No. 754,552. PATENTED MAR. 15, 1904.

A. E. ELLINWOOD.

MACHINE FOR INSERTING TRANSVERSE WIRES IN SOLID RUBBER TIRES.

APPLICATION FILED AUG. 5, 1903.

NO MODEL. 7 SHEETS—SHEET 1.

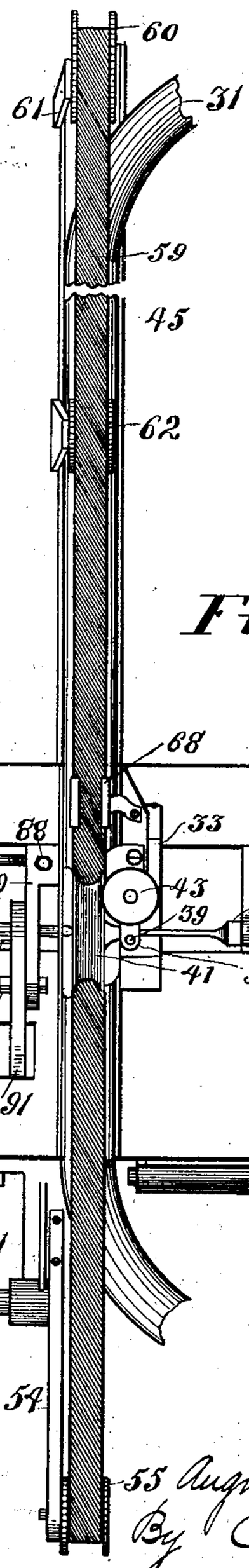

Fig. 1.

Witnesses:
Maude Spriler.
W. Bowman.

Inventor;
Augustus E. Ellinwood,
By C. C. Humphrey
Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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NO MODEL. 7 SHEETS—SHEET 2.

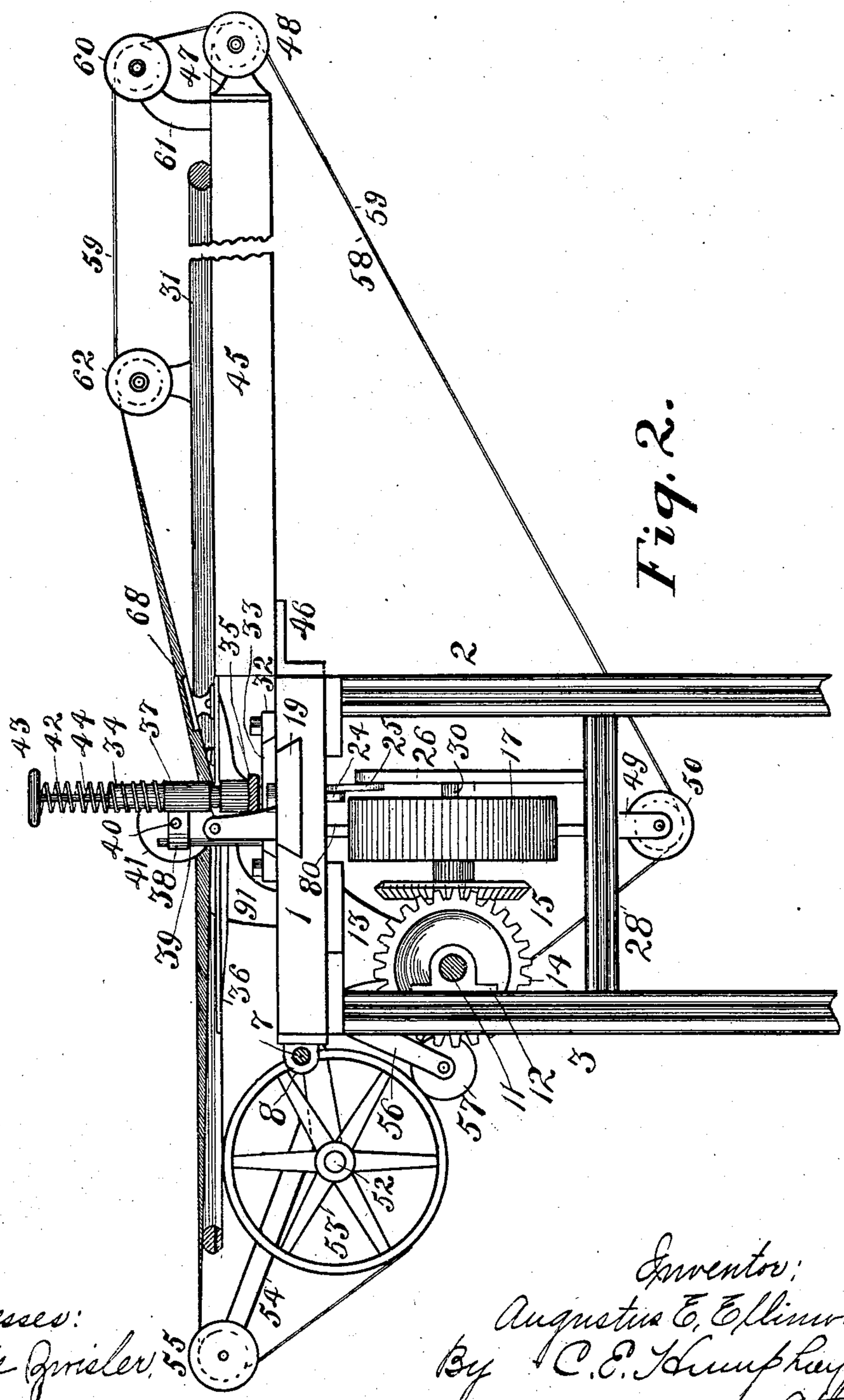

Fig. 2.

Witnesses:
Maude Grisler.
N. Bowman.

