

No. 619,374.

Patented Feb. 14, 1899.

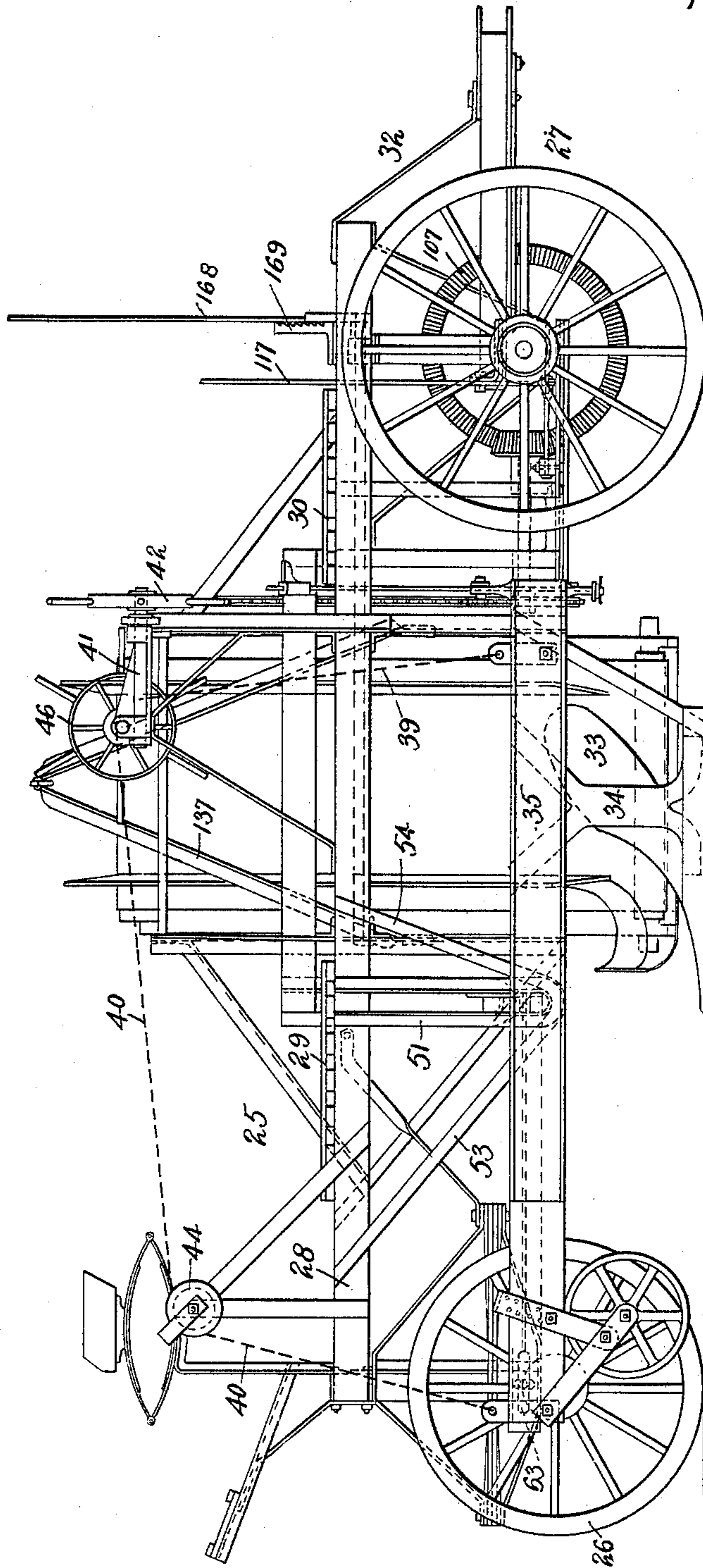
S. F. WELCH.  
ELEVATING GRADER.

(Application filed Apr. 2, 1897.)

(No Model.)

7 Sheets—Sheet 1.

Fig. 1.



Witnesses  
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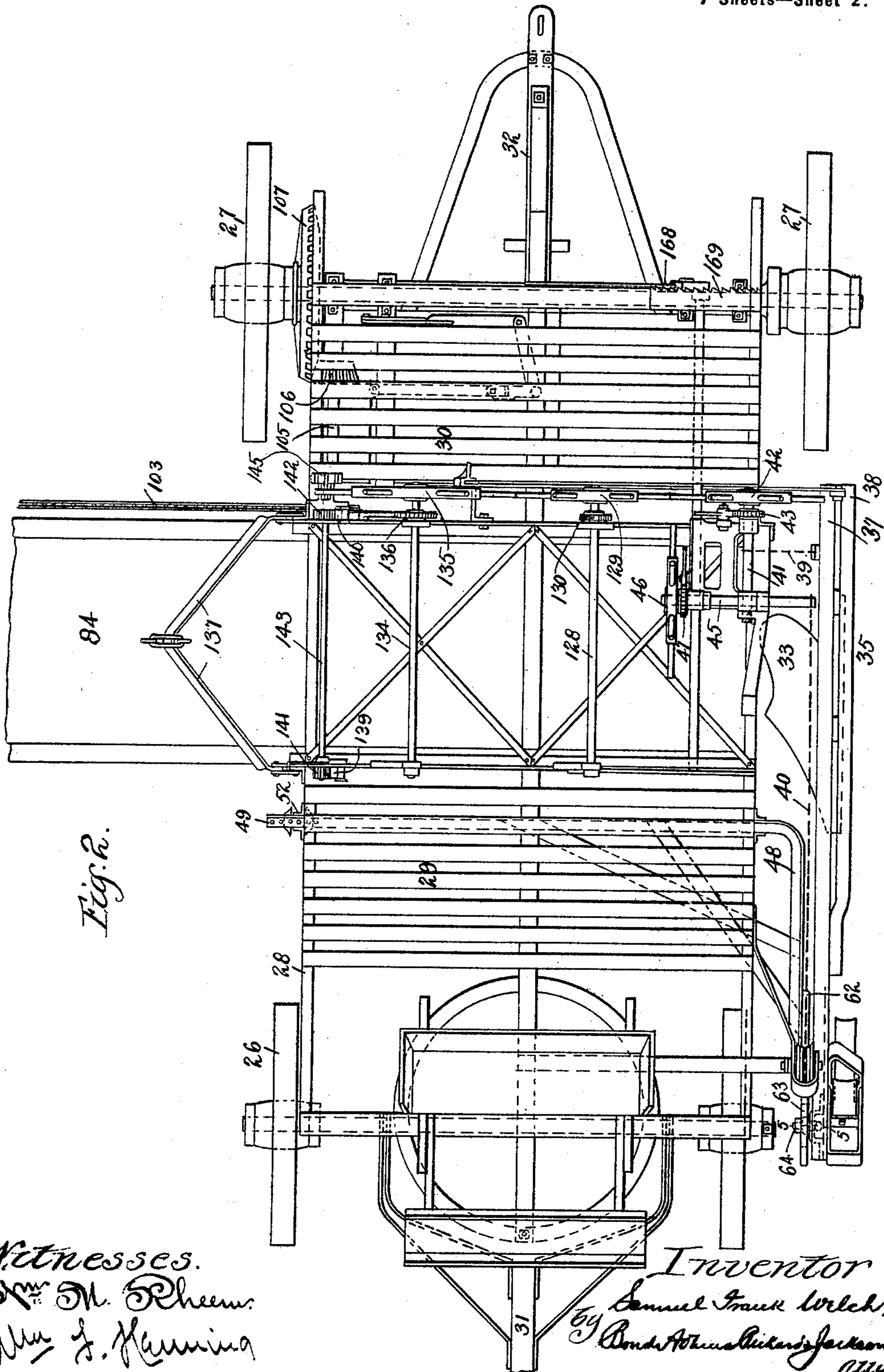
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7 Sheets—Sheet 2.



Witnesses.  
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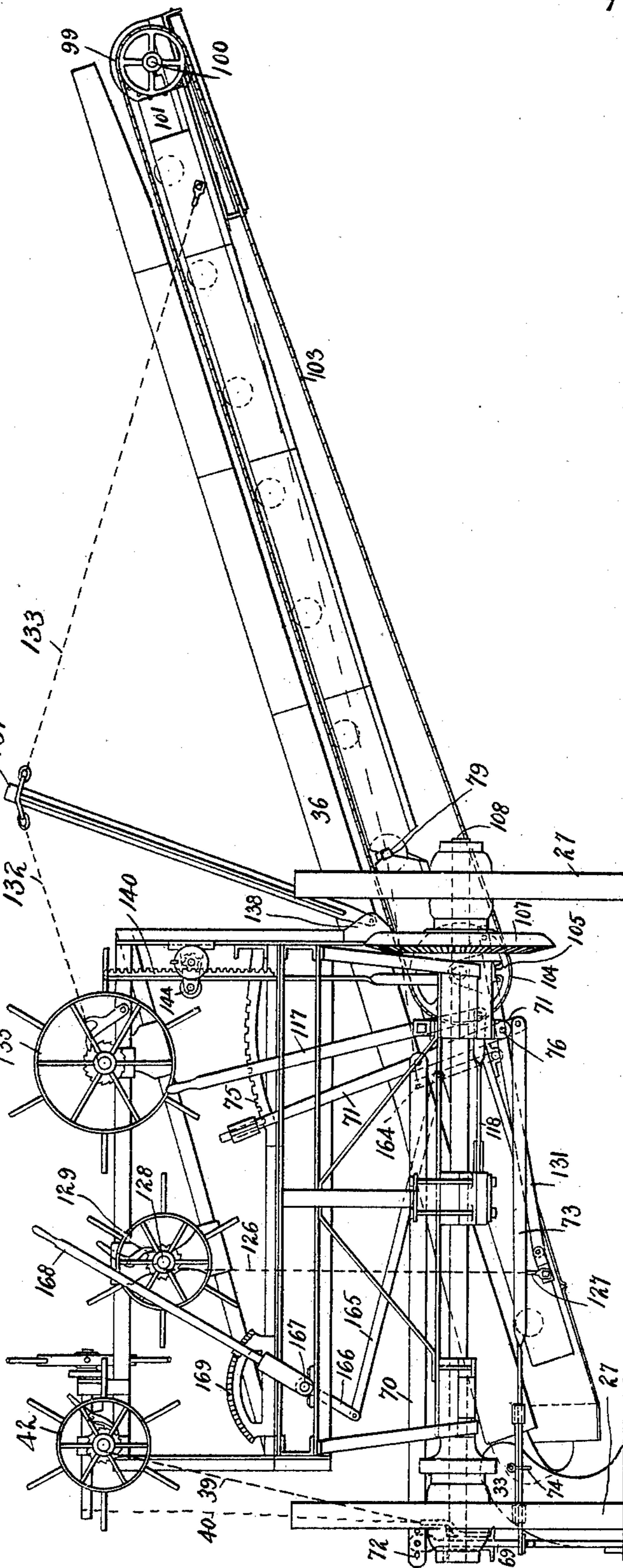
S. F. WELCH.  
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(No Model.)

