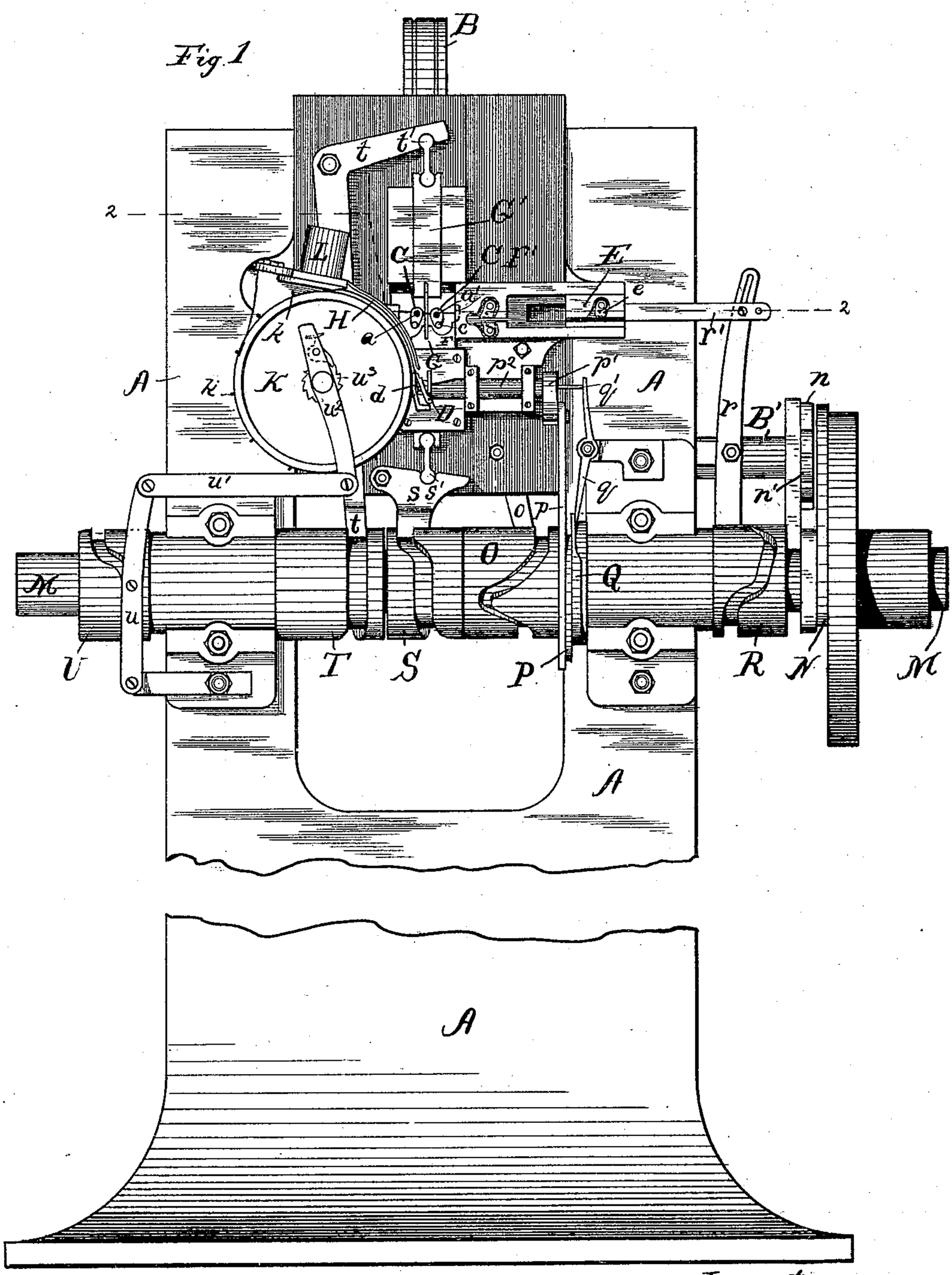
(No Model.) 3 Sheets—Sheet 1.

J. WILLOUGHBY.

MACHINE FOR MAKING SPUR WHEEL FENCING.

No. 343,288. Patented June 8, 1886.

Fig. 1



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(No Model.) 3 Sheets—Sheet 2.

J. WILLOUGHBY.

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Fig. 2.

