(No Model.) 3 Sheets—Sheet 1.

# G. F. CLEMONS.

## DIFFERENTIAL HOISTING MECHANISM.

No. 404,958. Patented June 11, 1889.

Fig. 1.

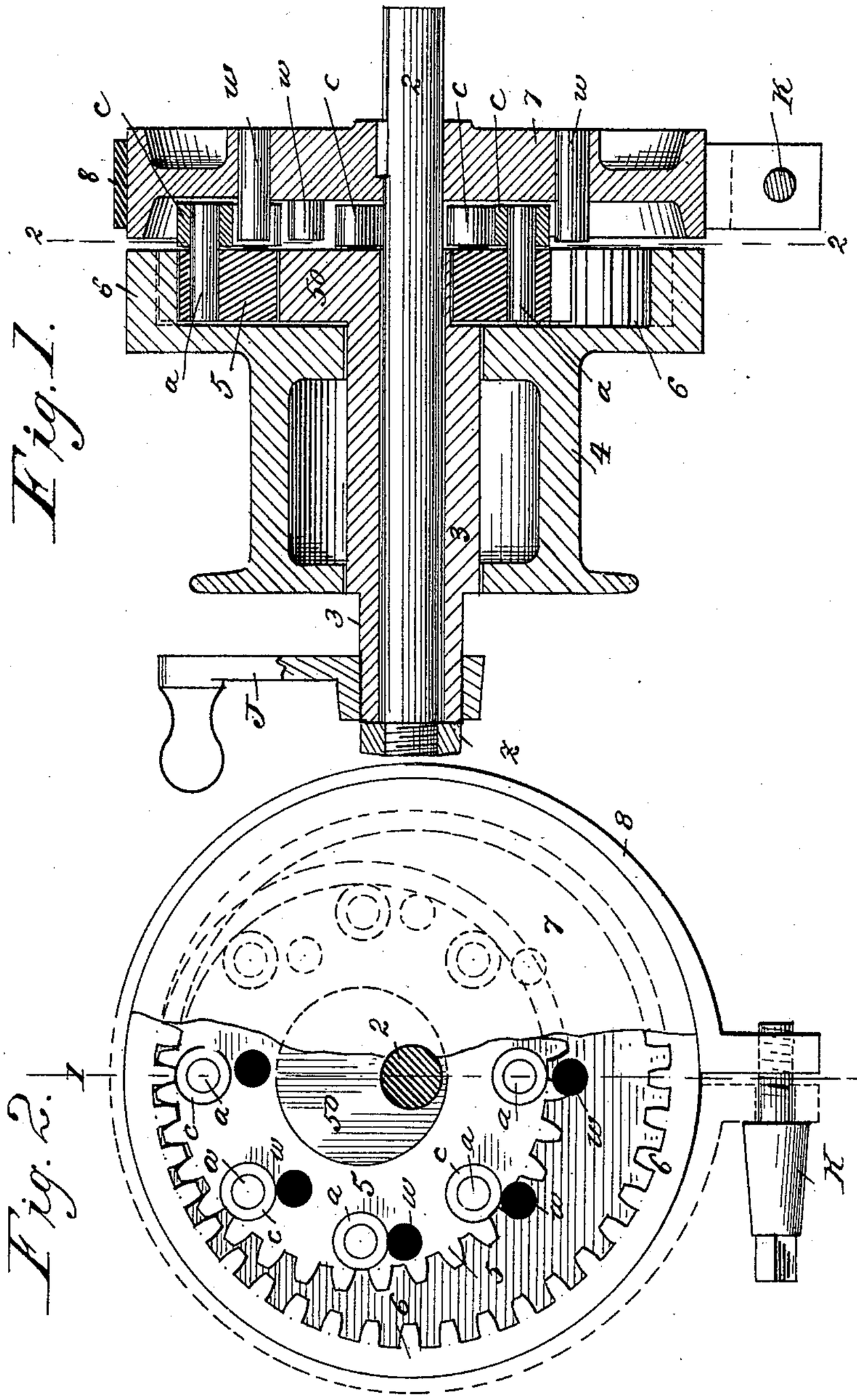


Fig. 2.




