(No Model.)

5 Sheets—Sheet 1.

O. FLOHR.

HOISTING ENGINE.

No. 436,828. Patented Sept. 23, 1890.

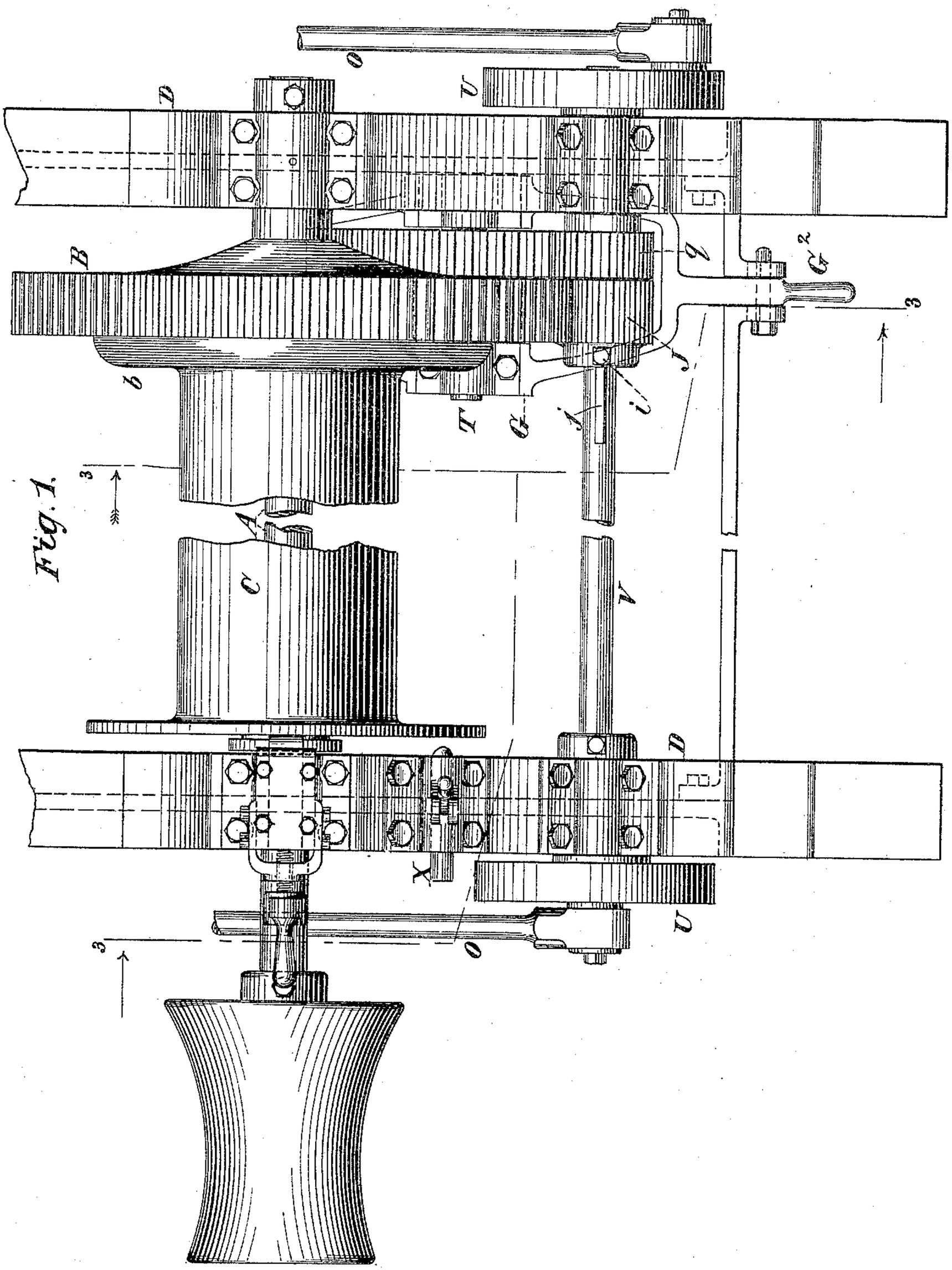

Fig. 1.

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INVENTOR:

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(No Model.) 5 Sheets—Sheet 2.

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HOISTING ENGINE.

