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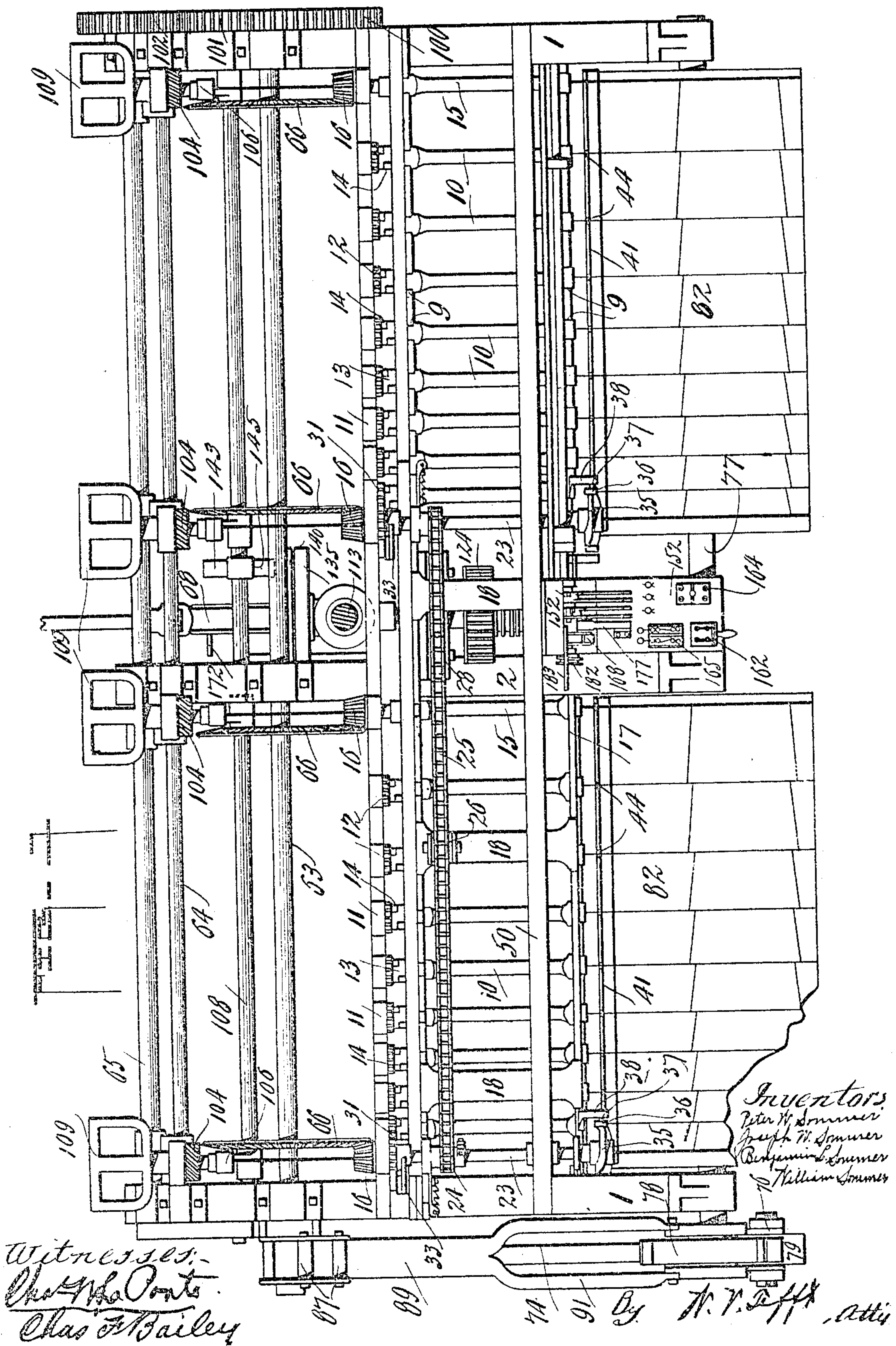
PATENTED NOV. 14, 1905.

P. W., J. W., B. L. & W. SOMMER.

WIRE FABRIC MACHINE.

APPLICATION FILED JULY 2, 1903. RENEWED OCT 9, 1905.

6 SHEETS—SHEET 1.



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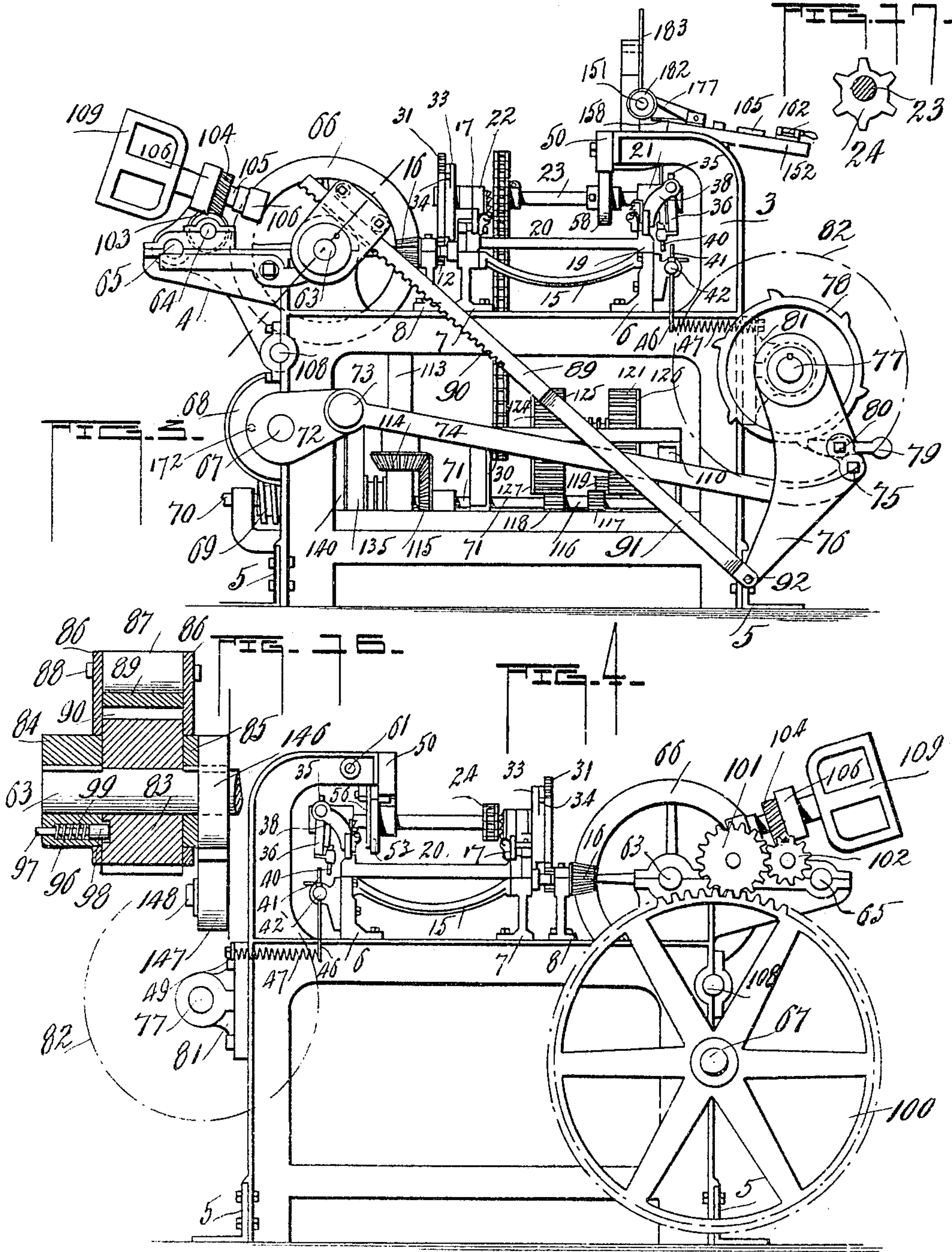
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6 SHEETS—SHEET 3.



