

No. 754,652.

PATENTED MAR. 15, 1904.

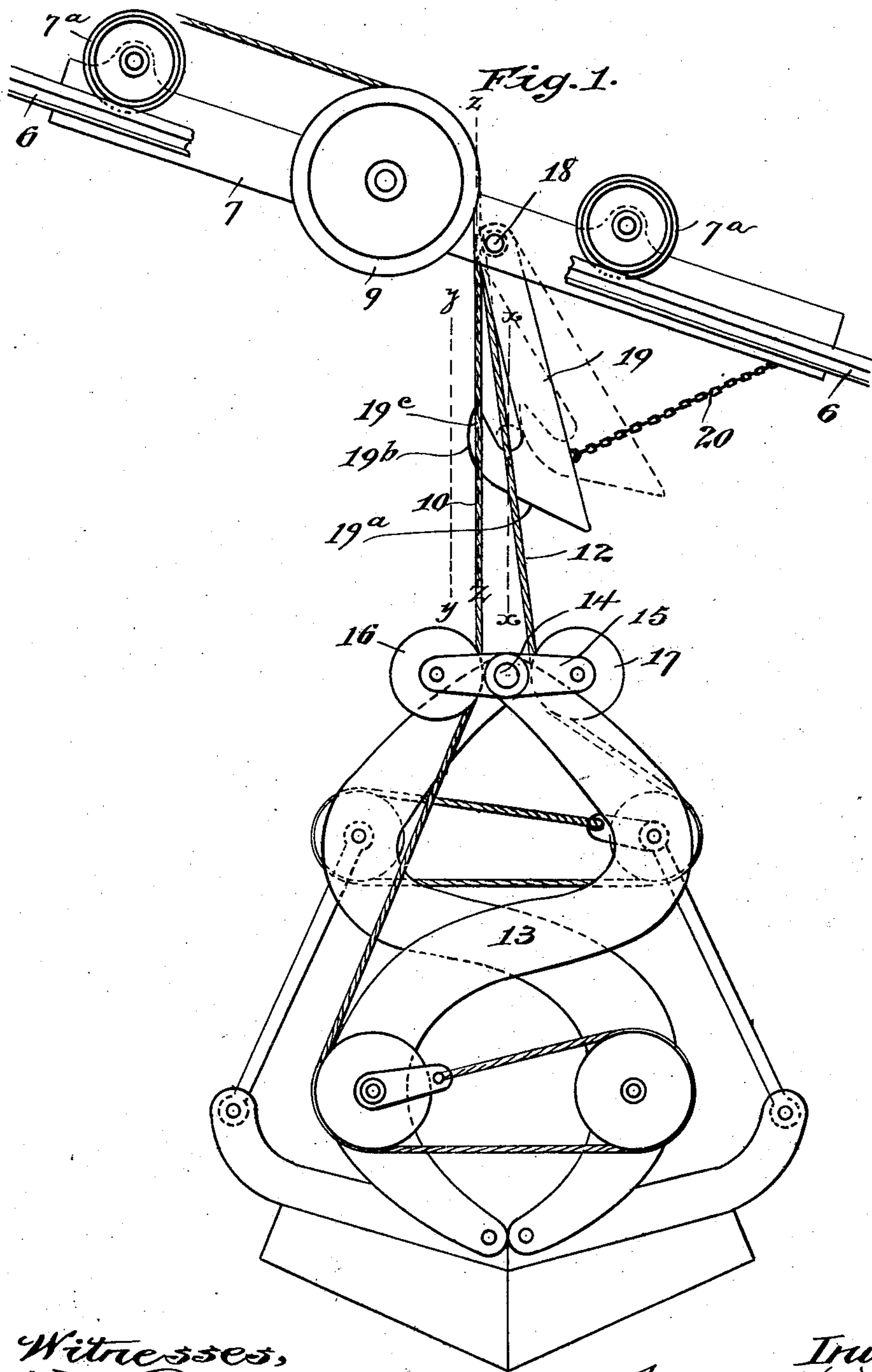
F. K. HOOVER & A. J. MASON.

TROLLEY HOOK FOR MANIPULATING SELF LOADING GRABS.

APPLICATION FILED MAY 21, 1903.

NO MODEL.

6 SHEETS—SHEET 1.



Witnesses,

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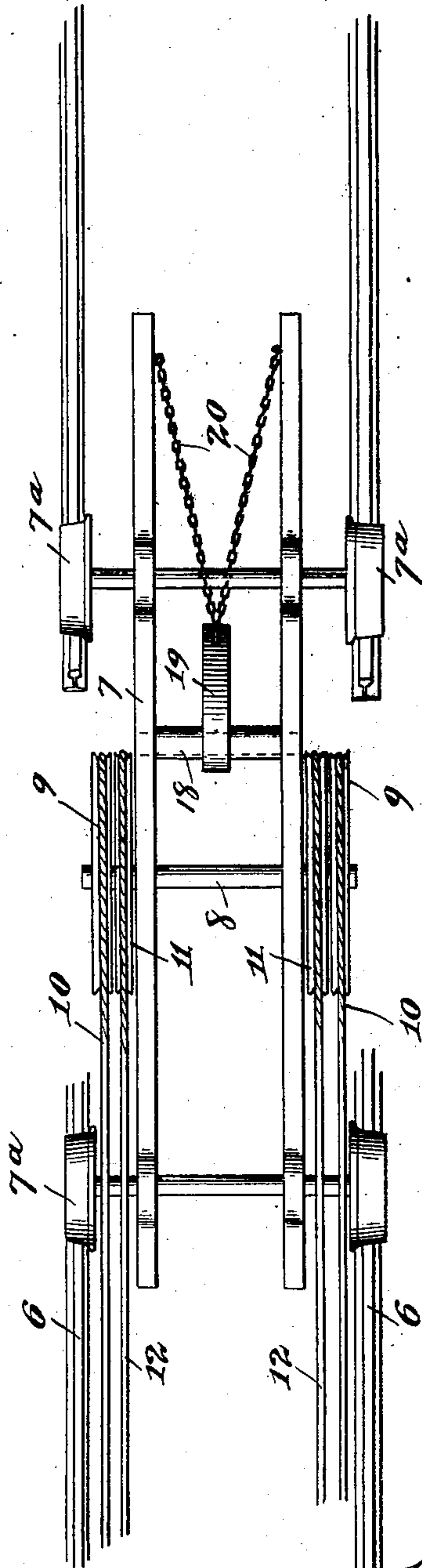
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6 SHEETS—SHEET 2.

