

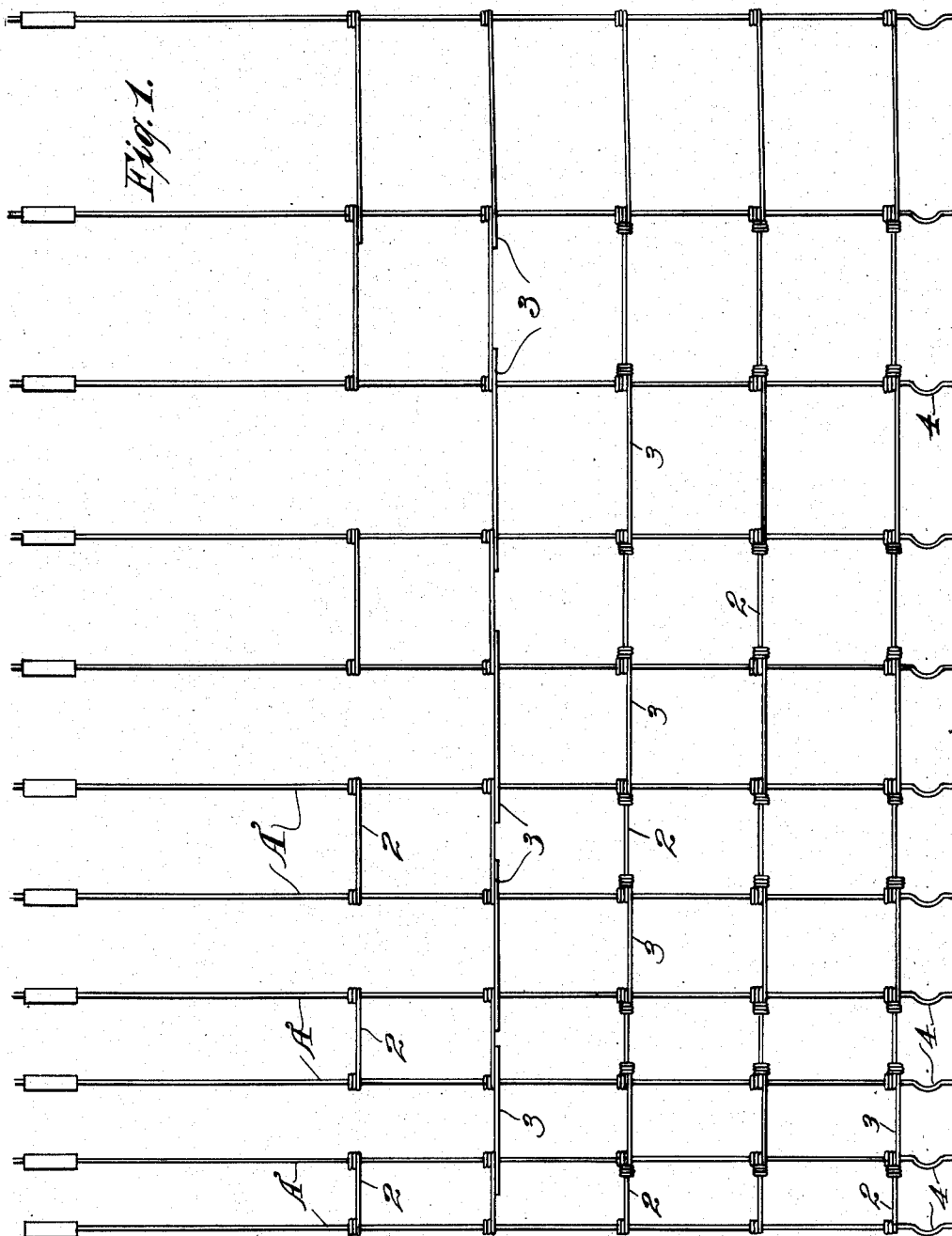
No. 866,146.

PATENTED SEPT. 17, 1907.

G. L. LANGER.
WIRE FENCE MAKING MACHINE.

APPLICATION FILED NOV. 21, 1906.