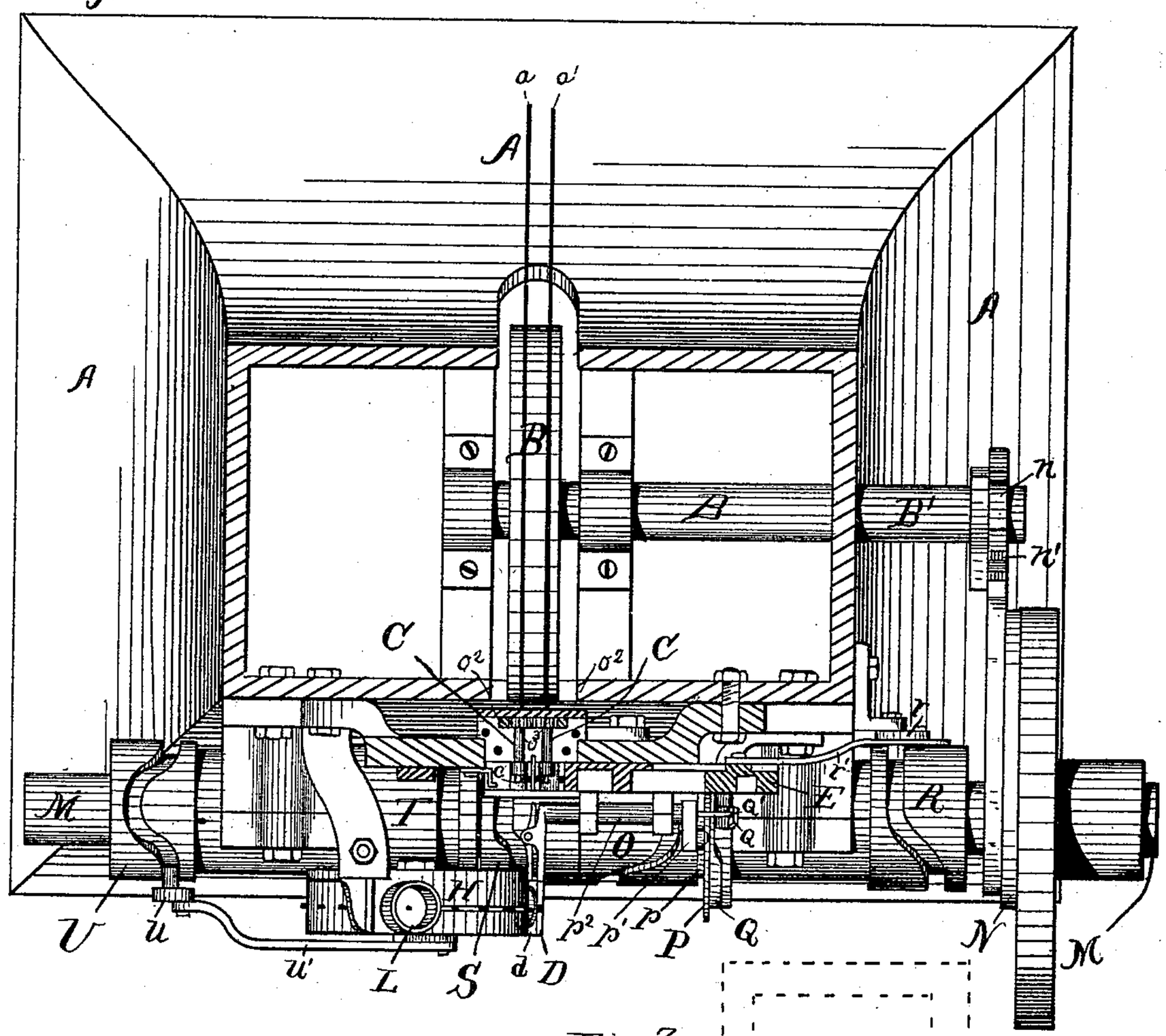


Fig. 4.

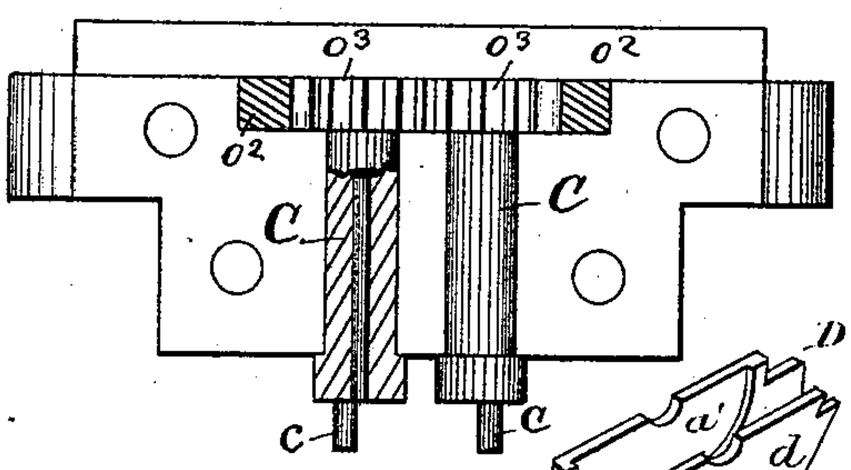


Fig. 13.

