

No. 797,204.

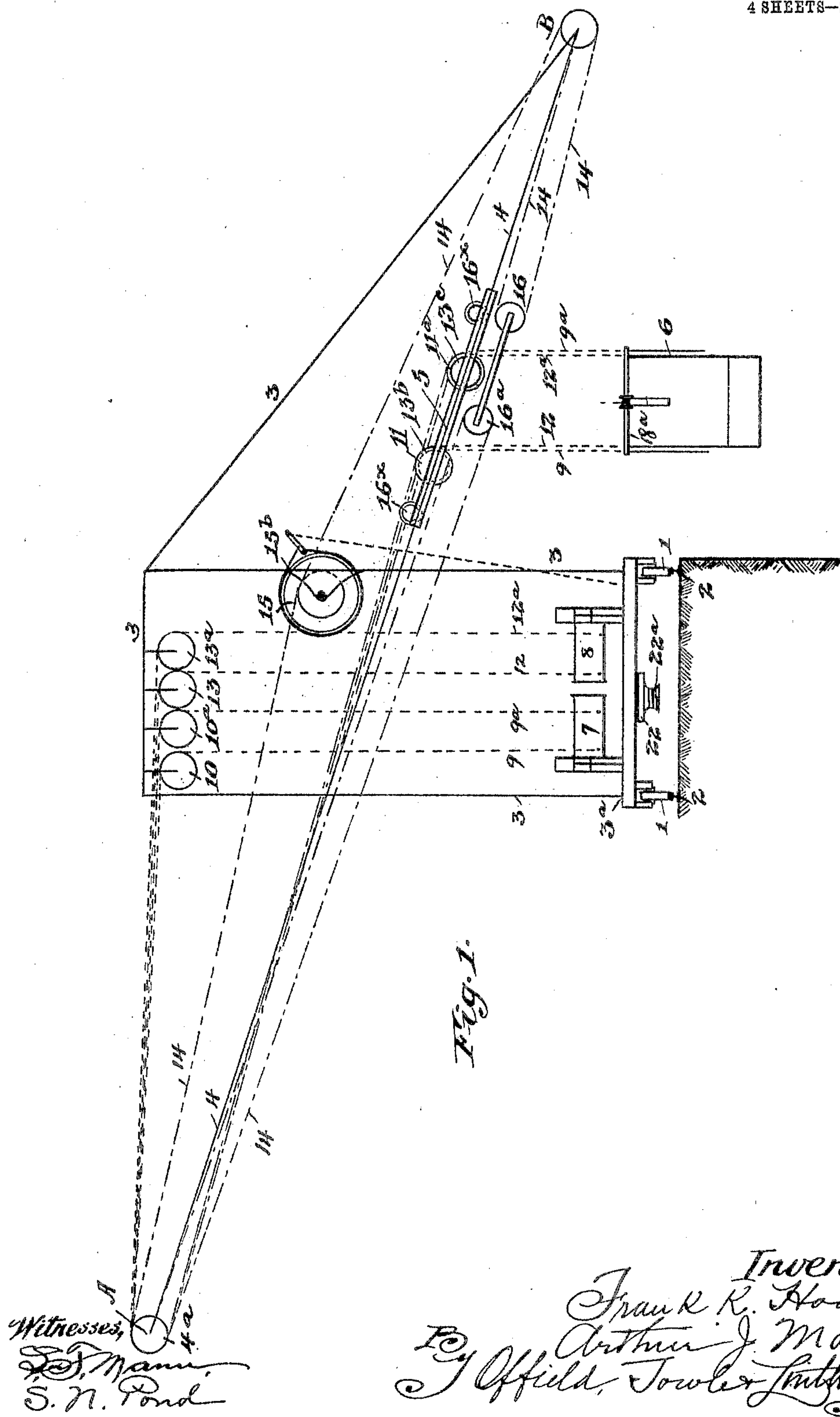
PATENTED AUG. 15, 1905.

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

CONVEYING APPARATUS.

APPLICATION FILED JAN. 26, 1901.