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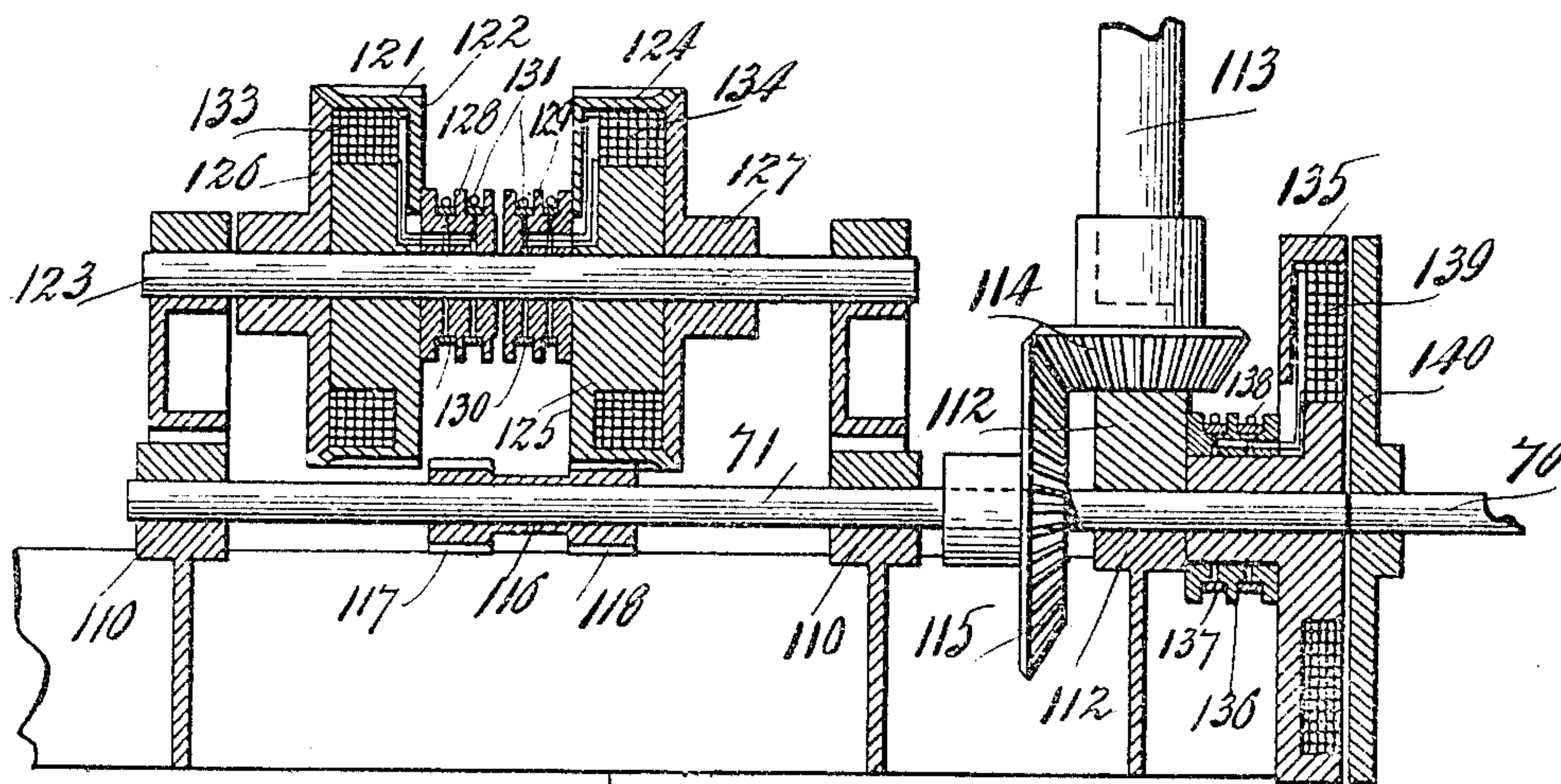
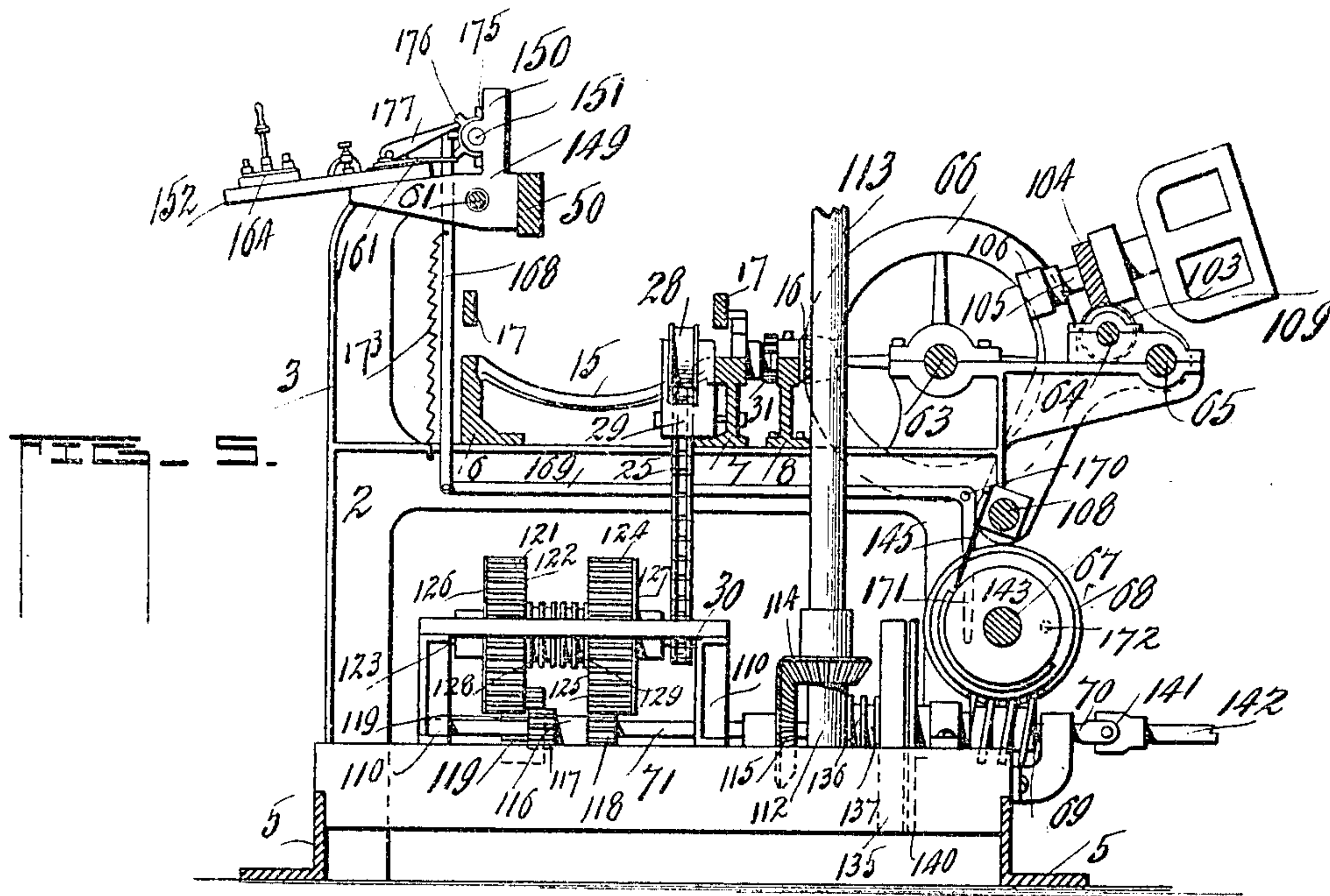
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6 SHEETS—SHEET 4.



