(No Model.)

7 Sheets—Sheet 1.

C. D. ROGERS.

BARB WIRE MACHINE.

No. 376,417. Patented Jan. 10, 1888.

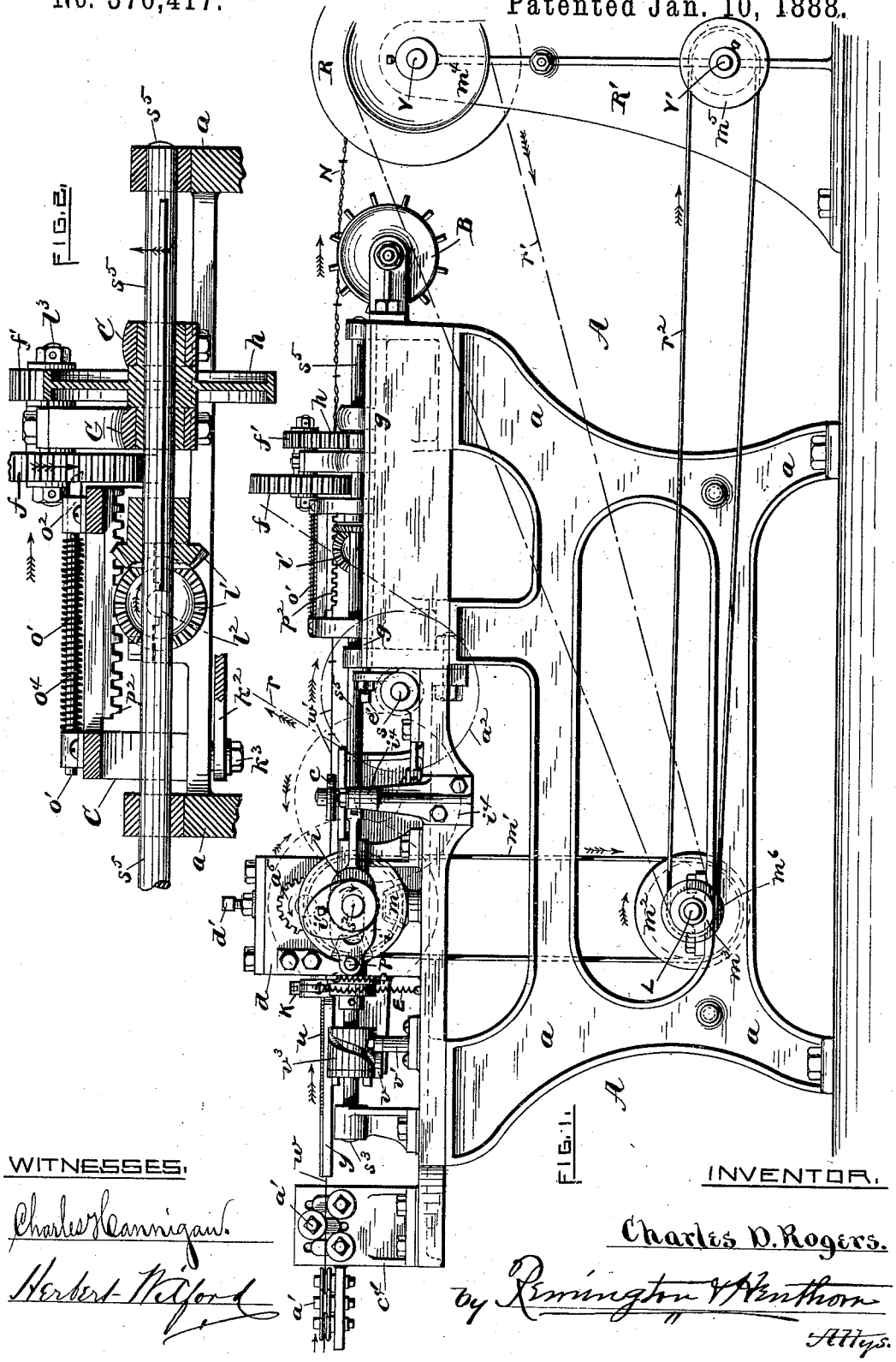


FIG. 2.

FIG. 1.

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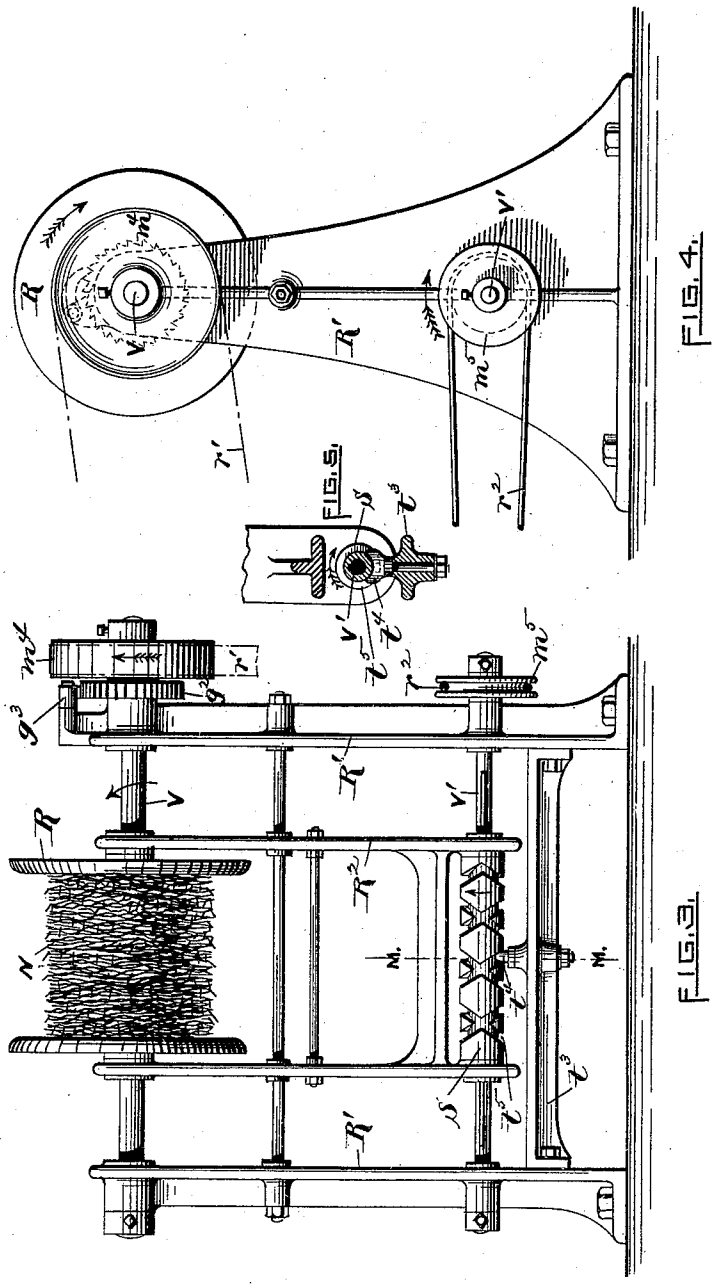
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(No Model.) 7 Sheets—Sheet 2.

C. D. ROGERS.

BARB WIRE MACHINE.

No. 376,417. Patented Jan. 10, 1888.