4 SHEETS—SHEET 1.



Witnesses,

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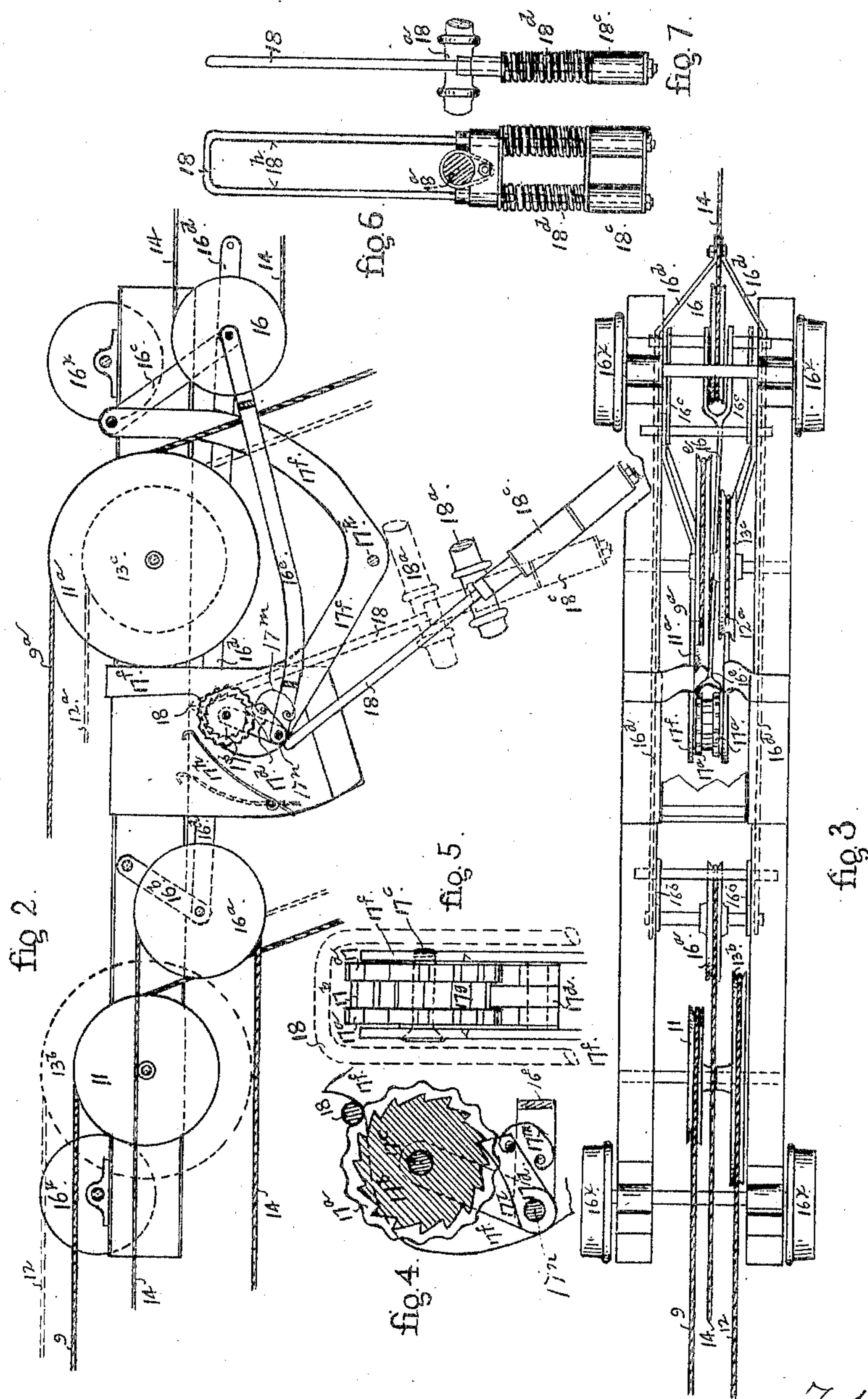
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4 SHEETS—SHEET 2.



