No. 693,103.

Patented Feb. 11, 1902.

D. J. BROPHY.

PILING MACHINE.

(Application filed Apr. 13, 1901.)

(No Model.)

7 Sheets—Sheet 1.

FIG. 1.

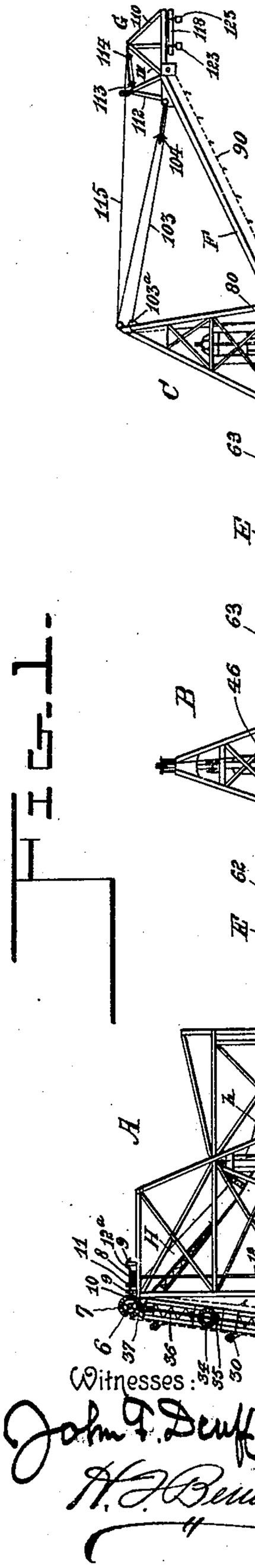
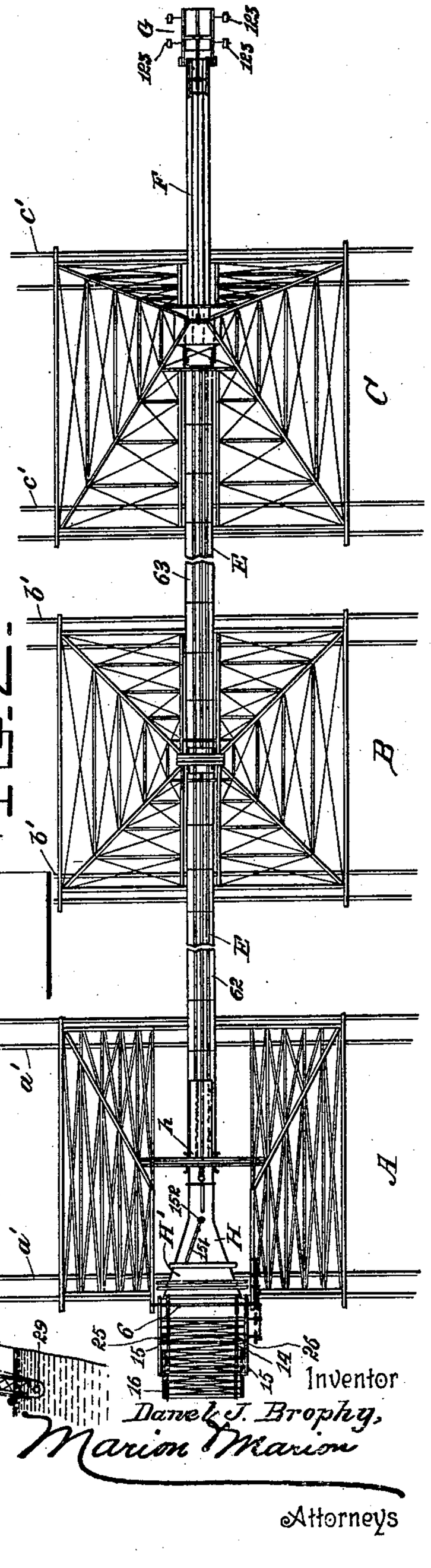


FIG. 2.



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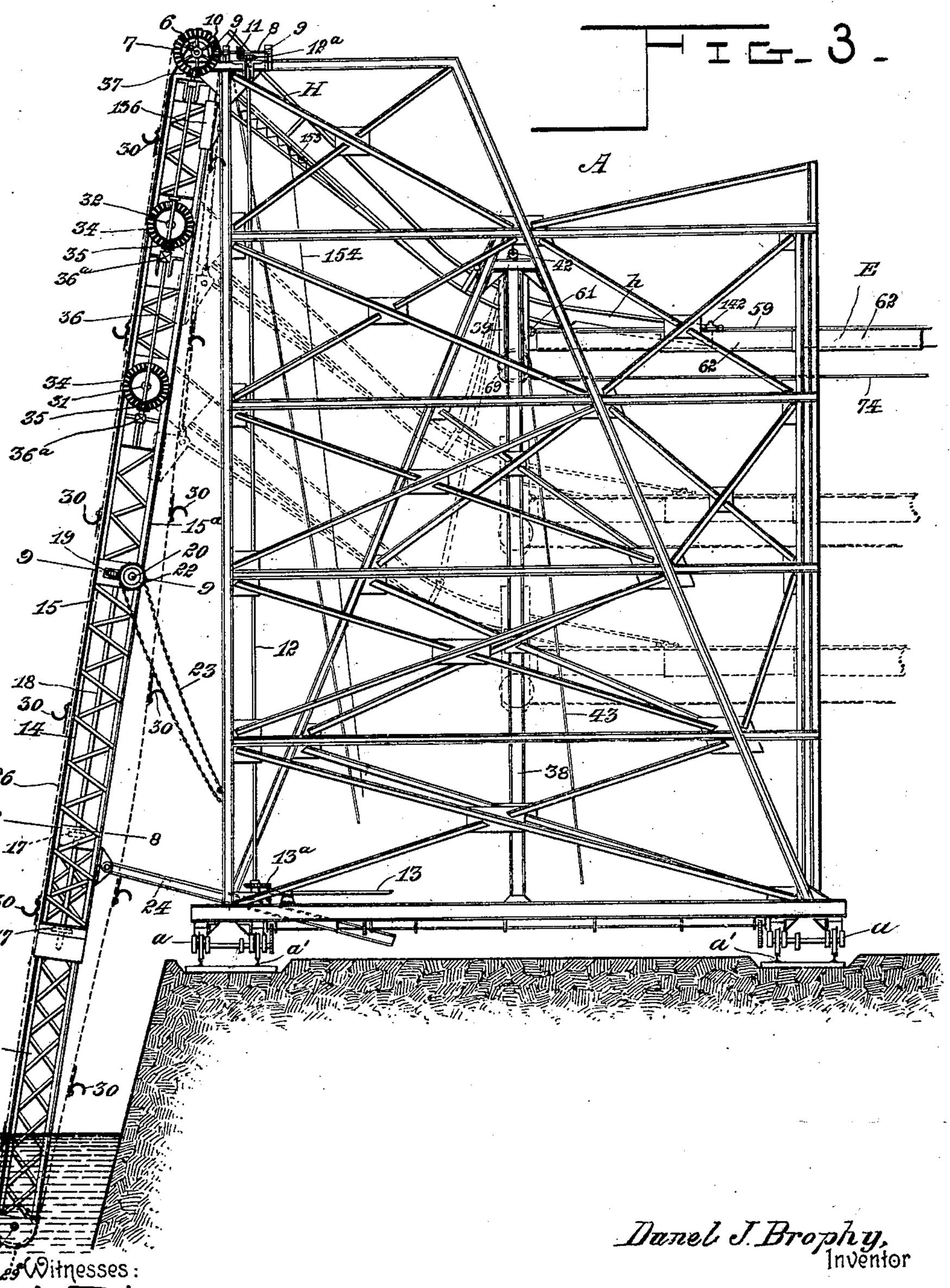
(No Model.) 7 Sheets—Sheet 2.

FIG. 3.



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(No Model.) 7 Sheets—Sheet 3.

FIG. 11.

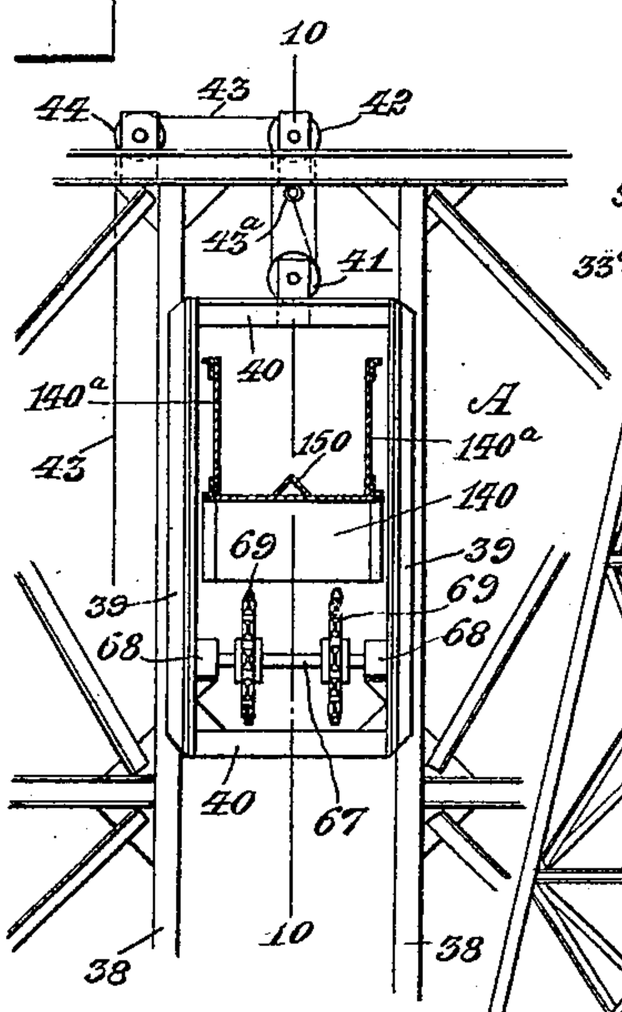

FIG. 14.

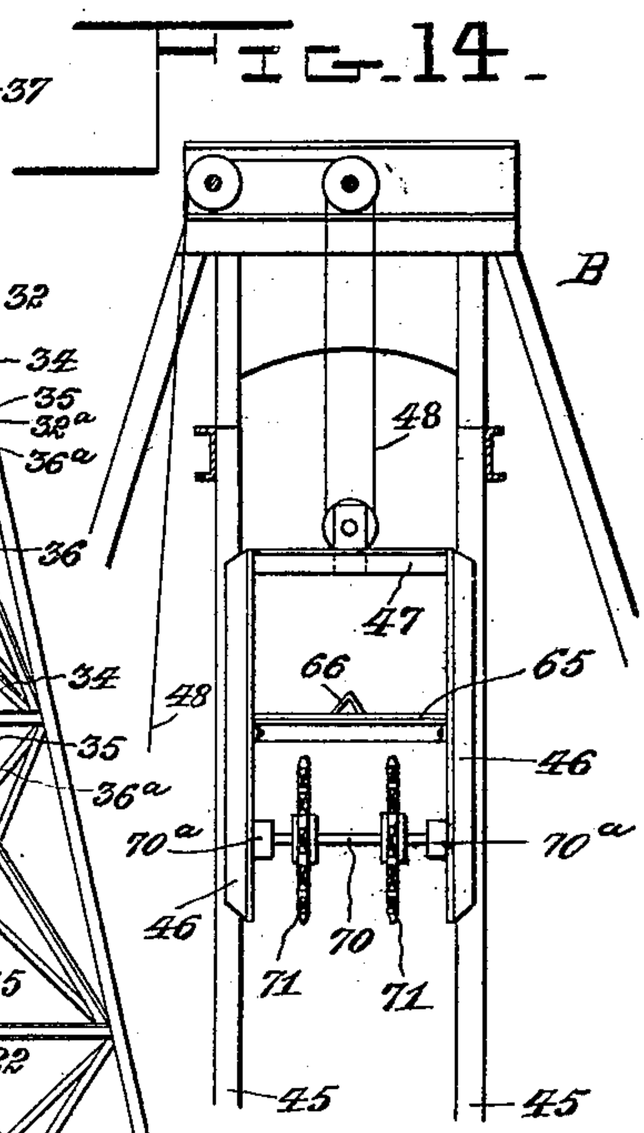

FIG. 4.

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(No Model.) 7 Sheets—Sheet 4.

FIG. 6.