7 Sheets—Sheet 3.

Fig. 3.



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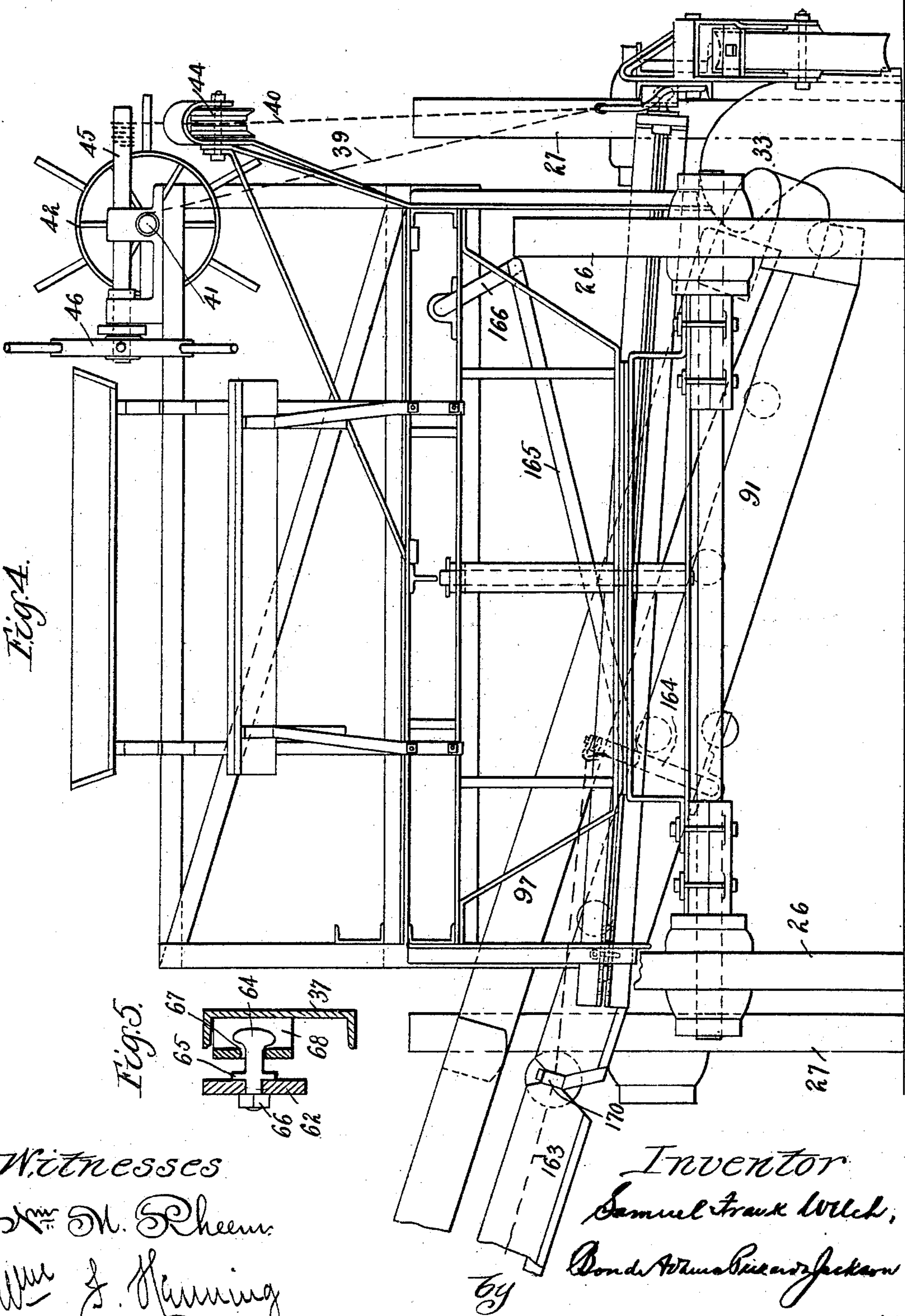
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(Application filed Apr. 2, 1897.)

(No Model.)

7 Sheets—Sheet 4.



Witnesses  
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**No. 619,374.**

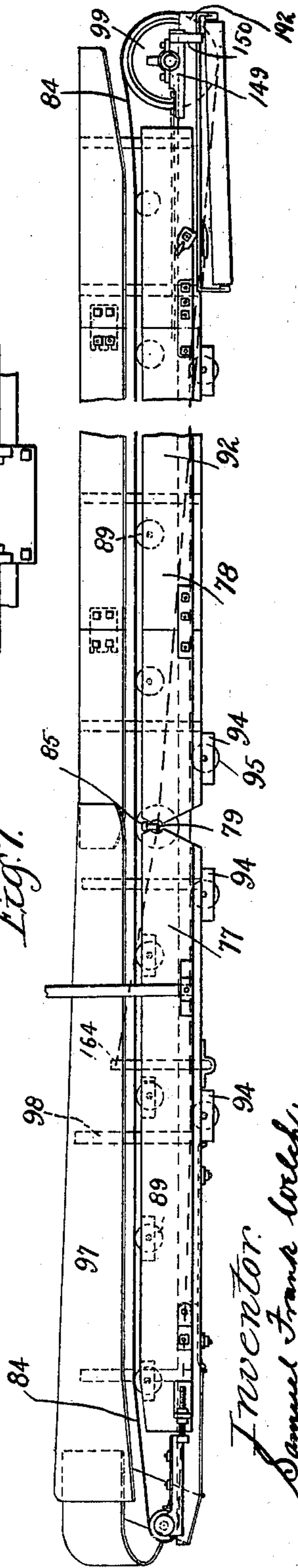
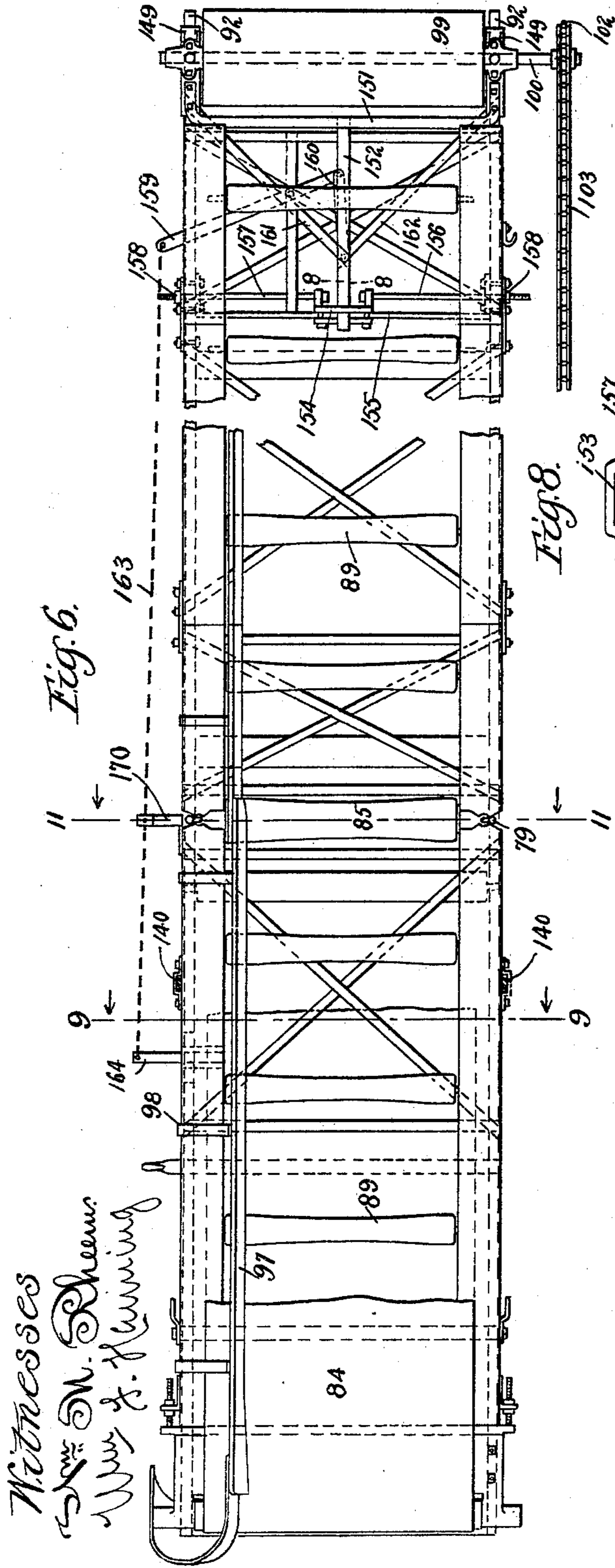
**Patented Feb. 14, 1899.**

**S. F. WELCH.**  
**ELEVATING GRADER.**

(Application filed Apr. 2, 1897.)

(No Model.)

