(No Model.)

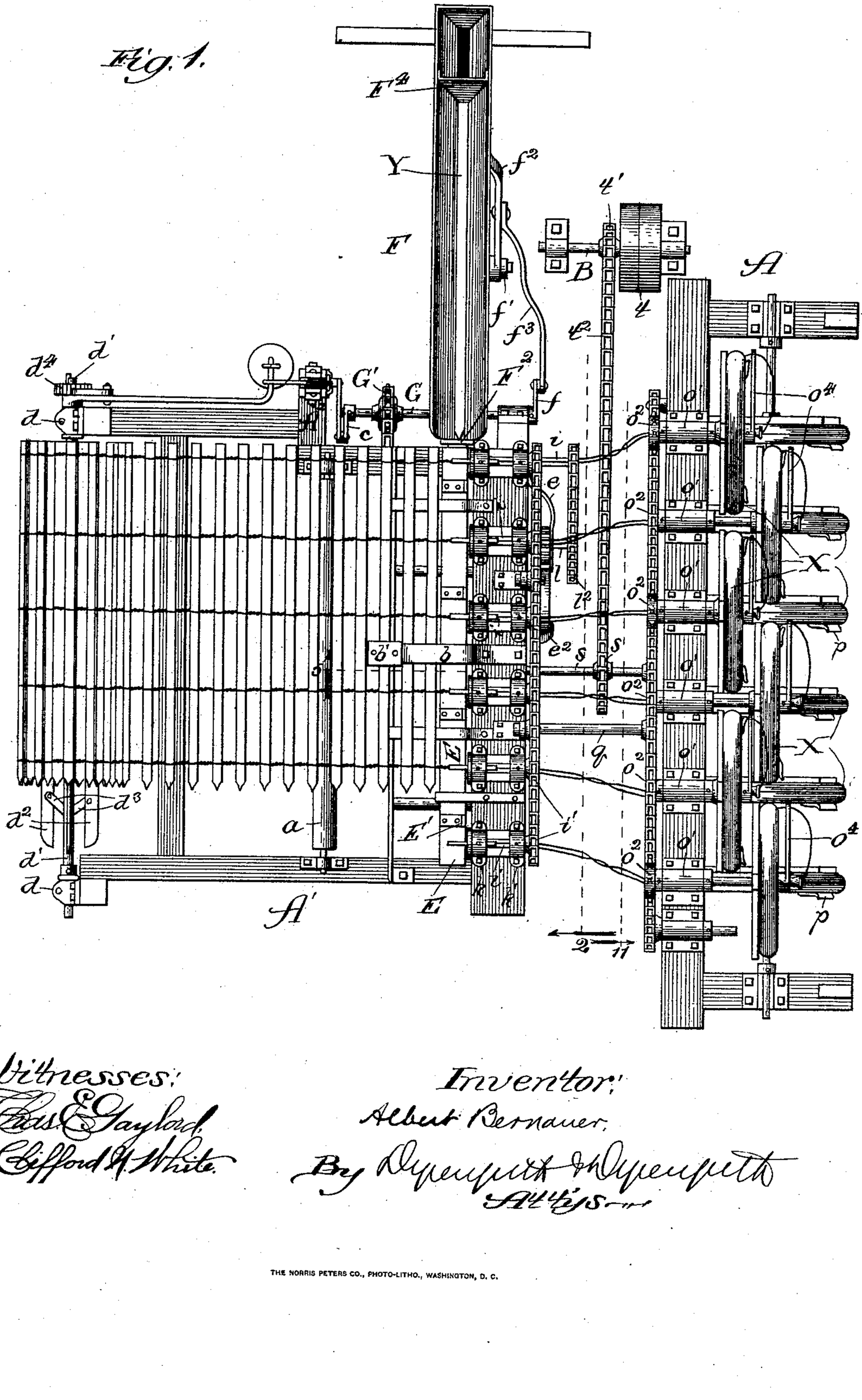
5 Sheets—Sheet 1.

A. BERNAUER.

FENCE MAKING MACHINE.

No. 472,663. Patented Apr. 12, 1892.

Fig. 1.



Witnesses:
Chas. E. Gaylord.
Clifford H. White.

Inventor:
Albert Bernauer.
By Dyer, Duell & Dyer, Duell
Att'ys.

(No Model.)

5 Sheets—Sheet 2.

A. BERNAUER.

FENCE MAKING MACHINE.

No. 472,663. Patented Apr. 12, 1892.

