No. 648,905. Patented May 1, 1900.

J. JACKSON & C. M. CLARKE.

WIRE FENCE MACHINE.

(Application filed Sept. 1, 1898. Renewed Oct. 4, 1899.)

(No Model.) 11 Sheets—Sheet 1.

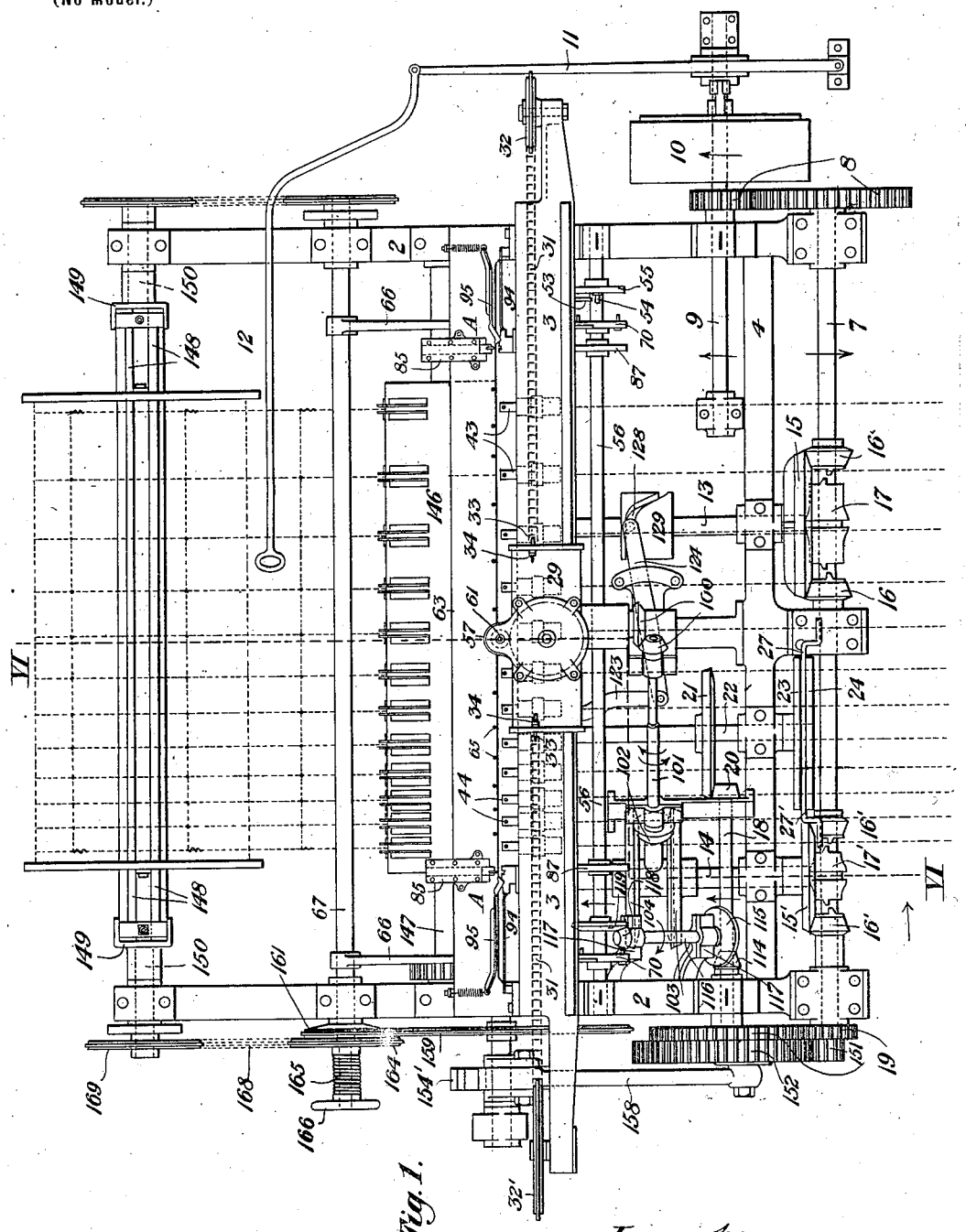

Fig. 1.

Witnesses:
Watson Large.
J. N. Cooke

Inventors:
John Jackson
Charles M. Clarke
By C. M. Clarke
their attorney.

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(No Model.) 11 Sheets—Sheet 2.

Fig. 3

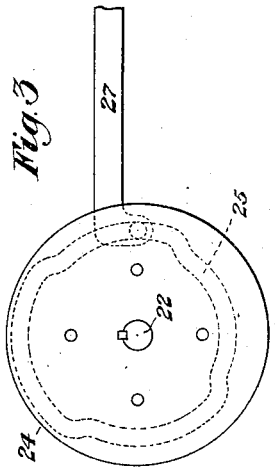
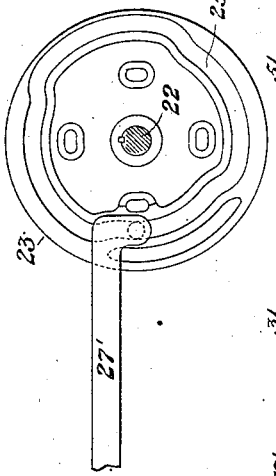


Fig. 4.



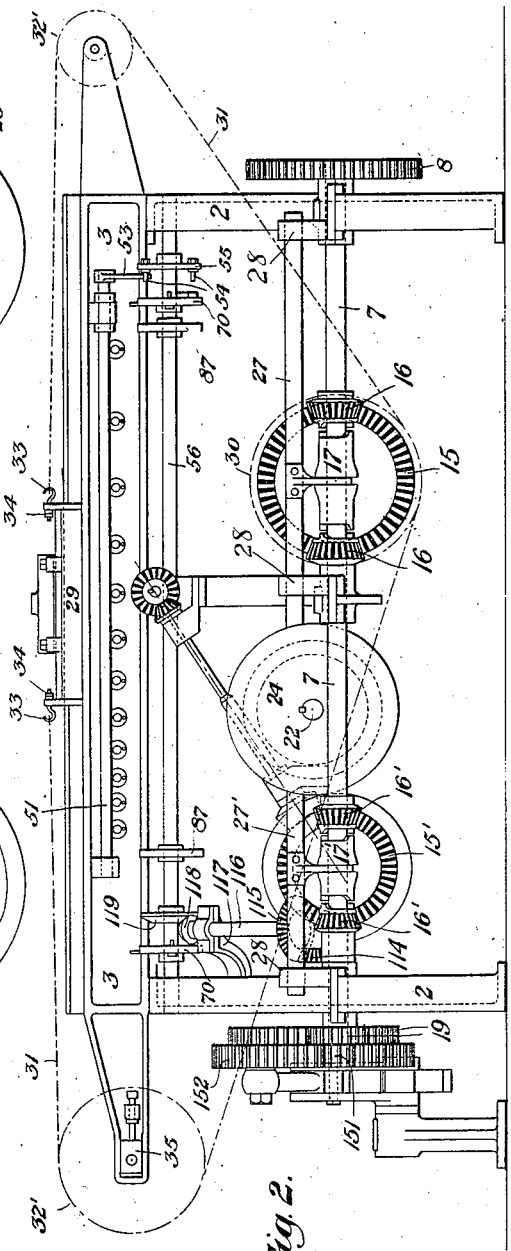


Fig. 2.

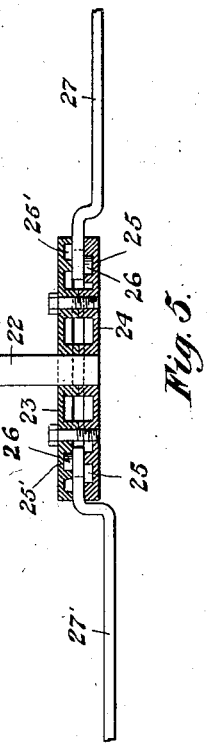


Fig. 5.

Witnesses:

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WIRE FENCE MACHINE.

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(No Model.) 11 Sheets—Sheet 3.

Fig. 6.

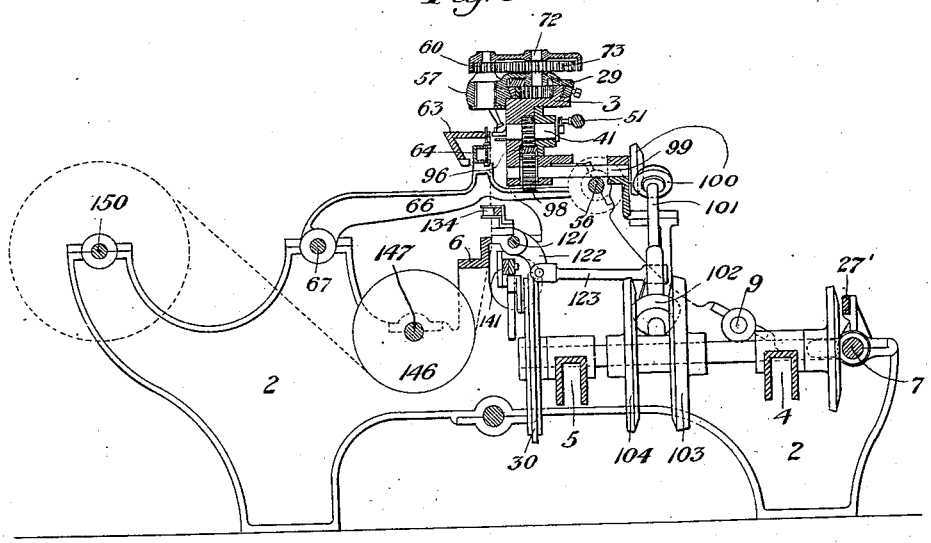
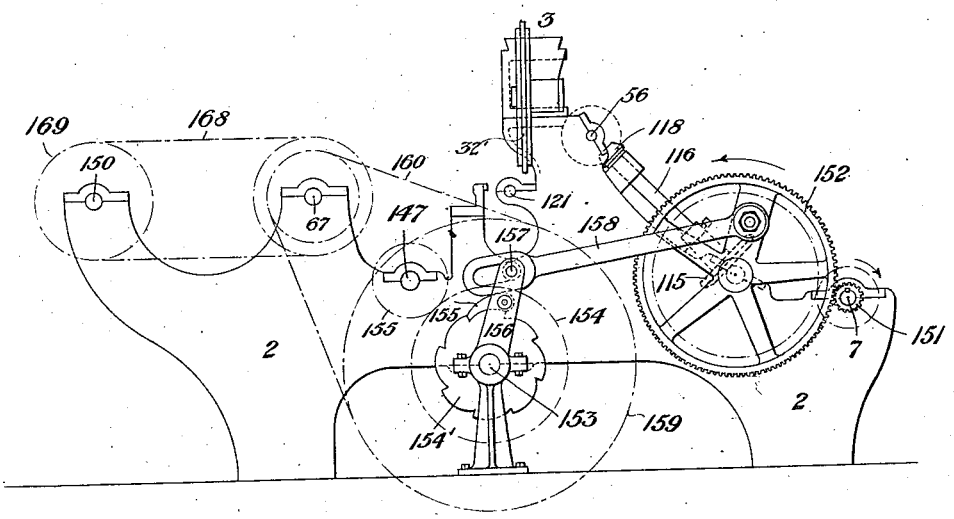