**7 Sheets—Sheet 5.**



Witnesses  
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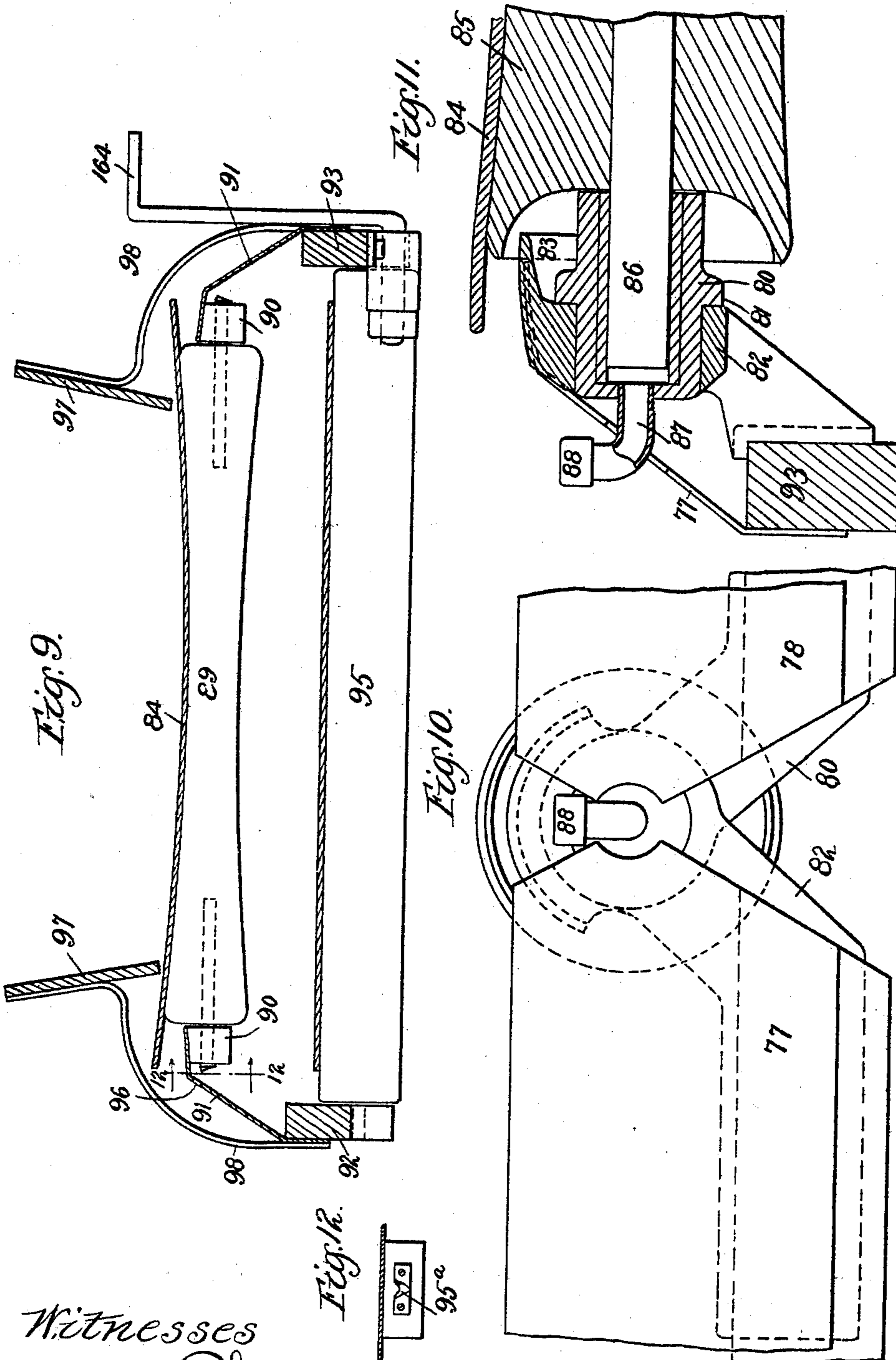
Patented Feb. 14, 1899.

S. F. WELCH.  
ELEVATING GRADER.

(Application filed Apr. 2, 1897.)

(No Model.)

7 Sheets—Sheet 6.



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(Application filed Apr. 2, 1897.)

(No Model.)

7 Sheets—Sheet 7.

Fig. 13.

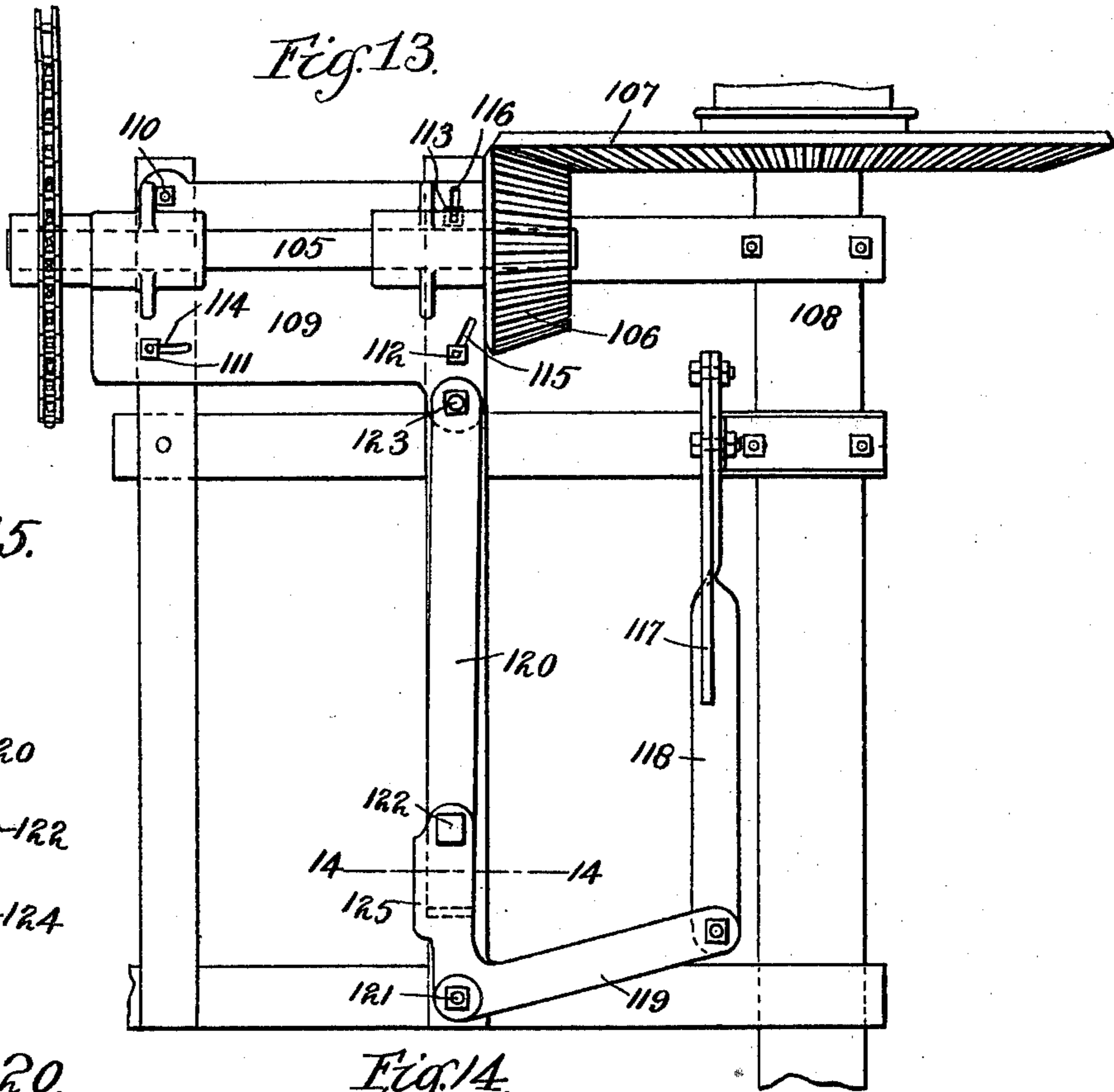


Fig. 15.

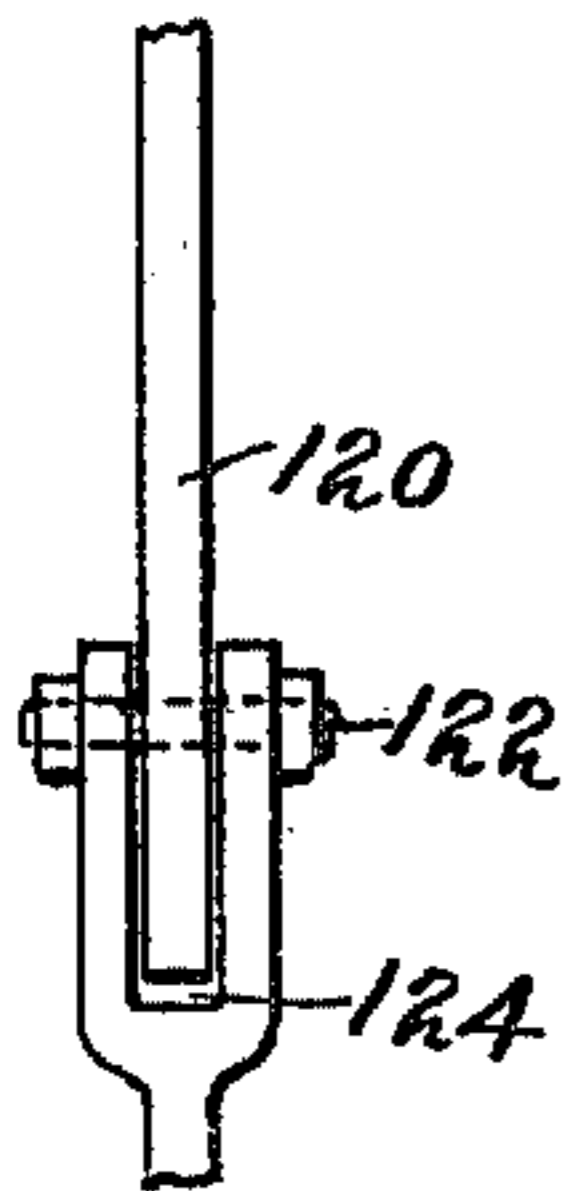


Fig. 20.