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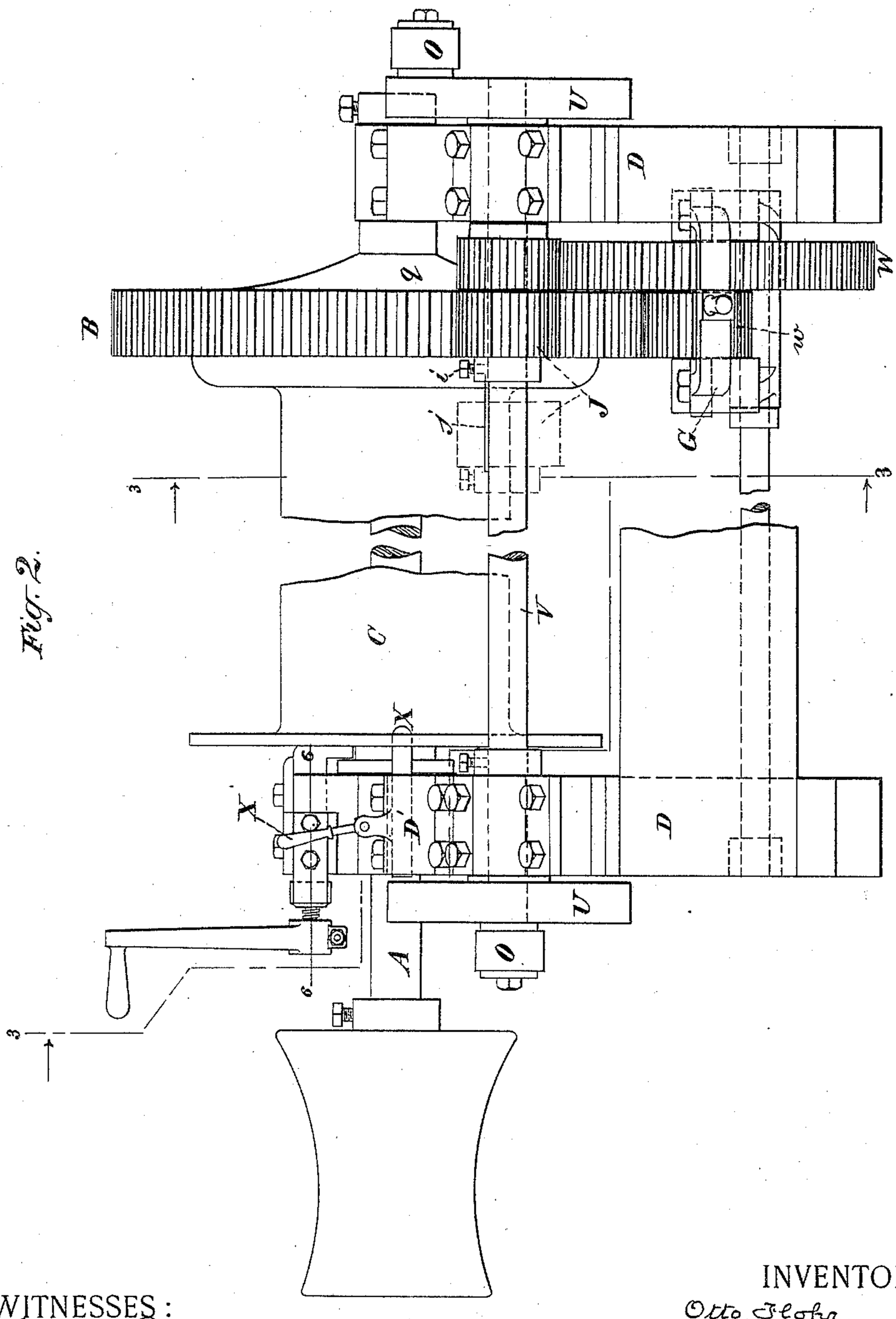

Fig. 2.

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(No Model.) 5 Sheets—Sheet 3.

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Fig. 3.