Fig. 2.



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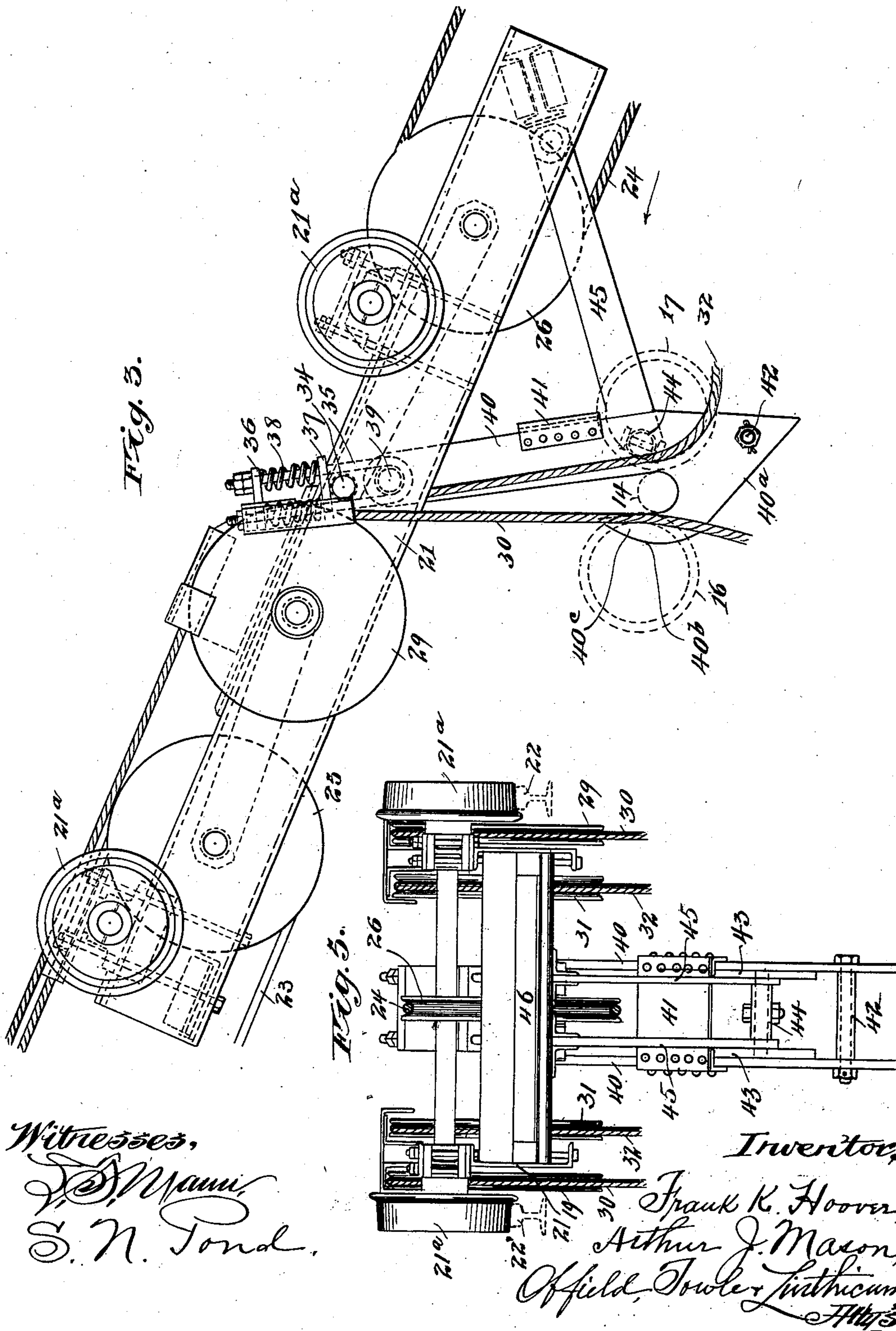
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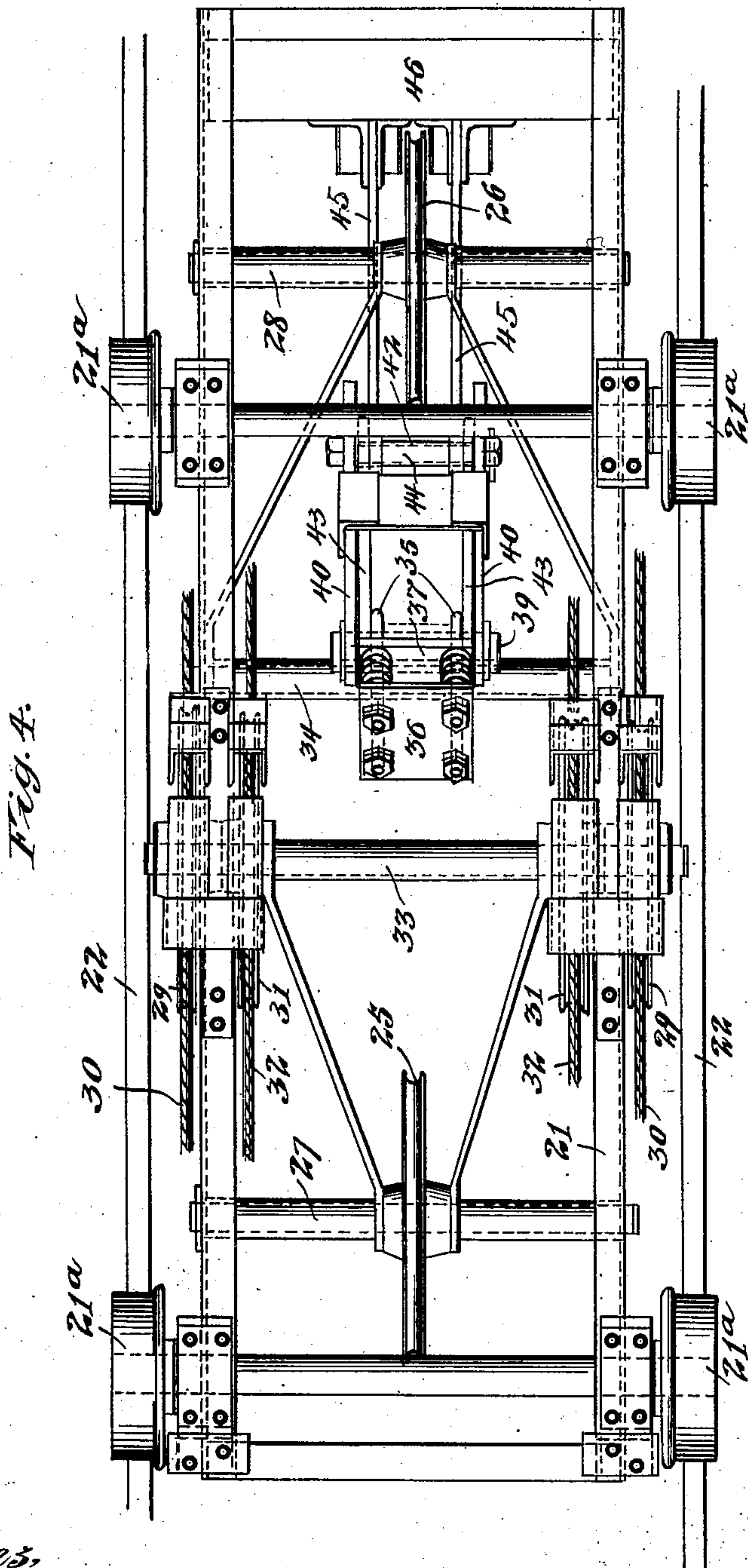
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6 SHEETS—SHEET 4.