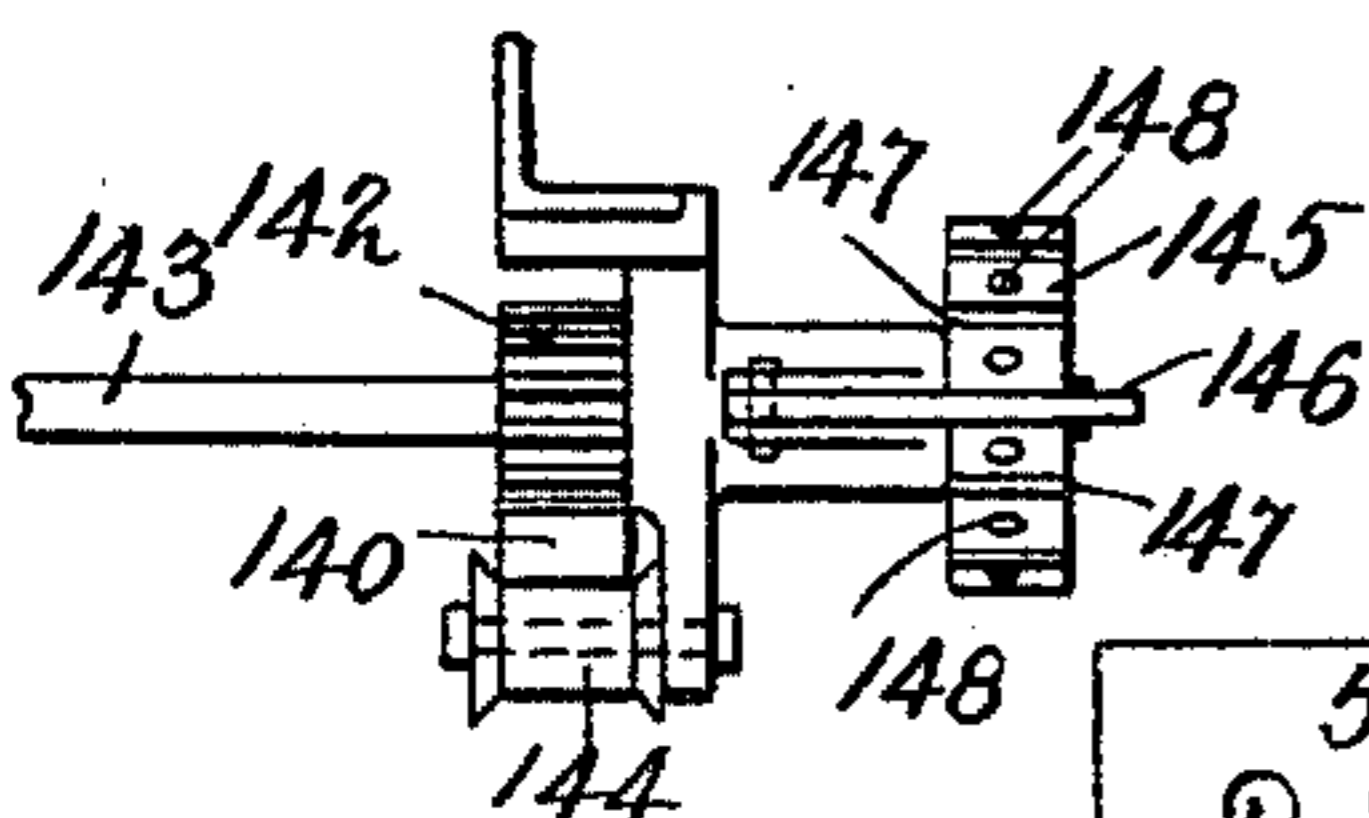


Fig. 14.



Fig. 17.

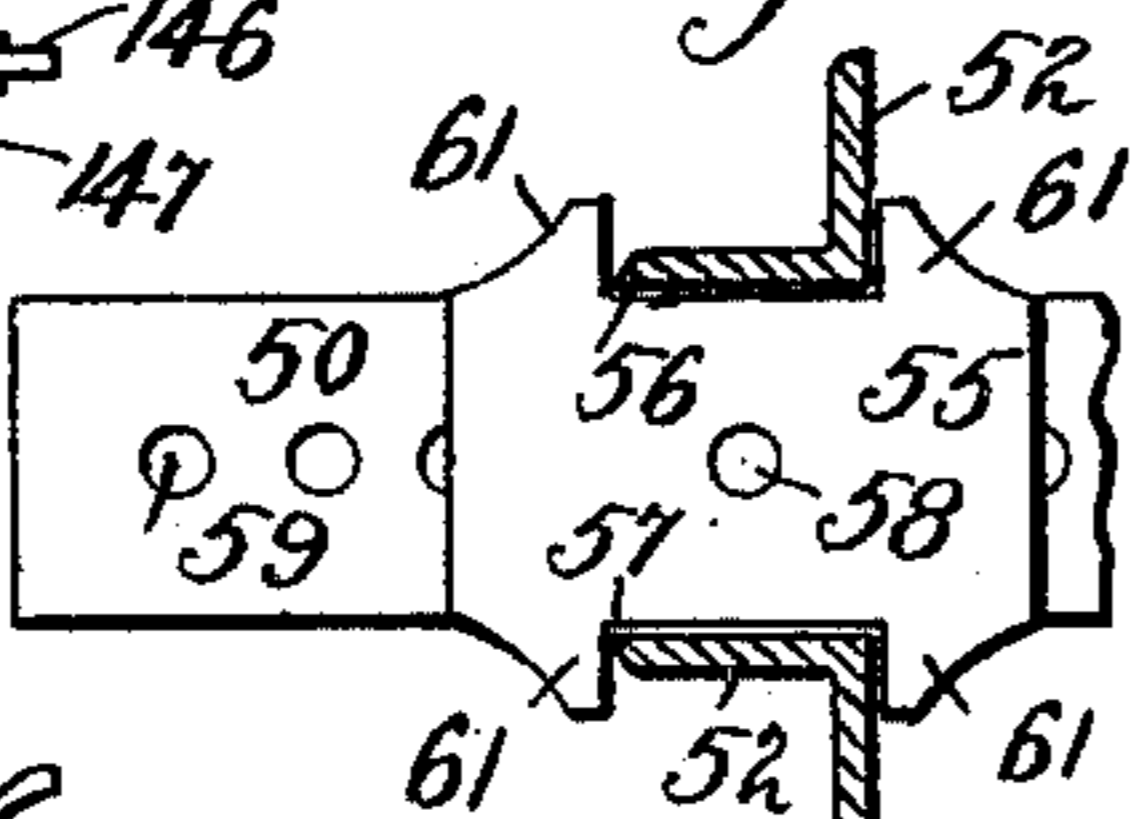


Fig. 18.

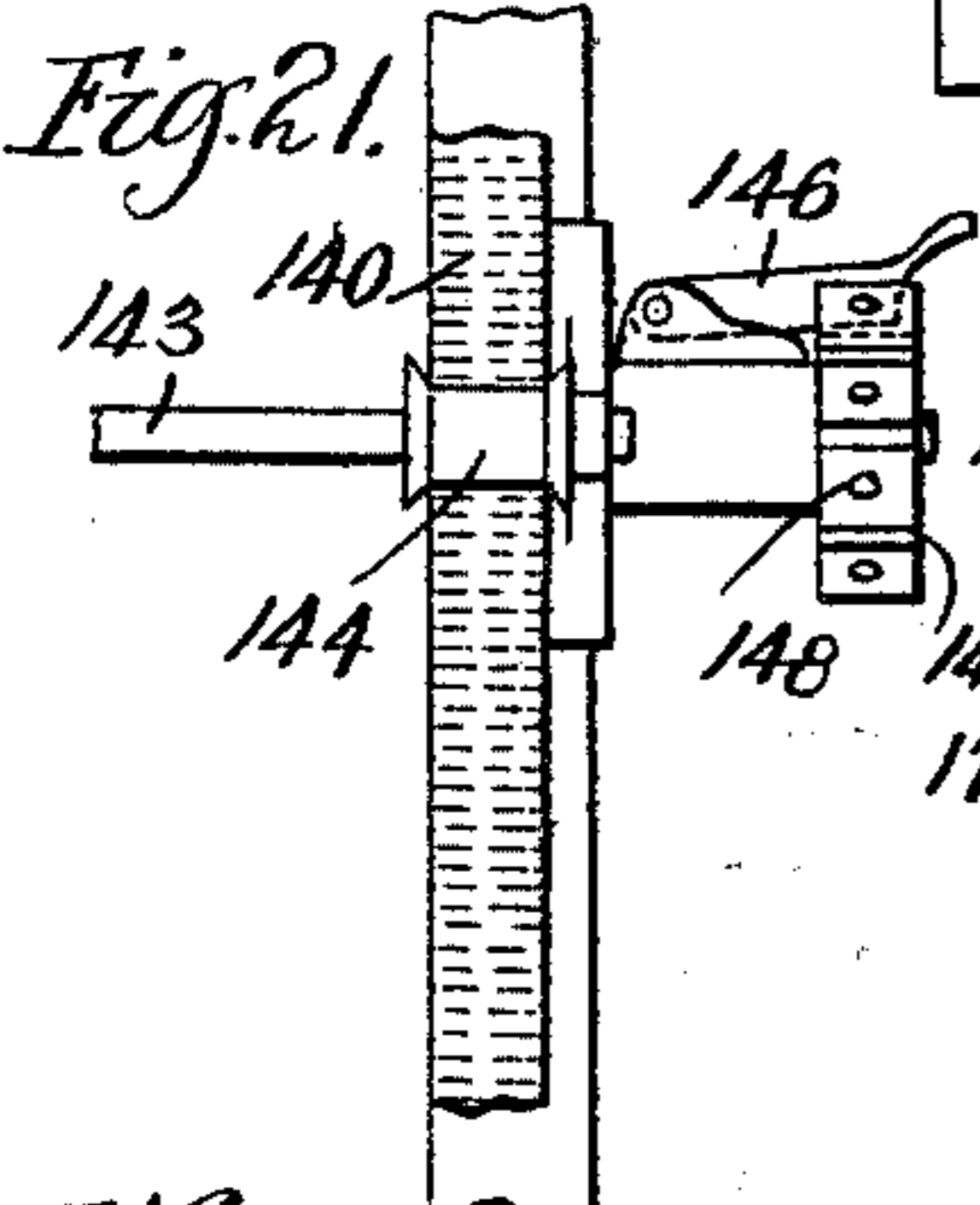
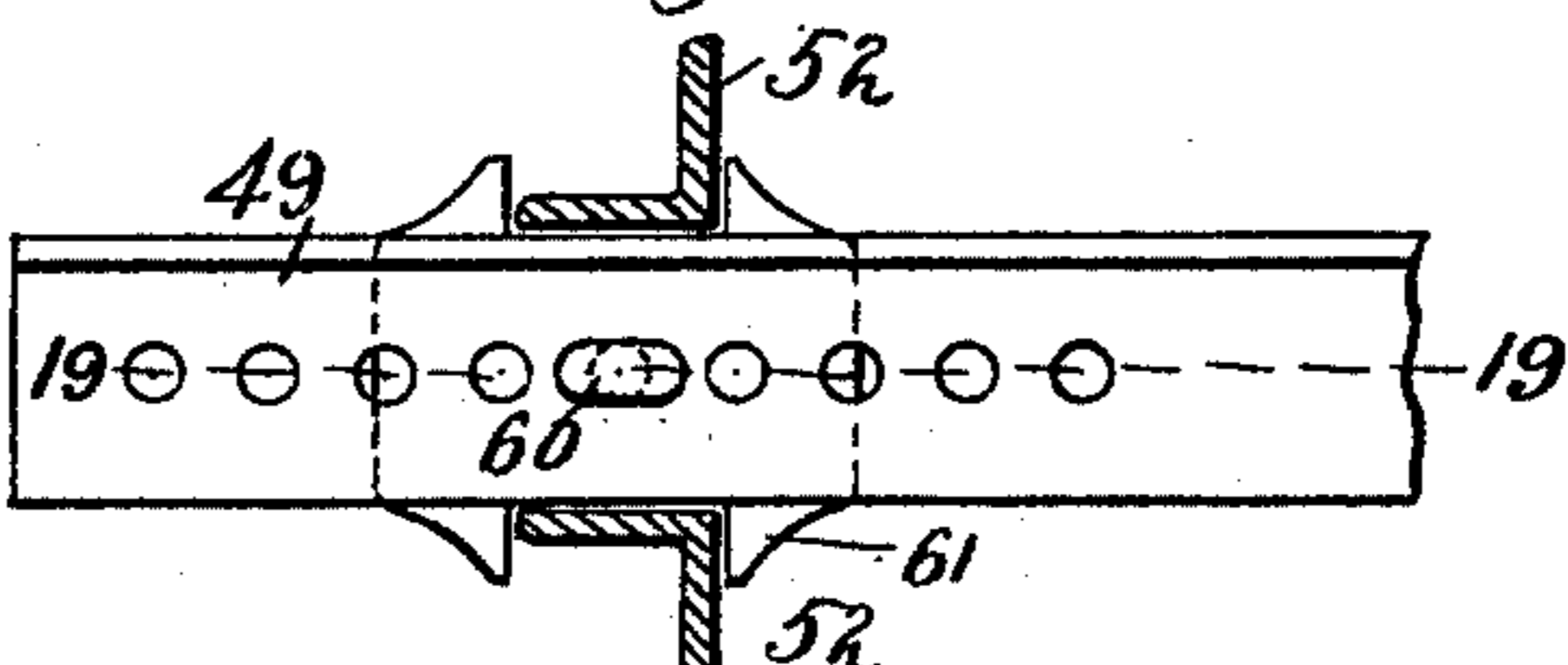


