B. S. SUMMERS.

FIBER CLEANING MACHINE.

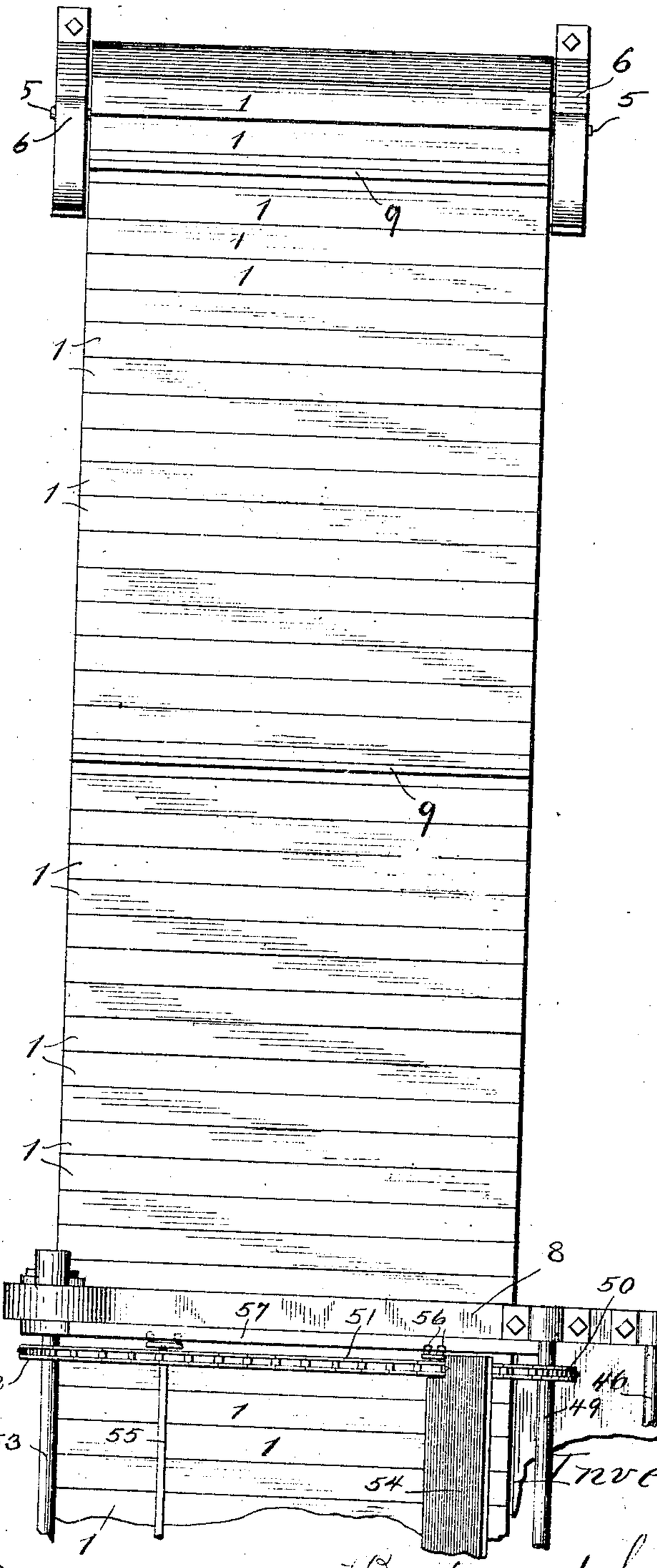
APPLICATION FILED DEC. 2, 1901.

915,125.

Patented Mar. 16, 1909.

29 SHEETS—SHEET 1.

Fig. 1.



Witnesses:

R. F. Jacker

Robert Lewis Ames.

Inventor:

By Bertrand S. Summers

Dyer & Addington

Attorneys

915,125.

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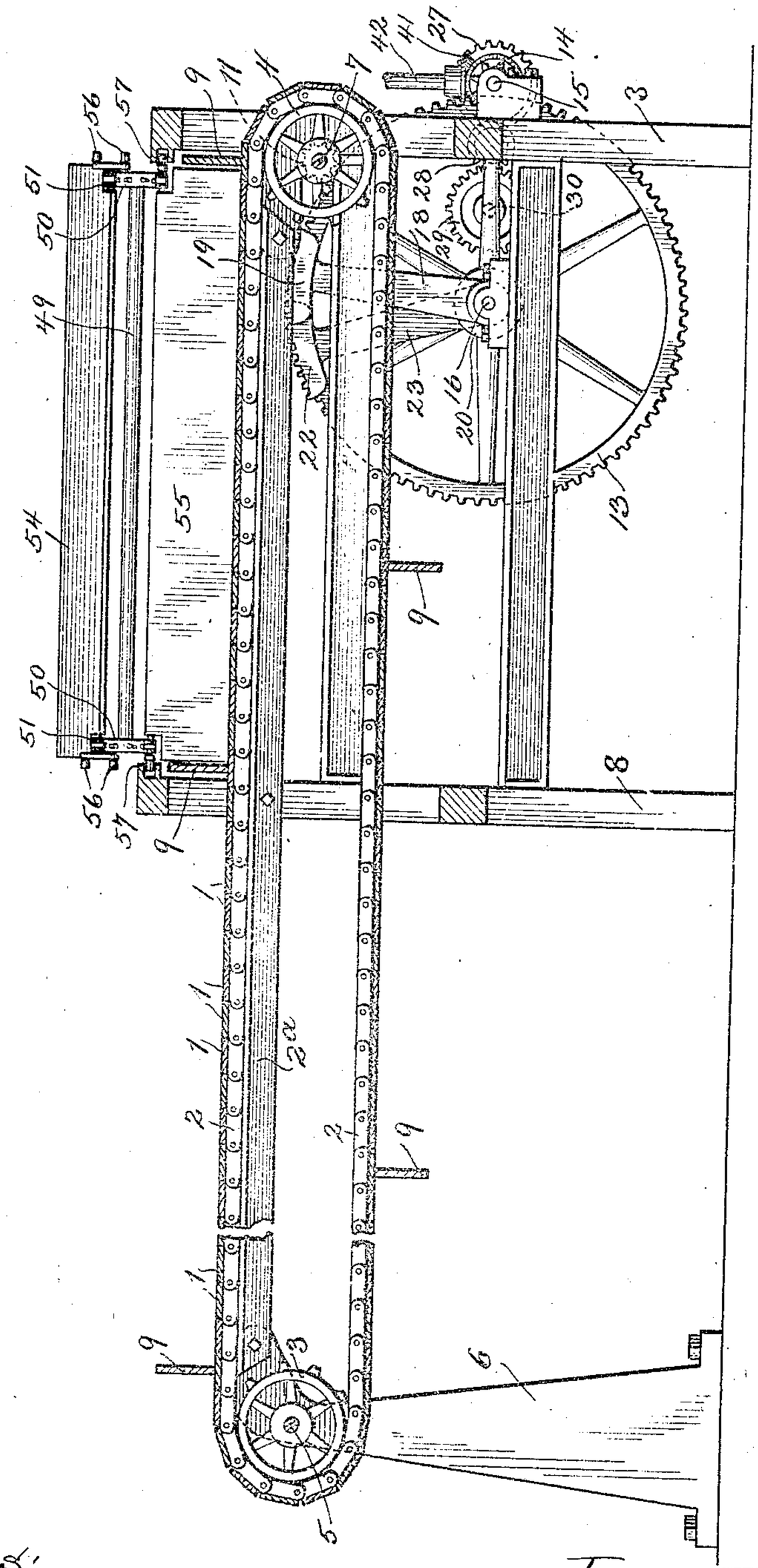
Patented Mar. 16, 1909.

29 SHEETS—SHEET 2.

Fig. 2.



Witnesses:
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Inventor:
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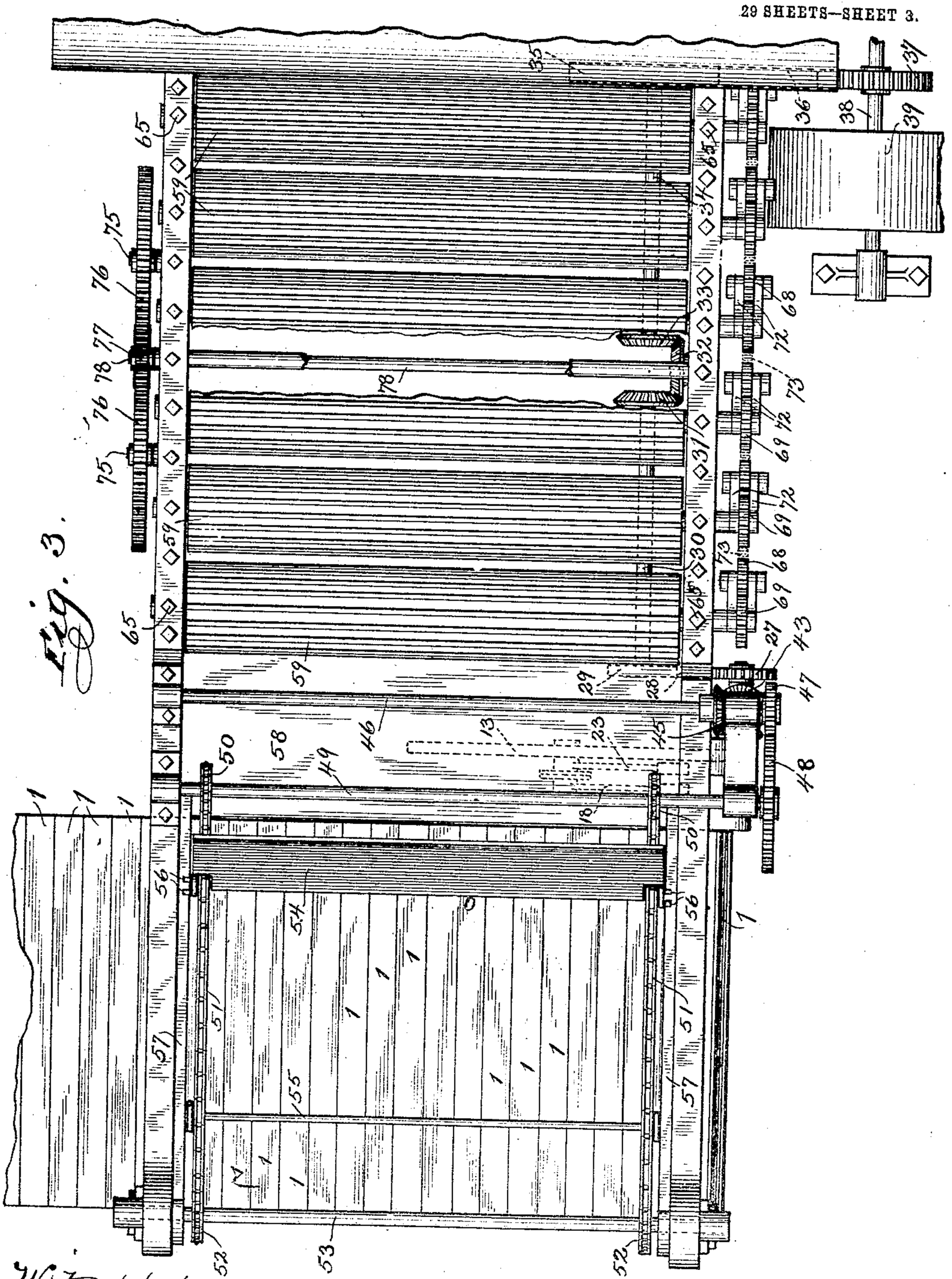
29 SHEETS—SHEET 3.

Fig. 3.



Witnesses:
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29 SHEETS—SHEET 4.

Fig. 4.

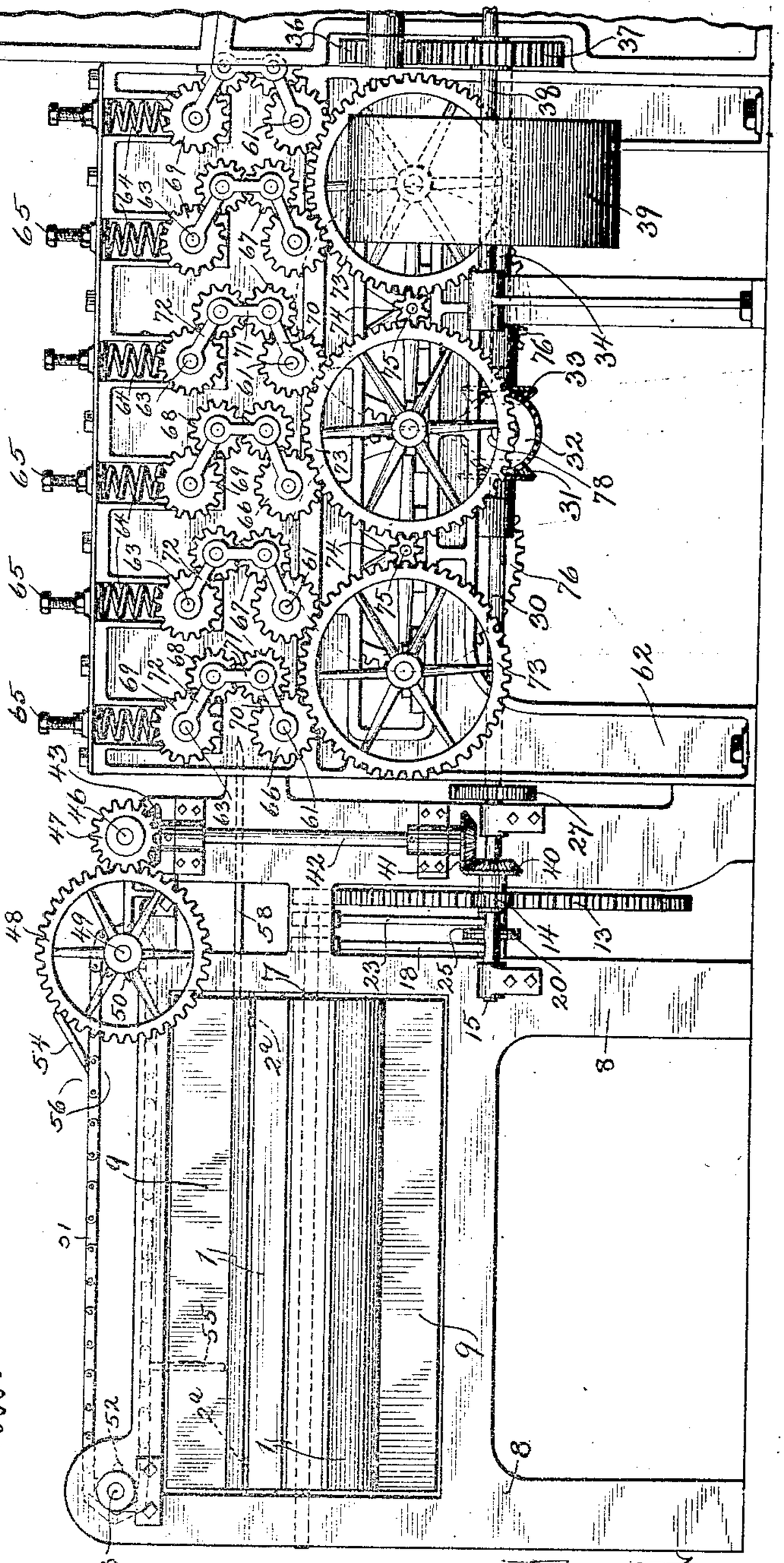
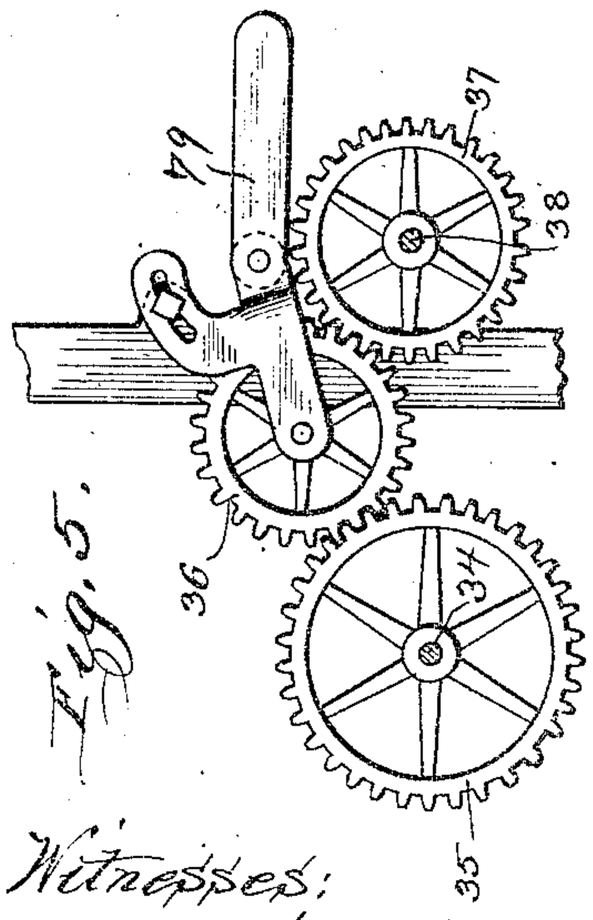


Fig. 5.



Witnesses:

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FIBER CLEANING MACHINE.

APPLICATION FILED DEC. 2, 1901

No. 915,125.

Patented Mar. 16, 1909.

29 SHEETS—SHEET 5.

Fig. 8.

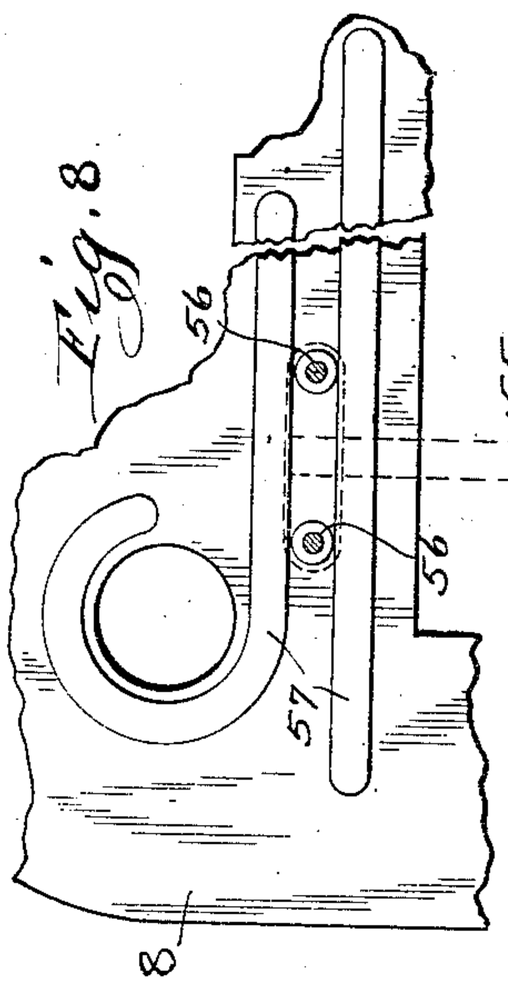
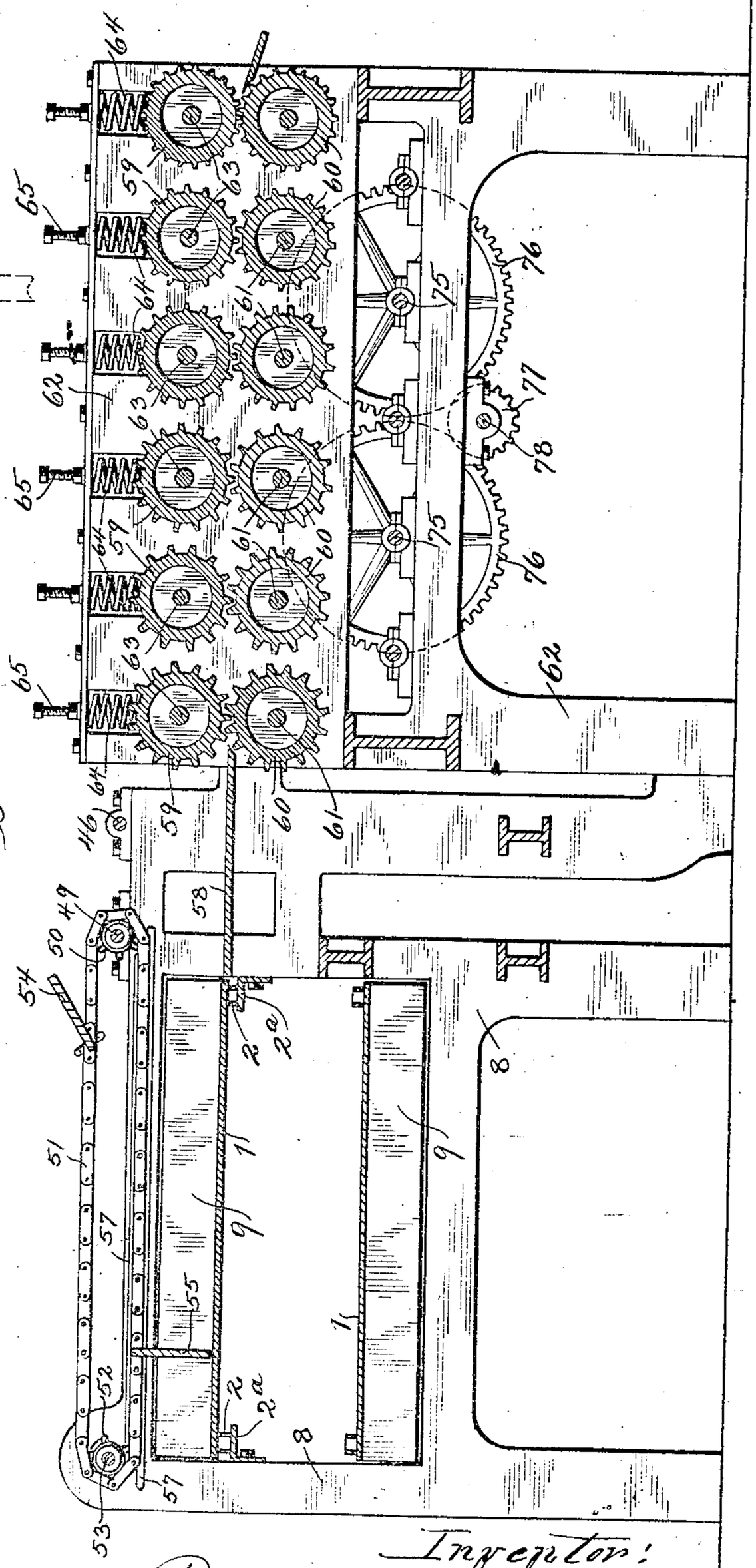


Fig. 6.



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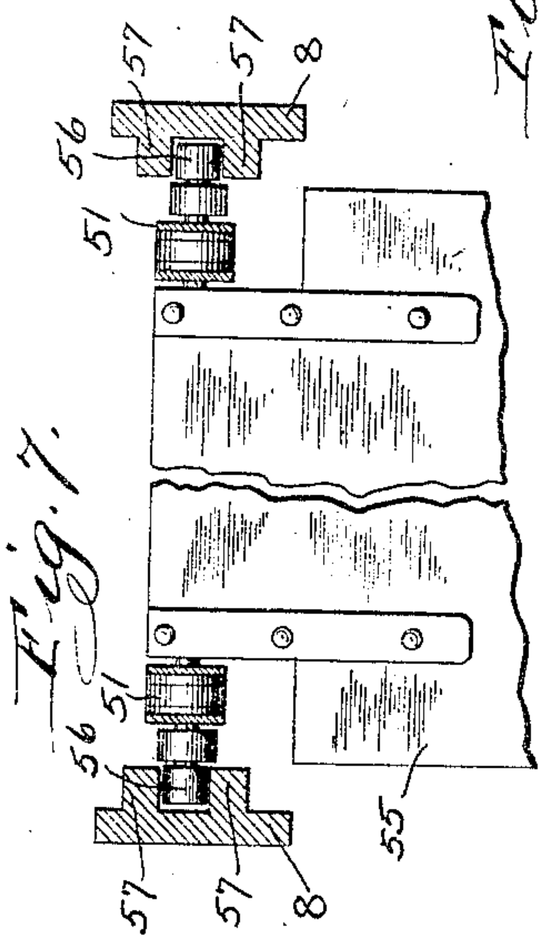

Witnesses:

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29 SHEETS—SHEET 6.

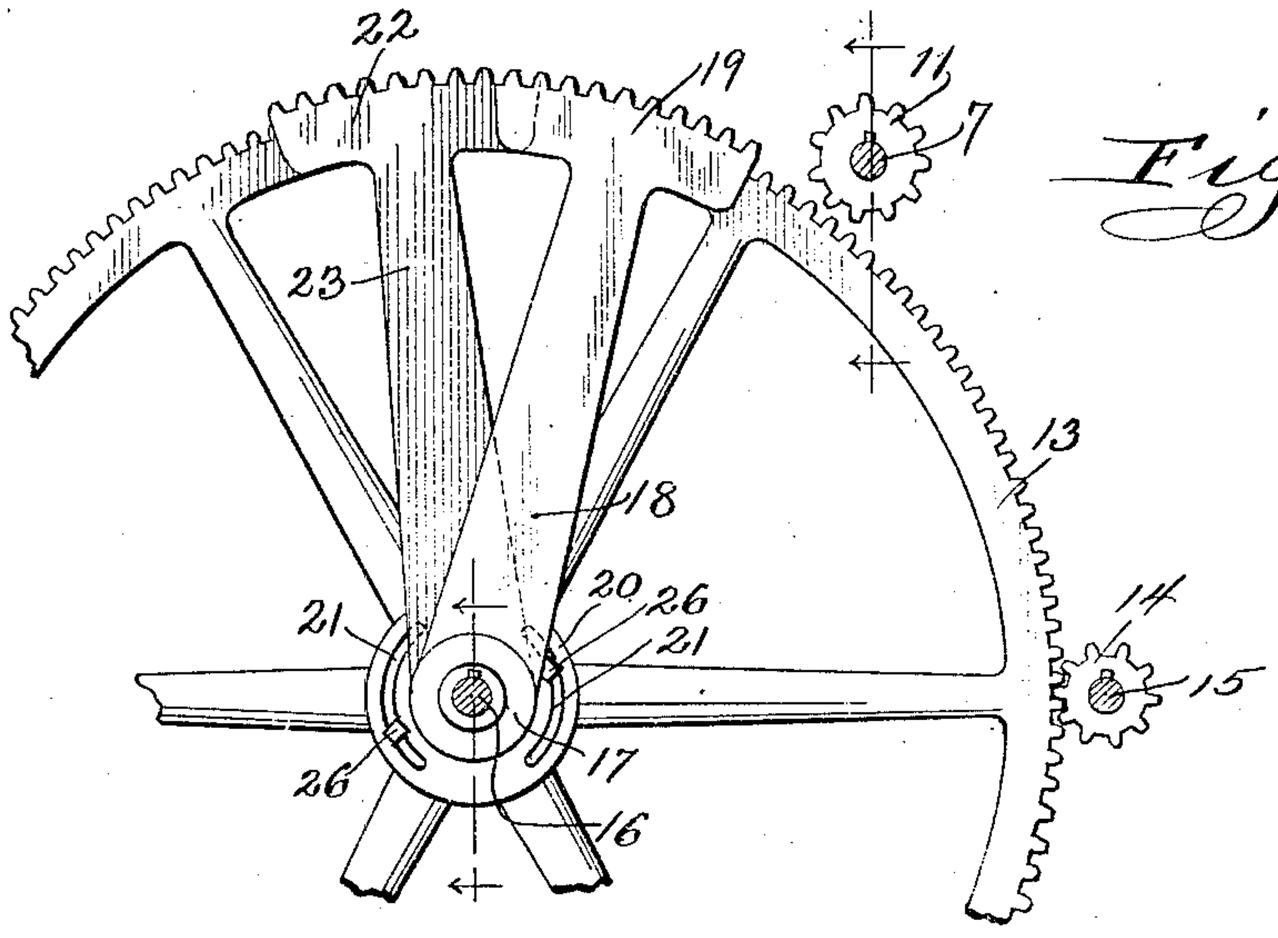


Fig. 9.

Fig. 10.

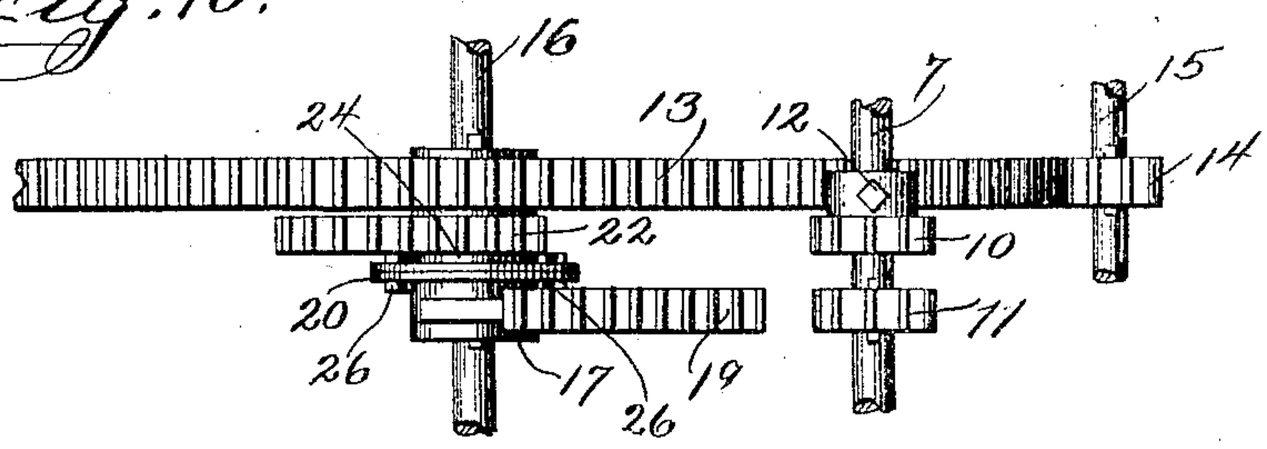


Fig. 11.

