

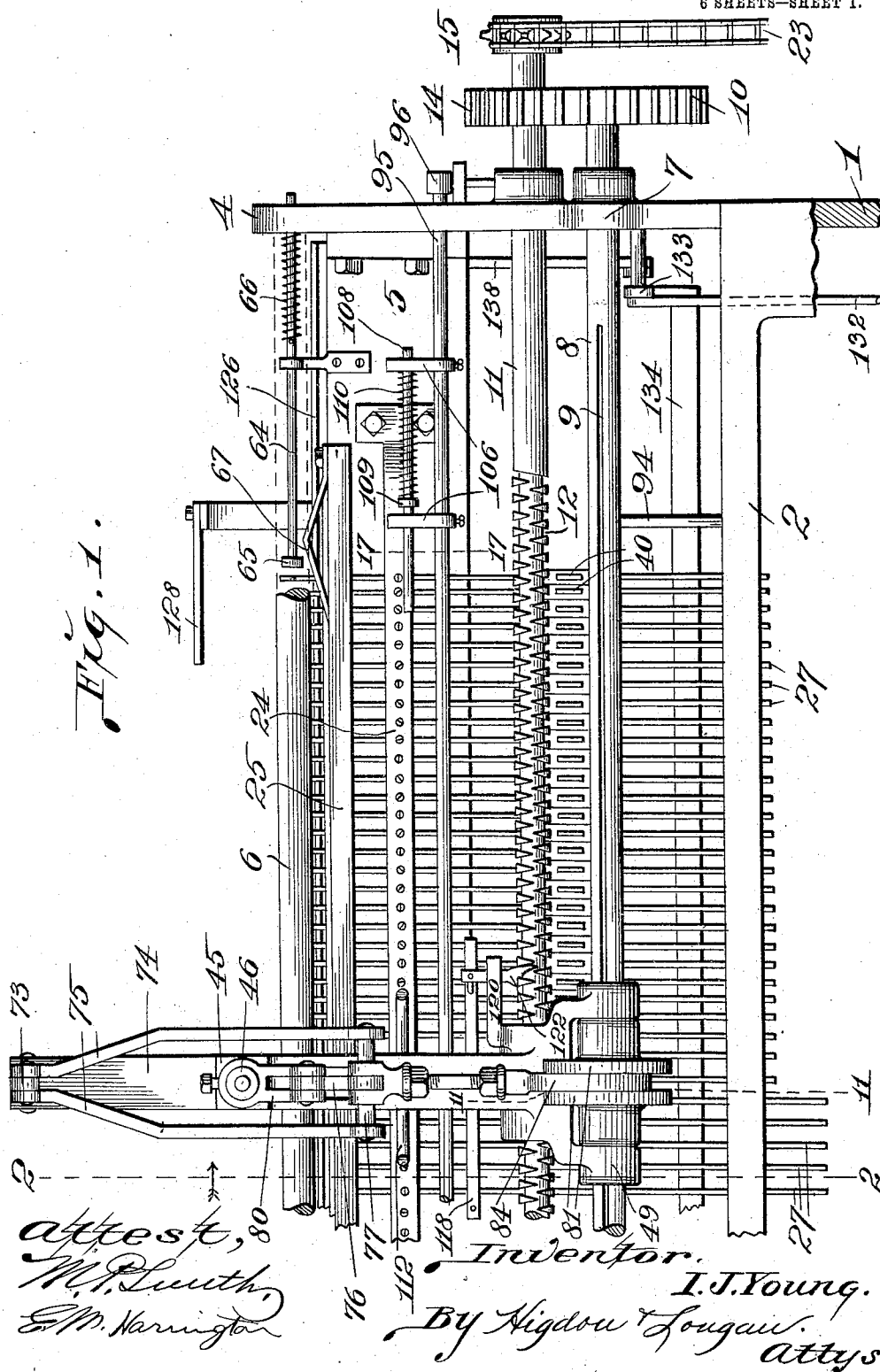
No. 863,482.

PATENTED AUG. 13, 1907.

I. J. YOUNG.
WIRE FABRIC KNITTING MACHINE.

APPLICATION FILED SEPT. 18, 1906.

6 SHEETS—SHEET 1.



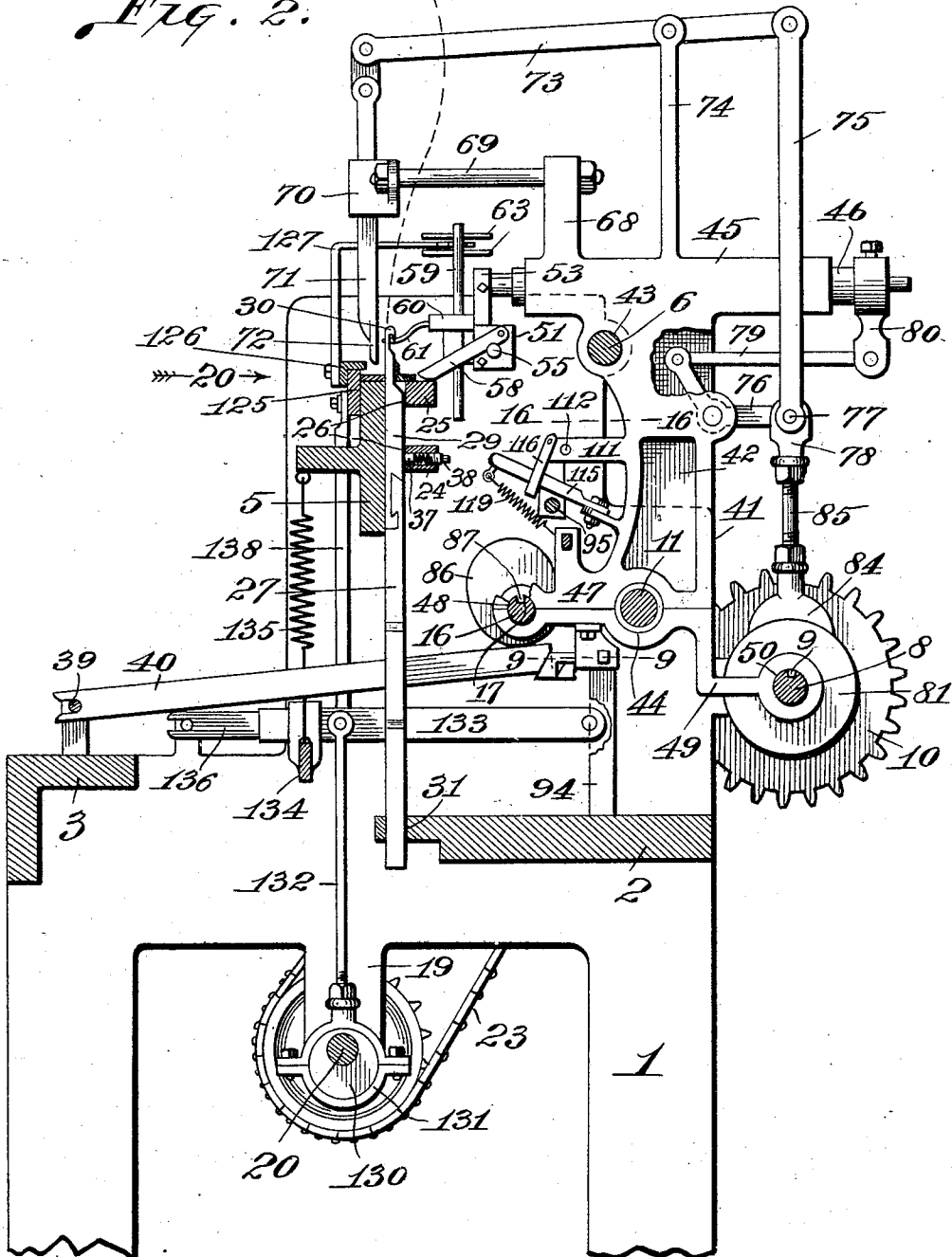
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6 SHEETS—SHEET 2.