Fig. 16.

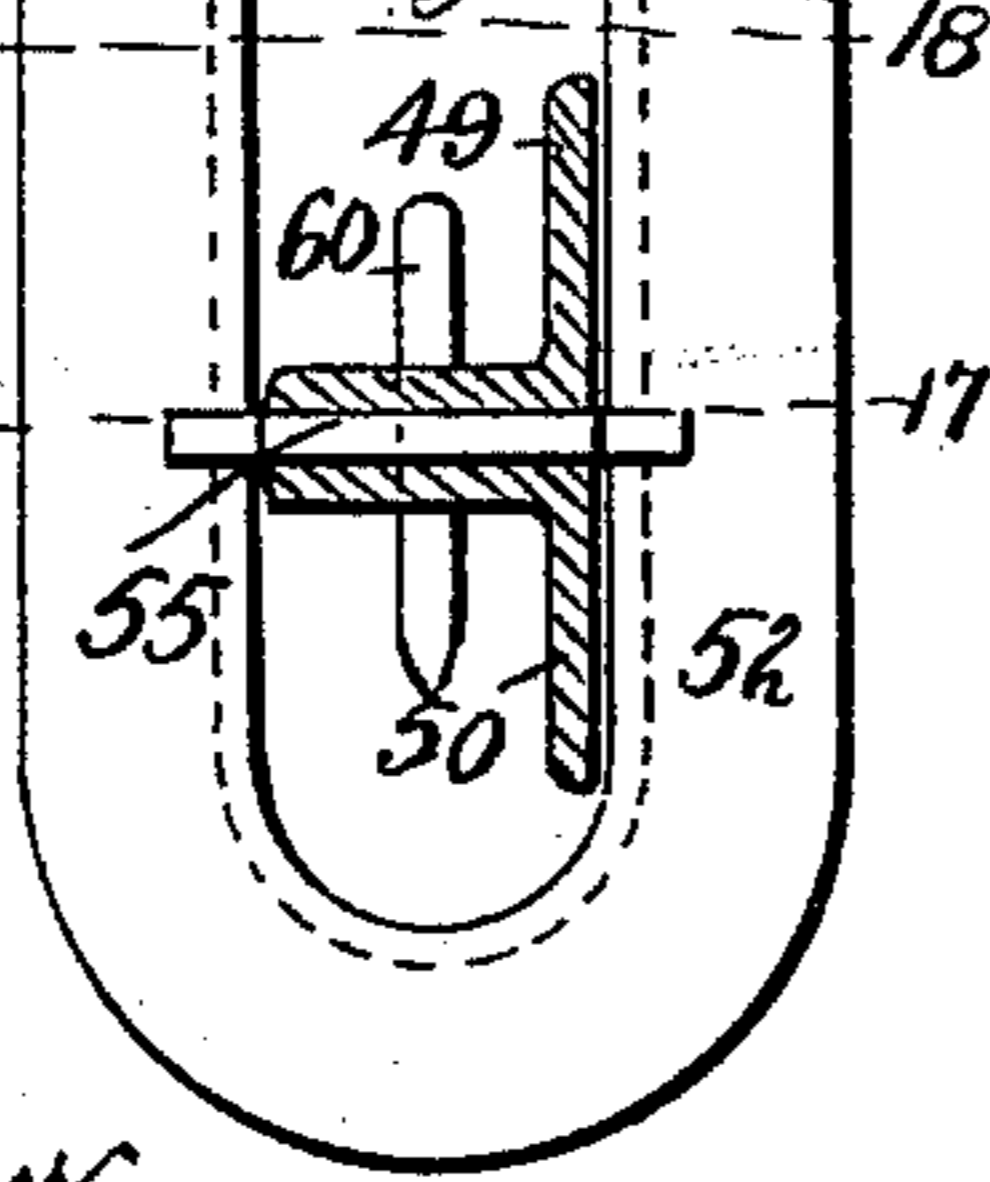
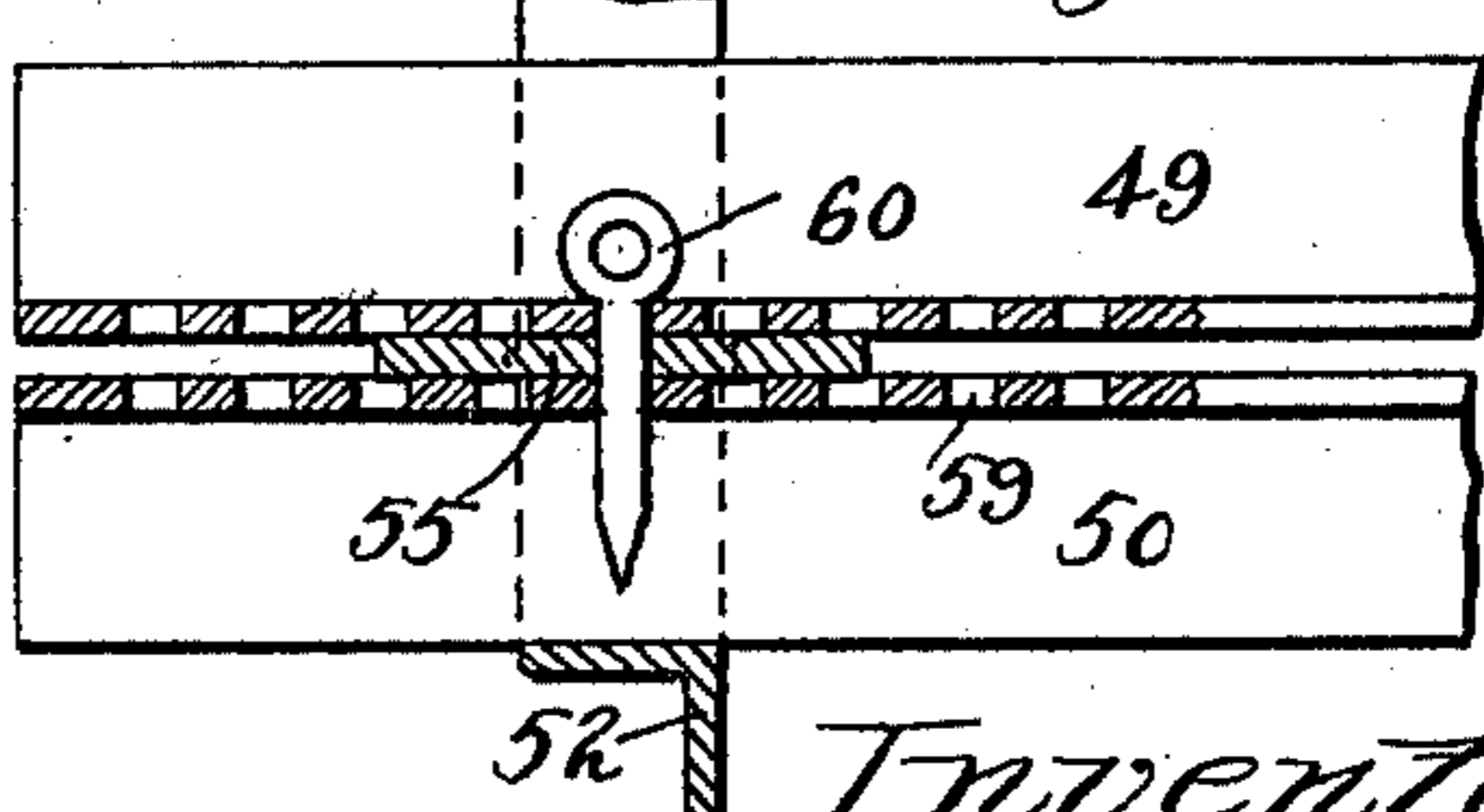


Fig. 19.



Witnesses.

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# UNITED STATES PATENT OFFICE.

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## ELEVATING-GRADER.

SPECIFICATION forming part of Letters Patent No. 619,374, dated February 14, 1899.

Application filed April 2, 1897. Serial No. 630,462. (No model.)

*To all whom it may concern:*

Be it known that I, SAMUEL FRANK WELCH, a citizen of the United States, residing in Aurora, in the county of Kane and State of Illinois, have invented certain new and useful Improvements in Elevating-Graders, of which the following is a specification.

My invention relates to road-making machines of the class commonly known as "elevating-graders," such machines consisting in general of a suitable carriage carrying a furrow-opener and having elevating apparatus arranged to receive the dirt from the furrow-opener and carry it off a suitable distance from the machine and deposit it at one side thereof, in road-making, for example, the dirt being delivered by the machine either in a ditch at one side of the road or piled up in the form of an embankment beside the road, the operation of the machine in ditch-making being substantially the same as that last referred to.

The object of my present invention is to provide certain improvements in machines of this type.

My invention consists, in the first place, in providing improved means for adjusting the plow or furrow-opener with reference to the elevator so that the dirt will be thrown properly upon the apron of the elevator, such adjustment being necessary owing to the fact that different kinds of soil are thrown differently by the plow, and consequently if the relative position of the plow and elevator were fixed the machine would not operate equally well with different kinds of soil.

