(No Model.) 2 Sheets—Sheet 1.

T. A. WEBER.

MACHINE FOR MAKING BARBED FENCE WIRE.

No. 286,511. Patented Oct. 9, 1883.

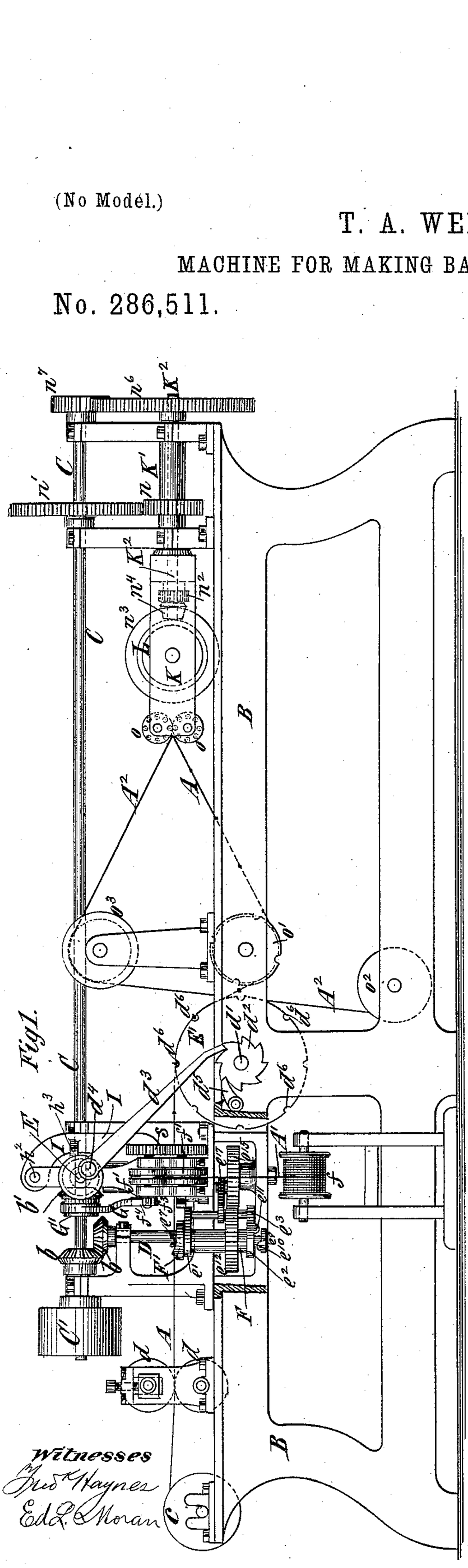

Fig1.

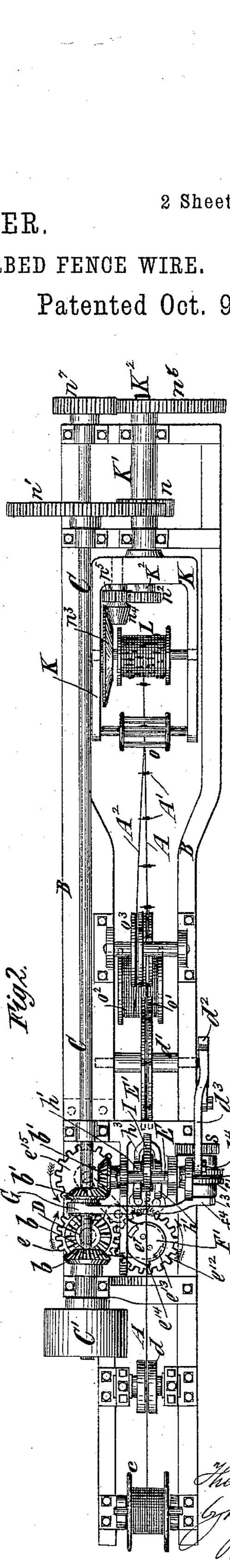

Fig2.

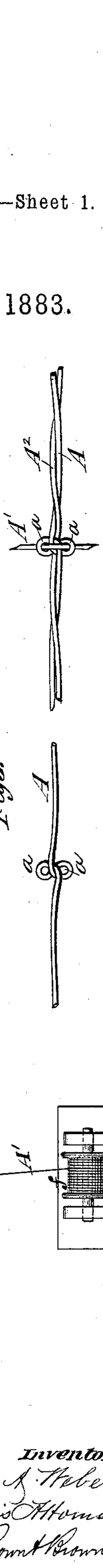

Fig3.