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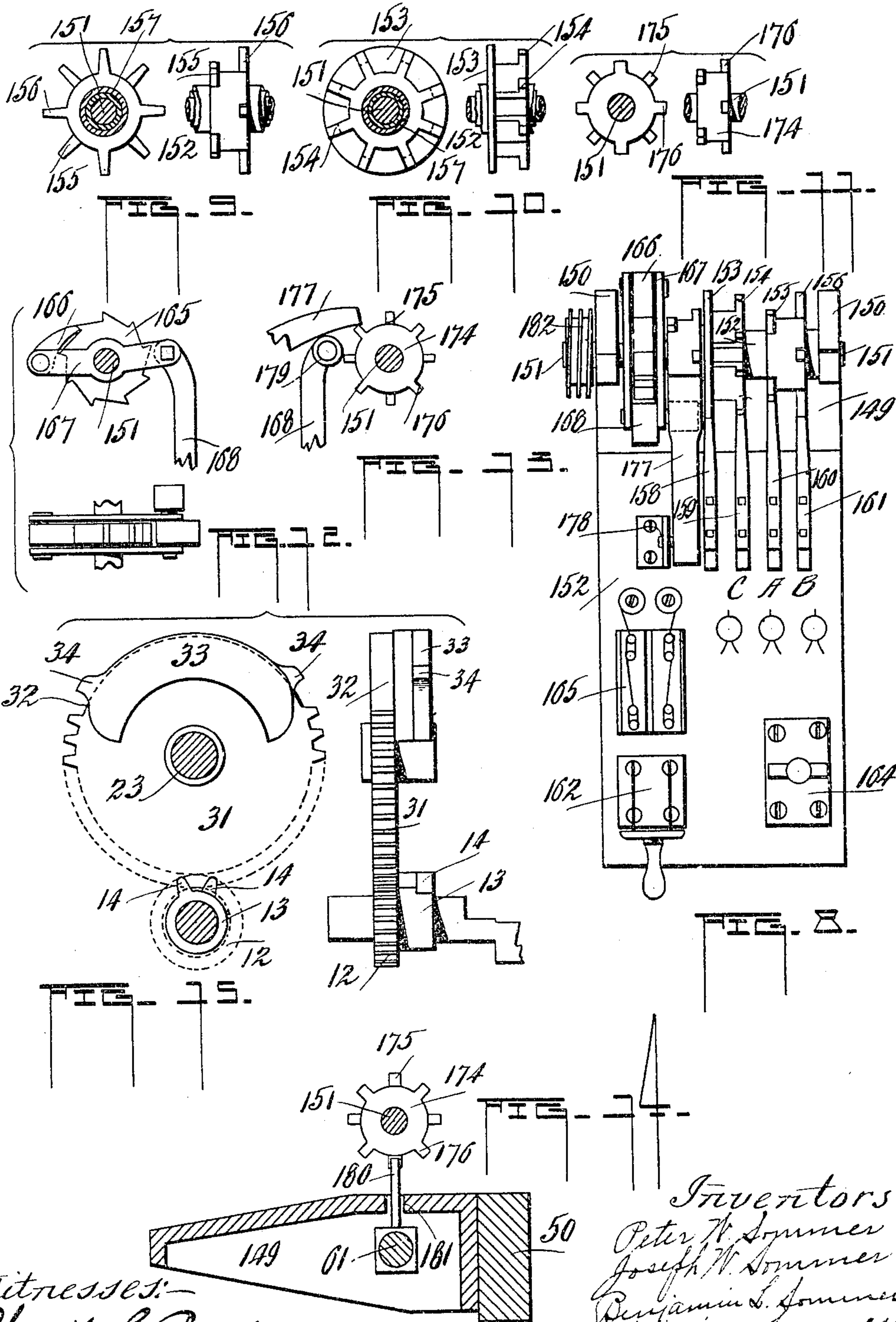
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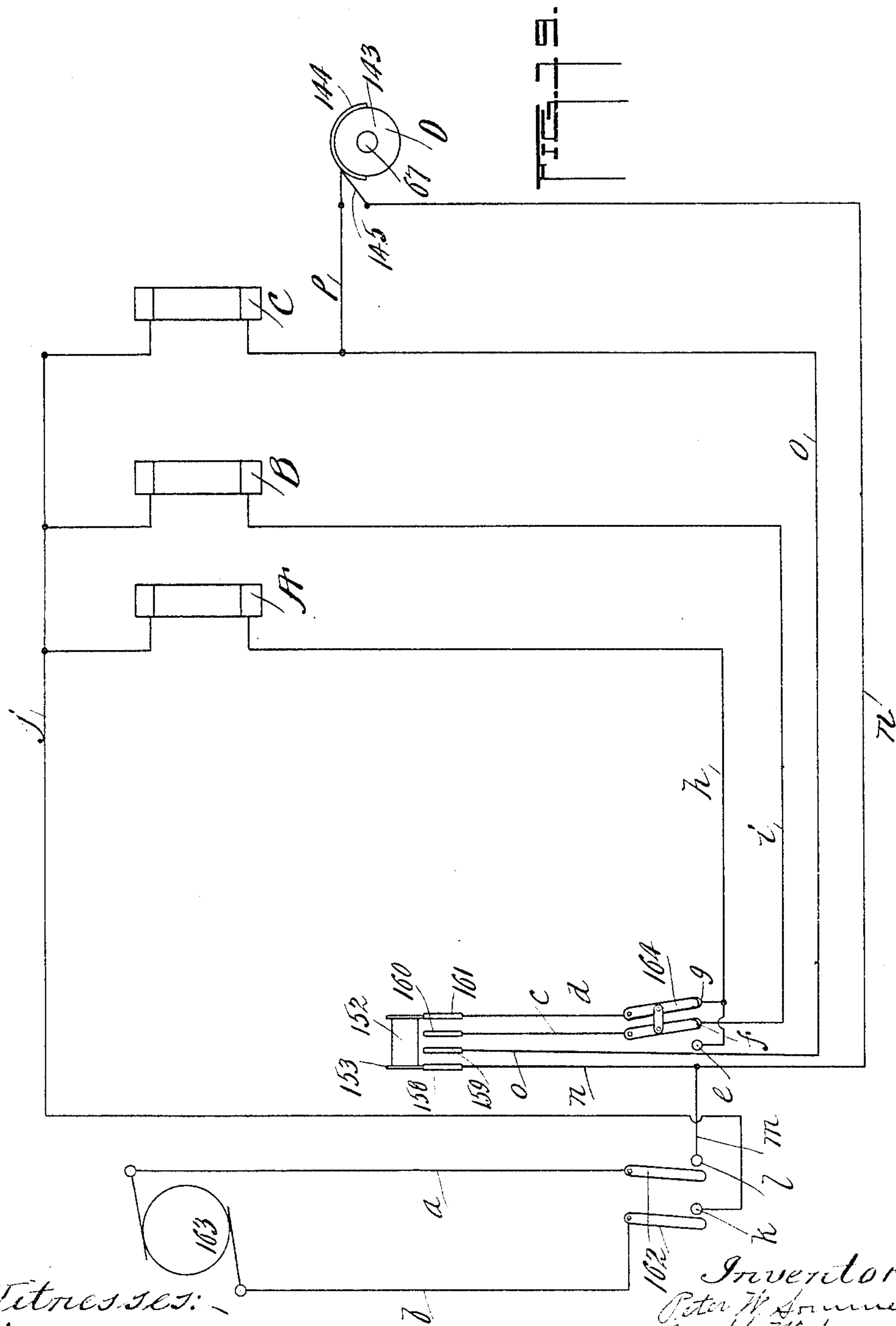
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UNITED STATES PATENT OFFICE.

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WIRE-FABRIC MACHINE.

No. 804,681.

Specification of Letters Patent.

Patented Nov. 14, 1905.

Application filed July 2, 1903. Renewed October 9, 1905. Serial No. 282,015.

To all whom it may concern:

Be it known that we, PETER W. SOMMER, JOSEPH W. SOMMER, BENJAMIN L. SOMMER, and WILLIAM SOMMER, citizens of the United States, residing at Peoria, in the county of Peoria and State of Illinois, have invented certain new and useful Improvements in Wire-Fabric Machines; and we do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

This invention has reference to machines for the manufacture of wire fence and fence fabrics.

The particular class to which the machine belongs is for the manufacture of wire fences substantially as shown in the patent to Peter Sommer, John Sommer, and Peter W. Sommer, dated October 29, 1889, No. 414,125; and the invention herein is an improvement upon Patent No. 651,785, dated the 12th day of June, 1900, and patent bearing number 711,011, dated the 14th day of October, 1902. In these two patents mentioned the bed, twister-sections, clamping devices, and framework are somewhat similar to those shown in this application, and it is understood that while such a structure is shown and partially described no claim for the same is made.

The object of the present invention is to provide new and improved means on the carriage for intermittingly transmitting power to the twister-sections in the bed; further, to provide new and improved pull-out mechanism operatively carried upon the carriage.

A further object of the invention consists in a new and improved cable-feeding device and to the mechanism for imparting momentum to the cable-twister sections of the bed, the mechanism referred to being operatively connected with the clamp-supporting shaft.

A further object of the invention consists in the provision of magnetic clutches for imparting power to and reversing the movements of the carriage and, further, to commutator mechanism and brushes for opening and closing the circuit between the dynamo and clutches, respectively.

Our invention embodies many other details of construction, to be hereinafter more particularly described, reference being had to the accompanying drawings, forming a part of such description, in which—

Figure 1 is a plan view of a machine embodying our improvements. Fig. 2 is a front elevation of the machine shown in Fig. 1 with the clamping devices removed. Fig. 3 is an end view from one end of the machine shown in Fig. 1. Fig. 4 is an end view from the end opposite to that shown in Fig. 3. Fig. 5 is a vertical transverse section through a point approximately central of the machine seen in Fig. 1. Fig. 6 is an enlarged transverse section of the clutches and component parts for driving the carriage in opposite directions and of the clutch which controls the movement of the clamp and cable-twisters. Fig. 7 is an elevation, certain parts in dotted lines, of a portion of the bed and operative parts of the carriage engaging such portions of the bed. Fig. 8 is an enlarged view in plan of the commutator mechanism, brushes, and poles which control the currents between the dynamo and clutch parts of the machine. Fig. 9 shows two views in elevation of the commutator-segments for opening and closing the circuits to the magnetic clutches which control the movements of the carriage. Fig. 10 shows two views in elevation of the commutator having direct connection with the dynamo and used for controlling the movements of the clutch designed to actuate the clamps and cable-twisters. Fig. 11 shows two views, in opposite elevation, of parts carried by the commutator mechanism. Fig. 12 shows two views, in elevation and plan, of mechanism designed to be actuated for intermittingly rotating the shaft carrying the commutator-segments. Fig. 13 shows in detail and in elevation parts seen in Figs. 8 and 11. Fig. 14 is an elevation in cross-section of parts operatively connected with the devices shown in Fig. 11. Fig. 15 shows enlarged opposite elevations of the mechanism carried by the carriage for imparting momentum to the twister-sections of the bed, the mechanism of the twister-sections shown coacting with the devices of the carriage. Fig. 16 is an enlarged detail in cross-section of devices employed in connection with the cable-twisting mechanism and clamping parts. Fig. 17 is a detached elevation of an eccentrically-carried sprocket on the carriage. Fig. 18 is a detached elevation of the gear shown in cross-section in Fig. 16. Fig. 19 is an outline of the electrical system employed by us for actuating the clutches.