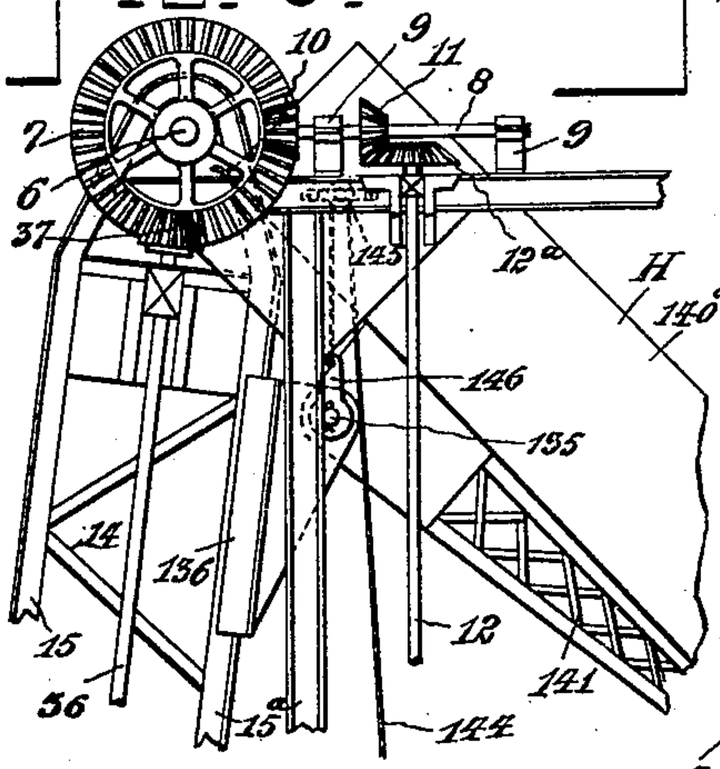


FIG. 5.

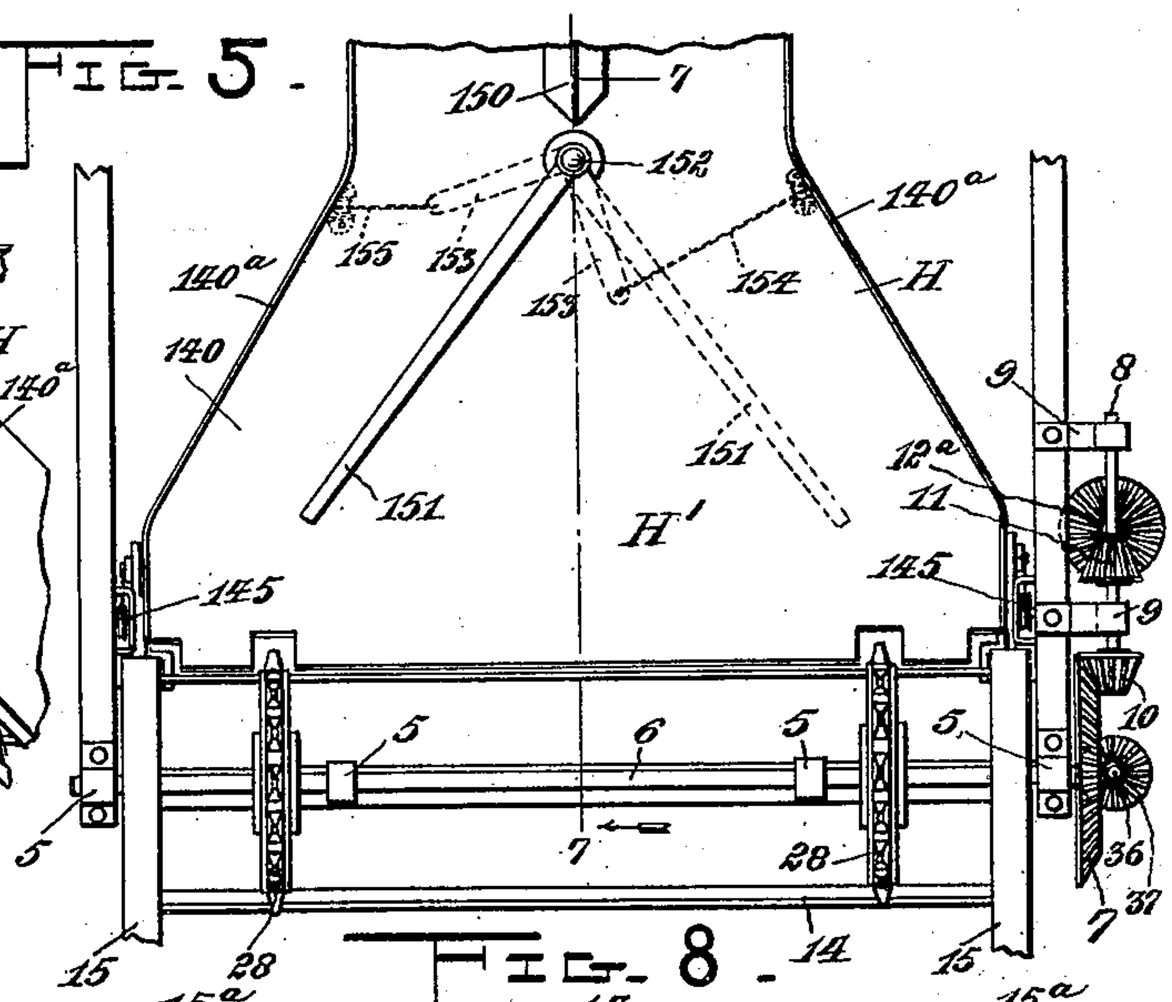


FIG. 7.

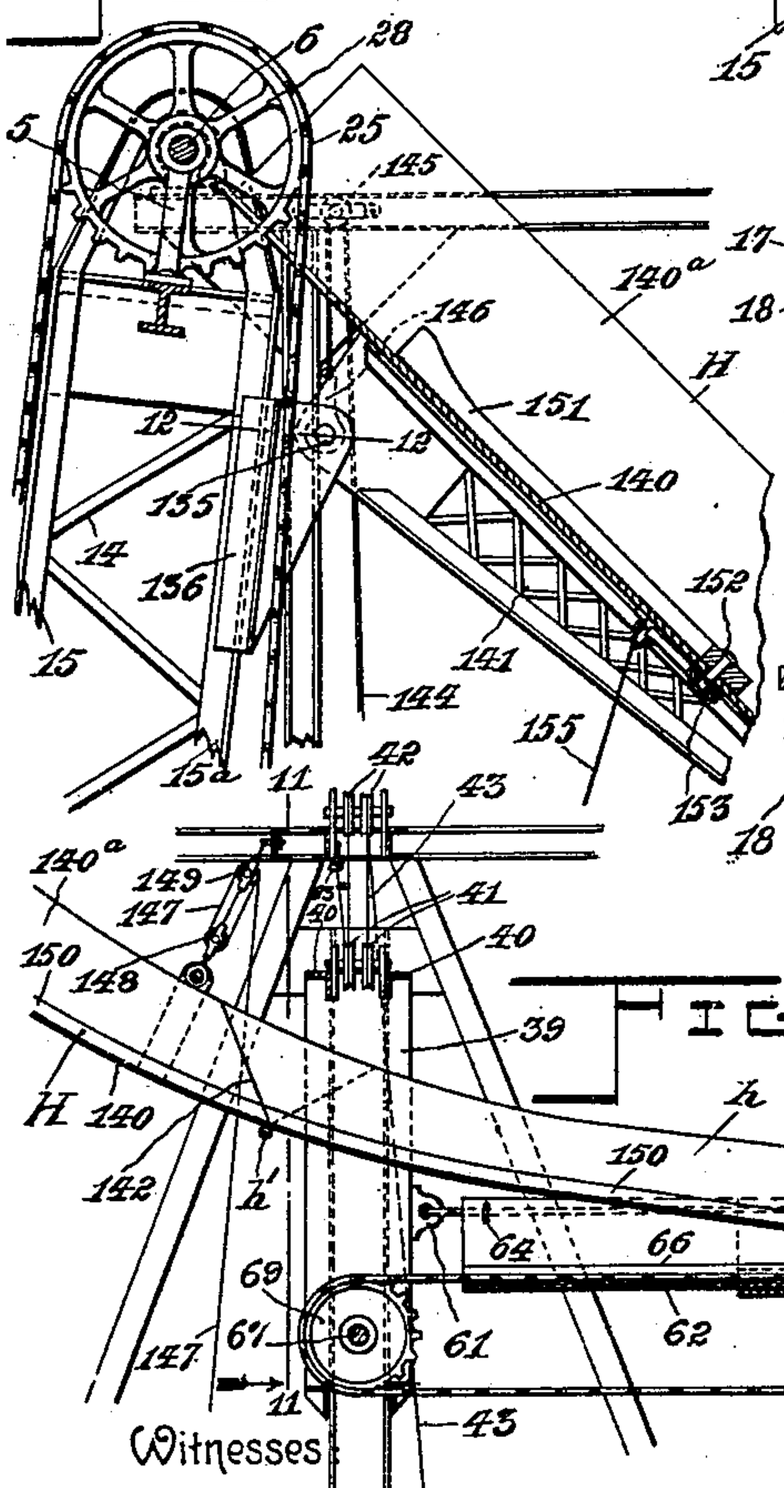


FIG. 8.

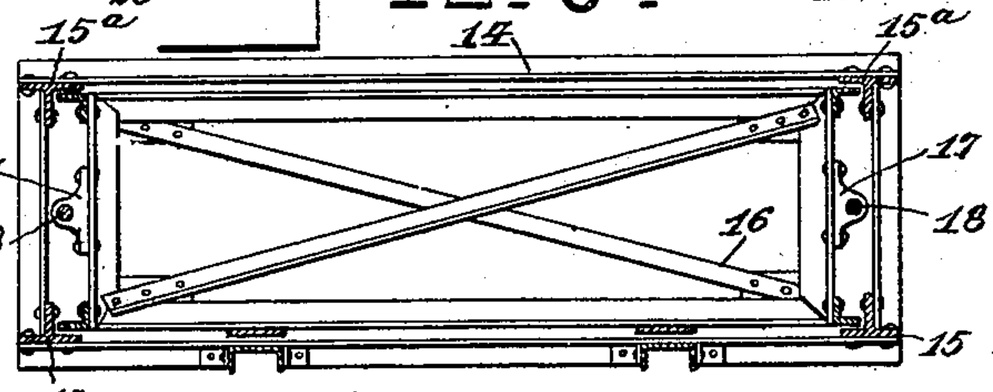


FIG. 9.

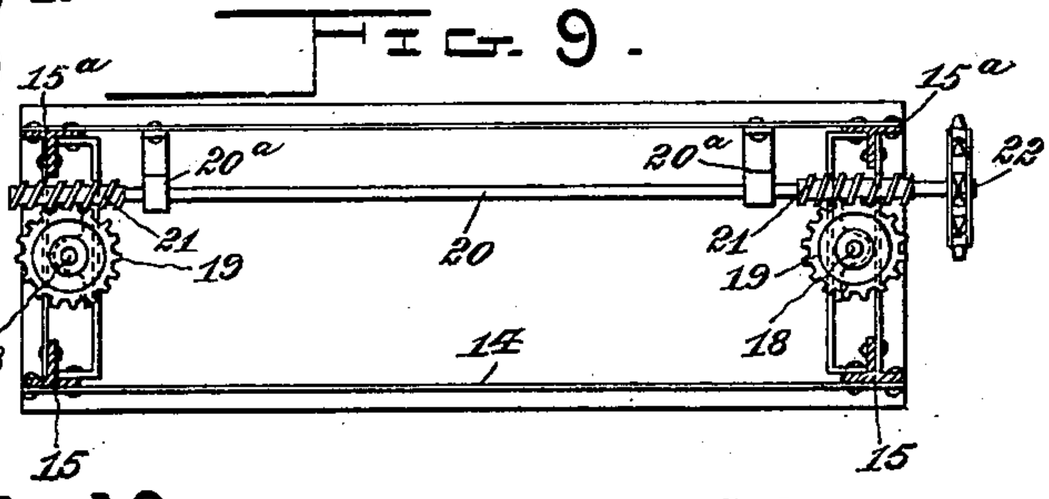
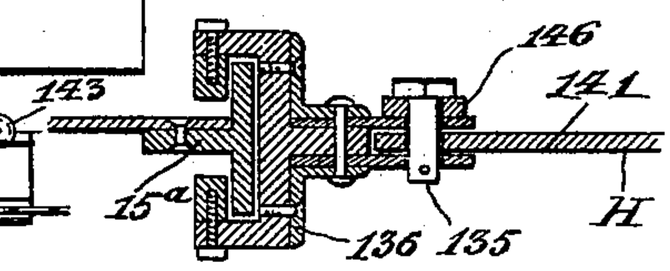


FIG. 10.

