

Aug. 2, 1938.

H. E. TWOMLEY
BAND STRAPPING MACHINE

2,125,528

Filed Aug. 14, 1934

10 Sheets-Sheet 1

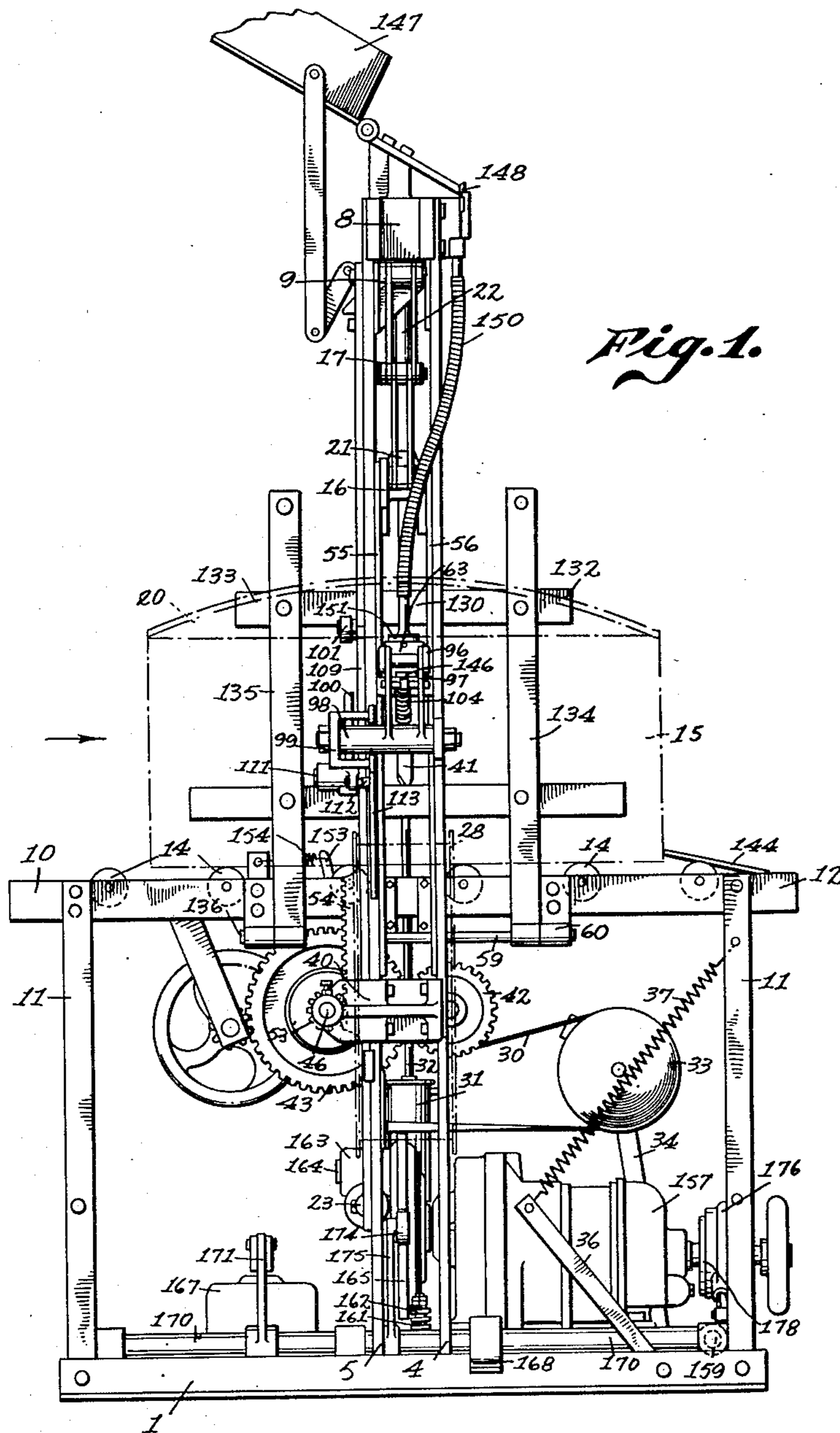


Fig. 1.

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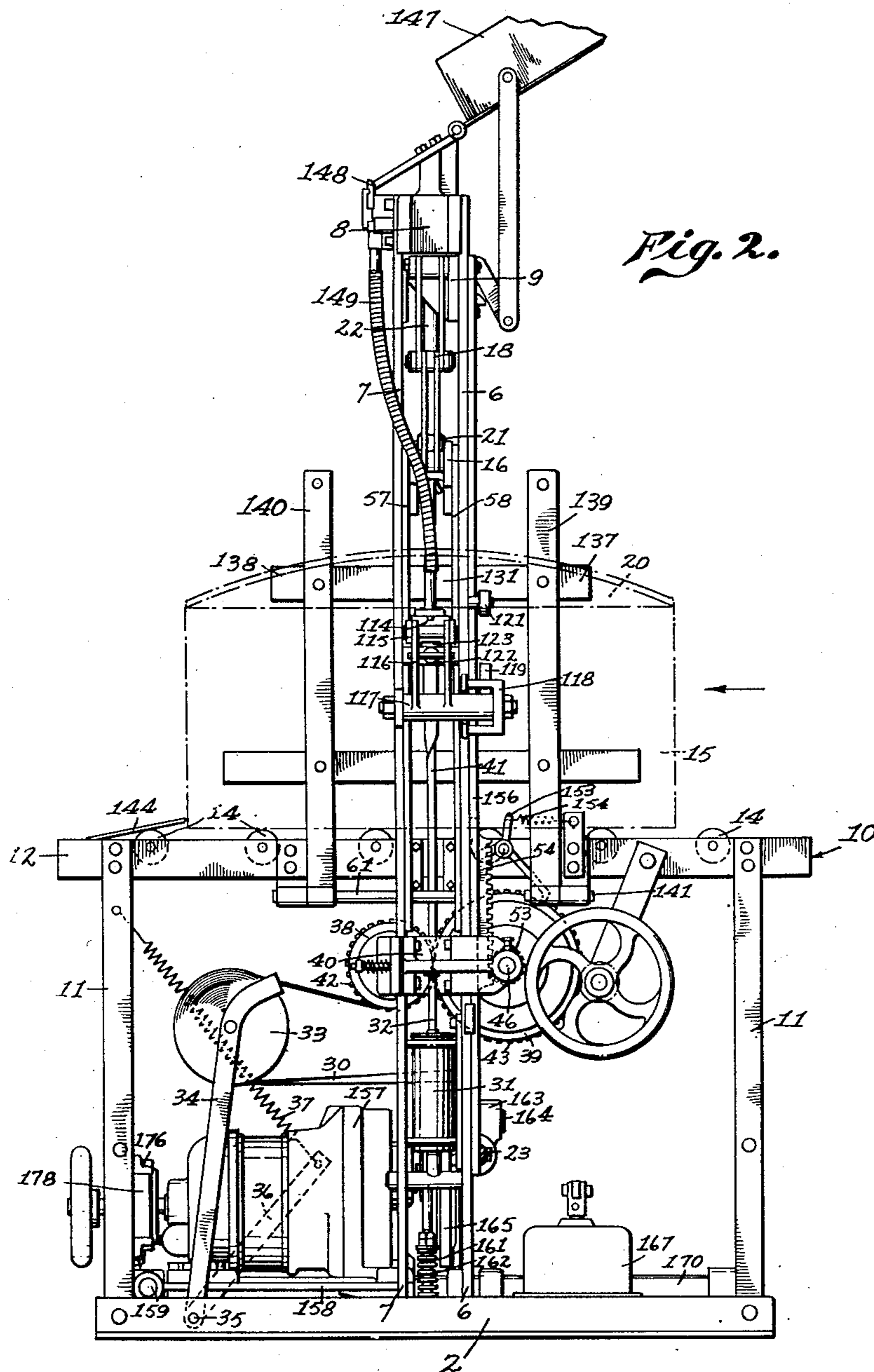
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10 Sheets-Sheet 2



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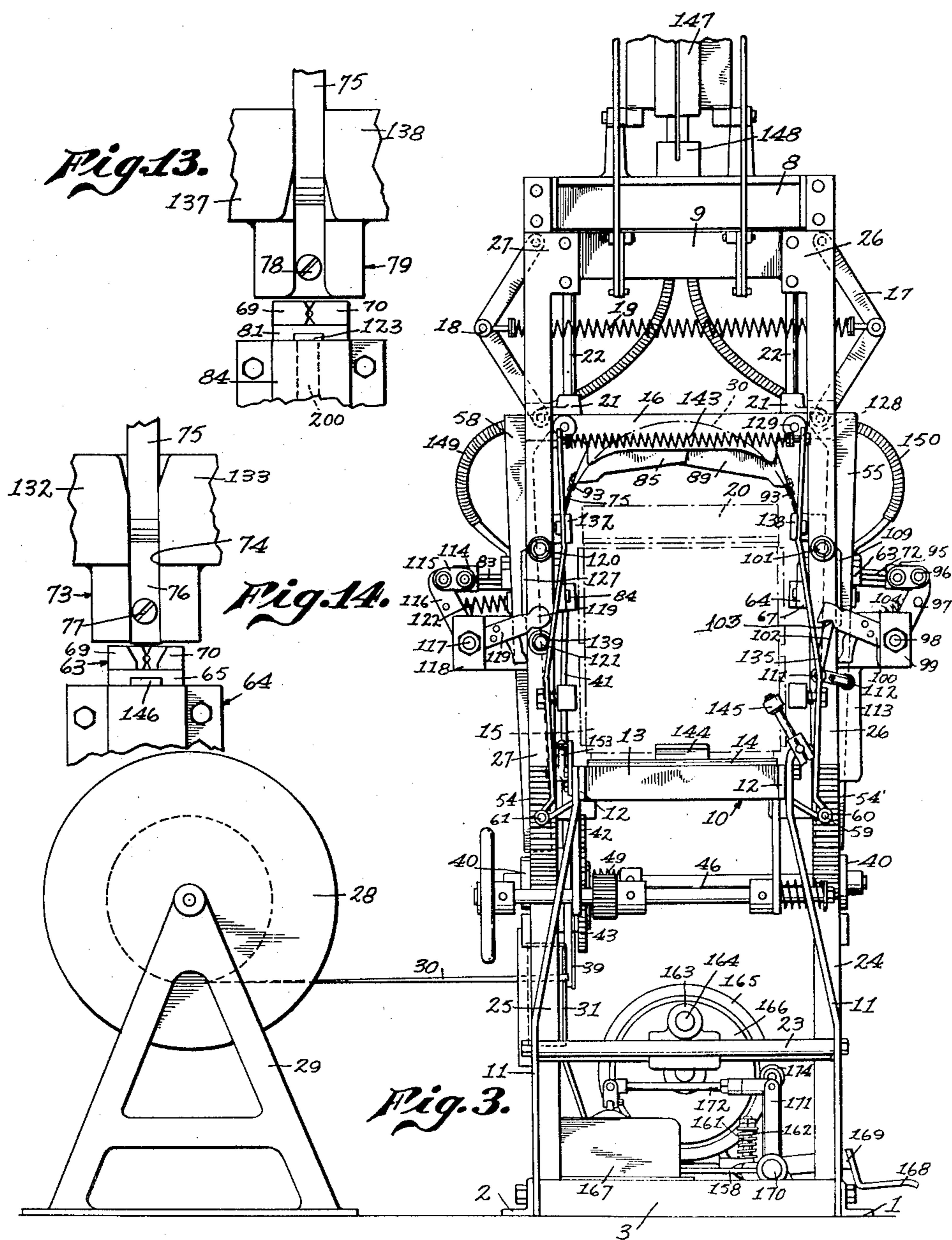
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10 Sheets-Sheet 3



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10 Sheets-Sheet 4

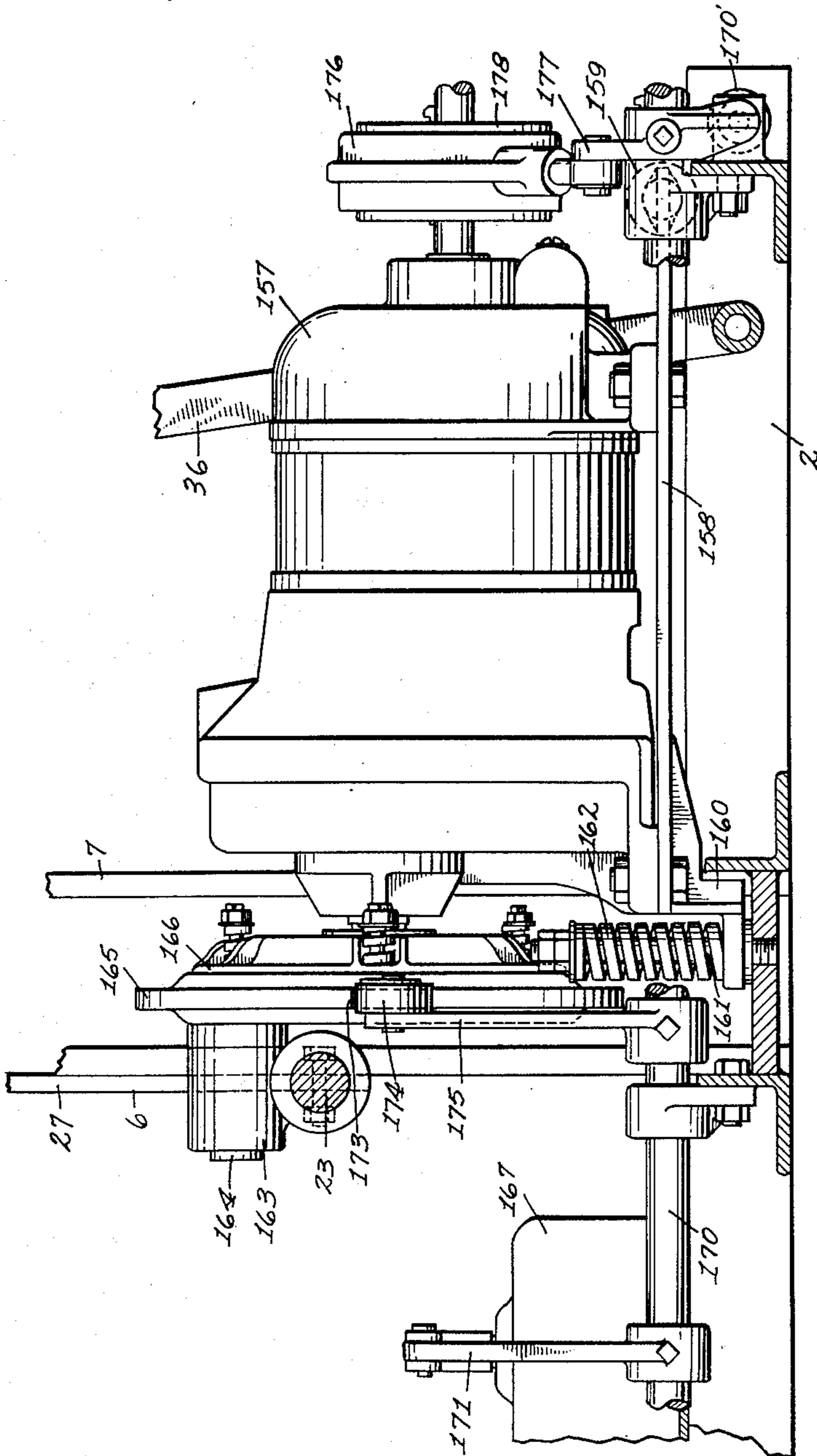


Fig. 4.