Witnesses
Jno. K. Haynes
Ed. L. Moran

Inventor
Theo. A. Weber
by his Attorneys
Brown & Brown

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 2 Sheets—Sheet 2.

T. A. WEBER.

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Fig. 5.

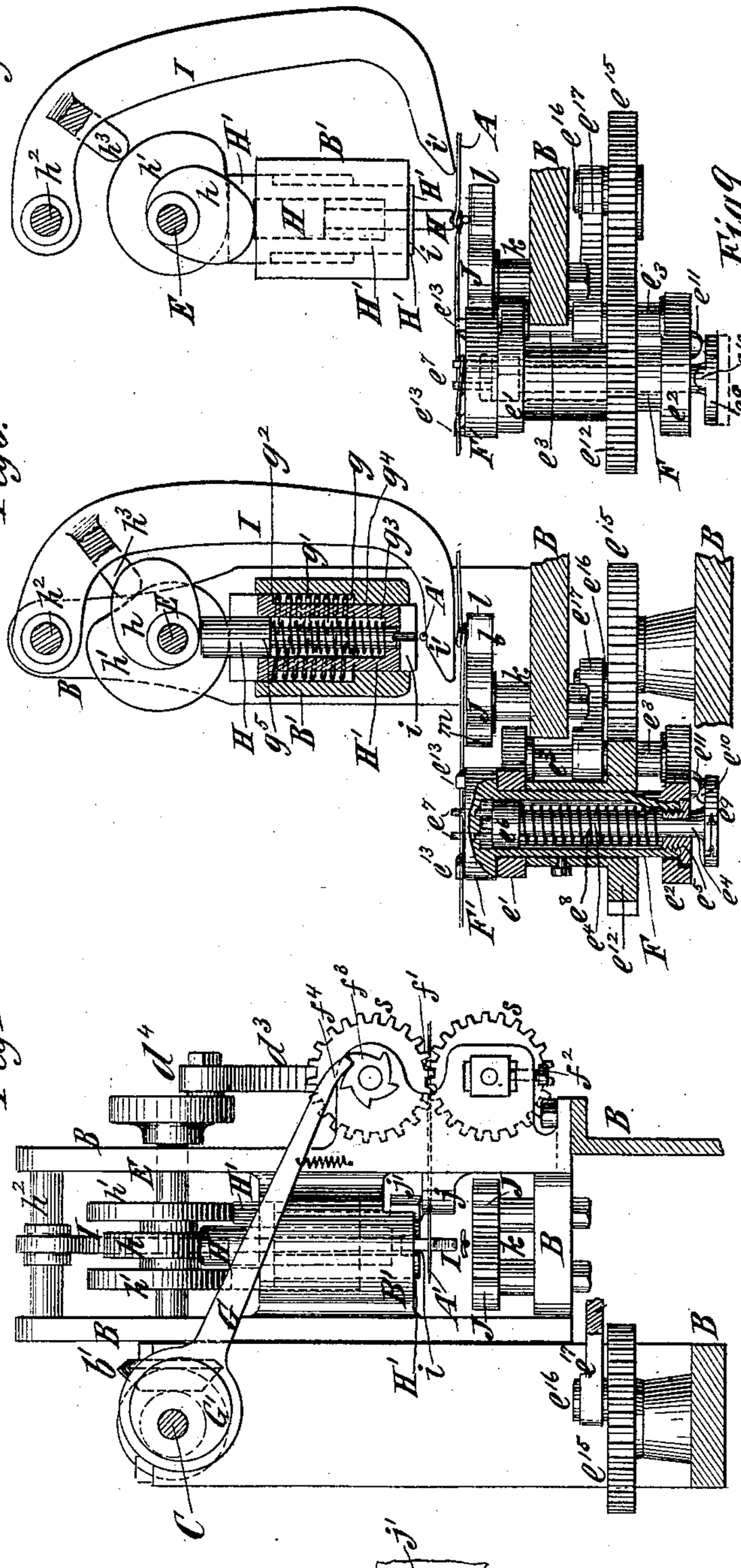


Fig. 6.

Fig. 9.