FIG. 12.



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(Application filed Apr. 13, 1901.)

(No Model.) 7 Sheets—Sheet 5.

FIG. 16.

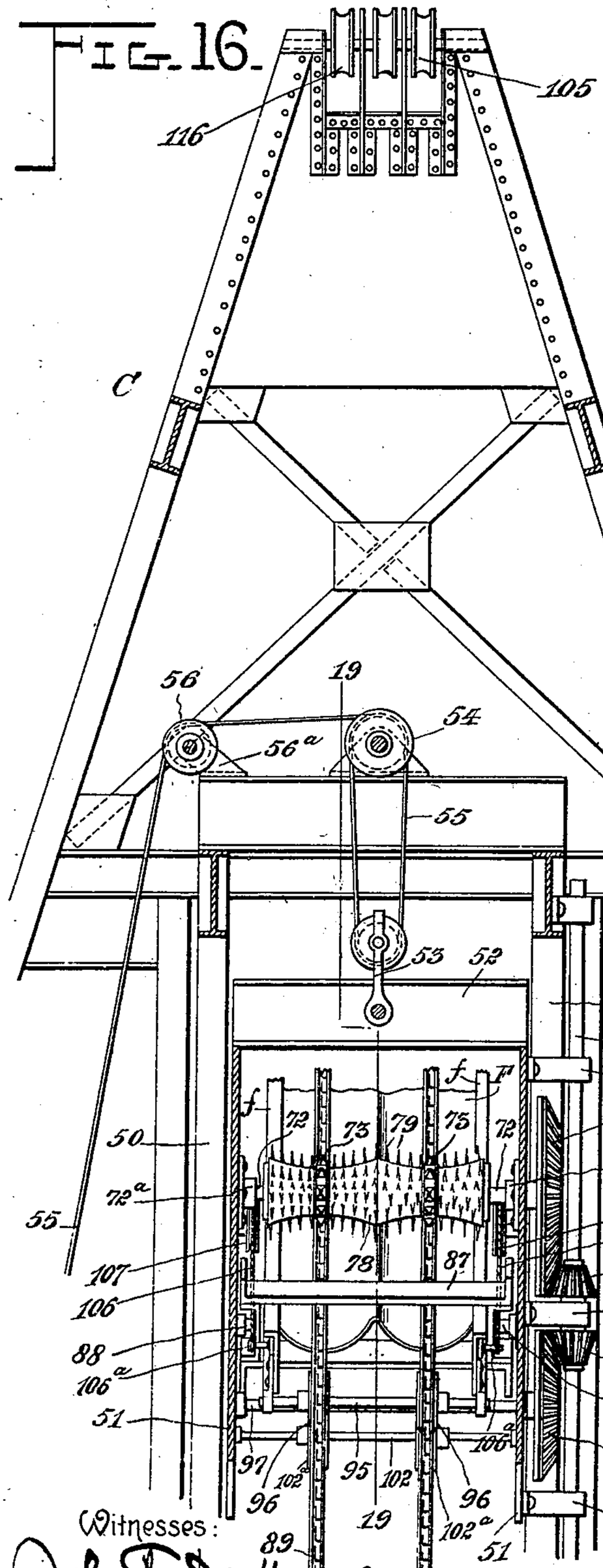

FIG. 19.

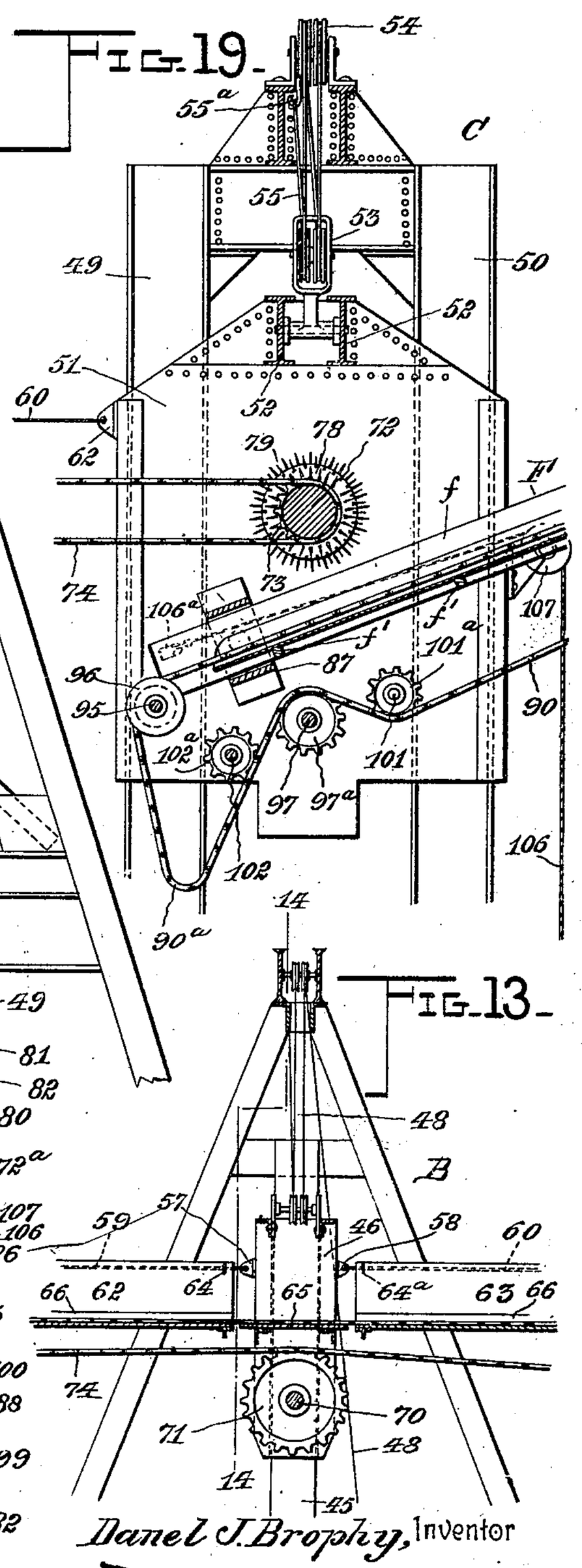

FIG. 13.

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No. 693,103. Patented Feb. 11, 1902.

D. J. BROPHY.

PILING MACHINE.

(Application filed Apr. 13, 1901.)

(No Model.) 7 Sheets—Sheet 6.

FIG. 17.

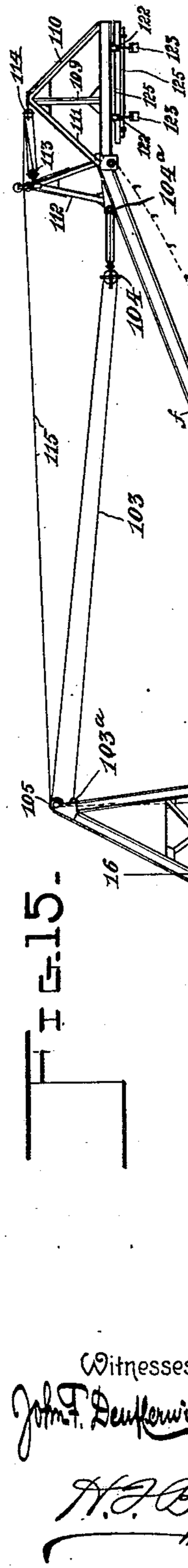

FIG. 15.

FIG. 18.

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No. 693,103. Patented Feb. 11, 1902.

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(No Model.) 7 Sheets—Sheet 7.

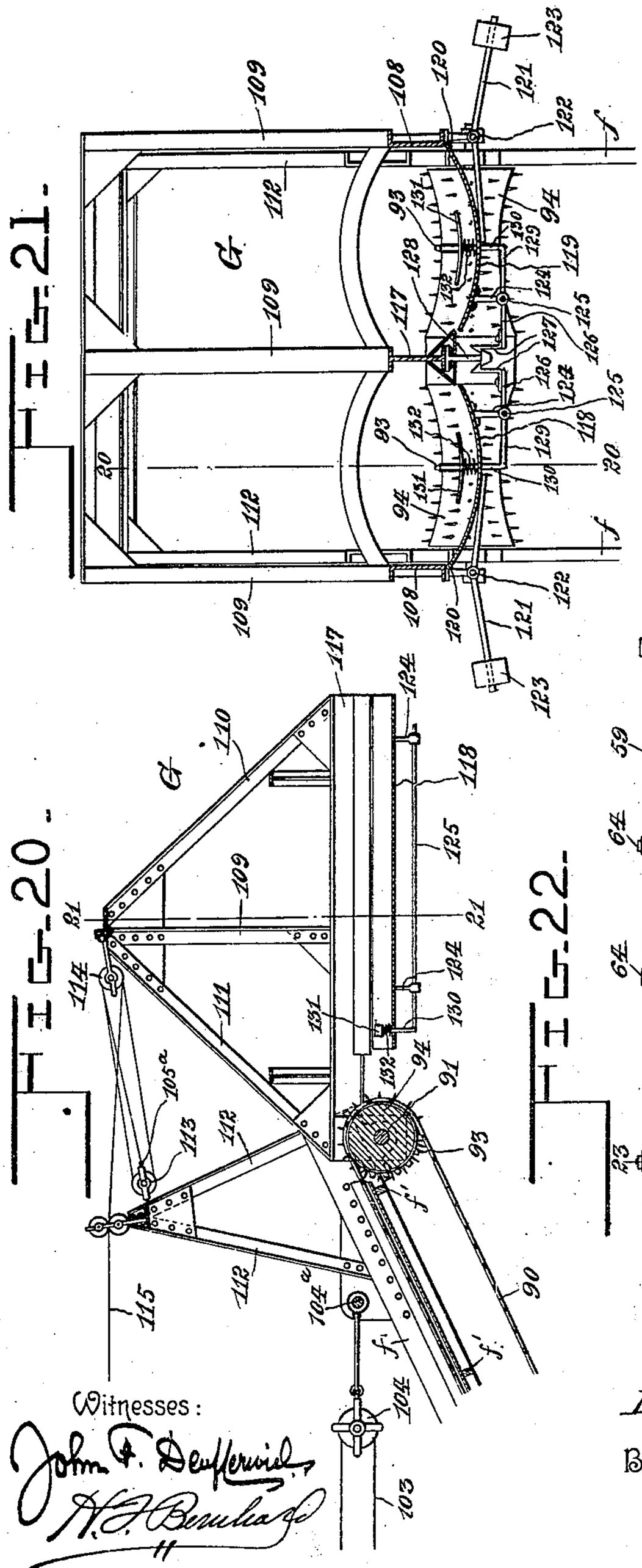

FIG. 21.

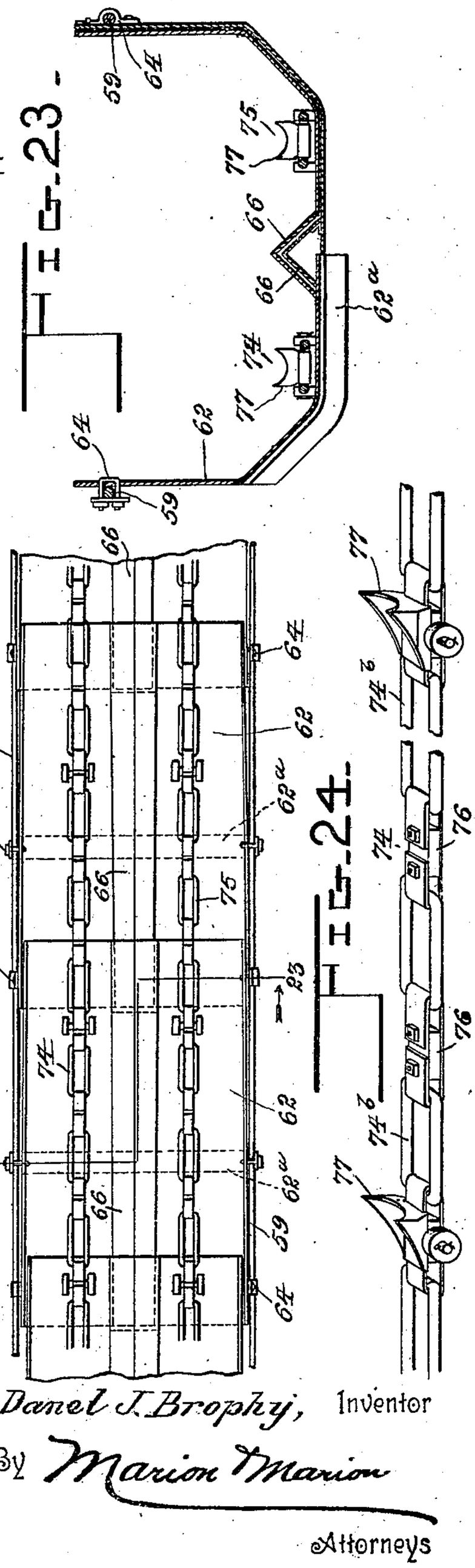

FIG. 23.