Fig. 7.



Witnesses:
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WIRE FENCE MACHINE.

(Application filed Sept. 1, 1898. Renewed Oct. 4, 1899.)

(No Model.) 11 Sheets—Sheet 4.

Fig. 8.

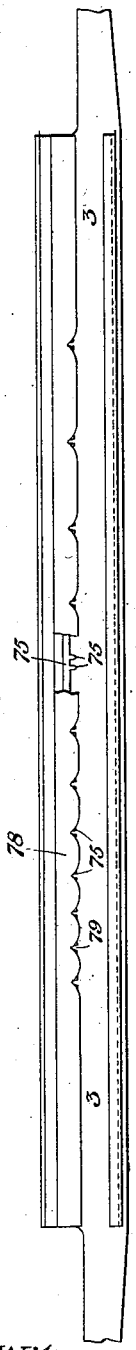
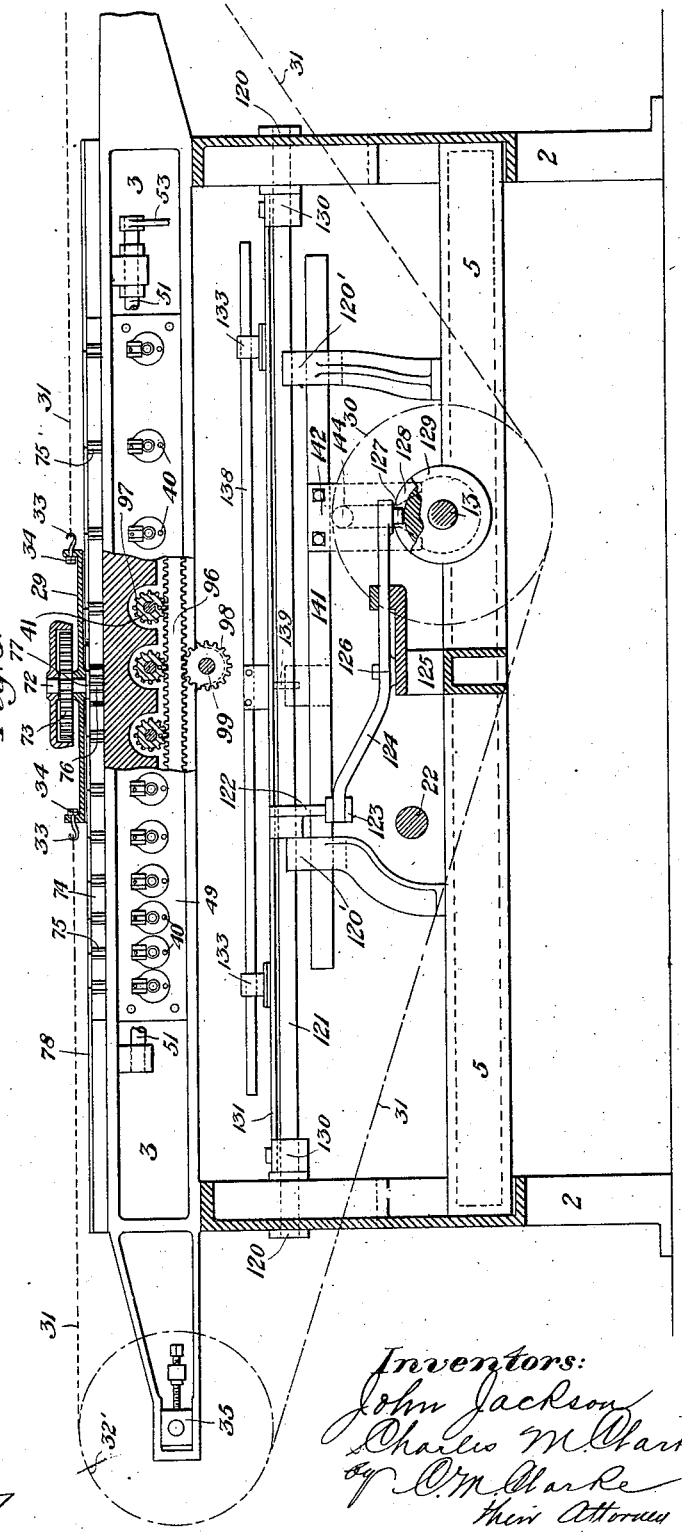


Fig. 9.



Witnesses:
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WIRE FENCE MACHINE.

(Application filed Sept. 1, 1898. Renewed Oct. 4, 1899.)

(No Model.) 11 Sheets—Sheet 5.

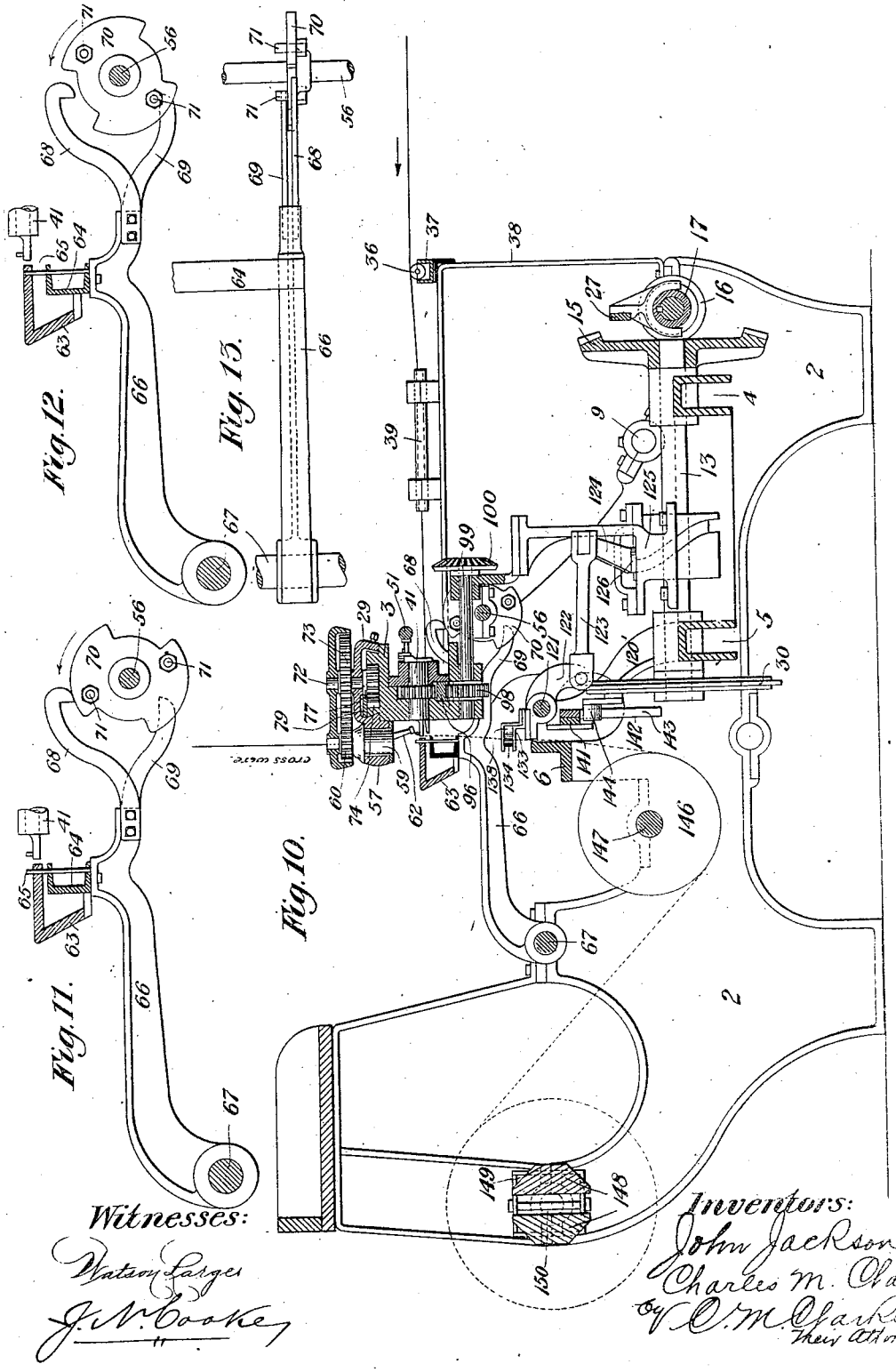

Fig. 12.

