No. 825,415. PATENTED JULY 10, 1906.

W. J. PINE.

COILED WIRE FABRIC MACHINE.

APPLICATION FILED OCT. 3, 1904.

13 SHEETS—SHEET 1.

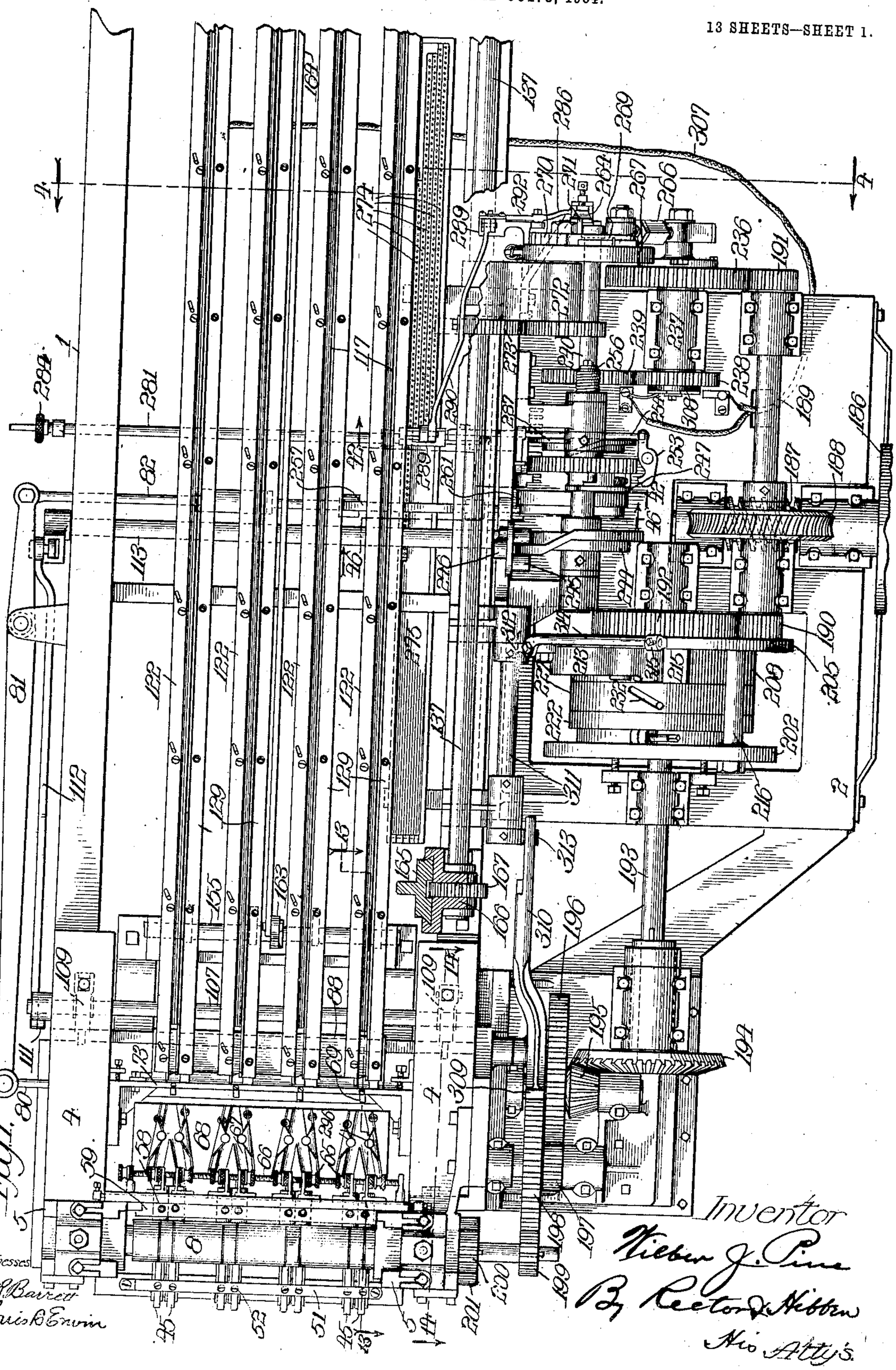

Fig. 1.

Witnesses
E. R. Barrett
Louis B. Erwin

Inventor
Nieber J. Pine
By Keeton & Hibben
His Att'ys.

No. 825,415. PATENTED JULY 10, 1906.

W. J. PINE.

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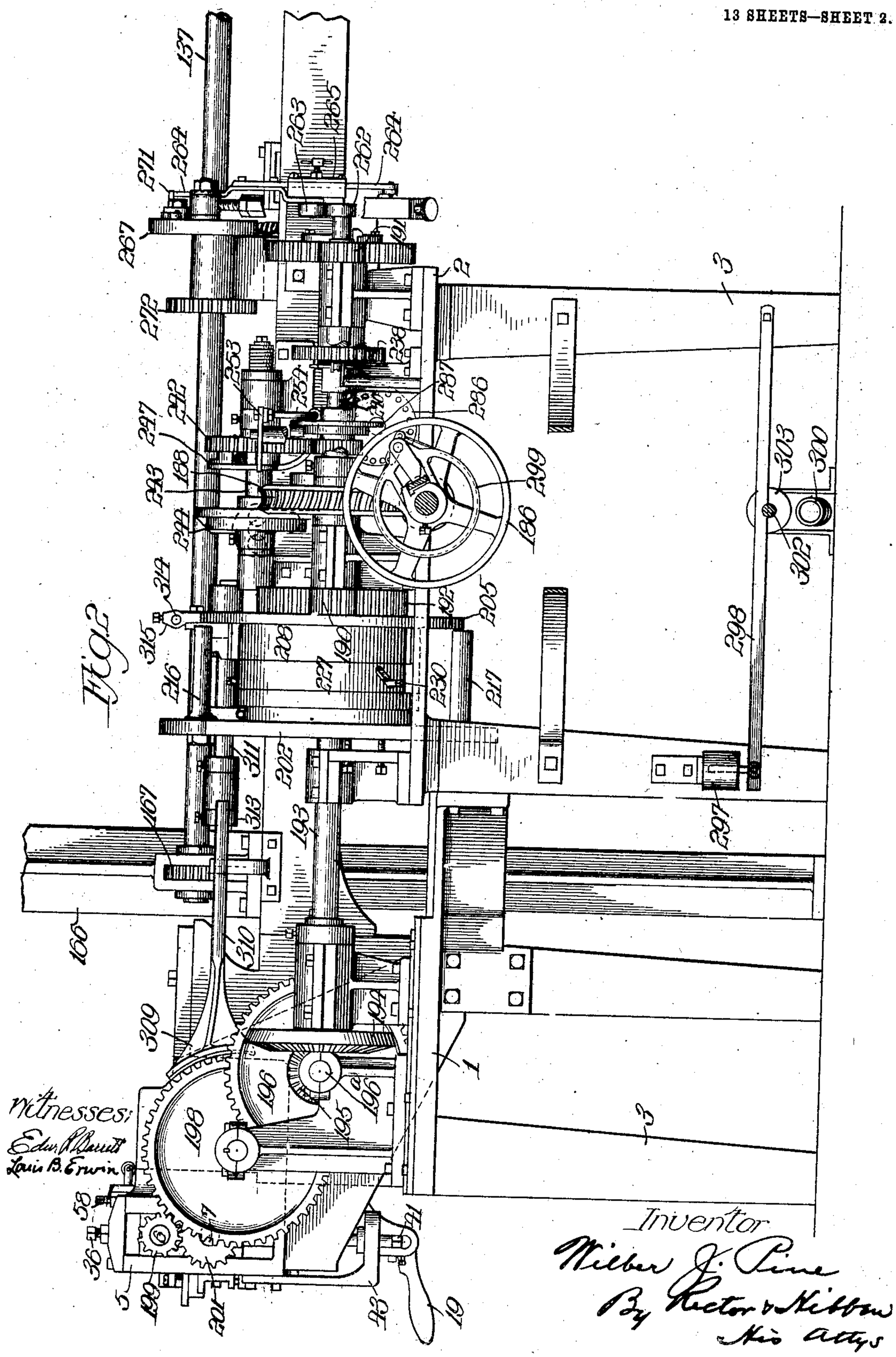
APPLICATION FILED OCT. 3, 1904.

13 SHEETS—SHEET 2.



Witnesses:
Edw. A. Barrett
Louis B. Erwin

Inventor
Wilber J. Pine
By Rector & Hibben
His Attys

No. 825,415. PATENTED JULY 10, 1906.

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13 SHEETS—SHEET 3.

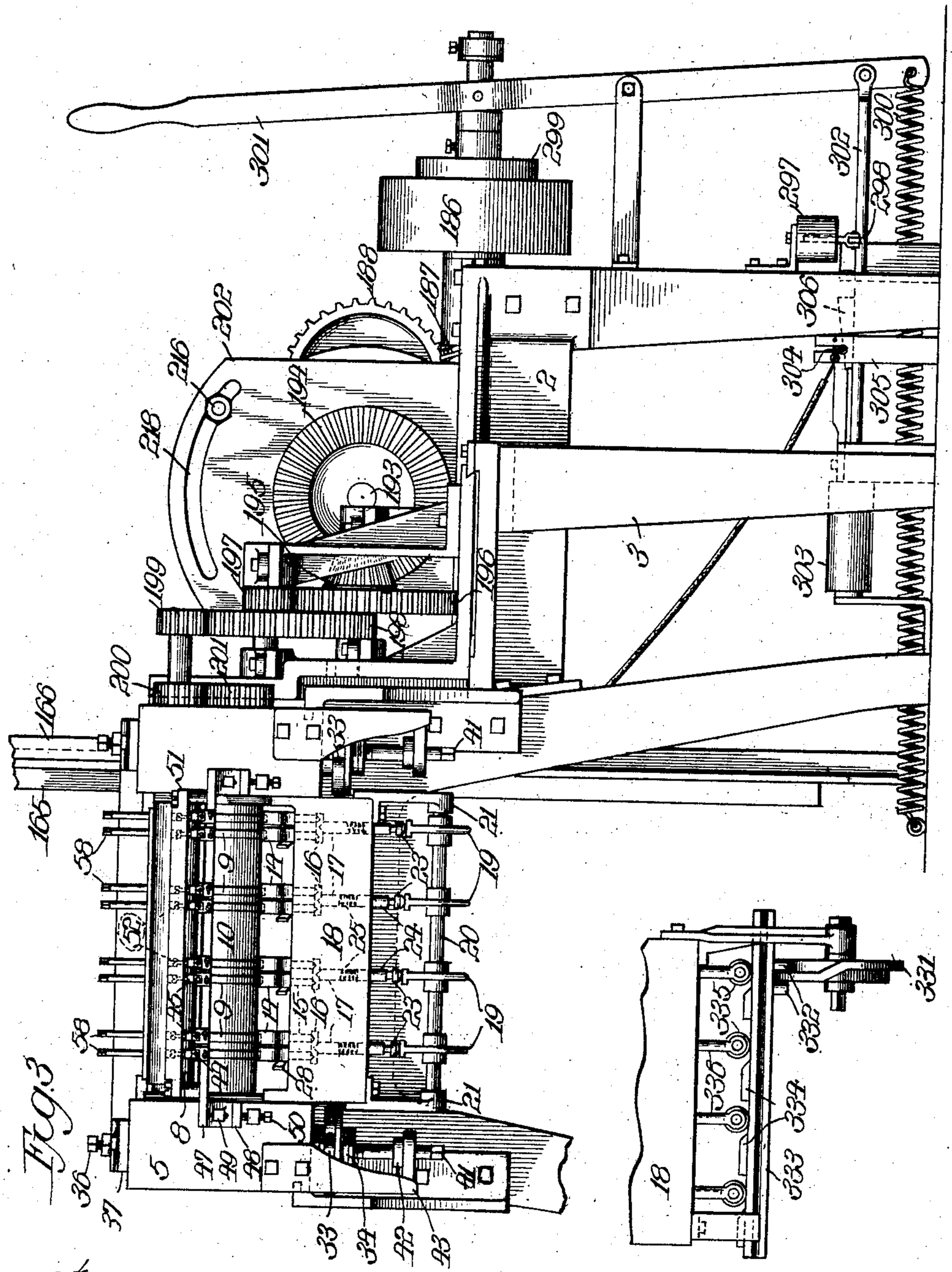

Fig. 3.

Fig. 5.

Witnesses;
Edw. P. Bassett
Louis B. Erwin.

Inventor
Wilbur J. Pine
By Rector & Hibben
His attys

No. 825,415. PATENTED JULY 10, 1906.

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13 SHEETS—SHEET 4.

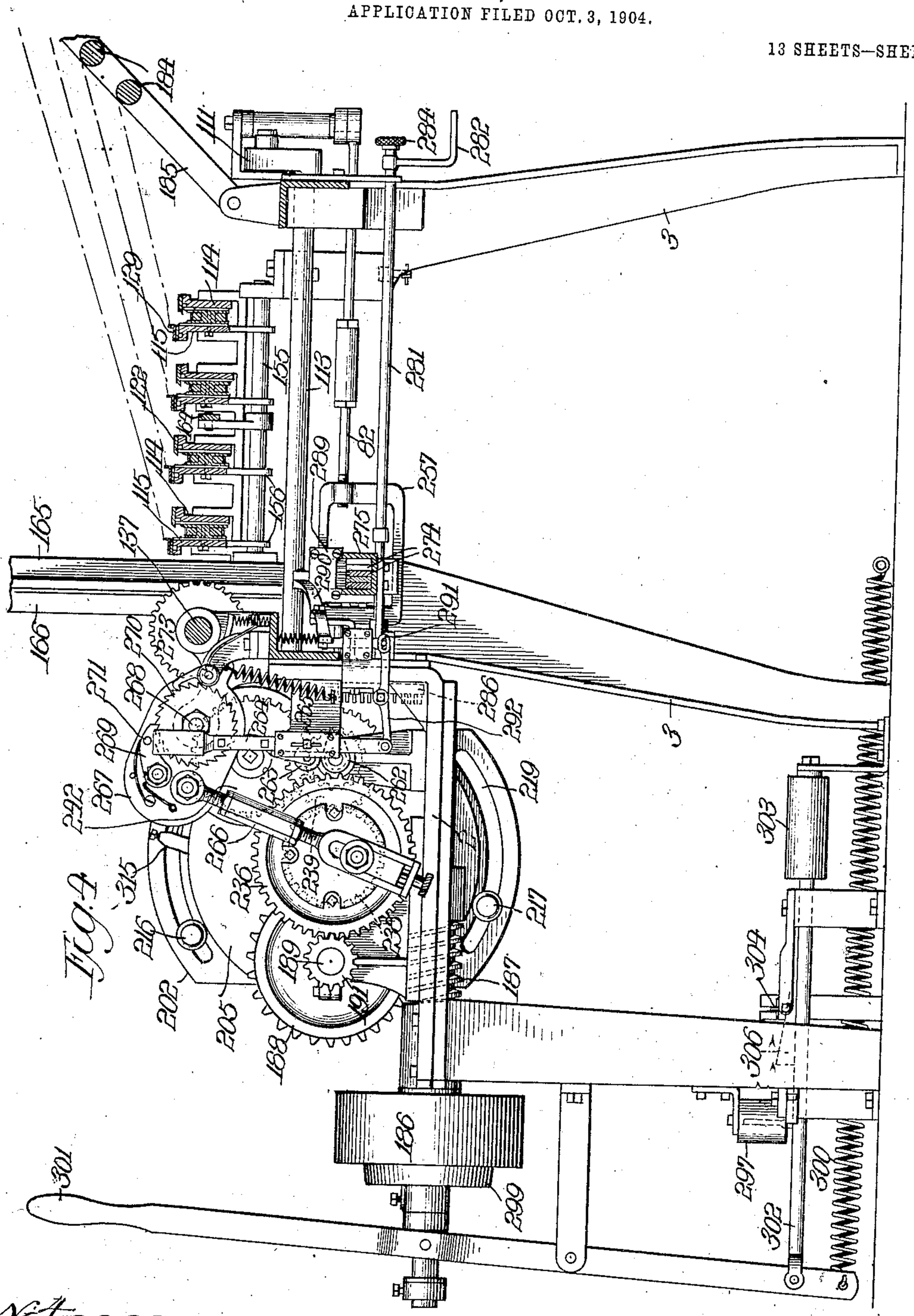

FIG. 4.

Witnesses:
Edw. P. Barrett
Louis B. Erwin

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Wilbur J. Pine
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No. 825,415. PATENTED JULY 10, 1906.

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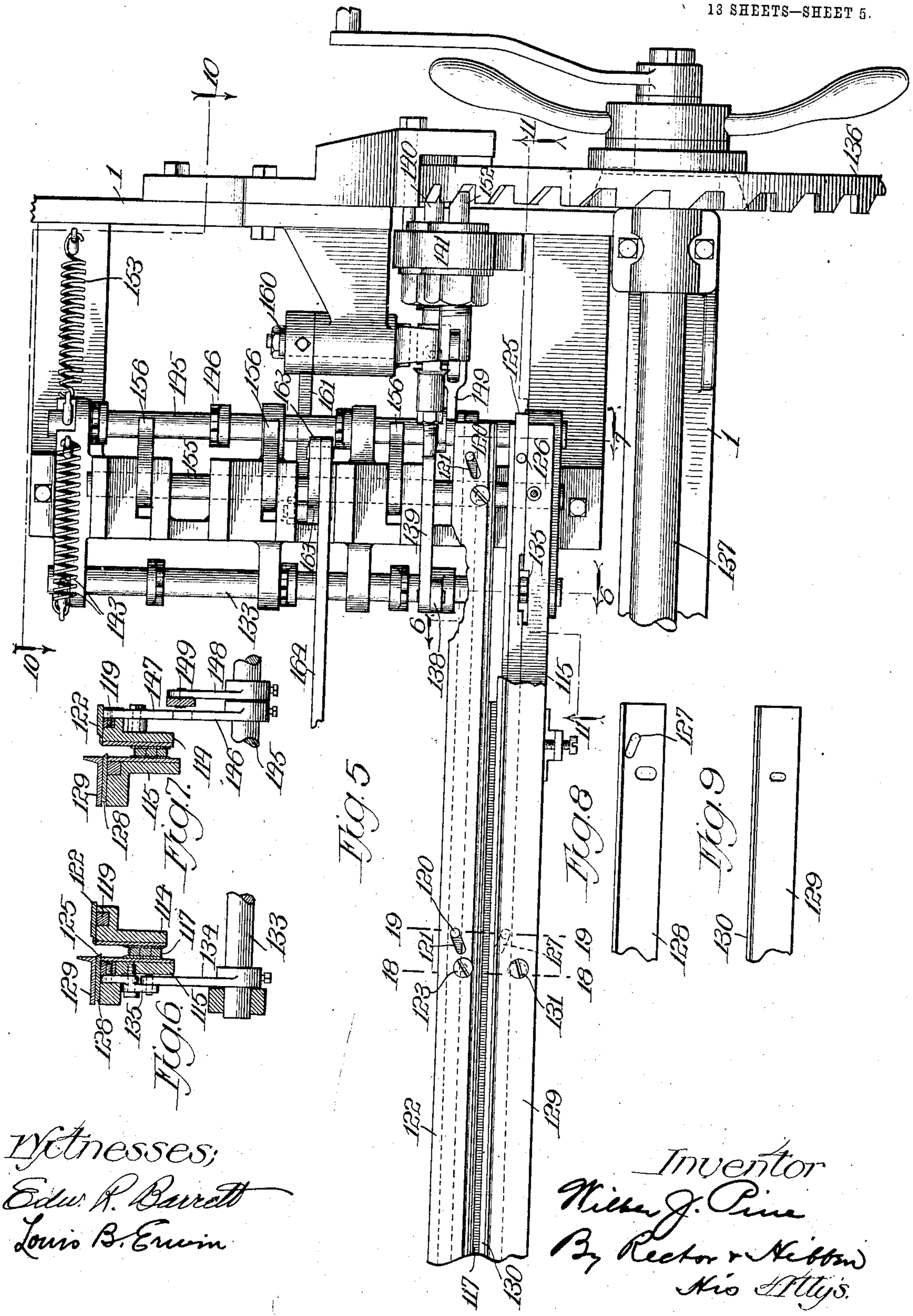
13 SHEETS—SHEET 5.



Witnesses;
Edw. R. Barrett
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Wilbur J. Pine
By Rector & Hibben
His Att'ys.

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13 SHEETS—SHEET 6.

