to engage with collar *b*; hand-chain wheel *Q*, provided with arms *q* and with lugs to engage with similar lugs of disk *O*; combined gear and chain wheel *D*, *E*, the gear *D* meshing with pinion *H*; and weighted lever *M* provided with incline *e* and serving to draw the sleeve *J* into firm frictional contact with its seat,—substantially as set forth.

3. In a pulley block or hoisting device of the class described, the combination with the hoisting mechanism proper, of a locking and releasing device, comprising a sleeve capable of rotation within the main frame, pawls carried by the hoisting mechanism and adapted to lock upon said sleeve, and a weighted cam lever normally acting to draw the sleeve firmly to its seat in the main frame and hold it against rotation.

4. In combination with the differential gearing of a pulley block or hoisting device such as described, the locking and releasing device comprising sleeve *J* provided with flange *a*, collar *b*, and conical neck *c*; lever *M* provided with incline *e* acting between the main frame or bail and the flange *a*; and pawls *P* carried by the hoisting mechanism proper, and adapted to engage with collar *b* to prevent backward rotation of said hoisting mechanism.

5. In a pulley block or hoisting device of the class described, the combination with hoisting gear provided with locking pawls, of a sleeve for the pawls to engage with, rotatable in the main frame of the device and adapted to be made fast to or released from the frame by longitudinal movement, and a lever adapted and arranged to effect longitudinal movement of said sleeve in either direction, at the will of the operator.

6. In a pulley block or hoisting device, the combination of hoisting gear a rotatable sleeve independent thereof means for locking and releasing the same at will, a slotted disk carried by a member of the hoisting mechanism

proper, provided with pawls to lock upon the sleeve; springs acting upon said pawls to throw them into engagement with the sleeve, and a hand-chain wheel adapted to move a limited distance independently of the disk and then to engage therewith, said wheel being provided with arms to ride beneath and lift the pawls out of engagement with the sleeve when the hand-chain wheel is turned backward.

7. In combination with the hoisting pulley and the power spindle or arbor *I* of a hoisting device, encircling said arbor and independent of the hoisting pulleys sleeve *J* and means for locking and releasing said sleeve at will,—a series of pawls *P* carried by a disk *O*, secured upon said spindle, said pawls being adapted to engage with the sleeve and prevent backward rotation of the spindle, except in unison with the sleeve.

8. In a pulley block or hoisting device, the combination of a rotatable sleeve, a pressure lever acting upon said sleeve to hold it in frictional engagement with the frame of the device; hoisting gear; and pawls carried by said gear and adapted to engage with the sleeve the instant said gear begins to turn backward.

9. In a pulley block or hoisting device, the combination with hoisting gear provided with locking pawls; and with a rotatable sleeve for the pawls to engage with; a lever *M* bearing on one face against the sleeve and having on the other face an incline bearing against a projection on the main frame of the device; whereby the rocking of the lever is caused to hold the sleeve against rotation or to release the same, according to the direction in which the lever is moved.

In witness whereof I hereunto set my hand in the presence of two witnesses.

WILLIAM CHAPMAN.

Witnesses:

HORACE A. DODGE,
WALTER S. DODGE.