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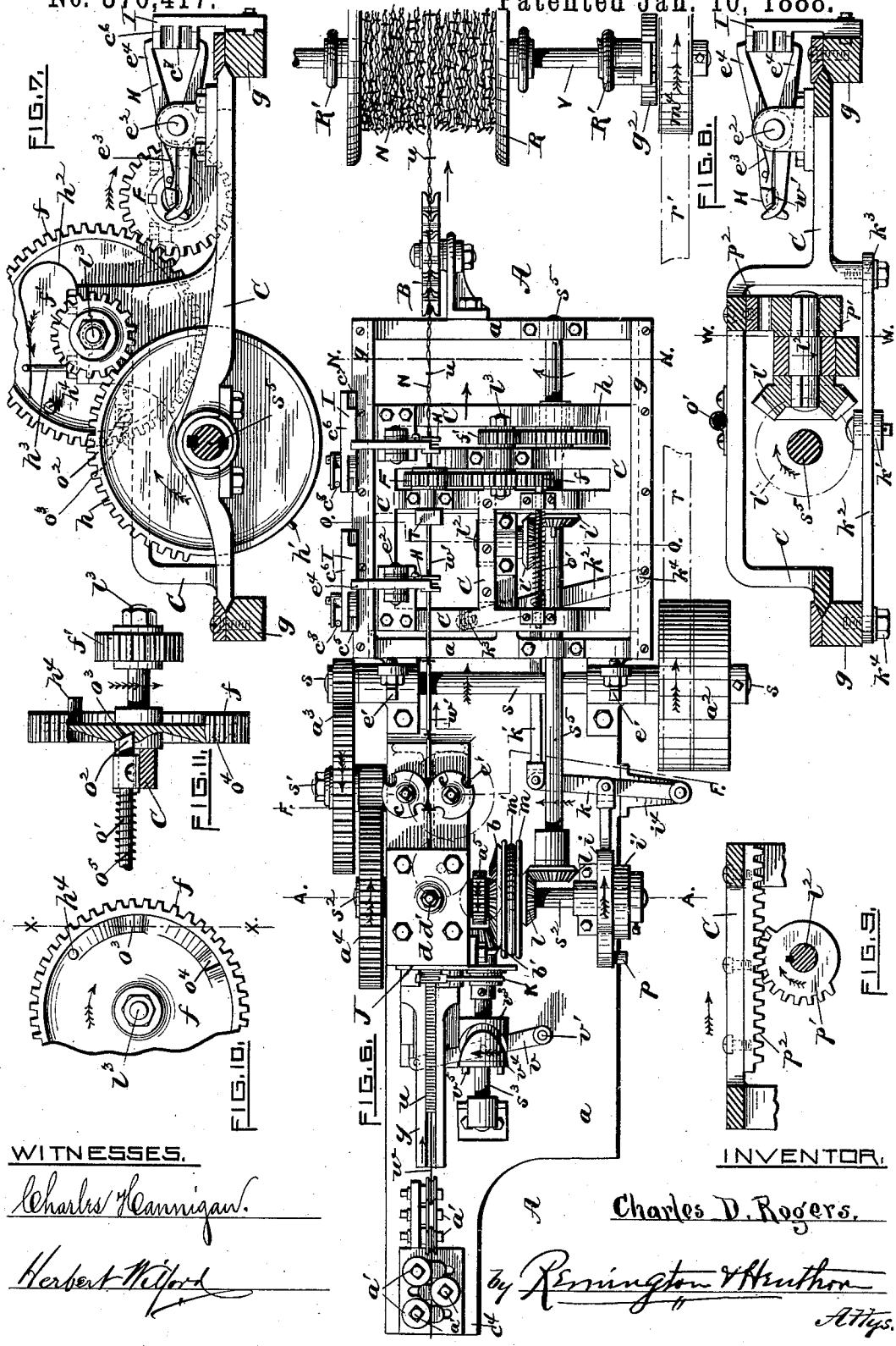
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(No Model.) 7 Sheets—Sheet 3.

C. D. ROGERS.

BARB WIRE MACHINE.

No. 376,417. Patented Jan. 10, 1888.



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(No Model.) 7 Sheets—Sheet 4.

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BARB WIRE MACHINE.

No. 376,417. Patented Jan. 10, 1888.

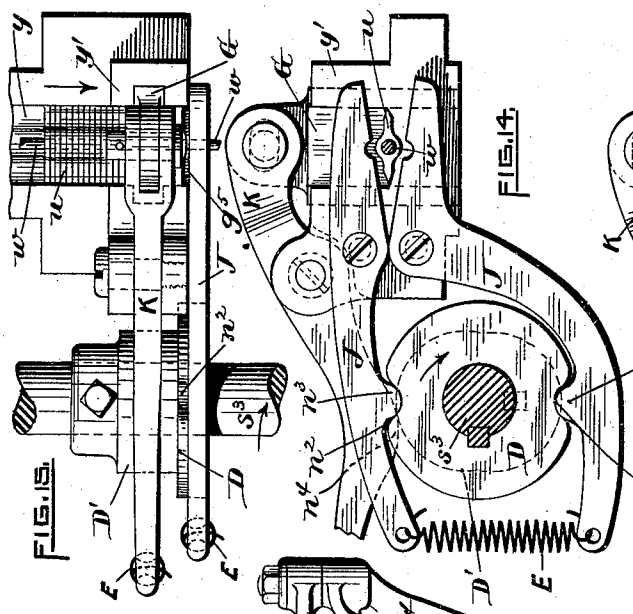


FIG. 15.

FIG. 14.

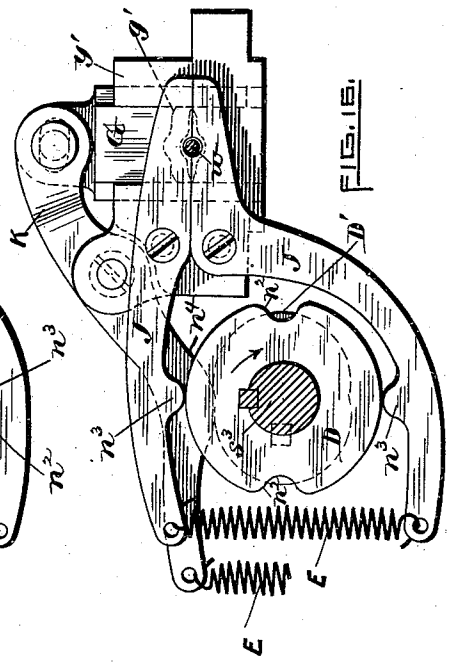


FIG. 16.

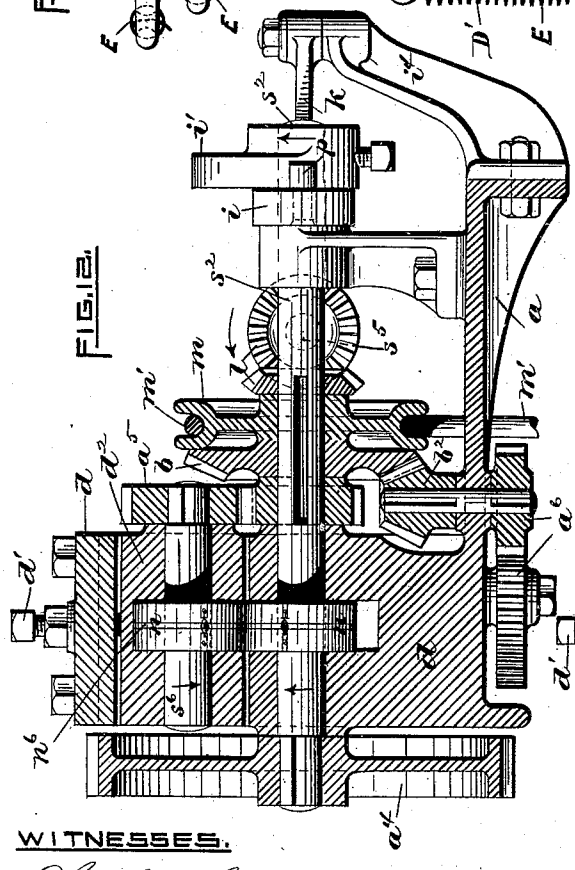


FIG. 12.

