

No. 682,226.

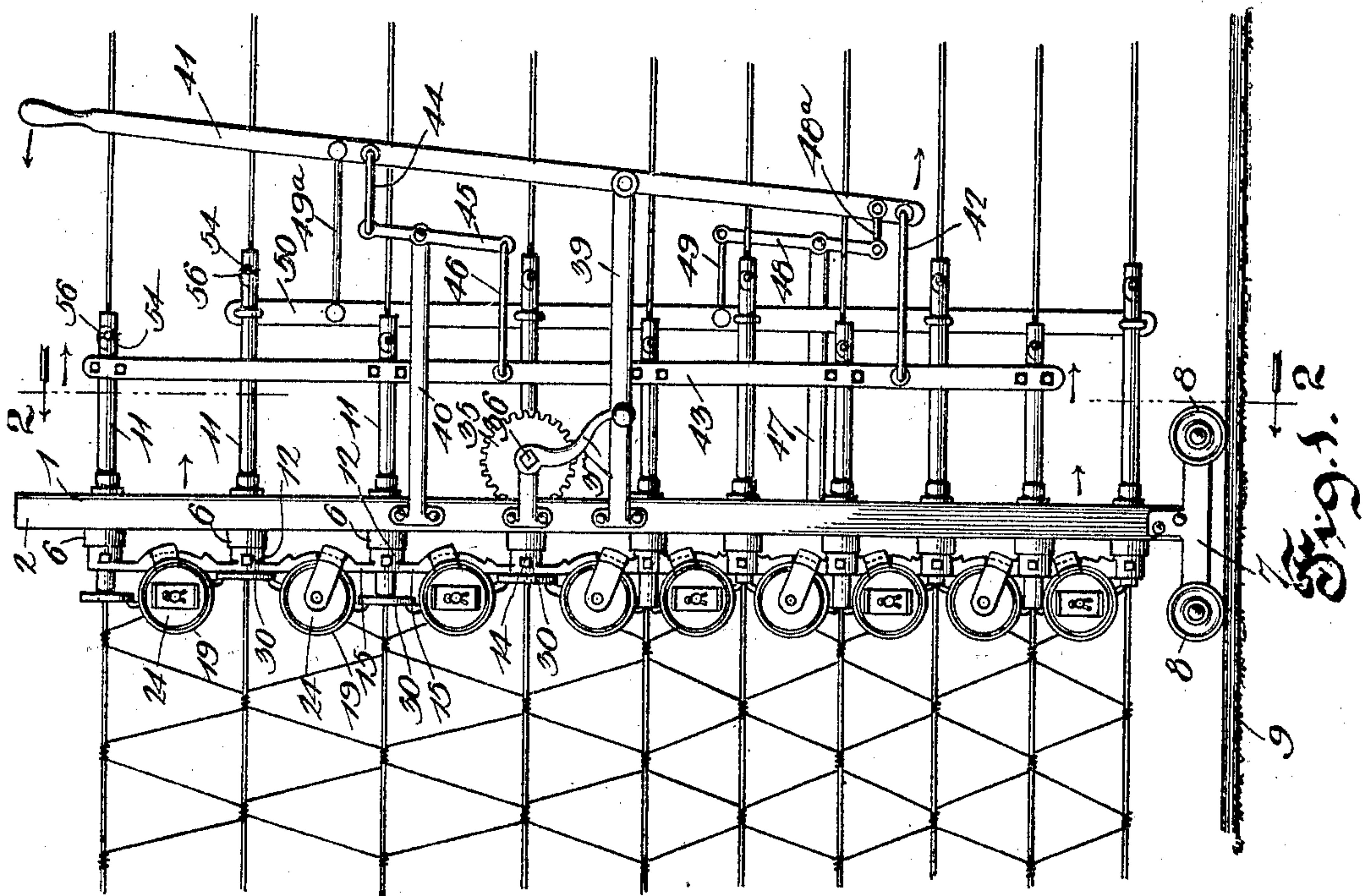