Fig. 13.

Fig. 10.

Fig. 11.

Witnesses:
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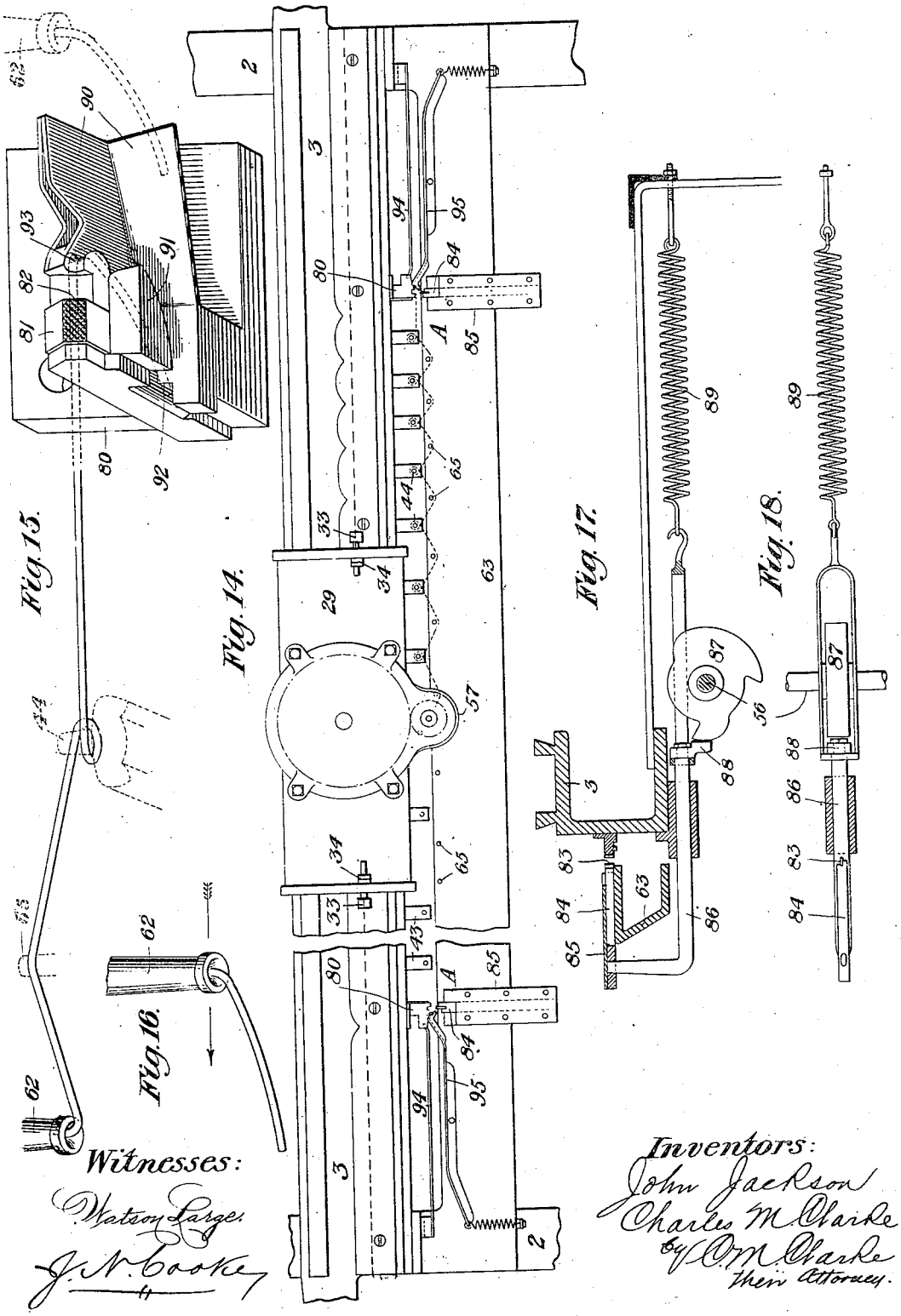
WIRE FENCE MACHINE.

(Application filed Sept. 1, 1898. Renewed Oct. 4, 1899.)

(No Model.) 11 Sheets—Sheet 6.



Witnesses:
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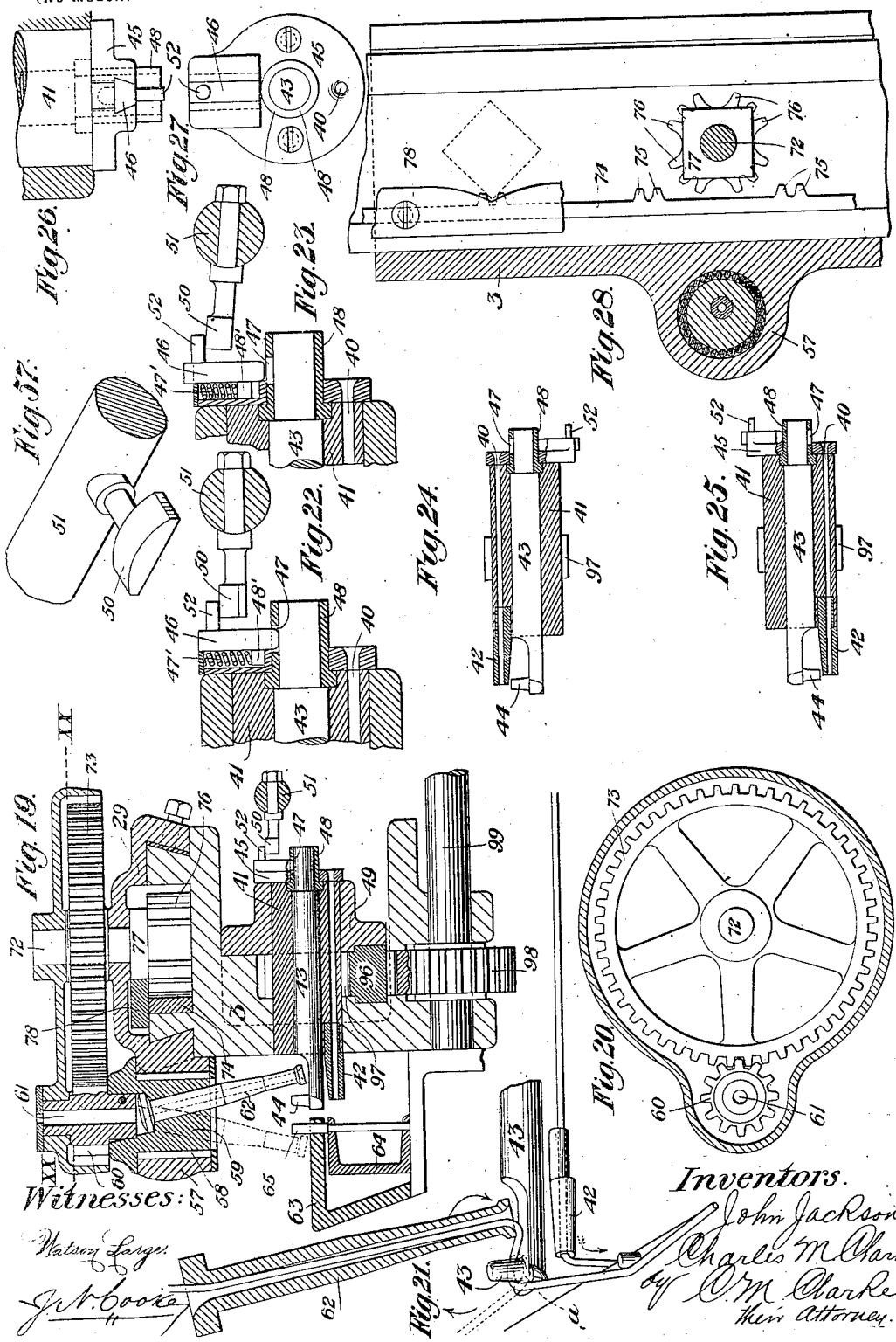
(Application filed Sept. 1, 1898. Renewed Oct. 4, 1899.)

(No Model.) 11 Sheets—Sheet 7.



Witnesses:
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No. 648,905. Patented May 1, 1900.

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(Application filed Sept. 1, 1898. Renewed Oct. 4, 1899.)

