

P. A. & W. V. REID.

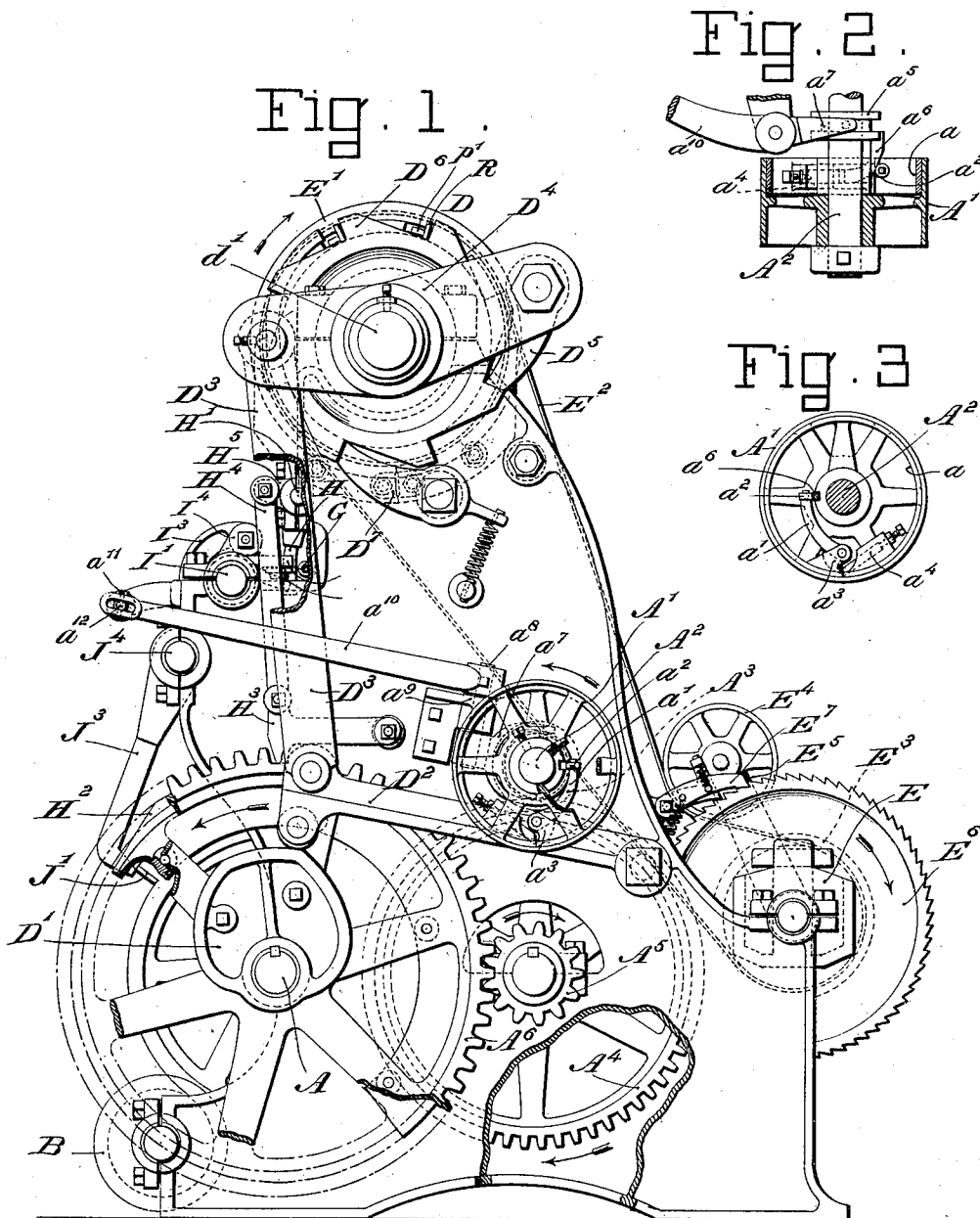
WIRE FENCE MACHINE.

APPLICATION FILED JULY 3, 1908. RENEWED DEC. 15, 1911.

1,047,292.

Patented Dec. 17, 1912.

16 SHEETS—SHEET 1.



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WIRE FENCE MACHINE.

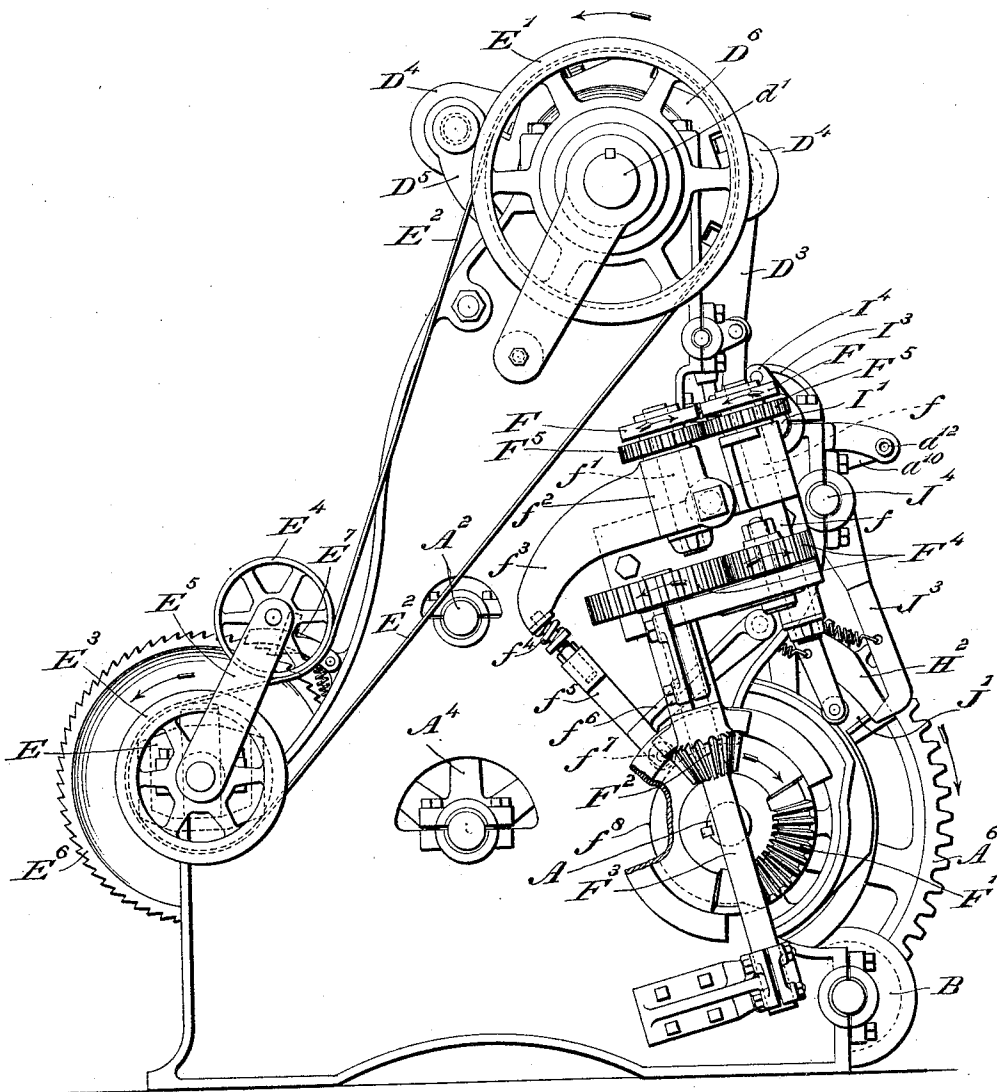
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16 SHEETS—SHEET 2.

Fig. 4.



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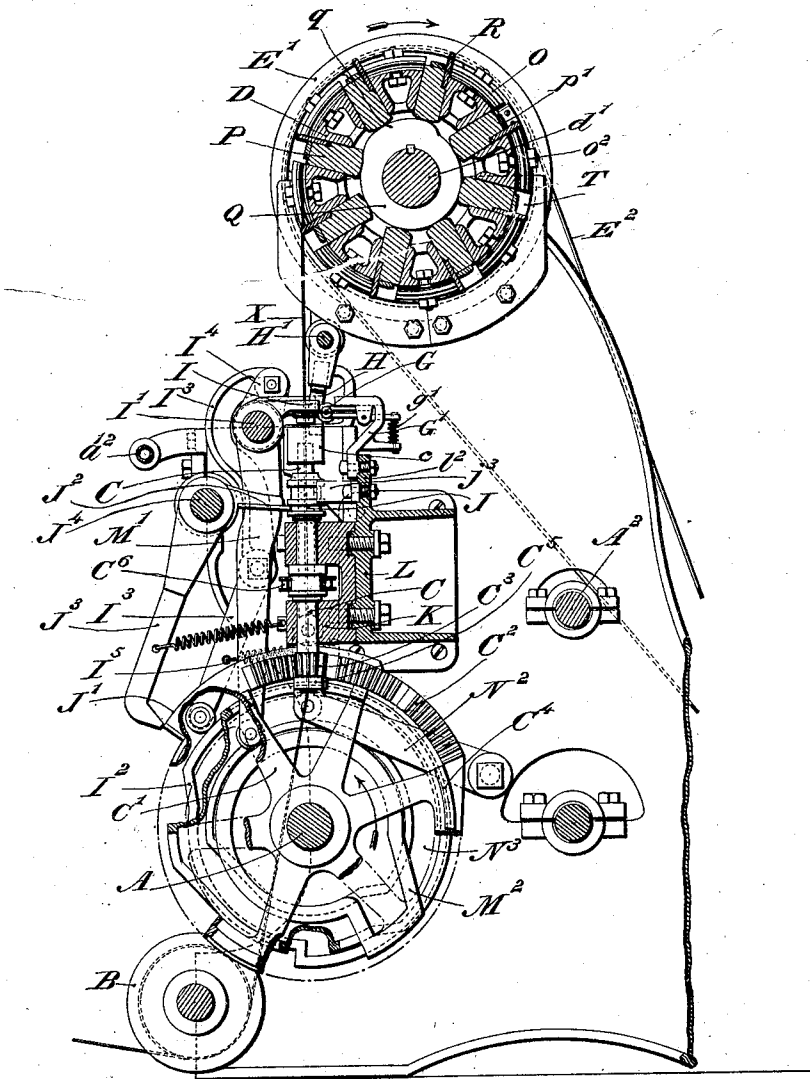
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16 SHEETS—SHEET 3.

Fig. 5.



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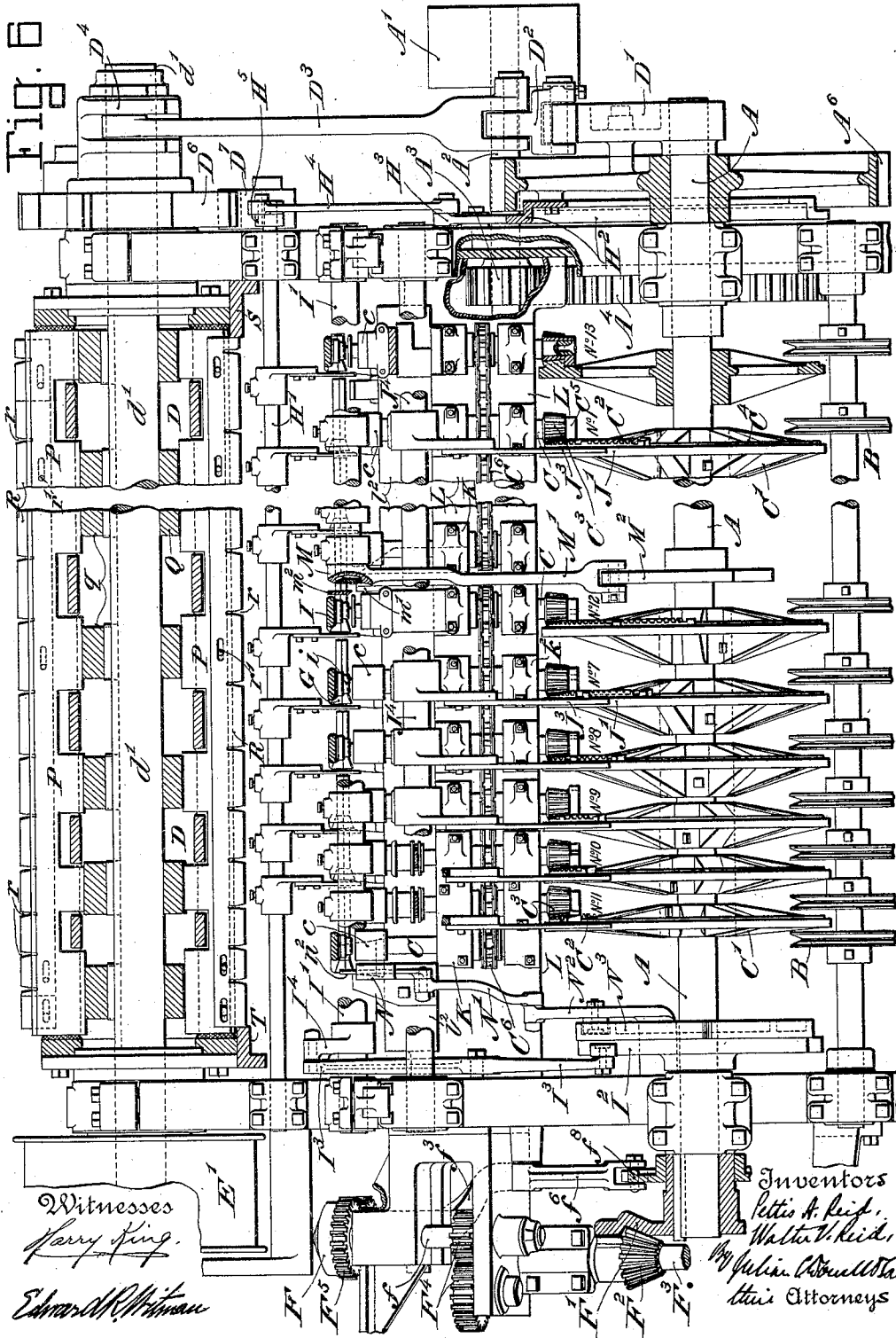
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16 SHEETS—SHEET 4.