The framework of the machine comprises

the end supports 1 and the intermediate support 2. Each of said supports is provided with the vertically-disposed extensions 3 at their forward end and the laterally-disposed extensions 4 from their rear upper ends. The supports 1 and 2 are suitably connected and braced by the ground-plates 5.

What will hereinafter be known as the "bed of the machine" consists of the longitudinal bed plates or frames 6, 7, and 8, the ends of which are supported on the supports 1 and intermediate said supports by the support 2. The bed-plates 6 and 7 are spaced suitably apart, with the former adjacent to the forward end of the supports and the latter somewhat to the rear thereof, and the plate 8 is disposed to the rear of the plate 7 and separated a short distance therefrom. The upper faces of the bed-plates 6, 7, and 8 are provided with semicircular depressions 9. These depressions are not shown excepting the outer edges thereof, as seen in Fig. 1 on the plates 6 and 7; but they are similar and arranged substantially in the manner shown in the patents above referred to, and the said depressions are arranged in two series for the purpose of carrying a double series of twisting devices and for the further purpose of producing double the quantity of wire fence as would be produced by a single series of said sections. It is designed in this machine, as in the others referred to, to space the depressions in the plates at graduated distances apart, and starting from the left of the machine looking at Fig. 1 the spaces between the twister-sections are wider and wider apart as they near the center of the machine, and the same plan is carried out in the adjacent series, starting from the center of the machine. The twister-sections, which are similar in all respects to the twister-sections in the patents referred to, with the exceptions of their rear ends, are indicated as 10 and are bowed substantially as seen in Figs. 3 and 4, having their outer ends formed of semicircular portions seated in the depressions 9 and substantially in the same manner seated in the depressions of the plate 7; but their rear ends are circular in appearance and journaled in the plates 8, which are covered by the boxings 11. (See Figs. 1, 3, and 4.) The portions of the twisters bearing between the plates 7 and 8 are provided with the spur-pinions 12 and the enlarged cam-like bodies 13, formed with the extended fingers or lugs 14. These lugs are offset on the cam-like bodies 13 and one disposed adjacent to the pinion 12 and the other removed a short distance away therefrom, for a purpose to be described, and for a detail view showing the arrangement and disposition of these parts see Fig. 15. It is to be understood, however, that the pinions 12, cam-bodies 13, and lugs 14 form a part of what is known as the "intermediate" sections, which carry the strand-wires intermediate the cables of a fence fabric, and

that the cable or outer twister-sections of the series are devoid of these parts. For convenience the outer twister-sections, which carry the cables, will be indicated as 15, which carry on their rear ends the bevel-pinions 16, lying adjacent to the outer faces of the bed-plates 8.

Reciprocally arranged on the bed-plates 6 and 7 is a carriage which in operation, appearance, and construction is similar to the carriage seen in the above-mentioned Patent No. 711,011, with exceptions which will be noted from the following description: The carriage comprises the side frame-supports 17, connected at suitable points by the braces 18, and the same travel upon the shoes 19, connected by the cross-plates 20, the shoes designed to travel along the upper faces of the bed-plates 6 and 7. At the opposite ends of the carriage-frame parts are provided tubular bearings 21 and 22, in which is journaled the cross-shaft 23. On each of said shafts is carried the sprocket-pinions 24, one of which is designed to be eccentrically carried somewhat in the manner as seen in Fig. 17 for a purpose to be described. These pinions 24 are engaged by a sprocket-chain 25, which, as it travels between the two pinions on the upper run, is guided by an idler 26, supported by a standard 27, carried by the intermediate support 18, which connects the frame parts 17. (Best seen in Figs. 1 and 2.) The chain on the under run passes between and rides upon the idlers 28, journaled in the bracket 29, secured to the plate 7, and passing down into the body of the machine travels around a pinion 30, from which it derives its power. All the parts of the carriage above referred to, with the exception of the eccentrically-carried pinion 24, are substantially like unto the carriage described in the claims in Patent No. 711,011, and while no attempt has been made to show the manner of carrying and operating a spool of wire which forms the stay of the fabric to be manufactured these features are also designed to be similar to that shown in the Patent No. 711,011. The improvements in this carriage, as will shortly be noted, consist in the intermittent drive between the shafts 23 of the carriage and the intermediate twister-sections of the bed, also the pull-out mechanism supported by the carriage and operatively connected with the forward ends of the shafts 23. On the rear end of such shafts will be seen the segmental gears 31, rotating in a path to intermittingly engage the pinions 12 of the intermediate twister-sections 10. The segmental gears 31 are provided with cam-like surfaces 32, and attached to the faces of said gears and struck on an arc of a circle approximating or corresponding to the cam-like surface 32 of the gear is seen the plate or plates 33, provided with the oppositely-disposed offset lugs or toothed portions 34. The object of the segmental gear and the cam-

plates, with their toothed portions, is to provide for the intermittent rotation of the intermediate twister-sections 10 and to provide for a gradual intermeshing of the gear 31 and the pinions 12 and to hold the same stationary for a predetermined period and to provide for moving away from the pinions 12, leaving them in a position to be readily reengaged by the carriage parts when again coincident therewith. As the carriage moves across the bed and the gears 31 aline with the pinions 12 the pinions are given a preliminary starting movement by one of the lugs 34 engaging with one of the offset teeth 14, to insure the teeth of the gear 31 and the pinion 12 being smoothly and evenly thrown into mesh, and it is designed by the gear 31 to impart two rounds to the pinions 12, which of course will give a corresponding movement to the twister-sections 10, and as the teeth of the gear 31 move away from the teeth of the pinion the cam-surface of the plates 33 will be engaged by the teeth 14, and by such engagement the latter are held in a position which enables the carriage to move to the adjoining twister-sections in the bed and leave the pinions 12 and the teeth 14 in a position to be engaged by the lugs 34 when the carriage retraverses the bed.

The object of employing the cam-like member 13 with the oppositely-arranged and offset fingers 14, together with a segmental gear having the cam-plate 33, with the oppositely-disposed and offset lugs 34, is to provide as the carriage moves across the bed from one end to the other in opposite directions that the lugs 34 will alternately and intermittently engage the fingers 14 for imparting a preliminary rotation to the pinion 12 through the fingers 14 to insure a smooth engagement of the teeth of the gear 31 with the pinion 12. It is to be further understood that during the reciprocation of the carriage in one direction the pinion 31 will rotate in one direction, and when the carriage is reversed the rotation of the gear 31 will be just opposite to its previous movement, and thus it is necessary to provide for imparting this preliminary movement to the pinion 12 through the offset fingers 14 and the oppositely-disposed lugs 34.

Referring now to the pull-out mechanism, reference is had to the shafts 34, on the forward ends of which are carried the cams 35, the acting portions of the cams being their front faces. 36 indicates an oscillating bowed frame, the ends of which are pivotally connected at 37 to frame parts 38, supported by frames 17 of the carriage. (See Figs. 1 and 3.) The bowed portion of the frame 36 is designed to follow the contour of the peripheral face of the cams 35 and carry the vertically-disposed rollers 39, which are designed to be acted upon by the acting faces of the cams 35. Depending from the bowed frame 36 are shown the short studs or pins 40, placed a suitable distance apart from each other. These

pins 40 are designed to extend down in front of the forward ends of the twister-sections in the bed and designed to be carried upon opposite sides of wires carried through the twister-sections which are intertwisted with the stay-wire carried in the spool which travels with the carriage. At predetermined periods as the carriage reciprocates across the bed and the spools of said carriage are coincident with the strands or cables which are carried through the twister-sections of the bed the cam 35 through the action of the drive-chain 25 on the shaft 23 is rotated to bring the acting faces of the cam against the roller 39 of the frame 36, which oscillates or shifts the frame outwardly, causing its pins 40 to engage with the stay-wire and pull it out, and the carriage is reciprocated to the adjacent strand-wire and the operation successively carried out, as hereinbefore stated.