Inventor:
Augustus E. Ellinwood.
By C. E. Humphrey
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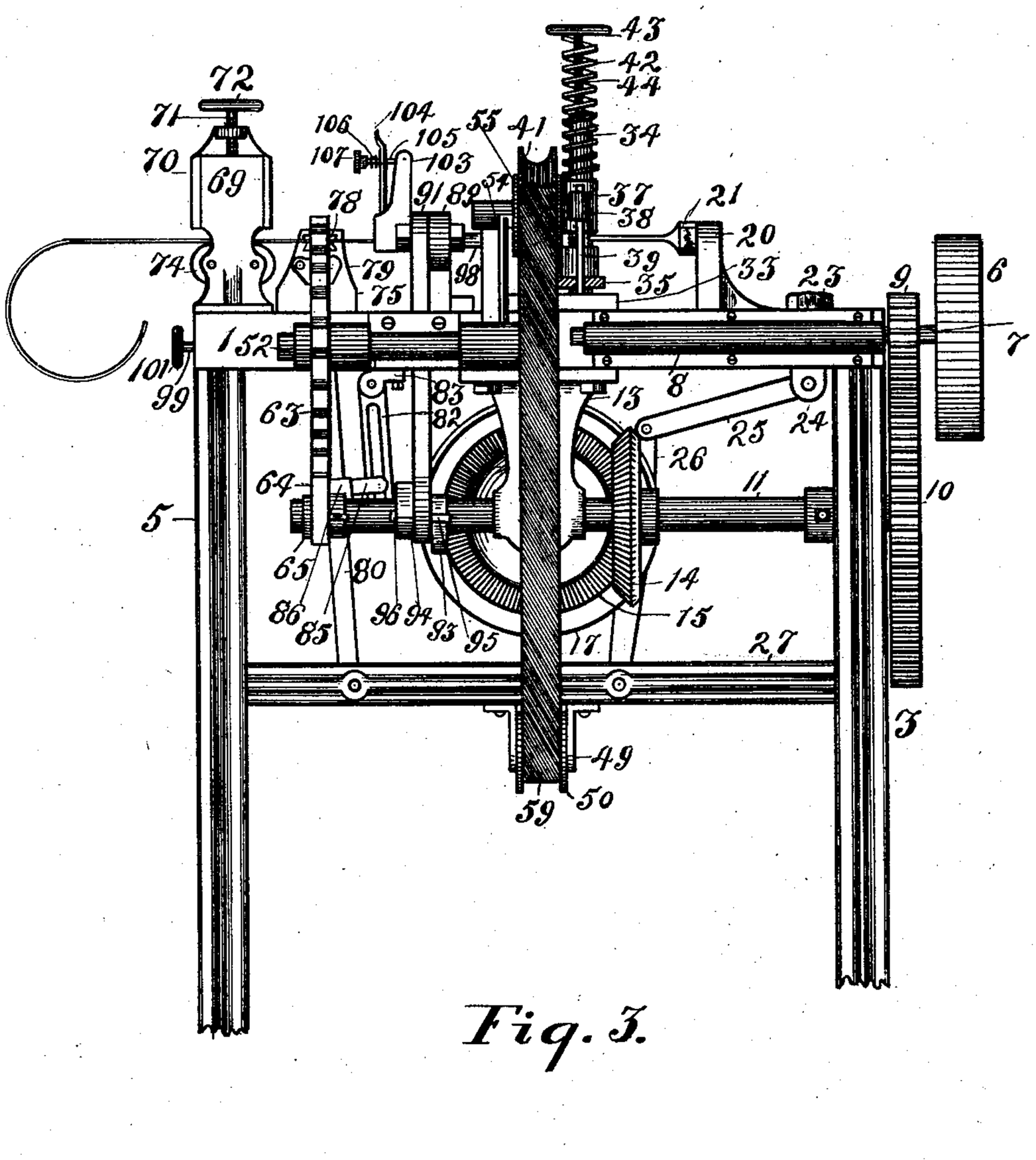

Fig. 3.

Witnesses:
Maude Zwisler,
N Bowman.

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Augustus E. Ellinwood,
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NO MODEL. 7 SHEETS—SHEET 4.