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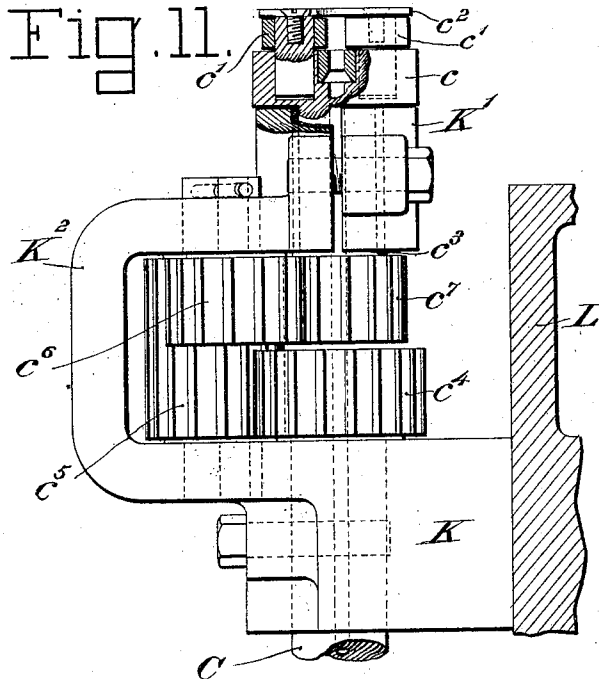


Fig. 13.

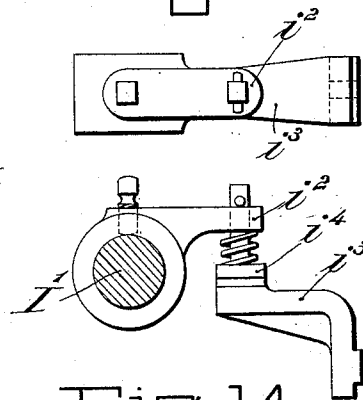
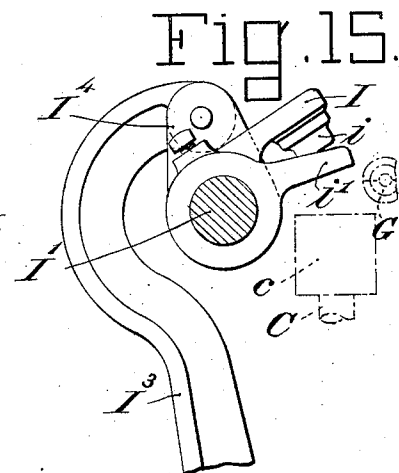
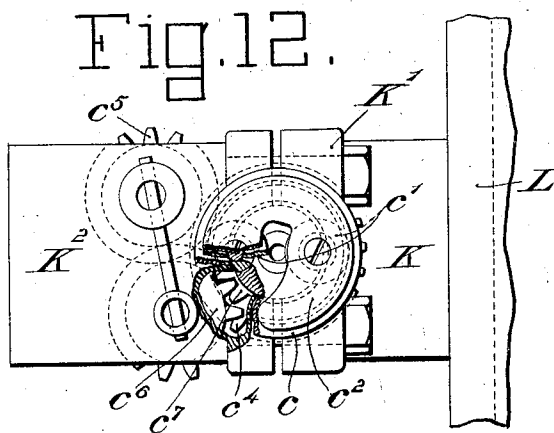


Fig. 14



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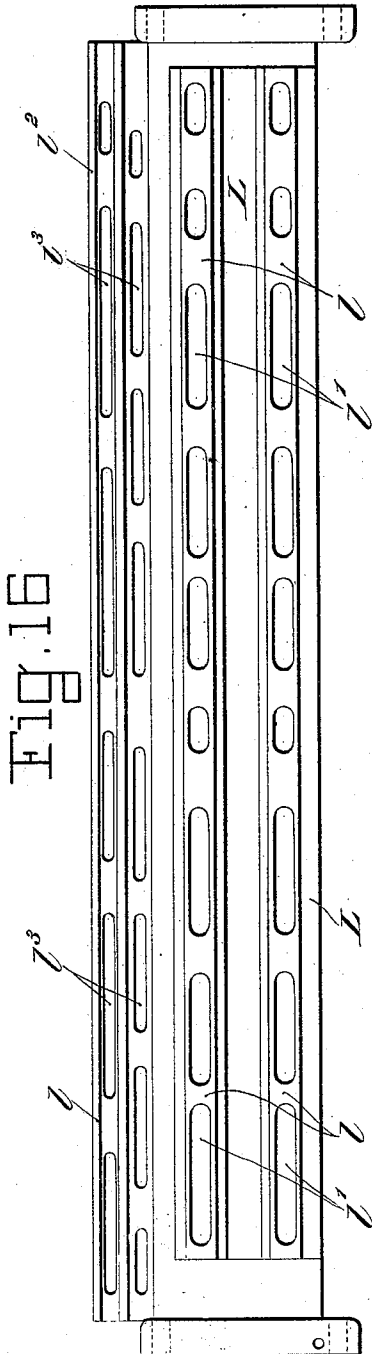
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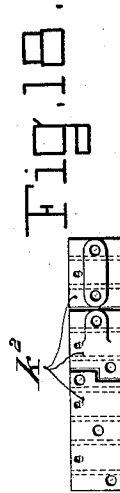
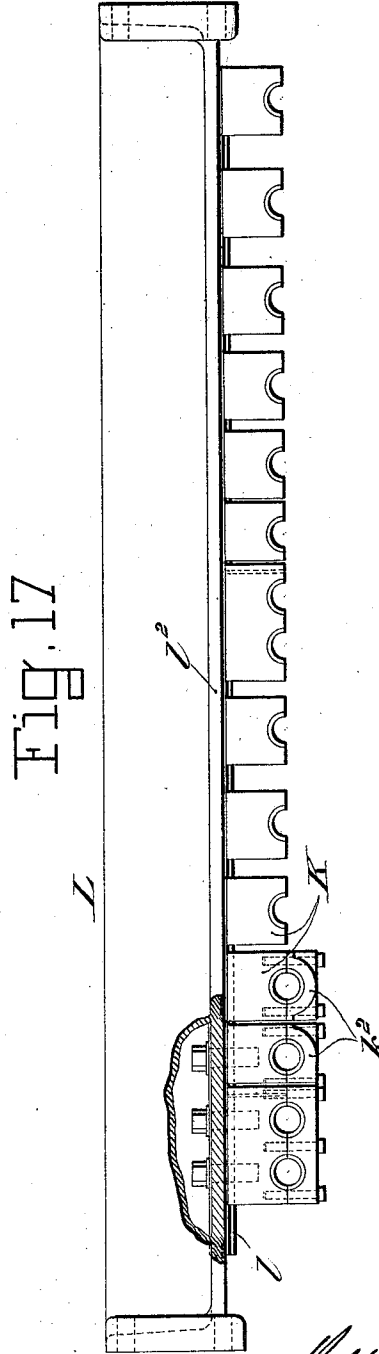
1,047,292.

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16 SHEETS—SHEET 7.



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WIRE FENCE MACHINE.

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16 SHEETS—SHEET 8.

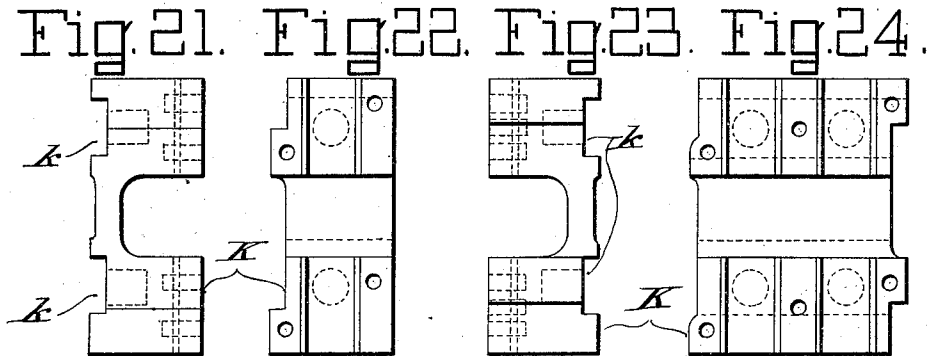
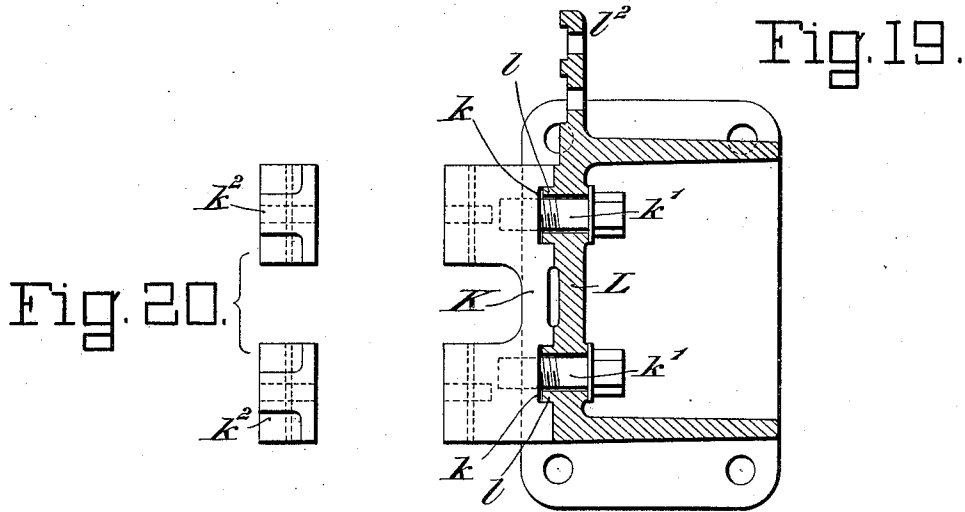
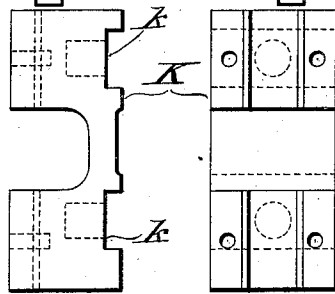


Fig. 25. Fig. 26.



Witnesses

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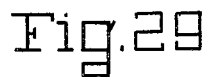
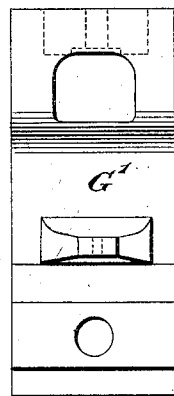
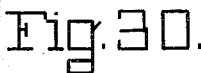
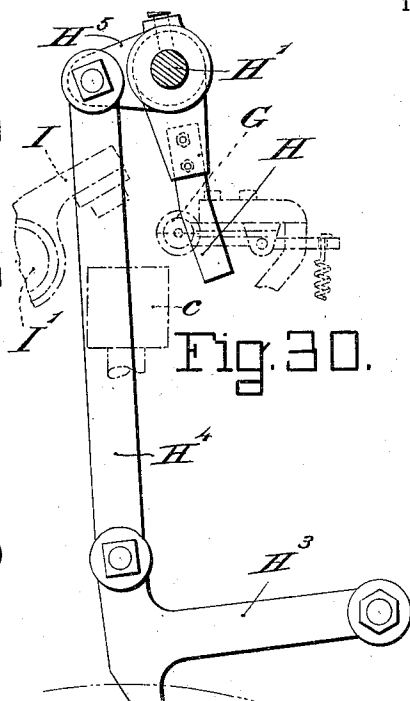
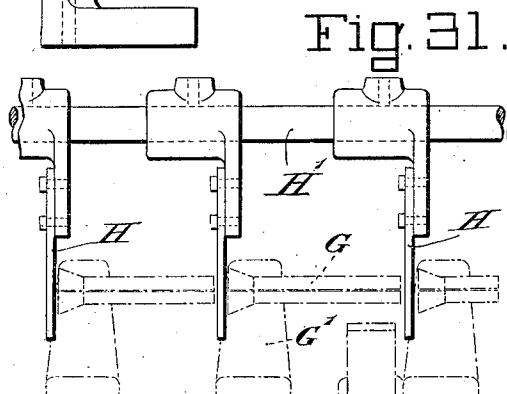
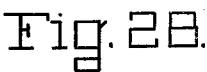
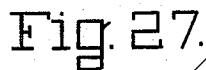
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APPLICATION FILED JULY 3, 1908. RENEWED DEC. 15, 1911.

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16 SHEETS—SHEET 9.