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Fig. 5.

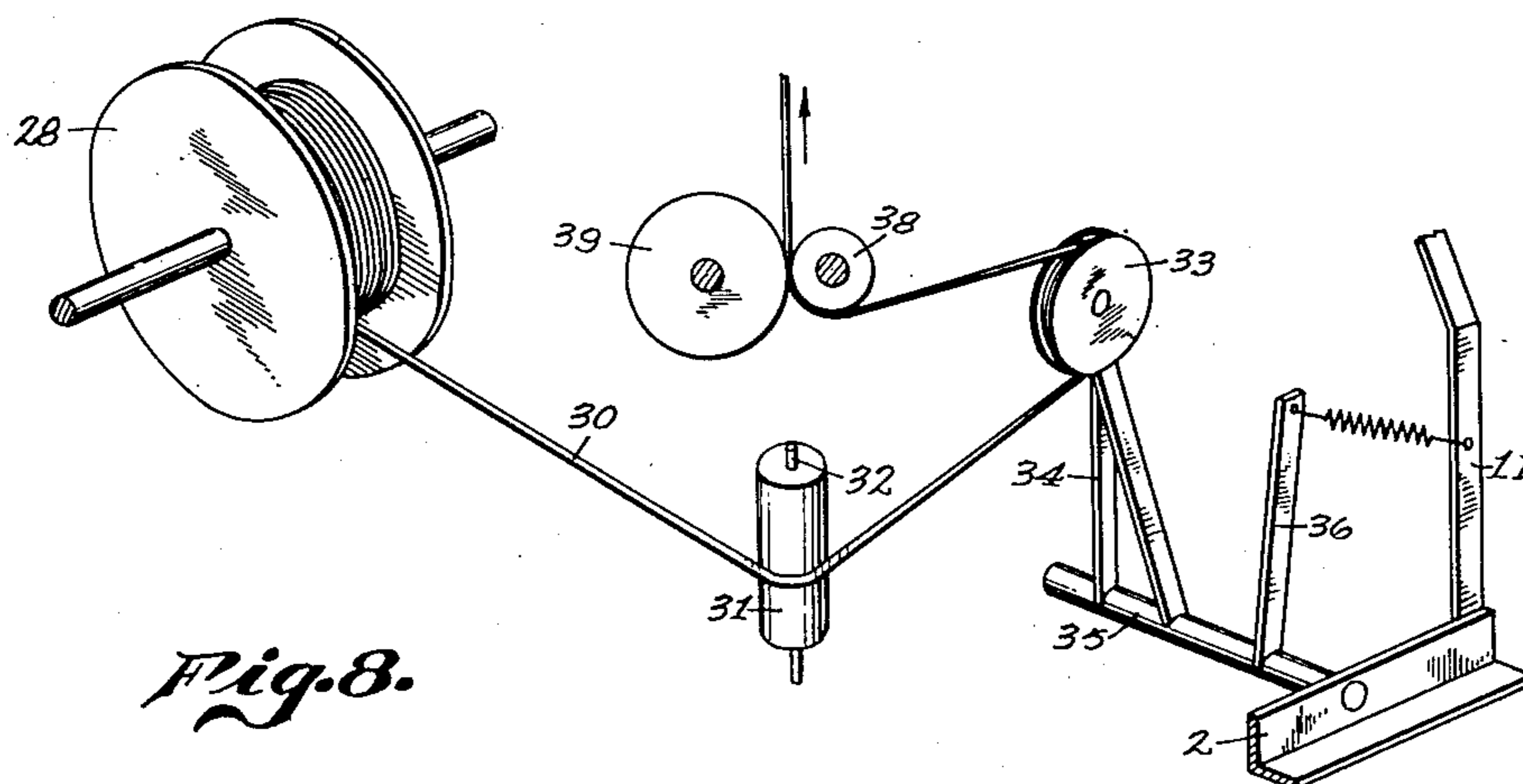
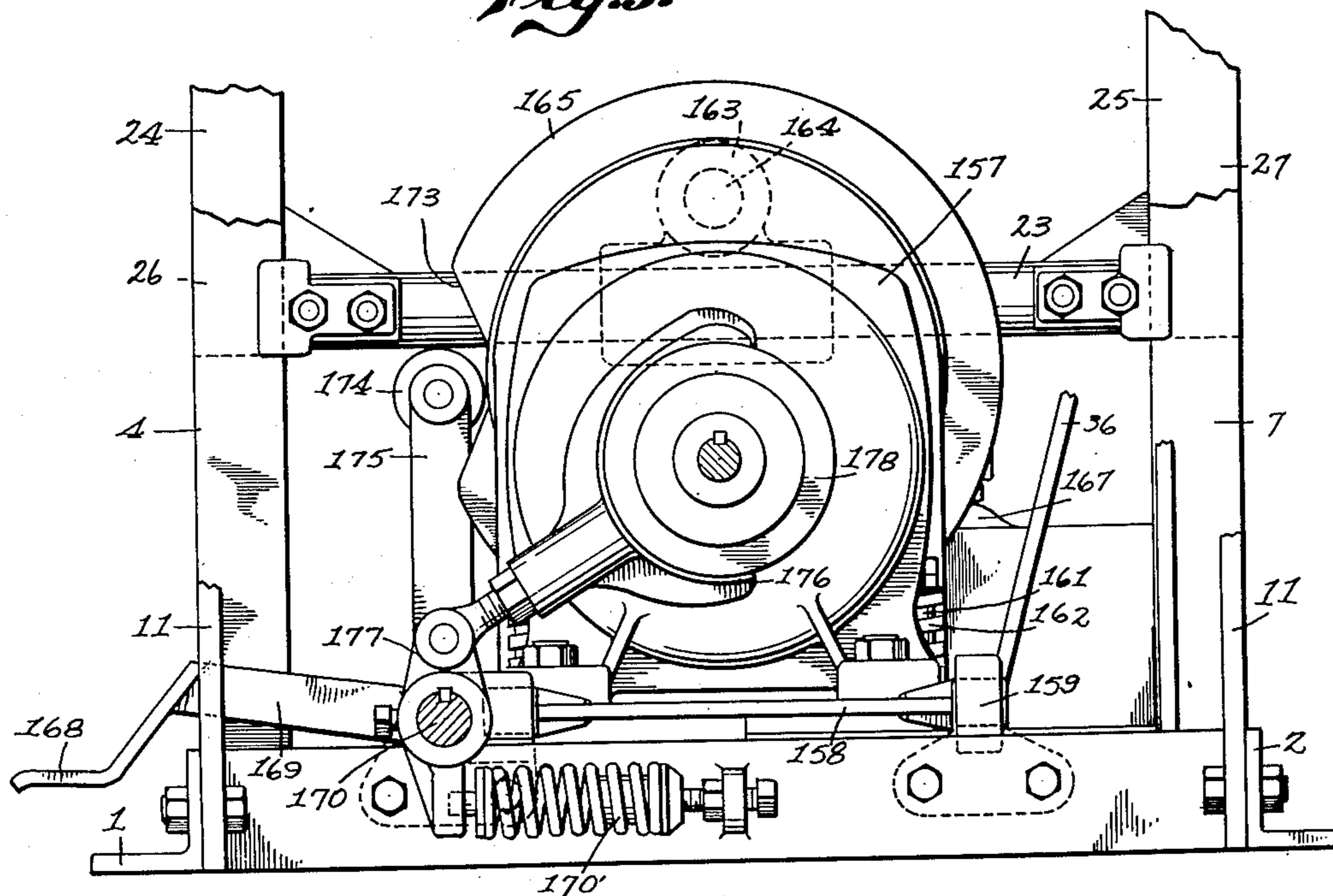


Fig. 8.

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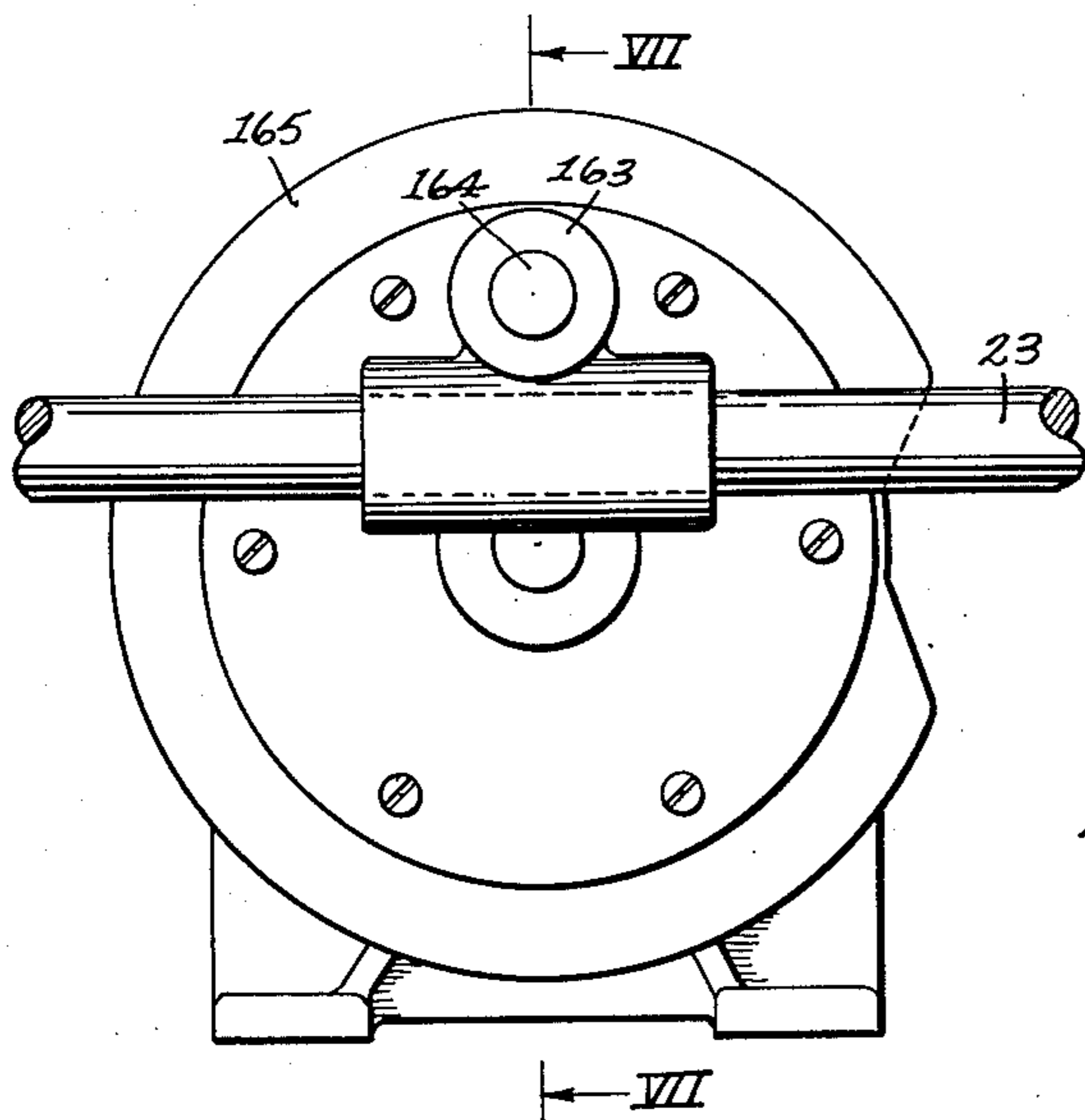


Fig. 6.

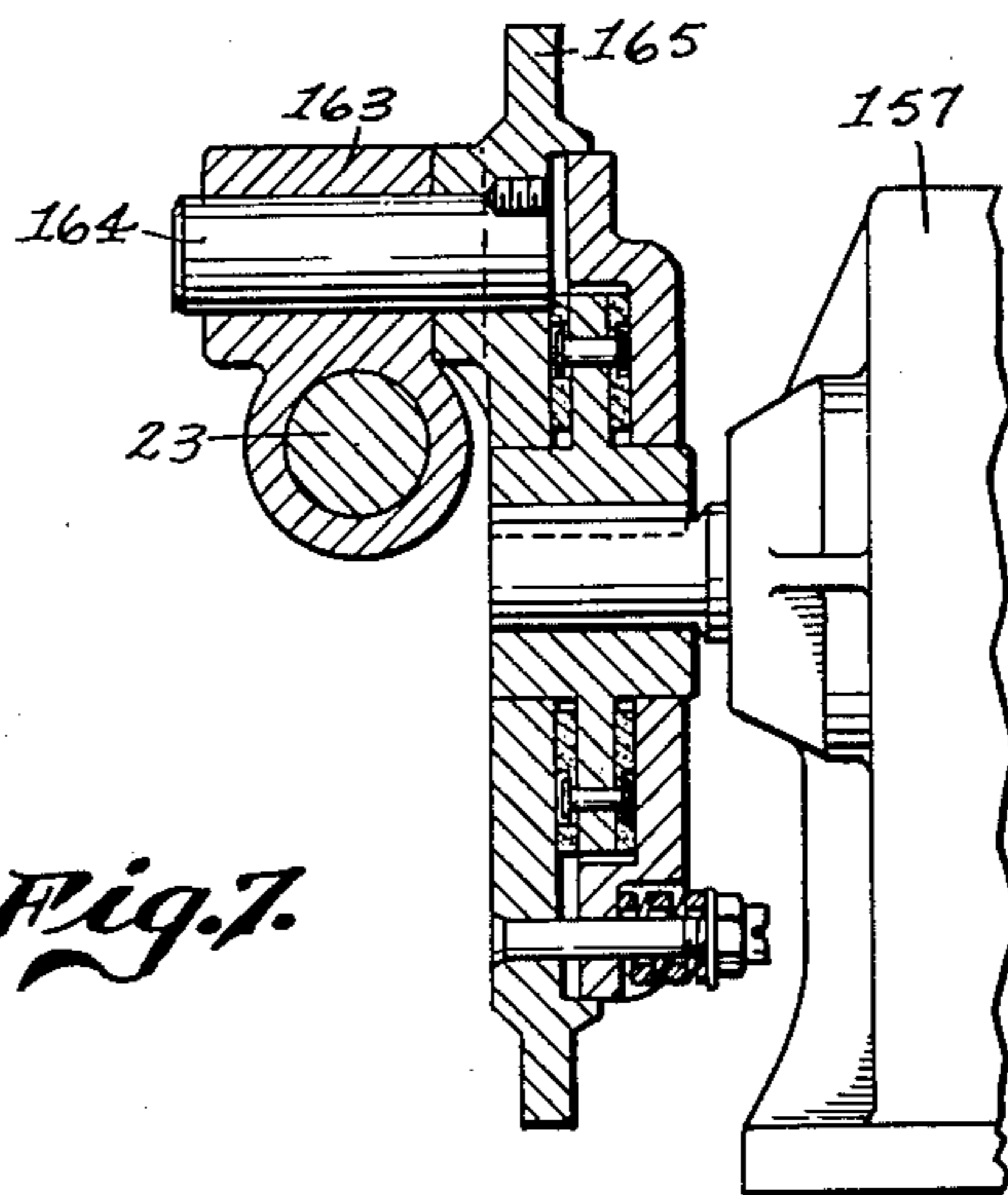


Fig. 7.

