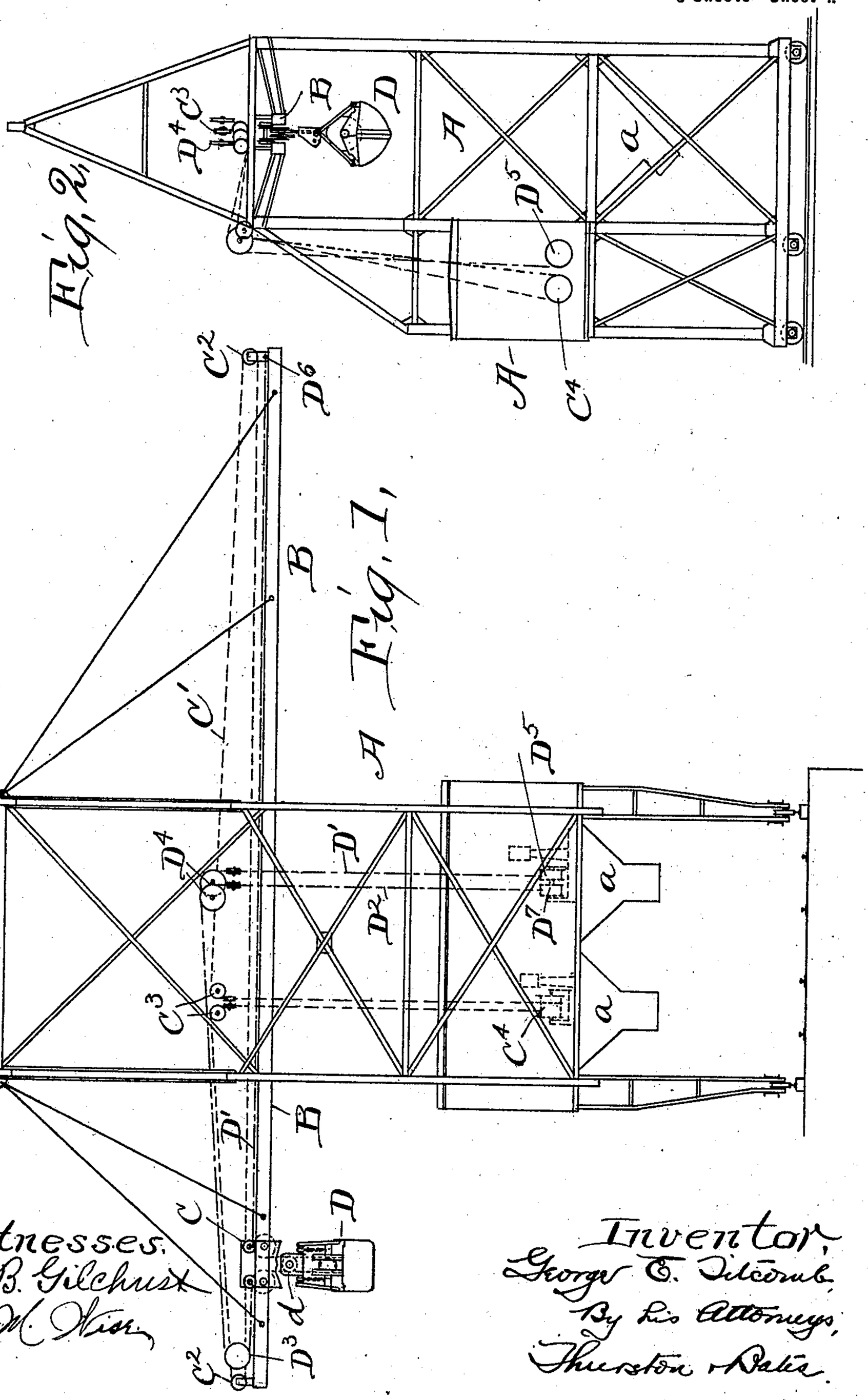
No. 695,592. Patented Mar. 18, 1902.

G. E. TITCOMB.

HOISTING AND CONVEYING APPARATUS.

(Application filed Apr. 22, 1901.)

(No Model.) 6 Sheets—Sheet 1.



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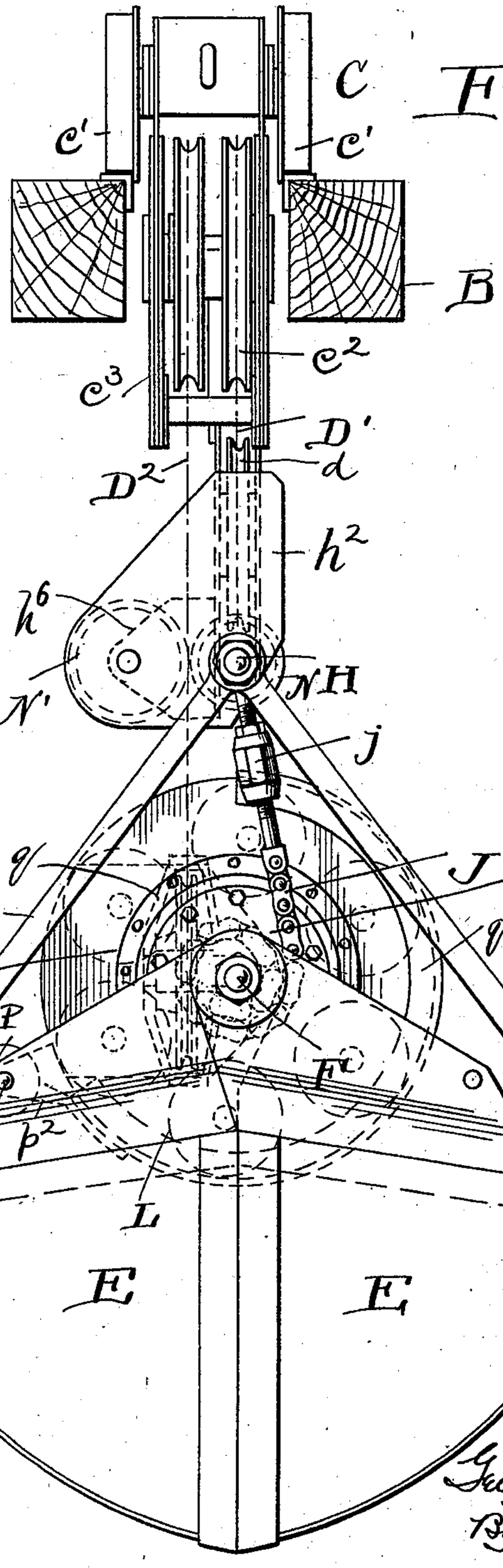
(No Model.) 6 Sheets—Sheet 2.

Fig. 3.



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(No Model.) 6 Sheets—Sheet 3.