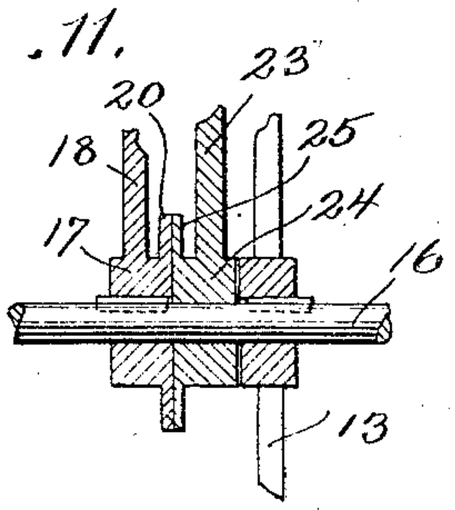
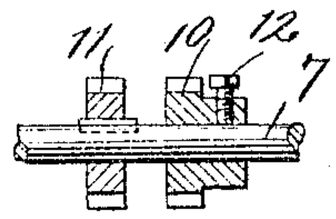


Fig. 12.



Witnesses:
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915,125. Patented Mar. 16, 1909.

29 SHEETS—SHEET 7.

Fig. 13.

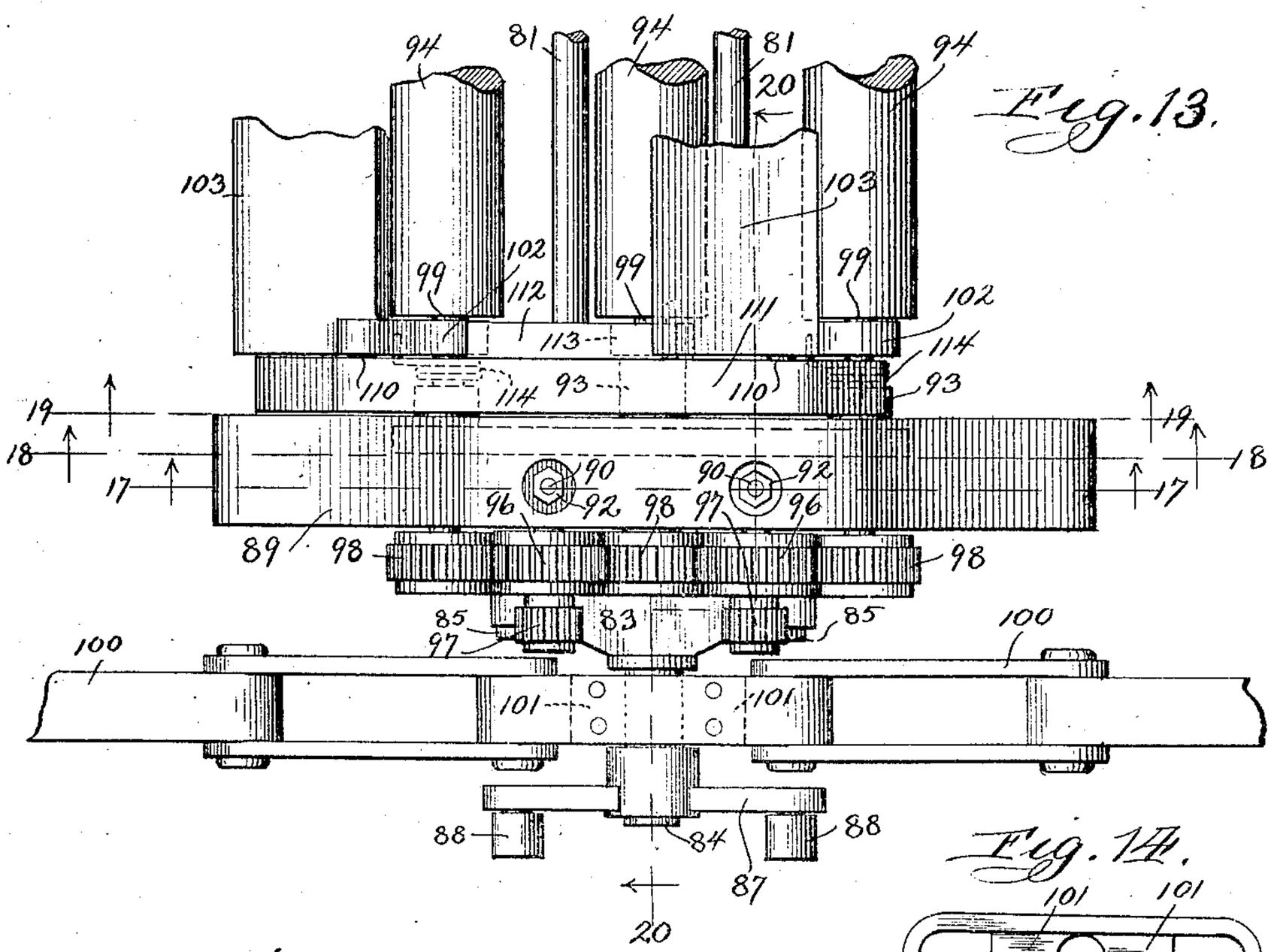


Fig. 14.

Fig. 15.

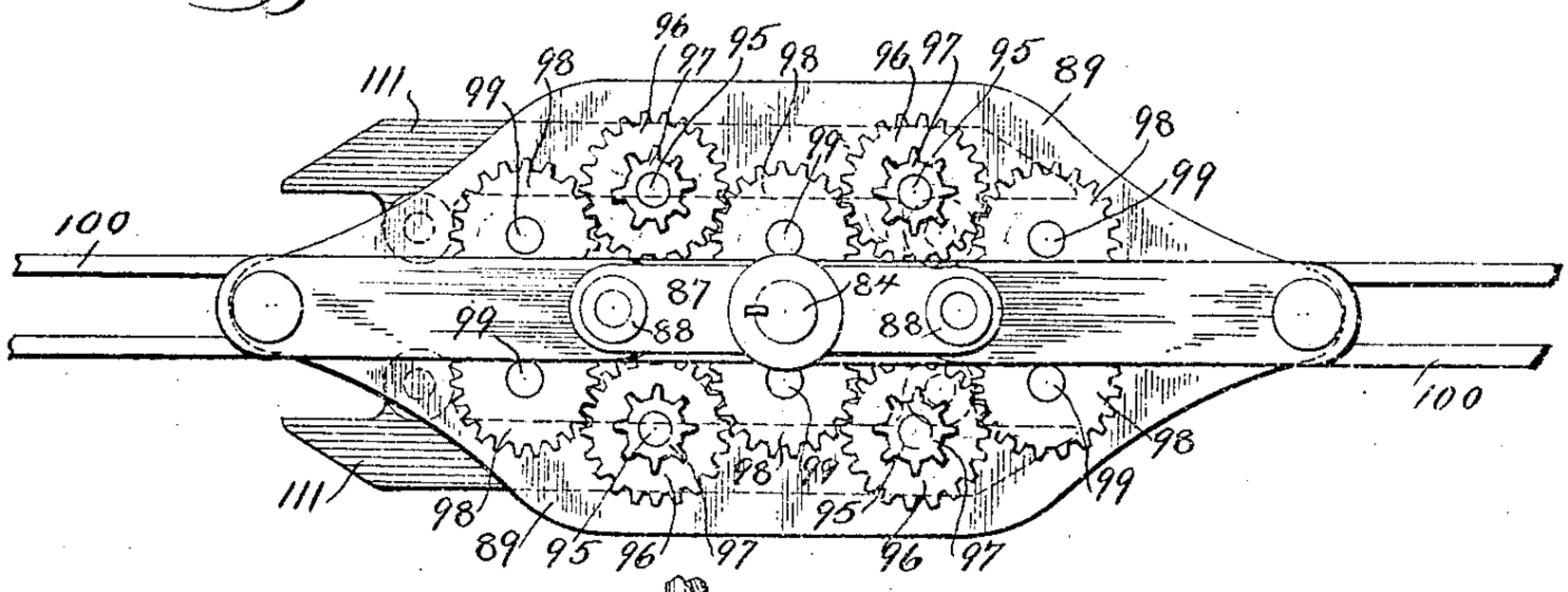
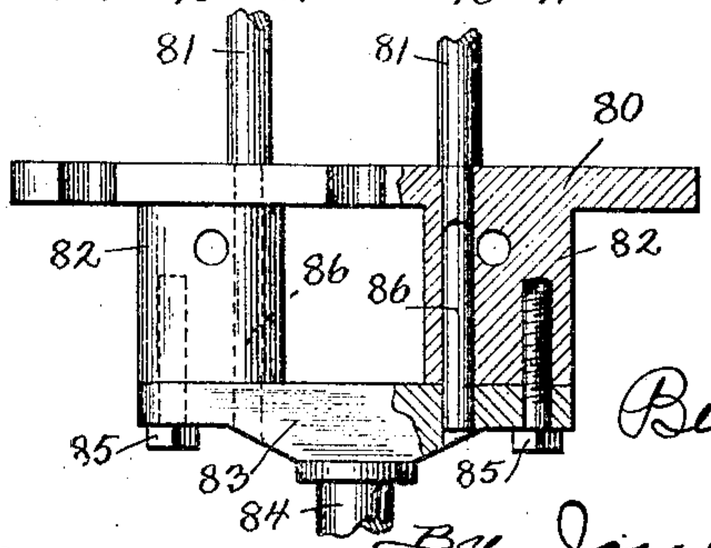


Fig. 16.



Witnesses:
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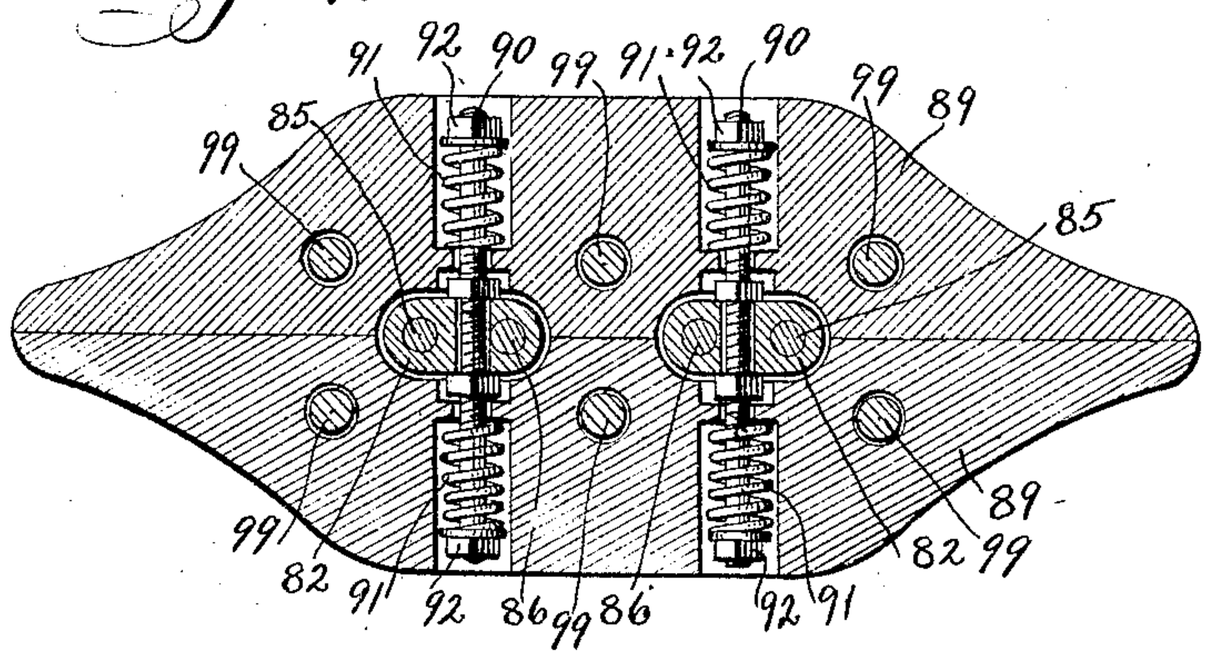
29 SHEETS—SHEET 8.

Fig. 17.



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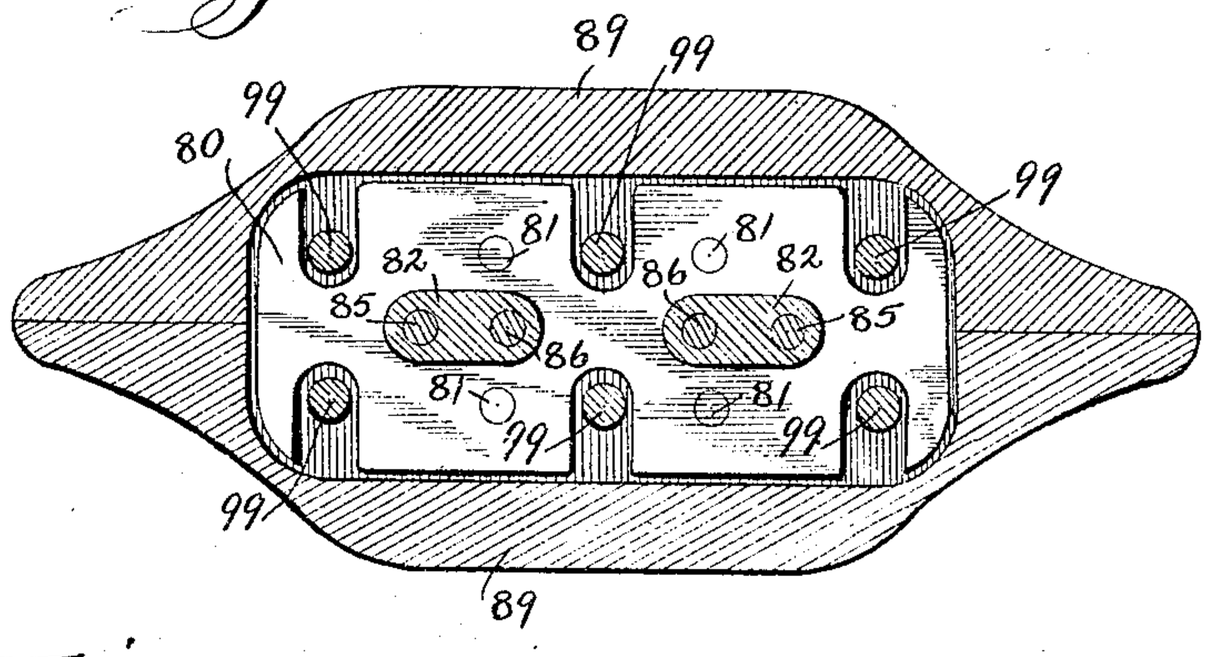

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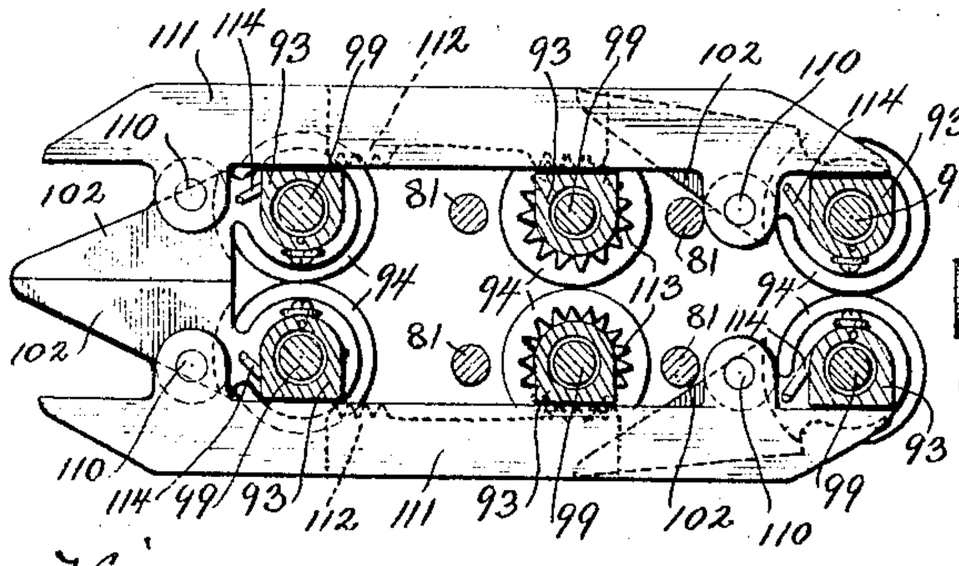
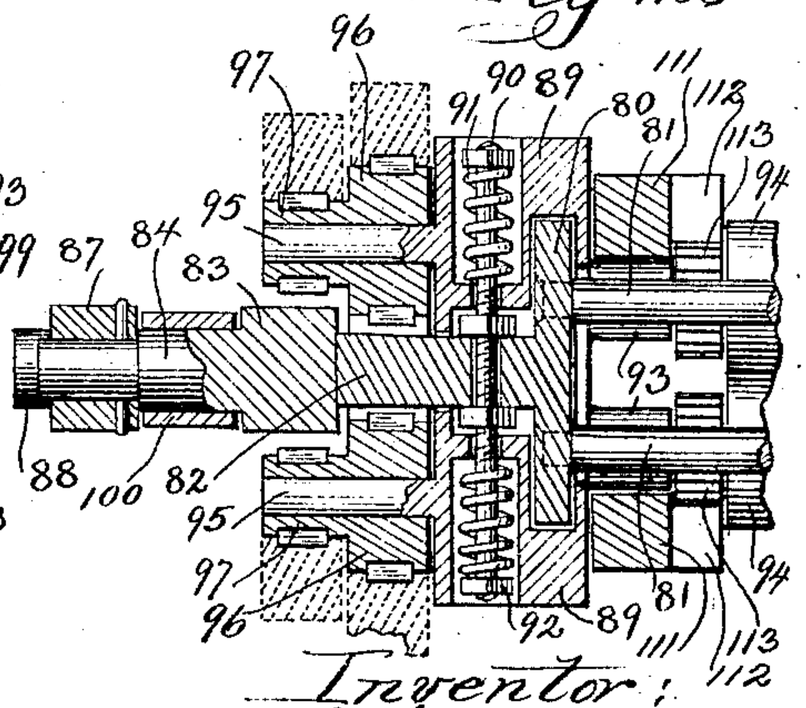


Fig. 20



Witnesses:

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29 SHEETS—SHEET 9.

Fig. 21.

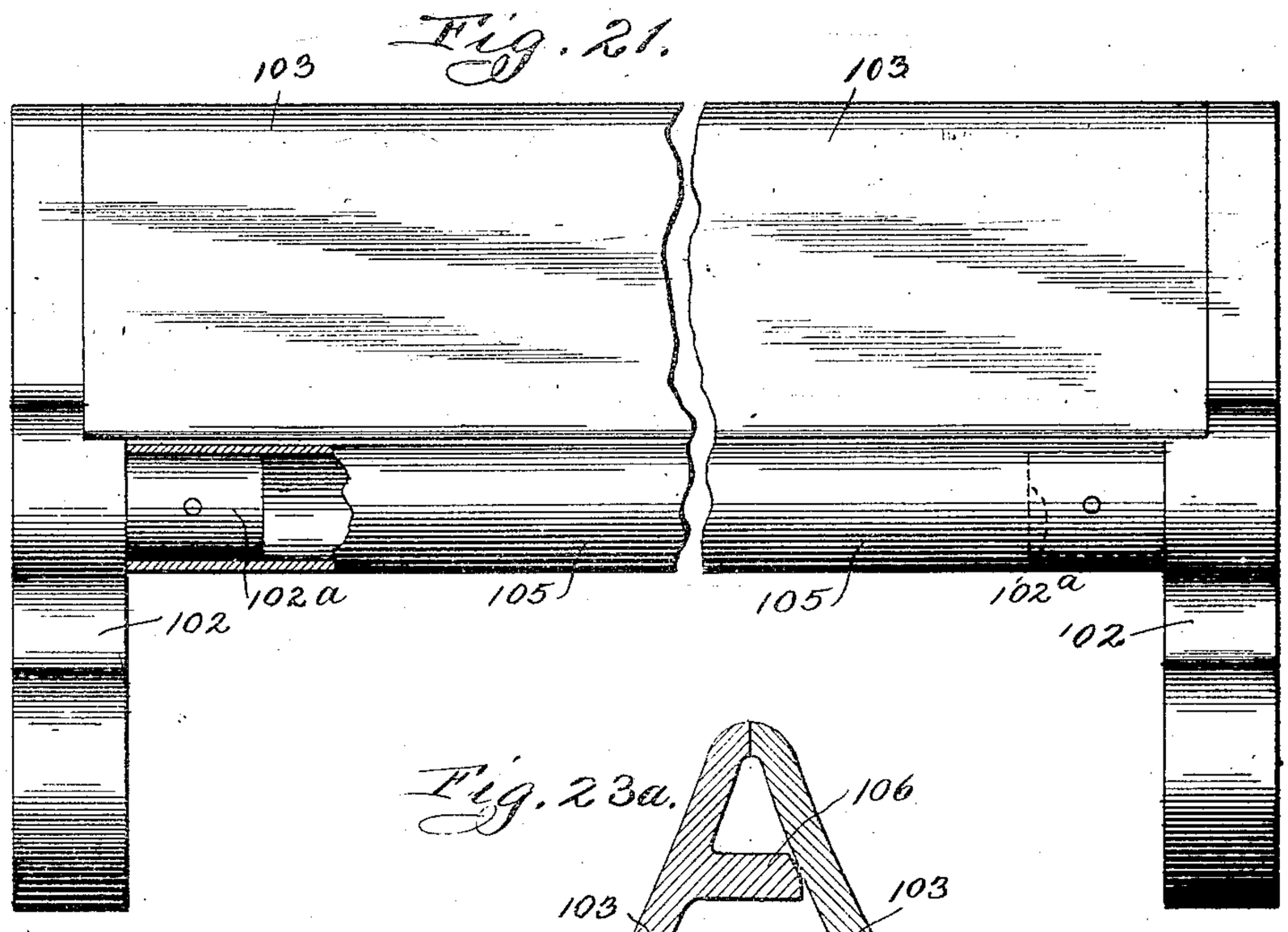
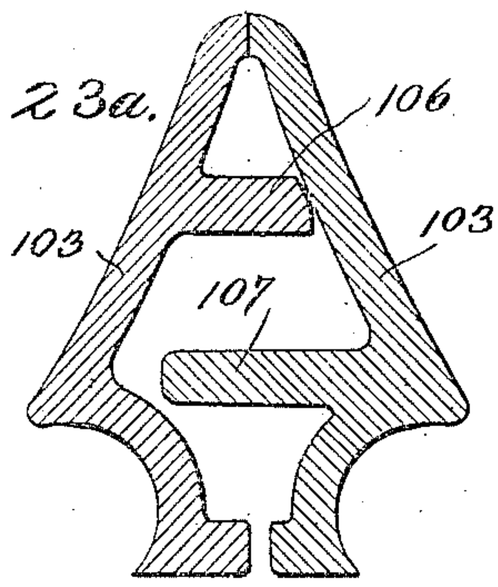


Fig. 23a.



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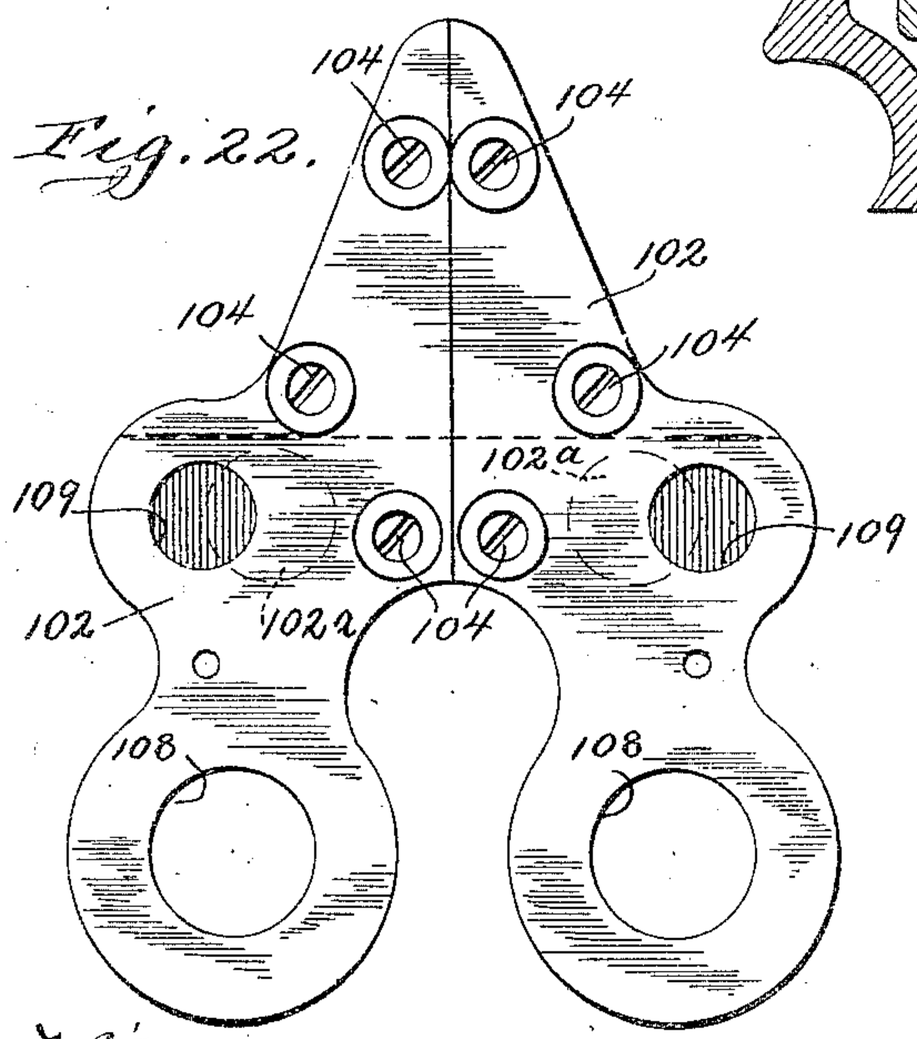
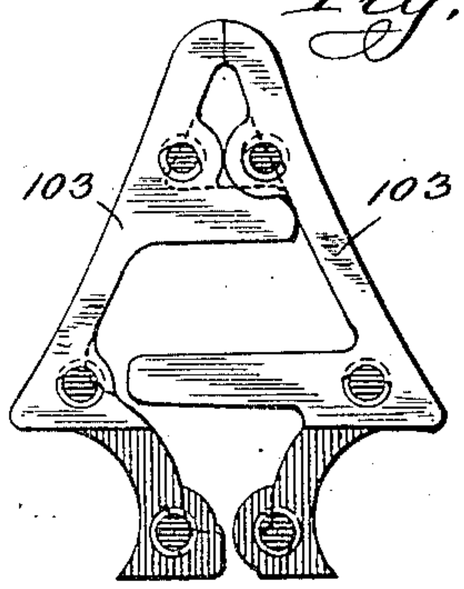


Fig. 23.



Witnesses
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29 SHEETS—SHEET 10.

Fig. 24.