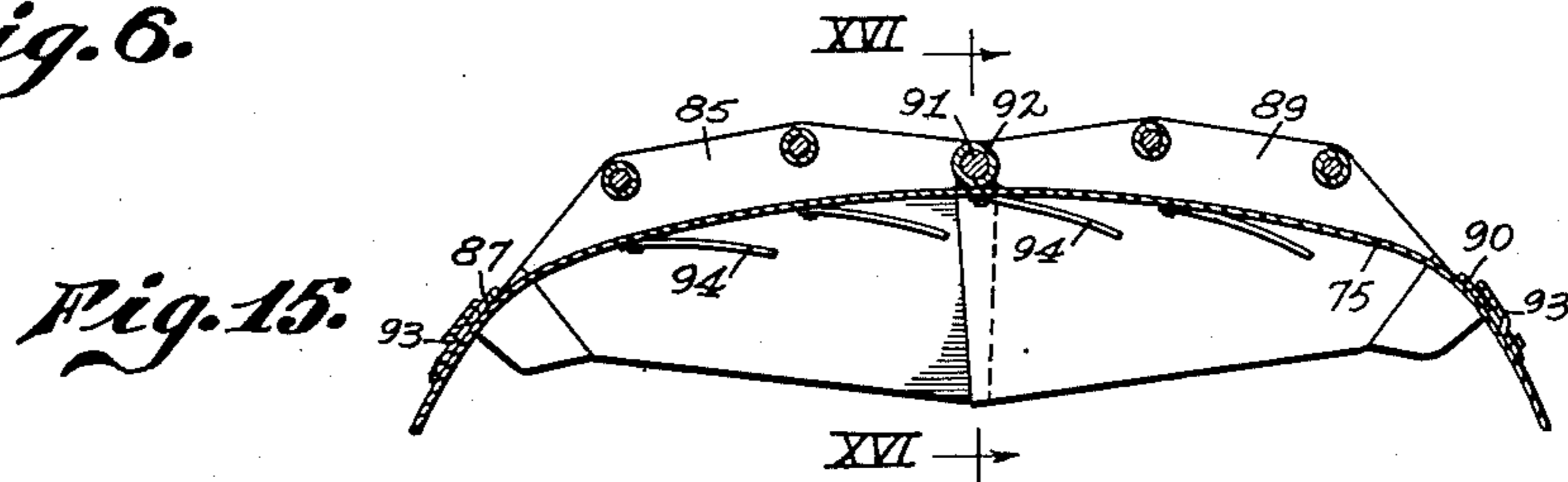


Fig. 15.

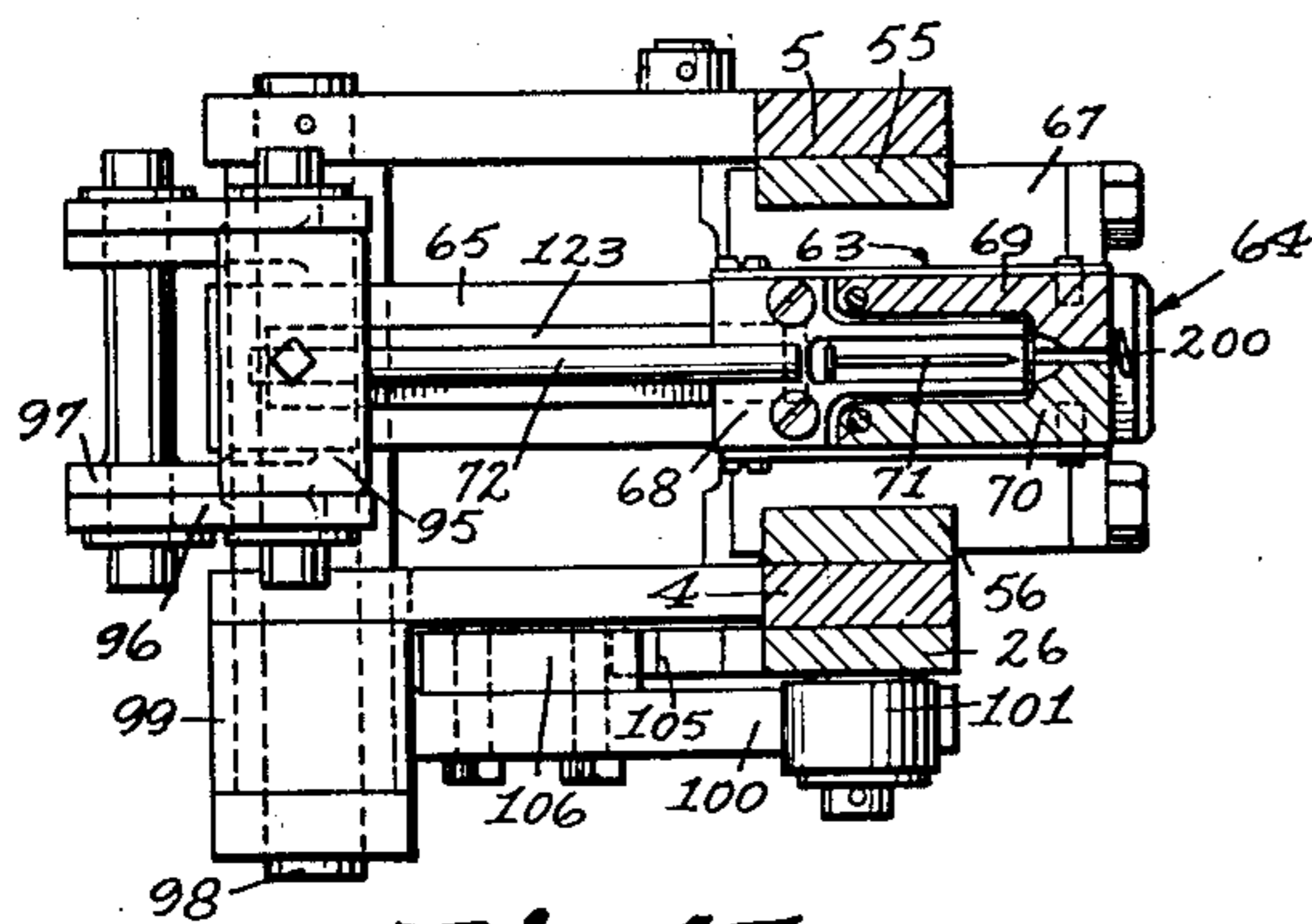


Fig. 17.

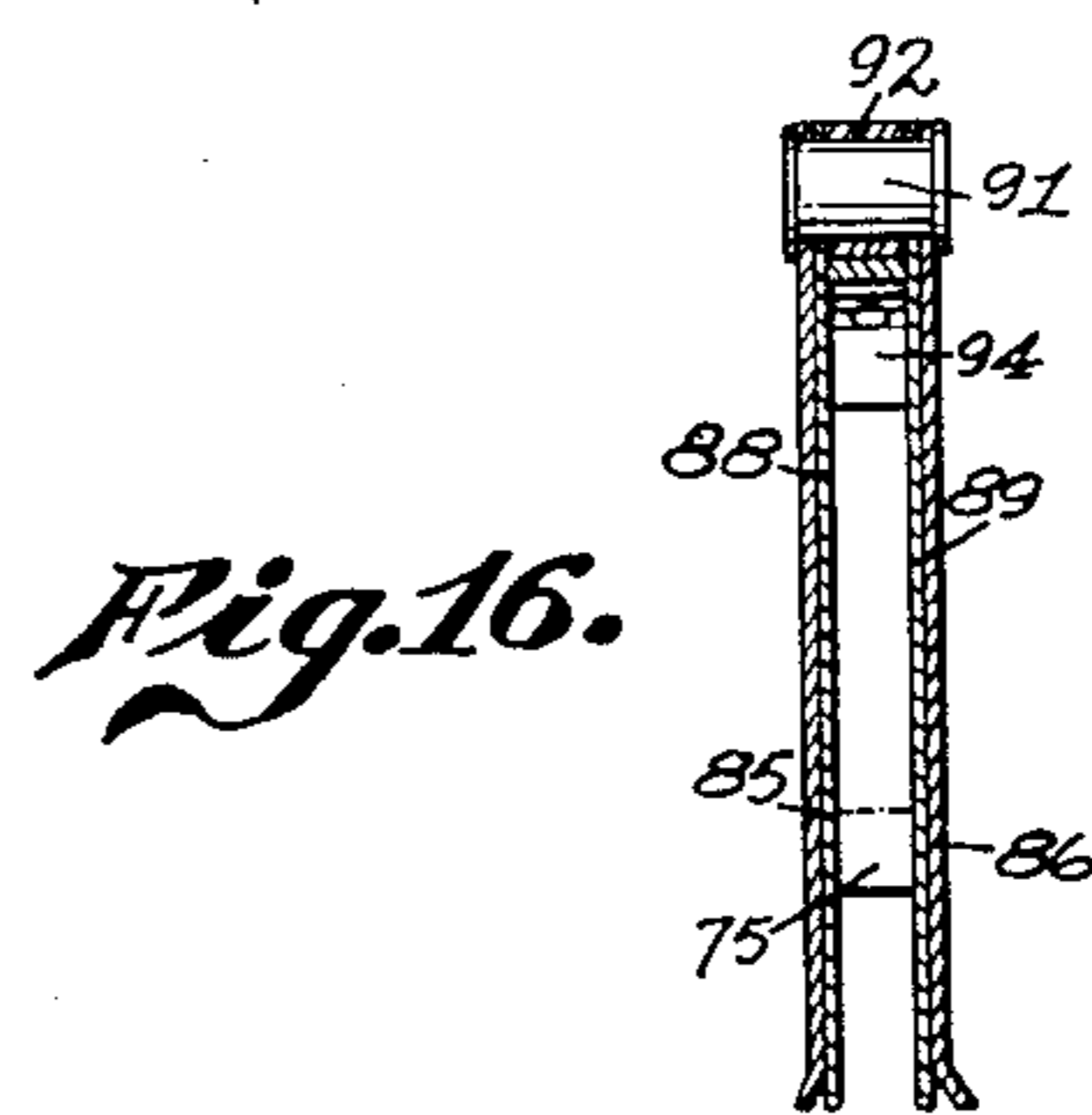


Fig. 16.