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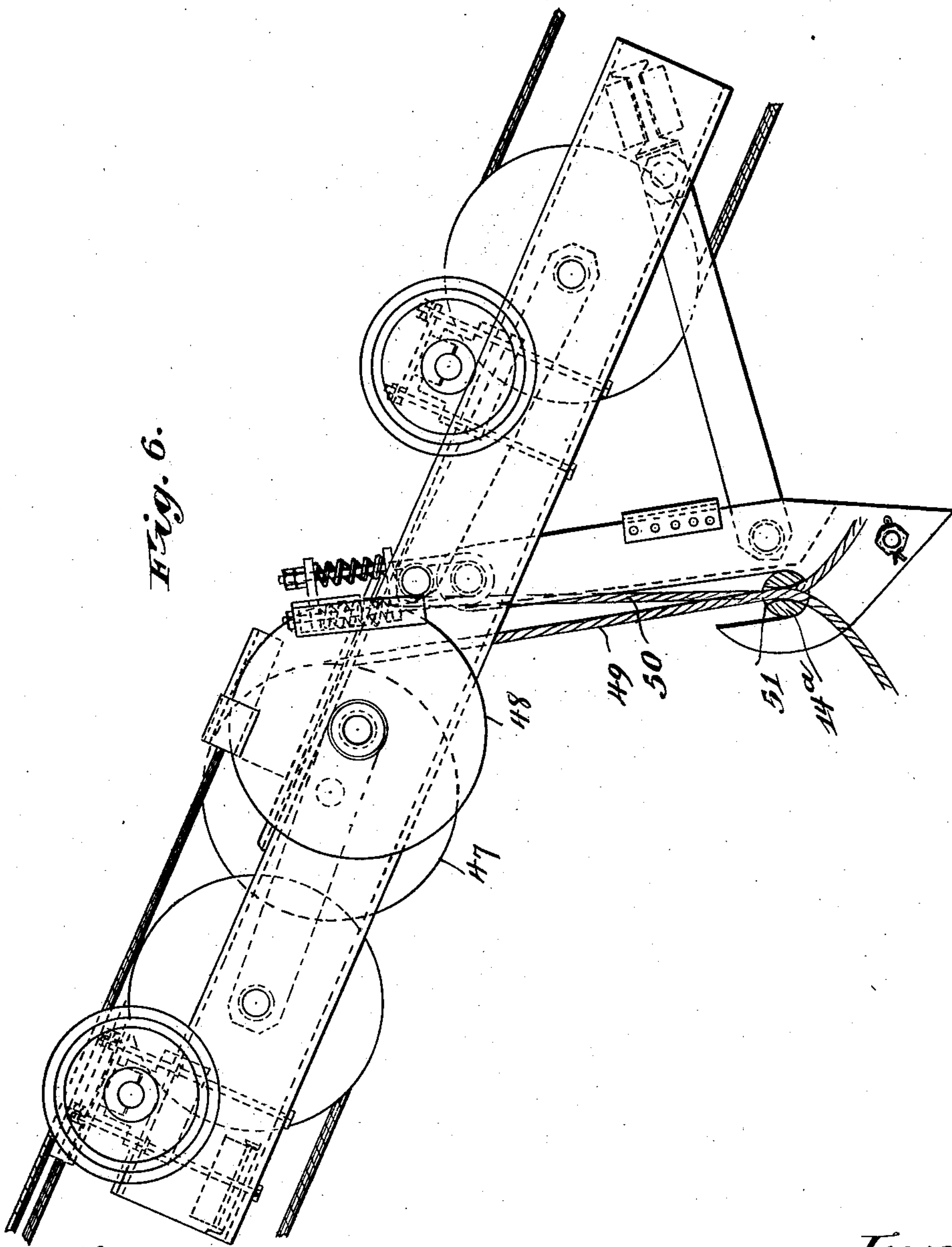
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6 SHEETS—SHEET 5.