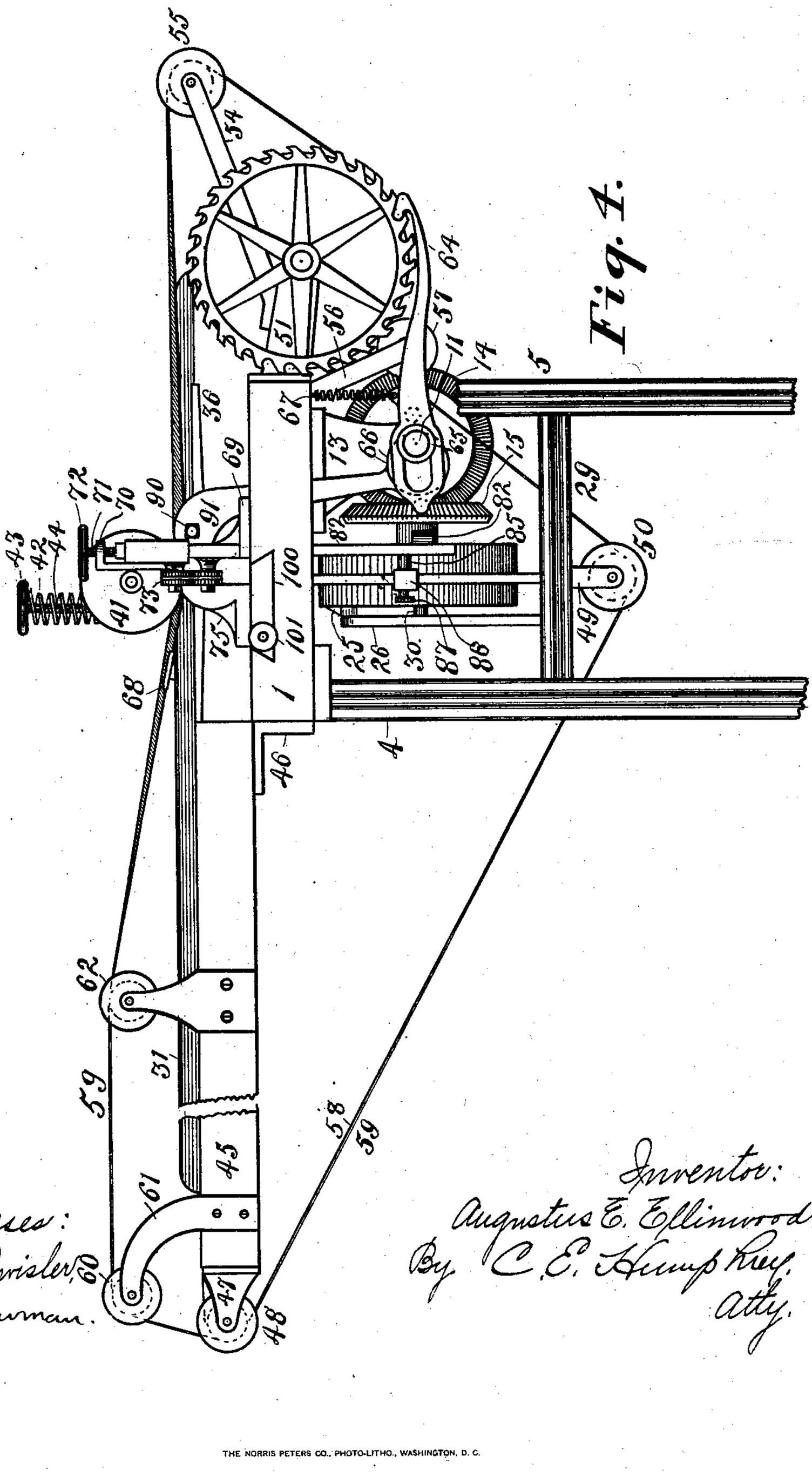

Fig. 4.

Witnesses:
Maude Quisler,
N. Bowman.

Inventor:
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NO MODEL. 7 SHEETS—SHEET 5.

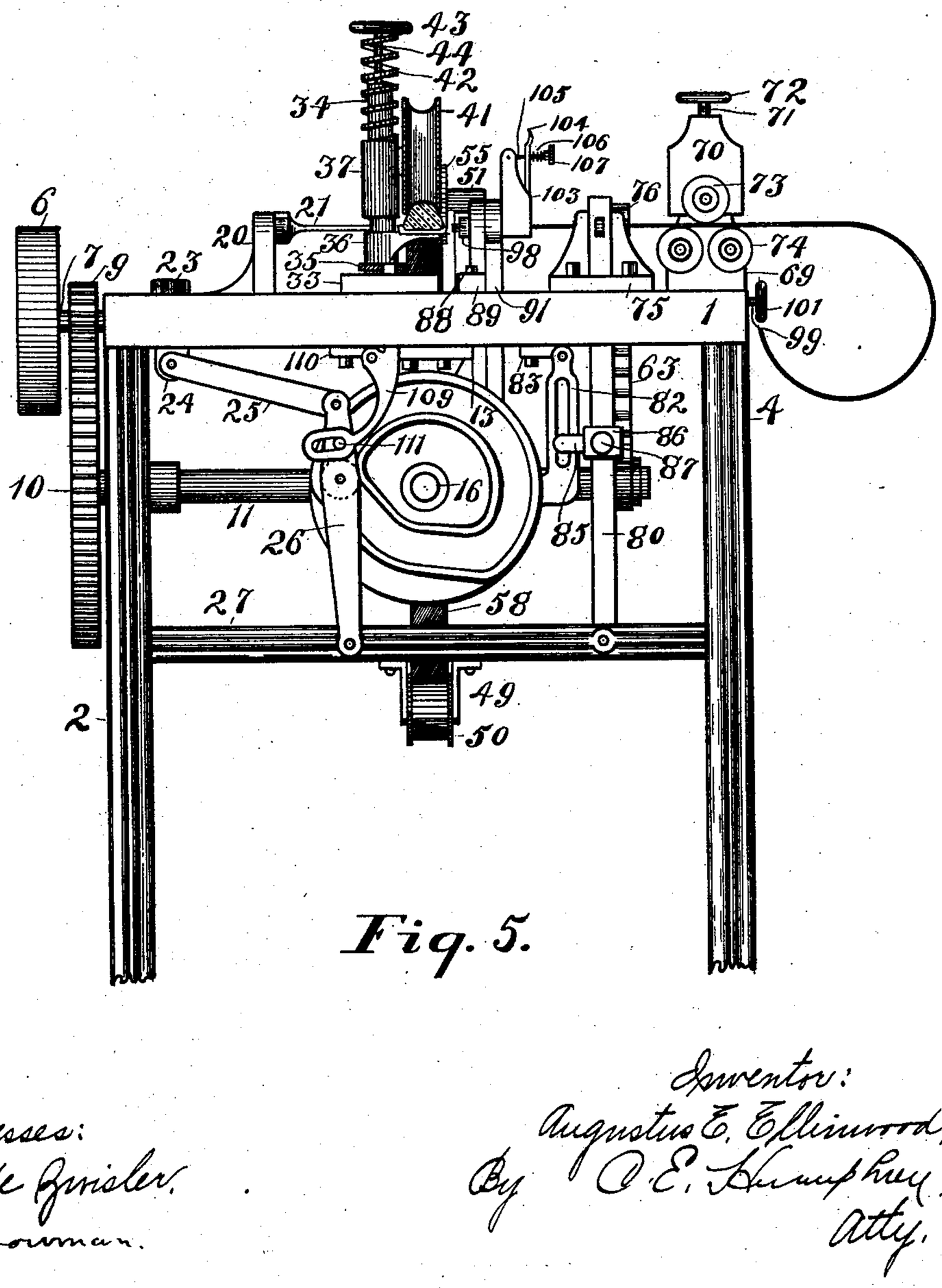

Fig. 5.

Witnesses:
Maude Spieler.
N. Bowman.

Inventor:
Augustus E. Ellinwood,
By O. E. Humphrey.
Atty.

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NO MODEL. 7 SHEETS—SHEET 6.