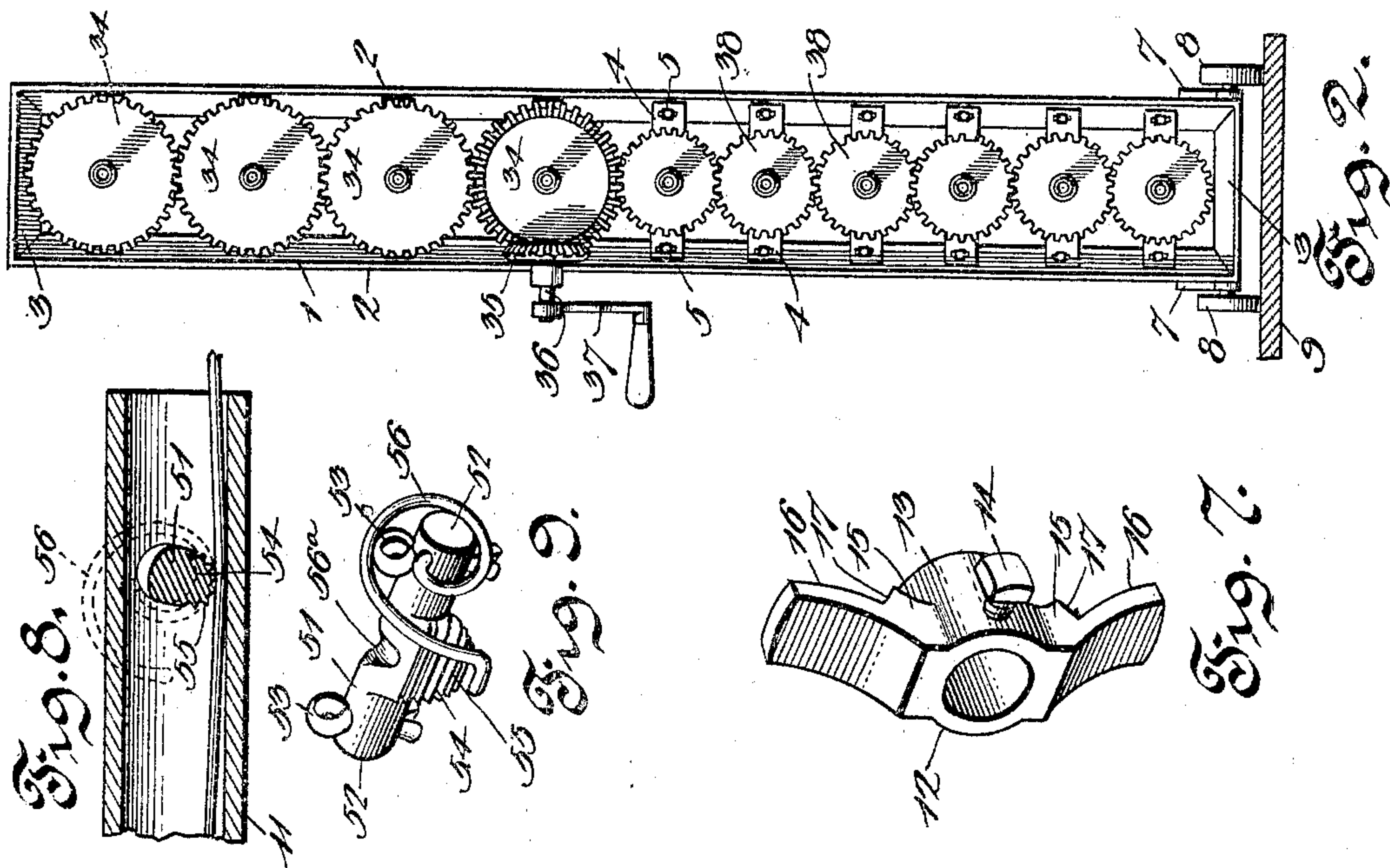
Patented Sept. 10, 1901.