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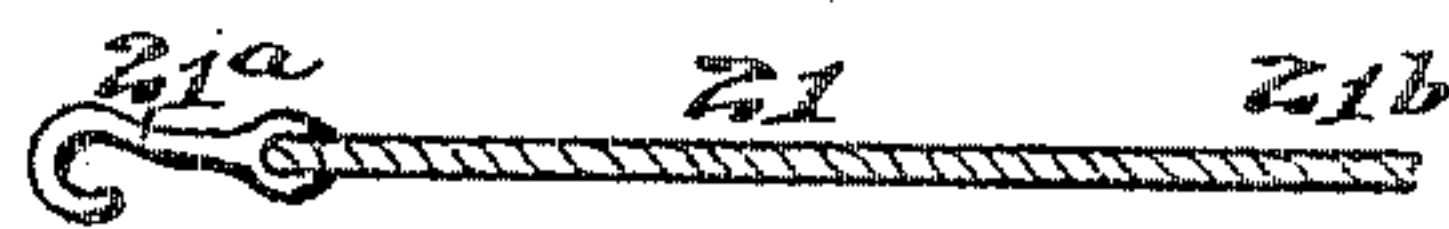
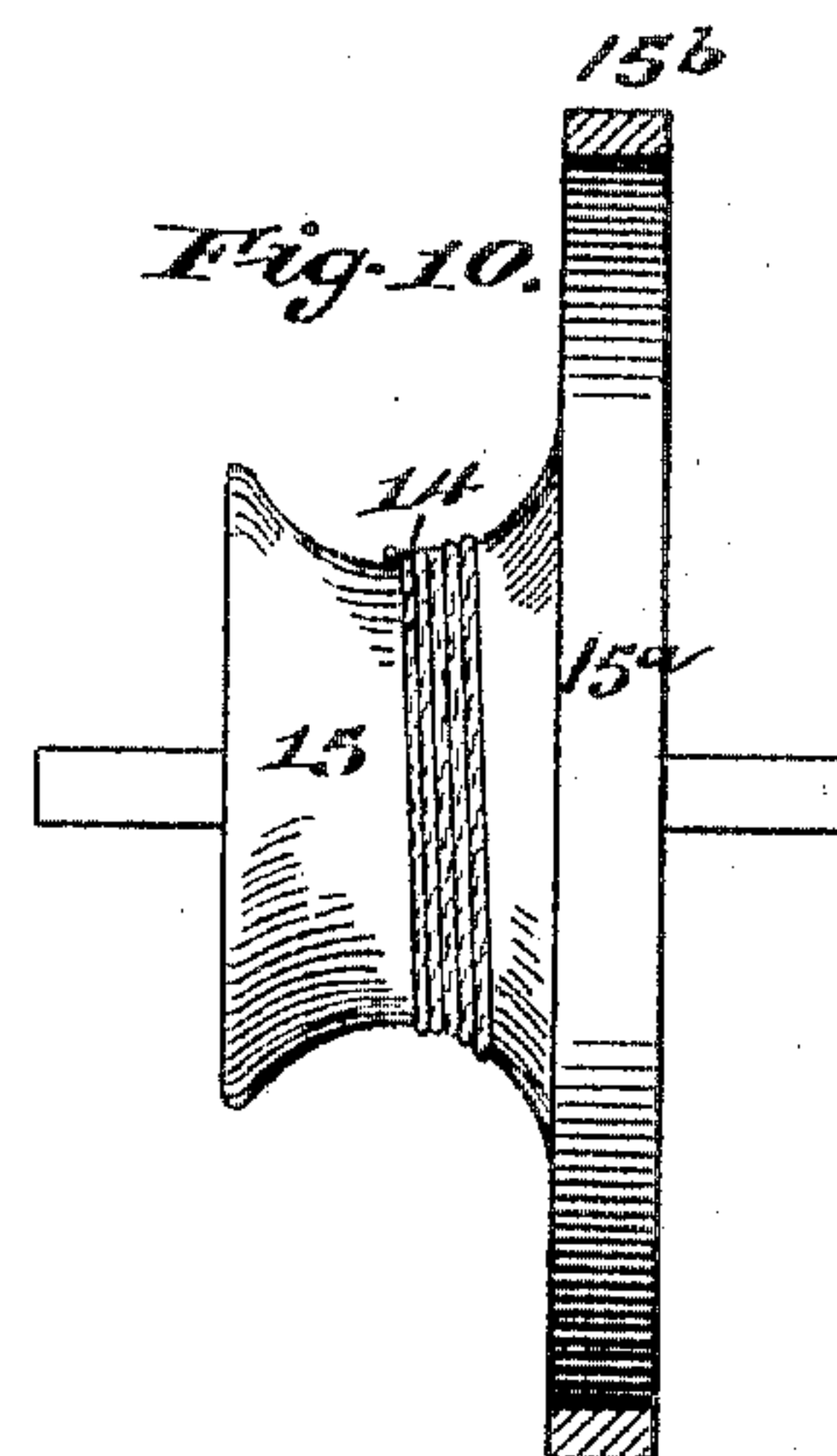
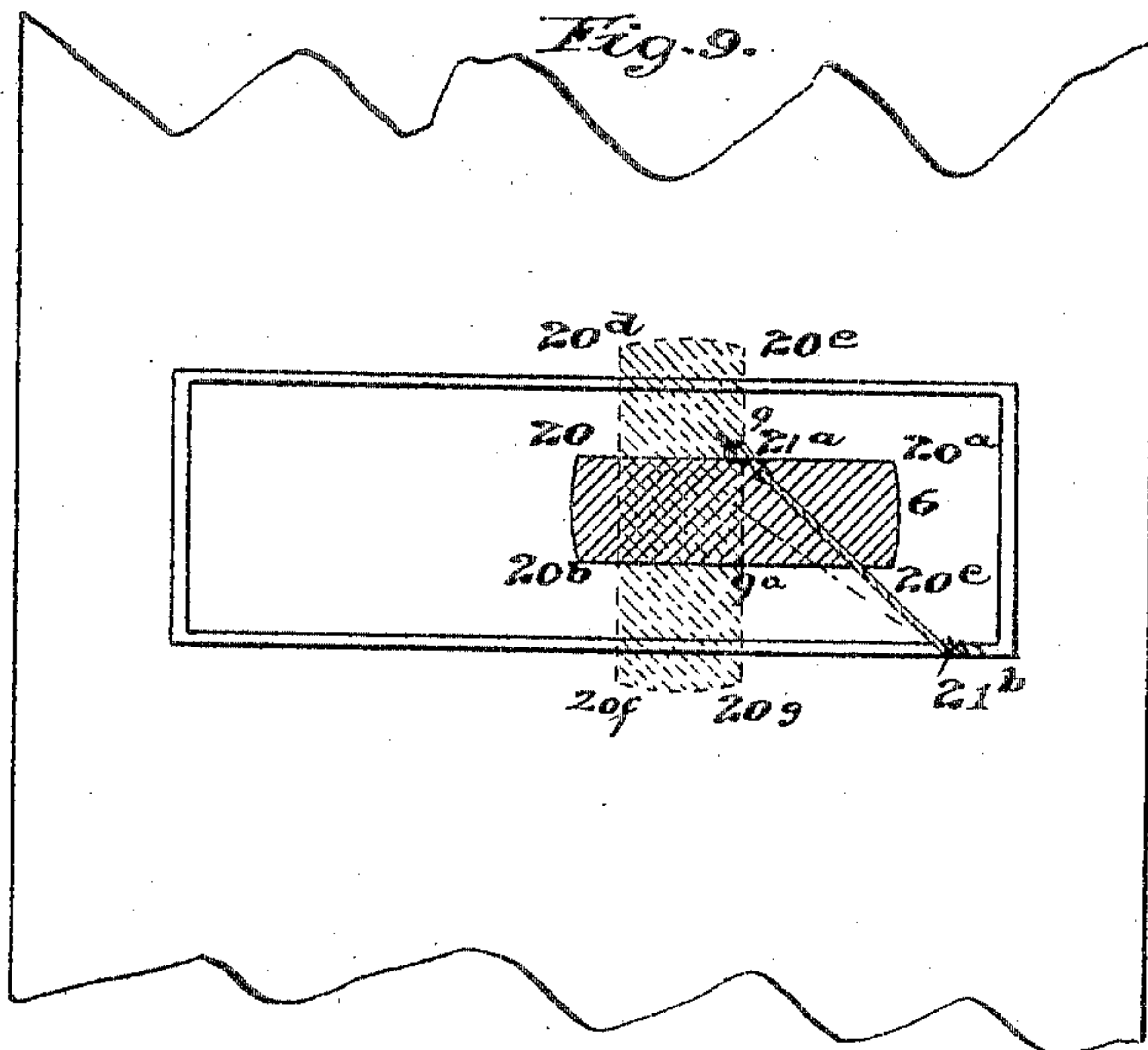
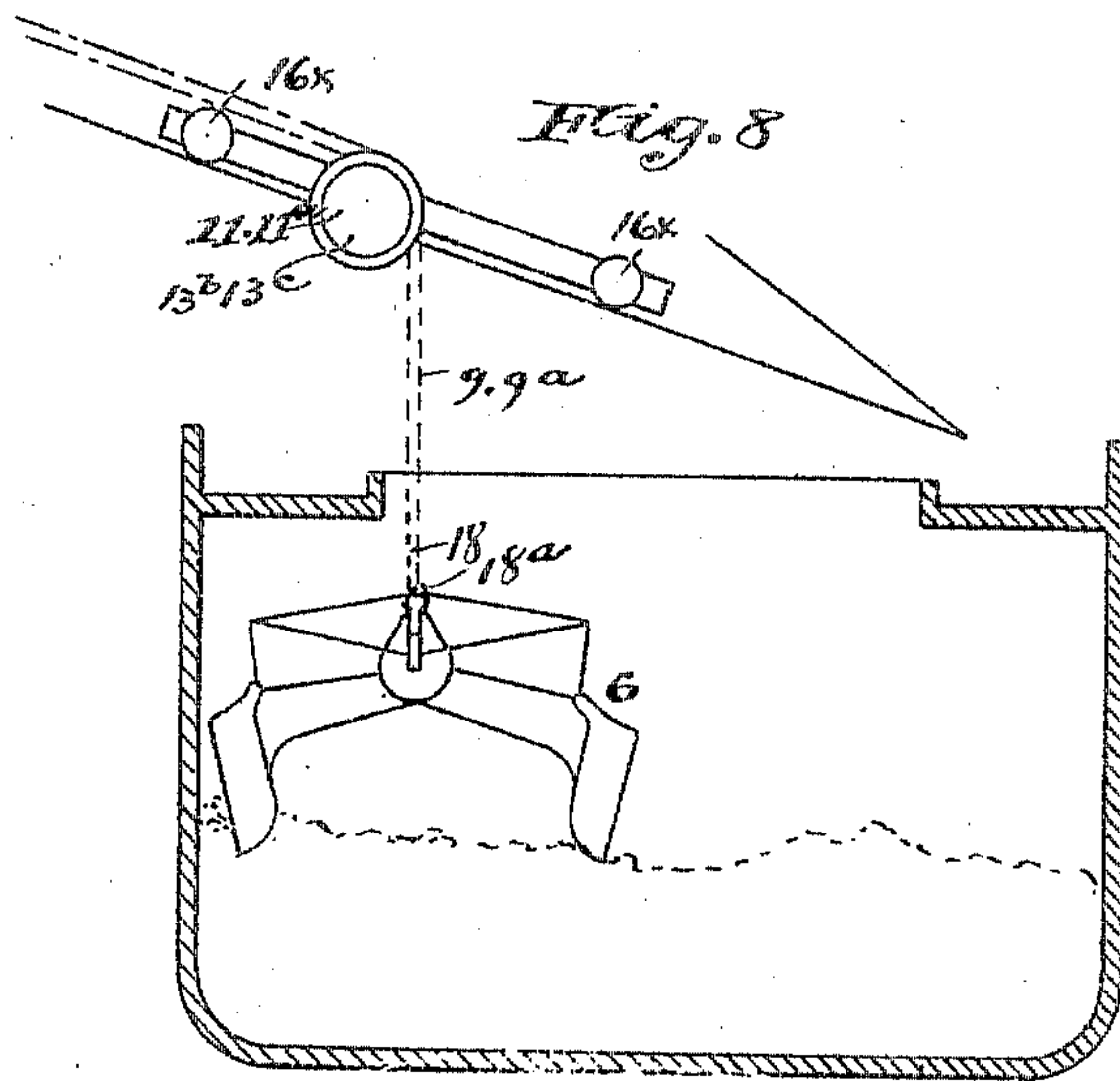
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APPLICATION FILED JAN. 26, 1901.