6 SHEETS—SHEET 1.



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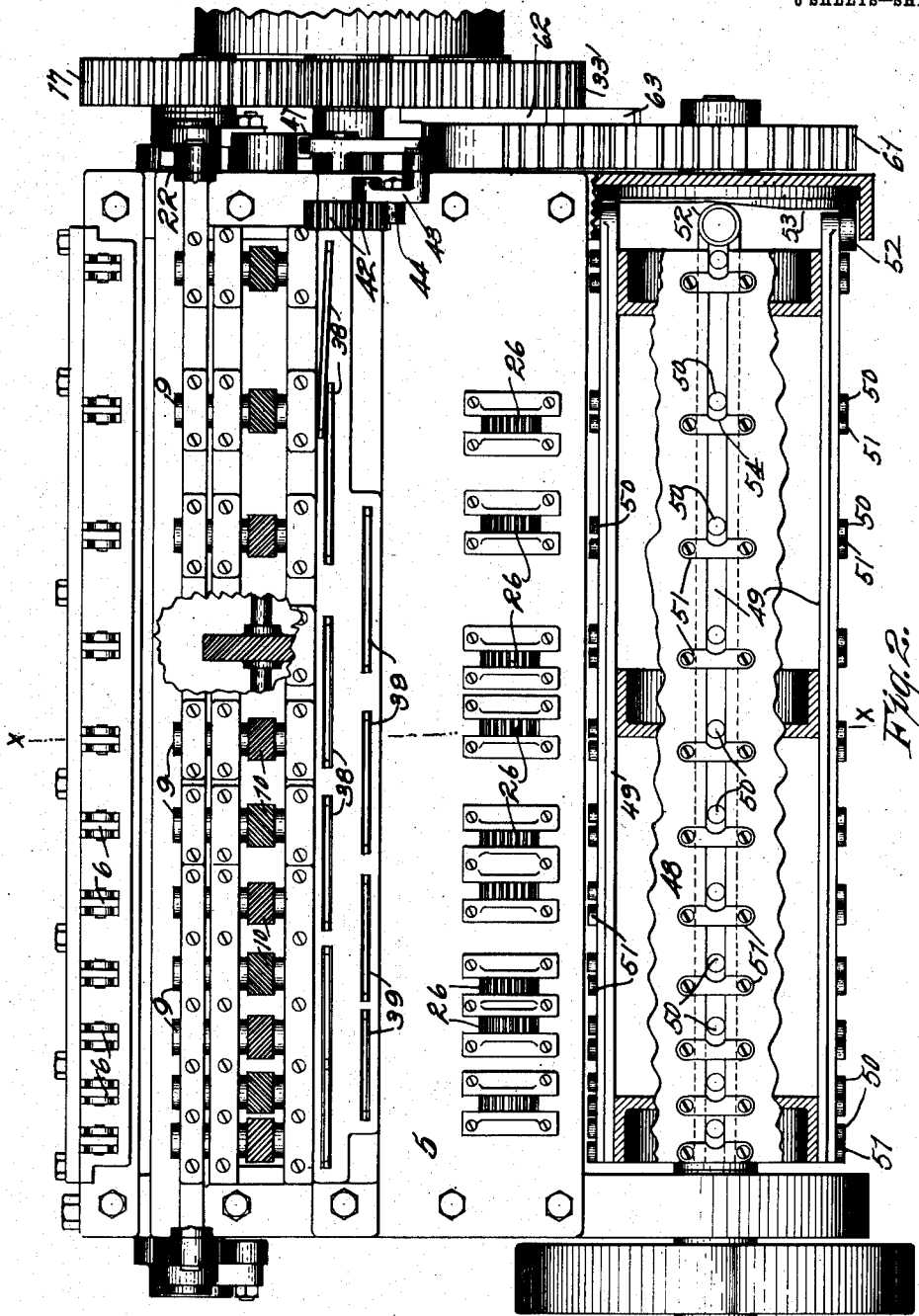
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6 SHEETS—SHEET 2.



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6 SHEETS—SHEET 3.

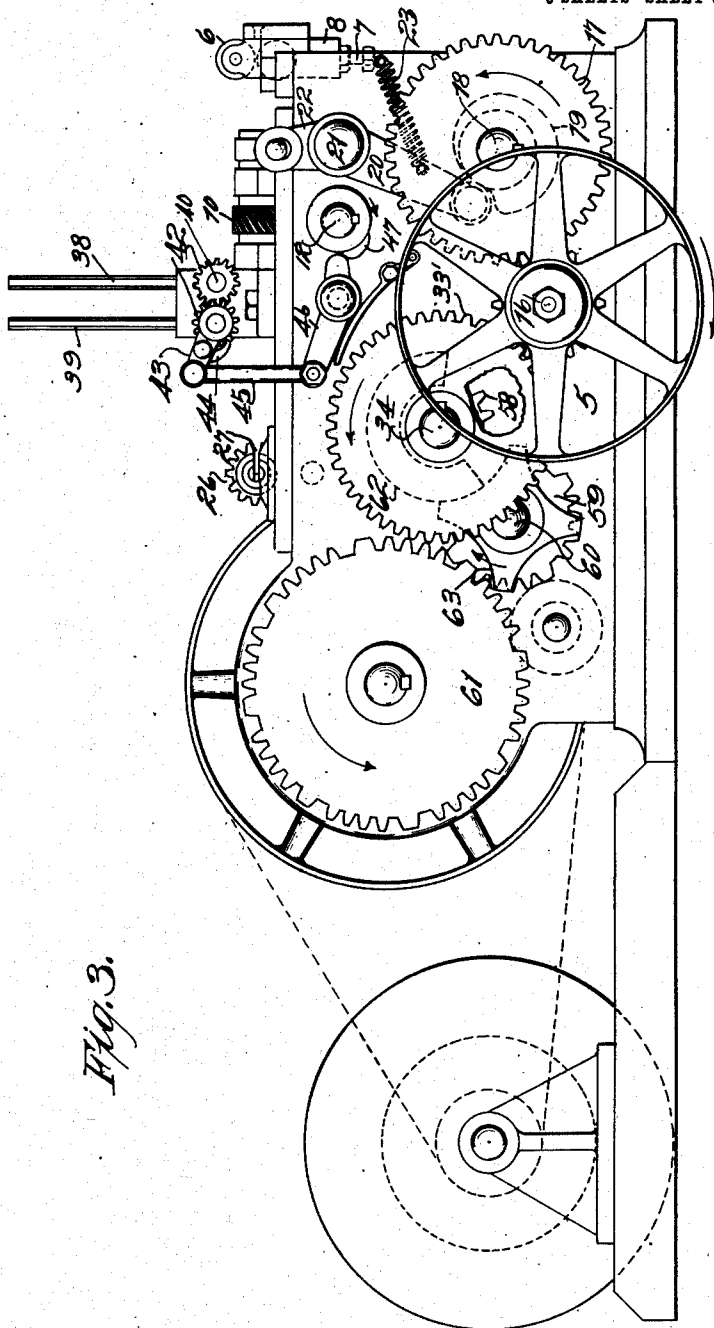


Fig. 3.