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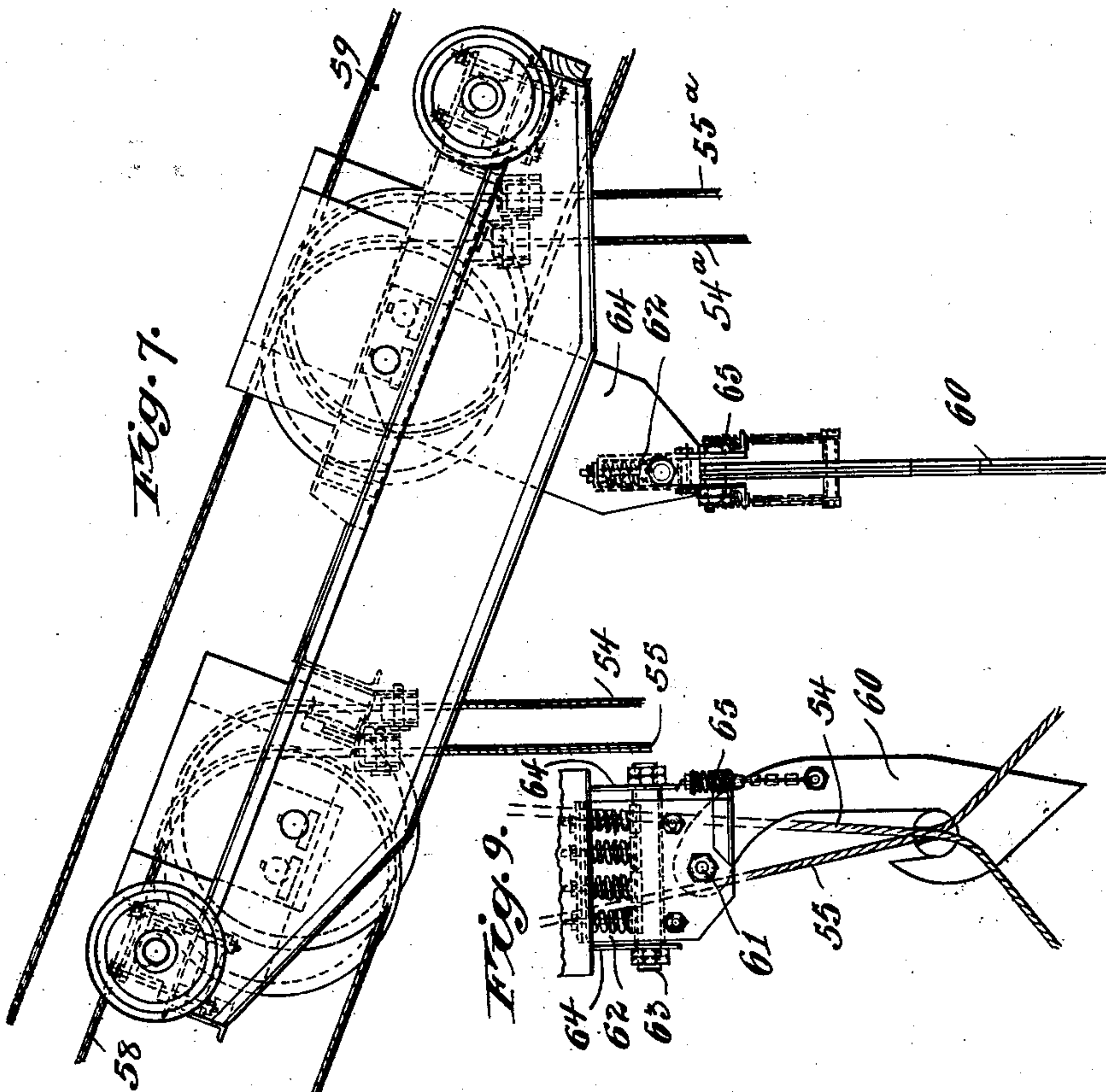
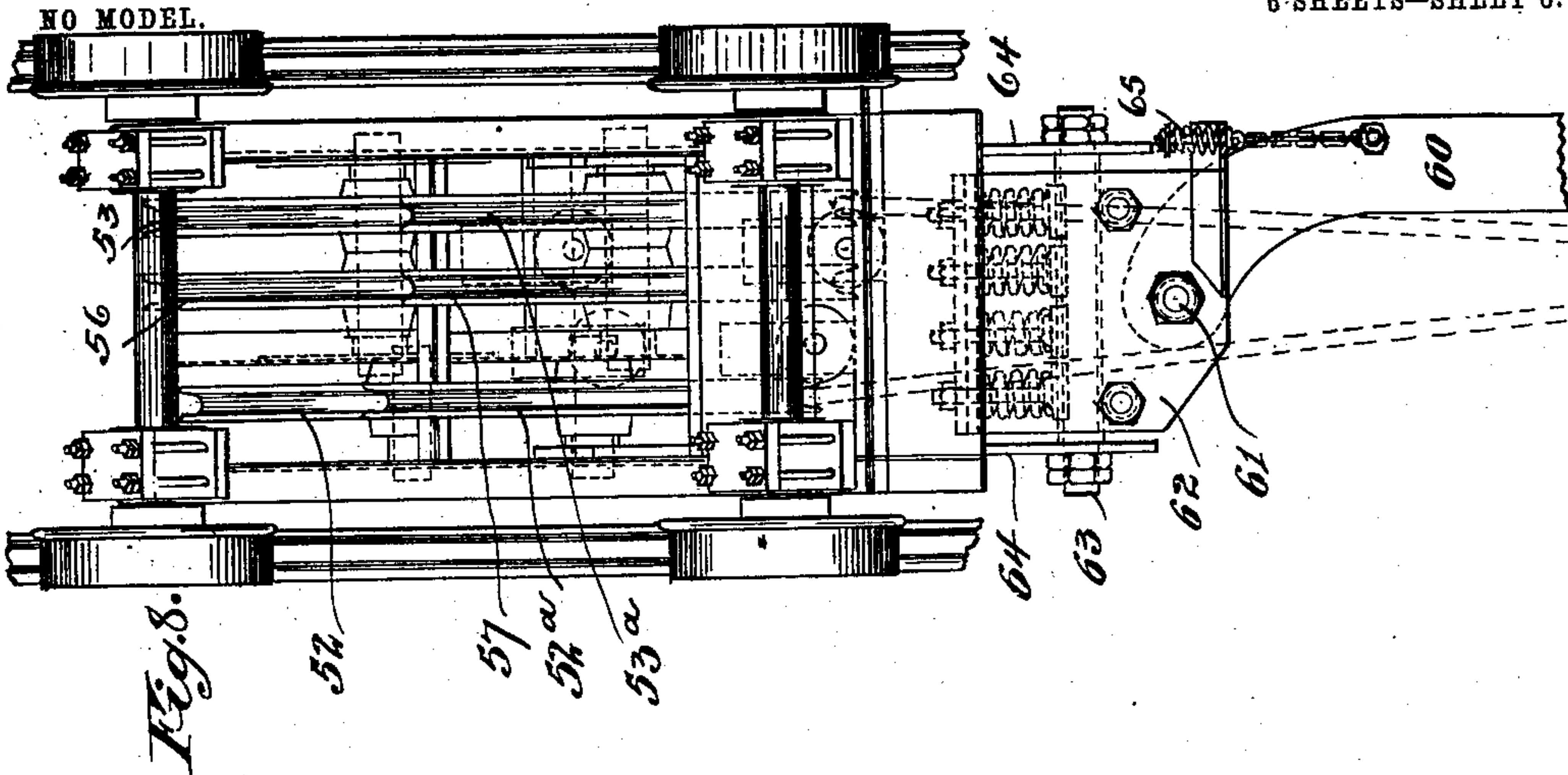
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6 SHEETS—SHEET 6.