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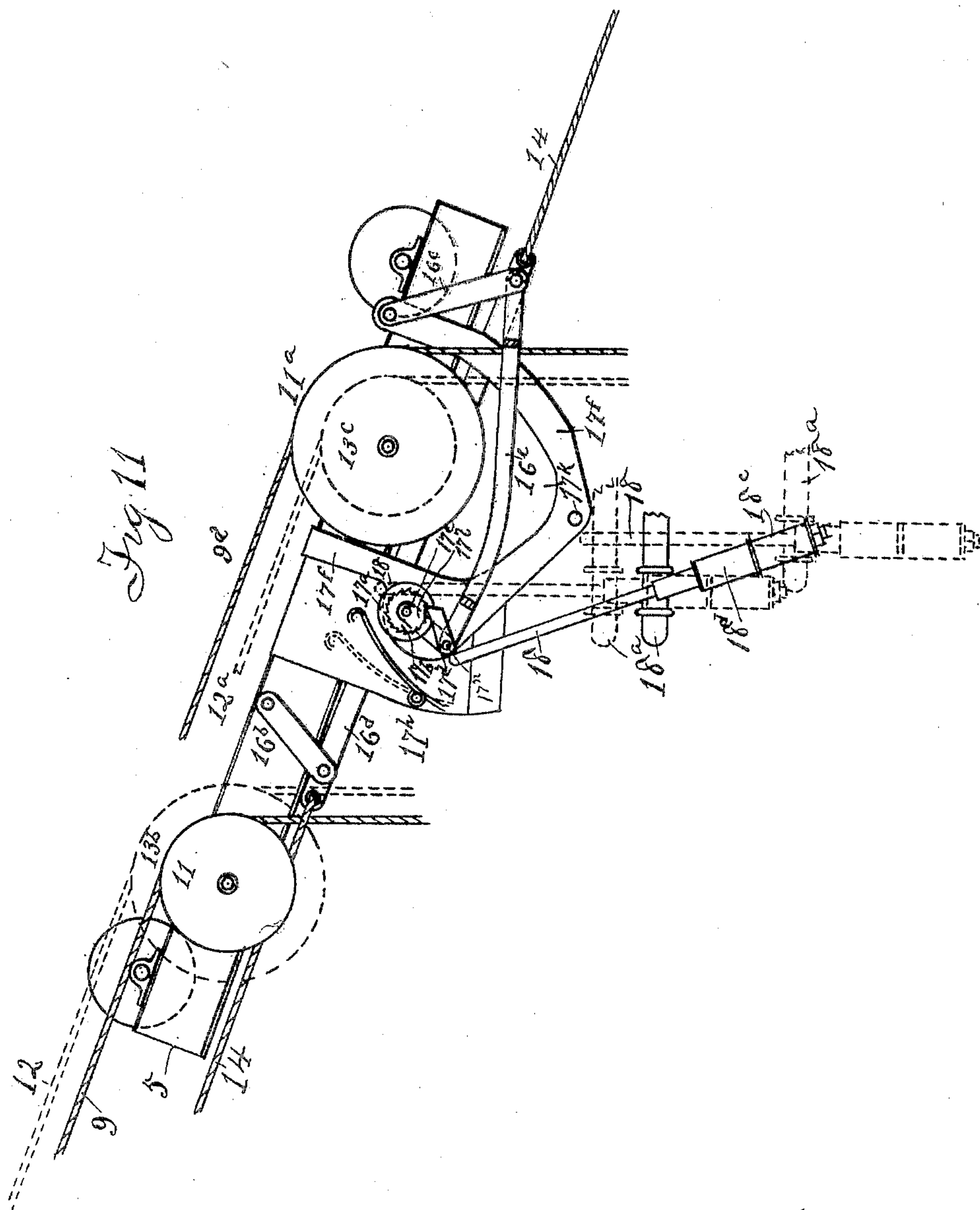
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4 SHEETS—SHEET 4.