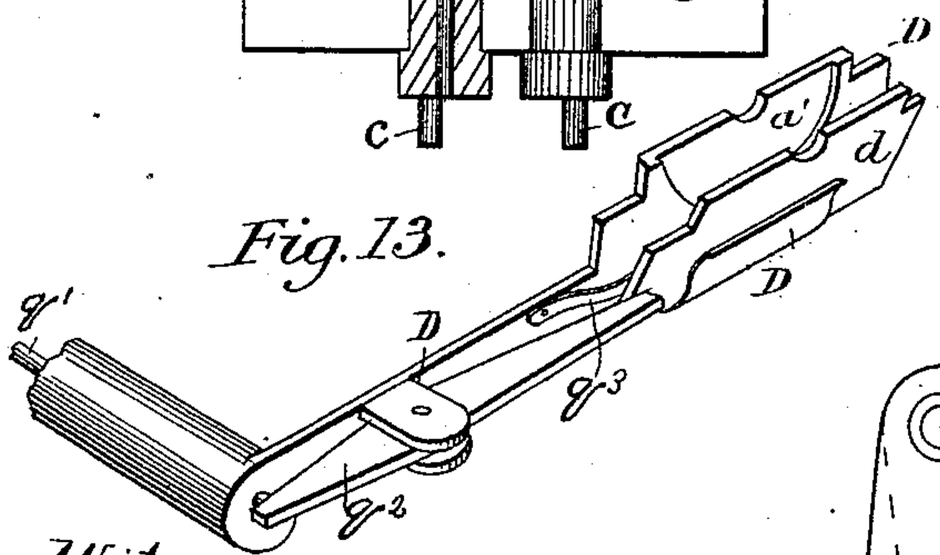
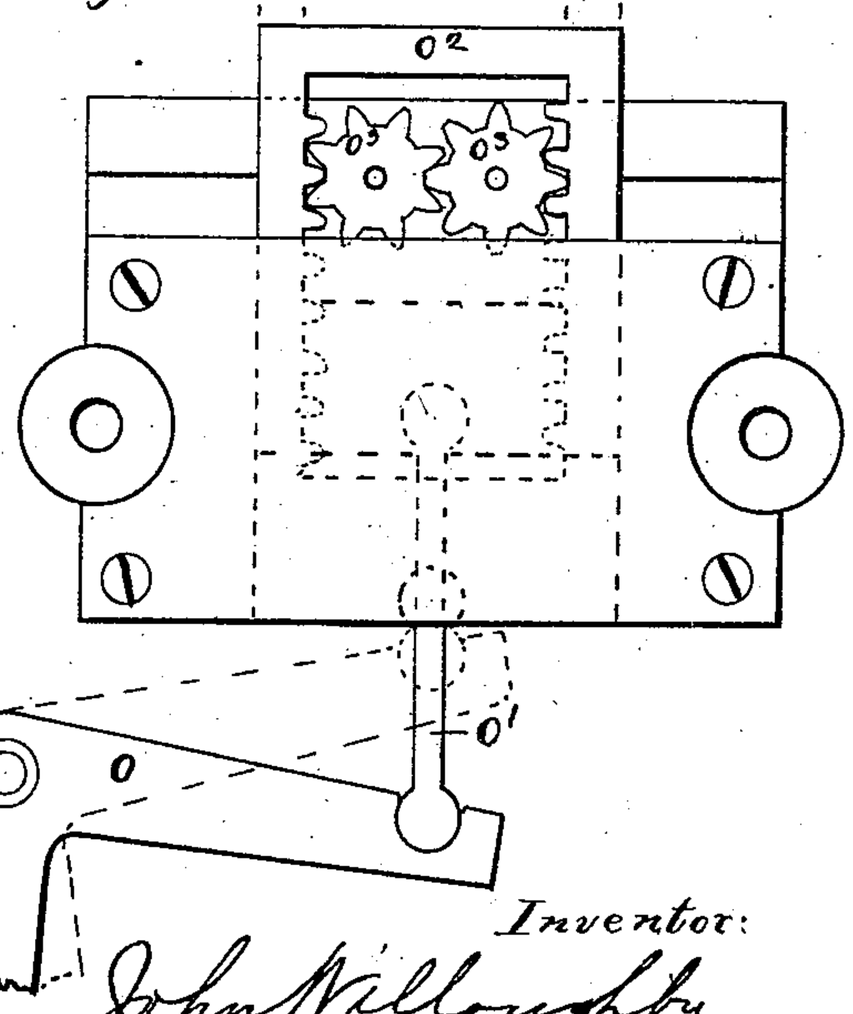


Fig. 3.



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(No Model.) 3 Sheets—Sheet 3.

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MACHINE FOR MAKING SPUR WHEEL FENCING.