Fig. 12

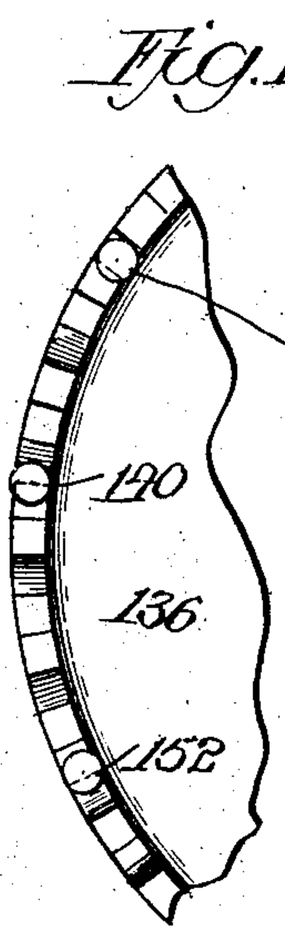
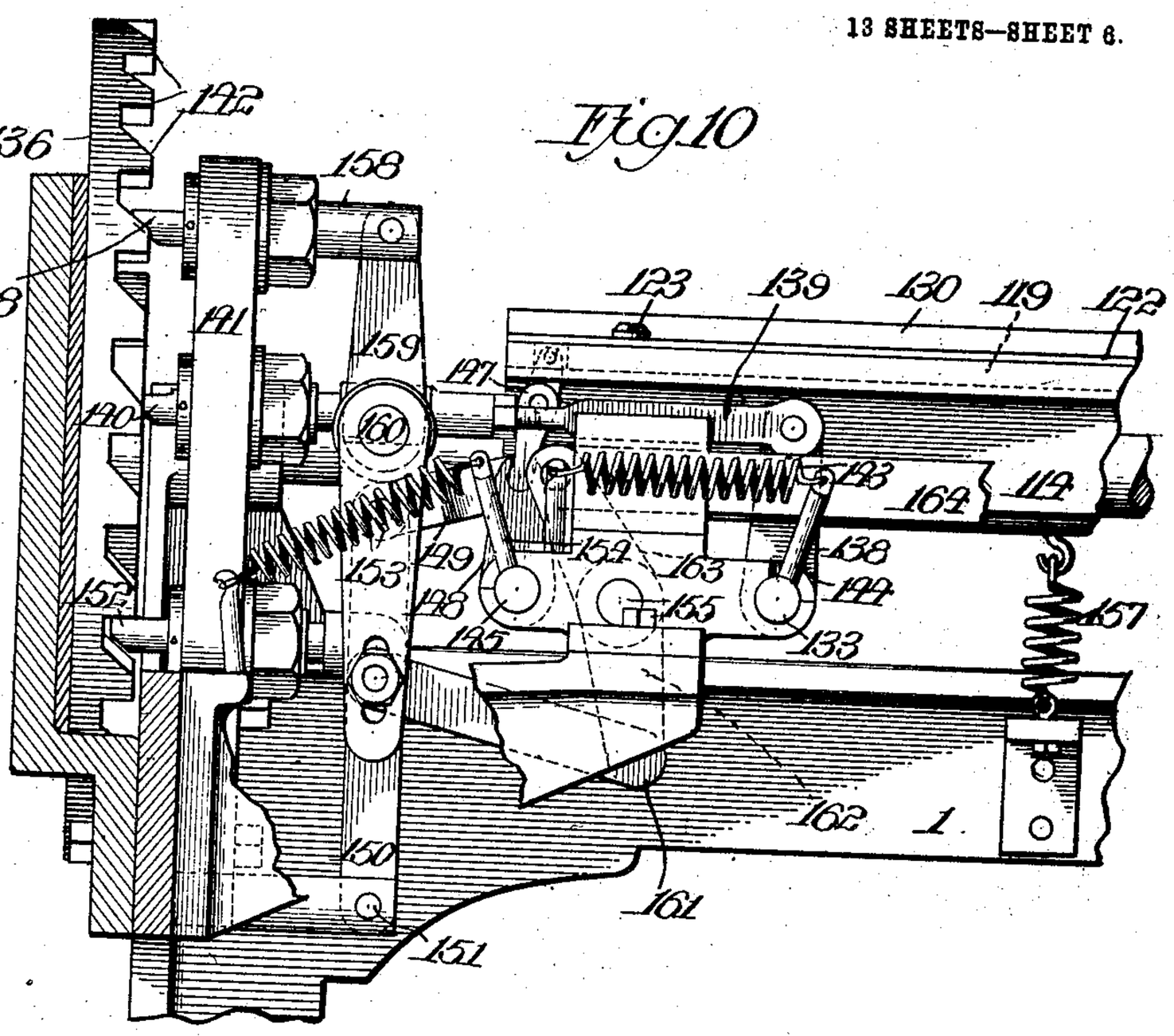


Fig. 10



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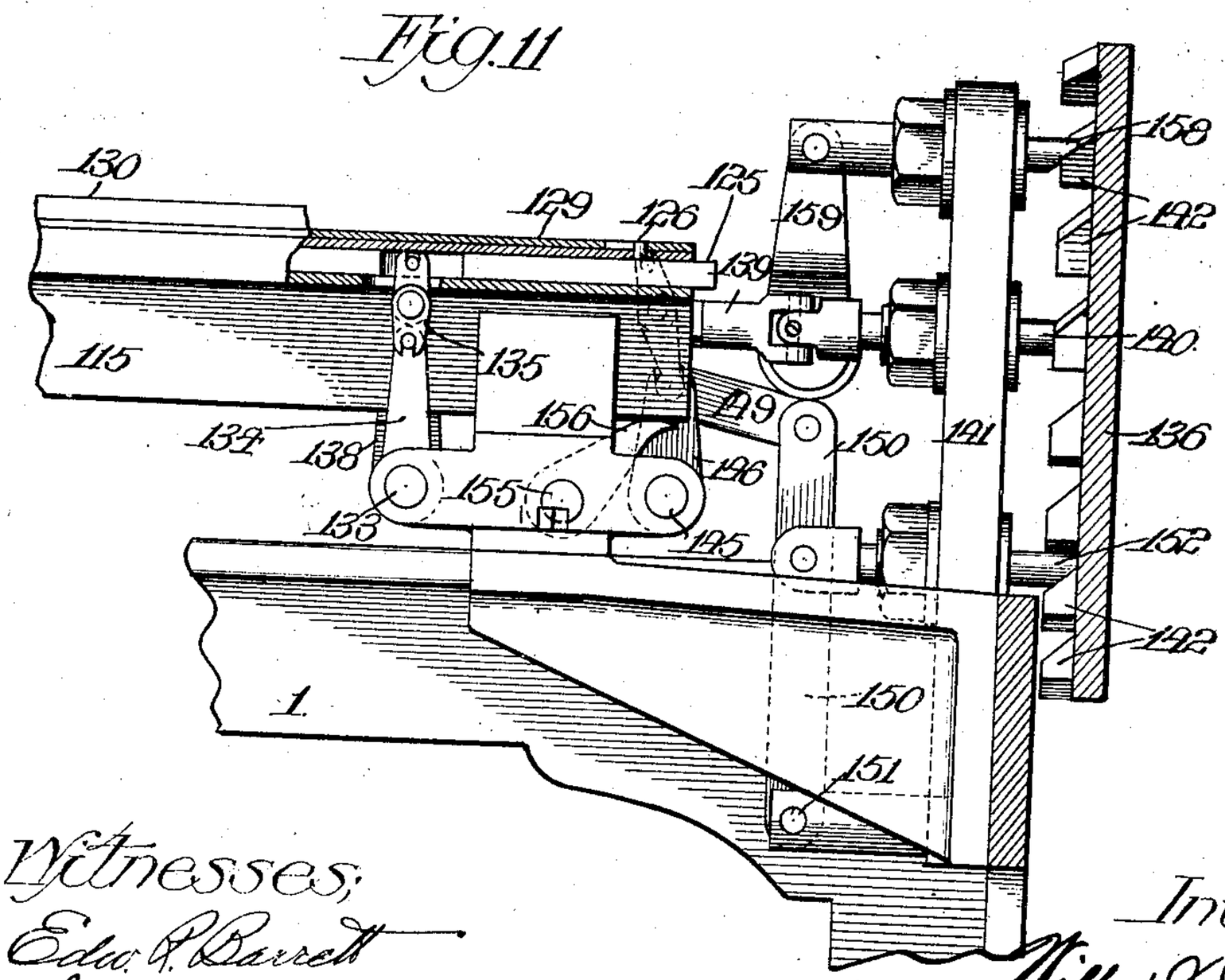

Witnesses;
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No. 825,415.

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13 SHEETS—SHEET 7.

Fig. 13

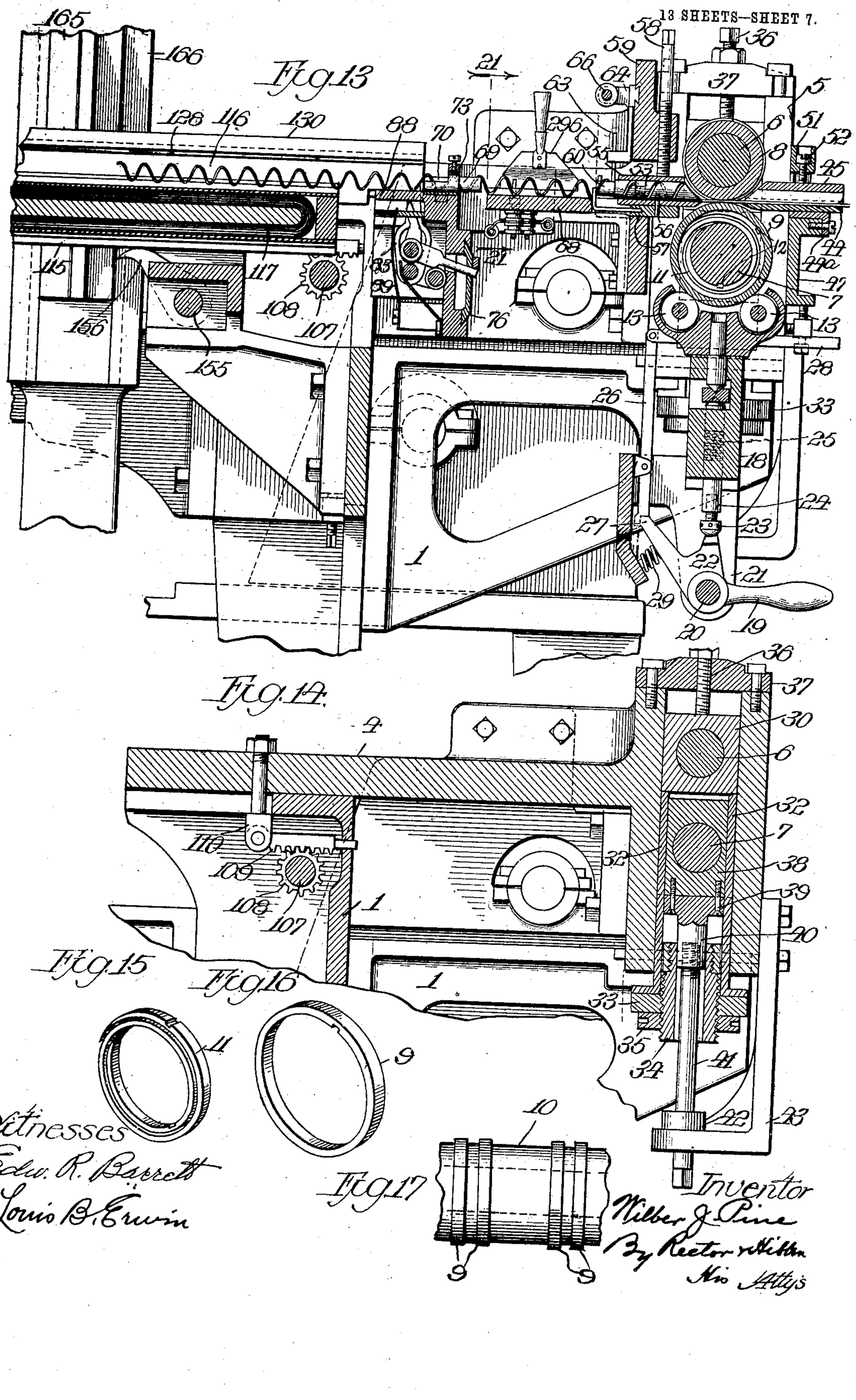

Fig. 14.

Fig. 15

Fig. 16

Fig. 17

Witnesses
Edw. R. Barrett
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His Attys

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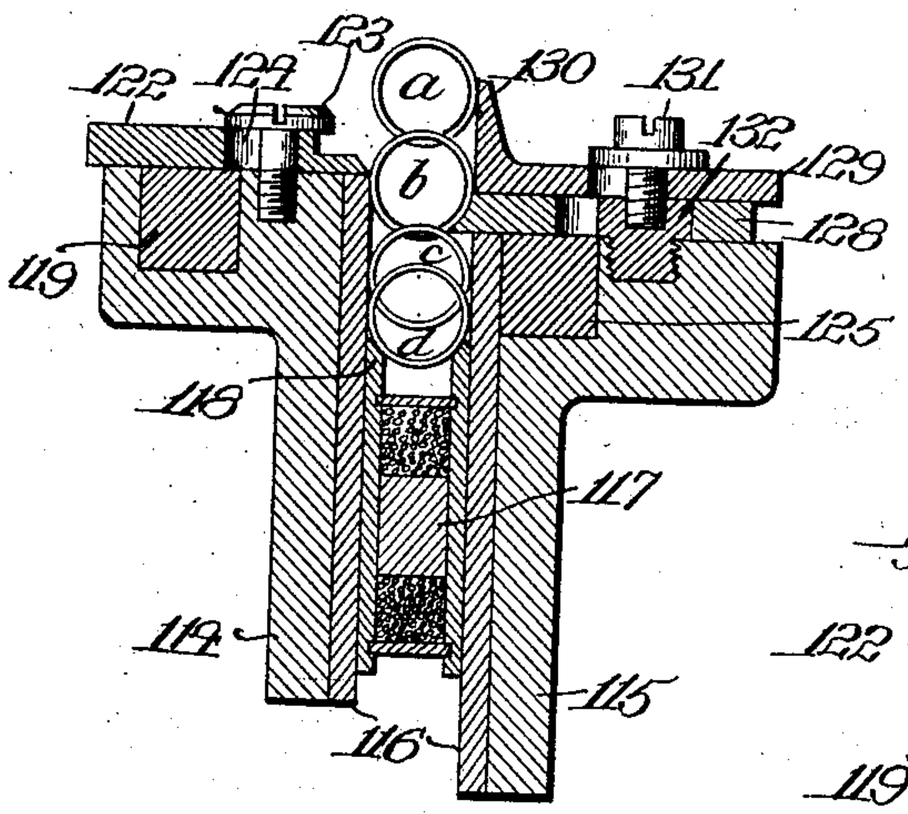
APPLICATION FILED OCT. 3, 1904.

13 SHEETS—SHEET 8.

Fig. 18



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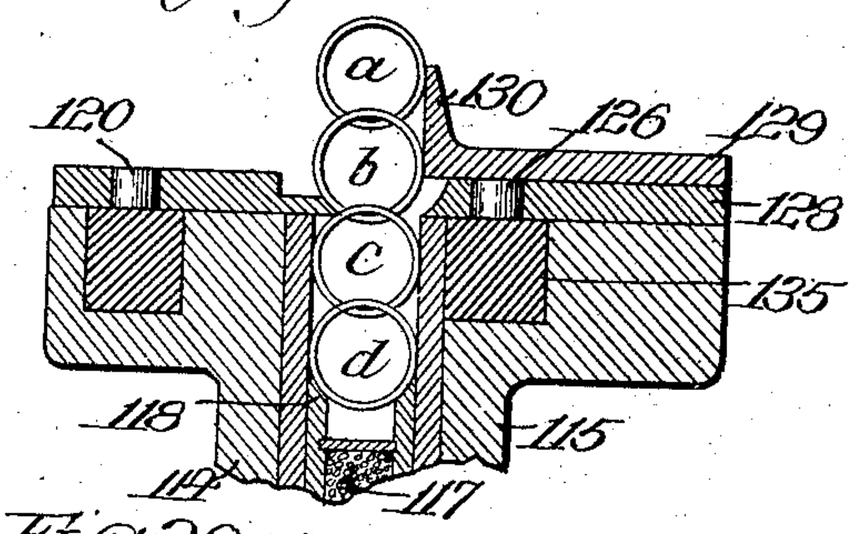

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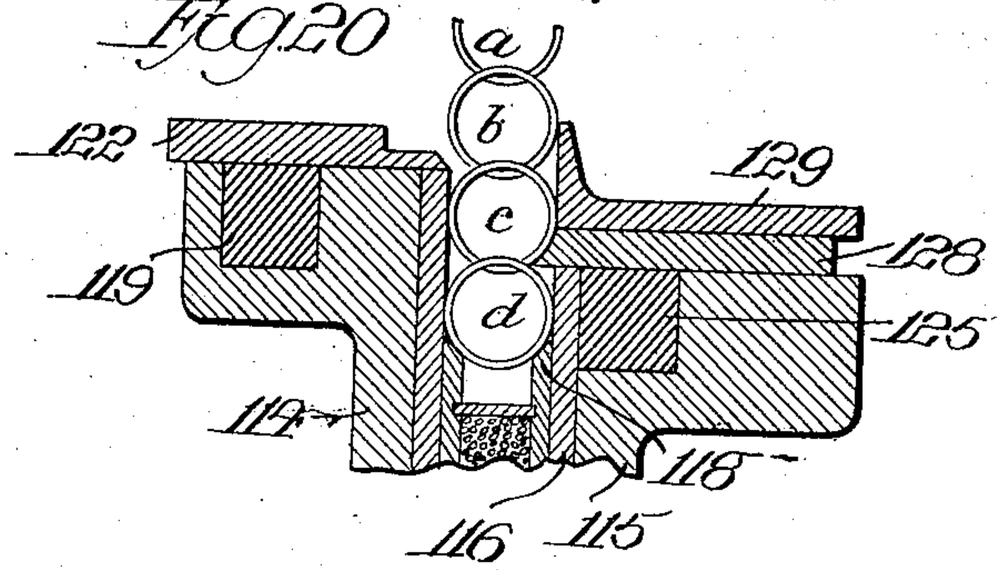

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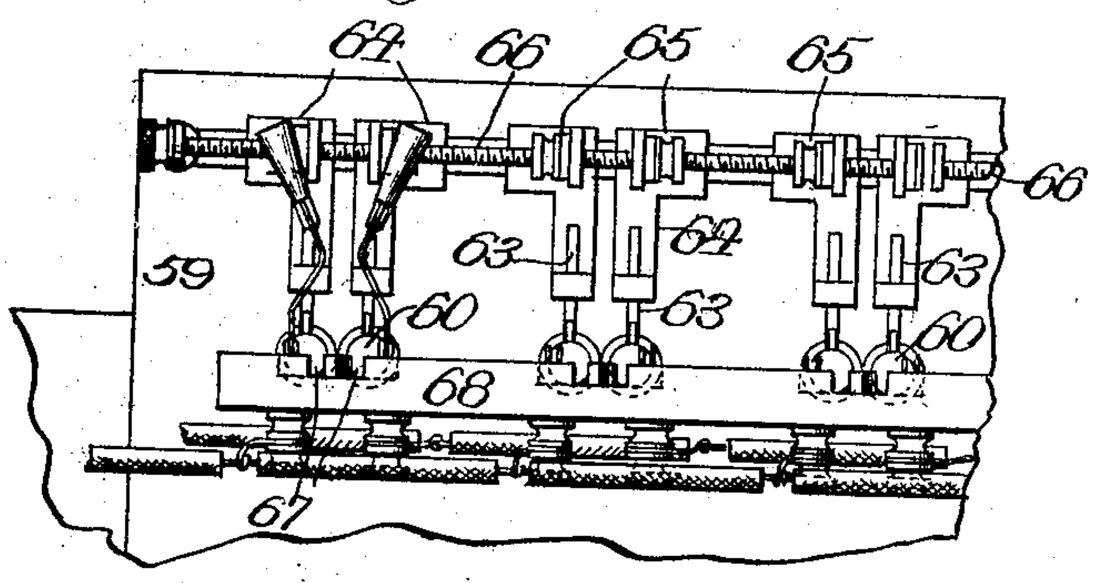

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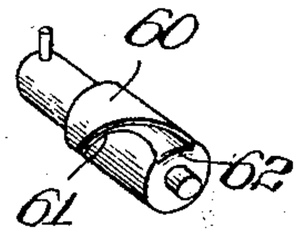

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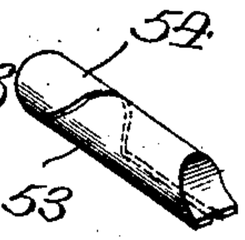

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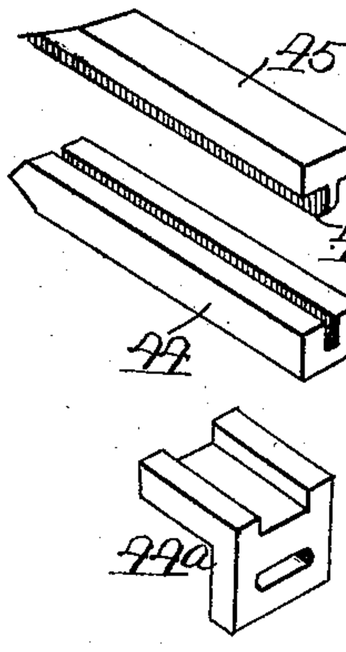

Witnesses;
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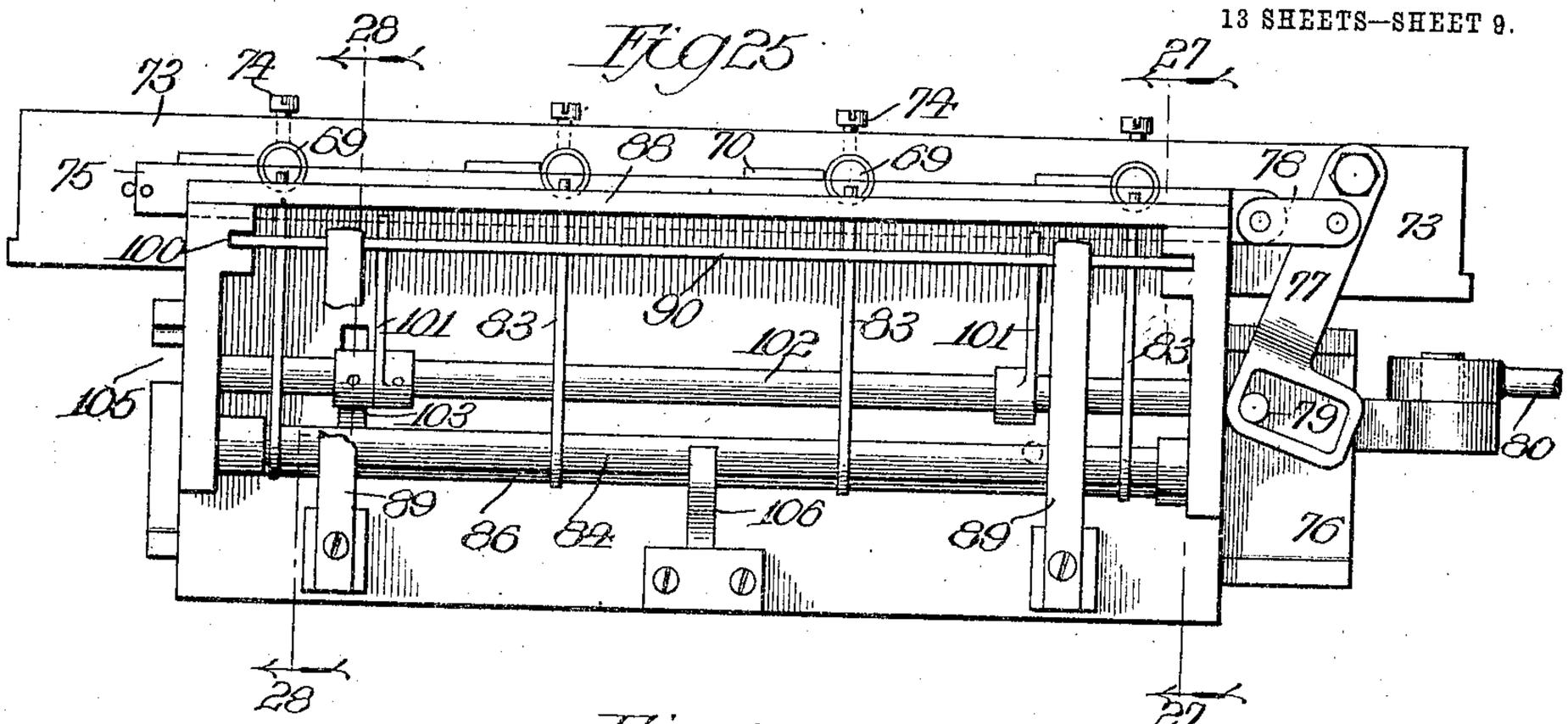
13 SHEETS—SHEET 9.