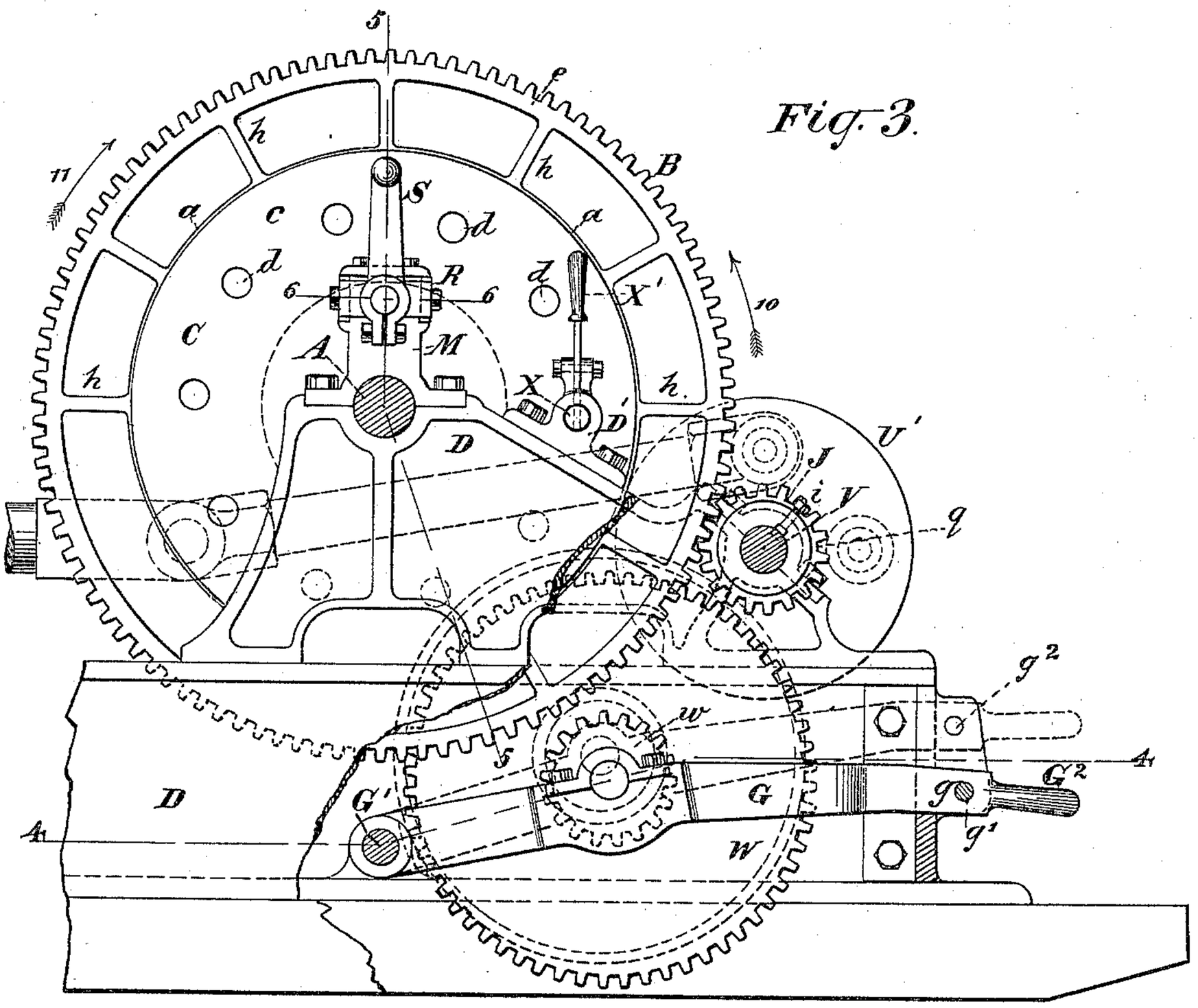
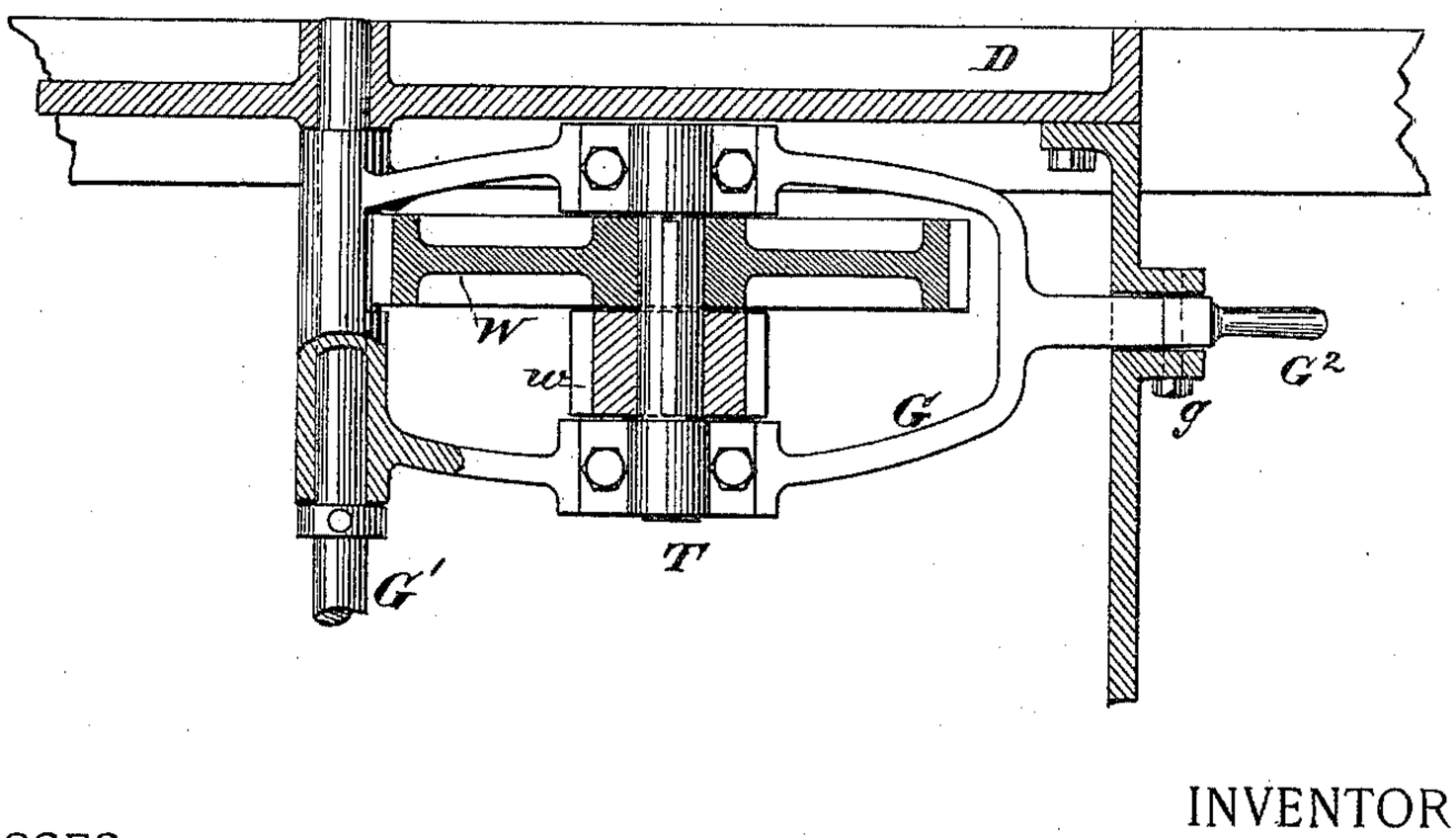


Fig. 4.



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(No Model.) 5 Sheets—Sheet 4.

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HOISTING ENGINE.

No. 436,828. Patented Sept. 23, 1890.

Fig. 5.