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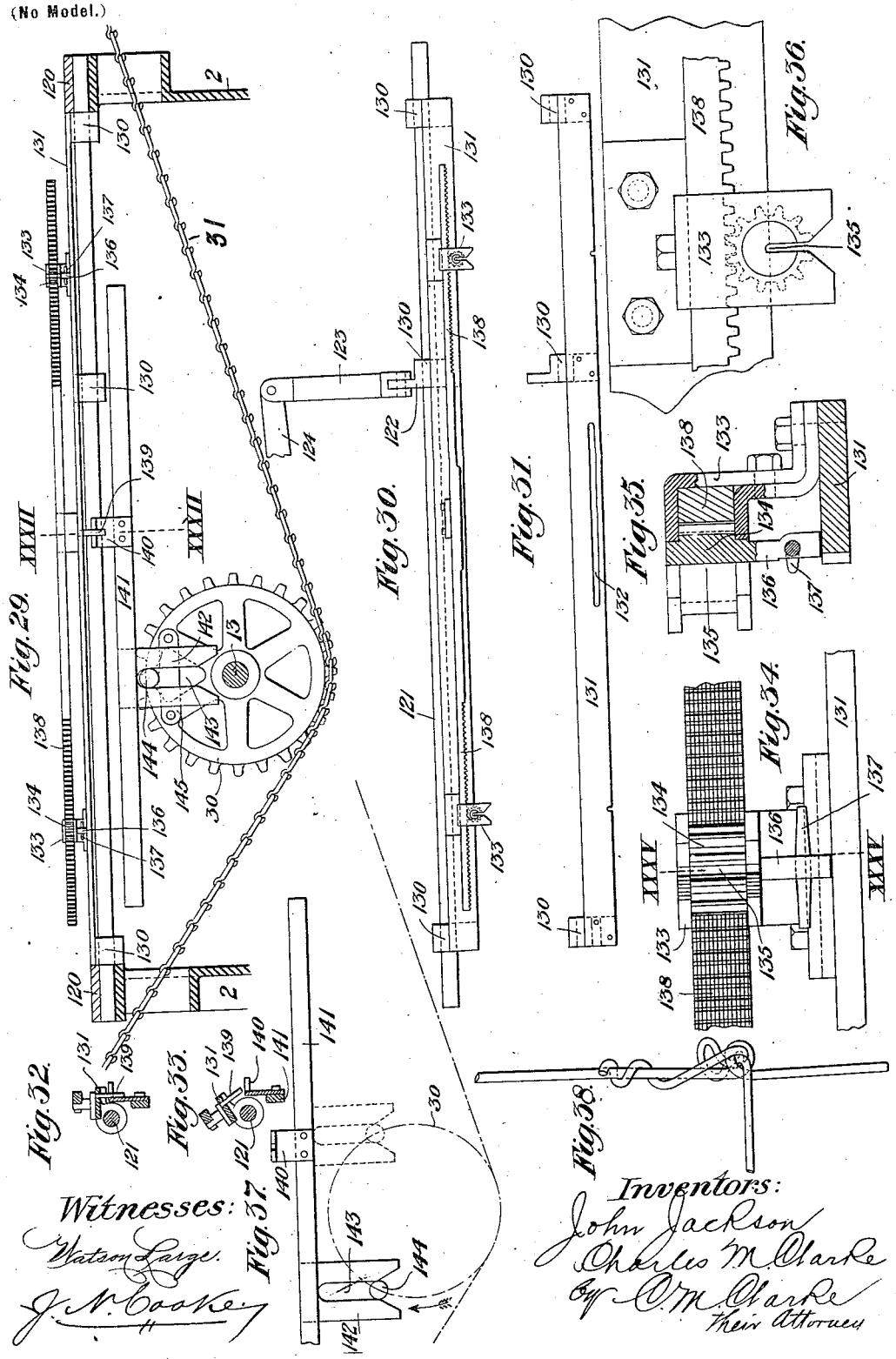

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J. JACKSON & C. M. CLARKE.

WIRE FENCE MACHINE.

(Application filed Sept. 1, 1898. Renewed Oct. 4, 1899.)

(No Model.) 11 Sheets—Sheet 9.

Fig. 39.

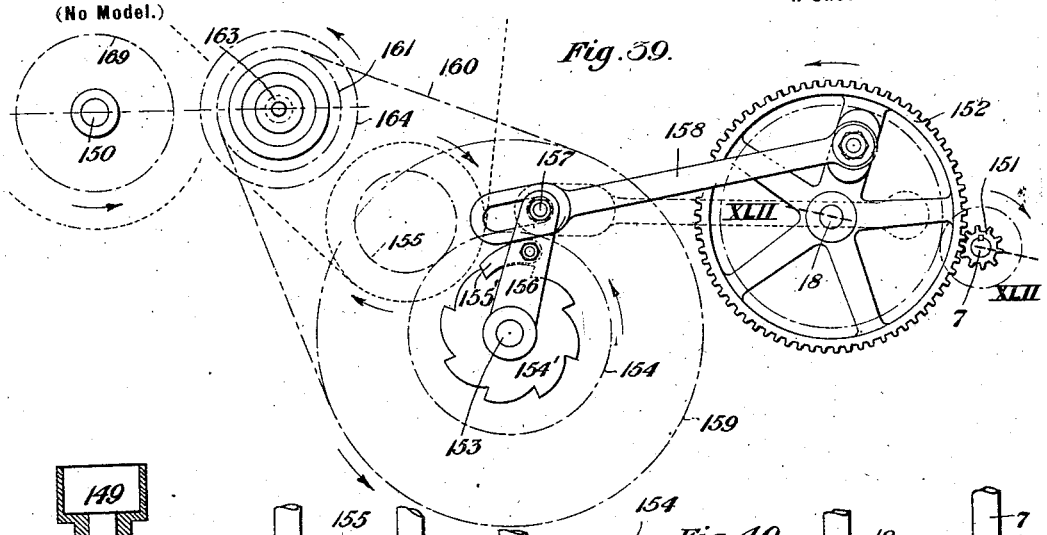

Fig. 40.

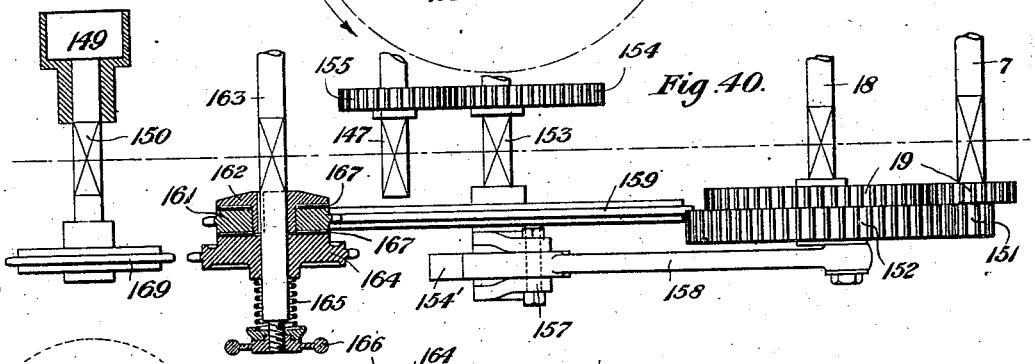

Fig. 41.

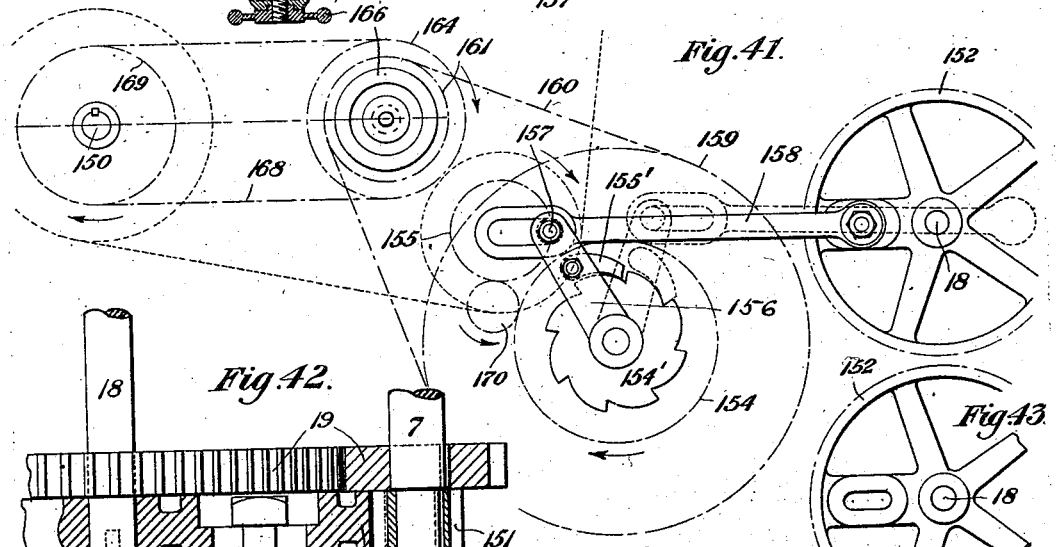

Fig. 42.

Fig. 43.

Fig. 44.

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No. 648,905. Patented May 1, 1900.

J. JACKSON & C. M. CLARKE.

WIRE FENCE MACHINE.

(Application filed Sept. 1, 1898. Renewed Oct. 4, 1899.)

(No Model.) 11 Sheets—Sheet 10.

Fig. 46.

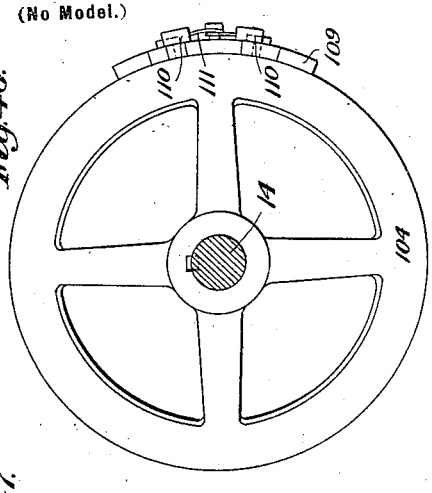


Fig. 47.

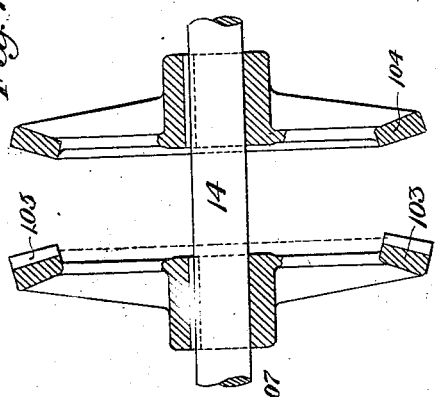


Fig. 45.

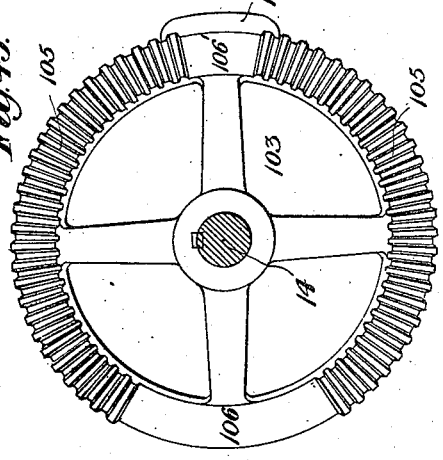


Fig. 50.