Fig 25



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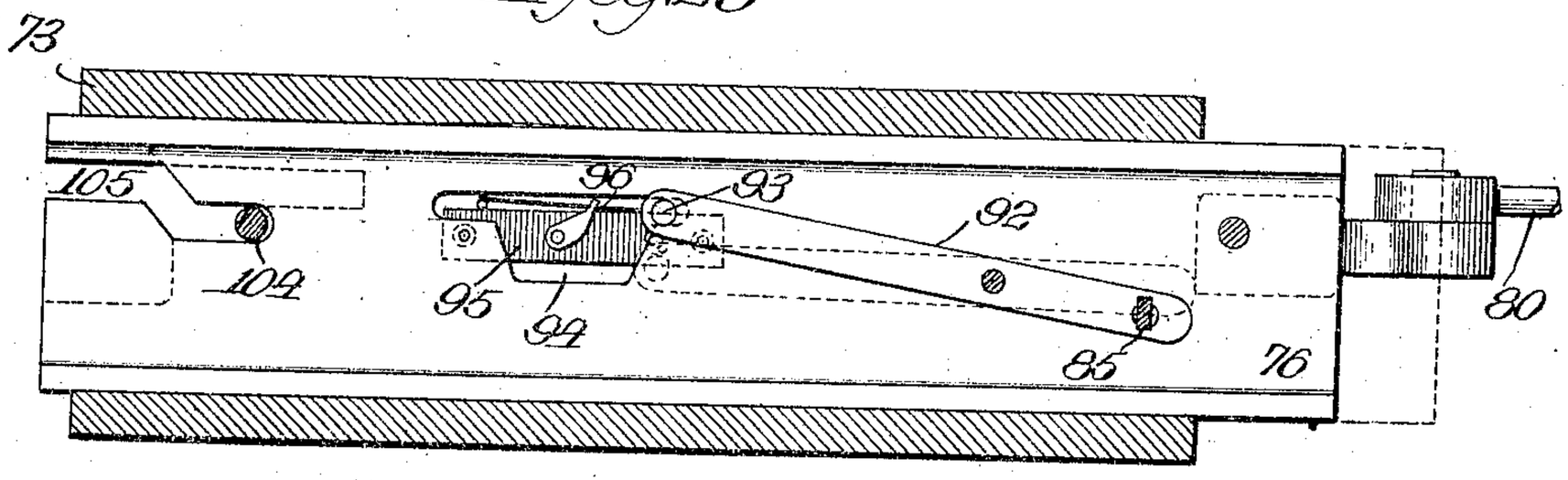

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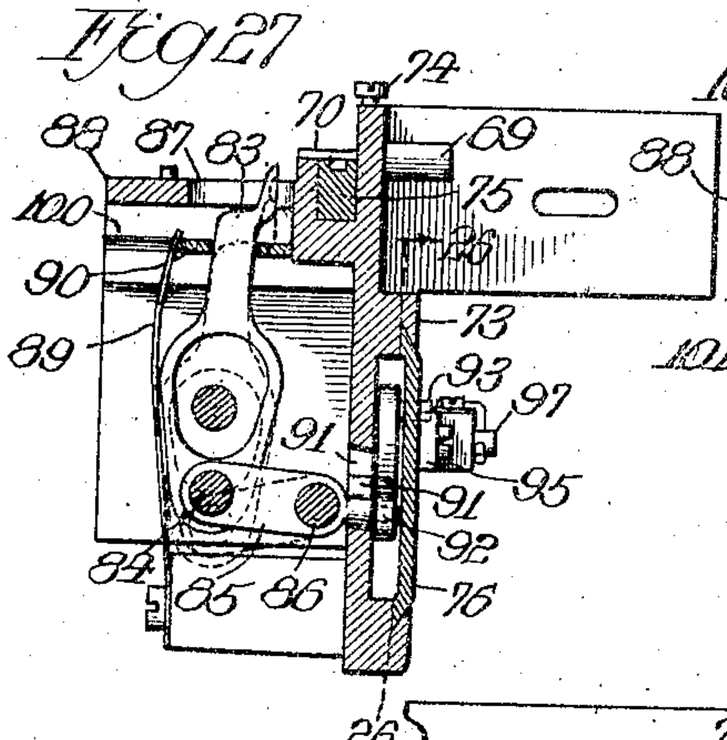

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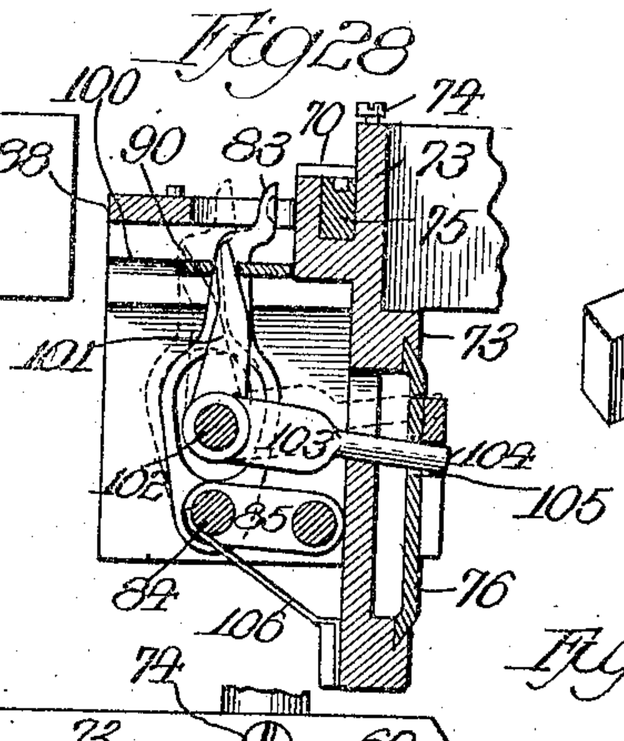

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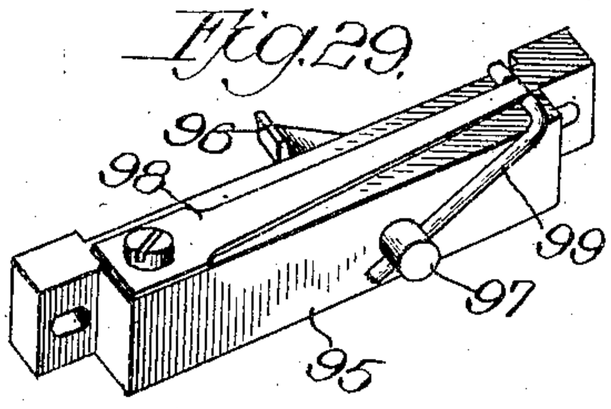

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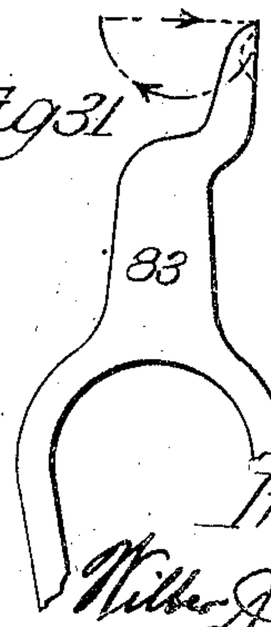

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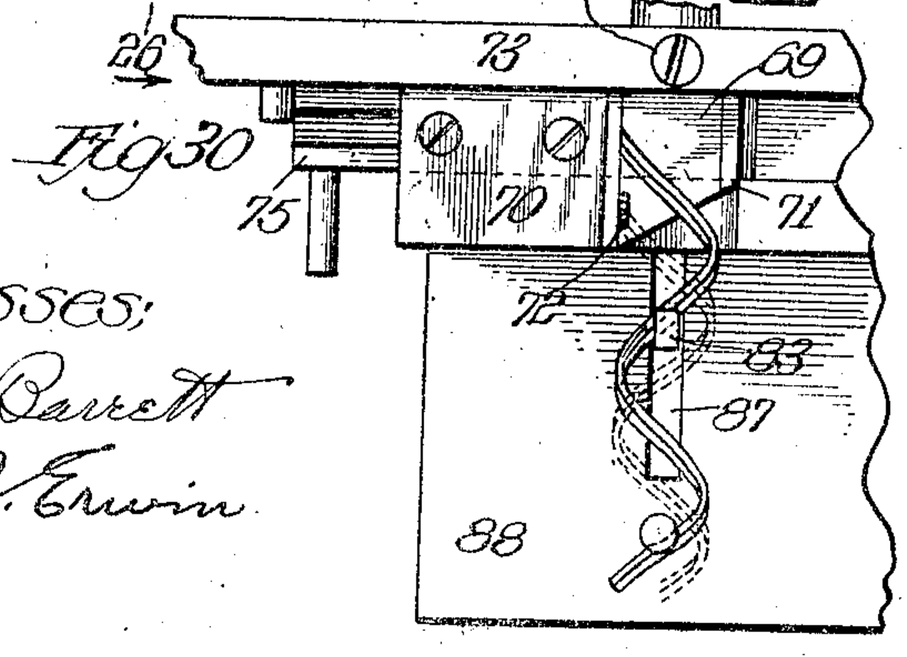

Witnesses:
Edw. R. Barrett
Louis B. Erwin

Inventor
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By Rector & Hibben
His Attys.

No. 825,415. PATENTED JULY 10, 1906.

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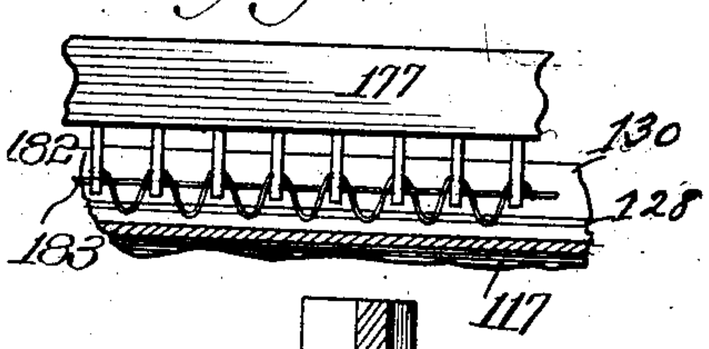
COILED WIRE FABRIC MACHINE.

APPLICATION FILED OCT. 3, 1904.

13 SHEETS—SHEET 10.

Fig. 34



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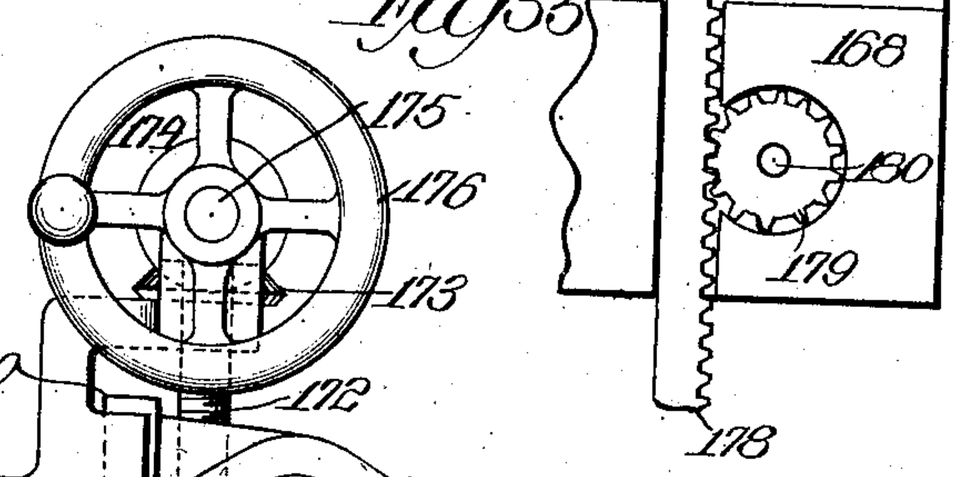

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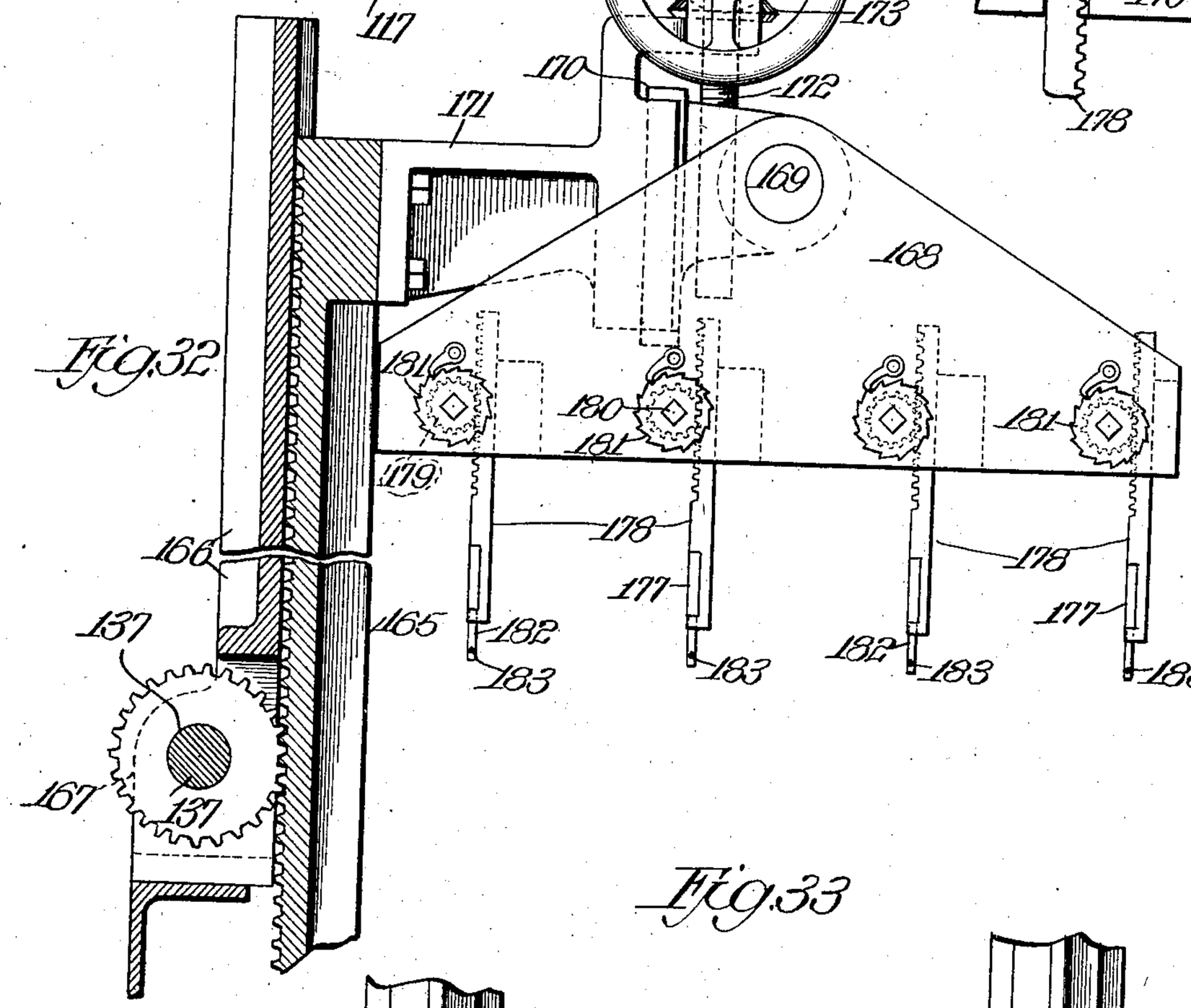
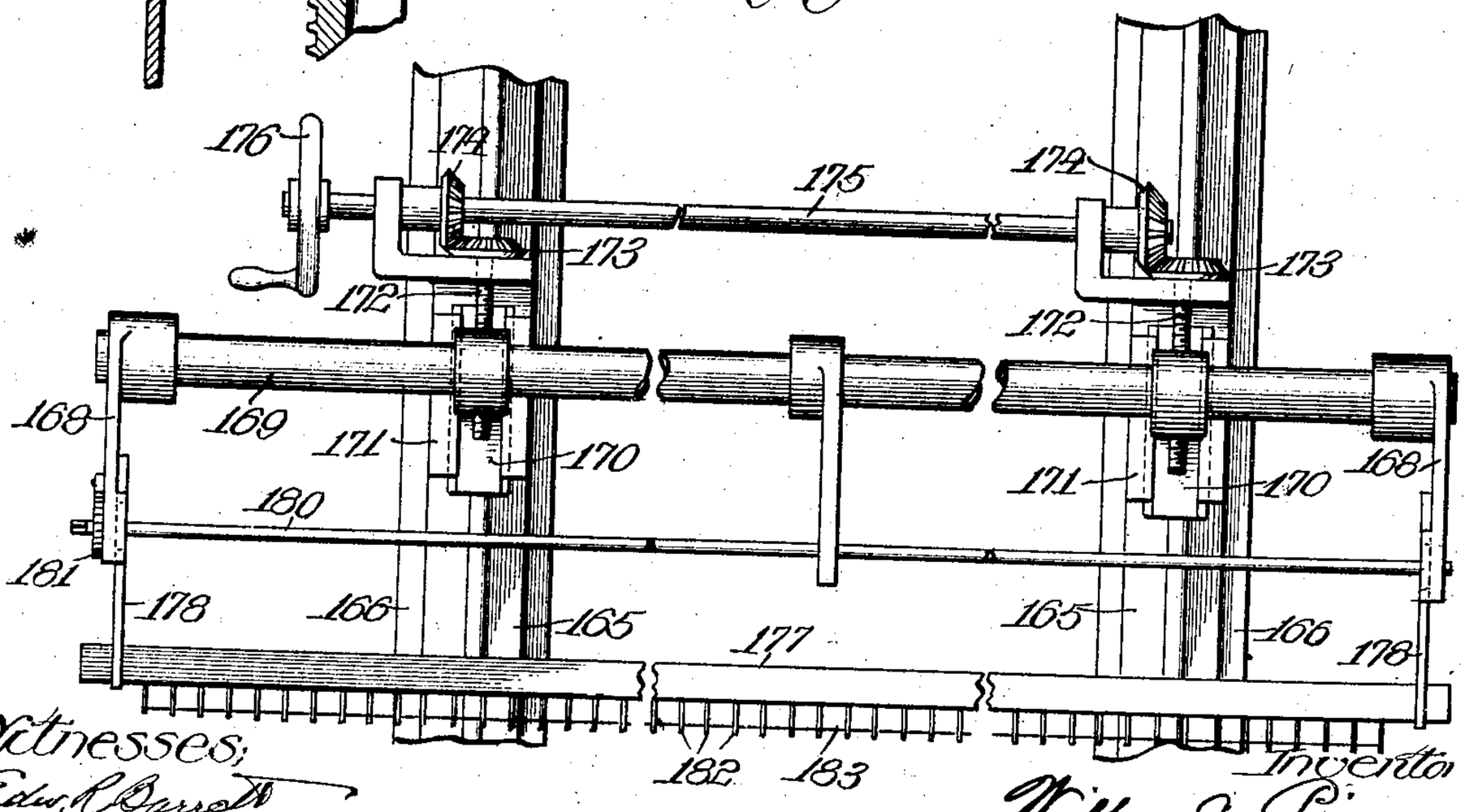


Fig. 33



Witnesses;
Edw. L. Barrett
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Inventor
Wilber J. Pine
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His attys

No. 825,415. PATENTED JULY 10, 1906.