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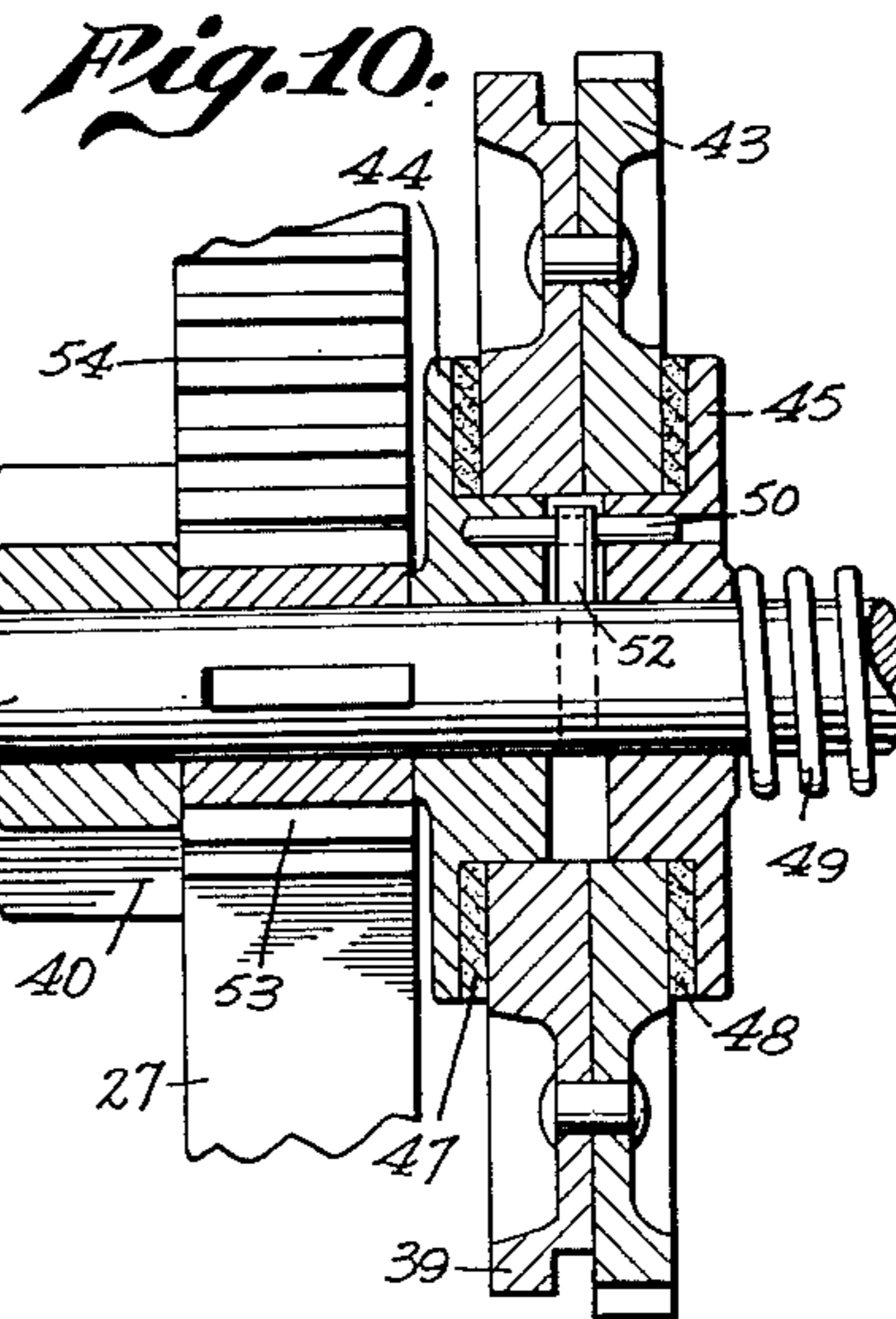
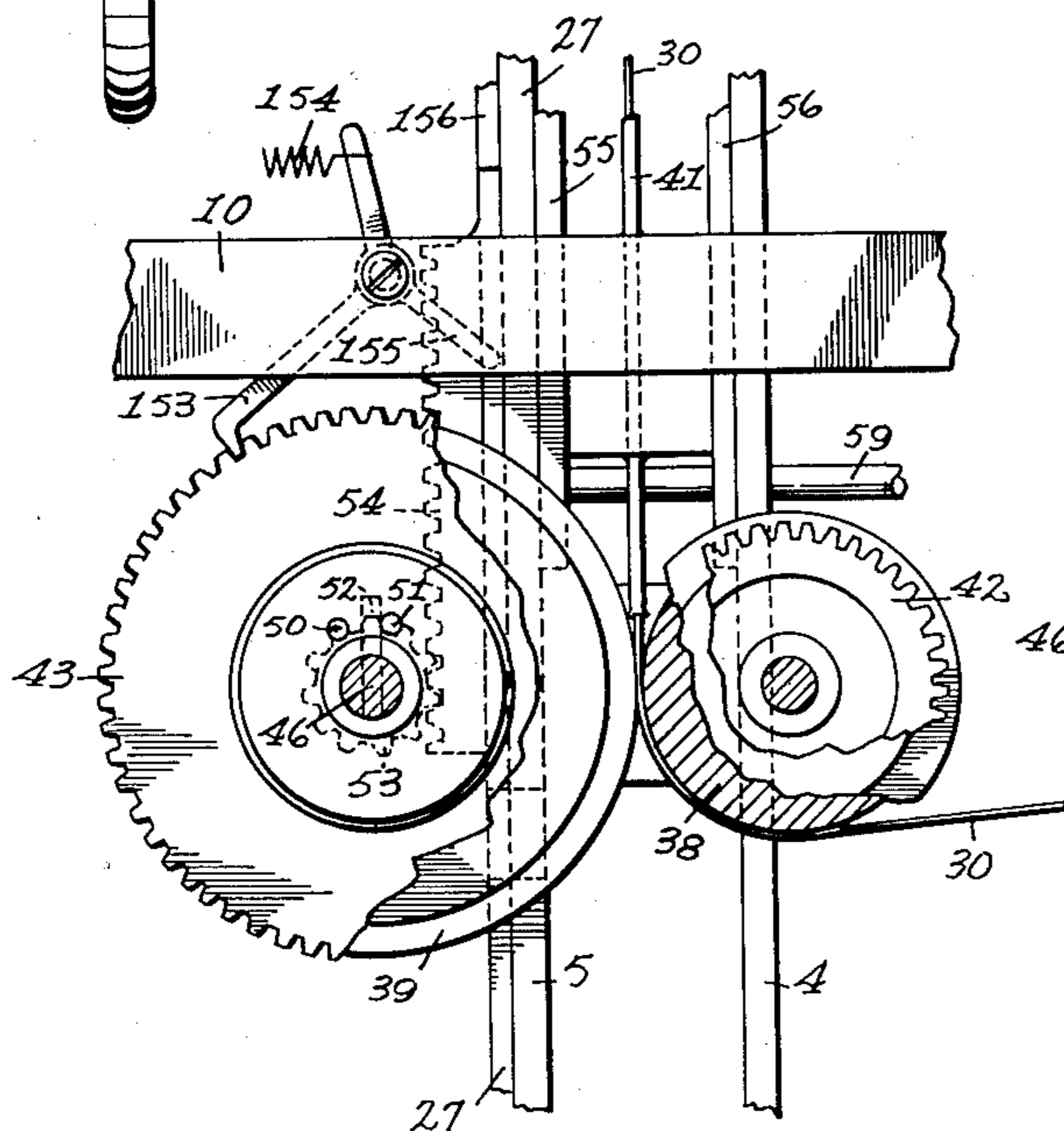
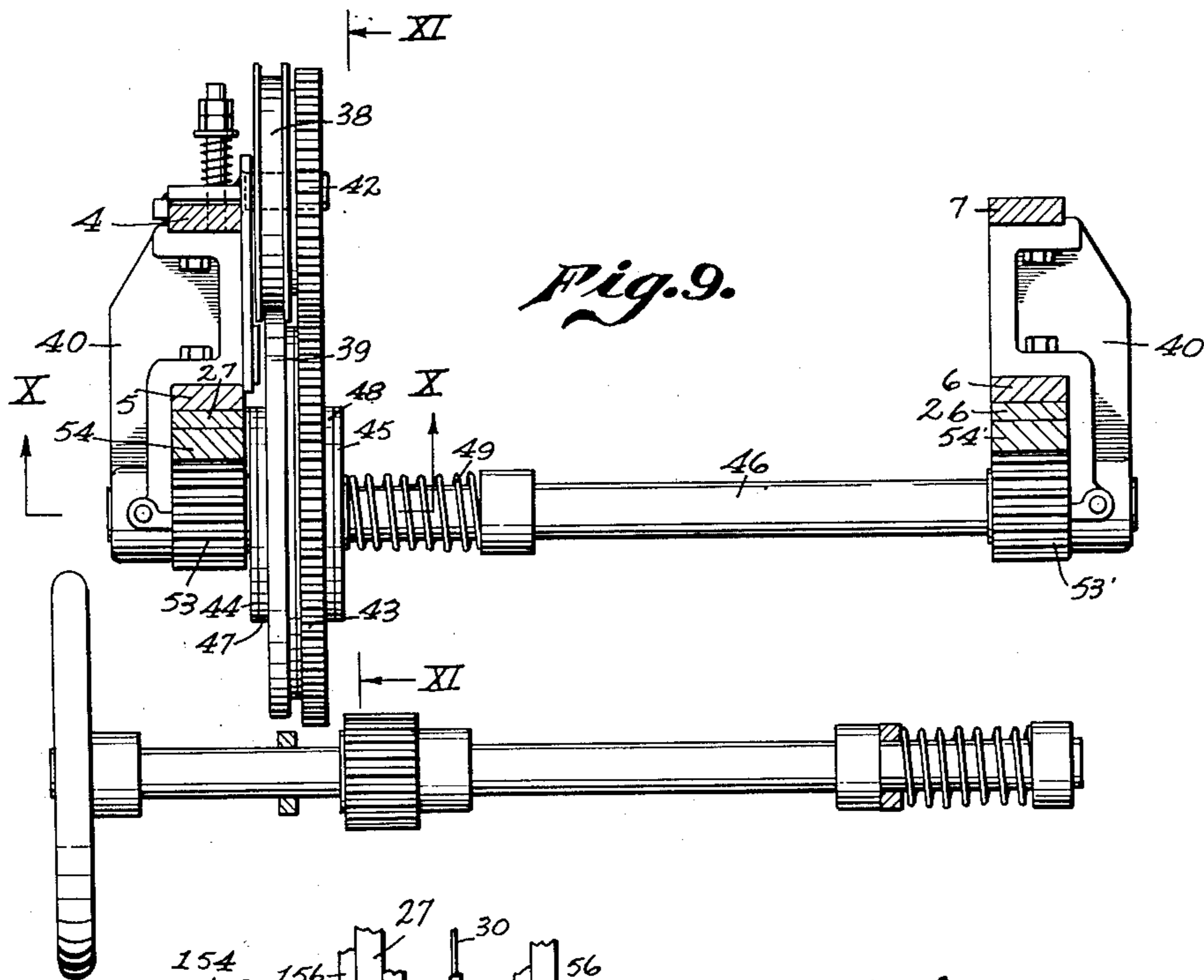
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10 Sheets-Sheet 7



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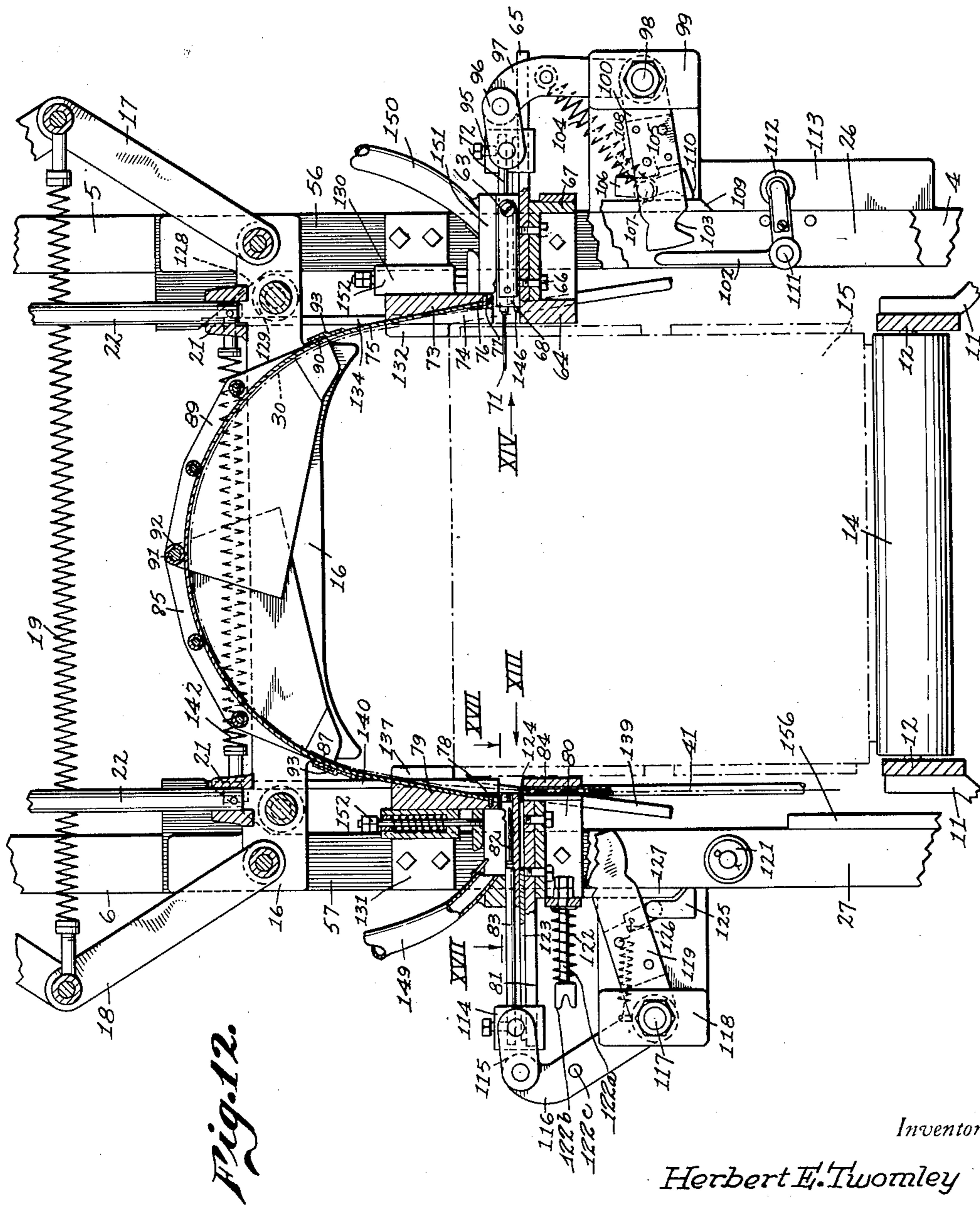
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BAND STRAPPING MACHINE

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10 Sheets-Sheet 8



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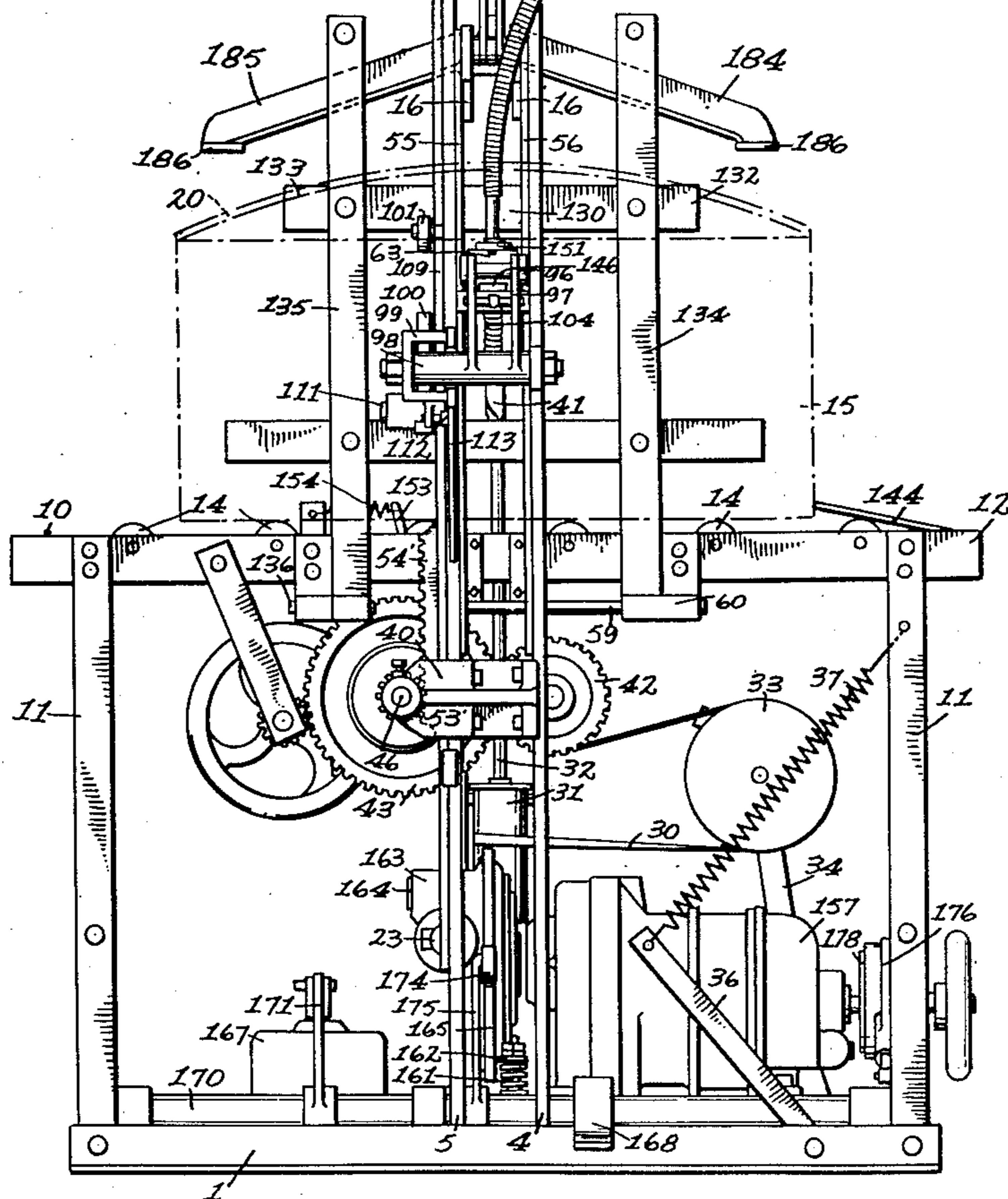
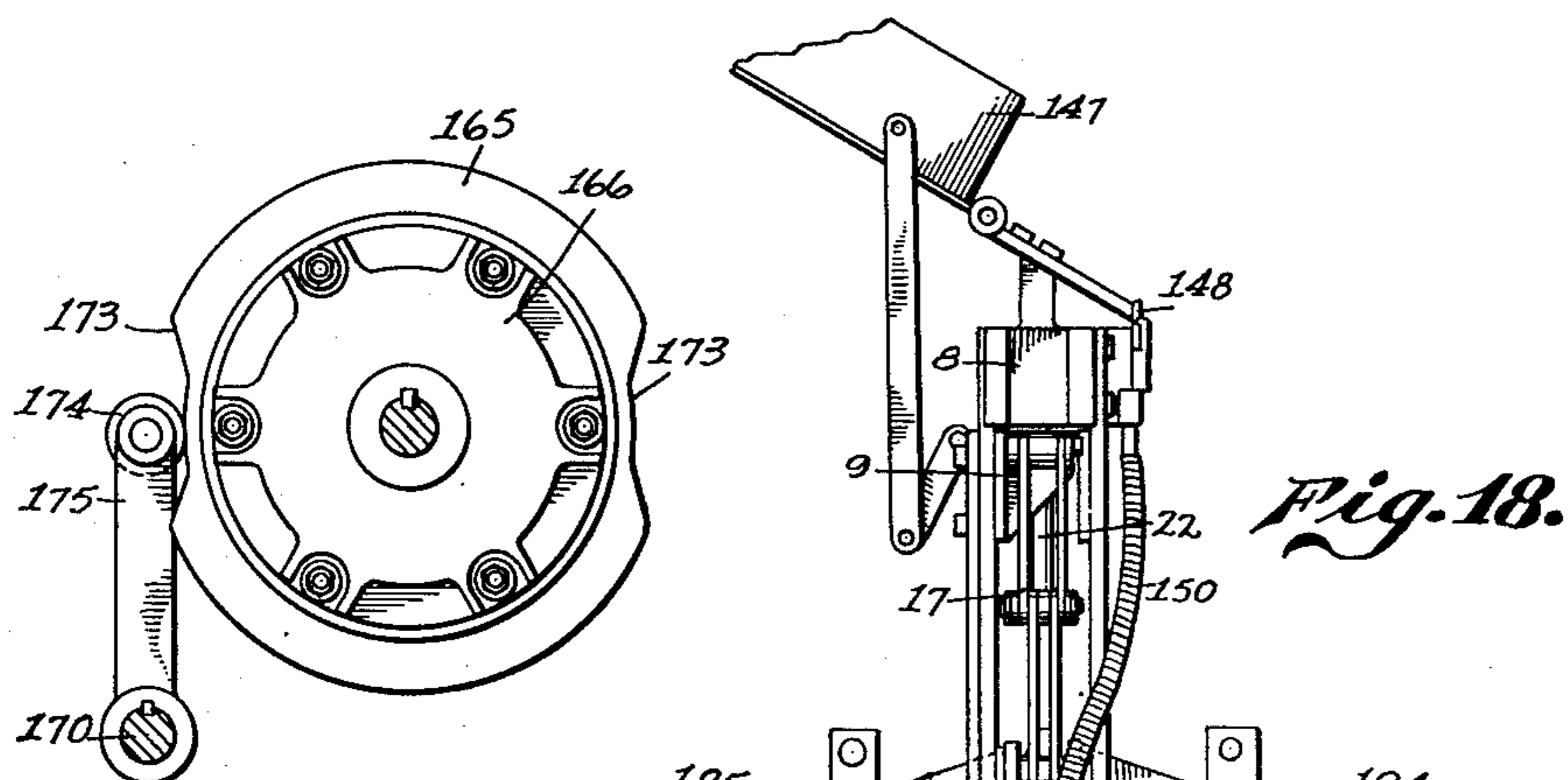
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10 Sheets-Sheet 9