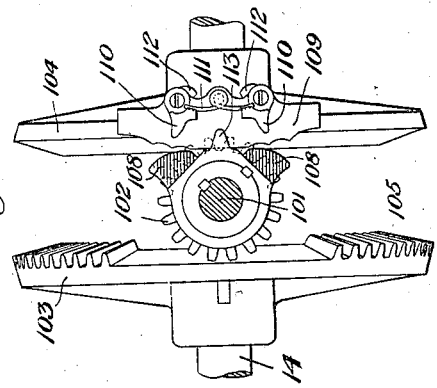


Fig. 49.

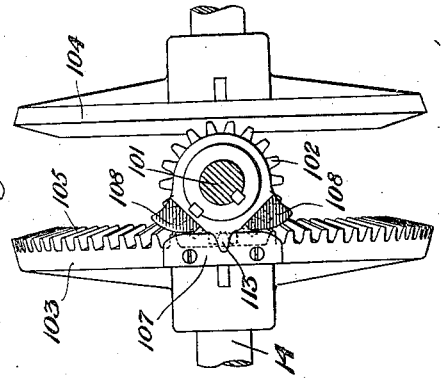
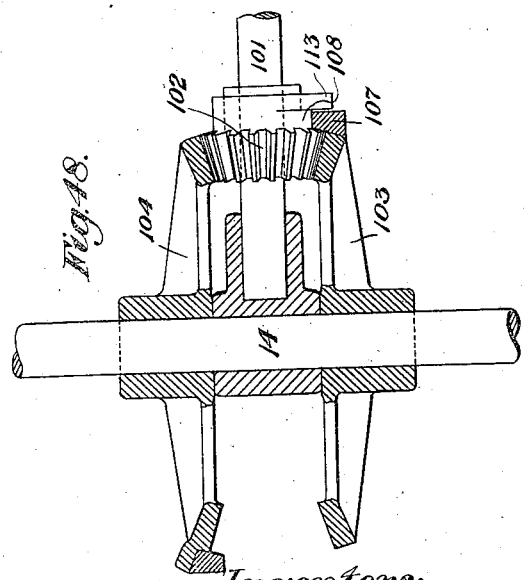


Fig. 48.



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No. 648,905. Patented May 1, 1900.

J. JACKSON & C. M. CLARKE.

WIRE FENCE MACHINE.

(Application filed Sept. 1, 1898. Renewed Oct. 4, 1899.)

(No Model.) 11 Sheets—Sheet 11.

Fig. 51.

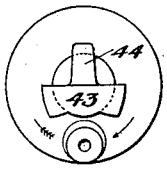


Fig. 52.

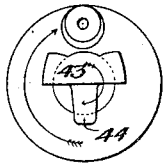


Fig. 53.

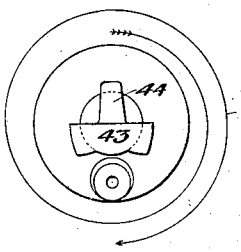


Fig. 54.

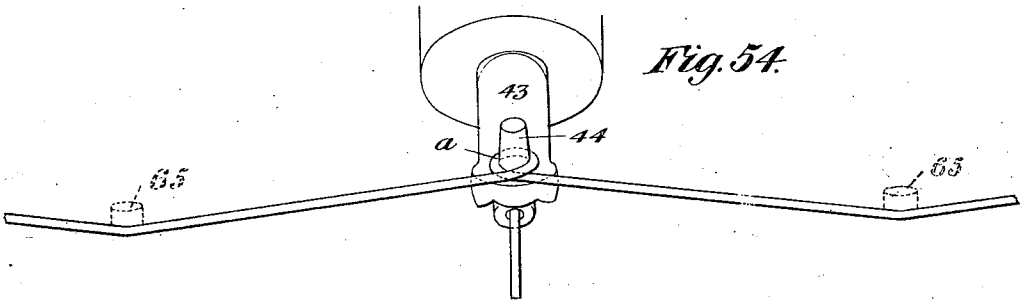


Fig. 55.

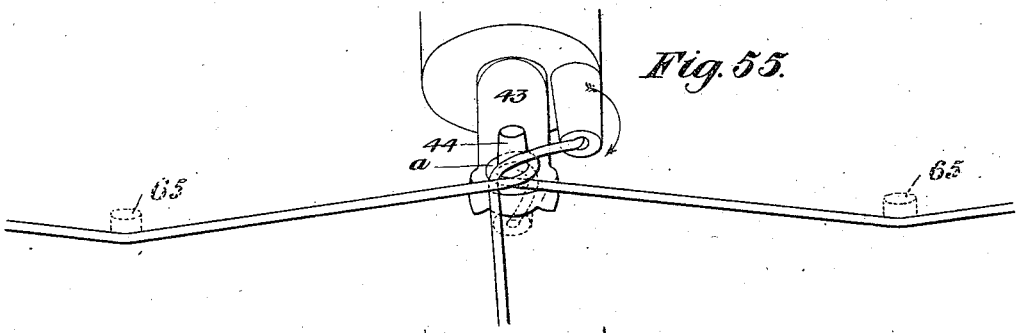
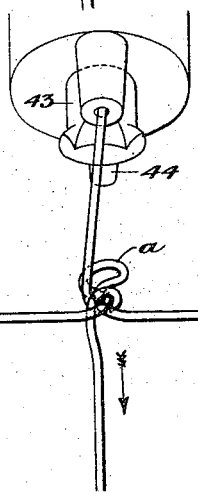


Fig. 56.



Witnesses:
Watson Large.
J. N. Cooke

Inventors:
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Charles M. Clarke
by C. M. Clarke
their Attorney.

UNITED STATES PATENT OFFICE.

JOHN JACKSON, OF ALLEGHENY, AND CHARLES M. CLARKE, OF PITTSBURG, PENNSYLVANIA, ASSIGNORS TO THE PITTSBURG WOVEN WIRE FENCE COMPANY, OF PITTSBURG, PENNSYLVANIA.

WIRE-FENCE MACHINE.

SPECIFICATION forming part of Letters Patent No. 648,905, dated May 1, 1900.

Application filed September 1, 1898. Renewed October 4, 1899. Serial No. 732,575. (No model.)

To all whom it may concern:

Be it known that we, JOHN JACKSON, residing at Allegheny, and CHARLES M. CLARKE, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, citizens of the United States, have invented or discovered a new and useful Improvement in Wire-Fence Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a plan view of the machine. Fig. 2 is a view in elevation from the back. Fig. 3 is an enlarged detail outside view of one of the clutch-actuating cams. Fig. 4 is a similar view of the inside of the opposite cam. Fig. 5 is a horizontal sectional detail view of the cams mounted on the end of the shaft with their rods in position. Fig. 6 is a cross-section taken on the line VI VI of Fig. 1. Fig. 7 is an end elevation. Fig. 8 is a plan view of the cross-head. Fig. 9 is a partial internal elevation from the back, partly in section, on an enlarged scale. Fig. 10 is a cross-sectional view, on an enlarged scale, similar to Fig. 6. Fig. 11 is an enlarged detail view, in side elevation, of the mechanism employed in raising and lowering the pins, showing the pins raised. Fig. 12 is a similar view showing the pins lowered. Fig. 13 is a plan view of Fig. 12. Fig. 14 is an enlarged plan view of the cross-head, partly broken away, showing the carriage. Fig. 15 is a perspective view of the stationary grip and shear for the cross-wire and distributing-needle in its progress around the pins. Fig. 16 is a perspective detail view of the end of the needle. Fig. 17 is a cross-sectional detail view illustrating the mechanism employed for actuating the shear-blade. Fig. 18 is a plan view thereof. Fig. 19 is an enlarged detail sectional view through the cross-head and carriage. Fig. 20 is a cross-sectional view indicated by the line XX XX of Fig. 19. Fig. 21 is a detail view illustrating the operation of the distributing-needle. Fig. 22 is a sectional detail view of a portion of the twister-head and the interlocking mechanism. Fig. 23 is a similar view showing the locking-pin withdrawn. Fig. 24 is a sectional detail view of the twister-head at the half-revolution. Fig. 25 is a similar view showing the parts reversed. Fig. 26 is a partial plan view of the twister-head. Fig. 27 is a face view of the end plate. Fig. 28 is a detail plan view, partly in section, of a portion of the cross-head. Fig. 29 is a detail view in elevation of the chain and its actuating sprocket-wheel with the mechanism for twisting the ends. Fig. 30 is a plan view of the twisters. Fig. 31 is a plan view of the slotted plate. Fig. 32 is a cross-section on the line XXXII XXXII of Fig. 29. Fig. 33 is a similar view showing the operative parts tilted up out of engagement. Fig. 34 is a detail face view of the twisting device. Fig. 35 is a cross-section taken on the line XXXV XXXV of Fig. 34. Fig. 36 is a detail plan view of the twisting device. Fig. 37 is a diagrammatic view in elevation of the shifting mechanism for moving the twister-rack. Fig. 38 is a perspective view of the end knot and twisted cross-wire end. Fig. 39 is a detail view, in side elevation, of the feed-actuating mechanism. Fig. 40 is a plan view thereof. Fig. 41 is a view similar to Fig. 39, illustrating a modified construction. Fig. 42 is a sectional detail view, on an enlarged scale, indicated by the line XLII XLII of Fig. 39. Fig. 43 is a detail view of a portion of the ratchet pitman-gear. Fig. 44 is a detail perspective view of one of the friction-disks. Fig. 45 is a face view of the differential gear-wheel for operating the twister-head-actuating mechanism. Fig. 46 is a similar view of the fender-wheel. Fig. 47 is a sectional view of both of the wheels in position. Fig. 48 is a similar view in plan showing the pinion bevel-wheel in operative position. Fig. 49 is an end view thereof, showing the wheels in a position of rest. Fig. 50 is a similar view showing the wheels at a half-revolution. Figs. 51, 52, and 53 are diagrammatic end views of the twister-heads. Figs. 54, 55, and 56 are similar views in perspective illustrating progressive steps in the formation of the knot. Fig. 57 is a detail perspective view of a portion of the paddle-shaft.