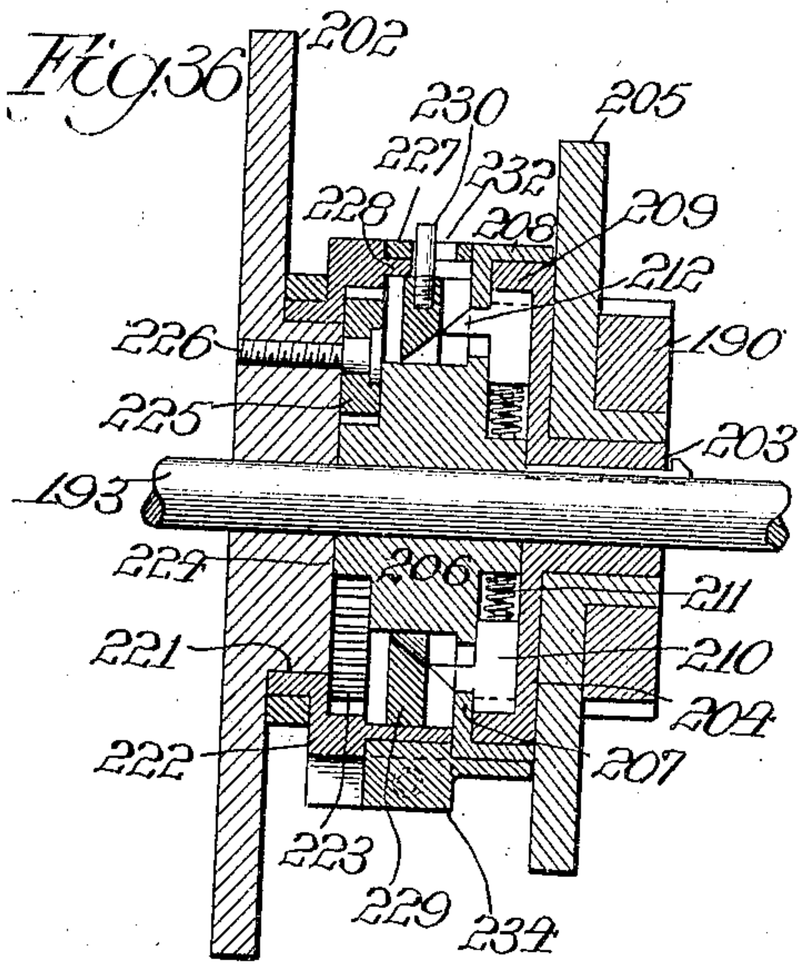
W. J. PINE.

COILED WIRE FABRIC MACHINE.

APPLICATION FILED OCT. 3, 1904.

13 SHEETS—SHEET 11.

Fig. 36



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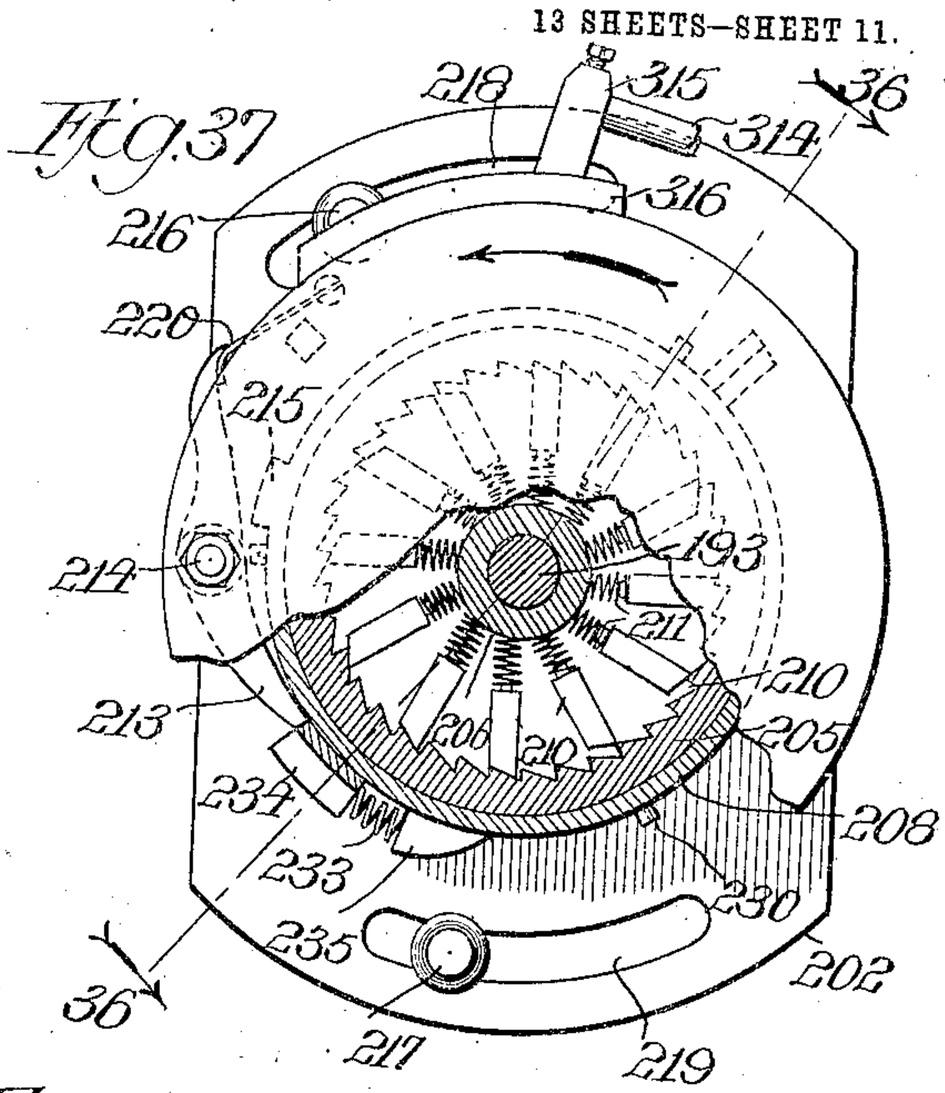

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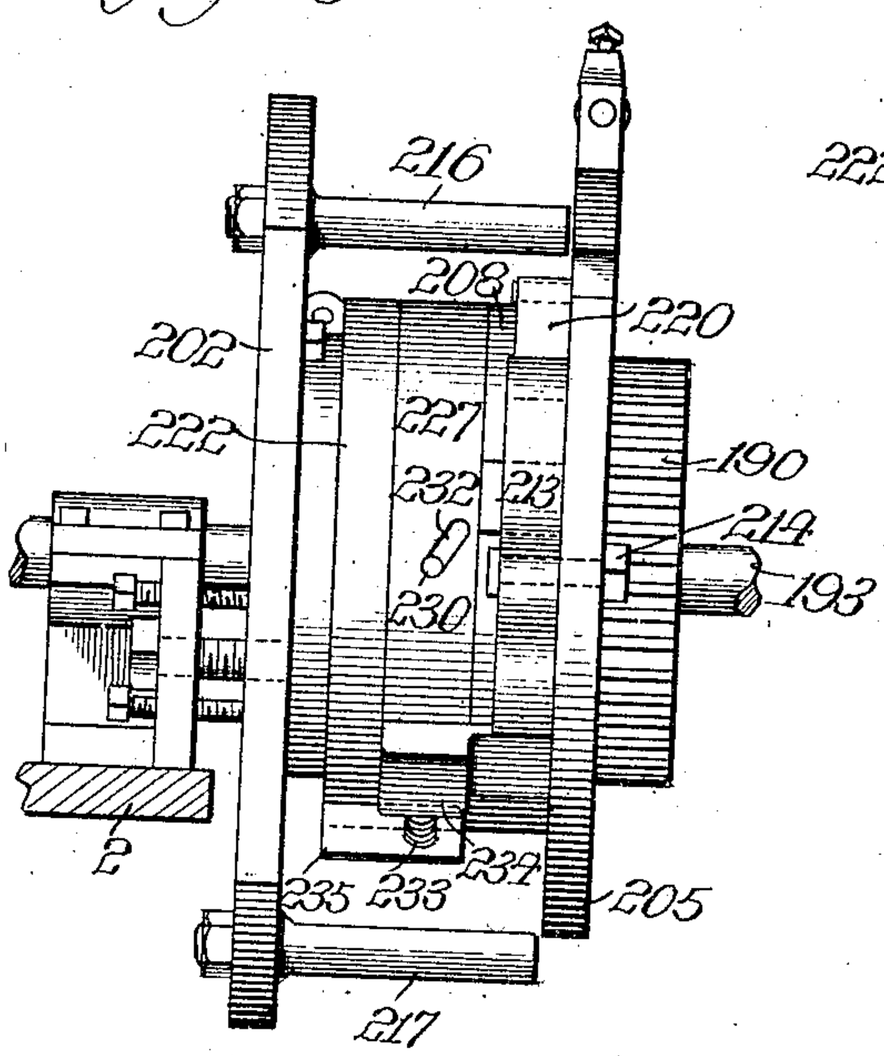

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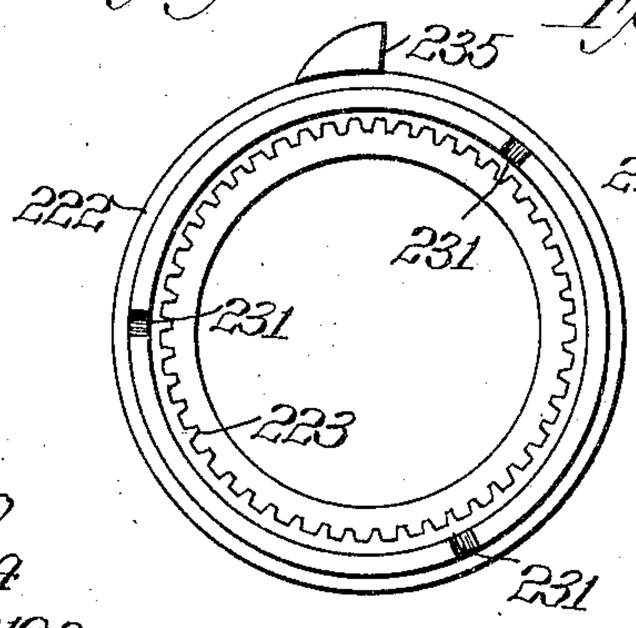

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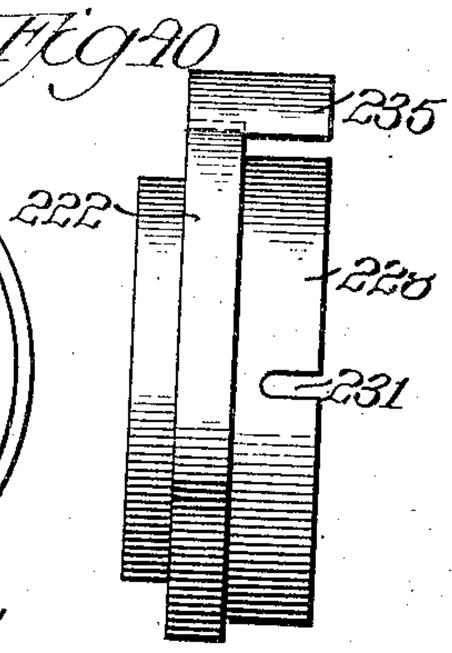

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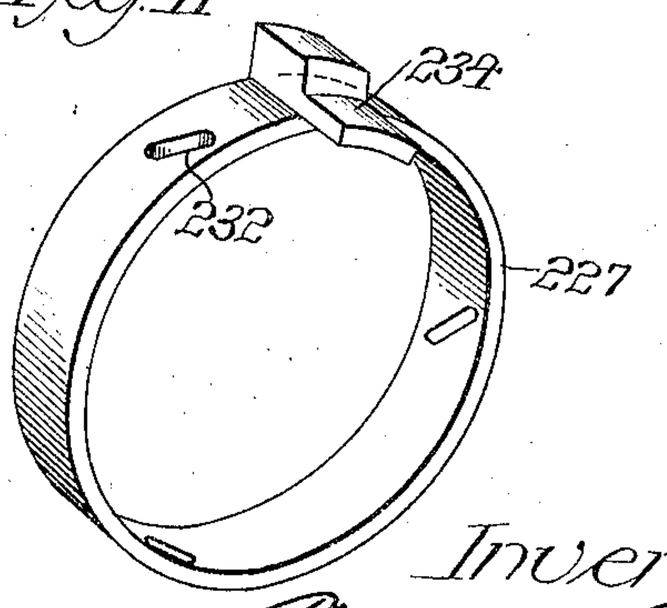

Witnesses:
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Wilbur J. Pine
By Rector & Hibben
His Attys

No. 825,415. PATENTED JULY 10, 1906.

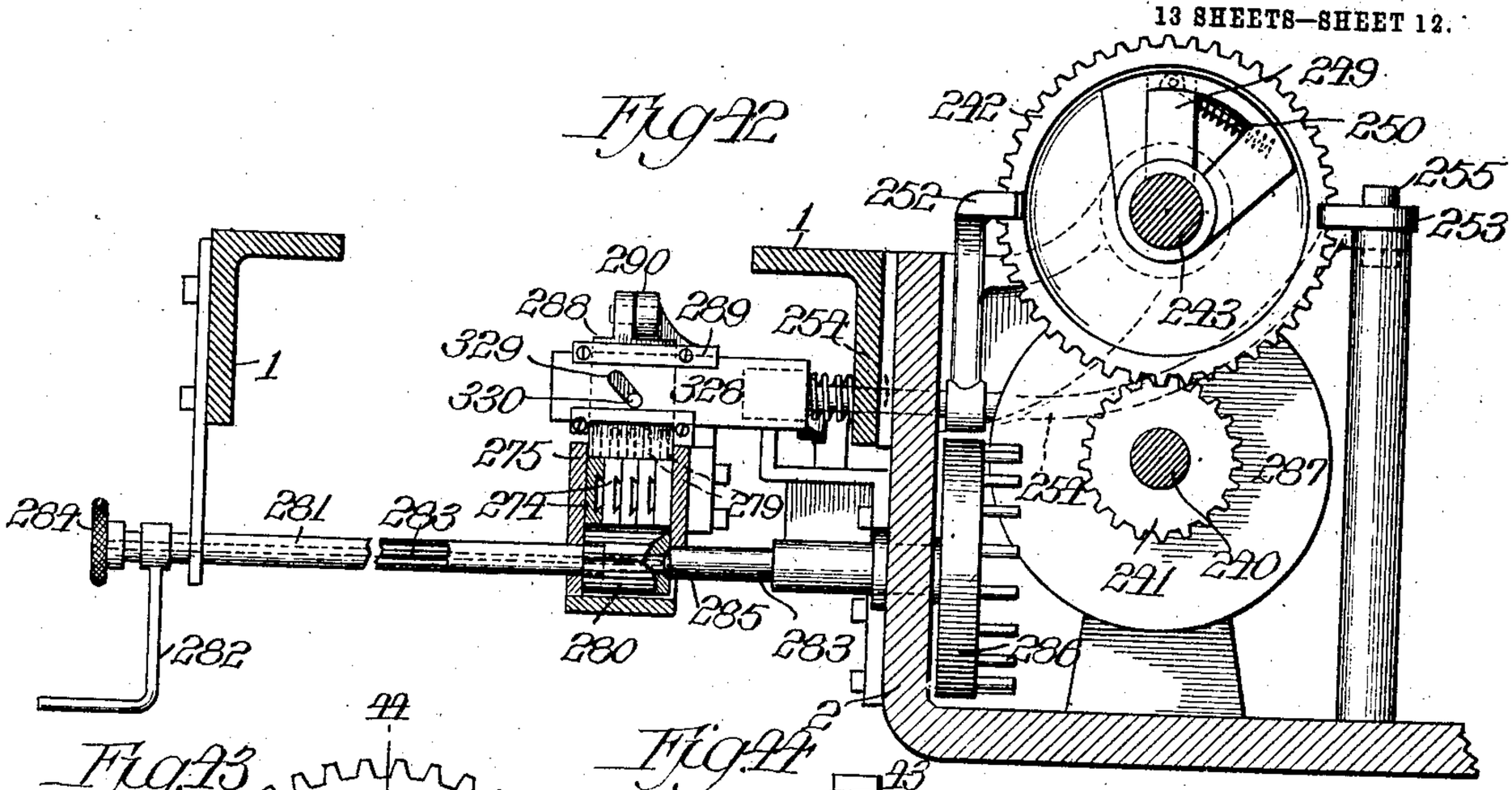
W. J. PINE.

COILED WIRE FABRIC MACHINE.

APPLICATION FILED OCT. 3, 1904.

13 SHEETS—SHEET 12.

Fig. 42



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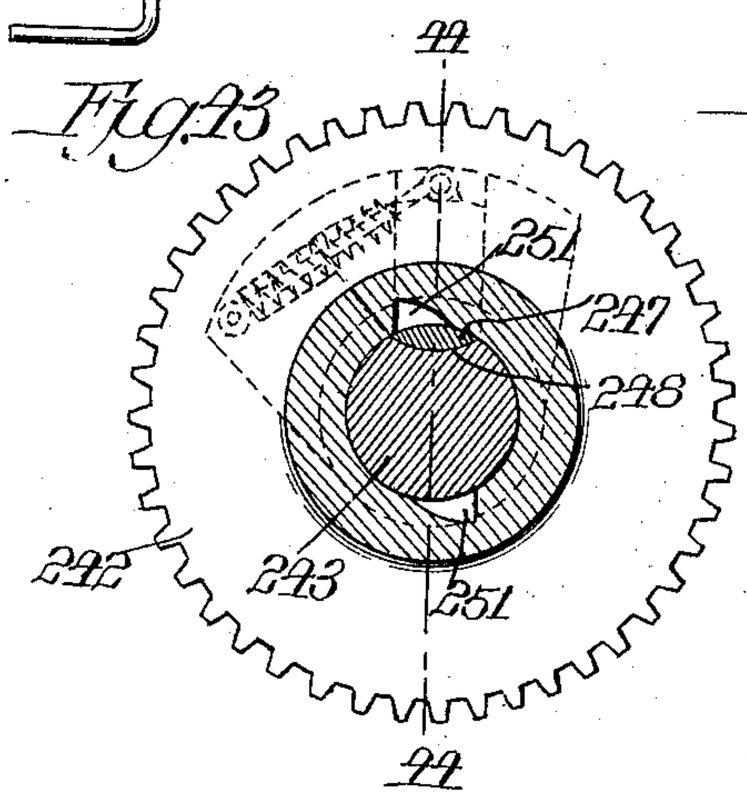

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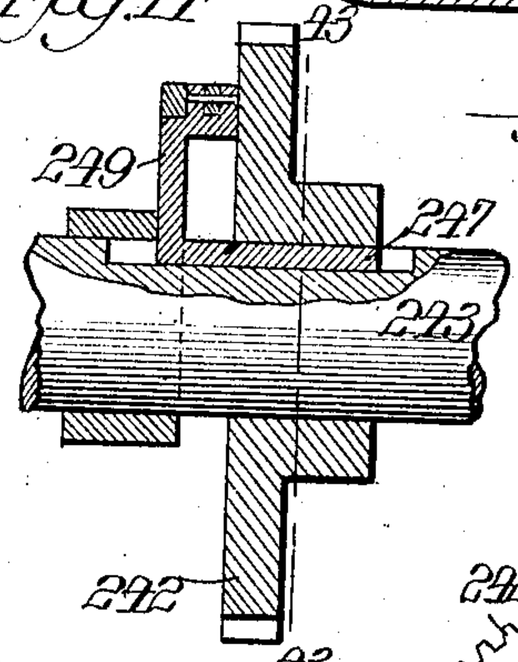
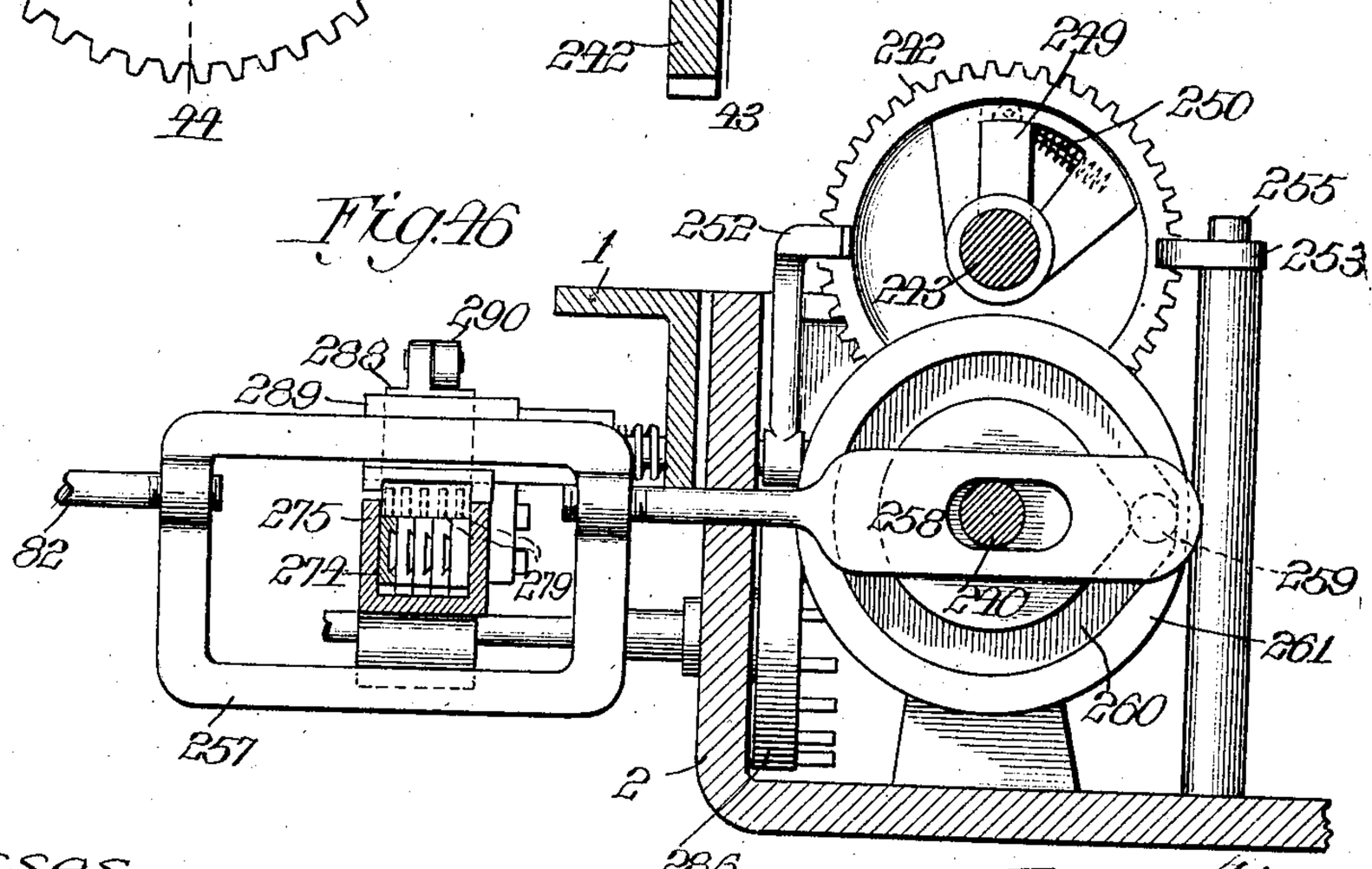


Fig. 45

Fig. 46



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Inventor
Wilber J. Pine
By Rector & Hibben
His Att'ys

No. 825,415.