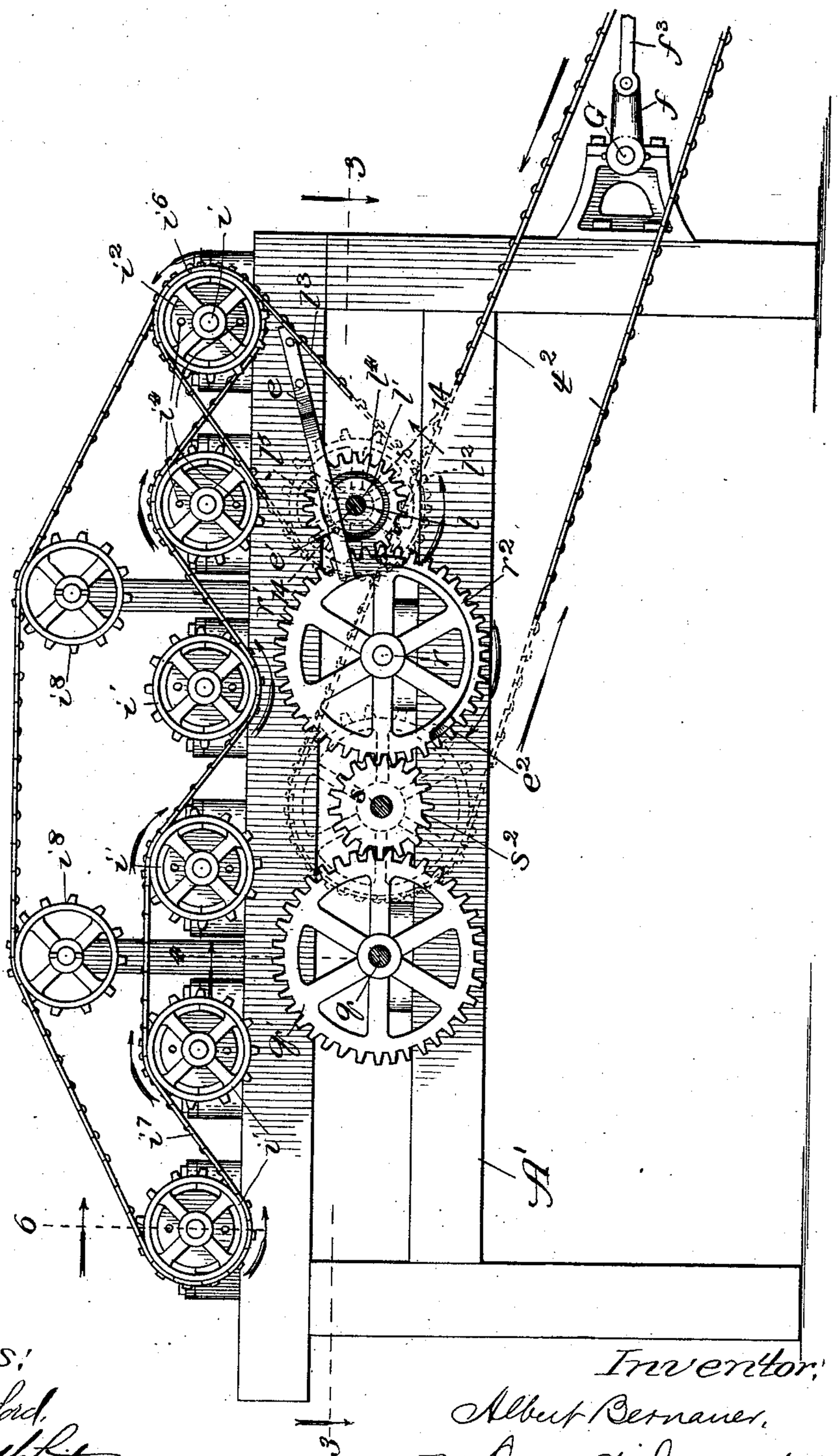


Fig. 4.

Witnesses:
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(No Model.)

5 Sheets—Sheet 3.

A. BERNAUER.

FENCE MAKING MACHINE.

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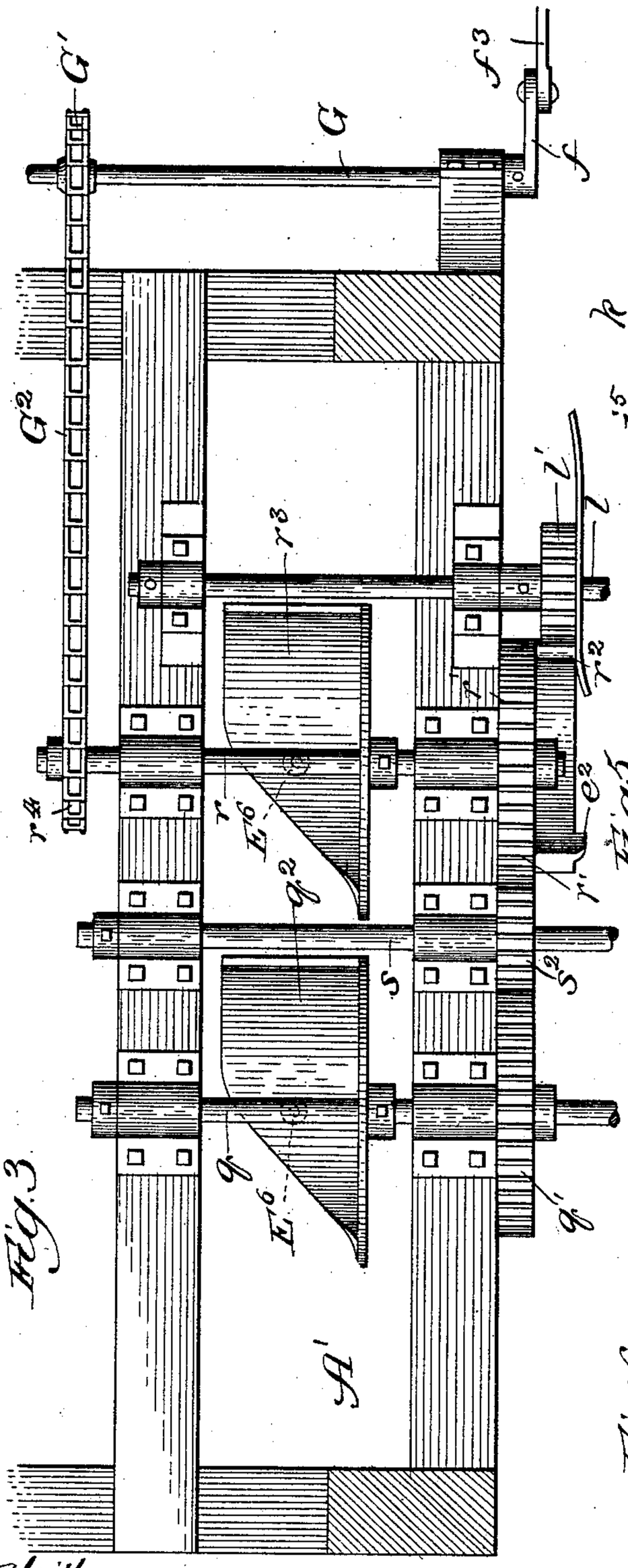

Fig. 3.