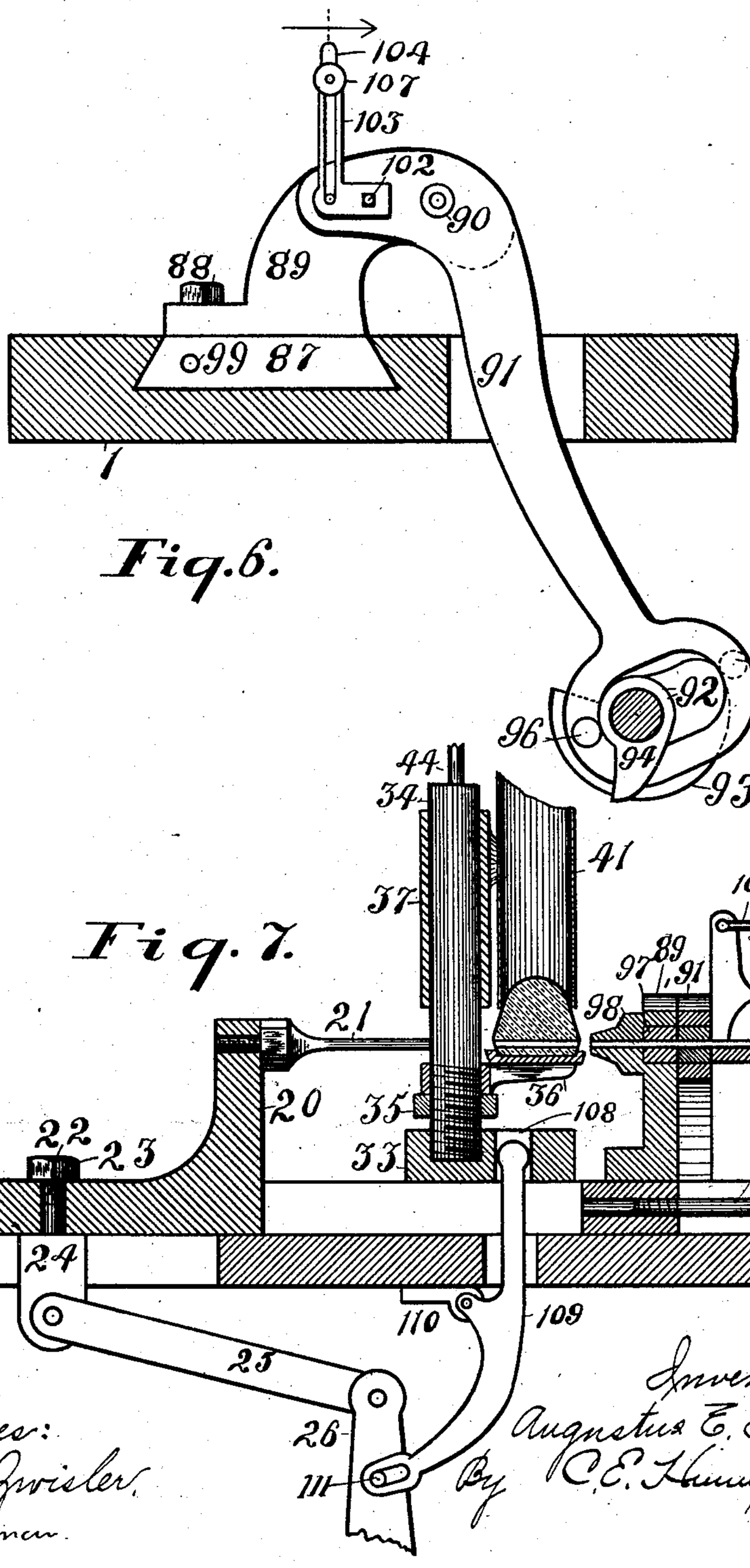

Fig. 6.

Fig. 7.

Witnesses:
Maude Spissler.
N. Bowman.

Inventor:
Augustus E. Ellinwood.
By C. E. Humphrey
Atty.

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NO MODEL. 7 SHEETS—SHEET 7.