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CONVEYING APPARATUS.

No. 797,204.

Specification of Letters Patent.

Patented Aug. 15, 1905.

Application filed January 26, 1901. Serial No. 44,937.

To all whom it may concern:

Be it known that we, FRANK K. HOOVER and ARTHUR J. MASON, citizens of the United States, and residents of Kansas City, in the county of Jackson, in the State of Missouri, have invented certain new and useful Improvements in Conveying Apparatus, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

In the operation of the extensive plants of the present day in which large amounts of ore and like material are handled the work of conveying the material is expedited by means of self-loading buckets in which the loads are taken up, elevated, transported, and dumped at any desired points. To do this successfully and expeditiously, it is desirable that the operator unaided and without leaving his post shall have at all times complete command of the bucket and be able to bring it either open or closed to any point and to take a load or dump it at any point or at any height within the scope of the apparatus.

In such an apparatus our invention relates to a trolley or carrier and controlling devices by which one man is able to accomplish the work above indicated, as also to provide means by which the cargo of a vessel not immediately under the hatchway may be reached and taken up by the bucket, and in this relation, bearing in mind that from the limited dimensions of the hatchway it is necessary in ordinary work to avoid twisting or turning the bucket, our invention also has reference to turning or twisting the bucket after passing through the hatchway, so that it may take up its load on the line of the axis of the vessel, as well as laterally in line with the hatchway, and, further, it being desirable that apparatus of this character should be worked in gangs, the number depending upon the speed and quantity of work to be done in a given time, our invention also relates to devices by which each member of the gang shall be independently portable and competent to be moved quickly from hatch to hatch or place to place, while at the same time it is so secured as not to be moved along its track by extraneous agencies.

To accomplish all of which, our invention consists in certain features of novelty hereinafter described, and pointed out in the claims.

Figure 1 represents a side elevation showing a general view of the apparatus. Fig. 2

represents a side elevation of the trolley or carrier by which the bucket or grab is transported. Fig. 3 represents a plan view of the same. Fig. 4 represents a side elevation, partly in cross-section, of the serrated disk for supporting the grab upon the carrier. Fig. 5 represents an edgewise view of the same. Fig. 6 represents a front elevation of the bail of the grab. Fig. 7 represents a side elevation of the same. Fig. 8 represents a cross-section of the hold of a vessel, showing the grab taking its load, in part, from a covered portion of the cargo away from under the hatchway. Fig. 9 represents a plan view of a portion of the deck, showing the grab turned to take its load on the line of the axis of the vessel. Fig. 10 represents a side elevation of the drum for controlling the carrier. Fig. 11 represents a side elevation showing the carrier controlled by a single controlling-line.

Similar characters refer to similar parts throughout the several views.

Primarily, as shown in Fig. 1, the apparatus consists of a cantaliver structure 3, mounted upon a car 3^a, supported upon wheels 1, adapted to travel upon a track 2, whereon the apparatus may be moved from place to place or from hatchway to hatchway as the exigencies of the work may require. On said car is mounted a drum 22, around which a cable 22^a is wrapped several times and anchored at its ends. Said drum 22 is geared to an engine by worm-gear and worm or other suitable means and controlled by a clutch, which being a familiar construction is not shown in detail. It is apparent that by rotating the drum 22 the whole apparatus is moved along on the supporting-track 2 and when not in motion is securely held in its place and not subject to movement by extraneous agencies, such as windage, grade influences, and the like. Where several such apparatus are worked in gangs, by wrapping the cable around a drum mounted upon each machine one cable may be used to operate the whole number.

The cantaliver structure overreaches on one side the material to be moved and on the other side the receptacles or stock-piles to which the material is to be delivered and has an inclination downward toward the side from which the material is to be taken.

Extending longitudinally on the cantaliver structure is provided a track or way 4, upon which is mounted and adapted to travel on

wheels 16^x a trolley or carrier 5, from which is hung a self-loading grab 6 or provided on its central shaft 18^a with a bail 18.

