(No Model.)

2 Sheets—Sheet 1.

H. S. HASKINS & Z. B. COES.

HOISTING APPARATUS.

No. 602,580. Patented Apr. 19, 1898.

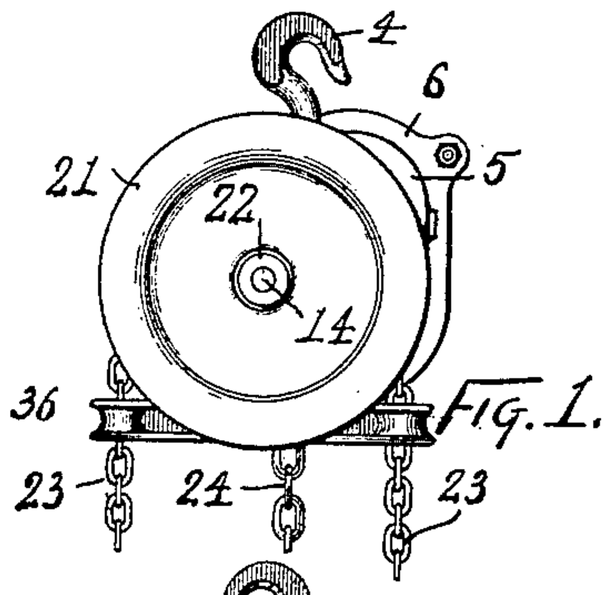

FIG. 1.

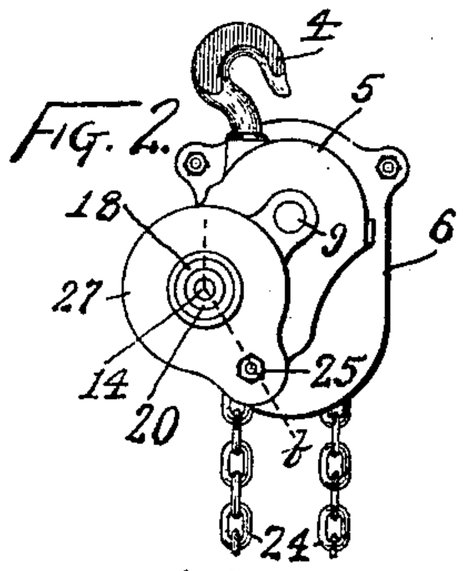

FIG. 2.

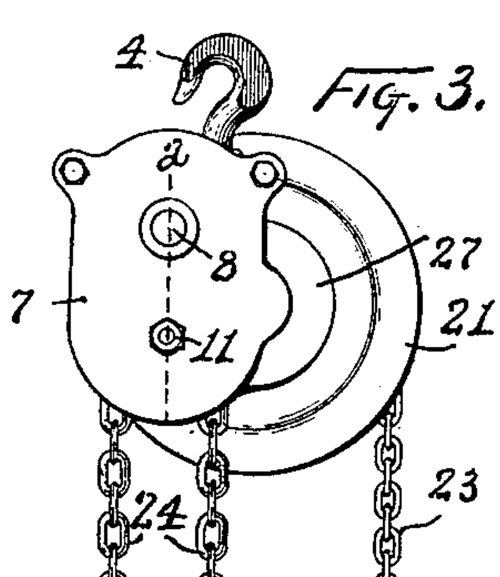

FIG. 3.

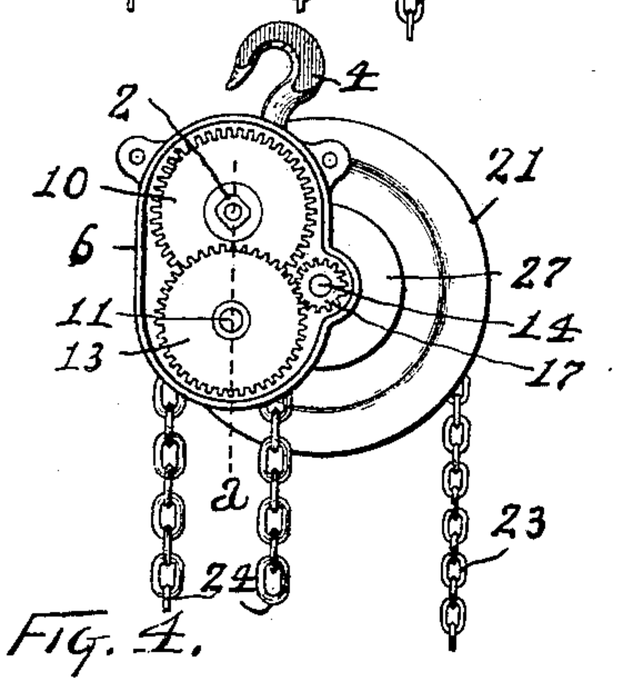

FIG. 4.

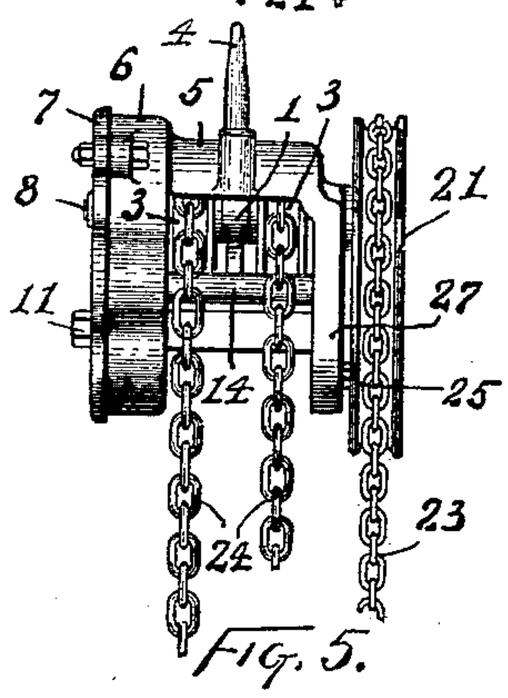

FIG. 5.