In connection with the pull-out mechanism just described is a wire guide comprising a plate 41, fixedly attached to short rods 42, which are journaled in brackets 43, secured to the front face of the bed-plate 6. The plates 41 are provided with a series of slots 44, extending down a suitable distance from their upper edges, and are spaced apart at graduated distances to correspond and to coincide with the twister-sections of the bed, and the strand wires and cables which are carried through the twistors extend through the slots 44 of the guide-plate 41. To the front face of the guide-plate 41 is attached the angular plate 45, upon which the wires rest as they are carried through the slots 44. To one end of the short rods 42 is attached a stem 46, to which is connected one end of a spring 48, the opposite end of which is attached at 49 to the frame parts 1.

During the operation of the clamping mechanism, to be more definitely referred to, which draws the fabric outwardly after the carriage has traversed the bed to complete a stay, the guide-plate 41 is tipped forward, permitting the stay to move over the guide, and the spring 48 automatically returns the plate 41 to its vertical position, with the strand-wires extending through its slots for the purpose of guiding the strands to the clamp.

The step-by-step movement imparted to the carriage in its movement across the bed and the mode of locking the same against movement when the spools thereof are coincident with the strand and cable wires are substantially the same as that shown in Patent No. 711,011 and will only be briefly described with a view of showing the complete operation of this machine.

50 is a cross-tie or plate secured at its opposite ends to the extension 3 of the frames 1 and intermediate said ends to a similar extension of the frame 2, and 51 is a frame or plate suitably supported by the main frame-supports or the tie 50, and its lower face is

provided with a series of grooves 50^a, arranged at graduated distances from each other in manner like the disposition of the twist-ers in the bed and corresponding in number to one series thereof, and 52 refers to lugs or stops depending from the cross-tie 50 and corresponds in number to the grooves in plate 51 and the twist-ers forming one series. The carriage in the position shown in the drawings is about ready to be advanced to the opposite side of the bed, although in Fig. 7 the carriage is shown nearing the opposite end thereof. The device coacting with the lugs of the cross-tie 50 and the depressions of the plate 51 consists of a cam 53, carried on one of the shafts 23 of the carriage, preferably the right-hand side looking at the carriage from the front. (See Figs. 2 and 7.) Coacting with such cam is a roller 54, carried on the extension 55 of an arm 56, the rear end of said arm 56 having a pivotal connection at 57 with a support attached to the center brace 18 of the carriage. The arm 56 also carries a roller 58, adapted to ride on the lower smooth surface of the frame 52 and intermittingly and successively drop into the notches 50^a thereof, while the cam 53 has operatively attached thereto the lug 59, adapted to intermittingly and successively engage with the lugs or stops 52 of the plate or cross-tie 50.

The carriage and its working parts being in the position shown and referred to, the cam 53 will be rotated sufficiently to bring the roller 54 on the arm 56 to its lowermost point in the cam. This movement will cause the roller 58 to slip out of the notch 50^a then engaged and cause the same to travel along the lower smooth surface of the bar 51, and at a given period the lug 59 of the cam will coact with one of the depending lugs 52, and simultaneous with such engagement the cam 53 will have rotated into such a position as to cause the roller 58 of the arm 56 to engage with the next successive depression 50^a of the bar 51, and during the period of stopping at these successive depressions 50^a the spool-sections of the carriage carrying the stay-wires are coincident with the successive strand-wires in the bed, and mechanism is brought into play for causing the stay-wire of the spool and the strand-wires to be twisted together, and the devices are further actuated so that the lug 59 of the cam will engage the opposite sides of the lugs 52 substantially in the manner and for the purposes described in the patent above referred to.

On the end of the carriage opposite to the cam and component parts just described is seen a roller 58^a on the shaft 23, which bears against the lower smooth surface of cross-tie 50 for firmly holding the end of the carriage to its work.

The carriage supports from one of its side frames 17 and at one end the arm 60, the

upper end of which is slidable on a reciprocally-supported rod 61, movable in suitable frame parts. On the rod 61 is secured the blocks 62, disposed at suitable points in proximity to its ends, which are intermittingly and alternately engaged by the arm 60 during the reciprocation of the carriage to impart to the rod 61 a corresponding movement for a purpose described.

63, 64, and 65 indicate longitudinal shafts journaled in suitable boxings on the extensions 4 of the end and intermediate supports 1 1 and 2. On the shaft 63 is carried a series of bevel-gears 66. The gears are designed to be adjusted, and for this reason: In the drawings the machine is shown capable of making a "ten-bar" fence with cables at opposite ends of each series. At any time the operator may rearrange the position of the stays and dispose the cable-twister sections so as to make a "nine-bar," "eight-bar," and so on, and for this reason the bevel-gears 66 on shaft 63 must be adjustable as the cable-twister sections are rotated through the action of the gears 66 intermeshing with the pinions 16 of the cable-twisters previously referred to. The mechanism which actuates gears 66 is operatively connected with clamping parts and derives its power from a suitable source.

67 refers to a longitudinally-carried shaft disposed down in the frame of the machine and journaled to the rear uprights of frames 1 1 and 2 and receives its power through a worm-wheel 68, which it carries and which meshes with a worm 69 on a shaft extension 70, forming a part of a power-shaft 71, but intermittingly disconnected therefrom, both of which will be hereinafter more fully described. On one end of the shaft 67 is carried a crank 72, the free end of which has pivotally attached thereto at 73 a pitman-rod 74, and the outer end of said pitman is pivotally connected at 75 with the oppositely-disposed frame parts or plates 76. The plates 76 are fixedly secured to a clamp-shaft 77, and on said shaft and between the plates is carried a ratchet-wheel 78, the teeth of which are engaged by a weighted pawl 79, pivotally supported at 80 between the plates 76. (See Fig. 3.) The clamp-shaft 77 extends across the entire front of the machine and is journaled on the forward uprights of supports 1 1 and 2 in boxings 81, and for each series of twist-ers a clamping-body is provided rotatably carried by the shaft 77 and indicated by dotted lines in the figures, as 82. The clamp is not shown in detail, for any suitable clamp may be employed. As the shaft 67 is rotated a corresponding movement will be imparted to the crank 72, which reciprocates the pitman-rod 74, and through the pawl 79 engaging the teeth of the ratchet-wheel 78 the clamp-shaft 77 and its clamping-body will be partially rotated. On the backward stroke

of the pitman 74 the pawl 79 will move into engagement with the adjacent tooth of the ratchet.

The shaft 67 is intermittingly actuated, and the power devices for imparting movement thereto will be hereinafter described in detail. The pitman-rod 74 and its connections with the plate 76 are the means, together with devices now to be described, for operating the shaft 63. On one end of the shaft 63 is carried a pinion 83, adapted to be intermittingly fixed for rotation with said shaft.

84 and 85 indicate collars fixedly attached to the shaft 63 and disposed upon opposite sides of the pinion 83. (See Fig. 16.)

86 indicates oppositely-placed guard-plates having a bearing on the collars 84 and 85, as seen in the figures, and 87 indicates rollers bearing between the plates and journaled thereto, as at 88.

89 indicates a reach having the toothed portion 90 intermeshing with the pinion 83 and retained in proper engagement with such pinion by the rollers 87, which bear against the upper face of the forward or toothed portion 90 of the reach 89. The opposite end of the reach diverges into the bifurcated extensions 91, which extend down upon opposite sides of the reach 74 and their ends pivotally attached at 92 to the lower ends of the plates 76. In the outer face of the pinion 83 is provided a depression or slot 93, struck on an arc of a circle from the center of the pinion, the same starting from nothing and reaching a suitable depth at its terminus to provide the seat portion 94 and the wall 95. In the collar 84 is provided a perforation 96 through the same, and through the perforation is carried a stem 97, having the enlarged head portion 98, which is designed to travel in the slot 93 and intermittingly engage the seat 94 and the end wall 95 thereof, a spring 99 being employed in the perforation 96 to normally thrust the stem into the depression 93 of the pinion at a predetermined period. When it is designed to actuate the cable-twisters through the action of the pitman 74 and its power connections, the reach 89 is reciprocated, which will rotate the pinion 83 in a direction to cause the end wall 95 of the slot 93 to bear against the stem 97, which being in the collar 84 and that secured to the shaft 63 the latter will be caused to rotate, and with it the gears 66 and the pinion 16, and with the pinion 16 the cable-twisters. During the return of the pitman 89 the rotation of the pinion 83 will be in an opposite direction to that just described, when the wall 95 of the depression 93 will move away from the stem 95, causing it to bear more and more against the shallower portion of the depression until it rides on the smooth face of the pinion, forcing the spring 99 back and by such movement enabling the pinion to rotate to enable the reach to return to its previous position

and yet not disturb the shaft 63 or the gears 66 until the return of the pitman 89, when the same operation just described will occur. Referring to shaft 67, on the end opposite to the crank 72 is carried a gear-wheel 100, which meshes with a gear 101 on shaft 64, and gear 101 meshes with a gear 102 on shaft 65. On shaft 64 is carried a series of spiral pinions 103, and they intermesh and impart power to spiral gears 104. The latter are carried by short shafts 105, disposed at a suitable angle and journaled in bearings 106 of a frame-support 107, supported by the shaft 65 and a stationary shaft 108, the latter journaled down in the frame in bearings of the supports 112, as seen in the drawings. Rotatably supported with and on the upper outer ends of the shafts 105 is a coil-retainer 109, in which the wires forming the cable of the fence are carried, which pass through the bearings of the frame 107, shaft 105, and through the cable-twister sections 15, all of which, it is believed, is apparent.