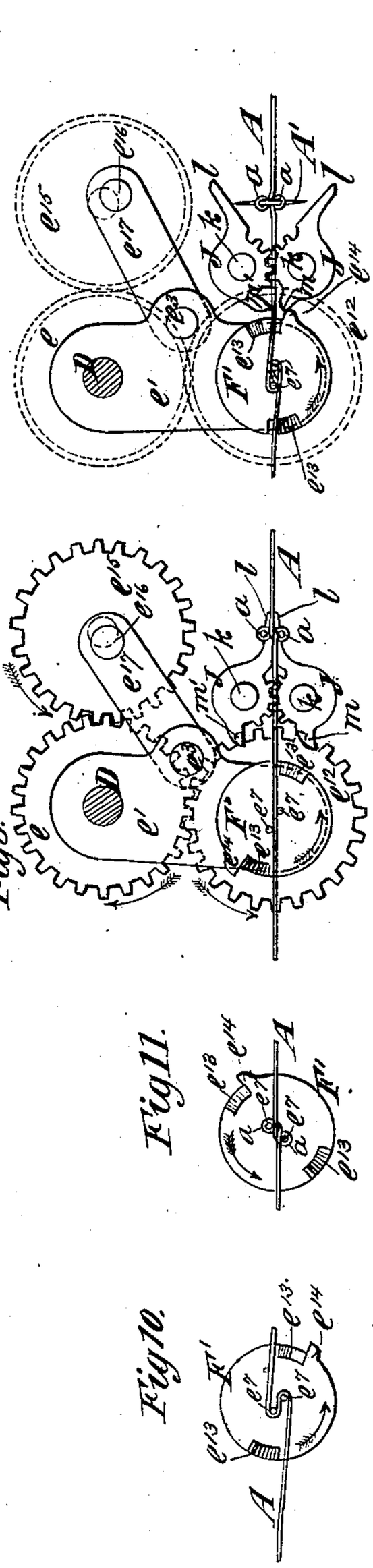


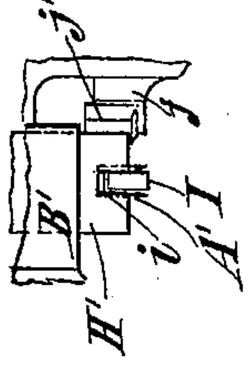
Fig. 8.

Fig. 4.

Fig. 11.

Fig. 10.

Fig. 7.



Witnesses
Fred'k Haynes
Ed. L. Moran

Inventor
Theodore A. Weber
by his Attorneys
Brown & Brown

UNITED STATES PATENT OFFICE.

THEODORE A. WEBER, OF NEW YORK, N. Y., ASSIGNOR TO JOHN L. CLARK, OF SAME PLACE.

MACHINE FOR MAKING BARBED FENCE-WIRE.

SPECIFICATION forming part of Letters Patent No. 286,511, dated October 9, 1883.

Application filed May 26, 1883. (No model.)

To all whom it may concern:

Be it known that I, THEODORE A. WEBER, of the city and county of New York, in the State of New York, have invented a new and Improved Machine for Making Barbed Fence-Wire, of which the following is a specification.

The object of my invention is to provide a machine for making barbed fence-wire, such as forms the subject of my application for Letters Patent filed May 3, 1883, and of which the serial number is 93,746. The wire referred to consists of a longitudinal wire having formed in or from it at intervals pairs of eyes, the eyes of each pair being opposite each other—that is, on opposite sides of the line of the wire—and barbs consisting of short wires, each inserted through the eyes of a pair, and having its sharpened ends projecting beyond the eyes in opposite directions. This wire, provided with barbs, may be employed alone for fencing; or it may be, and preferably is, twisted with another longitudinal wire, which prevents the wire having the pairs from being strained to such an extent as to draw out or distort the eyes and displace the barbs from their position at right angles to the longitudinal wire. In my machine is performed the whole operation of forming the pairs of eyes, forming and securing the barbs therein, and twisting the two longitudinal wires together.

The invention consists in novel features in the construction of the several parts of the machine, and in the manner of combining the said parts together to provide mechanism for feeding the wire forward with a step-by-step movement, and for giving the proper dwell between such movements; for forming the pairs of eyes in the longitudinal wire; for feeding wire and cutting it off to the proper length to form barbs; for bending such pieces of wire into the form of staples, or giving them a U shape; for inserting such staples or U-shaped pieces into the pairs of eyes, and spreading or bending outward the ends thereof which project through and beyond the eyes, so that they will project in opposite directions, and thereby be secured in the eyes; and, preferably, for twisting the wire thus provided with barbs with a second longitudinal wire, as above mentioned.