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Fig. 3.

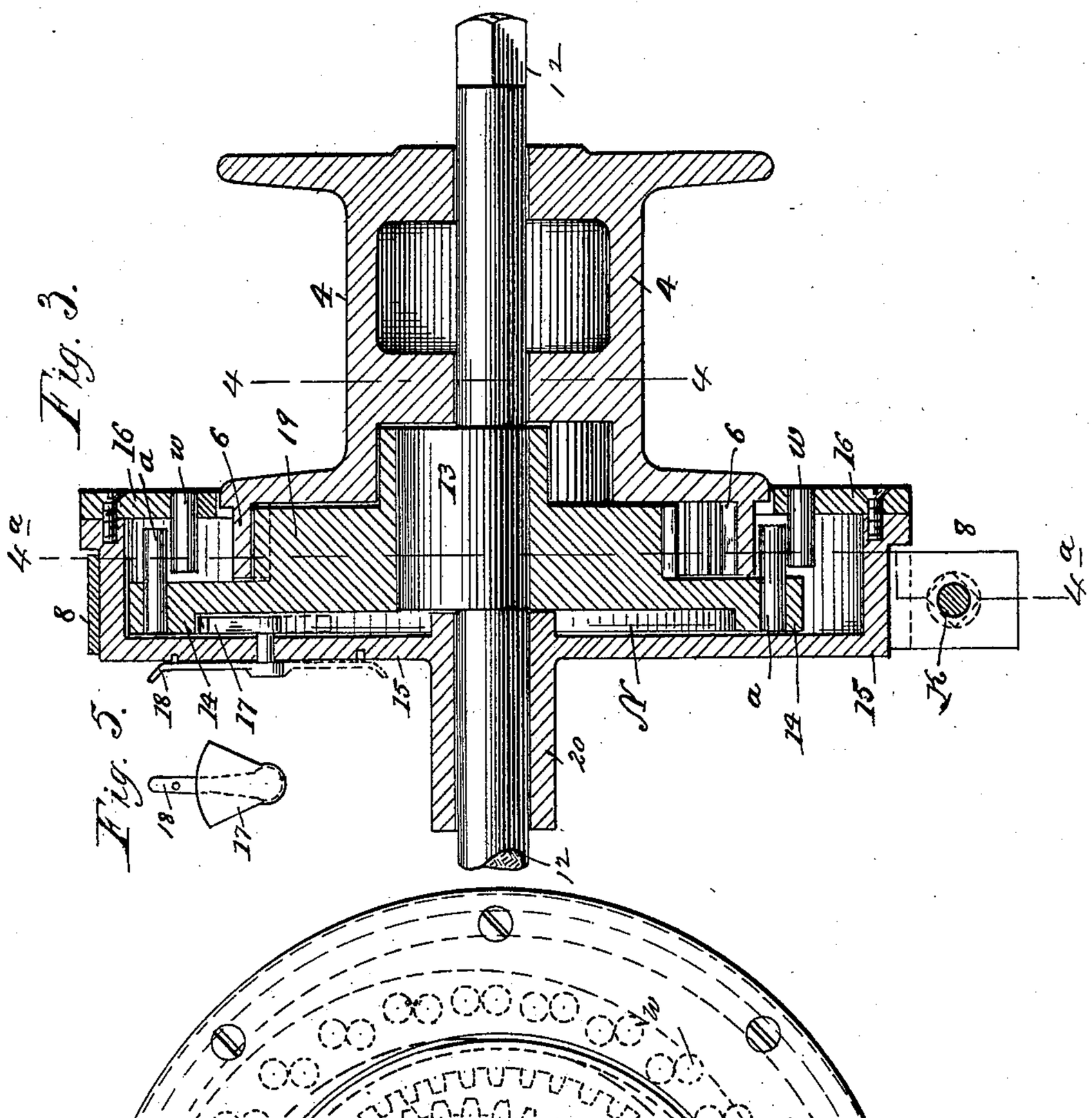
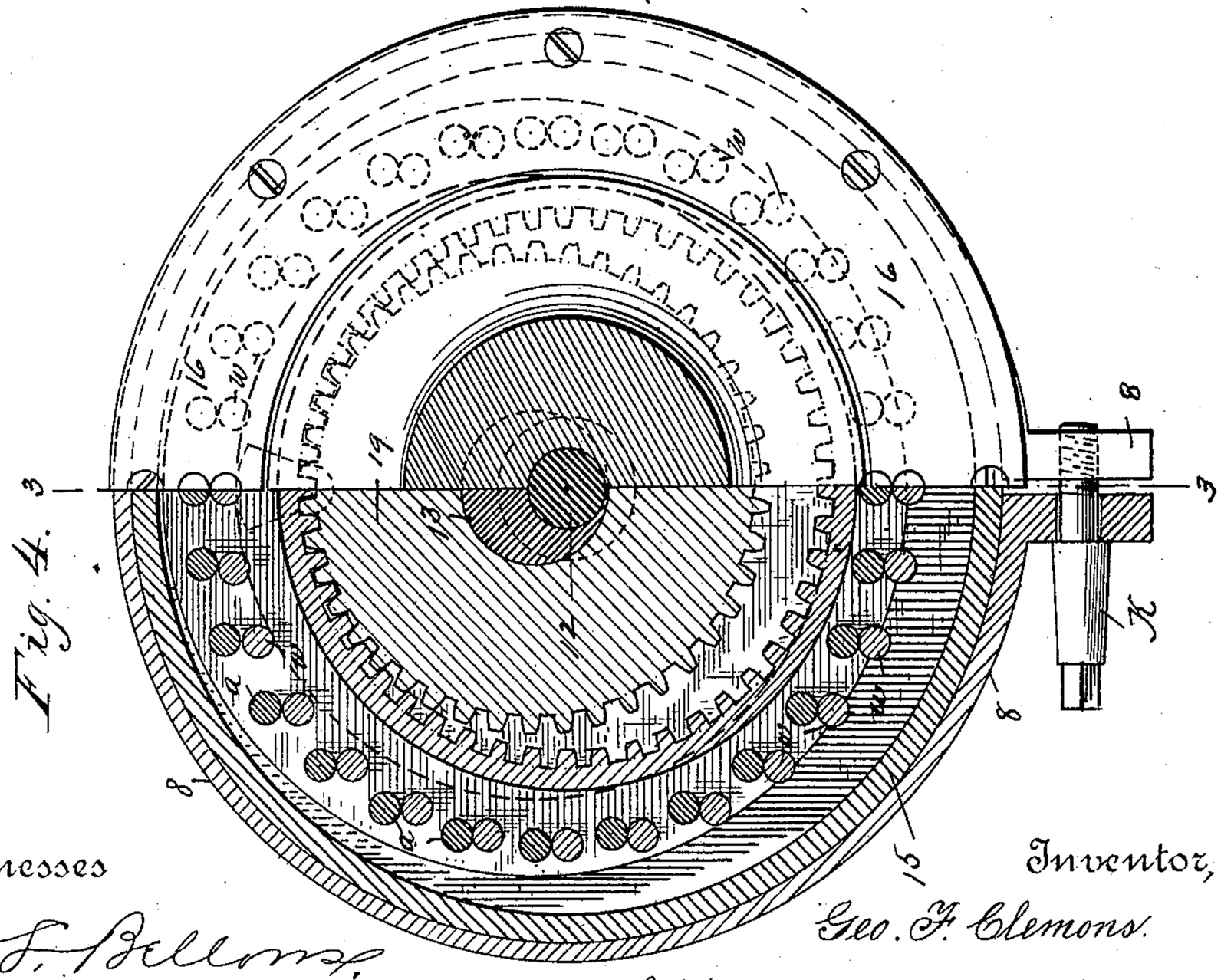



Fig. 5.