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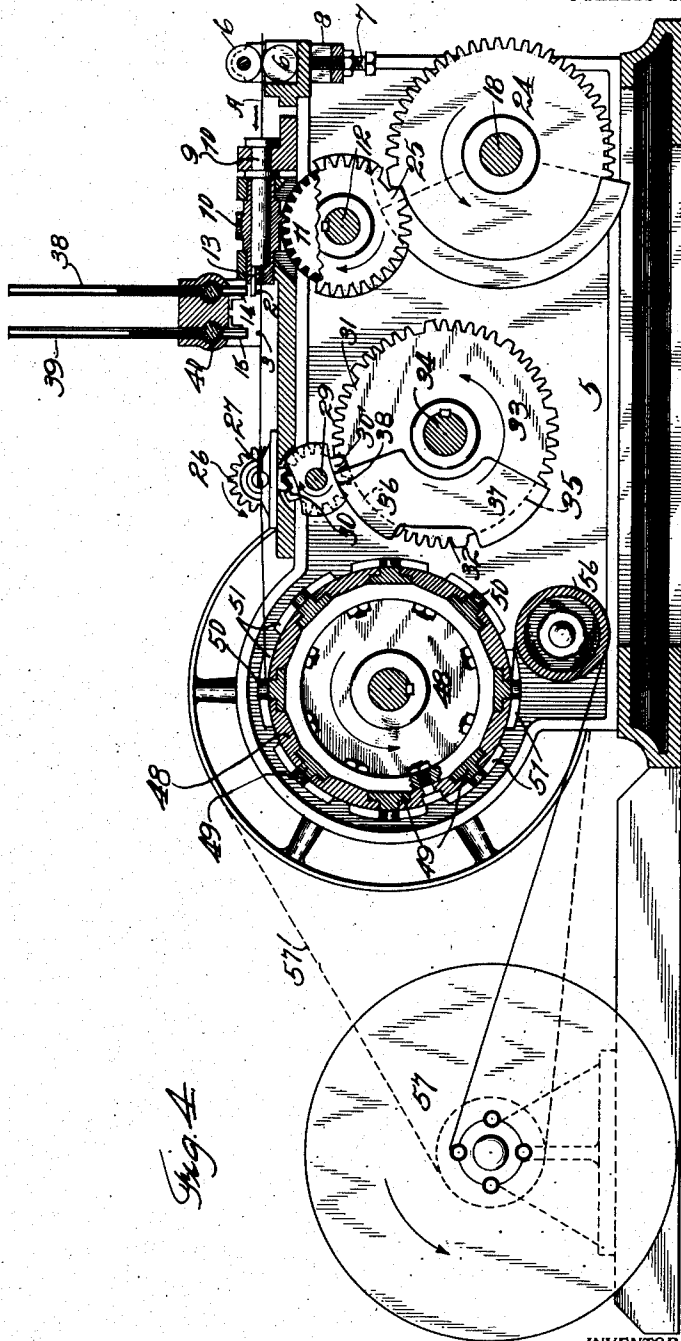
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6 SHEETS—SHEET 4.



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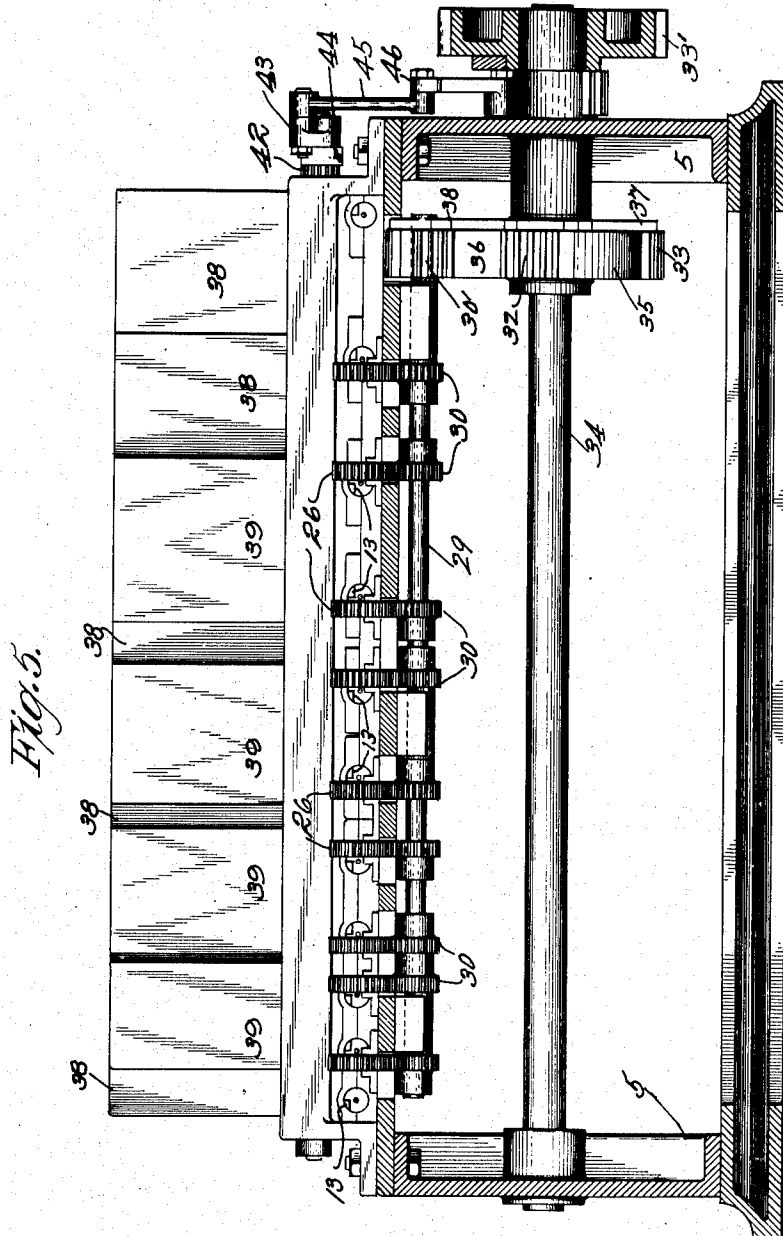
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8 SHEETS—SHEET 5.



