

No. 708,152.

Patented Sept. 2, 1902.

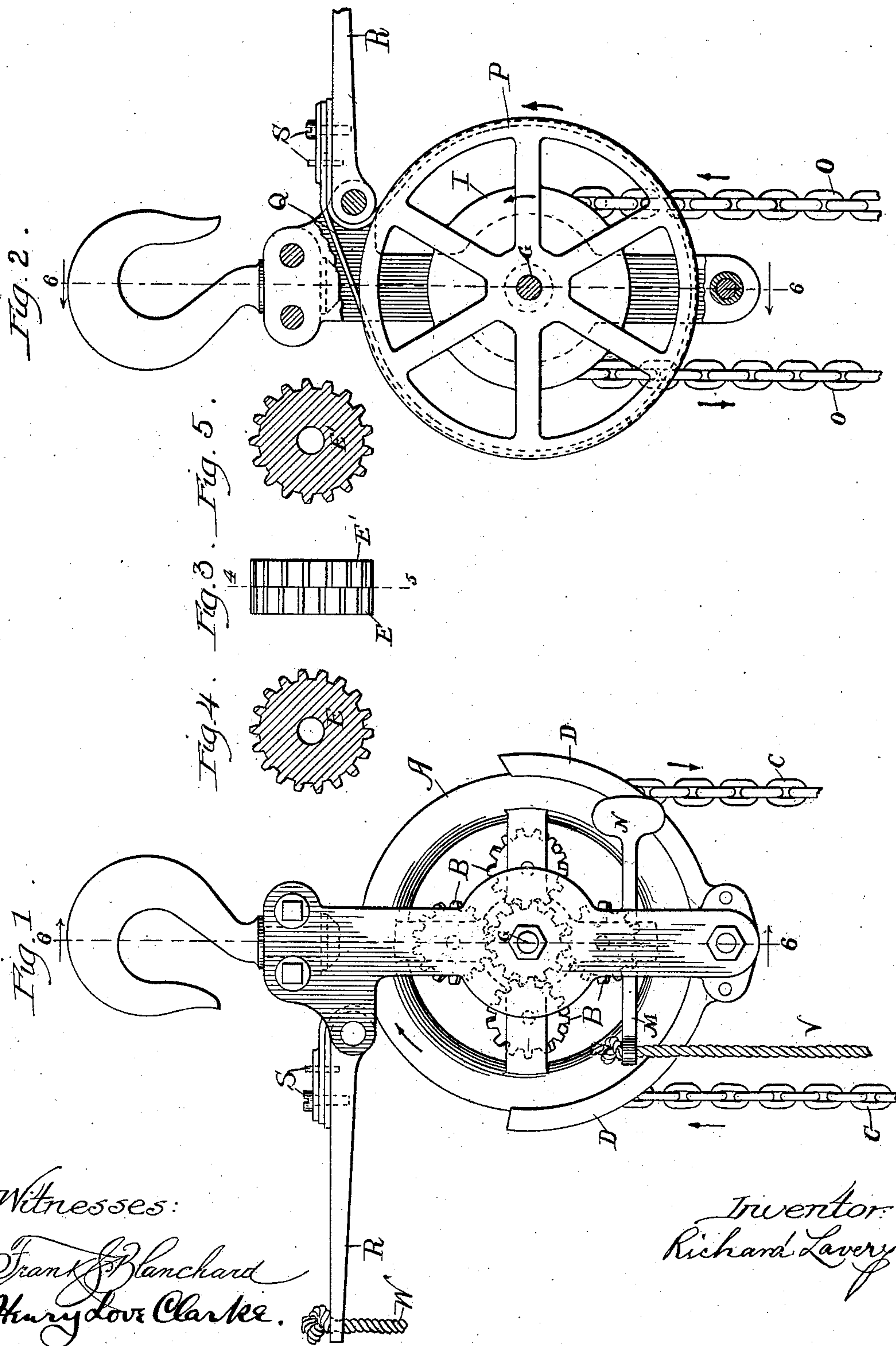
R. LAVERY.

DIFFERENTIAL GEAR PULLEY BLOCK.

(Application filed Mar. 29, 1901.)

(No Model.)