C. PACE.
WIRE FENCE MACHINE.

(Application filed Mar. 25, 1901.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses

J. F. Langwell.
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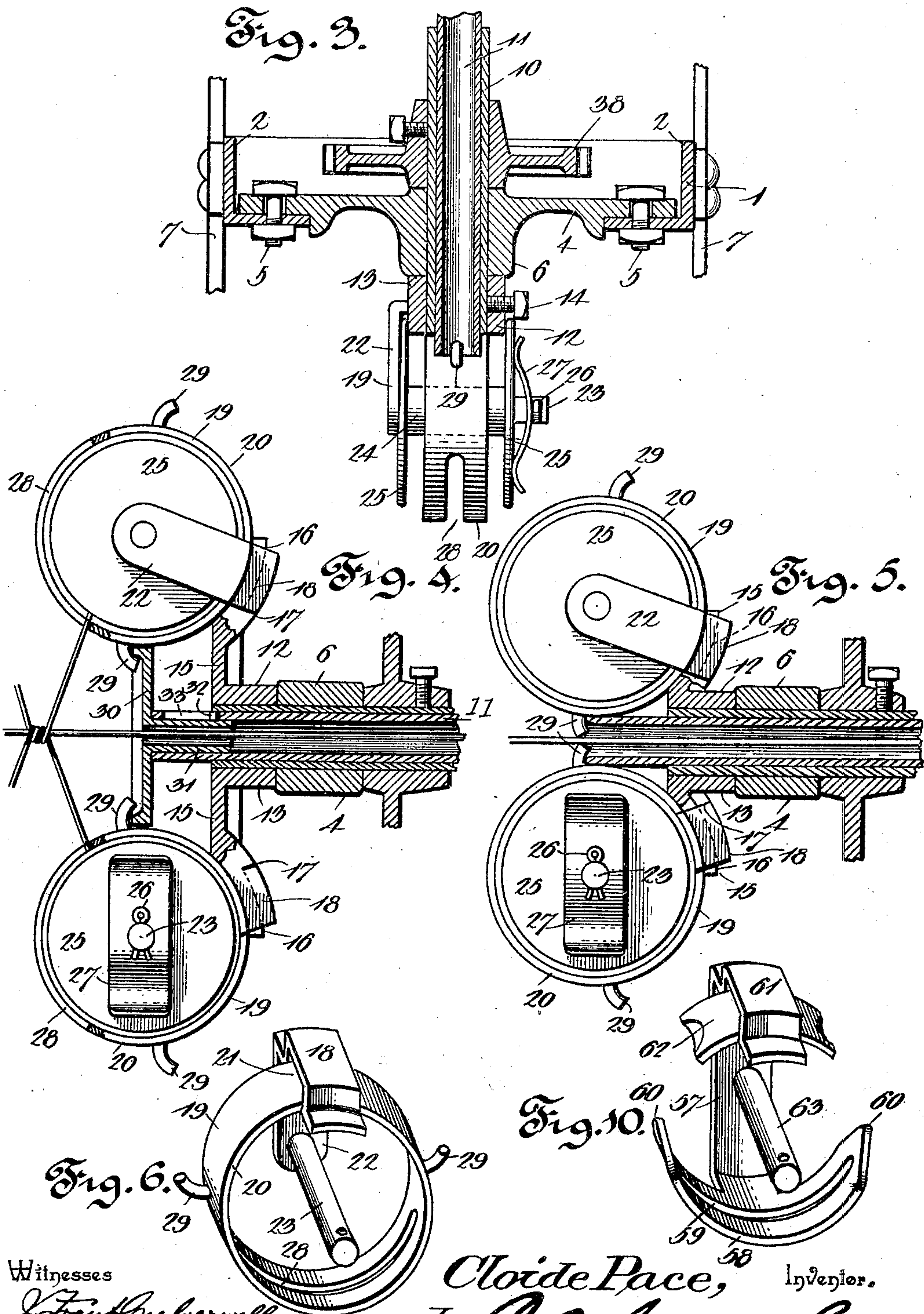
Cloide Pace, Inventor.
by C. A. Snow & Co. Attorneys

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WIRE FENCE MACHINE.

(Application filed Mar. 25, 1901.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses
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UNITED STATES PATENT OFFICE.

CLOIDE PACE, OF FARMLAND, INDIANA.

WIRE-FENCE MACHINE.

SPECIFICATION forming part of Letters Patent No. 682,226, dated September 10, 1901.

Application filed March 25, 1901. Serial No. 52,862. (No model.)

To all whom it may concern:

Be it known that I, CLOIDE PACE, a citizen of the United States, residing at Farmland, in the county of Randolph and State of Indiana, have invented a new and useful Wire-Fence Machine, of which the following is a specification.

This invention relates to wire-fabric machines especially designed for service in the field for the fabrication of a wire fence of that class embodying longitudinal warp-wires or stringers and woof or cross wires twisted around said warp-wires at regular predetermined intervals, although many of the operative parts are capable of embodiment in a stationary machine for use in a factory for the production of wire fabrics generally.

In the embodiment of the invention a woof or cross wire feeding mechanism is employed that is given an automatic operation by the shifting operation of the entire machine longitudinally of the warp-wires to change the center of said mechanism and cause the same to twist the woof or cross wires about adjacent warp-wires in alternation throughout the whole fabrication, and thereby regularly separate the woof or cross wires in the intervals between the twisting operations to form the mesh. The propelling or advancing devices are closely or intimately related to the woof-wire twisting and feeding mechanism; but the rotation of said latter mechanism is carried on independently of the movement of the machine on the warp or stringer wires and is not in the least disturbed during the latter operation, and one important structural advantage in the present machine is that while the twisting mechanism is operating to throw the woof or cross wires around two of the warp or stringer wires throughout the whole series of the latter the intermediate warp-wires between the series of two remain unacted upon and by a subsequent operation are similarly engaged, and the former series of two remain unacted upon, there being one less woof-wire-feeding device than there are warp or stringer wires.

The invention also contemplates the employment of gearing for rotating the woof or cross wire twisting devices or mechanism in part at a greater rate of speed than the remaining portion to compensate for a closer

arrangement of the warp or stringer wires for particular location at the bottom of a fence fabric, and thus permit the entire mechanism to be actuated by a single master-gear or like device and produce a fence fabric with the warp or stringer wires in closer relation in a part of the same by a continuous operation of the machine and without requiring the utilization of gear-shifting instrumentalities or an independently-operated gear organization to arrive at the result sought.

The invention furthermore contemplates the details of construction and arrangement of the several parts, which will be more fully hereinafter described and claimed.