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UNITED STATES PATENT OFFICE.

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TROLLEY-HOOK FOR MANIPULATING SELF-LOADING GRABS.

SPECIFICATION forming part of Letters Patent No. 754,652, dated March 15, 1904.

Application filed May 21, 1903. Serial No. 158,100. (No model.)

To all whom it may concern:

Be it known that we, FRANK K. HOOVER and ARTHUR J. MASON, both citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Trolley-Hooks for Manipulating Self-Loading Grabs, of which the following is a specification.

In the handling of iron and other ores, coal, and similar materials, and more particularly in the transferring of such materials from one place or situation to another—as, for instance, in withdrawing them from the hold of a vessel or other carrier and transferring them to stock-piles or other receptacles—there are now in use many self-loading grabs or buckets, which are generally operated by two lines passing over a trolley or carrier mounted to travel on a track or way overhanging the receptacles from which the material is extracted and to which it is delivered, one of said lines operating to close the grab in taking up a load and raising the closed grab to the trolley and the other operating to open the grab in subsequently discharging the load and in lowering the grab for the next load. In manipulating such devices it is of course necessary to connect and disconnect the grab relatively to the trolley or carrier each time a load is taken up and transferred and the grab is returned empty for another load. To do this in an expeditious manner, various more or less complicated devices have heretofore been used to effect an automatic coupling and uncoupling of the grab relatively to its trolley or carrier through a manipulation of the opening and closing lines.

It is the primary object of the present invention to improve and simplify the mechanism heretofore employed for this purpose through the provision of a simple hook so constructed and arranged that when the grab is operated by the closing-line it will automatically seat itself securely in the hook, and when the grab is operated by the opening-line and raised sufficiently it will automatically swing out of and away from the hook.

The present invention is based on the idea of so arranging or positioning the opening

and closing lines that those portions of said lines extending between their points of tangency on the trolley and grab, respectively, shall diverge or converge in a plane parallel to or coincident with the plane of the trolley-hook, the result of which arrangement is that when the weight of the grab is borne by the closing-lines the grab swings laterally slightly to an extent sufficient to carry its hook-engaging member into a vertical plane in which lies the seat portion of the trolley-hook, while when the weight of the grab is shifted to the opening-lines the grab swings laterally in the opposite direction to an extent sufficient to carry its hook-engaging member in the opposite direction into a vertical plane which lies slightly outside the nose or point of the hook; the shifting of the weight of the grab from the closing to the opening lines, and vice versa, thus providing a slight lateral bodily movement of the grab, and more particularly of its hook-engaging member, which is usually the central pivot-shaft of the grab, whereby such hook-engaging member is rendered capable of movement into and out of engagement with a simple form of hook suspended from the overhead carrier or trolley.