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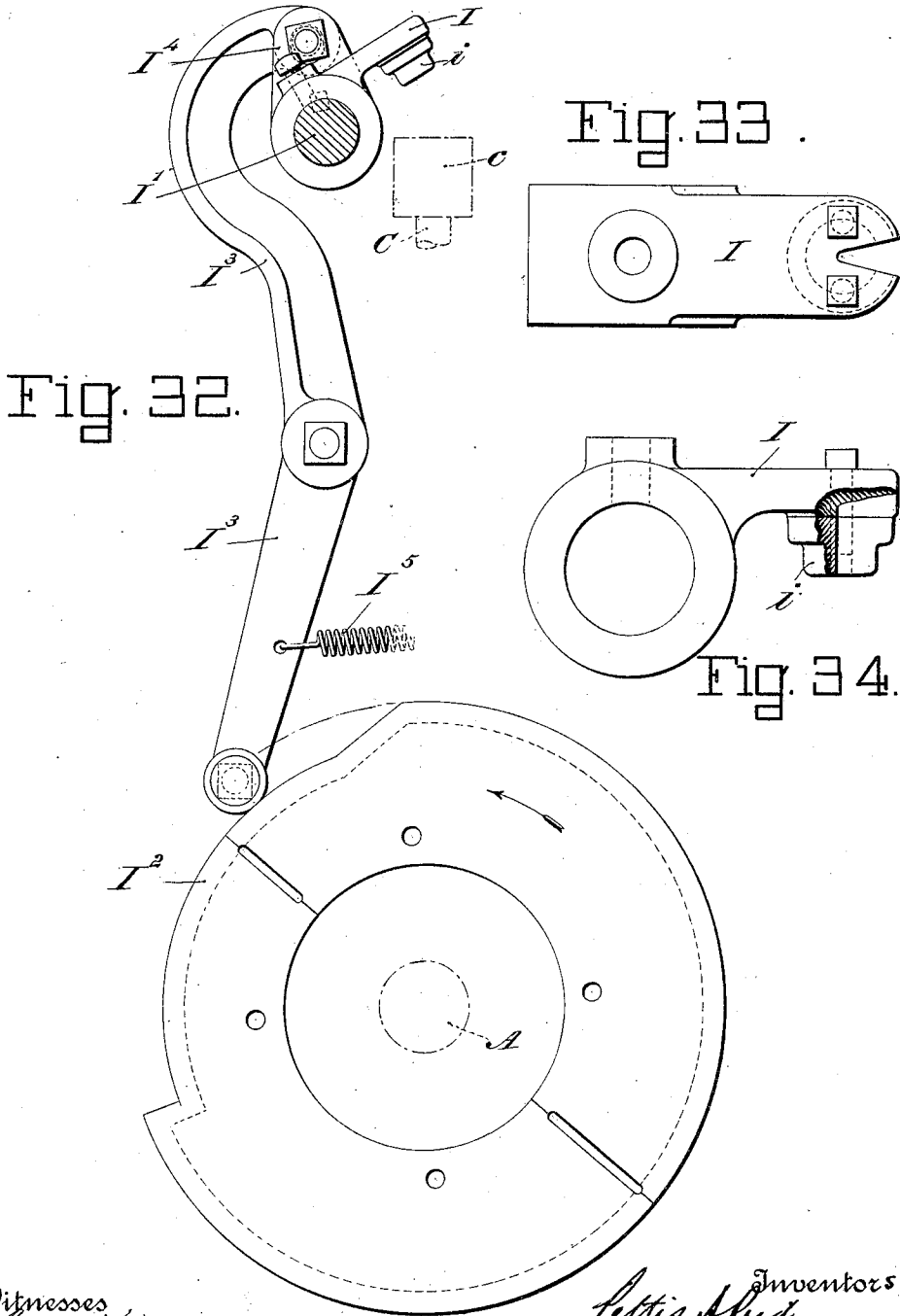
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16 SHEETS—SHEET 10.



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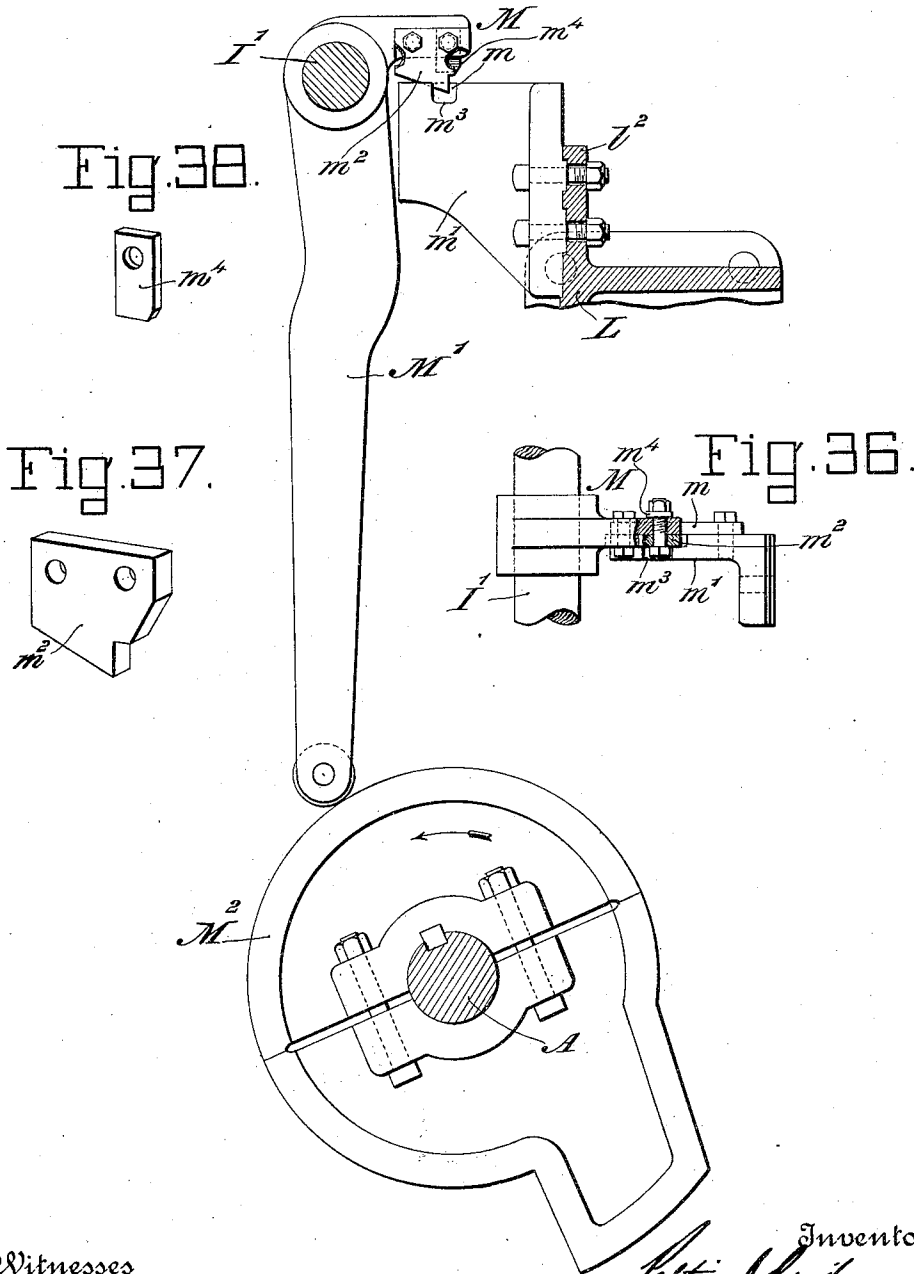
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Patented Dec. 17, 1912.

16 SHEETS—SHEET 11.

Fig. 35.



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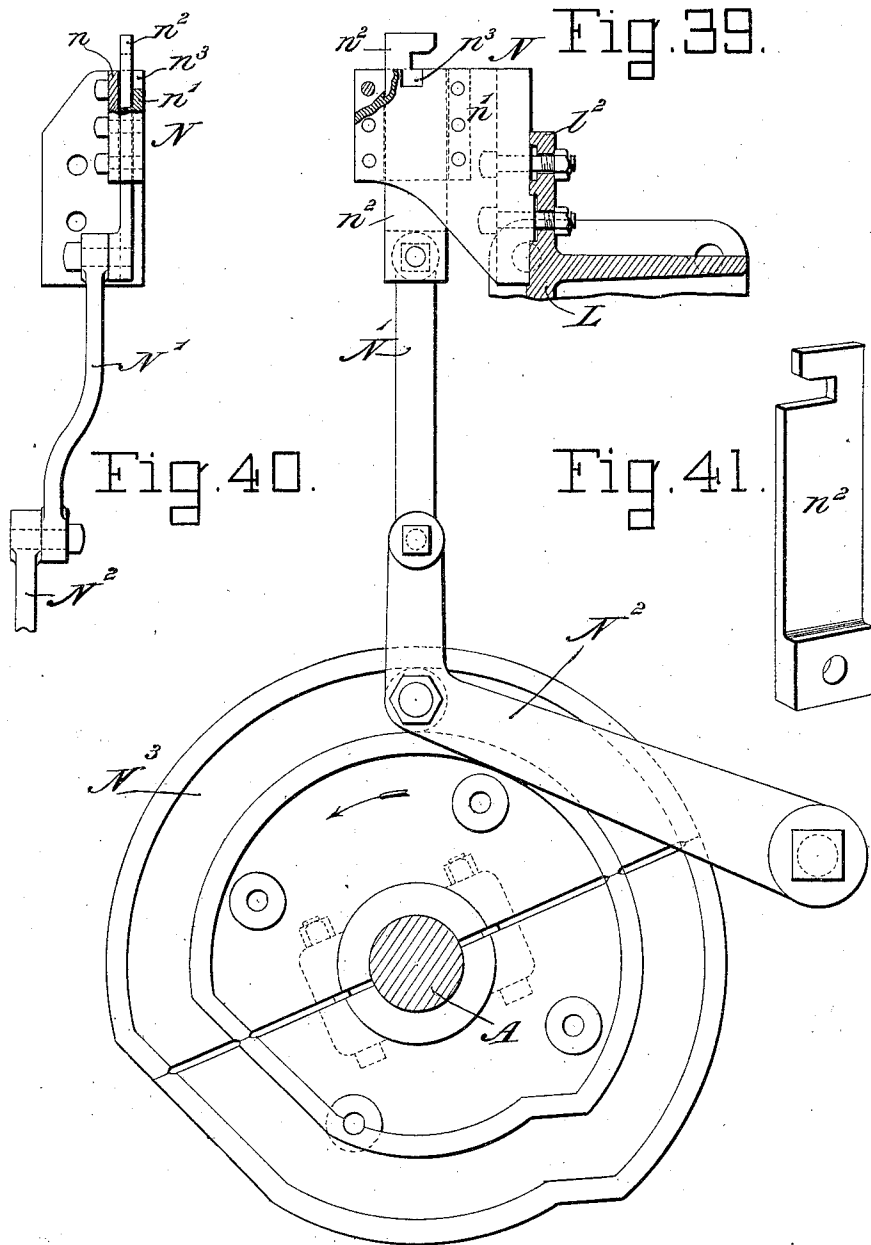
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WIRE FENCE MACHINE.

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16 SHEETS—SHEET 13.

Fig. 42.

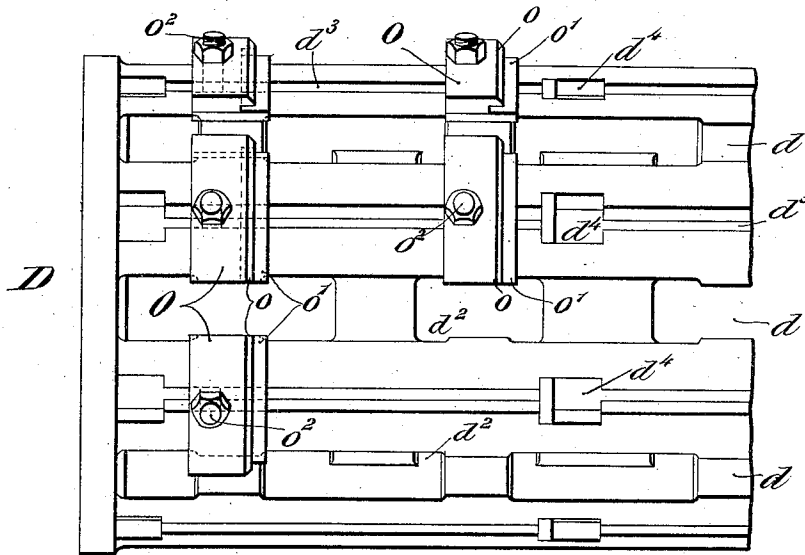
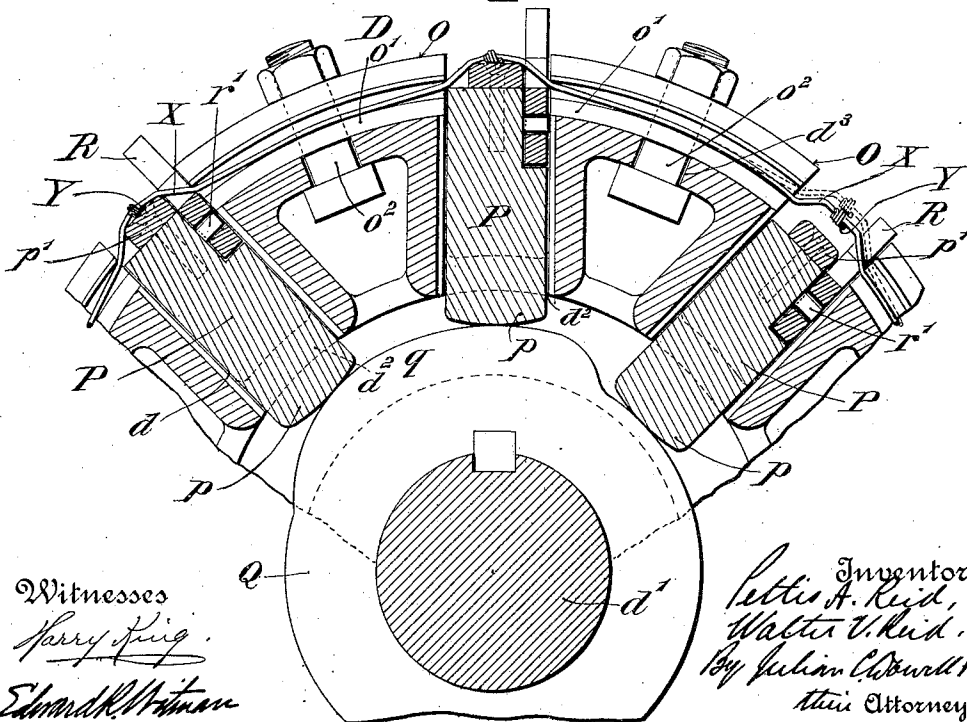


Fig. 43.