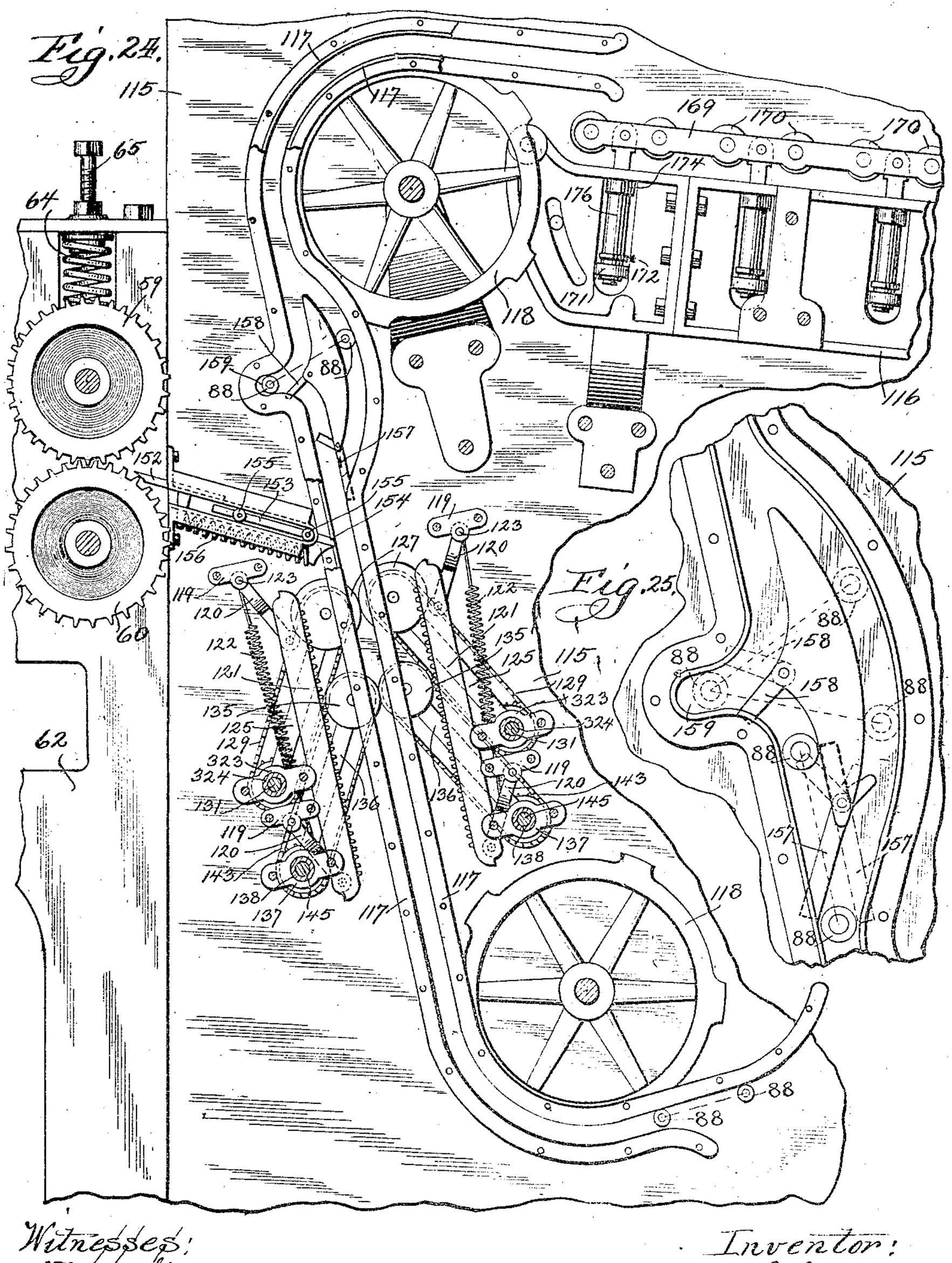

Fig. 25.

Witnesses:
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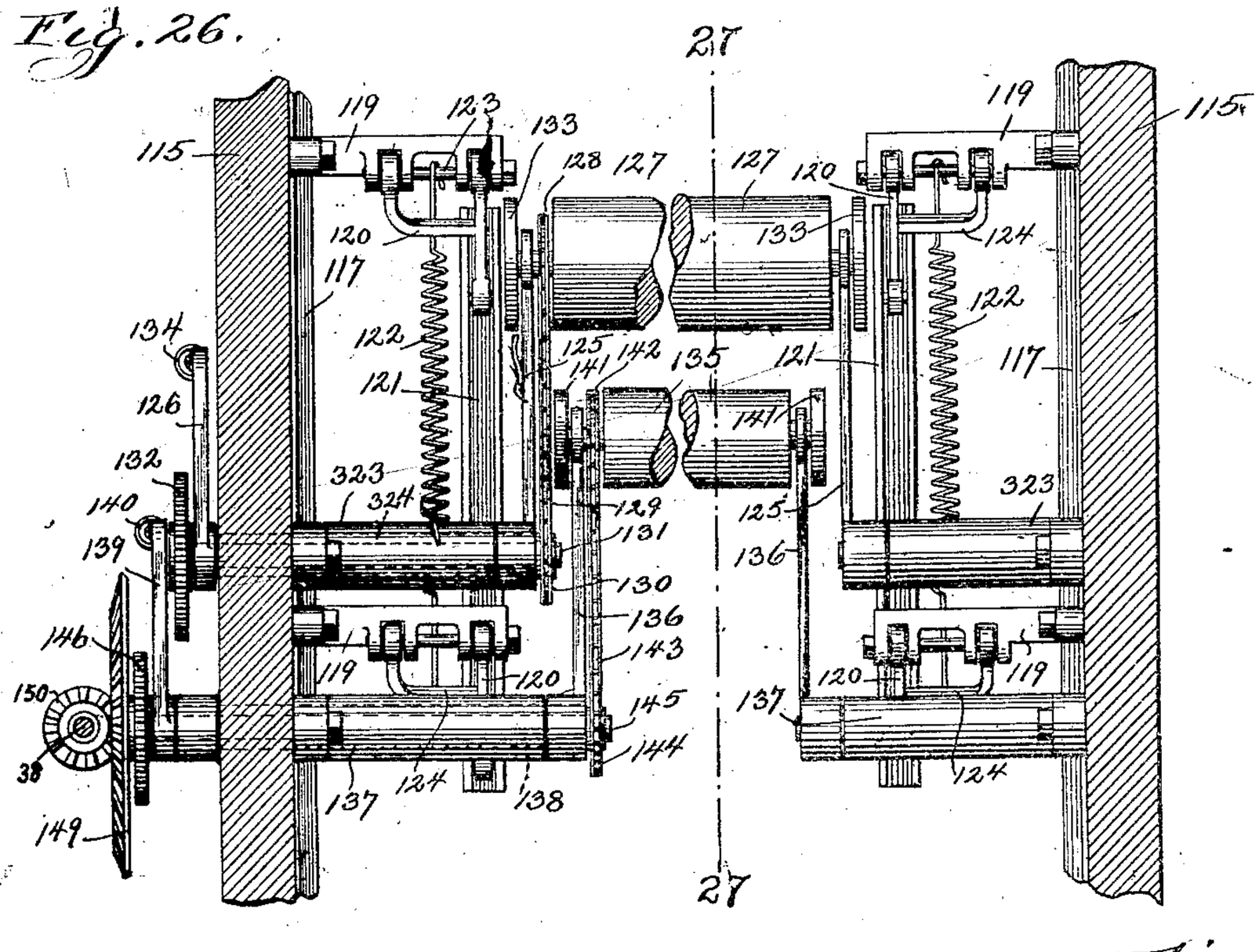
29 SHEETS—SHEET 11.

Fig. 26.



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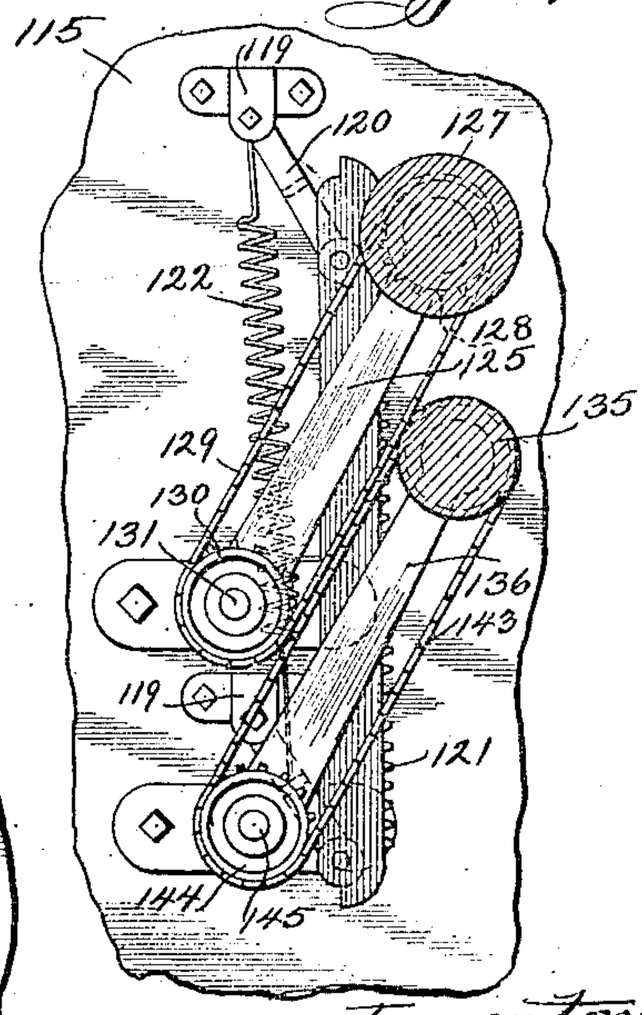
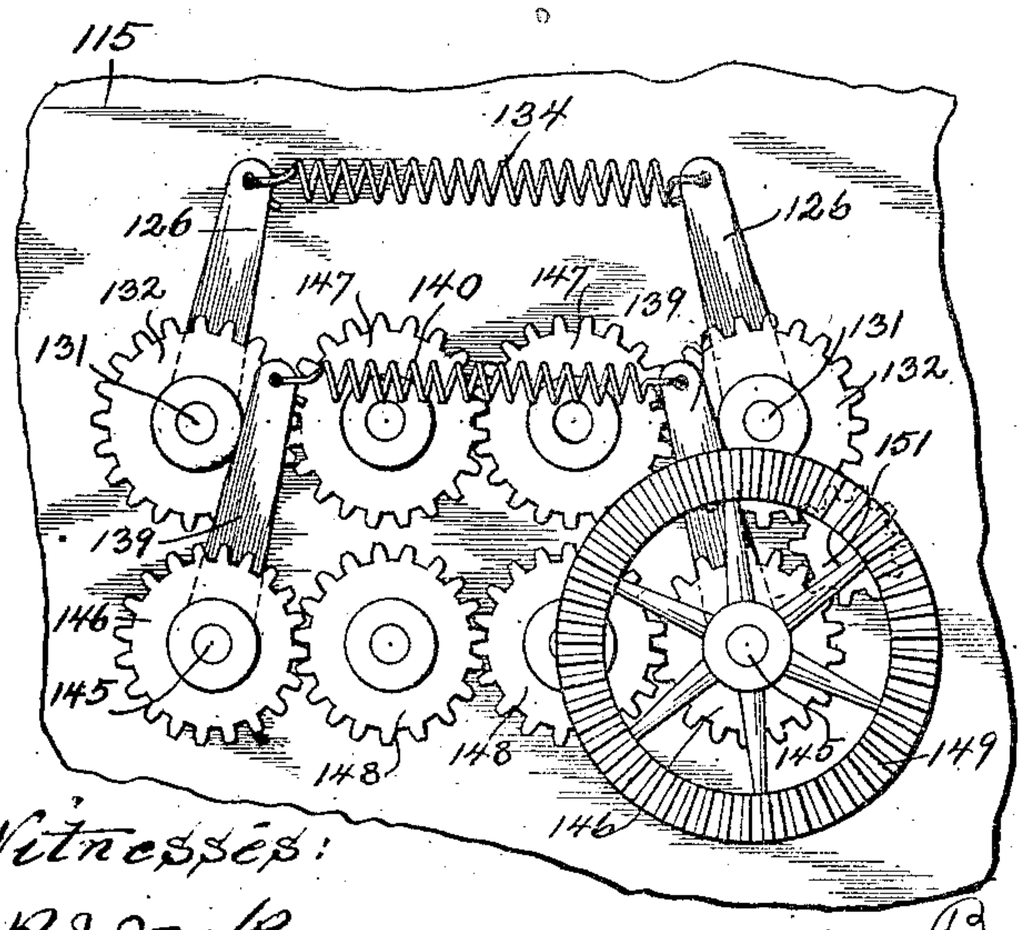


Fig. 28.



Witnesses:

R. J. Jackson

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Inventor:

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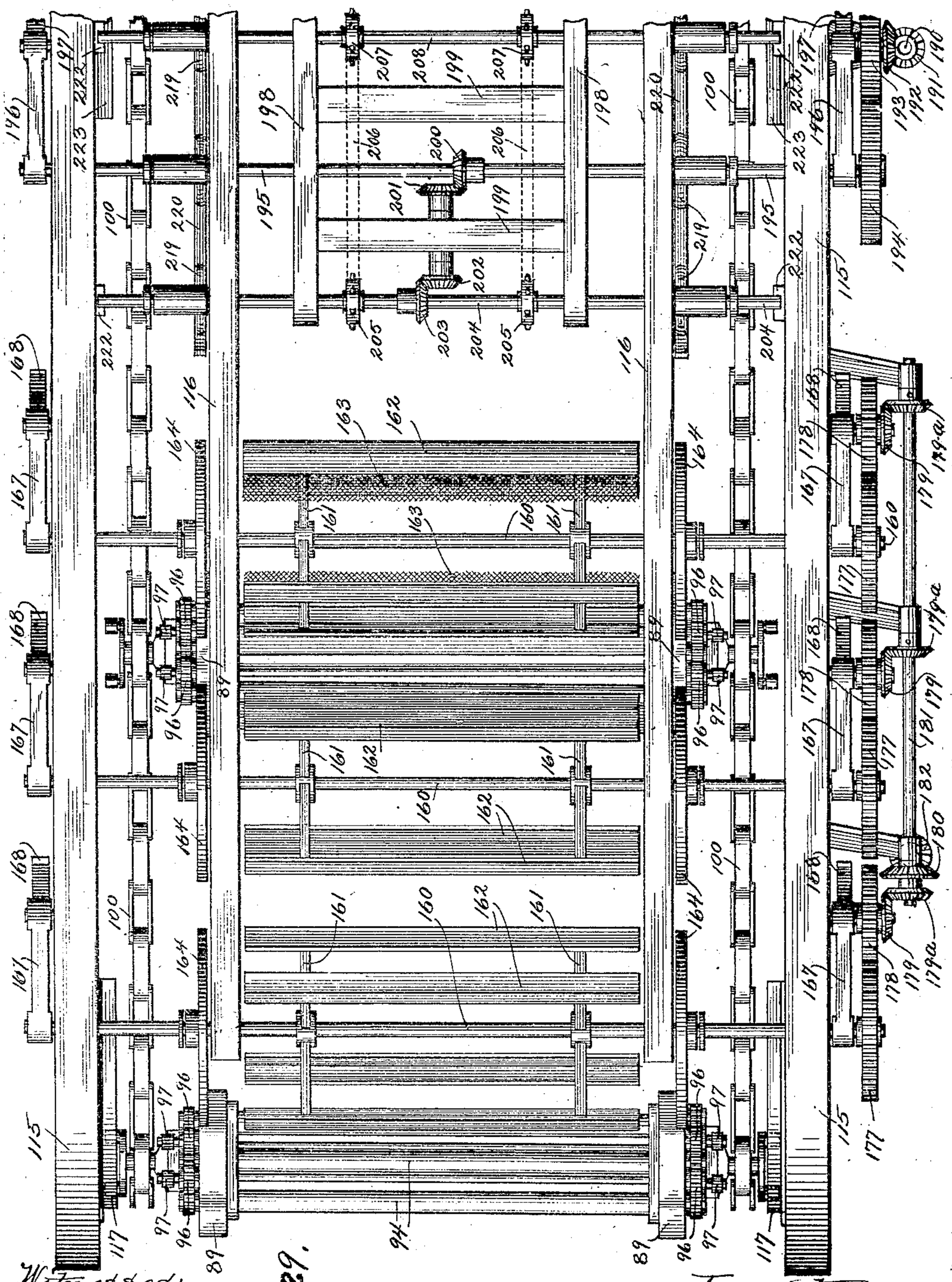
29 SHEETS—SHEET 12.



Witnesses:
W. J. Jacker
Robert Lewis Ames.

Fig. 29.

Inventor:
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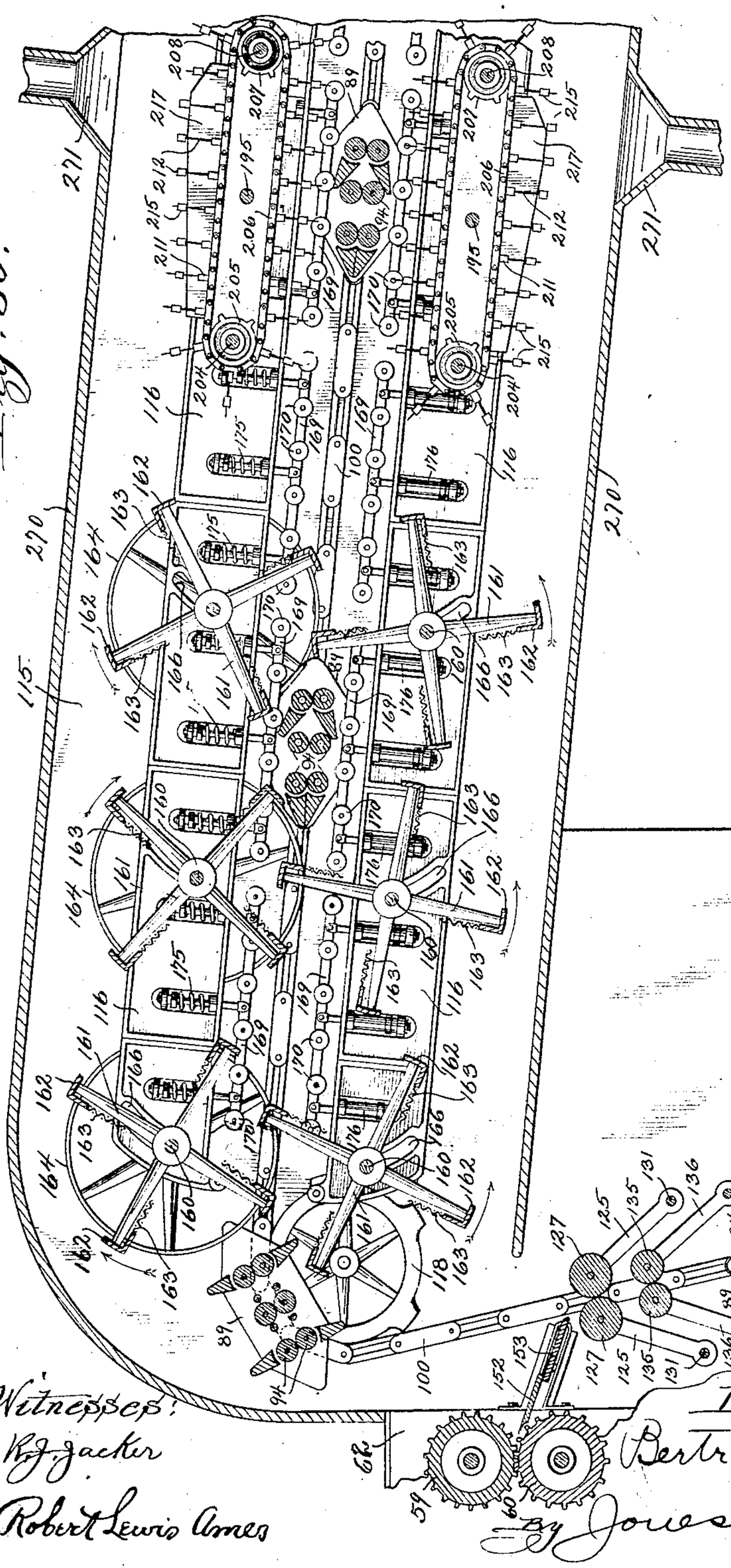
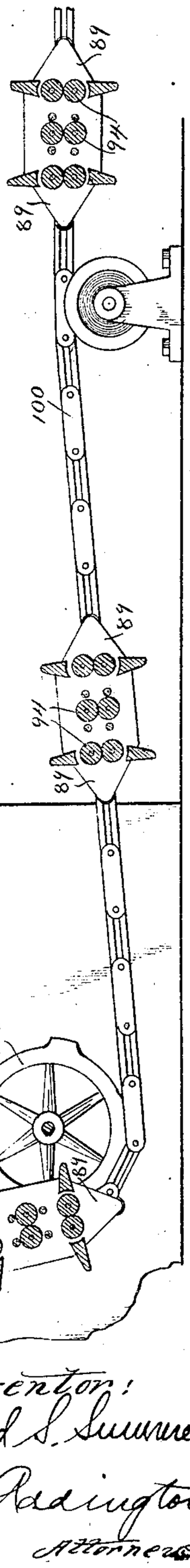
29 SHEETS—SHEET 13.

Fig. 30.





Witnesses:

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Inventor:

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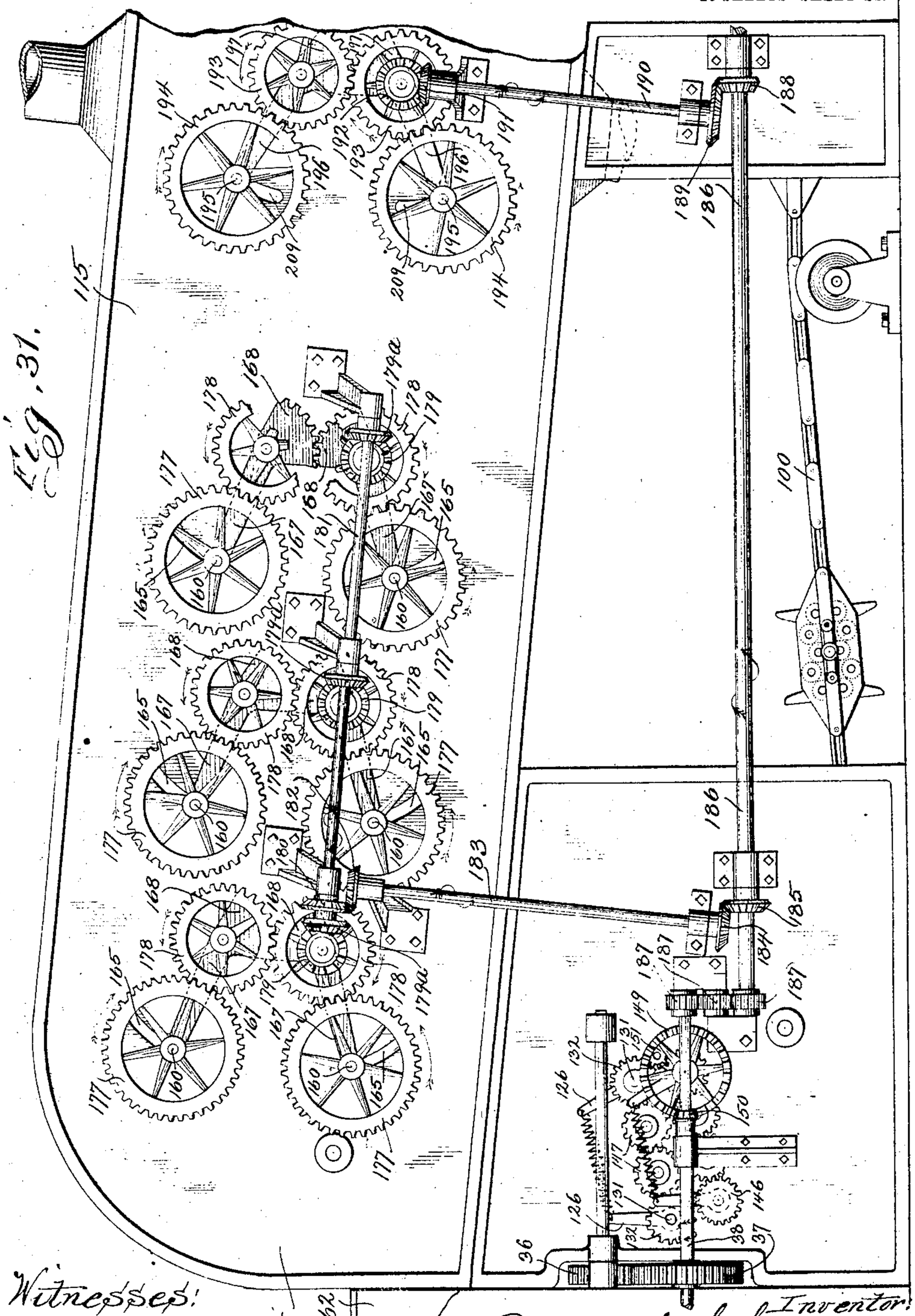
29 SHEETS—SHEET 14.



Witnesses:

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Inventor:

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29 SHEETS—SHEET 15.

Fig. 32.

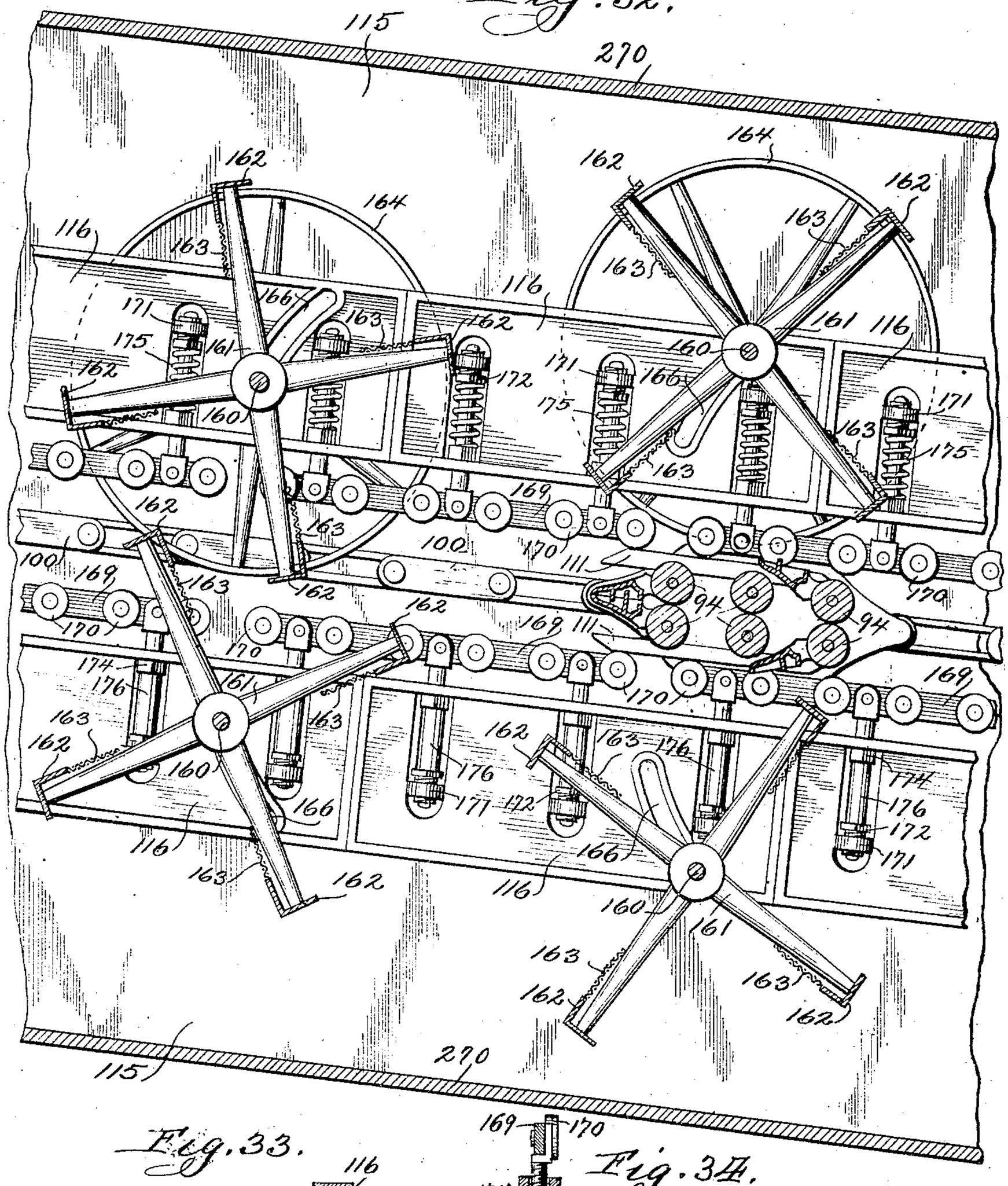


Fig. 33.

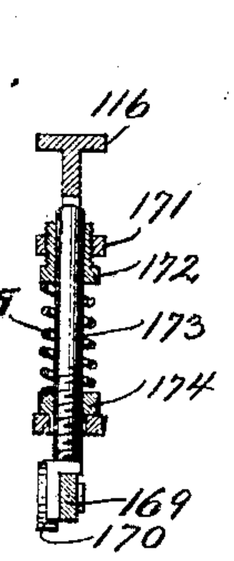
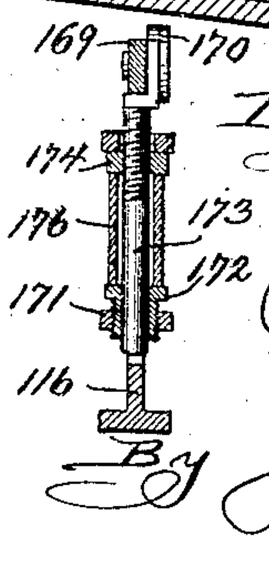


Fig. 34.



Witnesses:

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Inventor:

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29 SHEETS—SHEET 16.