PATENTED JULY 10, 1906.

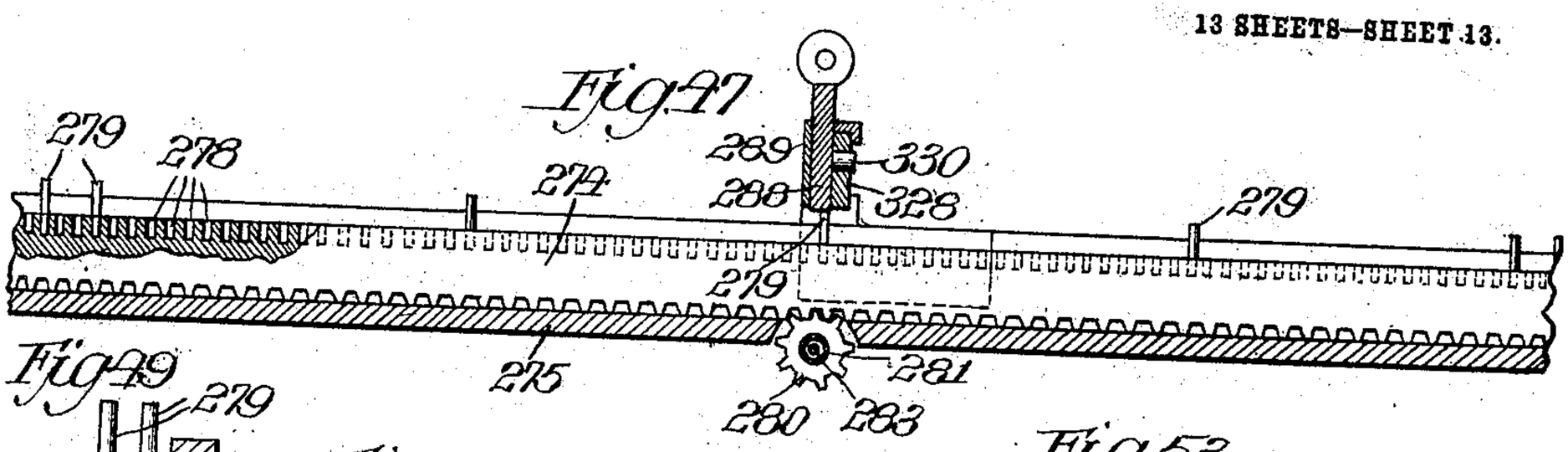
W. J. PINE.

COILED WIRE FABRIC MACHINE.

APPLICATION FILED OCT. 3, 1904.

13 SHEETS—SHEET 13.

Fig. 47



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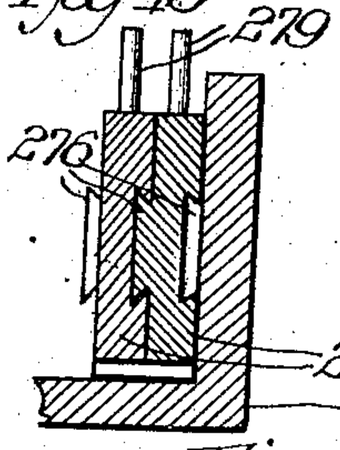

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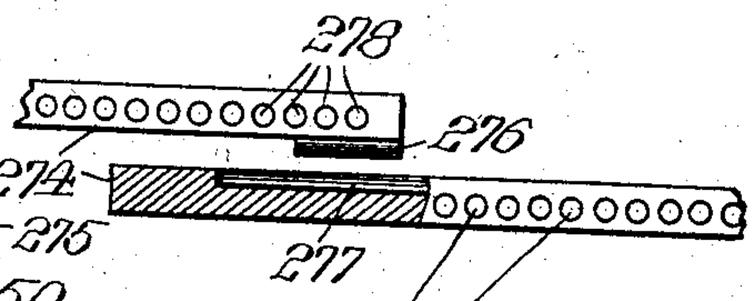

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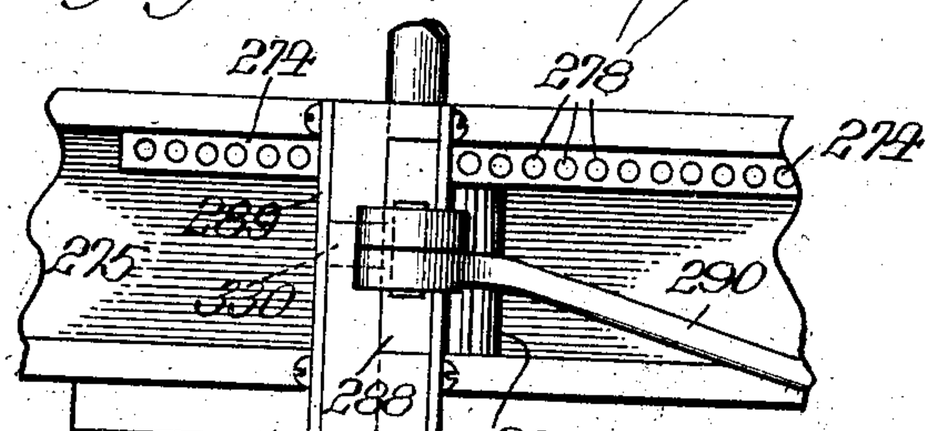

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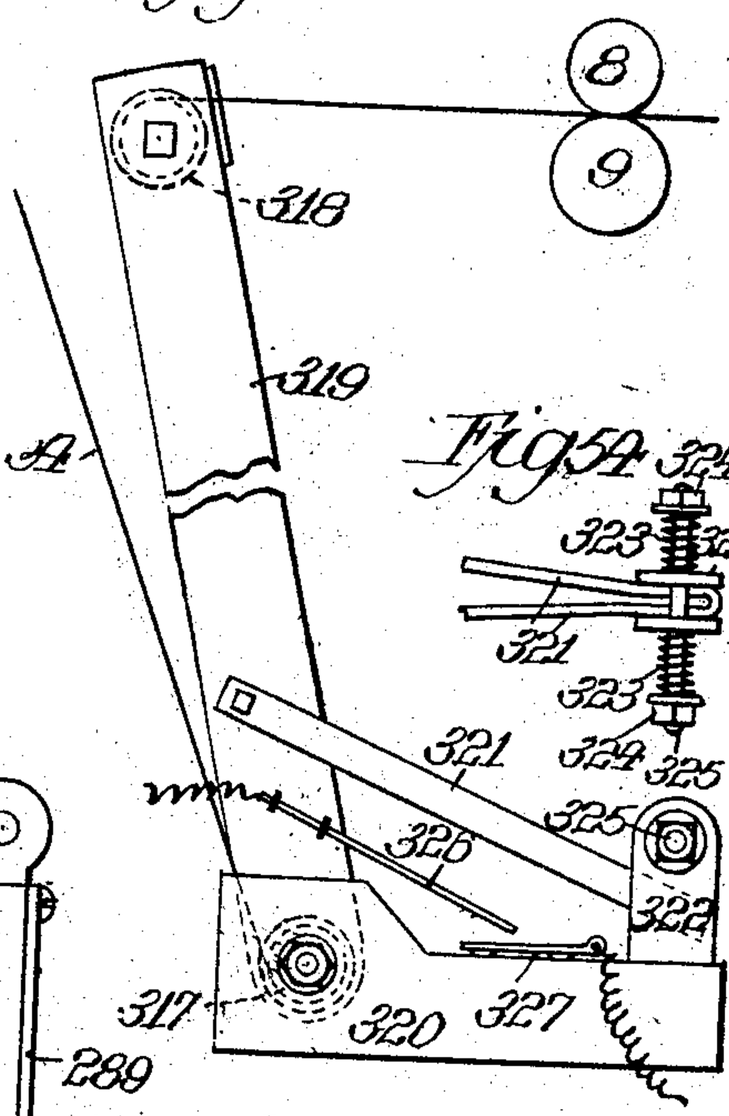
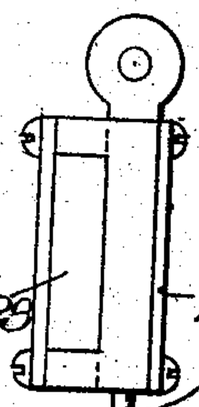


Fig. 54

Fig. 51



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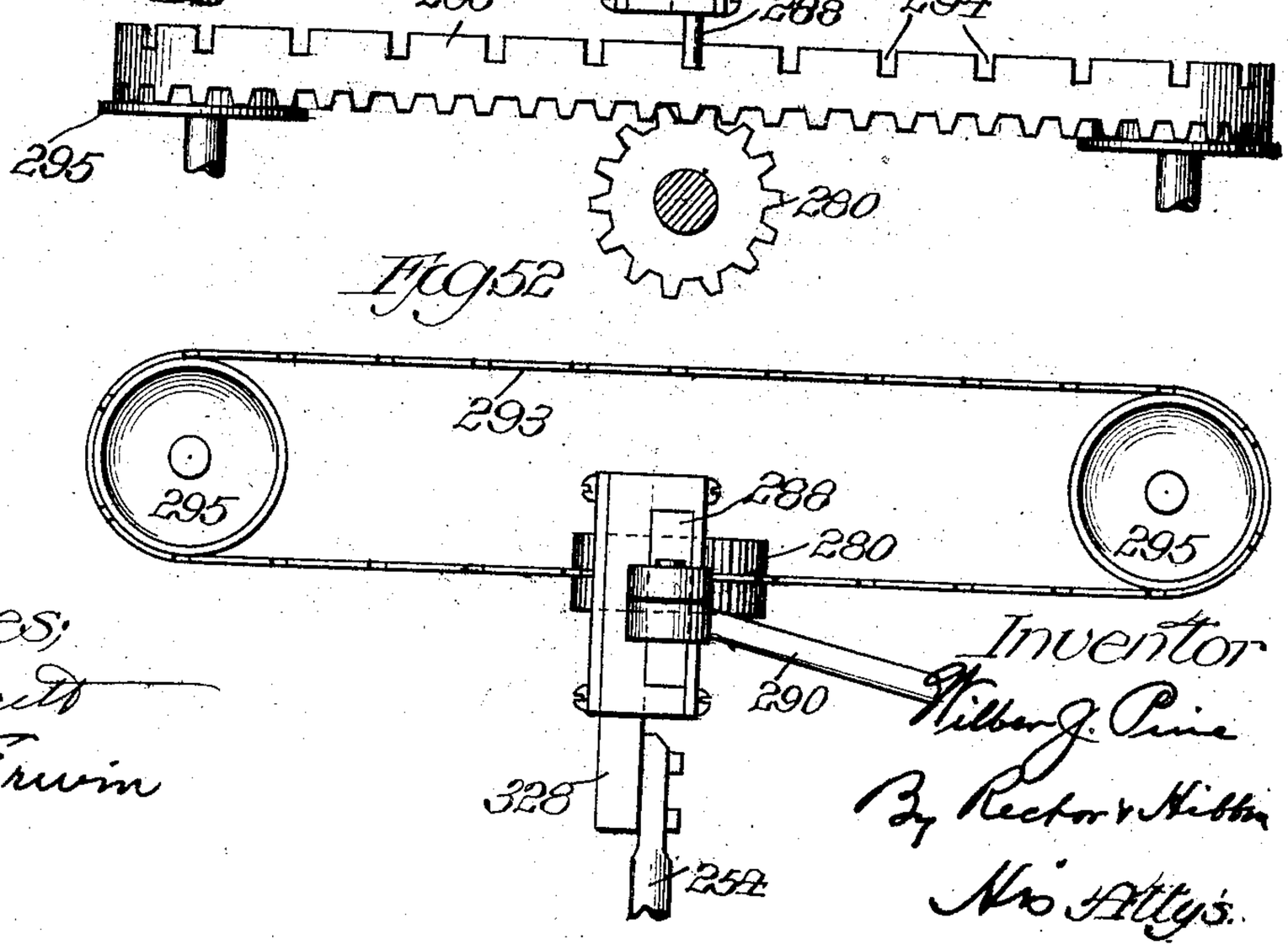

Witnesses;
Edw. R. Barrett
Louis B. Erwin

Inventor
Wilbur J. Pine
By Rector & Nibbe
His Attys.

UNITED STATES PATENT OFFICE.

WILBER J. PINE, OF OSHKOSH, WISCONSIN, ASSIGNOR TO PINE-IHRIG MACHINE COMPANY, OF OSHKOSH, WISCONSIN, A CORPORATION OF WISCONSIN.

COILED-WIRE-FABRIC MACHINE.

No. 825,415. Specification of Letters Patent. Patented July 10, 1906.

Application filed October 3, 1904. Serial No. 227,018.

To all whom it may concern:

Be it known that I, WILBER J. PINE, a citizen of the United States, residing at Oshkosh, in the county of Winnebago and State of Wisconsin, have invented certain new and useful Improvements in Coiled-Wire-Fabric Machines, of which the following is a specification.

My invention relates to machines for coiling and weaving wire into a fabric—such as employed, for instance, in the manufacture of wire mattresses; and the object of my invention is to produce a machine of this character which shall be efficient and reliable in operation, capable of automatically coiling and weaving the wire, beginning with the wire on the reel and ending with its conversion into the complete wire fabric.

My machine is designed and adapted to perform all its operations with precision and reliability, with the result that the product thereof is perfect and without the waste that would result from imperfect coiling or weaving at any point in the fabric. Moreover, my machine possesses great capacity, and the arrangement is such that the capacity may be increased by increasing the number of coilers and weaving devices, so that one machine may be provided with a plurality of gangs of coiling and weaving devices, producing separate wire fabrics, but operating as a unit or as a single machine. Again, in my machine I provide for the adjustment of the parts so that wire fabrics with coils of different size or pitch may be produced. Furthermore, I provide novel and efficient mechanism, herein designated as "pattern-racks," whereby the cords which are arranged at the sides of a wire mattress to form the borders and which are also run intermediate the width of the mattress for strengthening purposes may be woven into the fabric automatically according to any predetermined arrangement as provided for by the pattern-racks.

The various features of utility and advantage of my machine will be made apparent from the description hereinafter given.

In the drawings, Figure 1 is a plan view of my machine when constructed with a plurality of gangs of coiling and weaving devices, four gangs being shown in the present instance; Fig. 2, a side elevation of the machine; Fig. 3, an end elevation thereof; Fig. 4, a section on the line 4 4 of Fig. 1; Fig. 5, a plan view of the rear portion of the machine with some of the parts removed; Figs. 6 and 7, sections on the lines 6 6 and 7 7, respectively, of Fig. 5; Figs. 8 and 9, detail views of one of the shutters and a plate operating in connection therewith; Figs. 10 and 11, sectional elevations on the lines 10 10 and 11 11, respectively, of Fig. 5; Fig. 12, a detail view of a portion of the cam-wheel; Fig. 13, a sectional elevation on the line 13 13 of Fig. 1; Fig. 14, a sectional elevation on the line 14 14 of Fig. 1; Figs. 15, 16, and 17, detail views of the tension-applying rings or bands and associated parts; Fig. 18, a section on the line 18 18 of Fig. 5; Fig. 19, a section on the line 19 19 of Fig. 5; Fig. 20, a section through another point of the weaving-channel, said three last-named figures showing the parts of the weaving-channel in different relative positions; Fig. 21, a sectional elevation on the line 21 21 of Fig. 13; Fig. 22, a detail view of the wire-guide; Fig. 23, a perspective of one of the coilers; Fig. 24, a perspective of one of the tension-cylinders; Fig. 25, a front elevation of the cutting devices; Fig. 26, a section on the line 26 26 of Fig. 27; Figs. 27 and 28, sections on the lines 27 27 and 28 28, respectively, of Fig. 25; Fig. 29, a perspective of the block or plate 95 and associated parts; Fig. 30, a plan view of one of the cutters; Fig. 31, an elevation of one of the back-feed arms or triggers; Fig. 32, an elevation of the starting or developing frame or rack with its guide-post and movable standard in section; Fig. 33, a side elevation of such rack or frame; Fig. 34, a detail view showing the position of the starting-wire in the weaving-channel; Fig. 35, a detail view of the inner side of one of the end heads of the rack or frame; Fig. 36, a section on the line 36 36 of Fig. 37; Fig. 37, a front elevation of the clutch device illustrated in Fig. 36 with a portion thereof broken away; Fig. 38, a side elevation of said clutch; Figs. 39, 40, and 41, detail views of portions of said clutch; Fig. 42, a section on the line 42 42 of Fig. 1; Fig. 43, a sectional elevation on the line 43 43 of Fig. 44; Fig. 44, a section on the line 44 44 of Fig. 43; Fig. 45, a perspective of the rolling key; Fig. 46, a section on the line 46 46 of Fig. 1; Figs. 47, 48, 49, and 50, detail views

of the pattern-racks; Figs. 51 and 52, detail views of a modified form of construction of the pattern-rack; Figs. 53 and 54, detail views of the circuit-closer arranged adjacent the reels from which the wire is taken, and Fig. 55 a detail view of a modified form of construction of the mechanism for adjusting the tension of the bands or rings on the lower feed-roll.

In the machine herein illustrated as embodying my invention I have chosen to show four gangs of coiling and weaving devices, whereby four separate fabrics may be simultaneously produced; but it will be understood that my invention, except where specifying a plurality of such gangs, is not to be limited thereto, but that the same may be embodied in a machine employing one coiling and weaving device and producing a single-wire fabric.

Before proceeding with a detailed description of the construction and mode of operation of my machine I will state the operation briefly, as follows: Assuming that the wire fabric is to be composed of double wires, as usual in mattress-springs, and following out the operation of a single coiling and weaving device, the two wires taken from the reels are fed by means of feed-rolls to a pair of coilers, where the wires are given the proper coiling, the size or diameter of the coil and the pitch thereof being dependent upon the size and pitch of the spiral of the coilers. The wires as thus coiled are brought together as a single wire and are passed through a knife or cutting device and also passed or run into a weaving-channel. After the two wires thus forming, in effect, a single wire or strand are run into the weaving-channel a sufficient distance the knife operates to cut off the wires. In the running or extending of the wires in the weaving-channel the same are woven or interlocked with the coils of a preceding wire, after which the completed coils are raised a sufficient distance in the weaving-channel to enable the next or running wire to be itself interwoven with the last completed wire or strand in the fabric.

It will be understood that the feeding action of the feed-rolls is not continuous, but intermittent, and the same is true of the operations connected with the performance of the functions of the weaving-channel, inasmuch as it is evident that the coiling and advancement of the wire must pause or be interrupted until the last wire has been operated upon in the weaving-channel and been raised to a proper position therein so as to be engaged by the next or running wire in the weaving operation.

As is well known, the strengthening-cords and border-cords are run in fabrics of this character, and it is therefore essential that the machine shall provide for the running or weaving thereof in the fabric. These cords consist simply of the ordinary strand of two or more wires, which are inserted in the same position occupied by the preceding strand or set of wires instead of being regularly coiled therewith, with the result that the number of wires in a strand is multiplied and the fabric thereby strengthened at such point. It is desirable that the border shall have a series of these strengthening-cords and that the cords intermediate should have simply a double set of strands; but in the fabric corresponding to what will become the middle line of a wire mattress it is desired that the strengthening-cord shall alternate with the usual strands. The construction and arrangement of my machine are such that these cords may be run or inserted in an automatic manner and according to any predetermined pattern—that is to say, the number of the cords at any particular point or line, as well as the location thereof transversely of the fabric, may be varied by the operator according to any pattern which he may adopt.