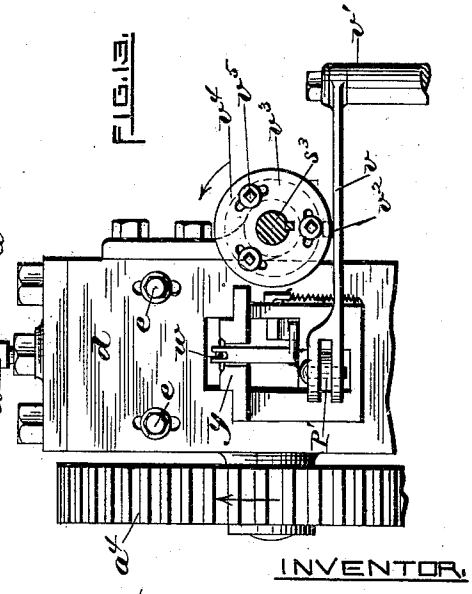


FIG. 13.

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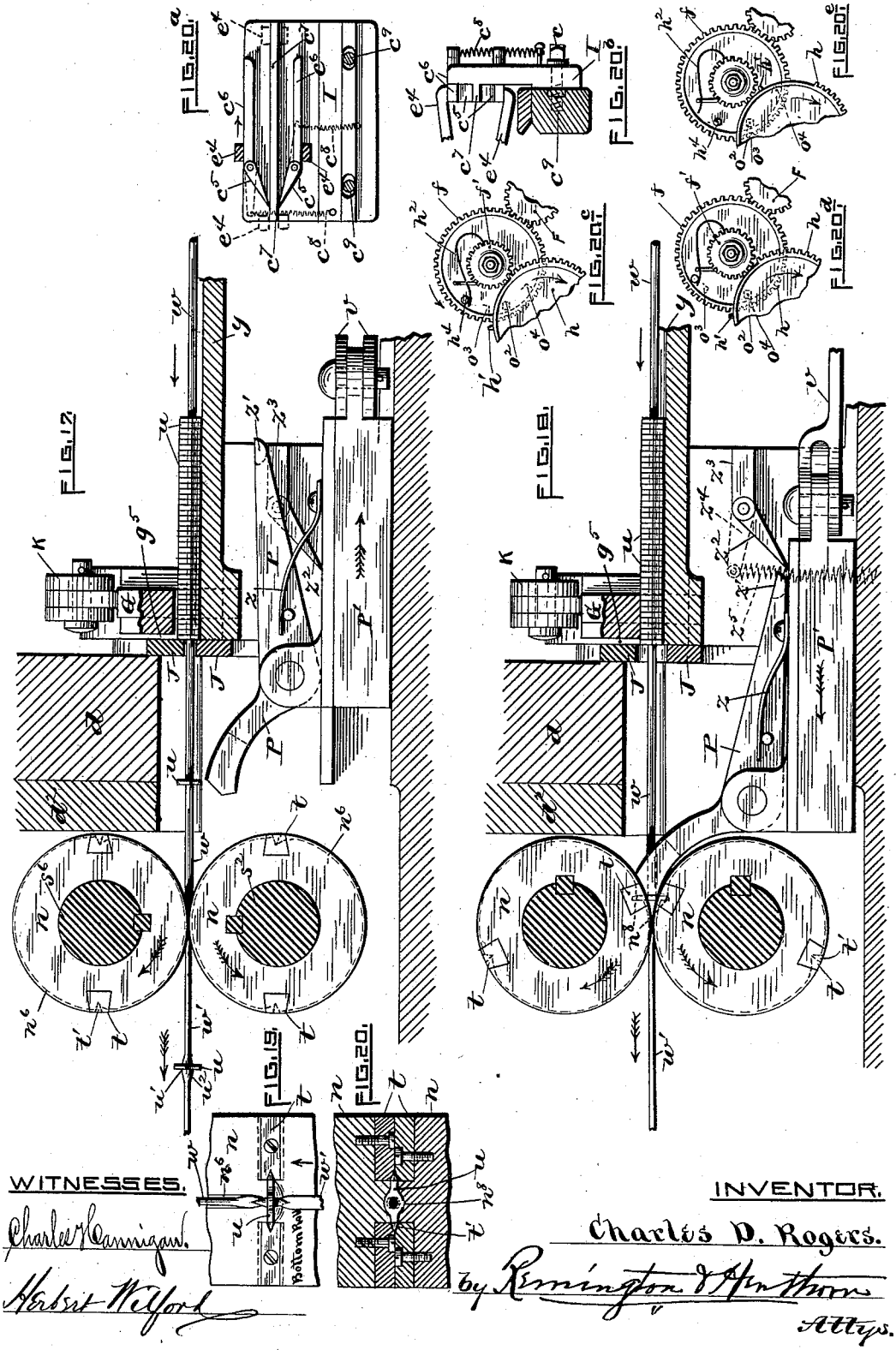
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(No Model.) 7 Sheets—Sheet 5.

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BARB WIRE MACHINE.

No. 376,417. Patented Jan. 10, 1888.



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(No Model.) 7 Sheets—Sheet 6.

C. D. ROGERS.

BARB WIRE MACHINE.

No. 376,417. Patented Jan. 10, 1888.

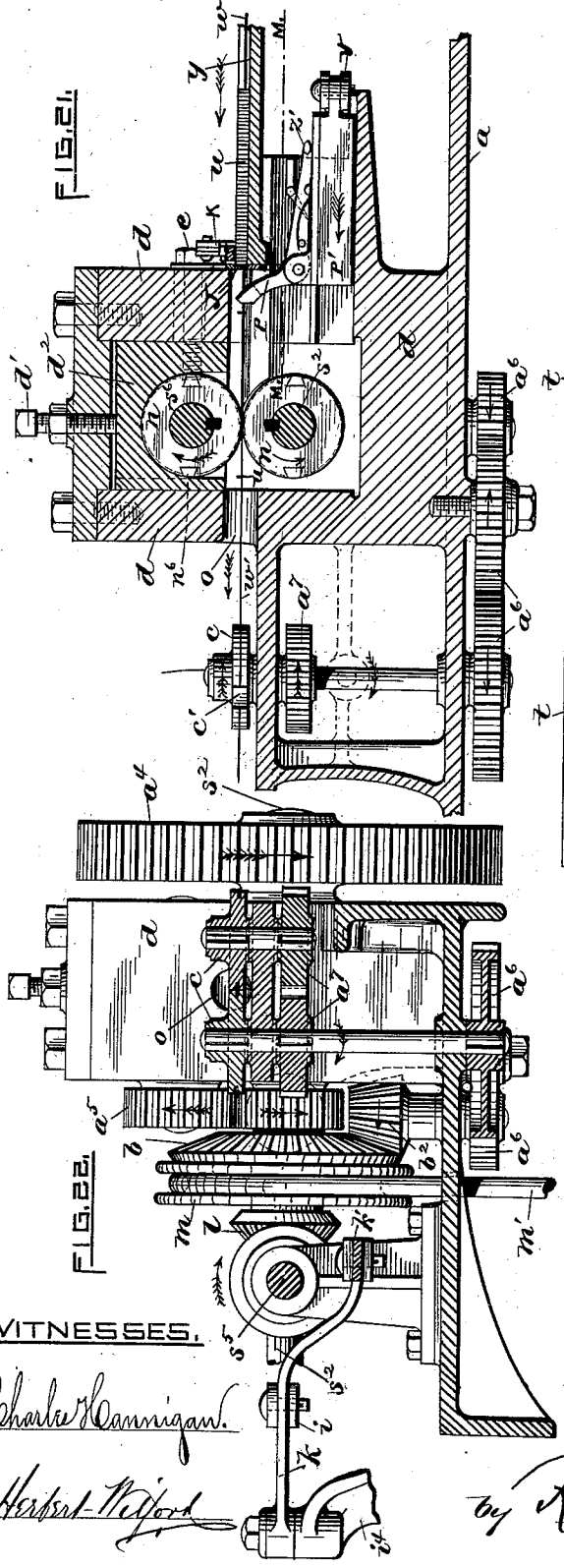


FIG. 21.