My invention further contemplates improved means for securing vertical adjustments of the elevator and so arranging the adjusting apparatus that they will all be fully within the control of the operator.

My invention further consists in improved means for rocking or oscillating the plow, such adjustment being to permit the plow to attack the soil at different angles.

My invention further consists in improved means for securing lateral adjustments of the plow and for holding it rigidly in all such adjustments.

My invention further contemplates certain

improvements in the elevator-frame by which the tension of the belt or apron may be properly regulated; also, improved means for preventing dirt from gaining access to the elevator pulleys or rollers; also, certain improved devices for adjusting the upper portion of the elevator without affecting the lower portion thereof.

Finally my invention consists in certain specific improvements in the construction and operation of machines of this class, which will be hereinafter pointed out.

Referring to the drawings, Figure 1 is a side elevation. Fig. 2 is a plan view. Fig. 3 is a rear elevation. Fig. 4 is a front elevation. Fig. 5 is an enlarged detail, being a cross-section on line 5 5 of Fig. 2. Fig. 6 is a plan view of the elevator, part being broken away. Fig. 7 is an edge view of the same. Fig. 8 is a view of part of the elevator on line 8 8 of Fig. 6, looking to the left. Fig. 9 is an enlarged detail, being a cross-section of the elevator on line 9 9 of Fig. 6. Fig. 10 is an enlarged detail, being a side view of the hinged joint of the elevator. Fig. 11 is an enlarged detail, being a partial cross-section of the elevator on line 11 11 of Fig. 6. Fig. 12 is a cross-section on line 12 12 of Fig. 9. Fig. 13 is an enlarged detail, being a plan view of part of the driving mechanism, showing the apparatus for throwing the driving-gears into and out of mesh with each other. Fig. 14 is a cross-section on line 14 14 of Fig. 13. Fig. 15 is an edge view of the parts shown in Fig. 14. Fig. 16 is an enlarged detail showing the draft-frame in section and one of the U-shaped guides therefor. Fig. 17 is a cross-section on line 17 17 of Fig. 16. Fig. 18 is a cross-section on line 18 18 of Fig. 16. Fig. 19 is a longitudinal section on line 19 19 of Fig. 18. Figs. 20 and 21 are plan and side views, respectively, of the devices for adjusting the elevator near the hinged joint thereof and for locking the same in its various positions.

As shown in the drawings, 25 indicates a carriage having front wheels 26 and rear wheels 27.

28 indicates the frame of the carriage, which carries front and rear platforms 29 30, respectively, for the use of the operators.

31 32 indicate front and rear tongues.

33 indicates the plow, which is secured by its standard 34 between the members of a beam 35, suspended from the frame 28 of the machine.

36 indicates an elevator, which, as best shown in Figs. 3 and 4, has its lower end arranged in juxtaposition to the moldboard of the plow and extends from that point transversely across the machine and terminates at a distance from the machine, at one side thereof.

As has hereinbefore been suggested, the plow has various adjustments—to wit, longitudinal, vertical, lateral, and oscillatory—such adjustments being secured as follows: The plow-beam 35, which, as shown in Figs. 2 and 3, is composed of a long channel-beam 37 and a shorter channel-beam 38, secured together at their ends, is suspended from the frame of the machine by flexible connections, preferably chains 39 40, connected to its rear and front ends, respectively. The rear chain 39 is connected to a shaft 41, mounted in suitable bearings near the rear platform 30 and provided with a hand-wheel 42, by which it may be rotated, and with ratchet-and-pawl mechanism 43 for preventing reverse rotation, as best shown in Fig. 2. The front chain 40 passes over a sheave 44, suitably supported by the frame of the machine, as shown in Fig. 1, and thence to a shaft 45, to which it is secured, said shaft being arranged at right angles to the shaft 41 and in juxtaposition thereto, as shown in Fig. 2. The shaft 45 is also provided with a hand-wheel 46 and with pawl-and-ratchet mechanism 47. By this arrangement the mechanism for vertically adjusting the plow-beam at both ends is within easy reach of a single operator, and the hand-wheels may be operated either simultaneously or separately, as it will be evident that should the operator desire to raise or lower the plow-beam uniformly both hand-wheels would be simultaneously rotated, whereas should he desire to raise or lower one end of the beam alone this may be accomplished by rotating the corresponding hand-wheel.

The motion of the carriage is communicated to the plow-beam by means of a draft-frame 48, which also serves to brace the beam against lateral pressure, as will hereinafter appear.

As shown in Fig. 2, the draft-frame 48 is of bell-crank form and is composed of two angle-bars 49 50, as best shown in Figs. 16 to 19. The draft-frame is secured to the frame of the machine by means of two U-shaped braces or guides 51 52, which, as herein shown, are each composed of an angle-bar bent into the shape stated. Said braces 51 52 are connected at their upper ends to the frame 28 of the machine and extend downward therefrom, being braced by suitable braces 53 54. The draft-frame is held against moving transversely of the machine by means of a lock-plate 55, which is provided with grooves 56 57 at its opposite sides to fit the opposite sides

of the brace 52 and is adapted to be secured to the members of the draft-frame 49 50, an eye 58 being provided in said plate 55, which is adapted to register with eyes 59 in the members 49 50 of the draft-frame, so that a pin 60 may serve to lock the lock-plate and the draft-frame together, as shown in Figs. 16 and 19. It will be apparent that by this construction when the lock-plate 55 is locked to the draft-frame, as shown, movement of said frame transversely of the machine will be prevented by reason of the fact that the shoulders 61 of the lock-plate engaging the brace 52 will prevent transverse movement of said plate, and consequently of the draft-frame. Vertical movement of the draft-frame will not, however, be interfered with. In order to adjust the draft-frame transversely of the machine, all that it is necessary to do is to remove the pin 60 and place it in some other of the eyes 59.

As shown in Fig. 2, the forward end of the draft-frame 48 extends substantially parallel with the plow-beam and terminates near the forward end thereof, at which point said draft-frame has secured to it a plate 62, which lies parallel with and adjacent to the plow-beam. Said plate 62 is provided with a slot 63, in which slot is secured a T-bolt 64. The bolt 64 is provided with a shoulder or collar 65, adapted to abut against the plate 62, so that by screwing a nut 66 upon the end of the bolt, upon the opposite side of the plate from the collar 65, said bolt may be firmly secured to said plate. Said bolt being fitted in the slot 63, it may be adjusted longitudinally of the plate 62 as desired. The head of the bolt 64 is adapted, when turned to the proper position, to pass through an oval slot 67 in a plate 68, which is U-shaped and is secured to the member 37 of the plow-beam, as shown in Fig. 5. After the head of the bolt 64 has passed through the slot 67 by turning it upon its axis through ninety degrees it cannot be withdrawn, and by then securing the bolt in that position by means of the nut 66 the draft-frame and plow-beam will be secured together. The slot 67 is made slightly larger than the bolt 64, so that oscillatory adjustment of the plow-beam (to be hereinafter described) will not be prevented.

From the foregoing description it will be evident that if it be desired to adjust the plow-beam longitudinally by loosening the nut 66 upon the bolt 64 the plow-beam may be moved backward or forward within the limit of the slot 63 and may be secured in its adjusted position by tightening the nut 66 upon its bolt. The slot 63 need not be of great length, as the longitudinal adjustment of the plow which is necessary is never very great.

The adjustment of the draft-frame 48 transversely of the machine has already been described, and as such draft-frame is connected to the plow-beam by adjusting the draft-frame transversely of the machine, as described, the front end of the plow-beam may

be adjusted laterally. The rear end of the plow-beam is adjusted laterally by means of a bar 69, secured to the rear end of the plow-beam, as shown in Fig. 3, and extending beyond the upper and lower surfaces of said beam. The upper end of said bar 69 is connected to a connecting-rod 70, which connects with the upper portion of a hand-lever 71, pivoted between its ends upon a suitable support. Said connecting-rod 70 is provided with a series of adjusting-holes 72, by which the point at which said connecting-rod is connected to the bar 69 may be varied. The lower end of the bar 69 is connected to a connecting-rod 73, which connects with the lower end of the lever 71, as shown in Fig. 3. The connecting-rod 73 is adjustable in length, being composed of two parts connected by a pin 74, as shown Fig. 3, and provided with suitable adjusting-holes, so that the length of said rod may be varied as desired.

75 indicates a segmental rack by which the lever 71 may be locked in its different positions. It will be apparent that by adjusting the point at which the bar 69 is connected to the connecting-rod 70 and extending or reducing the length of the connecting-rod 73 correspondingly the rear end of the plow-beam may be moved away from or toward the frame of the machine, as desired. For this purpose the lever 71 is not operated.

The oscillatory adjustment of the plow-beam is effected by means of the apparatus just described, the lever 71 being operated for this purpose. As already stated, the lever 71 is pivoted between its ends, and consequently when it is rocked about its pivot 76 the connecting-rods 70 73 will be moved in opposite directions, rocking or oscillating the plow-beam, the forward end of the plow-beam rocking upon the bolt 64. When the plow-beam has been rocked to the desired angle, it may be secured in such position by means of the segmental rack 75, which locks the lever in its adjusted position.

The elevator 36 is made in two sections 77 78, pivoted together by a hinged joint 79. (Best shown in Figs. 7, 10, and 11.) As shown in Figs. 10 and 11, the upper section 78 of the elevator is provided at opposite sides with journals 80, having shoulders 81, which journals receive sleeves 82, carried by the section 77 of the elevator, thus forming a hinged joint, permitting of angular adjustment of the sections of the elevator with reference to each other. The inner portions of the sleeves 82 extend inward over the shoulders 81, forming flanges 83, as shown in Fig. 11. The object of this arrangement is to protect the bearings from dirt which may drop from the belt or apron 84 of the elevator. A roller 85 is provided at the hinge of the elevator, said roller being provided with journals 86, fitted in a bearing within the journal 80 of the upper section of the elevator, as shown in Fig. 11, and the ends of the roller 85 are made concave to receive the flanges 83, thus in-

creasing the protection of the bearings from dirt.

87 indicates an oil-duct, which is adapted to conduct oil to the bearing of the journal 86. Said oil-duct is provided with a suitable cap 88.