Our invention relates to machinery for making wire fencing employing a series of horizontal parallel strands of the desired gage and

spacing with cross-strands at regular intervals attached to the horizontal strands by loop-knots.

A machine for the manufacture of fencing having the same general objects in view as the machine herein shown and described was invented by C. W. Holm and patented to him in the United States December 10, 1895, No. 551,280.

The improvements comprised in the present invention relate to the means for delivering the wires to the machine, mechanism for transmitting motion from the main shaft to the various operative parts of the machine in a more mechanical and economical manner than heretofore, mechanism for operating the feeding and winding drums, the knotters, twisters, cutters, and holding devices for the ends of the wire, together with the various details and modifications of construction, as shall be hereinafter more fully set forth.

Referring now to the drawings, 2 2 are the main supporting-frames of the machine, upon the top of which is mounted the cross-head 3, which, with the various shafts and cross-frames 4, 5, and 6, serves to rigidly brace and strengthen the machine.

7 is the main shaft of the machine, driven through gearing 8 from a power-shaft 9, to which power is applied through a friction-pulley 10, under control of the operator through lever 11, provided with an operating-bar 12.

Intermittent forward-and-back motion is transmitted to counter-shafts 13 14 by means of bevel-wheels 15 15′, keyed to the shafts 13 14, and pinion bevel-wheels 16 16′, loosely mounted on main shaft 7 and held in mesh with the teeth of wheels 15 15′ by collars on the shaft. The pinion bevel-wheels are provided with clutch-teeth on their inner faces adapted to be engaged by similar teeth on the sliding clutches 17, mounted with a spline on the main shaft 7. A counter-shaft 18, parallel with the main shaft 7, is driven through pinion-gearing 19, which shaft 18 transmits motion at a reduced speed through bevel-gearing 20 21 to cross counter-shaft 22, mounted in bearings in the supporting-framework. On the outer end of counter-shaft 22 are mounted the double cam-disks 23 24, provided with cam-grooves 25 25′, engaging a roller 26 on the inner ends of the clutch-shifting rods 27 27′, mounted in suitable sliding bearings 28. The grooves 25 are so disposed as to throw the clutches into engagement with the pinions 16 and into positions of rest at such times as to transmit motion through the shafts 13 and 14 when required and to permit the shafts and their dependent mechanism to remain at rest when required.

Mounted on the top of the cross-head 3 is the carriage 29, which traverses the length of the cross-head from end to end, accomplishing in its travel the distribution of the cross-wires, as shall be hereinafter described. This forward-and-back travel of the carriage occurs when the other operative parts of the machine are at rest and is caused by a sprocket-wheel 30, mounted on the end of shaft 13, acting through sprocket-chain 31, passing around guiding sprocket-wheels 32 32′, mounted on the outer projecting ends of the cross-head and secured to the ends of the carriage by hook-bolts 33, provided with nuts 34 for taking up the slack. One of the sprocket-wheels 32′ may, if desired, be mounted in an adjustable box 35 for the same purpose. The driving sprocket-wheel 30 imparts forward-and-back travel to the carriage, through chain 31, alternately, and the amount of such travel is governed by the size of the sprocket-wheel and the extent of its revolution under the action of bevel-gearing 15 16, the time of operative contact of the gearing being controlled by the groove 25, acting through rod 27. In practice we have found good results from a rotation of about one and one-fifth revolutions of the sprocket-wheel.

The parallel strands of wire forming the main horizontal members of the fence are introduced in a horizontal plane to the cross-head of the machine, first passing over a roller 36, journaled and adapted to revolve in a bath of oil contained in a box 37, mounted on a light framework 38, after which each wire is introduced, through hollow guides 39, to the guiding-passage 40 of the twister-head 41, the passage 40 being eccentric to and normally directly below the center of the twister-head. The passage 40 terminates through the center of an inserted teat 42, of hardened metal, adapted to be renewed when worn. Extending through the center of the twister-head and loosely journaled therein is a short shaft 43, having a projecting end provided with a pin 44, extending at right angles from the reduced face of the shaft, upon which pin the loop *a* of the cross-wire is formed by the distributing-finger of the traveling carriage. (See Fig. 19.) At the entrance end of the twister a circular-shaped plate 45 is secured to it, in which plate is slidingly mounted a locking-bolt 46, adapted to enter a recess 47 in a sleeve 48, secured to the pin-shaft 43 and provided with a shoulder in such a manner as to prevent end movement of the shaft. The bolt 46 is held in engagement with the recess by a spring 47′, adapted to bear against a lug 48′, and when so connected the twister-head and shaft will rotate together; but when the bolt 46 is withdrawn, as in Fig. 23, the head 41 will rotate independently of the pin-shaft 43. It will be understood that the twisters are arranged in a series, mounted in the cross-head, with removable bearing-plates 49, and so spaced at gradually-increasing distances apart as to distribute the horizontal wires to make a fence with close strands at one side and more open toward the opposite side. All of the bolts 46 are disengaged simultaneously by means of lifting-paddles 50, mounted in a rock-shaft 51 and adapted to engage pins 52 in each slide. The rock-shaft is intermittently rotated a partial revolution by means

of an arm 53, acted upon by pins 54 of a wheel 55, mounted on the cam-shaft 56, the rock-shaft being returned to its original position immediately by spring action, the bolt 46 in the meanwhile remaining out of engagement during the entire rotation of the twister-head and the shaft being retained in position by the holding action of the loop *a*. The carriage is caused to traverse the cross-head from end to end under action of chain 31 through intermittent motion of driving sprocket-wheel 30, the motion of the sprocket-wheel being controlled by the length of time the forward or reverse pinion 16 is in engagement with the gear 15, which period of engagement is controlled by the cam-groove 25 and of sufficient duration to accomplish the full travel of the carriage.

The carriage is mounted on the cross-head by means of dovetail slides, and at one side, projecting over the line of knots, is a boss 57, within which is mounted, with intervening rollers 58, a hub 59, to the upper portion of which is secured a pinion 60, having a vertical passage 61, through which the cross-wire is introduced to the looping-needle 62. This needle is likewise hollow for passage of the wire and projects downwardly through the hub 59 at an angle from the perpendicular to within close proximity to the twister-shafts 43. Immediately beyond the ends of such shafts is a cross-bar 63, rigidly secured to the frame, within which is the tension-needle bar 64, in which is mounted the tension-needles 65, projecting up through holes in bar 63, slightly beyond the line of twisting-pins 44 and spaced between them. The needle-bar 64 is mounted at each end upon arms 66, pivoted to cross-shaft 67, and the arms terminate in upper and lower spanners 68 69, the upper of which, 68, bears upon the upper edge of cam-wheel 70 on shaft 56. The lower spanner 69 projects into the path of pins 71, and the cam-wheel is provided with corresponding depressions, so as to permit the spanner 68 to fall when the pin engages the lower spanner, while the raised portions of the cam reverse the motion and lift the arm. By this means the pins 65 are withdrawn below the level of bar 63 in the action of releasing the cross-wire from tension and are then returned to the raised position.

Mounted on a stud 72 is a toothed wheel 73, in mesh with the pinion 60 and of a diameter four times that of the pinion-wheel 60, so that by one-quarter revolution of the driving-wheel the pinion, and consequently the looping-needle 62, will be caused to make one complete revolution. In the travel of the carriage the needle makes one revolution around each twister-pin 44, and in its outward sweep travels around each of the tension-needles 65, distributing the cross-wire, as indicated in dotted lines in Fig. 14. The action of the needle is intermittent and is produced by a rack-bar 74, mounted in the cross-head, having isolated teeth 75 at positions corresponding to each twister, with which teeth intermesh one of the series 76 of a mutilated toothed gear-wheel, mounted on the stud 72, by which means the stud is caused to rotate one-quarter revolution for each set of teeth 75, producing the entire revolution of the needle 62. For the purpose of checking momentum and positively controlling the action of the stud a square cam 77 is secured to or formed integral with the stud, which cam has a bearing along the inner face of a guiding-plate 78, set above the rack-bar 74 and recessed at 79 to permit the cam to turn under action of the gearing.

At each end of the cross-head are located the shearing-grippers A A, which cut off the wire, leaving a projecting end protruding from the looping-needle, as in Fig. 16, and grip it until released by retraction of the grip. The stationary portion of the gripper consists of a base 80, bolted to the frame in which is mounted the gripping-die 81, having a serrated face and an edge 82, against which the wire is sheared. The shear-blade 83 is set in the end of a bar 84, slidingly mounted in a housing 85, bolted to the cross-bar 63 at each end. The bar is actuated through a rod 86, having a bearing at the under side of the cross-head and an upturned end in engagement with the bar. The rod and shear-bar are thrown backward from engagement with the grip by action of a cam 87 on shaft 56, which cam is provided with release-faces bearing on dog 88 and so located as to permit the rod to fly forward under action of spring 89 when released, severing the wire and firmly gripping its end until again released.

Secured to the base 80 are fender-plates 90, against which the projecting end of the wire bears in its next forward movement due to the travel of the carriage, the end projecting between the vertical plate and a downwardly-projecting abutment 91 and against a sharp corner 92, by which it is tightly held against the strain of the departing needle, the wire in the meantime passing around a guiding grooved shoulder 93 and across the face of grip 81.

Spring-plates 94 95, the latter pivoted and adapted to open for entrance of the end of the needle, assist in controlling the direction of the projecting wire end, which is finally cut off and drops down as waste.