It will be understood that the machine produces a continuous wire fabric, which is preferably received upon suitable winding-rolls, such fabric of course containing the material for a number of wire mattresses, according to the length thereof. It will also be understood that the fabric in such continuous roll contains the border-cords at intervals corresponding to a division-line between the various mattresses, which are separated, as usual, by withdrawing the strand connecting the border-cords of two adjacent mattresses in the roll or fabric.

From the brief description already given of the machine it will be understood that the same is capable of simultaneously weaving a plurality of fabrics when gangs of coiling and weaving devices are employed. It will also be understood that the fabric may be of the double-wire variety, as is the most common in commercial fabrics of this kind. Consequently in the description hereinafter given it will be assumed without any limitation that the fabric is of the double-wire type, and for convenience in description the machine will be described as if it had only a single set of coiling and weaving devices instead of the four sets or gangs illustrated in the complete machine of the drawings.

Now describing the machine in detail and referring particularly to Figs. 1, 2, 3, and 4, such machine, as herein shown, comprises a main longitudinal frame 1, consisting of parallel longitudinally-extending beams or strips, and also a side frame 2, all supported in suitable manner, as by the legs 3. Upon the front end of the machine a head 4, adapted to carry some of the operating parts of the machine, such as the feed-rolls and coilers, is arranged to reciprocate in a horizontal plane in a manner and for a purpose hereinafter made apparent. As shown in Figs. 1 to 3

and 13 and 14, this reciprocating head is provided with posts or bearing-guides 5 in two pairs rising from opposite sides of the machine, having between them the bearings of two feed-roll shafts 6 and 7, the purpose of which is to feed the wire which passes between them from the reel to the coiler or coilers in advance thereof, as hereinafter explained. In the present instance the pressure-surface of the upper roll is a shell or cylinder 8, secured to the shaft; but the roll might, if desired, be made in one piece.

It is desired that one of the feed-rolls shall act on the wire with a yielding pressure and also that such pressure or tension shall be adjustable, to which end the lower roll is in the present instance made in a novel manner, such roll being, in effect, a band or ring 9 in case a single-wire fabric is to be produced, or in case a double-wire fabric, as in the present instance, a pair of rings is provided, or a plurality of rings in case of a gang-machine. In this connection it will be borne in mind that in the machine illustrated four gangs of coiling and weaving devices are employed, in which instance a series of eight of these rings arranged in four pairs is employed. These rings surround or encircle the lower shaft 7 and are spaced to proper distance by means of a series of distance-sleeves 10, also encircling the shaft 9, Fig. 13 and Figs. 15 to 17. Between each ring and the shaft is interposed a coiled spring 11, the outer end of which is fastened to its ring 9 and the other or inner end to the shaft 7, in the present instance such connection being made by means of keys 12, as illustrated in Fig. 13. As a result of this arrangement and construction the motion of the shaft 7 is not directly communicated to the rings or roll proper, but indirectly thereto with a yielding pressure and through the medium of the springs, it being understood that the feed-rolls should act on the wires in such a manner as to feed them properly, but without flattening or crushing them.

The rings or bands are arranged in pairs, one pair for each gang and one ring for each wire, assuming that a double-wire fabric is the one to be woven or produced by the machine. In order to obtain the accurate adjustment of the rings as regards the tension or pressure against the wires, the rings are adapted to be adjusted independently of their shaft, whose adjustment will be hereinafter explained, and to this end adjustable rollers 13 are arranged below the rings in such manner as to bear against the lower peripheries thereof. Each ring coöperates with a pair of these rollers, which are mounted to rotate in a vertically-movable cradle 14, having a depending fulcrum-pin 15. The fulcrum-pins have bearing-points at their lower ends, and the pins of two companion cradles coöperate with and bear against a common transverse fulcrum-bar 16, which is sustained or supported at the upper end of a single pivot-pin 17, bearing against the under side thereof at a point midway of the bearing-points of the fulcrum-pins.

The fulcrum-pin 15, as well as the pivot-pin 17, are movable in vertical openings or holes in the block 17 of the reciprocating head or frame of the machine. The pin 17 is arranged to be moved with a yielding pressure, and to this end an operating-handle 19 is mounted to turn freely upon a cross-shaft 20 having its end supported in depending brackets 21, secured to the block 18. When a plurality of gangs of coiling and weaving devices are employed, there is a corresponding number of these handles, one handle for each pin 17 and for each pair of rings or bands. As shown, each handle is provided with a projection or arm 22, arranged to bear, as shown, against the head of an adjusting-screw 23, which screws into the lower end of a depending rod or pin 24. This latter pin bears against the same hole or opening as the pin 17; but instead of bearing directly thereagainst or forming a part thereof a spring 25 is interposed between their adjacent ends for cushioning purposes and to yield to different variations in the wires and prevent such variations as to one wire from affecting the tension of the other wire or wires.

From the foregoing description it will be understood that the upward movement of the right-hand end of the handle, Fig. 13, will move the arm 22 away from contact with the adjusting-screw 23, with the result that the cradle and its roller, together with the associated parts, will drop forward, thereby relieving its rings or bands from any pressure or tension to which they had been previously subjected. By adjusting the screws 23 up or down the degree of pressure of the rollers 13 and the consequent tension of the rings upon the wires will be correspondingly adjusted—that is, increased or decreased. It will be understood that the handles 19 are pivoted loosely upon the cross-shaft 20 in order that the tension or pressure adjusting mechanism for the several gangs may be independently adjusted.

As will be clearly understood from Fig. 13, an upward adjustment of the cradles and the rollers 13 will move or adjust the pressure or feed rings to a position eccentric of the drive-shaft 7, and such rings will consequently bear with an increased pressure against the wires as they are being fed into the machine. By the means described this feed and pressure can be adjusted to a nicety.

In order to hold and lock each handle 19 to its normal working position, I provide suitable means, such as those illustrated more particularly in Fig. 13, wherein a vertical locking-bar 26 is pivoted to the reciprocating head or frame of the machine, with its lower

end arranged to coöperate and engage with the upper end of a locking-arm 27. By actuating a pull-rod 28, extending forwardly toward the operator and within easy reach, the lock may be disengaged by the swinging of the lower end of the locking-bar away from the locking-arm, whereupon the handle proper may be raised against the tension of the spring 29, and thereby relieve the tension-applying mechanism thereabove. When the handle is returned to its normal working position, as illustrated in Fig. 13, the locking-bar will engage the locking-arm 27 and hold the parts in the normal position illustrated in said figure.

The shafts of the feed-rolls are both adjustable vertically in their guide-frames, as clearly indicated in Figs. 13 and 14. Referring first to the upper roll, the shaft thereof is journaled at its ends in blocks 30, movable vertically in the ports or guides in the reciprocating head and resting upon the upper ends of two parallel vertical strips 32, extending along the inner sides or walls of the guides and passing through slots at their lower ends. These strips 32 extend beyond the lower end of the guides and are outwardly flanged at their extreme ends to fit upon the upper face of an adjusting-nut 33. This nut screws upon a plug 34, secured in an opening in the lower end of the guide-frame, with the result that when the nut 33 is adjusted vertically the journal boxes or blocks 30 are correspondingly adjusted in their guides, the parts being locked in the adjusted position by means of the locking-nut 35. To hold the journal-blocks 30 in fixed position after the proper vertical adjustment is obtained, I provide set-screws 36, bearing against the top of such boxes or blocks and screwing through bridge-pieces 37, extending across and connecting the tops of the guides. The lower feed-roll is likewise journaled at its ends in boxes or blocks 38, which are movable or vertically adjustable between the strips 32, as indicated in Fig. 14. To the lower ends of these blocks are secured blocks 39, provided with screw-threaded tubular extensions 40, which are adapted to coöperate with vertical adjusting rods or shafts 41. These shafts are provided with collars 42, which bear upon brackets 43, depending from the guides, and the extreme lower ends thereof extend through the brackets and are provided with an angular portion to receive a key-wrench or the like. By rotating these adjusting-shafts in one direction or the other the feed-roll shaft 9 is correspondingly adjusted vertically up or down, as the case may be. As clearly indicated in Fig. 14, the adjusting-shafts, as well as the tubular extensions 40, extend through the hollow plug 34, and in addition such tubular extension is guided thereby.

Before reaching the feed-rolls the wires are caused to pass through guides, which are made in the novel form illustrated particularly in Figs. 1, 3, 13, and 22, for the purpose of straightening out any kinks or bends in the wire and also for properly directing the wires before their entrance between the rolls. As shown, each wire has its own individual guide, each consisting of a strip or substantially rectangular block 44, provided with a longitudinal channel, in which the wire lies and runs, together with an upper strip or block 45, provided with a longitudinal rib or fin 46, adapted to enter the channel of the lower bar and to rest upon the wire as it passes through. By preference each lower block rests in a bracket 44^a, secured to the machine-frame. In order to vertically adjust the position of these guides, I mount them all on a cross-piece or plate 47, which is adjustably secured to the sides of the feed-roll guides 31, as more clearly indicated in Figs. 1, 3, and 13. This plate has depending brackets 48, which are slotted to receive the bolts 49, secured in said guides 31. The proper adjustment of the cross-piece or plate is obtained by adusting the set-screws 50 and then tightening up the bolts. To this plate is secured a parallel plate or bar 51, arranged thereabove and adapted to receive a series of set-screws 52, Figs. 3 and 13. These screws are adapted to bear against the upper block 45 of the wire-guides in order to regulate the position of such upper block to the passing wire and also in order to take up wear.

The wires as they pass through the rolls are fed to the coilers, one for each wire, whereby the wires are given the proper coil according to the diameter and pitch of the particular coilers employed. Each coiler comprises a coiler proper, consisting of a cylinder 53, having a spiral groove 54 cut on its periphery and of the pitch to be imparted to the wire, Fig. 23. This coiler is incased in a shell 55, and such shell and its coiler are held in proper relative position and such parts are also held in fixed position in the machine by means of a pin 56, passing through a plate 57 on the machine and extending radially through the shell 55 and partially entering the coiler. Each coiler is held against upward displacement by means of a set-screw 58, passing through a cross-piece 59 of the machine and bearing against the top surface of the coiler-shell.

To extend the coils as may be desired or required as they emerge form the coilers, I provide a tension device, which acts upon the coils as a resistance by destroying the regularity of the spiral path to be taken by the coils after they leave the coilers. The purpose of thus extending the coils is to provide for a uniform pitch for two companion wires, so that they will keep close together and run together in harmony. To this end I employ a short cylinder 60, (as detailed in Fig. 22

and as assembled in Fig. 13,) having a spiral groove 61, which is considerably widened or enlarged at its mouth 62, which is placed adjacent the rearward end of the coiler proper. This tension-cylinder is adapted to enter the rearward end of the coiler-shell and to coöperate with the coiler for the purposes named.

In one position of the tension cylinder 60 its spiral groove forms a perfect continuation of the spiral groove on the coiler, with the result that the coil as produced and to be run into its weaving-channel corresponds in diameter and pitch to the grooves of the coiler and to its diameter. However, this tension-cylinder is rotarily adjustable for the purpose of varying the pitch of the coils after leaving the coiler, and, as will be observed from an examination of Figs. 13 and 22 of the drawings, a rotary movement of the tension-cylinder will break the uniformity or continuity of the spiral by causing the wire to press with some force against one side of the mouth or enlarged end of the groove 61 in the tension-cylinder and thereby flatten or extend the coils according to the amount of this rotary adjustment.

For the purpose of rotarily adjusting the tension-cylinder as described suitable means are employed, and in the present instance (see Figs. 1, 12, and 21) I provide the reduced end of each of such cylinders with an upwardly-projecting pin 63, whose upper end passes loosely through an opening in a transversely-adjustable bracket 64, slidable in a transverse groove in the cross-piece 59. As shown in Figs. 13 and 21, these adjustable brackets are all dovetailed in said groove, and each of them is adapted to be adjusted or shifted independently and transversely by means of a thumb-nut 65, screwing upon the transverse screw-rod 66, having bearings at its ends in said cross-piece, Figs. 1, 13, 21. Each nut is arranged to bear against a projection on its bracket, with the result that any one of the brackets may be shifted laterally by operating any particular one of the thumb-nuts. It will be understood that it is preferred that the tension-cylinders shall have separate and independent adjustment and that consequently there are as many of the brackets and thumb-nuts as there are coilers and tension-cylinders.

The wires as coiled by two companion coilers are fed along two channels or grooves 67, formed on the top surface of a plate 68 and converging at the forward edges thereof. This plate, which is preferably of non-conducting material, such as a fiber, which is a non-conductor of electricity, extends transversely of the machine, as seen in Fig. 1, and is of course provided with as many of said channels as there are coilers, in the present instance having eight of such channels arranged in four pairs, inasmuch as four gangs of coiling and weaving devices for producing four rolls of wire fabric at one time are illustrated in the present machine.

Assuming that a double-wire fabric is to be produced, the wires of two coöperating or companion coilers are thus brought together at the ends of the converging channels or grooves 67, and the same are then threaded through a knife-block 69, a series of which is provided in the present machine, one for each pair of coilers, Fig. 30. Each knife or cutter-block has a forward cylindrical portion and a reduced rearward portion which is cut down through a diameter to present a flat horizontal cutting-surface over which the knife 70 passes. As seen in Fig. 13, the periphery or outer surface of the knife-block is spirally grooved for a portion of its extent in order to receive the pair of wires which pass together thereto from the coilers, and in order to form an opening through which such pair of wires shall emerge on the cutting-surface of the knife-block I surround the lower half of the knife-block, or at least the rearward portion thereof, with a semicircular band 71, whereby the opening 72 is provided for the wires, as indicated in Fig. 28.

The series of knife-blocks is secured in fixed position in suitable manner, and in the present instance such blocks pass through openings in a cross-piece 73, and they are held or secured thereto by means of the set-screws 74, all as clearly indicated in Figs. 25, 27, and 30.

Each knife-block is provided with a knife 70, which is moved at the proper predetermined time, with the result that the coiled wires are cut off after a certain length thereof has been fed or run through the opening 72 to the weaving devices. In the present instance the knives, which are flat plates presenting a cutting edge or corner to the knife-blocks, are secured in suitable manner to a transverse bar 75, arranged to slide in grooves formed in the upper portion of the cross-piece 73 of the reciprocating frame or head. (See Figs. 1, 13, 27, 28, and 30.) The knife-bar is operatively connected with a transverse plate 76, adapted to slide transversely of the machine and to be operated through connections with the power or driving mechanism, as hereinafter explained. As indicated in Figs. 25, 26, and 27, this plate 76 has its bearing in the lower portion of the cross-piece 73 and the same is designed not only to operate the cutter-bar, but also to operate a back-feed arm, as will be hereinafter described. The operating connection between the cutter-bar and the actuating-plate 76 consists in the present instance, Fig. 25, of a lever 77, pivoted at its upper end to the cross-piece 73 and connected with one end of the cutter-bar by means of a link 78. The lower end of the lever is slotted in order to receive a pin 79. The object of the slot and of the connection is to enable the feed-arm to be operated in

advance of the cutter-bar—in other words to cause the triggers or feed-arms to be first moved and the cutter-bar to be moved only near the last movement of the actuating-plate 76. As shown more particularly in Fig. 1, the left-hand end of the sliding plate is connected by a rod 80 with the end of an actuating-lever 81, pivoted on one of the side frames or beams of the machine. The other end of this actuating-lever is connected with a sliding or reciprocating rod 82, extending transversely of the machine and operated by power mechanism, as hereinafter described.

The back-feed arm hereinafter referred to is arranged in advance of the knife and is employed for the purpose of withdrawing or feeding backwardly the front end of the severed wire when a cord is to be run in order that they may lie forwardly of the opening 72 in a manner indicated in Fig. 28 and in order to enable the next succeeding strand or set of wires to properly coöperate with the first-described strand and to take the same position.

In the present instance, and referring more particularly to Figs. 25 to 31, the feed-arm is a pivoted lever or trigger 83, having a peculiar movement in order to enable it to accomplish the purposes described. This arm or trigger is secured at its lower end to a transverse rock-shaft 84, which is common to all of the arms or triggers employed in the present gang-machine. This rock-shaft is supported at the rearward ends of the links 85, which are secured to a transverse shaft 86, suitably journaled at its ends in the machine-frame. The upper end of the arm or trigger operates in and projects slightly above a slot or opening 87, extending in a transverse bed-plate 88. In order to hold the series of arms or triggers in a normally forward position and to take up lost motion, as indicated in Fig. 27, I employ suitable tension mechanism, such as flat springs 89, secured at their lower ends to a fixed part of the machine and bearing at their upper ends against the rearward side of a flat plate or strip 90, through which the triggers pass. The forward end of the link 85 is extended forwardly through a slot or opening 91 in the cross-piece 73, and there engages one end of a pivoted lever 92, which works between the front face of the cross-piece 72 and the silding plate 76. The other end of this lever 92 is provided with a stud 93, which is received and operated by a cam slot or opening 94 in the body of the actuating-plate 76, as clearly indicated in Fig. 26. On the front side of this actuating-plate and extending across the cam-opening, as seen in Fig. 26, is a block 95. (Shown in detail in Fig. 29.) This block on its inner side adjacent the cam-slot is provided with a stop-finger 96, which is secured to a rocking pin 97, extending transversely through the block and held with a yielding pressure in a normal position by means of a flat spring 98, which cooperates with a rod or wire 99, secured to the locking-pin 97.

The mechanism just described is employed for the purpose of giving the feed arm or trigger 83 the proper vertical movements; but in order to provide for the forward and rearward movement of such arm I employ suitable mechanism for automatically sliding the plate 90, whose ends are movable in guides 100 in the machine-frame, as indicated in Figs. 25 and 27. In the present instance this reciprocation is brought about by connection with the actuating-plate 76 by suitable connections, as follows: The plate 90 is operatively connected with the upper ends of arms 101, which are secured to a rock-shaft 102. From this rock-shaft projects forwardly an arm 103, whose extreme forward end is formed as pin 104, received and operated by a cam-slot 105 at one end of the actuating-plate 76. It will be observed that a slight transverse movement of this actuating-plate will move the cam-pin 104 in a vertical plane, as indicated by the dotted lines in Fig. 28, whereupon the shaft 102 will be rocked and the plate or strip 90 be thereby reciprocated forwardly and backwardly on its pivots. Inasmuch as the plate 90 is operatively connected with the arms or triggers, the latter will be correspondingly actuated forwardly and backwardly.

The different mechanisms described in connection with each back-feed arm or trigger combine to give the peculiar movement required of the latter in order to act upon the forward end of the cut-off strand or set of wires, and in Fig. 31 I have illustrated by dotted lines the course or path of movement of the extreme upper end of each trigger in each of its cycle of movements, from which it will be seen that the first movement is downwardly and then upwardly in a semicircle until it engages back of the first coil of the strand adjacent the cutter, whereupon at the next and forward movement of the trigger the extreme forward end of the wire will be drawn forwardly of the opening 72 in the knife-block.

The cycle of operation of the parts illustrated in Figs. 25 to 31 is as follows: Assuming that the wires have just been run through the coilers and through the knife mechanism to the proper extent, the lever 81 is actuated, with the result that the plate 76 is shifted toward the right, Fig. 25, whereupon the stud 93 of the lever 92, which is normally held in the position indicated in Fig. 26 by the tension of the spring 106 acting on the rock-shaft 84, will be contacted by the stop-finger 96 and will be forced downwardly by the curved contact face or surface thereof, with the result that the lever 92 will be rocked and such rocking movement communicated to

the rock-shaft 84 and feed-arm 83, which parts will now assume the position indicated in dotted lines in Fig. 27. When the actuating-plate 76 is moved to the right, as described, the cam-pin 104 will ride upwardly in its cam-slot 105, with the result that the plate or strip 90, to which the trigger is also connected, will be permitted to move rearwardly—that is, to the left in Figs. 27 and 28—until the parts assume the relative position shown by the dotted lines in Fig. 28. Toward the end of the stroke of the actuating-plate 76 the knife mechanism will be actuated, inasmuch as by this time the stud or pin 79 will have traversed the slot in the lever 77 and have moved its lower end to the right, Fig. 25, thereby moving the cutter-bar in the same direction and severing the strands or set of wires. Upon the return movement of the actuating-plate 76 the knives will be restored to normal position, and the feed-arm or trigger, which has already engaged behind the first coil of the severed strand, as indicated in Fig. 30, will move forwardly and draw the ends of such strand forwardly and away from the opening 72 in the cutter-block, so that the next strand or set of wires as they emerge from the knife mechanism will be properly run together with the first strand as a cord. In this return movement of the actuating-plate 75 the stud 93 of the lever 92 will not be affected by the stop-finger, which will flip by such stud as such actuating-plate returns to said normal position. In this connection it will be understood that the feed-arm or trigger, although continuously operating, is effective only when a cord is to be run, at which time the coil is not raised by the weaving devices, but left in the path of movement of such trigger. At other times—that is, when a cord is not to be run—the coil or wire is raised by the weaving devices out of reach of the feed-arm or trigger.