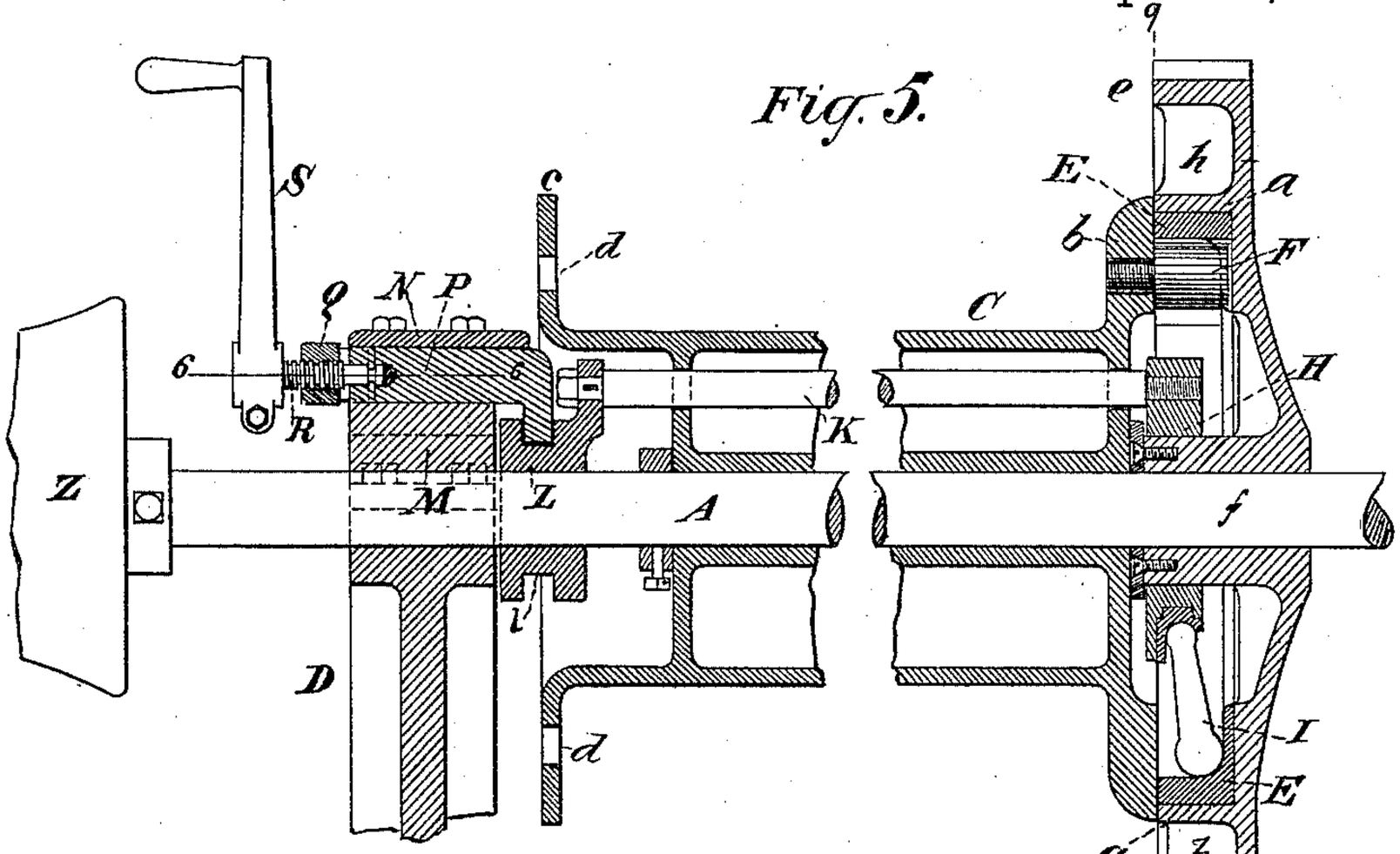


Fig. 6.

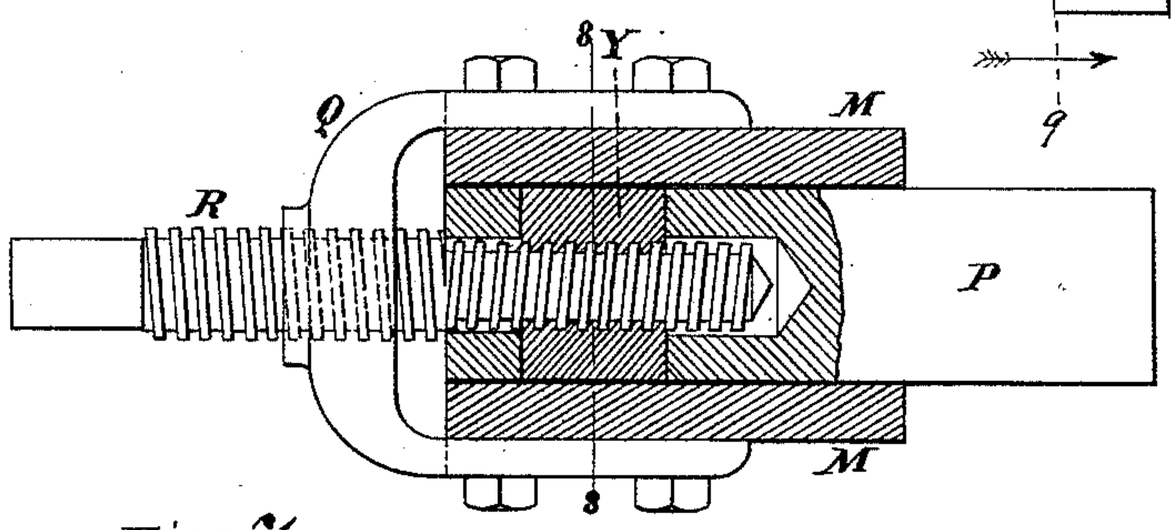


Fig. 7.