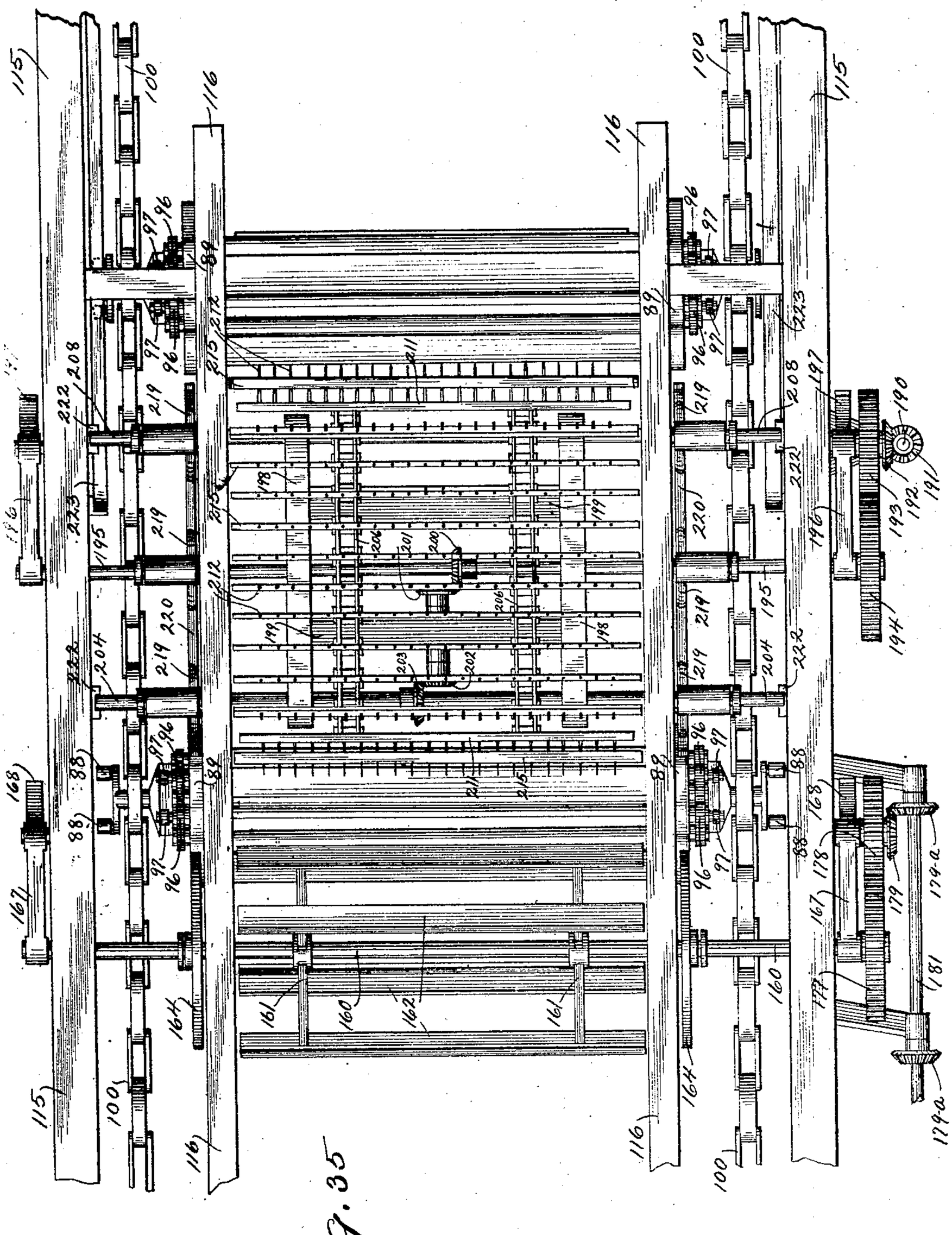

Fig. 35

Witnesses:
R. J. Jacker
Robert Lewis Ames.

Inventor:
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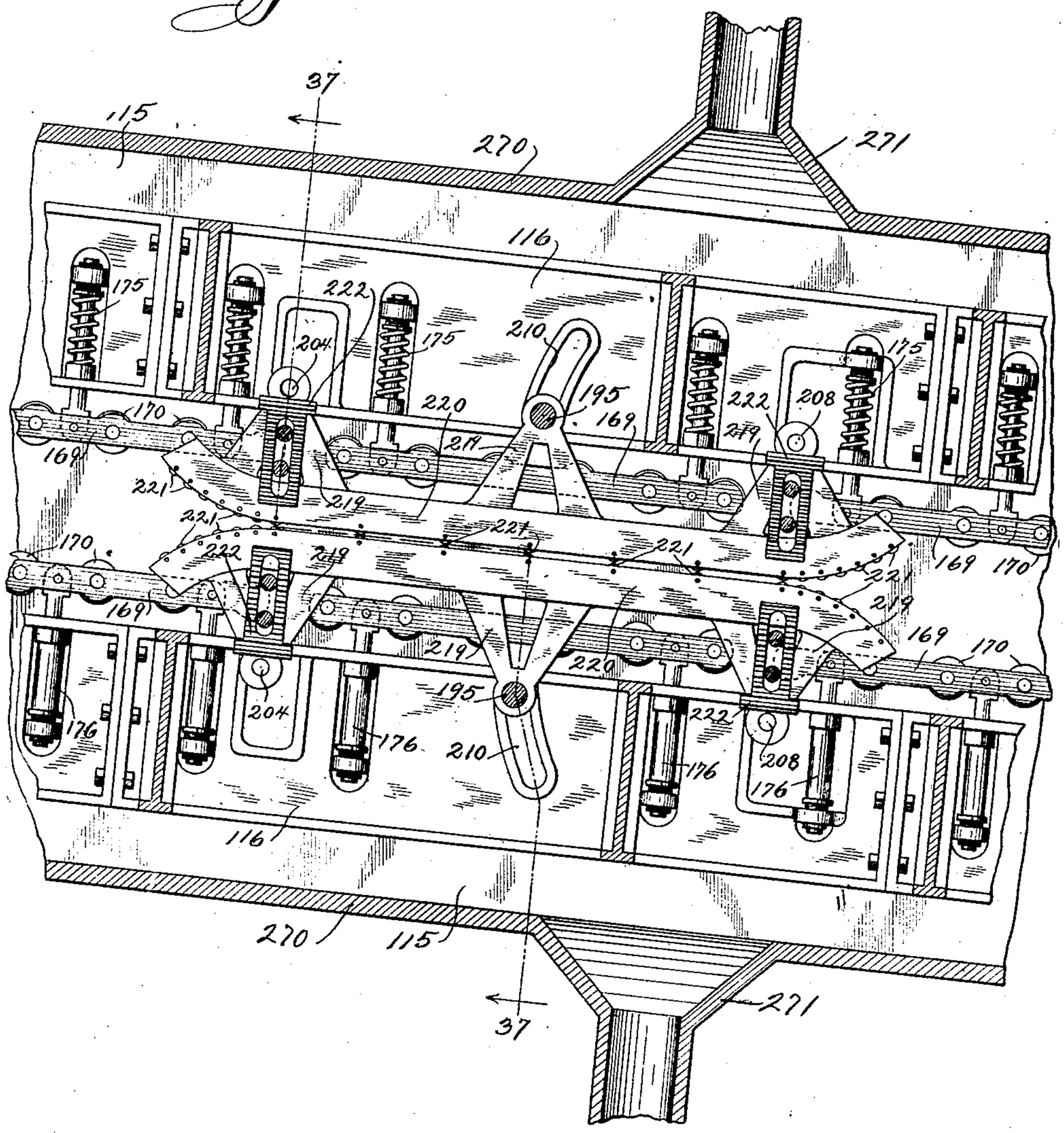
29 SHEETS—SHEET 17.

Fig. 36.



Witnesses:
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29 SHEETS—SHEET 18.

Fig. 38.

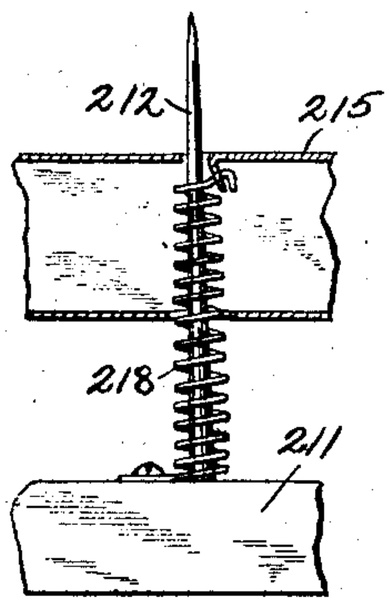

Fig. 37.

Witnesses:

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29 SHEETS—SHEET 19.

Fig. 39.

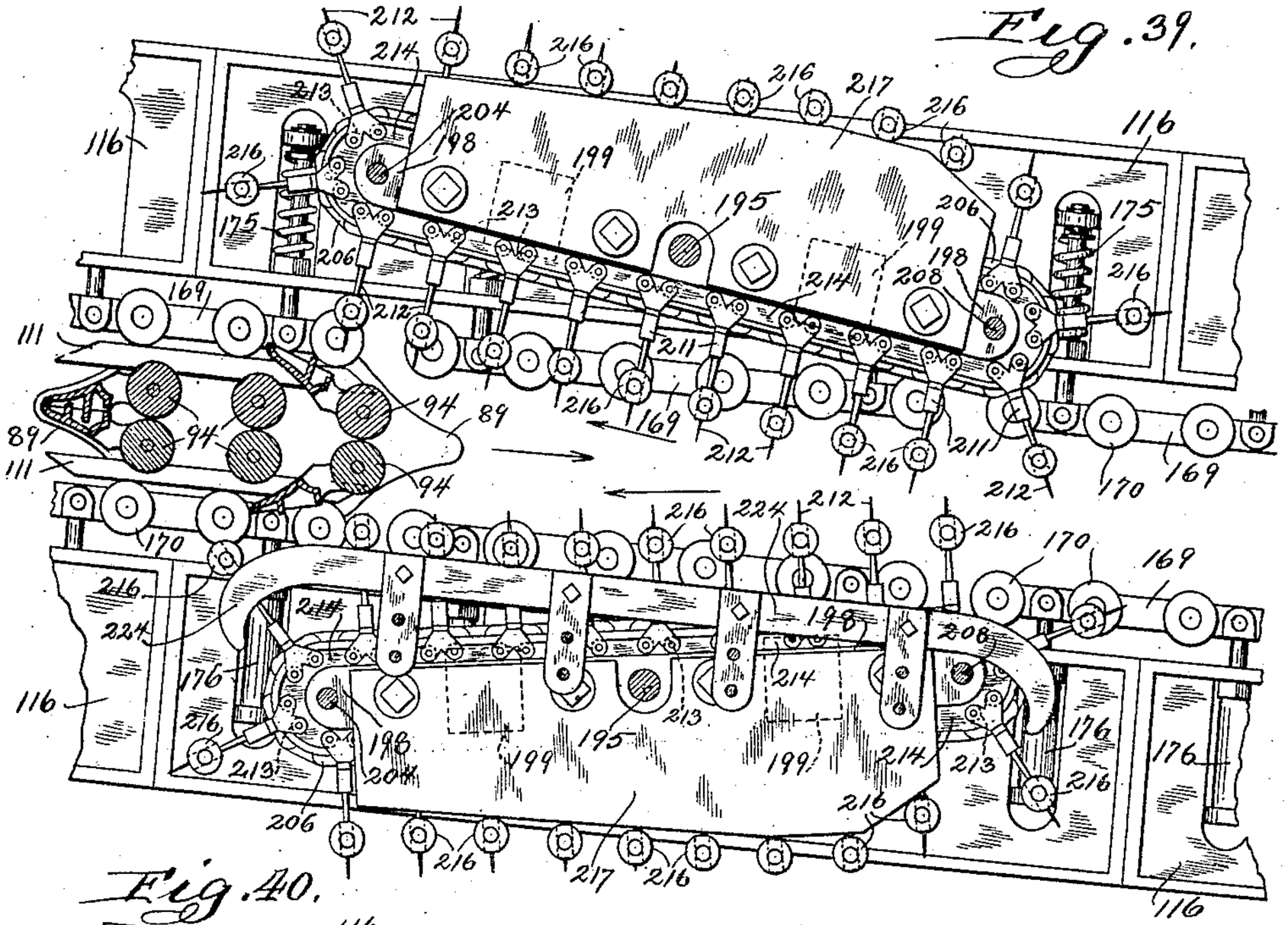

Fig. 40.

Witnesses:

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Robert Lewis Ames

Inventor:

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29 SHEETS—SHEET 20.

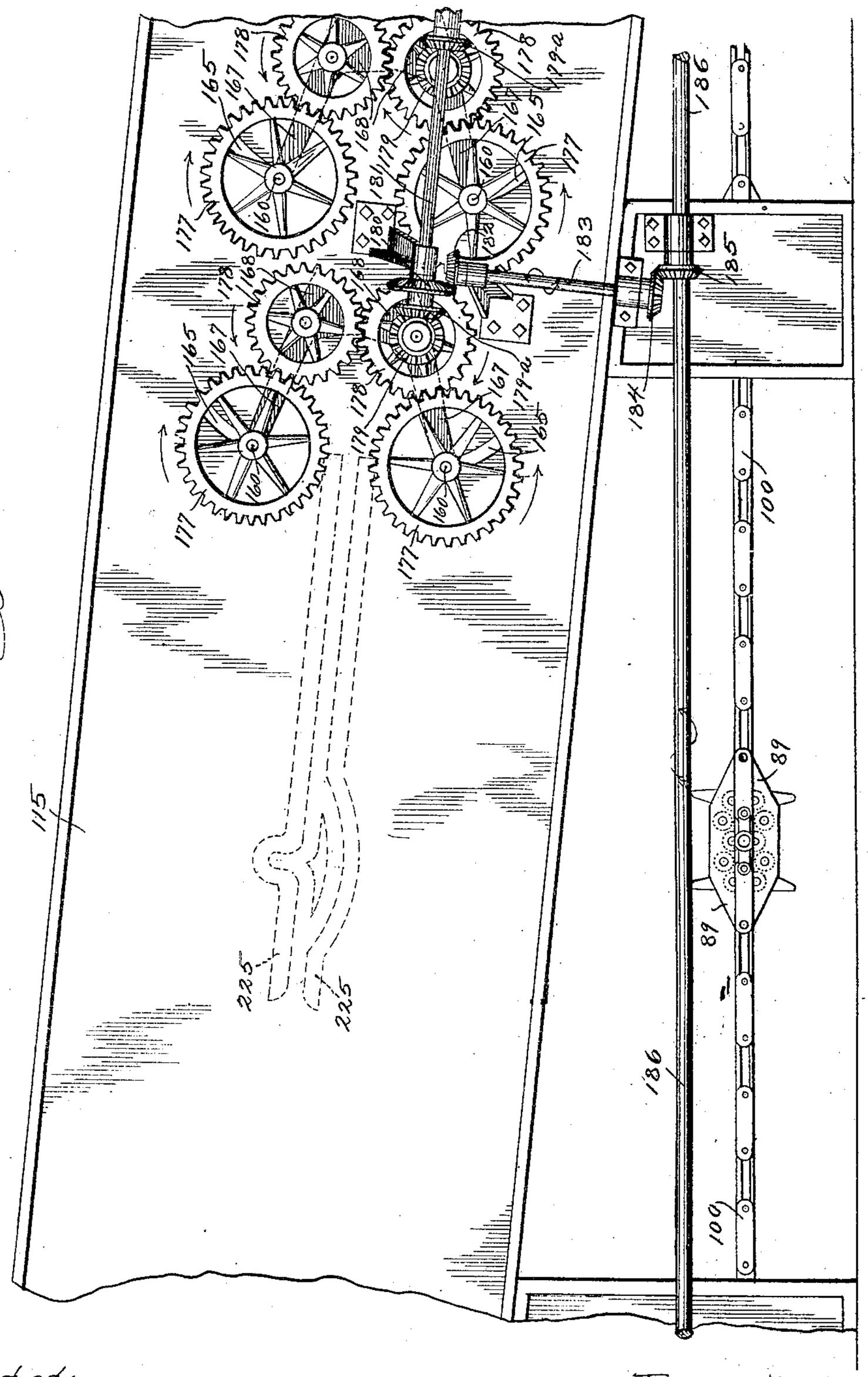

Fig. 1.

Witnesses:
W. J. Jacker
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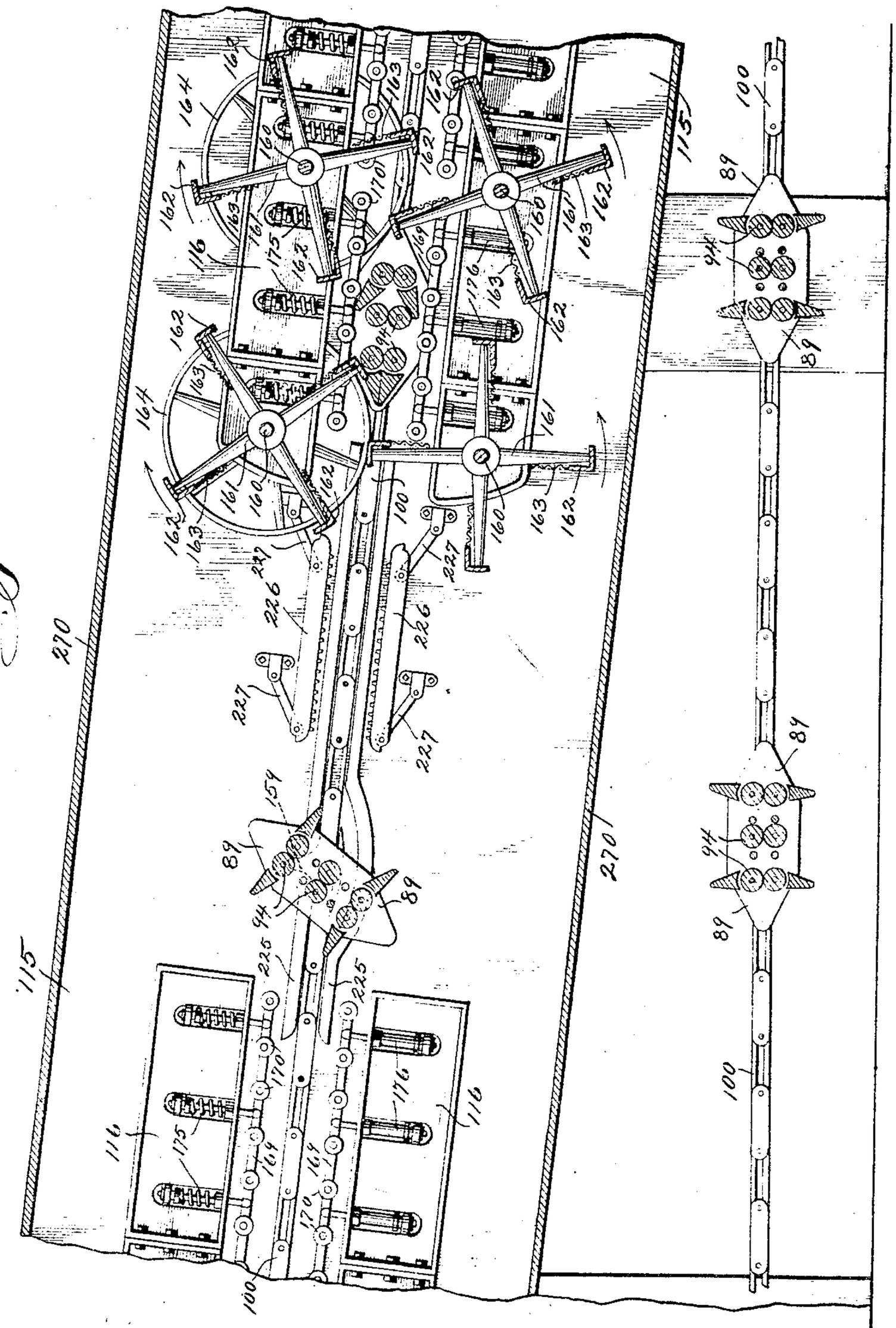
29 SHEETS—SHEET 21.

Fig. 42.



Witnesses:

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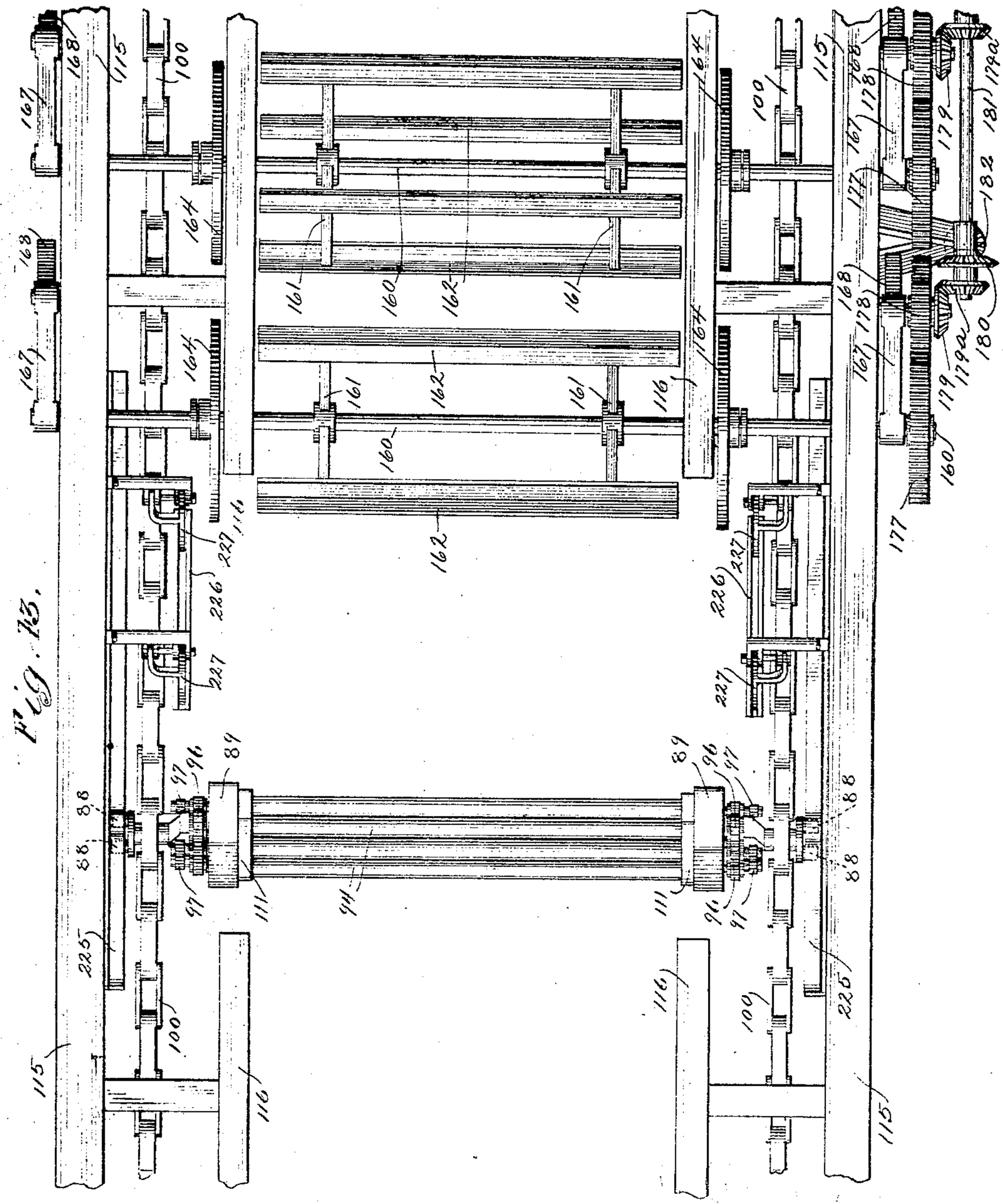
29 SHEETS—SHEET 22.



Witnesses:
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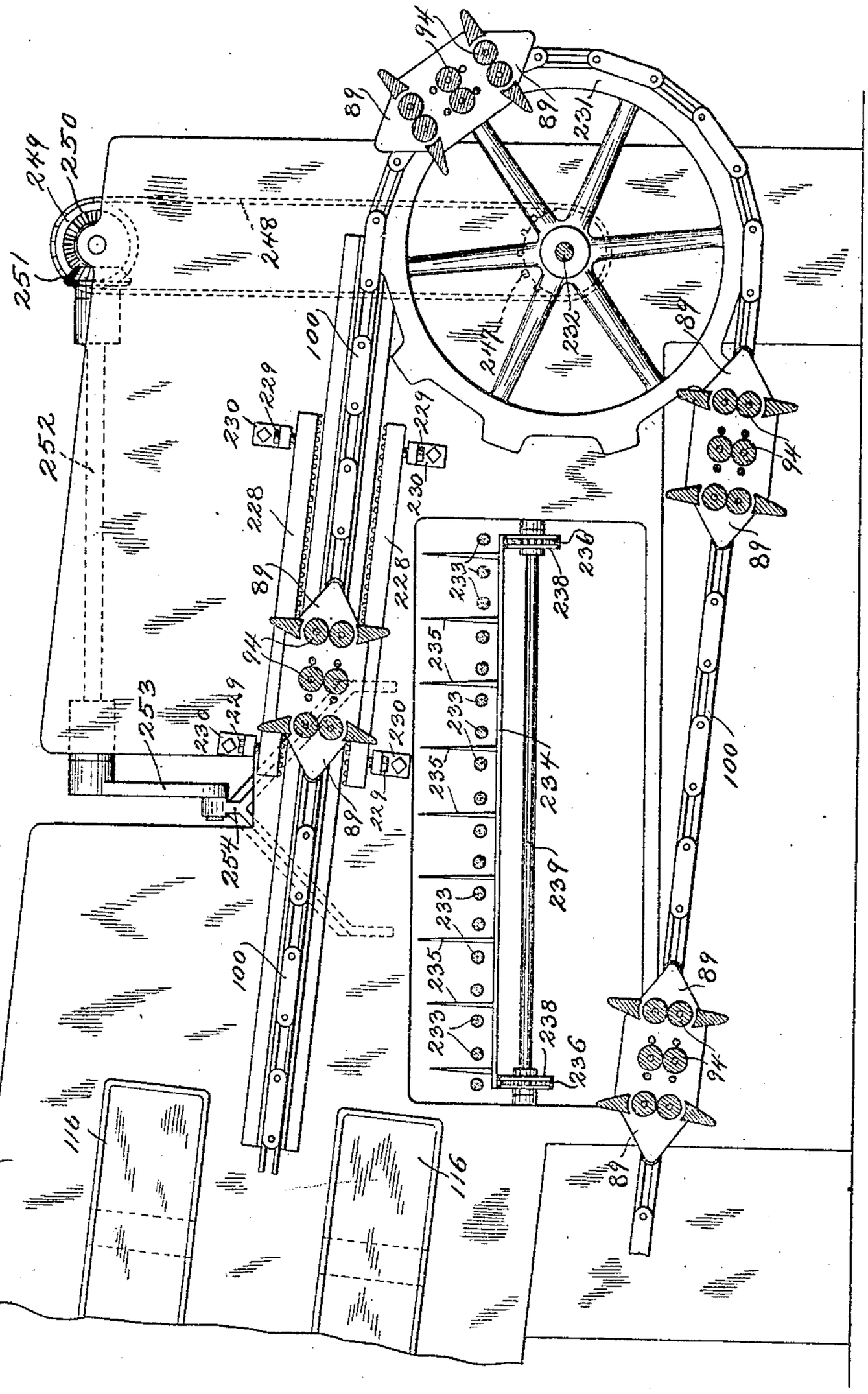
29 SHEETS—SHEET 23.

Fig. 44.