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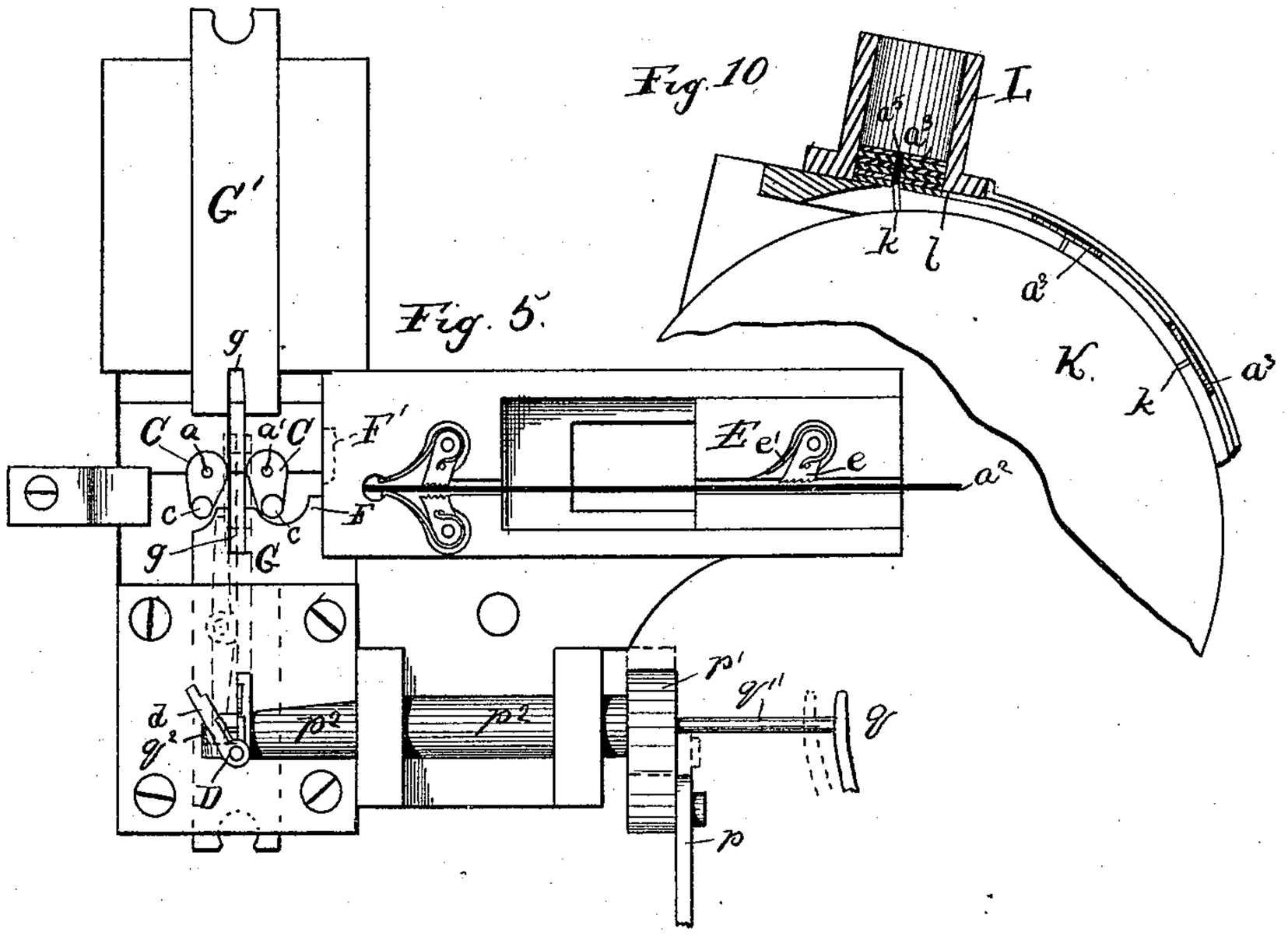
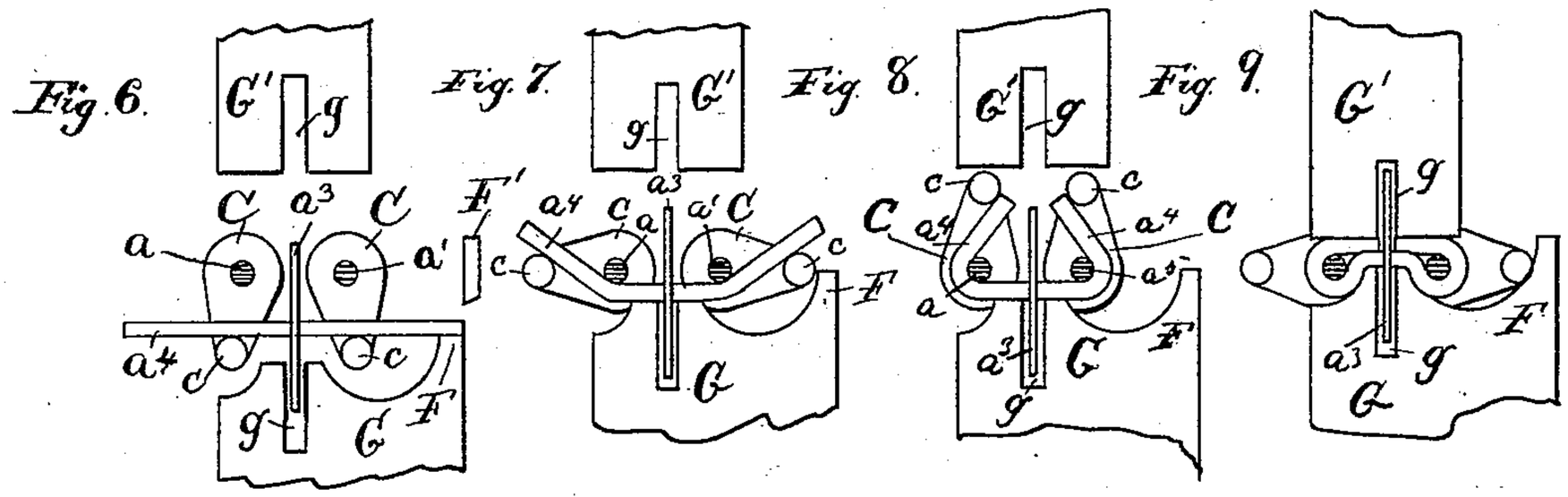