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10 Sheets-Sheet 10

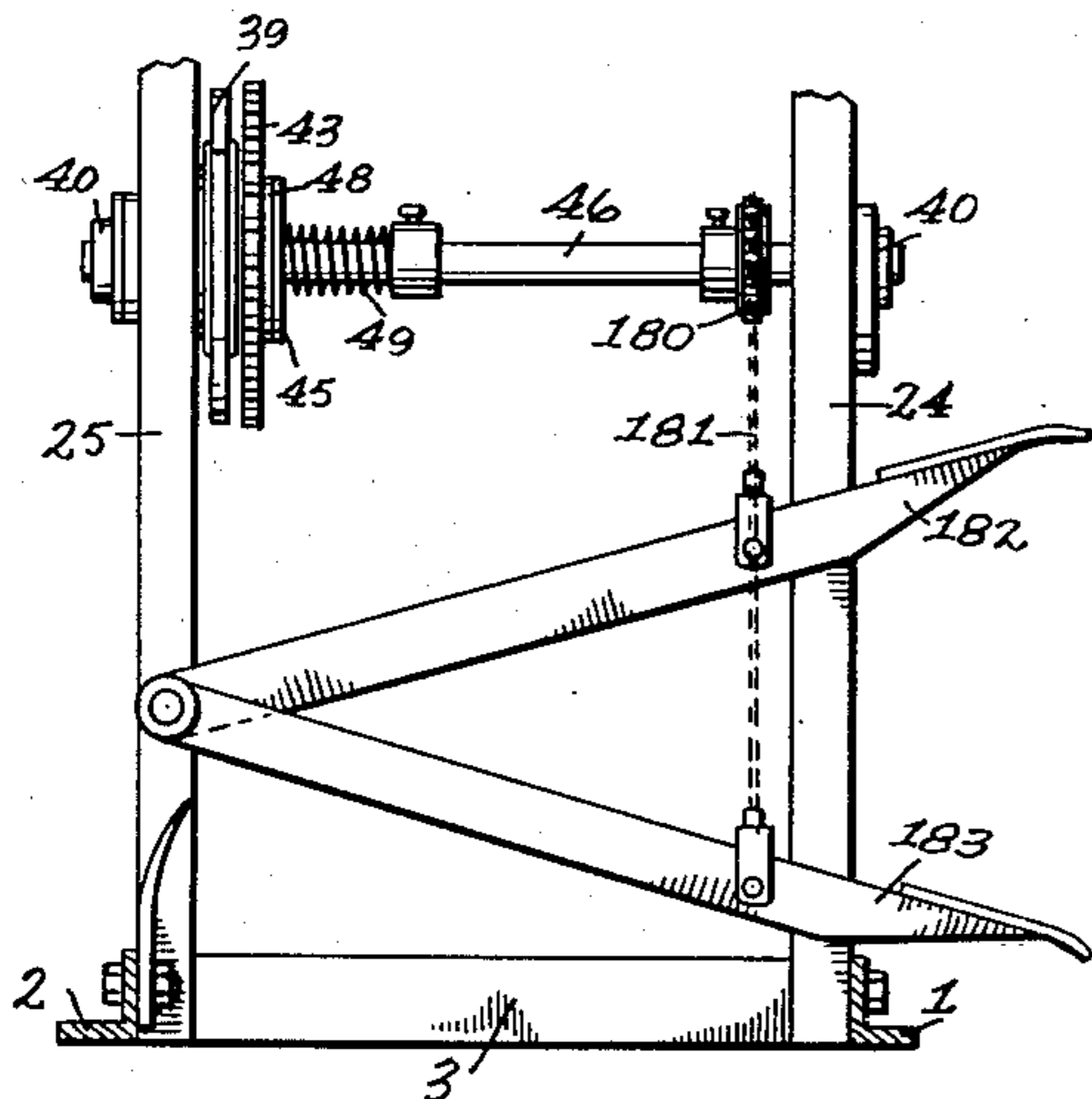
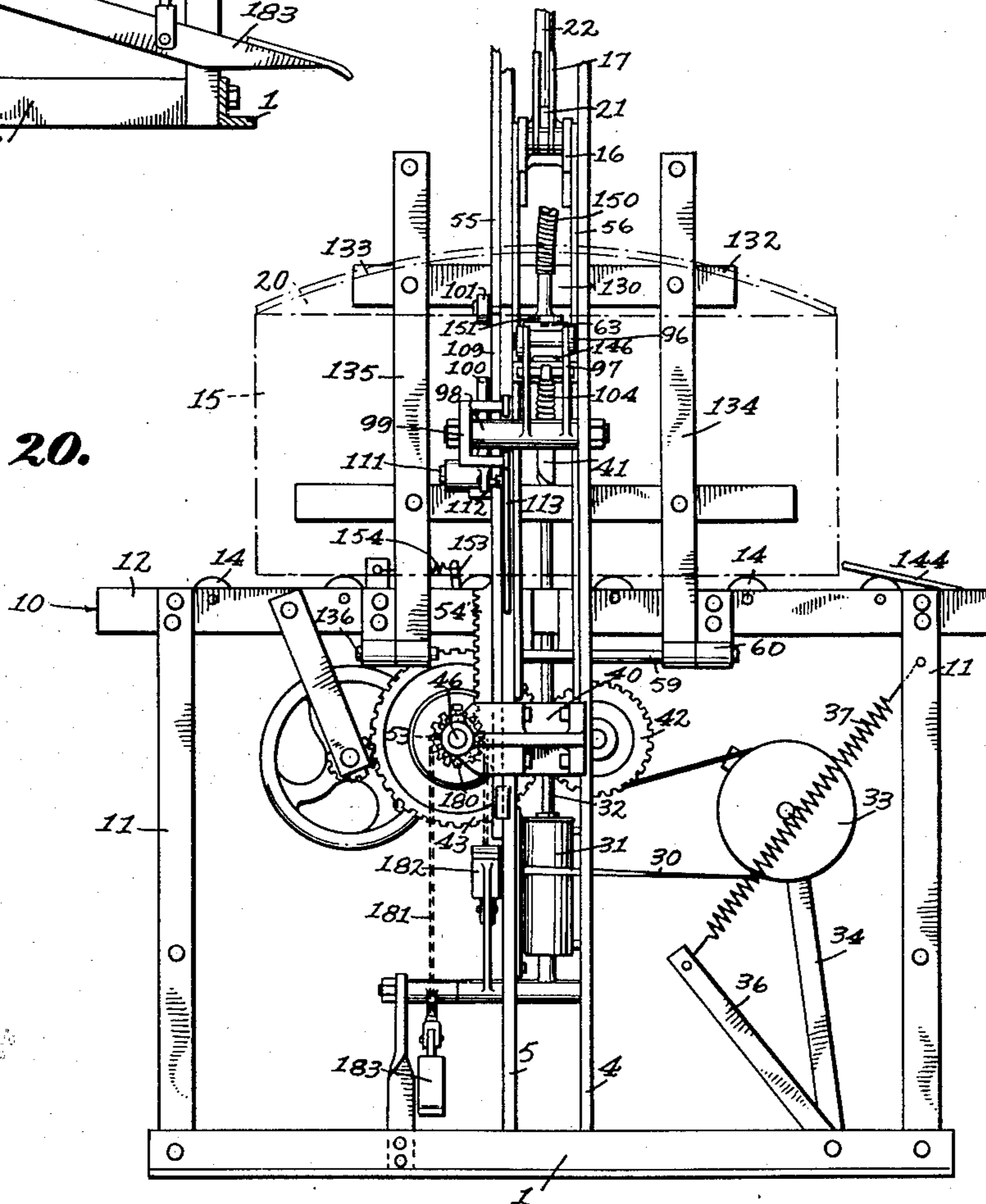


Fig. 21.

Fig. 20.



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UNITED STATES PATENT OFFICE

2,125,528

BAND STRAPPING MACHINE

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mesne assignments, to Acme Steel Company,
Chicago, Ill., a corporation of Illinois

Application August 14, 1934, Serial No. 739,734

20 Claims. (Cl. 1—10)

My invention relates to strapping machines and has particular reference to a machine adapted to apply a band or strip of material about at least two sides of a box or other container.

5 In certain packing industries boxes are required to be reinforced or have their parts secured together by the application about the box parts of a metal strap, which strap may be secured to the box parts by either forming driving
10 ends upon the strap material which are then driven into the box parts, or by means of nails which are driven through the strap material into the various box parts.

My present invention relates to that type of
15 strapping mechanisms which are employed by applying a band of flat strap material to the box parts by driving nails through the strap material and more particularly to the class of machines which apply such strap material across
20 the covers of boxes to secure or reinforce the covers upon the boxes.

In the citrus industry it has long been the common practice to pack oranges or other fruits in boxes in such a manner that the box is over-
25 packed, that is a greater amount of material is used than is necessary to completely fill the box, the over-pack of the material being forced under pressure down into the box so as to compensate for the natural shrinkage of the fruit during its
30 transportation and storage and for this purpose it is necessary that the covers applied to the containers shall be sufficiently flexible to be bound down over the protruding contents of the box and shall be secured to the box in a tensioned rela-
35 tion so that the cover will follow the shrinking of the fruit and keep the same in tight packed relation during the shrinking period. The common practice, therefore, is to compress the central portion of the cover over the protruding or over-
40 packed fruit and to apply a strap to such cover while the cover is held under compression, the strap being drawn sufficiently taut over the compressed cover that when pressure is released upon the cover the same will spring back against the
45 relatively tight strap and will be held by the strap in tensioned relation (that is in compressing relation upon the fruit).

In my application Serial No. 590,455, filed February 2, 1932, now U. S. Letters Patent No. 1,937,675, granted December 5, 1933, I disclosed a
50 machine for applying straps to covers of boxes of this character, in which the band or strap material was fed from a suitable endless source of supply and directed across the covers of boxes
55 whereupon one end of the strap was secured to

the box, the strap drawn taut, and the other end of the strap secured to the box, whereupon the length of strap material so secured to the box was cut off from the supply of material.

It is an object of my present invention to provide a machine of similar character which will apply bands across the covers of boxes and cut the same from a supply of material.

Another object of my invention is to provide a machine for applying bands or straps across
10 the covers of boxes, in which the covers will be compressed upon the fruit prior to the securing of the band thereon.

Another object of my invention is to provide a machine of the character described, in which one
15 end of the strap material is initially secured to the box by partially driving a nail through the band into the box and then the final driving of the nail occurring only when the opposite end
20 of the strap is nailed to the box.

Another object of my invention is to provide a machine of the character described which is adapted to apply a band across the covers of
25 boxes and to secure the same thereto, the two operations being performed in sequence permitting the interruption of the operation at the end of either one of the steps.

Another object of my invention is to provide a machine of the character set forth in which
30 the ends of the strap or strip of material employed as the band will be driven into the material of which the box is formed so as to prevent extending edges thereon from liability of becoming caught on other boxes or other objects.

Another object of my invention is to provide
35 a box strapping machine adapted to place a strap across the covers of boxes irrespective of the amount of over-pack of the contents of the box and in which the length of strap material applied to each box will be only such length as is
40 required to extend adequately across the cover of the particular box being strapped, thereby automatically adjusting the length of the strap material used to the particular conditions existing on the box being strapped.

Other objects of my invention will be apparent from the following specifications read in connection with the accompanying drawings, wherein:

Fig. 1 is a side elevational view of a machine
50 constructed in accordance with my invention.

Fig. 2 is a side elevational view of the opposite side of the machine constructed in accordance with my invention.

Fig. 3 is a front elevational view of the ma- 55

chine constructed in accordance with my invention, looking in the direction of the arrow shown in Figures 1 and 2.

Fig. 4 is a detail view illustrating the manner of mounting a driving motor upon a machine constructed in accordance with my invention.

Fig. 5 is a detail end elevational view of the motor and its mounting means as shown in Figure 4.

Fig. 6 is a detail end elevational view of the motor and its connecting means to the operating parts of the machine.

Fig. 7 is a vertical sectional view taken along the line VII—VII of Figure 6.

Fig. 8 is a diagrammatical view illustrating the feeding mechanism employed to feed strap material from a suitable source of supply.

Fig. 9 is a detail sectional view of the strap feeding mechanism employed in the practice of my invention.

Fig. 10 is a detail sectional view taken along the line X—X of Figure 9.

Fig. 11 is a detail sectional view taken along the line XI—XI of Figure 9.

Fig. 12 is a detail partial sectional view, partly in end elevation, illustrating the strap feeding mechanism and nail driving mechanism employed in the practice of my invention.

Fig. 13 is a detail view of the strap feeding anvil employed on the strap feeding mechanism at the point of initial entry of the strap, looking in the direction of the arrow XIII of Figure 12.

Fig. 14 is a detail view of the strap anvil employed in the strap feeding mechanism at the opposite or terminal end of the strap, looking in the direction of the arrow XIV of Figure 12.