Referring to shaft 71, the same is journaled in boxings 110 of a frame-support 111, attached to a support by the ground-plates 5, and the shaft 71 is carried transversely of the frame in the lower portion and approximately in the center thereof. The shaft 71 is also journaled in a boxing 112, which also forms a bearing for the lower end of the main drive-shaft 113, extending vertically down into the body of the machine, and carries on its lower end a bevel-pinion 114, intermeshing with a bevel-gear 115, fixedly attached to the shaft 71. On the shaft 71 is also fixedly attached a sleeve 116, having the oppositely-disposed integral pinions 117 and 118. The former intermeshes with a pinion 119, carried upon a shaft 120, and pinion 119 intermeshes with the toothed surface 121 of a magnetic clutch member 122, loosely carried on a shaft 123 in suitable boxings on the frame-support 111 and is disposed above the shaft 71, as seen in the figures, while the pinion 118 intermeshes direct with the toothed surface 124 of the loosely-carried magnetic clutch part 125. By this arrangement of gears through the action of shaft 71 clutch part 122 will be driven in a direction just opposite to clutch part 125.

126 and 127 indicate clutch parts which are fixedly attached to the shaft 123 and are designed to have an intermittent fast and loose connection with the clutch parts 122 and 125 for imparting a reverse motion to the shaft 123, and it is on this shaft that the pinion 30 is carried which imparts power to the chain 25 for actuating the carriage, and the reverse motion imparted to the shaft 123 is for the purpose of shifting the carriage first in one direction and then in an opposite direction. Carried on the shaft 123 and having connection with the clutch parts 122 and 125 is seen the commutators 128 and 129, formed of a se-

ries of fiber rings to which are attached the metal plates 130, forming the commutator direct, and contacting with this commutator is seen brushes 131, supported by the cross-strips 132, carried by the frame-support 111, and these brushes through suitable wiring are connected with the dynamo, and each of the commutator-segments 130 of the commutators 128 and 129 by suitable wiring is connected with coils 133 and 134 in the clutch parts 122 and 125. Thus it will be seen that through proper wiring to the brushes 131 and through the commutator-segments 130 to the coils 133 and 134 the current passed to either of these coils will energize the cores of the clutch parts, which will draw together the sections of the clutch parts 122 and 126 or 125 and 127, which will result in fixedly connecting the toothed portion of the clutch parts with the shaft 123 for intermittingly and alternately imparting reverse motion thereto.

On the rear end of the shaft 71 is seen a clutch part 135, corresponding in every detail to clutch parts 122 and 125, with the exception that its periphery is not toothed and is fixedly attached to said shaft. The same carries a commutator 136, made up of a series of fiber rings and commutator-segments 137, and contacting with said segments are brushes 138, suitably supported and by suitable wiring connected with the dynamo, and 139 is a coil of the clutch part 135, which by suitable wiring is connected with the commutator-segments 137.

140 indicates a clutch part similar in all respects to clutch parts 126 and 127 referred to and is fixedly attached to the end of the shaft 70 adjacent to the end of the shaft 71, of which the shaft 70 forms an extension. Thus it will be seen through proper wiring to the brushes 138 and through the commutator-segments 137 to the coil 139 that a current passed to the coil through such wiring will energize the core of the clutch part 135, which will draw together the sections 135 and 140, which will result in fixedly connecting the shaft extension 70 with shaft 71 for the purpose of imparting power to wrapping devices and to the shaft 67 through the worm 69 on the shaft extension 70, intermeshing with the worm-wheel 68. The rear end of the shaft extension 70 is coupled by a suitable knuckle 141 with a shaft 142, and it is designed to have the latter connect with suitable wrapping devices (not shown) just previously referred to. On shaft 67 at a suitable point is seen a rotary switch 143, having a segmental contact-plate 144, substantially semicircular in form, and 145 indicates a brush or contact-plate designed to intermittingly contact with the segments 144 during its rotation with the switch 143, and the contact 145 is supported on a suitable part carried by the non-rotatable shaft 108. The contact 145 by suitable wiring is connected with the dynamo and forms

a part of the system in which the magnetic clutches are carried. The purpose of the rotary switch is that as the clutch parts 135 and 140 are cut out the switch is brought into play for the purpose of imparting a continued rotation to the gear 100, which will impart a corresponding movement to the pinion 101 and from thence to the shaft 64 through the pinion 102 and from said shaft to the cable-coilers 109 through the spiral gears referred to, and by means of the said switch the pitmen 74 and 89 are caused to return to the position shown in Fig. 3 after having been carried forward through the action of the clutch parts 135 and 140, which are first placed into motion to impart power to the shaft 67 through the worm 69. The twisting devices of the bed, referring more particularly to the cable-twisters, are intended to be rotated much faster than the cable-coilers 109, and for this reason additional rotation is imparted to said coilers to place them sufficiently in advance of the cable-twisters of the bed so that when the stay-wire of the carriage is brought coincident with the cable-twisters the same may be caused to rotate therewith and the fabric drawn from the machine onto the clamp, and it is during such movement and for a short period thereafter that the additional revolution is imparted to the cable-coilers. In the particular fence to which reference has heretofore been made the cables are made up of alternately-twisted two and three wires, the three wires formed of the two cable-wires fed from the coilers 109 and inter-twisted for a short distance with the stay-wire fed from the spool of the carriage, and such twisting is accomplished as the fabric is being drawn out, and the continued rotation of the coilers forms a preparatory twist of the two wires forming the cable, the twists of which are longer than the previous twists, and for this reason means as described must be provided to permit of the cable-coilers rotating alternately slow and fast to accomplish the alternate twist of the two and three wires of the cable.

On the shaft 63 and adjacent to the collar 85 described and in juxtaposition to the frame-support 1 we provide a ratchet-wheel 146, engaged by a weighted pawl 147, pivoted at 148 to the frame-extension 4, (see Figs. 5 and 16,) and the employment of such a device is to insure that the shaft 63 is held to its work and not permitted any backward play after its operation, which might accidentally occur if the provision of the ratchet were not made.

At a suitable point on the cross-tie 50 we provide a support 149, provided with the standard 150, in which is journaled the short shaft 151. The frame 149 further supports the board 152, on which is carried poles, fuse-plugs, commutator-brushes, and component parts which form a part of an electric system for controlling the clutches, which will now

be described, attention being had to the plan of the system in Fig. 19, which is used as a guide to show the method of wiring. On the shaft 151 is seen a commutator 152, provided with the disk 153 and the commutator-segments 154, 155, and 156, and interposed between the commutator and shaft is an insulating-sleeve 157.

158, 159, 160, and 161 indicate brushes supported by the board 152. The brush 158 is designed to be continuously in contact with the commutator-disk 153, while the remainder of the brushes intermittingly and at predetermined periods are contacted with by the commutator-segments of the commutator 152, referred to. Carried by the board 152 is a double pole 162, having a single throw designed for cutting in or out the current between the commutator and the magnetic clutch devices and rotary switch referred to.

In Fig. 16 a dynamo is represented as 163, and wires representing the opposite poles (indicated as *a b*) lead from the dynamo to the double-pole switch 162, and when the switch is in the position shown in Fig. 8 the circuit is open between the dynamo and the commutator 152.

164 indicates a double-pole switch having a double throw, and *c d* indicate electric wires forming a part of the system leading from the opposite poles of the switch to the brushes 160 and 161, and *e f g* indicate contact-points, whereby the current passing through the switch and from thence to the clutches may be changed by shifting the points of the switch from *f g* to *e f*, or vice versa, and 165 refers to a fuse-plug supported by the board 152 and located a suitable point in the electric system to prevent abnormal currents passing into the machine parts. However, its purposes and advantages are too well known to require further or detail description.