For the purpose of bringing the ends of the strands or sets of wires to a proper position at their forward ends, so that the wires may properly interweave, I provide for moving or reciprocating the entire head 4, which is so mounted as to have a slight reciprocation on the main end frame 1, this reciprocation being substantially one-half the pitch of the coil being run, so that the upper helix of the running coil will interweave with the lower helix of the preceding coil. In the present instance and referring more particularly to Figs. 13 and 14 the reciprocating head 4 is mounted to slide upon said main frame 1 and is operatively connected with the power or drive mechanism in suitable manner. As shown this is accomplished by means of a transverse shaft 107, journaled in the main frame and provided with similar pinions 108, arranged to mesh with horizontal racks 109 on each side of the machine. The racks are carried by the reciprocating head, one end of the racks being connected with the lower end of depending pins or bolts 110 and the other ends being mounted to slide in openings in the main frame, as clearly indicated in Fig. 14. It is obvious that when the shaft 107 is rocked or partially rotated in one direction or the other the entire reciprocating head is correspondingly moved. As indicated in Fig. 4, the rock-shaft 107 is provided with a crank or cranked end 111, operatively connected, by means of a rod 112, with another rock-shaft 113, extending transversely of the machine and actuated by the power or driving mechanism in a manner hereinafter explained. It will be understood that this reciprocating head carries all of the operating parts connected with the coiling and cutting off of the wire, and it will also be understood that the reciprocations of such head are properly timed in order to coöperate with the movements of the weaving devices.

From the foregoing description it is obvious that the head will so present a running coil or wire that the same will properly interweave with the preceding wire or coil.

After the wires have been coiled and passed through the cutting mechanism they are delivered to the weaving devices or mechanism, where they are woven or interlocked in order to form a complete coiled fabric. The weaving mechanism is arranged in advance of the coiler and knife mechanism and in alinement therewith. As shown in the drawings, particularly in Figs. 1, 4, 5, 13, 18, 19, and 20, such weaving mechanism consists of a weaving-channel, with which cooperates a series of movable elements adapted to act upon the coiled wires in order to bring about the desired weaving thereof. As shown, the weaving-channel is composed of two longitudinal strips or plates 114 and 115, extending parallel to each other and having outwardly-directed flanges at their upper ends. These plates are lined on their inner adjacent faces with strips 116 of brass or the like, Figs. 18 to 21, in order to prevent magnetization by electromagnet 117, occupying the lower portion of the channel and constituting, in effect, the bottom of the channel. As indicated in Figs. 13 and 18 to 20, the electromagnet consists of a long field-frame extending from end to end of the channel and having a winding which is electrically connected with a suitable source of supply of electricity and also connected with an automatic circuit-breaker, whereby the magnet may be energized and deënergized at the proper time in the cycle of operation of the machine, as will be hereinafter explained. This magnet is thus provided with a pole 118 of considerable length, inasmuch as it extends substantially the entire length of the weaving-channel. This pole is always presented to the lowermost coil of wire and when energized acts to clamp such coil with-

in the channel in order to prevent upward movement of such coil when the fabric already woven is being slightly raised, as hereinafter explained. In addition residual magnetization is relied upon in the weaving operation, as will also be hereinafter explained. The field-frame is secured in the channel or space between the strips 114 and 115 in any suitable way and in such manner that while the strip 114 is at all times stationary the other plate 115, with its associated parts may move or slide vertically without affecting the position of the electromagnet or the other strip. Referring first to the channel-plate 114 and to the parts connected therewith, and particularly to Figs. 1, 5, 8, 9, and 18 to 20, the top face of the flange of such plate is longitudinally grooved to receive a sliding bar 119, which is operatively connected with the power mechanism, as hereinafter described, and provided with a series of upwardly-projecting pins 120, Fig. 19, arranged to be received by and to coöperate with oblique slots 121, formed at intervals along the length of a strip or plate 122, which I will hereinafter term a "shutter," Figs. 5, 8, and 18 to 20. This shutter extends longitudinally of the channel and is arranged to slide upon the top face of its plate 114, such shutter being moved or slid laterally by means of the reciprocation of the actuating-bar 119, with the result that its inner beveled edge is caused to project partially into the weaving-channel, as seen in Fig. 19, or to be retracted to the edge of such channel, as seen in Figs. 18 and 20. Flat-headed screws 123, coöperating with transverse slots 124 in the shutter, serve to keep the latter in proper position longitudinally of the channel. The other plate 115 is likewise grooved on its top face to receive a reciprocating actuating-bar 125, which is also provided with a series of upwardly-extending pins 126, adapted to be received by and to coöperate with a series of oblique slots 127 in a second shutter 128, whereby the latter is caused to be shifted or reciprocated laterally partially over and away from the weaving-channel, according to the direction of movement of the bar. This shutter is arranged to slide between the top surface of its plate 115 and a horizontal plate 129, provided with an upwardly-directed flange 130 in the same plane as one side or wall of the channel and constituting, in effect, a continuation of such wall. To secure this top plate 129 to the side plate 115 of the channel and yet permit its shutter to move, I provide studs or screws 131, screwing into plugs 132, inserted in the top of the side strip 115 and received by transverse slots in the shutter 128, as clearly illustrated in Fig. 18.

The parts associated with the weaving-channel have three movements—first, the movement of the bar 119; second, the movement of the other bar 125, and, third, the vertical movement or reciprocation of the side or strip 115 of the channel. These movements are independent, but are controlled from a common point or by the same mechanism and are properly timed to accomplish the desired results in the weaving operation. The construction of the operating connections for accomplishing the described movements is best illustrated in Figs. 4 to 11. First describing the operating connection for the shutter 128 and its actuating-bar 125, and referring more particularly to Figs. 6 and 11, such bar is connected to a rock-shaft 133, extending transversely of the machine and suitably journaled therein. In the present instance the connection is had with the rock-shaft through a rock-arm 134, secured to such shaft and pivoted at its upper slotted end to the lower end of a lever 135, which is fulcrumed intermediate its length to the outer side of the plate 115. At its upper end this lever 135 is slotted and pivotally connected to the actuating-bar 125, with the result that when the shaft 133 is rocked the bar 125 is correspondingly reciprocated. This rock-shaft 133 is rocked by means of a cam-wheel 136, mounted on the rearward end of the longitudinal shaft 137, extending longitudinally of the machine and parallel to the weaving-channel and driven by the power mechanism, as hereinafter explained. The operating connection, as herein shown, between the rock-shaft and the cam-wheel, comprises a rock-arm 138, secured to such rock-shaft, and whose upper end is pivoted to the forward end of a link 139, Figs. 5, 10, and 11. This link is adjustable in length, as shown, and its rearward end is in the form of a cam-pin 140, bearing or sliding in a frame 141 and coöperating with the cam-teeth 142, formed on an inwardly-directed marginal flange of the cam-wheel. Obviously when the cam-pin 140 is forced toward the front of the machine (to the left in Fig. 5 and to the right in Fig. 10) its sliding bar is moved in the opposite direction—that is, toward the rear of the machine. As illustrated in Fig. 10, a spring 143 serves to hold the parts in normal position—that is to say, with the cam-pin under a tension toward the rear of the machine, (to the left in Fig. 1,) with the result that the cam-teeth operate to force the cam-pin and connected parts forwardly against the tension of such spring. In the present instance such spring is connected at one end to a post or pin 144, attached to the rock-shaft 133, and at its other end to a fixed part of the machine. From this description it will be understood that when the cam-pin is projected forwardly, as just stated, its shutter 128 is in its operative position with respect to the weaving-channel—that is to say, such shutter is

projected partially across such channel, as indicated in Fig. 19. When, however, the movement of the cam-wheel is such as to permit the spring 143 to thrust the cam-pin in the space between the cam-teeth, then the actuating-bar 125 is reciprocated in such direction as to cause a withdrawal of the shutter 128 to inoperative position, as indicated in Fig. 19.

Next describing the operation of the shutter 122, and referring particularly to Figs. 5, 7, 10, and 11, its actuating-bar 119 is operated by a transverse rock-shaft 145 by means of a crank-arm 146, having at its upper end a knuckle-joint or connection with the lower rounded end of a lever 147, fulcrumed intermediate of its length to the side strip 114 of the weaving-channel. This lever is in turn pivoted at its upper end to the sliding bar 119, with the result that such bar will be reciprocated according to the direction of the rocking of the shaft 145. In the present instance this rock-shaft is controlled in its movements by the cam-wheel 136, to which end such rock-shaft is provided with a second crank-arm 148, pivotally connected at its upper end to a link 149, in turn pivoted to the upper end of a lever 150, fulcrumed at 151 to a fixed part of the machine and carrying intermediate its length a cam-pin 152, which also bears in and is guided by the frame 141. This cam-pin 152 is normally held projected rearwardly to a position between the cam-teeth with a yielding pressure by means of a spring 153, connected at one end with the shaft 145 by means of a post 154, such spring being connected at its other end with a fixed part of the machine, as clearly indicated in Figs. 5 and 10. It will thus be seen that the movements of the cam-pin as controlled by the cam-teeth on the wheel 136 are communicated to the sliding bar 119 and thence communicated to the shutter 122, whereby such shutter is caused to move inwardly, partially closing the weaving-channel, and to be retracted, such movements being at intervals as timed by the construction and adjustment of the machine.

The reciprocation or vertical movement of the side plate or strip 115 of the channel, together with the subsequent bodily movement of all the parts associated therewith, is accomplished through the rocking of a shaft 155, extending transversely of the machine and located in the present machine intermediate of and parallel with the other two rock-shafts 133 and 145, all as clearly indicated in Figs. 5, 10, and 11. This rock-shaft 155 carries an arm or cam 156, which bears against the lower edge of the side plate 115 in such manner that when the shaft is rocked in an anticlockwise direction, Fig. 11, such plate and the parts thereon are raised against the tension of a spring or springs 157, tending to hold said strip or plate in a lowered position. This rock-shaft is operated by a third cam-pin 158, also bearing in the frame 141 and coöperating with the cam-teeth of the wheel 136. This cam-pin 158 is pivotally connected at its forward end to the upper end of a crank-arm 159, secured upon a short rock-shaft 160. This latter arm depends from such shaft 160 and is operatively connected, by means of a link 161, to the lower end of a depending crank-arm 162, which is secured upon the shaft 155, with the result that the reciprocations of the cam-pin 158 are transmitted to the rock-shaft 155 to rock the latter. The rock-shaft 155 and its cam 156 are duplicated toward the front end of the machine, where a similar cam is employed, with the result that the entire side of the weaving-channel is properly operated throughout its entire length. To obtain simultaneous movement of these duplicate mechanisms, I provide both the rearward and the front rock-shafts 155 with crank-arms 163, which are connected by means of a long rod or link 164, extending longitudinally of the machine. From the foregoing description it will be understood that the reciprocations of the cam-pin 158 as determined by the cam-wheel 136 cause a vertical reciprocation of one side of the weaving-channel, such movements being properly timed with respect to the other operations of the machine parts with respect to the movements of the two shutters.

The developing or starting frame or rack.—I will now refer to the developing or starting frame or rack, which is provided for the purpose of enabling the fabric to be started and developed to such a distance that the weaving device, and particularly the ejector portion thereof, may be enabled to act thereon, after which such ejector is capable of ejecting the fabric as produced or woven. To this end I provide the mechanism as illustrated in Figs. 1, 2, and 32 to 35. As shown, this starting-rack comprises, essentially, a frame consisting of two parallel upright guides or supports 165, which are arranged to slide in suitable grooves in two upright posts 166, secured to the frame of the machine. These posts form bearings for the opposite ends of the longitudinal shaft 137, which drives the cam-wheel 136, as already described, and in order to communicate the movement of such shaft to the guides and to thereby raise and lower the starting-frame I mount thereon gears 167 in slots in the vertical posts. These gears mesh with racks formed on the inner surface of the vertical guides of the frame, as clearly indicated in Figs. 1 and 2. The starting-frame further consists of two end heads 168, which are mounted upon or secured to an arbor or shaft 169, extending longitudinally of the machine and secured or keyed to vertically-movable slides 170. These slides are dovetailed in brackets 171, which extend horizontally and laterally from the guides or

supports 165. The object of this construction is to provide for a vertical movement or adjustment of the end heads independently of the guides or supports 165, and for accomplishing this adjustment I mount upon the brackets 171 vertical adjusting-screws 172, which engage the slides 170, and thereby move them up and down, as desired. For operating these screws in unison I provide their upper ends with bevel-gears 173, meshing with similar bevel-gears 174, which are secured to a longitudinal shaft 175. This shaft is provided with a handle-wheel 176 for adjusting purposes.

Adjustably suspended from the frame is a series of four bars 177, corresponding in number to the number of gangs of weaving and coiling devices employed in the present machine. As all of these bars and the operating parts are similarly constructed, I will proceed to describe a single set only thereof. Each bar 177 is carried by the two depending rack-bars 178, arranged adjacent the end headsof the frame and provided on one side with a rack adapted to engage small gears or pinions 179. These gears are mounted on a longitudinal shaft 180, having bearings in the end heads and having one end angularly shaped to receive a key-wrench or the like. In order to hold this shaft in adjusted position, I provide it with a ratchet device 181. It will be understood that the adjusting mechanisms at the ends of the bars 177 are similar and are moved in unison.

Suspended from the lower edge of each bar 177 by a series of short pins 182 is a starting-wire or small wire 183, which is designed to be inserted in the weaving-channel and to receive the first wire or coil run into such channel. The number and the spacing of these supporting-pins are dependent upon the particular pitch of weave of fabric, so that there shall be no obstruction to the running wire, but, on the contrary, such running wire will be woven upon the starting-wire, as indicated in Fig. 34.

It will be understood from the foregoing description that the starting-frame, with its series of longitudinal bars 177, is moved up and down as a unit as the guides or supports 165 are correspondingly moved and also that the starting-frame proper may be adjusted independently of the guides or supports by actuation of the hand-wheel 176, and, further, that any one of the strips or bars 177 may be adjusted independently of the starting-frame proper, as well as independently of the guides and supports.

In practice the starting-frame is moved downwardly to such position that the starting-wire 183 is arranged in the weaving-channel at the proper position or height as to enable the first wire or coil run therein to be woven thereon, as indicated in Fig. 34. At the next movement of the machine the starting-frame is raised a predetermined distance by the shaft 137, and the second coil or wire is run so as to be woven with the first coil or wire. The starting-frame is moved upwardly again to the same predetermined distance, and the coiling and weaving devices operate as hereinafter described, and this operation continues until a sufficient length of fabric is produced to be attached to a winding-roll on which the fabric as made may be wound, as indicated in Fig. 4. After the starting-frame has developed the fabric until the ejector of the weaving device is able to perform its functions such ejector takes care of the fabric independently of the starting-frame, which may then be used to take up the slack in the fabric. It is possible, of course, to employ the starting-frame for the purpose of taking care of the fabric so far as the upward limit of movement of such frame will permit, although it is intended to employ such frame only until such time as a sufficient length of fabric is produced to provide for connection with a winding-roll. The fabrics as produced by the machine may be run upon winding-rolls 184, journaled in a frame 185, as seen in Fig. 4.

The accurate adjustment or positioning of the starting-wire 183 within the weaving-channel is accomplished through the medium of the adjusting-shaft 180 and the rack-bars 179, the adjustment of the series thereof being entirely independent. The adjustment of all of the starting-wires as a unit is accomplished through the medium of the hand-wheel 176 and connected parts.

Before explaining the pattern-racks, which provide for the insertion or weaving of the strengthening-cords and the border-cords in the fabric and determine their position and number, I will proceed to explain the weaving operation as performed by the parts already described without taking other parts into consideration, but merely explaining a simple double-wire fabric.

Beginning with the starting-frame in its lowered position, the longitudinal or starting wire thereof is positioned within the weaving-channel sufficiently low down to be intercepted by the first running coiled wire, which after being coiled, as already described, is run or forced into the channel with a rotary movement, with the result that in its rotation it is woven or threaded upon the starting-wire, as indicated in Fig. 34. At this time the two shutters, as well as the vertically-movable side of the weaving-channel, are operative, but they perform no function, inasmuch as the fabric is not now sufficiently started. Consequently to afford a better understanding of the operation of these shutters it will now be assumed that the weaving has progressed sufficiently to produce several coils or wires, such as the wires *a*, *b*, and *c*, as indicated in Figs. 18, 19, and 20.

Referring to Fig. 18, the shutter 122 is now

in its inoperative position, with its inner edge flush with or upon the line of the channel, while the other shutter 128 is between the coils of wire *b* and *c* in its position of raising and ejecting the fabric, while the movable side of the channel is on its upward movement. It will be observed from an inspection of Fig. 18 that the wire *c* is elevated slightly above the bottom of the channel formed by the poles of the magnet, with the result that the next wire *d*, which has just been run into the channel, is woven or threaded through the preceding wire *c*. At the conclusion of the running of said wire *d* the electromagnet is energized by automatic mechanism properly timed, whereupon such wire is attracted and is, in fact, clamped to the bottom of the channel—that is, to the magnet-pole. At this time the entire right-hand side, Fig. 18, of the weaving-channel, which had been in its depressed position with the shutter 128 between the coils *b* and *c*, is now elevated to the position illustrated in Fig. 19, and the fabric—that is to say, the coils of wire *a*, *b*, and *c*—is moved upwardly a slight distance, in the present instance such movement being substantially one-half the diameter of the coil, with the result that the lower helix of the wire *c* is brought in substantial contact with the upper helix of wire *d*. It will be borne in mind that during this upward movement of the fabric the magnet is energized and that the wire *d* is thereby clamped in the channel, so that it cannot by any chance follow the fabric as it is being moved upwardly, as described. This clamping of the wire *d* thus compels wires *c* and *d* to be relatively positioned as indicated in Fig. 19.

As the fabric reaches the proper elevation in the channel in the movements just described the shutter 122 moves inwardly between the coils of wires *b* and *c*, on the left-hand side thereof, Fig. 19, and the other shutter 128 recedes, at which time said parts and the fabric are in the relative position indicated in Fig. 19. The entire right side frame of the channel, Fig. 20, now moves downwardly with the shutter 128 in inoperative position until such side frame reaches the position indicated in Fig. 20, whereupon the shutter 128 will be moved inwardly and partially across the channel to engage between the coils of wire *c* and *d*. The next movement in sequence is the receding of the shutter 122 substantially simultaneously with or immediately after the inward movement of the shutter 122, at which time the parts have the relative position indicated in Fig. 20. The entire right-hand side of the weaving-channel now moves upwardly with the shutter 128 in operative position and the shutter 122 withdrawn, as described, with the result that the fabric within the channel, including the last or lowermost wire or coil *d*, is moved bodily upwardly, it being understood that the weaving device acts as an ejector of the fabric from the channel. This upward movement of the side of the channel brings the wire *d* to the same relative position above the bottom of the weaving-channel—that is, above the magnetic pole—as was occupied by the wire *c* in Fig. 18. The next operation is the coiling and weaving of the next wire, which will be interwoven with the wire *d* in the same manner as the latter was interwoven with the wire *c*. This completes a cycle of operation of the parts connected with the weaving operation.

Now referring specifically to the action of the electromagnet and its functions, this magnet serves when energized to hold and, as a matter of fact, to firmly clamp the wire last run during the period when the fabric, with the exception of such last wire, is being moved upwardly in the channel. The result is that such last wire and the one preceding are brought to the desired relative position illustrated in Fig. 19—that is, with their helices together, or substantially so; otherwise in this upward movement of the fabric the last wire might, owing to frictional contact or for some other reason, be also carried upward, which would bring such last wire out of the range of the next wire to be run, and thereby prevent the weaving or at least prevent perfect weaving through the length of the wires. Just after the last wire has been run into the weaving-channel and woven with the preceding wire, as illustrated in Fig. 18, the electromagnet is energized automatically, and the magnet remains in that condition during the time that the fabric has been raised to the position indicated in Fig. 19, and the movable side of the channel has returned to its lowered position, as indicated in Fig. 20, and the shutter 128 has been advanced to operative position, whereupon the magnet is deënergized automatically. The residual magnetism is now availed of during the running and weaving of the next wire to keep the same in proper position in the bottom of the weaving-channel and to overcome any tendency of said running wire or coil to move upwardly in the running and weaving thereof.

Power or driving mechanism.—Now referring to the power or driving mechanism and the parts provided for the purpose of giving an intermittent movement to the various mechanisms already described, such driving mechanism is arranged laterally of the machine on the extension-frame 2, as more clearly indicated in the plan view, Fig. 1. The power is derived from a pulley 186, whose driving-shaft is properly journaled in the frame 2 and is provided with a worm 187. This worm in turn drives a worm-gear 188 on a shaft 189, also journaled on the frame 2. At its opposite ends the worm-gear shaft carries two driving-pinions 190 and 191, the one

on the left, Fig. 1, driving the feed-rolls and a braking device and the one on the right driving the reciprocating head or front of the machine, the cam-wheel and associated parts, the starting-frame, and also the pattern-racks to be described. First following the driving connection for the feed-rolls, the driving-pinion 190 meshes with a gear 192, which is operatively connected with a long shaft 193 through an operating mechanism or clutch device for giving intermittent actuation to such shaft, as hereinafter explained. This shaft 193 is journaled in the external frame 2 and carries at its front end a bevel-gear 194, meshing with a bevel-gear 195, which is secured to a gear 196, in turn driving a pinion 197. This pinion carries a gear 198, driving a pinion 199, Figs. 1 and 3. This latter pinion is arranged at the end of the shaft of the upper feed-roll, which shaft is provided with a second pinion 200 for transmitting motion to the shaft of the lower feed-roll through a pinion 201.