FIG. 22.

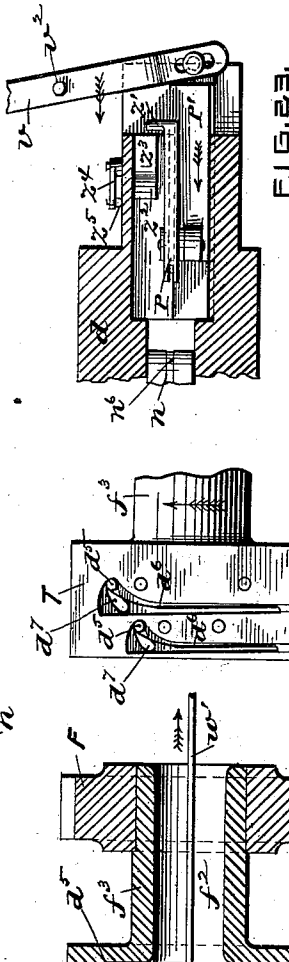


FIG. 23.

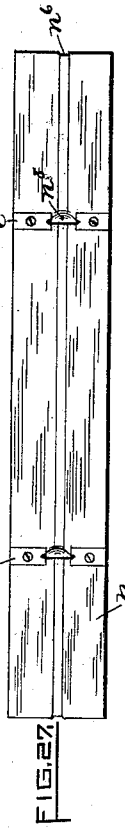


FIG. 27.

FIG. 24.

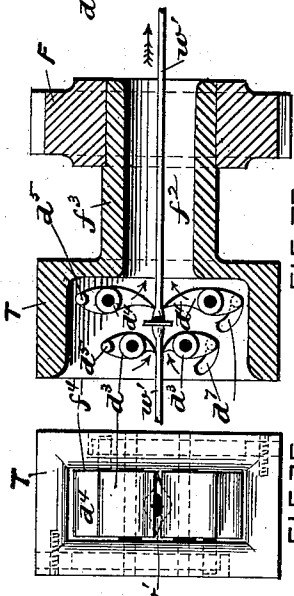


FIG. 25.

FIG. 26.

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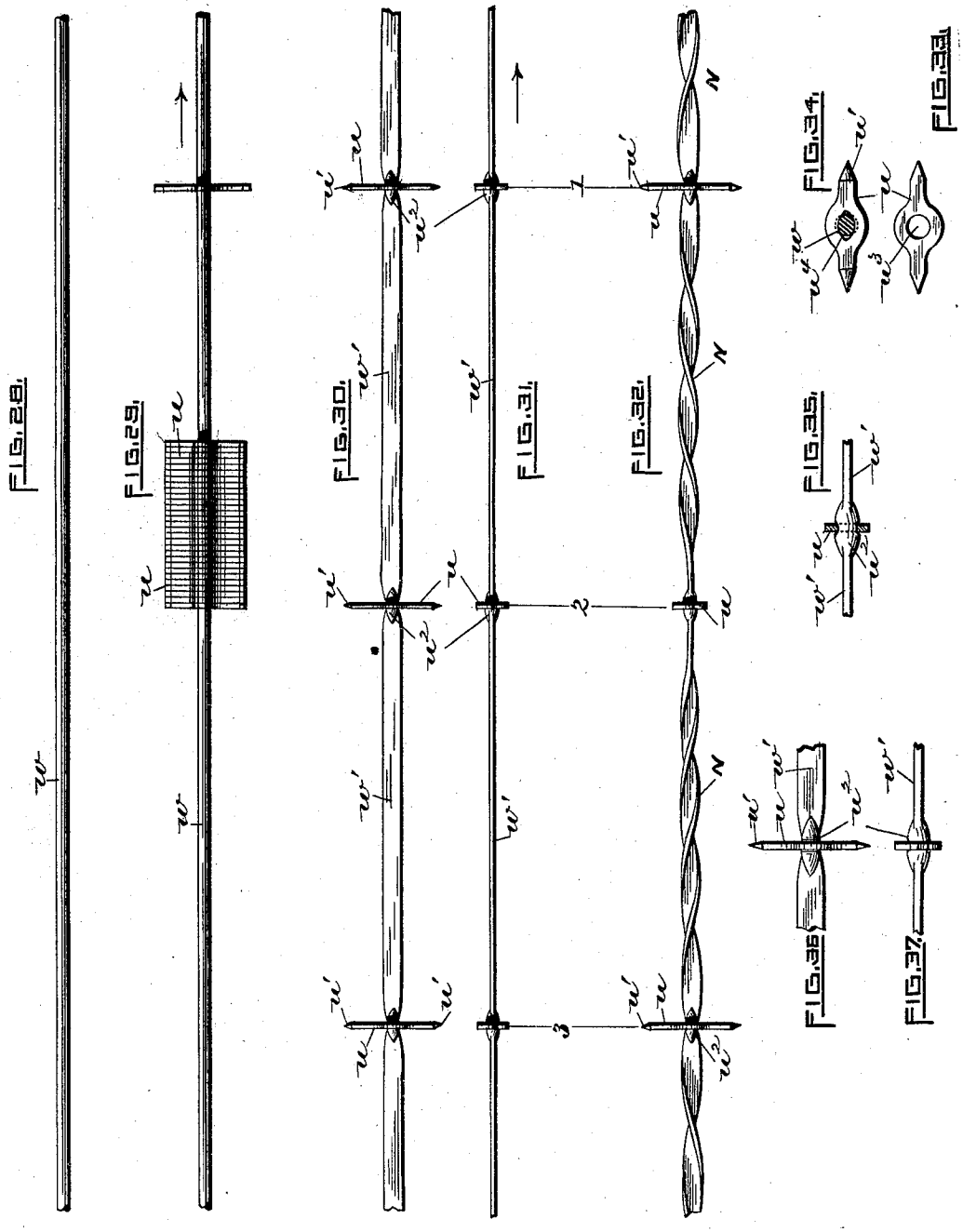
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(No Model.) 7 Sheets—Sheet 7.

C. D. ROGERS.

BARB WIRE MACHINE.

No. 376,417. Patented Jan. 10, 1888.



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UNITED STATES PATENT OFFICE.

CHARLES D. ROGERS, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO THE AMERICAN SCREW COMPANY, OF SAME PLACE.

BARB-WIRE MACHINE.

SPECIFICATION forming part of Letters Patent No. 376,417, dated January 10, 1888.

Application filed July 30, 1887. Serial No. 245,657. (No model.)

To all whom it may concern:

Be it known that I, CHARLES D. ROGERS, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Barb-Wire Machines; and I 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, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

My invention relates to a barb-wire machine for automatically making a flattened and twisted barb-wire; and it consists of the following improvements: mechanism for continuously feeding the strand of plain wire, combined with an intermittently-acting device for locating the barbs at fixed intervals along the wire, a device for flattening the wire intermediate of the barbs, and means for securing them in position upon the wire, a reciprocating carriage carrying clamps which automatically clasp and release the wire, and mechanism which acts to twist the wire while the latter is retained by the traveling clamps.