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WIRE FENCE MACHINE.

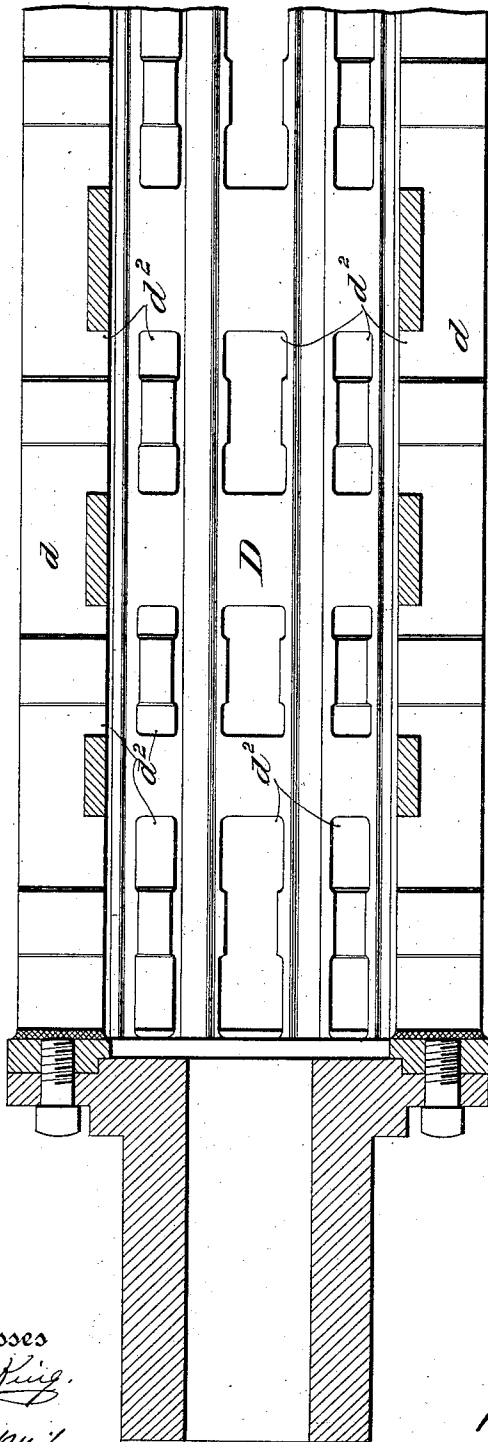
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Patented Dec. 17, 1912.

16 SHEETS—SHEET 14.

Fig. 44.



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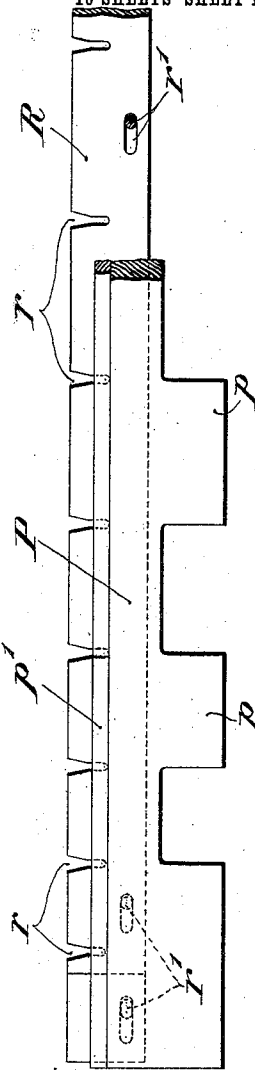


Fig. 45.

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16 SHEETS—SHEET 15.

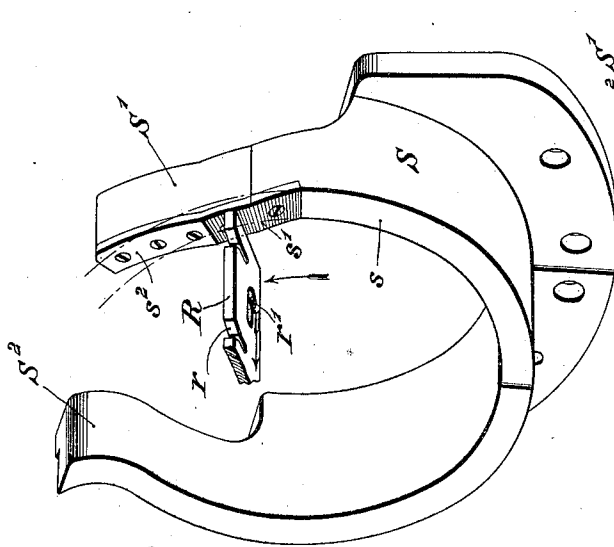


Fig. 47.

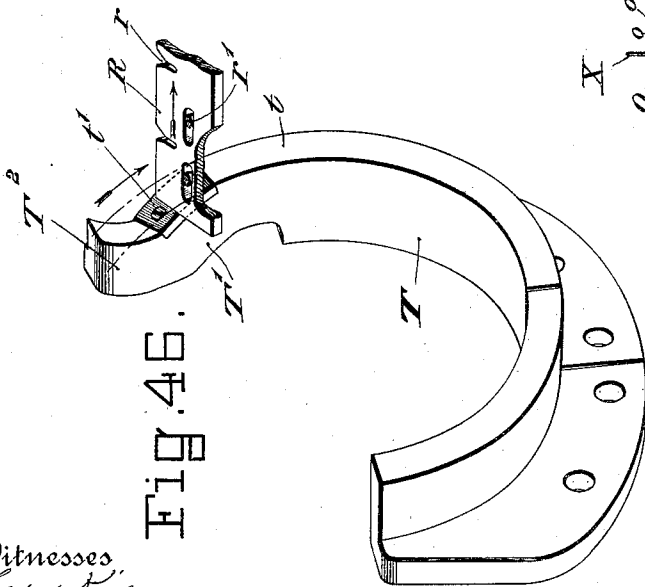


Fig. 46.

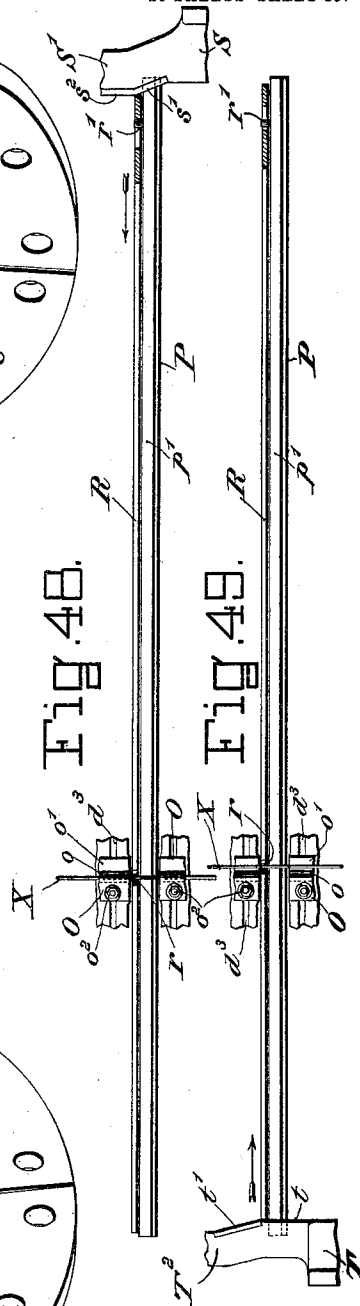


Fig. 48.

Fig. 49.

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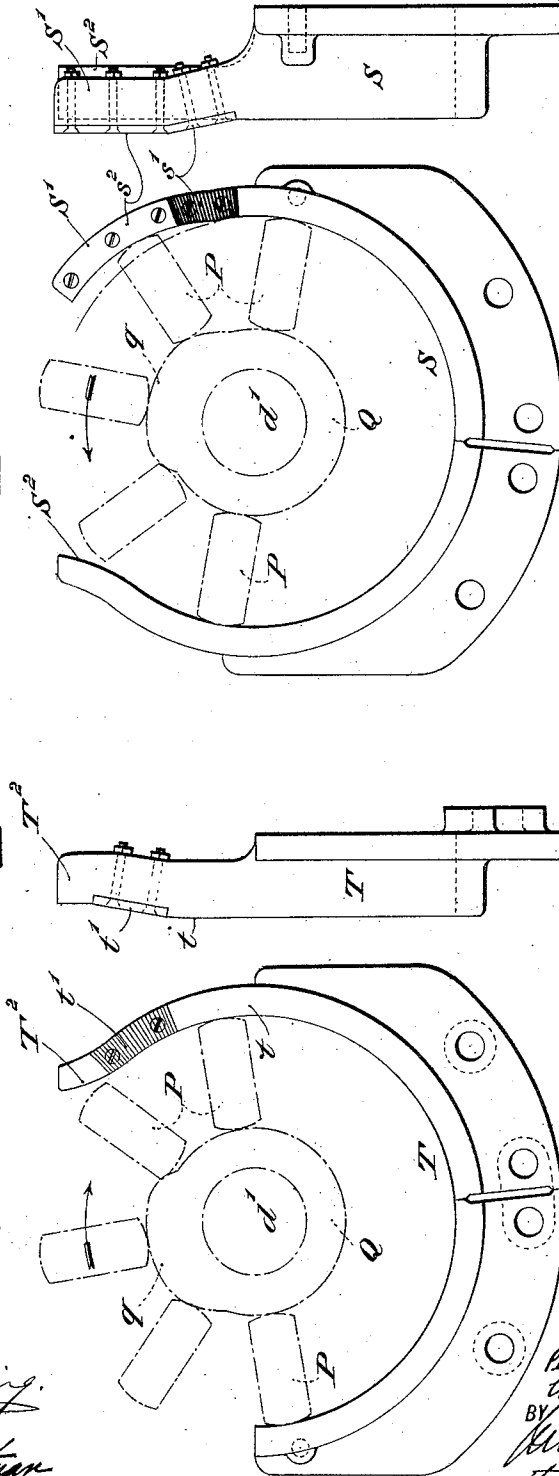
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16 SHEETS—SHEET 16.

Fig. 50. Fig. 51. Fig. 52. Fig. 53.



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UNITED STATES PATENT OFFICE.

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WIRE-FENCE MACHINE.

1,047,292.

Specification of Letters Patent.

Patented Dec. 17, 1912.

Application filed July 3, 1908, Serial No. 441,815. Renewed December 15, 1911. Serial No. 666,038.

To all whom it may concern:

Be it known that we, PETTIS A. REID and WALTER V. REID, citizens of the United States, residing at Richmond, in the county of Wayne and State of Indiana, have invented certain new and useful Improvements in Wire-Fence Machines; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to machines for manufacturing wire fabric or fencing, more particularly square mesh fencing composed of longitudinal wires or strands with attached cross wires or stays.

The general objects of the invention are: first, to simplify and improve the construction and increase the efficiency of the machine exhibited in our pending application Serial No. 262,966, filed May 29, 1905; second, to provide an upright compact machine that will occupy a relatively small floor-space as compared with former machines which lie flatwise; third, to provide certain improvements in the fabric-weaving or stay-applying mechanism disclosed in our aforesaid application, and certain improvements in correlated mechanisms; and fourth, to provide for convenient adjustment of the spacing between the strands.

A fence-machine embodying our invention is illustrated in the accompanying drawings, which are made a part of this specification.

The invention will be first fully described with reference to said drawings and then more particularly pointed out in the appended claims.