Drums 7 and 8 are mounted upon the car 3^a and have an operative connection with a suitable engine. The opening-lines 9 and 9^a of the grab are connected with the drum 7 and passing up over sheaves 10 and 10^a and around sheaves 4^a, mounted upon the shaft A at the end of the cantaliver, and over sheaves 11 and 11^a, mounted upon the carrier 5, are attached to the grab. The closing-lines 12 and 12^a of the grab are connected with the drum 8 and passing up over sheaves 13 and 13^a and around sheaves mounted alongside and on the same shaft as the sheaves 4^a and over sheaves 13^b and 13^c, mounted upon the carrier 5, are also attached to the grab. The said grab is with respect to its general construction and means of actuation of the type of that set forth in our copending application, Serial No. 47,472, filed January 8, 1901, now become Patent No. 679,475, granted to us July 30, 1901, (the two applications being, in fact, divisional applications of a single ore-handling system,) and in which the opening and closing cables 15 and 7, respectively, are the opening and closing cables or lines 9 9^a and 12 12^a of this application and wherein also the cables 7 correspond to the cables 12 12^a of this application in effecting the raising or lowering of the grab when closed, and the cables 15 correspond to the cables 9 9^a of this application in effecting the raising or lowering of the grab when opened.

16^b and 16^c represent swinging arms pivotally mounted at one end upon each side of the carrier and having their free ends connected by the bars 16^d, pivotally mounted thereon.

14 represents a cable constituting the controlling-line of the carrier. Said line at its ends is connected with the ends of the swinging bar 16^d, as shown in Fig. 1, 1 and passing around sheaves mounted upon the end shafts A and B is passed a number of times around a controlling-drum 15, mounted upon the frame 3. A brake 15^b, operating upon a disk 15^a upon the drum 15, is provided for holding said drum when desired, the necessary levers and connections being provided and extending to the engineer's stand, whereby the control of the whole apparatus is brought within the reach of a single operator, it being observed that similar brakes are provided for controlling the drums 7 and 8, carrying the operating-lines of the grab and having suitable levers and connections for operating the same. Such levers and connections being familiar construction are merely indicated.

Between a pair of U-shaped bars forming a yoke 17^f, mounted upon the carrier 5, upon a pin 17^e are mounted the serrated disks 17^a and the ratchet-wheel 17^b, said disks and ratchet-wheel being secured together and free to move

on said pin 17^e. On said pin 17^e are also loosely mounted a pair of arms 17ⁱ, connected at their lower ends by a pivot-bolt 17ⁿ, upon which latter is pivotally mounted a pawl 17^d, arranged to engage the teeth of the overlying ratchet-wheel 17^b. A bar 16^e, provided with a forked forward end, as shown in the plan view Fig. 3, is pivotally hung on the pivot-bolt 17ⁿ and at its opposite end is pivoted to the lower end of the swinging arm 16^c, its function being to operate the pawl in the manner hereinafter described. A spring 17^m, secured at its lower end between the prongs of the bar 16^e, serves to retain the pawl normally in engagement with the ratchet-teeth.

The location of the sheaves 11 11^a and 13^b 13^c, which carry the operating-lines of the grab, is such that when the grab is suspended by said lines from the carrier the points of suspension on the carrier shall be immediately over the points upon the grab where said lines leave the same, and this for the reason that thereby twisting of the grab is prevented in its normal action and more accurate work can be done in cleaning up the decks of barges and danger of striking the sides of hatchways when removing cargo from the hold of a vessel is avoided.

As shown in Fig. 6, a bail 18 is mounted upon the central shaft 18^a of the grab-frame and is retained in a vertical relation thereon by weights 18^c on the arms of the bail below said shaft, and springs 18^d are interposed between said weights and the bearing-block of the bail upon the shaft to release from shock. Said bail has no connection with either the opening or closing lines of the grab, and in its operation is independent of both of them.

It is manifest that the track or way 4 being inclined the carrier 5 if, unrestrained, will travel down the incline and if the grab be hung by its bail therefrom the added weight will but increase the tendency to such travel, and it is to be observed that the relation of the parts is such that when a strain is brought upon either the opening or closing lines passing over the sheaves mounted upon the carrier there is a tendency on the part of the carrier, if unrestrained, to travel up the incline. This is due to the fact that under such conditions there are two forces operating upon the carrier, one force being the gravity of the grab and its load acting vertically and the other force being the strain brought upon the opening or closing lines, which acts in the direct line of travel of the carrier, and since this latter strain or force is only partially counteracted by the force of gravity operating in a direction at an angle thereto it follows that there is a resultant force tending to impel the carrier up the incline. It is also to be observed that if the carrier be free to travel and the grab be hung by its operating-lines therefrom the tendency of the carrier will be to travel up the incline. This

is due to the fact that the carrier constitutes, in effect, a movable deflecting-point interposed between one end of a cable to which the force is applied and the opposite end of the cable at which the force is resisted and that component of the force (gravity) which acts parallel with and upwardly of the incline is greater than that component of the gravity of the carrier which acts in the opposite direction or downwardly of the incline. This tendency of the carrier to travel down or up the incline of the track is regulated and controlled and the carrier stopped and held at any desired point on the track by application of the brake upon the controlling-drum 15.