In the accompanying drawings I have illustrated a machine embodying my invention.

Figure 1 is a side elevation of the machine with a portion of one of the side frames broken away. Fig. 2 is a plan of the machine. Fig. 3 is a view of a piece of wire with the pairs of eyes, in one pair of which a barb is secured. Fig. 4 is a transverse section of a portion of the machine. Fig. 5 is a sectional elevation of a part of the machine. Fig. 6 is a view of many of the parts of Fig. 5, showing them in different positions. Fig. 7 is a view at right angles to Figs. 5 and 6, showing a portion of the dies whereby the barbs are bent into U shape. Figs. 8 and 9 are plan views of parts of the mechanism for forming the pairs of eyes and securing the barbs therein, the parts being shown in different positions in the views; and Figs. 10 and 11 are detail views of a part of the mechanism for forming the eyes, showing the same in different positions. Figs. 3 to 11, inclusive, are upon a larger scale than Figs. 1 and 2.

Similar letters of reference designate corresponding parts in all the figures.

A clear conception of the work to be performed by the several operations of the machine can be obtained from Fig. 3.

A designates the longitudinal wire, in or from which pairs of eyes *a a* are formed at suitable intervals or distances apart.

A′ designates the barbs, which are inserted through the eyes of each pair and have their sharpened ends projecting in opposite directions. The wire A, with its barbs, may be used for fencing purposes; or it may be twisted with a second longitudinal and plain wire, A^2, as shown in Fig. 3.

Referring now to the machine, B designates a bed or frame of considerable length. At one end thereof is supported the mechanism for forming the eyes and forming and applying the barbs, and at the other end thereof is a flier or twisting device for twisting two longitudinal wires together.

C designates the main or driving shaft, to which motion may be imparted by a belt passing around a pulley, C′.

D designates a vertical shaft receiving motion by bevel-wheels *b* from the shaft C, and E designates a transverse counter-shaft receiv-

ing motion through bevel-wheels b' b' from the said shaft C. By means of these three shafts motion is imparted to all the operating parts of the machine. The wire A is taken from a reel or drum, *c*, at one end of the machine, and is drawn forward between two wheels or rollers, *d d*, which have their peripheries grooved to form a channel for the wire. These wheels or rollers serve to direct the wire as it is drawn off different points in the length of the drum, and also to produce a friction or tension to hold the wire back. They may be made to grasp the wire more or less tightly by adjusting-screws applied to their bearings in a well-understood manner.

E′ designates a feed wheel or roller, which is secured upon a rotary shaft, d', and has a peripherical groove, in which the wire A rests. The shaft d' has secured upon it a ratchet-wheel, d^2, with which engages a pawl, d^3. This pawl is carried by a crank-pin, d^4, on the end of the shaft E, and by it a step-by-step rotary motion is imparted to the wheel or roller E′. A stop-pawl, d^5, engaging with the ratchet-wheel d^6, prevents backward or return movement of the feed-wheel E′. In the periphery of the feed-wheel E′ are notches d^6, which are placed at a distance apart equal to the distance between the barbs A′, and the notches engage with the barbs and serve as teeth to draw the wire forward positively after the barbs are secured to it.

Between the directing wheels or roliers *d d* and the feed-wheel E′ is arranged the apparatus for forming the pairs of eyes *a a* and for forming the barbs and securing them in said pairs of eyes. The mechanism for bending the wire A to form the eyes *a* is represented in Figs. 1 and 2, and upon a larger scale in detail in Figs. 5, 6, 8, 9, 10, and 11.