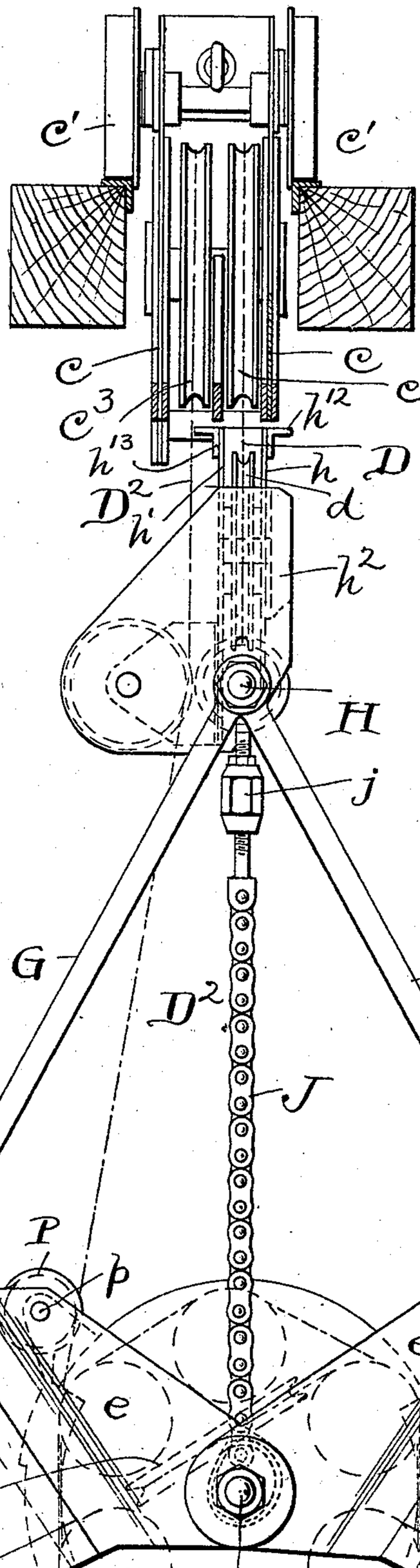

Fig. 1.

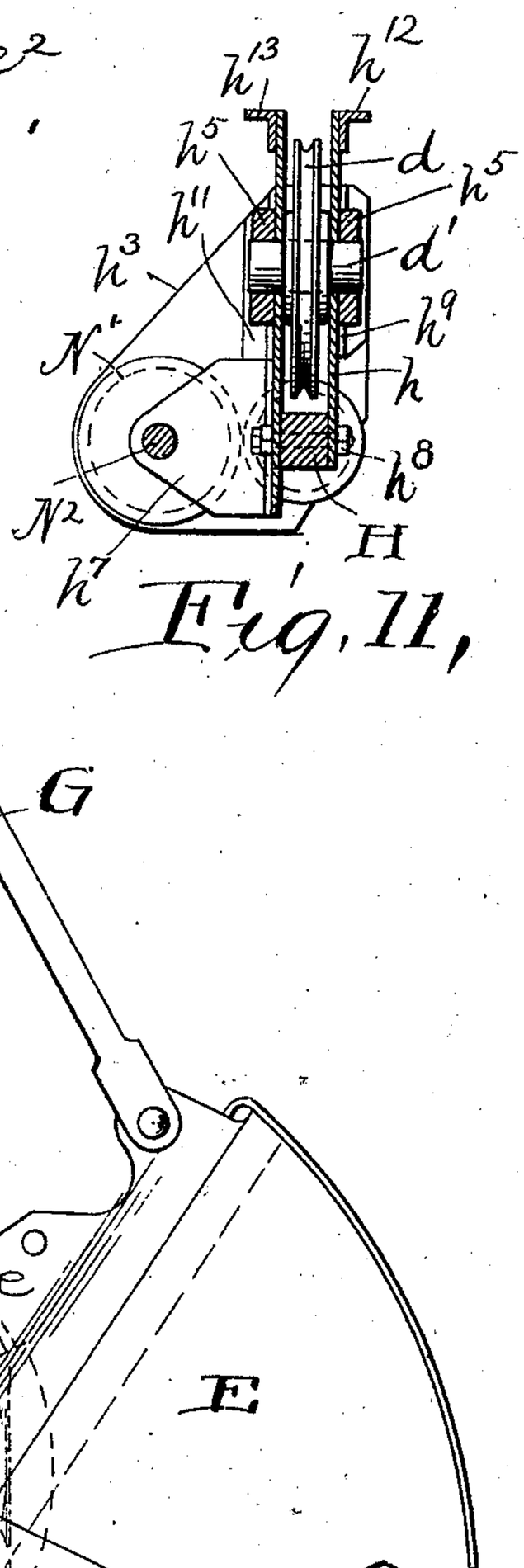

Fig. 11.

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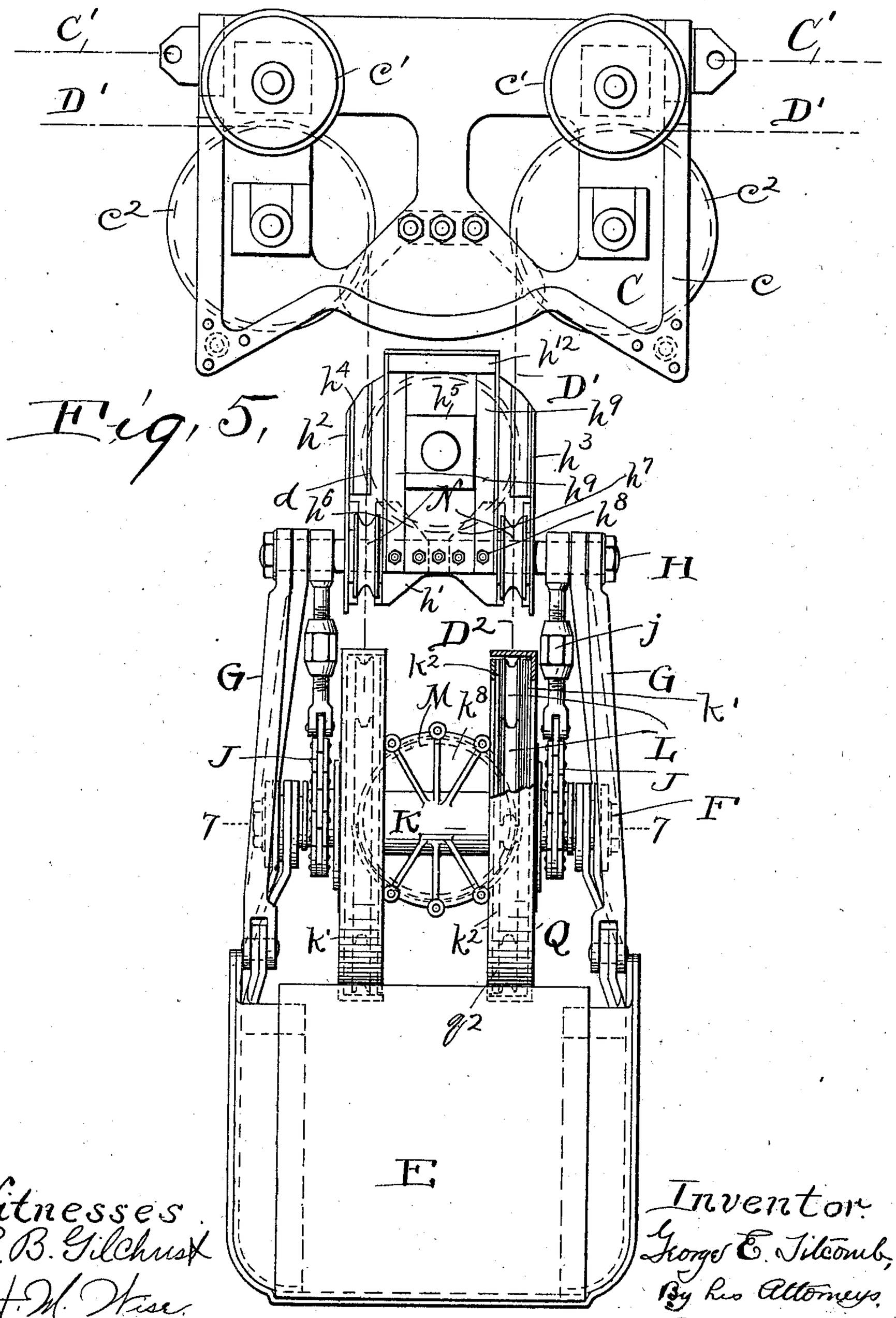
(No Model.) 6 Sheets—Sheet 4.