Fig. 2.



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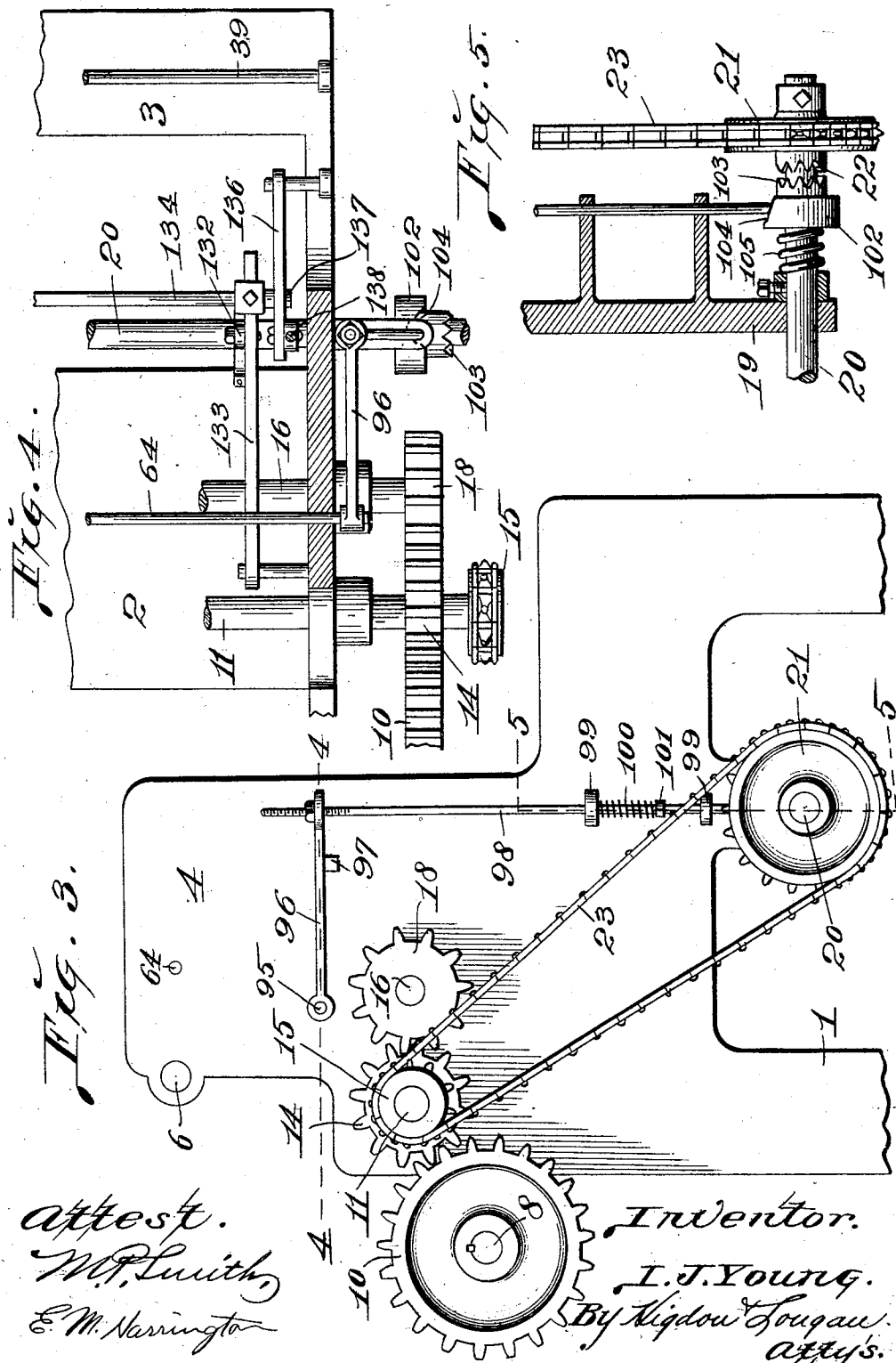
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6 SHEETS—SHEET 3.