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6 SHEETS—SHEET 6.

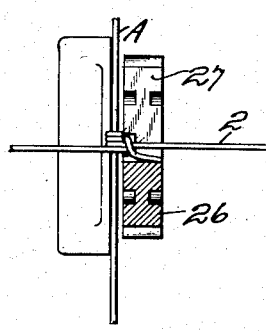
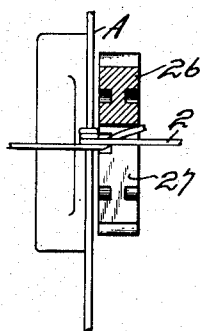
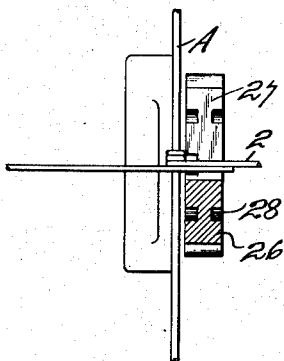
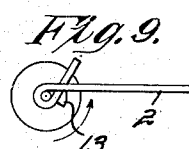
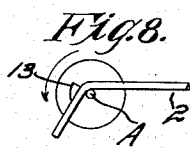
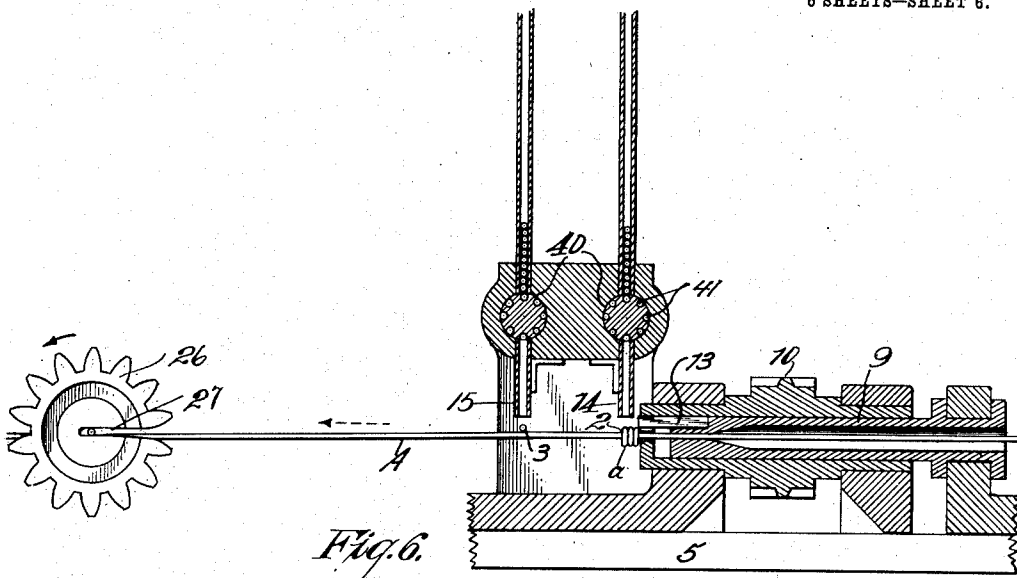


Fig. 10.

Fig. 11.

Fig. 12.

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UNITED STATES PATENT OFFICE

GOTTHOLD L. LANGER, OF STOCKTON, CALIFORNIA, ASSIGNOR TO PACIFIC STEEL & WIRE CO., OF OAKLAND, CALIFORNIA, A CORPORATION OF MAINE.

WIRE-FENCE-MAKING MACHINE.

No. 866,146.

Specification of Letters Patent.

Patented Sept. 17, 1907.

Application filed November 21, 1906. Serial No. 344,447.

To all whom it may concern:

Be it known that I, GOTTHOLD L. LANGER, a citizen of the United States, residing at Stockton, in the county of San Joaquin and State of California, have invented new and useful Improvements in Wire-Fence-Making Machines, of which the following is a specification.