FIG. 20.

FIG. 22.

FIG. 24.

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UNITED STATES PATENT OFFICE.

DANEL J. BROPHY, OF MONTREAL, CANADA.

PILING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 693,103, dated February 11, 1902.

Application filed April 13, 1901. Serial No. 55,784. (No model.)

To all whom it may concern:

Be it known that I, DANEL JAMES BROPHY, a citizen of the United States of America, residing in the city and district of Montreal, Province of Quebec, Canada, have invented certain new and useful Improvements in Piling-Machines; and I do hereby declare that the following is a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in piling-machines for different kinds of articles—such, for example, as for piling logs, although the apparatus is capable of or adaptable to the work of piling many other kinds of materials and substances, among which may be mentioned merchandise and packages adapted to be taken or unloaded from the hold of a vessel and landed on a pier or dock, or vice versa.

One object of the present invention is to provide an apparatus in which several mechanisms are combined for harmonious and continuous service in the work of elevating, conveying, and discharging logs of timber which are adapted to be floated on a surface of a river or the like to the place of landing and from thence deposited regularly and in proper order upon one another, so as to produce a compact, uniform, and symmetrical pile of logs.

A further object of the invention is the provision, as one part of the system or apparatus, of an elevator mechanism which may be easily shortened or lengthened, as well as adjusted to various required positions for conveniently placing or loading the work thereon.

A further object of the invention is the provision of a conveyer mechanism arranged to receive from the elevator mechanism and to transport the work to the point where it is to be unloaded or piled, such conveyer mechanism being adjustable vertically so as to be operable at different heights, and the same, furthermore, being disposed in coöperatve relation at all times to the elevator and the discharging mechanisms.

A further object of the invention is to provide a discharging mechanism adapted to receive the work from the conveyer and arranged to shift and deposit the work in the required position for the purpose of piling or stacking the same, such discharging mechanism being adapted to change the position of the work, if necessary, preliminary to dropping the work upon the pile or stack, whereby all the articles will be arranged in the same manner or position while on the apparatus, and they may be stacked or piled without difficulty.

Further objects and advantages of the invention will be set forth in the annexed description, and the novelty in the combinations of mechanisms, in the organization of devices comprising the individual mechanisms, and in the construction and arrangement of parts will be defined by the claims.

In the drawings hereto annexed, forming a part of this specification, Figure 1 is a general view, in side elevation, of my piling apparatus or system. Fig. 2 is a plan view of the system represented by Fig. 1. Fig. 3 is an enlarged view, in side elevation, of one of the towers adapted to support the elevator mechanism, the receiving portion of the horizontally-movable conveyer, and the parts associated therewith. Fig. 4 is a front view, also in elevation, of the tower and the elevator shown by Fig. 3. Fig. 5 is an enlarged fragmentary view of the upper portion of the elevator mechanism and the corresponding portion of a chute which is contiguous to said elevator mechanism. Fig. 6 is an enlarged view, in side elevation, of the upper portions of the elevator mechanism and the chute. Fig. 7 is a vertical sectional elevation in the plane of the dotted line 7 7 on Fig. 5 looking in the direction of the arrow. Fig. 8 is a cross-section through the elevator mechanism in the plane of the dotted line 8 8 on Fig. 3. Fig. 9 is another cross-section through the elevator mechanism in the plane of the dotted line 9 9 on Fig. 3. Fig. 10 is a vertical sectional elevation in the plane of the dotted line 10 10 on Fig. 11, illustrating the means for supporting and adjusting the delivery portion of the inclined chute, also the vertically-adjustable carriage and a portion of the receiving end of the horizontal carrier, which is operatively related to the elevator-tower and is arranged to receive the work from the delivery portion of the chute. Fig. 11 is a

sectional elevation in a plane at right angles to Fig. 10, the plane of said section being indicated by the dotted line 11 11 on Fig. 10 looking in the direction of the arrow. Fig. 12 is an enlarged detail section through a portion of the elevator-mechanism frame and one of the slides to which the inclined chute is hung, the plane of the section being indicated by the dotted line 12 12 on Fig. 7. Fig. 13 is a detail vertical section through the upper portion of the middle tower, illustrating the means for supporting and adjusting the contiguous portions of the two lengths of the trough for the continuous horizontal conveyer. Fig. 14 is a detail sectional elevation in a plane at right angles to Fig. 13 and indicated by the dotted line 14 14 on said Fig. 13. Fig. 15 is an enlarged view, in side elevation, of the final or delivery tower, the same having a boom adapted to move in a vertical plane and carrying a discharging mechanism by which the work is positioned preliminary to dropping the same. Fig. 16 is an enlarged sectional view through the upper portion of the delivery-tower in the plane of the dotted line 16 16 on Fig. 15. Fig. 17 is an enlarged view, in side elevation, of the vertically-movable carriage for the delivery-tower, illustrating the means for driving the conveyers and the means for supporting the delivery end of the horizontal conveyer, so that it will discharge its load upon the boom-conveyer. Fig. 18 is a sectional plan view in the irregular plane indicated by the dotted line 18 18 on Fig. 17. Fig. 19 is an enlarged sectional view in the plane of the dotted line 19 19 on Fig. 16. Fig. 20 is a sectional elevation taken through the delivery portion of the boom and the discharging mechanism supported thereon, the plane of the section being indicated by the dotted line 20 20 on Fig. 21. Fig. 21 is a vertical transverse section through the discharging mechanism on the line 21 21 of Fig. 20. Fig. 22 is a fragmentary plan view through the horizontal tower-conveyer. Fig. 23 is a transverse section on the line 23 23 of Fig. 22 looking in the direction of the arrow. Fig. 24 is a detail view of one chain equipped with a series of dogs and adapted to serve as a conveyer in the apparatus.

The same characters of reference denote like and corresponding parts in each of the several figures of the drawings.

My apparatus or system contemplates the employment of a group or series of towers indicated in Figs. 1 and 2 by the reference-letters A B C, the first of which, A, constitutes the elevator-supporting tower, the second of which, B, will hereinafter be indicated as the middle tower, while the last tower, C, will be designated as the final or delivery tower. The towers are supported on the wheeled trucks *a b c*, respectively, and said trucks are adapted to travel on the spaced tracks *a' b' c'*, respectively. These tracks extend through a yard or across a dock or any other place where the work is to be piled, and with these tracks intersects a transverse track, one rail of which is indicated by the reference-letter *d* on Fig. 1. This transverse track is arranged in a lower horizontal plane than either of the parallel tracks, also as indicated by Fig. 1, and on said track *d* is adapted to run the wheeled transfer-truck D, the latter being in a plane below the tracks of the towers, whereby either tower may be run upon the transfer-truck, so that the tower may be shifted by the truck D along the transverse track *d* to an inoperative position. The number of towers in use in the apparatus depends upon the length of the horizontal tower-conveyer E, and by Figs. 1 and 2 I have shown the three series of towers in the same vertical plane and adapted to furnish a continuous support for the horizontal conveyer E. The number of towers, however, is not material, because they may be increased or decreased, as desired; but in the exemplification of the invention herein shown it is intended that the middle tower B shall be shifted by the transfer-truck out of its alined relation to the towers A C, and then the tower C may also be shifted by the transfer-truck from the track *c'* over to the track *b'*, whereby the tower C is made to take the place occupied by the tower B in Figs. 1 and 2. This shifting in the position of the towers is intended to take place as the labor of piling the work progresses, and the operation of bringing the towers A C closer together of course involves a change in the operative length of the horizontal conveyer mechanism E.

The track *a'* for the elevator-tower A is laid on the dock, pier, or landing adjacent to a river or other body of water, as represented by Figs. 1 and 3, so that the logs may be floated to the place of landing in order that they may be loaded upon the elevator mechanism, which is adapted to carry the logs to the required height before they are delivered to the chute, the conveyer, and the other mechanisms comprised in the improved apparatus or plant. At its extreme upper portion the elevator-tower is furnished with the bearings 5, in which is journaled the main elevator-shaft 6, and to one end of this shaft is secured the large bevel-gear 7, as clearly shown by Figs. 3, 4, 5, and 6. A short horizontal counter driving-shaft 8 is journaled in bearings 9 on said upper portion of the tower A, (see Fig. 6,) said counter driving-shaft being disposed at right angles to the main elevator-shaft 6 and provided with a bevel gear-pinion 10, which has intermeshing engagement with the bevel-gear 7 of said shaft 6. The counter driving-shaft 8 is furthermore provided with a bevel gear-pinion 11, with which meshes a bevel gear-wheel 12^a, fastened to the upper portion of a vertical shaft 12, the latter extending the full height of the tower and having its lower portion intergeared at 13^a with a line-shaft 13, the same being journaled on the base portion of the tower and adapted to be propelled by an engine, a mo-

tor, or any other source of power, which may be located in any convenient place, either on the tower itself or on a landing adjacent thereto.

The work is carried to the upper portion of the tower by an elevator mechanism, the latter being supported by an upright telescopic frame, the same consisting of an upper length 14 and a lower slidable leg 16. (See Figs. 1, 3, 4, 8, and 9.) Each length or section of this elevator-frame consists of suitable longitudinal rails or bars united and trussed by suitable lattice-work, as clearly shown by the drawings. The described construction of the upper length 14 of the elevator-frame makes its corner angle-bars 15 serve as guides for the slidable leg 16 of said elevator-frame, as clearly shown by Fig. 8, whereby the leg 16 is slidable or telescopic with relation to the upper and major length 14 of said elevator-frame.

The slidable or telescopic leg 16 is furnished at its sides with appropriate bearing-plates 17, two, four, or more innumber, and provided with threaded openings, which makes the plates serve the purposes of nuts, which are fixed to the telescopic leg, said plates or nuts being arranged at the side edges of the leg. (See Figs. 3, 4, and 8.) On the sides of the upper length 14 of the elevator-frame are journaled the upright shafts 18, the same being provided with male threads at their lower portions and adapted to engage with the nuts 17 of the leg 16. The upper portions of these threaded shafts 18 are suitably supported at a proper height on the frame length 14, as shown by Figs. 3 and 9, and to said upper portions of the shaft are secured the worm-gears 19. These worm-gears have intermeshing engagement with the worms 21, which are provided on the horizontal worm-shaft 20, that is journaled in proper bearings 20^a, attached to the frame length 14 at a suitable elevation above the base of the tower. The worm-shaft 20 extends transversely across the elevator-frame, on which it is journaled in order that the worms may mesh with the gears on the two shafts that adjust the telescopic elevator-leg, whereby the latter may be raised or lowered to maintain the lower portion of the elevator in the water or in proper relation to the place where the work is to be loaded on said elevator. One end of the worm-shaft 20 is extended beyond a side of the elevator-frame in order that it may have a sprocket-wheel 22 fastened thereto, and with this sprocket-wheel engages an adjusting-chain 23, (see Fig. 3,) the same arranged to extend in a downward direction from the shaft 20, so that it may be reached and manipulated by a person stationed at the base of the tower.

The upper portion of the elevator-frame has the length 14 thereof loosely mounted or fitted on the main elevator-shaft 6, whereby the entire elevator-frame and the elevator thereon are adapted to be adjusted laterally with respect to the pier or dock for the purpose of shifting the elevator mechanism to different inclined positions and accommodating the structure to the different conditions necessary to load the work thereon.