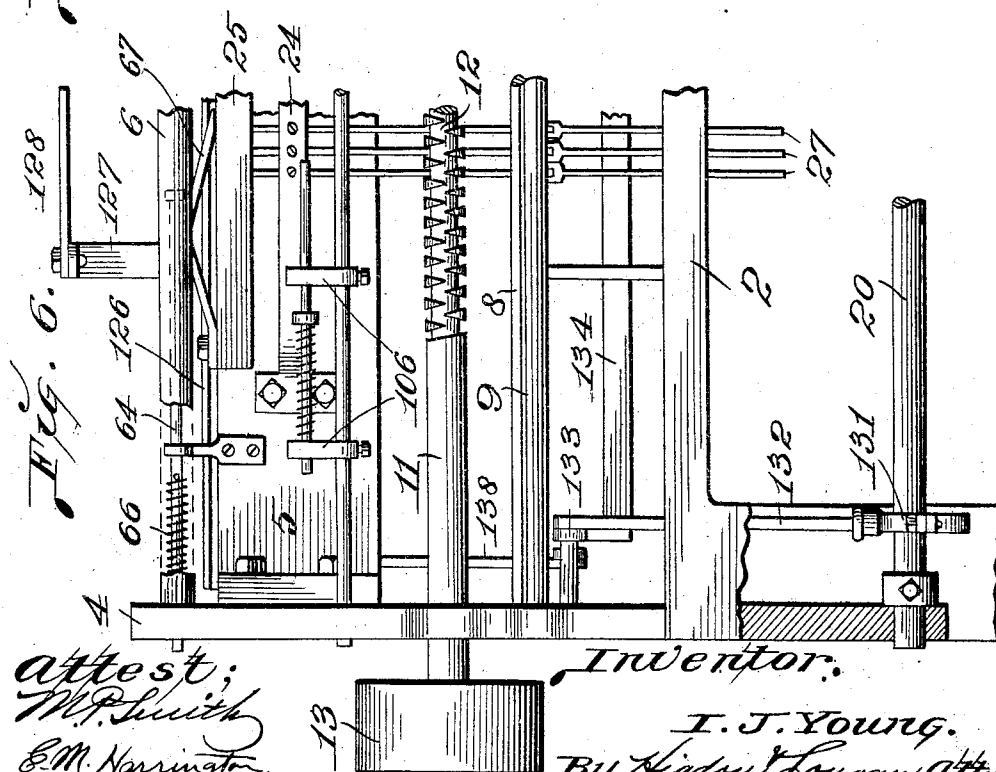
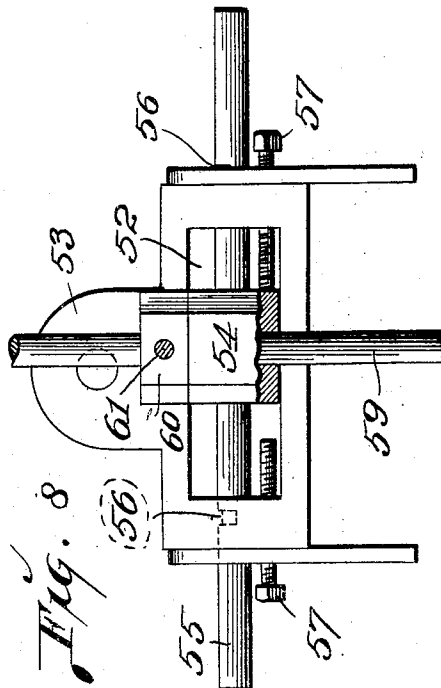
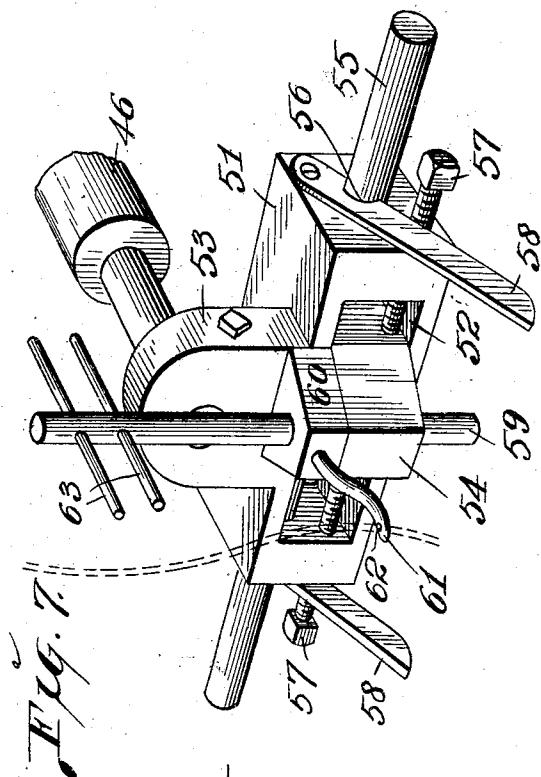
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6 SHEETS—SHEET 4.



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6 SHEETS—SHEET 5.

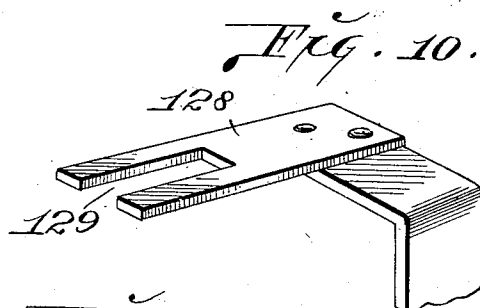
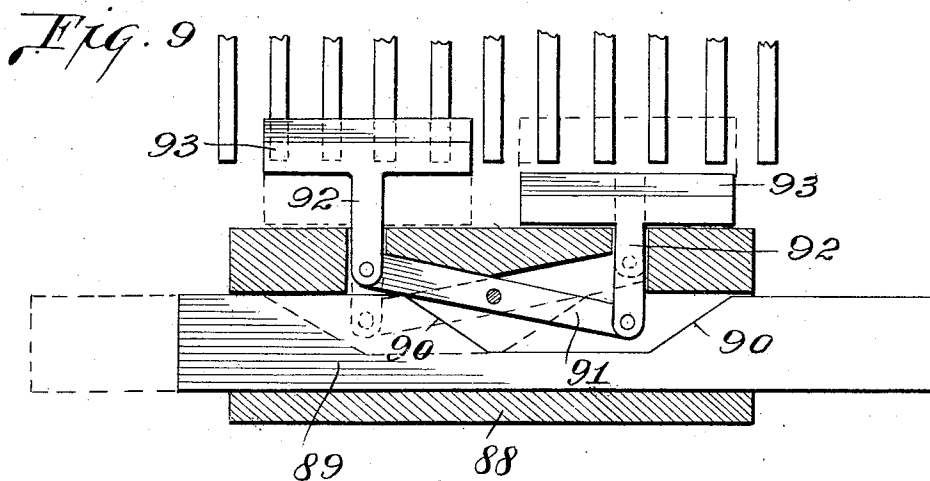


Fig. 11.

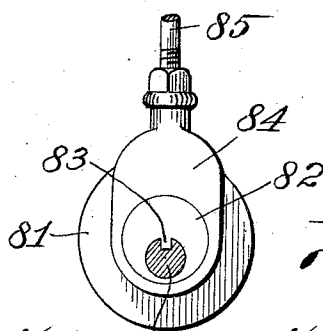


Fig. 12.

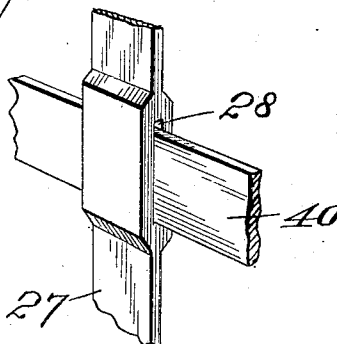


Fig. 13.

Fig. 14.