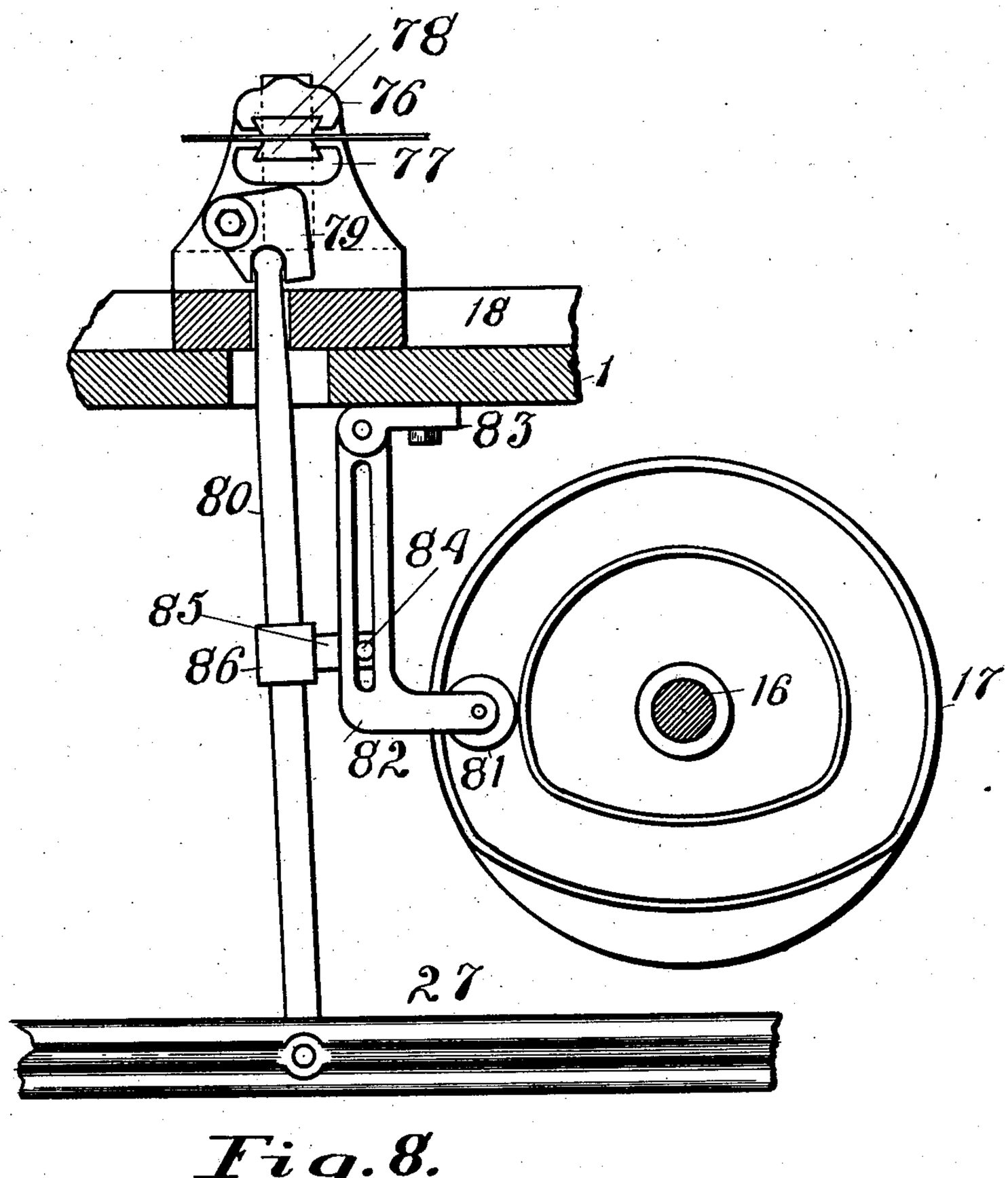

Fig. 8.

Witnesses:
Maude Spriesler.
N. Bowman.

Inventor:
Augustus E. Ellinwood,
By C. E. Humphrey
Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 754,552. Patented March 15, 1904.

UNITED STATES PATENT OFFICE.

AUGUSTUS E. ELLINWOOD, OF AKRON, OHIO.

MACHINE FOR INSERTING TRANSVERSE WIRES IN SOLID-RUBBER TIRES.

SPECIFICATION forming part of Letters Patent No. 754,552, dated March 15, 1904.

Application filed August 5, 1903. Serial No. 168,294. (No model.)

To all whom it may concern:

Be it known that I, AUGUSTUS E. ELLINWOOD, a citizen of the United States, residing at Akron, in the county of Summit and State of Ohio, have invented a certain new and useful Improvement in Machines for Inserting Transverse Wires in Solid-Rubber Tires, of which the following is a complete specification.

My invention has relation to machines for inserting cross-wires in solid-rubber tires.

In the manufacture of certain kinds of tires transverse cross-wires are inserted and vulcanized into the body of the tire upon which the longitudinal wires are adapted to rest and be sustained with a view to holding and retaining the tire in the channeled iron tire in which it is to be seated. Heretofore machines have been used for the insertion of cross-wires in this class of tires in which the machine simultaneously places a cross-wire in position and at the same time bores an opening for the next succeeding wire. Objection has been found to the use of this machine; and consequently the objects of my invention are to produce a machine in which the insertion of the cross-wires in the tire shall be rapid and attended with absolute accuracy as to location and depth of insertion and in which the withdrawal of the needle which perforates the tire will be immediately followed by the insertion of the wire which is to be placed in the opening made by the needle.

Another object is to so make the machine that the longitudinal distance between the cross-wires, the length of the wires, and their position can accurately be adjusted.

To the accomplishment of the aforesaid objects my invention consists in the peculiar and novel construction, arrangement, and combination of the various parts hereinafter described, reference being had to the accompanying drawings, forming a part hereof.

In the accompanying drawings, in which similar reference-numerals indicate like parts in the different figures, Figure 1 is a plan of my invention. Fig. 2 is a side elevation from the right of Fig. 1; Fig. 3, an end elevation looking from the bottom or lower end of Fig. 1; Fig. 4, a side elevation looking from the left of Fig. 1; Fig. 5, a view looking from the upper or front end of Fig. 1; Fig. 6, a detail of the shear or wire-cutting device and its accompanying mechanism; Fig. 7, a section through the tire, showing the needle and wire-inserting device; and Fig. 8, an enlarged detail of the mechanism whereby the wire to be inserted in the tire is fed forward.

In the drawings, 1 represents a flat-topped table, preferably of metal, which forms a supporting medium for the balance of the mechanism, to be hereinafter described. This table or platform is supported by four legs 2 3 4 5. The power for driving the mechanism, to be hereinafter described, is obtained from any desired or preferred source of power, which may be delivered upon a pulley 6 by means of a belt. This pulley 6 is mounted on a shaft 7 in a long bearing 8, fastened to the side of the table 1. On this shaft 7 is a spur-pinion 9, which meshes into a large spur-wheel 10, mounted on a shaft 11, supported by a bracket 12, attached to leg 3 of the table and in a bearing 13, bolted to the under face of the table-top 1. On the shaft 11 is mounted a miter-gear 14, which is arranged to mesh into a similar miter-gear 15, mounted on a shaft 16, supported by bearing 13 at substantially right angles to the shaft 11. Upon the shaft 16 is a double cam 17, having races on both faces for a purpose to be hereinafter described.

It has been found by experience that in order to properly insert wires in a tire a puncturing-needle capable of forming an opening in the green unvulcanized tire is first necessary to make an opening therethrough, which must be immediately followed by the insertion of the wire before the opening has time to sufficiently close and seal itself to prevent this insertion.