The elevator-frame is held in its proper angle of inclination by a boom 24, which is represented by Fig. 3 as having a pivotal connection with the elevator-frame length 14 and is adapted to extend across the tower-base, so that it may be secured firmly thereon, although I have not considered it necessary to illustrate the securing means.

The elevator mechanism which is shown by the drawings is of the endless variety, the same consisting of a pair of chains 25 26, arranged and supported on the elevator-frame in parallel positions and adapted to extend from the lower end of the telescopic frame-leg 16 to a suitable height at or near the shaft 6. Said shaft 6 is provided with the sprockets 28, spaced at suitable intervals from each other and adapted to engage with said elevator-chains when the elevator is of the extreme length and is adapted to deliver the work to the highest point on the tower. The lower portions of the elevator-chains are kept in place with relation to the frame-leg 16 by means of an idler-shaft 29, provided with sprocket-wheels 29^a and journaled in the lower portion of the extensible leg 16. (See Figs. 3 and 4.) These elevator-chains are provided with dogs 30, which are arranged in coincident positions and furnish the supports for the work, the same being represented by Fig. 4 as logs which are to be lifted from the water to the extreme upper portion of the tower.

The horizontal conveyer E is arranged for adjustment vertically, to the end that it may operate at different heights, and I have constructed the elevator so that it may be shortened to deliver the work at the first height of the conveyer, said elevator being driven in its shortened condition from that height and the elevator being, furthermore, adapted to be elevated successively and to be driven at the required speed, according to the adjustments of the conveyer E. To this end the elevator-frame is provided with a series of supplementary elevator-driving shafts 31 32, which are supported on suitable bearings of the elevator at different heights and transversely across the elevator-frame, as shown by Fig. 4. Each shaft 31 or 32 is journaled in suitable bearings 33, and at one end said shaft is furnished with a bevel-gear 34. I prefer to mount the bearings 33 for each elevator-shaft on a suitable frame-piece 33^a, and the shaft 31 is furnished with suitable sprockets 31^a, while the shaft 32 has similar sprockets 32^a. The bevel-gears 34 of the supplementary shafts 31 32 have intermeshing engagement with bevel gear-pinions 35 on a vertical shaft 36, the latter being journaled in suitable bearings 36^a, provided on one side of the elevator-frame length 14. This shaft 36 extends from a point below the shaft 31 up

to the bevel-gear 7, and the upper end of said shaft 36 is furnished with a bevel-pinion 37, which meshes with said gear 7 of the main elevator-shaft 6, whereby the shaft 36 is driven from the shaft 6, and it in turn drives the supplementary shafts 31 32. It is evident that the elevator-chains 25 26 may be shortened so as to fit to the sprockets 20 and 31ª, respectively, whereby the work is adapted to be carried by the elevator in order to supply work to the horizontal conveyer E when the latter is in its lowermost position. (Indicated by dotted lines in Fig. 3.) It is evident, however, that the elevator-chains 25 26 may be lengthened in order to fit the sprockets 32ª on the shaft 32 as well as the sprockets of the lowermost shaft 29, thereby adapting the elevator to deliver the work to the intermediate position of the horizontal conveyer E, also as indicated by dotted lines in Fig. 3, said elevator being driven from the shaft 32, or the elevator-chains may be lengthened so as to fit the sprockets 28 of the main driving-shaft 6, and thereby adapted to extend from the shaft 29 to the shaft 6, so that the load will be elevated to the highest point of the tower and discharged to said conveyer E when adjusted to the upper limit of its movement.

I will now proceed to describe the horizontal conveyer E, the means for supporting the same on the series or group of towers, and the means for adjusting said conveyer E in a vertical direction to the end that it may operate at different heights.

The elevator-tower A is provided with vertical guideways 38, the same secured to the tower in any suitable way, preferably at the middle portion thereof, and said guides disposed parallel to each other, as shown more clearly by Fig. 1. On said guideways is slidably fitted the side portions of a vertically-movable carriage 39, the same being constructed to snugly embrace the guideways and adapted to be united together in any suitable way—as, for example, by the cross-rails 40. This carriage on the elevator-tower is adapted to be raised or lowered by any suitable form of mechanism, and as one means for attaining this end I employ a tackle, which comprises the pulleys 41, mounted on the head-rail 40 of the carriage, the pulleys 42, which are supported on a suitable part of the tower, a cable 43, which is reeved around the pulleys 41 42 and has one end portion thereof attached to the tower at a fixed point, as at 43ª in Fig. 11, and a guide-sheave 44ª, which is supported on the tower at one side of the pulleys 42 and over which runs the tackle-cable 43, so that it may extend downwardly for operation by an attendant at the base of the tower. It is evident that this cable may be slackened for the purpose of lowering the carriage 39 within the tower A; but when the cable is hauled upon by manual labor or through the medium of any suitable power the carriage 39 will be raised to the required elevation.

Referring now to Figs. 13 and 14, it will be seen that the middle tower B is furnished with the vertical guideways 45, which are secured thereto in parallel relation, and to these guideways is fitted a slidable carriage 46, the same being joined together by a head-rail 47, with which is associated a tackle mechanism which is similar to that described in connection with the carriage 39 of the tower A, said tackle mechanism for the carriage 46 of the tower B being indicated in its entirety by the numeral 48. The tackle mechanism of the tower B is adapted for operation in a manner similar to the other tackle mechanism in order to raise or lower the carriage 46 of said tower B.

The final or delivery tower C is equipped with a vertically-slidable carriage 51, which is adapted to support the devices by which are driven the horizontal conveyer E and the conveyer mechanism for the swinging boom to be hereinafter described. This carriage 51 is of substantial rigid construction and comprises parallel side plates united solidly together and provided with suitable head-rails 52, and these side pieces of said carriage are constructed to slidably embrace the group of four guide-rails 49 50, which are arranged in suitably-spaced and parallel relation within said tower C in order to limit the carriage to vertical slidable movement therein. To the head-rails 52 of the slidable carriage 51 is connected a pulley-block 53, while the tower has the sheaves 54. The tackle-rope 55 is reeved around the pulleys 53 54 and has one end connected at 55ª to the frame, (see Fig. 19,) said cable being carried over a guide-sheave 56, mounted in a suitable support 56ª on the tower, whereby the cable may lead to the base of the tower for the purpose of manipulation by power appliances or by manual labor, so as to adjust the carriage 51 vertically to the required heights.

The middle carriage 46 of the tower B is provided on one side with lugs 57 and on its opposite side with lugs 58, (see Fig. 13,) and to these lugs are connected the conveyer suspension-cables 59 60. The lengths of the cable 59 extend from the carriage of the middle tower toward the carriage of the tower A, said cable lengths 59 being secured to lugs 61 on said carriage 39. (See Figs. 10 and 13.) The other lengths 60 of the cables extend from the carriage 46 of the middle tower toward the delivery-tower C, and they are fastened to the lugs 62, which are provided on the carriage 51, as shown by Fig. 17. From this description it will be understood that the conveyer-supporting cables between the towers A and B are fastened to the opposing sides of the carriages 39 46, whereas the other cables 60, between the towers B and C, are fastened to the carriages 46 51.

The conveyer trough or casing is in two sections 62 63, corresponding to the cables 59 60, and the length 62 of the trough has its members fastened by staple-bolts 64 to the cables

59. The other trough length 63 has its members fastened to the other pair of cables 60 between the carriages of the middle and delivery towers by similar staple-bolts 64ª, although any suitable means may be adopted for the attachment of the parts. A detail of one of these lengths of the trough or casing is shown by Figs. 22 and 23, by reference to which it will be seen that each length of said trough consists of a series of members approximately U-shaped in cross-section, (see Fig. 23,) each member of said length being secured at a number of points to the pair of suspension-cables and having one end of said member arranged to overlap an adjoining member, while the other end of the first-named member is in turn overlapped by a succeeding member. The members forming the length of the trough or casing are thus overlapped and supported by the cables so as to present a comparatively flexible housing for the endless chains of the horizontal conveyer E, which chains are arranged to travel close to the bottom of the conveyer-housing, so that the logs or other articles will be properly housed within the trough or casing. As shown by Figs. 22 and 23, each length of the conveyer-trough has its members formed by sheet-metal plates, bent to form the side flanges and reinforced by the external stay-pieces 62ª.

The horizontal conveyer E has its chains arranged to extend continuously from the carriage 39 on the tower A to the carriage 51 on the tower C, so that the chains will pass through the carriage 46 of the middle tower, and by reference to Fig. 13 it will be seen that the contiguous portions of the trough lengths 62 63 are separated by the middle carriage 46. To provide a continuous support for the upper lead of the conveyer-chains, I employ a transfer-plate 65, which is secured in the carriage 46, so as to occupy the same horizontal plane as the bottoms of the trough lengths 62 63.

Each length of the conveyer-trough is provided along its bottom with an upstanding longitudinal ridge 66, the same serving to divide said trough into longitudinal compartments, within which operate the parallel chains 74 75, which constitute the horizontal conveyer proper. It is to be understood that the dividing-ridge is provided in each length of the conveyer-housing.

The carriage 39 of the elevator-tower A is provided with bearings 68, which receive the conveyer idler-shaft 67, which is arranged in a horizontal position at the lower portion of the carriage, as shown by Figs. 10 and 11, and this shaft is furnished with the sprockets 69, with which engage the conveyer-chains 74 75. The carriage 46 of the middle tower is also furnished with bearings 70ª, which accommodate the transfer-shaft 70, (see Figs. 13 and 14), said shaft being arranged below the transfer-plate 65 and also provided with the sprocket-wheel 71, with which engage the lower lead of the endless conveyer-chains 74 75, whereby the conveyer-chains are prevented from having undue sag below the conveyer-trough, because the transfer-shaft furnishes an intermediate support for said conveyer-chains between the elevator and delivery-towers A C.

72 designates the conveyer-driving shaft, which is journaled in suitable bearings 72ª, with which the carriage 51 on the delivery-tower C is equipped, and this shaft 72 is furnished with the sprocket-gears 73, the same adapted to be engaged by the chains 74 75 of the conveyer. From this description it will be seen that the conveyer-housing is suspended by cables from the group of three carriages, that the endless chain conveyer extends continuously between the carriages on the towers A C and is supported at its middle by devices on the tower B, that the carriage 39 on the tower A has an idler-shaft for supporting one end of the endless conveyer, and that the other end of said endless conveyer is engaged by a shaft on the carriage 51 of the tower C, said last-named shaft 72 adapted to be positively driven by means, to be hereinafter described, for the purpose of propelling the conveyer-chains and making them travel in a horizontal path irrespective of the height at which the conveyer may be suspended.

Any suitable form of conveyer may be adopted; but I prefer to employ two endless chains, one of which is shown in detail by Fig. 24, by inspection of which it will be seen that the links 74ᵇ are united by the couplings 76, certain of said couplings having the dogs 77, the same adapted to furnish a rest for the work or to afford an abutment against which the work may press. This form of conveyer is calculated or intended to operate efficiently in the transmission of articles, such as logs, by the conveyer mechanism; but it may be found that the particular type of conveyer mechanism herein described may not be well adapted to the labor of carrying other kinds of work or merchandise, in which event I reserve the right to modify or change the type of conveyer mechanism and to employ as a substitute therefor a form of mechanism which may be specially designed for transferring a particular class of merchandise.

The conveyer-driving shaft 72 is equipped with a delivery-drum 78, the same being made fast with the shaft, so as to rotate therewith. Said drum is provided with two concaved portions, as shown by Fig. 16, arranged to be in line with the chains 74 75 of the conveyer, and said drum is provided with a multiplicity of sharp-pointed teeth or spikes 79, whereby as the log or other piece of merchandise approaches the delivery end of the conveyer E the same will be engaged by the spikes of the drum, which, owing to its rotary motion, will operate to impart a feed motion to the log or other work and irrespective of the position of the boom F.