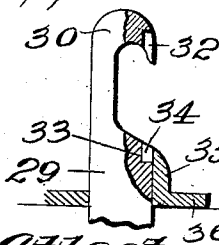
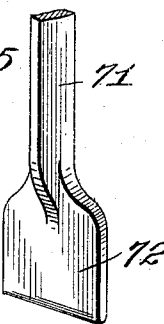
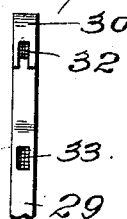


Fig. 15.



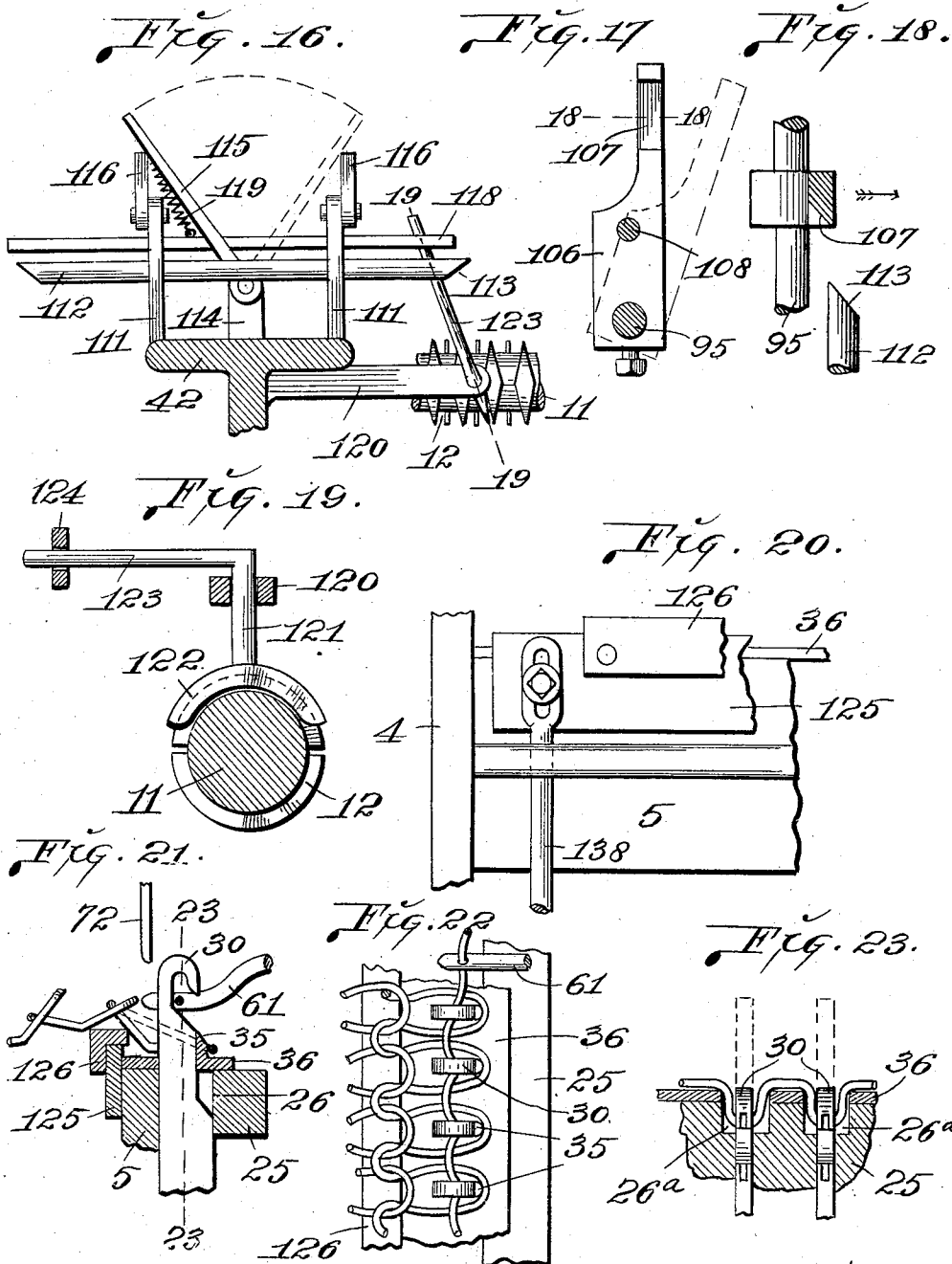
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I. J. YOUNG.
WIRE FABRIC KNITTING MACHINE.
APPLICATION FILED SEPT. 18, 1906.

6 SHEETS—SHEET 6.



Attest,
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Fig. 24. Inventor.
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UNITED STATES PATENT OFFICE.

IRA J. YOUNG, OF ST. LOUIS, MISSOURI.

WIRE-FABRIC-KNITTING MACHINE.

No. 863,482.

Specification of Letters Patent.

Patented Aug. 13, 1907.

Application filed September 18, 1906. Serial No. 335,145.

To all whom it may concern:

Be it known that I, IRA J. YOUNG, a citizen of the United States, and a resident of St. Louis, Missouri, have invented certain new and useful Improvements in

5 Wire-Fabric-Knitting Machines, of which the following is a specification containing a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to a wire fabric knitting machine, and the particular object of my invention is to provide a simple machine which can be operated with a minimum amount of power, and which will automatically form from a single strand of wire a fabric which can be advantageously used for doormats, chair seats,

10 bed bottoms, and analogous purposes.

A further object of my invention is to construct mechanism which will so form the loops of the fabric as that said fabric will lie perfectly flat while in use, without buckling or curling up at the ends and corners.

A further object of my invention is to construct a machine for knitting wire fabric which is entirely automatic in all its operations, and which requires no attention after having been started in operation other than the maintenance of a sufficient amount of wire

15 which is formed into the fabric.

To the above purposes, my invention consists in certain novel features of construction and arrangement of parts, which will be hereinafter more fully set forth, pointed out in the claims, and illustrated in the accompanying drawings, in which:—

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Figure 1 is a front elevation of the right hand portion of the machine, and showing the traveling carriage in a central position on the machine; Fig. 2 is a vertical section taken on the line 2—2 of Fig. 1; Fig. 3 is an elevation of the right hand end of the machine; Fig. 4 is a horizontal section taken on the line 4—4 of Fig. 3; Fig. 5 is a vertical section taken on the line 5—5 of Fig. 3; Fig. 6 is a front elevation of the extreme left hand end of the machine; Fig. 7 is a perspective view of the wire feeding mechanism; Fig. 8 is a front elevation of the feeding mechanism, with a portion thereof in section; Fig. 9 is an enlarged horizontal section taken on the line 9—9 of Fig. 2; Fig. 10 is a perspective view of one of a pair of plates which engage and elevate a portion of the feeding mechanism at the ends of its travel; Fig. 11 is an enlarged vertical section taken on the line 11—11 of Fig. 1; Fig. 12 is a perspective view of a portion of one of the needles, and showing its connection with one of the needle levers; Fig. 13 is a perspective view of the lower end of a vertically reciprocating plate which operates directly behind the needles, and which forms the bends in the loops of the fabric; Fig. 14 is an enlarged view of the upper end of one of the needles, portions thereof being in section; Fig. 15 is a front elevation of the upper end of one of the needles; Fig. 16 is an enlarged detail section taken on the line 16—16