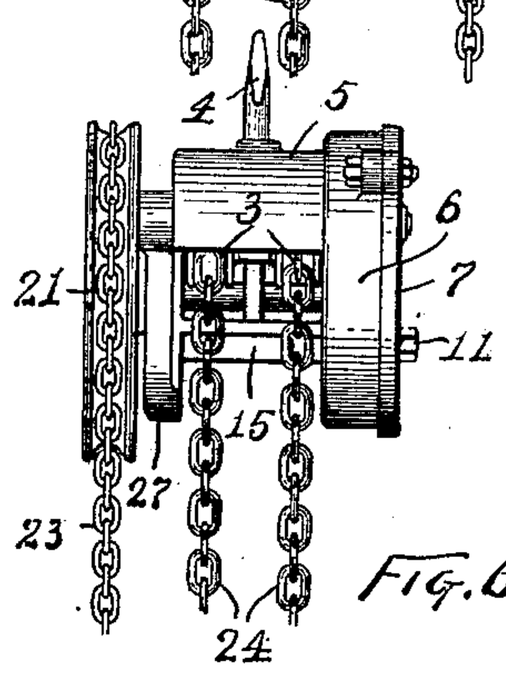

FIG. 6.

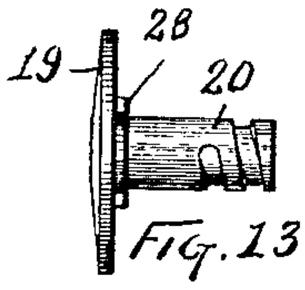

FIG. 13.

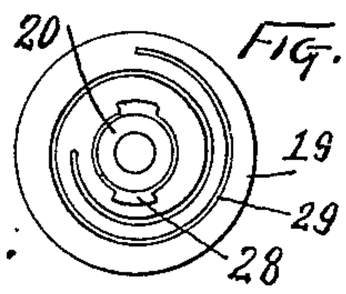

FIG. 14.

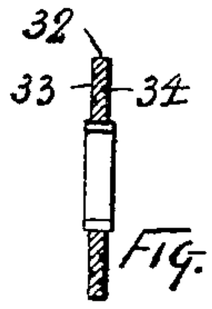

FIG. 15.

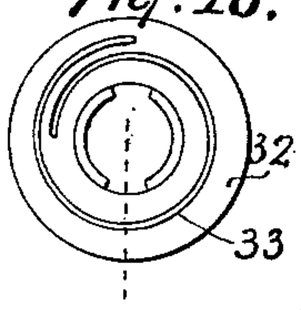

FIG. 16.

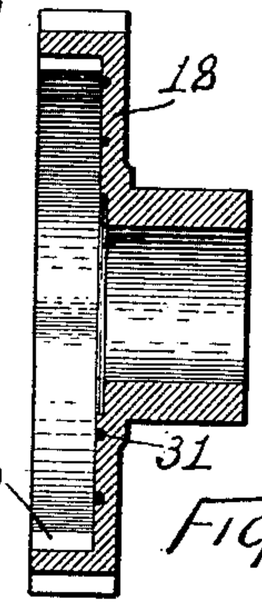

FIG. 12.

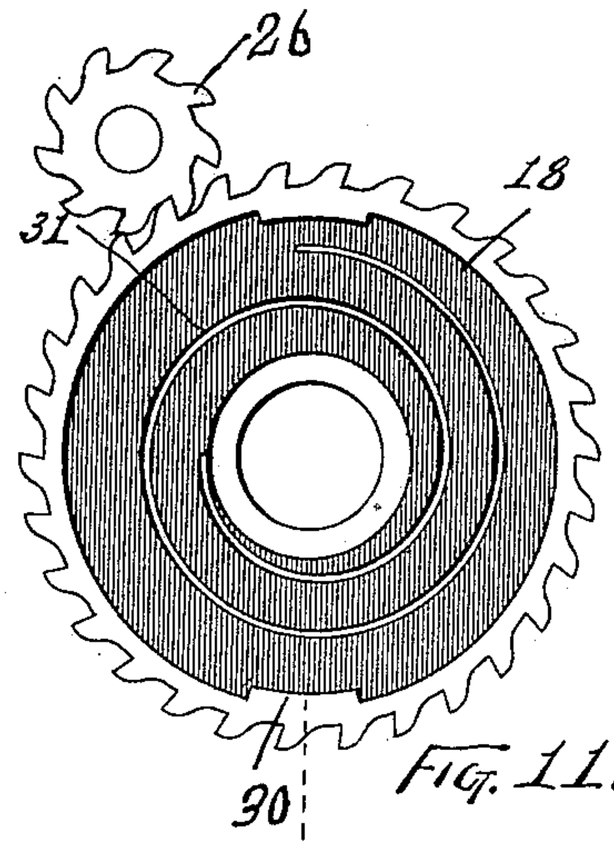

FIG. 11.