Figure 1 is a right-hand side elevation of the fence-machine. Fig. 2 is a horizontal sectional view of the drive pulley with its friction-clutch. Fig. 3 is a side view of said drive-pulley. Fig. 4 is a left-hand side elevation of the fence-machine. Fig. 5 is a vertical section of the machine. Fig. 6 is a front elevation of the machine with parts broken away and parts in section. Fig. 7 is a plan view of the series of twisters or coilers. Fig. 8 is a detail side view of one twister. Fig. 9 is a perspective view of the twister, showing its looping tool engaging the stay-wire and pulling it around the

strand so as to form a loop. Fig. 10 is a similar view showing the release of the looping tool from the loop. Fig. 11 is a side view of a reverse twister and its reversing gears. Fig. 12 is a plan thereof. Fig. 13 is a plan view of a bracket and lever for holding the end of the stay-wire after it has been fed across the strands. Fig. 14 is a side view of the same. Fig. 15 is a right-hand view of the beater shaft, showing an arm thereon for bending the end of the stay-feed-wire into the face-slot of the first twister. Fig. 16 is a face view of the bed-plate on which the pillow-blocks of the twister-spindles are mounted. Fig. 17 is a plan of the same with the pillow-blocks attached. Fig. 18 is a front view of the three caps shown on the pillow-blocks at the left-hand end of Fig. 17. Fig. 19 is a cross-section of the aforesaid bed-plate, showing a pillow-block attached. Fig. 20 shows the caps which are detached from the pillow-block in Fig. 19. Figs. 21 and 22 are side and front views of one style of pillow-block. Figs. 23 and 24 are corresponding views of another style of pillow-block. Figs. 25 and 26 are corresponding views of a third style of pillow-block. Fig. 27 is an end view of one of the separable guide-tubes for guiding the stay-feed-wire as it is fed across the strands, showing also the bracket on which said guide-tube is mounted. Fig. 28 is a plan of said guide-tube. Fig. 29 is a back-view of the bracket shown in Fig. 27. Fig. 30 is a side view of one of the pusher-arms or devices for pushing the stay-wire laterally from the guide-tubes and placing it against the strands, together with the actuating mechanism for said devices. Fig. 31 is a front view of a number of said pusher-arms. Fig. 32 is a side view of one of the beaters for holding the stay-wire against or upon the faces of the twister-heads, together with the actuating mechanism for said beaters. Fig. 33 is a plan view of one beater-arm. Fig. 34 is a side view thereof, with a part broken away. Fig. 35 is a side view of the middle wire-cutter and its actuating mechanism. Fig. 36 is a top view of said cutter, with a part broken away. Fig. 37 is a detail view of the cutter blade. Fig. 38 is a detail of a small plate or lug which is fastened on the side of the cutter

blade and serves to bend one end of the severed stay-wire into the face-opening of the adjacent twister. Fig. 39 is a side view of the end wire-cutter and its actuating mechanism. Fig. 40 is a front view of said cutter. Fig. 41 is a detail of the movable cutter blade. Fig. 42 is a top view of a section of the clamp-drum, with parts omitted. Fig. 43 is a transverse section through a sector of the drum. Fig. 44 is a horizontal section of a part of the drum. Fig. 45 is a front view of a part of one of the crimp-bars and its tracker-bar. Fig. 46 is a perspective view of the left-hand tracker-cam, showing how the tracker-bar which is revolving in the direction indicated by the arrow is shoved endwise toward the right. Fig. 47 is a perspective view of the right hand tracker-cam, showing how the tracker-bar is shoved endwise toward the left. Fig. 48 is a plan view representing a portion of a strand-wire and adjacent crimp-lugs, and showing one crimp-bar with its tracker-bar, and a fragment of the right-hand tracker-cam which has shoved the tracker-bar toward the left and thereby carried the strand-wire under said crimp-lugs. Fig. 49 is a similar view showing a fragment of the left-hand tracker-cam which has shoved the tracker-bar toward the right and thereby carried the strand-wire from under said crimp-lugs. Fig. 50 is a face view of the left-hand tracker-cam, with dotted lines indicating some of the crimp-bars and the cams for moving said crimp-bars radially outward. Fig. 51 is a rear elevation of said left-hand tracker-cam. Fig. 52 is a view similar to Fig. 50 of the right-hand tracker-cam. Fig. 53 is a front elevation of said right-hand tracker-cam.

General arrangement.—As shown in Figs. 1, 4, 5 and 6, two upright housings or standards, constituting the sides of the machine-frame, support therebetween the fabric-weaving, feeding and reeling mechanisms, and provide bearings for transverse shafting, including a main drive shaft A.

At the lower front of the machine are a series of shive-wheels B, fixed on a common shaft so as to turn in unison. The strand-wires, coming from any suitably arranged number of supply-spools (not shown), are first passed around or caused to encircle the shive-wheels, for the purpose of guiding and tensioning said wires against the pull of the revoluble clamp-drum.

Above the shaft A, at the front of the machine, are the vertically-disposed twister-spindles C of the fabric-weaving mechanism, through which the strand-wires are threaded, and by means of which the stays or cross-wires are successively affixed to the strands. See Figs. 5 and 6. In the type of weaving mechanism herein selected for illustrating our invention, the stays are supplied

by successively feeding and cutting a continuous stay-feed-wire, which is fed across the strands by coacting feed-rolls F mounted at one side of the machine (Fig. 4). Said stay-feed-wire is fed through an alined series of separable guide-tubes G, from which it is removed and placed adjacent to the strands by a number of pusher-arms H, and then pressed and held against the faces of the twistors or coilers by a series of beaters I.

Mounted at the top of the machine, above the fabric-weaving mechanism, is a revoluble clamp-drum D, over which the fabric is drawn. This drum is provided with devices for gripping the strands, enabling the drum to pull up the fabric as the stays are successively applied, thus intermittently feeding the strands. Said gripping devices also serve to crimp the strands.

At the back and base of the machine is the winding-reel E, to which the fabric passes from the clamp-drum D, and by means of which it is wound into a bundle or roll.

It will be observed that the machine is very compact and substantially upright in form, whereby it occupies comparatively little floor-space.

Power and control.—As shown in Figs. 1 and 6, power is applied by a belt (not shown) at pulley A¹ on the power-shaft A² and is transmitted by pinion A³, gear A⁴, pinion A⁵ and gear A⁶ to the main drive-shaft A, which directly or indirectly operates the several mechanisms of the machine. Control of power, enabling the operator to start and stop instantly, is provided by a friction-clutch in connection with pulley A¹ (Figs. 1, 2 and 3). As shown, an expansible friction-ring a, the same being a split or divided ring, is carried by a hub keyed on the power-shaft. This friction-ring a is adapted to revolve freely with a loose running fit in the flange or rim of pulley A¹. Said friction-ring carries a friction-applying lever a¹ whose free end is provided with a roller a² and whose fulcrummed end has a short tail-piece a³. The friction-ring also carries an adjusting-key a⁴ having a beveled or inclined end engaging the tail-piece a³. Adjustment of the key or wedge member a⁴ is regulated by a set-screw at its other end. A grooved slip-collar a⁵, loose on the power shaft, has a laterally-projecting wedge a⁶ which works in a slot in the hub of the friction-ring and with its inclined side under the roller a²; whereby lateral adjustment of the slip-collar a⁵ will control expansion and contraction of the friction-ring, so as to clutch or release the pulley A¹. Said slip-collar is engaged by a yoke or fork a⁷ carried by a spindle a⁸ which is journaled in a bearing a⁹. A clutch-controlling lever a¹⁰ is rigidly attached to the spindle a⁸. The free end of said lever is shown connected by

a pivot-bolt a^{11} to a shift-bar a^{12} arranged at the front of the machine. By this means, the operator can conveniently control the power from either side or at any position along the front of the machine, by shifting the bar or rod a^{12} .

Distribution of power.—Shaft A operates the coiler-spindles C by means of a series of drive-wheels C¹ (Figs. 5 and 6). It also operates by means of cams other instrumentalities associated with or forming part of the fabric-weaving mechanism, including the stay-wire positioning devices and cutters, as will more fully appear.

At one side of the machine (Fig. 1) shaft A communicates intermittent motion to the clamp-drum D by means of a cam D¹ on said shaft. Said cam D¹ controls a lever D², carrying a roller which rests on said cam; and said lever D² is connected by a link D³ to a dog-carrying lever D⁴ loosely mounted on the drum-shaft. As rocking motion is thus imparted to the lever D⁴, the drum D is revolved step by step by the dog D⁵ engaging a ratchet-wheel D⁶ on one of the drum-journals. The drum is prevented from reverse turning by a spring-controlled detent or pawl D⁷.

At the opposite sides of the machine (Fig. 4), the drum-journal is provided with a pulley E¹, and motion is communicated therefrom by a belt E² to a reel-pulley E³. The on-going run of the belt E² is slack, but the slack is taken up by a belt-tightener pulley E⁴ carried by a swinging arm or lever E⁵ which is loosely mounted on the shaft of the reel-pulley E³. The inclination of the arm E⁵ allows the belt-tightening pulley E⁴ to rest of its own weight upon the slack run of the belt. The reel E is thereby driven from the drum D, but at a quicker speed, the pulley E¹ being larger than the pulley E³; so that the reel will wind the fabric and pull it taut as fast as it is delivered from the drum; at the same time the reel can vary its rotation to compensate for the increasing diameter of the roll or bundle thereon, or the reel will stop when the slack in the fabric is taken up, since the tension of the strands will cause the reel-pulley E³ to slip in the belt E², the slack run of the latter bearing up against the idler E⁴. Reverse rotation of the reel is prevented by the ratchet-wheel E⁶ engaged by a detent or pawl E⁷. At the same side (Fig. 4), shaft A transmits motion to the stay-wire feed-rolls F by a segmental gear F¹ adapted to engage intermittently the beveled pinion F² on a shaft F³ which is connected by gears F⁴ with one of the feed-roll spindles f , said spindles being intergeared at F⁵ to revolve the feed-rolls oppositely for feeding the stay-wire. The other feed-roll spindle f^1 is mounted in an adjustable or rocking bearing f^2 from which extends a lever f^3 ; and a

spring f^4 acts on said lever to hold the feed-rolls forcibly but yieldingly together. Said spring f^4 is arranged between the lever f^3 and a projection or post f^5 on another lever f^6 , the latter being provided with a roller f^7 which rides on a cam f^8 made on or as a part of the segmental gear-wheel F¹. At each period of feed, the cam f^8 lifts the roller f^7 and thereby compresses the spring f^4 and causes the feed-rolls F to positively grip the stay-feed-wire with great pressure during the interval of feed; after which the roller f^7 is dropped and the feed-rolls are held together by the normal power of the spring f^4 , so that the wire can be jerked or pulled inward by the coilers or twisters to furnish the additional lengths required for successively coiling around the respective strands, as explained in said pending application Serial No. 262,966.

From the foregoing, it is noted that the strand-wires are fed step-by-step by the intermittently-revolving clamp-drum D, while the stay-supply-wire is also fed intermittently across the strands. Preferably these feeds are timed to occur simultaneously, leaving the interim for the coiling or stay-attaching operation, and thus using the time to best advantage.

Fabric-weaving mechanism.—While this invention in a broad aspect is not intended to be limited to any particular mechanism for making the fencing-fabric, or attaching the stays to the strands, we have adopted as a preferred type, and have selected for illustration herein, a wire-weaving mechanism of the character set forth in our said pending application Serial No. 262,966, the same having been modified to adapt it to this machine and improved generally and in various particulars as a part of our present invention.

As shown in Figs. 5, 6 and 7, said mechanism comprises a series of rotary twisters or coilers through which the strand-wires are threaded; said twisters being timed to begin their operations progressively or one after another and adapted to form loops in the transversely-placed stay-wire and coil or twist said loops around the corresponding strands; excepting the marginal or first and last twisters which simply wrap or coil the ends of the stay-wire around the outer strands, that is the top and bottom strands of the fence. The purpose of this progressive action of the series is to enable one twister or coiler to draw out the needful extra length of stay-wire to form a loop before effective operation of the next twister begins, thus avoiding breakage. As the strands are intermittently drawn through the twisters, a continuous stay-feed-wire is successively fed across and placed against the strands, in position for engagement by the twisters; and at each operation the

length of stay-feed-wire so fed is attached to the strands and severed, thus making a stay. Associated with the twisters are a series of separable guide-tubes for guiding the stay-feed-wire across the strands; a series of pushers or devices for removing the stay-feed-wire from said guide-tubes and placing it adjacent to the strands; and a series of beaters or devices for pressing said stay-feed-wire against the faces of the twister-heads; also a cutter for severing the stay from the main length of its feed-wire.

The above general description applies more particularly to a machine for making a single width of fencing. It should be stated, however, that the drawings hereto attached show what is termed a "double machine," that is a machine for making simultaneously two separate widths of fencing; although the mechanism may be so altered and adjusted as to make a single fencing of various widths as well as with different spacing between adjacent strands. For this reason two stay-wire cutters are employed, designated M and N. One cutter M is located mid-wise and the other cutter N is located adjacent to the last twister next the in-feed of the stay-feed-wire (left hand side of the illustrated machine). While the whole number of twisters constitute a progressively-operating series, the middle knife M divides them into two groups each of which may be considered as a series for a single width of fencing, and each group of which has its own marginal or first and last twisters. The stays for both widths of fencing are supplied by the same stay-feed-wire which at each operation is fed by the feed-rolls F clear across the entire number of strands and is afterward severed into two lengths by the cutters M and N.

In the present machine the fabric-weaving mechanism is shown in an upright position, as before stated, and below the front surface of the pull-up drum D, so that the strand-wires drawn taut over said drum from the shive-rolls B are threaded vertically through the twister-spindles C.

The device for guiding and positioning the stay-feed-wire are similar to those disclosed in said application Serial No. 262,966. These devices consist of the funnel-mouthed separable guide-tubes G for guiding the stay-feed-wire as it is fed across the strands (Figs. 5, 6 and 27); the pushers or pusher-arms H, carried by a rocker-shaft H¹ (Figs. 5, 6, 30 and 31), for displacing the stay-feed-wire laterally from said guide-tubes and moving it within reach of the beaters or beater-arms I, carried by a rocker-shaft I¹ (Figs. 5, 6 and 32), for pressing and holding the stay-feed-wire against the faces of the coiler-heads c. As seen in Fig. 5, the guide-tubes G are shown arranged behind the strands; the rocker-shaft H¹ above and

the rocker-shaft I¹ in front of the coiler-heads. This is a preferred arrangement though not essential to our invention.