Fig. 5.



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HOISTING AND CONVEYING APPARATUS.

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(No Model.) 6 Sheets—Sheet 5.

Fig. 6.

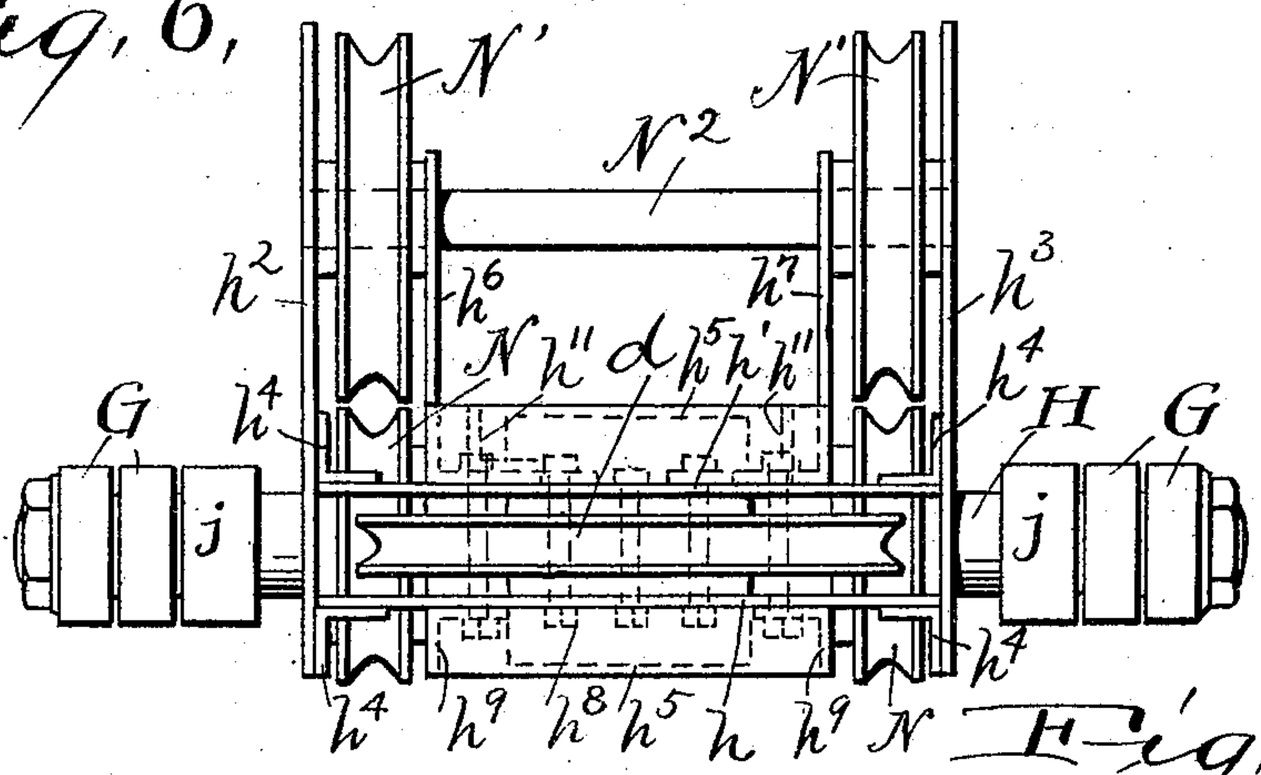
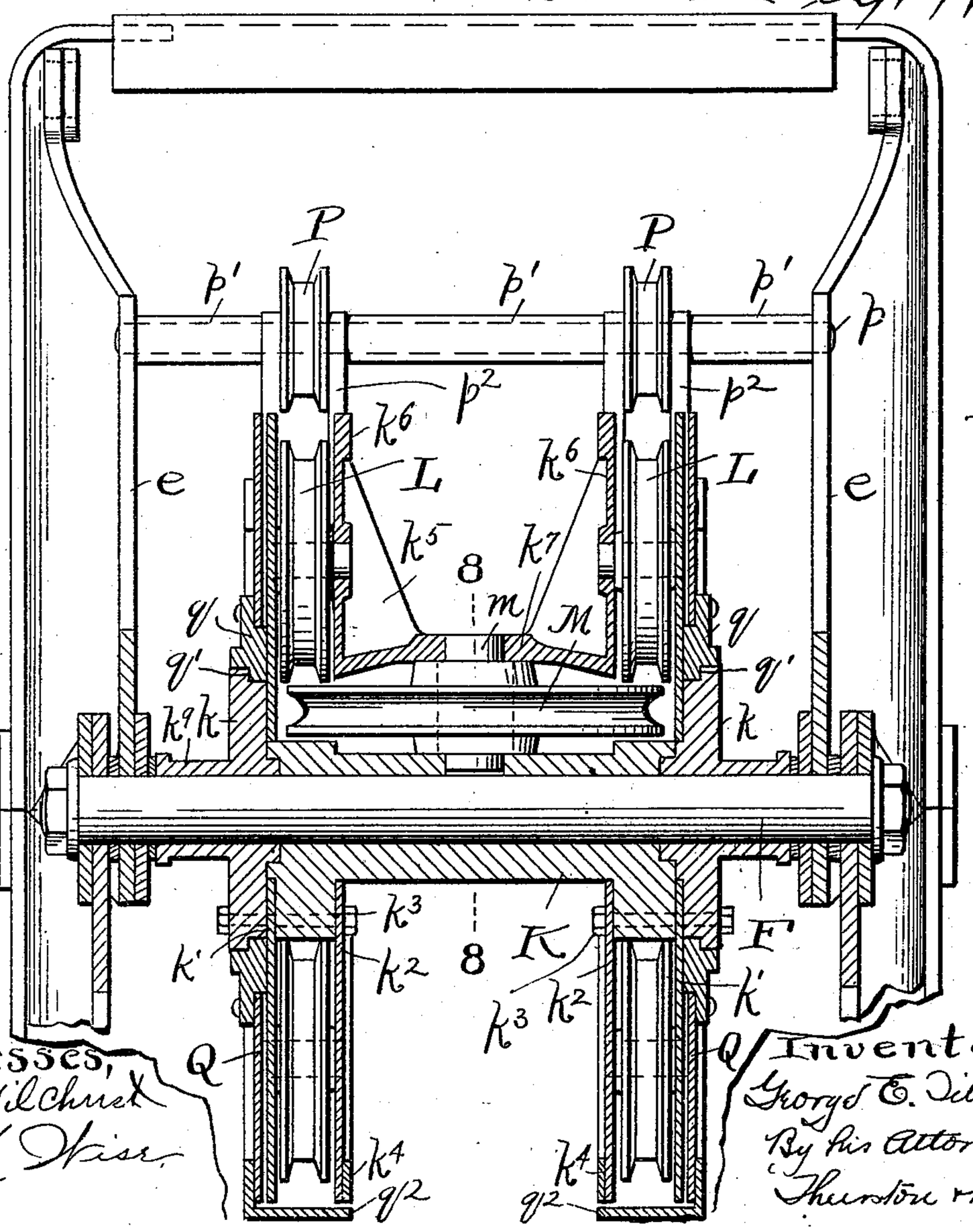