3 Sheets—Sheet 1.



Witnesses:  
Frank Blanchard  
Henry Love Clarke.

Inventor:  
Richard Lavery

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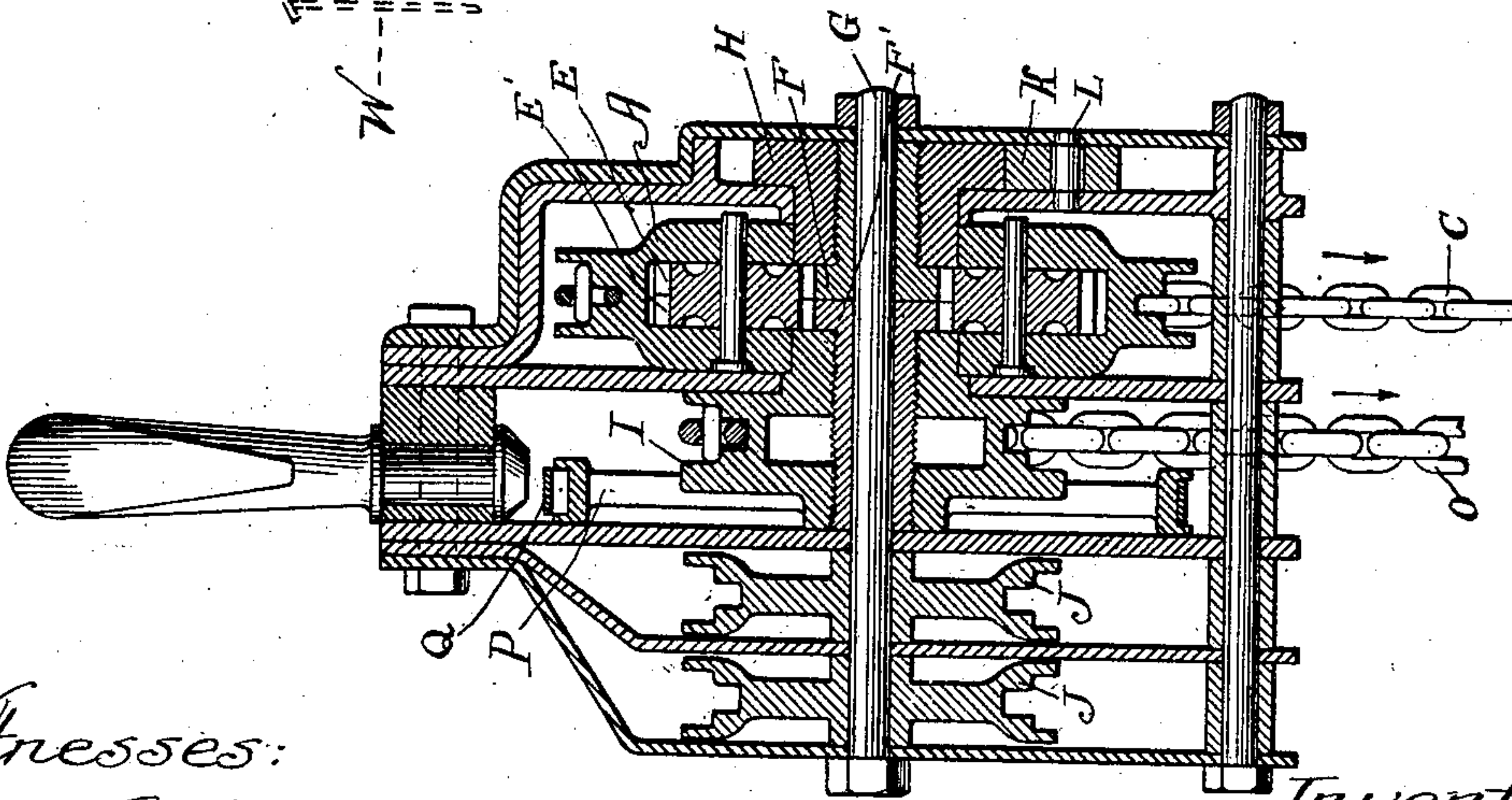
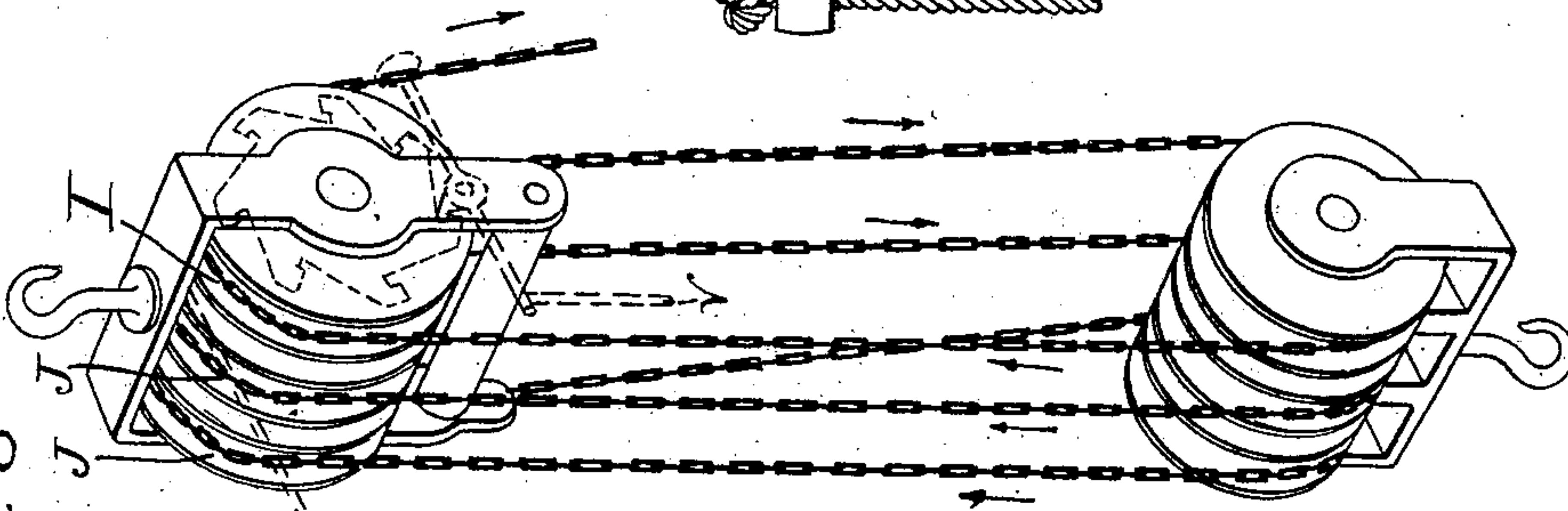
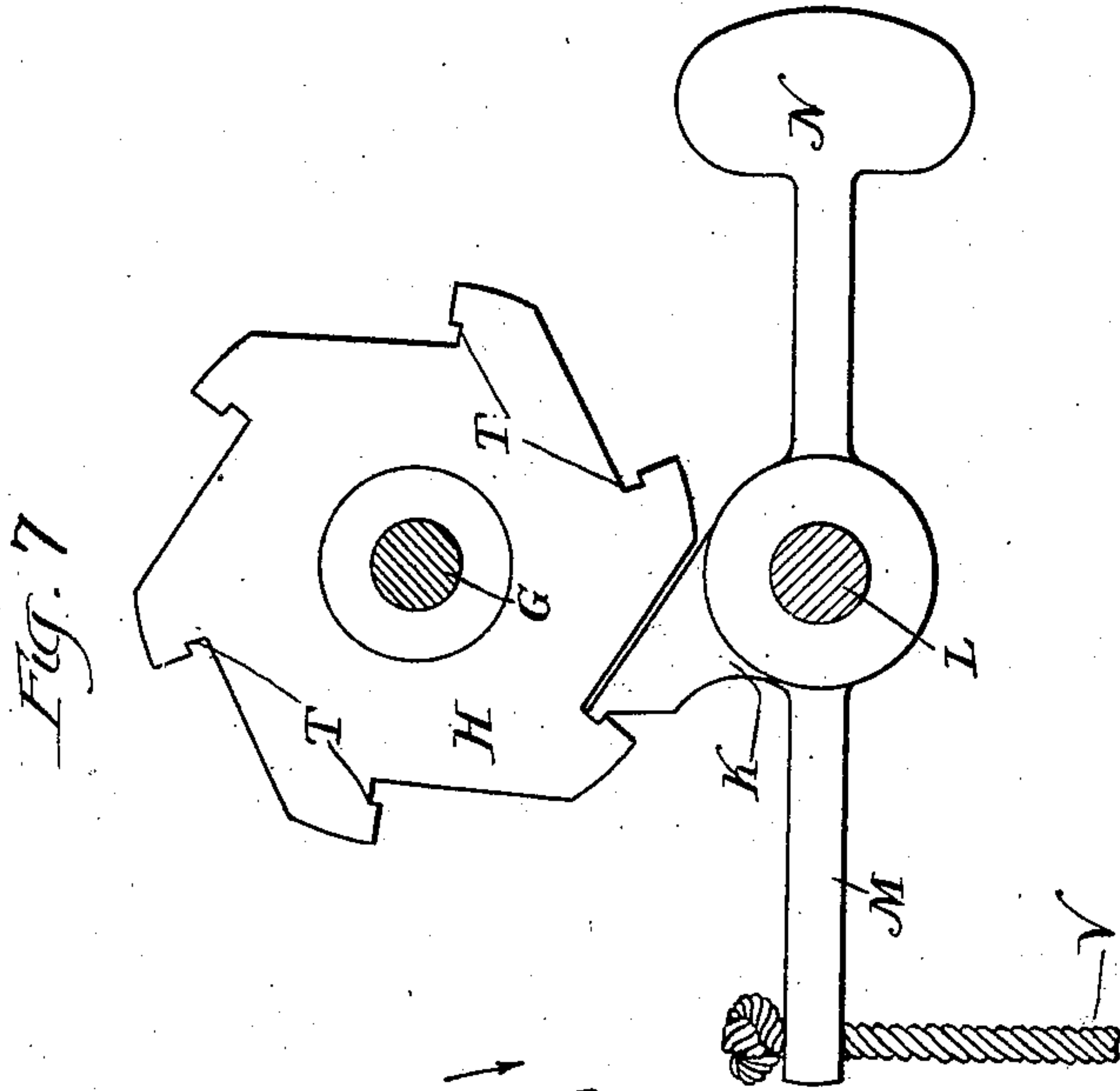
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