As shown in Figs. 3 and 7, the elevator belt or apron 84 is endless, and the upper portion thereof extends over a series of rollers 89, mounted in bearing-blocks 90, which are secured by plates 91 to the side pieces 92 93 of the elevator, as shown in Fig. 9. The side pieces 92 93 also carry bearing-blocks 94, in which are journaled rollers 95, over which the lower portion of the belt runs. The bearing-blocks of the rollers 89 are provided with oil-cups 95<sup>a</sup> at their ends, and the plates 91 are provided with orifices 96 opposite the oil-cups 95<sup>a</sup> to permit access to said cups. As shown in Fig. 9, the orifices 96 are formed in the inclined portion of the plates 91 and are not in the same vertical plane with the cups 95<sup>a</sup>. The consequence is that should dirt drop through the orifices 96 it will not fall into the oil-cups which are thus protected.

97 indicates the side members of the elevator, which are secured to the side pieces 92 by bars 98, as shown in Fig. 9.

The belt 84 at its upper end passes around an enlarged pulley 99, mounted upon a suitable shaft 100 in an extensible frame 101, arranged at the upper end of the elevator, as will be hereinafter described.

The shaft 100 carries a sprocket-wheel 102, connected by a link belt 103 with a sprocket-wheel 104, mounted upon a shaft 105, journaled in the frame of the machine, as best shown in Fig. 13. The shaft 105 carries at one end a beveled pinion 106, which meshes with a beveled gear 107, mounted upon the rear axle 108, as shown in Figs. 3 and 13. When the gears 106 107 are in mesh, therefore, the link belt 103 will be driven by the movement of the machine, and consequently the elevator-belt will be driven. In order that the belt may be thrown out of operation when desired, the shaft 105 is adjustably mounted, so that it may be moved sufficiently to throw the gear 106 out of mesh with the gear 107, and for this purpose said shaft 105 is mounted upon a plate 109, which is pivoted to the frame of the machine upon a pivot 110, as shown in Fig. 13. Said plate 109 is held in position by bolts 111 112 113, secured to the frame of the machine and passing through slots 114 115 116, respectively, said slots being arranged to permit a limited motion of the plate 109 about its pivot 110, such motion being sufficient, however, to throw the gear 106 out of mesh with the gear 107. The plate 109 is rocked for the purpose stated by means of a hand-lever 117, which is pivoted upon the machine and is connected by a connecting-rod 118 with one arm of a bell-crank lever 119, the other arm of said lever being connected to the plate 109 by a connecting-rod 120. The connecting-rod 120 is

normally substantially in line with the arm of the bell-crank lever 119 to which it is connected, and by rocking the lever 117 to throw the connecting-rod 120 out of line with said arm of the bell-crank lever the plate 109 will be moved upon its pivot, throwing the beveled pinion 106 out of mesh with the gear 107. By moving the lever 117 in the opposite direction said gears may be moved into mesh with each other.

The pivot 121 of the bell-crank lever, the pin 122, by which said lever is connected to the connecting-rod 120, and the pin 123, by which said connecting-rod 120 is connected to the plate 109, are arranged so that when the gears 106 107 are in mesh with each other the pin 122 will be slightly out of line with the pivot 121 and the pin 123, thus locking the gears in mesh.

As shown in Fig. 15, the connecting-rod 120 is fitted into a slot 124 in the arm of the bell-crank lever, such slot being provided with a closed side 125 to act as a stop to limit the inward movement of the end of the connecting-rod 120. Therefore when the parts are in the position shown in Fig. 13 the lever 117 may be moved in one direction only, such direction being that by which the gears 106 107 are thrown out of mesh with each other.

The elevator is supported from the frame of the machine at three points—to wit, near its lower end, at a point a short distance below the hinged joint, and at its upper end.

The lower end of the elevator is supported by flexible connections, such as chains 126, such chains being connected to hooks 127, carried by the elevator, and to a shaft 128, mounted upon the frame, as shown in Figs. 2 and 3. The shaft 128 carries a hand-wheel 129, by which it may be rotated, and pawl-and-ratchet mechanism 130 for locking it against reverse rotation. The hand-wheel 129 is arranged conveniently to the platform 30, so that it may be readily manipulated by the operator. A link 131, which is connected at one end to the elevator, preferably near the hook 127, and at the other end to a stationary portion of the frame of the machine, serves to prevent the elevator from swinging laterally out of position when raised or lowered. By this construction the elevator when raised or lowered moves in the arc of a circle of slight curvature.

The upper end of the elevator is supported by flexible connections, such as chains 132 133. The chains 132 are connected at one end to a shaft 134, similar to the shaft 128, and carrying a hand-wheel 135 and pawl-and-ratchet mechanism 136. At their other ends the chains 132 are connected to an arch 137, which is pivoted to a suitable support 138 on the frame of the machine, at one side thereof, as shown in Figs. 2 and 3. The chains 133 are also connected to the arch 137 and are connected at their other ends to the upper portion of the elevator. The arch 137 thus serves as a bridge, by means of which tension

applied to the chains 132 will be exerted in an upward direction upon the outer end of the elevator.

The elevator is supported intermediately by rack-bars 139 140, one at each side thereof, the lower ends of which rack-bars are connected to the sides of the elevator-frame a short distance below the hinged joint, as shown in Fig. 3. The upper ends of said rack-bars mesh with pinions 141 142, respectively, which are mounted upon the ends of a shaft 143, suitably supported in the frame of the machine, as shown in Figs. 2 and 3. Rollers 144, which bear against the back of the rack-bars 139 140, serve to hold said rack-bars in mesh with their respective pinions. The rack-bars 139 140 may be locked at different heights by locking mechanism which locks the pinions 141 142, with which they mesh respectively, against rotation. Such locking apparatus consists of a disk 145, which is mounted upon the shaft 143 and keyed thereto, and a dog 146, which is pivoted upon a stationary portion of the machine and is adapted to engage notches 147, with which the periphery of the disk 145 is provided, as best shown in Fig. 20. It will be evident that when the dog 146 rests in one of the notches 147 the disk 145 cannot be rotated, and consequently the shaft 143 and pinions 141 142 cannot be rotated, thus locking the racks 139 140 in position. The racks 139 140 are moved upward to raise the elevator by rotating the disk 145, which may be accomplished by inserting a lever in any one of a series of holes 148 in the periphery of the disk 145, as shown in Fig. 20.

By supporting the elevator at three points in the manner described the lower section thereof may be adjusted to the desired position to correspond with the arrangement of the plow, and such adjustment may be made entirely independently of the upper section of the elevator. Furthermore, the upper section may be adjusted independently of the lower section—an arrangement which is often advantageous. The racks 139 140, being rigid and being locked against upward as well as downward movement, serve also to hold the lower section of the elevator against upward movement.

For the purpose of regulating the tension of the belt or apron 84 the pulley 99 is arranged to be adjusted longitudinally of the elevator and also angularly thereto. To this end the shaft 100, which supports said pulley, is mounted in bearing-boxes 149, which are fitted upon the ends of the side pieces 92 of the frame of the elevator and are secured thereto by clips 150, as shown in Figs. 6 and 7. The boxes 149 fit loosely upon the side pieces 92, so that the pulley 99 may be adjusted angularly with reference to the frame to a slight extent. The boxes 149 at opposite sides of the elevator are connected by a cross-bar 151, and said cross-bar is provided with a stem 152, which is connected centrally thereto and

extends backward substantially parallel with the sides of the elevator, as shown in Fig. 6. The rear end of the stem 152 passes through a slot 153 in a box 154, which is supported by 5 and movable upon a bar 155, which extends transversely of the elevator and is secured to the side pieces thereof. By moving the box 154 upon the bar 155 the shaft 100 may be moved slightly to vary the angular position 10 of the pulley 99 with reference to the sides of the elevator, the object of which is to provide for regulating the tension at the two edges of the belt.

For adjusting the box 154 rods 156 157 are 15 provided, which are connected at their inner ends to said box and at their outer ends to the side pieces 92 of the elevator. As shown in Fig. 6, the outer ends of the rods 156 157 pass through the side pieces of the elevator and 20 are provided with nuts 158, by which they are held in position and their adjustment is provided for.

The pulley 99 may be moved lengthwise of the elevator by means of a lever 159, which 25 is fulcrumed upon the stationary portion of the elevator and is connected at its inner end by a link 160 to bars 161 162, the latter being connected to the boxes 149, as shown in Fig. 6. By rocking the lever 159, therefore, the 30 pulley may be moved backward or forward, the stem 152 moving in the slot 153. The lever 159 is adapted to be operated from the platform of the machine by means of a flexible connection, such as a chain 163, one end 35 being connected to the lever 159 and the other end being connected to a lever 164, suitably pivoted upon the lower portion of the elevator, as shown in Fig. 4. In order that the length of the chain 163 may not vary with the 40 adjustment of the height of the outer section of the elevator, said chain is passed through a guide 170, arranged in line with the center, about which the outer section of the elevator swings when being adjusted.

The lever 164 is connected by a connecting-rod 165 to the crank 166 of a crank-shaft 167, said crank-shaft being provided with a lever 168, by means of which it may be rocked to 45 apply tension to the chain 163, as may be necessary. A ratchet-segment 169 is provided for locking the lever 168 in its different positions. By this construction the tension of the belt may be adjusted without affecting the 50 relation of the elevator to the plow.

The method of making the various adjustments has been pointed out in connection with the description of the construction of the machine, and I do not therefore consider it necessary to again describe the manner in which 55 the different adjustments are made. I merely call attention again to the fact that by the construction above described the plow-beam may be adjusted longitudinally independently of the elevator. It also has an oscillatory adjustment, a vertical adjustment, and 60 a lateral adjustment. The elevator also is adjustable, and being divided into two sec-

tions pivoted together, as described, either section may be adjusted substantially independently of the other, and such adjustments 70 may be effected without affecting the tension of the belt. Furthermore, the tension of the belt may be regulated as desired by the operator on the machine; also, the mechanism for driving the elevator may be thrown into 75 or out of operation at pleasure.

I have described my invention in detail in order that the construction of the machine as illustrated in the accompanying drawings might be fully understood; but I do not con- 80 fine my invention to the specific details of construction illustrated except where specifically claimed, as various modifications may be made without departing from the spirit of my invention.

That which I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination with a carriage, of a plow-beam, said beam being composed of two members secured together, and a plow carried 90 by said beam, said plow having its standard secured between the members of the beam, substantially as described.

2. The combination with a carriage, of a plow-beam composed of channel-bars secured 95 together, and a plow carried by said beam and having its standard secured between said channel-bars, substantially as described.

3. The combination with a carriage, a plow-beam, and a plow, of a draft-frame extending 100 transversely of said carriage and supported thereby, and a locking-plate 55 adapted to be secured to said draft-frame and engaging a stationary part of the machine, substantially as described.