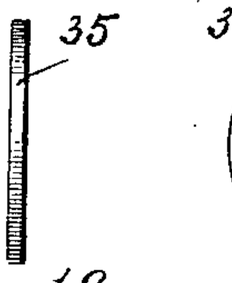

FIG. 18.

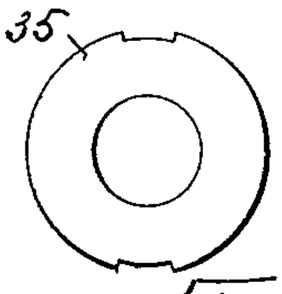

FIG. 17.

Witnesses:
E. R. Shipley
M. S. Belden

Harry S. Haskins
Zorester B. Coes.
Inventors
by James W. See
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(No Model.)

2 Sheets—Sheet 2.

H. S. HASKINS & Z. B. COES.

HOISTING APPARATUS.

No. 602,580. Patented Apr. 19, 1898.

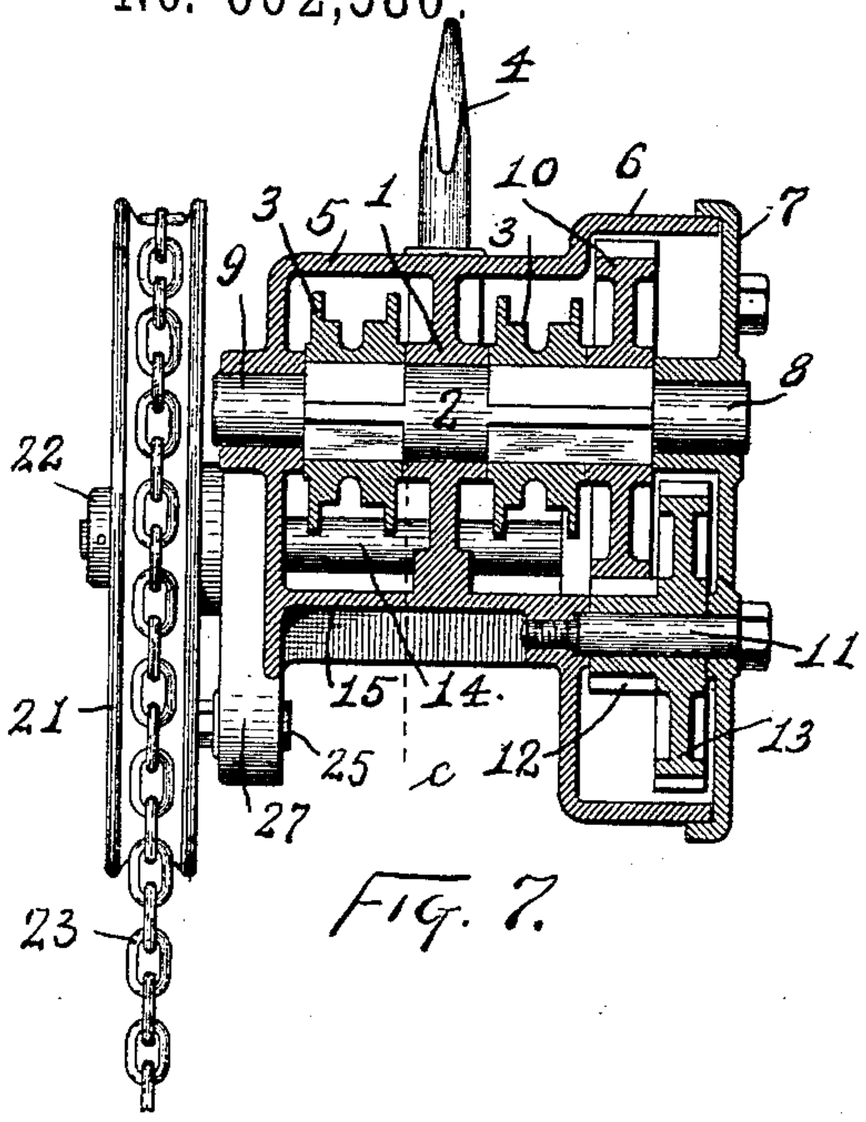

FIG. 7.