The electric wires employed between the clutches and rotary switch and from the same to the dynamo are designated as follows: *h* indicates an electric wire leading from the contacts *e g* and enters the coil 133 of the clutch part 122. *i* indicates a similar wire leading from contact *f* to coil 134 of the clutch part 125, and leading from both of said coils is a return-wire *j*, connecting with a contact-plate *k*, representing one of the poles of the switch 162, and leading from the opposite pole (indicated by the contact-plate *l*) is a wire *m*, connected with a wire *n*, leading to the disk 158 of the commutator 152 and from said disk to the plate 145, designed to contact with the plate 144 of switch 143, and *o* indicates a wire leading from the brush 159 to the coil 139 of the clutch part 135, and from the opposite side of the coil 139 and representing the opposite pole is the wire *p*, and leading into the wire *o* is seen the wire *p*, representing the opposite pole leading from the rotary switch 143, when the circuit is complete between con-

tacts 144 and 145 of a current passing through the wire *n*. Thus it will be seen, attention is particularly called to the plan of the system in Fig. 19, that if the switch 162 were shifted to permit the current from the dynamo to enter the wire *m*, which leads to the commutator 152, that upon the rotation of said commutator to bring its segments into contact with either of the brushes 159, 160, or 161, and the switch 164 being in the position shown, a current would pass from the brush then in contact with the commutator-segment to its proper magnetic clutch and the circuit made complete through the wire *j* to the switch 162 and to the dynamo, or if the commutator-segment designed to engage with the brush 159 and contact therewith the current would pass to the clutch controlling the clamp and cable twisters, and from thence through the wire *j* to the dynamo in the manner just described, and when the rotary switch 143 rotates to bring its contact-plate in engagement with the contact 145 the circuit is made complete by the current which passes through the wire *n*, rotary switch and wire *p*, through the wire *j*, and to the dynamo, as described. For convenience in illustrating the system we have indicated as A the clutch for driving the carriage to the right, B the clutch to drive the carriage to the left, and C the clutch for controlling the movements of the clamping devices and cable-twisters, and the rotary switch as D, which is brought into action after C has been cut out for imparting the additional movement to the cable-coilers. By employing the switch 164 having the double-pole double throw we can at any stage of the operation of the carriage in its movement across the bed reverse such movement by cutting out and in the switch 162 to stop and start the carriage and reverse its movement by shifting the switch to open the circuit between either of the contacts *e* and *f* or *f* and *g* for the purpose of changing the current of the wires leading to the clutches A and B, which is apparent.

In Figs. 9, 10, and 11, we have, for a better understanding of the commutator and its component parts, illustrated in detail the manner of arranging the commutator-segments, it being understood that by the use of the commutator-disk 153 when the switch 162 is properly opened a current is passing into the commutator from the dynamo and upon the commutator-segments 154, 155, and 156, which have a predetermined movement, coming into contact with their respective brushes, a current will pass to the switch A when it is designed to shift the carriage to the right, it being intermittingly stopped, as the spools thereof are coincident with the strand-wires in the bed, and as the cable-sections are made coincident with the spools of the carriage in its movement the clutch C is brought into play through a proper contact of a commutator-segment

with its respective brush. At a predetermined period the clutch C is cut out and the rotary switch D cut in for the purposes described, and after the drawing out of the fabric and the carriage being ready to reverse its movement across the bed the clutch B through the proper commutator-segment contacts with its respective brush for cutting in said clutch, for the purposes hereinbefore described. The commutator is mechanically actuated by parts now to be described which control the rotation of the commutator for bringing into play its proper segments for cutting in and out the clutches and switch referred to.

On the commutator-shaft 151 is carried a ratchet-wheel 165, secured thereto, and engaged by a pawl 166, supported by a pair of arms 167, fulcrumed on the shaft 151, and to the opposite ends of the arms 167 is pivotally attached the upper end of a lever or operating-arm 168, which extends down in the frame and has pivotal connection at its lower end with a lever or bar 169, the opposite end of which is fulcrumed at 170 to the frame 2, (see Fig. 5,) and the said arm is provided with the depending extension or finger 171 normally lying in the path of and adapted to be actuated by a finger 172, extending laterally from the face of the worm-wheel 68, designed for intermittent engagement with the finger 171 during the rotation of the shaft 67. The lever or operating-rod is normally held down under the tension of a spring 173, attached at one end to the lever, and its opposite end attached to the frame 2. (See Fig. 3.) Carried on the shaft 151, adjacent to the ratchet 165, and between that and the commutator is seen a segment-wheel 174, provided with the alternately and oppositely disposed segments or studs 175 and 176, extending radially therefrom. 177 refers to an arm or finger having pivotal connection at 178 to a support attached to the frame 152, and its opposite end is disposed in such a position as to alternately engage the segments 175 and 176 of the member 174, and 179 is a roller carried by the lever 168 in the manner seen in Figs. 12 and 13 for the purpose of engaging with and raising the finger 177 as the lever 168 is raised through the action of the worm 68, as hereinbefore described, which will release the finger 177 from its engagement with the segments of the member 174 and employed for the purpose of controlling the movements of the commutator-shaft, together with devices now to be described. Referring again to the rod 61, adapted and designed to be reciprocated through the action of the arm 60, supported by the carriage, and to intermittently and alternately engage the member 62 on the rod 61 as the carriage nears the opposite ends of its movement in its reciprocation across the bed, at which time the proper commutator-segments are brought into play for cutting out the clutches for

moving the carriage and cutting in the clutch which regulates the clamp and cable-twisters, on the rod 61 is carried a finger 180, which extends up through and is movable in the slot 181 of the support 149. (See Fig. 14.) This finger at its upper end is carried alternately in the path of the segments 175 and 176 during the movement of the member 174 for the purpose of intermittently locking the shaft 151 in its movement as the commutator-segments are rotated to contact with their respective brushes. In the movement of the lever 168 a partial movement is imparted to the ratchet 165 through the action of the spring 173 after the lever has been shifted through the action of the worm 68, as described, and during such movement the finger 180 is in such a position as to allow such partial rotation of the ratchet to be imparted to the shaft and then locks the same for a predetermined period by the engagement therewith of a suitable segment of the member 174 and retained in such a position until the carriage assumes a position to cause the rod 61 to be moved to change the position of the finger 180 to permit the spring 173 to complete its action by drawing down the lever 168 its full length—that is, sufficient to cause the ratchet to complete its movement through the action of the pawl 166, which will rotate the shaft 151 to cause the opposite and alternate segment of the member 174 then in position to move forward to engage the pin 180 in its reversed position and cause the proper commutator-segment to contact with its respective brush—and the clutch is cut out and cut in, at this time required for the perfect operation of the machine.

On the shaft 151 is seen a suitable wheel 182 substantially in the form of a worm which meshes in a suitable manner with a counter 183, rotatably mounted at 184 on the frame 149 to register the number of rods made on the machine, the details of which are not shown.

In the operation of the machine power is imparted from a suitable source to the upright shaft 113, which continuously rotates the shaft 71, and this through the described gears drives the clutch-sections carrying the electric coils previously referred to. Through suitable electric wires and the employment of a dynamo and such apparatus as is necessary and heretofore described the operation of the working parts of the machine are controlled from a switchboard conveniently placed and previously described, as 152, which supports the controlling-switches and the brushes described. By the switch 162 the operator controls the current entering the clutches to start or stop the machine, and through the switch 164 he may change the current of the clutch-coils to reverse the carriage at leisure. The employment of a system of this character

in a wire-fence machine aids materially in the control of the operative parts by the operator and simplifies the structure and operation of such parts, doing away with unnecessary gearing and other machine parts heretofore employed and found necessary.

Attention is directed to the eccentrically-carried sprocket-pinion 24 on the shaft 23 of the carriage which imparts an alternately slow and fast movement to such shaft through the chain 25 on starting the shaft 23.

It is obvious that various changes may be made in the construction and arrangement of the machine parts and the electric system, clutches, and commutator modified to suit conditions and details resorted to without affecting the principle of invention herein.

Having thus fully described our invention, what we claim, and desire to secure by Letters Patent of the United States, is—

1. A carriage for a fence-machine, provided with oppositely-arranged driven shafts, a cam on one end of each shaft, a pull-out mechanism supported by the carriage, and means engaged by the cams for operating the pull-out mechanism, substantially as specified.

2. A carriage for a fence-machine, provided with an operating-shaft, an oscillatory frame supported by the carriage-carrying pulling-out devices, and means on the carriage-shaft for actuating the frame, substantially for the purposes set forth.

3. A carriage for a fence-machine, provided with oppositely-disposed shafts, means for actuating said shafts, oscillatory frames pivotally supported on the carriage-frame and having depending pulling-out devices, and means on the carriage-shafts for intermittently actuating the oscillatory frames, substantially as specified.

4. A carriage for a fence-machine, having oppositely-disposed shafts, means connecting both of said shafts for intermittently and simultaneously actuating the same, pivoted frames adjacent to the ends of said shafts supporting pull-out mechanism, rollers carried by said frames, and cams on the shafts adapted to engage the rollers of the frames, substantially for the purposes set forth.

5. In a fence-machine, the combination with strand-wire twistors having a pinion on one end and offset fingers adjacent thereto, a carriage, an operating-shaft on the carriage, a segmental gear on the shaft, a cam on the gear and lugs on the cam adapted to engage the fingers of the twister for imparting preliminary movement thereto, substantially as specified.