The needle-operating mechanism is as follows: Transversely across the upper face of the table 1 is a dovetailed groove 18, in one end of which is arranged to play backward and forward a carriage 19, on the upper face of which is a standard 20, from which projects a puncturing-needle 21, whose operation is to puncture at determinate intervals the green unvulcanized tire. Through the carriage 19 projects a bolt 22, having on its upper end a nut 23 and on its lower end a head

24, to which is attached a link 25, the opposite end of which is attached to the upper end of a vertical lever 26, the lower end of which is hinged to a cross-bar 27, sustained by being fastened to two cross-bars 28 and 29, extending, respectively, between legs 2 and 3 and 4 and 5. On the central portion of this vertical lever 26 is a roller 30, which plays in the race on that face of the double cam 17 which is toward the top in Fig. 1, so that as the cam 17 rotates the carriage 19 will be reciprocated backward and forward, bearing with it the needle 21. The tire 31, which is presented to the puncturing-needle in an unvulcanized condition, is fed into operative position to receive the stroke of the needle by the following mechanism: Mounted on the upper face of the table 1 outside of and in alinement with the slot 18 are guides 32, between which is slidably mounted a carriage 33, rising from which vertically is a shaft or column 34, near the lower end of which is an adjusting-nut 35, arranged to mesh in screw-threads cut on the outside of the shaft 34 and to raise and lower by its revolutions thereon. Immediately above this adjusting-nut 35 is a hollow cylindrical tube-like casing having projecting therefrom a long flat platform 36, with its flat portion of a desired configuration to receive the base portion of the advancing tire. It will be obvious, of course, that in puncturing tires of different sizes this platform for the reception of the tires may be varied to suit the different sizes thereof. The vertical position of this platform for the reception of tires is capable of being changed by the revolution of the adjusting-nut 35. Surrounding the shaft 34 immediately above the tubular portion of the platform 36 is a similar tube 37, having projecting from one side thereof an arm 38, which is perforated vertically and is intended to inclose a straight vertical pin 39, rising from the carriage 33, with a view to keeping the tube 37 at exactly the right horizontal position on the shaft 34. From the arm 38 projects horizontally a pin 40, on which is mounted a concave-faced roller 41, which is adapted to press down or rest upon the upper rounded face of the passing tire.

In order to insure sufficient pressure of the roller upon the passing tire, a coiled spring 42 surrounds the shaft 34 and extends considerably above its upper end and is pressed down by a cap or hand-wheel 43, mounted on a shaft 44, which enters the upper end of the shaft 34 and is capable of vertical adjustment by being screw-threaded. From this it will be seen that any pressure caused by the downward screwing of the shaft 44 into the top of the shaft 34 will exert a corresponding pressure upon the spring 42 and likewise upon the cylindrical portion 37, and from thence it is transferred to the roller 41 and onto the tire 31. From the upper side in Fig. 1 of the drawings and to the right in Fig. 2 extends a platform or support 45, which is supported at its outer end in any preferred manner and at its inner end by a bracket 46, fastened to the table 1. Over this platform, which may be trough-shaped on its upper surface, passes the incoming tire 31, and the inner end of this trough or platform 45 is adapted to abut against and nicely meet one end of the platform 36, so as to present a continuous course over which the tire may travel. This platform 45 may be of any desired length and is broken in the drawings with that object in view.

On the end of the platform 45 is a bracket 47, which sustains a pulley 48, for a purpose to be stated.

Depending from the cross-bar 27 are supports 49, between which is mounted a pulley 50. Attached to the lower face of the table 1 in Fig. 1 is a double bracket 51, in the outer ends of which is a cross-shaft 52, having mounted thereon a large pulley 53, in exact vertical alinement with the center of the trough 45 of the platform 46. Rising from this bracket 51 is a smaller bracket 54, having mounted in its outer end a pulley 55. The face of this pulley and the face of the pulley 53 are in exact alinement. Depending at a slight angle from the lower face of the table 1 in Fig. 1 and the left in Fig. 2 is a bracket 56, having mounted in its lower end a pulley 57, adapted to bear against the face of the pulley 53. A belt 58 passes around the pulley 48, along the base of the platform 45, over the platform 36, around the outer face of the pulley 53, between it and the pulley 57, and over the pulley 57, and down under the pulley 50, back to the pulley 48. Upon this belt the tire upon which this machine is designed to operate is intended to ride and be supported in its course past the puncturing-needle. In feeding this tire in onto the platform 45 it is slightly curved and dropped into the trough upon the belt 58, and as it leaves the platform 36 it is drawn out either by hand or by suitable machinery, which it is here unnecessary to describe, as the means of taking care of the tire after it has received the cross-wires is a matter not pertaining particularly to this invention.

In order to cause a progressive step-by-step movement forward of the tire to insure the regular determinate puncturing by the needle at determinate intervals, a second belt 59 is arranged to pass over the upper face of the tire and pass forward therewith while under the roller 41 and out over the pulley 55, down under the pulley 53, and over the pulley 57, from thence down under the pulley 50 in immediate contact with the before-mentioned belt 58, around the outside of the pulley 48 and up over a pulley 60, suitably sustained by a bracket 61 above the tire, and along over a number of pulleys 62, sustained in any preferred manner, by brackets or otherwise, so as to keep above the tire until just at the point that the roller is pressing downward thereon.

From this it will be seen that the tire is practically clamped by means of the roller 41 between the belts 58 59 while under the roller and that if both belts are moved simultaneously in one direction the tire will, as a matter of course, be obliged to move forward therewith. In order to cause these two belts to move forward in unison, there is mounted on the shaft 52 a ratchet-wheel 63, which is caused to move forward a definite distance by means of a long pawl 64 entering the notches in the ratchet-wheel. This ratchet-wheel 63 is caused to reciprocate forward and backward by being slotted to surround a collar 65, having at one end an enlarged portion to retain the pawl in place and having on the other side of the pawl a cam 66. This cam is designed to engage pins extending transversely from the side of the pawl at both ends of the slotted portion thereof. This collar 65, bearing the cam 66, is mounted on the shaft 11, so that as the cam 66 revolves with the shaft 11 the pawl will reach out and engage the next adjacent notch and draw forward the ratchet-wheel 63 a proportional part of its revolution, and this part is accurately determined so as to place the punctures in the tire at the desired distance apart. The ratchet-wheel 63 being mounted on the same shaft as the pulley 53, they revolve in unison and draw forward the two belts at the same time, the belts being held firmly against the wheel 53 by reason of the pressure of the pulley 57.