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of Fig. 2; Fig. 17 is an enlarged vertical section taken on the line 17—17 of Fig. 1, and showing a rock shaft actuating finger; Fig. 18 is a horizontal section taken on the line 18—18 of Fig. 17; Fig. 19 is an enlarged cross section taken on the line 19—19 of Fig. 16; Fig. 20 is an enlarged elevation of the parts seen looking in the direction indicated by the arrow 20, Fig. 2; Fig. 21 is a detail section of the parts through which the upper ends of the needles operate, and showing a portion of the fabric adjacent said parts, and with the feeder between the needles; Fig. 22 is a plan view of a series of the needles, with a portion of the fabric thereon; Fig. 23 is a vertical section taken approximately on the line 23—23 of Fig. 21, and showing the needles at their downward limit of movement, and with the wire engaged thereby; Fig. 24 is an edge view of a portion of fabric formed by our improved machine.

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The frame of my improved machine comprises a pair of end pieces 1, connected by a bed plate 2 on the front side of the machine, and by a rail 3 at the rear. Formed integral with the end frames 1, above the bed plate 2, are the upwardly projecting plates 4, and joining the rear portions of these plates 4 is a rail 5. The ends of a shaft 6 are seated in the forward upper corners of the plates 4, which shaft supports the traveling carriage of the machine. Formed integral with and projecting forwardly from the plates 4 are brackets 7, in which is journaled a shaft 8, provided with a longitudinally extending groove 9, and the right hand end of said shaft is extended and has mounted thereon a gear wheel 10. A shaft 11 having right and left hand screw threads 12 formed thereon is journaled in the plates 4 a short distance below the shaft 6 and to the rear of the shaft 8, and mounted on the left hand end of this shaft is a belt wheel 13; and mounted on the right hand end is a pinion 14, which meshes with the gear wheel 10; and adjacent the pinion 14 is a small sprocket wheel 15. Journaled in the plates 4 immediately to the rear of the screw shaft 11 is a shaft 16, in which is formed a longitudinally extending key way 17; and fixed on the extended right hand end of said shaft is a pinion 18, which meshes with the pinion 14.

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Journaled in bearings, depending from the end frames 1, is a shaft 20, on the extended right hand end of which is loosely mounted a sprocket wheel 21, the inner hub of which is provided with a clutch face 22; and passing around this sprocket wheel 21 and the sprocket wheel 15 is a chain 23. Fixed to the front face of the rail 5 is a longitudinally extending bar 24, and fixed to the rail, immediately above said bar 24, is a second bar 25. Formed at regular intervals through the rear portions of these bars 24 and 25 are vertically alined apertures 26, through which the needles of the machine operate, and formed in the top side of the rail 25, immediately adjacent the needle apertures 26, are recesses 26^a, which are for the purpose of receiving the

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wire of which the fabric is formed when the needles are moved downwardly, (see Fig. 23.) Each needle comprises a vertically disposed body portion 27, having a horizontal opening 28 at its center to receive one of the needle levers, and detachably secured to the upper end of each body portion 27 is an upper needle portion 29, which operates through one pair of the aligned openings 26, and the extreme upper end of this upper portion 29 is formed into a hook 30. The upper portion 29 is made detachable in order that said portion may be replaced when worn or broken, without the necessity of replacing an entire needle. The lower ends of the body portions 27 of the needles operate through suitable openings 31 formed in the rear end of the bed plate 2. Formed in the front edge of the each hook 30 is a recess 32, and formed in the front edge of the upper portion 29, immediately below the hook 30, is a recess 33. These recesses are for the reception of a lug 34 carried by the inner upper end of a stripping finger 35, which is formed integral with a plate 36, which is fixed to the top sides of the rail 5 and bar 25, (see Figs. 14 and 15.) There is one of these stripping fingers 35 for each needle, and the lugs 34 on the fingers are for the purpose of causing the wire loops of which the fabric is formed to readily pass out from beneath the hooks 30. Bearing against the front edges of the needles, and carried by the rail 24, are spring pressed tension plugs 37, which are for the purpose of frictionally engaging the needles, and said plugs are adjustable by means of set screws 38, thus providing means for creating the proper amount of friction against each needle.

Arranged on top of the rail 3 is a longitudinally extending rod 39, and fulcrumed thereto are the rear ends of a series of needle levers 40, which extend forwardly through the openings 28 in the body portions 27 of the corresponding needles, and the forward ends of which levers terminate just below and in front of the shaft 16.

The traveling carriage 41 of my improved machine comprises a vertically disposed member 42, and formed through the upper end thereof is a bearing 43, which receives the shaft 6, and formed through the lower end is an opening 44 which receives the screw shaft 11. Formed integral with the upper end of the member 42 is a horizontally arranged member 45, through which is arranged to slide a shaft 46. Formed integral with the rear side of the member 42, at the lower end thereof, is a bracket 47, which is provided with a bearing 48, which receives the shaft 16; and formed integral with the front side of said member 42 is a downwardly and forwardly projecting bracket 49, the front end of which is bifurcated and is provided with bearings 50 which receive the shaft 8.

The feeder mechanism of the machine which travels immediately in front of the upper ends of the needle comprises a rectangular block 51, in the front side of which is formed an opening 52, and formed integral with the top of said block is a bracket 53, which is rigidly fixed to the forward end of the shaft 46. Arranged to slide in the opening 52 is a block 54, to which is rigidly fixed a short rod 55, the ends of which project through the ends of the block 51; and formed in said rod at suitable distances from its ends are notches 56. Set screws 57 are seated in the ends of the block 51, and project into the openings 52 therein

to limit the movement of the block 54. Pivotaly mounted on the ends of the block 51 are locking fingers 58, the lower ends of which ride on top of the bar 25, and which fingers are adapted to engage in the notches 56 to lock the rod 55 and block 54 at each end of their movement. Passing vertically through the extended end of the block 54 and loosely mounted therein is a vertically disposed rod 59, on the center of which is fixed a block 60, the rear face of which bears against the front face of the bracket 53. Formed integral with the front end of this block 60 and curving downwardly therefrom is a feeder finger 61, in the outer end of which is formed a vertical aperture 62, through which the wire passes in being fed to the needles. Rigidly fixed in the upper end of the rod 59 is a pair of horizontally disposed parallel rods 63.