My invention relates to improvements in machines for making wire fencing. Its object is to provide a practical machine suitable for manufacturing wire fencing having an uneven number of strands, if it is desired to make fencing of that character; also to make fencing which shall have two sets of stay or brace wires, the stays of one set having their ends coiled about or otherwise connected to the strand wires or cables and the other set of stay wires being coiled about or otherwise connected to the first set of stay wires. This idea of two sets of stay-wires, one only of which is connected direct to the strand wires or cables, constitutes one of the main features of the present invention which consists of the parts and the construction and combination of parts as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Figure 1 is a diagrammatic plan view showing the various steps incident to the positioning and tying of the stay wires. Fig. 2 is a plan view of the machine. Fig. 3 is a side elevation of the same. Fig. 4 is an elevation somewhat similar to that of Fig. 3, showing certain parts in section and taken on line X—X of Fig. 2. Fig. 5 is a cross section on line Y—Y of Fig. 4, with the gears shown in full elevation. Fig. 6 is a detail showing in elevation on an enlarged scale the tying mechanisms of Fig. 3. Figs. 7—8 & 9 are side views of the wrapping means for the second set of stay wires, with these means shown in successive positions. Figs. 10—11 & 12 are corresponding sections of the same means.

The general character of the fence which my machine is designed to make is clearly indicated in Fig. 1, wherein A represents a series of longitudinal strand wires or cables suitably spaced apart; successive pairs of these strands being connected together from left to right by the short cross wires or stay wires 2; these latter in turn being connected by other cross or stay wires 3. In that figure which is partially diagrammatic the placing of the stay wires in position and the successive steps of tying them is clearly indicated; the finished portion of the fence being at the bottom of the sheet as the same is viewed when turned to bring its longer side horizontal. The invention is mainly concerned with the positioning of these stay wires on the strands, tying one set to the strands and the other set to the already tied set, advancing the strands, and crimping the strands as shown at 4.

The distance apart of the several strands and stays

determines the "mesh" of the fence; and the mesh like the height of the fence, the number of wires, the size of the wires used, etc., depends on the particular use or purpose for which the particular fence is intended.

A characteristic of my machine is that the stay wires 2—3 are all cut to length before being fed into the machine as distinguished from feeding the stay-wire-material from a coil and cutting it to lengths in the machine.

5 represents the frame of the machine; 6 are friction rollers or tension rollers arranged in pairs and between which the several strand wires are drawn from the reels or spools and by which they are held taut during the subsequent tying operations. Each pair of rollers 6 is adjustable to cause the rolls to grip with greater or less pressure on their respective strands. As shown the lower rollers are vertically adjustable to and from their respective upper rollers by means of the set screws 7 and the movable boxes 8 which support the shafts of the lower rollers.

From the rollers 6 the strands pass axially through the hollow spindles 9 which slide in and turn with and are coaxial with the hollow worm gears 19; the latter being suitably journaled in the frame and being driven intermittently in unison by the gears 11 on shaft 12. Each spindle 9 carries a coiling finger or projection arranged substantially parallel with and movable in a circle about the contained strand wire when the spindle is rotated, for the purpose of tying one end of a cross or stay wire 2. The strand wires are assumed to travel intermittently in the direction of the arrow Figs. 4—6—1. The stay wires 2—3 which as before stated are preferably cut to length before being fed to the machine are delivered at proper intervals on the strand wires from the respective hoppers 14—15.

The hoppers 14 are adapted to drop their stay wires 2 onto the strand wires or cables A in such manner that one stay wire 2 will rest on the first and second strands from the left, another stay wire 2 will rest on the 3rd. and 4th. stay wires from the left, and so on, each stay wire 2 coming down upon a corresponding pair of strand wires or cables, except the last stay wire 2 which overlaps the next to the last stay wire and has its inner end supported in common with the next to the last stay wire on the next to the last cable. This is where an odd number of cables enter into the construction of the fence.

As the stay wires 2 are deposited onto the cables A with an end of each stay projecting a sufficient distance beyond a corresponding cable to admit of the proper tie or knot being made, the spindles 9 are reciprocated to project their fingers 13 forward and over the corresponding ends of the stay wires 2. As the spindles 9 are made to turn in unison with the worms 10, the setting

in motion of the worms 10 will wrap the projecting ends of the stay wires 2 about the cables A and form the knot shown at a in Fig. 6.

The forward projection of the spindles 9 into operative position and their gradual retraction during the wrapping process is effected by the following means: By reference to Fig. 3, 16 is the main drive shaft adapted to be driven constantly from any suitable source of power. This shaft carries a gear meshing a larger gear 17 on a countershaft 18; the latter is provided with a cam 19 adapted at each revolution of shaft 18 to rock an arm 20 fixed to a rock shaft 21; the latter has a series of forked projections 22, each to engage a corresponding spindle. A spring 23 acts on arm 20 to tend to throw all the spindles forward so that their coiling fingers 13 will be underneath hoppers 14 and over the ends of the stay wires 2 deposited from hoppers 14. The timing of the parts however, is such, that these fingers will be projected only into such position beneath the hoppers at the moment subsequent to the deposit of the stay wires and while the strand wires are stationary and immediately prior to the setting in rotation of the spindles to tie these stay wires. Thus in Fig. 3 the roller on arm 20 is shown to have just passed over the highest point of cam 19, which would indicate that the fingers 13 are all thrust forward in a position shown in Fig. 4, and that the coiling operation is about to begin. This operation is effected through the medium of the mutilated gear 24 engaging a smaller gear 25 on shaft 12. By the turning of the shaft 12 and correspondingly its several gears 11 the various spiral gears 10 are set in motion, which in turn causes the fingers 13 to wrap the ends of the stay wires 2 about the strands A in the desired fashion.