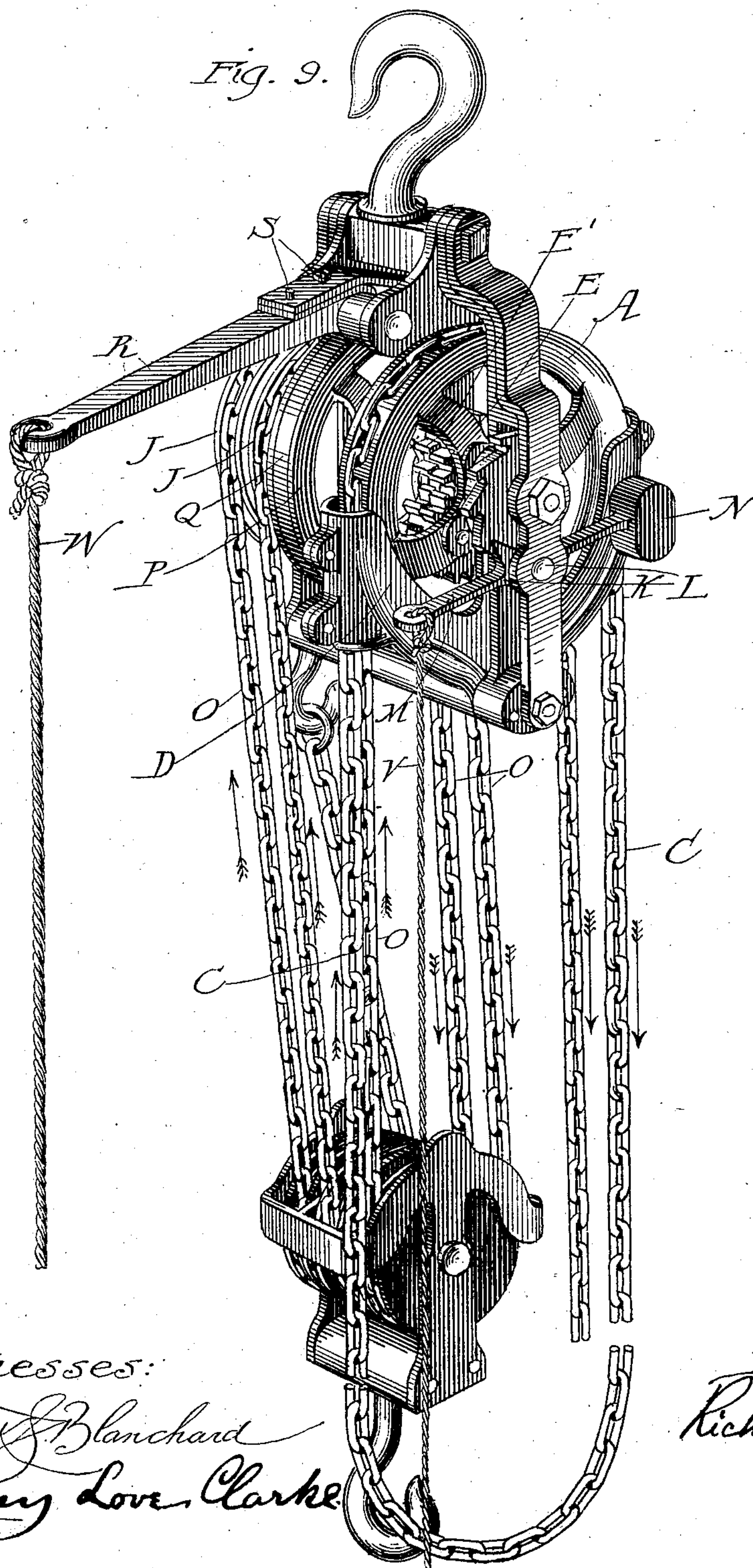
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# UNITED STATES PATENT OFFICE.