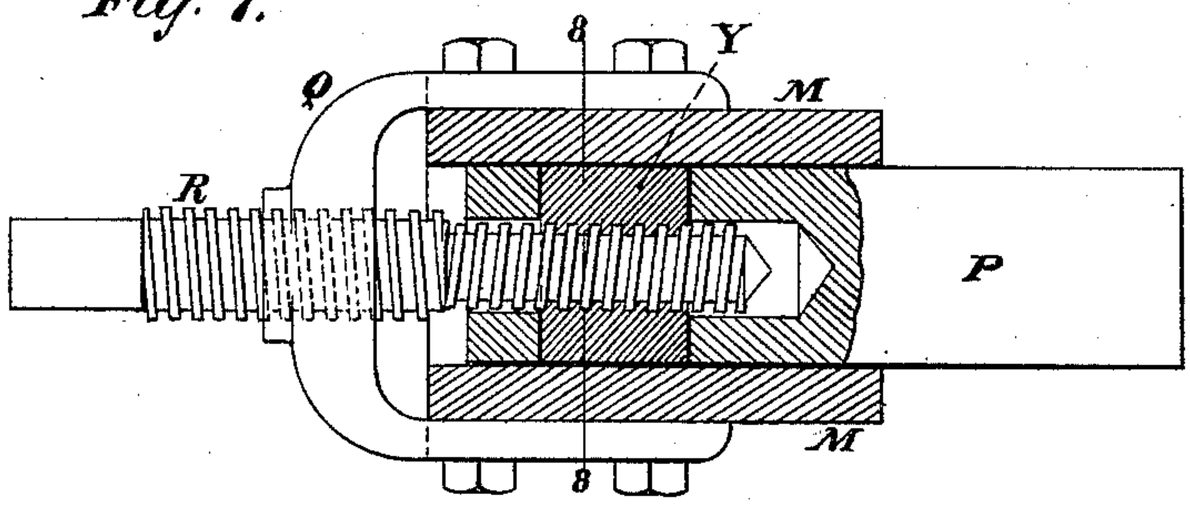
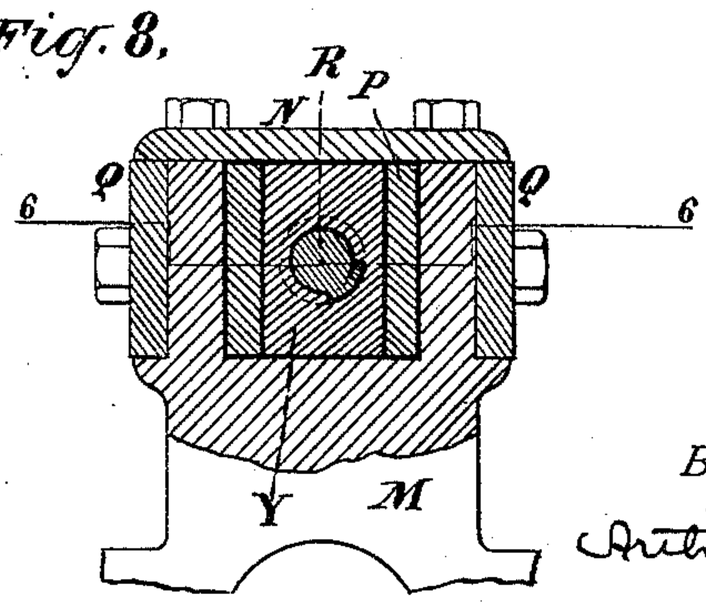


Fig. 8.



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5 Sheets—Sheet 5.