Fig. 15 is a detail sectional view of the strap guide shown in Figures 3 and 12, enlarged to illustrate the detail of its construction.

Fig. 16 is a sectional view taken along line XVI—XVI of Figure 15.

Fig. 17 is a detail sectional view of one of the strap nailing mechanisms taken along line XVII—XVII of Figure 12.

Fig. 18 is a side elevational view similar to Figure 1 illustrating a modified form of my invention.

Fig. 19 is a detail view similar to Figure 5 illustrating a motor cut-off mechanism employed with the modification shown in Figure 18.

Fig. 20 is a detail view of an operating mechanism which may be employed to operate my machine by manual power in place of electric motor means.

Fig. 21 is a side elevational view similar to Figure 18 illustrating the manual operation of my machine.

Referring to the drawings, I have illustrated in Figures 1, 2 and 3, the general assembly of a machine constructed in accordance with my invention, such machine comprising a suitable base formed of longitudinal rails 1 and 2 connected in spaced relation to each other by means of cross bars 3 to form a rectangular base frame from which rise two sets of uprights, one being formed of bars 4 and 5 attached to rail 1 and the other comprising identical upright bars 6 and 7 attached to rail 2 and extending upwardly therefrom. The upper ends of the groups of uprights 4—5 and 6—7 are connected together by a casting 8 so as to form a substantially rigid vertically extending truss upon which is mounted a crosshead 9 for reciprocation vertically along the uprights 4—5 and 6—7.

Between the casting 8 and the base 1—2—3 is mounted a box supporting table 10 preferably secured at a convenient level upon a plurality of upright legs 11 attached to and extending upwardly from the base 1—2—3. The box supporting table is preferably constructed of a pair of longitudinal rails 12 interconnected at each end by cross bars 13 and having spaced along the longitudinal extent of the rails 12 a plurality of rollers 14 constituting a roller conveyor over which boxes 15 may readily be passed longitudinally of the machine.

The reciprocating crosshead 9 constitutes the carrier for a press shoe 16 (Figs. 3 and 12) connected to the crosshead 9 by toggle levers 17 and 18 interconnected by means of springs 19 so that as the crosshead 9 is moved downwardly toward a box on the supporting table 13 the press shoe 16 will engage the cover 20 of the box and press the same downwardly upon the over-packed fruit to compress the cover and the fruit during the application of the strap to the box. The press shoe 16 is preferably formed of two relatively narrow plates, the lower edges of which are formed in arcuate shape to assist in shaping the flat boards, of which the cover 20 is constructed, in an arcuate contour laterally of the box, the two plates 16 being interconnected at their ends by means of a filler casting 21 which constitutes the mounting for guide rods 22 extending upwardly and through the crosshead 9 to hold the press shoe 16 in vertical alignment with the crosshead 9 irrespective of variations in the contours of covers 20 encountered by the press shoe. With the construction of the press shoe and its connection to the crosshead 9, as described, it will be apparent that a predetermined amount of movement may be given the crosshead 9 upon each strapping operation and that the press shoe 16 will be moved downwardly into engagement with the cover 20 of the box and compress the same with a predetermined pressure, determined by the tension of the spring 19, and further that irrespective of the fact that the cover 20 on different boxes may extend a different distance above the box, the press shoe 16 will only be moved down until the desired pressure is exerted upon the box, thereafter the crosshead 9 being capable of downward movement independent of the press shoe 16 without exerting further pressure upon the cover. Thus, the crosshead 9 may be moved a predetermined distance upon each operation and the toggle and spring connections of the press shoe 16 will compensate for different levels of pack of the fruit within the boxes.

The crosshead 9 is drawn downwardly by means of a crossbar 23, the ends of which are connected through vertical bars 24 and 25 to the crosshead 9 as indicated at 26 and 27. Thus, downward movement of the crossbar 23 will draw the crosshead 9 downwardly, while upward movement of the crossbar 23 will return the crosshead 9 to its normal uppermost position as shown in Figures 1, 2 and 3. As will be hereinafter pointed out, the crossbar 23 may be reciprocated either by power or manually.

Strap feeding mechanism

Since the machine is adapted to apply to the covers of boxes, straps formed from a length of strapping material, preferably an elongated flat band, a supply of such band material may be supplied to the machine from a reel 28 (Figs. 3 and 8) which, if desired, may be supported upon

the machine though I prefer to rotatably support the same in a suitable frame 29. The strap material 30 from such reel may be fed into the machine over a suitable guide roller 31 journaled upon a vertical axis 32 mounted between the side uprights 6—7 upon the left hand side of the machine as viewed in Figure 3. The band 30 may then extend over a suitable take-up pulley 33 (Figs. 2 and 8) mounted upon vertically extending arm 34 rigidly connected to a shaft 35 to which a lever 36 is also connected and is normally urged toward the rear of the machine by means of a spring 37. The band 30 then extends between a pair of strap feeding rollers 38 and 39 which are so mounted upon a bracket 40 as to present their peripheries to the surface of the strap or band 30 with just sufficient space for the band to pass therebetween. Thus, by rotating the strap feeding rollers 38 and 39 (Fig. 2) in one direction, the strap or band material 30 will be drawn from the reel 28 and passed upwardly into a strap feed tube 41 while rotation of the strap feeding rollers 38 and 39 in the opposite direction will draw the strap material 30 down through the feed tube 41 where the material so drawn will be kept taut by the action of the take-up pulley 33.

By referring particularly to Figures 9, 10 and 11, it will be seen that the strap feed rollers 38 and 39 are arranged to operate at exactly the same peripheral speed by rigidly connecting to each of these rollers a gear 42 and 43, respectively, which gears are so selected in size and pitch that when the gears are intermeshed and one of them is rotated the other will be rotated at the same peripheral speed, since it is necessary to feed from the reel 28 a length of strap sufficient to extend across the cover of the box and then it is necessary to retract the strap to tighten the same upon the box. During the latter movement, however, a lesser length of material will be retracted than was moved forwardly and it is, therefore, necessary that the driving mechanism for the rollers 38 and 39 shall be connected to these rollers by a suitable slip connection, which is illustrated herein as comprising a pair of friction discs 44 and 45 rotatably mounted upon a drive shaft 46, the disc 44 engaging the feed roller 39 through the medium of a disc of friction material 47, while the disc 45 engages the gear 43 through the medium of a similar disc 48 of friction material. The two discs 44 and 45 are pressed toward each other by means of a suitable compression spring 49 on the shaft 46 so that rotation of the shaft 46 will rotate the discs 45 and thus frictionally rotate the gear 43 and roller 39. The two discs 44 and 45 are illustrated as being interconnected for simultaneous rotation by means of a pair of pins 50 and 51, between which extends a cross-pin 52 rigidly secured to the drive shaft 46. Thus, upon rotation of the drive shaft 46 through a predetermined number of revolutions in one direction the feed rollers 38 and 39 will be rotated a sufficient distance to draw a predetermined length of strap from the reel and feed the same over the cover of a box while upon reverse rotation of the shaft 46 and similar number of revolutions the strap will be retracted until it becomes taut, thereupon the friction discs 44 and 45 will slip on the feed roller 39 and hold the strap taut without further retraction of the same. It will also be observed at this point that rotation of the drive shaft 46 in a counter-clockwise direction, as viewed in Figure 2, will be accomplished through the engagement of the pin 52 with the pin 50, thus providing a slight lag between the reverse

rotation of the shaft 46 and the reverse movement of the feed roller 39. This lag will, as will be hereinafter described, provide for a cutting operation by which the length of strap which has been secured to the box may be cut from the supply and the cutter therefor will be withdrawn out of the path of the strap prior to the subsequent feeding movement to feed a second strap into the machine.

Rotation of the shaft 46 is accomplished by rigidly connecting to the shaft 46 two small pinions 53 and 53' engageable with gear racks 54 and 54', respectively, to the drive bars 27 and 26 which, as hereinbefore described, connect with the crossbar 23 and the crosshead 9. Thus, whenever the crosshead 9 is drawn downwardly, the downward movement of the drive bars 26—27 will cause the shaft 46 to be rotated in a counter-clockwise direction while upward movement of the crosshead 9 will cause the shaft 46 to be rotated in a clockwise direction, as viewed in Figure 2.

Strap guide

By referring particularly to Figs. 1, 2, 3 and 12, it will be observed that a pair of vertically extending carrier bars 55 and 56 are mounted between the uprights 4 and 5 at one side of the machine while a similar pair of carrier bars 57 and 58 are likewise mounted between the uprights 6 and 7 at the opposite side of the machine.

The lower ends of the uprights 55 and 56 are pivoted upon a shaft 59 which extends from a bracket 60 secured to the side rail 12 of the box supporting table, the opposite end of the shaft 59 engaging the upright 5. Carrier bars 57 and 58 are likewise pivoted upon a similar shaft 61 upon the opposite side of the machine so that the carrier bars 55—56 and the carrier bars 57—58 may move inwardly of the machine. The carrier bars 55 and 56 constitute supports or carriers for a nail chuck 63 and an anvil 64. By referring particularly to Figures 12 and 17, it will be observed that the nail chuck 63 comprises a horizontal base 65 bolted as at 66 to a casting 67 extending between and secured to both of the carrier bars 55 and 56. A nail chuck body 68 is bolted directly to the base 65 and has a pair of jaws 69 and 70 pivoted thereto, between which a nail 71 may rest and be pressed outwardly by a reciprocating nail driver 72.

Secured directly to the casting 67 is the anvil 64 against which the forward or free end of the strap 30 may abut, the anvil 64 comprising a block of metal particularly shown in Figure 14. Immediately above the nail chuck is a strap terminal guide 73 comprising a block of metal having a recess 74 extending vertically down the face of the block. The recess 74 constitutes a seat in which the right hand end of a strap guide 75 is secured, this guide being constructed of a relatively narrow resilient band of metal placed in the recess 74 and held therein by means of a filler block 76 secured to the terminal guide 73 by means of a screw 77. The strap guide 75 extends in an arch across the box supporting table and has its opposite or left hand end secured, as at 78, in a similar terminal guide block 79 mounted upon the carrier bars 57 and 58 on the left hand side of the machine.

Similarly a casting 80 extends between and is mounted upon the carrier bars 57 and 58, to which is secured the base 81 of a nail chuck assembly, including jaws similar to the jaws 69 and 70, through which a nail 82 may be driven by a nail punch 83.

A second strap anvil 84 is secured to the front end of the casting 80, into which the strap guide tube 41 extends, the strap guide tube being supported at its lower end and being free to telescope relative to the casting 80.

Thus, the strap material 30 when fed by the feed rollers 38 and 39 will pass upwardly through the guide tube 41 to strike the strap guide 75 which, by reason of its arcuate shape, will guide the incoming strap in an arc across the box supporting table until the free end of the band or strap material 30 strikes against the anvil 64 on the right hand side of the machine as viewed in Figures 3 and 12.

It will be apparent, therefore, that upon each cycle of operation of the machine the feed rollers 38 and 39 must be rotated through the same distance in order to insure that this full length of strap will be fed into the machine and across the box supporting table and hence for this purpose it is necessary that the drive bars 24 and 25 shall operate through the same amount of vertical travel upon each operation of the machine entirely independent of the total amount of travel afforded the cover press shoe 16.

By referring particularly to Figures 12, 15 and 16, it will be observed that a box like guide housing is provided over the strap guide 75, this housing comprising a pair of plates 85 and 86 connected together at their outer ends by means of a cross strap 87. It will be noted that the plates 85 and 86 extend approximately one-half of the distance between the two sides of the machine, there being a similar set of plates 88 and 89 likewise connected at their outer ends by a cross strap 90. The inner ends of the two sets of plates 85-86 and 88-89 are pivotally connected together as by passing a short shaft 91 through suitable aligned openings in the plates, the shaft 91 preferably extending also through a tube 92 welded at the approximate center of the strap guide 75. The strap guide 75 also has secured thereto a pair of lugs 93 to form a sliding engagement with the cross straps 87 and 90 so that the entire structure is supported upon and operates with the strap guide 75 as a unit. By referring particularly to Figures 12 and 15, it will be noted that when the carrier bars are in their extended position (the positions shown in Figure 3), the strap guide 75 will be somewhat stretched out while when the carrier bars are in their inner positions (as shown particularly in Figure 12), the strap guide will be more sharply arched and the plates 85-86 and 88-89 will have been moved slightly toward each other. Thus, in both the extended and the contracted positions of the strap guide 75 the plates 85-86 and 88-89 will constitute side guiding plates preventing the incoming strap from being deflected away from the strap guide.

As will be understood by those skilled in the art, the incoming strap will tend to follow a straight line instead of following the curve of the guide 75 and it is, therefore, necessary to provide some means for guiding the end of the incoming strap, not only in an arc over the box supporting table but also to flex or bow the portions of the strap adjacent the end so that the body portion of the strap will extend in the arcuate shape desired to follow the contour of the strap guide 75. For this reason, I have provided along the strap guide 75 a plurality of deflectors 94 preferably formed of short strips of spring steel against which the free end of the incoming strap may ride and which will from

time to time during the passage of the strap across the guide 75 deflect the end of the strap downwardly, thus causing the following portions of the strap to bow upwardly in a series of waves until the end of the strap will come to rest upon the anvil 64 with the following portions of the strap extending in a high arch. Not only will this construction insure that the strap will follow the contour of the strap guide 75 but it will insure that the end of the strap will abut the relatively narrow anvil 64 instead of deflecting inwardly and possibly failing to contact the anvil 64.

Nail driving mechanisms

The nail driving mechanisms have been partially described hereinbefore with reference to the nail chucks and nail chuck assemblies. The nail driving mechanisms, however, differ slightly on the opposite sides of the machine, the nail driving mechanism employed upon the right hand side of the machine as viewed in (see Figures 3 and 12) including the nail punch 72 connected at its outer end to a slide block 95 slidably mounted upon the horizontal base 65. The slide block 95 is connected through a suitable clevis 96 to a crank 97 pivoted upon a short shaft 98 extending through a filler block 99 welded or otherwise secured to the uprights 4 and 5. The shaft 98 has rigidly secured thereto a forwardly extending arm 100, the outer end of which extends into the path of movement of a driving roller 101 (Fig. 3) mounted upon the drive bar 26 and also in the path of movement of a bell crank 102 also mounted upon the drive bar 26.

By referring particularly to Figure 3, it will be observed that when the drive bar 26 is in its uppermost position the vertical arm of the bell crank 102 will be engaged in a notch 103 upon the lower side of the arm 100 so that the arm 100 will be lifted to the position shown in Figure 3 and held in this elevated position as long as the drive bar 26 is elevated. Upon downward movement of the drive bar 26, the bell crank 102 will be moved downwardly away from the arm 100 and will permit the arm 100 to descend.