Fig. 4.

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## DIFFERENTIAL HOISTING MECHANISM.

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Fig. 7.

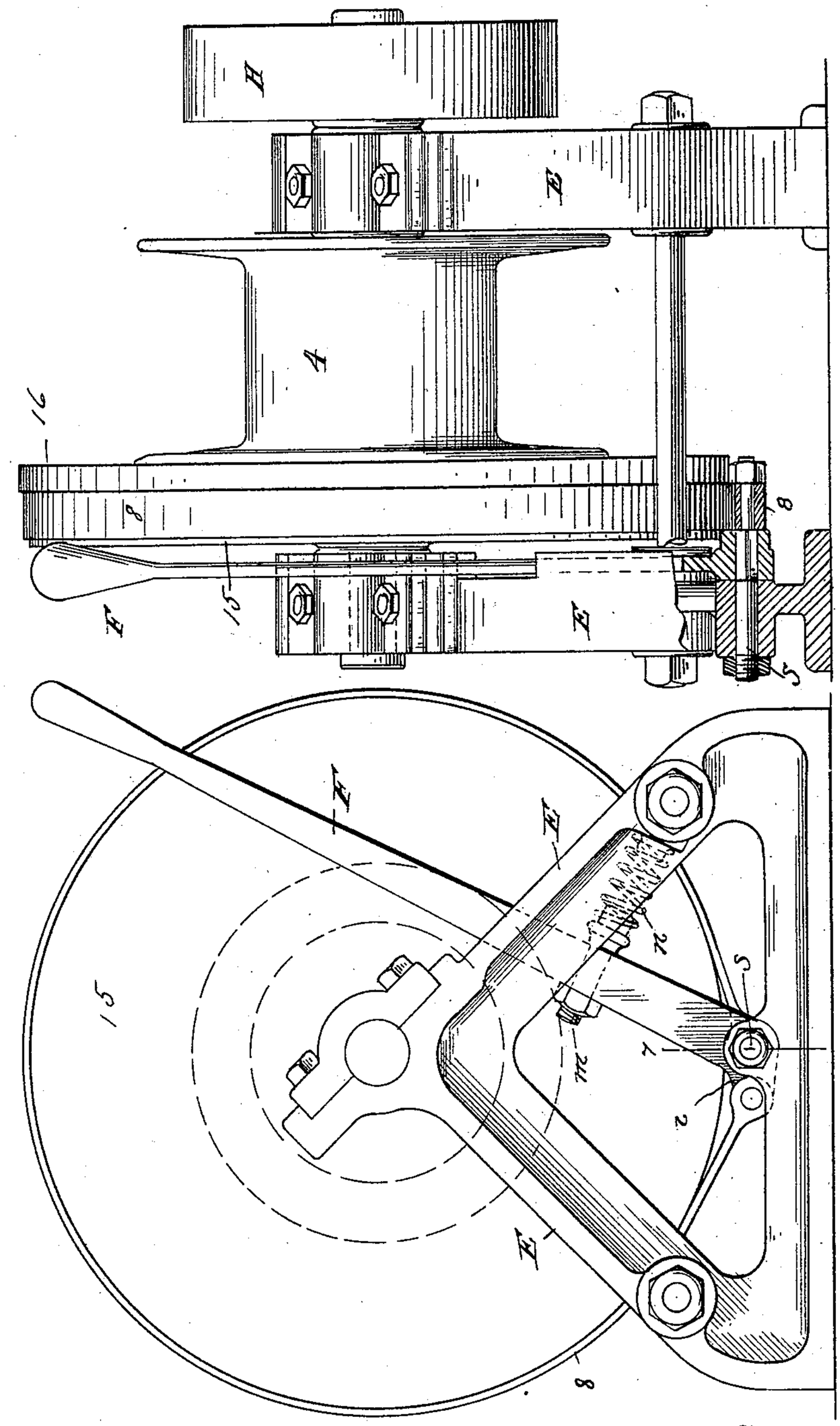


Fig. 6.