Upon the vertical shaft D is fixed a spur-gear wheel, *e*, and upon the same shaft is loosely fulcrumed a frame, which is capable of swinging slightly on the shaft in a horizontal plane. This frame is composed of upper and lower arms, e' e^2, which are connected by a rod, e^3. In the arms e' e^2 is journaled a rotary shaft or spindle, F, which has fixed or formed upon its upper end a disk, F′, that rotates with it. This disk may be considered as a part of the shaft, for if the shaft were large enough no disk would be necessary. The shaft or spindle F is hollow, as shown in Fig. 5, and within it is a rod or plunger, e^4, which is made to rotate with it, but is free to slide slightly upward and downward within it. The rod e^4 passes through a nut or plug, e^5, screwed into the lower end of the hollow shaft F, and near its upper end is a collar or head, e^6, from which two pins, e^7, project upward through and above the disk F′. The two pins form a twisting-fork, and their distance apart is just equal to the distance apart of the eyes *a* of each pair. The rod e^4 is normally pressed upward, so as to hold its pins e^7 above the surface of the rotary disk F′ by a spring, e^8, in the hollow shaft F, which bears at one end on the collar or head e^6 and at the other end upon the nut or plug e^5. Upon the lower end of the rod e^4 is a flange or collar, e^9, on the upper side of which is a projection, e^{10}, and in the circular path described by this projection is a fixed cam, e^{11}, on the lower arm, e^2. Once during each rotation of the shaft F and disk F′ the projection e^{10} comes in contact with the fixed cam e^{11} and draws the rod e^4 down sufficiently to sheathe the pins e^7 or twisting-fork below the upper surface of the rotary disk F′. Immediately on the projection e^{10} passing the cam e^{11}, the spring e^8 again raises the rod e^4 and projects its pins e^7 above the surface of the disk F′.

Upon the hollow shaft F is secured a spur-wheel, e^{12}, which gears into and receives motion from the wheel *e* on the shaft D. These wheels being of the same size, the shaft C, the shaft D, and the shaft F and twisting-disk F′ all rotate in unison.

Upon the upper surface of the disk F′ are two inclined projections, e^{13}, and on the periphery of the disk is a projection or cam-like lug, e^{14}, the purpose of which will be hereinafter described.

When the pins e^7 are projected upward by the spring e^8, they are in such a position that they straddle the wire A, or receive said wire between them, and as they move with the rotary disk they come against opposite sides of the wire, as shown in Fig. 8, and bend it. Fig. 10 shows the wire after the bending operation has progressed considerably. Fig. 9 shows the wire after the bending operation has progressed still more, and Fig. 11 shows the wire after the bending operation is almost completed and shortly before the pins e^7 are drawn down by the action of the projection e^{10} on the cam e^{11}. Before the pins are drawn down, however, the eyes *a a* are brought into position opposite each other and in a line directly across the wire, as shown by the completed pairs of eyes *a a*, Figs. 8 and 9. When the two uncompleted eyes are brought into the position shown in Fig. 9, it is necessary to raise the wire before and behind the pins, so that the eyes will be carried under such portions of the wire, and this is effected by the inclined projections e^{13}, which are shown in Figs. 6 and 9 as in action, and which raise the wire up, so that the incomplete eyes pass under it. When the bending operation to form the eyes is just about to commence, and the pins e^7 are in the position shown in Fig. 8, the inclined projections e^{13} pass first under the wire. This is not objectionable, although it serves no useful purpose; but it is unavoidable, because two projections set diametrically opposite to each other are used. Just as the eye-forming operation is completed and the two eyes are brought into a line directly across the wire, the pins e^7 are drawn down out of the eyes which they have formed, and at this instant the feed of the wire commences, and it is drawn forward to carry the pair of eyes beyond the disk F′, and to bring a fresh portion of the wire in position to be

acted upon by the pins e^7 after they have been projected upward. Obviously, a surplus of wire is required in forming the pairs of eyes, and as the wire in advance of the pins e^7 is firmly held by the feed-wheel E', it cannot be drawn back. The surplus, therefore, must all come from the portion of wire behind the pins e^7—that is, from the reel *c*. The pins e^7 draw, however, from both directions, and hence it is necessary that the mechanism for forming the eyes should be moved bodily forward a distance equal to half the surplus required. The swinging frame e' e^2 e^3, on which the shaft F is journaled, provides for such forward movement of the eye-forming mechanism, and I produce such forward movement and return movements by means of a wheel, e^{15}, gearing with the wheel *e*, journaled on a stud fixed in the frame B, and carrying a crank-pin, e^{16}, which is connected by a link, e^{17}, with the rod e^3 of the swinging frame. The said frame is therefore vibrated slightly forward and backward, while the shaft F and disk F' are rotated. After each pair of eyes are formed, the wire A is fed forward by the wheel E' a distance sufficient to bring the pair of eyes last formed opposite the mechanism for forming and inserting the barbs A', which I will next describe.