Now when the grab has taken its load from the material to be moved, the brake being applied to the drum 15 to hold the carrier in its position, the grab is elevated by the closing-lines until the bail 18 comes in contact with the yoke 17^f, when as the grab is elevated still farther the upper end of the bail will travel along the incline of the yoke, as shown in solid lines in Fig. 2, and guided in part by the guide-plate 17^h and in part by the action of the weights 18^c will pass up and over the ratchet-wheel 17^b and serrated disks 17^a and by the action of the weights 18^c will assume a substantially vertical position beyond the center shaft of the disks, as shown in dotted lines in Fig. 2, it being observed that the position shown in dotted lines is in the vertical plane. The upper portion of the forward end of the yoke 17^f acts as a stop to prevent the bail swinging too far over the disk to seat itself therein. At this moment the operator frees the brake on the controlling-drum 15. This permits the carrier to move up the incline and the bail to lower and seat itself on the serrated disks, as shown in dotted lines in Fig. 2, and the vertical plane being beyond or within the center of the disk the tendency will be to turn the disk in that direction, and thus to keep the bail firmly seated therein, the bail being supported in part by the disks and in part by the forwardly-projecting shoulders of the yoke, between which the disks and ratchet are pivoted. The center shaft 18^a of the grab coming in contact with a stop-pin 17^k on the lower angle of the yoke will prevent the grab being raised higher than is necessary. Then the controlling-line 14 having been released by relieving the brake on the drum 15, a continued strain on the closing-lines will carry the carrier up the incline to the point where the dump is to be made. Reaching that point and applying the brake to the drum 15 to hold the carrier and transferring the strain from the closing to the opening lines, the load is dumped. Then releasing the brake on drum 15 and paying out the opening and closing lines the carrier, with the grab hanging by its bail thereon, will travel down the track

under the influence of gravity to the point over the material from which the next load is to be taken. Reaching this point, the grab is released from the carrier and descends without substantial loss of time or cessation of movement on the part of the grab. The release of the grab from the carrier is effected thus: The brake is applied to the controlling-drum 15, checking the controlling-line 14 to stop the carrier; but the carrier will still move forward under gravity and its momentum to the length of the longitudinal movement permitted by the swing of the bar 16^d. This movement of the carrier permitted by the relative backward swing of the bar acts to set the pawl in the succeeding teeth of the ratchet-wheel 17^b. Then after the limit of such movement of the carrier is reached a strain is taken on the opening-lines 9 9^a, which operates to return the carrier slightly back up the incline, and in and by such movement the ratchet-wheel, through its described connections to the controlling-line 14, is turned by the pawl, as also the serrated disks 17^a 17^b, thus carrying the bail over the center of the disks and leaving the grab ready to descend for its load. When, however, a still more rapid action is desired, it may be effected thus: The carrier, with the grab hanging therefrom, is permitted to travel down the incline with velocity, whereby by the time the desired point is reached a considerable momentum will be gained both by the carrier and by the controlling-drum 15. Then as the desired point is reached by the carrier at its acquired momentum the brake is applied to the drum 7, carrying the opening-lines 9 9^a, whereby the movement of the carrier is checked; but the momentum of the carrier gives a strain upon said opening-lines tending to raise the bail from its seat and to that extent to relieve the disk from the weight of the grab. At the same time with this action of the carrier and grab the momentum acquired by the controlling-drum 15 will through the line 14 carry the swinging bar 16^d forward, and this movement acting through the connecting-bar 16^e upon the pawl will rotate the serrated disks and free the bail 18 entirely therefrom. In this case it is found that the friction of the controlling line and drum to be overcome as the carrier starts down the incline will be sufficient to set the pawl back on the ratchet in such position as to effect the proper rotation of the serrated disks and cause the release of the bail. In the last-described method of detaching the grab-bail from the carrier the movement from the beginning of the descent of the carrier down the incline to the descent of the grab, including its release from the carrier, is substantially a continuous movement. The movement is also substantially continuous when the loaded grab is elevated, for the bail enters and seats itself on the disk and the

carrier takes the load and moves up the track without any appreciable stoppage in the advance movement of the grab.

In case very heavy loads are to be carried and controlled the controlling-line 14 may require to be strengthened or the strain divided and taken by two parts of such line. To effect this, as shown in Figs. 1 and 2, sheaves 16 and 16^a are mounted upon the swinging arms 16^c and 16^b, respectively, and rigidly connected by the bar 16^d. Around said oppositely-disposed rigidly-connected swinging sheaves the ends of the line 14 are passed and carried back and secured to the frame of the cantaliver near the ends thereof, and the strain will be thus divided and taken upon the two parts of the line, the operation of the carrier and its operative parts remaining the same. It will be observed in this construction that when the carrier is traveling down the incline, the controlling-line being doubled, its speed will be double the speed of the carrier, giving to a controlling-drum 15 a very much higher velocity of rotation and consequent momentum than a single line.

The sheaves carrying the opening and closing lines of the grab instead of being arranged longitudinally on the carrier, as shown in Fig. 1 and Fig. 2, may be mounted abreast thereon, as shown in Fig. 8. When it is desired that the grab shall open parallel with the line of travel of the carrier, as shown in Fig. 8, instead of across such line, as shown in Fig. 1, the last-described arrangement is necessary in order that the points of suspension on the carrier shall be immediately over the respective lifting-points of connection of such lines on the grab when the grab is arranged to open parallel to the line of travel of the carrier.

As shown in Fig. 8, our improved apparatus is of very great advantage in removing that part of a cargo which lies under the covered part of the hold. To effect this, the grab is lowered through the hatchway. The carrier is then released and permitted to move up or down the track as may be necessary to carry the grab to the desired position in the hold, and the carrier being held by the controlling-drum brake, the grab closed, and the load taken the carrier is again moved to permit the grab to be drawn up through the hatchway. These movements of the carrier are very quickly and easily effected, being all under the control of the brake-levers.

It is sometimes desirable that the grab take its load from a cargo across the line of the hatchway instead of in line therewith. To do this, it is necessary to turn the grab after passing through the hatchway. In Fig. 9 is shown a very simple and effective device by which the grab is easily turned to the desired position. In said figure the grab is shown in solid lines as it hangs upon its opening-lines 9^a. A turning-line 21 has one end secured to the frame of the vessel at 21^b on one side

of the hatchway and at its other end is provided with a hook 21^a. As the grab hangs from its opening-lines under the hatchway the hook 21^a is caught on the opening-line on the farther side from the point where its end is secured to the vessel and the carrier is moved up the incline or to the left. The grab being under the restraint of the turning-line, such movement will cause it to turn on its lines to the position shown in dotted lines. The grab is then closed, the load taken, the hook 21^a released, and the grab raised by the closing-lines. As the grab is raised it will swing back to its position in solid lines to pass up through the hatchway.