The guide-tubes G, as shown in Figs. 6 and 31, are arranged in an alined series with their funnel-shaped mouths disposed to receive the stay-feed-wire as the latter is fed across the strands from the feed-rolls F (Figs. 4 and 6). As shown in detail in Figs. 27, 28 and 31, each guide-tube is composed of two half-tubes, one affixed to the bracket G¹ and the other carried by an arm g hinged or pivoted to said bracket and having a tail-lever engaged by a retractile spring g¹, whereby the half-tubes are held yieldingly closed, but are adapted to open to allow the wire to be displaced or pushed laterally therefrom.

The transferers or pusher-arms H are arranged to operate between adjacent guide-tubes, as shown in Figs. 30 and 31. While the stay-feed-wire is being fed through the guide-tubes, the pusher-arms are disposed behind said wire, but at the proper period said arms are moved forward by the rocker-shaft H¹ so as to displace the wire laterally and place it adjacent to said strands. The rocker-shaft H¹ is operated from the main shaft A by a cam H² (Figs. 1, 6 and 30) controlling a lever H³ which is connected by a link H⁴ to an arm H⁵ on the rocker-shaft H¹. The cam H² is or may be made on or attached to the drive gear A⁶ at one side of the machine (Figs. 1 and 6).

The beater-arms I, one of which is shown in detail in Figs. 32, 33 and 34, are respectively arranged to operate directly upon the faces of the twister-heads c, and the acting faces of said beater-arms are provided with circular lugs l for pressing the stay-feed-wire against the twister-heads while yet allowing the looping-tools of the coilers to revolve around said circular lugs. The ends of the beater-arms, including the beater-lugs l, are notched or bifurcated to straddle the strand-wires. The beater-arms are raised off the twister-heads as shown in Fig. 32 until the stay-feed-wire is fed across and placed against the strands, whereupon the rocker-shaft I¹ forces the beaters down upon the faces of the twister-heads, pressing the wire thereagainst. The rocker-shaft I¹ is operated from shaft A by a cam I² which controls an intermediately-fulcrumed lever I³ (Figs. 5, 6 and 32), the lower arm of said lever I³ having a roller engaged by said cam, and the upper arm of said lever being connected to an arm I⁴ on the rocker-shaft I¹. The cam moves the lever in a direction to throw the beaters upon the twister-heads, and the lever is moved in the opposite direction to lift the beaters by a spring I⁵.

Figs. 30 and 32 show the relative position of the pusher-arms H and beater-arms I before positioning the stay-feed-wire, and

while the latter is still in the separable guide-tubes G.

Fig. 5 shows the positions of the pusher-arms and beater-arms after they have respectively displaced the stay-feed-wire from the guide-tubes and placed it against the strands and against the faces of the twister-heads.

The operations of feeding, guiding and positioning the stay-feed-wire are desirably performed during the interval of feed of the strands by the pull-up drum D, thus utilizing the time to best advantage. The stay-feed-wire, having been placed in position, is then ready for the operation of the twist-ers or coilers for attaching the stay-feed-wire to the strands. During this operation, the pushers and beaters maintain the stay-feed-wire in position. As soon as the operation is completed, the pushers and beaters are moved away from the stay to allow the next feed of the strands to withdraw the knots from the twist-ers and carry the stay just attached upward toward the drum D.

Coming back to the twist-ers or coilers (Figs. 6 and 7), it will be remembered that the middle knife M divides the series into two groups, one for each width of fencing. For convenience of description, the first and last twist-ers of each group will be termed marginal, and those between will be called intermediate. It should also be noted that the first twister of each group, which is the one farthest from the feed-rolls F, rotates in an opposite direction from the others, and may therefore be referred to as a reverse twister.

One of the intermediate twist-ers is shown in Figs. 8, 9 and 10. The twister-head c carries oppositely-disposed coiling rollers c^1 , and an eccentric looping tool or pin j having a hooked end j^1 . This looping pin j is adapted to protract and retract, being connected to a slip-collar J on the twister-spindle C. It is also capable of turning as well as sliding. It is spring-held so that its hook j^1 points outward from the axis, but is adapted to be turned so as to point the hook inward; which is accomplished by the tripping of a lateral toe or projection j^2 against a trippet j^3 . Said trippet j^3 is attached to the bed-plate L (Fig. 16) which supports also the pillow-blocks or bearings of twister-spindles. In operation, as the twister-head revolves, the protracted looping-pin j engages the stay-feed-wire and forms a loop therein by drawing said wire over or around the strand; at the same time the looping-pin retracts so that its hook pulls the loop between the twister-rollers c^1 , whereupon the looping-pin is turned by the trippet j^3 so as to disengage its hook from and release the loop; and the revolving rollers c^1 then coil, wrap or twist the loop around the

strand. The knot or connection made by this operation is drawn out from the twister-head by the next intermittent feed of the strands.

Since the marginal twist-ers are designed to coil or twist the ends of the stays around the outer strands, they carry no looping tools, but they are provided like the intermediates with the twisting-rollers c^1 , which may be covered by slotted face-plates c^2 as shown in Fig. 7, the construction being according to the twister-heads exhibited in our prior Patent No. 721,605. One of said marginal twist-ers is shown in Figs. 11 and 12, the same being a first or reverse twister.

The reason for reversing the direction of rotation of the first twister is explained in our former application Serial No. 262,966, and may be briefly stated as follows. Since the intermediate twist-ers successively draw out additional lengths of the stay-feed-wire to furnish material for the loops, it is desirable that they should rotate in such direction that the looping-pins j will engage said stay-feed-wire at the sides of the strands nearer or toward the feed-rolls F. This will necessitate rotating the first twister in an opposite direction, so that it will engage the extremity of the stay-feed-wire at the far side of the first strand and twist it around said strand; for otherwise the first twister would be inoperative.

In view of the reverse rotation of said first twister, the twister-head c thereof is on a short spindle c^3 separated from the main twister-spindle C but geared therewith by reverse gears c^4 , c^5 , c^6 , c^7 (Figs. 11 and 12). The gear c^5 is a long pinion meshing with pinion c^4 on spindle C and with the idler c^6 which in turn meshes with pinion c^7 on stub shaft c^3 . The bearing K^1 of stub shaft c^3 is supported by a yoke K^2 extending around the reverse gears from the pillow-block or bearing box K of spindle C, which in turn is attached to bed-plate L. Said yoke K^2 makes a rigid connection between the two bearing boxes and also provides bearings for the axles of the gears c^5 and c^6 . The bed-plate L, extending between and secured to the side-members of the machine-frame, supports the pillow-blocks or bearing-boxes for all the twister-spindles, as will be referred to later.

The twister-spindles C are operated by the drive-wheels C^1 on the shaft A; each drive-wheel C^1 having a segment gear C^2 which intermittently engages a bevel pinion C^3 on the corresponding twister-spindle, and having also a segmental bearing-surface C^4 which is engaged by a wiper C^5 on the twister-spindle during the interval between engagement of gears C^2 , C^3 . The drive-wheels C^1 are set at different angles on the shaft A, whereby the aforesaid progressive timing of the twist-ers is accomplished. Said

drive-wheels C¹ also operate the slip collars J on the twister-spindles C, by means of cams J¹ which at each revolution are adapted to raise or displace the spring-retracted levers J³ fulcrumed on a stationary shaft J⁴ and having yoke-arms J² engaging said slip-collars J for controlling the looping-tools j.

As the marginal twisters of both groups carry no looping-tools, the slip-collars and corresponding actuating means therefor are omitted for these twisters. Another exception to the general plan is made in connection with the last twisters of both groups, that is the twisters immediately to the right of the knives M and N. These twisters take their motion from the drive-spindles C of the first twisters, by means of sprocket-chains C⁶. This allows spacing for the knives M and N, by omitting one drive-wheel at each of these places, and also accomplishes a further result which will appear presently.

A feature of this invention resides in the mode of operating the series of twisters or coilers, whereby the following results are accomplished: First, in a progressively-operating series of twisters for making simultaneously two widths of fencing, the stays for each width have their extremities coiled around the marginal strands; as distinguished from the mere severing of a stay-wire mid-wise after it has been attached to all the strands, which latter operation would be objectionable for obvious reasons. Second, the operation of the whole series of twisters is effected in a comparatively brief interval of time. Third, the marginal twist-ers of each group are saved from robbery of their wire by the looping pins of the twist-ers adjacent thereto. The following will explain the accomplishment of these objects.

In Fig. 6, the twister drive-gears are numbered 1 to 13 inclusive, being numbered in accordance with their respective times of operation, except No. 13 which operates in the same time as No. 9. The same numbering is shown in Fig. 7 applied to the twister-heads, with the addition of the symbols 12* and 13* to the left-hand marginals of the two groups, since these left-hand marginals take their motion from the right-hand marginals or reverse twist-ers No. 12 and No. 13, and consequently operate in the same time as the latter. From the foregoing, it is noted that the whole number of twist-ers operates as a progressive series, beginning with No. 1; but the two marginals of each group operate simultaneously after the operation of the intermediates of the same group. This timing allows for the formation of the loops, which requires successive pulls on the stay-feed-wire, in the respective halves of the wire before said halves are severed by the respective knives

or cutters M and N. It also enables the cutter M to operate after the stay-feed-wire has been attached to some of the strands of the left-hand fencing, as well as to all the intermediate strands at the right.

The far end of the stay-feed-wire is bent into the face-opening of the first marginal or reverse twister of the right-hand group (No. 13) while the latter is stationary, by means of a rocker-arm or lever i¹ on the beater shaft I¹ (Figs. 1 and 15). The two ends of the mid-wise severed wire are bent into the face-openings of the two central marginals (Nos. 13* and 12) by the moving part of the cutter M after it has severed the wire; and the end of the wire severed by cutter N is bent into the face-opening of the last marginal (No. 12*) by the moving part of said cutter, as will appear later from the description of the knives. The ends of the stay-wire are bent into the face-openings of twist-ers No. 13, No. 13* and No. 12 before the latter begin rotation, wherefore said twist-ers are shown arranged with their face-openings substantially in alinement with the stay-feed-wire. But the last marginal No. 12* is shown set at the same angle as the intermediates, so that it revolves through an angle of about 45° before coming into alinement with the stay-feed-wire, at which instant the knife N cuts said wire and bends it under into the face slot of said marginal, while the latter is in motion, thus saving time by avoiding the delay of cutting and engaging the wire in the marginal while stationary.

The second twister (No. 1) of the right-hand group would tend to rob the marginal (No. 13) of its stay-feed-wire unless some resistance were provided. For this purpose an arm or lever i² on the beater-shaft I¹ is arranged to grip the end of the stay-feed-wire by clamping it firmly against a bracket i³ on the bed-plate L (Figs. 13 and 14). Said lever i² is shown carrying a spring-pressed foot i⁴ between which and the bracket the wire is clamped.

Neither of the marginals No. 13* and No. 12 can rob the adjacent twist-ers of their wire, since the wire is attached to the strands at both sides of the cutter M before the latter operates.

Twister No. 11, which forms the last loop, is prevented from robbing the last marginal No. 12* by the relative timing. By the time the wire is cut and bent into the face-slot of the marginal No. 12*, the latter being in motion, the looping-pin of twister No. 11 has pulled in all its wire and is about tripped; and now the twisting or coiling rollers of the twist-ers No. 11 and No. 12* proceed substantially simultaneously with their wrapping, which simultaneous operation avoids robbing the marginal while yet further saving in time.

Summarizing the operation, when the stay-feed-wire has been fed across and placed upon the strands, and forced against the faces of the twister-heads by the beaters, the end of said stay-feed-wire is also bent down into the face-slot or opening of the right-hand marginal twister No. 13, and said wire is clamped between twisters No. 13 and No. 1 by the lever i^2 against the bracket i^3 . The whole number of intermediate twisters now operate in progression, starting with No. 1 which is the second twister from the right-hand end. Each twister, by means of its looping-tool j , draws in an additional length of wire and loops it around the corresponding strand, and by means of its rollers c^1 wraps, coils or twists said loop around the strand, as hitherto explained with reference to Figs. 8, 9 and 10. After operation of the second or left-hand group of twisters has progressed sufficiently to start the attachment of the stay-wire to the second width of fencing, the cutter M severs the stay-feed-wire mid-wise and bends the two ends of the wire down into the face-slots or openings of the center marginals No. 13^x and No. 12, which thereupon twist said ends around the respective strands. As soon as twister No. 11, which forms the last loop, has drawn in all its wire for said loop, the cutter N severs the stay-feed-wire, and the severed end is bent into face-slot of the last twister or marginal No. 12^x and twisted around the outer strand simultaneously with the twisting of the last loop by the last intermediate twister No. 11.

It will be noted that the arrangement described saves in time by the simultaneous operation of the two marginals for each group; by the operation of the marginals for the first group during the operation of the intermediates of the second group; and by the timing of the marginals of the second group to start shortly after the last intermediate of said group and to continue simultaneously therewith.

A further feature of the invention resides in utilizing the cutter M for bending the ends of the midwise severed stay-feed-wire into the face-slots of the opposite twister-heads, and the cutter N for bending the severed end of the wire into the face-slot of the adjacent twister-head. This may best be explained by a description of the cutters.