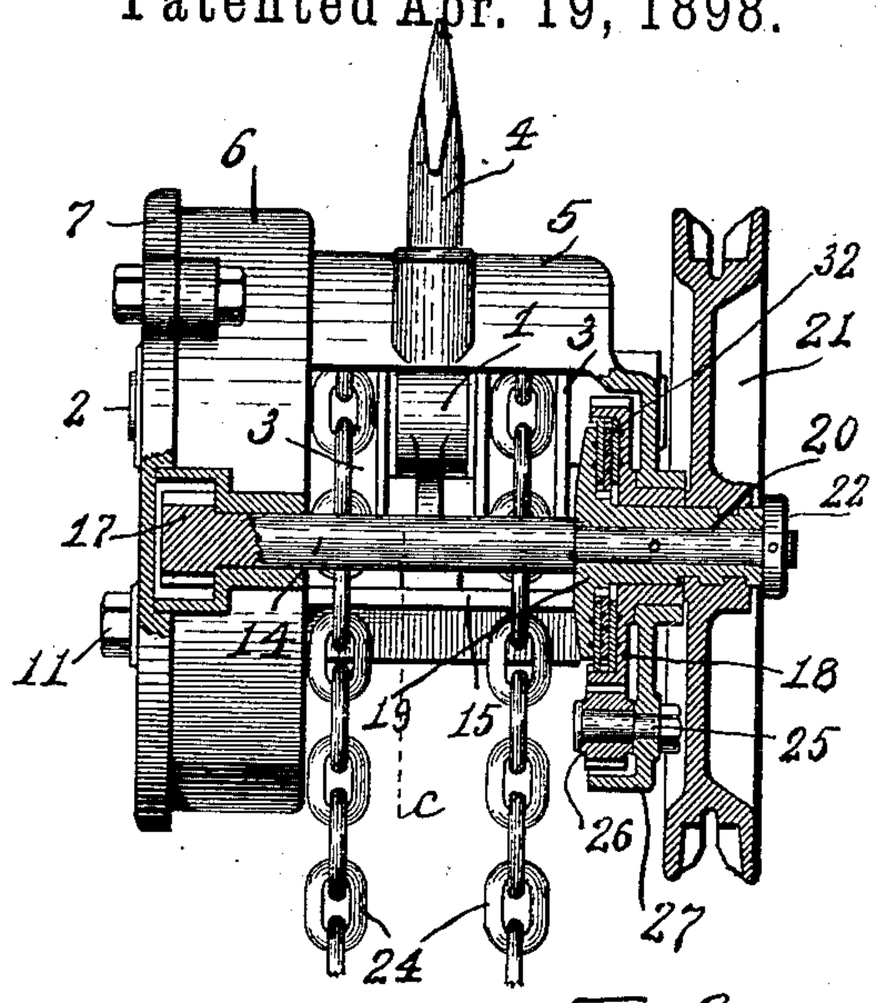

FIG. 8.

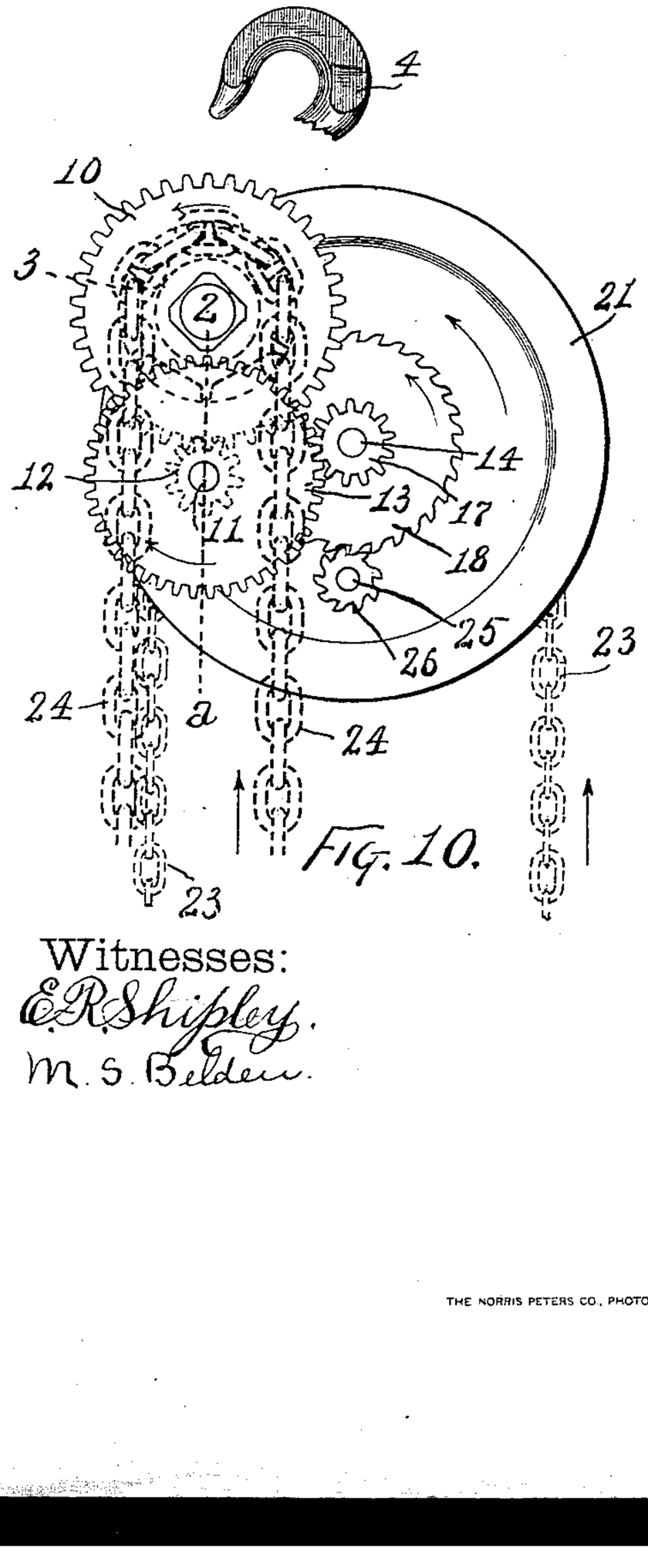

FIG. 10.