Arranged to slide through each of the plates 4 in direct longitudinal alinement with the ends of the rod 55 is a rod 64, the inner end of which is provided with a head 65; and fixed to said rod is a coil spring 66, the opposite end of which bears against the corresponding plate 4; and these rods are for the purpose of shifting the rod 55 and block 54 whenever the feeder reaches the ends of its travel. Mounted on the ends of the bar 25 are inclined plates 67, which are in the path of travel of the lower ends of the locking fingers 58 and which elevate said fingers out of the notches 56 to allow the rod 55 and block 54 to be shifted. Formed integral with the top of the member 45 at the rear end thereof is an arm 68, with which is formed integral a rearwardly extending arm 69, and carried by the rear end of said arm is a block 70, through which is arranged for vertical movement a bar 71, carrying on its lower end a plate 72, which travels directly behind the needles and immediately over the rear portion of the plate 36. The upper end of this vertically moving bar 71 is flexibly connected to the rear end of a lever 73 fulcrumed to the upper end of a standard 74, carried by the member 45; and pivotaly connected to the forward end of this lever are the upper ends of a pair of vertically disposed connecting rods 75, the lower portions of which extend below the front end of the member 45. Fulcrumed to the front side of the member 45 is a bell crank 76, the outer end of the horizontal member of which is connected by means of a transverse pin 77 to the lower ends of the rods 75, and to a short vertically disposed link 78. The upper end of the vertical arm of the bell crank 76 is pivotaly connected to the rear end of a rod 79, the forward end of which is connected to the lower end of a loop 80, which is detachably fixed to the forward end of a shaft 46.

Loosely mounted on the shaft 8, between the arms of the bracket 49, is a pair of disks 81, and arranged on said shaft 8, between these disks, is an eccentric disk 82, provided with an integral key 83, which travels in the key way 9. A plate 84 is provided with a circular opening which receives the disk 82, and connected to the upper end of said plate 84 is a rod 85, the upper end of which is connected to the link 78. The mechanism just described provides means for imparting vertical movement to the bar 71 and plate 72, and also for imparting reciprocatory motion to the shaft 46, and the feeder mechanism.

The rear portion of the bracket 47 is bifurcated, and

arranged therein is an eccentric disk 86, which is provided with a key 87, which travels in the key way 17 in the shaft 16, which eccentric travels immediately over the forward ends of the needle levers 40, and depresses the same in succession in order to move the needles downwardly. Fixed on the under side of the bracket 47 is a block, through which is arranged to slide a bar 89, in one edge of which is formed a pair of oppositely arranged inclined shoulders 90. Pivotaly mounted in the forward portion of said block is a lever 91, to the ends of which are pivotally connected the rear ends of arms 92, which operate through openings in the front of the block 88, and which are provided on their forward ends with plates 93, which are arranged to engage immediately over the forward ends of a series of the needle levers 40 after the same have been depressed.

Posts 94 are arranged on the bed plate 2 directly in the path of travel of the ends of the bar 89, for the purpose of shifting said bar at the ends of the travel of the carriage 41 to reverse the positions of the plates 93, which reversal is brought about by the action of the inclined shoulders 90 against the ends of the lever 91.

Journalled in the plates 4 between the shafts 6 and 16 is a rock shaft 95, and fixed on the right hand end thereof is a rearwardly projecting lever 96, which normally rests on a stop 97 formed on the right hand plate 4. Connected to the free end of this lever 96 is the upper end of a vertically disposed rod 98, which operates through bearings 99 formed on said plate 4, there being an expansive coil spring 100 mounted on this rod beneath one of the bearings, and engaging on a collar 101 carried by said rod, thus normally forcing said rod downwardly.

Arranged to rotate with and slide upon the right hand end of the shaft 20, adjacent the sprocket wheel 21, is a collar 102, the outer end of which is formed into a clutch face 103, which engages with the clutch face 22; and formed in the top of said collar 102 is a notch 104, in which the lower end of the rod 98 normally engages. When so engaged, the collar 102 is so held that the clutch face 103 is out of engagement with the clutch face 102. Interposed between the collar 101 and the right hand bearing 19 is a stiff expansive coil spring 105.

Fixed on the rock shaft 95, inside each end plate, is a pair of vertically disposed fingers 106, the inner ones of which are provided at their upper ends with inclined faces 107, and arranged to slide through each pair of fingers is a rod 108, on which is fixed a collar 109; and bearing against said collar, and against the outer one of each pair of fingers 106 is an expansive coil spring 110. Formed integral with and projecting rearwardly from the member 42, between the shafts 6 and 11, is a pair of arms 111, and fixed in said arms is a longitudinally arranged rod 112, the ends of which are beveled, as indicated by 113, in opposition to the beveled edges 107 of the fingers 106.

Hinged to a bracket 114 formed integral with the rear side of the member 42 is a swinging arm 115, and fixed to the outer ends of the arms 111 are fingers 116, which act as stops to limit the swing of said arm 115. Formed integral with the top of the bracket 47 is a pair of upwardly projecting bearings 117; in which is arranged to slide a longitudinally disposed bar 118,

and fixed to the center of said bar and to the outer end of the swinging arm 115 is a retractile coil spring 119. Fixed to the right hand side of the member 42 is an upwardly projecting bracket 120, in the outer end of which is journaled a short vertical shaft 121, the lower end of which is provided with a curved runner 122, which is adapted to travel in the threads of the screw shaft 11. Formed integral with the upper end of the shaft 121 is a forwardly projecting arm 123, the outer end of which projects through an opening 124 formed in the right hand end of the bar 118. The runner 122 acts as a nut upon the shaft 11 to govern the direction of travel of the carriage 41, and the bar 118 and swinging arm 115 are for the purpose of shifting the runner from the right hand thread to the left hand thread, and vice versa.

Arranged to slide vertically on the rear face of the rail 5 is a longitudinally disposed bar 125, and fixed on the top thereof is an inclined bar 126. Secured to this bar 126, adjacent each end, is an upwardly projecting arm 127, the upper end of which is bent forwardly, and fixed to said forwardly bent upper end is a horizontally disposed plate 128, the inner end of which is bifurcated, as designated by 129, and this pair of plates is in direct horizontal alinement with the upper end of the rod 59 which bears the parallel rods 63.

Mounted on the shaft 20, adjacent each end frame, is an eccentric 130, around each of which passes a strap 131, and secured to each strap is a vertically disposed rod 132, the upper end of which is connected to the rear end of a lever 133. Each of the levers 133 is pivoted at its forward end to the corresponding end plate 4, and connecting the rear ends of said levers is a cross bar 134, which extends immediately beneath the centers of all of the needle levers 40. Connected to this cross bar 134, adjacent its ends, are the lower ends of a pair of retractile coil springs 135, the upper ends of which are secured to the rail 5.