Fig. 7.



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(Application filed Apr. 22, 1901.)

(No Model.) 6 Sheets—Sheet 6.

Fig. 8,

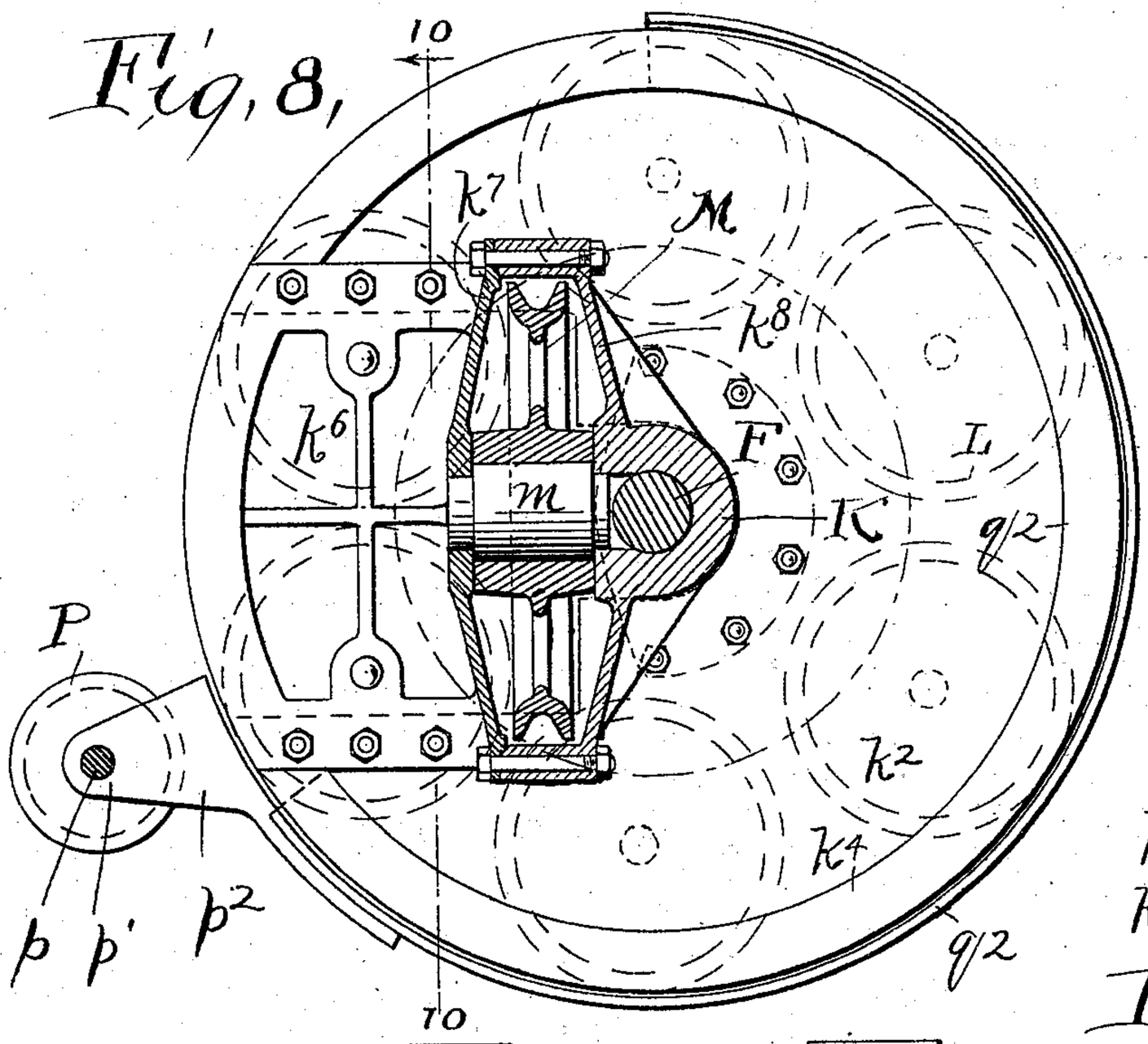


Fig. 10,

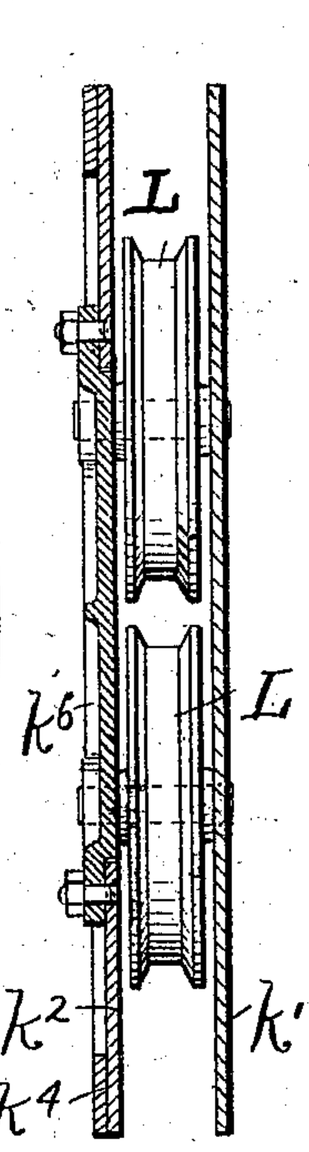
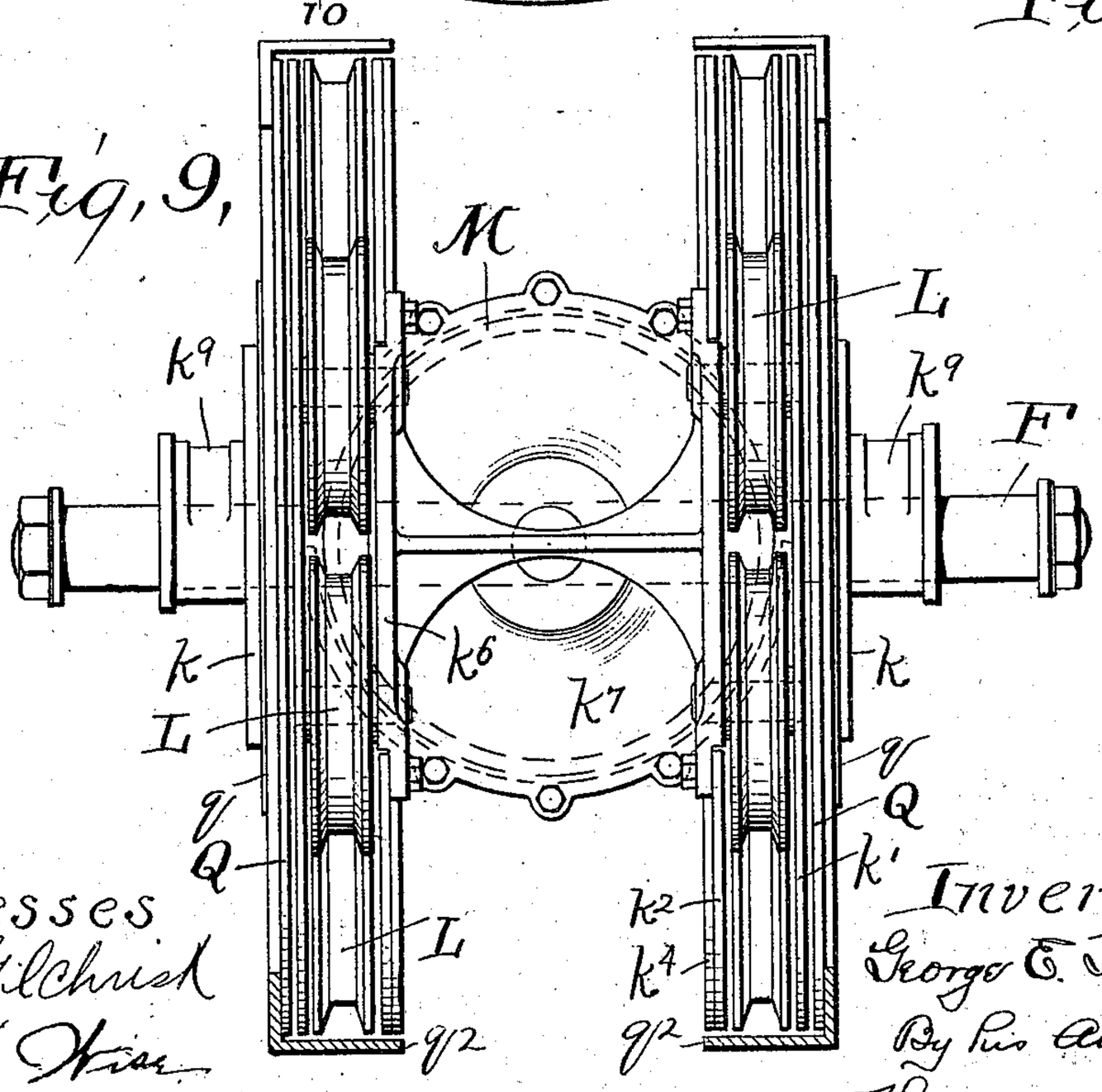


Fig. 9,



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UNITED STATES PATENT OFFICE.

GEORGE E. TITCOMB, OF CLEVELAND, OHIO, ASSIGNOR OF ONE-HALF TO THE McMYLER MANUFACTURING COMPANY, OF CLEVELAND, OHIO, A PARTNERSHIP.

HOISTING AND CONVEYING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 695,592, dated March 18, 1902.

Application filed April 22, 1901. Serial No. 56,992. (No model.)

To all whom it may concern:

Be it known that I, GEORGE E. TITCOMB, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Hoisting and Conveying Apparatus, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

The primary object of this invention is to provide an efficient and powerful digging, hoisting, and conveying apparatus wherein an elevating-bucket may be caused to travel laterally (technically called "racked" in and out) independently of its elevation. In accomplishing this I hang the bucket in a bight on the elevating-cable, whereby as the bucket is racked in or out such elevating-cable passes idle through the bucket, and I provide a rotatable driving mechanism adapted to close the bucket and connect this with the elevating-cable, so that when the cable is drawn up the driving mechanism will be rotated, and a powerful closing movement will be thereby given to the bucket, enabling it to efficiently dig into the load or material to be elevated.

The invention consists, broadly, of a bucket so arranged and operating. Now to cause the bucket to automatically fill itself I use a bucket of the clam-shell type and provide it with a holding-cable and an elevating-cable, arranged so that if the bucket is dropped into engagement with the load and the elevating-cable drawn up the clam-shell scoops will dig into the load and close, and the continued drawing up of the elevating-cable will raise the bucket and load as desired, the load being dumped when the holding-cable is held and the elevating-cable released. To allow this bucket to be moved in or out independently of its elevation and without requiring the operation of the drums of the holding or elevating cable, these cables are arranged to depend in bights around suitable sheaves; but