The barbs A' are formed from a wire, A, which is taken from a reel or drum, *f*, at the side of the machine, and passes between feed-rollers *f'*, which are geared together by wheels *s* and feed it forward in a direction transverse to the line of movement of the wire A. The feed-rollers *f''* may be made to grasp the wire with sufficient tightness by means of adjusting-screws f^2, applied to the bearings of one of the rollers, as shown in Fig. 4. Upon the shaft of one of the rollers is a ratchet-wheel, f^3, and f^4 designates a pawl which is formed upon or attached to an eccentric-rod, G, which is reciprocated by an eccentric, G', on the shaft C. By the feeding-rollers *f''* the wire A is moved step by step, at each step a distance equal to the length of a barb. Figs. 4, 5, 6, and 7 best show the mechanism for forming and inserting the barbs.

The shaft E is journaled in an upwardly-extending portion of the frame B, as shown in Fig. 4, and in a cross-bar or portion, B', of this frame is a compound punch, which consists of an inner plunger, H, and an outer annular plunger, H', both arranged directly below the shaft E. The frame portion B' has an annular countersunk hole or bore, *g*, which receives the outer plunger, H', and the latter is maintained normally in an elevated position, unless otherwise acted upon, by a spring, g', bearing on its upper end on a flange or shoulder, g^2, on the plunger H', and at its lower end on the bottom of the countersink which receives the plunger. The said outer plunger, H', has a countersunk hole or bore, g^3, which receives the plunger H, and the latter is normally maintained in an elevated position by a spring, g^4, bearing at its upper end on a shoulder, g^5, on the plunger H, and at its lower end on the bottom of the countersink in the plunger H'. The two plungers can be pushed down independently of each other, and are returned by the aforesaid springs.

Upon the shaft E is a cam, *h*, which acts upon and serves to depress the inner plunger, H, and at each side of said cam are cams *h'*, which are of similar form and act on the outer plunger, H', to depress it.

I designates a swinging arm fulcrumed at h^2 above the shaft E, and having projections h^3, which bear on the cams *h'*. These latter cams therefore serve the double purpose of operating the outer plunger, H', and imparting a swinging motion to the arm I. This arm is in the same vertical plane as the plungers H H', and it may swing into the position shown in Fig. 5, so that its end portion will be directly under the plungers H H', or into the position shown in Fig. 6, so that its end will be entirely out of the way of the said two plungers. The barb is bent into an inverted-U shape by a peculiar formation of the lower end of the plunger H', acting in conjunction with the swinging arm I. In the lower end of the plunger H' is formed a notch, *i*, which is in the same plane as the swinging arm I, and when the plunger H' is pushed down, as shown in Fig. 7, it straddles the point portion *i'* of the arm I, the latter being received into the aforesaid notch *i*.

For cutting off the wire A, I employ shear-blades *j j'*, the former of which is fixed to the frame B, as shown in Figs. 4 and 7, while the latter is secured to and moves with the plunger H', and operates, in conjunction with said fixed blade, to cut off the wire diagonally, thus giving each barb sharp points at both ends. When the pair of eyes *a a* last formed are brought forward by the feeding operation of the wire A, they are brought directly under the center of the plungers H H', and at the same time a sufficient length of the wire A has been fed forward beyond the shear-blades *j j'* to form a barb as shown in Fig. 4. The cams *h'* now allow the swinging arm I to move forward under the barb-wire A, and the end *i'* of said arm is or may be inclined, as shown in Figs. 5 and 6, so that it will readily pass under the projecting portion of the wire A' and not strike against it. The plunger H' now descends, and its first function is to cut off the wire A' by the action of the blade *j'* upon it, in conjunction with the fixed blade *j*. At the moment that the barb is cut off, the end of the plunger H' comes upon the cut-off portion, and, continuing its downward movement, bends the said cut-off portion down over the end *i'* of the arm I and brings it into the form of an inverted U. The end portion of the arm I therefore forms a former, over which the cut-off portion of the wire is bent, and the said arm constitutes a swinging former. In Fig. 7 I have shown the plunger H' and the former *i'* in the position which they occupy at the completion of the bending operation. It will be understood that the two limbs or ends

of this U-shaped barb are the same distance apart as the eyes *a* of each pair in the wire A. While the cams *h'* still hold the plunger H' down, they act on the projections h^3 of the swinging arm or former I, and move it outward, so as to withdraw its point from the staple-like or U-shaped barb, and at the same time the cam *h* forces down the plunger H, so that it presses on the top of the staple or U-shaped barb, and forces it downward out of the notch *i* in the plunger H', and into the two eyes *a a* of the pair, which are directly below the plunger. The plunger remains for a slight interval in its downward position, and retains its pressure on the top of the staple-like or U-shaped barb A' while the operation of spreading the ends of the barb is performed, as I shall now describe.