The object of the present invention is to produce an automatically-working machine adapted to receive an end of a coil of wire and submit it while continuously traveling to the action of the several devices above mentioned, the finished product being automatically wound upon an arbor or spool.

Usually, heretofore, in the manufacture of barb-wire the coil of plain wire is intermittently passed along by the action of feeding mechanism, which permits the barbs to be secured to the wire at regular intervals. Such an arrangement not only reduces the product of the machine due to the loss of time, but also increases the power necessary to operate it.

In the case of twisted ribbon wire a strand of round wire is first submitted to a machine adapted to reduce it to a flattened cross-section. The wire thus flattened is then passed through another machine, which gives it the desired twist, and if it is to be barbed the twisted wire is passed through still another machine adapted to affix the barbs thereon at regular intervals. In the operation of twisting the wire it is continuously wound upon an axially-revolving reel, which is also adapted to be revolved transversely, corresponding to the twist imparted to the wire. In view of such former modes of operation it is obvious that several distinct machines, with their attendant operators, are required to produce a flattened and twisted barb-wire.

By means of my improvements only one organized machine is required to produce the coil ready for use, whereas, as just stated, two or more machines are, so far as I am aware, necessarily employed to produce flattened and twisted barb-wire. Therefore the cost of the finished product made by my machine is obviously reduced as compared with such former mechanisms.

In the accompanying seven sheets of drawings, illustrating my barb-wire machine, Figure 1, Sheet 1, is a side view of the machine complete. Fig. 2 is an enlarged vertical longitudinal sectional view taken through the twisting device. Fig. 3, Sheet 2, is a side elevation of the wire-winding mechanism or reel. Fig. 4 is an end view of the same. Fig. 5 is a partial transverse sectional view taken on line M M, Fig. 3, showing the traverse motion. Fig. 6, Sheet 3, is a plan view of the complete machine and corresponding with Fig. 1. Fig. 7 is an enlarged transverse sectional view taken on line N N, Fig. 6, looking toward the front end of the machine, showing the carriage, &c., of the twisting device. Fig. 8 is a similar sectional view taken on the irregular line *o o*, showing the feed and gripping jaws. Fig. 9 is a transverse sectional view taken on line W W of Fig. 8, showing a portion of the twisting feed mechanism. Fig. 10 is a front view of a portion of the twisting-gear and shaft. Fig. 11 is a transverse sectional view taken on line X X of Fig. 10. Fig. 12, Sheet 4, is an enlarged vertical transverse sectional view taken through line A A, Fig. 6, looking toward the rear end of the machine, showing the main feeding mechanism. Fig. 13 is a view in elevation of a portion of the front end of the main feed-head. Fig. 14 is a front view of the checking-device jaws, showing them open and with the back gate closed. Fig. 15

is a plan view thereof. Fig. 16 represents the checking-jaws closed and the back gate in the open position. Fig. 17, Sheet 5, is a partial vertical longitudinal sectional view representing the feed-rolls, checking device, and barb track or runway, the checking-jaws being closed and the barb-pusher nearly to the end of its forward stroke. Fig. 18 is a similar view showing the jaws open and the pusher advanced to the end of its rearward stroke, thereby placing the barb in position on the wire immediately preceding its engagement with the main feed-rolls. Fig. 19 is a partial side elevation of one of the feed-rolls, showing a barb and wire in relation thereto. Fig. 20 is a partial vertical sectional view taken in the direction of their axes through the pair of feed-rolls at their adjacent faces, showing a barb in the act of being pointed by means of dies mounted in the rolls. Fig. 20^a is a side elevation of the locking-plate removed from the machine, the rear ends of the gripping-jaws, corresponding to the extreme positions of the carriage, being represented by dotted lines, the section-lines showing the location of the jaws corresponding to that shown in Fig. 6. Fig. 20^b is an end elevation of the same. Fig. 20^c is a reduced side elevation showing a portion of the twisting device, its position corresponding to that just before the instant the wire is completely twisted. Fig. 20^d represents the same just after the wire is twisted, the parts remaining stationary. Fig. 20^e shows the relation of said parts immediately succeeding the action of a pin, h', to return the twisting-box to its normal position, ready to again receive a barb at the commencement of the next rearward stroke of the carriage. Fig. 21, Sheet 6, is a longitudinal sectional view (reduced) similar to Fig. 17, showing in addition the rear feed arranged and adapted to straighten the wire after being flattened by the action of the main feed-rolls. Fig. 22 is a transverse sectional view of the machine, taken on the irregular line F F, Fig. 6, showing the rear feed and reel-driving mechanism. Fig. 23 is a partial horizontal sectional view taken on line M M, Fig. 21, showing the pusher, guide, and connection. Fig. 24 is a partial side view of the twisting-box. Fig. 25 is a longitudinal vertical sectional view taken through the center of the twisting-box, showing the jaws engaging the wire preparatory to the twisting operation. Fig. 26 is an end view of the twisting-box looking toward the entering end. Fig. 27 represents the development of one of the main feed-rolls. Fig. 28, Sheet 7, is a view of a piece of plain wire preparatory to entering the machine. Fig. 29 is a view of the same while passing through the barbs, one of which is shown loosely in position. Fig. 30 is a section of the wire after passing through the combined feeding and flattening rolls. Fig. 31 is an edge view thereof. Fig. 32 is a view of the same after being subjected to the twisting mechanism. Fig. 33 is a perspective view of one of the barbs enlarged. Fig. 34 is a view of the same as secured to the wire and showing the points of the barb swaged to a rounded form. Fig. 35 is a detached view (the barb being in section) showing the manner of retaining the barb in place. Fig. 36 is a plan view thereof, and Fig. 37 is an edge view.

The following is a detailed description of my barb-wire machine, including the manner of its operation:

A, referring to the drawings, designates the machine as a whole, as constructed, arranged, and adapted by its several devices to simultaneously and continuously perform the following operations—viz., to first feed a plain wire through the straightening-rolls, then to receive the barbs and place them in position (say five inches apart) on the wire, then passing the wire and barbs between feed-rolls, which in revolving point the barbs and secure them in position and flatten the wire intermediate of the barbs to a "ribbon" form, then passing the now flattened and barbed wire between straightening rolls, and next passing the wire to a reciprocating carriage having automatically-operating clamping-jaws, which simultaneously seize upon two of the barbs, an intermediate barb at the same instant being retained by dogs mounted in a twisting-box adapted to be revolved. The confined wire now being carried ahead is acted upon by a twisting device, which twists it both right and left from the said intermediate or center barb to the lateral barbs retained by the clamping-jaws, the mechanism being so timed that the jaws release the wire, and the carriage is returned preparatory to reclamping the wire and twisting another length (about ten inches) as before, the finished wire in the meantime being automatically wound upon a reel having a traverse movement.

a, again referring to the drawings, indicates the main framing of the machine, having an extension, a^1, at its front or feeding end, in which are mounted, as common, a series of rolls, a', adapted to reduce the plain wire *w* after it leaves the coil to a straight form preparatory to entering the feeding device, &c.

s, Figs. 1 and 6, designates the main driving-shaft mounted in suitable bearings. A driving-belt, *r*, leading from a counter-shaft, if desired, to a pulley, a^2, secured in front to the shaft *s*, is adapted to impart motion to the machine. A train of gearing, as a^3 and a^4, mounted, respectively, on the shafts s' s^2 at the rear or opposite side of the machine, serves to transmit motion to the several combined devices.