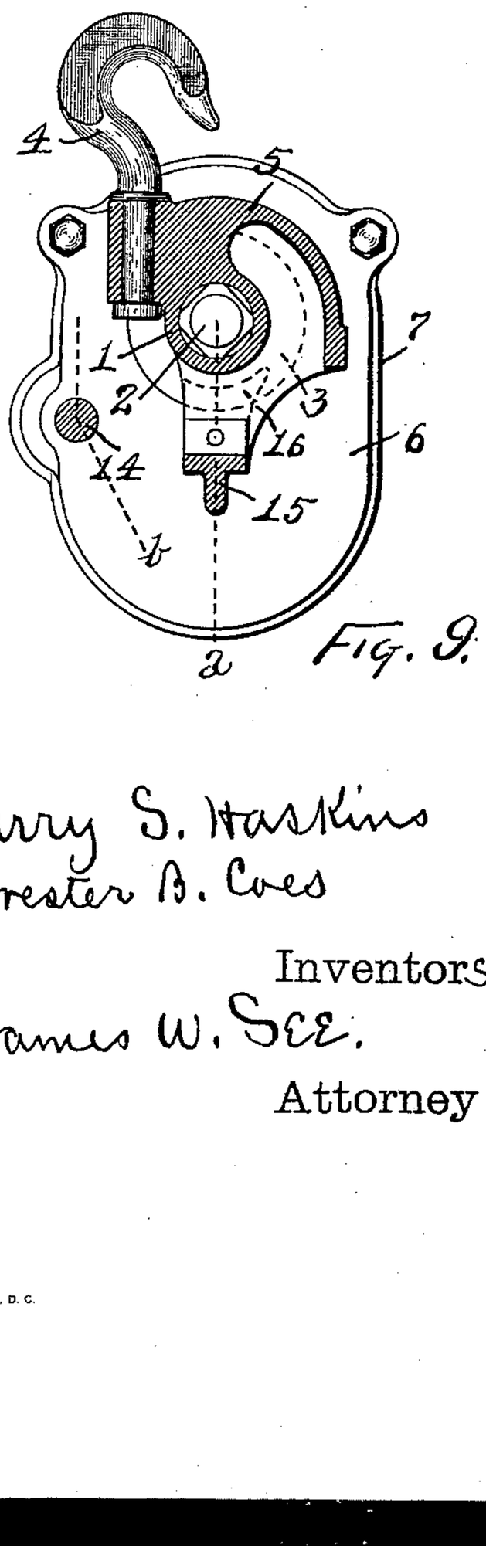

FIG. 9.

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Zorester B. Coes
Inventors
by James W. See.
Attorney

UNITED STATES PATENT OFFICE.

HARRY S. HASKINS AND ZORESTER B. COES, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNORS TO THE EDWIN HARRINGTON, SON & COMPANY, INCORPORATED, OF SAME PLACE.

HOISTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 602,580, dated April 19, 1898.

Application filed January 13, 1898. Serial No. 666,515. (No model.)

To all whom it may concern:

Be it known that we, HARRY S. HASKINS and ZORESTER B. COES, of Philadelphia, Philadelphia county, Pennsylvania, have invented certain new and useful Improvements in Hoisting Apparatus, of which the following is a specification.

Our invention pertains to improvements in the constructive details and general organization of devices for hoisting loads by hand. While some features of the invention are applicable to other kinds of hand hoisting devices, the improvements have been designed mainly with a view to the construction of that class of hand hoisting devices known as "chain-blocks," and we herein exemplify our invention in a chain-block having two hoisting-chains—that is to say, the load is lifted by two chains, dividing the strain between them and each engaging its own sheave, the hoisting-sheaves being operated, as usual, by hand-chain on a sheave, which latter sheave will be herein termed the "hand-sheave." The general frame of the block has the hand-sheave at one side and certain gearing at the other side, and these sides will be referred to, respectively, as the "hand-sheave" side and "gear" side. The hoisting-sheaves are on an arbor, and in the plane of one vertical tangent of the hoisting-sheaves is arranged the axis of the suspension-hook, and in this same vertical tangent plane fall the members of the hoisting-chain, which are strained by the load, the other idle members of the hoisting-chains falling in the other vertical tangent plane of the hoisting-sheaves. That side of the block structure corresponding with the hoisting elements of the chain will be hereinafter termed the "load" side, and that side of the structure nearest the idle members of the hoisting-chains will be termed the "idle" side.

Our improvements will be readily understood from the following description taken in connection with the accompanying drawings, in which—

Figure 1 is an elevation of the hand-sheave side of a chain-block embodying our improvements; Fig. 2, a similar view with the hand-sheave removed; Fig. 3, an elevation of the gear side; Fig. 4, a similar elevation with the gear-bonnet removed; Fig. 5, an elevation of the load side of the block; Fig. 6, an elevation of the idle side; Fig. 7, a vertical section of the block in the plane of line *a* of Figs. 3, 4, 9, and 10, viewed from the idle side; Fig. 8, an elevation of the load side of the block, parts appearing in substantially vertical section in the plane of line *b* of Figs. 2 and 9; Fig. 9, a vertical section of the block in the plane of line *c* of Figs. 7 and 8, viewed from the hand-sheave side; Fig. 10, a diagram illustrating the general relation of the sheaves and gearing; Fig. 11, an elevation of the inner face of the brake-gear; Fig. 12, a diametrical section of the brake-gear; Fig. 13, a side elevation of the friction-clamp; Fig. 14, an elevation of the inner face of the friction-clamp; Fig. 15, a diametrical section of the friction-disk; Fig. 16, a face elevation of the friction-disk; Fig. 17, a face elevation of one of the friction-washers, and Fig. 18 an edge elevation of the same.