As readily understood the spindles are arranged in pairs corresponding with the pairs of cables on which a stay wire 2 is deposited with the exception of the last spindle. The spindles of each pair are adapted to be rotated in opposite directions while the end spindle where there is an odd number of cables runs in the same direction with the next succeeding spindle. Of course if it is desired to make a fence with an even number of strands, the last spindle, or that one to the extreme right to Fig. 1, may be omitted; and, if fencing of a variety of sizes or widths having an odd number of strands is to be made, the spiral gears for driving the twisting spindles can easily be changed so as to run the last spindle in the series in a proper direction.

At the same moment that the shaft 12 is set in operation the cam 19 begins to act on the roller on arm 20 to gradually retract the several spindles consistently with the wrapping of the ends of the wires; this gradual retraction of the fingers and spindles being for the purpose of preventing the latter from cutting or severing the stay wires. This wrapping or tying of the stay wires 2 to the cables is effected in approximately a half revolution of shaft 18; during the remainder of the revolution the gear 25 and shaft 12 and the several gears 10 remain stationary, and the spindles and fingers 13 are retracted from beneath the hoppers 14. The strands A may now all be advanced in unison to carry the tied stays 2 up against the stays 3 which have been deposited from the hoppers 15 upon the strands. By a succeeding movement of the strands the tied stays 2 and the untied stays 3 are carried forward to the slotted

rotatable jaw members 26 by which the ends of the stays 3 are wrapped around the previously knotted stays 2. The spindles 9 by which the first set of stays 2 are tied to the strands A have their axes parallel with the strands. The wrapping jaws 26 have their axes at right angles to the strands and parallel with the stays 2.

The hoppers 15 by which the stays 3 are deposited on the strands are arranged alternately with the hoppers 14 as shown in Fig. 2, and they are designed to deposit their stays on the second and third, fourth and fifth strands, and so on, thus bridging and connecting those strands which were not connected by the stays 2.

The wrapping jaws 26 are each shown substantially in the form of a gear wheel having a radial slot 27. The width of the slot 27 is just sufficient to admit a stay wire, and is less than twice the width of any stay wire. The depth of the slot is a trifle greater than the length of a radius of the gear 26, so that when the stays are in position for knotting in the member 26, the already knotted stay 2 will be approximately coaxial with the jaw member 26 while the stay 3 is slightly eccentric to the same, so that when the jaws are rotated, the free end of the stay 3 will be coiled about the stay 2 in the desired manner. These several gear wheels are intermittently rotatable and the slots in each are adapted to be brought into coincidence with the plane of the strands A to permit of the proper entry, and subsequently of the proper exit, of the stays 2—3. These jaw members 26 are shown in Figs. 10—11 & 12 as having annular grooves to receive corresponding annular bearings 28 on which the gears 26 turn.

The proper revolution of the knotting devices 26 is effected synchronously with the various other movements of the machine by the following means: A shaft 29 is arranged parallel with the axial line of the members 26 and carries a series of gears 30 engaging the gear teeth on the respective members 26. The end of the shaft 29 has a gear 30' which is engageable intermittently and successively by the toothed segments 31—32, Fig. 4, of gear 33 on shaft 34, which latter is driven constantly from shaft 16.

By reference to Fig. 4, it will be observed that the slot 27 of the jaw 26 is turned toward the spindles, and that a stay 3 which has been pushed up against a previously tied stay 2 has been moved into position in the jaws 26. At that moment the gear 33 revolving in the direction of the arrow, the toothed portion 31 of the gear engages the gear 30' on shaft 29 to set the latter and the several jaws 26 in motion. This rotation of the jaws 26 acts in the manner indicated in Figs. 7 to 12 inclusive to wrap the ends of the stays 3 about the stays 2. This wrapping or knotting operation is completed by the time the blank portion 35 of the gear 33 comes around to the gear 30' on the shaft 29. While the blank portion 35 is passing the gear 30', the latter remains stationary but with the slot 27 pointing toward the rear of the machine or in the direction opposite to that indicated in Fig. 4; this allows for the stays and the completed portion of the fencing to pass on. A continued movement of the gear 33 brings the teeth 32 into mesh with the gear 30' which results in a half turn being given to all the jaw members 26, so as to bring the slots 27 into position shown in Fig. 4, ready for the next operation. There is another blank space 36 on gear 33 between the toothed segments 32—31 and

while the gear 33 is traversing this space, the jaw-member 26 remains stationary and the strands are advanced to carry a succeeding set of stays 3—2 into position in the jaws for tying. Appropriate stop mechanism as the plate 37 fixed to gear 3 and engaging corresponding concaved parts 38 on shaft 29 are employed to lock the members 26 against movement during that time when the gear 30' is out of engagement with either of the segments 31—32. Similar stop mechanisms, not necessary to be shown, are employed throughout the machine where one part has an intermittent rotative movement with respect to another constantly rotating part.