Fig. 5.

Fig. 10.



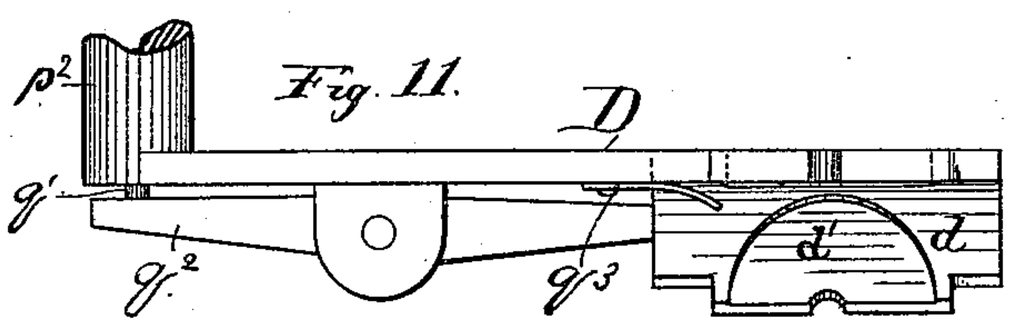


Fig. 11.

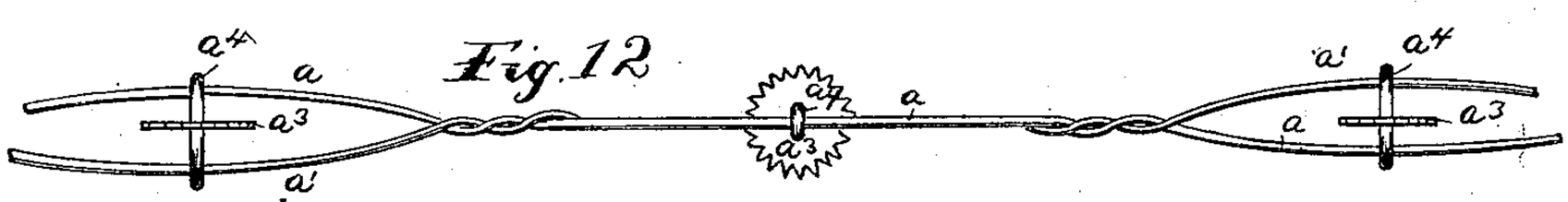


Fig. 12.

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UNITED STATES PATENT OFFICE.

JOHN WILLOUGHBY, OF DECATUR, ILLINOIS, ASSIGNOR TO THE MONITOR WORKS, OF BELOIT, WISCONSIN.

MACHINE FOR MAKING SPUR-WHEEL FENCING.

SPECIFICATION forming part of Letters Patent No. 343,288, dated June 8, 1886.

Application filed January 21, 1886. Serial No. 189,279. (No model.)

To all whom it may concern:

Be it known that I, JOHN WILLOUGHBY, a citizen of the United States, residing in Decatur, in the county of Macon and State of Illinois, have invented a new and useful Improvement in Machines for Making Spur-Wheel Fencing, of which the following is a specification.

The object of my invention is to provide a machine for manufacturing spur-wheel fencing—such, for example, as that patented in Letters Patent No. 230,445 to J. Stoll, July 27, 1880, or No. 282,453 to J. Goss, July 31, 1883—and wherein the fence-wire consists of two main strands provided at intervals with star or spur wheels mounted on cross or pivot wires secured to the two main strands; and to this end my invention and my machine embodying the same consists, essentially, in connection with suitable feed-wheels or other feed mechanism for feeding the two main strands or wires forward at suitable intervals, of a spur-wheel carrier or device for moving the spur-wheel into position between the two main wires, a reciprocating feed-slide or other suitable feed device for inserting the pivot-wire through the hole or opening in the spur-wheel and across the two main or fence wires, knives or other suitable devices for cutting off the pivot-wire, and coiling-fingers or other suitable devices for bending or folding the ends of the pivot about the two fence-wires.