Witnesses:
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Robert Louis Ames

Inventor
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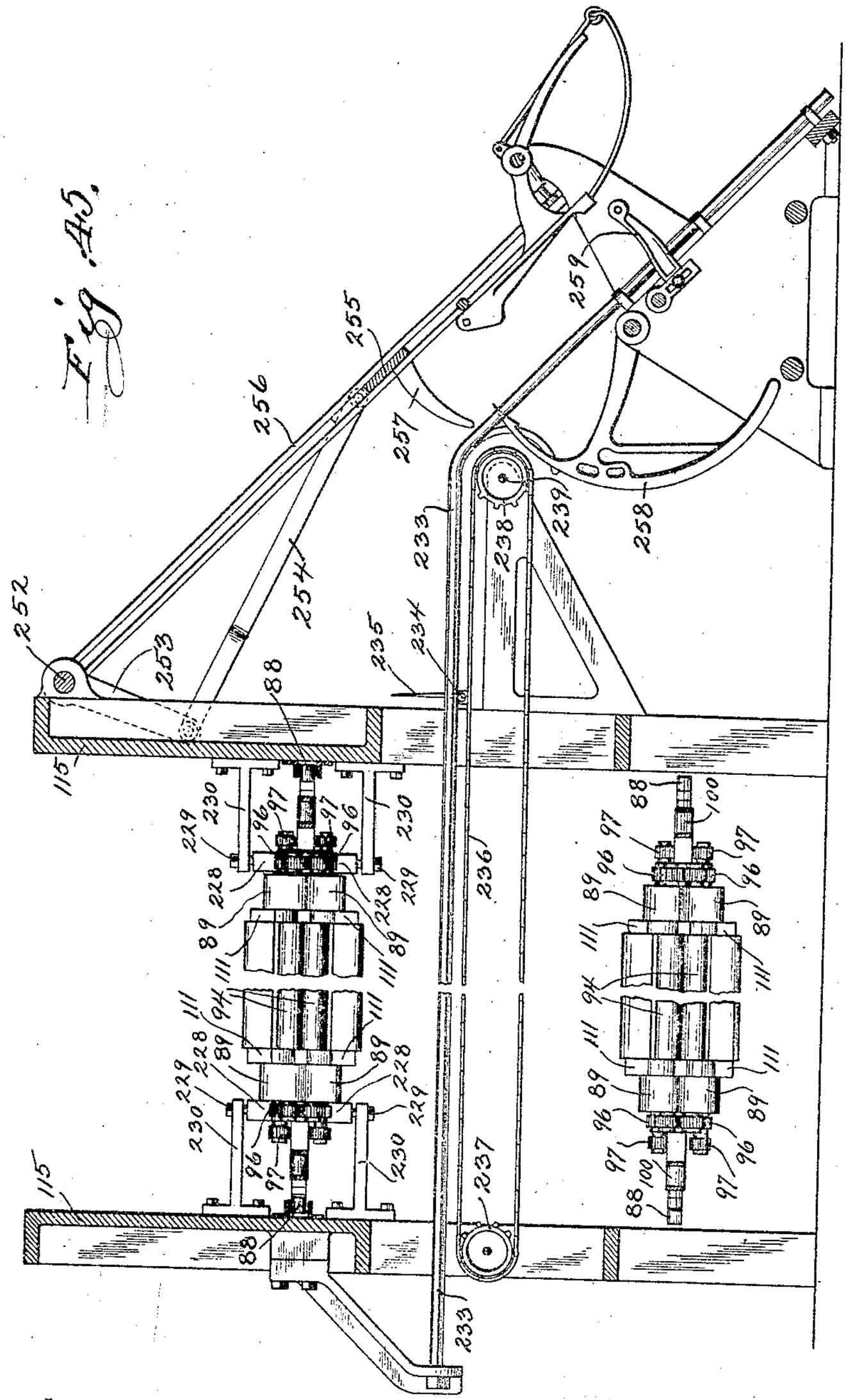
FIBER CLEANING MACHINE.

APPLICATION FILED DEC. 2, 1901.

Patented Mar. 16, 1909.

29 SHEETS—SHEET 24.

Fig. 45.



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29 SHEETS—SHEET 25.

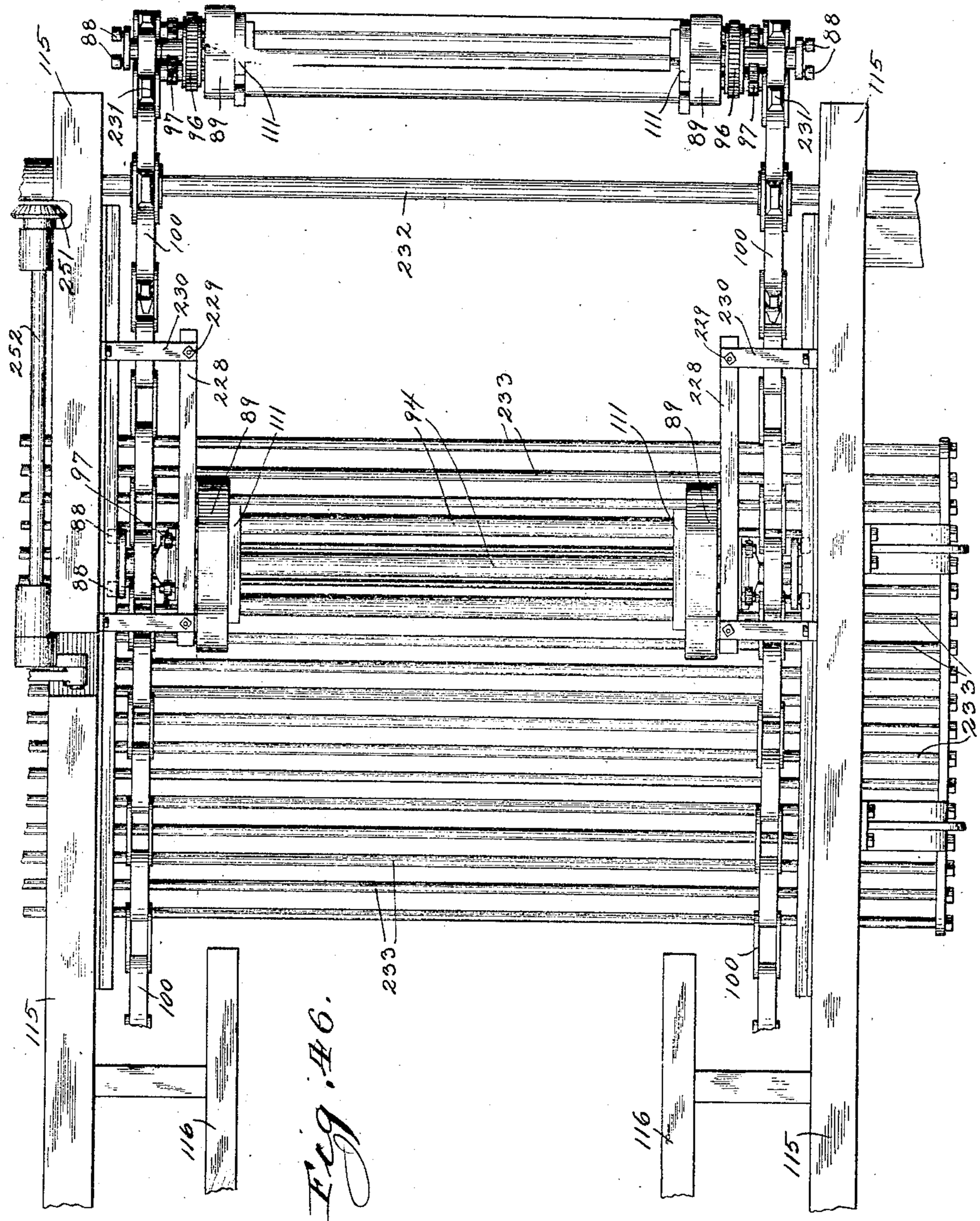

Fig. 46.

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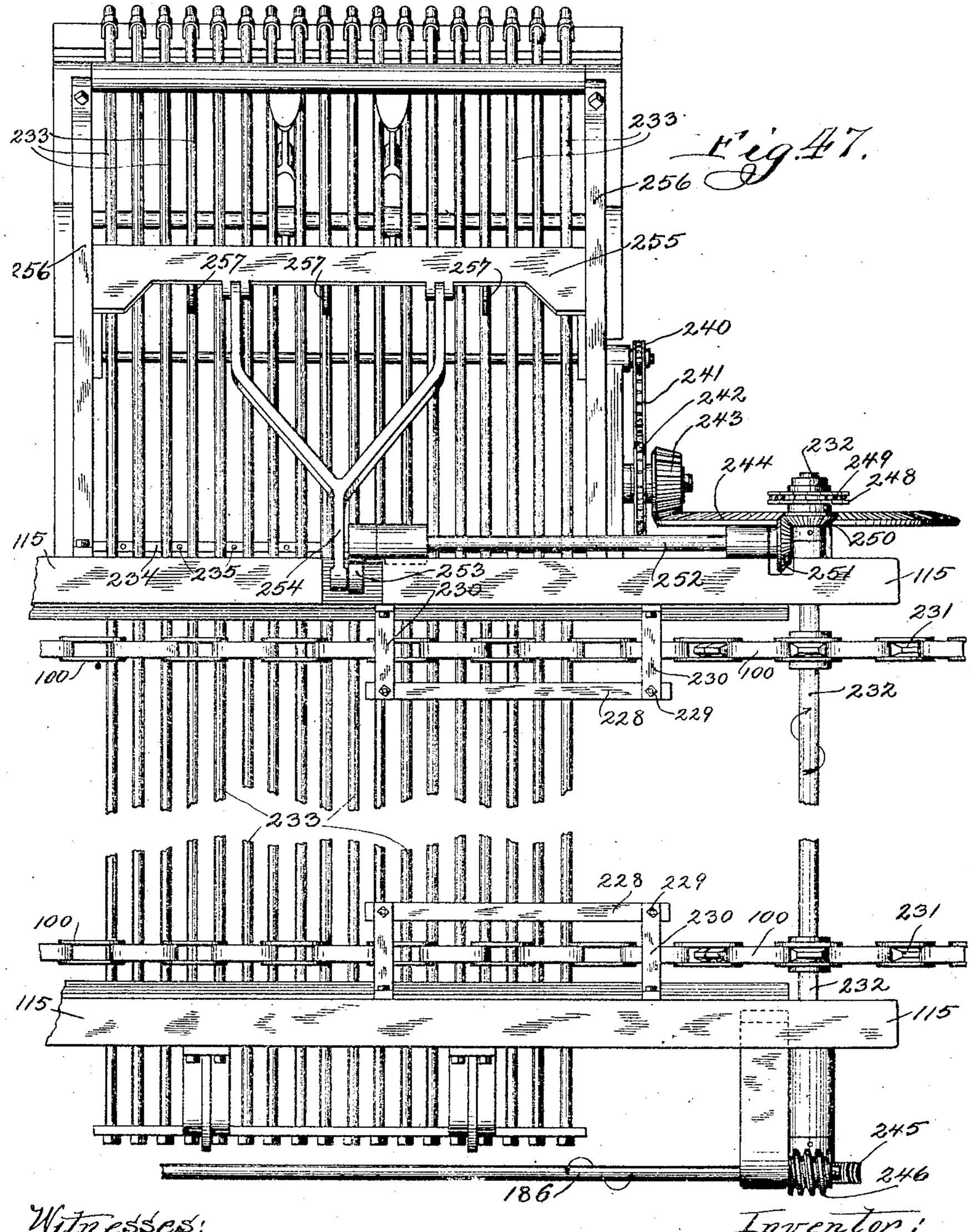
29 SHEETS—SHEET 26.

Fig. 47.



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29 SHEETS—SHEET 27.

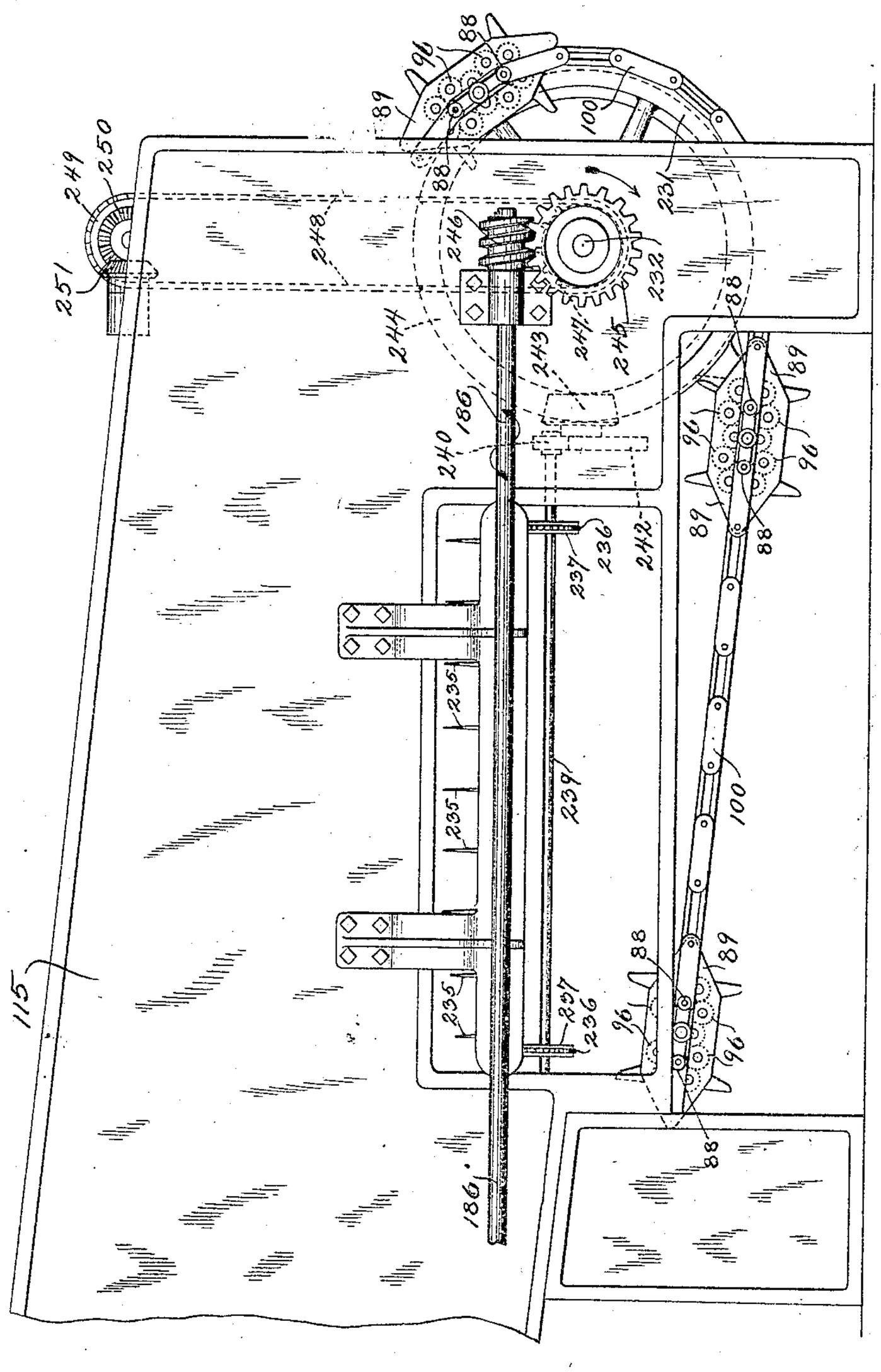

Fig. 48.

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29 SHEETS—SHEET 28.

Fig. 49.

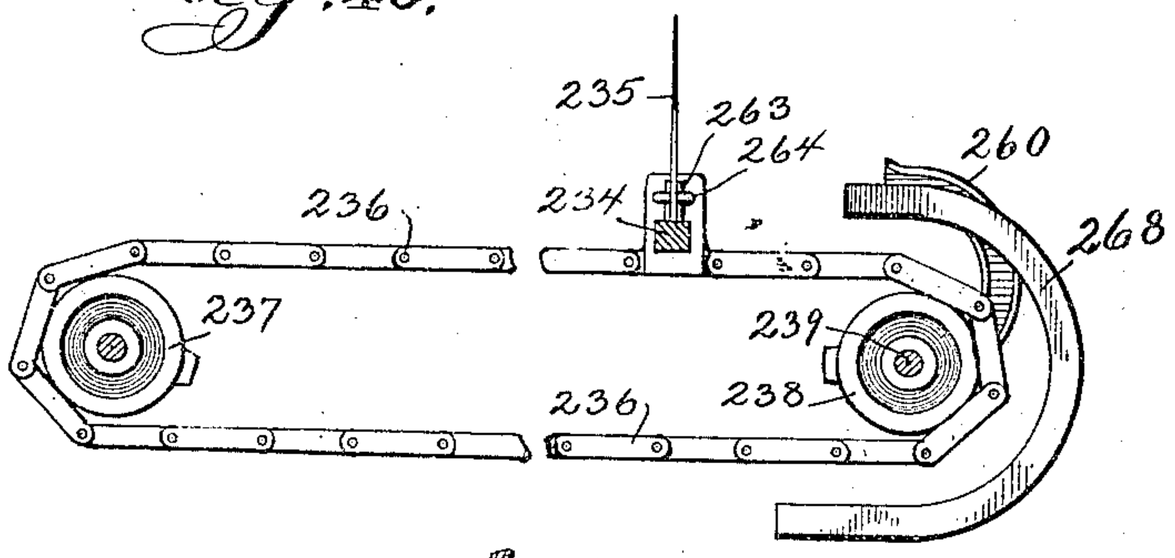


Fig. 50.

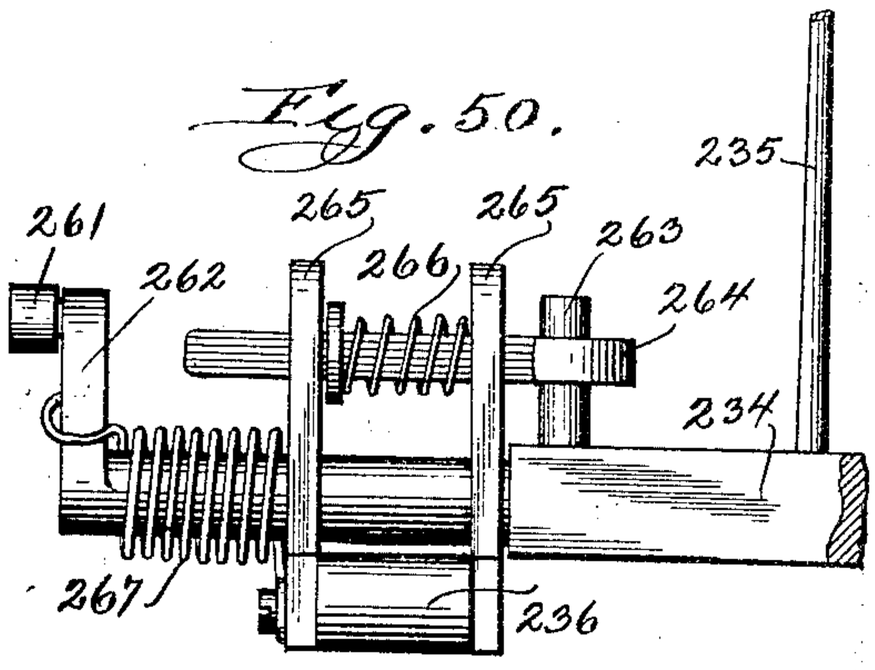
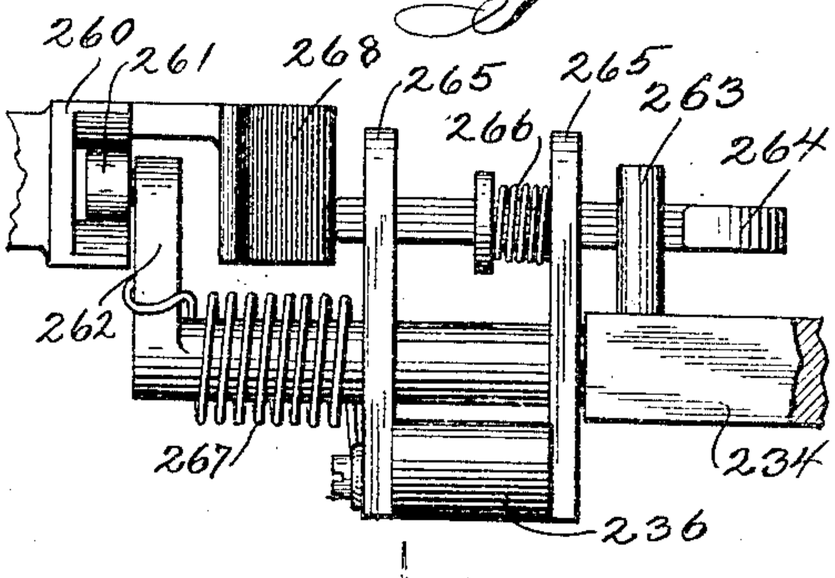


Fig. 51.



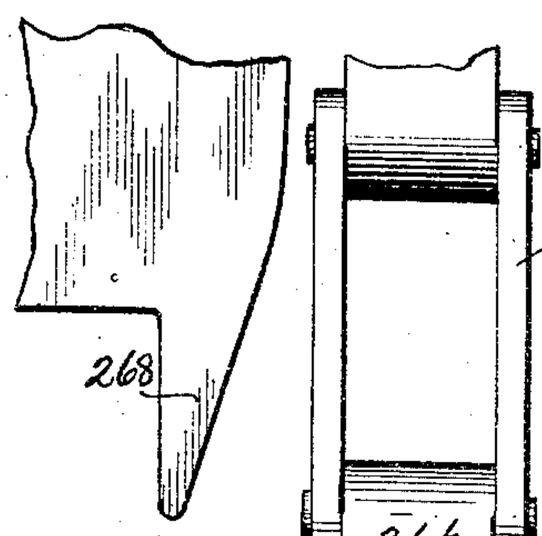


Fig. 52.

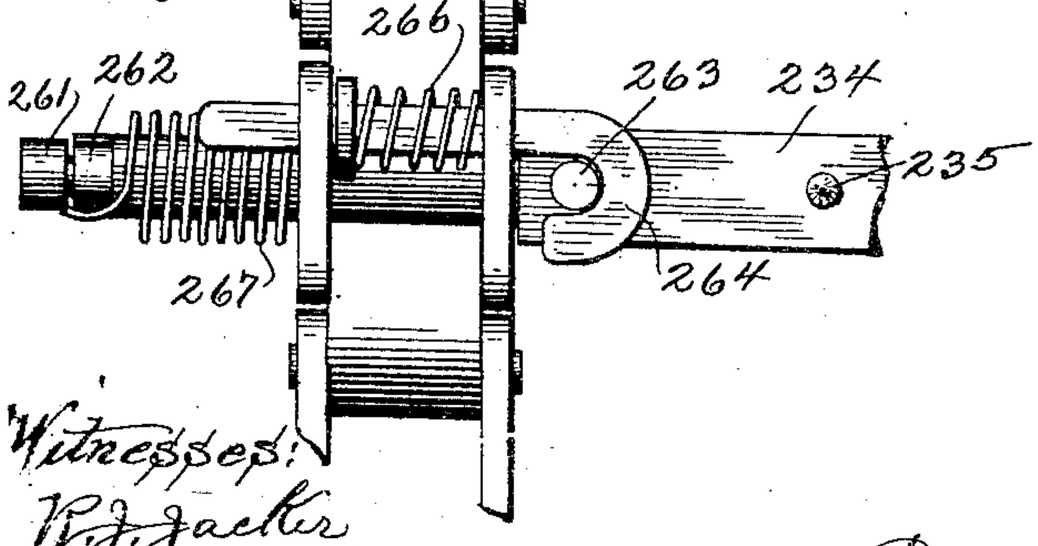
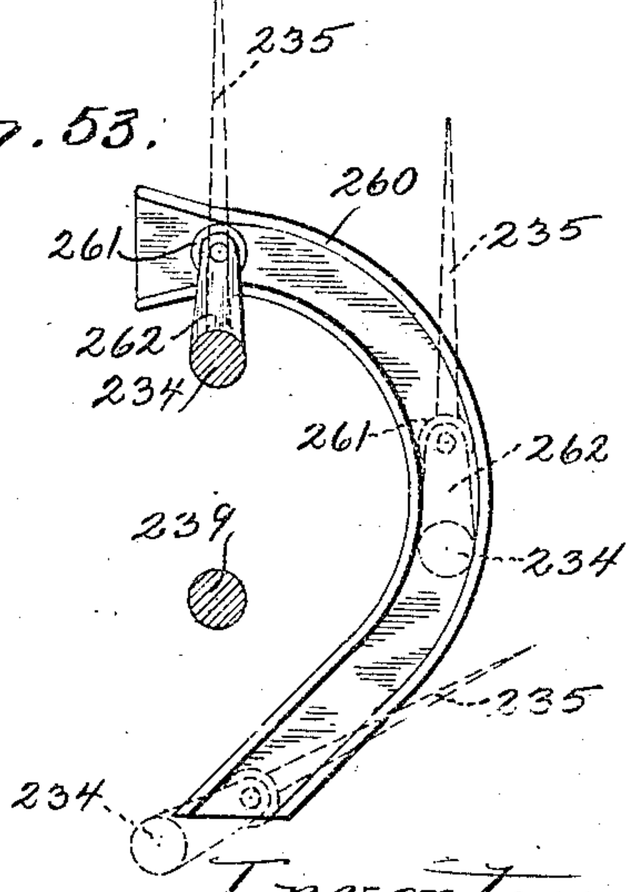


Fig. 53.



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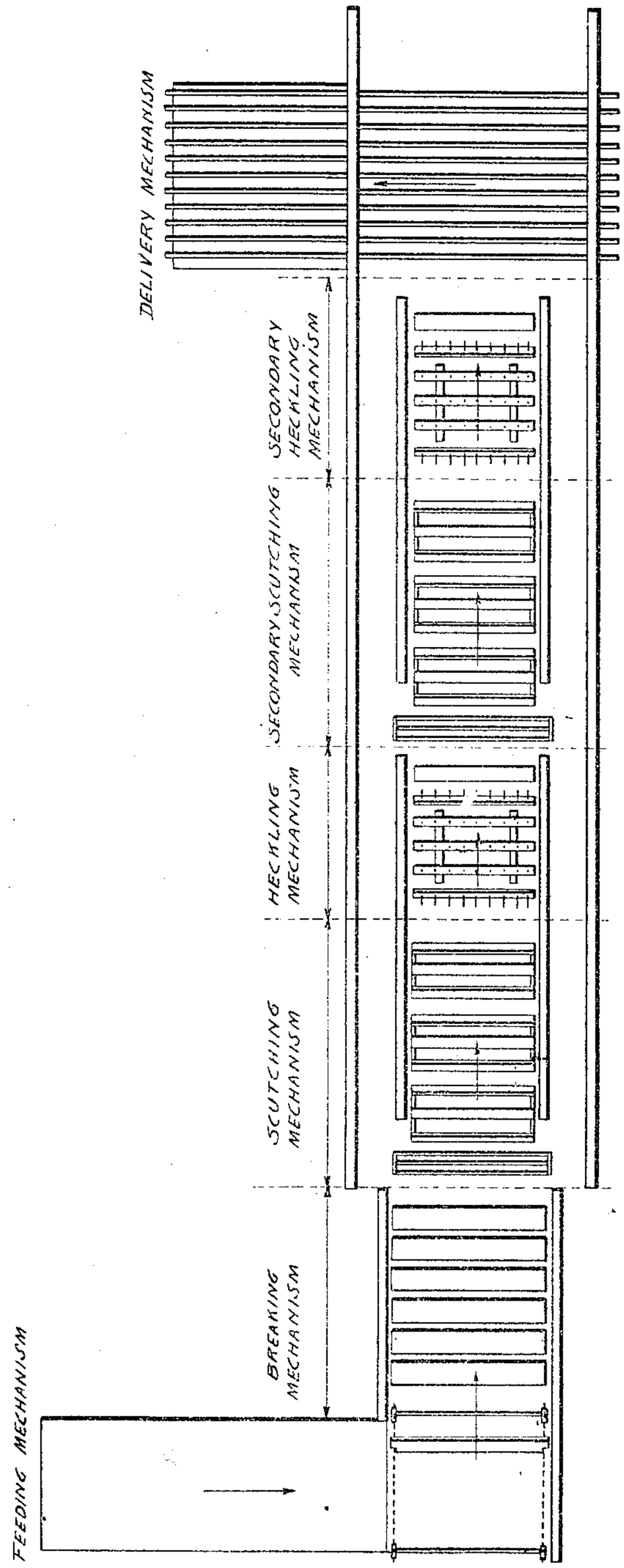
29 SHEETS—SHEET 29.

Fig. 54.



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UNITED STATES PATENT OFFICE.

BERTRAND S. SUMMERS, OF CHICAGO, ILLINOIS.

FIBER-CLEANING MACHINE.

No. 915,125. Specification of Letters Patent. Patented March 16, 1909.

Application filed December 2, 1901. Serial No. 84,413.

To all whom it may concern:

Be it known that I, BERTRAND S. SUMMERS, citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Fiber-Cleaning Machines, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to a machine for preparing fiber for manufacturing purposes, and has for its objects, generally stated, the provision of a machine adapted to receive fibrous stalks and to thoroughly prepare the fiber of said stalks for use in the arts.

Other objects are the provision of such a machine which is entirely automatic in its action, whereby manual labor is not required in connection therewith, except to supply the raw material, and to remove the finished product.

Still further objects are the production of a machine of the kind described that is entirely practical, is comparatively simple, and one that has a large capacity and is efficient in operation.

In carrying out my invention I locate successively in the machine, a breaking mechanism, primary scutching and hackling mechanisms, and secondary scutching and hackling mechanisms. In connection with the breaking mechanism, a feeding mechanism is arranged which is adapted to feed the stalks of the fiber longitudinally into the same in separate and successive layers of the width and capacity of the machine. A plurality of traveling clamps are mounted on suitable endless chains and are adapted to advance the fiber to be further treated or worked upon after it issues from the breaking mechanism. A suitable charging mechanism receives the layers of fiber from the breaking mechanism and charges each of the clamps as it passes with a layer of the fiber, the movement of the clamps being so timed with reference to the feeding movement that a clamp is presented at the proper time to receive each layer. The clamps are arranged to grasp one end of the layer of fiber while the other end trails after the same as the clamp travels through the various mechanisms, the said trailing end being thereby suitably scutched and hackled. Between the primary and secondary sets of mechanisms, means are located to cause the clamp to release the unworked end of the layer of fiber and to grasp the other end, whereby when the secondary sets of mechanisms are traversed, the fiber is entirely scutched and hackled. A discharging mechanism then causes the releasing of the fiber when it falls upon a delivery table or bed, from whence it is delivered to a binding mechanism where it is tied up in bundles suitable for handling.

The invention further consists in the details of construction, parts and combinations of parts, hereinafter described and particularly pointed out in the appended claims.