Our invention will be more readily understood when considered in connection with apparatus embodying and illustrating the same, and in order to more completely explain the broad principle of the invention we have in the accompanying drawings disclosed several forms and types of apparatus showing different relative arrangements of the opening and closing lines between the trolley and the grab, but all illustrating the novel rule governing the operation of the invention.

Briefly describing such drawings, therefore, Figure 1 is a side elevational view of a trolley, a grab suspended therefrom, and a trolley-hook, illustrating our invention in a simple form. Fig. 2 is a top plan view of the trolley and its hook as illustrated in Fig. 1. Fig. 3 is a view similar to Fig. 1, without the grab, of a more developed and finished form of the invention. Fig. 4 is a top plan view of the form shown in Fig. 3. Fig. 5 is an end view of Fig. 3. Fig. 6 is a side elevational view similar to Fig. 3, but illustrating a different

relative arrangement of the opening and closing lines between the tangent points on the trolley and grab, the same being the converse of the arrangement shown in Fig. 3. Figs. 7 and 8 are side elevational and end views, respectively, of a trolley and trolley-hook and the opening and closing lines passing thereover, the parts arranged to cooperate with a grab opening and closing in a plane transverse to the longitudinal plane of the trolley; and Fig. 9 is a side elevational detail view of the trolley-hook and its cushioned connections to the trolley.

Referring first to the simpler form of the invention illustrated in Figs. 1 and 2, 6 designates a portion of a track or way over which travels the trolley or carrier 7 by means of wheels 7^a, mounted on said track. 8 is a shaft disposed transversely in and across the main longitudinal side members of the trolley-frame, on the outer overhanging ends of which shaft are rotatably mounted a pair of sheaves 9, over which are trained the closing-lines 10 of the grab and a corresponding pair of sheaves 11, herein shown as of equal diameter to the sheaves 9, over which are trained the opening-lines 12. 13 designates as an entirety the grab or self-loading bucket, which is provided with a central pivotal shaft 14 or its equivalent, adapted to enter the hook of the trolley, on either side of which and a short distance therefrom pass the opening and closing lines. Mounted in the outer ends of a pair of arms 15, themselves mounted centrally on the opposite ends of the central shaft 14, are two pairs of guide-sheaves 16 and 17, engaged by the opening and closing lines 10 and 12, respectively, said guide-sheaves thus constituting or defining in this form of the invention the points of tangency on the grab-frame from which the latter is suspended when its weight is borne by the opening and closing lines, respectively. Suspended from the center of a transverse shaft 18, mounted in and between the longitudinal side frame members of the trolley, is a hook, (designated as an entirety by 19.) This hook is held drawn to a position slightly to one side of the vertical position which it would naturally assume under the effect of its own weight by means of a pair of chains 20, attached to the back side of the hook and to the lower ends of the longitudinal side frame members of the trolley. The lower end of the hook has an inclined or beveled edge 19^a, which terminates in a convex curve 19^b, extending up to and constituting the outer edge or face of the point 19^c of the hook. The operation is as follows: Assuming the parts to be in the relative positions shown in Fig. 1, in which the closed grab hangs suspended by the closing-lines 10, the hook 19 occupies the position shown in full lines. As the grab is raised the central shaft 14 thereof rises along a path indicated by the dotted line xx , which, it will be observed, is to the right of the cen-

tral vertical line zz , tangent to the guiding and supporting sheaves 9 and 11, coincident with which latter line lies the vertical weight-supporting closing-line 10. As the shaft 14 in its upward movement reaches the inclined under edge of the hook it pushes the lower end of the latter rearwardly in an obvious manner to the position indicated by dotted lines until the shaft has traveled to a point just above the point 19^c of the hook, after which the hook swings back by gravity to the full-line position, whereupon by slackening the closing-line 10 the grab is allowed to drop slightly, with its shaft 14 coming to rest in the seat of the hook, after which the trolley, with the grab suspended therefrom, is drawn along the track to a position above the point of discharge. The load having been discharged and the trolley, with the grab suspended therefrom, returned for another load, the operator thereupon applies the power to the opening-lines 12, at the same time raising the grab slightly on the latter. The result of this is to cause the opening-lines under the weight of the empty grab to assume a perpendicular position tangent to their supporting-sheaves 11 and coincident with the transverse plane in which falls the central vertical line zz . In doing this the grab swings a slight distance inwardly of the overlying support and transfers the central shaft 14 from a position in the path of the line xx on the right of the central line zz to a position in the path of a line yy on the left of the central vertical line zz , which line yy lies sufficiently to one side of the point of the trolley-hook to carry the shaft 14 entirely clear of the latter when the hook is in its full-line position, thus enabling the grab to be lowered without interference from the point of the hook. The grab having been lowered and the power once more transferred to the closing-lines, the load is gathered, the grab raised, and the foregoing operation repeated.