in order to produce the desired powerful closing action of the bucket there is provided a rotatable mechanism for closing the bucket, and this mechanism is operated through the elevating-cables by doubling the cable on itself and wrapping it around the driving mechanism and having it pass across its own equalizer-sheave at the point where it is doubled, whereby the cable may idly play through the mechanism, but when it is drawn up will rotate such mechanism and close the bucket. The support for the cable as it is wrapped around such driving mechanism consists of a series of idler-sheaves. Both cables depend in bights between guide-pulleys on a trolley, which is carried on a suitable support and independently moved in and out. The holding and elevating cables and trolley have independent winding-drums. Thus when the trolley is moved in or out the holding and elevating cables play idly through the bucket; but when the elevating-cable is raised the idlers are given a circular translation rotating drums which wind up flexible members, as chains, and thus close the bucket. My invention includes such an arrangement, broadly.

Finally, the particular embodiment of the bucket and its coöperating parts, as shown herein and more fully hereinafter described, is also of my invention.

In the drawings, Figures 1 and 2 illustrate somewhat diagrammatically a complete installation of my invention, including the trestle-tower, boom, trolley, bucket, cables, and winding-drums, Fig. 1 being a side elevation, Fig. 2 an end elevation. The remaining views relate to the bucket and the trolley supporting the same. Fig. 3 is an end elevation of the trolley and the bucket in its closed position. Fig. 4 is a similar end elevation, but with the trolley in vertical section and with the bucket open. Fig. 5 is a side elevation of the trolley and bucket. Fig. 6 is a plan of the bucket. Fig. 7 is a horizontal section of the bucket through the lower cross-rod, being on the line 7 7 of Fig. 5. Fig. 8 is a vertical cross-section of the bucket through the center of the equalizing-sheave, being on the line 8 8 of Fig. 7. Fig. 9 is an elevation taken from the side opposite Fig. 5 and showing the lower cross-rod and the parts carried thereon. Fig. 10 is a cross-section on the line 10 10 of Fig. 8, looking toward the left, as

indicated by the arrow. Fig. 11 is a vertical central section through the supporting-pulley and its housing.