In the barb-wire represented the barb *u* thereof is punched from sheet metal, a hole, u^3 being formed through its center adapted to loosely receive the plain round wire *w*. I prefer to use steel barbs, although, obviously, other metal may be employed, if desired. Intermediate of the straightening-rolls a' and the main feed-rolls is located a track or trough, in which a series of barbs are placed side by side,

as clearly shown in Figs. 6 to 16, &c. The trough may be of sufficient length to receive enough barbs to barb several hundred feet of wire. Practically, however, I prefer to use a shorter trough and couple the wire together in shorter lengths. The wire *w* is inserted through the several barbs, and is then passed to the feed-rolls *n*, about to be described.

d indicates a head or housing in which the feed-rolls *n* are mounted, the lower roll being secured to the shaft s^2 and driven by the gear a^4, Fig. 12, &c, the upper roll being secured to a shaft, s^6, and driven through the medium of the small external spur-gears, a^5.

d^2 indicates a block in which the upper shaft and roll are mounted, said block being vertically adjusted by a screw, *d'*, and retained in position by the lateral screws *e*, Fig. 21, which pass through elongated holes formed in the frame *d*.

n n, as stated, designate the upper and lower main feed-rolls. The periphery of each at its center is provided with a groove, n^6, adapted in conjunction with the fellow roll to laterally reduce the plain wire while passing between them to a flattened or ribbon form, *w'*. (See sheet 5 of the drawings.) Dies *t* are oppositely mounted and arranged in the rolls, so as to coincide with each other as they pass the vertical center. The object of these dies is to receive the barbs *u* as they are successively placed in position and reduce the ends thereof to a sharpened point, *u'*, *t'* being the shaping portion of the dies therefor. Intermediate of the dies, as at n^7, referring to Fig. 19, each roll is cut away to freely receive the barbs, the depth of the groove or cut-away portion at n^8 being slightly less than one-half the width of the barb. By means of this arrangement the joint action of the rolls causes the opposite sides of the metal surrounding the hole w^3 to be slightly impressed into the wire. (See Figs. 33 to 37.) The continued action of the rolls then flattens the wire, the resulting product being shown in Figs. 30, 31, &c., wherein the wire is flattened intermediate of the barbs. By means also of this construction the barbs are secured on the wire at regular intervals and in a uniform manner, the barbs thereby being retained in a fixed position both longitudinally and axially of the wire.

I will next describe the mechanism adapted to single out the barbs and place each in position so as to be properly received by the combined feeding and reducing rolls *n*.

The lower roll-shaft, s^2, extends across the machine toward the front side. On this shaft adjacent to the feed-gear a^5 is secured a bevel-gear, *b*, Figs. 6, 12, &c., which intergears with a bevel-pinion, *b'*, secured to a short shaft, s^3, mounted in bearings arranged lengthwise of the frame *a*. A flanged hub or center, v^4, is secured to this latter shaft, which, by means of bolts v^5, passing through slotted openings formed in said flange, serves to adjustably secure a cam, v^3, thereto.

v is the cam-lever, pivoted at *v'* to the frame, which, by means of a pin, v^2, Figs. 13, 23, secured to the lever and engaging the cam-groove, causes the lever to vibrate back and forth. The outer or free end of the cam-lever is jointed to a guided block, P', which is located immediately below the barb carrying trough *y* and contiguous to the feed-rolls. A two-arm lever, P, which I term the "pusher-lever," is pivoted to the rear end of the block P'. The upper arm of said lever is bent, the end thereof being forked to receive the wire *w*, and is also shaped to properly present a barb, *u*, to the feed-rolls. A spring, *z*, secured to the lever-block and engaging a pin of the pusher-lever, serves to maintain the latter in its normal position during the rearward stroke. The lever in returning on its forward stroke (see Fig. 17) is lifted or tripped against the tension of the spring *z* by means of an extension, *z'*, secured thereto, which engages the inclined surface of a hinged plate, z^2, and guides the lever along the stationary flat surface z^3, the bent arm of the lever at the same time being carried along below and disengaged from a barb. During this forward movement of the lever the continuously-traveling wire is permitted by means of intermittingly-acting jaws, &c., soon to be described, to carry a released barb in the opposite direction. As soon as the lever passes by the end of the stationary guide z^3, the spring causes the opposite end to be elevated and loosely receive the wire *w*, the increased velocity of the shaft s^3, in conjunction with the action of the cam v^3, serving to force the barb along to the rolls in advance of the wire, there to remain until received at the proper time by the dies *t*, as shown in Fig. 18, the hinged plate z^2 readily permitting the end *z'* of the lever to pass beneath during the rearward stroke, a spring-actuated lever, z^4, being secured to a stem extending from the plate. (See Fig. 23.)

The mechanism for controlling the column of barbs is as follows:

Referring to Sheet 4 of the drawings and to Fig. 21, &c., it will be noticed that the barb-track *y* is provided at its rear end with a pair of pivoted jaws, J, and a clamping-gate, G.

D indicates a disk secured to the shaft s^3, said disk having oppositely-formed recesses n^2 in its rim, into which lugs n^3 of the jaws engage, as in Fig. 14, thereby opening the jaws and uncovering the end of the track and permitting a barb to freely pass out. Immediately in front of the jaws a gate, G, is mounted to slide up and down in an extension, *y'*, of the track, the lower end, *g'*, of the gate being made to approximately fit a series of barbs. A pivoted lever, K, is jointed to the upper end of the gate, the outer or free arm of the lever having a lug, n^4, formed on its under side, adapted to engage a cam, D', secured to the shaft s^3. These two cams are so located relatively to each other upon the shaft that while the jaws J are opened the gate G bears firmly against the barbs, (and vice versa,) thereby preventing their escape. Springs E serve to

maintain the levers in contact with the respective cams. It will be noticed, referring to Fig. 15, that a space, g^5, is left uncovered between the gate G and the face of the jaws. This space is to receive a barb by the action of the traveling wire against the front side of the jaws while the latter are closed. By means of this arrangement it is obvious that upon opening the jaws the unconfined barb is free to pass from the end of the track. In fact, the barb, by being freely supported by the traveling wire, is by its friction carried into the space formed in the housing of the feed-rolls, there to be forced into place in advance of the wire by the pusher-lever, &c., as before described.

The device for straightening the wire after the barbs are affixed thereon by the action of the feed-rolls, &c., is as follows:

A pair of vertically mounted and geared shafts, Figs. 21, 22, &c., are mounted in the framing of the machine, one of which is elongated and extends below the frame, the same being driven through the medium of a train of gearing, a^6, which in turn is actuated by a suitably-mounted pinion, b^2, intergearing with the bevel-gear b. A roll or disk, c, surmounts each of said vertical shafts. These disks are grooved to receive the flattened wire, and are cut out, as at c', to freely receive the barbs. (See Fig. 6.) The peripheral surfaces of the disks travel at the same rate of speed as that of the feed-rolls n. By means of this device the wire is made practically straight, and having all the barbs lying in the same plane, so as to uniformly enter the twisting mechanism.