The bending of the ends of the pivot-wire may be best performed in part, especially the finishing part, by a reciprocating die or clincher; and my invention also consists, in conjunction with other bending or folding devices, of a die or clincher by which the pivot-wire may be securely closed or folded into the required position.

In the accompanying drawings, which form a part of this specification, and in which similar letters of reference indicate like parts, I have shown one form of machine, and that which I deem to be the best, embodying my invention and illustrating its principle and mode of operation.

In said drawings, Figure 1 is a side elevation of the machine. Fig. 2 is a horizontal section taken on the line 2 2 of Fig. 1, and showing in plan view most of the operating parts. Fig. 3 is an enlarged detail view showing the form of driving mechanism employed for actuating the coiling fingers or shafts. Fig. 4 is an enlarged detail view showing the coiling-shafts. Fig. 5 is an enlarged detail view showing the spur-wheel carrier. Figs. 6, 7, 8, and 9 are detail views illustrating the operation of the pivot-wire-bending devices. Fig. 10 is a detail sectional view of the spur-wheel-feeding device. Fig. 11 is a plan view of the spur-wheel carrier, and Fig. 12 is a view of the spur-wheel fencing produced by the machine. Fig. 13 is a detail perspective view showing the mechanism for operating the clamp on the spur-wheel carrier.

In said drawings, A represents the frame of the machine, which may be of any suitable construction to accommodate the particular kind of driving or actuating mechanism which may be employed to give the required motion to the several operating devices.

a and *a'* represent the two fence-wires, a^2 the pivot-wire, a^3 the star or spur wheels, and a^4 the pivot as cut from the pivot-wire.

B B represent the fence-wire-feeding device, preferably consisting of two intermittingly-driven grooved feed-wheels. Any other suitable feeding device ordinarily used in wire-working machines may, however, be employed.

C C are coiling or bending devices for bending the ends of the pivot a^4 about the two main wires. These bending devices may preferably consist, as shown in the drawings, of two hollow coiling-shafts having fingers or projections *c* at their ends. My invention is, however, not limited to any particular kind or construction of coiling, bending, or folding devices, though I consider rotary coiling-shafts the preferable ones to use, as if hollow rotary coiling-shafts are employed they will also serve as guides or supports for the main fence-wires *a a'*, passing through them.

D represents the spur-wheel carrier, or device by which the spur-wheels a^3 are carried or conveyed one by one into position between the fence-wires *a* and *a'*. This device may preferably consist of a rotary or swinging arm provided with a clamp, *d*, for holding the spur-

wheel. This carrier or conveyer may, however, be of any other suitable construction—as, for example, a reciprocating slide—without departing from the principle and mode of operation of my invention. After the spur-wheel has been moved into position between the two fence-wires *a* and *a'* by its carrier the pivot-wire a^2 is inserted through the hole or opening a^5 in said spur-wheel by the pivot-wire-feed device E. This wire-feed device may preferably consist of a reciprocating slide provided with dogs or wire-clamping devices *e*, pivoted to said slide E, and operating to prevent the pivot-wire a^2 from slipping or passing in the wrong direction. These dogs *e* may be operated by springs *e'*.

While this reciprocating slide and its dogs afford a convenient means or device for feeding the pivot-wire forward the requisite length at the intervals mentioned, any suitable wire-feeding device ordinarily used in wire-working machines may be employed for performing this function—as, for example, wire feed-rolls like those shown for feeding the main fence-wires *a a'*.

F and F' represent two opposing knives or cutters for severing the pivot a^4 from the pivot-wire a^2 after the same has been fed across the main wires and through the spur-wheel. One of these knives, F', may preferably be stationary or immovable. The cutting-edges of these knives are or should be so set or arranged in relation to the direction of the pivot-wire a^2 as to cut the same off square, and thus leave square ends on the pivot a^4, to abut against the spur-wheel when turned or folded around against the same, as shown in Fig. 9. The square ends of the pivot thus serve to hold the spur-wheel in a plane approximately at right angles to the pivot. After the pivot-wire has been thus fed through the spur-wheel and across the main wires and the pivot cut off by the knives the folding devices C C bend or fold the ends of the pivot a^4 about the two fence-wires, as illustrated in Figs. 6, 7, and 8, the spur-wheel-carrier device being moved out of position shortly after the pivot-wire is inserted through the spur-wheel, so as not to be in the way of the operation of the bending devices.

G G' represent dies or clinchers, preferably reciprocating ones, which serve to bend or close the folded or partially-folded ends of the pivot down close and firm, as shown in Figs. 9 and 12. These dies or clinchers G G' may preferably both be made movable, and the lower die, G, may also preferably be secured to the same slide or bar as the movable knife F. In this way both the knife and the slide G may be both operated by the same cam or actuating mechanism. Before the dies or clinchers G G' close upon the partially-folded pivot a^4 the bending devices C C are receded into the position shown in Fig. 9, so as not to be in the way of the dies.