Having thus fully described our improvements, what we claim as our invention, and desire to secure by Letters Patent, is—

1. A conveying apparatus, comprising in combination a cantaliver structure having a track or way thereon, a carrier mounted to travel along said track or way, actuating-drums mounted on said structure, a grab, two separate lines passing from said drums in the same direction to and over the carrier and connected to said grab, one of said lines effecting the closing of the grab and its raising or lowering when closed and the other positively effecting the opening of the grab and its raising or lowering when opened, and independent controlling mechanism adapted to arrest and hold the carrier at any desired point, substantially as set forth.

2. A conveying apparatus, comprising in combination a cantaliver structure having an inclined track or way thereon, a carrier mounted to travel along said track or way, actuating-drums mounted on said structure, a grab, two separate lines passing from said drums in the same direction to and over the carrier and connected to said grab, one of said lines effecting the closing of the grab and its raising or lowering when closed and the other positively effecting the opening of the grab and its raising or lowering when opened, and independent controlling mechanism adapted to arrest and hold the carrier at any desired point, substantially as set forth.

3. A conveying apparatus, comprising in combination a cantaliver structure having an inclined track or way thereon, a carrier mounted to travel along said track or way, actuating-drums mounted on said structure, a grab, two separate lines passing from said drums in the same direction to and over the carrier and connected to said grab, one of said lines effecting the closing of the grab and its raising or lowering when closed and the other positively effecting the opening of the grab and its raising or lowering when opened, a controlling-drum mounted upon said structure, a brake mechanism therefor, and a controlling-line frictionally engaging said drum and connected to said carrier, substantially as set forth.

4. A conveying apparatus, comprising in combination a cantaliver structure having an inclined track or way thereon, a carrier mounted to travel along said track or way, actuating-drums mounted on said structure, opening and closing lines passing from said drums in the same direction to and over the carrier, a grab suspended by said lines, a controlling-drum mounted upon said structure, a brake mechanism therefor, a pair of guide-sheaves mounted on said carrier adjacent the respective ends thereof, and a controlling-line frictionally engaging said drum and at its ends passing over said guide-sheaves and secured to the opposite ends of the inclined track or way, substantially as set forth.

5. In a conveying apparatus of the character described, the combination with a cantaliver structure having a track or way thereon and a carrier mounted to travel over said track or way, of a self-loading grab, actuating-drums mounted on said structure, opening and closing lines trained over said carrier and connected to said actuating-drums by which the grab is suspended, controlling mechanism for arresting the carrier at any desired point, and coöperating mechanism on said carrier and grab whereby said parts are automatically coupled when the grab is raised into engagement with the carrier and automatically uncoupled through the momentum of the operating parts at the end of the return travel of the carrier, substantially as set forth.

6. In a conveying apparatus of the character described, the combination with a cantaliver structure having a track or way thereon and a carrier mounted to travel over said track or way, of a self-loading grab provided with a bail and suspended from said carrier by opening and closing lines connected to actuating-drums on the cantaliver structure, controlling mechanism for arresting the carrier at any desired point, and mechanism on said carrier for automatically seating the bail of the grab in the carrier upon the elevation of the grab and unseating said bail from the carrier upon the descent of the grab, substantially as set forth.

7. In a conveying apparatus of the character described, the combination with a cantaliver structure having a track or way thereon and a carrier mounted to travel over said track or way, of a self-loading grab provided with a bail and suspended from said carrier by opening and closing lines connected to operating-drums on the cantaliver structure, a pivoted receiving device on the carrier for the bail of the grab, an actuating-bar for said receiving device pivotally suspended from the carrier and adapted to effect the unseating of the grab-bail, a controlling-drum on the cantaliver structure, a brake mechanism therefor, and a carrier-controlling line frictionally en-

gaging said drum and at its opposite ends connected to said actuating-bar on the carrier, substantially as set forth.

8. In a conveying apparatus of the character described, the combination with a cantaliver structure having a track or way thereon, of a carrier mounted to travel over said track or way, a self-loading grab, a pair of opening-lines therefor connected respectively to the opposite sides of said grab, a pair of guide-sheaves for said opening-lines mounted on the carrier at separated points substantially vertically over the points of connection of said lines to the grab, a pair of closing-lines for the grab, a pair of guide-sheaves therefor also mounted on the carrier at points substantially vertically over the points of connection of said closing-lines to the grab, and actuating-drums mounted on the cantaliver structure to which the opposite ends of said opening and closing lines are respectively connected, substantially as set forth.

9. In a conveying apparatus of the character described, the combination with a cantaliver structure having a track or way thereon, of a carrier mounted to travel over said track or way and provided with guide-sheaves for a pair of opening-lines disposed at longitudinally-separated points thereon, and another pair of guide-sheaves for the closing-lines also disposed at longitudinally-separated points thereon, actuating-drums mounted on the cantaliver structure, opening and closing lines extending from said drums over said opening and closing sheaves on the carrier, respectively, and a self-loading grab to which said opening and closing lines are connected at the sides thereof respectively which are vertically beneath their respective guide-sheaves on the carrier, substantially as set forth.

10. In a conveying apparatus for removing the cargo from a vessel, the combination with a grab having a pair of opening-lines secured to the opposite sides thereof, respectively, and also a pair of closing-lines similarly secured to the sides thereof, whereby the grab is lowered and raised through the hatchway, of means for swinging the grab to a position transverse of the hatchway, the same comprising a turning-line secured at one end to a fixed point on or near the hatchway and provided at its opposite end with a hook arranged to engage the remote side of the grab in such a manner that a continued movement of the grab longitudinally of the hatchway effects a turning or twisting of the grab, substantially as set forth.

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