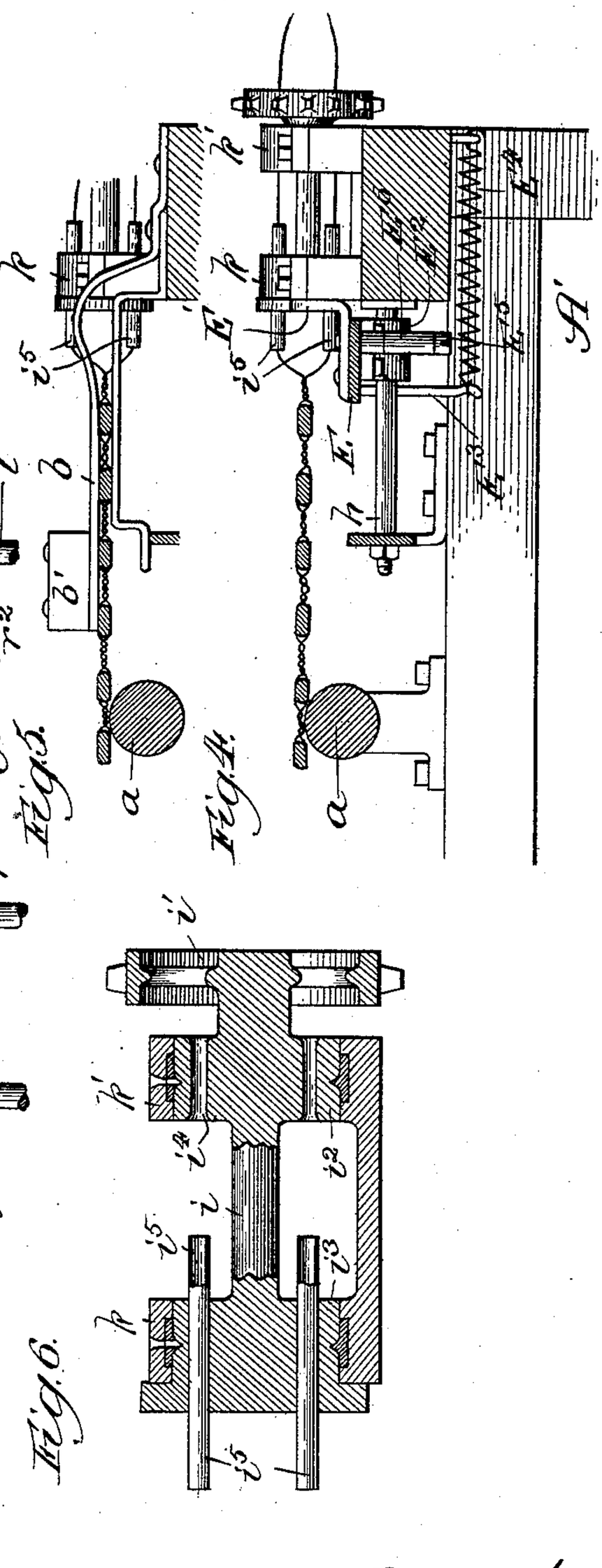

Fig. 4.

Fig. 5.

Fig. 6.

Witnesses:
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(No Model.)

5 Sheets—Sheet 4.

A. BERNAUER.

FENCE MAKING MACHINE.

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Fig. 8.

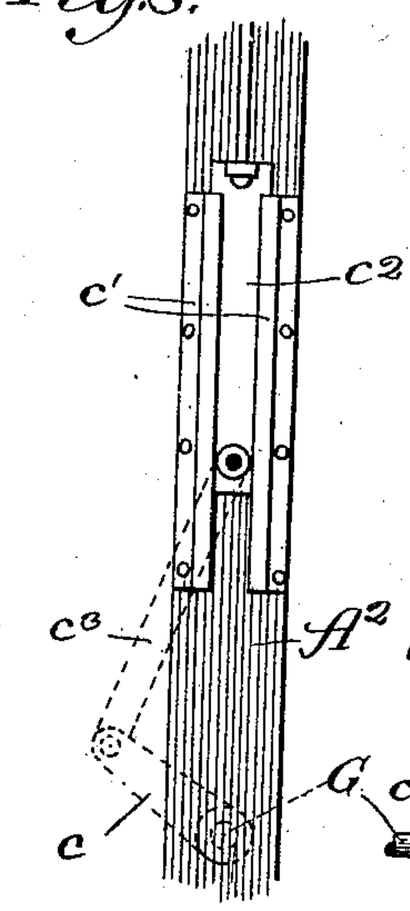


Fig. 7.

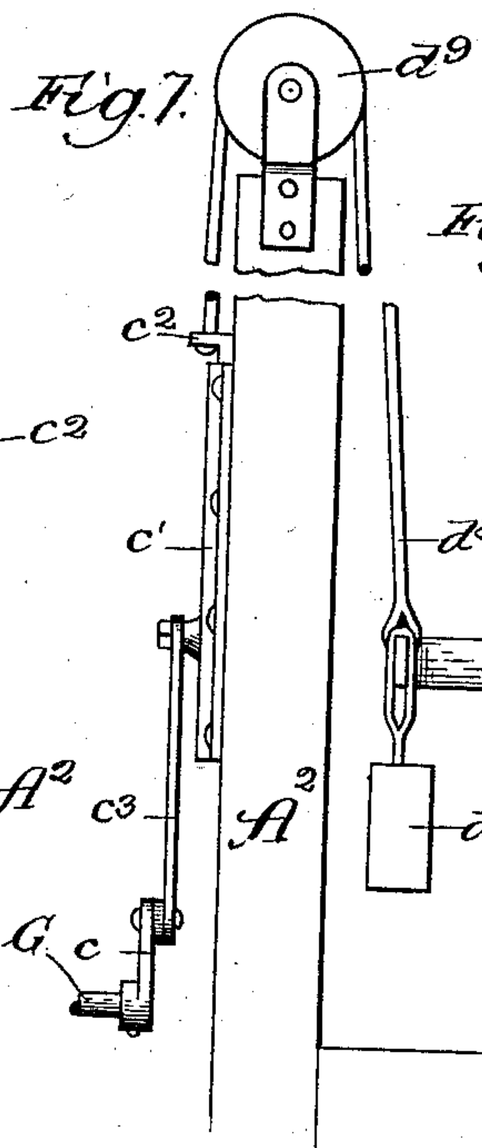


Fig. 10.