In Fig. 1, A represents a suitable trestle-tower from which projects the lateral boom B. This boom may extend in each direction and overhang a vessel to be unloaded—for example, the charge therefrom being dumped into hoppers *a*, carried by the trestle-tower and discharging into cars beneath them or dumped in a pile beyond the tower, as desired. Along the boom B travels the trolley C, being racked in or out thereon by the racking-cable C′, which is, in effect, an endless cable secured to the trolley and passing in each direction therefrom around sheaves C^2 at each end of the boom and then down between suitable guide-sheaves C^3 and around the drum of an independent trolley-engine C^4, supported on the trestle-tower.

D represents the bucket. It is supported by the holding-cable D′, (shown in broken lines,) which depends in a bight between sheaves on the trolley and takes around a supporting-sheave *d* in the bucket. This cable D′ is shown as anchored to one end of the boom, as at D^6, and passes over a sheave D^3 at the other end thereof and suitable guide-sheaves D^4 to a winding-drum D^5. The clam-shell is closed by the elevating-cable D^2, which for the most part lies directly behind the cable D′ and may be also anchored at the end of the boom at D^6 and passes down in a bight between sheaves on the trolley and eventually passes to an independent drum D^7 of the bucket-engine. These two drums D^5 D^7 may be thrown into engagement, either or both, as desired, by frictional clutches. Thus the man operating the bucket-engine may lower or raise the bucket as desired independently of its lateral position, and the man operating the trolley-engine may rack the bucket in or out independently of its elevation. This independence adds greatly to the convenience and efficiency of operation and is one of the primary features of this invention.

The trolley-carriage consists of a built-up frame structure of reinforced side plates *c* and cross-braces and having four wheels *c*′, which travel on a track on the boom. The trolley carries also four sheaves c^2 c^2 and c^3 c^3, over which take the holding and elevating cables, respectively, these cables depending in bights between the sheaves.

As stated, the bucket is of the clam-shell type. It consists, briefly, of the two quarter cylindrical scoops E, pivoted together at the center of their curves by a cross-rod F, while near the outer edges of the scoops they are supported by links G, which are pivoted on an upper cross-rod H, which rod is hung from the frame of the supporting-sheave *d*. A pair of elevating-chains J, anchored on this rod H, are secured at their lower ends to a rotatable spindle K on the cross-rod F. Around this spindle are circularly disposed two series of idler-sheaves L, the axes of which are stationary with respect to the spindle. The spindle also carries a cross equalizing-sheave M. The elevating-cable passes down around the idler-sheaves L and across the equalizing-sheave. Now if the elevating-cable D^2 is drawn up the spindle is rotated and the chain J is wound up, causing the bucket to close. Then the continued elevation of this cable raises the bucket. When it is at the desired elevation, if the holding-cable D′, taking around the sheave *d*, (which cable has been kept taut during the elevation,) is held and the raising-cable allowed to play downward, the weight in the buckets and of the parts of the bucket carried by the shaft F causes this shaft to be lowered at once, unwinding the chain and opening the bucket. When, however, the trolley is being racked in or out, one ply of the cable D^2 passes downward and the other ply upward, wherefore the tendency of one set of idler-sheaves L to move bodily in one direction is neutralized by the tendency of the other set to move in the other direction, so the axes of these sheaves remain stationary, and they simply rotate idly without affecting the spindle K or the chain. This closing mechanism is not only very powerful, but being self-contained within the bucket structure beneath the upper cross-bar does not require for its operation any additional head-room whatever. This is of advantage, as it saves in the necessary height of the trolley-support.

I will now describe more specifically the form of elevating-bucket which is shown in the drawings and which is a very efficient arrangement.

The arrangement of the supporting-pulley *d* and its housing clearly appears in Figs. 4, 5, 6, and 11. The upper supporting-bar H is of square cross-section near its middle, and onto the front and rear side of this bar are bolted a pair of vertical plates *h* and *h*′, the bolts h^8 passing through the bar. Extending at right angles to the bar are two vertical plates h^2 and h^3, through which the bar passes and which are secured to the plates *h* and *h*′ by the angle-cleats h^4. The plates *h*, *h*′, h^2, and h^3 thus form a secure housing for the supporting-sheave *d*, which lies between and is journaled in the two plates *h* and *h*′, its axle *d*′ taking into reinforces h^5, secured to the plates. A pair of guide-sheaves N for the elevating-cable are journaled on the rod II outside of the squared portion and inside of the plates h^2 and h^3. The plates *h*′ and *h* are cut away at their lower outer portions to accommodate these sheaves. Coöperating with these sheaves are a pair of guide-sheaves N′, carried on an axle N^2, which lies parallel with the cross-bar II and is secured to the plates h^2 and h^3 and also to a pair of angle-plates h^6 and h^7, which lie on the back side of the plate *h*′ and are bolted to it by the main bolts h^8. To further strengthen this structure, angle-braces h^9 and h^{11} are secured on the front and

rear side, and at the upper end cross-angles h^{12} and h^{13} are secured to the plates and to these angle-braces. The bucket is supported freely on the sheave d, while the two plies of the elevating-cable are guided by the two pairs of guide-sheaves N and N'.

The rotatable driving structure which surrounds the lower cross-rod F consists, as shown, of the hollow spindle K, having a central or intermediate portion and bolted to this a pair of outer portions k, having flanges and hubs k^9, which form the drums on which the chains J wind. Two pairs of radial plates k' and k^2 are secured to the spindle by the bolts k^3, which by means of the flanges secure also the extensions k to the central spindle K. The inner plates k^2 are reinforced by rings k^4. The idlers L are journaled between these plates k' k^2. As shown in the drawings, there are six of these idlers in each set, which I have found a convenient number. On the side of the spindle K which the equalizer-sheave occupies I cut away the plates k^2, and their place is filled by the bracket k^5, which is preferably a casting formed as shown particularly in Figs. 7, 8, and 9 and having a pair of parallel webs k^6, which are bolted to the plates k^2 and carry axles of two of the idler-sheaves in each set, these webs k^6 being connected by the cross-web k^7, which forms the bearing for one end of the axle m of the equalizer-sheave M. The other end of this axle m is carried in the central portion K of the spindle. This central portion K flares, as shown in Figs. 5 and 8, to make a cup-like casing k^8 for receiving this sheave M, and this casing abuts and is bolted to the web k^7. The sheave M is thus completely boxed between the planes of the plates k^2; but it projects into the space between the plates k^2 and k' so that its operative periphery comes into the transverse planes of the operative peripheries of the idler-sheaves L.

The two plies of the elevating-cable D^2 passing downward between guide-sheaves N and N' when the bucket is closed, as shown in Fig. 3, take directly around the sheave M, passing upward between the two pairs of idler-sheaves L, which are adjacent to the upper corners of the casing k^8. Now when the elevating-cable is released and the holding-cable held the weight causes the scoops to open and the rod F to drop, while the wound-up chains J thus unwinding cause the rotation of the spindle K and the idlers and equalizers carried by it, whereby the two plies of the elevating-cable D^2 are wound around the idlers. Now when the cable D^2 is drawn up the whole driving system carried by the spindle K is rotated thereby, and the chains J are wound up around the hubs k^9. These hubs are formed in the cam-like shape shown to allow the convenient starting of the chains thereon. The extreme link of the chain is pinned to these hubs, while the upper end of the chain is secured to a turnbuckle j, by which it is adjusted, the upper end of the turnbuckle being an eyebolt j', taking around the rod H.