The conveyer-driving shaft 72 is extended at one end beyond its bearing in the carriage 51 of the tower C, and to said end of the shaft is secured a bevel gear-wheel 80. The tower C is equipped with a vertical driving-shaft 81, the same being supported in the tower in any suitable way, as shown by Fig. 15, and having its upper portion received loosely in the bearings 82 83, said bearings being secured at suitable intervals to one side of the carriage 51, as shown by Figs. 15 and 17, whereby the bearings 82 83 will travel up and down with the carriage 51, while the shaft 81 remains stationary on the tower, except for the rotary motion which may be imparted thereto. This shaft 81 is square or polygonal in cross-section in order that it may rotate the bevel gear-pinions 86 and 100, which are slidably fitted on the shaft, so as to travel thereon with the adjustment of the carriage 51 and to be propelled or rotated at all times thereby. Said gear-pinion 86 has intermeshing engagement with the bevel-gear 80 on the conveyer-driving shaft, whereby the latter is driven at all times from the shaft 81 and irrespective of the height of the slidable carriage 51 and the conveyer mechanism. This vertical shaft 81 has its lower portion intergeared at 84 with a horizontal shaft 85 on the bed or platform of the tower C, said shaft 85 being propelled by an engine or motor or from any source of power, as may be required.

It will be understood that the shaft 81, extending practically the height of the tower C, affords only one means for the operation of the shaft that drives the conveyer E and the boom-conveyer, to be presently described; but in lieu of this shaft 81 I may employ an electric motor, which may be carried by the tower C at any suitable elevation and to be operatively connected with the driving-chains for the horizontal and boom conveyers in any manner which may be suggested by a skilled mechanic.

I will now proceed to describe the boom and the conveyer which is associated therewith; but it is desired to remark that this boom is supported or mounted on the carriage 51, so as to partake of the vertical adjustment thereof, that it occupies an operative relation to the delivery end of the horizontal conveyer E for the purpose of receiving the work or other merchandise therefrom, and that it is capable of movement on a horizontal axis and in a vertical plane, so that it may be raised or lowered independently of the adjustment of the carriage 51, whereby said boom is well adapted to the labor of dropping the work in certain regular order for the purpose of properly piling or stacking the same. This boom comprises parallel side pieces *f f*, united or joined together by intermediate lattice-work *f'*, said boom being of any required length and of such width that it may be slidably fitted in a support provided therefor in the carriage 51, whereby the boom may extend outwardly and rearwardly from the tower C, although it is capable of being drawn inwardly to any desired or required extent, because it is capable of sliding freely through the tower and the carriage 51. The support for the boom F is a horizontal open boxing 87, the same arranged within the carriage 51, transversely across the same and in a position immediately below the shaft 72 and the spiked drum thereon. This boxing 87 is pivoted centrally, as at 88, to the carriage in order that it may rock or turn on a horizontal axis, so as to permit the boom to be raised or lowered according to the demands of the service, and this boxing is arranged to slidably receive the inner portion of the boom, which is thus adapted to be moved inward or outward through the boxing in order to vary the operative length of said boom, which may be projected from the rear side of the tower C. This boom F supports a delivery-conveyer, which is preferably embodied in the form of parallel endless chains 89 90, said delivery-conveyer extending lengthwise of the boom and mounted thereon, so as to partake of its back-and-forth or up-and-down adjustments. The chains of the delivery-conveyer are fitted at the outer end of the boom on the sprockets 93 of an idler-shaft 91, which is mounted in suitable bearings provided at the free or unconfined end of the boom F, and this idler-shaft is adapted to be rotated by the motion of the delivery-conveyer chains, so as to furnish power for the operation of a spiked drum 94, which is made fast with said shaft 91. This spiked drum at the outer extremity of the delivery-conveyer on the boom is provided with concave portions in line with the conveyer-chains 89 90, thus arranging the spiked drum for engagement with the logs or other merchandise at the time when the same is to be discharged from the delivery-conveyer, whereby the spiked drum is adapted to feed the logs or other work so long as the same remain in engagement with said drum. The other inner portions of the chains forming the delivery-conveyer are supported at the inner end of the boom by means of a shaft 95, which is journaled on said inner extremity of the boom and is furnished with suitable pulleys 96, adapted for engagement by the conveyer-chains, and said chains of the delivery-conveyer engage with sprockets 97^a, which are fast with the delivery-conveyer-driving shaft 97, the latter being journaled in suitable bearings provided on the slidable carriage 51 and arranged below the support 87 of the boom contiguous thereto, so that the delivery-conveyer chains will have proper engagement with the sprockets 97^a on the shaft 97 to propel the same, whereby the delivery-conveyer is positively propelled, so as to traverse the boom.

The delivery-conveyer-driving shaft is extended at one side beyond its bearing in the slidable carriage for the purpose of receiving a bevel-gear 99, which is made fast with said shaft and is arranged to have intermeshing

engagement with the bevel-pinion 100, the latter being slidably fitted on the shaft 81, whereby the pinion 100 is adapted to travel up and down on the shaft 81 with the carriage 51 and to remain in mesh with the gear 99 for the purpose of rotating with said shaft 81 and to drive the gear 99 and the shaft 97 at all points in the adjustment of said carriage 51. The lower leads of the chains 89 90, forming the delivery-conveyer, have proper engagement with the sprockets 97^a on the shaft 97, and between said shaft 97 and the shaft 95 at the rear end of the boom said conveyer-chains 89 90 have a permanent allowance of abundant slack, as indicated at 90^a in Figs. 17 and 19, whereby the boom-conveyer is adapted to move with the boom F in its slidable adjustments without straining or disarranging the operative connection of the chains to the sprocket-wheels on the shaft 97. The carriage 51 is equipped with an idler guide-shaft 101, disposed on one side of the driving-shaft 97 and provided with sprockets 101^a, having engagement with the conveyer-chains. A similar guide-shaft 102 is journaled in the carriage 51 on the opposite side of the shaft 97, somewhat below the horizontal plane thereof, and said shaft has the sprocket-wheels 102^a, which also engage with the conveyer-chains, whereby the shafts 101 102 are disposed so as to direct the conveyer-chains into proper engagement with the sprockets on the conveyer-driving shaft 97.

The boom F is supported at its outer or free end portion by means of a tackle, the same having a cable 103, which is attached at 103^a to the top part of the tower, (see Fig. 15,) and this tackle-cable is reeved through a block 104, which is connected at 104^a to the outer portion of the boom-frame. (See Fig. 20.) The tackle-cable passes from the block 104 to and over a guide-sheave 105, which is supported at the top of the tower above the point of attachment 103^a of the cable thereto, and from this sheave 105 the tackle-cable is led down through the tower, so as to be accessible at the base thereof, whereby the cable may be operated by manual labor or by suitable power appliance, as desired. When the boom F is raised to a position wherein it inclines upward and outward from its pivotal support in the carriage 51, as shown by Fig. 15, said boom has a tendency to slide downward and rearward through the tower, and to overcome this objection I employ the anchoring-cable 106, the same passing over a sheave 107, mounted on the carriage 51, said cable being attached to the rear extremity of the boom, as at 106^a. This cable 106 may be anchored at the base of the tower C or attached to any suitable operating appliance, and when the boom is in its upwardly-inclined position the cable 106 may be slackened, so as to permit the boom to slide rearwardly through its pivoted support and through the tower, thus shortening the operative length of the boom. The cable 106 may, however, be anchored so as to restrain the boom from slidable movement, and the tackle-cable 103 may be slackened, so as to permit the boom F to swing in a downward direction from the center afforded by the pivot of the rocking support 87, whereby the boom may be raised or lowered to assume the upwardly-inclined position shown by Fig. 15 or to assume a horizontal position or to assume a downwardly-inclined position, as the necessity of the service may demand.

With the boom F and the conveyer thereon I have associated means which is designated in this specification as a "discharge" mechanism and which is primarily intended for use in connection with a log-piling apparatus for the purpose of placing each log in a horizontal position previous to dropping the log upon the pile or stack which lies beneath the boom. It will be recalled that the boom F may be adjusted to work in various positions according to the height of the stack or pile, and during transit of the log from the elevator along the horizontal conveyer and the boom-conveyer said log is moved in an endwise direction in contradistinction to the lateral position of the log on the elevator, as represented by the drawings. This endwise movement of the log along the conveyer and the boom will present the front end of the log when at the end of the boom in advance of the rear end, and consequently the log will be improperly discharged in the absence of the discharging mechanism G or its equivalent, thus discharging the logs so that they will turn over and be piled indiscriminately and in irregular order. The discharge mechanism is adapted to place the logs in horizontal positions previous to dropping them upon the pile, and said discharge mechanism includes a frame 108, the same being hung or fitted loosely on the shaft 91 and extending outwardly beyond the boom. The frame of the discharge mechanism is intended to occupy a horizontal position irrespective of the angular relation of the boom to the carriage 51, for which purpose the frame 108 is fitted loosely on the shaft in order that said frame may be adjusted to the proper horizontal position. Said frame is provided with the upstanding posts 109, which are braced by the stays 110 111. The outer end portion of the boom F is also provided with the posts 112, to which posts is fastened a tackle-block 113, the other post 109 on the frame of the discharge mechanism being equipped with a tackle-block 114. A tackle-cable 115 is reeved through the blocks 113 114 and arranged so as to have one end fastened, as at 105^a, to the tackle-block 113, said cable 115 passing loosely over a sheave 116, which is mounted on the top of the tower, whereby the cable may be led to the base of the tower for operation, so as to raise or lower the frame of the discharge mechanism according to the adjustment of the boom. The frame 108 is provided with a middle rail or beam

117, and on opposite sides of this rail are disposed the trap-doors 118 119, the same arranged in substantially horizontal positions and made of curved sheet metal, although any other material or shape may be adopted. These trap-doors are pivoted at their outer edges individually to the sides of the frame 108, as indicated at 120 in Fig. 21, whereby the doors are adapted to swing individually in downward directions and outward toward the sides of the frame. Each door is held normally in its closed position by the action of a latch mechanism and by a counterpoised lever, the latter being indicated by the numeral 121 and having its fulcrum 122 on the frame 108. The inner arm of each lever is arranged to engage with the bottom side of one door, while its outer arm has a counterpoise-weight 123, the ponderosity of the latter exceeding the weight of the door, whereby the latter when opened by the weight of the log will be automatically returned by the action of the counterpoised lever to its closed position immediately following the discharge of the log. The latch mechanism contemplates the employment of a latch-rod 125, which is journaled in suitable hangers 124, depending from the under side of each door, near the free edge thereof, and this rod is furnished with an arm 126, that extends toward the middle rail 117 of the frame, said arm 126 being provided with a beveled head 127, that is arranged to snap into locking engagement with a catch 128, that depends from the rail 117. As shown by Fig. 21, the element 128 is a double catch arranged between the latch-heads 127 on the latch-rods for the two trap-doors, said latches arranged to engage individually with the catch, so as to lock the trap-doors in their raised positions. Each latch-rod is furthermore provided with an arm 129, to which is connected an upwardly-extending finger 130, which passes loosely through the trap-door and is disposed near the inner end of the latter contiguous to the spiked drum on the shaft 91 of the delivery-conveyer. This upstanding finger of the latch-rod is provided at its upper portion with a releasing-plate 131, which is held in a raised position by the action of a coiled spring 132, and this releasing-plate is disposed in a horizontal plane below the spiked drum 94, so that a log during its passage over the drum will be free to rest upon one of the trap-doors without engaging with the releasing-plate 131 until the rear end of the log shall have passed the drum and the full length of the log will be contained in the discharge mechanism, at which time the rear end of the log will rest upon the releasing-plate, so as to depress the latter. In the normal position of the parts each trap-door is closed by the lever 121 and by the latch mechanism, and this position is maintained during the period when the log is moved from the delivery-conveyer upon the trap-door. Immediately following the discharge of the log from the conveyer and its deposit entirely upon the trap-door the releasing-plate is depressed and the latch mechanism is released, so as to permit the trap-door to be swung downwardly and outwardly by the weight of the log, whereby the log is first arranged in a horizontal position and is dropped from the discharge mechanism in such horizontal position instead of permitting the endwise discharge of the log, which is likely to make the log turn over and over when it is dropped. Immediately after the log is discharged the lever 121 returns the door to its raised position, and the latch makes said door fast, so that it will not be opened until another log shall have been fully deposited thereon.

As shown more clearly by Fig. 3 of the drawings, the receiving end of the endless conveyer E is at the middle of the tower A, whereas the delivery end of the elevator mechanism is at one side of the tower, thus leaving a space between the elevator and the conveyer. This space is bridged or spanned by the employment of a chute, which is indicated in its entirety by the letter H. This chute is adapted to occupy a generally-inclined position between the delivery end of the elevator and the receiving end of the conveyer, although the lower portion of the chute is curved, as indicated by Fig. 10, and is formed with an adjustable or flexible section h, the latter arranged to have a jointed or hinged connection at h' with the chute proper, H. (See Fig. 10.) The adjustable section h of the chute is arranged to extend for a short distance over the conveyer-trough and the conveyer in order that said adjustable section may properly discharge logs upon the conveyer-chains.