A coiled spring 67 constantly tends to draw upward the working face or hooked end of the pawl 64, so as to cause it to engage the ratchet-wheel 63.

As the upper belt 59 is fed under the roller 41 it is steadied and guided by a guide 68, fastened to the platform 36, through which the belt must pass just previous to passing under the roller 41.

Having now described the means by which the puncturing-needle is caused to operate and the means by which the tire is supported and fed progressively forward, a description of the means by which the wires are placed in the tire follows: The wire which is used for insertion in the tires is generally steel with a spring-temper and is supplied to the machine in a coiled condition, which may be placed on a reel supported on the floor or on a bracket attached to the left side of the machine in Fig. 1, from whence it is fed to the mechanism to be hereinafter described. Any form of reel may be used, an illustration of which is not necessary to the comprehension of this invention, and the coiled condition of the wire is simply indicated in Figs. 3 and 5 by bending the wire into a loop. In view of the fact that the wire is in this coiled condition a wire-straightener is absolutely necessary before the wire can be utilized by this machine. Hence I place on the left side of the table-top 1 a wire-straightener, which consists of an upright standard 69, on the beveled sides of which slide a vertically-movable carriage 70, the vertical position of which is determined by a screw 71, provided at its upper end with a hand-wheel 72, the lower end of the screw resting on the standard 69 and the main portion thereof being threaded to pass through an ear projecting from the carriage 70. On this carriage 70 is revolubly mounted a grooved roller 73, adapted to compress a wire passing under it against two rollers 74, and thus straighten any kinks or curvature therein. Of course the grooves in the rollers 73 and 74 are in alinement with the center of the needle 21. After the wire has passed through this straightener it passes through a reciprocating feeding mechanism for pushing the wire forward a definite distance at each movement of the machine. The mechanism by which this wire is grasped and passed forward is as follows: Mounted in the slot 18 on the opposite side of the passing tire from that which contains the needle-carriage is a carriage 75, mounted on a dovetailed plate which slides in the groove 18. In the front upper edge of this feeding device (see Fig. 8) are two jaws 76 and 77, both provided with hardened-steel plates 78, roughened sufficiently to firmly grasp the wire, the upper one, 76, being integral with the upright portion 75, the lower one being pivoted or hinged, so as to normally hang down free from engagement with the wire. On the front face of the carriage 65, which carries the jaws 76 and 77, is a rocking pawl 79, so placed that when rocked in one direction its outer front end or nose will press upward on the lower jaw 77 and cause it to engage the wire with great force. In the lower end of this pawl 79 is a notch, into which projects the upper end of a lever 80, the lower end of which is pivoted in a slot in the cross-bar 27. This lever 80 is rocked backward and forward by the following mechanism: On the rear face of the double cam 17 (see Fig. 3) is a race in which runs a collar 81, supported by an L-shaped lever 82, the upper end of which is hinged to a bracket 83 on the under side of the table-top 1. This L-shaped lever 82 is slotted for the purpose of inserting a pin 84 therein. This pin projects from an arm 85 integral with a sliding sleeve 86 on the lever 80. This sleeve 86 is held in place on the lever 80 by a set-screw 87. Definite graduation-marks may be impressed on the face of the lever 80 to accurately determine the correct position of the sleeve 86, so as to insure a definite stroke of the lever 80. From this mechanism just described it will be obvious that as the cam 17 rotates the roller 81, following the race on the rear face thereof, will swing the slotted L-shaped lever 82 backward and forward, and thus by means of the pin 84, arm 85, and sleeve 86 cause the simultaneous rocking of the lever 80. The effect of rocking the lever 80 to the right in Fig. 8 will first be to cause the pawl

79 to push with great force upon the lower swinging jaw 77, resulting in tightly compressing the wire between the lower jaw and the upper jaw, and as this pressure continues upon the pawl 79 the entire carriage 75 will be moved forward, drawing with it the wire a definite determinate distance. The return stroke of the lever 80 is attained at the first instance by the complete release of the pawl from engagement with the rocking jaw 77, with the result that the pressure of the jaws upon the wire is immediately released and is followed by the return of the carriage 75 to its original place. (Shown in Fig. 8.) The positive clamping of the wire just previous to the commencement of the movement of the carriage 75 is rendered necessary by the fact that the wire must be driven forward an exact determined distance each time to insure the equal length of the cross-wires which are to be inserted in the tire.

As the wire moves forward, driven by the previously-described mechanism, it passes through shears for severing the extreme end from the body of the wire, a description of which now follows. The shear and its accompanying mechanism is best shown in Figs. 6 and 7, to which reference is now made. In the dovetailed slot 18 is a slidable plate 87, on the upper face of which is held by a bolt 88 one member 89 of the shear, to the outer end of which is pivoted by a bolt or pin 90 the other member 91 of the shear. The lower end of this member 91 is enlarged and slotted to embrace a collar 92 on the shaft 11. On this collar 92 are two cams 93 and 94. On opposite sides of this slotted portion of the member 91 are pins 95 96. The operation of these cams is as follows: As the cam 91 revolves with the shaft 11 it encounters the pin 96 and throws the free end of the member 91 suddenly upward, and as soon as the cam 94 has passed the pin 96 the cam 93 will commence to engage the pin 95 and rapidly return the member 91 to the position shown in Fig. 6, and as the balance of this cam 93 is concentric with the center of the shaft 11 it will retain the member 91 in this position until just before it is time for the cam 94 to operate. The cam 94 is a quick-acting cam to suddenly cause the shear to operate, and the cam 93 is a cam capable of retaining the shear in a definite place during the larger part of the revolution of the shaft 11. Through both members 89 91 of the shear is an opening for the insertion of the wire, and the openings in each member of the shear are lined with a hardened-steel bushing 97 to prevent wear while severing the wire. (See Fig. 7.) It is obvious from this description that if the wire is passed through the opening in both members of the shear and retained there during the time of the operation of the cam 94 on the pin 96 the wire will be severed squarely by the upward movement of the free end of the shear 91.