In the drawings, Figure 1 is a side elevation of the improved machine applied in operative relation to warp-wires or stringers. Fig. 2 is a section taken in the plane of the line 2 2, Fig. 1, and looking in the direction of the arrows. Fig. 3 is a horizontal section taken through one of the lower plungers and showing the frame construction. Fig. 4 is a longitudinal vertical section through one of the upper plungers and the twisting-wire-holding devices in intimate relation thereto. Fig. 5 is a view similar to Fig. 4 of one of the lower plungers and its intimately-coacting mechanism. Fig. 6 is a detail perspective view of one of the spool-holders. Fig. 7 is a detail perspective view of one of the rotating carriers for controlling the movement of the spools. Fig. 8 is a longitudinal vertical section of a portion of one of the plungers and the warp or stringer wire gripping device therein. Fig. 9 is a detail perspective view of one of the warp or stringer wire gripping devices. Fig. 10 is a detail perspective view of a modified form of spool-holder.

Similar numerals of reference are employed to indicate corresponding parts in the several views.

The numeral 1 designates a frame which, as clearly shown by Fig. 3, is composed of opposite side angle-irons 2, connected at top and bottom by corresponding irons 3, and secured to the inner transversely-extending members of the said irons 2 are transversely-disposed plates 4, each terminally fastened by bolts 5 or the like and having a central longitudinally-directed bearing-hub 6. To the lower extremities of the irons 2 truck-

irons 7 are attached and provided with rollers 8, which will preferably be caused to run on a board or other flat base 9, so as to provide a level support, though it will be understood that in some instances the said rollers may contact directly with the ground-surface, or if the machine be used for the construction of the fabric indoors the said rollers will have contact directly with the floor of the structure in which it is located.

The improved machine is shown in upright position and arranged for field use; but it will be understood that it can be arranged so the frame will rest on one side or be disposed horizontally, or said frame may be held at the ends in any preferred manner to have movement longitudinally of a plurality of warp or stringer wires and form part of a machine located within a factory or shop and arrive at precisely the same result, or to manufacture the fabric in bulk for after setting up in connection with fence-posts. In changing the machine from a movable field to a stationary one the organization of coacting elements remains the same in both instances and the principle of the invention is preserved, and only such minor changes will be made as come within the purview of the ordinary skilled mechanic.

The plates 4 each give support to mechanism of substantially the same construction, with the minor exceptions which will be hereinafter set forth, and in describing the mechanism in connection with one plate it will be understood that the others have similar devices in the main. In the bearing-hub 6 of each plate 4 an elongated sleeve 10 is rotatably mounted, and therein an elongated tubular plunger 11 is slidingly disposed. On the front extremity of the sleeve 10 a spool-actuating carrier 12 is fixed and comprises a central collar 13, removably fixed or attached to said sleeve by a set-screw 14, and from the collar 13 arms 15 project at diametrically opposite points at equal distances, the front faces or sides of the arms being concaved for clearance purposes, and the rear sides of the said arms are formed with convex bearing-faces 16, terminating at inner shoulders 17. Slidingly engaging each of the arms 15, to move in the arc of a circle, is a yoke 18 of a spool-holder 19, which comprises a circular band 20, integrally formed with or secured to the yoke, an opening being formed between the head portion of the yoke and the adjacent portion of the band, as at 21, for the reception of the arm 15. The front concave side of each arm 15 corresponds in curvature to and closely engages the outer surface of the band 20 to an extent equal to the arc of movement prearranged for the band to have in the operation of the device, as will be presently described. Extending inwardly from one extremity of the yoke and offset from the latter a suitable distance is a radial support 22, and from the free extremity of the said support a spindle 23 rigidly extends through the center

of the band 20 to removably receive a wire-holding spool 24, having opposite heads 25. One of the spool-heads bears closely against the support 22, and removably mounted over the free end of the spindle 23 and held against accidental disconnection therewith by a cotter-pin or analogous key 26 is a broad tension-spring or bowed spring-plate 27, which prevents the spool from having slack rotary movement and permits the wire to be drawn therefrom under a regular tension. The spool is considerably wider than the band 20, and for this reason the support 22 is offset from the yoke 18 and the spindle 23 is made long enough to provide a bearing therefor and to practically receive the spring-plate 27, and when the parts are properly assembled the band 20 centrally circumscribes the spool. In the portion of the band 20 diametrically opposite to that to which the yoke 18 is attached an elongated slot 28 is formed, and through the said slot the wire is fed from the spool, so that whatever may be the position of the unwinding coils on the spool, and whether they be near either head 25 or on opposite sides of the center, the strand will always go out from the spool in a central line relatively to the latter, so that the said strand will always be regularly applied to the warp-wires or stringers without surplusage. The band 20 is rotatable around the spool and is provided with opposite or diametrically-disposed projections 29, which have a rearward direction, and between the warp or stringer wires that are separated by considerable width, or those at the upper portion of the fence fabric, dished heads 30 are located to engage the said projections and are provided with tubular necks 31 to slide in the forward extremities of the plungers 11. Each neck 31 has a stud 32 projecting therefrom, which moves in a slot 33 in the plunger, the said slot being long enough to permit the plunger to shift rearwardly a sufficient distance after the head 30 has come in contact with the front side of the carrier 12 to compensate for the spacing movement of the entire machine to regulate the size of the meshes, and which will be in accordance with a predetermined and prearranged adjustment and disposition of the parts. The plungers between the warp or stringer wires which are closer together, as at the bottom portion of the fence fabric, have their front ends directly engage the projections 29, (see Fig. 5,) and the reason for this difference in the plunger structure is that the spools, bands 20, and the projections 29 are farther apart between the upper warp or stringer wires than between the lower ones, and hence it becomes necessary to use the dished heads 30 to avoid increasing the dimensions of the plungers and maintain a uniformity in the scale of the parts, which is of material advantage in economically manufacturing the machine. The spools, bands 20, and all parts pertaining directly to said spools and bands