6. In a fence-machine, the combination with strand-wire twistors each having a pinion and a pair of fingers, one disposed adjacent to the pinion and the other spaced a suitable distance from the pinion and offset from the first-mentioned finger, a carriage, a shaft supported by the carriage, a segmental gear on the shaft

adapted to intermittently engage the pinion on the twistors, offset lugs on the gear for engaging the fingers of the twistors in advance of the gear and pinion intermeshing, and a cam designed to ride on the fingers, in manner and for the purposes set forth.

7. In a fence-machine, the herein-described mechanism for operating twister-sections, comprising twistors, a pinion on each twister, the fingers 14 disposed in manner described on said twistors, an operating-shaft carried by a reciprocal member, a segment-gear on the shaft, cam-plates attached to the gear provided with lugs 34 adapted to alternately engage the fingers 14 for imparting a preliminary starting movement to the pinions, substantially for the purposes set forth.

8. In combination with a carriage of a fence-machine, operating-shafts supported thereby, and means for actuating the same, a segment-gear supported by one end of the shafts, cam-plates of each gear provided with toothed segments, a cam on the opposite end of said shafts, pull-out mechanism pivotally supported by the carriage and means on the pull-out mechanism intermittently actuated by the cam for operating the said pull-out mechanism, substantially as specified.

9. In a fence-machine, a bed-plate, cable-twister sections journaled in said bed, a bevel-pinion on said sections, an operating-shaft carrying bevel-gears meshing with the twister-pinions, a spur-gear on the end of the operating-shaft, a rack-bar engaging the gear, and mechanism for actuating the bar and thereby imparting power to the operating-shaft, substantially as specified.

10. In a fence-machine, a bed-plate, cable-twister sections journaled in said bed, an operating-shaft, gearing between said shaft and said twistors, a spur-gear on one end of said operating-shaft, a pitman having a toothed portion meshing with the spur-gear, means for reciprocating the pitman, and means for locking the spur-gear with the operating-shaft when the pitman is moving in one direction and releasing it from the shaft when moving in the opposite direction, substantially as specified.

11. The mechanism for imparting movement to the cable-sections and clamping devices simultaneously, comprising twister-sections, a clamp-shaft, the shaft 63, gearing between said shaft and the twistors, a member attached to the clamp-shaft, operative connections between the member and shaft 63, and power devices from the clamp-shaft member to a source of power, all substantially as specified.

12. The mechanism for imparting movement to the cable-sections and clamping devices simultaneously, comprising twister-sections, shaft 63 and gearing between said shaft and twistors, a clamp-shaft, a member attached to said shaft, a ratchet-wheel on the

clamp-shaft and a pawl of the member engaging the ratchet, connections between the member and shaft 63, and power devices operatively attached to the clamp-shaft member adapted to impart movement thereto for actuating the ratchet through the pawl and the shaft 63 through its connections with the clamp-shaft member, substantially as specified.

10 13. In a wire-fence machine, a bed-frame, a series of strand-wire and cable twister sections, journaled in the bed, a carriage adapted to be reciprocated across the bed designed to support spools for carrying stay-wires, a
15 power-shaft, magnetic clutches operatively connected with the power-shaft, driving mechanism between the clutches and carriage, and commutator mechanism for automatically cutting in and out the clutches and there-
20 by controlling the carriage in its movements across the bed, substantially as specified.

14. In a wire-fence machine, a bed-frame, twisting devices in said bed, a carriage designed to support spools for carrying weft-
25 wires reciprocally supported above the twisters in the bed, a series of magnetic clutches, driving connections between the carriage and clutches, an electric circuit connecting the clutches with a dynamo, a commutator in the
30 circuit, segments of the commutator designed to intermittently engage brushes also in the circuit, and means having a predetermined movement for imparting an intermittent ro-
35 tation to the commutator for causing its segments to alternately engage their respective brushes for cutting in and out the clutches and thereby control the carriage in its move-
ments, substantially as specified.

15. The system for controlling the move-
40 ments of the carriage of a fence-machine, comprising two magnetic clutches, one for driving the carriage in one direction and the other for driving it in the opposite direction, driving connections between the clutches and car-
45 riage, an electric circuit, a commutator in the circuit having a series of rows of segments designed to intermittently engage brushes, mechanism for mechanically actuating the
50 commutator having a predetermined movement for causing the commutator-segments to alternately engage their respective brushes for alternately cutting in and out the clutches and thereby impart a reverse movement to the carriage, substantially as specified.

55 16. In a fence-machine, the combination of strand-wire and cable twister sections, a reciprocating carriage, and clamping mechanism, magnetic clutches for controlling the movements of the carriage in opposite direc-
60 tions, a magnetic clutch for controlling the movements of the cable-twisters and clamping mechanism, an electric circuit, commutator mechanism in the circuit designed for controlling the current to the clutches, and means
65 for actuating said commutator for alternately

cutting in and out the clutches and thereby reciprocating the carriage in one direction and at the end of its movement cause the cable-twisters and clamp mechanism to be actuated and then reciprocate the carriage in the
70 opposite direction, substantially as specified.

17. In a fence-machine carriage, the combination therewith, of a shaft, a cam carried on said shaft, and a pulling-out device operated by said cam, substantially as specified. 75

18. In a fence-machine carriage, the combination therewith, of a shaft, a cam carried on said shaft, a pulling-out device operating beneath the cam, and means engaged by the cam in its movement to intermittently actuate
80 the pulling-out device, substantially as specified.

19. In a fence-machine, the combination of a twister carrying a gear, a spool-carrier, a shaft on said carrier carrying a segmental
85 gear adapted to intermittently coact with the gear of the twister, and means on the segmental gear and carrier-shaft adapted to coact in advance of the teeth of the gears for im-
90 parting a preliminary movement to the twister, substantially as specified.

20. In a fence-machine, the combination of a stationary bed, a series of twisters mounted on said bed, each twister carrying a pinion and a pair of lugs, one lug in juxtaposition
95 to the pinion and the other removed therefrom, a carriage, an operating-shaft on the carriage, a segment-gear on said shaft, and engaging devices of the segment-gear rotating in the path of the lugs on the twister
100 adapted to alternately engage the lugs of the twister for imparting a preliminary movement thereto, substantially as specified.

21. In a fence-machine, the combination of cable-twister sections, an operating-shaft, con-
105 nections between said shaft and twisters, a rack-and-pinion drive for operating said shaft, and means for actuating said rack and thereby rotate the pinion, substantially as specified.

22. In a fence-machine, the combination of
110 a twister-section, an operating-shaft, gearing connecting the shaft and twister, a gear on said shaft, a rack-bar engaging the gear, and means for actuating said rack-bar, substan-
115 tially as specified.

23. In a fence-machine, the combination of a twister-section, an operating-shaft, gearing connecting the shaft and twister, a spur-gear on said shaft, a rack-bar engaging the spur-gear, means for locking the gear to its shaft
120 when the rack-bar is moving in one direction and releasing it when the bar is moving in the opposite direction, and means for operating said bar, substantially as specified.

24. In a fence-machine, the combination of
125 the cable-twisters and clamp member, an operating-shaft, connection between the operating-shaft and cable-twisters, connections between the clamp member and said operat-
130 ing-shaft, and power devices operating to ac-

tuate the connections between the clamp member and operating-shaft and thereby rotate the cable-twisters, substantially as specified.

25. In a fence-machine, the combination
5 with a movable carriage, a power-shaft, connections between the power-shaft and carriage, magnetic clutches for operating said carriage, and commutator mechanism for automatically cutting in and out said clutches and
10 thereby control the movements of the carriage, substantially as specified.

26. In a fence-machine, the combination
15 with a carriage, a power-shaft, gearing connecting the shaft with operative parts of the carriage, an electric circuit, magnetic clutches on the power-shaft and in said circuit, and means for controlling the circuit and thereby regulate the movement of the carriage by the
20 clutches, substantially as specified.

27. A carriage for a fence-machine, comprising a reciprocating frame traveling on the
25 bed of the machine, a pull-out mechanism on the reciprocating frame, and magnetic clutches controlling the movement of the frame.

28. A carriage for a fence-machine, with

twister mechanism journaled to the bed thereof, the said twister mechanism operated by a segment-gear engaging pinions on the said twister mechanism, and a reciprocating frame, with pull-out mechanism thereon, traveling
30 on the bed of the machine operating in relation to the twister mechanism.

29. A carriage for a fence-machine, consisting of a reciprocating frame traveling on the bed of the machine, magnetic clutches operated intermittently by commutators, controlling the movement of the traveling frame
35 on the bed of the machine, and pull-out mechanism on the said traveling or reciprocating frame, the said pull-out mechanism operated
40 by cams on oppositely-driven shafts.

In testimony whereof we affix our signatures in presence of two witnesses.

PETER W. SOMMER.
JOSEPH W. SOMMER.
BENJAMIN L. SOMMER.
WILLIAM SOMMER.

Witnesses:

CHAS. W. LA PORTE,
CHAS. F. BAILEY.