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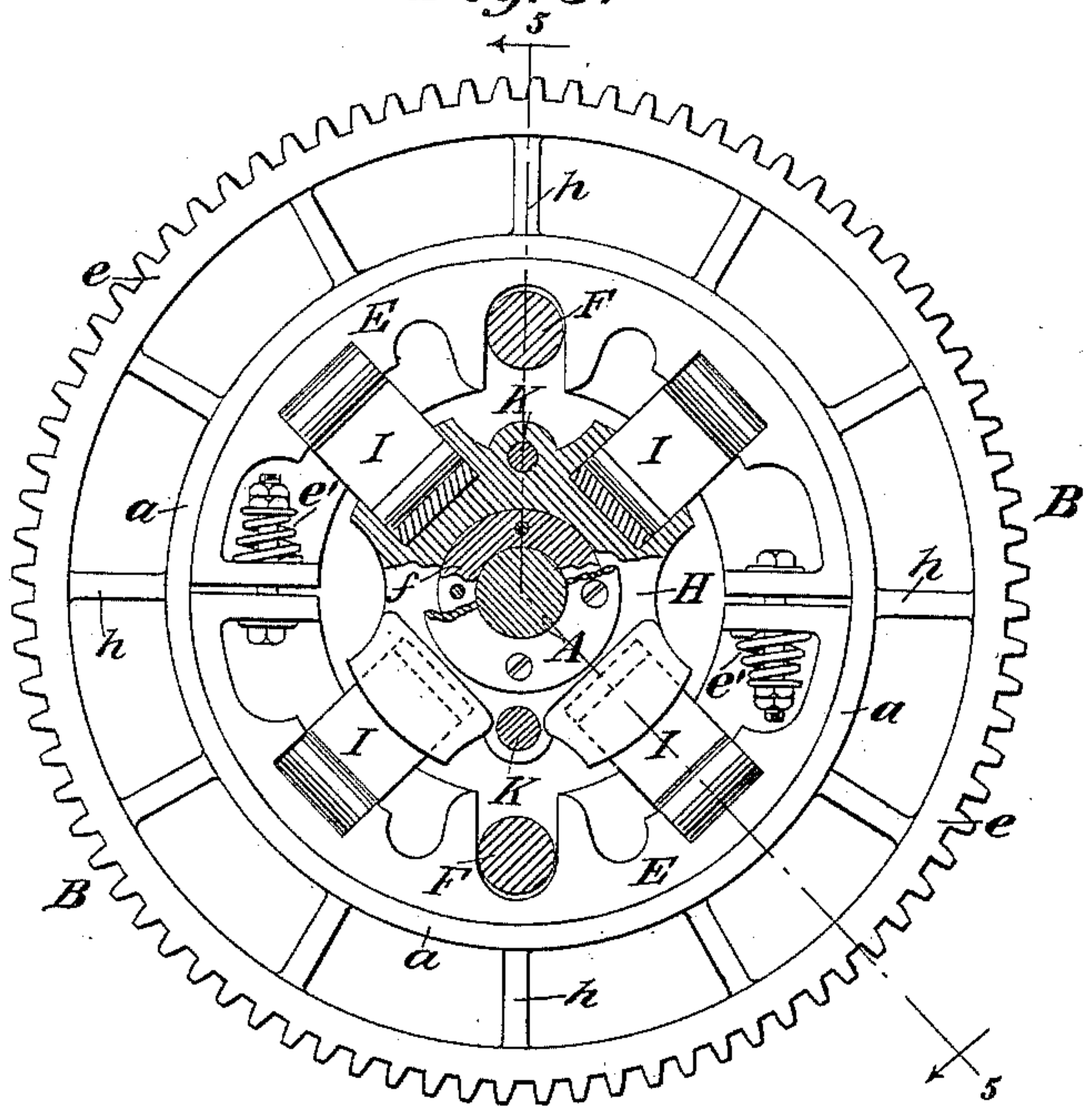
HOISTING ENGINE.

No. 436,828. Patented Sept. 23, 1890.

Fig. 9.



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UNITED STATES PATENT OFFICE.

OTTO FLOHR, OF BUFFALO, NEW YORK.

HOISTING-ENGINE.

SPECIFICATION forming part of Letters Patent No. 436,828, dated September 23, 1890.

Application filed July 18, 1888. Serial No. 280,294. (No model.)

To all whom it may concern:

Be it known that I, OTTO FLOHR, a citizen of the United States, and a resident of Buffalo, Erie county, New York, have invented certain new and useful Improvements in Hoisting-Engines, of which the following is a specification.

The objects of the invention are to provide ready and convenient means for changing the speed of the gearing through which the hoisting-drum is driven, to provide means for locking the hoisting-drum fast in order to hold the load in any position, and to improve the construction of the friction-clutch by means of which the winding-drum is united to the hoisting-gear, and the means for applying such clutch.

My invention is in part applicable to all kinds of hoisting machinery wherein a winding-drum is employed driven from the crank-shaft of an engine or otherwise through gearing; but is also in part confined in its application to drums driven through the medium of a friction-clutch, and in particular of such a friction-clutch as is disclosed in my patent, No. 375,739, granted January 3, 1888.

In the accompanying drawings, Figure 1 is a plan of sufficient of a hoisting-engine to illustrate my invention, the same being partly broken away and the remaining portions closed together. Fig. 2 is a front elevation thereof, similarly broken away. Fig. 3 is a side elevation, partly in vertical section, cut in the several planes, as denoted by the lines 3 3 in Figs. 1 and 2. Fig. 4 is a fragmentary plan view in section on the line 4 4 in Fig. 3. Fig. 5 is a vertical axial section through the drum in the two planes denoted by the lines 5 5 in Figs. 3 and 9. Figs. 6 and 7 are horizontal sections on a larger scale cut in the plane of the lines 6 6 in Figs. 2, 3, and 8. Fig. 8 is a fragmentary front view on the same scale as Figs. 6 and 7 and in vertical section on the lines 8 8 in Fig. 6. Fig. 9 is a side elevation of the clutch, partly in section, on line 9 9 in Fig. 5.

Referring to the drawings, let A designate the drum-shaft of the hoisting-engine, B the driving-gear fixed thereto, C the winding-drum mounted loosely thereon, and D the fixed frame-work of the engine. In hoisting, the gear B is rotated by the engine, of which the pitman O and crank U are shown in full lines in Figs. 1 and 2 and in dotted lines in Fig. 3. The drum C is coupled to the gear through the medium of the friction-clutch, and is revolved thereby until the load is raised to the desired height. Then, when it is desired to lower the load, the friction-clutch is partially released, and the drum is thereby permitted to be revolved backward by the descent of the load, the rapidity of its backward revolution being governed by the clutch, which then acts as a friction-brake.