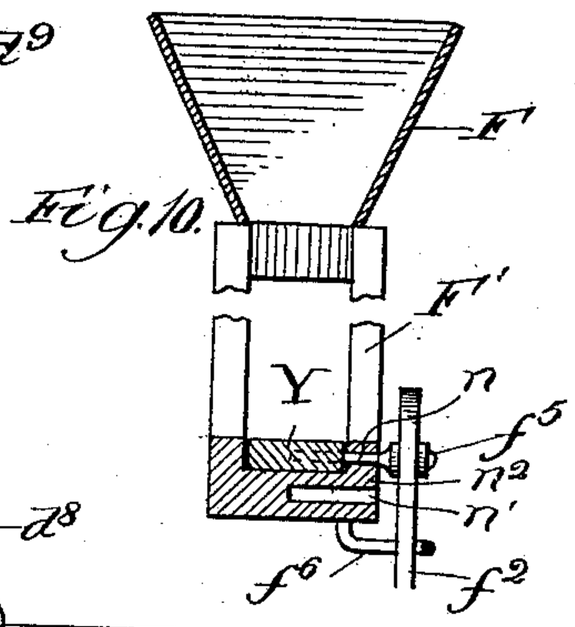


Fig. 13.

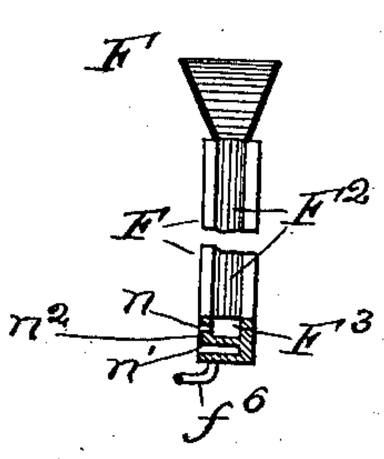
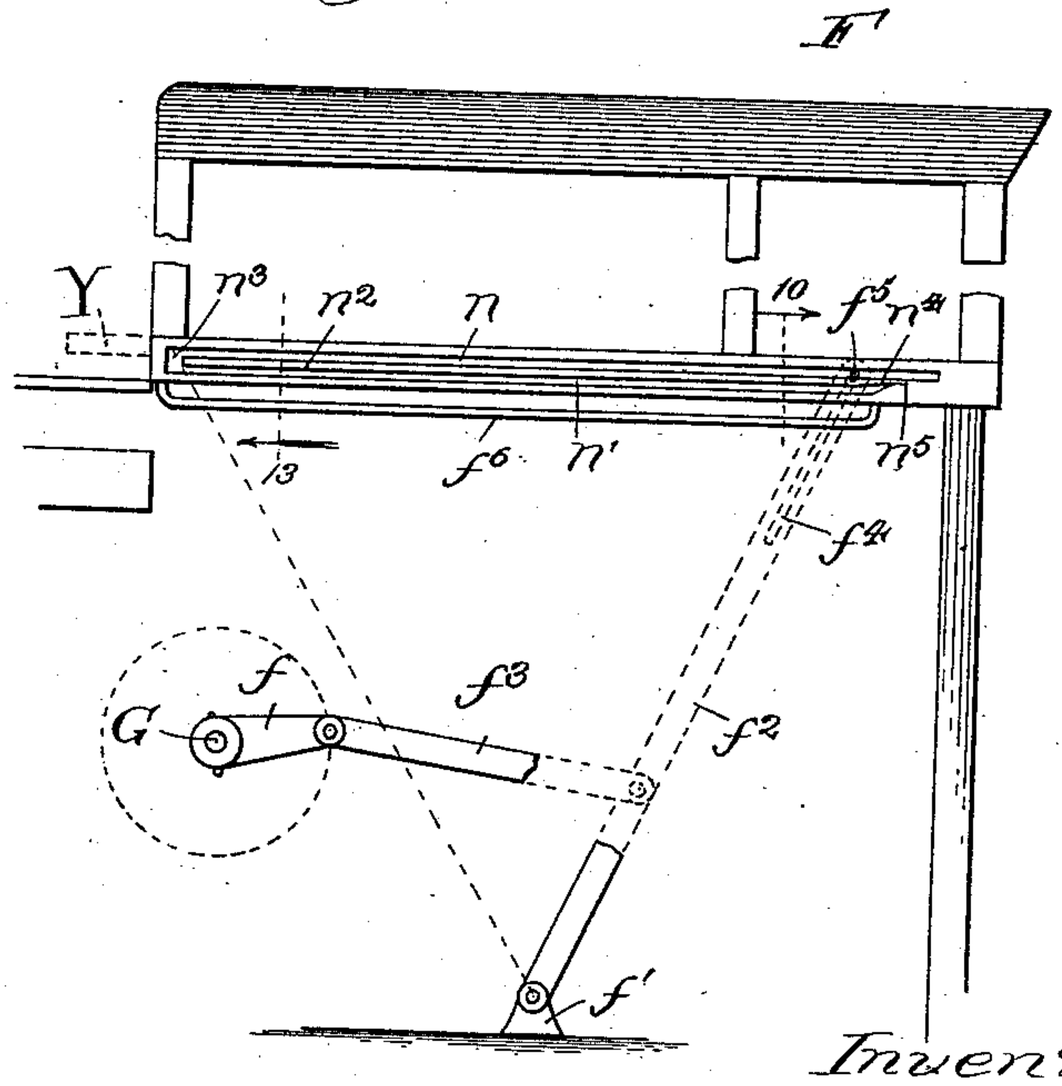


Fig. 9.



Witnesses:
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(No Model.) 5 Sheets—Sheet 5.