The machine is designed chiefly to operate upon flax straw in a manner to separate the fiber from the other parts thereof.

I have illustrated my invention in the accompanying drawings in which:

Figure 1 is a plan view of the feeding mechanism. Fig. 2 is a view thereof in elevation. Fig. 3 is a plan view of the breaking mechanism showing a portion of the feeding mechanism. Fig. 4 is a view in elevation of the breaking mechanism and the end of the feeding mechanism. Fig. 5 is a detail view of the driving gearing of the breaking mechanism. Fig. 6 is a sectional view of the breaking mechanism and the feeding mechanism. Figs. 7 and 8 are detail views of the feed pushers and the driving mechanism therefor. Fig. 9 is a view of the gearing which drives the feeding belt. Fig. 10 is a plan view thereof. Figs 11 and 12 are detail views of said mechanism. Fig. 13 is a plan view of the end of one of the clamps. Fig. 14 is a view showing the manner of journaling the clamp in the traveling chain. Fig. 15 is an end view of the clamp. Fig. 16 is a detached view of the skeleton of the clamp. Fig. 17 is a sectional view on line 17—17 Fig. 13. Fig. 18 is a sectional view on line 18—18 Fig. 13. Fig. 19 is a sectional view on line 19—19 Fig. 13. Fig. 20 is a sectional view on line 20—20 Fig. 13. Fig. 21 is a plan view of the clamping jaw. Fig. 22 is an end view thereof. Fig. 23 is an end view of the cross pieces of the jaw. Fig. 23[a] is a cross section of the cross pieces of the jaw. Fig. 24 is a view in elevation of the clamp charging mechanism, one side of the main supporting frame being removed. Fig. 25 is a detail view of the reversing track or switch. Fig. 26 is an end view of the clamp charging mechanism

Fig. 27 is a sectional view thereof on line 27—27 Fig. 26. Fig. 28 is a view of the gearing which drives the clamp charging mechanism. Fig. 29 is a plan view of the end of the machine showing the scutching mechanism. Fig. 30 is a longitudinal sectional view showing the scutching mechanism. Fig. 31 is a view showing the driving gearing for the scutching mechanism. Fig. 32 is a detail view of a portion of the scutching mechanism. Fig. 33 is a detail view of the resilient support for the upper compression track. Fig. 34 is a detail view of the rigid support for the lower compression track. Fig. 35 is a plan view of the hackling mechanism. Fig. 36 is a view thereof in elevation. Fig. 37 is a sectional view on line 37—37 Fig. 36. Fig. 38 is a detail view of one of the stripper pins. Fig. 39 is a view of the hackling frames as the clamp approaches the same. Fig. 40 is a view thereof showing the clamp leaving. Fig. 41 is a view in elevation of that portion of the machine opposite the clamp reversing mechanism showing also a portion of the gearing of the secondary scutcher. Fig. 42 is a sectional view showing the clamp reversing mechanism and a portion of the secondary scutcher. Fig. 43 is a plan view showing the clamp reversing mechanism and a portion of the secondary scutcher. Fig. 44 is a sectional view of the delivery end of the machine. Fig. 45 is a transverse sectional view thereof. Fig. 46 is a plan view of the delivery end of the machine. Fig. 47 is a plan view showing the rake and bundling mechanism. Fig. 48 is a view in elevation of the delivery end of the machine. Fig. 49 is a detail view of the rake mechanism. Fig. 50 is a detail view of the lock for the rake bar. Fig. 51 is a similar view showing the parts in alternative position. Fig. 52 is a plan view of the locking mechanism. Fig. 53 is a view of the guide which controls the position of the rake pins. Fig. 54 is a diagrammatic plan view of the entire machine.

Feeding mechanism.—The cross feeding apron Figs. 1 and 2, comprises a series of slats or strips, 1, 1, secured at the opposite ends to the chains, 2, 2, which pass around the sprocket wheels, 3, 4, at the opposite ends of the machine. The sprocket chains are adapted to travel upon the brackets or guides, 2^a, 2^a. The sprocket wheels, 3 are mounted upon a shaft 5, journaled at the ends in the standards, 6, 6. The sprocket wheels, 4 are mounted upon the shaft 7, which is journaled in the frame 8, 8. The apron carries at intervals upright bars or cross pieces 9, 9. These bars are placed at a distance apart so as to afford the desired space for the spreading of the fibrous stalks which are to be placed upon the feed apron. An operator places a bundle of fibrous stalks to be acted upon, upon the apron and spreads the same evenly thereon, so that when the belt is moved, the fibers will be carried to the pushing mechanism hereinafter described. The feeding apron may be made of any desired length to accommodate the number of operators necessary to properly feed the machine. The feeding apron is moved intermittently, and I will now describe the mechanism which effects this intermittent movement of the apron.

Upon the shaft 7, a pair of pinions, 10 and 11, Fig. 12, are provided, the pinion 11 being keyed to the shaft, while the pinion 10 is adapted to be secured thereto by means of a set screw 12. The gear wheel, 13, is driven by means of a pinion 14, carried upon the shaft 15, the gear wheel, 13, being keyed to a shaft 16. Keyed to the shaft 16, is a boss 17 carrying an arm 18, supporting upon the end a segmental gear 19. The boss 17 carries a flange 20, provided with curved slots, 21, 21. The segmental gear, 22, is carried upon an arm 23, supported upon a hub 24, which hub carries a flange 25, Fig. 11 adapted to be secured to the flange 20 by means of bolts, 26, 26 Fig. 9 passing through the slots 21, and holes provided in the flange 25. As the shaft 16 rotates the segment 19 engages the pinion 11, and the segment 22 engages pinion 10, and shaft 7 is thus rotated during the period the segments engage the pinions. The combined operative length of the segments, 19 and 22, determines the distance through which the shaft 7 will be rotated during each rotation of the shaft 16. The distance through which the shaft 7 is rotated may be adjusted as desired, even to a fraction of a tooth by varying the angular position of the arm 23 carrying segment 22 relatively to the arm 18 carrying segment 19, this angular adjustment being permitted through the agency of the bolts 26 and slots 21. The pinion 10, is secured to the shaft 7 by means of a set screw 12, whereby the pinion 10, may be rotated relatively to the shaft to cause the teeth thereof to properly mesh with the segment 22. By the adjustment of the pinion 10, and the segment 22, the desired rotation of the shaft 7 may be secured. In this manner in the operation of the machine, the shaft 7 will remain at rest except when the pinions 10 and 11 are engaged by the segments 22 and 19, and this engagement takes place once during each revolution of the shaft 16. Accordingly, the feeding apron, is intermittently moved step by step, during the operation of the machine.

As seen more clearly in Figs. 3 and 4, the shaft 15 carries in addition to the pinion 14, a gear wheel 27 which is geared through an idler 28, with a gear wheel 29, mounted on a shaft 30, carrying upon the other end a bevel gear 31, meshing with a bevel gear 32, which latter meshes with a bevel gear 33, carried upon a shaft 34, which latter shaft carries

upon the end a gear wheel, 35, connected through an idler 36 with a gear wheel 37, which is mounted upon the shaft 38 carrying the driving pulley, 39. The pulley 39 is belted with any suitable engine or motor, and by means of the mechanism above described, motion is transmitted to the feeding apron. The shaft 15 also carries a bevel gear 40, which meshes with a bevel gear 41, carried upon a shaft 42 which shaft carries at the upper end a bevel gear 43 meshing with a pinion 45, carried upon a shaft 46. The shaft 46 carries a pinion 47, which meshes with a gear wheel, 48, mounted upon a shaft 49. Upon the shaft 49 sprocket wheels, 50, 50, are mounted, and these sprocket wheels are geared by means of the chains, 51, 51, with sprocket wheels, 52, 52, mounted upon the shaft, 53. Mounted upon the chains 51, are the pushers, 54, 55, shown in detail in Figs. 7 and 8. The pushers 54, 55, are journaled at opposite ends to the chains and carry rollers 56, 56, which are adapted to travel between the bars 57, 57. Accordingly when the pusher is traveling to the right, as seen in Fig. 6, the engagement of the rollers with the bars, 57 maintains the pusher in a vertical position; when, however, the pusher reaches the right hand end of its travel, and begins to travel around the sprocket wheel, the rollers are released and the pusher is thus permitted to ascend vertically and to then occupy the position shown in connection with the pusher 54, during the return travel of the pusher. As the fibrous stalks are laid upon the feeding apron, parallel to the slats or strips thereof, the stalks will be presented end-on to the pusher 55, and the pushers will thus carry the stalks over the floor 58 to the breaking rolls. The travel of the pushers which is continuous is so timed, relatively to the movement of the feeding apron, that the feeding apron rests stationary while the pusher is traversing the path of the feeding apron, the feeding apron being moved after the pusher has passed beyond the path of the apron, a second compartment of the apron being thus brought opposite the path of the pushers whereby the next pusher may carry the fibers into engagement with the breaking rolls.

Breaking mechanism.—The breaking mechanism consists of a plurality of toothed rolls between which the stalks or fibers are adapted to pass to break the wood thereof. A plurality of pairs of rolls, 59, 60 are provided, the pitch of the teeth of the successive pairs gradually diminishing from the receiving end of the series toward the delivery end thereof, as shown more clearly in Fig. 6. The lower rolls 60 are mounted upon shafts 61 journaled in boxes carried upon the frame, 62, of the machine. The upper rolls 59 are mounted upon shafts 63 which have freedom of motion vertically, being resiliently pressed downwardly by means of the springs 64, the tension of which may be adjusted by means of the screws, 65. The shafts 61 carry gear wheels, 66, geared through idlers 67 and 68 with the gear wheel, 69, carried upon the shaft 63, of the upper roller. Links 70, 71 and 72 connect the several gear wheels and idlers, so that the shaft 63 carrying the upper roller may rise and fall, while the motion of the gear wheel 66, is positively transmitted to the shaft 63, regardless of the position of said shaft. The rise and fall of the upper roller to accommodate the varying thickness of the fibrous stalks passing between the same is thus secured. The teeth upon the rollers, 59 and 60 do not make contact, but each roll is positively driven by means of the gearing above described so that the rolls rotate without the teeth thereof coming into contact and the positive driving of the upper roll is insured regardless of the position thereof. The several gears, 66, 66, engage the gear wheels, 73, 73, which latter are driven by the pinions, 74, 74, carried upon the shafts, 75, 75, which shafts carry at the opposite ends the gear wheels, 76, 76 which intermesh with the driving pinion 77, carried upon the shaft 78. The shaft 78 carries the bevel gear 32 heretofore mentioned, and this bevel gear meshing with the bevel gear 33 serves to impart motion through the chain of gears above described to the breaking rolls. The passage of the fibers or stalks between the series of breaking rolls thoroughly breaks the wood of the stalks. In order that the feeding and breaking mechanism may be adjusted and properly timed with reference to the remaining mechanism hereafter to be described, I mount the idler 36 upon a pivoted lever, 79, whereby said idler may be moved into or out of engagement with the gears 35 and 37 to throw the breaking mechanism into or out of operation as desired. The fibers after passing through the breaking rolls are delivered to clamps carried upon a traveling chain and the fibers are thus carried through the scutching and hackling apparatus, and finally delivered to the bundling mechanism.

I will now describe the clamps which serve to hold the fibers and to carry the same through the scutching and hackling mechanism.

Fiber clamp.—The clamp comprises a pair of duplicate end pieces 80, secured together by means of the tie rods, 81, the end pieces carrying bosses, 82, 82. The cross piece, 83 carrying the pivotal pin, 84, is secured to the ends of the bosses 82 by means of screws 85 and pins 86. The pivotal pin 84 has keyed upon the end thereof, the reversing lever 87, carrying the rollers 88, 88. Surrounding the end piece 80, are the cam plates 89, 89, the inner faces of which are adapted to rest normally in contact and the outer faces of which are cut away to a point at the ends to con-

stitute a cam in the form of a double wedge. In order to resiliently press the cam plates toward each other, rods 90, 90, are carried upon the respective bosses 82, 82, and springs 91, 91, rest within recesses provided in the cam plates 89 and engage nuts 92, carried upon the rods, 90, whereby the cam plates are resiliently pressed toward each other. The cam plates 89 carry bosses 93 having flat outer edges against which the links 111 are adapted to bear as shown in Fig. 19, and within which are journaled the ends of the rollers 94, 94, arranged in pairs, the opposite members of which normally rest in contact. The cam plates 89, 89, carry bosses, 95, 95, upon which are journaled the actuating gears, 96, 97, each gear 96, being fastened together as one piece with its companion gear 97. Meshing with the actuating gear, 96, are the roll gears 98, which are mounted respectively, upon the shafts 99, supporting the rolls, 94. The shafts 99 pass through openings provided in the cam plates and slots are provided in the end pieces 80 to accommodate the movement of the shafts 99 as the cam plates are separated. When the gears 96 or 97 are rotated, the rolls 94, are positively rotated. The opposite ends of the clamp are counterparts and are constructed as above described, and the pivotal pin, 84, at each end of the clamp is journaled in the main traveling chain, 100, preferably by means of a pair of blocks, 101, 101, secured within one of the links of the chain as shown more clearly in Fig. 14.

The clamp is provided with a pair of noses at the opposite sides thereof, Figs. 21 to 23[a]. Each nose extends across the clamp and is formed of three pieces, namely, the end pieces, 102, and the cross piece 103, which extends between them. Each end piece, 102, is provided with a boss 102[a], and between these bosses a tube, 105, extends, the ends of the tubes being driven over the bosses. Each end piece is secured to the end of the cross piece by means of screws, 104. The cross pieces of the two clamps of a pair are provided with oppositely extending tongues, 106, 107, whereby the noses may more securely clamp the fibers in position as will be more particularly described hereafter. The end pieces are provided with openings, 108, 108, through which the shafts 99 are adapted to pass to serve as pivots for the swinging of the noses. The end pieces are also provided with openings, 109, 109, through which pass pins, 110, 110, by means of which the connecting links, 111, 111, are pivoted to the noses at opposite sides of the clamp. The connecting links 111 carry the toothed plates, 112, 112, the teeth of which plates are adapted to engage the toothed wheels, 113, 113, carried upon the shaft of the central rollers, 94. When the connecting links, 111, are in the position shown in Fig. 19, the noses upon the left are forced together while the noses upon the right are separated. At the same time, the teeth at the right hand end of the plate 112, are forced into engagement with the wheels, 113, to thereby lock the rollers 94 against rotation. Since all of the rollers are geared together, the locking in this manner of the shafts carrying the central set of rollers locks all of the rollers of the clamp. When the clamp is traveling to the right as seen in Fig. 19, the engagement of the tapered ends of the links, 111, with the compression track, hereafter described, forces the links into the position shown in this figure, thereby forcing together the rolls of the clamp and the noses at the following side of the clamp. The springs 114 tend to force the noses into positions perpendicular to the links and when the links are not in engagement with the compression track the noses occupy these perpendicular positions. When the clamp is traveling to the left as seen in Fig. 19, the links, 111, will be moved to the right to force into contact the jaws shown upon the right of the clamp, and by the same movement the jaws upon the left of the clamp will be separated. In either position of the links, they will engage the bosses, 93, and under the action of the compression track tend to compress the rolls, 94, and the teeth upon the plates, 112, will engage the toothed wheels, 113, to lock the rollers against rotation while the clamp is passing between the compression tracks. The end of the layer of fibers being operated upon is adapted to be clamped between the rolls, 94, and also between the noses at the trailing or following end of the clamp as will be more fully described hereafter.

It will thus be seen that each clamp comprises a plurality of pairs of clamping rollers, three being shown, but any desired number being permissible. These rolls are journaled at the ends in cam plates, which are normally pressed together by means of springs, to force the rolls toward each other, the springs, however, permitting the separation of the rolls as required for the admission of the fibers to be clamped. The cam plates are adapted to be forced together by means of the compression tracks to securely hold the fibers between the rollers. In addition to the rollers, noses are provided at the ends of the clamp which also engage the fibers to assist in locking the same in the clamp, a pair of noses being provided at each end of the clamp and the two pairs connected together by means of links, so that when one pair is in operation the other pair will be out of operation; means being also provided in connection with the rollers for locking the same against rotation, while the fibers are clamped therein. The clamps as thus constructed, are mounted upon the main traveling chain of the machine, and are situated at such distances apart that each

clamp may pass through the mechanism of the machine without interfering with the operation of the preceding and following clamps. The distance between the clamps is also to be determined by the speed of operation of the breaking mechanism in delivering the fiber units to the clamps. By "fiber unit" I contemplate the layer of fibers which pass through the breaking mechanism, which layer is fed from the breaking rolls directly to one of the clamps.

I will now describe the clamp charging mechanism.

Clamp charging mechanism.—The machine comprises two main frame pieces, 115, 115, extending throughout the length of the machine. Supported within this main frame are the frame pieces, 116, 116, of the auxiliary frame. At the end of the machine, a pair of guiding tracks, 117, 117 is provided, one of the tracks being mounted on the inner face of each side frame, 115, as shown more clearly in Fig. 29. Fig. 24 shows these tracks and the clamp charging mechanism with the front frame, 115, removed. The forward track, 117, comprises two parallel bars as is shown in this figure, and a portion of this track is broken away to show the track mounted upon the other frame plate 115. The rollers, 88, 88, carried at the end of the clamp are adapted to travel between the bars of the tracks, 117. The main chain, 100, travels about sprocket wheels, 118, 118. Upon the inner faces of the frame plates, 115, brackets, 119, 119 are provided, these brackets supporting pivoted arms, 120, 120, which at the end are pivoted to a rack, 121. A spring, 122 is connected at one end with the journal pin, 123, and at the other end with the cross piece, 124, of the arm 120, whereby a tendency is imparted to the rack to move inward toward the track, 117. Two of the racks, 121, are provided, one upon each side of the track, 117. A pair of racks, is thus provided in connection with each of the said tracks, 117. These racks are adapted to be engaged by the gears 97, on the clamp. The front plate, 115, carries a bracket, or bearing sleeve, 323, within which is journaled a sleeve, 324, carrying upon one end an arm, 125, and upon the other end an arm, 126. To the arm, 125 is journaled one end of the roller, 127. A similar bracket, 323 is carried upon the frame plate, 115, on the other side of the machine, and to this bracket is journaled a similar arm, 125, upon the end of which the opposite end of the roller, 127, is journaled. The forward end of the roller, 127 carries a sprocket wheel, 128, geared by means of a chain, 129, with a sprocket wheel, 130, carried upon a shaft, 131, which passes through the sleeve, 324, and carries upon the opposite end the gear wheel, 132. A cam wheel, 133, is carried upon the end of the roiler, 127. By means of the gear wheel, 132, the roller may be rotated through the agency of the sprockets, 130, and 128, and the chain 129. At the same time, the rollers may be diverged or converged by means of the arms, 125. A similar roller, 127, is provided as a companion roller, and this second roller is provided with a similar mounting, the corresponding parts of which are marked with the same reference figures. The corresponding arms, 126, of these two rollers are connected by a spring, 134, which serves to draw the arms, 126 together, thereby forcing the rollers, 127 into contact. The spring, 134, permits the rollers to yieldingly separate upon the passage of the fibers or the clamp between the same. A similar pair of rollers, 135, 135, are provided adjoining the rollers, 127, and each of the rollers, 135 is journaled at the opposite ends to the arms, 136, pivotally mounted in the brackets, 137. The arm, 136 at the front of the machine is mounted upon a sleeve, 138, carrying at the end an arm, 139. The arms, 139 of the companion rollers are connected by means of a spring, 140. The roller, 135 carries a cam wheel, 141, and a sprocket, 142, geared by chain 143, with a sprocket, 144, carried upon a shaft, 145, extending through the sleeve, 138. Shaft 145 carries upon the end a gear wheel, 146. Looking at Fig. 28, it will be seen that the gear wheels, 132, are connected by idlers, 147, and that the gear wheels, 146, are connected by idlers, 148. The gear wheel, 146, upon the right is mounted to move with a bevel gear, 149 meshing with a pinion, 150, carried upon the shaft 38. An idler 151 connects the gearwheels 146 and 132. By this train of gears the shafts, 131 and 145 are rotated and motion is thus imparted to the rolls, 127 and 135.

At the end of the series of the breaking rolls, a tail board, 152, is provided, a false tail board, 153, being carried thereon, having a nose piece, 154. The false tail board is mounted on rollers, 155, and is normally pressed outward by means of a spring, 156. The clamp in passing engages the nose 154, and the false tail board is thus moved back out of the way to permit the passage of the clamp. The fibers after passing through the breaking rolls are delivered upon the tail board, and as the end of the layer of fibers passes beyond the end of the nose piece, 154, the ends of the fibers point downward and pass between the rolls, 127. These rolls move in such a direction as to grasp the fibers and draw the same between them. The fibers are thus fed forward by the rolls, 127, and the ends of the fibers are passed between the rolls, 135, 135. By the time the ends of the fibers have reached the rolls, 135, and are passing between the same, the clamp has approached the rolls and the ends of the fibers after passing through the rolls

135 are engaged by the rolls, 94, of the clamp. The breaking rolls are preferably operated at a peripheral speed of about thirty feet per minute, and accordingly, the fibers are fed forward at a lineal speed of thirty feet per minute. The rolls, 127 and 135, are rotated at the same speed of thirty feet per minute, and, accordingly, the rolls, 127 and 135 will continue to feed the fibers forward while the rear ends of the fibers are still between the breaking rolls. The main chain carrying the clamps travels at a speed of thirty feet per minute, and in order that the rollers, 94 on the clamps may grasp the fibers, and feed the same into the clamp at the same rate that the fibers are fed through the rolls, 127 and 135, the gearing operating the rolls on the clamp is such as to drive the rolls at a peripheral speed of sixty feet per minute. The rolls thus feed the fibers relatively to the frame of the clamp at a speed of sixty feet per minute, but as the frame of the clamp is moving in a direction opposite to the travel of the fibers, at a speed of thirty feet per minute, the resultant movement of the fibers relative to the frame is at the rate of thirty feet per minute. The fibers are thus fed into the clamp at the same rate that they are delivered from the breaking rolls. Since there is no compression track during this travel of the clamps, the nose pieces on the clamps will extend perpendicular and will not grasp the fibers. As the clamp continues its travel, the upper ends of the cam plates, 89, pass between the cam wheels, 133, and 141, carried at the ends of the rolls, 127 and 135, respectively, and the rolls are thus separated to permit the passage of the same. Upon the passage of the clamp between the rolls, the springs, 134 and 140, move the rolls together. The length of the fibers operated upon is such that by the time the forward ends of the fibers have thus been fed into the clamp the rear ends of the fibers are just leaving or are about to leave the last pair of breaking rolls. Of course, the location of the charging mechanism and the path of travel of the clamps will be such relatively to the breaking rolls as to accommodate the particular length of the fibers being operated upon. As the ends of the fibers now project beyond the forward end of the clamp it is necessary to reverse the clamp before passing the same through the scutching and hackling mechanism, and for this purpose, a reversing switch or track is provided above the charging mechanism. As the rollers, 88 travel upward, the leading roller engages the end of a dog, 157, thereby moving the lower end of the dog into the path of the following roller, and forcing the following roller into a shunt or side track which curves to the right. As the clamp continues this movement the leading roller lifts the dog, 158 and passes into the recess 159, the following roller continuing its travel through the side track, and being thus moved into a position in advance of the other roller. The dog, 158, drops down to the position shown in full lines, and the roller resting in the recess, travels into the main track. In this manner, the roller which was initially the following roller, becomes the leading roller, and vice versa, and the clamp is in this manner reversed in position, so that the projecting ends of the fibers trail from the end of the clamp. As the clamp continues its travel, it is carried through the scutching mechanism.

Scutching mechanism.—The scutching mechanism comprises a plurality of pairs of rotating beaters, each beater comprising a shaft, 160, upon which is mounted a pair of spiders, 161, each having spokes which support the beating knives 162, preferably formed of angle plates, and carrying guards 163, which may be made of wire gauze, or other suitable material, to prevent the fibers from becoming wrapped about the beating knives. The beaters are arranged in pairs and the knives thereof are arranged to successively move into operative position to engage the fibers trailing from the clamp and beat the same, to thereby remove, from the fibers the dust and clinging bits of wood or shive which have been broken by the passage of the fibers through the breaking mechanism. The shafts, 160 of the upper beaters carry at the opposite ends and exterior to the auxiliary frames, 116, cam wheels, 164, which are adapted to be engaged by the cam plates on the clamps. Slots, 165, are provided through the exterior plates of the main frame, and similar slots, 166, are provided through the auxiliary frames to accommodate the movement of the shafts 160, which are journaled at the ends in segment arms, 167. The arms, 167 carry segmental gears, 168, the segmental gears of the two beaters of a pair being in mesh as shown more clearly in Fig. 31. As the clamp carrying the fibers approaches the first pair of beaters, the cam plates on the clamp engage and raise the cam wheels, 164 and the upper beater is thus raised, and through the meshing of the segmental gears, 168, the lower beater is correspondingly moved downward and the clamp is thus permitted to pass between the upper and lower beaters. Upon the passage of the clamp the beaters are permitted to approach, and the beating knives thus act upon the fibers. The pairs of beaters are thus separated in turn upon the approach of the clamp and are permitted to approach each other after the clamp has passed between the beaters. The meshing segments which control the movement of the arms carrying the beaters serve also to always maintain the proper relative movement of the beater knives so

that they will not interfere and cause serious trouble.

Supported upon the auxiliary frame, 116, are the compression tracks, 169, carrying the rollers, 170. As shown in detail in Fig. 33, a boss 171 is carried upon the upper frame, 116, in which is screwed a nut, 172, through which extends a rod, 173, secured at the lower end to the frame, 169, of the compression track. Screwed upon the rod, 173, is a nut, 174, between which and the nut 172, a spring, 175, is placed. The upper compression track is thus resiliently mounted. As shown in Fig. 34, the frame, 169, of the lower compression track is secured to a rod, 173, carrying a nut, 174, and passes through a nut, 172, secured to the boss, 171. Instead of a spring, however, a rigid sleeve, 176, is interposed between the two nuts so that the lower compression track is rigid, although the same may be made resilient, if desired, by substituting a spring for the sleeve. As the clamp passes between the beaters, the connecting links, 111, on the clamp engage the rollers of the compression track and the links are thus moved to the rear and forced inward as shown in Fig. 19, to bring the following noses together, and thereby clamp the fibers between the same. This same movement firmly compresses the clamping rolls upon the fiber as explained, and locks them against rotation due to the engagement of the teeth of the plates, 112, and the wheels, 113. The tongues of the inner faces of the noses assist in gripping the fibers. By means of the rolls and the noses, the fibers are securely locked in the clamp, while the same is traveling through the scutching and hackling mechanism.

The shafts, 160, carry gear wheels, 177, which mesh with the gear wheels, 178, the gear wheels, 178 also meshing with each other. Connected to the lower gear, 178, is a bevel pinion, 179, meshing with a pinion, 179ª, carried upon a shaft, 181. A pinion, 180, on the shaft, 181, meshes with a pinion, 182, carried upon a shaft, 183, having at the lower end a pinion, 184, meshing with a pinion, 185, carried upon the main driving shaft, 186. The main driving shaft, 186, is connected by means of gears, 187 with the driving shaft, 38. A bevel pinion, 179ª, is provided for each pair of beaters, and is connected with the upper shafts through gearing similar to that above described in connection with the first pair of beaters.

The clamp after passing through the scutching mechanism passes through the hackling mechanism which will now be described.

Hackling mechanism.—The main shaft 186 carries a bevel pinion, 188, meshing with a pinion, 189, carried on a shaft 190, having at the end a bevel gear, 191 meshing with a bevel gear, 192. The pinion, 192, rotates with the gear, 193, and the gear, 193, meshes with a similar gear, 193, provided above the same, the gears, 193, meshing with gears, 194, mounted upon the shafts, 195. Shafts, 195, are mounted respectively upon the arms, 196, carrying segmental gears 197 which intermesh. The shafts, 195 have journaled thereon, the side members, 198, of the hackling frame, said side members being joined together by cross bars, 199. The shaft, 195, carries a bevel pinion 200, meshing with a pinion, 201, journaled upon the cross piece 199, moving with a pinion, 202, meshing with a pinion, 203, upon the shaft, 204, which shaft is journaled in the side members, 198, 198. The shaft, 204, carries sprocket wheels, 205, 205, which are connected by means of sprocket chains, 206, with sprocket wheels, 207, 207, carried upon a shaft, 208, which is journaled in the side members, 198. The main shaft, 195 thus imparts movement to the intermediate shaft, 204, through the bevel gears, and intermediate shaft, 204, imparts movement to the driven shaft by means of the sprocket wheels and chain. The hackling frame is capable of a rocking motion about the main shaft, 195, and the main shaft is capable of a tilting motion about the pivots of the arms, 196. To accommodate this rocking movement of the shaft, 195, slots, 209, are provided in the main frame of the machine and corresponding slots, 210 are provided in the auxiliary frame. The sprocket chains, 206, support the transverse bars, 211, upon which are mounted the hackling pins, 212. The bars, 211, are pivoted to the chains, and carry rollers, 213, 213, adapted to travel in a channel, 214, provided in the outer face of the side members, 198, of the hackling frame. A similar channel and coöperating rollers are provided in connection with each of the side members of the frame. A stripper, 215, is provided in connection with each pin bar, the stripper being formed from a tube, and having holes therethrough to accommodate the passage of the pins, 212. Rollers 216 are provided upon the opposite ends of the strippers and are adapted to ride upon the stripper cams 217. As shown more clearly in Fig. 38, a spring, 218, serves to resiliently draw the stripper toward the pin bar. As the chain 206 travels to the right, as shown in Figs. 39 and 40, the rollers carried on the strippers engage the cam, 217, and the strippers are thus forced toward the points of the pins whereby any clinging fibers are removed from the pins. The object of the strippers is thus to withdraw any fibers clinging to the points of the pins. Upon the shafts, 195, 204 and 209 brackets, 219, are provided which support the shoes 220, see Fig. 36, provided with a series of rollers 221. To limit the movement of the shafts 204 and 208 stops 222 are provided against which said shafts are adapted to abut. Tracks are

provided for the rollers at the ends of the clamps, these tracks being formed from angle bars 223. Compression tracks are provided the same as in connection with the scutcher above described, said tracks comprising the bars or frames, 169 supporting the rollers, 170.