From the side of the member 89 of the shear adjacent to the passing tire there projects a guide 98, extending sufficiently to just touch the side of the passing tire when the time arrives for the insertion of the wire. This guide has for its object the directing of the course of the wire to be inserted in the tire into the proper place. The distance between the tire and the shear is determined and changed at will by means of a screw 99, entering the plate 87, which slides in the slot 18. The outer end of this screw 99 passes through a plate 100, bolted in the outer left end of the slot 18, and it has on its outer end a hand-wheel 101, by which it is manipulated. Thus the transverse position of the shear is accurately and readily determined. This is permitted by the fact that at the place where the member 91 of the shear passes through the table-top 1 there is a wide slot to permit the adjustment of the shear, and the shaft 11 is splined to permit the sliding of the collar 92 thereon. On the swinging member 91 and surrounding the opening through which the wire is designed to pass is a one-way clamp. This clamp is held in place on the member 91 by a bolt 102. This clamp consists of two side pieces 103, having mounted between them a blade or clamp proper, 104, the upper end of which is perforated and through which passes a shaft 105, surrounded by a coiled spring 106, the force of which is adjusted by a thumb-nut 107. The object and purpose of this clamp is to permit the ready movement of the wire toward the tire and to absolutely block any back pull which may be given to the wire from various causes, such as a poorly-balanced reel on which the wire is wound suddenly turning on its axis during the time that the clamps 76 and 77 on the carriage 75 have released their hold on the wire and are moving backward to take another grasp thereon. Another cause which necessitates the use of this clamp on the shear is the fact that it might happen that the jaws 76 and 77 might not always release themselves from the wire as promptly as the necessity of the case might require.

Experience has shown that in perforating rubber with the use of a very fine needle and as sharp as can be utilized in ordinary work at the point where the needle should come through after perforating the green unvulcanized rubber will cling to the needle and project a considerable distance before it is completely punched through, and in order to drive the needle through a tire it is necessary to pass the needle one-half or three-fourths of an inch through the tire before a complete puncture is made—that is, the needle should project a considerable distance beyond the normal outlines of the tire before the last portion of the rubber is completely opened—and hence in puncturing a tire with the machine heretofore described it will be necessary

to drive the needle so far through the tire that it would interfere with the mechanism of the shear before the opening would be completely made. In order to facilitate this puncture of the tire and to remove the tire from close proximity to the shear during the perforation, I make the carriage 33, on which the shaft 34 is mounted, which in turn bears the tire-platform 36, capable of being slid transversely to the line of the tire between the guides 32. Motion to do this is obtained in the following manner: Through the carriage 33 I cut a vertical opening 108, into which projects the upper free end of a bent lever 109, which is pivoted in a bracket 110 on the under face of the table-top 1. The lower end of this lever 109 is slotted and incloses a pin 111 on the upper end of the swinging lever 26. A suitable opening is cut through the table-top 1 for the purpose of permitting this movement of the lever 109. The operation of this lever 109 is as follows: As the carriage bearing the perforating-needle moves toward the tire due to the rocking of the lever 26 the pin 111 will swing the lever 109 on its pivot on the bracket 110, so that its upper end in the slot 108 will push the carriage 33 toward the needle, and hence the advancing needle will meet the advancing tire, and the perforation of the tire will be attained much more rapidly and more of the needle can pass through the tire than could otherwise were the tire to stand perfectly still. As the needle retreats from the tire the tire on its platform will likewise retreat from the needle and move toward the shear until the projecting end 98 of the shear will substantially abut against the side of the tire, so that the wire driven forward by the means heretofore described will cause the wire to enter the opening just left by the puncturing-needle. The operation of this device is as follows: An unvulcanized tire is placed upon the belt 58 at the end of the platform or trough 45 substantially distant from the main portion of the machine. It is then gradually carried forward due to the motion of the two belts 58 59 until it passes under the roller 41. By the mechanism hereinbefore described simultaneously with the termination of the movement of the tire the puncturing-needle 21 passes through. As the needle is withdrawn due to the action of the cam 17 the tire and its supporting-platform 36 is carried to the left in Fig. 1 until it abuts against the projecting tip 98 of the shear. Previous to this a wire has been inserted through the straightener and the feeder-carriage 75 and into the shear, where an appropriate length is severed from the main portion of the tire. As soon as the puncturing-needle leaves the tire and it has returned to its proper place the feeding-carriage driven by the lever 80 is thrown suddenly forward toward the tire and the end of the wire drives forward the severed piece into the tire. The tire then moves forward due to the action of the ratchet-wheel 63, moved by the pawl 64, a definite determined distance. During this movement of the tire forward the shear is operated by its cams and severs the piece of wire then in the shear, and as soon as the tire has ceased its forward movement the needle 20 again punctures the tire and the operation is repeated.

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

1. The combination in a machine of the class designated of mechanism to progressively move forward a tire at determinate intervals and for determinate distances, a reciprocatory puncturing-needle, means to move the tire toward the point of said puncturing-needle simultaneously with the movement of said needle

2. The combination in a machine of the class designated of mechanism to move a tire progressively forward, a platform to sustain said tire, a pressure-roller to hold said tire in place on said platform, a reciprocatory puncturing-needle adapted to pass through said tire, and means to move said tire and platform toward the approaching needle.

3. The combination with alternately-acting puncturing mechanism, and embedding mechanism, of a series of belts to convey a tire between said mechanisms.

4. The combination with a reciprocatory puncturing-needle, a means to support a tire passing in front of said needle, of two belts passing over and under said tire to convey the same forward at a step-by-step movement, of a ratchet-wheel to move said belts, a pawl to operate said ratchet and a cam to actuate said pawl.

In testimony that I claim the above I hereunto set my hand in the presence of two subscribing witnesses.

AUGUSTUS E. ELLINWOOD.

In presence of—

H. P. LIMRIC,

C. E. HUMPHREY.