A. BERNAUER.

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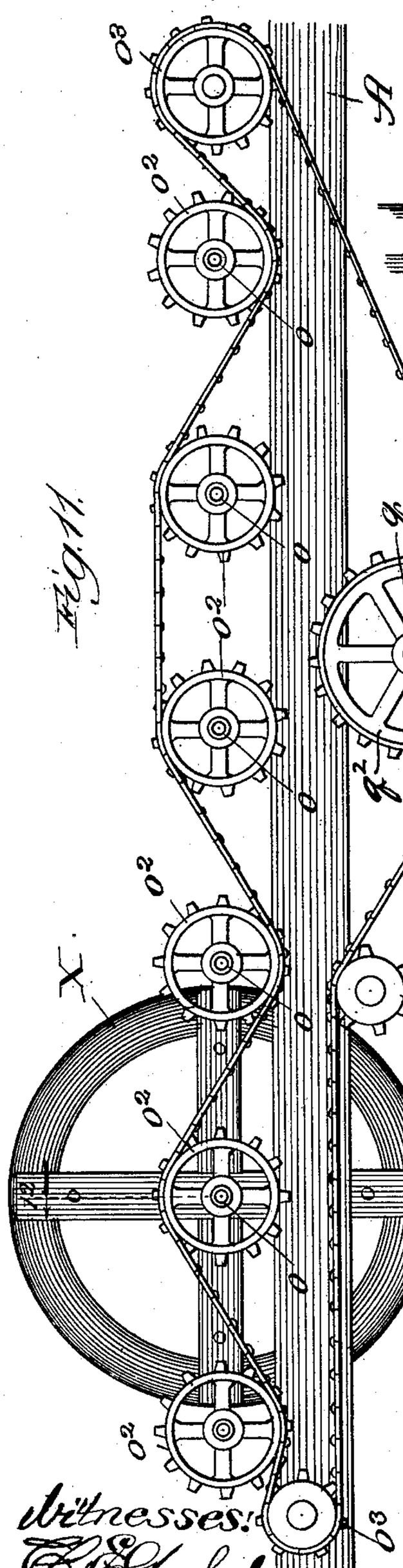

Fig. 11.

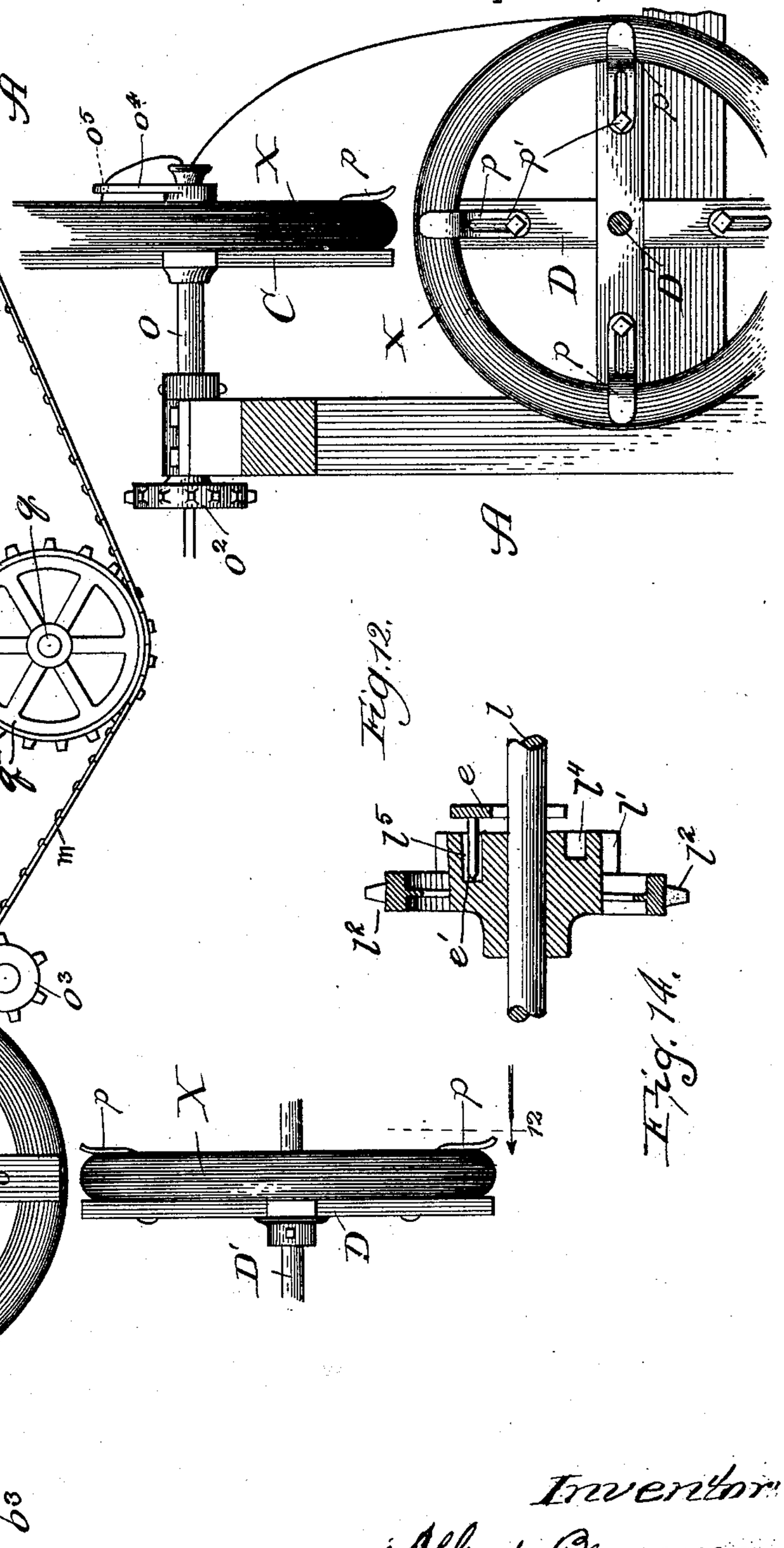

Fig. 12.

Fig. 14.

Witnesses:
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Clifford H. White.

Inventor:
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UNITED STATES PATENT OFFICE.

ALBERT BERNAUER, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO JOHN E. WAUGH, OF SAME PLACE.

FENCE-MAKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 472,663, dated April 12, 1892.

Application filed November 16, 1891. Serial No. 412,005. (No model.)

To all whom it may concern:

Be it known that I, ALBERT BERNAUER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Fence-Making Machines, of which the following is a specification.

My invention relates to an improvement in machines for making twist-wire and picket fences; and my object is to provide certain improvements in the construction thereof which render them more simple and economical to construct, as well as adapting them to operate with greater rapidity and certainty and with less attendance than other machines of the same character hitherto employed, to the end of cheapening the cost of the product.