It will be recalled that the elevator-chains are adapted to be shortened or lengthened and to be driven by shafts located at different heights, and this adaptation of the elevator mechanism necessitates the adjustable support of the inclined chute, so that it may be raised or lowered corresponding to the height of the delivery end of said elevator. In view of these conditions I pivotally or hingedly connect the upper portion of said chute H to the slides 136, such pivotal connection being indicated by the numeral 135, said slides having the flanges 139 and 139^a, which are arranged to embrace the T-rails 15^a of the elevator-frame length 14. The slides 136 are adapted to move up or down on the elevator-frame, so as to assume positions below and close to the series of shafts 6 32 31, which are adapted to individually drive the elevator, whereby the slides are adapted to support the upper receiving portion of said inclined chute on the elevator-frame. The chute H consists of a bottom 140, the sides 140^a, and the trusswork 141, and the upper portion of this chute is flared or widened, as at H′ in Fig. 5, whereby it is adapted to properly receive the logs as they are delivered from the elevator.

The adjustment of the chute H to different

heights makes it occupy different angles relative to the horizontal conveyer, and the meeting ends of the chute and its adjustable section *h* are beveled, so as to produce the lap-joint 142, (indicated by full and dotted lines in Fig. 10,) thus making the chute and its adjustable section continuous under all adjustments. To maintain the operative relation of the chute to the conveyer, I have arranged the adjustable section *h* thereof to ride freely upon the suspension-cables 59 for the length 62 of the conveyer-trough, and this end is attained by the employment of the bearing-plates 142, which are secured to the unconfined end of the chute-section *h*, each bearing-plate having the wheels 143, that rest upon the cables 59.

The slides 136, which hingedly support the upper end of the chute, may be raised or lowered through the agency of a rope 144, the same passing over a pulley 145, that is mounted on the tower A, as shown by Figs. 6 and 7, and said cable 144 being fastened to a plate 146, which is fitted on the pivot-pin 135 between the slide and the chute, although other means may be adopted for attaching the cable to the slides. Said cable extends downwardly to the base of the tower and is adapted to be manipulated in any suitable way for the purpose of raising or lowering the slides on the elevator-frame, and thereby give adjustment to the upper end of the chute.

The weight of the lower portion of the chute is not imposed wholly upon the cables 59, which support the conveyer-trough length 62, but said lower portion of the chute is partly suspended by the employment of a tackle mechanism, the cable 147 of which is attached to a block 148, that is fastened to the lower portion of the chute close to the overlapping jointed connection of the chute H to its adjustable section *h*. Another block 149 is connected to the tower, and the cable 147 leads downwardly from said block to the base of the tower, whereby it may be adjusted.

The chute H and its adjustable section *h* are provided with the longitudinal central division-ridge 150, the same being similar to the division-ridge 66 in the conveyer-trough, and a log-turner and directing-gate 151 is provided at the upper portion of this inclined chute H, so as to operate in the enlarged mouth H′ thereof. (See Figs. 5 and 7.) This turner and gate is pivotally mounted in the chute by means of a pivotal shaft 152, which is located contiguous to the ridge 150 and in line therewith, said shaft having the element 151 made fast therewith, so that it may be swung across the mouth of the chute and assume the full or dotted line positions indicated by Fig. 5. Any suitable means may be adopted for swinging the gate 151; but, as shown by the drawings, a double-armed lever 153 is arranged on the under side of the chute and is made fast with the pivotal shaft, and to the free ends of the lever-arms are attached the cables 154 155, the same extending to any suitable point of operation. When the pivoted gate 151 is adjusted to the full-line position of Fig. 5, the left-hand end of a log which is discharged by the elevator over the shaft 6 is adapted to strike against the end of the gate and to thereby be turned to slide end foremost down the chute at one side of the ridge 150 and into one compartment of the chute, from whence the log will be delivered while still moving in an endwise direction upon one chain of the horizontal conveyer E. Before another log is delivered from the elevator the gate 151 is switched over to the dotted-line position shown by Fig. 5, so that the right-hand end portion of the log will strike against said gate, and thereby be turned so as to slide end foremost down the chute and on the opposite side of the ridge 150, so as to travel in the other compartment of the chute and to be delivered therefrom upon the other chain of the endless conveyer E, after which the gate 151 is returned to its full-line position, whereby the logs are alternately directed into the different compartments of the chute, so as to be delivered to the different chains of the conveyer mechanism.

This being the general construction of my machine or apparatus, the operation thereof may be summarized as follows: Assuming that the three towers are employed, that the conveyer mechanism is adjusted to its lowered position, as indicated by the first dotted line in Fig. 3, that the elevator is shortened, so as to be driven by the shaft 31, that the chute is properly adjusted to bridge the space between the conveyer and the elevator, and that all the conveyers are properly driven, so as to run in the required directions, the work is placed on the dogs 30 of the elevator, so as to be carried up thereby and delivered over the shaft 31 upon the chute. The first log or other piece of work strikes the gate and is turned as it slides along the chute, the latter serving to deliver the work to one of the endless chains forming a part of the horizontal conveyer mechanism E. The gate is reversed, and the next log is directed thereby upon or to the other chain of the endless conveyer E. The series of logs are carried by the conveyer across from the tower A through the tower B and to the tower C, the logs being carried end foremost. At the beginning of the piling operation the boom F should be lowered to a dowardly-inclined position, while the discharge mechanism G is adjusted to assume a horizontal position, and the logs are carried along this boom by the endless chains of the delivery-conveyer, the spiked drum on the shaft 72 serving to transfer the logs from the conveyer E over and upon the delivery-conveyer, whereas the spiked drum on the drum 91 moves the logs from the delivery-conveyer to and upon the trap-doors of the discharge mechanism, whereby the logs are arranged in horizontal positions and automatically dropped upon the stack or pile. As the pile

increases in height the boom is raised and the position of the discharge mechanism G is shifted, so as to always maintain the latter in a horizontal position for the purpose of arranging and dropping the logs, and the operations are continued until the stack or pile of logs reaches such a height as to necessitate the vertical adjustment of the three carriages, the chute, and the boom, the elevator being correspondingly lengthened. After the pile of logs shall have reached the maximum height permitted by the apparatus it is my purpose to shift the middle tower B by means of the transfer-truck D out of working position. This of course requires the temporary disarrangement of the horizontal conveyer E, and the tower C is now run from its track c' over and upon the transfer-truck, which is moved along the track d until it reaches the track b', whereupon the tower C is run onto the track b' until it assumes an alined relation with the tower A. The horizontal conveyer E is now readjusted; but its length is reduced, because it is only required to span the space between the towers A C. The operations of elevating the work, transferring the work by the conveyer E and the delivery-conveyer on the boom, and discharging the work by the discharge mechanism are repeated, the conveyer E being in its lowered position at the beginning of the second stage of the operation. The boom and discharge mechanism are adjusted, as before, so as to place the logs in the second pile, which may be continuous with or contiguous to the first pile, and the conveyer mechanism E is raised as the operation of piling the logs in the second stage is continued until completed. It will be understood that the boom is raised or lowered independently of the adjustment of the carriage 51 and that the boom may be slid in or out by an endwise movement thereof, according to the progress of the work of piling or stacking the logs.

Parts of my invention may be used without the whole, and other changes within the scope of the appended claims may be made in the form and proportion of some of the parts, while their essential features are retained and the spirit of the invention is embodied. Hence I do not desire to be limited to the precise form of all the parts as shown, reserving the right to vary therefrom.

Having thus described my invention, what I claim as new is—

1. In a piling apparatus or system, the combination of an elevator mechanism, a substantially horizontal conveyer mechanism, load-transfer means bridging the space between the elevator and conveyer mechanisms whereby a load is automatically shifted from the elevator to the conveyer mechanism, and load-delivery mechanism arranged to receive the load from said conveyer mechanism; substantially as and for the purposes set forth.

2. In a piling apparatus or system, the combination of towers, a substantially horizontal conveyer mechanism supported thereon, an elevator mechanism on one of said towers, load-transfer mechanism bridging the space between the elevator mechanism and said conveyer mechanism, and means for vertically adjusting the conveyer mechanism, substantially as set forth.

3. In a piling apparatus or system, the combination of towers, a substantially horizontal conveyer mechanism, means whereby said conveyer mechanism may be raised or lowered with relation to the towers, and an elevator mechanism arranged to deliver its load to said conveyer mechanism, substantially as set forth.

4. In a piling apparatus or system, the combination of towers, a substantially horizontal conveyer mechanism, means for adjusting said conveyer mechanism vertically, an elevator mechanism arranged to discharge its load from different heights, and transfer means bridging the space between the elevator and conveyer mechanisms, substantially as set forth.

5. In a piling apparatus or system, the combination of an elevator mechanism arranged to discharge its load from different heights, a conveyer mechanism adjustable vertically and normally occupying a position below the point of discharge from the elevator mechanism, and adjustable transfer means bridging the space between the discharge of the elevator mechanism and said conveyer mechanism, as and for the purposes set forth.

6. In a piling apparatus or system, the combination of an elevator mechanism arranged to discharge from different heights, a substantially horizontal conveyer mechanism arranged for vertical adjustment, an inclined chute bridging the space between the elevator and conveyer mechanisms, and means for adjusting said chute to occupy an operative relation to the elevator and conveyer mechanisms, substantially as set forth.

7. In a piling apparatus or system, an elevator mechanism having a series of driving devices determining the points of discharge of the elevator, and a suitable carrier adapted to be lengthened or shortened and to be operatively arranged to either of said driving devices, in combination with a mechanism arranged below the point of discharge from the elevator, and a chute bridging the space between the conveyer and the point of discharge of the elevator, substantially as described.

8. In a piling apparatus or system, an elevator mechanism comprising an extensible frame, a shaft carried by one member of said frame, a series of shafts on the other frame member, and a suitable carrier operatively fitted to certain of the shafts, in combination with a conveyer, and transfer devices bridging the space between the point of discharge of the elevator and said conveyer, substantially as described.

9. In a piling apparatus or system, an elevator mechanism comprising an extensible frame having its members slidably fitted together and provided with suitable means whereby one frame member may be lengthened or shortened with respect to the other frame member, an idler-shaft carried by the lower frame member, a series of shafts on the upper frame member, and a suitable carrier adapted to be operatively fitted to certain of said shafts, in combination with a conveyer mechanism, and transfer devices between said conveyer and the point of discharge of the elevator, substantially as described.

10. In a piling apparatus or system, an elevator mechanism comprising an extensible frame having its members slidably fitted together, threaded shafts supported on one frame member and operatively connected to the other frame member, a worm-shaft mounted on one frame member and geared to said threaded shafts and provided with operating means, an idler-shaft carried by the lower frame member, a series of shafts on the upper frame member, and a suitable carrier operatively fitted to certain of said shafts, in combination with a conveyer mechanism, and suitable transfer devices bridging the space between the conveyer mechanism and the points of discharge of the elevator, substantially as described.

11. In a piling apparatus or system, an elevator mechanism comprising a suitable frame, a series of driving-shafts, a primary driving-shaft, gearing operatively connecting certain of said driving-shafts with said primary driving-shaft, and suitable conveyer-chains operatively fitted to certain of the shafts, in combination with a conveyer mechanism, and a chute between the elevator and the conveyer, substantially as described.

12. In a piling apparatus or system, the combination of an elevator mechanism, a conveyer mechanism, and a transfer-chute having an adjustable section which is operatively disposed to the conveyer mechanism, substantially as described.

13. In a piling apparatus or system, the combination of an elevator mechanism having points of discharge at different heights, a conveyer mechanism adjustable vertically with respect to its supports, and a flexible chute bridging the space between the elevator and the conveyer and equipped with means whereby said chute may be raised or lowered to maintain an operative relation to the elevator and the conveyer, substantially as described.

14. In a piling apparatus or system, the combination of an elevator having a rigid frame and points of discharge at different heights, slides fitted to said elevator-frame, a chute pivoted to said slides, means for raising and lowering the slides and correspondingly adjusting the chute, and a conveyer in operative relation to the chute, substantially as described.