I will briefly describe the clutch. The gear-wheel B is formed with an annular overhanging flange *a*, and within this flange is placed the divided friction-ring E, Fig. 9, which is divided at diametrically-opposite points into half-sections. The friction-ring is carried with the drum, the latter being formed with an expanded flange *b*, to which the ring is connected by carrying-pins F, so that the ring is forced to turn with the drum. The sections of the ring are drawn together by springs *l' l'*, and are forced apart by toggle-arms I I, Figs. 5 and 9. These toggle-arms abut at their outer ends against the divided ring and at their inner ends against a ring or "knee-piece" H, which is free to slide longitudinally on the hub *f* of the gear B. As it is forced to the right in Fig. 5, it straightens the toggle-arms and expands the friction-ring, thereby locking the drum C to the gear B. The advancing and retractile movements of the knee-piece H are imparted to it through the medium of rods K K, one of which is shown in Fig. 5, which are carried by the drum and slide longitudinally through holes therein, and are fixed at their front ends to a sliding sleeve L, which is mounted to slide freely on the shaft A, and has an annular groove *l*, into which projects a toe extending downwardly from the rear end of a slide P. This slide moves in bearings or slideways formed at the top of the bearing-cap M, and motion is imparted to it by means of a screw R, turned by a crank S and engaging a fixed nut in a yoke Q. As the screw is turned in one direction, it transmits motion through the slide to the collar L and applies the clutch, and when turned in the other direction it releases the clutch.

The construction thus far described forms

no novel part of my present invention, being disclosed in my said patent, No. 375,739.

The winding-drum is driven, as is usual, through the intervention of gearing from the crank-shaft V of the engine. In the construction shown this shaft has crank-wheels U U fixed on its opposite ends, with crank-studs ninety degrees apart engaged by the pitmen O O of the two pistons of the engine. On the shaft V is mounted a pinion J, which is connected to the shaft through the medium of a spline or feather *j* on the shaft and a set-screw *i* in the boss of the pinion, whereby the pinion may be slid along the shaft and fixed in any position by tightening the set-screw. When it is in the position shown in Figs. 1 and 2, it is in mesh with the gear B, so that the latter is rotated in the direction of the arrow 10 in Fig. 3 and at a relatively high speed.

In order to drive the gear B and the drum at a relatively low speed other gearing is provided. A swing-frame G (shown best in Figs. 3 and 4) is pivoted on a shaft G′ and has a handle G^2 at its front end, by which to raise or lower it. It is fastened in either position by putting a pin or bolt *g* through the frame G and through one or other of two holes *g′* and g^2 in the fixed frame of the machine, which holes are adapted to register with the hole in the frame G when the latter is, respectively, in its lowered and raised position. The frame G carries a shaft or stud T, on which are mounted a gear-wheel W and a pinion *w*, which are fixed together, either through the medium of the shaft T, to which both are keyed, as shown in Fig. 4, or in any other suitable manner. On the crank-shaft V, and in addition to the sliding pinion J, is fixed immovably a pinion *q*, arranged to one side of the gear B, as shown in Figs. 1 and 2. This pinion is in the same plane with the gear W, and the pinion *w* is in the same plane with the gear B.

When the engine is quick-geared—that is, when the gear B is being driven directly from the crank-shaft by means of the pinion J—the swing-frame G is dropped to the position shown in full lines in Fig. 3, so that the pinion *w* is out of mesh with the gear B and the gear W is out of mesh with the pinion *q*. To prevent any accidental raising of the frame which might bring the gears into mesh, the frame G is fastened down by passing the pin *g* through the holes *g′*.

When it is desired that the drum shall be slow-geared, the pinion J is loosened and slid along on the shaft V until it is beyond the plane of the gear B, as shown in dotted lines in Fig. 2, and the frame G is lifted to the position shown in dotted lines in Fig. 3, thereby bringing the gear W and pinion *w* into mesh respectively with the pinion *q* and gear B. The frame is fastened in this position by passing the pin *g* through the upper hole g^2. The motion of the crank-shaft is then transmitted through the pinion *q* to the gear W and through the pinion *w* to the gear B, whereby the latter is driven in the direction of the arrow 11 in Fig. 3, and at a much slower speed than before, the precise speed being determined by the proportions of the several gears.

The slow and quick motion change-gear just described admits of a change from slow to quick speed, or vice versa, being very rapidly effected, introduces no weak or defective mechanical parts, and brings the change-gears and their frames out of the way where they cannot foul with the winding-rope and where they are not liable to be injured.

In order to lock the winding-drum fast in any position, either to hold the load suspended or for other purpose, I provide in lieu of the ratchet and pawl shown in Fig. 9 of my said former patent the locking device which I will now describe. The flange *c* at one end of the drum C is pierced with holes *d d* at intervals, these holes being all equally distant from the center. On the adjacent side frame D is mounted a bearing-block D′, in which slides a cylindrical bolt X, the axis of which is parallel, or approximately so, with the shaft A and at the same distance therefrom as the holes *d d*, so that when the bolt is projected at a time when one of these holes is in line with it, it enters the hole, as shown in Fig. 2, and thereby locks the drum fast to the frame. The bolt X is moved by means of a lever X′ over it, which lever is fulcrumed on a pin or bolt passing through an upward projection on the frame D′. The end of the bolt X is preferably rounded to facilitate its entrance into the hole. Whenever it is desired to lock the drum fast in any position, it is turned sufficiently to bring the nearest hole into line with the bolt, whereupon the latter is projected by the lever X′ through the hole. The load may be thus held without reference to the clutch or the engine, so that by freeing the clutch the engine might be rotated for doing some other work, or by leaving the clutch in engagement the engine is locked fast and cannot turn. This improved locking device is greatly superior to any means heretofore applied for holding the load suspended, since after it is once applied it involves no attention and no exercise of strength on the part of the workmen, cannot accidentally become released, and is not liable to breakage or injury. Taken in connection with my improved friction-clutch, it enables the ordinary strap-brake heretofore applied to the winding-drums of hoisting-engines to be omitted. Such brakes have heretofore been applied for two purposes—namely, first, to hold the load suspended, and, second, to lower the load slowly and control the speed of its descent. The first of these functions is performed by my improved locking device, while the friction-clutch performs the second. In the construction shown in my said patent the gear-wheel B has its cog-teeth formed immediately on the exterior of the flange *a*, which