The twisting device is mounted on a carriage which travels back and forth in ways, the construction and arrangement of the mechanism being substantially as follows:

C indicates the carriage, having a rectangular form and provided with ties or ribs adapted to support and carry the several parts constituting the clamping and twisting mechanism. The carriage is fitted to reciprocate in ways or V's g, secured to the framing a at the rear end of the machine. The carriage is carried to the right or rearwardly (see Fig. 6) by the action of miter-gears l', which are driven by similar gears, l, in connection with the longitudinally-mounted and continuously-revolving shaft s^5. To the rear of the shaft and at right angles therewith is mounted a short gear-shaft, l^2, (driven by a gear, l',) on which is secured a spur-wheel, p', the teeth of which are removed from one-half of its periphery, Figs. 8 and 9. A rack, p^2, is secured to the carriage and arranged to mesh into the wheel. This arrangement causes the carriage to be driven rearwardly at the same rate of speed or in unison with the traveling wire. Now, when the last tooth of the wheel p' in its revolution leaves the rack, corresponding to the extreme movement of the carriage in that direction, it is evident that other mechanism than said gear and rack must be employed to return the carriage on its forward stroke to its normal position. The following description refers in detail to such a device:

k^2 indicates a lever fulcrumed at k^4 to the frame a and having its outer end slotted, through which a bolt, k^3, passes, thereby connecting the lever to the under side of the carriage. (See Figs. 6 and 8.) A link, k', is jointed to the lever intermediate of its two ends, the front end of the link being jointed to a lever, k, arranged transversely of the machine and fulcrumed in front to a bracket, i^4.

i' indicates a cam adjustably secured to the front end of the lower feed-roll shaft, s^2, i being the slotted cam-connection through which the shaft passes, Fig. 1, and having a pin, p, therein adapted to engage the cam, the rear end of the connection being jointed to the lever k. By means of this arrangement the cam, which is continuously revolving, is adapted to engage the pin p of the connection i, thereby causing the carriage to return to its normal position, the form of the cam and its fixed location upon the shaft being such that the carriage is brought into position somewhat in advance of its re-engagement with the gear p', thus producing a temporary stop. During this interval of time, while the carriage remains stationary, the wire w' is freely passing through the twisting-box. As soon, however, as the barb, which forms the center of the next twisting-section (or ten inches) enters the box, the revolving gear p' will have engaged the rack p^2, and the whole then travels rearwardly in unison, as before stated. It is during this latter half of the stroke of the carriage that the twisting of the wire is effected. The said shaft s^5 is mounted in bearings arranged longitudinally of the machine, and also in bearings formed in the carriage. The miter-gear l' and a large spur-gear, h, (having some of its teeth removed,) are fitted to a long spline let into the shaft. By this means the gears are kept continuously revolving, and at the same time travel back and forth with the carriage on the shaft.

Before further describing the twisting-box and its actuating mechanism, I will describe the gripping-jaws H, which are adapted to automatically seize a section of the wire w', then to firmly retain it while being twisted, and, finally, to release the twisted wire at or near the end of the rearward stroke of the carriage, the latter then returning to repeat the operation on another section of the wire, as before.

Each pair of gripping-jaws H consists of upper and lower members pivoted at e^2 to ears secured to the rear side of the carriage on its upper surface. These pivots are so adjusted longitudinally of the machine that the two pairs of jaws are separated a distance corresponding to a portion of the wire embracing two barbs' spaces, or, as stated, ten inches. The front ends of the jaws are adapted to receive and rigidly retain the flattened wire between them together with the contiguous

barb. (See Figs. 6, 7, 8.) The rear ends, e^4, of the jaws are reversely bent and separated, so as to engage the stationary combined locking and releasing plate I. Springs e^3 serve to keep the jaws in normal contact with the plate. These plates are each adjustably secured to the frame of the machine by bolts c^9.

c^6 indicates upper and lower parallel ribs separated sufficiently to close the jaws, Fig. 20^a, &c., each rib terminating at its front end in a hinged plate, c^5, thereby producing oppositely-inclined or wedge-shaped surfaces. A rib, c^7, is formed intermediate of the ribs c^6, the same extending at each end beyond the latter-mentioned ribs, as shown. An external arm is secured to each hinged plate, which, by means of the connected spring c^8, insures the engagement of the free ends of the plate with the center rib. It is obvious from this construction that when the jaws are at the extreme forward position (shown dotted, Fig. 20^a) the gripping portion of the jaws are fully opened; but as they travel rearwardly along the inclined surfaces c^5 the jaws are gradually closed down upon the wire and remain firmly grasping it during their engagement with the ribs c^6, at which time also the twisting takes place. As the jaws pass over the rear end of the ribs and engage the center rib, the grippers open by the action of the spring e^3 and permit the just-twisted wire to pass through, the grippers remaining fully open during the entire return or forward stroke, the ends e^4 of the jaws freely passing the spring-restrained hinge-plates c^5.

Probably I can better illustrate the manner of gripping the wire by a reference to Figs. 31 and 32. As before stated, the gripping-jaws travel in unison with the wire, the same being relatively adjusted, so that at the commencement of the rearward stroke the barbs 1 and 3 are in the proper position (all the barbs lying horizontally) to be seized by the rear and front pairs of grippers, respectively. At or about the time the jaws engage the flat surfaces c^6, Figs. 6 and 20^a, the grippers simultaneously seize the wire at the points indicated, 1 and 3, the intermediate barb, 2, at the same instant being held by spring-actuated dogs mounted in the hollow twisting-box. The latter by its driving mechanism is then revolved about two turns while the jaws are in contact with the ribs c^6, or until opened by their engagement with the center rib. Fig. 32 shows the wire thus twisted. The twist being both right and left, the wire loses about one-half of a twist, due to the elasticity of the metal, thereby producing only one and one half twist of the wire, the alternate barbs now being at right angles with the intermediate barbs.

T indicates the twisting-box, having a small gear-wheel, F, secured to the rear end of its annular central hub, f^3, Fig. 25, &c. The portion of the box intermediate of its head and said gear is turned to fit a bearing formed in the carriage. Mounted in the rectangular chamber f^4 of the box are pivoted the two sets of hardened-steel front and rear dogs, d^3 d^4, which are adapted to retain the wire axially while it is being twisted, a barb, as 2, Fig. 32, lying intermediate of the dogs. (See also Fig. 25.) Each dog is provided at its outer end with a pin, d^5, which extends through a slotted opening, d^7, cut in the sides of the box. Flat springs d^6, Fig. 24, let into and secured to the box and engaging said pins, serve to maintain the several dogs in the normal position shown. Upon opening the gripping-jaws H and returning the carriage on its forward stroke the wire is permitted to freely pass through the twisting-box by reason of the slotted openings d^7, which allow the dogs to vibrate in the arrow direction, Fig. 25. As soon, however, as the box begins to again move rearwardly in unison with the wire, the springs d^6 simultaneously act to cause the sharpened points of the dogs to engage the wire.

The construction and operation of the wire-twisting mechanism are as follows:

h is a spur-gear mounted to revolve in bearings of the carriage and driven by the splined shaft s^5, Figs. 2, 7, &c. The teeth of the gear extend around only about one-third of its periphery and intergear with a spur-pinion, f', secured to a short shaft, l^3, mounted to revolve in bearings formed on the carriage, the ratio of the two gears being about three to one. To the opposite or front end of the shaft l^3 is secured a spur-wheel, f, which in turn meshes into a smaller gear, F, secured to the hub of the twisting-box, the ratio of the latter gears being, say, two to one. By this proportion and arrangement of gearing it is obvious that the twisting-box is adapted to make six revolutions to one of the driving-shaft s^5; but, owing to the absence of teeth from two-thirds of the gear h, the box can actually make but two revolutions, (during one revolution of the said driving-shaft,) the same being accomplished while the carriage travels rearwardly about three and one-third inches, a distance equal to one-third of the circumference of the feed-roll n, and substantially corresponding with the length of the ribs c^6, before described, which lock the gripping-jaws. Therefore it is obvious that the twisting box remains stationary during two-thirds of each revolution of the driving-shaft.