RICHARD LAVERY, OF BOSTON, MASSACHUSETTS.

## DIFFERENTIAL-GEAR PULLEY-BLOCK.

SPECIFICATION forming part of Letters Patent No. 708,152, dated September 2, 1902.

Application filed March 29, 1901. Serial No. 53,448. (No model.)

*To all whom it may concern:*

Be it known that I, RICHARD LAVERY, a citizen of the United States, residing in the city of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Differential-Gear Pulley-Blocks, whereof the following is a specification.

My invention relates to improvements on that class of gear devices set forth and claimed by me in Letters Patent of the United States No. 281,195, of July 10, 1883; No. 286,206, of October 9, 1883; No. 298,697, of May 13, 1884, and No. 402,601, of May 7, 1889, all of which were heretofore granted to me.

The object of my invention hereinbelow set forth is the production of a differential-gear pulley-block that shall be adapted to be used not only for the relatively slow lifting and lowering of heavy loads through the operation of the differential-gear power, but also for the relatively rapid lifting and lowering of loads, whether light or heavy, through the action of direct simple-pulley power independent of the differential-gear power.

My invention consists, primarily, in means adapted to automatically throw off the differential power in differential-power pulley-blocks and allow the use of the lifting sheave or sheaves as a direct simple pulley, such automatic action being accomplished without any act on the part of the operator except that of hauling on the fall end of the load-chain.

My invention consists, preferably, in means whereby the differential-gear operating-wheel of my aforesaid Letters Patent is adapted to be thrown out of action as a source of differential power whenever the lifting sheave or sheaves may be required for rapid use as a direct-power simple pulley-block. I thus greatly facilitate the manipulation of loads that are much lighter than the maximum load for the differential power and also facilitate the operation of overhauling the chain in the handling of any load.

My invention further consists in the combination, with the foregoing, of a proper ratchet or clutch device adapted to hold the suspended load at any point while the block is in use as a simple pulley.

My invention further consists in the com-

bination, with the foregoing, of brake means for controlling the lifting sheave or sheaves adapted to facilitate the rapid lowering of loads independently of the differential-gear power; and my invention further consists in the combination, with the foregoing, of such a form of notches in the ratchet or clutch aforesaid that the ratchet or clutch cannot be released by direct pull upon the pawl engaging such notches unless a slight reverse rotation of the ratchet is first caused by braking the lifting-sheave and simultaneously operating the differential power.