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# UNITED STATES PATENT OFFICE.

GEORGE F. CLEMONS, OF SPRINGFIELD, MASSACHUSETTS.

## DIFFERENTIAL HOISTING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 404,958, dated June 11, 1889.

Application filed August 22, 1888. Serial No. 283,441. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE F. CLEMONS, a citizen of the United States, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Differential Hoisting Mechanism, of which the following is a specification.

This invention relates to differential hoisting mechanism, the object being to provide improved means for engaging the eccentrically-rotating element of the apparatus with other parts of the device, whereby friction is avoided to a greater extent than heretofore and a longer leverage is obtained; and the invention consists in the peculiar construction and arrangement of the parts of the device, all as hereinafter fully described, and pointed out in the claims.

In the drawings forming part of this specification, Figure 1 is a longitudinal section, and Fig. 2 a face view, of a portion of the operative parts shown by separating the latter on line 2 2, Fig. 1, said figures illustrating differential hoisting mechanism embodying my improvements. Figs. 3 and 4 are similar views to Figs. 1 and 2, and they illustrate a slightly-modified construction from that shown in said last-named figures, as fully described below. Fig. 5 illustrates a detail part below described. Fig. 6 is an end view, and Fig. 7 is a side elevation, of the hoisting device arranged in a supporting-frame for practical operation.

In the drawings, (referring now to Figs. 1 and 2,) 2 indicates the shaft of the hoisting device, and 7 indicates a metallic disk keyed to said shaft. The said disk 7 has fixed therein a series of pins *w* by one end, the opposite ends of which pins project beyond the inner face of said disk, as shown in Fig. 1, said pins being arranged in circular position and equidistant from the axis of the shaft 2. Certain of said pins *w* have their positions indicated wholly in black and others of the series in dotted lines in Fig. 2, showing substantially their operative relations to other similar pins in the spur-gear of the device, below described. A sleeve 3 is fitted to rotate on said shaft 2, and is held in position thereon by a nut *z*, screwed on the end of the shaft against the end of said sleeve. An eccentric 50 is formed on the inner end of said sleeve 3, and on said eccentric is fitted a spur-gear 5, within which said eccentric has a rotary motion. The said spur-gear 5 has a series of pins *a* fixed by one end therein and having the opposite ends thereof projecting beyond the side of said gear, substantially identical with the pins *w* in the said disk 7. The pins *a* of the spur-gear have loosely fitted thereon the metallic collars *c*, which collars have a rotary motion on the pins of the gear when brought into engagement with the pins *w* of the disk 7, as below described, and thereby more or less friction between the engaging surfaces of said pins is obviated; but, if desired, the said collars may be omitted and the two series of pins, respectively those of the disk 7 and of the spur-gear, may be permitted to engage directly with each other. The said pins *a* and *w*, or the said projecting portions thereof, on the disk 7 and the spur-gear 5 occupy parallel positions, as shown in Fig. 1. A winding-spool 4, around which a cord or chain is wound when the device is employed for hoisting articles to which said chain is attached by one end, is adapted to be rotated on the said sleeve 3, and has on its end, opposite the side of the disk 7, an internal gear 6, said internal gear being formed, preferably, integral with said spool by casting or other suitable means. The said spur-gear 5 is adapted to engage with the said internal gear 6 in the manner indicated in Fig. 2. Rotary motion is imparted to the eccentric-bearing sleeve 3 by a crank J or by a driving-pulley, as shown in Fig. 7, according to the work to which the device may be applied, thereby adapting it to be operated by hand or by power.