Just in advance of the rotary disk F' are a pair of oscillating spreaders, J, which are mounted on pivots *k* on a portion of the frame, and are provided with gear-teeth or sector-like portions, which engage and cause the spreaders to swing or move simultaneously, but in opposite directions. The spreaders are furnished with forwardly-projecting horns or arms *l*, which normally lie close together, as shown in Fig. 8, and these horns or arms form a rest over which the wire A passes, and upon which the pairs of eyes come to a stop in the position shown in Fig. 8. Upon the spreaders J are projecting lugs or ears *m m'*, which project in the circular path described by the projection e^{11} on the disk F'. While the horns or arms *l* of the spreaders J are together, as shown in Fig. 8, the staple-like or U-shaped barb has been driven down into the pair of eyes *a* by the action of the plunger H, and the horns or arms *l* form a bed or rest for the wire A during the operation. After passing through the eyes *a*, the barb passes down and straddles the horns or arms *l*, the ends of the barb being on opposite sides of the pair of horns. Just at this instant, the lug or projection e^{11} on the rotary disk F' strikes the lug or projection *m* on one of the spreaders J, and turns the spreaders on their pivots, so as to move their horns *l* in opposite directions, or spread them into the position shown in Fig. 9, and thereby the two ends of the barb A' are spread outward, so that they will project in opposite directions. During this spreading operation, the plunger H has retained its pressure on the top of the barb, and has prevented it from rising, as it otherwise would do. By this method of holding and spreading the barb, I make it bind in and across between the eyes and secure it very firmly in the eyes, so that it will be rigidly held and cannot shift and become loose, as the barbs in many kinds of barbed wire now do. After the projection e^{11} passes the lug *m*, it strikes the lug *m'* and swings the spreaders J in the opposite direction, so as to again bring their horns *l* together. By this time the forward movement of the wire A has taken place, and moved the pair of eyes wherein the barb is secured out of the way and brought another pair of eyes into position to receive a barb. The wire having the barbs secured as described may be taken from the feed-wheel E' and reeled up, and will form a strong and desirable fencing material. It may be conducted through a galvanizing-bath, and it will be thereby galvanized throughout, even to the cut ends of the barbs. After being galvanized, it may be twisted with the plain galvanized wire A^2.

It is impracticable to pass barbed-wire fencing in which two longitudinal wires are twisted together through a galvanizing-bath, because the galvanizing metal will lodge and adhere in great quantity to the twisted wires. Therefore the barbs in fencing of this character have not had their cut ends galvanized, and were liable to injure cattle by reason of the rust lodging in the scratches or wounds inflicted by them. I am enabled to galvanize the whole wire after the barbs are secured, because but a single wire is employed to secure the barbs.

In the machine here represented I have shown mechanism for twisting the wires A A^2 together.

At the end of the machine at which the barbed wire is delivered there is a flier, K, mounted on a hollow spindle, K'. On the spindle is a pinion, *n*, which receives motion from a wheel, *n'*, on the shaft C. In the hollow spindle K' is a shaft, K^2, on the inner end of which is fixed a pinion, n^2.

L designates the bobbin or reel, on which the completed twisted wire is wound. It carries a friction-wheel, n^3, which receives motion from a friction-pinion, n^4. The pinion n^4 is capable of rotating on a stud with a pinion, n^5, and receives its motion by the gearing of the pinion n^5 with the pinion n^2. The inner shaft, K^2, carries a wheel, n^6, which gears with and receives motion from a pinion, n^7, on the shaft C. By this mechanism the flier is rotated to twist the wires A A^2, and the reel L is rotated to take up the twisted wires. The barbed wire A passes from the feed-wheel E' under a roller or wheel, *o'*, to the rollers *o o*, which are slotted or composed of pins, and which form a nipper, and the wire A^2 passes from a reel, o^2, over a roller or wheel, o^3, and thence to the nipper *o o*. The twist takes place between the two guide rollers or wheels *o' o*^{3} and the rollers *o o*, forming the nipper.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a machine for making barbed wire of the kind specified, the several mechanisms herein described for feeding the longitudinal wire for forming pairs of eyes therefrom, for bending the barbs into the form of staples and inserting them through said pairs of eyes, and for spreading the ends of the barbs, all combined for operation substantially as herein described.