In the drawings, 1 indicates a short horizontally-disposed bearing; 2, an arbor journaled therein and projecting from each side thereof, the side projections of this arbor forming prisms with their axes coinciding with the axis of the central journal portion of the arbor; 3, a pair of hoisting-sheaves fitting upon the prismatic portions of the arbor, one immediately at each side of the bearing 1, these sheaves having their peripheries adapted, as usual, to properly grip the hoisting-chains; 4, the suspension-hook, having its vertical shank swiveled in a bearing disposed at one side of the vertical plane of the axis of the arbor and in the plane of the load tangent of the hoisting-sheaves and in a vertical plane midway between the two load members of the hoisting-chains; 5, roof portions projecting rigidly sidewise from the bearing 1 and over the hoisting-sheaves; 6, a gear-case formed at the gear side of the block and formed integrally with roof portion 5, this gear-case being open at the gear side of the block; 7, a bonnet bolted to and closing the gear-case; 8, a journal formed on that end of the arbor corresponding with the gear side of the block, this journal taking a bearing in

the bonnet and having a diameter less than that of bearing 1; 9, a journal formed upon that end of the arbor corresponding with the hand-sheave side of the block, this journal having a bearing smaller than bearing 1 in a wall portion depending from roof portion 5 at the hand-sheave side of the block; 10, a spur-gear fitting on one of the prismatic portions of the arbor just within the journal 8; 11, a journal-bolt passing through the bonnet 7 and across the gear-case parallel with the arbor and screwing into the rear wall of the gear-case, this bolt serving at once as a bolt to aid in securing the bonnet to the gear-case and as a journal for gears; 12, a pinion loose on journal-bolt 11 and engaging spur-gear 10; 13, a spur-gear loose on journal-bolt 11 and fast with pinion 12; 14, a spindle disposed parallel with the arbor and below the same and to the load side of it, this arbor being journaled at one end in the gear-case and having journal-support, as hereinafter explained, in the wall at the hand-wheel side of the block-framing, this spindle appearing in the diagram in Fig. 10 as below its correct position for purposes of clearness of view, Fig. 4 showing the true position; 15, a bridge disposed across the block-frame below the hoisting-sheaves and rigidly connected with bearing 1, the gear-case, and with the frame-wall at the hand-sheave side of the block; 16, Fig. 9, the usual strippers, bolted to this bridge and projecting up into the grooves of the hoisting-sheaves to strip the idle members of the hoisting-chains from the sheaves; 17, a pinion fast on that end of the spindle which is journaled in the gear-case, this pinion engaging gear 13 and being inclosed by the gear-case, the gear-case therefore inclosing all of the gearing which has been referred to; 18, a brake-gear having an outwardly-projecting hub journaled in a bearing in the frame-wall at the hand-sheave side of the block, the inner face of this gear being recessed and surfaced to form a flat friction-surface, the hub of this gear concentrically surrounding spindle 14, this gear having peculiar teeth, as hereinafter explained; 19, a friction-clamp in the form of a flange having a hub fast upon spindle 14 and journaled within the hub of brake-gear 18, the inner face of this flange forming a flat friction-surface and the hub of the flange forming a journal for the spindle, this journal running in the bore of the brake-wheel as a bearing; 20, a coarse thread upon a portion of the hub of the friction-clamp projecting outwardly beyond the framing of the block; 21, the hand-sheave, its hub being loosely screwed upon the threaded hub of the friction-clamp and adapted to screw up against the hub of brake-gear 18, the direction of spirality of the thread in question being such that the hand-sheave will screw farther upon the hub when turned in that direction corresponding with the hoisting of a load, the periphery of the hand-sheave being adapted, as usual, to grip the endless hand-chain; 22, a collar on the end of the spindle to limit the unscrewing of the hand-sheave from the hub of the clamp; 23, the usual endless hand-chain engaging the hand-sheave; 24, the hoisting-chains passing over the two hoisting-sheaves, one member of each of the chains being adapted, as usual, to join in the support of the suspended load being dealt with, while the other member of each chain hangs idly from the opposite side of its hoisting-sheave; 25, a stud supported in the frame-wall at the hand-sheave side of the block near the brake-gear 18 and parallel with the axis of the spindle; 26, a pinion turning idly on stud 25 and gearing with brake-gear 18, this pinion having peculiar teeth, as hereinafter explained; 27, an inwardly-open gear-case formed in the frame-wall at the hand-sheave side of the block and inclosing the brake-gear and its pinion 26; 28, Fig. 13, keys projecting outwardly from the hub of friction-clamp 19 at the inner face of its flange; 29, Fig. 14, a spiral groove formed on the inner surface of the flange of friction-clamp 19, the direction of spirality of this groove being such as to lead inwardly when followed in the direction corresponding with the motion of the hand-sheave in hoisting a load; 30, Fig. 11, keys projecting inwardly from the periphery of the recess in brake-gear 18; 31, a spiral groove formed in the inner face of the brake-gear, the direction of spirality of this groove being such as to lead inwardly if followed in the direction corresponding with that of the turning of the hand-sheave in lowering a load; 32, Figs. 15 and 16, a friction-disk having flat sides and fitting upon the hub and the keys 28 of friction-clamp 19, so that the friction-disk will turn with the friction-clamp; 33, a spiral groove in that face of friction-disk 32 which is contiguous to the flange of friction-clamp 19, the direction of spirality of this groove being, as before, such as to lead inwardly when followed in the direction corresponding with the hoisting direction of motion of the hand-sheave, the actual spirals of grooves 29 and 33 being therefore of opposite direction, owing to the fact that the two spirals face each other; 34, a spiral groove on the face of friction-disk 32 contiguous to the brake-wheel, the direction of this spiral being the same as that of groove 29; 35, friction-washers disposed upon the hub of friction-clamp 19 at each side of friction-disk 32 and adapted to be clamped between that disk and the friction-clamp and brake-gear, respectively, the peripheries of these washers being notched to engage keys 30 in the brake-gear, so that the washers will necessarily turn with the brake-gear, these washers being preferably formed of some material different from that of the friction-surfaces which clamp them, our preference being to make the friction-clamp, friction-disk, and brake-gear of cast-iron and the friction-washers of leather or rawhide or brass, and

36, Fig. 1, the usual hand-chain guide, which guide is omitted from the other figures of the drawings.