However, since it is desired to "start" the nail into the side wall of the box 15 prior to the time that the strap is drawn taut, I arrange for the initial downward movement of the drive bar 26 to cause a small amount of movement of the nail punch 72 and employ the full downward movement of the drive bar 26 to finally drive the nail completely. This initial driving of the nail is accomplished by providing a tension spring 104, connected to the casting 99 and to the crank 97, normally exerting a sufficient tension on the crank 97 to press a nail through the strap material and into the box material a distance of approximately one-fourth of an inch. However, when the drive bar 26 is in the elevated position, the crank 97 and its arm 100 are prevented from such driving movement and the inner surface of the arm 100 is formed with a shoulder 105 engageable by the upper end of a trigger 106 pivoted at 107 to the casting 99. For convenience, the pivot 107 may comprise the mounting for the inner end of the tension spring 104 and by providing a tongue 108 upon the pivot shaft 107 the flexure of the spring 104 when the crank 97 is "cocked" or moved outwardly to its extreme position will exert a force upon the pivot shaft 107 tending to swing the upper end of the trigger 106 outwardly into engagement with the shoulder 105. Thus, as the initial downward movement of the drive bar 26

occurs, the arm 100 will be prevented from descending by the trigger 106 and shoulder 105 even though the bell crank 102 has been moved entirely away from engagement with the arm 100.

By referring particularly to Figures 3 and 12, it will be observed that the drive bar 26 has, upon its outer edge, a short cam 109 arranged to engage the lower end 110 of the trigger 106 upon a short distance of travel of the drive bar 26 so that after this short distance of travel has been accomplished the cam 109 will press the trigger 106 out of engagement with the shoulder 105, thereby releasing the arm 100 and permitting the tension spring 104 to "snap" the nail punch 72 inwardly initially driving the nail to the desired depth.

As will be understood from the foregoing description of the strap feed mechanisms, the downward movement of the drive bars 26 and 27 will, by their gear racks 54, rotate the feed shaft 46 to cause the feed rollers 38 and 39 to retract the strap 30, now secured by the nail on the right hand side of the machine, and the strap will be drawn taut across the cover 20 of the box 15.

It may also be of importance to note at this point that if, upon the initial downward movement of the drive bars 26 and 27, the strap is retracted by its feed rollers 38 and 39 too rapidly a time delay mechanism, such as is illustrated in Figures 2 and 11, may be employed comprising a dog 153 engageable with the teeth of the gear 53 pivoted upon the side rail 10 of the box supporting table and urged by means of a spring 154 into engagement with the teeth of the gear 53. Thus, the gear 43 will be locked against rotation to tighten the strap until the dog 153 is removed from the gear 43. This may be accomplished by providing an arm 155 on the dog 153 engaging with a cam 156 carried by the inner edge of the drive bar 26 and arranged at such level and of such length that it will not engage the dog 153 until after such amount of downward movement of the drive bar 27 has occurred as will be necessary to allow the strap to be thoroughly secured to the right hand side of the box.

However, due to the location and mounting of the cover press shoe 16, the cover press shoe will engage the cover 20 of the box and depress the same down upon the protruding contents of the box prior to the time that the strap is drawn completely taut so that the strap is in fact drawn taut upon a portion of the cover which has been "over-compressed", that is compressed beyond the normal level to which it is desired to hold the cover when the strapping operations are complete.

In order that the return upward movement of the drive bar 26 shall recock the nail punch 72, the bell crank 102 is pivoted at 111 upon the drive bar 26 and has upon its outer arm a friction disc 112 which bears upon a plate 113 rigidly secured to the filler block 99, the friction disc 112 acting on the plate 113 as a friction drag. Thus, upon downward movement of the drive bar, the friction disc 112 drag upon the plate 113 will tend to swing the bell crank 102 out of the notch 103 and when the drive bar 26 has moved down sufficiently to separate the bell crank 102 from the arm 100, this bell crank 102 will be moved out of the path of downward movement of the arm 100. However, upon return movement of the drive bar 26, the bell crank 102, now disposed below the arm 100, will by the friction disc 112 be swung to the right as viewed in Figure 12 to reposition the bell crank 102 below the notch 103. Then upon

continued upward movement of the drive bar 26 the bell crank will engage the arm 100 and lift the same to its extreme position, allowing the trigger 106 to again engage the shoulder 105 to hold the nail punch 72 cocked for a subsequent operation. 5

The nail driving mechanism upon the opposite or left hand side of the machine includes the nail punch 83 secured to a slide block 114 mounted for sliding movement upon the base 81. The slide block 114 is connected by a clevis 115 to the end of a crank 116 fixed to a short shaft 117 pivoted in a filler block 118 similar to the casting 99. The shaft 117 has rigidly connected thereto a forwardly extending arm 119 the outer end of which is in the path of a drive roller 120 (Fig. 3) on the drive bar 27 and also in the path of movement of a lift roller 121 mounted upon the drive bar 27 so that when the drive bar 27 is in its uppermost position the lift roller 121 will lift the arm 119 and hold the nail punch 83 in its extreme outward position. 10 15 20

It will be apparent from the foregoing that the nail 82 must not be driven by its punch 83 until the cover has been fully compressed and the strap has been drawn taut, which will occur just prior to the completion of the downward movement of the drive bar 27. 25

Also the nail punch 83 when actuated to drive the final nail in the strap may also have associated therewith a cutter which will sever the attached strap from the source of supply and this cutting operation also must not occur until after all of the pressing and tightening operations have been completed. 30

By referring particularly to Figures 12 and 17, it will be observed that the slide block 114 has attached thereto a relatively thin cutter blade 123 which operates in a channel 124 immediately below the nail chuck assembly and immediately above the upper surface of the anvil 84 so that upon each driving operation of the nail punch 83, the cutter blade 123 will be moved over the top of the anvil 84 and will cut the strap 30 from the remainder of the supply. 35 40

By referring particularly to Figure 17 it will be observed that the opening 200 in the anvil 84, through which the strap is fed from the guide tube 41, is disposed at a considerable angle to the advancing end of the cutter blade 123, thus forming an opposing cutter blade assisting in the rapid and clean cutting of the strap material. 45 50

In order to insure, however, that the nail punch 83 and its cutter 123 will not operate until the final downward movement of the drive bar 27 occurs, a trigger 125, similar to the trigger 106, is employed to engage a shoulder 126 on the arm 119, this trigger being arranged to be actuated by a cam 127 mounted upon the drive bar 27 but, as will be observed from an inspection of Figure 3, arranged at a considerably higher level than the cam 109. Thus, the trigger 125 will not be released until after the initial movement of the right hand nail driving apparatus has started the right hand nail into the box and until the strap has been drawn taut upon the box. Then the nail punch 83 is released ready to perform its nailing operations on the engagement of drive roller 120 with the arm 119. 55 60 65

It will be observed from an inspection of Figure 3 that the drive roller 101 on the right hand side of the machine and the drive roller 120 on the left hand side of the machine are arranged at approximately the same level so that the final downward movement of the drive bars 26 and 27 will positively engage the drive arms 100 and 75

119 to complete the nail driving operations simultaneously.

When the nailing operation has been completed and the drive bars 26 and 27 start their return upward movement, to feed a new length of strap into the machine, it is desirable that the nail punch 83 and the cutter 123 shall be immediately retracted so as not to interfere with the incoming length of strap. This may be readily accomplished by providing a compression spring 122 surrounding a bolt 122a slidably supported upon the casting 80, the head of the bolt 122a being bifurcated as indicated at 122b to engage a pin 122c on the nail driver crank 116. The length of the bolt 122a is such that when the nail punch 83 and the cutter 123 are projected to their innermost positions, the pin 122c will have engaged the bolt 122a and moved the same inwardly against the force of the spring 122. Thus upon the initial upward movement of the drive bar 127, releasing the engagement of roller 120 from the arm 119, the spring 122 will instantly retract the crank 116, drawing the nail punch 83 and the cutter 123 outwardly to a sufficient distance to uncover the passageway for the incoming strap end as the drive bar 127 continues its upward movement the roller 121 will engage the arm 119 to fully retract the cranks 116.

As pointed out hereinbefore, the carrier bars 55—56 and 57—58 are pivotally mounted so that they may swing outwardly and inwardly relative to a box placed upon the supporting table 10. It will also be observed that the upper ends of the carrier bars are formed with an inwardly extending cam surface 128 engageable by rollers 129 mounted upon the press shoe 16. The press shoe 16 when in its elevated position, representing the end of one cycle of operation of the machine, will engage and move the carrier bars outwardly to insure a relatively wide passage through the machine for the entry and exit of boxes. However, before the pressing and strap securing operations are performed, it is desirable that the carrier bars shall move inwardly toward the box 15 which is to be strapped to thus insure that the nail chucks will press tightly against the sides of the box even though the box may vary slightly in its width. This inward movement of the carrier bars with their nail chucks is accomplished by connecting the carrier bars 55 and 56 with a cross casting 130 and by connecting the carrier bars 57 and 58 with a similar cross casting 131. The cross casting 130 has secured to its face a pair of longitudinally extending fruit flushing blades 132 and 133, the outer ends of which are connected respectively to vertically extending bars 134 and 135. Bar 134 is pivoted upon the same shaft 59 which pivots the carrier bars 55 and 56 while the bar 135 is pivoted upon a similar shaft 136 aligned with the shaft 59. At the opposite side of the machine the cross casting 131 is connected to a pair of longitudinally extending blades 137 and 138 connected respectively to upright bars 139 and 140, of which bar 140 is pivoted upon the shaft 61 which pivots the carrier bars 57 and 58, while upright bar 139 is pivoted upon a shaft 141 aligned with shaft 61.

Upright bars 134 and 140 are connected across the machine by means of a relatively heavy tensioned spring 142 (Fig. 12), while a spring 143 similarly connects upright bars 135 and 139 (Fig. 3). Thus, as soon as the press shoe 16 starts downwardly, the carrier bars will be swung inwardly by the springs 142 and 143 to serve not only the purpose of drawing the nail chucks tight

against the box but also serving the purpose of centering the box 15 upon the supporting table 10. Further, the blades 132—133 and 137—138 may be arranged at such a level that they will just clear the upper edges of the sides of the box and their inward movement toward the box may be employed as a flusher for engaging any overhanging contents of the box and pressing the same inwardly of the box prior to the compression of the cover by the press shoe 16.

From the foregoing description, it will be apparent that I have provided a strapping machine for placing straps across the covers of boxes by drawing a length of strap from a source of supply, passing the same over the cover of the box, attaching the free end to the box, compressing the cover upon the box, drawing the strap tight upon the box, nailing the opposite end of the strap to the box, then severing the strap so applied from the source of supply, and then returning the operating parts of the machine to their initial position, releasing the box, and feeding a new length of strap into the machine ready for the succeeding box.

Therefore, the operation of the machine thus far described is as follows. A box 15 to be strapped is fed into the machine upon the rollers of the box supporting table 10 and is drawn into such position upon the supporting table as will align the approximate center of the box with the uprights 4—5 and 6—7 of the machine, where the box may be held by any suitable box stop mechanism illustrated at 144 and 145, the construction of which may be substantially identical with any of the well known box centering or stopping mechanisms employed on box nailing and strapping machines common in this industry.

Assuming that at this time the machine is in its normal position as shown in Figures 1, 2 and 3, the press shoe 16 will be elevated out of the way of the incoming box, the carrier bars 55—56, 57—58 will be retracted to allow plenty of space for the box to enter, and the drive bars 26 and 27 will be in their elevated position. By virtue of which, the shaft 46 will have been previously rotated to feed into the machine a length of strap 30 from the supply so that the free end of the strap is now resting upon the anvil 64. Also, by reason of the elevated position of the drive bars 26 and 27, both of the nail driving mechanisms will be retracted, the nail punch 72 being cocked, and the nail punch 83 being also in its fully retracted position with the cutter blade 123 retracted.

The operator may now draw the drive bars 26 and 27 downwardly, as will be hereinafter described, either by manual power or by the operation of suitable motor mechanism. Downward movement of the drive bars 26 and 27 will first move the press shoe 16 downwardly toward the box past the cam surfaces 128 (Fig. 3), thus allowing the springs 143 to move the carrier bars 55—56 and 57—58 inwardly toward the box engaging the anvils 64 and 84 with opposite sides of the box to insure proper centering of the box upon the supporting table and to insure flush alignment of the anvils with the sides of the box.

Further, this initial inward movement of the carrier bars 55—56 and 57—58 also moves the flushers 132—133 and 137—138 toward the box to engage any overhanging contents of the box and press the same inwardly of the edges of the box. Further downward movement of the drive bars 26 and 27 will, by reason of the cam 109

and trigger 110 cause initial driving of the nail on the right hand side of the machine through the free end of the strap and partially into the box; further movement will compress the cover of the box and draw the strap tight thereon by the engagement of the press shoe 16 and by the reverse rotation of the shaft 46.

Continued downward movement of the drive bars 27 will drive both of the nail punches 72 and 83 inwardly to drive the nails home, while the cutter 123 will be actuated to sever the now attached strap from the supply.

At this point it might be noted that the nail punch 72 may have associated therewith a crimping blade 146, the outer end of which will engage the free end of the strap when the right hand nail is finally driven and will crimp or tuck the free end of the strap into the wood of the side wall of the box 15, thus preventing any edge of the strap from protruding where it may injure the hands of persons thereafter handling the box. Also the shape of the cutting end of the cutter 123 on the left hand side of the machine is such that after the completion of the cutting operation it will also press the freshly cut end of the strap into the wood of the box side, thus in effect counter-sinking the ends of the strap on both sides of the box.

The box, with its strap attached thereto, is now ready to be released from the machine, which is accomplished by the operator's elevation of the drive bars 26 and 27 (either by power or manual operation as hereinafter described), which will cause retraction of the nail punches 72 and 83 with their crimping and cutting blades 146 and 123 and which will also reversely rotate the shaft 46 to feed into the machine a new length of strap.

At this point it should be noted that due to the coupling of the shaft 46 with the feed roller 39 through the agency of the pin 52 engaging one or the other of the spaced pins 50—51 a slight time lag will be produced between the retractive movement of the cutter blade 123 and the start of the feeding in of the new length of strap so that the cutter blade will be retracted away from the upper end of the guide tube 41 before the upward feeding of the strap is started.

The final upward movement of the drive bars 26 and 27 will recock the nail punch 72 and will insure final and complete retraction of the nail punch 83.

The nails employed may be fed into the nail chucks from a suitable nail pan 147 mounted upon the upper end of the uprights 4—5, 6—7, from which the nails may be fed through suitable nail pick mechanism 148 similar in construction to the nail pick mechanisms commonly employed in this industry. The nails so selected may be fed through nail tubes 149 and 150 to their respective nail chucks, though I prefer to connect the lower ends of the nail tubes to a block 151 resting upon the nail chucks and held in place thereon by means of suitable spring actuated plungers 152 so that they may be readily removed when desired.

As hereinbefore stated, the operation of the machine may be either by power or by the manual force exerted by the operator thereof. I have illustrated the machine as power driven in Figures 1 to 19, in which an electric motor 157 is mounted upon the motor plate 158 which, in turn, is secured to the base of the machine as by trunnion bearings 159. By referring particularly to Figures 4 and 5, it will be observed that

the end of the motor mounting plate 158 opposite to the trunnion bearings 159 is formed with a pair of lugs 160 thereon which extend over a pair of upstanding bolts 161 around each of which is coiled a compression spring 162. Thus, when the motor is operated to drive the operating parts of the machine, the motor will exert a sufficient force to operate the press shoe 16 and to operate the nail drivers 72 and 83 but in the event that a box happens to be more overpacked than normal, the motor base will yield upon the springs 162 to prevent damage to the box or the fruit of such abnormal pack.