In the drawings, Figure 1 is a top plan view of my improved machine; Fig. 2, an enlarged broken section taken on line 2 of Fig. 1 and viewed in the direction of the arrows; Fig. 3, a plan sectional view partly broken and taken on line 3 3 of Fig. 2; Fig. 4, a broken section taken on line 4 of Fig. 2 and viewed in the direction of the arrow; Fig. 5, an enlarged broken section taken on line 5 of Fig. 1 and viewed in the direction of the arrow; Fig. 6, an enlarged sectional detail view on line 6 of Fig. 2, viewed as indicated; Fig. 7, a broken side elevation of the rear portion of the machine, showing the reel turning and tensioning mechanism; Fig. 8, a broken elevation of the same detail as Fig. 7 in a view from the left of that figure; Fig. 9, a broken elevation of the picket-feeding mechanism; Fig. 10, a section taken on line 10 of Fig. 9, viewed as indicated by the arrow; Fig. 11, an enlarged broken view taken from line 11 of Fig. 1 in the direction of the arrow, features being left out to more plainly illustrate the construction; Fig. 12, a section on line 12 of Fig. 11; Fig. 13, an end elevation of the picket-rack shown in Fig. 9, and Fig. 14 an enlarged detail sectional view taken on line 14 of Fig. 2.

The main frame of the machine as it is shown in the drawings is in two parts A and A′, held together in rigid relation by being bolted to the floor or otherwise.

B is the power-shaft, having a fast and loose pulley *t*, at which the machine is belted to a suitable driving-power. Upon the shaft B is a sprocket-wheel *t*′. Journaled in the frame A′ is a shaft *s*, carrying a sprocket-wheel *s*′, which is connected by a link belt t^2 with the sprocket-wheel *t*′ and a pinion s^2. (See Fig. 2.) On opposite sides of the shaft *s* are shafts *r* and *q*, carrying cog-wheels *r*′ and *q*′, respectively, which have twice the number of teeth of the pinion s^2. The shaft *r* is journaled entirely in the frame A′, while the shaft *q*, besides being journaled in said frame, extends across the space between the frames and is journaled in the frame A, where it carries a sprocket-wheel q^2.

C and D are reels or spools adapted to receive coils or bundles of wire X. The coils or bundles X are in the condition in which they are shipped from the wire-mill. On one side of each reel C and D are preferably four brackets *p*, of the shape shown in Fig. 12, which are adapted to be adjusted radially on the reels and secured in adjusted position by clamp-screws *p*′. To place a coil X upon a reel C or D, two adjacent-lying brackets *p* may be loosened and shifted toward the center of the reel and the coil passed over the brackets. The brackets, which have been shifted as described, are then slid outward to engage the coil and tightened by means of their clamp-screws *p*′. The reels C are mounted upon hollow shafts *o*, which extend in the direction longitudinally of the machine, and the reels D are mounted upon shafts D′, located below the shafts *o* and extending at a right angle to the latter. In the drawings I have shown six hollow shafts *o*, each journaled in boxes *o*′ on the frame A. On the end of each hollow shaft *o* is a sprocket-wheel o^2, these wheels being in horizontal line with each other. A link belt *m* passes across the sprocket-wheel q^2 and each of the sprocket-wheels o^2, as shown most clearly in Fig. 11. Three idle sprocket-wheels o^3 are also journaled upon the frame A in the position shown in Fig. 11 for the belt *m* to travel over. Each shaft *o* carries one of the reels C, and below each reel C is a reel D. The shafts *o* are rendered flaring at their rear ends, and adjacent thereto they carry radially-extending arms o^4, provided near their free ends with openings or eyes o^5.

On one side of the cog-wheel *r*′ is a sector-gear or segmental rack r^2, extending about

one-third of the distance around the circumference of that wheel. The rack r^2 is formed integral with the wheel r', and its teeth are elongations of the teeth of that wheel. Journaled in the frame A′, at the side of the shaft r, is a shaft l, carrying a pinion l', adapted to be engaged and rotated by the rack r^2 once with each revolution of the shaft r. In other words, the pinion l' is given one complete revolution by the rack in one-third of each revolution of the shaft r, and being then disengaged by the rack it remains idle during two-thirds or the balance of each revolution of the shaft r. On the shaft l, adjacent to the pinion l', is a sprocket-wheel l^2. Journaled on the frame A′, in boxes k k' on the latter, are shafts i, carrying sprocket-wheels i'. In the drawings six shafts i are shown, and they are located side by side in the plane of the hollow shafts o^2 on the frame A. Each shaft i is enlarged in circumference at the parts thereof within the boxes k k' to afford disks or wheels i^2 i^3. In each wheel i^2 and located diametrically opposite each other are openings or eyes i^4, and in direct line with the eyes i^4 are short hollow tubes i^5, which extend through openings in the wheels i^3. The shaft i to the extreme right in Figs. 1 and 2 extends forward a short distance to about the plane of the end of the shaft l, where it carries an additional wheel i^2, provided with eyes i^4 and a sprocket-wheel i^6. The sprocket-wheel i^6 is geared to the sprocket-wheel l^2 by a link belt l^3, and all the sprocket-wheels i' are geared together by a link belt i^7, which may, as shown in Fig. 2, also pass across idle sprocket-wheels i^8. The paths of the link belts m and i^7 may be as shown in Figs. 11 and 2, respectively, or they may extend along any other paths which will cause co-operating wheels o^2 and i' to rotate in the same direction.

E is a ram or laterally-sliding bar carrying at intervals brackets E′, having upward-extending arms. (See Fig. 4.) The bar E is provided with bearings E^2, which surround and move upon backward-extending guide-rods h, mounted upon the frame A′. Near its opposite ends the bar E is provided with downward-extending arms E^3, and connected at opposite ends, respectively, with the arms E^3 and forward end of the frame A′ are springs E^4. The springs E^4 operate, normally, to hold the ram E in its forward position, with the upward-extending arms of the brackets E′ bearing against the boxes k to one side of the wheels i^3. Extending downward from the under side of the bar E are two arms E^5, carrying vertical rollers E^6. On the shafts r q, respectively, are wedge-shaped cams r^3 q^2. (Shown in Fig. 3.) The cams r^3 and q^2 operate with each revolution of their respective shafts to engage simultaneously the respective rollers E^6, which extend in their paths and move the ram E backward against the resistance of the springs E^4. The cams r^3 q^2 terminate at their rear ends abruptly, as shown, and when their abrupt ends pass beyond the rollers E^6 the resilience of the springs E^4 causes the ram to spring forward to its normal position. (Shown in Fig. 4.)