Fig. 10 indicates the general relation of the gearing, &c., all the arrows having reference to direction of motion of parts when hoisting a load. The teeth on brake-gear 18 and its pinion 26 are of peculiar form, so that in one direction of motion the gears will run together like ordinary gears, but in the other direction they will immediately become locked. The teeth are thinner than the spaces between the teeth, thus permitting of considerable backlash. One face of the teeth is radial, or substantially so, while the opposite faces of the teeth are curved or inclined, the radial faces of the two gears engaging each other, so that the pair of gears present the general aspect of two ratchet-wheels running together with considerable capacity for backlash. The teeth of the brake-gear face in such direction that the inclined faces of the teeth are in advance when the brake-gear turns in the direction corresponding with the hoisting of a load, under which conditions the brake-gear may turn freely and turn the pinion idly; but if the brake-gear seeks to turn in the opposite direction it will turn a mere trifle, represented by the lost motion of the teeth, and then the approaching tooth of the gear will strike the top of a pinion-tooth and the brake-gear can be turned no farther, the pinion thus being in effect a rotary pawl, permitting free motion of the brake-gear in one direction and preventing motion in the other direction.

From Fig. 10 it will be understood that the turning of pinion 17 in hoisting direction causes the turning of arbor 2 and the hoisting-sheaves in hoisting direction and at a greatly-reduced speed, pinions 17 and 12 and gears 13 and 10 being merely reducing-gearing between spindle 14, to which the power is applied, and arbor 2, which turns the hoisting-sheaves. Thus understanding that these gears are mere motion-reducers we may for the present ignore them and turning to Fig. 8 assume that the turning of spindle 14 winds up the load direct. Hand-sheave 21 instead of being fast on the spindle is in effect loosely screwed thereon, and the turning of the hand-sheave in hoisting direction tends to screw it farther onto the spindle, the effect of which is to clamp friction washers and disk between the friction-clamp and the brake-wheel or, simply stated, to clamp the brake-gear 18 to the spindle. When this clamping has taken place, then everything on the spindle turns together in hoisting direction, pinion 26 turning idly and not interfering with the motion. Under these conditions the effect is that of a hand-sheave fast on the spindle, and these are the conditions in hoisting a load. If now there be no strain on the hand-sheave, the load would tend to run down and turn spindle 14 in lowering direction; but this spindle cannot turn in lowering direction, owing to the fact that brake-wheel 18 is firmly clamped to the spindle and is itself prevented from turning by the pawl-like action of pinion 26. The load cannot descend till the brake-wheel be sufficiently relieved from the friction devices to permit the spindle to be turned by the weight of the load. If now the the hand-sheave be turned a trifle in non-hoisting direction, then the friction-clamp will be loosened and the spindle may be turned by the descending load, while the brake-gear remains stationary; but while this trifling unscrewing of the clamp has permitted the spindle to start to turn under the influence of the descending load the turning of that spindle immediately screws up the friction-clamp again, so that the effect of the unscrewing of the friction-clamp becomes practically nullified. It follows that if the spindle is to turn in lowering direction it is necessary that the hand-sheave be simultaneously turned by the hand-chain in lowering direction. The spindle will turn in lowering direction so long as the operator turns the hand-sheave in lowering direction and at corresponding speed, and when he ceases to turn the hand-sheave then the load immediately screws up the friction and causes its own arrest. This principle of brake and lowering device is old and well known, and our improvements relate to details of construction.

The peculiar toothed gearing for preventing back motion of the brake-wheel is exceedingly simple, positive, smooth, silent, and efficient in operation and has many advantages over the clicking pawls and frictional devices heretofore proposed for the purpose. We screw the hand-sheave directly onto the hub of the friction-clamp independent of the spindle, and thus get practically a self-contained brake structure which can be constructed complete and assembled ready to mount in its bearing. By screwing the hand-sheave directly against the hub of the brake-gear we are enabled to get the entire brake mechanism into exceedingly short form and fit it to a single bearing engaging between the brake-gear and the hand-sheave. The grooves in the faces of the frictional elements are in such direction as to feed oil toward the center, and thus compensate for the tendency of centrifugal force as the parts turn rapidly in lowering direction.

The main strains in supporting the load are imposed through the central bearing 1, closely alongside of which are disposed the hoisting-sheaves which support the load. The bearings for the journals 8 and 9 are rigidly connected with the center bearing to properly supplement it in supporting the arbor.

The disposition of parts is obviously such as to secure a generally satisfactory balancing of the structure with reference to the line of suspension and at the same time the brake mechanism is gotten within the frame of the block.