The die-slides G G' may preferably be each made in a single piece, and they are each provided with a slot or opening, *g*, for the spur-wheel, so that the dies or clinchers may close together without injuring the spur-wheel. These slots or openings *g* also serve as a guide or partial holder for the spur-wheel when it is first carried into position by the spur-wheel carrier and while the pivot-wire is being inserted through the same. After the pivot-wire is inserted through the spur-wheel it will serve to support the spur-wheel.

The spur-wheels a^3 may be fed or supplied to the carrier D in any suitable manner—as, for example, by an intermittingly-rotary feed-wheel, K, having radially-projecting pins *k* upon its periphery, which, as the feed-wheel revolves, enter and engage in the central hole or opening of the bottom of one of the slightly-inclined stack or pile of spur-wheels in a supply-tube, L. The bottom *l* of this supply-tube is or should be inclined slightly to a tangent to the periphery of the feed-wheel, and covers only a portion of the base of the supply-tube L, so that as the pins *k* revolve they will pass under the edge of the bottom spur-wheel, but engage the same when it passes the central hole or opening in the spur-wheel. With this method or means of feeding or supplying the spur-wheels to the carrier D it will of course be understood that the spur-wheels are to be previously punched or manufactured. Suitable devices, however, may be employed to feed the spur-wheels to the carrier D directly from a punch, if desired.

The several operating parts or devices of my machine may be actuated or driven by any suitable or convenient mechanism from one or more main or driving shafts. I prefer, however, to actuate each of the operating devices by substantially such mechanism as is shown in the drawings, though the same may be greatly varied without departing from my invention—that is to say, the main wire-feed device B B, or one of said feed-wheels, is actuated by a cam, N, on the main driving-shaft M, through a pawl, *n*, and ratchet *n'* on the shaft B' of said feed-wheel. The other feed-wheel will revolve or be driven by friction with this one. The rotary benders or coiling-shafts C C are given their required motions by means of a cam, O, on the main shaft, through a lever, *o*, pivoted to the main frame, link *o'*, and double sliding rack o^2, which meshes with pinions o^3 o^3 on said coiling-shafts C C. The spur-wheel carrier or conveyer D is vibrated or swung into position by means of a cam, P, on the main driving-shaft, through a link, *p*, and crank *p'* on the shaft or pivot p^2 of said carrier D. The clamp *d* of said carrier is actuated to close upon the spur-wheel and hold it until the pivot-wire has been threaded through it, and then to release it by means of a cam, Q, on the main driving-shaft, through a pivoted lever or presser-foot, *q*, which presses against a pin, *q'*, extending through the hollow shaft p^2, and thus actuates the lever q^2, which closes the clamp *d*, said clamp *d* being hinged to the

carrier-arm D. The clamp *d* is thrown open, when not held closed by the cam and its connecting mechanism, by means of a spring, q^3. The seat or receptacle *d'* in the carrier D and clamp *d* for the spur-wheel should be of semicircular shape, as indicated more fully in Fig. 11, so that the spur-wheel will always occupy the same relative position in the carrier, and thus be presented in proper position for insertion of the pivot-wire. The pivot-wire-feed slide E may be operated by a cam, R, on the main driving-shaft through a lever, *r*, and link *r'*, which connects with said feed-slide. The clinchers or dies G G' may each be operated by cams S and T through levers *s* and *t* and links *s' t'*, connecting said levers and said die-slides. If the movable knife F is, as shown, made integral with or connected rigidly to the die-slide G, it may be operated by the same cam, S. It will of course, however, be understood that when so operated the cam S will or should have two convolutions, as the operations of the knife and of the die are not simultaneous. After the pivot has been folded into the form shown in Fig. 8 the die G makes a slight upward movement, so as to support the pivot on the under side, as an anvil, against the blow or pressure of the upper die or clincher, G'. The spur-wheel feed K may be actuated by a cam, U, on the main shaft through lever *u*, link *u'*, pawl and lever u^2, and ratchet u^3 on the shaft of the spur feed-wheel. A curved guard, H, should extend around the feed-wheel K as a guard or guide for the spur-wheels carried by the pins *k*. This curved guard should extend down almost to the carrier D, when it is retracted to receive the spur-wheel.

While the actuating mechanisms above described afford convenient means for giving the required movements to the various operating devices of the machine, I desire it to be distinctly understood that such actuating mechanism may be entirely changed and other equivalent or substitute mechanism may be employed without departing from the principle and mode of operation of my invention; and it will also be understood that any change in the particular kind of operating device employed for performing any particular function of the machine—as, for example, by the substitution of an equivalent device or devices—may also necessitate a change in the actuating mechanism therefor.

After the spur-wheel-fence wire leaves the machine the two fence-strands *a a'* may be twisted or partially twisted together by any suitable twisting mechanism, if desired, or it may be wound directly upon the spool, as the pivots a^4 serve to bind and hold the two fence-strands securely together, and as the fence-wire is ready for use without being twisted.