To prepare the machine for operation, a bundle or coil of wire X is placed upon each reel C and D. The end of the wire of the bundle on each reel C is threaded through the eye o^5 on the respective arm o^4 and through the respective hollow shaft o from the rear end of the latter. The said wire is passed thence across between the spokes of the opposite sprocket-wheel i', through one of the openings i^4 in the respective wheel i^2, and thence through the respective tube i^5. The end of the wire of the coil X on each reel D is passed through the hollow shaft o from the rear of the latter and thence across between spokes of the respective sprocket-wheel i', through the openings i^4 opposite to the openings i^4 in the wheel i^2, through which the other wire had been passed, and thence through the coincident tube i^5. The ends of the wires thus strung are fastened together by twisting them. The bundle on each reel C is caused to pay out from its center, while the bundle on each reel D pays out from its circumference, as shown in Fig. 12.

At one side of the frame A′ is a table or rack F for the pickets Y, which are to be fed to the machine at proper intervals. The rack F is hopper-shaped, as shown in the figures, and terminates in a chute F′ of the width of one picket, so that only one of the latter can rest at a time upon the base of the rack, which is in a plane a little above the upper surface of the bar E. The end of the rack F adjacent to the frame A′ is provided with a plate F^2, leaving an opening F^3 between its lower edge and the base of the rack of a size sufficient to permit one picket to pass longitudinally through it. The plate F^2 operates as a stop to prevent more than one picket being fed at a time. In a line slightly above the base of the rack is a longitudinal slot or opening n, and just below the latter and in a plane slightly below the base of the rack is a longitudinal slot n', extending parallel with the slot n. The slots n n' are divided from each other by a strip n^2 of a length slightly less than the lengths of the slots, leaving a passage n^3 from one slot to the other at the end of the rack adjacent to the frame A′ and a passage n^4 at the opposite ends of the slots, which passage is normally closed by a switch n^5. The outer end of the slot n' terminates in an inclined plane leading to the switch n^5.

Mounted in bearings at the side of the frame A′ near the base of the latter is a shaft G, carrying a sprocket-wheel G′, which is geared by means of a drive-chain G^2 to a sprocket-wheel r^4 on the rear end of the shaft r. On the forward end of the shaft G is a crank f. Fulcrumed in a bearing f' on the floor at the side of the rack F is a rod f^2, and a link f^3 is pivotally connected at opposite ends, respectively, with the free end of the crank f and the rod f^2 between the ends of the latter. In the up-

per end portion of the rod f^2 is a longitudinal slot f^4. Extending through the slots f^4 is a pin or pusher f^5, which slides freely along the slot, but is held against removal therefrom by shoulders thereon at opposite sides of the bar f^2, as shown in Fig. 10. The pin f^5 is adapted to slide in the guide-slots n n' and extends into the latter about half-way across the base of the rack. With each rotation of the shaft G its crank f, through the medium of the link f^3, swings the rod f^2 at its upper end back and forth a distance corresponding with the length of the guide-slots n n'. In the forward oscillation of the rod f^2 the pin f^5 travels along the guide-slot n to the passage n^3, whence it drops to the guide-slot n'. The rod f^2 then starts in the backward direction, and as it approaches the rear end of the slot n' the pin travels up the inclined plane of the latter, opens the switch n^5, and enters the guide-slot n again, the switch closing by gravity when the pin f^5 has passed. The switch n^5 thus operates to cause the pin as the rod f^2 is swung forward again to travel in the guide-slot n.

In the rack F forward of the switch n^5 is a vertical partition F^4, (see Fig. 1,) which causes the pickets as they drop into the chute F′ to extend at their rear ends forward of the switch. With each forward oscillation of the rod f^2 the pin or pusher f^5 strikes against the rear end of the lowest picket in the rack and forces it forward through the opening F^3, and with each backward movement of the rod f^2 the pin or pusher f^5, which has dropped into the guide-slot n', travels in a plane below the lowest picket in the rack and therefore out of engagement therewith. On the side of the rack F is a guide rod or stirrup f^6, which maintains the rod f^2 against the side of the rack and the pusher f^5 in the guide-slots.

The operation of the parts thus far described is as follows: As the power-shaft B rotates it rotates the drive-shaft s and through the latter the shafts q and r at one-half the speed of the shaft s. The shaft q rotates the hollow shafts o constantly at a speed equal to that of the shaft s. The reels C rotate with the shafts o and twist the wire, which pays out from its coil X, around the wire from the coils on their companion reels D. With each rotation of the shaft r the shaft l is given a complete revolution by the rack r^2, as before described, and in one-third of the time of the complete revolution of the shaft r. With each revolution of the shaft l the shafts i, owing to the difference in size of the sprocket-wheels i' and l^2, are given two complete revolutions. While the shafts i are at rest, which, as before stated, is two-thirds of the time, the tubes i^5, extending through each wheel i^3, must be in direct vertical plane one above the other, so that when a picket is fed, as hereinafter explained, between the wheels i^3 and the twist last formed it will be inserted between the wires. To insure the positions described of the tubes i^5 each time their rotation is stopped, I provide locking means to engage and hold the sprocket-wheel l' from the instant it is disengaged by the rack r^2 until again engaged by the latter. In the side of the wheel l' is a groove l^4, in which at one point is a deepened socket l^5. Secured upon the end of the frame A′ is a bar e of springy metal, which extends across the grooved side of the gear-wheel l' and terminates at one side of the rack r^2. The bar e carries a pin e', adapted normally to enter the socket l^5 in the wheel l' whenever the latter is turned to a certain point. At the forward end of the rack r^2 on the side of the latter is a cam e^2, adapted to engage the end of the bar e and force it outward against its resistance and withdraw the pin e' from the socket l^5. In the rotation of the shaft r at the moment the rack r^2 engages the pinion l' the cam e^2 engages the bar e and withdraws the pin e' from the socket l^5, whereby the wheel l' is free to rotate with the rack. Just after the wheel l' has commenced to rotate the cam e^2 releases the bar e and the pin e' remains pressed into the groove l^4 by the resilience of the rod e. On the instant that the rack r^2 disengages the wheel l' the latter, as aforesaid, has been given one complete revolution, which brings its socket l^5 coincident with the pin e', which enters it and maintains the shaft l rigid until the next operation. As the shafts o rotate constantly, while the shafts i rotate but one-third of the time, a twist of the wire is formed between the said shafts in the space between the frames A and A′. The machine is so timed that when the shafts o have rotated one and one-half times the shafts i are started up and rotate twice, while the shafts o receive half a revolution. As before stated, the shafts o and i, which operate upon the same wires, must rotate in the same direction. Therefore when the shafts o have rotated one and a half times they produce a one-and-one-half twist of the wires between the frames A and A′ before the shafts i commence to operate. When, however, the shafts i operate, they complete two revolutions at the same instant that the shafts o complete their two revolutions, and thus untwist the wires between the frames, so that at the end of the two revolutions the wires extend untwisted between the frames. At the moment that the shafts i cease rotating and are held by the engagement of the locking-bar e with the gear-wheel l' the picket-feed mechanism above described commences to operate—that is to say, the pusher f^5 commences to travel forward in the guide slot n and forces a picket longitudinally into the machine between the guide-tubes i^5. As soon as the picket reaches its proper position, the cams q^2 r^3 engage the rollers E^6 on the downward-projecting arms E^5 of the ram and carry the latter forward, as above described. In the forward movement of the ram the upward-projecting arms of its brackets E′ engage the picket and press it forward against the twist last made, leaving