2. In a machine for making barbed wire of the kind specified, the several mechanisms

herein described for feeding the longitudinal wire, for forming pairs of eyes therefrom, for bending the barbs into the form of staples and inserting them through the pairs of eyes, for spreading the ends of the barbs, and for finally twisting the longitudinal wire provided with barbs with a second longitudinal wire, all combined for operation substantially as herein described.

3. The combination, with means for feeding the longitudinal wire step by step, as described, of a rotary twisting shaft and fork for forming the pairs of eyes in said wire, a movable frame carrying said shaft and fork, and mechanism for imparting to said frame a positive movement during the rotation of said shaft and fork, substantially as specified.

4. The combination, with means for feeding the longitudinal wire step by step, as described, of a rotary twisting shaft and fork for forming the pairs of eyes in said wire, a frame mounted on a vertical pivot and carrying said shaft and fork, and mechanism for imparting to said frame a positive swinging movement during the rotation of said shaft and fork, substantially as specified.

5. The combination of the vertical shaft D, the wheel e thereon, the wheels e^{12} e^{15}, both gearing with said wheel e, but not with each other, the rotary twisting-shaft F and its fork e^7, the swinging frame e' e^2 e^3, and the crank e^{16} and rod e^{17}, for swinging said frame from the wheel e^{15}, all substantially as herein described.

6. The combination, with means for feeding the longitudinal wire step by step, as described, of the rotary hollow twisting-shaft F, the twisting-fork e^7, the fork-rod e^4, rotating with but movable longitudinally in said shaft, the spring e^8, and a fixed cam on which the lower end of said rod acts to depress said fork, substantially as herein described.

7. The combination, with means for feeding the longitudinal wire step by step, as described, of a rotary twisting shaft and fork for forming the pairs of eyes, and inclined cams at the upper end of the shaft for raising the wire above the fork, so that the uncompleted eyes may pass under the wire, substantially as herein described.

8. The combination, with means for feeding the longitudinal wire step by step, as described, of a hollow rotary twisting-shaft, a fork and fork-rod sliding in but rotating with said shaft, cams at the upper end of said shaft for raising the wire, so that the uncompleted eyes can be carried under it, and devices for lowering or withdrawing the said fork-rod to free the fork from the completed eyes, substantially as herein described.

9. The combination of the hollow shaft F, the disk F′, with its inclined projections e^{13}, the fork-rod e^4 and pins e^7, the plug e^5, the spring e^8, the projection and cam e^{10} e^{11}, and the swinging frame e' e^2 e^3, all substantially as herein described.

10. The combination, with means for feeding the longitudinal wire step by step, as described, and forming pairs of eyes therefrom, of the notched plunger and movable former for bending the barbs into the form of staples, and a second plunger for pushing the staples through said pairs of eyes, substantially as herein described.

11. The combination, with means for feeding the longitudinal wire step by step, and for forming pairs of eyes therefrom, of the notched plunger and movable former for bending the barbs into the form of staples, a second plunger for pushing said staples into the pairs of eyes, and movable spreaders, which, when together, form a rest for the wire, substantially as herein described.

12. The combination of the cam-shaft E, the compound punch H H′, the swinging former I, and cams on said shaft for actuating the punch and the former, substantially as herein described.

13. The combination of the cam-shaft E, the compound punch H H′, the swinging former I, cams on said shaft for actuating the punch and the former, and shear-blades attached one to the outer part, H′, and the other to the frame, substantially as herein described.

14. The combination of the cam-shaft E, the compound punch H H′, the swinging former I, cams on the said shaft for actuating said punch and former, the feed-wheel E′, and devices operated by said shaft for imparting a step-by-step motion to said feed-wheel, substantially as herein described.

15. The combination, with means for feeding the longitudinal wire step by step and for bending and inserting the barbs, of the rotary twisting shaft and fork for forming the pairs of eyes, spreaders for the barbs, and a cam or projection carried by said shaft for actuating the spreaders, substantially as herein described.

16. The combination, with the spreaders J, geared together, and provided with horns l and projections m m', of the twisting-disk F′, carrying the fork e^7, and the projection e^{14}, for acting on the said spreaders, substantially as herein described.

17. The combination, with the spreaders J, of the plunger H, and a cam for forcing down the plunger and holding it down on the staples during the operation of the spreaders, substantially as herein described.

THEODORE A. WEBER.

Witnesses:
FREDK. HAYNES,
ALFRED L. BROWN.