are the same scale throughout the entire machine; but the arms of the carriers 12 in the lower series of plungers are shorter than the arms of the upper carriers to bring the spools and bands in closer to the plunger extremities to compensate for the difference in width or extent of space between the lower warp or stringer wires and the upper ones. As shown and obviously necessary, the carriers that respectively operate in relation to the uppermost and the lowermost warp or stringer wires are formed with single arms; but the remaining carriers are constructed as shown in detail by Fig. 7. In their twisting operation the spools and bands 20 rotate around the warp or stringer wires, and when a twist of the woof or mesh wires has been completed the spools will assume the position shown by Fig. 1, and at such time the ends of the arms of the carriers 12 will be continuously disposed, so that the several yokes 18 can be unobstructedly moved from one set of arms to another, so as to carry the mesh-wires in alternation from one warp or stringer wire to another throughout the whole series of warp or stringer wires. The movement of the yokes to engage the contiguous arms in alternation is accomplished by the sliding movement of the plungers and through the medium of the heads 30 striking the projections 29, or the ends of the plungers directly engaging said projections, as before set forth, and during the rotation of the spools and bands 20 around the warp or stringer wires the said heads or ends of the plungers remain in contact with said projections and maintain the adjustment desired. A part of the plungers are projected forwardly in relation to the frame and a part withdrawn, the plungers being so disposed in alternation that when the uppermost or terminal plunger at one margin of the fabric formed is projected the one next to the same will be withdrawn and the next projected, and so on.

It will be readily understood that in view of the closer arrangement of some of the spools and bands 20 it is required that they be operated to have a greater number of revolutions or rotations around the warp or stringer wires with which they coact than do the spools and bands, which are farther apart in order to obtain a uniformity in the position of all the parts at the completion of the fastening of the woof or mesh wires as predetermined to practically change to engagement of the yokes 18 with relation to the contiguous arms of the carriers 12. To arrive at the result sought, the upper series of four sleeves 10 have gears 34 secured thereto and held in the rear part of the frame in continual mesh with each other, the lowermost of said gears being provided with bevel-teeth and forming the master-gear, which is actuated by a bevel-pinion 35 on a short shaft 36, having bearing in the frame and operated by a crank-handle 37. The lower series of six sleeves 10 also have smaller gears 38 se-

cured thereto and in continual mesh with each other and the uppermost one with the gear 34, forming the master-gear. The gears 34 and 38 are respectively in the proportion of one and one-half to one, or under the present scale the gears 34 have forty-eight teeth and the gears 38 thirty-two teeth, so that while the gears 34 are making two revolutions the gears 38 are making three, and thus the carriers 12, in connection with said gears 34, cause the spools and bands 20 thereof to make two twists of the woof or mesh wires operated thereby and the carriers connected to the gears 38 cause their spools and bands to make three rotations around the warp or stringer wires with which they coact. This gearing arrangement is a very important factor in the successful operation of the present improved machine, as the use of the usual compensating gearing and means for actuating the same are entirely dispensed with and the result desired equally well obtained by a materially simplified method and decreased cost of manufacture. Moreover, by the use of the gearing set forth the resistance is less than in the usual forms of fence-machines, and consequently less power is required to actuate the same, and it will also be apparent that the securing of the woof or mesh wires to the lower series of warp or stringer wires will be stronger and more durable in view of the extra twist made during such operation.