Referring more particularly to Figs. 36, 39, and 40, it will be noted that as a clamp approaches the shoes, 220, the cam plates on the clamp, engage and separate the shoes, 220, the counterparts of the hackling mechanism of the hackling frames being thereby rocked about the shafts, 208, into the position shown in Fig. 39. The hackling pins are thus moved away from each other to permit the passage of the clamp between the same. As the cam plates on the clamp reach the middle of the shoes, the hackling frames will occupy substantially parallel positions and as the clamp passes beyond the middle of the hackling frame, the left hand of the frames will approach, while the right hand ends remain separated until the clamp has passed from between the same. It will therefore be seen that the hackling pins will not engage the fibers until the clamp has almost passed the hackling frames as seen in Fig. 40. It will be noted that the pins upon the left of the frames will first engage the fibers and as the clamp continues to move forward, other pins will successively engage the fiber until when the clamp has passed beyond the ends of the frames, all of the pins will be moved into operative position and will engage the fibers. The result of this construction and operation is that the pins instead of first engaging the fibers near the noses of the clamp begin to engage the fibers near the free ends thereof, the pins gradually creeping up toward the noses of the clamp as the clamp continues its movement. The danger of tearing the fibers in case of entanglement is thus avoided. If the pins should suddenly be thrown into engagement with the fibers throughout the length of the hackling mechanism, the fibers would be subjected to severe strain, and in case the fibers were entangled among themselves there would be danger of tearing the fibers. By the construction above described, however, the pins are successively and gradually admitted into operative contact with the fibers thus in effect creeping from the free ends of the fibers toward the clamp. As the clamp passes between the hackling frames, the free ends of the fibers will hang down and would thus come into engagement with the pins of the lower frame were not some provision made to prevent this. Accordingly, I provide the protecting stripper cams, 224, one being provided upon each side of the machine and supported upon the superstructure frame. As shown in Fig. 39, the rollers upon the strippers engage the cam and the strippers are thus forced outward to cover the ends of the pins as the clamp passes between the hackling frames, and the fibers are thus prevented from catching upon the pins. As the clamp passes from between the frames the inward movement of the frames carries the strippers out of engagement with the protecting cam, 224, and permits the pins to engage the fibers to comb the same.

Upon the passage of the clamp through the beaters, and the hackle, as above described, one end of the layer of fibers being operated upon will have been scutched and hackled. It is next necessary to move the layer of fibers within the clamp so as to expose the remaining ends of the fibers which have not as yet been operated upon. This transference of the fibers is accomplished as the clamp passes through the clamp reversing mechanism, which will now be described.

Clamp reversing mechanism.—Upon the passage of the clamp from the hackling mechanism, the rollers, 88, at the end of the clamp pass between the bars forming the tracks, 225. These tracks are each provided with a reversing switch or track like that which is illustrated in detail in Fig. 25, and as the clamp passes this track, the same is reversed in position in the manner heretofore described in connection with Fig. 25. After the reversal of the clamp the fibers will project from the leading end thereof instead of from the following end. As the clamp continues its travel it passes between the racks, 226, 226, which racks are supported upon the links, 227 and are yieldingly forced inward by means of springs situated as shown more clearly in connection with the racks, 121, (Fig. 24). As the clamp passes between the racks, the gear wheels, 97 upon the clamp engage the racks and the clamp rolls are thus rotated in a direction to feed the fibers toward the rear so that the unworked ends thereof will project beyond the clamp upon the trailing side thereof. The racks, 226, are of such length as to insure the necessary movement of the fibers within the clamp. Since the connecting links, 111, of the clamps have passed from between the compression tracks, the clamp noses will be perpendicular and will not be in engagement with the fibers, the fibers being thus free to move as the rolls are rotated.

Secondary scutching mechanism.—After the fibers have thus been moved within the clamp to expose the unworked ends thereof, the fibers are carried through beaters of a secondary scutching device, which is a counterpart of the scutching device heretofore described and like parts have been indicated by the same reference figures employed in connection with the primary scutching device heretofore described. The clamp is made of sufficient length to protect the worked end of the layer or unit of fiber

whereby it is kept clean during its passage through the secondary mechanism.

Secondary hackling mechanism.—After the passage of the fibers through the secondary scutching mechanism, they are passed through a secondary hackle, which is a counterpart of the hackle heretofore described, and, accordingly, like parts have been indicated by the same reference figures employed in connection with the primary hackle heretofore described.

Clamp discharging mechanism.—After passing through the secondary hackle, the clamp passes between the pairs of racks, 228, mounted in a stationary position by means of the screws, 229, and brackets, 230. As the clamp passes between the racks, the larger gears 96 engage the racks and the rolls are thus rotated. There is no need in this case of placing adjusting dogs on the racks for the only requirement is that the fiber be delivered. As the compression tracks are omitted at this point, the noses occupy perpendicular positions, thereby releasing the fibers and releasing the lock for the clamp rolls. The gears on the clamp are so proportioned that the rolls will have a peripheral speed of thirty feet per minute, that is, a speed equal to that of the travel of the clamp. Accordingly, the layer of fibers will be deposited upon the receiving frame or grid without disarrangement, since the rolls rotate in a direction to move the fibers toward the trailing end of the clamp at the same speed that the clamp travels forward. The main chain, 100, travels around a sprocket wheel, 231, at the end of the machine, this sprocket wheel being mounted upon a shaft, 232.

Delivery mechanism.—The fibers upon being discharged from the clamp are delivered upon a grid or frame formed from a plurality of rods or pipes, 233, extending transverse to the machine, the ends of the rods being bent downward as shown more clearly in Fig. 45. The rake bar, 234, carries a plurality of pins, 235, forming a rake, the pins extending upward between the bars, 233. The rake bar, 234, is mounted upon sprocket chains, 236, passing over sprocket wheels, 237, 238, the latter being mounted upon a shaft, 239, carrying a sprocket wheel, 240, geared by means of a chain, 241, with a sprocket wheel, 242, mounted to move with a bevel pinion, 243, meshing with a bevel gear, 244, carried upon the shaft 232. The shaft 232 carries the main sprocket wheels, 231, for the main traveling chains, and is provided upon the end with a worm wheel, 245, meshing with the worm 246, carried upon the main shaft 186. The shaft 232 also carries a sprocket wheel, 247, connected by means of a sprocket chain, 248, with a sprocket wheel, 249, moving with a bevel pinion, 250, meshing with a bevel pinion, 251, carried upon the shaft 252. The shaft 252 carries upon the end a crank 253, to which is connected a yoke 254, supporting upon the end a cross piece 255, moving in guides 256 and supporting the packers, 257, of a pair of twine binders. I have illustrated the needle, 258, and the trip finger, 259, and other mechanism of a typical twine binder. It will be understood, that any preferred form of twine binder may be employed in this connection, as for instance, a binder constructed in accordance with Letters Patent No. 601,609, granted March 29th, 1898. I have illustrated merely a few of the parts of the binders to show how the same will coöperate with the mechanism of my invention. The twine binders in their individual capacity do not form a part of the present invention. The fibers having been delivered upon the grid from the clamp, the pins or prongs 235, of the traveling rake move the fibers along the grid to a point where the same are engaged by the packers, 257 and carried into the binding mechanism, where the fibers are bound together in a bundle, the bundle being then delivered from the binding machine in the usual manner. While I have shown two binders whereby two cords will be wound around the bundle, it will be understood that any desired number of binders may be employed.

It is desirable that the pins, 235, of the rake should be withdrawn from the fibers without disturbing the same at the end of the travel of the rake, and for this purpose, I provide at the end of the travel of the rake, a guide, 260, with which engages a roller, 261, carried upon an arm, 262, provided upon the end of the rake bar, 234. This guide serves to maintain the pins of the rake in a vertical position as shown in Fig. 55, as the same are withdrawn from the fibers. In order to maintain the rake pins in a vertical position during the right line travel thereof, a lock is provided comprising a pin 263, carried upon the rake, 234, and adapted to be engaged by a bolt, 264, sliding within the brackets, 265, carried upon the chain 236. A spring 266 maintains the end of the bolt in engagement with the pin 263, to lock the rake in the perpendicular position. A spring, 267, connected between the chain 236 and the arm 262 tends to maintain the rake in the perpendicular position. A cam 268 is provided alongside the chain at the end thereof with which the end of the bolt 264 is adapted to engage whereby the bolt is moved into the position shown in Fig. 53, to release the pin 263, thereby permitting the rake to rotate within the chain as the roller 261 engages the guide 260. Instead of this mechanism, the mechanism described in connection with the pusher mechanism may be employed to maintain the vertical direction of the said pins.

A sheet iron casing 270 may surround substantially the entire machine and suction pipes 271 may be led off from the same whereby all dust is effectively carried away from the machine.

Having described my invention what I claim as new and desire to secure by Letters Patent is:

1. In a fiber treating machine, in combination, a feeding apron on which independent units or layers of fiber are formed, a removing mechanism for transferring each unit of fiber bodily to said machine, said layers being transferred by said mechanism one by one so as to be separated one from the other and the fibers being advanced endwise, and means for operating said apron so as to bring said units to said removing mechanism.

2. In a fiber treating machine, in combination, a feeding apron on which independent units or layers of fiber are formed, a removing mechanism for transferring each unit of fiber bodily to said machine, said layers being transferred by said mechanism one by one, so as to be separated one from the other and the fibers being advanced endwise, and means for operating said apron intermittently to bring said units to said removing mechanism, said removing mechanism being operated to remove said units from said apron during the intervals of rest.

3. In a fiber treating machine, a feeding apron on which independent units or layers of fiber are formed, said apron being movable transversely with reference to the main portion of said machine, a removing mechanism for transferring each unit of fiber bodily to said machine, said removing mechanism being movable longitudinally with reference to the main portion of said machine, said units being transferred by said removing mechanism one by one, so as to be separated one from the other and the fiber being advanced endwise as it is transferred by said mechanism, and means for operating said apron intermittently to bring said units to said removing mechanism, said units being removed from said apron during the intervals of rest.

4. In a fiber-treating machine, in combination, a feeding apron upon which units or layers of the fiber may be laid, means for intermittently operating said apron, and means for removing said units or layers bodily from said apron during the intervals of rest.

5. In a machine of the class described, the combination with an intermittently operating feeding conveyer, of a pushing mechanism to feed the fibers to the fiber working portions of the machine during the intervals of rest of the feeding conveyer, substantially as described.

6. In a machine of the class described, the combination with a breaking mechanism, of a feeding apron transverse to said mechanism, means for intermittently operating said feeding apron whereby the fiber may be spread upon the same during the periods of rest, a pushing mechanism to transfer the fiber from said apron to the breaking mechanism, the operation of said pushing mechanism being so timed relatively to the feeding apron as to remove the fiber therefrom during the periods of rest, substantially as described.

7. In a machine of the class described, the combination with a breaking mechanism, of a transversely arranged feeding apron upon which fiber is adapted to be spread with the stalks transverse to the apron, and a pushing mechanism to remove the fiber from the apron and feed it end-on into said mechanism, substantially as described.

8. In a machine of the class described, the combination with a breaking mechanism, of a feeding apron divided into sections so that the fiber may be spread thereon in units, means for intermittently operating said apron to bring the several sections before the breaking mechanism, and a pushing mechanism to transfer the fiber on each section to the said mechanism at one operation, substantially as described.

9. In a machine of the class described, the combination with a breaking mechanism, of a traveling clamp adapted to receive an independent unit of fiber from said breaking mechanism and then advance the fiber endwise in a line with the movement of the clamp and means to feed independent units of fiber to said breaking mechanism at predetermined intervals.

10. In a machine of the class described, the combination with a breaking mechanism, of a feeding mechanism adapted to feed independent units of fiber to said breaking mechanism one by one, and a plurality of traveling clamps each adapted to receive one of said units and then advance the fiber endwise in a line with the movement of the clamp.

11. In a machine of the class described, the combination with a breaking mechanism of means adapted to feed independent units of fiber to said breaking mechanism one by one, traveling clamps, each adapted to receive one of said units and advance the fiber endwise in a line with the movement of the clamp, and means for scutching the fiber.

12. In a machine of the class described, the combination with a breaking mechanism, of a feeding device to charge the breaking mechanism in units, and clamps for receiving and advancing each unit, the feeding movement being timed relatively to the movement of the clamps so that each unit of fiber is grasped and advanced at the proper time, substantially as described.

13. In a machine of the class described, the combination with a breaking mechanism,

of a feeding device intermittently operated, a clamp to receive the fiber after it passes through said mechanism, the feeding and clamping movements being so timed relatively to each other that the clamp will be in proper position to receive the fiber after it passes through the mechanism, substantially as described.

14. In a machine of the class described, the combination with a breaking mechanism, of a feeding mechanism arranged to feed a layer of fiber thereto of the width of said mechanism, and a clamp adapted to grasp the end of the layer of fiber after it passes through said mechanism and to advance the same, substantially as described.

15. In a machine of the class described, the combination with a breaking mechanism, of a feeding apron arranged transversely to said mechanism and having a plurality of sections whereby a layer or unit of fiber can be spread upon each section with the stalks arranged cross-wise the apron, means for moving said apron intermittently to bring the sections one at a time before the breaking mechanism, a pushing mechanism to push the layer or unit of fiber on each section from the apron into the breaking mechanism whereby the stalks are fed to the same end-on, and a traveling clamp to grasp each layer or unit of fiber after it issues from the breaking mechanism and to advance the same, substantially as described.

16. In a machine of the class described, a clamp having a pair of clamping rolls adapted to receive an independent layer or unit of fiber and advance said unit with the fiber endwise in a line with the movement of the clamp, and means for forming independent units of fiber and feeding the same to said clamp at predetermined intervals.

17. In a machine of the class described, a clamp having a pair of rolls adapted to receive a layer or unit of fiber, and driving mechanism adapted to rotate said rolls to draw the fiber into the same as it is fed thereto.

18. In a machine of the class described, a traveling clamp having a pair of rolls arranged transversely to the line of movement to the clamp, and means adapted to charge said clamp with an independent unit of fiber.

19. In a machine of the class described, a clamp having rolls arranged transversely to the line of movement of the clamp, and means adapted to charge said clamp with an independent unit of fiber while it is moving.

20. In a machine of the class described, a clamp having rolls arranged transversely to the line of movement of the clamp, means adapted to insert the fibers endwise into said clamp, and means for forming the fiber into independent units and delivering said units at predetermined intervals.

21. In a machine of the class described, the combination with a traveling clamp of means arranged in the path of the same to charge the clamp with a unit of fiber, the fiber being inserted endwise into the clamp, and means for forming the fiber into independent units.

22. In a machine of the class described, a clamp comprising a pair of rolls, and a clamping nose at the end to assist in holding the fiber in the clamp, substantially as described.

23. In a machine of the class described, a clamp comprising a pair of rolls, and a pair of clamping noses at each end of the clamp, whereby the same is adapted to grasp a layer of fiber at either end of the clamp, substantially as described.

24. In a machine of the class described, a clamp, a pair of clamping rolls, a pair of noses at each end and intermediate connecting mechanism between said pairs of noses, whereby when one pair is in action the other is out of action, substantially as described.

25. In a machine of the class described, a clamp having a plurality of pairs of clamping rolls, clamping noses at each end, links connecting the latter whereby when one pair is in action the other is out of action, and a locking means for the rolls to prevent their rotation and the consequent withdrawal of the fiber, substantially as described.

26. In a machine of the class described, a clamp comprising a plurality of pairs of opposed rolls adapted to clamp a layer of fiber between them, a pair of opposed clamping noses pivoted at each end of the clamp, said noses being adapted normally to stand open and perpendicular to the sides of the clamp, links connecting the like noses of each pair, locking plates for the rolls to prevent rotation of the rolls carried upon said links whereby when either pair of noses are together the rolls are locked but when both pair are open the rolls are not locked, and members mounted in the path of said clamp to engage said links as the clamp passes, to cause the rear pair of noses to close together and clamp upon the layer of fiber held by the rolls and to also cause said locking plate to lock the rolls against rotation, substantially as described.

27. In a machine of the class described, the combination with a traveling clamp, of means at a point in the path of said clamp for charging the same with an independent layer or unit of fiber, the fiber being inserted endwise into the clamp.

28. In a machine of the class described, the combination with a traveling clamp, of means for charging the same with an independent layer or unit of the fiber without stopping the movement of the clamp, the fibers being inserted endwise into the clamp.

29. In a machine of the class described, the combination with a traveling clamp con-

stituting a unitary structure, of means for charging said clamp with an independent unit of fiber, the fibers being inserted endwise into the clamp.

30. In a machine of the class described, the combination with a traveling clamp, of means for charging the same with an independent layer or unit of fiber, the fiber being inserted endwise into the clamp and grasped at one end while the other end trails after the clamp.

31. In a machine of the class described, the combination with a traveling clamp of means for causing the same to grasp an independent layer of fiber at one point in its path, the fiber of said layer being received endwise by the clamp.

32. In a machine of the class described, the combination with a traveling clamp, of means for causing the same to grasp an independent layer of fiber at one end without stopping the movement of the clamp, the fiber of said layer being received endwise by the clamp.

33. In a machine of the class described, the combination with an upwardly traveling clamp, of a charging mechanism for said clamp from which the advance end of a layer of fiber depends as the clamp rises, and means for causing the said clamp to grasp the said depending end of the layer of fiber and to carry the layer along with it, substantially as described.

34. In a machine of the class described, the combination with a traveling clamp, of charging means to feed an independent layer of the fiber endwise into the line of movement of the clamp, whereby the clamp is enabled to grasp the advance end of the layer.

35. In a machine of the class described, the combination with a traveling clamp, of a charging mechanism transverse to the path of said clamp and adapted to feed a layer of fiber to the clamp as the latter approaches, the fiber being fed endwise in a line with the movement of the clamp, and means to cause said clamp to grasp the end of the fiber and advance the layer without stopping the movement of the clamp.

36. In a machine of the class described, the combination with a breaking mechanism, of a traveling clamp, and means adapted to receive independent layers of the fiber from the breaking mechanism and charge said clamp therewith the fiber being passed endwise into the clamp.

37. In a machine of the class described, the combination with a breaking mechanism, of a feeding mechanism therefor adapted to feed layers or units of the fiber intermittently, traveling clamps, and means adapted to receive the independent layers or units of the fiber as the same issue from the breaking mechanism and charge said clamp therewith the fiber being passed endwise into the clamp.

38. In a machine of the class described, the combination with a traveling clamp, of a charging means having feeding rolls, said rolls being disposed in the path of the clamp so as to feed a layer of fiber thereto, and means whereby said clamp grasps the layer of fiber as it advances from the rolls, and thereafter passes between said rolls and carries the layer of fiber with it, substantially as described.

39. In a machine of the class described, the combination with a traveling clamp, of charging rolls located in the path of the clamp to feed a layer of fiber, a cam on the said clamp to separate the rolls to permit the clamp to pass therebetween, and means on the clamp to grasp the layer of fiber and carry it therewith, substantially as described.

40. In a machine of the class described, the combination with a traveling clamp having clamping rolls, of charging means to feed a layer of fiber to the clamp comprising a pair of coöperating rolls, pinion gears connected with said clamping rolls; rack gears mounted in proximity to the path of the clamp to engage and rotate said clamping rolls and cause them to grasp and feed in the layer of fiber, and cams mounted on the said clamp to separate said charging rolls and permit the same to pass therebetween, substantially as described.

41. In a machine of the class described, the combination with a traveling clamp, of a charging mechanism to feed a layer of fiber to the clamp, a false tail board in the path of the clamp adapted to guide the fiber to the said charging mechanism, and cam members on the clamp to engage said tail board and move it out of the path of the clamp, substantially as described.

42. In a machine of the class described, the combination with a charging means to feed a layer of fiber, of a traveling clamp to grasp the layer of fiber from said means with the rear end of the layer extending beyond the preceding end of said clamp, and a reversing mechanism for said clamp beyond the charging mechanism whereby the clamp is reversed so that the layer of fiber trails after the clamp in its further movement, substantially as described.

43. In a machine of the class described, the combination with a charging means, of a traveling clamp to grasp in its forward end a layer of fiber from said means, a track for said clamp, and a reversing switch in the track beyond the charging means to reverse the position of the clamp end for end to permit the fiber to trail after the same, substantially as described.

44. In a machine of the class described, the combination with a traveling clamp, of

bers mounted on the frame of the machine and adapted to press said pieces together as said clamp advances.

58. In a machine of the class described, the combination with a traveling clamp having opposed clamping rolls geared together, a plate mounted on the clamp and having teeth normally out of engagement with the gears of said rolls, and members mounted on the frame of the machine to engage said plates during the passage of the clamp to cause the said teeth on the plate to engage the gears to lock said clamping rolls from movement, substantially as described.

59. In a machine of the class described, the combination with a traveling clamp adapted to carry a layer of fiber, of normally open clamping noses mounted thereon, links secured to said noses, and a compression track mounted on the frame of the machine in the path of the clamp to engage said links and cause them to clamp said noses together upon the fiber, substantially as described.

60. In a machine of the class described, the combination with a traveling clamp having clamping rolls mounted thereon, normally open clamping nose pieces carried on the clamp, links mounted upon the clamp and pivoted to said nose pieces, plates secured to the links and having teeth adapted to engage the gear teeth upon the rolls, a compression track mounted on the frame of the machine in the path of the clamp and adapted to engage said links during the passage of the clamp to press said nose pieces together and to cause the teeth on the said plates to engage the gears of the rollers to lock the latter from movement, substantially as described.

61. In a machine of the class described, the combination with a traveling clamp adapted to carry an independent layer of fiber with the fiber endwise in the line of movement of the clamp, of a scutching mechanism through which the same is adapted to pass, a compression track secured to the frame of the machine and adapted to engage coöperating members upon the clamp to cause the same to firmly grip the fiber during the passage of the clamp through the scutching mechanism, and means adapted to feed independent units of fiber at predetermined intervals, substantially as described.

62. In a machine of the class described, the combination with a traveling clamp having opposed clamping members thereon and rolls arranged transversely to the movement of the clamp, links on each side of the clamp to control said members, a compression track comprising sets of rollers mounted on the frame of the machine on each side of the path of the clamp to engage said links during the passage of the clamp, one set of said rollers being yieldingly mounted, substantially as described.

63. In a machine of the class described, the combination with a traveling clamp having clamping members and adapted to carry an independent unit of fiber the fiber being advanced endwise in a line with the movement of the clamp, of a compression track adapted to engage said clamping members and means for delivering independent units of fiber to said clamp at predetermined intervals.

64. In a machine of the class described, the combination with a traveling clamp having suitable rolls to receive the fiber and jaws for grasping the fiber said clamp being adapted to advance the fiber endwise in a line with the movement of the clamp, of a compression track adapted to compress said rolls and close said jaws.

65. In a machine of the class described, the combination with a traveling clamp adapted to carry an independent unit or layer of the fiber and draw the trailing ends of the fiber in a line with the movement of the clamp, of a separate hackling mechanism through which said clamp passes and by which the trailing ends of the fiber are hackled.

66. In a machine of the class described, the combination with a traveling clamp adapted to carry the fiber endwise in a line with the movement of the clamp, of a hackling mechanism, adapted to commence hackling the fiber at the rear end thereof and then work forward said mechanism being adapted to separate, to permit said clamp to pass therethrough.

67. In a machine of the class described, the combination with a traveling clamp adapted to carry a layer of fiber, of a hackling mechanism having opposed sets of teeth, and means to permit the clamp to pass between said sets of teeth to carry the fiber between said sets to be operated upon, substantially as described.

68. In a machine of the class described, the combination with a traveling clamp, to carry a layer of fiber, of hackling mechanism having opposed sets of teeth, and means to separate said sets to permit the passage of the clamp therethrough and to cause them to approach each other after the clamp has passed to work upon the fiber, substantially as described.

69. In a machine of the class described, the combination with a traveling clamp adapted to carry a layer of fiber, of a hackling mechanism comprising opposed sets of teeth, and means operated by the clamp in its movement to separate said sets of teeth to permit the clamp to pass therebetween and to permit said sets to approach after the passage of the clamp to act upon the trailing ends of the fiber, substantially as described.

70. In a machine of the class described, the combination with a traveling clamp, of

a track therefor, and a reversing switch in the track to cause the clamp to change its position end for end without stopping the forward movement thereof, substantially as described.

45. In a machine of the class described, the combination with a traveling clamp, of a track therefor, rollers near each end of the clamp adapted to be guided by said track, a propelling chain affixed to said clamp between the rollers, and a reversing switch in the track comprising a double Y curve of the main track into which the first set of rollers is guided, and a side track about the said curve through which the last set of rollers passes, whereby the position of the clamp is changed end for end, substantially as described.

46. In a machine of the class described, the combination with a traveling clamp adapted to carry an independent layer or unit of fiber, of automatic means for delivering independent units of fiber at predetermined intervals, a scutching mechanism through which said clamp is adapted to advance said layer of fiber with the fiber endwise in the line of movement of the clamp.

47. In a machine of the class described, the combination with an upper beater and a lower beater, of a traveling clamp adapted to carry an independent layer of fiber and pass between said upper and lower beaters and automatic means for delivering independent units of fiber at predetermined intervals.

48. In a machine of the class described, in combination a breaking mechanism, means adapted to feed independent units of fiber to said breaking mechanism one by one at predetermined intervals, a pair of scutching devices, and a traveling clamp adapted to receive said units of fiber from said breaking mechanism and pass between said scutching devices.

49. In a machine of the class described, in combination breaking rolls, a feeding mechanism adapted to feed independent units of fiber to said rolls one by one at predetermined intervals, a pair of rotary beaters and a traveling clamp by which said units are grasped as the same issue from said breaking rolls and carried through said beaters, said clamp passing between said beaters and said beaters being separable to permit said clamp to pass between the same.

50. In a machine of the class described, the combination with a traveling clamp adapted to grasp the forward end of a layer of fiber and advance said layer with the fiber endwise in the line of movement of the clamp, means for delivering independent units of fiber at predetermined intervals, and a plurality of pairs of beaters through which said clamp travels and by means of which the free end of the layer or unit of fiber is beaten.

51. In a machine of the class described, the combination with a traveling clamp adapted to carry a layer of fiber, of a pair of beaters or scutchers means for feeding independent units of fiber at predetermined intervals, and means to separate said beaters or scutchers to permit the clamps to pass therebetween, substantially as described.

52. In a machine of the class described, the combination with a traveling clamp, of a pair of beaters or scutchers, the said clamp being adapted to spread said beaters or scutchers apart to permit the same to pass therebetween, and means for delivering independent units of fiber at predetermined intervals, substantially as described.

53. In a machine of the class described, the combination with a traveling clamp, of a pair of beaters or scutchers, and cams carried on said clamp to act upon or spread said beaters to permit the passage of the clamp therebetween, and means for delivering independent units of fiber at predetermined intervals, substantially as described.

54. The combination with a traveling clamp, of a track therefor, a pair of beaters disposed on opposite sides of the track, segment arms in the movable ends of which the said beaters are journaled, the other ends of the arms being provided with intermeshing segmental gears, cam rollers carried upon the ends of one beater shaft, and cams mounted upon the clamp to engage said rollers and thereby spread the beaters apart to permit the clamps to pass between and to allow the beaters to approach each other after the clamp has passed therethrough, substantially as described.

55. In a machine of the class described, in combination, a traveling clamp adapted to advance the fibers endwise in the line of movement of said clamp, means for delivering independent units of fiber at predetermined intervals, and oppositely disposed rotating beaters or scutching devices having their blades arranged to successively move into operative position to engage the fiber passing between them.

56. In a machine of the class described, the combination with a traveling clamp adapted to receive the fiber and advance the same endwise in the line of the movement of the clamp, of a pair of oppositely disposed rotating beaters adapted to have said clamp pass between the same, said beaters or scutchers having intermeshed blades, whereby the fiber passing between them are successively engaged by said blades, means for delivering independent units of fiber at predetermined intervals.

57. In a machine of the class described, the combination with a traveling clamp having connected clamping pieces and adapted to receive the fiber and advance it endwise in the line of movement of the clamp, of mem-

hackling mechanism comprising opposed sets of teeth, cams mounted upon the clamp, members in connection with the said sets of teeth adapted to be engaged by said cams in the movement of the clamp to cause the sets of teeth to separate and permit the passage of the clamp therebetween, the said coöperating cams and members being also adapted to permit the sets of teeth to approach and act upon the trailing ends of the fiber carried by the clamp after the passage of the latter, substantially as described.