Pivoted at their rear ends to the end frame 1 are horizontally disposed levers 136, the same being journaled to the levers 133 by means of pins 137; and pivotally connected to the forward ends of said levers 133 are the lower ends of vertically disposed rods 138, the upper ends of which pass through the webs of the rails 5, and are adjustably connected to the rear sides of the vertically sliding bar 125.

The mechanism just described provides means for elevating the cross bar, which in turn elevates the needle levers 40 after the same have been depressed, and said mechanism also elevates the sliding bar 125 and parts carried thereby to strip the wire fabric from the needles after a row of loops have been formed on said fabric.

The operation of my improved machine is as follows: A belt applied to the belt wheel 13, and driven in the usual manner, drives the shaft 11, and the rotary motion thereof is imparted by means of the gear wheel 10 to the pinions 14 and 18, and to the shafts 11 and 16 on which said pinions are mounted. Rotary motion is also imparted to the sprocket wheel 21 by means of the sprocket chain 99 traveling around said sprocket wheel, and the sprocket wheel 15. The runner 122 traveling in the proper thread in the screw shaft 11 and being held in proper position by the bar 118 will travel

along in the thread of said shaft 11, and, as a result, the carriage 41 will be likewise moved along said shaft, and the shafts 6, 8, and 16. The shaft 8 being rotated operates the disk 82, and the plate 84 and connections thereto are alternately raised and lowered, and in this manner the bell crank 76 is swung upon its fulcrum. The connecting rod 179 shifts backwardly and forwardly, and in like manner the shaft 46 is shifted in the upper member 45 of the carriage 41. This reciprocating motion moves the feeder backwardly and forwardly in such a manner as to move the feeding finger 61 successively between the upper ends of the needles, and the wire of which the fabric is formed is suspended in any suitable manner above the center of the machine, and said wire passes through the vertical eye 62 of the finger, and is carried thereby beneath the hooks 30 on the upper ends of the needles in succession, (see Fig. 22.) The vertical movement of the plate 84 is imparted to the rods 75, and as a result the lever 73 is actuated, and the bar 71 is reciprocated vertically, and the plate 72 on the lower end of said bar is moved vertically, and in succession over the loops that were formed by the needles on their prior movements, in order to bend said loops transversely at their centers, which bend is necessary to cause the fabric to lie flat, and to overcome any tendency to curl or buckle, (see Figs. 21 and 24.) When the plate 72 descends, the previously formed row of loops lie straight, with their rear ends bearing on the top of the inclined bar 126, (as shown by dotted lines in Fig. 21,) and the feeder finger carries the wire beneath the hooks on the upper end of the needles over this row of loops, (as shown in Fig. 22.) Immediately after the wire has been carried beneath each needle, said needle is moved downwardly following the depressing of the corresponding needle lever 40 by the eccentric 86, the high portion of which bears upon the forward ends of the needle levers in succession, and moves the same downwardly to the position shown by dotted lines in Fig. 2, which eccentric rotates with the shaft 16, and is moved longitudinally on said shaft with the carriage 41. Immediately after the forward ends of the levers 40 have been depressed, the plate 93 which has been moved forwardly by the actuation of the shifting bar 89 passes over the rear ends of the needle levers to prevent their being elevated by reason of an upward pull of the wire engaged in the hooks on the upper ends of said needles. The opposite plate 93 during this travel is moved rearwardly to its limit of movement against the block 88. Thus the carriage travels from one end of the machine to the other, and the wire is engaged beneath the hooks of all of the needles, and, during said travel, the plate 72 has bent all of the loops previously formed by the needles, (as shown in Figs. 21 and 24.) As the needles are moved downwardly, the wire is engaged and pulled downwardly into the recesses 26^a, (as shown in Fig. 23,) so that when the carriage reaches the end of its travel, all of the needles are so positioned. As the carriage reaches the end of its travel, the beveled end 113 of the rod 112 engages against the beveled edge 107 of one of the fingers 106, and, as a result, said finger is swung forwardly, (as indicated by dotted lines in Fig. 17,) which movement rocks the shaft 95, in turn elevating the outer end of the lever 96. This movement elevates the rod 98 against the resistance of the coil spring 100,

thereby withdrawing the lower end of said rod from the notch 104, and releasing the collar 102. This collar which is mounted upon a key carried by the shaft 20 is forced outwardly by the pressure of the coil spring 105 until the clutch faces 103 and 22 are engaged. The rotary motion of the sprocket wheel 21 will now be imparted to the shaft 20, and, as a result, the eccentrics 130 will be rotated a single turn, and, as a result, the rods 132 will be elevated. This vertical movement is in turn imparted to the rods 138 through the levers 133 and 136, and in turn the bars 125 and 126 are elevated, which will elevate the fabric from the top of the rail 5, and strip the last formed series of loops from the fingers 35 on which they have been held. This vertical movement of the rods 132 also elevates the cross bar 134, and, as a result, all of the needle levers 40 are elevated to their normal positions, in turn elevating the needles, and the bent portions of the wire which were engaged by the hooks on the upper ends of the needles, and which have been occupying the recesses 26^a, will, during this elevating movement of the needles, ride out of the openings beneath the hooks 30, and will be engaged over the fingers 35 immediately in front of the needles. Just prior to the movement of the carriage toward one end of the machine, the end of the corresponding one of the rods 108 will be engaged by the side of the swinging arm 115, and said rod 108 will be gradually moved outwardly, thus storing power in the coil spring 110. As soon as the power stored therein overcomes the resistance offered by the coil spring 119, the swinging arm will be shifted from one side to the other, (as shown by dotted lines in Fig. 16,) which movement takes place suddenly, owing to the tension of the coil spring 119, and, as a result, the bar 118 is shifted into a reverse position, thus swinging the arm 123, and changing the position of the runner 122. This action results in a reversing of the travel of the carriage 42, and as soon as the beveled end 113 of the rod 112 leaves the beveled edge 107 of the finger 106, the rock shaft 95 will return to its normal position, owing to the power stored in the coil spring 100; and, as a result, the lower end of the rod 98 will descend onto the periphery of the collar 102, and pass therefrom into the notch 104, and the continued rotation of said collar will cause one of the faces at the ends of said notch to bear against the lower end of the rod 98, and, as a result, said collar will, by its own rotation, become disengaged from the clutch face 22, and in so doing will compress the spring 105. At each end of the travel of the carriage 41, the corresponding end of the bar 89 strikes against one of the posts 94, and, as a result, said bar is reversed in position, and the corresponding inclined shoulder 90 reverses the position of the lever 91, and in turn reversing the positions of the plates 93, (see dotted lines Fig. 9.) When the carriage 41 reaches the ends of its travel, the bifurcated end 129 of the plate 128 passes between the parallel rods 63 carried by the rod 59, and, as a result, when the bar 125 is elevated, said rod 59, together with the block 60, and the finger 61, will likewise be elevated, this movement taking place at each end of the travel of the carriage, and is for the purpose of elevating the finger at the time the fabric is stripped from the needles and fingers 35. Simultaneous with this movement at the end of the travel of the carriage 41, the corresponding end of the rod 55 engages against the corresponding