The improved machine is also provided with novel means for shifting or propelling the frame in a step-by-step manner and in alternation, and at the same time project every other one of the plungers and properly dispose the spools and bands to draw the woof or mesh wires into attaching relation to the warp or stringer wires. Secured to one side edge or the outer member of one of the angle-irons 2 is a main fulcrum-bar 39, which extends horizontally rearward from about the center of the said iron, and above the plane of the said bar is an auxiliary fulcrum-bar 40, which is shorter than the one below, but similarly arranged. To the rear end of the bar 39 a lever 41 is movably connected, the said lever being attached to the bar at a point near its lower end or below the center thereof. The lower end of the lever 41 is movably connected by a link 42 with the lower portion of a shifting bar 43, firmly clamped to alternate plungers beginning with that at one end of the frame, and to the said lever, above the center thereof, a short link 44 is movably attached and also to the one end of a transfer-lever 45, which is pivotally secured to the rear end of the fulcrum-bar 40 and has its lower end connected by a link 46 to the shifting bar 43. To the side of the frame opposite that to which the fulcrum-bars 39 and 40 are secured a horizontally-disposed rearwardly-projecting fulcrum-bar 47 is secured, and to the rear end thereof a transfer-lever 48 is pivotally attached, a short link 48^a being connected to

the lower end of said lever and the lower extremity of the lever 41. The upper end of the lever 48 is connected by a link 49 to a shifting bar 50, which is clamped to the plungers which are skipped by the shifting bar 43, the upper portion of the lever 41 being connected to the bar 50 by a link 49^a. It will be seen that the levers 45 and 48 act as reducers, and the draft exerted on the shifting bars 43 and 50 in either direction by the power applied to the operating-lever 41 to advance the machine will be distributed equally on said bars through the transfer-levers and links set forth and by said shifting bars transmitted to the separate series of plungers engaged by the latter. Each of the plungers has a transversely-extending or diametrically-disposed gripping-dog 51, located within the rear extremity thereof, as clearly shown by Figs. 8 and 9. The dog 51 comprises opposite trunnions 52, movably mounted at diametrically opposite points in the plunger and held in place by externally-located cotter or similar key pins 53, inserted through the outer ends of the trunnions. From the center of the dog a semi-oval enlargement 54 depends toward the center of the lower portion of the plunger and is formed with gripping-teeth 55, the said enlargement being held down in the normal position shown by Fig. 8 by a coiled spring 56, having one end engaging one of the exterior terminals of the dog and the other end fixed in an adjacent portion of the plunger. The central portion of the dog diametrically opposite the location of the enlargement is formed with a recess 56^a, so that during the shifting movement or slip of the plungers on the warp or stringer wires, which will take place in one direction, the dogs will be thrown around and bring the said recesses adjacent the wires and binding on the latter will be prevented and obstruction to the extent of movement designed and necessary will be avoided. When the force applied tends to draw the enlargements downwardly and rearwardly, a strong biting action will be effected by the latter on the warp or stringer wires, and thus hold the set of plungers receiving such force immovably on said wires.

Referring to Fig. 1, it will be seen that the twist of the mesh-wires has been made around the warp or stringer wire at the top and every alternate one of the latter toward the bottom, or if the frame had been horizontally disposed and supported the warp or stringer wires operated upon would have been the marginal one at one side and every alternate one toward the opposite side or margin. As shown, the mechanism has just completed its twisting operation and it is necessary before a further like operation can be carried on that the frame be advanced or propelled, and to accomplish the latter movement the operating-lever 41 is grasped at its upper handle end by the operator and pushed forward or toward the frame. Through the medium of

the link 48^a, lever 48, and links 49 and 49^a the pushing force of the said lever 41 will be transmitted to the shifting bar 50, but movement of the latter and the plungers engaged thereby will be prevented by the dogs 51 in said plungers being thrown down by such tendency or effort to move the bar and the enlargements of the dogs will grip the warp or stringer wires adjacent thereto, and therefore the plungers under control of the said bar 50 will remain stationary. The motion of the lever 41 is transformed, through the medium of the link 42, transfer-lever 45, and links 44 and 46, into a pulling motion on the shifting bar 43 and slides the plungers clamped to the latter toward the said lever 41, the dogs in this group or series of plungers being turned against the resistance of the springs thereof, and thus free the warp or stringer wires passing thereunder. Hence the plungers carried by or connected to the bar 43 strike the frame and move the latter toward the lever 41 over the plungers connected to the bar 50, which is being held stationary, and simultaneously the bands 20 are turned to disengage their yokes from the arms of the carriers 12 of the plungers connected to the bar 43 to engage the arms of the carriers 12 of the plungers connected to the said bar 50, so as to twist the woof or mesh wires around the warp or stringer wires that were previously unengaged. The gearing is then operated to make the requisite twists of the woof or mesh wires to reliably secure the same, and it will be seen that the movement of the mechanism, as just explained, will cause the woof or mesh wires to be regularly disposed at oblique angles. The lever 41 will remain in its forward position after the adjustment thereof, as just explained, and until it is desired to further shift the machine, when said lever will be pulled away from the frame and the bar 43 and its plungers will be held stationary on the warp or stringer wires passing therethrough by the dogs cooperating therewith and the bar 50 and its plungers will be drawn back and similarly move the frame, thus again projecting the forward ends of the plungers carried by the bar 43 and again shifting the bands 20 and spools therein to the position shown by Fig. 1. These operations will be carried on successively until the woof or mesh wires are secured to the length of warp or stringer wires desired to be filled or in accordance with the length of fabric produced. In the initial application of the machine the warp or stringer wires are threaded through the plungers and stretched as may be desired, and in the use of the mechanism as shown for the fabrication of fence material the said warp or stringer wires may be stretched between posts or other analogous devices at a distance from each other and afterward secured at regular intervals to intermediate posts or holding devices set up in the usual manner.