Referring to Figs. 3, 4, and 5, wherein we have illustrated a somewhat modified and more developed form of the invention, characterized, however, by the same relative arrangement of opening and closing lines and their points of tangency to the trolley and grab as in Figs. 1 and 2, 21 designates the trolley-frame equipped with the supporting-wheels 21^a, traveling on the tracks 22, Figs. 4 and 5, the trolley being controlled in its travel by means of controlling-cables 23 and 24, carried around a brake-equipped controlling-drum (not shown) and passing around pulleys 25 and 26, respectively, suitably mounted on transverse shafts 27 and 28 at opposite ends of the frame. 29 designates the guide-sheaves carrying the closing-lines 30, and 31 designates similar guide-sheaves carrying the opening-lines 32, both pairs of sheaves being of equal diameter and rotatably mounted side by side on the opposite ends of a transverse shaft 33,

mounted in and between the main longitudinal side frame members of the trolley. 34 designates another shaft mounted in and between the side frame members of the trolley slightly in advance of the shaft 33, on which shaft 34 are hung a pair of U-shaped suspension-rods 35, connected at their upper ends by a pair of transverse plates 36 and 37, between which are interposed a plurality of cushioning-springs 38, the lowermost plate 37 resting directly upon and supported by the shaft 34. In the looped lower ends of the suspension-rods 35 is seated a short shaft 39, on which latter are pivotally hung a pair of parallel twin hook members 40, rigidly united to constitute, in effect, a single hook of considerable width by means of a brace-plate 41 and a tie-bolt 42. The twin side members 40 of the hook thus formed are substantially similar in contour to the hook 19, already described in connection with Fig. 1, having the inclined lower edge 40^a terminating in the rounding or convexed outer edge 40^b of the hook-point 40^c. Fast on the shaft 39 just inside the twin hook members 40 are a pair of depending arms 43, which, as shown in Fig. 5, extend down below the lower edge of the brace-plate 41 and are rigidly united at or near their lower ends by a tie-bolt 44, and these arms are held rigid by means of a pair of parallel back struts 45, at their inner or lower ends mounted on the tie-bolt 44 and at their outer or upper ends secured to a transverse member 46 of the trolley-frame. The operation of this form of the invention is similar to that already described, with the exception of the fact that the springs 38 provide a desirable cushioning effect in connection with the seating of the central shaft of the grab in the hook and of the further fact that the presence of the rigid arms 43 just inside the arms of the hooks prevents an undue rearward oscillation or swing of the grab, particularly when arrested after its descent along the track, such as might otherwise cause the grab to strike the overhanging end of the track-frame were the grab permitted to swing from the shaft 34 as a center of oscillation. While the hook members 40 are free to yield rearwardly sufficiently to permit the seating of the shaft 14 in the manner described in connection with Figs. 1 and 2, the rigid arms 43 extending to a point below the shaft 14 when the latter is seated in the hook members constitutes a back-stop against rearward swing of the said shaft, and consequently makes the shaft 14, rather than the shaft 34, the center of whatever oscillation the grab may undergo.

In Fig. 6 of the drawings we have illustrated a modification of the construction last described in connection with Figs. 3 to 5, wherein the sections of the grab-operating cables between the guiding-sheaves on the trolley and their points of tangency on the grab are outwardly divergent from a common

vertical plane in an upward direction instead of in a downward direction, this effect being produced by arranging the guiding-sheaves 47 and 48, carrying the opening and closing cables 49 and 50, respectively, so that the points of tangency of the cables thereon do not lie in the same transverse plane, as in the forms of the invention thus far described, but lie in different transverse planes, while the points of tangency of said cables on the grab do lie in the same transverse vertical plane, whereas in the forms of the invention previously described they occupied different transverse planes, the cables in Fig. 6 being shown as passed through vertical slots or openings 51 in the pivotal shaft 14^a of the grab. Of course the last-described relative disposition of the cables between the trolley and the grab might be secured by training the cables over trolley-sheaves concentrically mounted, but of different diameters, and by passing the cables over points of tangency on the grab other than through slots in the pivotal shaft so long as these points of tangency lay in the same or substantially the same transverse plane.

In the operation of the mechanism when arranged as last described it is obvious that a transfer of the weight of the grab, whether loaded or empty, from either of the cables 49 and 50 to the other effects the same bodily lateral movement of the grab in a direction which is parallel or coincident with the plane of the hook already described by reason of a change in the point of suspension of the grab on the trolley, whereas in the previous described construction this same movement of the grab resulted from a change in the point on the grab itself, through which its gravity effect was resisted by the cable supporting it. It is evident that the same principle of operation underlies both arrangements.

Figs. 7, 8, and 9 illustrate an application of our invention to an arrangement of mechanism wherein the grab is designed to open and close in a plane transverse to rather than parallel with the plane of the trolley and its track. In this arrangement 52 and 53 designate the guide-sheaves at the rear end of the trolley supporting the opening and closing lines 54 and 55, respectively, on one side of the grab, while 52^a and 53^a designate companion sheaves at the forward end of the trolley similarly supporting the opening and closing lines 54^a and 55^a on the opposite side of the grab, it being understood that the pivotal axis of the grab lies parallel with rather than transversely of the trolley. 56 and 57 designate pulleys over which are trained the trolley-controlling cables 58 and 59, respectively. 60 designates a hook of the general form and contour indicated in the constructions hereinbefore described, but hung so as to lie in a plane transverse to the plane of the trolley, as clearly shown in Fig. 7. Said hook is conveniently

pivoted on a bolt 61, disposed across and between the side members of a spring-box 62, itself pivotally supported upon a rod or bolt 63, supported in and between a pair of depending plates or brackets 64, hung from opposite sides of the trolley, whereby the hook 60 is permitted to oscillate both longitudinally and transversely of the overhead trolley. To cushion and limit the swing of the hook in the direction of its own plane, tensile springs 65 may be interposed between the back of the hook and the bracket members in which it is hung, it being understood that the hook maintains its normal operative position by gravity, as in the constructions previously described.