The driving-gear h of the twisting-box is provided with a pin, h', located in the rim thereof and about sixty degrees to the rear of its last gear-tooth. (See Fig. 7.) A U-shaped spring, h^2, is firmly secured to the carriage contiguous to the gear f. A stationary stud, h^3, is adapted at its upper end to engage the free end of said spring to retain it in its normal position. The spur-gear f is, as before stated, secured to the shaft l^3. A pin, h^4, projects from the rear face or side of the gear adapted to compress the spring h^2. Two ratchet-shaped notches, o^3 o^4, are formed in the front face of the gear, about forty-five degrees apart, adjacent to the rim thereof and in advance of the pin h^4. (See Figs. 10, 11, &c.)

o' indicates a spring locking bolt or pawl mounted to slide endwise in boxes secured to the carriage. The rear end of the bolt is made angular and beveled off to automatically engage the said notches o^3 o^4. This bolt serves to lock the gear f (and consequently the twisting-box) in position while it remains stationary, preventing the reaction of the wire from revolving the gear in the reverse direction when the gear-teeth h are disengaged from the pinion f'. A spring, o^5, insures the contact of the bolt with the notches.

The following is the manner of twisting the wire. Referring to Figs. 6 and 7, the carriage is represented as well under way in its rearward stroke, the gripping-jaws firmly engaging the wire and the twisting-box also retaining the wire through the agency of its dogs, and the driving-gear h being just in the act of revolving the box by means of the gear-train f' f F, the spring-bolt being in contact with the upper notch, o^3. Now, as the gear h revolves, (the carriage, grippers H, twisting-box and wire all at the same time traveling in unison,) the twisting-box is axially turned, thereby twisting the length of wire secured between the two sets of grippers, the latter being prevented from opening, because of their engagement with the ribs c^6 of the locking-plate I. At the instant of the completion of the twisting operation, which ceases when the last tooth of the driving-gear leaves the pinion f', the gear f will have made just one revolution, and its pin h^4 has compressed the spring h^2, as shown in Fig. 20^c. Immediately thereafter the tension of the spring, in connection with the torsion or relaxation of the wire itself, revolves the gear f in the opposite direction until restrained by the engagement of the bolt with the lower notch, o^4, as shown in Fig. 20^d, thereby somewhat reducing the amount of twist in the wire. At or just prior to the termination of the first half-revolution of the gear h the single tooth or pin h' engages the contiguous teeth of the small gear f', thereby causing a partial forward revolution of the gear f, which movement forces the pin h^4 from its spring h^2 and permits the end of the locking-bolt o' to again enter the upper notch, o^3, (the same corresponding to the normal position of the box,) as shown in Fig. 20^e, there to remain until withdrawn by the action of the teeth h in twisting the succeeding length of wire while advancing in the next rearward stroke, as described. The action of the pin h' further serves to vertically place the twisting-box in its normal position, the same corresponding to that shown in Fig. 25, wherein the barbs lie horizontally. Immediately following the locking of the gear f through the medium of the pin h' and bolt o' the final rearward movement of the carriage by the gear p', Fig. 9, causes the jaws to open by passing from the ribs c^6 to the center rib, c^7. The carriage now quickly returns on its forward stroke to its limit by means of the cam i and its connections, (the stroke being about six inches in each direction,) the wire and barbs at the same time passing freely through the jaws H and the box T, the several operations being continuously repeated during the running of the machine.

The construction and arrangement of the reeling mechanism are as follows:

A pulley, m, is secured to the lower feed-roll shaft, s^2, from which a belt, m', drives a pulley, m^2, secured to a counter-shaft, L, mounted in the lower portion of the machine. (See Fig. 1.) A pulley, m^3, is secured to the front end of this shaft, and a small score-pulley, m^6, immediately in its rear. A reel-stand is placed in position at the rear end of the machine to receive the finished wire.

R' indicates the uprights or side frames, united by a tie, t^3, near the floor, Figs. 3, 4.

V indicates the upper or reel shaft, and V' the lower or traverse shaft. A spool, R, is mounted to slide on the upper shaft, the same being revolved by a belt, r', leading from the pulley m^3 to the pulley m^4. A ratchet-wheel, g^2, secured to the reel-shaft, in connection with the check-pawl g^3, serves to prevent the tension of the wire from acting to revolve the reel in the opposite direction.

R^2 indicates a traverse-frame fitted to freely slide back and forth on the upper and lower shafts, its upper portion being adapted to embrace the spool R and give it a corresponding movement. The lower shaft is driven by a belt, r^2, leading from the pulley m^6 to a pulley, m^5, secured to the front end of the shaft.

S indicates a traverse-screw fitted to splines let into the lower shaft, V', said screw having right and left helical grooves or threads t^5, crossing each other, as common. The ends of the screw bear against the inner faces of the frame R^2.

t^4 designates a stud mounted to vibrate in the tie t^3. The upper end thereof is enlarged laterally and fitted to freely engage the grooves t^5. By means of this device it is obvious that the spool R is reciprocated back and forth on its shaft, while at the same time, by its revolutions, the finished wire N is continuously and uniformly wound thereon. The reels, as fast as filled with the wire, may be readily removed from the shaft and an empty one substituted.

By changing the proportions of the twisting-gears, &c., more or less twist may be put into the wire. Such change, however, is largely dependent upon the quality of the wire used, in connection with the amount of reduction or flattening to which it may be subjected.

A plain or untwisted barb-wire, as in Figs. 30, 31, is produced by simply disconnecting the carriage from the cam. This is readily accomplished by removing the joint-pin which connects the lever k to the cam-connection i, the carriage then remaining at the end of its rearward stroke with the gripping-jaws fully opened.

It is obvious that the surface of the grooves n^6 of the feed-rolls may be roughened. Such surface also may be provided with characters

or symbols to be impressed into the wire, thereby designating the manufacturer, brand, &c., as desired. It is further evident that my machine is adapted to receive wire having other forms in cross-section. The barbs in like manner may be made diamond shape, angular, &c., although I prefer the form represented in the drawings.

I claim as my invention—

1. In a barb-wire machine, the combination of mechanism for continuously feeding the wire and securing the barbs thereon and mechanisms for automatically gripping, twisting, and releasing the wire while it is passing through the machine.

2. A reciprocating carriage having mounted thereon gripping-jaws and twisting mechanism adapted to seize and twist the wire while traveling in unison with the carriage.

3. The feeding and compressing rolls having recesses in their peripheries for the passage of the barbs and provided with dies for sharpening the barbs in their passage.

4. The feeding and compressing rolls having recesses in their peripheries adapted to receive the barbs and compress them laterally upon the wire as they pass.

5. The combination of a barb-feeding mechanism and combined feeding and compressing rolls adapted to receive the barbs and secure them at regular intervals on the continuously-moving wire, substantially as described.

6. In a barb-wire machine, the combination of the following automatically-operating mechanisms, viz: a checking and feeding device for successively placing the barbs in position on the wire, continuously-revolving wire feeding and reducing and barb-compressing rolls between which the wire and barbs pass, whereby the barbs are secured upon the wire and the wire is reduced to a ribbon form intermediate of the fixed barbs, rolls for straightening the thus-flattened barb-wire, gripping-jaws adapted to retain the portion of wire to be acted upon by the twisting device, means for locking and unlocking the gripping-jaws, an intermittingly-operating twisting apparatus for twisting the length of wire retained between the gripping-jaws, and a revolving reel upon which the twisted barb-wire is wound, substantially as set forth.

7. In a barb-wire machine, the combination of a barb-feeding device, combined feeding and swaging rolls between which the wire and barbs pass and by which the barbs are secured to the wire and the wire reduced intermediate of the barbs to a ribbon form, and a revolving reciprocating wheel upon which the barb-wire is wound, substantially as specified.

In testimony whereof I have affixed my signature in presence of two witnesses.

CHARLES D. ROGERS.

Witnesses:
CHARLES HANNIGAN,
GEO. H. REMINGTON.