In Fig. 10 a modification of the spool-holder

is shown and embodies a connecting-support 57, with upper and lower offsets, the lower offset being continuous with a segmental member 58 with a slot 59, similar to the band 20, heretofore described, and having the terminals 60 reduced and slightly outturned to engage the forward ends of the plungers or the heads carried thereby and replace the projections heretofore set forth. The upper offset of the support 57 continues into a yoke 61, similar to the yoke 18, previously referred to, and connected to said yoke 61 is a segmental guard 62 and a spindle 63 for receiving a spool extending from the support 57 in a central plane relative to the member 58 and guard 62. This modified form of holder will perform the same service as that heretofore described.

There are many other modifications that will readily suggest themselves and which are fully contemplated by the scope of the invention. Among others may be mentioned the use of carriers 12, having arms which are all of similar length to operate to produce a fabric wherein the warp or stringer wires are all an equal distance apart, though the close arrangement of some of said wires over a portion of the width of the fabric is preferred in order to produce an inclosure particularly useful in preventing the passage of small stock or fowls therethrough. If the machine is to be equipped to form a fabric wherein the warp or stringer wires are all equally distant from each other and wherein the intervals between them are of considerable width, the plungers may all be supplied with the heads 30, or, conversely, if the said warp or stringer wires are close enough together in the fabric the heads may be entirely dispensed with. These changes are contemplated without in the least sacrificing the essential features of the present machine, the most important of said features being the centralization of the plungers in operative position between pairs of the spools and bands 20 instead of having the means for shifting said latter devices at the outer portions only thereof, and thereby reduce the mechanism without detracting from the effectiveness of the accuracy demanded in making the alternate changes. It will be seen that the plungers serve as means for permitting the frame to slide in a reliable manner as supports for the rotary twisting devices, as positive means for alternately adjusting the twisting devices to bring the woof or mesh wires in operative relation to the different warp or stringer wires, and as means for reliably holding the said twisting devices in their adjusted positions and prevent accidental movement of the same out of their proper working locations. The crank 37 can also be rotated in either direction to operate the twisting devices, and another very material advantage is the readiness with which the wire-spools can be replaced when emptied and which is

accomplished by reversing the crank 37 or turning the latter far enough to laterally project the holders 29, so that the spools may be detached. This is also advantageous when the use of only a portion of the spools is required and when changes in the design of the fabrication is to be effected at certain points. In certain fabric formations some of the spools may be dispensed with, so that only a portion of the warp or stringer wires will be operated upon, and said depletion can be made without in the least affecting the practical operation of the machine, and a variety of designs can thus be produced.

The improved form of the machine has been shown and described; but it is obviously apparent that changes in the form, size, proportions, and minor details may be resorted to without departing from the principle of the invention.

Having thus described the invention, what is claimed as new is—

1. In a fabric-making machine of the class set forth, a frame, a plurality of plungers on which the frame is movable, a series of twisting devices between pairs of which the front portions of the plungers are movable to alternately shift the same, and means for propelling the frame.

2. A fabric-making machine of the class set forth having a plurality of plungers through which stringers are passed, and a series of twisting devices between pairs of which front portions of the plungers are movable to change their position in operative relation to different stringers, the twisting devices carrying mesh-wires.

3. A fabric-making machine of the class set forth having a plurality of plungers, and a series of twisting devices supported by and rotatable around the plungers and shiftable to different positions by the movement of the latter between them.

4. A fabric-making machine of the class set forth having a plurality of tubular plungers, and twisting devices rotatable therearound and automatically shiftable to different positions by the movement of the plungers between them.

5. A fabric-making machine of the class set forth having a plurality of plungers, carriers rotatable on the plungers, and twisting devices shiftable in alternation to and from adjacent carriers by the projection of front portions of the plungers.

6. A fabric-making machine of the class set forth having a plurality of plungers, carriers rotatably supported by the plungers, and twisting devices having yokes shiftable in alternation to and from adjacent carriers by the projection of front portions of the plungers.

7. A fabric-making machine of the class set forth having a plurality of plungers, carriers rotatable on the plungers, and twisting devices shiftable in alternation to and from ad-

jacent carriers by the projection of front portions of the plungers between pairs of the said devices.

8. A fabric-making machine of the class set forth having a plurality of plungers, carriers rotatably supported by the plungers, and twisting devices shiftable in opposite directions in arcs of circles by the projection of front portions of the plungers between the same.

9. A fabric-making machine of the class set forth having a plurality of plungers, and rotatable twisting devices shiftable in opposite directions in alternation to change their position in relation to different wires by the projection of portions of the plungers between them.