receives the frictional contact of the divided ring E. This construction answers well for a small gear; but in some instances it is desirable that the pitch-line of the gear be made of so much larger diameter than the friction-ring that it is impracticable to form the cog-teeth on the same flange which receives the thrust of the ring. In such case I adopt a construction which forms part of my present invention, and is shown in Figs. 3 and 5. The gear B is formed with two concentric annular and approximately-cylindrical flanges *a* and *e*. The inner flange *a* receives the frictional contact of the ring E, as heretofore. The outer flange *e* has the cog-teeth formed on its exterior. The two flanges are connected by the web of the wheel, which is extended beyond the flange *a* and joins the flange *e*. Between the two flanges are a series of radial ribs *h h*, which serve to connect the two flanges together after the manner of a truss and greatly strengthen the flange *a* against the bursting strain of the expanding-ring within it by transmitting a portion of this strain outwardly and distributing it to the flange *e*, while they also stiffen and brace this flange against the strains it receives through the cog-teeth.

For ordinary hoisting purposes I employ the means for releasing the clutch shown in Fig. 5 and in my said previous patent, wherein a screw R has its end swiveled to the slide P and its threads engage female threads in the fixed yoke Q; but for pile-driving and other purposes, where a very quick release of the drum is desired, I employ the construction shown in Figs. 6, 7, and 8. The screw R is formed with right and left hand threads, of which the right-hand threads engage the yoke Q, while the left-hand threads engage female threads in the slide P or in a separate nut fastened to the slide. Both threads are preferably single and of the normal pitch, so that no movement can be transmitted through the slide to the screw, and consequently the clutch cannot release itself, so that the handle may be let go without thereby throwing off the clutch. At the same time a greater movement is given to the slide with a given radial movement or oscillation of the screw, since the movement imparted to the slide is the sum of the movements due to the pitch of the two threads of the screw. In Fig. 6 the slide is shown drawn fully back, while in Fig. 7 it is thrust partly forward by a turn of the screw. The preferred construction is that wherein the slide is provided with a separate nut, as shown at Y, this nut being inserted into a vertical mortise formed through the slide in such portion thereof that the movement of the slide leaves it always inclosed in the slideway, where it is held in place by the top plate N, as well as by the screw. The nut is formed exteriorly in the shape of a rectangular block, which makes a close fit endwise with the mortise.

I claim as my invention the following-defined novel features and combinations, substantially as hereinbefore specified, namely:

1. The combination, with the drum-gear and driving-shaft, of a pinion on the latter, a swing-frame, a gear-wheel carried by said frame and adapted to mesh with said pinion, and a pinion carried by said frame fastened to said gear-wheel and adapted to mesh with said drum-gear, whereby when the swing-frame is in one position said gears are in mesh and when it is in the other position they are out of mesh.

2. The combination, with the drum-gear and driving-shaft, of a pinion mounted on the latter meshing with said drum-gear when in the plane thereof and adapted to slide on said shaft out of the plane of said drum-gear, another pinion fastened on said shaft in a different plane from the drum-gear, a gear-wheel in the plane of said latter pinion, a pinion fastened to said gear-wheel and in the plane of the drum-gear, and a swing-frame carrying said gear-wheel and pinion and adapted to move them into or out of mesh with said driving-shaft pinion and drum-gear, respectively.

3. The combination, with the drum-gear and driving-shaft, of a pinion on the latter, a gear-wheel adapted to mesh with said pinion, a pinion fastened to said gear-wheel and adapted to mesh with said drum-gear, a swing-frame carrying said gear-wheel and pinion and adapted to bring them into or out of mesh with said driving-shaft pinion and drum-gear, respectively, and fastenings for fixing said swing-frame in either position.

4. The combination, with a friction-clutch, of mechanism for engaging and disengaging it, consisting of an annularly-grooved sleeve carried with the rotating parts, a slide engaging said sleeve, and an operating-screw formed with right and left hand threads engaging female threads in said slide and in a fixed part, whereby the turning of said screw imparts a quick motion to said slide, while the rotation of the screw by the thrust of the slide is prevented.

5. The combination, with a friction-clutch, of mechanism for engaging and disengaging it, consisting of an annularly-grooved sleeve carried with the rotating parts, a slide engaging said sleeve and formed with a mortise, a nut inserted in said mortise, an operating-screw formed with right and left hand threads, one of which engages said nut, and a fixed nut or re enforce engaging the other threads of said screw.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

OTTO FLOHR.

Witnesses:
ARTHUR C. FRASER,
GEORGE H. FRASER.