head 65 of one of the spring actuated rods 64, and as the corresponding one of the locking fingers 58 rides up the adjacent inclined plate 67, which movement unlocks said rod 55 by disengaging the finger from the notch 56, the rod 55 will be shifted longitudinally, which movement carries the block 54 and parts carried thereby from one position to another in the opening 52. This operation is for the purpose of getting the feeder finger 61 immediately in advance of the needles as they are depressed by the action of the eccentric 86 on the needle levers 40; and the locking fingers 38 engaging in the notches 56 lock the blocks 54 and parts carried thereby at the ends of their movement in the block 51.

A machine of my improved construction operates very rapidly and with a minimum amount of power, and the automatic reversing movements at the ends of the travel of the carriage take place rapidly and in proper sequence. Therefore, wire fabric can be very rapidly manufactured, and the machines require no attention after being set in operation, other than to be supplied with the necessary wire.

The body of the fabric after being formed extends downwardly behind the inclined bar 126, and over the web on the rear of the rail 5.

I claim:—

1. In a machine of the class described, a series of vertically disposed needles, hooks formed at the upper ends of said needles, means whereby wire is carried in succession beneath the hooks of the needles, means whereby the needles are moved downwardly in succession immediately after the wire has been carried beneath the hooks thereof, and means whereby all of the needles are simultaneously elevated; substantially as specified.

2. In a machine of the class described, a series of vertically disposed needles, hooks formed at the upper ends of said needles, means whereby wire is carried in succession beneath the hooks of the needles, means whereby the needles are moved downwardly in succession immediately after the wire has been carried beneath the hooks thereof, means whereby all of the needles are simultaneously elevated, and means whereby the wire is stripped from beneath the hooks of the needles; substantially as specified.

3. In a machine of the class described, a series of vertically disposed needles, hooks formed at the upper ends of said needles, means whereby wire is carried in succession beneath the hooks of the needles, means whereby the needles are moved downwardly in succession immediately after the wire has been carried beneath the hooks thereof, means whereby the wire is stripped from beneath the hooks of the needles, means whereby the wire loops formed by the needles are bent immediately after said needles are depressed; and means whereby all of the needles are simultaneously elevated; substantially as specified.

4. In a machine of the class described, a series of vertically disposed needles, hooks formed at the upper ends thereof, a needle lever engaging each needle, means whereby the needle levers are successively engaged to move the needles downwardly, means whereby wire is carried successively beneath the hooks of the needles; and means whereby all of the needles are simultaneously elevated; substantially as specified.

5. In a machine of the class described, a series of vertically disposed needles, hooks formed at the upper ends thereof to engage the wire of which the fabric is formed, a stripping finger rigidly positioned immediately in front of the upper end of each needle, a projection integral with each stripping finger, and there being recesses formed in each needle above and below the hook thereon to receive the projection; substantially as specified.

6. In a machine of the class described, a series of vertically disposed needles, hooks formed at the upper ends

thereof, means whereby wire is carried successively beneath the hooks of the needles, means whereby the needles are moved downwardly immediately after the wire has been carried beneath the hooks thereof, means whereby the fabric is stripped from the needles immediately after they have all been moved downward; and means whereby all of the needles are simultaneously elevated; substantially as specified.

7. In a machine of the class described, a series of loop forming needles, means whereby wire is fed successively to said needles, means whereby said needles are depressed in succession after the wire has been delivered thereto, means whereby all of the needles are simultaneously elevated after being depressed, and means whereby the wire feeding mechanism is caused to reverse its travel after having delivered wire to all the needles; substantially as specified.

8. In a machine of the class described, a series of loop forming needles a feeder operating adjacent the portions of said needles which form the loops, means whereby the feeder is simultaneously reciprocated and moved longitudinally; means whereby the needles are successively moved downwardly immediately after a reciprocating movement of the feeder, and means whereby all of the needles are simultaneously elevated at the completion of each longitudinal movement of the feeder; substantially as specified.

9. In a machine of the class described, a series of needles arranged for vertical reciprocation, hooks formed at the upper ends thereof, a feeder arranged to operate adjacent the hooks, a finger carried by said feeder, means whereby said feeder is moved longitudinally in front of the hooks, and at the same time reciprocated to carry the finger successively between the hooks; means whereby the needles are moved downwardly in succession after the reciprocating movements of the feeder, and means whereby all of the needles are simultaneously elevated at the completion of each longitudinal movement of said feeder; substantially as specified.

10. In a machine of the class described, a series of needles arranged for vertical reciprocation, hooks formed at the upper ends thereof, a feeder arranged to operate adjacent the hooks, a finger carried by said feeder, means whereby said feeder is moved longitudinally in front of the hooks and at the same time reciprocated to carry the finger successively between the hooks, and means whereby the travel of the feeder is automatically reversed after having delivered wire to all of the needles in one direction; substantially as specified.

11. In a machine of the class described, a series of vertically disposed needles, hooks formed at the upper ends thereof, means whereby wire is carried successively beneath the hooks, means whereby the needles are moved downwardly in succession immediately after the wire has been delivered to the hooks thereof, a series of fingers rigidly fixed in front of the upper ends of the needles for engaging the loops of wire after the same have been formed by the needles, means whereby the loops are stripped from the fingers, and means whereby each loop is bent transversely at its center during the time it is engaged on the finger; substantially as specified.

12. In a machine of the class described, a series of needles arranged for vertical reciprocation, hooks formed at the upper ends thereof, a carriage arranged to travel adjacent the needles, a feeder mounted on the carriage for delivering wire to the hooks, means whereby the feeder is reciprocated as it moves with the carriage, means whereby the needles are depressed after the wire has been delivered thereto, means whereby certain of the needles are held against elevation after being depressed, and means whereby the direction of travel of the carriage is automatically reversed after it has passed all of the needles; substantially as specified.

In testimony whereof, I have signed my name to this specification, in presence of two subscribing witnesses.

IRA J. YOUNG.

Witnesses:

M. P. SMITH,
E. L. WALLACE.