With the parts proportioned as shown in the drawings each ply of the cable D^2 makes something more than one and two-thirds complete turns about the hexagonal pathway defined by the idlers in order to completely open the bucket, this position being shown in Fig. 4. A comparison of the length of these turns, with the amount of rise of the rod F corresponding thereto, (*i. e.*, the distance between the positions of the rod F in Figs. 3 and 4,) shows them to have the ratio of about five to one, and as the cable D^2 hangs in a bight and, as shown, is drawn in only at one end the ratio of the amount of cable drawn in to the rise of the rod F caused thereby is twice that, or ten to one. This gives a very powerful digging action to the bucket.

With the bucket open the cable D^2 passes onto the rearmost idler and is guided thereagainst by the pair of guide-sheaves P, loosely carried on a rod p, connecting the two rear arms or plates e, which are secured to and form an upward extension of that half of the scoop E. Carried by the rod p on opposite sides of the sheaves P and separated by distance-sleeves p' are a pair of bifurcated brackets p^2, to each of which is secured a guide-plate Q. This plate carries centrally the annular ring q, which is journaled on the projecting flange of the spindle extensions k by a tongue-and-groove connection, as shown at q' in Fig. 7. At its outer periphery these plates carry arc-shaped rims q^2, which extend for something over half a circumference. These rims thus prevent the cables D^2 from leaving the idlers during the operation of the bucket. This guard shifts around on the flange k as the bucket opens or closes.

In operation suppose the apparatus is to be used for conveying ore from a vessel, for example, beneath the boom at the right of Fig. 1 to a pile at the left of Fig. 1. The empty bucket is brought above the load by the racking of the trolley in that direction by means of the trolley-engine C^4. Assuming the bucket to have remained open from the last-dumped load, the two drums D^5 D^7 are now simultaneously released, and the open bucket, as shown in Fig. 4, is dropped into the ore. Then the cable D^2 is wound in by means of the drum D^7. This rotates the driving mechanism on the spindle K and winds up the chains J, raising the shaft F and closing the bucket, bringing it into the position shown in Fig. 3. As soon as the bucket has closed upon its load in the position shown in Fig. 3 it is elevated by a continued winding up of the cable D^2, the cable D' being also wound in sufficiently to keep it taut. After the bucket has cleared the boat, for example, but before it has reached its highest elevation, the man in charge of the trolley-engine may begin to rack the bucket in at the same time that its elevation is going on. When the bucket reaches

its proper destination for dumping, the cable D′ is held while the cable D^2 is released, and thus the bucket opens from its own weight and that of the load, the chains J straighten out, and the cable D^2 winds onto the idlers, as shown in Fig. 4.

The complete segregation of the elevating and racking operations rendered possible by my bucket very much simplifies the operation, for the elevation of the bucket is not varied by the racking, and the elevating and racking operators can thus time their movements so that the bucket may travel upward diagonally, as desired, but is under accurate control. With the ordinary arrangement of the bucket on one end of the cable the elevation is varied by the racking, which thus makes the conjoint movement so intricate that it has been customary to complete the elevation before the racking begins, which entails a loss of time. By making the two operations independent I reduce the time necessary for completing the cycle of operations, and hence increase the efficiency of the plant. Moreover, with my system the weight of the load does not tend to shift the trolley, requiring its being constantly restrained, as in the older method.

Having described my invention, I claim—

1. A bucket having a rotatable driving member adapted by its rotation to close the bucket, combined with a cable depending in a bight and adapted to rotate said mechanism and also adapted to play idly through the bucket when one ply of the cables moves up and the other down at the same rate, substantially as described.

2. A bucket having a rotatable operating mechanism which carries an equalizer-sheave, combined with a cable double on itself to make a bight, both plies wrapping around said operating mechanism and the bight lying around said equalizer-sheave, substantially as described.

3. The combination of a clam-shell bucket, a pair of cables depending in bights on which said bucket is hung, a rotatable driving mechanism adapted by its rotation to wind up a flexible member to close the bucket, means operated by one of the cables for so rotating the driving mechanism, and means for shifting the bucket laterally independently of its elevation, substantially as described.

4. A bucket having an upper support, hinged scoops, a rotatable driving mechanism and a flexible member adapted to be wound up by the rotation of said driving mechanism, said driving mechanism and flexible member forming a connection between the hinge of said scoops and said support above the same, combined with a pair of cables depending in bights one adapted to support the bucket and the other adapted to rotate said driving mechanism, substantially as described.

5. A bucket having a support, links depending therefrom, scoops hinged together and supported near their outer edges by said links, a rotatable driving mechanism at the common hinge of the scoops, a flexible member connecting said driving mechanism and support, a sheave carrying said support combined with a pair of cables depending in bights, one around said sheave and the other around said driving mechanism, substantially as described.

6. A clam-shell bucket having a pair of cross-bars one above the other, a pair of scoops hinged at the lower cross-bar, links connecting the upper bar and the scoops, a rotatable driving mechanism mounted on the lower bar, a chain connecting said mechanism with the upper bar, a cable depending in a bight and adapted to rotate said driving mechanism, and another cable depending in a bight for supporting the bucket, substantially as described.

7. The combination of a bucket of the clam-shell type, an equalizer-sheave carried thereby, an elevating-cable passing in a bight around said equalizer-sheave, driving mechanism adapted by its rotation to close said bucket, a connection between the same and the elevating-cable whereby the cable may rotate said mechanism to close the bucket, said cable being adapted to also play idly through the bucket, substantially as described.

8. The combination of a clam-shell bucket, an elevating-cable therefor depending in a bight, a pair of driving members on said bucket carrying idler-sheaves, mechanism connected with said members whereby the rotation of said members closes the bucket, an equalizer-sheave, and an elevating-cable passing around the idler-sheaves and intermediately around the equalizer-sheave, substantially as described.

9. The combination of a clam-shell bucket, driving mechanism adapted to close the same, an equalizer-sheave and a supporting-sheave carried by the bucket, an elevating and a holding cable each depending in a bight one around the equalizer-sheave and the other around the supporting-sheave, and a connection between the elevating-cable and the driving mechanism whereby the movement of said cable may operate to close the bucket, substantially as described.

10. A bucket, driving mechanism for closing it, said driving mechanism including a series of idler-sheaves, whose rotation is idle but whose bodily translation is adapted to operate said driving mechanism, and an elevating-cable hanging in a bight around said idler-sheaves, whereby when one ply of the cable moves up and the other down at the same rate the closing mechanism is not altered but when the movement of the plies is otherwise the closing mechanism is driven accordingly, substantially as described.