a space between the forward ends of the tubes i^5 and the adjacent side of the picket. As soon as the picket has been pressed forward, as described, the twisters (meaning the shafts i and wheels carried thereby) rotate to produce a double twist between the said picket and twister. When the twisters have commenced to operate as described, the cams q^2 r^3 disengage the rollers E^6 and the ram springs back to its normal position, as before described.

The rack F is kept supplied with pickets and the operation is continuous, as above set forth. As the fence is formed it is wound up into bundles for shipment by the following mechanism: Extending across the back of the machine in bearings d on the frame A′ is a shaft d', carrying strips or bars d^2, preferably four in number and disposed equidistant from each other around the said shaft. The bars d^2 are connected with the shaft by toggle-levers d^3, which permits the reel or take-up which they form to be expanded or contracted in circumference. On the end of the shaft G opposite its end carrying the crank f is a crank c. At the side of the frame A′ and forming a part thereof is a standard A^2. On the face of the standard A^2 are guides c' for a vertically-reciprocating bar c^2. The bar c^2 is pivotally connected by means of a link c^3 with the free end of the crank c. With each revolution of the shaft G the bar c^2 is thus reciprocated up and down in the guides c'. On the end of the shaft d' is a ratchet-wheel d^4, and fulcrumed upon the said shaft at the side of the ratchet-wheel is a lever d^5, carrying a pivotal dog d^6, which engages the teeth of the ratchet-wheel d^4. At the free end of the lever d^5 is a weight d^7, and at its said end the lever is connected by means of a rope d^8, or other flexible medium, with the bar c^2, the rope passing over a pulley-wheel d^9 at the top of the standard A^2. Thus with each rotation of the shaft G the bar c^2 is drawn in a downward direction, and through the medium of the rope d^8 raises the free end of the lever d^5. As the lever d^5 is swung upward its dog d^6 slides over the teeth of the ratchet-wheel d^4. In the further rotation of the shaft G the bar c^2 rises and the lever d^5 is carried downward by its weight d^7. In the downward swing of the lever d^5 the dog d^6 engages the ratchet-wheel and turns the shaft d' in the direction to wind the fence upon it. While the lever d^5 will be caused to rise to the same point with each downward reciprocation with the bar c^2, the descent of the lever will depend upon the growth of the bundle of fence as it is reeled. In other words, as the fence is formed the reel d^2, by rotating as described, rolls up the fence and the weight d^7 tensions the fence between the twisters and bundle. Upon the top of the frame A′ is a backward-extending spring-arm b, provided at its free end with a weight b'. The weighted end of the spring b rests gently and yieldingly upon the web of fence and operates to hold the latter down. One or more rollers a may be mounted, as shown, in bearings on the frame A′ for the fence to travel over.

It will be seen from the foregoing description that the operation of the machine is positive and accurate, and while I prefer to construct the machine as described of course it may be modified in the matter of details without departing from the spirit of my invention. I do not therefore confine my invention to the exact construction shown and described.

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

1. In a fence-making machine, the combination, with the wire feed and twisting mechanisms, of a support for pickets at one side of the machine, comprising a rack in which the pickets are placed, one upon the other, in a single tier resting on the base of the rack, and intermittent feed mechanism for transferring pickets from the rack to the machine, comprising a reciprocating pusher and guide mechanism therefor operating to direct the pusher in the forward movement to engage the end of the lowest picket of the tier and advance it from under the balance of the tier and in the backward reciprocation to move out of the path of the pickets, and a stop at the rack to prevent the pickets above the lowest in the tier from being advanced therewith, substantially as described.

2. In a fence-making machine, the combination, with the wire feed and twisting mechanisms, of a support for pickets at the side of the machine, an upper and a lower guide-slot in the support, an oscillating rod, and a pusher operated by said rod to move forward in the upper guide-slot and backward in the lower guide-slot, substantially as described.

3. In a fence-making machine, the combination, with the wire feed and twisting mechanisms, of a support for pickets at the side of the machine, and means for engaging and advancing the pickets into the machine, comprising a reciprocating pusher and a guide therefor on the support, comprising an upper slot n, a lower slot n', openings n^3 n^4 between the slots at opposite ends, and a switch at the opening n^4, substantially as described.

4. In a fence-machine, the combination, with the wire and picket feed mechanisms and twisters, of a ram for the pickets, comprising a laterally-sliding bar provided with upward-extending arms to engage the pickets and downward-extending arms E^5, spring mechanism resisting movement of the ram from its normal position, and revolving wedge-shaped cams operating with each revolution to engage the ram at the arms E^5, advance, and then release the same, substantially as described.

ALBERT BERNAUER.

In presence of—
M. J. FROST,
J. N. HANSON.