The cutter M is shown in Figs. 35 to 38, where m is a stationary cutter-plate affixed to a bracket-plate m^1 , the latter being affixed to the bed-plate L. The movable knife m^2 , carried and actuated by the short arm of an elbow lever M^1 , which rocks on the shaft I^1 , works between the spaced plates m and m^1 and coacts with the shearing edge of the fixed cutter-plate m . The bracket-plate m^1 has in its edge a notch or cut-away portion m^3 which allows the end of the stay-wire to

be bent down therein by the knife itself, which thus serves to bend the wire down into the face-slot of the twister-head No. 13^x at that side. At the other side of the cutter-plate m , the lever-arm which carries the knife m^2 also carries a small plate m^4 which will bear down the wire at that side and bend it into the face-slot of the adjacent twister-head No. 12. The cutter is operated from shaft A by a cam M^2 which contacts with a roller on the knife-lever M^1 .

The cutter N, as shown in Figs. 39 to 41, comprises a fixed cutter-plate n , affixed to a bracket-plate n^1 , and a movable knife n^2 working between them, said bracket-plate n^1 having a similar notch or cut-away portion n^3 in its edge, whereby the operation of the knife will bend the severed end of the wire into the face-slot of the marginal twisters No. 12^x. For operating the knife, the knife-bar is connected by a rod or link N^1 to a lever N^2 which is operated from shaft A by a cam N^3 , said cam having a groove engaging a roller on the lever. The cam N^3 may be affixed to or formed as a part of the cam I^2 (Fig. 6).

Another feature of this invention resides in provision for adjusting the spaces between the twisters and cooperating instrumentalities, according to the spacing desired between the strands of the fencing, and allowing the double machine to be converted into a single machine or one for making a single width of fencing. This adjustment is permitted by the slotted conformation of the bed plate L and mode of attachment of the pillow-blocks of the twister-spindles to said bed-plate, as shown in Figs. 16 to 26; in connection with which a similar provision for adjustment is made in the clamp-drum D as will be hereinafter described; while the guide-tubes G are also adjustably-attached to the slotted bed-plate L, and the pusher-arms H and beaters I, collars J and drive-wheels C^1 are adjustably-arranged on their respective shafts.

The bed-plate L is made preferably in the form of a heavy channel-beam, as shown in Figs. 17 and 19, and has heads at its opposite ends for attachment to the side-members of the machine-frame. On the front of the bed-plate are two longitudinal squared projections l , through both of which the bed-plate is formed with a plurality of longitudinal slots l^1 . The upright pillow-blocks K which support the twister-spindles are formed on their backs with transverse grooves k which fit over the longitudinal projections l of the bed-plate; and screw-bolts l^1 are inserted from the back of the bed-plate through the slots l^1 and are tapped into the pillow-blocks, securely fastening them to the bed-plate. On loosening the screw-bolts slightly, the pillow-blocks can be slid longitudinally of the bed-plate, the double-grooved backs of

the pillow-blocks sliding on the double-ribbed face of the bed-plate; and the slots l^1 permit adjustment to such positions as desired, also allowing for omission of one or more twist-ers and readjustment of the others. The bed-plate is provided with a longitudinal top flange l^2 , which is also longitudinally slotted as at l^3 for attachment of the brackets G^1 of the guide-tubes G , so that said guide-tubes can be adjusted to correspond with the lateral adjustment of the twister-spindles.

Where it is desired to convert the double machine into a single machine, the middle knife M and twist-ers No. 13* and No. 12 can be omitted and the remaining twist-ers readjusted to the spacings desired.

Figs. 17 to 26 inclusive show the pillow-blocks and their arrangement on the bed-plate as designed for the particular arrangement of the series of twist-ers represented in Figs. 6 and 7.

Figs. 23 and 24 show a double pillow-block, two of which are used in this series, one immediately to the right of each wire-cutter for supporting two twister-spindles, Nos. 6 and 13* and Nos. 11 and 12*. Figs. 21 and 22 show a pillow-block such as used adjacent to each of the double pillow-blocks, for supporting the twister-spindles No. 5 and No. 10. The pillow-block shown in Fig. 22 has lateral projections interfitting with the rabbeted side of the pillow-block shown in Fig. 24, which is to accommodate the close spacing of the twister-spindles adjacent to the wire-cutters. Figs. 25 and 26 show the form of the other pillow-blocks, nine of which are used in this series for supporting the remaining twister-spindles. The caps h^2 for the three forms of pillow-blocks are shown in Figs. 17 and 18.

The graduation of the length of the stay wires for various widths of fencing is or may be controlled primarily by the size of the driver or left-hand gear of the series F^4 (Figs. 4 and 6), that is the gear on shaft F^3 (being the easiest and most convenient to change), and secondarily by the diameters of the feed-wires F . By the first adjustment is secured to within the latitude of one tooth of the drive gear, and by the latter the adjustment is completed to less than one tooth. This necessitates the gears F^5 having the longest possible teeth to accommodate slight differences in diameters of the different sized feed-rolls. In view of changing the afore-said drive-gear for one of different size, the spindle or axle of the intermediate gear of the series F^4 is adjustable on an arc having the center of spindle f for its axis; the spindle of said intermediate gear being adjustable in a segmental slot (not shown) according to a well known construction.

The clamp-drum.—The clamp-drum D , over which the fabric passes to the reel E ,

pulls or draws up the fabric intermittently, thus imparting a uniform step-by-step feed, while the reel E winds the fabric only so fast as it is paid out by the drum, the rotation of the reel being variable as the roll thereon increases in diameter, as previously pointed out. This clamp-drum is illustrated and described herein, but not specifically claimed, as it is the subject of a divisional application Serial No. 680,768, filed February 29, 1912. Said drum D (Figs. 5, 42, 43, 44 and 45) is of the following construction: It comprises a hollow shell having longitudinal channels d alternating with rows of crimp-lugs O which are mounted on the surface of the drum between said channels. As a preferred structure, the said shell comprises concentric cylinders united by longitudinal web-portions which constitute the walls of the channels d ; so that the channels alternate with hollow portions of trapezoidal cross-section, as shown more clearly in Fig. 43. The crimp-lugs O are or may be attached on the surface of such intermediate portions by bolts o^2 . The crimp-lugs O are arranged in both annular and longitudinal rows; that is they are alined both longitudinally and circumferentially of the drum. As shown in Figs. 42 and 43, they consist of segmental blocks formed with undercut sides, leaving over-hanging ledges having beveled edges o . In the present illustration the under-cuts are formed in the right-hand sides of the lugs. The annular rows of these crimp-lugs are so placed that the taut strand-wires passing over the drum will lie between said rows and adjacent, or approximately so, to the undercut sides. The lugs are desirably mounted on segmental wearing plates o^1 of hardened steel, of which material the lugs are likewise made.

Fitted in the longitudinal channels d of the clamp-drum are radially-movable crimp-bars P . These have, each of them, a plurality of inwardly projecting lugs p which extend through openings d^2 in the bottoms of the channels d and ride respectively upon a number of stationary cams Q keyed on the drum-shaft d^1 ; it being noted that the heads of the drum are journaled to revolve on said shaft. The bulges q on the cams Q are preferably arranged to move the crimp-bars P radially outward as they approach to the uppermost position of their orbit, and to allow them to drop inwardly just after they have started on the downward turn, as will be seen in Fig. 43. The crimp-bars are provided on their outer faces with hardened steel crimp-strips p^1 which normally lie approximately even with the cylindrical surface of the wearing plates o^1 under the crimp-lugs O .

Attached to the crimp-bars P are notched tracker-bars R , the notches r thereof being

aligned circumferentially of the drum and spaced to receive and guide the strand-wires X. These tracker-bars, which project above the cylindrical surface of the drum, are shown fitted in rabbets in the rear faces of the crimp-bars, and are attached by pin-and-slot connections r^1 which permit the tracker-bars to have a limited end-wise movement. (Figs. 43 and 45.)

At opposite ends of the clamp-drum, stationary tracker-cams S and T are affixed to the inner sides of the machine-frame (Figs. 6 and 46 to 53). These tracker-cams comprise semi-annular members supporting the ends of the crimp-bars P for the lower half of the drum; while the confronting surfaces s and t of said tracker-cams constitute segmental tracks which contact with the opposite ends of the tracker-bars R, as shown in Figs. 6 and 46 to 49 inclusive.

The segmental track s of the right-hand tracker-cam S has an incline at s^1 adapted to shove the tracker-bars toward the left, and a terminal surface s^2 to maintain the tracker-bars in their shifted position. This surface s^2 is provided on a front extension S^1 of the tracker-cam which is made on an increased radius, as seen in Fig. 52, to allow for the radially-outward movement of the crimp-bars P as they ride on the bulge of the cams Q.

The segmental track t of the left-hand tracker-cam T has an incline at t^1 , provided on a rear extension T^1 , adapted to shove the tracker-bars toward the right. It is noted by reference to Figs. 46, 47, 50 and 52 that the surfaces s^1 and s^2 of the tracker-cam S occur at the front upper quarter of the orbit of the tracker-bars, while the surface t^1 of the tracker-cam T occurs at the rear upper quarter; said surfaces s^1 and t^1 being respectively arranged to shift the tracker-bars in opposite directions before and after the crimp-bars are raised and lowered by the cams Q.

Both tracker-cams are preferably also provided with rear curved or inclined extensions S^2 , T^2 , adapted to insure the return or inward-radial movement of the crimp-bars P after they have passed off the bulges of the cam Q; though this is not essential since the tension on the fabric passing over the reel will force the crimp-bars inward.

In operation, as the fabric is drawn over the drum (the strands being taut by virtue of the pull exerted by the winding-reel), the strand-wires X are engaged in the notches r of the tracker-bars R and lie between the annular rows of crimp-lugs O, while the stays Y will come over the crimp-bars or between the longitudinal rows of crimp-lugs. The beveled edges o of the overhanging ledges of the crimp-bars serve as sheds to insure that the taut strand-wires

X will drop down upon the wearing plates o^1 in case any one or more of such wires should have a tendency to lodge upon said ledges, that is if any of the wires should become slightly disaligned. As the drum revolves, each crimp-bar P is in turn forced outward by the cams Q, but before it is so operated its tracker-bar R is shoved end-wise in one direction (to the left) by the incline s^1 of the tracker-cam S (Figs. 47 and 48); and thus the strands X are carried and held under the over-hanging ledges o of the two rows of crimp-lugs O on opposite sides of the particular crimp-bar. While so held, the crimp-bar is forced outward and thus clamps or grips the strands, at the same time crimping them, as shown in Fig. 43. It is desirable that the strands should always be gripped or clamped by at least two crimp-bars. As each crimp-bar passes off the bulges of the cams Q, thus releasing the strands X from the corresponding crimp-lugs, its tracker-bar R is shoved end-wise in the opposite direction (to the right) by means of the incline t^1 of the tracker-cam T (Figs. 46 and 49), and thereby the strands are moved from under the undercut crimp-lugs. This is timed to occur sufficiently in advance of the point where the strands leave the drum, on passage to the reel, to avoid catching under the crimp-lugs by the off-going lengths of the strands. The tension of the wires on the crimp-bars P forces them inward when they pass the bulges of the cam Q, and this inward motion of the crimp-bars is insured by the inclines S^2 , T^2 of the tracker-cams; so that in the lower half of the drum the crimp-bars will be supported by the semi-annular tracker-cams, as shown in Fig. 6.

The action of the tracker-cams is illustrated in Figs. 46 to 49 inclusive. In Fig. 47, one of the tracker-bars R is shown at that point of its orbit just before the crimp-bar P to which it is attached is moved radially-outward by the cams Q. The right-hand end of the tracker-bar is riding on the incline s^1 , which thus shoves the strand X under the ledges of the crimp-lugs O, as indicated in Fig. 48. When the end of the tracker-bar reaches the surface s^2 , which will hold the tracker-bar to its shifted position, the crimp-bar P will be raised by the cams Q, the increasing radius of the extension T^1 accommodating this outward radial movement of the crimp-bar as shown in Fig. 52. In Fig. 46, the tracker-bar is shown at that point of its orbit when the crimp-bar has passed off the bulges of the cam Q and when the tracker-bar is being shoved toward the right by the incline t^1 of the tracker-cam T, so as to move the strand X from under the crimp-lugs as indicated in Fig. 49.

The arrows in Figs. 47 and 52 indicate the

direction of revolution of the drum relative to the right-hand tracker-cam, and the arrows in Figs. 46 and 50 indicate the direction of revolution relative to the left-hand tracker-cam; while the arrows in Figs. 48 and 49 indicate the direction in which the tracker-bar is shifted by the opposite tracker-cams.

It will be seen that the fabric is always clamped by the revolving drum, drawing the strands taut from the shive-rolls B (Fig 2); and the strands are crimped at the connections of the stays, or at the stays and intermediate points, according to the length of intermittent feed of the strands, which depends upon the diameter and angular speed of the drum. The crimp-bars P constitute radially movable clamp-jaws coacting with the stationary rows of clamp-jaws provided by the under-cut crimp-lugs O.

The peripheral motion of the clamp-drum D at each intermittent turn or rotation may be equal to the distance from one crimp-bar to another, or it may be twice that distance, or other desired multiple thereof, according to the spacing desired for the stays. In the first case, the stays will come over each crimp-bar, and the strands will be crimped at the stays, while in the second case the stays will come at alternate crimp-bars and the strand will be crimped at the stays and also between adjacent stays.