The device is ordinarily mounted in a frame E, substantially such as is shown in Figs. 6 and 7, and when so mounted a retaining-strap 8, rigidly attached by one end to a part of said frame, encircles the disk 7, and through the angularly-projected end portions of said strap, as shown in Figs. 1, 2, 3, and 4, is placed a screw-bolt K, whereby the ends of said strap are drawn together, causing the strap to so clamp the disk 7 that the said disk is held fixed in relation to the eccentrically-rotating spur-gear 5, said disk being so held when the sleeve 3 is rotated to lift articles by

winding a chain or cord onto the spool 4; but when it is desired to let the device run down freely, for the purpose of dropping the end of the cord or chain more quickly than it would be if the motion of the sleeve 3 were reversed, the strap 8 is loosened or disengaged from the disk 7 by unscrewing the screw K with any suitable wrench, and under those conditions the disk and spool and shaft all rotate freely to unwind said cord or chain.

In operating the device to hoist articles by giving motion to the sleeve 3 and the spur-gear 5, as above described, while the disk 7 is held fixed, the said spur-gear has an eccentric motion within the internal gear 6, which is induced by the action of the eccentric 50, on which it is carried, and by the successive engagement of certain of the pins *a* in said spur-gear during the said eccentric motion of the latter with the ends of the pins *w* in the disk 7 (the latter being immovable) the spur-gear and the winding-spool are given a rotary movement in the direction in which the crank or pulley is rotated. During the aforesaid operation of the described parts of the device the said pins *a* of the spur-gear make a revolution around the pins *w* of the disk 7 in substantially a circle, the engagement of said pins with each other being only upon surfaces of very slight area, owing to their comparatively small diameters, and hence the friction resulting from said contact is very slight.

The action relatively of said interlocking pins is illustrated in Fig. 4, wherein the line 3 3, which is drawn through the axes of the shaft 12 and the eccentric 13, passes through the axes of the disengaged pins *a* and *w*, and the engaged pins of the spur-gear and disk are on opposite sides of the shaft 12 on a line drawn about at right angles to and across said line 3 3.

With the disk 7 held against rotation by the strap 8, as aforesaid, the winding-spool 4 and the internal gear 6 are incapable of turning reversely by any weight which is being hoisted when no power is applied to the crank J, because of the engagement of the pins *a* of the spur-gear with those of the disk 7.

The section shown in Fig. 1 is taken about on line 1 1, Fig. 2.

Referring now to the construction illustrated in Figs. 3, 4, and 5 and the mounting of the hoisting device in a frame, as shown in Figs. 6 and 7, Fig. 3 is a section about on line 3 3, Fig. 4, and Fig. 4 shows sections about on lines $4^a$ and 4, Fig. 3. The shaft 12 in Figs. 3 and 4 has an eccentric, 13, formed thereon, and the eccentric-sleeve shown in Fig. 1 is thus dispensed with; but the action of the eccentric itself on the spur-gear in both cases is identical. The spur-gear 19, Fig. 3, is supported on said eccentric and has a flange 14 extending beyond the teeth of said gear, as shown, in which the pins *a* are set, instead of setting them within the pitch-line of the teeth of the said gear, as in Fig. 2. The spur-gear 19 of Fig. 3 has also a circular recess N in one face thereof. To adapt the pulley 15 in this construction, which answers to the disk 7 in that shown in Fig. 1, to the said changed construction of the spur-gear 19, the said pulley 15 consists of a cup-shaped or flange-bounded wall having therein said spur-gear, and having a flat metallic ring 16 secured to its flange and extending in a plane at right angles to the axis of shaft 12 over said extended flange of the spur-gear, and in said flat ring the pins *w*, which engage with said pins *a*, are set. By this means both sets of said pins are carried to positions considerably farther from the axis of the shaft 12 than they are in Fig. 1, and the said pins are much better protected from dirt, and thereby they are kept in better working condition.