The operation of twisting the loop and forming the knot is more clearly illustrated in Figs. 51 to 56, inclusive. The cross-wire having been disposed around the pins, as has been shown, the strand-wires are thrown around the loops formed on the pins 44 in one revolution, and the loops and strand-wires are then given a one-half revolution, when the knotted loops are removed downwardly from the pins, and the pins and twister-shafts are then given a one and one-half revolution without performing any work in order to bring them to the correct position for the next operation in the reverse direction. This in-

termittent motion is imparted to the twisters by means of a rack 96, mounted in the cross-head, in engagement with teeth 97 of each twister-head and with a single driving pinion-wheel 98 on shaft 99, to which motion is imparted in both directions, respectively, through bevel-gearing 100, shaft 101, and bevel-wheel 102, actuated by the toothed differential gear-wheel 103 and its accompanying mechanism. Immediately before rotary motion is imparted to the twister-head 41 the locking-bolt 46 is withdrawn from engagement with sleeve 48 by paddle 50, and the twister-head will make one entire revolution about the shaft 43, which will be held stationary by the loop, when the paddle having been lowered the bolt 46 will be inserted in socket 47 under action of spring 47', and the twister-head and shaft will complete the half-revolution together. The twister will then momentarily remain at rest until the section of fence is withdrawn, when the remaining one and one-half revolutions will be made, the twister operating idly, and the parts are then in position for another operation. This intermittent action of the twister is accomplished through the differential gear-wheel 103. (More fully illustrated in Figs. 45 to 50, inclusive.) The gear-wheel 103 and a fender-wheel 104 are rigidly keyed on the shaft 14, to which intermittent motion is imparted, as has been described, through gearing 16' 17' in a forward-and-back direction alternately. The pinion gear-wheel 102 is keyed on shaft 101 and is adapted to intermesh with the series of teeth 105 and to rotate when so in mesh and to remain stationary when occupying the spaces 106 106' between such series, the bevel-pinion normally occupying the position of rest, as shown at space 106'. Secured to the wheel 103 opposite such space 106' is a cam-bar 107, while upon the hub of the pinion is a double-ended shoe 108, adapted to ride over the cam-bar upon leaving engagement with the last tooth and to hold the pinion in position to properly engage the teeth without binding at the commencement of the next turn. The blank space 106 is diametrically opposite space 106' and the teeth are so proportioned that the pinion will make just one and one-half revolutions in traversing one of the series of teeth 105, transmitting motion to the twisters and producing the first one and one-half revolutions, as has been described, one revolution of the twister-head alone and one-half revolution in engagement with the shaft 43. The time occupied by the blank 106 in passing without engagement is utilized to withdraw the knots, the pins 44 being turned down, and the various parts are held against movement due to momentum, and the position of the pinion with relation to the next engagement of the teeth is controlled by a somewhat-longer cam-plate 109, secured to the blank fender-wheel opposite the space 106 and provided with gradually-ascending faces corresponding to the pitch of the teeth upon which the shoe 108 rides. In order to insure proper engagement of the teeth for the next half-revolution of wheel 103, it is necessary to cause a slight retrograde movement of the pinion just sufficient to cause the tooth last in engagement with the departing section to be the first to engage the oncoming section of teeth. This is accomplished by means of triggers 110, pivoted to the plate 109, normally held upright by spring 111, adapted to be turned inwardly, but retained against outward throw by lugs 112. Upon the hub of the pinion beyond the shoe 108 is a finger 113, which in the turn of the pinion will throw down the first trigger when it comes into range, but will be engaged by the second trigger, thus causing a sudden reverse movement of the pinion from the state of rest produced by the cam-plate engaging shoe 108 and presenting the proper tooth for engagement, at which time the arresting-trigger will have passed around and the pinion will be free to turn.

The operation will be identically the same in the reverse movement of the driving and fender wheels, the movement alternating with the corresponding actuating movements of the machine.

It will be understood that the sizes and proportions of the wheels and their parts, the rack, its driving-pinion, and the pinion-teeth of the twisters are to be regulated and designed to perform their various functions at the proper time and speed, and such work in designing the machine for practical operation is within the province of the skilled engineer.

Motion is transmitted to the cam-shaft 56 from shaft 18 by bevel-wheels 114 on the driving-shaft meshing into bevel-wheel 115 on the lower end of angle-shaft 116, mounted in brackets 117, secured to the inner side of the frame, the shaft having at its upper end a bevel-wheel 118, intermeshing with a driven bevel-wheel 119 on the cam-shaft 56.

At each side the projecting end of the cross-wire after being cut is drawn down for one section of fence, when it comes into range of the end-twisters, by which the free ends are neatly twisted around the outside strand-wires, as shown in Fig. 38. This is accomplished by action of the sprocket-wheel 30 during travel of the carriage when the fence is stationary in its passage through the machine and by the following mechanism: Mounted in bearings 120 in the side frames is a cross-shaft 121, to which is secured a crank-arm 122, the shaft having intermediate bearings 120'. Connected with the crank 122 by a short connecting-rod 123 is a lever 124, pivoted in bracket 125 at 126, the outer end of the bracket carrying a roller 127 in engagement with a cam-groove 128 on cam 129, secured upon shaft 13 and adapted to rotate when the sprocket-wheel 30 is actuated. Mounted on the shaft 121 by means of brackets 130, secured to it, is a plate 131, having at about its middle

tion a slot 132, and to either end of the plate, at positions corresponding to the outer strand-wires, are secured the brackets 133, within which are mounted the pinion-twisters 134, having a slot 135 to the center. A downwardly-projecting stem 136 is formed integral with the twister and is provided with the cross twister-fingers 137, which in the rotation of the twister engage the free end of the wire and wrap it around the strand. The twister-pinions 134 are rotated forward or back by rack 138, mounted in the brackets 133, provided with an actuating-pin 139, projecting downwardly through slot 132 and adapted to engage a slotted angle-plate 140, secured to a horizontal bar 141, also mounted in the bearings 120'. Secured to the bar 141 is a downwardly-extended arm 142, having a central slot 143, the inner edges of which are outwardly beveled at the bottom. Into this slot enters the roller 144, mounted on a bracket 145, secured to the sprocket-wheel 30, and by which the bar 141 is carried forward and back at each forward and back rotation of the sprocket-wheel. Normally the twister-pinions are held away from engagement with the wires during the downward travel of the fence by the lever 122, as shown in Figs. 30 and 31, the pin 139 being held out of engagement with slotted plate 140 until the shaft 13 is actuated, when the plate 131 and its supported mechanism will be thrown down into operative position, engaging the wire end at the same time that the parts are thrown into position for operation. The finished fence is drawn downwardly under tension by a feeding-drum 146, mounted on shaft 147, the tension of the drum drawing the strand-wires through the passages 40 in the twister-heads, and the finished fence is wound into a roll on a double bar 148, constituting a winding-drum, supported in brackets 149 on the inner ends of short shafts 150, mounted in bearings in the ends of the side frames. It is desirable to rotate the bars 148 sufficiently far to wind upon them the whole feed of the machine at all stages of its progress and to graduate the amount of winding to the increasing diameter of the roll; also, to transmit such motion at a time when the other functions of the machine are inoperative, and the winding of the fence upon the reel and the operation of the feed-drum are accomplished within a fraction of the entire operation of the machine by the following-described mechanism: To the outer end of main shaft 7 is secured a pinion-wheel 151, intermeshing with a toothed gear-wheel 152, loosely mounted on the end of shaft 18, the diameters of the two wheels being regulated so as to produce a sufficiently-slow movement of the wheel 152.

Mounted in the framework and in suitable bearings is a counter-shaft 153, having a toothed gear 154 meshing into a similar gear 155 on the shaft 147 of the winding-drum. On the outer end of the shaft 153 is secured a ratchet-wheel 154', with which engages a pawl 155', mounted in arms 156, at the upper end of which is a roller mounted on a cross-pin 157. A pitman 158 is secured to a slotted arm of the wheel 152, so as to provide for adjustment of throw, and the outer end is slotted to permit of considerable lost motion, the slot engaging the roller and pin 157. By this means it will be seen that at a portion only of the revolution of wheel 152 will motion be transmitted to the ratchet-wheel and through the gearing to the winding-drum, such operation occupying but a comparatively-limited time. Upon the shaft 153 is keyed a sprocket-wheel 159 of considerable diameter, connected by chain 160 to a smaller sprocket-wheel 161, mounted loosely on a friction-disk 162, keyed to a cross-shaft 163, mounted in bearings in the side frames. Outside of the wheel 161, mounted loosely on the shaft 163, is a sprocket-wheel 164, upon the hub of which bears a coiled spring 165, adapted to be set against the wheel with considerable pressure by nut 166. Intervening between the friction-disk 162 and wheel 161 and between this wheel and wheel 164 are friction-washers 167, of leather or other suitable substance, and when the parts are brought together with sufficient pressure motion will be transmitted from wheel 161 through the friction-washers to wheel 164 and from such wheel through chain 168 to wheel 169 on end of reel-shaft 150. By this means the reel-shaft will be rotated until the slack is wound up on the reel, when any further rotation of the wheel 161 will produce slippage between the friction-washers. The action of the winding-drum is positive, and its diameter and amount of travel will accurately regulate and control the amount of feed of the fence at each operation.

If it is desired to reverse the action of the sprocket-wheel, as in Fig. 41, an idle pinion 170 may be inserted between the gears 154 and 155, so as to secure proper direction of rotation. It will be observed that the pull on the ends of the reel-shafts is equalized by the employment of sprocket-gearing at the other side of the machine, as shown in Fig. 1.

The operation of the machine will be readily understood from the foregoing description.

Various changes and modifications may be made in the design or proportions of the machine and its parts, and we do not desire to be limited to the exact construction shown, but to include such changes within the scope of the invention as covered by the following claims.