11. The combination of a bucket, a rotatable spindle adapted to close the same, a series of idler-sheaves carried by said spindle, said sheaves being independently rotatable idly

but having their bodily translation adapted to rotate the spindle, an elevating-cable passing down beneath one series of idlers and then across and beneath the other series in the same direction, whereby if the cable move down in one ply and up in the other at the same rate the tendency of one set of idlers to bodily translate is neutralized by the tendency of the other to translate in the other direction, while if both plies move upward or downward the spindle may be rotated thereby accordingly, substantially as described.

12. In combination, a bucket, a pair of rotatable members whose rotation is adapted to close the bucket, an annular row of idler-sheaves carried by each member, an equalizer-sheave between said members extending into the space within each annular row of idlers, and an elevating-cable which may make somewhat more than one complete turn about one set of said idlers and then pass across to the other set of idlers, and make a similar turn thereabout, said cable intermediately lying on the periphery of the equalizer-sheave, substantially as described.

13. A bucket having driving mechanism for closing it, which mechanism includes a series of idler-sheaves whose rotation is idle but whose bodily translation is adapted to operate said driving mechanism, substantially as described.

14. A trolley, means for racking the trolley in and out, an elevating-cable and a holding-cable depending in bights from said trolley, combined with a bucket having a pair of sheaves about which said cables pass respectively, and rotatable mechanism for closing the bucket adapted to be operated by one of said cables, said cable being adapted to also play idly through the bucket, substantially as described.

15. The combination, with suitable trackway, of a laterally-movable trolley thereon, means for racking said trolley in or out, guide-sheaves carried by the trolley, a pair of cables passing over said guide-sheaves and depending in bights between them, a clam-shell bucket having scoops pivoted on a lower cross-rod and connected by links to an upper cross-rod, a supporting-sheave from which the upper cross-rod depends, one of said cables passing beneath and supporting said sheave, driving mechanism for closing the bucket carried by the lower cross-rod, idler-sheaves whose rotation is idle but whose bodily translation is adapted to operate said mechanism, an equalizer-sheave, the elevating-cable passing around said idler-sheaves and equalizer-sheave, substantially as described.

16. The combination of a bucket, rotatable mechanism carried by the bucket adapted to operate the same, and a series of idler-sheaves carried by such mechanism and adapted to rotate idly or to circularly translate and thus rotate said mechanism, substantially as described.

17. In a clam-shell bucket, a pair of scoops, rotatable mechanism for closing the scoops, and a series of idler-sheaves carried by such mechanism and adapted to rotate idly or to circularly translate and thus rotate said mechanism, substantially as described.

18. The combination of a clam-shell bucket, a rotatable spindle, driving mechanism operated by the rotation of the spindle to close the bucket, a plate or member carried by said spindle, and a series of idler-sheaves carried by said member, substantially as described.

19. In a bucket, in combination, a rotatable spindle, driving mechanism connected therewith whereby the rotation of the spindle may close the bucket, a series of idler-sheaves having their axes supported stationary with respect to said spindle, said idler-sheaves being idly rotatable but having their translation bodily adapted to rotate said spindle, and an equalizer-sheave carried by said spindle, substantially as described.

20. In combination, a bucket, a pair of rotatable members whose rotation is adapted to close the bucket, an annular row of idler-sheaves carried by each member, and an equalizer-sheave between said member extending into the space within each annular row of idlers, substantially as described.

21. In a bucket, in combination, a spindle whose rotation is adapted to close the bucket, a pair of plates carried by said spindle, an annular row of idler-sheaves carried by each plate and a transverse equalizer-sheave carried by the spindle, substantially as described.

22. In a bucket, in combination, a spindle whose rotation is adapted to close the bucket, a pair of plates carried by said spindle, an annular row of idler-sheaves carried by each plate, and a transverse equalizer-sheave on an axis rigid with reference to the spindle and at right angles to the axis thereof, substantially as described.

23. In a bucket, the combination of a spindle whose rotation is adapted to close the bucket, a pair of plates carried by said spindle, an annular row of idler-sheaves carried by each plate and a transverse equalizer-sheave carried by the spindle, said equalizer-sheave being carried within a casing rigid with the spindle, substantially as described.

24. In a bucket, the combination of a rotatable spindle, suitable mechanism operated thereby to close the bucket a pair of parallel radial plates carried by said spindle, an annular row of idler-sheaves carried by each plate, a transverse equalizer-sheave, said equalizer-sheave being contained within a casing formed partly by an extension of the spindle and partly by a removable member which carries some of the idler-sheaves and is secured to the said radial plates, substantially as described.

25. In a bucket, a supporting-bar, a rotatable floating spindle, a flexible connection between the bar and spindle adapted to be wound

up by the rotation of the spindle, a series of idler-sheaves supported about the spindle on axes rigid therewith, whereby the sheaves may rotate idly but their circular translation rotates the spindle, combined with pivoted scoops connected with the spindle and the supporting-bar, substantially as described.

26. In a clam-shell bucket, a pair of cross-rods one above the other, a pair of scoops pivoted on the lower cross-rod, links connecting the outer part of said scoops with the upper cross-rod, a hollow spindle journaled on said lower cross-rod, a flexible member secured at one end to said spindle and at the other to the upper cross-rod and adapted to be wound up by the rotation of said spindle, a pair of radial members rigid with said spindle, an annular row of idler-sheaves supported on each member, an equalizer-sheave carried by the spindle at right angles to the idler-sheaves, substantially as described.

27. The combination in a clam-shell bucket, of a pair of scoops pivoted on a lower rod, and links running from the scoops to an upper rod, a flexible connection between the two rods, a rotatable member for winding the same up to draw the two rods together and close the bucket, a series of idler-sheaves carried by said member, and a supporting-sheave carried by said upper rod, substantially as described.

28. A bucket having a pair of scoops combined with a rotatable spindle, mechanism driven thereby for closing the bucket, a pair of radial members rigid with said spindle, an annular row of idler-sheaves carried by each member, and a pair of stationary guards rigid with one of the scoops and each extending partly around one of said rows of idler-sheaves, substantially as described.

29. In a bucket, in combination, a supporting-bar, a housing consisting of vertical plates secured to said bar, a supporting-sheave journaled between said plates, pivoted scoops, links connecting them with said bar, and a flexible connection between said bar and the pivot of the scoops, substantially as described.

30. In a bucket, in combination, a supporting-bar having flat sides intermediate of its ends, a pair of parallel plates lying against said flat sides and bolted thereto, a sheave housed between said plates, and a bucket-body depending from said bar near its ends, substantially as described.

31. In a bucket, in combination, a supporting-bar, a pair of parallel plates secured to opposite sides of said bar, a pair of cross-plates secured to the ends of said parallel plates, a supporting-sheave housed between said plates, guide-sheaves carried by said bar and said cross-plates, and a bucket-body depending from said bar, substantially as described.

32. In a bucket, in combination, a housing consisting of a pair of parallel plates and a pair of cross-plates secured at the ends of said parallel plates and projecting therefrom, a supporting-sheave within said housing, a supporting-bar secured to the housing, an axle carried by said cross-plates, two pairs of guide-sheaves, each pair being carried one member by said bar and the other by said axle, and a bucket-body depending from said bar, substantially as described.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

GEORGE E. TITCOMB.

Witnesses:
T. V. HETZEL,
W. J. PANCOAST.