A stop 17, consisting of a metal segment, as shown in Fig. 5, is pivoted to the inner side of the said pulley 15 in such position that its free end may be swung into engagement internally with the rim forming the flange-wall of said recess N in the outer side of the spur-gear 19, as shown in Fig. 3, whereby the eccentric motion of said gear is prevented. By so preventing the eccentric movement of the spur-gear the device becomes a simple hoisting-machine in which all of the parts are rotated by the rotation of the shaft 12 to wind or unwind a cord which may be attached to the spool 4. This provision is oftentimes desirable when a light load or object is to be quickly lifted or lowered. A crank or pulley is attached to either end of the shaft 12, the end of the shaft extending beyond the end of the hub 20 of the pulley 15, or said hub may have a bearing in one of the boxes of the frame in which the device may be mounted. The said stop 17 has a spring-handle 18 attached to the outer end of its pivot-pin, on the under side of which is a stop-pin, as shown, engaging with sockets in pulley 15. By means of said handle, which swings on the outer side of the pulley 15, said stop is swung to carry its free end to the position shown in Fig. 3, or to an opposite position, as there shown by dotted lines, and when in the latter the spur-gear is free to act eccentrically, as described. The said stop-pin serves to hold the stop 17 in either of the above-named positions.

The frame E shown in Figs. 6 and 7 may be used in which to mount either description of said hoisting devices; but the provision of a driving-pulley H (shown on one end of the shaft 12) in lieu of a crank-arm is an obvious expedient, which is desirable in some uses of the machine.

As means for operating the retaining-strap 8 (shown in Figs. 6 and 7) a lever F is pivoted by one end to said frame by a stud S, and to the inner end of said stud one end of the strap 8 is attached, said strap passing around the pulley 15, and having its opposite end attached to a short arm *l* on said lever. A spiral spring *n* is interposed between a part

of the frame E and the lever F to swing the free end of said lever upward and hold the strap 8 normally against the rim of the pulley 15 to prevent its rotation. The lower end of said spring is held in place by a fixed stud which enters its lower end, and a stud *m* in said lever retains the upper end of said spring in place.

When the hoisting device is to be run down free, as above described, the free end of lever F is swung downward against the spring *n*, thereby slightly disengaging the strap 8 from said pulley.

What I claim as my invention is—

1. The combination of mechanism consisting of a spur-gear carrying a series of pins, a pulley carrying a like series of pins for engagement with the pins on said gear, a rotatable eccentric acting on said spur-gear, as described, an internal gear with which said spur-gear engages, adapted to have a rotary motion about said eccentric, and a supporting-shaft, substantially as set forth.

2. The combination of mechanism consisting of a spur-gear carrying a series of pins projecting from the face thereof, a rotatable disk or pulley having also a like series of pins projecting from its face for engagement with the pins on said gear, a rotatable eccentric having said spur-gear thereon, a winding-spool integrally formed with an internal gear with which said spur-gear engages, said internal gear adapted to have a rotary motion about said eccentric, a supporting-shaft, and means, substantially as described, for rotating said eccentric, substantially as set forth.

3. The combination, with a pulley having a rim and the inwardly-extending flange 16, having a series of circularly-arranged pins *w*, projecting inwardly therefrom, of a spur-gear disposed within said flanged pulley, having an outwardly-extended and surrounding ring having a series of circularly-arranged pins thereon, an internal gear of longer diameter than said spur-gear surrounding same, and an eccentric for action on said spur-gear, as described, substantially as and for the purposes specified.

4. The combination, with a pulley 15, having a rim and the inwardly-extending flange 16, provided with a series of circularly-arranged pins *w*, projecting inwardly therefrom, of a spur-gear disposed within said flanged pulley, having an outwardly-extended and surrounding ring provided with a series of circularly-arranged pins thereon, and having the circular recess N, an internal gear of longer diameter than said spur-gear surrounding same, an eccentric for action on said spur-gear, as described, and the stop 17, pivoted on said pulley for engagement with or disengagement from the rim forming the wall of said recess, substantially as set forth.

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