We claim as our invention—

1. In hoisting apparatus, the combination,

substantially as set forth, of a spindle to be turned by the application of power in hoisting the load and to turn in the opposite direction as the load is lowered, a friction-brake element turning positively with said spindle, a brake-gear mounted concentric with and loose with reference to said spindle and adapted for frictional coöperation with said friction-brake element, a thread carried by said spindle, a hand-sheave screwed upon said thread and adapted to clamp the brake-gear to said friction-brake element when the hand-sheave is turned in load-hoisting direction, and an idle-pinion gearing with said brake-gear, the teeth of said idle-pinion and said brake-gear having curved or inclined faces to engage when the brake-gear turns in load-hoisting direction, the opposite faces of said teeth being formed so as to lock when the brake-gear starts to turn in load-lowering direction, the space between the teeth being greater than the thickness of the teeth.

2. In hoisting apparatus, the combination, substantially as set forth, of a spindle to be turned by the application of power in hoisting the load and to turn in the opposite direction as the load is lowered, a friction-clamp flange with a threaded hub secured to said spindle, a brake-gear loose upon the hub of the friction-clamp and adapted to frictionally coöperate with said friction-clamp, means for limiting the rotation of said brake-gear to the hoisting direction of motion, a hand-sheave screwed upon said threaded hub and forcibly impinging against the hub of said brake-gear when the hand-sheave is turned in hoisting direction, and a bearing engaging the hub of said brake-gear between said brake-gear and hand-sheave.

3. In hoisting apparatus, the combination, substantially as set forth, of a spindle to be turned by the application of power in hoisting a load and to turn in the opposite direction when the load is being lowered, a friction-clamp flange secured to said spindle, a brake-gear loose with reference to said spindle, means for limiting the rotation of said brake-gear to the hoisting direction of motion, a friction-disk and washers interposed between the faces of said flange and brake-wheel, the frictional faces of said flange and friction-disk and brake-weel being provided with spiral grooves having such direction of spirality as to urge oil inwardly when the spindle turns in the load-lowering direction, and a hand-sheave connected with said spindle through the medium of a threaded part having a direction of helicity such as to cause the hand-sheave to press the brake-gear toward said flange when the hand-sheave is turned in the hoisting direction.

4. In hoisting apparatus, the combination, substantially as set forth, of a horizontal bearing and a vertical bearing rigidly united, a suspension-hook having its shank swiveled in said vertical bearing, an arbor having a journal portion engaging said horizontal bearing and having prismatic portions at the ends of said journal portion, a hoisting-sheave fitting upon the prismatic portion of said arbor against each end of said horizontal bearing, a gear fitting one of the prismatic portions of the arbor against one of said hoisting-sheaves, a spindle mounted in bearings having rigid connection with said horizontal bearing, a hand-sheave connected with said spindle, and gearing connecting said spindle with said gear on the arbor.

5. In hoisting apparatus, the combination, substantially as set forth, of a horizontal bearing and a vertical bearing rigidly united, a suspension-hook swiveled in said vertical bearing, a roof-piece rigidly connected with said bearings and carrying a horizontal bearing in line with the first-mentioned horizontal bearing, an arbor mounted in said horizontal bearings, hoisting-sheaves on said arbor, a gear on said arbor, a spindle mounted in bearings rigidly connected with the before-mentioned bearings, gearing connecting said spindle and arbor, and a hand-sheave connected with said spindle.

6. In hoisting apparatus, the combination, substantially as set forth, of a vertical bearing, a suspension-hook with its shank swiveled therein, a frame-roof rigidly connected with said vertical bearing, a horizontal bearing in a vertical wall rigidly carried by said frame-roof, an outwardly-open gear-case rigidly carried by said frame-roof, a bonnet closing said gear-case, a hoisting-arbor journaled in said bonnet and in one of said horizontal bearings, a spindle journaled in one of said horizontal bearings and in a bearing in said gear-case, gearing within said gear-case connecting said spindle and arbor, and a hand-sheave connected with said spindle.

7. In hoisting apparatus, the combination, substantially as set forth, of a frame having horizontal bearings and a vertical bearing and a gear-case, a suspension-hook having its shank swiveled in said vertical bearing, a hoisting-arbor journaled in bearings supported by said frame, a gear on said arbor within the gear-case, a spindle journaled in the framing, a hand-sheave connected with the spindle, a stud crossing the gear-case, a gear on the arbor within the gear-case, a pinion on the spindle within the gear-case, a gear loose on said stud and engaging said pinion, and a pinion fast with the last-mentioned gear and engaging the first-mentioned gear.

8. In hoisting apparatus, the combination, substantially as set forth, of a frame, a suspension-hook having its shank swiveled in a vertical journal in said frame, a gear-case carried by said frame to one side of said hook, a hoisting-arbor journaled in the frame, a spindle journaled in the frame, gearing within said gear-case and connecting said spindle and arbor, a hand-sheave connected with the spindle exterior to the frame, upon that

side of the suspension-hook opposite said gear-case, and a lowering-brake on said spindle within the frame.

9. In hoisting apparatus, the combination, substantially as set forth, of a frame having a horizontal bearing, a horizontal bearing in line with the first bearing and of less diameter, a vertical bearing rigidly connected with the other bearings, a suspension-hook having its shank swiveled in said vertical bearing, a gear-case carried by said frame at the side opposite said smaller bearing, an arbor having journals fitting said horizontal bearings and having a prismatic portion between said bearings of a size adapted to pass through the first-mentioned horizontal bearing, a hoisting-sheave on the prismatic portion of said arbor, a bonnet closing said gear and having a bearing engaging a journal on said arbor, a spindle mounted in the frame, a hand-sheave connected with the spindle, and gearing disposed within the gear-case and connecting the spindle and arbor.

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