We claim—

1. In a wire-fence machine, the combination of a cross-head, twister-heads mounted therein, a traveling carriage mounted on the cross-head having a distributing-needle for the cross-wire, a tension-drum, a winding-reel, operating mechanism therefor, a cam-shaft provided with a series of cams adapted to transmit operative movements at variable times through interposed mechanism, and driving means for

the cam-shaft consisting of a driving bevel-wheel mounted on a counter-shaft of the machine, a driven bevel-wheel mounted on the cam-shaft, and an interposed power-transmitting shaft provided with bevel-wheels intermeshing with such driving and driven bevel-wheels, substantially as set forth.

2. In a wire-fence machine provided with a cross-head, twister-heads mounted therein and a traveling carriage mounted on the cross-head having a distributing-needle for the cross-wire; a gripping device for the wire consisting of a die, a reciprocating bar adapted to bear upon the die and to shear the wire, and a retaining-shoulder for the wire, substantially as set forth.

3. In a wire-fence machine; a gripping and shearing device for the wire consisting of a block mounted in the path of travel of the wire provided with fender-plates, an abutment and holding device for the free end of the wire, a rounded grooved shoulder, a gripping and shearing die and a reciprocating shear and grip bar, substantially as set forth.

4. In a wire-fence machine; a gripping and shearing device for the wire consisting of a block mounted in the path of travel of the wire provided with fender-plates, an abutment and holding device for the free end of the wire, a rounded grooved shoulder, a gripping and shearing die and a reciprocating shear and grip bar with an operating-bar having an impelling-spring, and a retracting-cam for the bar, substantially as set forth.

5. In a wire-fence machine, in combination with a cross-head having a series of twister-heads mounted therein, means for operating the twister-heads and for interlocking their coacting parts, and a traveling carriage on the cross-head provided with a distributing-needle and means for operating the needle; a rigid cross-bar mounted across the face of the cross-head and a series of reciprocating tension-needles therein mounted on a supporting-bar, with means for reciprocally operating the needles, substantially as set forth.

6. In a wire-fence machine, in combination with a series of twister-heads mounted in a cross-head, such twister-heads being composed of an outer body portion provided with peripheral teeth and a longitudinal wire-passage, and a centrally-located independently-operating twister-shaft, and a rack-bar provided with teeth intermeshing with the peripheral teeth of the heads, and adapted to impart intermittent motion thereto; a driving-pinion in engagement with the rack-bar mounted on a shaft provided with a driven bevel-wheel in engagement with a driving bevel-wheel, substantially as set forth.

7. In a wire-fence machine, in combination with a series of twister-heads mounted in a cross-head, a rack-bar adapted to impart intermittent motion to the twister-heads, a driving-pinion in engagement with the rack-bar mounted on a shaft, intermeshing bevel-wheels for transmitting motion thereto, and a driving-shaft provided with a pinion bevel-wheel in engagement with differential driving mechanism, substantially as set forth.

8. In combination with a series of twister-heads mounted in a cross-head, a rack-bar adapted to impart intermittent motion to the twister-heads, a driving-pinion in engagement with the rack-bar mounted on a shaft, intermeshing bevel-wheels for transmitting motion thereto, and a driving-shaft provided with a pinion bevel-wheel, differential driving mechanism consisting of a mutilated bevel gear-wheel adapted to engage the pinion bevel-wheel, a fender-wheel, and mechanism thereon and on the mutilated bevel gear-wheel for checking the rotation of the pinion bevel gear-wheel, substantially as set forth.

9. In combination with a series of twister-heads mounted in a cross-head, a rack-bar adapted to impart intermittent motion to the twister-heads, a driving-pinion in engagement with the rack mounted on a shaft, intermeshing bevel-wheels for transmitting motion thereto, and a driving-shaft provided with a pinion bevel-wheel, differential driving mechanism consisting of a mutilated bevel-gear having oppositely-disposed blank spaces, a cam-bar secured to the peripheral boundary of one of such spaces, a blank fender-wheel secured to the bevel-gear shaft provided with spring-controlled triggers, and cam-faces and a finger secured to the pinion bevel-wheel adapted to engage the cam-bar and triggers respectively, substantially as set forth.

10. In a wire-fence machine, the combination of a winding-reel, mechanism for transmitting variable rotation to the winding-reel in proportion to the required diametral feed thereof, a tension-drum adapted to withdraw the finished fence from the knotting mechanism and to deliver it to the winding-reel, and feeding mechanism consisting of a ratchet-wheel secured to the drum-shaft, a pawl mounted in supporting-arms, a pitman having a slotted connection with the arms, and means for imparting motion to the pitman, substantially as set forth.

11. In a wire-fence machine provided with a tension-drum, feeding mechanism consisting of a ratchet-wheel secured to a shaft geared to the drum-shaft, a pawl mounted in supporting-arms pivoted to the shaft, a pitman having a slot engaging a pin in the supporting-arms, a toothed driving-wheel mounted loosely on the end of a supporting-shaft, means for adjustably connecting the pitman to the driving-wheel, and a driving-pinion in mesh with the driving-wheel, substantially as set forth.

12. In a wire-fence machine, the combination of a winding-reel, intervening frictional driving mechanism for transmitting variable rotation to the winding-reel in proportion to the required diametral feed thereof, a tension-drum provided with variably-spaced guides adapted to withdraw the finished fence from the knotting mechanism and to deliver it to the winding-reel, and feeding mechanism con-

sisting of a ratchet-wheel secured to the tension-drum shaft, a pawl mounted in supporting-arms pivoted on the drum-shaft, a pitman having a lost-motion connection with the arms, and means for imparting motion to the pitman, substantially as set forth.

13. In a wire-fence machine the combination with a driving-shaft and ratchet-wheel mechanism for intermittently actuating the shaft, of a winding-drum provided with a driven sprocket-wheel, an intervening shaft having mounted thereon a friction-disk keyed to the shaft, a driven sprocket-wheel mounted on the hub of the friction-disk with an intervening friction-washer between the disk and the wheel, and a driving sprocket-wheel mounted loosely on the shaft with a friction-washer between the sprocket-wheels, means for holding the wheels, washers and disks in contact with varying pressure, a sprocket-wheel on the intermittently-acting driving-shaft, and connecting sprocket-chains, substantially as set forth.

14. In a wire-fence machine, the combination of a series of twister-heads mounted in a cross-head, provided with longitudinal passages for the strand-wires located eccentric to the center of such heads, means for imparting intermittent motion to the twister-heads whereby such passages and the wire are rotated around such center, and a series of hollow guides for the strand-wires corresponding to the number and position of the twister-heads, and having their delivery ends terminating at a sufficient distance from the twister-heads to permit free operation of the strand-wires, substantially as set forth.

15. In a wire-fence machine, the combination of a series of twister-heads mounted in a cross-head, provided with longitudinal passages for the strand-wires located eccentric to the center of such heads, means for imparting intermittent motion to the twister-heads whereby such passages and the wire are rotated around such center, and a series of hollow guides for the strand-wires corresponding to the number and position of the twister-heads, and having their delivery ends terminating at a sufficient distance from the twister-heads to permit free operation of the strand-wires, an oil-trough mounted transversely in front of the entrance end of the guides, and a roller therein over which the strand-wires pass before entering the guides, substantially as set forth.

16. In a wire-fence machine, a twister-head provided with peripheral teeth, an actuating-rack in gear therewith, a passage through one side of the twister-head terminating in an extended teat, a central shaft provided with a loop-pin, a sleeve on the inner end of the central shaft provided with a socket, a retaining-plate on the end of the twister-head and a locking-bolt mounted in the plate provided with a pressure-spring, substantially as set forth.

17. In a wire-fence machine, a twister-head provided with peripheral teeth, an actuating-rack in gear therewith, a passage through one side of the twister-head terminating in an extended teat, a central shaft provided with a loop-pin, a sleeve on the inner end of the central shaft provided with a socket, a retaining-plate on the end of the twister-head, a locking-bolt mounted in the plate provided with a pressure-spring and means for retracting the locking-bolt, substantially as set forth.

18. In a wire-fence machine, the combination with a series of twister-heads provided with peripheral teeth mounted in a cross-head, a reciprocating rack in engagement therewith, wire-passages through one side of the twister-heads terminating in extended teats, central shafts provided with loop-pins, sleeves on the inner ends of the central shafts provided with sockets, retaining-plates on the ends of the twister-heads and locking-bolts mounted in the plates provided with pressure-springs and lifting-pins; a series of paddles having rounded upper surfaces adapted to engage the pins mounted in a rock-shaft, substantially as set forth.

19. In a wire-fence machine, the combination, with a series of twister-heads provided with peripheral teeth mounted in a cross-head, a reciprocating rack in engagement therewith, wire-passages through one side of the twister-heads terminating in extended teats, central shafts provided with loop-pins, sleeves on the inner ends of the central shafts provided with sockets, retaining-plates on the ends of the twister-heads, and locking-bolts mounted in the plates provided with pressure-springs and lifting-pins; a series of paddles having rounded upper surfaces adapted to engage the pins mounted in a rock-shaft provided with an actuating-arm and a cam adapted to engage the arm intermittently to operate the rock-shaft, substantially as set forth.

20. In a wire-fence machine, the combination of a series of twister-heads mounted in a cross-head, an actuating rack-bar, a driving-pinion in engagement with the rack-bar mounted on a shaft driven through bevel-gearing, a driving-shaft for the bevel-gearing in engagement with differential driving mechanism, a traveling carriage provided with a distributing-finger, knot-forming mechanism, a tension-drum, a winding-drum, intermittent driving-gearing, and feeding mechanism for the tension-drum consisting of a ratchet-wheel secured to the drum-shaft, a pawl mounted in supporting-arms, a pitman having a lost-motion connection with the arms, and means for imparting motion to the pitman, substantially as set forth.

In testimony whereof we have hereunto set our hands.

JOHN JACKSON.
CHARLES M. CLARKE.

Witnesses:
J. N. COOKE,
P. J. EDWARDS.