I claim—

1. In a machine for manufacturing spur-wheel fencing, the combination, with a feed device for the main fence-wires, of a spur-wheel carrier, a pivot-wire-feed device, knives for severing the pivot, pivot bending or folding devices, and dies or clinchers for pressing the folded ends of the pivot into position, substantially as specified.

2. In a machine for manufacturing spur-wheel fencing, the combination, with a feed device for the main fence-wires, of a spur-wheel carrier, a feed device for delivering the spur-wheels one by one to said carrier, a pivot-wire-feed device, knives for severing the pivot, pivot bending or folding devices, and dies or clinchers for pressing the folded ends of the pivot into position, substantially as specified.

3. The combination, with suitable guides or supports for the two fence-strands, of a spur-wheel carrier or device for moving the spur-wheel into position between the two fence-strands, and a pivot-wire-feed device for thrusting the pivot-wire through the opening in the spur-wheel, substantially as specified.

4. The combination, with a spur-wheel carrier or device for conveying the spur-wheel into position between the two fence-strands, of a pivot-wire-feed device for thrusting the pivot-wire through the opening in the spur-wheel, substantially as specified.

5. The combination, with a spur-wheel carrier or device for conveying the spur-wheel into position between the two fence-strands, of a pivot-wire-feed device for thrusting the pivot-wire through the opening in the spur-wheel, and knives for severing the pivot-wire, substantially as specified.

6. The combination, with a spur-wheel carrier or device for conveying the spur-wheel into position between the two fence-strands, of a pivot-wire-feed device for thrusting the pivot-wire through the opening in the spur-wheel, and knives for severing the pivot-wire, said knives being set or arranged with their cutting-edges at right angles to the direction of the pivot-wire, substantially as specified.

7. The combination, with a spur-wheel carrier or device for conveying the spur-wheel into position between the two fence-strands, of a pivot-wire-feed device for thrusting the pivot-wire through the opening in the spur-wheel, knives for severing the pivot-wire, and bending devices for folding the ends of the pivot about the two fence-strands, substantially as specified.

8. The combination, with a spur-wheel carrier or device for conveying the spur-wheel into position between the two fence-strands, of a pivot-wire-feed device for thrusting the pivot-wire through the opening in the spur-wheel, knives for severing the pivot-wire, bending devices for folding the ends of the pivot about the two fence-strands, and dies or clinchers for pressing the folded ends of the pivot into the required form, substantially as specified.

9. The combination, with a spur-wheel carrier or device for conveying the spur-wheel into position between the two fence-strands, of a pivot-wire-feed device for thrusting the pivot-wire through the opening in the spur-

wheel, knives for severing the pivot-wire, bending devices for folding the ends of the pivot about the two fence-strands, and dies or clinchers for pressing the folded ends of the pivot into the required form, said dies or clinchers having slots or recesses for the spur-wheel, substantially as specified.

10. The combination, with devices for bending the ends of the pivot about the two fence-strands, of slotted dies or clinchers for finishing said operation, substantially as specified.

11. The combination, with devices for bending the ends of the pivot-wire about the two fence-strands, of a pair of reciprocating dies or clinchers having slots for the spur-wheel, substantially as specified.

12. The combination, with rotary coiling or bending shafts C C, of slotted clinchers or dies G G′, substantially as specified.

13. The combination, with a vibrating or swinging spur-wheel carrier, D, having clamps *d*, of a rotary feed-wheel, K, having pins *k* on its periphery, and a supply-tube, L, substantially as specified.

14. The combination, with two parallel coiling-shafts, C C, provided with gears o^3 o^3, of a reciprocating double rack, o^2, for actuating the same, substantially as specified.

15. The combination, with two parallel rotary coiling-shafts, C C, provided with gears o^3 o^3, of a reciprocating double rack, o^2, cam O, lever *o*, and link *o′*, for actuating the same, substantially as specified.

16. The combination, with a vibratory or swinging spur-wheel carrier, D, provided with clamp *d*, of a cam and suitable connecting mechanism for actuating said clamp, substantially as specified.

17. The combination, with a spur-wheel-carrier arm, D, of clamp *d*, cam P, link *p*, crank *p′*, hollow shaft p^2, cam Q, lever *q*, pin *q′*, and lever q^2, substantially as specified.

18. The combination of clinchers or dies G G′ with cams S T, levers *s t*, and links *s′ t′*, substantially as specified.

19. The combination, with supply-tube L, of feed-wheel K, having pins *k* on its periphery, and a curved guard, H, substantially as specified.

20. The combination, with supply-tube L, of feed-wheel K, having pins *k* upon its periphery, cams U, lever *u*, link *u′*, pawl-lever u^2, and ratchet u^3 on the shaft of said feed-wheel, substantially as specified.

21. The combination, with two parallel guides or supports for the two fence-wires *a a′*, of a carrier or device for conveying the spur-wheel into position between said fence-wires, said carrier having a semicircular seat or recess for said spur-wheel, substantially as specified.

22. In a spur-wheel-fence machine, a pair of clinchers or dies, as G G′, having slots *g* for the spur-wheel, substantially as specified.

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