The stay wires 2—3 have previously been cut to the proper length and delivered into respective magazines 38—39 corresponding to the feed hoppers 14—15. The stay wires are fed singly from the magazine to the hoppers by means of the rotating cylinders or feeders 40 having longitudinal grooves 41 corresponding in length and depth to a stay wire. The number of these grooves 41 and the step by step rotative movement of the feeders 40 are appropriate to the step by step movement of the cables A.

As seen in Fig. 3 the feeders 40 are geared together as shown at 42 and a step by step movement is given to the feeders in unison by means of an arm 43 fulcrumed loose on the shaft of one of the feeders 40 and having a pawl 44 to engage one of the gears 42; a link 45 connects arm 43 with a spring-pressed-arm 46, which is actuated intermittently by a cam 47 on shaft 12.

The intermittent feed or step by step motion of the strands or cables, and the simultaneous crimping of the strands or cables is done by means of the drum 48 with its series of sliding gripper bars 49 carrying the projections 50 which co-act with the concaved fixed projections 51 on the drum. This drum 48 extends across the machine and has a series of bars arranged on its periphery and extending lengthwise of the drum and slidable in suitable guides as shown in Fig. 4. The distance apart of the bars correspond to the distance between the crimps 4 of the fencing. The bars 49 each carry a roller 52 at one end adapted to run on a fixed annular cam 53 arranged concentric with the drum, and by which the bars are pushed in to cause the cables to be gripped. The bars are retracted by the natural springiness of the cables.

The bosses 51 are disposed relative to the respective projections 50 and the positions of these several bosses and projections or jaw-members 50—51 correspond to the distance-apart of the several cables. The adjacent face of each boss is concaved as shown at 54 corresponding with the convexity of the adjacent cooperating gripper part 50. When the bars are drawn out so as to separate the parts 50—51, the strands are easily engaged or removed from between these parts 50—51. As the drum is rotated to reciprocate the bars 49 and grip the cables between the parts 50—51, the several cables are drawn forward, and at the same moment they are given a crimp or kink, as indicated at 4 Fig. 1. This kink 4 while not new in the manufacture of wire fencing, is advantageous in that it allows for the expansion and contraction of the fence and permits the fence to be properly stretched and maintained taut under all climatic conditions.

The length and pitch of the cam 53 are such, and the

number of bars 49 is great enough, to insure a sure grippage by one or more of the bars all of the time on the cables. The fence is carried a considerable distance around the drum before the bars are retracted to release the cables, the fence then passes around the idle roller 56 and thence onto the receiving reel 57; the latter being revolved in unison with the drum 48 by suitable means as shown at 57'. A step by step motion is given to the drum coordinate with the other moving parts of the apparatus by any suitable means. As shown in Fig. 3, the shaft 34 has a mutilated gear 58 to engage a gear 59 on a countershaft 60. Gear 59 meshes a corresponding gear 61 on the shaft of drum 48. A stop-plate 62 on shaft 34 is adapted to engage a corresponding stop member 63 on shaft 60 to hold the drum stationary during the period of rest of the gear 59.

It is understood that all the various moving parts of the machine are so timed, that every part will perform its required function in the proper manner and with due respect for every other part.

The operation of the apparatus is briefly as follows: The several cables A according to the number of desired strands in the fence, are passed between the tension-rollers 6 and through the several spindles 9, thence around the drum 48, idler 56 and connected with the reel 57. The magazines 38—39 being filled with stay wires, the machine is set in operation. The feeders 40 of the magazine are adapted to be revolved and deposit each a stay onto the cables, when the latter are at rest. The spindles 9 are then moved forward to allow the fingers 13 to overlap the ends of the stays 2. Next, the several pairs of spiral gears 10 are set in motion in opposite directions to knot the ends of the stays 2 around the cables A; the spindles being gradually retracted during the knotting operation. During the successive forward movements of the cables, the knotted stays 2 and the unknotted stays 3 are carried forward into the radial slots 27 of the wrapping jaws 26. The cables then come to rest, and at the proper moment the gear segment 31 acts on the gear 30' to revolve the jaws 26 and tie the stays 3 to the stays 2. When this knotting operation is completed, the slots 27 are left in open position toward the drum 47; on the next forward movement of the cables A and while the blank space 37 on gear 33 is passing gear 30', the stays are withdrawn from the slots in jaws 26. The cables then come to rest and the segment 32 on gear 33 engages gear 30' to turn the latter a half revolution. With the slots 27 now opening toward the magazines the cables are again advanced bringing a fresh set of stays into position in the slots in the jaws 26. The operation of crimping the stays 33 is then repeated. As before described the step by step feed of the cables is done by an intermittent rotation of the drum 48 and the sliding in and out of the bars 49 to cause the projections 50 to co-act with the bosses 51 in gripping the cables.

Having thus described my invention, what I claim and desire to secure by Letters Patent, is—

1. The combination in a wire fence making machine, of means for supporting and feeding a series of strand-wires, means for wrapping the ends of stay-wires around adjacent strand-wires, and means for wrapping the ends of other stay-wires around the first mentioned stay-wires.