Further, the motor 157 (Figs. 3, 6 and 7) is connected to the crossbar 23 through a crosshead 163 which is slidable upon the bar 23 and is engaged by a crank pin 164 mounted upon the driven plate 165 of a friction clutch, of which the driving member 166 is keyed directly to either the motor shaft or to the shaft of a reduction gearing preferably formed integrally with the motor 157. Thus, as the crossbar 23 is drawn downwardly upon a substantially over-packed box, sufficient pressure will always be exerted to move the drive bars 26 and 27 of the machine to their normal full length of travel, any undue resistance to the movement of the drive bars 27 being compensated for by the slipping of the clutch 165—166. However, it must be observed that in order to insure the full driving of the nails in the sides of the box, the drive bars 26 and 27 must be moved downwardly to substantially the same level upon each operation of the machine and for this reason the clutch 165—166 must be adapted to exert sufficient pressure to accomplish this full travel of the drive bars.

By reason of the connection of the motor 157 to the crossbar 23, through the crosshead 163, one complete rotation of the disc 165 will first draw the drive bars 26 and 27 downwardly during one-half of the revolution of the disc 165, while during the last half of the revolution the drive bars 26 and 27 will be elevated to their normal position as shown in Figures 1, 2 and 3. In order to insure that the motor 157 will stop when the drive bars 26 and 27 have been completely elevated, I provide a motor control which preferably includes a switch 167 arranged to be closed by actuation of a control pedal 168 (see Figure 3). The control pedal 168 is preferably formed upon the end of a lever 169 rigidly secured to a shaft 170 to which is also rigidly secured a lever 171 connected to the switch 167 by connecting rod 172. Thus, depression of the pedal 168 will close the switch 167 and start the motor. By referring particularly to Figures 3, 4, 5 and 6, it will be observed that the periphery of the disc 165 is provided with a notch 173 into which a roller 174 is mounted upon an upstanding lever 175 may rest when the notch 173 is aligned with the end of the lever 175. The lever 175 is likewise rigidly secured to the shaft 170 so that once the pedal 168 has been depressed and the motor started, rotation of the disc 165 will present its greatest periphery to the roller 174 and will hold the shaft 170 in its depressed position, maintaining the circuit closed for the motor until the disc 165 has traveled through one complete revolution to again present the notch 173 to the roller 174.

It will thus be observed that a momentary depression of the pedal 168 will cause the disc 165 to rotate through one complete revolution and it follows that the crossbar 23 will be moved through one complete cycle of operations,

namely, first drawn downwardly to its fullest extent and then raised upwardly to again assume its normal elevated position as shown in Figure 3.

If desired, a brake 176 (Figs. 1, 4 and 5) may be mounted upon a crank 177 also rigidly secured to the shaft 170, the brake 176 engaging a brake drum 178 on the motor shaft so that depression of the shaft 170 by the pedal 168 will withdraw the brake 176 from the brake drum 178 until the roller 174 is again received in the notch 173 allowing spring 170' to move the shaft 170 to again place the brake against its drum and insuring rapid stopping of the motor without over-travel.

In view of the fact that with my machine the operation and control thereof consists merely in first drawing the drive bars 26 and 27 downwardly to perform one-half of the cycle of operations and then returning the drive bars 26 and 27 to their uppermost position to perform the last half of the cycle of operations, the machine is readily adapted to manual operation as shown in Figures 20 and 21, in which the shaft 46 is illustrated as being provided with a sprocket 180 over which passes a chain 181, one end of the chain being secured to a depressing lever 182 while the other end of the chain is connected to an elevating lever 183. Thus, to manually operate the machine, all that is necessary is for the operator to first step upon the pedal 182 operating the shaft 46 which, through the pinions 53 and gear racks 54 on drive bars 26 and 27, will draw these drive bars downwardly in the same manner as though they had been drawn by the application of force to the crossbar 23. Then when the pressing and nailing operations on the strap have been completed by the downward movement of the drive bars 26, the operator may step upon the elevating pedal 183 to reelevate the drive bars 26 and 27, performing the last half of the cycle of operations.

While I have thus far described my strapping machine as adapted only to apply straps to boxes, it will be apparent to those skilled in the art that the machine may readily be employed for the purpose of placing lids upon the boxes and for clamping them in place while the ends of the cover are nailed to the ends of the box.

In order to so adapt the machine, a pair of press frames 184 and 185 (Fig. 18) may be secured to the press shoe 16, one of the press frames 184 being secured to one of the plates forming the press shoe 16 while the other press frame 185 is secured to the opposite plate forming the press shoe 16. The outer ends of the press frames may be formed with laterally extending feet 186 adapted to engage the cover to be applied to boxes at a point spaced inwardly a short distance from the extreme ends of the cover. Thus, when the machine is operated to draw the drive bars 26 and 27 downwardly and to draw the press shoe 16 downwardly, the press frames 184 and 185 will engage the ends of the cover and spring the same down over the protruding over-packed fruit until the cover ends have engaged the box ends ready to be nailed thereto.

With this adaptation of my machine, however, it is necessary that the cycle of operations of the machine be interrupted at the point at which the drive bars 26 and 27 are at their lowest level and for this purpose the disc 165 may be provided with two notches 173 arranged at diametrically opposite points upon the disc so that when the disc has rotated through one-half of a

revolution, representing the travel of the drive bars 26 and 27 from their uppermost to their lowermost position, one of the notches 173 will be pressed opposite the roller 174 and will allow the switch 167 to be opened and the brake 176 applied to stop the motor and hold the motor stopped with the drive bars in their lowermost position and requiring a subsequent operation of the pedal 168 to again start the motor to complete the cycle.

During the interval, the cover ends may be nailed to the box ends by hand or, if desired, suitable automatic nail driving apparatus may be incorporated in the machine (not shown but which will be readily understood by those skilled in the art), to automatically nail the cover to the box.

While I have shown and described the preferred embodiment of my invention, I do not desire to be limited to any of the details shown or described herein except as defined in the appended claims.

I claim:

1. In a machine for applying straps to boxes, a supporting table for supporting boxes ready to be strapped, means for feeding a strap across said table above the position of a box thereon, means for initially partially nailing the free end of said strap to said box, means for reversing the strap feeding means to draw said strap taut upon said box, means for nailing the strap to the opposite side of said box, and means for completing the nailing of said free end of said strap to said box.

2. In a machine for applying straps to boxes, a box supporting table, means for feeding a predetermined length of strap across said supporting table to position a strap across a box thereon and for retracting said strap to draw the same taut upon the box, nailing means for nailing the free end of said strap to said box, and means controlled by said nailing means for preventing said feeding means from retracting said strap until the free end thereof is nailed to said box.

3. In a machine for applying straps to boxes, a box supporting table having uprights at opposite sides thereof, and means for feeding a strap across said nailing table between said uprights including an arcuate strap guide extending between said uprights and means on said strap guide for deflecting the free end of the incoming strap downwardly to bow said strap above said supporting table.

4. In a machine for applying straps to boxes, a box supporting table, a pair of drive bars, one on each side of said table, means mounting said drive bars for vertical reciprocation relative to said table, nailing means actuated by movement of said drive bars for nailing a strap to opposite sides of a box on said supporting table, means for supporting a supply of strap material, means for feeding material from said supply across said table and for retracting said material to draw the strap taut upon a box on said table, and means actuated by movement of said drive bars in one direction for operating said strap feeding means to pass a predetermined length of strap across said table and actuated by reverse movement of said drive bars for retracting said strap material to draw the same tight upon a box.

5. In a machine for applying straps to boxes, a supporting table for boxes to be strapped, a pair of nailing means mounted on opposite sides of said supporting table, means supporting a sup-

ply of a continuous length of strap material, strap feeding means engageable with said strap material for feeding said material in a direction from said source of supply and in a direction toward said source of supply, a pair of vertically reciprocating drive bars for actuating said nailing means, means for reciprocating said drive bar and means operable by movement of said drive bars to drive said strap feeding means to feed strap from said supply when said drive bars are moved in a direction to retract said nailing means and to feed strap material toward said supply when said drive bars are moved in a direction to nail said strap to said box.

6. In a machine for applying straps to boxes, a supporting table for boxes to be strapped, a pair of nailing means mounted on opposite sides of said supporting table, means supporting a supply of a continuous length of strap material, strap feeding means engageable with said strap material for feeding said material in a direction from said source of supply and in a direction toward said source of supply, a pair of vertically reciprocating drive bars for actuating said nailing means, means for reciprocating said drive bar and means operable by movement of said drive bars to drive said strap feeding means to feed strap from said supply when said drive bars are moved in a direction to retract said nailing means and to feed strap material toward said supply when said drive bars are moved in a direction to nail said strap to said box, said last recited means including means for delaying the action of said feeding means to feed strap toward said supply until said nailing mechanism has been actuated to secure the free end of said strap material to said box.

7. In a machine for applying straps to boxes, a supporting table for boxes to be strapped, a pair of nailing means mounted on opposite sides of said supporting table, means supporting a supply of a continuous length of strap material, strap feeding means engageable with said strap material for feeding said material in a direction from said source of supply and in a direction toward said source of supply, a pair of vertically reciprocating drive bars for actuating said nailing means, for reciprocating said drive bars, and means operable by movement of said drive bars to drive said strap feeding means to feed strap from said supply when said drive bars are moved in a direction to retract said nailing means and to feed strap material toward said supply when said drive bars are moved in a direction to nail said strap to said box, said last recited means including means for delaying the actuation of said feeding means to feed strap from said supply until said nailing means has been retracted.

8. In a machine for applying straps to boxes, a box supporting table, a pair of nail driving mechanisms, one mounted on each side of said box supporting table, means for initially actuating one of said nail driving mechanisms to secure one end of a length of strap material to one side of a box, means for drawing said strap material taut across said box, and means for then actuating both of said nailing mechanisms to completely secure both ends of said taut strap to said box.

9. In a machine for applying straps to boxes, a box supporting table, a pair of nail driving mechanisms, one mounted on each side of said box supporting table, means for initially actuating one of said nail driving mechanisms to partially nail one end of a length of strap ma-

terial to one side of a box, means for drawing said strap material taut across said box, means for then actuating said nailing means on the opposite side of said box to secure said taut strap to said box and means for then actuating said first named nailing means to complete the nailing of said first named end of said strap to said box.

10. In a machine for applying straps to boxes, nailing means for securing one end of a length of strap material to a box, means for partially actuating said nailing means to partially secure one end of said strap to a box, means for completing the actuation of said nailing means to completely secure said end of said strap to said box, and means for drawing said strap taut across said box between said partial operation and said completed operation of said nailing means.

11. In a machine for applying straps to boxes, a box supporting table, a pair of nail driving mechanisms, one mounted on each side of said box supporting table, means for partially actuating one of said driving mechanisms for partially securing one end of a strap to a box, and means for thereafter simultaneously actuating both of said nailing mechanisms to simultaneously complete nailing operations on both sides of said box.

12. In a machine for strapping boxes and the like, the combination of: means for feeding strap material along its own axis across the top of a box in a plane disposed transversely of said box; nailing mechanisms at opposite sides of said box; means mounting said mechanisms for movement toward and away from said box; and a flexible strap guide means having its opposite ends mounted on said nailing mechanisms and shiftable therewith, the flexible character of said guide means causing the latter to automatically adjust its contour so as to properly guide said strap regardless of the positions of said nailing mechanisms.

13. In a machine for applying straps to boxes, the combination of: a table for supporting a box; means for feeding a strap into position across said box to permit said strap to be nailed to said box; nailing mechanisms positioned opposite those portions of said box to which said strap is to be nailed, said nailing mechanisms being disposable away from said box when the latter is received in said machine and toward said box to facilitate said strap nailing operation; and gathering members mounted for inward movement with said nailing mechanisms to gather produce inwardly from over upper edges of the sides of said box prior to said strap being nailed to said box.

14. In a machine for applying straps to boxes, the combination of: a table for supporting a box; means for feeding a strap into position across said box to permit said strap to be nailed to said box; nailing mechanisms positioned opposite those portions of said box to which said strap is to be nailed; arms disposed on opposite sides of said box, said nailing mechanisms being mounted on said arms, the pivots of said arms being spaced substantial distances vertically from said nailing mechanisms; and gathering members mounted on said arms, said arms being swingable inward towards said box to bring said nailing mechanisms into their proper positions for nailing the said strap to said box and to bring said gathering members into position to gather produce inwardly from over upper edges

of the sides of said box prior to said strap being nailed to said box.

15. In a machine for applying straps to boxes, the combination of: a table for supporting a box; means for feeding a strap into position across said box to permit said strap to be nailed to said box; nailing mechanisms positioned opposite those portions of said box to which said strap is to be nailed, said nailing mechanisms being disposable away from said box when the latter is received in said machine and toward said box to facilitate said strap nailing operation; gathering members mounted for inward movement with said nailing mechanisms to gather produce inwardly from over upper edges of the sides of said box prior to said strap being nailed to said box; and flexible strap guide means having its opposite ends mounted on said nailing mechanisms and shiftable therewith, the flexible character of said guide means causing the latter to automatically adjust its contour so as to properly guide said strap regardless of the positions of said nailing mechanisms.

16. In a machine for applying straps to boxes, the combination of: a table for supporting a box; means for feeding a strap into position across said box to permit said strap to be nailed to said box; nailing mechanisms positioned opposite those portions of said box to which said strap is to be nailed; arms disposed on opposite sides of said box, said nailing mechanisms being mounted on said arms, the pivots of said arms being spaced substantial distances vertically from said nailing mechanisms; gathering members mounted on said arms, said arms being swingable inward towards said box to bring said nailing mechanisms into their proper positions for nailing the said strap to said box and to bring said gathering members into position to gather produce inwardly from over upper edges of the sides of said box prior to said strap being nailed to said box; and flexible strap guide means having its opposite ends mounted on said nailing mechanisms and shiftable therewith, the flexible character of said guide means causing the latter to automatically adjust its contour so as to properly guide said strap regardless of the positions of said nailing mechanisms.

17. In a machine for applying straps to boxes, the combination of: a frame; a table on said frame for supporting a box with a cover disposed thereover; means for feeding a strap into position across said box to permit said strap to be nailed to said box; nailing mechanism positioned on said frame opposite those portions of said box to which said strap is to be nailed; means slidable vertically on said frame for shaping said cover transversely; and means on said slidable means for actuating said nailing mechanisms when said cover is thus shaped.

18. In a machine for applying straps to boxes, the combination of a frame; a table on said frame for supporting a box with a cover disposed thereover; means for feeding a strap into position across said box to permit said strap to be nailed to said box; nailing mechanisms positioned on said frame opposite those portions of said box to which said strap is to be nailed; means slidable vertically on said frame for shaping said cover transversely; and means on said vertically slidable means for actuating said strap feed means.

19. In a machine for applying straps to boxes, the combination of: a table for supporting a box with a cover disposed thereover; means for feeding a strap into position across said box to permit said strap to be nailed to said box; vertically slidable means operatively connected to said strap feed means to actuate the latter; nailing mechanisms positioned opposite those portions of said box to which said strap is to be nailed; and means on said vertically slidable means for actuating said nailing mechanisms.

20. In a machine for applying straps to boxes, the combination of: a table for supporting a box with a cover disposed thereover; means for feeding a strap into position across said box to permit said strap to be nailed to said box; vertically slidable rack means for operating said strap feed means; nailing mechanisms positioned opposite those portions of said box to which said strap is to be nailed; and means on said vertically slidable means for actuating said nailing mechanisms.

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