71. In a machine of the class described, the combination with a traveling clamp having diverging cams on its forward portion and converging cams in its rear portion, of a hackling mechanism comprising opposed sets of teeth, members connected with said sets with which said diverging cams engage when the clamp is passing to separate said sets to permit the passage of the clamp between the same, the converging cams being adapted to permit the closing of said sets of teeth together to act upon the free end of the layer of fiber carried by the clamp, substantially as described.

72. In a machine of the class described, the combination with a separable hackling mechanism having a series of pins, of a traveling clamp adapted to carry a unit of fiber through said hackling mechanism, said hackling mechansim being so operative as to cause said pins to first engage the ends of the fiber and then work forward.

73. In a machine of the class described, the combination with a separable hackling mechanism having a series of pins, of a traveling clamp adapted to grasp a unit of fiber at one end and carry it through said mechanism, said mechanism being separated as said clamp passes therethrough and so operated that the pins first engage the free ends of the fiber and then work forward toward the clamp.

74. In a machine of the class described, the combination with a traveling clamp adapted to grasp a layer of fiber at one end, of a hackling mechanism comprising a pair of opposed sets of pins, and means to permit said clamp to pass between said sets and to cause them to close upon and engage the trailing ends of the fibers, said engagement taking place first at the free ends of the fibers and at the forward ends of the sets of pins, and thence gradually toward the clamp as the remainder of the said sets is brought into action, substantially as described.

75. In a machine of the class described, the combination with a traveling clamp adapted to carry a layer of fiber, of a hackling mechanism comprising a pair of opposed structures on which the hackling pins are mounted, said structures being bodily separable to permit the clamp to pass between, means to cause the gradual and successive approach of the structures into operative contact with the fiber from the forward to the rear ends of the structures, substantially as described.

76. In a machine of the class described, the combination with a traveling clamp, adapted to carry a layer of fiber, of a hackling mechanism comprising a pair of opposed structures on which the hackling pins are mounted, said structures being bodily separable to permit the clamp to pass between, means to cause the gradual and successive approach of the structures into operative contact with the fibers from the forward to the rear ends of the structures, the said forward ends of the structures being adapted to engage first the extreme ends of the fibers and thence gradually to a point close to the clamp, substantially as described.

77. In a machine of the class described, the combination with a traveling clamp, of a hackling mechanism comprising oppositely disposed frames on which the hackling pins are adapted to travel, said frames being pivoted intermediate their ends upon suitable levers to permit them to be bodily moved, and at the same time to change their angular positions relative to the arms, shoes fixed to the said frames, cams on the clamp adapted to engage said shoes in the movement of the clamp whereby the frames are first separated to permit the clamp to pass between and then allowed to approach each other gradually and successively from the front to the rear ends to work upon the trailing ends of the fiber, substantially as described.

78. In a machine of the class described, the combination with a traveling clamp adapted to carry a layer of fiber, of a hackling mechanism comprising oppositely disposed frames on which the hackling pins are adapted to travel, levers pivotally supported upon the machine at one end, said levers being pivoted at their free ends to the frames intermediate their forward and rear ends, shoes carried by the said frames, cams on the clamp adapted to engage said shoes as the same approaches the frames, whereby the frames are separated to permit the clamp to pass between them, the intermediate pivoting of the frames upon the levers allowing them to approach each other at their forward ends first as soon as the clamp has passed toward the rear in order to engage the trailing ends of the layer of fiber gradually and successively from the extreme ends to a point adjacent the clamp, substantially as described.

79. In a machine of the class described, the combination with a traveling clamp adapted to carry a layer of fiber, clamping rolls and noses on said clamp, links also on the clamp connecting the noses and adapted to lock the rolls, a hackling mechanism

through which the fiber is adapted to be drawn, and a compression track on the frame of the machine to engage said links and thereby operate said noses to clamp them together and to compress and lock the rolls during the passage of the clamp through said mechanism, substantially as described.

80. In a machine of the class described, the combination with a traveling clamp adapted to grasp an independent unit of fiber at one end and advance the fiber endwise in a line with the movement of the clamp, of means located in the path of the clamp to cause it to release said end of the fiber and grasp the other end and means for delivering independent units of fiber to said clamp at predetermined intervals.

81. In a machine of the class described, the combination with a traveling clamp having pairs of clamping rolls arranged transversely to the line of movement of the clamp adapted to clamp a layer of fiber at one end, pinions connected with said rolls, stationary rack gears mounted on the frame of the machine, and adapted to be engaged by the pinions to rotate said rolls as the clamp proceeds to cause the layer of fiber to be fed partially through the clamp so as to be retained by the other end, substantially as described.

82. In a machine of the class described, the combination with a traveling clamp having clamping rolls and a pair of clamping noses, of means situated near the path of the clamp to cause it to rotate the rolls so as to feed the fiber partially through the clamp, its noses being at this time open, substantially as described.

83. In a machine of the class described, the combination with a unitary traveling clamp adapted to grasp one end of an independent layer of fiber and advance said layer with the ends of the fiber forward, and means to cause said clamp to release said end and grasp the other end without stopping the movement of the clamp.

84. In a machine of the class described, the combination with a unitary traveling clamp having a pair of engaging rolls adapted to grasp an independent layer of fiber at one end, and arranged transversely to the line of movement of the clamp, of means situated at a point in the path of said clamp to engage and rotate said rolls, whereby the fiber is fed through the clamp a sufficient distance to be grasped at its other end, substantially as described.

85. In a machine of the class described, the combination with a traveling clamp adapted to grasp a layer of fiber at one end, and advance the fiber endwise in the line of movement of the clamp, of mechanism to operate upon the trailing portion or ends of the layer of fiber, a reversing mechanism to turn the clamp end for end, and an actuating means to cause the clamp to release the unworked end of the layer of fiber and to grasp the worked end, and other mechanism situated in the path of the clamp to operate upon the said unworked ends of the fiber, substantially as described.

86. In a machine of the class described, the combination with a traveling clamp having clamping rolls, pinions upon said rolls, and racks mounted upon the frame of the machine adapted to engage said pinions to rotate the rolls and cause them to release or discharge the fiber, substantially as described.

87. In a machine of the class described, the combination with a traveling clamp having engaging clamping rolls adapted to engage a layer of fiber, of members situated in the path of said clamp to operate said rolls as the clamp passes to cause the layer of fiber to be discharged from the rolls and clamp, substantially as described.

88. In a machine of the class described, the combination with a breaking mechanism, of a feeding mechanism therefor adapted to feed layers or units of the fiber, a traveling clamp, a discharging mechanism to cause the clamp to release its charge of fiber, a delivery mechanism comprising a grid of transverse bars on which the fiber is adapted to fall when released, and laterally traveling pins projecting through the grid between the bars to remove said fibers, substantially as described.

89. In a machine of the class described, the combination with a traveling clamp, of a discharge mechanism to cause the clamp to release its charge of fiber, a delivery mechanism, and a binding mechanism located in proximity to the delivery mechanism for binding up the fiber into bundles, substantially as described.

90. In a machine of the class described, the combination with a traveling clamp adapted to advance the fiber endwise in the line of movement of the clamp, of a charging mechanism adapted to charge the clamp with an independent layer of fiber, and a scutching mechanism to scutch the fiber carried by the clamp, substantially as described.

91. In a machine of the class described, the combination with a traveling clamp adapted to advance the fiber endwise in the line of movement of the clamp, of a charging mechanism to feed a layer of fiber to the clamp, a scutching mechanism to operate upon the layer of fiber, and a hackling mechanism to hackle said layer of fiber as the clamp passes through the same, substantially as described.

92. In a machine of the class described, the combination with a traveling clamp, of a charging mechanism to charge the clamp with a layer of fiber, a scutching mechanism

and a hackling mechanism through which the clamp passes and by which the layer of fiber is scutched and hackled, a reversing and actuating mechanism in the path of the clamp to cause it to release the unworked end of the layer of fiber and to grasp the worked end, and a secondary scutching mechanism through which the clamp passes and by means of which the unworked ends of the fibers are scutched, substantially as described.

93. In a machine of the class described, the combination with a traveling clamp, of a charging mechanism to charge the clamp with a layer of fiber, a scutching and hackling mechanism through which the clamp passes to permit the trailing end of the layer of fiber to be scutched and hackled, actuating mechanism in the path of the clamp to cause it to feed the fiber partially through itself, a reversing mechanism to reverse the clamp end for end whereby the unworked ends of the fiber trail after the clamp, and a secondary scutching and hackling mechanism for operating upon said trailing end of the fiber, substantially as described.

94. In a machine of the class described, the combination with a traveling clamp, of a charging mechanism to cause the clamp to grasp one end of the layer of fiber, a scutching and hackling mechanism through which the clamp passes and by means of which the trailing end of the fiber is scutched and hackled, a reversing and actuating means in the path of the clamp to cause the clamp to grasp the other end of the layer of fiber and reverse its position end to end to permit the free ends of the fiber to trail after the clamp, a secondary scutching and hackling mechanism to treat the unworked ends of the fiber, and a discharging mechanism to cause the clamp to release the fiber, substantially as described.

95. In a machine of the class described, the combination with a traveling clamp, of a charging mechanism to cause the clamp to grasp one end of a layer of fiber, a scutching mechanism and a hackling mechanism through which the clamp is adapted to pass, a reversing and actuating means to cause the clamp to grasp the worked end of the layer of fiber and release the unworked end which trails after the clamp, a secondary scutching mechanism and a secondary hackling mechanism to treat the said unworked end of the layer of fiber, a discharging mechanism to cause the clamp to release the layer of fiber and a delivery mechanism adapted to receive said layer of fiber, substantially as described.

96. In a machine of the class described, the combination with a traveling clamp, of a charging mechanism to cause the clamp to grasp one end of the layer of fiber, a scutching mechanism and a hackling mechanism to treat the trailing end of the layer a reversing switch and actuating means in the path of the clamp to cause the same to grasp the worked end of the fiber and release the unworked end and to reverse the position end for end so that the free ends will trail after the clamp, a secondary scutching mechanism and a secondary hackling mechanism through which the clamp passes and by which the unworked end of the layer of fiber is treated, a discharging mechanism to cause the clamp to release the layer of fiber, a delivery mechanism upon which the layer of fiber is deposited, and a binding mechanism to bind up into bundles the fiber as it is received from the delivery mechanism, substantially as described.

97. In a machine of the class described, the combination with a traveling clamp, of a charging mechanism adapted to cause the clamp to grasp the advancing end of a layer of fiber, a reversing mechanism for the clamp to cause the free end of the said layer to trail after the clamp in its further movement, mechanism to work upon said trailing end, a reversing switch to cause said clamp to turn end for end, actuating means to cause the clamp to feed the layer of fiber partially through itself so as to be grasped at its worked ends and to permit the unworked ends to trail after the clamp, and other mechanism through which the clamp passes to treat the said unworked ends, substantially as described.

98. In a machine of the class described, the combination with a breaking mechanism, of means adapted to feed units or layers of fiber to said mechanism a plurality of traveling clamps adapted to pass successively through the machine and each adapted to carry one of said units, said clamp being adapted to advance the fiber endwise, means for charging said clamps, mechanism for operating upon the fiber carried by the clamps, and mechanism for causing said clamps to discharge the fiber, substantially as described.

99. In a machine of the class described, the combination with an endless chain, of a plurality of clamps attached thereto, each clamp being adapted to carry an independent layer or unit of fiber and advance the fiber endwise, mechanism for delivering independent units of fiber to said clamp at predetermined intervals, and operating mechanism in the machine to work upon the fiber.

100. In a machine of the class described, the combination with a breaking mechanism of a feeding mechanism to feed the fiber into the breaking mechanism in layers or units, an endless chain having clamps mounted thereon adapted to grasp the said layers or units after they issue from the breaking mechanism, and to advance the fiber endwise through the remainder of the machine

by which it is treated, the feeding mechanism and the speed of the chain being so regulated that the clamps and layers or units of fiber reach the desired positions at the proper time, substantially as described.

101. In a machine of the class described, the combination with mechanism to treat the fiber, of a carrying device for the fiber, mechanism for delivering independent units of fiber to said device at predetermined intervals, and means to cause the separation of said mechanism to permit the carrying device to pass therethrough, substantially as described.

102. In a machine of the class described, the combination with mechanism to treat the fiber, of a carrying device for the fiber, mechanism for delivering independent units of fiber to said device at predetermined intervals, and means associated with said device to separate said mechanism and permit the carrying device to pass therethrough, substantially as described.

103. In a machine of the class described, the combination with mechanism arranged in counterparts to treat the fiber, of a carrying device for the fiber, mechanism for delivering independent units of fiber to said device at predetermined intervals, and means to separate said counterparts to permit the said device to pass therebetween, substantially as described.

104. In a machine of the class described, the combination with mechanism arranged in counterparts and adapted to treat the fiber, of a carrying device for the fiber, mechanism for delivering independent units of fiber to said device at predetermined intervals, and means associated with said device to separate said counterparts and permit the passage of the device therebetween, substantially as described.

105. In a machine of the class described, the combination with mechanism arranged in counterparts adapted to treat the fiber, of a carrying device for the fiber to advance the same through said mechanism and cams on said device to engage and separate said mechanism to permit the device to pass therebetween, mechanism for delivering independent units of fiber to said device at predetermined intervals, substantailly as described.

106. In a machine of the class described, the combination with separable mechanism adapted to treat the fiber, of a plurality of traveling carrying devices for the fiber adapted to pass successively through said mechanism, mechanism for delivering independent units of fiber to said devices at predetermined intervals, and means for causing said mechanism to separate as each said device approaches to permit the same to pass therethrough, substantially as described.

107. In a machine of the class described, the combination with separable mechanism to treat the fiber, of a plurality of traveling carrying devices for the fiber adapted to pass successively through said mechanism, mechanism for delivering independent units of fiber to said devices at predetermined intervals, and means associated with each device to separate said mechanism to permit the passage of the device therethrough, substantially as described.

108. In a machine of the class described, the combination with mechanism to treat the fiber, of a plurality of traveling carrying devices for the fiber, mechanism for delivering independent units of fiber to said devices at predetermined intervals, and cams on said devices to engage coöperating members on said mechanism to separate the same and permit the devices to pass therethrough, substantially as described.

109. In a machine of the class described, the combination with mechanism to treat the fiber arranged in counterparts, of a plurality of traveling carrying devices for the fiber, mechanism for delivering independent units of fiber to said devices at predetermined intervals, means on the devices to separate said counterparts to permit the same to pass therebetween, substantially as described.

110. In a machine of the class described, the combination with mechanism to treat the fiber arranged in counterparts, of a plurality of traveling clamps arranged at intervals on endless chains and adapted to each carry a layer of fiber, cams on said clamps, mechanism for delivering independent units of fiber to said clamps at predetermined intervals, and coöperating members in the mechanism whereby as the clamps pass the counterparts are separated to permit the passage of the clamps between them, substantially as described.

111. In a machine of the class described, a clamp having a pair of clamping rolls adapted to receive a layer of fiber and arranged transversely to the line of movement of the clamp, mechanism for feeding independent units of fiber to said clamp at predetermined intervals, and means to compress said rolls together to cause them to firmly grip the fiber, substantially as described.

112. In a machine of the class described, a clamp having a pair of clamping rolls arranged transversely to the line of movement of the clamp and adapted to receive a layer of fiber between them, and means to compress said rolls together and to lock them against rotation to cause them to firmly grip the said layer, substantially as described.

113. In a machine of the class described, the combination with a traveling clamp adapted to carry a layer of fiber, of normally open clamping noses mounted thereon, links secured to said noses, pairs of clamping rolls carried by the clamp to grip the layer of fiber

and a compression track in the path of the travel of the clamp to engage said links and cause them to compress the rolls of the said pairs together and the noses together upon the fiber, substantially as described.

114. In a machine of the class described, the combination with a unitary traveling clamp adapted to grasp the end of an independent layer of fiber and advance said layer with the ends of the fiber forward in the line of movement of the clamp, of means adapted to change the position of the layer in the clamp and cause said clamp to grasp the other end of the layer.

115. In a machine of the class described, the combination with a traveling clamp adapted to grasp the end of a layer of fiber and advance said layer with the ends of the fiber forward in the line of movement of the clamp, of means adapted to change the position of the layer in the clamp and cause said clamp to grasp the other end of the layer, and means adapted to reverse the position of the clamp.

116. In a machine of the class described, the combination with a traveling clamp adapted to grasp one end of an independent layer of fiber and advance the fiber endwise, of means for operating upon the free end of said layer, means adapted to operate the clamp to change the position of the layer therein without the layer being removed from the clamp and to cause said clamp to grasp the other end of the layer, and a second mechanism for operating upon the free unworked end of the layer.

117. In combination, a traveling clamping mechanism adapted to carry an independent unit or layer of fiber, said clamp being adapted to advance the fiber endwise, of means for operating said mechanism to discharge the fiber, and a delivery mechanism upon which fiber is received from said clamping mechanism.

118. In a machine of the class described, the combination with a clamp adapted to seize one end of a layer of fiber in its forward end and advance the layer with the ends of the fiber forward in the line of movement of the clamp, of a reversing mechanism for the clamp to reverse it end for end, whereby the said forward end becomes the rear or following end, and the free end of the layer trails after the clamp in its further movement, substantially as described.

119. In a machine of the class described, the combination with a unitary traveling clamp from which one end of an independent layer of fiber projects, of means to cause said layer to be fed partially through the clamp whereby the reverse end of the layer projects from the opposite end of the clamp, said clamp being adapted to advance the layer of fiber with the ends of the fiber forward in the line of movement of the clamp, substantially as described.

120. In a machine of the class described, the combination with a traveling clamp from the following end of which one end of a layer of fiber trails, of means to feed said layer partially through the clamp whereby the reverse end of the layer projects from the opposite end of the same, and means to reverse said clamp end for end to permit the free end of the fiber to trail from the following end of the clamp in its further movement, substantially as described.

121. In a machine of the class described, the combination with a traveling clamp, of means to feed one end of a layer of fiber into a clamp, a reversing mechanism to change the clamp end for end to permit the free end of the layer to trail after the clamp, an actuating mechanism at a further point in the path of the clamp to feed said layer partially through the same, and a second reversing mechanism for the clamp to permit the free end of the fiber to trail from the rear end of the clamp, substantially as described.

122. The combination with a traveling clamp for the fibers of separable and rocking hackling frames carrying the hackling mechanism and adapted to separate to permit the clamp to pass between the hackling mechanism, substantially as described.

123. The combination with a traveling clamp, of separable and rocking hackling frames, and means for separating said frames to permit the passage of the clamp between the same and for rocking said frames to permit the hackling mechanism to engage the fibers, substantially as described.

124. The combination with a traveling clamp, of separable and rocking hackling frames carrying the hackling pins, means for separating said frames to permit the passage of the clamp between the same and means for first moving the forward ends of the hackling frames toward each other to engage the fibers, and for then gradually moving the rear ends of the frames toward each other as the clamp advances, whereby the hackling pins are caused to successively engage the fibers and to advance from the free ends of the fibers toward the clamp, substantially as described.

125. In combination, a breaking mechanism, means adapted to feed independent layers or units of fiber to said mechanism at predetermined intervals with the ends of the fiber forward, a scutching mechanism, and a clamp adapted to advance each layer through said scutching mechanism with the ends of the fiber forward.

126. In combination, a breaking mechanism, means adapted to feed layers or units of fiber to said mechanism with the ends of the fiber forward, a scutching mechanism, a

clamp adapted to advance said layer through said scutching mechanism with the ends of the fiber forward, means adapted to change the position of the fiber in said clamp, and means adapted to reverse said clamp.

127. In a machine of the class described, the combination with a breaking mechanism, of a cleaning mechanism for the fiber, a feeding mechanism for the breaking mechanism, means to take the fiber as it issues from the breaking mechanism and advance it to the cleaning mechanism, a binding mechanism for binding the fibers into bundles, and means to convey the fibers from said means for advancing the same to the binding mechanism, substantially as described.

128. In a machine of the class described, in combination a plurality of pairs of separable rotary beaters, a traveling clamp, adapted to pass between said beaters and carry an independent unit of fiber, the fiber being advanced endwise by said clamp.

129. In a machine of the class described, in combination a plurality of pairs of separable rotary beaters, a separable hackling mechanism and a traveling clamp adapted to pass between said beaters and said hackling mechanism and carry an independent unit of fiber, the fiber being advanced endwise.

130. In a machine of the class described, in combination a plurality of pairs of separable rotary beaters, a pair of separable hackling devices, a traveling clamp adapted to pass between said beaters and said hackling devices, and carry an independent unit of fiber, the fiber being advanced endwise and the hackling device being operated so as to commence hackling the fiber at the rear ends and then work forward.

131. In a fiber cleaning machine, a separable scutching mechanism, a separable hacking mechanism, a second separable scutching mechanism, a second separable hackling mechanism, a traveling clamp adapted to pass through said mechanisms and carry an independent unit of fiber, the fiber being advanced endwise, and means for reversing the clamp and shifting the position of the fiber therein after it passes through the first scutching and hackling mechanism and before it enters the second scutching and hackling mechanism.

132. In a machine of the class described, in combination, a set of pairs of separable rotary beaters, a pair of separable hackling devices, a second set of pairs of separable rotary beaters, a second pair of separable hackling devices, a traveling clamp adapted to pass between said beaters and said hackling devices and carry independent units of fiber, and means for reversing the clamp and shifting the position of the unit of fiber therein after it passes through the first set of beaters and the first hackling devices, and before it enters the second set of beaters and the second hackling devices.

133. In a machine of the class described, in combination a scutching and hackling mechanism, a second scutching and hackling mechanism, a traveling clamp, means arranged in the path of the clamp for charging the clamp with an independent unit of fiber, means for reversing the clamp after it has been charged, and before it enters the first scutching and hackling mechanism, and means for reversing the clamp and shifting the position of the fiber therein after it passes through the first scutching and hackling mechanism and before it enters the second scutching and hackling mechanism.

134. In a machine of the class described, in combination, a breaking mechanism, means for feeding independent units of fiber to said breaking mechanism at predetermined intervals, a scutching and hackling mechanism, a traveling clamp adapted to take a unit of fiber as it issues from said breaking mechanism and advance it endwise through said scutching and hackling mechanism.

135. In a machine of the class described, in combination, breaking rolls, a feeding mechanism adapted to feed independent units of fiber to said breaking rolls at predetermined intervals, a separable scutching and hackling mechanism, a traveling clamp, adapted to take a unit of fiber as it issues from said breaking rolls and advance it endwise through said scutching and hackling mechanism.

136. In a machine of the class described, in combination, breaking rolls, a feeding mechanism adapted to feed independent units of fiber to said rolls at predetermined intervals, a cleaning mechanism, a second cleaning mechanism, a traveling clamp adapted to take a unit of fiber as it issues from said rolls and advance it endwise through said cleaning mechanisms, and means for reversing the clamp and changing the position of the fiber therein after it passes through the first cleaning mechanism and before it enters the second cleaning mechanism.

137. In a machine of the class described, in combination brdaking rolls, a feeding mechanism adapted to feed independent units of fiber to said mechanism at predetermined intervals, a separable cleaning mechanism, a second separable cleaning mechanism, a traveling clamp adapted to take a unit of fiber as it issues from said rolls and advance it endwise through said cleaning mechanism, said cleaning mechanism being adapted to separate to permit the clamp to pass therethrough, and means for reversing the position of the clamp and shifting the position of the fiber therein after it passes through the first cleaning mechanism, before it enters the second cleaning mechanism.

138. In a machine of the class described, in combination breaking rolls, a feeding

mechanism adapted to feed independent units of fiber to said mechanism at predetermined intervals, a cleaning mechanism, a second cleaning mechanism, a traveling clamp adapted to grasp one end of a unit of fiber as it issues from said breaking rolls and advance the fiber endwise through said cleaning mechanism, means for reversing the clamp after it grasps the end of the fiber and before it enters the first cleaning mechanism, and means for reversing the clamp and causing it to grasp the other end of the unit after said clamp passes through the first cleaning mechanism and before it enters the second cleaning mechanism.

139. In a machine of the class described, in combination, breaking rolls, a feeding mechanism adapted to feed independent units of fiber to said rolls at predetermined intervals, a cleaning mechanism comprising a separable scutching mechanism and a separable hackling mechanism, a second cleaning mechanism comprising a separable scutching mechanism and a separable hackling mechanism, a clamp adapted to take a unit of fiber as it issues from said breaking rolls and advance it endwise through said cleaning mechanisms, and means for reversing the clamp and shifting the position of the fiber therein after it passes through the first cleaning mechanism and before it enters the second cleaning mechanism.

140. In a fiber cleaning machine, in combination, breaking rolls, a feeding mechanism adapted to feed independent units of fiber to said breaking rolls at predetermined intervals, separable rotary beaters, a separable hackling mechanism, a second set of separable rotary beaters, a second separable hackling mechanism, a traveling clamp adapted to take a unit of fiber as it issues from said breaking rolls and advance it endwise through said beaters and said scutching mechanism, said beaters and said hackling mechanism being adapted to separate to permit said clamp to pass between the same, and means for reversing the clamp and shifting the position of the fiber therein after it passes through the first set of beaters, and the first hackling mechanism and before it enters the second set of beaters and the second hackling mechanism.

141. In a machine of the class described, in combination breaking rolls, a feeding mechanism adapted to feed independent units of fiber to said rolls at predetermined intervals, a cleaning mechanism, a second cleaning mechanism, a traveling clamp adapted to advance a unit of fiber endwise through said cleaning mechanism, means arranged in the path of the clamp for inserting the end of a unit of fiber in said clamp as said unit issues from said breaking rolls, means for reversing the position of the clamp after the unit of fiber is inserted therein and before it enters the first cleaning mechanism, means for reversing the clamp and causing it to grasp the other end of the unit after said clamp passes through the first cleaning mechanism and before it enters the second cleaning mechanism, and means for causing the clamp to discharge the unit of fiber after it passes through the second cleaning mechanism.

142. In a fiber cleaning machine, in combination breaking rolls, a feeding mechanism adapted to feed independent units of fiber to said rolls at predetermined intervals, two cleaning mechanisms each comprising a separable scutching mechanism and a separable hackling mechanism, a traveling clamp adapted to pass through said mechanisms and carry a unit of fiber, the fiber being advanced endwise, said hackling mechanisms and said scutching mechanisms each being separable to permit the clamp to pass therethrough, means arranged in the path of the clamp for inserting one end of a unit of fiber in said clamp as said unit issues from said breaking rolls, means for reversing the position of the clamp after it grasps the end of the unit and before it enters the first cleaning mechanism, means for reversing the clamp and causing it to grasp the other end of the unit after it passes through the first cleaning mechanism and before it enters the second cleaning mechanism, and means for causing the clamp to discharge the unit after it passes through the second cleaning mechanism.

143. In a fiber cleaning machine, in combination breaking rolls, a feeding mechanism adapted to feed independent units of fiber to said mechanism at predetermined intervals, two cleaning mechanisms each comprising sets of separable rotary beaters and a separable hackling mechanism, a traveling clamp adapted to pass through said cleaning mechanisms and carry a unit of fiber, the fiber being advanced endwise, the rotary beaters and the hackling mechanisms each being separable to permit the clamp to pass therethrough, and each hackling mechanism being adapted to commence hackling the fiber at the rear end and then work forward, means arranged in the path of the clamp for inserting one end of a unit of fiber therein as said unit issues from said breaking rolls, means for reversing the clamp after it receives the unit of fiber and before it enters the first cleaning mechanism, means for reversing the clamp and causing it to grasp the other end of the unit after said clamp passes through the first cleaning mechanism and before it enters the second cleaning mechanism, and means for causing the clamp to discharge the unit after it passes through the second cleaning mechanism.

144. In a fiber cleaning machine in combination, breaking rolls, a feeding mechanism adapted to feed independent units of fiber

to said rolls at predetermined intervals, two cleaning mechanisms each comprising a set of separable rotary beaters, and a separable hackling mechanism, a plurality of traveling clamps carried by a chain and adapted to pass through said cleaning mechanisms, said rotary beaters and said hackling mechanisms being separated to permit the clamps to pass therethrough, and each clamp being adapted to advance a unit of fiber endwise through said cleaning mechanisms, means arranged in the path of the clamp for inserting the end of a unit of fiber in each clamp as said unit issues from said breaking rolls, means for reversing the clamp after it grasps the end of the unit and before it enters the first cleaning mechanism, means for reversing the clamp and causing it to grasp the other end of the unit after said clamp passes through the first cleaning mechanism and before it enters the second cleaning mechanism, and means for causing said clamp to discharge said unit after it passes through the second cleaning mechanism.

145. A machine of the character described comprising an endless carrier, means for holding the ends of fibrous material to be treated thereon, said holding means comprising clamp members between which the ends of the fibrous material are gripped and combing and scraping devices in the path of said holding means.

In witness whereof, I have hereunto subscribed my name in the presence of two witnesses.

BERTRAND S. SUMMERS.

Witnesses:
W. CLYDE JONES,
M. R. ROCHFORD.