2. The combination in a wire fence making machine, and as a unitary structure of means for supporting and

intermittently advancing an odd number of strand wires, means for wrapping the ends of stay-wires around adjacent of said strand-wires, and means for wrapping the ends of other stay-wires around adjacent of said first-mentioned stay-wires.

3. In a wire fence making machine, the combination of means for stretching and advancing a plurality of strands of wires, means for tying said strand-wires together in pairs by stay-wires, and means for securing a second set of stay-wires to the first-mentioned stay-wires whereby the previously tied pairs of strands are connected together.

4. In a wire fence making machine, the combination with means for supporting and feeding strand-wires, of means for feeding two sets of stay-wires to said strand-wires, means for securing one set of said wires directly to the strands, and means for securing the other set of stay-wires to the first set of stay-wires.

5. In a wire fence making machine, the combination with means for supporting and feeding a series of strand-wires, of means for feeding stay-wires to said strand-wires, means for connecting alternate of said stay-wires to the strands, and means for connecting the intermediate stay-wires to said stay-wires which are connected with the strands.

6. In a wire-fence-making machine, the combination of mechanism for supporting and feeding strand-wires, of mechanism for feeding stay-wires to said strand-wires, coiling devices having their axes parallel with the strand-wires for knotting certain of said stay-wires to the strand-wires, and other coiling devices having their axes at right angles to the strand-wires for attaching other of said stay-wires to those stay-wires which are secured to the strand-wires.

7. In a wire fence making machine, the combination of means for supporting a series of strand-wires, means for feeding stay-wires to said strand-wires, means for wrapping the ends of the stay-wires around adjacent strand-wires, means for wrapping the ends of other stay-wires around the first-named stay-wires, and a drum over which said strand-wires pass, said drum having gripping devices for engaging and crimping the strand-wires.

8. In a fence making machine, the combination of a series of hollow spindles arranged in pairs and through which the strand-wires pass, means for positioning stay-wires on said strand-wires with respect to each pair of spindles, means carried by the spindles to engage the ends of the sections of the stay-wires to knot them to the strand-wires, hollow-spiral gears in which said spindles are slidable and with which they are rotatable, a shaft carrying gears to engage said spiral gears to rotate said spindles, the spindles of each pair being arranged to revolve in opposite directions, and means to reciprocate the spindles during their rotative movement.

9. In a wire fence making machine, the combination of hollow-coiling spindles through which the strand-wires pass, means for positioning a set of stay wires on the strands, means to operate the spindles to knot said stay-wires to the strands, means for positioning a second set of stay-wires on the strand, and means to knot this second set of stay-wires to the first set.

10. In a wire fence making machine, the combination of hollow-coiling spindles through which the strand-wires pass, means for positioning a set of stay-wires on the strands, means to operate the spindles to knot said stay-wires to the strands, means for positioning a second set of stay-wires on the strands, and means to knot this second set of stay-wires to the first set, said last-named means including rotatable slotted coiling devices arranged in the

path of the stays and having their axes at right angles to the strand-wires.

11. In a wire fence making machine, the combination of a means for supporting strand-wires, means for positioning two sets of stay-wires on said strands, means to knot one set direct to the strands, and means to knot the other set to the first set, and a rotary drum having gripping devices to engage the strand-wires to advance them step by step.

12. In a wire fence making machine, the combination of a means for supporting and advancing strand-wires, means for positioning two sets of stay wires on said strands, means to knot one set direct to the strands, and means to knot the other set to the first set, said last-named means including rotatable slotted coiling devices arranged in the path of the stays and having their axes at right angles to the strands.

13. In a wire fence making machine, the combination of means for supporting and intermittently advancing a series of strand-wires, means for positioning one series of stay-wires crosswise on said strands, and means for positioning a second series of stays cross-wise of the strands and alternating with and overlapping the first series, means to knot the first series of stays to the strands, and means to knot the second series of stays to the first series.

14. In a wire fence making machine, the combination of means for supporting and intermittently advancing a series of strand-wires, means for positioning one series of stay-wires crosswise on said strands, and means for positioning a second series of stays crosswise of the strands and alternating with and overlapping the first series, means to knot the first series of stays to the strands, and means to knot the second series of stays to the first series, said means for positioning the stay-wires on the strands including rotatable feeders having longitudinal pockets for the stay-wires.

15. In a wire fence making machine, mechanism for feeding stay-wires to the strands which consists of a magazine portion and a rotary feeder in the magazine having a series of peripheral longitudinal grooves, means to advance the strands step by step, means to revolve said feeder coordinately with the movement of the strands to deposit stays singly on the strands, mechanism to connect said stays to the strands, mechanism for positioning a second set of stays on the strands, and mechanism connecting the ends of the second set of stays with the first-named stays.

16. In a wire fence making machine, mechanisms for positioning a series of stay-wires crosswise of the strands and for connecting them thereto, means for positioning a second set of stay-wires on the strands, means for advancing the strand-wires step by step, and mechanism operated alternately with the advance movement of the strands to tie the second set of stay wires to the first set.

17. In a wire fence making machine, mechanism for connecting two wires together in substantial alinement which consists, in combination with means for intermittently advancing said wires in a direction transverse to their length, of a rotatable, radially-slotted device having its axis of rotation substantially parallel with said wires, and means to revolve said device alternately with the advance movement of the wires.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

GOTTHOLD L. LANGER.

Witnesses:

J. H. THOMPSON,
A. L. FARRINGTON.