15. In a piling apparatus or system, the combination of an elevator-frame, an elevator thereon, a suspended conveyer, an inclined chute slidably supported on the elevator-frame and having a flexible section arranged to ride upon said suspended conveyer, and means for adjusting said chute, substantially as described.

16. In a piling apparatus or system, the combination of an extensible elevator, a vertically-adjustable conveyer normally occupying a substantially horizontal position, and vertically-adjustable load-transfer mechanism bridging the space between the elevator and the conveyer, substantially as described.

17. In a piling apparatus or system, the combination of an elevator, a conveyer having a number of individually-operable members all traveling in the same direction, a chute between the elevator and conveyer, and work-deflecting means disposed in the path of the discharge from the elevator and shiftable across the chute, to alternately direct the work to the different members of said conveyer mechanism, substantially as described.

18. In a piling apparatus or system, the combination of an elevator, a conveyer having separate traveling members, a chute between said elevator and the conveyer, means for adjusting the conveyer and the chute individually, and work-deflecting means mounted on and adjustable with the chute and disposed in the path of discharge from the elevator, and shiftable across the chute, for directing the work to different members of said conveyer, substantially as described.

19. In a piling apparatus or system, the combination of an elevator, a conveyer, an inclined chute having a jointed adjustable section and arranged for the chute to receive the load from the elevator and for its adjustable section to overhang the conveyer, and suitable devices connected to different portions along the length of the chute for suspending and adjusting the latter, substantially as described.

20. In a piling apparatus or system, the combination of a tower having an elevator-driving shaft, an elevator-frame hung for adjustment with said shaft and its axis in motion, means whereby the angle of the conveyer-frame to the tower may be varied, an elevator mechanism supported by the frame and adapted to be driven from said elevator-shaft, a conveyer slidably supported by the tower, and transfer devices between the elevator and said conveyer, substantially as described.

21. In a piling apparatus or system, the combination of a group of towers, vertically-adjustable carriages on said towers, a conveyer mechanism supported by said carriages and adjustable vertically therewith, and an elevator mechanism arranged to deliver its load to said conveyer, substantially as described.

22. In a piling apparatus or system, the combination of a group of towers, each provided with vertical guides, a series of carriages fitted slidably to the guides of said towers, a

horizontal conveyer supported on the carriages and arranged for adjustment vertically thereon, an elevator mechanism, and a transfer device between said elevator and said conveyer, substantially as described.

23. In a piling apparatus or system, the combination of a group of towers, means whereby one tower of the group may be shifted out of operative position with respect to the other remaining towers, a conveyer mechanism supported by said towers, an elevator mechanism, and transfer devices between the elevator and said conveyer, substantially as described.

24. In a piling apparatus or system, the combination of a group of towers each having a vertically-adjustable carriage, a sectional conveyer-trough having its members suspended by said carriages between the towers, a continuous conveyer mounted on the carriages and extending partially through said trough, an elevator mechanism, and transfer devices between the elevator and said conveyer, substantially as described.

25. In a piling apparatus or system, the combination of a group of towers each having a vertically-adjustable carriage, suspension-cables spanning the spaces between the towers and attached to the carriages thereof, a sectional trough or casing having its members attached to the cables and disposed in overlapping relation, the idler and driving shafts on certain of said carriages, a continuous conveyer mechanism fitted to the shafts and extending between said towers, and an elevator mechanism arranged to discharge its load to the conveyer, substantially as described.

26. In a piling apparatus or system, the combination of a group of towers, a substantially horizontal conveyer-trough suspended from said towers and provided with a longitudinal division-ridge, a continuous conveyer mechanism having members operatively disposed with relation to the trough and on opposite sides of the division-ridge therein, and an elevator mechanism arranged to discharge its load to said conveyer, substantially as described.

27. In a piling apparatus or system, the combination of a group of towers, a vertically-slidable carriage on each tower, an idler-shaft on one carriage, a driving-shaft on the other carriage, an endless conveyer mechanism supported by said carriages and operatively related to the driving and idler shafts, means for propelling the conveyer-driving shaft at all points of adjustment of its carriage, and an elevator mechanism arranged to discharge its load to said conveyer, substantially as described.

28. In a piling apparatus or system, the combination of towers, a series of carriages vertically adjustable therein, means for individually adjusting said carriages with relation to the towers, a conveyer mechanism supported by the carriages and adjustable therewith, means for driving said conveyer mechanism at all points of the adjustment of the carriages, and an elevator mechanism arranged to discharge its load to the conveyer, substantially as described.

29. In a piling apparatus or system, the combination of towers, a conveyer mechanism, a boom projecting from one of the towers, means whereby the boom is slidably and pivotally mounted on one tower, and a delivery-conveyer supported by and adjustable with the boom and arranged to receive the load from the first-named conveyer, substantially as described.

30. In a piling apparatus or system, the combination of towers, an elevator on one tower, a boom projecting from another tower, a primary load-conveyer extending between the elevator and the boom, and a delivery-conveyer mounted on the boom and arranged to receive the load from the primary conveyer, substantially as described.

31. In a piling apparatus or system, the combination of towers, a conveyer mechanism mounted for vertical adjustment thereon, an elevator mechanism for loading the conveyer, a boom projecting from one of the towers, means for bodily shifting the boom up or down to maintain an operative relation to the conveyer mechanism, and a delivery-conveyer mounted on the boom and arranged to receive the load from the first-named conveyer, substantially as described.

32. In a piling apparatus or system, the combination of towers, a conveyer supported thereon, means for loading said conveyer, a boom projecting from one of the towers, a delivery-conveyer mounted on the boom and arranged to receive the load from the first-named conveyer, and a discharge mechanism operatively related to the boom and the conveyer thereon and arranged to properly position the load previous to dropping the same, substantially as described.

33. In a piling apparatus or system, the combination of a boom, a conveyer thereon, a discharge mechanism operatively related to said conveyer for receiving the load therefrom, said discharge mechanism having elements arranged to automatically position the load previous to discharging the same, as and for the purposes set forth.

34. In a piling apparatus or system, the combination with a boom, and means for delivering a load thereto, of a delivery-conveyer supported on the boom and arranged to receive the load from the first-described means, and a discharge mechanism mounted on the boom in adjustable relation thereto, and occupying normally an operative position with reference to the conveyer, said discharge mechanism having elements operable to automatically arrange the load in a horizontal position, and to automatically discharge the load immediately following the proper disposition thereof, as and for the purposes set forth.

35. In a piling apparatus or system, the combination of a boom, means for conveying a load

thereto, a delivery-conveyer supported by the boom and operatively related to the first-described conveyer means, a discharge mechanism adjustably mounted on the boom and having elements arranged to be opened automatically by the weight of the load, and means for adjusting said discharge mechanism to occupy a horizontal position at all points of adjustment of the boom, substantially as described.

36. In a piling apparatus or system, the combination of a boom, means for conveying a load thereto, a delivery-conveyer mounted on the boom for adjustment therewith, means for adjusting said boom, a discharge mechanism supported on the boom in operative relation to the delivery-conveyer thereon, and means for adjusting the discharge mechanism irrespective of adjustment of the boom, substantially as described.

37. In a piling apparatus or system, the combination of a boom, means for conveying a load thereto, a delivery-conveyer on the boom, and a transfer device between the first-named conveyer and the delivery-conveyer, whereby the load will be carried from one conveyer to the other positively, substantially as described.

38. In a piling apparatus or system, the combination of a boom, a conveyer for transporting a load thereto, a delivery-conveyer supported by the boom and arranged contiguous to the first-named conveyer, and a revoluble drum occupying an operative relation to the first-named conveyer and arranged to automatically transfer the load therefrom to, and upon, the delivery-conveyer, as set forth.

39. In a piling apparatus or system, the combination of a boom, a conveyer for transporting a load thereto, a delivery-conveyer supported by the boom, a discharge mechanism having trap-doors disposed in operative relation to the delivery-conveyer, and means whereby said trap-doors are automatically actuated, substantially as described.

40. In a piling apparatus or system, the combination of a boom, a conveyer for transporting a load thereto, a delivery-conveyer on said boom, a discharge mechanism having trap-doors operatively related to the delivery-conveyer, and an automatically-releasable latch mechanism for maintaining the trap-doors in their closed operative positions, substantially as described.

41. In a piling apparatus or system, the combination with a boom and a delivery-conveyer thereon, of a discharge mechanism mounted on the conveyer and comprising trap-doors normally in operative relation to the conveyer means, means for locking the trap-doors in their closed position and adapted to be released by the deposit of the load thereon, and means for returning said doors to their closed positions immediately following the discharge of the load therefrom, substantially as described.

42. In a piling apparatus or system, the combination with a delivery-conveyer, a discharge mechanism having hinged doors, and load-actuated locking devices for normally holding the doors in their closed positions, substantially as described.

43. In a piling apparatus or system, the combination with a conveyer, of a discharge mechanism having a trap-door, and a load-actuated latch mechanism arranged to maintain the trap-door in operative relation to the conveyer, substantially as described.

44. In a piling apparatus or system, the combination with a conveyer mechanism, of a trap-door arranged to receive the load from the conveyer mechanism, and means for maintaining said trap-door in its operative position, whereby the load will be properly disposed previous to its discharge from the trap-door, substantially as described.

45. In a piling apparatus or system, the combination with a conveyer, of a discharge device having a load-actuated latch mechanism, and a transfer-drum arranged to shift the load from the conveyer to the discharge device without releasing the latch mechanism until the load shall have been fully imposed upon the discharge device, substantially as described.

46. In a piling apparatus or system, the combination with a conveyer, of a hinged trap-door, a counterpoise operatively related to said trap-door, and a load-actuated latch mechanism to normally maintain the trap-door in operative relation to the conveyer, substantially as described.

47. In a piling apparatus or system, the combination with a delivery-conveyer having individually-operable members, of a discharge mechanism provided with individually-hinged doors arranged to swing outwardly on the deposit of the load thereon from said conveyers, and means whereby the trap-doors are maintained in their operative relations to said conveyer, substantially as described.

48. In a piling apparatus or system, the combination with a delivery-conveyer having individually-operable members, of a discharge mechanism having hinged trap-doors adjacent to said conveyer, a counterpoise for each trap-door, load-actuated latch devices for maintaining the trap-doors in their closed position, and a transfer device between the conveyer and said trap-doors, substantially as described.

49. In a piling apparatus or system, the combination of towers, carriages mounted thereon, a conveyer mechanism supported by the carriages, and a boom mounted on one of said carriages for adjustment therewith and capable of an independent movement, substantially as described.

50. In a piling apparatus or system, the combination with a carriage, and a conveyer mechanism, of a boom having means for transferring the load, and means whereby said boom

may be given an endwise movement with respect to the carriage, substantially as described.

51. In a piling apparatus or system, the combination with a carriage, and a conveyer mechanism, of a boom mounted on said carriage to be capable of a swinging movement in a vertical plane and of an endwise movement to the carriage, and means supported by the boom to receive the load from the conveyer, substantially as described.

52. In a piling apparatus or system, the combination of towers, carriages thereon, a conveyer supported by the carriages, a pivoted boxing mounted in one of the carriages, a boom slidable in said boxing and arranged to turn therewith in a vertical plane, means for adjusting the boom, and a conveyer supported on the boom, substantially as described.

53. In a piling apparatus or system, the combination of towers, vertically-movable carriages thereon, a conveyer supported by the carriages, two conveyer-driving shafts individually mounted in one of said carriages, and one of said shafts having operative connection with said conveyer, a boom mounted in said carriage having the shafts, a delivery-conveyer operatively related to the boom and having connection with the other of said conveyer-driving shafts, and means whereby the two conveyer-driving shafts may be propelled at all points of the adjustment of the carriage or of the boom, substantially as described.

54. In a piling apparatus or system, the combination with a conveyer mechanism, of means for supporting the same in an elevated position, a load-conveying elevator arranged to deliver to said elevated conveyer mechanism, and a load-discharge mechanism arranged to receive from the conveyer mechanism and having a yieldable load-detaining door arranged in the path of the load operable to properly position the load before releasing or dropping the same, substantially as described.

55. In a piling apparatus or system, the combination with an elevated conveyer mechanism, of an automatic load-discharge mechanism situated in operative relation to said conveyer mechanism and having a yieldable load-retaining door arranged to momentarily retain and to position the load before finally discharging the same, substantially as described.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

DANEL J. BROPHY.

Witnesses:
H. T. BERNHARD,
JOHN F. DEUFFERWIEL.