In the last-described arrangement it will be seen from the relative positions occupied by the opening and closing cables on each side of the grab, as indicated in Figs. 8 and 9, that the operation of the grab relatively to the hook in seating and unseating itself therein will be the same as that last described in connection with Fig. 6, since by reason of the lateral separation of the guide-sheaves on the trolley which support the opening and closing cables, respectively, the points of tangency of said opening and closing cables on each side of the grab lie in two separated vertical planes which are at right angles to the vertical plane of the hook 60 and not in a single vertical plane at right angles to the plane of the hook 60, whereby a transfer of the weight from one cable to the other creates the described bodily shifting movement of the grab in a direction coincident or parallel with the plane of the hook, thereby carrying the hook-engaging shaft into and out of its seat in the hook.

From the foregoing it will be seen that our present invention provides an extremely simple and automatic means for connecting and disconnecting the grab under and from its supporting and carrying trolley. No hooks or bails are required on the grab itself, as the pivotal shaft 14 itself may constitute the direct hook-engaging element of the grab, and this shaft itself under the action of the opening and closing lines directly coöperates with the hook in such a manner as to engage and be seated in the latter on the rise of the grab and unseat and disengage itself therefrom on the subsequent lowering of the grab. It will also be observed that this peculiar coöperation of the shaft and the hook results from the practice of suspending the grab by the opening and closing lines, which are not parallel, but have a slight relative inclination between the trolley and the grab in the direction of movement of the grab in seating and unseating itself in the hook, thereby causing a slight lateral or edgewise bodily travel of the grab to and fro each time the power is transferred between the opening and closing lines.

We claim—

1. The combination with a trolley and a grab

suspended from said trolley by opening and closing lines, of a hook suspended from said trolley and adapted to engage and disengage an element of the grab by reason of the lateral movement imparted to the grab when the power is transferred from the opening to the closing lines and vice versa, respectively, substantially as described.

2. The combination with a trolley and a grab suspended from said trolley by opening and closing lines, of a pivoted, rearwardly-yieldable hook suspended from said trolley and adapted to engage and disengage an element of the grab by reason of the lateral movement imparted to the grab when the power is transferred from the opening to the closing lines and vice versa, respectively, substantially as described.

3. The combination with a trolley and guide-sheaves carried thereby, of a grab having a central shaft suspended from said sheaves on the trolley by opening and closing lines, and a grab-supporting hook suspended from said trolley, the said sheaves, shaft and hook being so positioned that the shaft is engaged in and disengaged from the hook by reason of lateral movement imparted to the grab and its shaft when the power is transferred from the opening to the closing lines and vice versa, respectively, substantially as described.

4. The combination with a trolley and guide-sheaves carried thereby, of a grab having a central shaft suspended from said sheaves on the trolley by opening and closing lines, and a cushioned, rearwardly-yieldable grab-supporting hook pivotally suspended from said trolley, the said sheaves, shaft and hook being so positioned that the shaft is engaged in and disengaged from the hook by reason of lateral movement imparted to the grab and its shaft when the power is transferred from the opening to the closing lines and vice versa, respectively, substantially as described.

5. The combination with a trolley and a grab-supporting hook suspended therefrom, of a grab having opening and closing lines carried over and depending from said trolley, said lines being so disposed between their points of tangency on the trolley and grab, respectively, as to lie at an inclination to each other in the direction of movement of the grab in engaging and disengaging the hook, substantially as described.

6. The combination with a trolley, and a grab having opening and closing lines carried by said trolley and supporting said grab at points on opposite sides of its transverse central vertical plane, of a hook suspended from said trolley and adapted to engage and disengage an element of the grab lying between said opening and closing lines by reason of the bodily lateral movement imparted to said element when the power is transferred from the opening to the closing lines and vice versa, respectively, substantially as described.

7. The combination with a trolley, and a grab having a central pivotal shaft, of opening and closing lines carried by said trolley and supporting said grab at points on opposite
5 sides of said central shaft, and a hook suspended from said trolley and adapted to engage and disengage said shaft by reason of the bodily lateral movement imparted to the grab and its shaft when the power is transferred
10 from the opening to the closing lines and vice versa, respectively, substantially as described.

8. The combination with a trolley, and a grab having a central pivotal shaft and guide-sheaves located adjacent to and on opposite
15 sides of said shaft, of opening and closing lines carried by and suspended from said trolley at points thereon in the same transverse vertical plane, said opening and closing lines engaging said oppositely-disposed guide-sheaves on the grab, respectively, and a hook
20 suspended from said trolley, said hook having an inclined lower edge lying across the path of said shaft in its upward movement, substantially as described.

25 9. The combination with a trolley, and a grab having a central pivotal shaft and guide-sheaves located adjacent to and on opposite sides of said shaft, of opening and closing lines carried by and suspended from said trolley
30 at points thereon in the same transverse

vertical plane, said opening and closing lines engaging said oppositely-disposed guide-sheaves on the grab, respectively, and a yieldably-suspended hook depending from said trolley, said hook having an inclined lower edge
35 lying across the path of said shaft in its upward movement, substantially as described.

10. The combination with a trolley, and a grab having a hook-engaging member and guide-sheaves located adjacent to and on opposite
40 sides of said hook-engaging member, of opening and closing lines carried by and suspended from said trolley at points thereon in the same transverse vertical plane, said opening and closing lines engaging said oppositely-
45 disposed guide-sheaves on the grab, respectively, a rearwardly-yieldable hook pivotally suspended from said trolley, said hook having an inclined lower edge lying across the
50 path of said hook-engaging member in its upward movement, and a rigid member disposed alongside of said hook and serving to engage and check rearward movement of said hook-engaging member when seated in the hook, substantially as described.

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