All of the foregoing features of my invention are hereinafter set forth in a particular and preferable form; but I do not limit my invention to such special form.

In the accompany drawings, forming a part of this specification, Figure 1 is a side elevation of the tackle-block, showing the differential-gear operating-wheel with its endless chain and the ratchet-and-pawl device and also the lever of the band-brake for the lifting-sheave beyond the operating-wheel. Fig. 2 is an elevation from the opposite side of the block, showing the lifting-sheave with its load-chain and the band-brake as applied to a brake-wheel integral with the lifting-sheave. Fig. 3 is an edge view of one of the differential gears carried by the operating-wheel, and Figs. 4 and 5 are views of respectively opposite sides of the said gear. Fig. 6 is a vertical section of the block on the lines 6 6 of both Fig. 1 and Fig. 2. Fig. 7 is an enlarged detail side elevation of the ratchet and pawl shown in Figs. 1 and 6; and Fig. 8 is a merely diagrammatic view to show the direction in which the lifting-chain is reeved through the block, the operating-wheel and the brake-wheel being omitted for clearness, and the brake-lever and ratchet and pawl being indicated in dotted lines. Fig. 9 is a perspective view of the complete mechanism.

Like letters of reference indicate like parts in all the figures, and all the direction-arrows indicate the direction of movement of the parts when the differential mechanism is in operation in the act of hoisting a load.

A is the operating-wheel, carrying the differential gears B B B B and actuated by the endless chain C C, whereof only the upper



loop is shown, the said chain passing through the chain-guides D D. The respectively different gears E E' of each differential gear-wheel B mesh, respectively, with separate gears F F', that are rotatable on the shaft G. The gear F is secured to or integral with the ratchet H and forms the hub thereof. Additional plain sheaves J J whose peripheries are not provided with pockets to engage the individual links of the chain are supplied to cooperate with the pocketed sheave I when it may be necessary to multiply the lifting power of the latter. The ratchet H is engaged by the pawl K, pivoted at L, and having the lever M and counterweight N. The lifting-sheave I carries the load-chain O, which may also be reeved through the unpocketed sheaves J J to multiply the lifting power at the expense of speed. Secured to or integral with the lifting-sheave I is the brake-bearing wheel P, adapted to furnish a frictional bearing for the band-brake Q, operated by the lever R and secured to the said lever by the pin and bolt S. The ratchet H is provided with lock-notches T T, that prevent the disengagement of the pawl K until the ratchet has been caused to rotate slightly in the direction reverse to that in which the said ratchet normally bears against the said pawl. The cord V controls the pawl-lever M, and the cord W controls the brake-lever R.

When the endless hand-chain C C is used to actuate the differential-gear operating-wheel A, the ratchet and pawl hold the center gear F in a fixed position, and the said gear F constitutes the fulcrum by means of which the differential gears rotate the other center gear F', and so actuate the lifting-sheave. When the fall end of the load-chain O O is pulled upon directly, the ratchet will rotate in the reverse or release direction, and the lifting-sheaves I J J will thus become a direct-power simple pulley, with the additional feature that the ratchet and pawl allow the load to be freely held suspended at any point. The pawl may at any time be released from the ratchet by holding the lifting-sheave with the band-brake and simultaneously turning the differential-gear operating-wheel in the direction of lowering until the reverse motion of the ratchet withdraws the lock-notch T from the end of the pawl, and thus allows the lever M to be pulled down. When the lifting-sheave is so held by the band-brake, the center gear F' becomes the fulcrum by means of which the differential gears cause the said reverse rotation of the ratchet. Whenever the lever M is pulled down and the pawl thus held away from contact with the ratchet K, the load may be lowered by using the lifting-sheaves I J J and their load-chain O O as a simple block and tackle and controlling the main or pocketed sheave I by means of the band-brake. Likewise the overhauling of the load-chain is facilitated.