It is noted that the drum D is longitudinally slotted as indicated at d^2 , and the fastening bolts o^2 which attach the crimp-lugs O are inserted through the longitudinal slots in the drum, thus providing for lateral adjustment of the clamp-devices of the drum to accord with the lateral adjustment of the twisters provided by means of the slotted bed-plate shown in Fig. 16. The longitudinal slots d^3 in the drum have enlarged spaces d^4 at intervals for insertion of the heads of the bolts to engage the bolts in the slots d^3 .

Summary of operation.—As the clamp-drum D intermittently revolves, the fabric being clamped thereon, the taut strands X are pulled up intermittently through the twister-spindles C (Figs. 5, 6 and 7), and the feed-rolls F (Fig. 4) feed the wire for the stay Y across the strands, through the separable guide-tubes G; and said wire Y is then displaced from said guide-tubes and pressed against the strands and upon the faces of the twister-heads c by the pusher arms H and beaters I. During the interval of rest of the wires, the progressively-operating series of twisters attach the stay, by forming intermediate loops in the wire Y and twisting said loops around the intermediate strands, and also twisting the ends of the stay around the marginal strands; the

cutters M and N severing the wire Y into two stays. The attached stay is pulled up by the next feed, and in due time reaches the drum D which crimps the strands at the knots or connections of the stay.

We do not intend to restrict ourselves to the specific details of construction and arrangement herein shown and described since the same may be modified in various ways within the scope of this invention.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. A wire-fence machine having, in combination, a series of upright twisters, laterally-located feed-rolls for feeding a stay-wire across a series of strands threaded through said twisters, an overhead revoluble clamp-drum, a drive-shaft below the twisters, a series of drive-gears thereon for revolving the twister-spindles, gearing for driving said feed-rolls from said shaft, and driving-mechanism for operating said drum from said shaft.

2. A wire-fence machine having, in combination an upright fabric-making mechanism, an overhead revoluble clamp-drum adapted for pulling up the fabric, a reel arranged behind said fabric-making mechanism, a drum-shaft geared with the fabric making mechanism, driving connections between said shaft and drum, and driving connections between said drum and reel.

3. A wire-fence machine having, in combination, a series of upright twisters, an overhead revoluble clamp-drum, lateral feed-rolls for feeding a stay-wire across a series of strands threaded through said twisters, a drive-shaft under the twisters, a series of twister-drive gears thereon, gearing for driving said feed-rolls from said shaft arranged at one side of the machine, and mechanism for running said drum from said shaft arranged at the opposite side.

4. A wire-fence machine having, in combination, a series of upright twisters, an overhead revoluble clamp-drum, a rearwardly-located reel, lateral feed-rolls for feeding a stay-wire across the strands threaded through said twisters, a twister-driving shaft, gearing for driving said feed-rolls from said shaft arranged at one side of the machine, driving-connections between said shaft and one end of the drum at the opposite side, and driving connections between the other end of said drum and said reel.

5. A wire-fence machine having, in combination, a series of upright twisters adapted for attaching stays to a series of strands threaded through said twisters, an overhead mechanism for pulling up the strands, feed-mechanism for placing a stay-wire

across the strands and within the operation of the twisters, guiding and positing devices for said stay-wire, a cutter for severing said stay-wire, a drive-shaft below said twisters, a series of twister-drive gears thereon, and mechanism for operating said positing devices and cutter from said shaft.

6. A wire-fence machine having, in combination, suitable feed rolls, a series of upright twisters, means for placing a stay-wire across a series of strands threaded through said twisters, and within the operation of the twisters; an overhead revoluble clamp-drum, a drive-shaft below the twisters, a series of drive-gears thereon for revolving the twister-spindles, gearing for driving said feed rolls from said shaft, and driving-mechanism for operating said drum from said shaft.

7. A wire-fence machine having, in combination, a series of upright twisters, means for pulling the strands upward through said twisters, means for feeding a stay-wire across the strands, guides for the stay-wire, a series of presser-feet arranged to push the stay-wire within the operation of the twisters, and devices for displacing the stay-wire from said guides and bringing it within the reach of said presser-feet.

8. A wire-fence machine having, in combination, a series of upright twisters, means for pulling the strands upward through said twisters, lateral feed-rolls for feeding a stay-wire across the strands, an aligned series of separable guide-tubes arranged to guide said stay-wire while feeding, a rocker-shaft provided with a plurality of pusher-arms arranged for displacing the stay-wire laterally from said guide-tubes and placing it against the strands, and a rocker-shaft provided with a series of beater-arms arranged for pressing said stay-wire down upon the faces of the twister-heads.

9. A wire-fence machine having, in combination, a series of rotary twisters, means for feeding a series of strands therethrough, means for feeding a stay-wire across the strands, guiding and positing devices for said stay-wire, a stay-wire cutter, a drive-shaft having a series of twister-drive gears, and cams on said shaft for operating said positing devices and cutter.

10. A wire-fence machine having, in combination, means for feeding intermittently a series of strand-wires, an intermittently-operating series of rotary twisters adapted for attaching stays during the intervals of rest of the strands, and a continuously-rotating drive-shaft having a series of segment-gears which intermittently engage bevel pinions on the twister-spindles.

11. The combination with the feed-rolls F on intergeared spindles, and driving-mechanism connected with one spindle, of the rocking-bearing f^2 for the other spindle

having a lever-arm f^3 , and a cam f^8 , lever f^7 controlled thereby, and a spring f^4 arranged between said lever-arm f^3 and lever f^7 .

12. In a wire-fabric weaving mechanism, a series of twisters, means for feeding a stay-feed-wire across a series of strands threaded through said twisters, and a cutter for severing the stay from said feed-wire, the intermediate twisters adapted to form loops in the feed-wire and twist said loops around the respective intermediate strands, while the marginal twisters are adapted to twist the ends of the stay around the marginal strands, means for operating the intermediate twisters in progression, means for operating the cutter only after all the loops have been formed, and means for operating the marginal twisters and timing the twister adjacent to the cutter to operate after the cutter.

13. In a wire-fabric weaving mechanism, a series of twisters, the intermediates of which are adapted to form loops in a transversely-placed stay-wire and twist said loops around the strands threaded through said intermediate twisters, while the marginal twisters are adapted to twist the ends of said stay-wire around the marginal strands, a cutter for severing the stay-wire from a continuous feed-wire, means for operating the intermediate twisters in progression, means for operating the cutter after the last loop is started, and means for operating the marginal twisters simultaneously after operation of the cutter.

14. In a wire-fabric weaving mechanism, a series of twisters, the intermediates of which are adapted to form loops in a transversely-placed stay-wire and twist said loops around the strands threaded through said intermediate twisters, while the marginal twisters are adapted to twist the ends of said stay-wire around the marginal strands, means for operating the intermediates in progression, means for holding the ends of the stay-wire at either side of the intermediates while allowing the stay-wire to be pulled in by the successive intermediates to furnish the loops, and means for operating the marginals simultaneously after operation of the intermediates.

15. The combination, in a series of twisters whose intermediates operate in progression and whose marginals operate simultaneously after the intermediates of a drive-shaft, a series of twister-drive gears thereon set at successively different angles and engaging pinions on the intermediate twister-spindles, a drive-gear operating one marginal, and a sprocket-chain for driving the other marginal from the first.

16. In a machine for manufacturing a plurality of widths of fencing, a series of twisters divided into separate groups, means for feeding a continuous stay-feed-wire across all the strands threaded through the

whole number of twist-ers, a cutter between adjacent groups of twist-ers for severing said feed-wire into stays, the intermediate twist-ers of each group adapted to form loops in the stay-feed-wire and twist said loops around the corresponding intermediate strands, the marginal twist-ers of each group adapted to twist the ends of the stay around the marginal strands, means for operating in progression the whole number of intermediate twist-ers, means for operating the cutter between adjacent groups of twist-ers after the progressive operation of the intermediates has continued to a partial extent in the group at the side of the cutter nearer the infeed of the stay-feed-wire, and means for operating the adjacent marginals at opposite sides of said cutter after operation of said cutter.

17. In a machine for manufacturing a plurality of widths of fencing, a series of twist-ers divided into separate groups, means for feeding a continuous stay-feed-wire across all the strands threaded through the whole number of twist-ers, stay-wire cutters located between the groups of twist-ers and between the series and said feed-means, the intermediate twist-ers of each group adapted to form loops in the stay-wire and twist said loops around the respective intermediate strands, while the marginal twist-ers of each group are adapted to twist the ends of the stays around the corresponding marginal strands, means for securing the far end portion of the stay-feed-wire before operation of the twist-ers, means for operating the entire series of intermediate twist-ers in progression, means for operating each cutter after all the intermediates of the group at the side farther from the infeed of the stay-feed-wire have been set in operation, and means for operating simultaneously the two marginal twist-ers of each group after operation of the cutter to the side of the infeed of the stay-feed-wire.

18. In a machine for manufacturing a plurality of widths of fencing, a series of twist-ers divided into separate groups, means for feeding a continuous stay-feed-wire across all the strands threaded through the whole number of twist-ers, a cutter between adjacent groups of twist-ers for severing said feed-wire into stays, said cutter being provided with means for bending the two ends of the medially-severed wire into the heads of the opposite adjacent marginal twist-ers, the intermediate twist-ers of each group adapted to form loops in the stay-feed-wire and twist said loops around the corresponding intermediate strands, the marginal twist-ers of each group adapted to twist the ends of the stay around the marginal strands, means for operating in progression the whole number of intermediate twist-ers, means for operating the cutter between adjacent groups

of twist-ers after the progressive operation of the intermediates has continued to a partial extent, in the group at the side of the cutter nearer the infeed of the stay-feed-wire, and means for operating the adjacent marginals at opposite sides of said cutter after operation of said cutter.

19. In a machine for manufacturing a plurality of widths of fencing, a series of twist-ers divided into separate groups, means for feeding a continuous stay-feed-wire across all the strands threaded through the whole number of twist-ers, stay-wire cutters located between the groups of twist-ers and between the series and said feed-means, said cutters provided with means for bending the severed ends of the stay-wire into the adjacent twister-heads, the intermediate twist-ers of each group adapted to form loops in the stay-wire and twist said loops around the respective intermediate strands, while the marginal twist-ers of each group are adapted to twist the ends of the stays around the corresponding marginal strands, means for securing the far end portion of the stay-feed-wire before operation of the twist-ers, means for bending the far end of the stay-feed wire into the twister-head of the first marginal twister which is farthest from the infeed of said wire, means for operating the entire series of intermediate twist-ers in progression, means for operating each cutter after all the intermediates of the groups at the side farther from the infeed of the stay-feed-wire have been set in operation, and means for operating simultaneously the two marginal twist-ers of each group after operation of the cutter to the side of the infeed of the stay-feed-wire.

20. In a wire-fabric making mechanism, a series of twist-ers, the intermediates of which are adapted to form loops in a transverse stay-wire and twist said loops around the strands threaded through said twist-ers, while the marginals are adapted to twist the ends of said stay-wire around the marginal strands, means for feeding a continuous stay-feed-wire across the strands, a wire-cutter between said feed-means and the series of twist-ers, means for operating the twist-ers in progressive order, and means for operating said cutter while the adjacent marginal is in motion and at the time the last intermediate has drawn in the necessary wire to form its loop, said cutter being provided with means for bending the end of the severed stay-wire into the marginal twister-head.

21. The combination with a series of stay-attaching twist-ers, of a stay-wire cutter, the twister adjacent thereto having a face-opening to receive the end of the stay-wire when severed, and means whereby the operation of said cutter will bend the end of the wire into said face-opening.

22. The combination of two fixed plates, and a movable cutter-plate or knife adapted to sever a wire placed across the edges of said fixed plates, the edge of one fixed plate having a notch to allow the end of the severed wire to be bent down by the action of the knife.

23. The combination of two fixed plates, and a movable cutter-plate or knife adapted to sever a wire placed across the edges of said fixed plates, the edge of one fixed plate having a notch to allow the end of the severed wire to be bent down by the action of the knife, and the knife carrying a projection on the outer side of the other fixed plate to bend down the other end of the wire.

24. The combination with a series of twist-ers adapted for attaching a stay-wire to a series of strands, of an intermediate stay-wire cutter, the adjacent twist-ers at opposite sides thereof having face-openings adapted to receive the two ends of the wire when severed, and means whereby the operation of said cutter bends down both ends of the severed wire into the said face-openings.

25. In a wire-fencing machine, the combination with a series of twist-ers for attaching stays to a series of strands, of a revolvable clamp-drum over which the fabric is drawn, said drum provided with devices for clamping the strands, means for laterally

adjusting the twist-ers, and means for laterally adjusting said clamping devices, for varying the spacing between the strands.

26. In a wire-fence machine, the combination with a series of twist-ers, of a longitudinally-slotted bed-plate, pillow-blocks or bearings for the twister-spindles slidable on said bed-plate, and fastenings therefor inserted through the slots in the bed-plate.

27. The combination of the bed-plate provided with longitudinal ribs which are longitudinally slotted, and the pillow-blocks for the twister-spindles grooved across their backs to fit said ribs, and fastenings for said pillow-blocks inserted through the slots in the bed-plate.

28. The combination of the twist-ers and guides for guiding a stay-wire across the strands threaded through said twist-ers, of the longitudinally-slotted bed-plate having a longitudinally slotted flange, the twister-spindle pillow-blocks slidably mounted on said bed-plate, and the guide-brackets slidably mounted on said flange, and fastenings for said pillow-blocks and brackets inserted through the slots in the bed-plate and flange.

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

PETTIS A. REID.
WALTER V. REID.

Witnesses:

JOHN L. WELLER,
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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."