10. A fabric-making machine of the class set forth having plungers and twisting devices, the plungers being projectable in planes between the twisting devices to connect the latter in alternation with different plungers.

11. A fabric-making machine of the class set forth having twisting devices including wire-carrying spools supported to have arcuate movement in opposite directions, and plungers projectable between the twisting devices to shift the same.

12. A fabric-making machine of the class set forth having a plurality of plungers, carriers rotatably supported on said plungers and having arms, and twisting devices including yokes to shiftablely engage the arms and wire-holding spools.

13. A fabric-making machine of the class set forth having a plurality of plungers, and twisting devices rotatably supported by said plungers and including shiftable holders with wire-carrying spools removably mounted therein, parts of the plungers being adapted to engage portions of the holders to move the latter.

14. A fabric-making machine of the class set forth having a plurality of plungers, and twisting devices rotatably supported by said plungers and including holders comprising bands with slots therein shiftable in relation to the plungers, and wire-carrying spools removably mounted in said holders and having the strands fed through said slots of the bands to centralize the same.

15. A fabric-making machine of the class set forth having a plurality of plungers, and twisting devices rotatably supported by said plungers and comprising carriers on the plungers, shiftable holders having yokes to engage the said carriers and slots in opposite portions to the yokes, and wire-supporting spools removably mounted in said holders and having the strands therefrom fed through the slots to always hold said strands in central position.

16. A fabric-making machine comprising a plurality of plungers and twisting devices, the plungers being projectable between pairs of the said devices, and the latter in a portion

of the machine being closer together than in the remaining portion.

17. A fabric-making machine comprising a plurality of plungers, a series of twisting devices supported by, rotatable around and shiftable in relation to the plungers, the plungers being projectable between the twisting devices, and the latter closer to the plungers and having a greater number of rotations in one portion of the machine than in the other portion of the latter, and mechanism for imparting the difference in motion to the said twisting devices.

18. A fabric-making machine comprising a plurality of plungers, and rotatable twisting devices which are closer together in one portion of the machine than in the other, the plungers being projectable between the said devices to shift the same, and portions thereof provided with heads at their front ends to compensate for the difference in distance between the devices.

19. A fabric-making machine comprising a plurality of plungers, a series of twisting devices and a frame, the plungers affording means for the frame to regularly slide in its propulsion, and also serving as supports, means for adjusting and means for maintaining the adjustment of the twisting devices.

20. A fabric-making machine comprising a plurality of tubular plungers, a frame slidable on said plungers, rotatable twisting devices supported and shiftable by the plungers, automatically-operating dogs located within the rear portions of the plungers, independent shifting-bars alternately connected to different plungers, and lever mechanism fulcrumed on devices projected from the frame and connected to said bars to alternately impart pulling and pushing motions thereto to shift the frame and project portions of the plungers.

21. A fabric-making machine comprising a plurality of plungers, and a series of twisting devices rotatable around the said plungers, the latter being alternately projected and retracted, the projection of the plungers shifting the said devices to throw them into operative relation to the plungers projected.

22. A fabric-making machine comprising a plurality of plungers, carriers rotatably mounted on the plungers and having arms in planes substantially at right angles to the plungers, holders having portions to engage the said arms and shiftable from the arms of the one carrier to the arms of adjacent ones, the holders having spools for coiled wire therein, the ends of the arms being contiguously disposed in accurate alinement at the end or completion of each twisting operation for subsequent shifting of the holders, and means for operating the carriers.

23. A fabric-making machine comprising a plurality of plungers, carriers rotatably mounted thereon and having arms, and hold-

ers for spools having portions to shiftably engage the said arms, the holders being arranged in pairs and movable from the two arms of one carrier to an arm of each of two adjacent holders on opposite sides.

24. A fabric-making machine comprising a plurality of plungers, a portion of the plungers having slots in their front extremities, heads having tubular necks to move in the latter extremities and projections to engage the said slots, and shiftable twisting devices provided with projecting portions for engagement by said heads and in part directly by the plunger extremities.

25. A fabric-making machine comprising a plurality of twisting devices, a frame, a series of plungers of tubular form which support said twisting devices, and gripping-dogs in the rear portions of the plungers, each dog comprising opposite trunnions and a central depending toothed enlargement inside of the plunger.

26. A fabric-making machine comprising a

plurality of twisting devices, a frame, a series of plungers of tubular form and which support said twisting devices, and gripping-dogs in the rear portions of the plungers, each dog comprising opposite trunnions, a central depending toothed enlargement inside of the plunger, and an upper recess opposite said enlargement.

27. A fabric-making machine comprising a plurality of plungers, carriers supported by said plungers and having arms with curved seats and inner shoulders, and shiftable twisting devices having yokes to engage said seats for imparting a rotary motion to said twisting devices.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

CLOIDE PACE.

Witnesses:

WILLIAM M. ZIMMERMAN,
JESSE PACE.