Having thus set forth my invention, I now claim—

1. In a pulley-block, in combination, a differential-gear operating-wheel, a lifting sheave or set of sheaves, and means adapted to automatically throw off the differential power and allow the use of the lifting sheave or sheaves as a direct simple pulley, substantially as specified.

2. In a pulley-block, in combination, a differential-gear operating-wheel, a lifting sheave or set of sheaves, means adapted to automatically throw off the differential power and allow the use of the lifting sheave or sheaves as a direct simple pulley, and means whereby the load may be held suspended at any point when the differential power is so thrown off, substantially as specified.

3. In a pulley-block, in combination, a differential-gear operating-wheel, a lifting sheave or set of sheaves, means adapted to automatically throw off the differential power and allow the use of the lifting sheave or sheaves as a direct simple pulley, and means for braking the said lifting sheave or sheaves, substantially as specified.

4. In a pulley-block, in combination, a differential-gear operating-wheel, a lifting sheave or set of sheaves, means adapted to automatically throw off the differential power and allow the use of the lifting sheave or sheaves as a direct simple pulley, means whereby the load may be held suspended at any point when the differential power is so thrown off, and means for braking the said lifting sheave or sheaves, substantially as specified.

5. In a pulley-block, in combination, a differential-gear operating-wheel, a lifting sheave or set of sheaves, and a ratchet and pawl adapted to automatically throw off the differential power and allow the use of the lifting sheave or sheaves as a direct simple pulley, substantially as specified.

6. In a pulley-block, in combination, a differential-gear operating-wheel, a lifting sheave or set of sheaves, a ratchet and pawl adapted to automatically throw off the differential power and allow the use of the lifting sheave or sheaves as a direct simple pulley, and means for braking said lifting sheave or sheaves, substantially as specified.

7. In a pulley-block, in combination, a differential-gear operating-wheel, a lifting sheave or set of sheaves, a ratchet and pawl adapted to automatically throw off the differential power and allow the use of the lifting sheave or sheaves as a direct simple pulley, and means adapted to lock said pawl in said ratchet until said ratchet is given a slight reverse impulse, substantially as specified.

8. In a pulley-block, in combination, a differential-gear operating-wheel, a lifting sheave or set of sheaves, a ratchet and pawl adapted to automatically throw off the differential power and allow the use of the lifting sheave or sheaves as a direct simple pulley, means adapted to lock said pawl in said ratchet until said ratchet is given a slight re-



verse impulse, and means for braking said lifting sheave or sheaves, substantially as specified.

5 9. In a pulley-block, in combination, a differential-gear operating-wheel, a chain-pocketed lifting-sheave, accessory unpocketed lifting-sheaves, and a ratchet and pawl, the said ratchet being secured to a gear meshing with one side of the aforesaid differential gearing, 10 substantially as specified.

10. In a pulley-block, in combination, a differential-gear operating-wheel, a chain-pocketed lifting-sheave, accessory unpocketed lifting-sheaves, a ratchet and pawl, the said 15 ratchet being secured to a gear meshing with one side of the aforesaid differential gearing, a friction-wheel secured to one of the lifting-sheaves, and a band-brake bearing upon said friction-wheel, substantially as specified.

20 11. In a pulley-block, in combination, a differential-gear operating-wheel, a chain-pocketed lifting-sheave, accessory unpocketed lifting-sheaves, a ratchet and pawl, the said ratchet being secured to a gear meshing with 25 one side of the aforesaid differential gearing,

the ratchet-notches adapted to lock said pawl in said ratchet until said ratchet is given a slight reverse impulse, substantially as specified.

12. In a pulley-block, in combination, a differential-gear operating-wheel, a chain-pocketed lifting-sheave, accessory unpocketed lifting-sheaves, a ratchet and pawl, the said ratchet being secured to a gear meshing with one side of the aforesaid differential gearing, 30 ratchet-notches adapted to lock said pawl in said ratchet until said ratchet is given a slight reverse impulse, a friction-wheel secured to one of the lifting-sheaves, and a band-brake bearing upon said friction-wheel, substantially as specified. 35 40

13. In a differential-power pulley-block, means adapted to automatically throw off the differential power and allow the use of the lifting sheave or sheaves as a direct simple 45 pulley.

RICHARD LAVERY.

Witnesses:

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GEO. L. LAVERY.