4. The combination with a carriage, a plow-beam, and a plow, of a draft-frame arranged transversely of the machine, U-shaped guides therefor, and a locking-plate adapted to be 110 secured to said draft-frame and engaging one of said guides, substantially as described.

5. The combination with a carriage, a plow-beam, and a plow, of a draft-frame arranged transversely of the machine, said draft-frame being formed of angle-bars 49 50 secured to- 115 gether, U-shaped guides for said draft-frame, and means for locking said draft-frame to a stationary part of the machine, substantially as described.

6. The combination with a carriage, a plow-beam, and a plow, of a draft-frame arranged transversely of the machine, said draft-frame being formed of angle-bars 49 50 secured to- 120 gether, U-shaped guides for said draft-frame, and a locking-plate secured between the mem- 125 bers of the draft-frame, substantially as and for the purpose specified.

7. The combination with a carriage, a plow-beam, and a plow, of a draft-frame arranged transversely of the machine, said draft-frame 130 being formed of angle-bars 49 50 secured together, U-shaped guides for said draft-frame, a locking-plate secured between the members of the draft-frame, perforations in said draft-

frame and locking-plate, and a pin adapted to lock said plate and frame together, substantially as described.

8. The combination with a carriage, a plow-beam, and a plow, of a draft-frame having a longitudinal slot, a bolt connecting said plow-beam with said draft-frame, said bolt passing through said slot, and means for securing said bolt fixedly to said draft-frame, substantially as described.

9. The combination with a carriage, a plow-beam, and a plow, of a plate 68 secured to said plow-beam, said plate having an elongated slot, a draft-frame, and a bolt connecting said draft-frame with said plate 68, said bolt having an elongated head, substantially as described.

10. The combination with a carriage, and a plow, of an elevator composed of hinged sections, means for adjusting the inner and outer ends of said elevator vertically, an intermediate vertically-adjustable device for supporting the outer end of the lower elevator-section, and a link 131 connected to the elevator and to the machine-frame to prevent the elevator from swinging laterally when raised or lowered, substantially as described.

11. The combination with a carriage, and a plow, of an elevator adapted to cooperate therewith, said elevator being composed of hinged sections, means for supporting the lower section of the elevator, an arch 137 supported upon the frame of the machine, and means operating through said arch for supporting the end of the elevator, substantially as described.

12. The combination with a carriage, and a plow, of an elevator adapted to cooperate therewith, said elevator being composed of hinged sections, means for supporting the lower section of the elevator, an arch 137 supported upon the frame of the machine, and a flexible connection connected to said arch and to the outer end of the elevator, substantially as described.

13. The combination with a carriage, and a plow, of an elevator adapted to cooperate therewith, said elevator being composed of hinged sections, means for supporting the lower section of the elevator, an arch 137 supported upon the frame of the machine, a flexible connection connected to said arch and to the outer end of the elevator, and a hand-wheel for raising and lowering the outer end of the elevator, substantially as described.

14. The combination with a carriage, and a plow, of an elevator adapted to cooperate with said plow, said elevator being composed of two sections hinged together, devices supporting the inner and outer ends of the elevator, and rack-and-pinion mechanism acting upon the elevator near the outer end of the lower section for supporting the same and locking it against upward movement, substantially as described.

15. The combination with a carriage, and a plow, of an elevator adapted to cooperate

with said plow, said elevator being composed of two sections hinged together, devices supporting the inner and outer ends of the elevator, and rack-and-pinion mechanism acting upon the elevator near the outer end of the lower section for supporting the same, and means for locking the pinion against rotation, substantially as described.

16. The combination with a carriage, and a plow, of an elevator adapted to cooperate therewith, a rack-bar 140 supporting said elevator, a pinion 142 meshing with said rack-bar, means for holding said pinion and rack-bar in mesh with each other, and means for locking said pinion against rotation, substantially as described.

17. The combination with a carriage, and a plow, of an elevator adapted to cooperate therewith, a rack-bar 140 supporting said elevator, a pinion 142 meshing with said rack-bar, means for holding said pinion and rack-bar in mesh with each other, a disk 145 rotating with said pinion 142, said disk having notches 147, and a dog 146 adapted to enter said notches, substantially as described.

18. An elevator-frame composed of sections hinged together, one of said sections having journals 80, the other section having a sleeve 82 adapted to fit upon said journals 80, and a flange 83 for protecting the bearing, substantially as described.

19. An elevator-frame composed of sections hinged together, one of said sections having journals 80, the other section having a sleeve 82 adapted to fit upon said journals 80, a flange 83 for protecting the bearing, and a roller journaled in said journals 80, substantially as described.

20. An elevator-frame composed of sections hinged together, one of said sections having journals 80, the other section having a sleeve 82 adapted to fit upon said journals 80, a flange 83 for protecting the bearing, a roller journaled in said journals 80, and an oil-duct conducting oil to the bearing of said roller, substantially as described.

21. An elevator-frame composed of sections hinged together, one of said sections having journals 80, the other section having a sleeve 82 adapted to fit upon said journals 80, a flange 83 for protecting the bearing, and a roller journaled in said journals 80, the ends of said roller being concave and overlapping said flange 83, substantially as described.

22. An elevator having rollers 89, boxes 90 forming bearings for said rollers, said boxes having oil-cups 95<sup>a</sup>, substantially as described.

23. An elevator having rollers 89, boxes 90 forming bearings for said rollers, said boxes having oil-cups 95<sup>a</sup>, and inclined plates 91 opposite said oil-cups, said plates having perforations 96, substantially as described.

24. The combination with a carriage, and an elevator, of a gear adapted to be rotated by the movement of the carriage, a shaft 105, a beveled pinion mounted upon said shaft

and meshing with said gear, means for driving the elevator by the rotation of said shaft, a pivoted plate 109 supporting said shaft, and means for rocking said plate upon its pivot to move said pinion out of mesh with said gear, substantially as described.

25. The combination with a carriage, and an elevator, of a gear adapted to be rotated by the movement of the carriage, a shaft 105, a beveled pinion mounted upon said shaft and meshing with said gear, means for driving the elevator by the rotation of said shaft, a pivoted plate 109 supporting said shaft, a hand-lever mounted on the carriage, and devices connecting said hand-lever with said plate, whereby said plate may be rocked upon said pivot by the operation of said lever, to move said pinion laterally out of mesh with said gear, substantially as described.

26. The combination with a carriage, and an elevator, of a gear adapted to be rotated by the movement of the carriage, a shaft 105, a beveled pinion mounted upon said shaft and meshing with said gear, means for driving the elevator by the rotation of said shaft, a pivoted plate 109 supporting said shaft, a hand-lever mounted on the carriage, devices connecting said hand-lever with said plate, whereby said plate may be rocked upon its pivot by the operation of said lever to move said pinion laterally out of mesh with said gear, and means for automatically locking said pinion in mesh with said gear, substantially as described.

27. The combination with a carriage, and an elevator, of a gear adapted to be rotated by the movement of the carriage, a shaft 105, a beveled pinion mounted upon said shaft and meshing with said gear, means for driving the elevator by the rotation of said shaft, a pivoted plate 109 supporting said shaft, a link connected to said plate, a bell-crank lever connected to said link, the arm of said lever which is connected to said link being slotted and having a closed back 125, and a hand-lever connected to said bell-crank lever for operating the same, substantially as described.

28. The combination with a carriage, of an elevator consisting of a jointed frame, rollers carried thereby, an endless belt moving over said rollers, a pulley at the outer end of said frame over which the belt passes, and means operated from the carriage for adjusting the said pulley to adjust the tension of said belt, and a guide at the joint of said frame, substantially as described.

29. The combination with a carriage, of an elevator, said elevator consisting of a jointed frame, rollers carried thereby, a pulley at the outer end of said frame, an endless belt passing around said pulley and rollers, and means operated from the carriage for adjusting said pulley longitudinally of the elevator, and a guide at the joint of said frame, substantially as described.

30. The combination with a carriage, and an elevator consisting of a jointed frame, rollers, a pulley at the outer end of said frame, and an endless belt passing around said pulley and rollers, of an adjustable frame carrying said pulley, said frame being movable longitudinally of said elevator-frame, and means adapted to be operated from the carriage for adjusting said pulley-frame, and a guide at the joint of said frame, substantially as described.

31. The combination with a carriage, of an elevator, a pulley at the outer end of said elevator, boxes 149 upon which said pulley is mounted, a bar 151 connecting said boxes, a stem 152 connected to said bar 151, a guide for the rear end of said bar, and means for moving said bar 151 longitudinally of the elevator, substantially as described.

32. The combination with a carriage, of an elevator, a pulley at the outer end of said elevator, boxes 149 upon which said pulley is mounted, a bar 151 connecting said boxes, a stem 152 connected to said bar 151, a guide for the rear end of said bar, means for moving said bar 151 longitudinally of the elevator, and means for moving the rear end of said stem transversely of the elevator, substantially as described.

33. The combination with a carriage, of an elevator, a pulley at the outer end of said elevator, boxes 149 upon which said pulley is mounted, a bar 151 connecting said boxes, a stem 152 connected to said bar 151, a guide for the rear end of said bar, means for moving said bar 151 longitudinally of the elevator, rods 156 connected with said guide and adjustable transversely of the elevator, substantially as described.

34. The combination with a carriage, and an elevator, of a longitudinally-movable frame at the outer end of said elevator, a pulley mounted in said frame, a lever 159 connected to said frame, and a flexible connection connected to said lever and extending to the carriage, substantially as described.

35. The combination with a carriage, and an elevator, of a longitudinally-movable frame at the outer end of said elevator, a pulley mounted in said frame, a lever 159 connected to said frame, a flexible connection connected to said lever and extending to the carriage, a lever 164, connecting-rod 165, rod 166, and lever 168, substantially as described.

36. The combination with a carriage, and an elevator, said elevator consisting of two sections hinged together, of a longitudinally-movable frame at the outer end of said elevator, a pulley mounted in said frame, a lever 159 connected to said frame, a flexible connection connected to said lever and extending to the carriage, a lever 164, connecting-rod 165, rod 166, lever 168, and a guide at the hinge of said elevator for said flexible connection, substantially as described.

37. The combination with a carriage, and

an elevator, said elevator consisting of two  
sections hinged together, of a longitudinally-  
movable frame at the outer end of said ele-  
vator, a pulley mounted upon said frame, a  
5 lever for adjusting said frame, a flexible con-  
nection connected to said lever and extend-  
ing to the carriage, and a guide at the hinge

of said elevator for said flexible connection,  
substantially as described.

SAMUEL FRANK WELCH.

Witnesses:

JOHN L. JACKSON,  
JULIA M. BRISTOL.