It will be understood that after a wire has been coiled and run into the weaving-channel for the proper distance and prior to the time of the other movements the feeding of the wire should cease and that according to the construction herein shown the rotation of the feed-rolls should be interrupted or caused to pause. Moreover, provision must be made for regulating the period of time of rotation of the feed-rolls and the consequent amount of feeding of the wire thereby in order to regulate or predetermine the length of the coiled wires supplied to the weaving-channel. For this purpose I provide a novel clutch mechanism, which is interposed between the shaft 193 and the driving mechanism proper. Referring more particularly to Figs. 1, 2, and 36 to 41, such clutch device in the present instance is driven by the driving-pinion 190 on the driving-shaft 189, and the object of the clutch device is to intermittently put the pinion 190 into operative or driving connection with the shaft 193, which is connected by the compound gears with the feed-rolls, as already described. This shaft 193 bears in a stationary plate 202, mounted upon the machine in fixed position, and also forms the axis for the different operating parts of the clutch. As shown in Fig. 36, the shaft 193 is keyed to the hub 203 of an internal ratchet wheel or disk 204, having an annular series of ratchet-teeth, as indicated in Figs. 36 and 37. Upon this hub is mounted to rotate a disk 205, to which the driving-pin 190 is secured and which is driven thereby. As a power-transmitting mechanism between the ratchet-wheel 204 and the disk 205 I provide a hub 206, freely rotatable on the shaft 193 and provided with an annular web 207 and a marginal flange 208, surrounding the similar flange 209 of the ratchet-wheel, as clearly indicated in Fig. 36. The hub-piece 206 is provided on its face adjacent the ratchet-wheel with a series of radial slots or channels adapted to receive a series of radially-arranged sliding ratchets 210, outwardly held with a yielding pressure and in engagement with the ratchets of the ratchet-wheel, in the present instance a series of springs 211 being employed, such springs being located in the inner ends of the slots, with the result that the hub 206 and the ratchet-wheel 204 are normally in operative connection, so that the rotary movements of the hub are communicated to the shaft 193 through the ratchet-wheel and its key. These ratchets are provided on their inner sides with teeth or projections 212, beveled at their ends and extending laterally through the web of the hub, which is slotted, as indicated in Fig. 36. The purpose of these lateral teeth will be hereinafter explained. In order to drive the hub from the disk 205, such disk is provided with a dog 213, pivoted at 214 to the inner side thereof adjacent the clutch proper and adapted when permitted to engage a lug 215 on the periphery of the rim-flange 208 and to thereby rotate the latter, together with its hub, and consequently actuate the feed-rolls through the driving connections already referred to. It is required to disengage this dog from the lug or projection 215 after a certain amount of movement in order to stop the feeding of wires by the feed-rolls, and it is also required to regulate or adjust the amount of such feed, for which reason provision is made for disengaging the dog from the lug 215 by adjustable mechanism, comprising in the present instance two tripping-pins 216 and 217, projecting at right angles from the fixed plate 202 and adjustable, respectively, in arc-shaped slots 218 and 219 therein. These pins project into the path of movement of the tail of the dog, which is normally outwardly pressed by a spring 220, such tripping being done against the tension of said spring. It will be understood that normally the dog is inwardly spring-pressed, so as to engage the lug 215, but to be released from engagement therewith by the uppermost tripping-pin 216. (Shown in Fig. 37.) This dog after said disengagement operates other parts, as hereinafter described, before again engaging and actuating the lug 215. For the purpose of returning the hub to normal or initial position after having rotated the feed-rolls I provide for the disengagement of the ratchet and for a positive return movement of such hub, to which end the fixed plate 202 has a projecting hub 221, on which bears a rotatable shell or wheel 222, having an internal gear 223, adapted to transmit its motion to a gear 224, formed on or secured to the left-hand side, Fig. 36, of the hub, such motion being transmitted through the medium of a pinion

225, journaled on a stud 226 in the plate 202. The construction is such that motion communicated to the shell or wheel 222 in the same direction as that communicated to the hub by the dog will move or rotate such hub in the opposite direction—that is, it will return it to initial position. For the purpose of obtaining a noiseless return of the ratchets in this return movement of the hub a ring 227, Figs. 36 and 41, is mounted on the external annular flange 228 of the wheel 222 and arranged to have a slight independent movement thereon sufficient to enable the ratchets to be disengaged. The ratchet-disengaging device comprises, as shown, a ratchet-releasing ring 229, operating in a space between the flange 228 of the gear 222 and the hub and having one of its inner edges beveled and adapted to coöperate with the correspondingly-beveled ends of the lateral projections of the ratchets. It is evident that when this releasing-ring is in the position indicated in Fig. 36 it is inoperative, so that the ratchets are in engagement with their ratchet-teeth, but that when the releasing-ring is moved bodily to the right, Fig. 36, its beveled edge will simultaneously press all of the ratchets inwardly and withdraw them from their engagement with the ratchet-teeth, with the result that the return of the ratchets will be noiseless and without wear. For the purpose of automatically operating the releasing-ring I provide a slot-and-pin connection between such ring and the outer ring 227, such connection comprising in the present instance a series of pins 230, which extend radially and which passing through marginal slots 231 in the shell or wheel 222 are received by the oblique or angular slots 232 in the outer rings. Obviously an anticlockwise movement, Fig. 37, of this outer ring will cause a right-hand shifting of the releasing-ring, Fig. 36, and a consequent disengagement of the ratchets. The relative movement of the outer ring with respect to the wheel 222, as just described, is against the tension of a spring 233, as hereinafter explained, which spring will serve to return the parts to their normal relative position. (Indicated in Fig. 36.) The particular movement of the releasing-ring, as described, is brought about by the rotating dog 213, which after being released from engagement with the lug 215 travels upon the surface of the flange 208 of the hub until it contacts a lug 234, extended laterally from the edge of the outer ring, Figs. 38 and 41, with the result that such outer ring is carried bodily along by the dog until the latter is tripped by one of the tripping-pins, in the present instance the lowermost tripping-pin 217. (Shown in Fig. 37.) At the first movement of such outer ring the ratchets are disengaged, as described, and upon a continuation of such movement of the ring the body of the lug 234 is brought into operative contact with a lateral projection of a somewhat similar lug 235 on the wheel or shell 222, with the result that such wheel is partially rotated and the hub moved in a direction opposite to that movement caused directly by the dog 213. Consequently the ratchets are returned to normal or initial position ready for the next rotation of the feed-rolls. It will be understood that after contact between the dog and the outer ring the ratchets are first released, and the hub and ratchets are then returned. As soon as these parts are properly returned the dog is tripped and the outer ring is backed off sufficiently by the spring 233 to return the releasing-ring to inoperative position. This spring besides returning the outer ring, as described, also serves as a cushion to prevent violent impact between the two lugs. Describing in sequence the movement of the operating parts of the clutch, it will be observed from Fig. 37 that the dog has just been tripped by the uppermost tripping-pin 216 and that such dog is now in engagement with the lug 234 and ready to carry it in an anticlockwise direction. Continued movement of the dog gives the outer ring 227 its preliminary and independent movement to release the ratchets and to bring the two lugs 234 and 235 together, whereupon the hub is rotated in a reverse direction. At the proper time the dog is tripped from engagement with the lugs by means of the lowermost tripping-pin 217. The dog now continues in its rotation and slips over the rim-flange 208 until it contacts the lug 213 thereon, with the result that the shaft 193 will again be rotated through the medium of the hub, ratchet-teeth, and ratchet-wheel. After a certain predetermined movement of the dog the latter is tripped by the uppermost tripping-pin 216, and further rotation of the shaft 193 and of the feed-rolls will cease. It will be understood from the foregoing description that the length of time of the operation or rotation of the shaft 193 is dependent upon the time of tripping by the pins and that consequently an adjustment of such pins in one direction or the other will shorten or lengthen the period of rotation of the rolls. For instance, if the uppermost pin 216 is adjusted to the right, Fig. 37, to the full limit the shaft 193 will be rotated a comparatively short period, and upon adjustment of this tripping-pin to the left in its slot such period will be lengthened. The lowermost tripping-pin is also correspondingly adjusted in order to properly time the release of the dog from the other lugs. In this manner the length of the wire run and coiled is regulated and determined. Now, describing the parts driven by the other pinion 191 and referring particularly to Figs. 1, 2, and 4, such pinion meshes with a gear 236 on one end of a short shaft journaled at 237 in the side frame 2. To the

other end of the shaft is secured a gear 238, carrying the automatic circuit-breaker for the electromagnet hereinbefore described and meshing with a gear 239, secured intermediate the length of a shaft 240, extending longitudinally of the machine. As seen best in Fig. 42, this shaft 240 carries a pinion 241, arranged to mesh with a gear 242 thereabove and arranged to rotate freely on and at times to drive a shaft 243 parallel to the shaft 240. The shaft 243 is designed to control the operation of the reciprocating head by intermittently actuating the same, to which end such shaft is connected by an automatic clutch to the driving-gear 242. This shaft 243 carries a rotatable cam 244, provided with a cam-flange occupying two different vertical planes. This flange is adapted to operate between two antifriction-rollers 245 on the upper end of a rock-arm 246, which is secured to the rock-shaft 113, with the result that as the cam rotates the rock-arm and rock-shaft are rocked forwardly and backwardly and the head 4 correspondingly reciprocated.

As stated, the shaft 243 is adapted to be connected with and disconnected from the gear 242 by a clutch device, and such device consists, as illustrated in detail in Figs. 43, 44, and 45, of a rolling key 247, which is oval-shaped and arranged to lie in a keyway 248 longitudinally of the shaft 243. This key is connected to a radial arm 249, which is at all times spring-pressed by means of a spring 250, tending to force such key to the right, Fig. 43, for the purpose of automatically rolling the key into one or the other of the two keyways 251, formed in the hub of the driving-gear 242. It will be understood that when the gear is rotated, so as to present one or the other of its keyways 251 to the rolling key, the latter will be rocked therein to establish operative connection between the shaft 243 and its driving-gear 242. This key is adapted to be automatically unlocked or disengaged from the hub of the driving-gear, and in the present instance such mechanism consists of a pair of trippers 252 and 253, both operatively connected to a transverse operating-rod 254, as indicated in Figs. 1 and 42. This rod is actuated by mechanism concerned with the operation of the pattern-racks and will be hereinafter described. The tripping-arm 252 is secured directly to the actuating-rod, so that its projecting end cooperates with the rocking arm of the key, whereas the other tripping-arm 253 is pivoted at 255, Fig. 42, and is pivotally connected to the outer end of the actuating-rod 254, with the result that when such rod is moved outwardly both of the trippers will move inwardly toward the rocking arm 249; but only one of such trippers will be in service at any one time. These trippers are intended to be interposed in the path of movement of the rocking arm 249, with the result that the latter, as well as its key, will be disengaged and also held to an inoperative position against the tension of the spring tending to throw the key into engagement with the gear-hub. These trippers coöperate alternately with the rocking or rolling key device. A spring 256 on the end of shaft 243, Fig. 1, serves to give the latter such frictional resistance as to prevent further rotation of such shaft which might be caused by friction of the driving-gear in its continual rotation and which would otherwise prevent the proper operation of the rolling key.

For the purpose of actuating the transverse rod 82, which is operatively connected with the cutter device and with the trigger mechanism hereinbefore described, I provide a suitable operating connection between the driving-shaft 240 and the inner end of said rod 82, whereby such rod shall be reciprocated transversely of the machine. To this end and in the present instance I adopt the construction illustrated in Fig. 46, in which such rod 82 is shown connected, by means of a frame 257, with the driving rod or plate 258, which is slotted to accommodate shaft 240. One side of this driving-plate is provided with a stud or antifriction-roller 259, which is received by a cam-slot 260, formed internally on a cam-wheel 261. It is obvious that the rotation of the cam-wheel will reciprocate the operating-rod 82, and thereby bring about the desired operations of the cutters and triggers, it being understood that the movements are timed by proper adjustment of the cam-wheel on its shaft.

Referring next to the mechanism for driving the shaft 137, which carries the cam-wheel 136 and which also operates the developing frame or rack, and referring particularly to Figs. 1, 2, and 4, the shaft 240 is provided at its outer end with a cam 262, arranged to coöperate with an antifriction-roller 263, which is operatively connected with a vertically movable or sliding bar 264. This bar is movable in an upright guide 265, extending from the machine-frame, and is adapted at certain times to interfere with the driving of certain of the parts. The driving-pinion 236 is operatively connected, by means of an adjustable pitman 266, with an oscillating plate or block 267, which is loosely mounted upon a shaft 268. Upon this plate is pivoted a spring-pressed pawl 269, which cooperates with and drives a ratchet-wheel 270, secured to said shaft 268. It is obvious that the rotation of the gear 236 will be transmitted through the pitman 266, plate 267, and pawl 269 to the ratchet-wheel and its shaft 270. It will also be obvious that any interference or disengagement of this pawl from its ratchet at the time of driving will prevent actuation of such ratchet-wheel. To accomplish this latter result, I extend the sliding bar 264 sufficiently upward, so that when

raised the same will engage a pin or stud 271 on the pawl and raise the latter and keep the same from engagement with the ratchet-wheel at certain predetermined times. The shaft 268 is provided with a gear 272, which meshes with a pinion 273, secured to the shaft 137, with the result that such latter shaft and its cam-wheel 136 partake of the intermittent movement of the shaft 268.

Referring next to the pattern-racks, and particularly to the form thereof, as illustrated in Figs. 42, 46, and 47 to 50, such racks comprise a series of parallel extensible strips 274, which are contained within a rectangular case 275, extending longitudinally of the machine. These racks are dovetailed into each other, and the outermost one on the right-hand side, Figs. 4 and 49, also has sliding engagement with an inner wall of the case. Moreover, as indicated in Fig. 48, one end of each rack, except the outermost one on the left, Fig. 49, is provided with a projection or tongue 276, arranged to slide on the groove 277 of its next adjacent rack, which groove, however, does not extend quite to the end of the rack, with the result that the first rack will carry the second rack along with it after the tongue 276 engages the end of the groove 277. In this way the racks will be carried along by successive engagement with the adjacent racks on the right. The top edge or surface of the racks is provided with a series of holes 278, which are spaced equidistantly and at a certain predetermined distance apart. These holes are adapted to receive pins 279, which are placed in certain predetermined ones of the holes by the operator according to the desired pattern of the fabric—that is, according to where the strengthening-cords are to be inserted and according also to the number thereof.

The pattern-racks are provided on their lower edges with rack-teeth, adapted to be engaged (one rack at a time) by a pinion 280; which is secured to a transverse hollow shaft 281, which extends to one side of the machine and is there provided with a handle 282. Through this hollow shaft passes a rod 283, having a milled nut 284 at its outer end and having a bearing in the main frame 2, as indicated in Fig. 42. Intermediate its length this rod is provided with a friction-surface 285, which is adapted to engage with a corresponding friction surface or face on one side of the pinion 280, with the result that when these surfaces are brought together by screwing up the nut 284 the movements of such rod will be communicated to the pinion, and therefore to the racks. For actuating this rod I provide a pin-wheel 286, mounted on the inner end thereof and actuated by means of a cam-wheel 287, Figs. 1, 2, and 42. This cam-wheel has a flange adapted to coöperate with the pins of the pin-wheel and to move such wheel step by step, such flange having an opening for such operation.

The pattern-racks and their pins determine the particular moment when the ratchet-wheel 270 is rendered inoperative by the sliding bar 264. To this end I provide an operating connection consisting of a vertically-sliding plate 288, guided in a frame 289, Figs. 1, 2, 4, 42, and 46, and whose lower edge is adapted to coöperate with the pattern-racks. The construction is such that when no pins are presented to the lower edge of this plate 288 the latter will have its full downward movement; but when a pin is presented, such pin will prevent such full downward movement of the plate, and thereby cause a pause or interruption in the weaving operation, with the result that a strengthening or border cord will be run into the fabric.

As hereinbefore suggested, the pattern-rack mechanism serves to control or operate the trippers concerned in the movement of the rolling key by reason of an operative connection between the rod 254 and such pattern-rack mechanism. To this end and as shown more particularly in Fig. 42, such operating-rod 254 is secured at one end to a plate 254^a, which has a slot-and-pin connection with the vertically-movable plate 288, with the result that the vertical movements of such latter plate transmit a horizontal movement to the plate 254, and therefore transmit the required movement to the trippers. Inasmuch as these trippers control the reciprocations of the oscillating or reciprocating head 4, it will now be seen that such reciprocation is stopped simultaneously with the stopping of the weaving mechanism as accomplished through the pattern-rack devices as just explained.

The plate 288 is pivotally connected to a lever 290, Figs. 1 and 4, pivoted on the frame of the machine, and pivotally connected by a link 291 with a horizontal rocking lever 292, Fig. 4. This rocking lever is pivoted at one end to the lower end of the sliding bar 264. It will now be seen that when the full downward movement of the plate 288 is prevented by striking any one of the pins the sliding bar 264 will be kept upwardly pressed, with the result that the pawl 269 will be kept from engagement with this ratchet-wheel and the shaft 268 thereof be thereby prevented from rotating in the driving movement of the pitman 266. After the racks have been run out to their full extent and it is desired to return the same in their case the shaft 283 is released from frictional engagement with the pinion 280 by loosening the nut 284, whereupon rotation of the handle 282 in a reverse direction will operate such pinion and return all of the racks.

In Figs. 51 and 52 I have shown a modified form of construction in which an endless band

293 is employed, the same having a series of rack-teeth on its lower edge to engage pinion 280 and with a series of notches 294 spaced a certain distance apart, according to the desired design or pattern of the fabric. This band works over drums or rollers 295, suitably supported in the machine, it being understood that a series of these bands are provided, one for each particular form or pattern of fabric, whereas in the other form or pattern device the pattern was made up by the operator by simply inserting the pins in certain of the holes. In one respect the operation of the connecting parts concerned with this modification is the reverse of those concerned with the other pattern device, inasmuch as according to the modification the sliding plate 288 is prevented from having its full movement by striking the upper edge of the band, at which time the ordinary coils of the fabric are being woven; but at intervals such plate will enter one of the notches 294, at which time a strengthening-cord will be run into the fabric. The desired connections simply represent a proper system of leverage between the plate 288 and sliding bar 264.

In order to automatically stop the entire machine in case of an entangling or snarling of the coiled wires, which might by chance occur before their entrance to the weaving-channel, I provide and arrange on opposite sides of the grooves 67, formed in the fiber plate in front of the coilers, two electrodes 296, Figs. 1, 13, and 21. The plate is made of fiber of non-conducting material, and the electrodes are removably inserted therein adjacent the grooves or channels. These electrodes, which are connected in suitable manner to a source of electricity, are made of flexible material, so that in case the operator desires to stop the machine he may do so by pinching the upper ends or handles together to complete the circuit and throw out the driving-clutch, as hereinafter explained. These electrodes are arranged in an electrical circuit in which is interposed an electromagnet 297. This magnet has an armature 298, which is pivoted at one end to one of the legs 3 of the machine, as clearly indicated in Fig. 2. The object of this armature is to hold a driving-clutch 299 in operative or driving connection with the pulley 186 against the tension of a spring 300, which coöperates with the lower end of a shifting lever 301, operatively connected with the clutch. To this end such shifting lever is provided with a rod 302, working at its inner end in a dash-pot 303 and provided intermediate its length and on its upper face with a notch at such position thereon that the armature 298 will drop therein when the clutch is in engaging position. It is obvious that when the armature is in such engagement with the rod 302 the clutch is held in operative position, but that when the electromagnet 297 is energized its armature 298 is attracted and withdrawn from engagement with the rod 302, with the result that the spring 300 draws the clutch out of engagement. The closing of the circuit and the described energizing of the electromagnet 297 is accomplished automatically by the wires themselves in front of the coilers in case of any tangling or snarling thereof, inasmuch as the wires when tangled will form a connection between the two electrodes 296. By preference the circuit is normally broken at two points, such second point being adjacent to the rod 302, as indicated in Figs. 3 and 4, to which end a portion of the circuit is composed of a small rod or wire 304, which is arranged to slide vertically in the slotted upper end of two parallel plates 305, rising from the lower portion of the frame of the machine. When the clutch is in engagement, this rod 304 forms a part of the electrical circuit, so that at such time the only open point is at the electrodes 296; but when the clutch is disengaged this rod is moved upwardly by means of an inclined projection 306 in the rod 302, with the result that the circuit is broken at this particular point and remains broken until the clutch is again put into engagement.

As hereinbefore stated, the electromagnet in the weaving-channel is arranged in an electrical circuit having an automatic circuit-breaker. To this end the wires which are arranged in a cable 307, as shown in Fig. 1, are led to two opposite poles or electrodes, which coöperate with a circuit-breaker 308 of any suitable construction. This circuit-breaker is mounted on one side of the gear 238 and rotates therewith, so that the electromagnets in the weaving-channels are intermittently energized and deënergized.

In order to accurately determine the feed of the wires and to quickly stop the intermittently-operated feed-rolls, and thereby prevent additional movement due to momentum, I provide a brake device which is in the present instance arranged to coöperate with the gears for operating the rolls. As shown in Figs. 1 and 2, this brake device consists of a brake-shoe 309, arranged adjacent gear 198 and provided with a suitable braking-face, such as leather. This shoe is mounted on the end of a rock-shaft 310, whose other end is connected with a short rock-shaft 311, provided at its ends with crank-arms 312 and 313. The crank-arm 312 is provided with a rod or arm 314, terminating in or provided with a cam-follower 315, Figs. 1, 2, 37, and 38. By preference this cam-follower is made separate from its rod in order to be adjustable thereon. The cam-follower presses upon the edge of the disk 205, which in order to actuate the brake is provided on such edge with a cam-block 316, with the result that the arm 314 and shaft 310 are rocked and the brake thereupon applied to the gear-wheel

198 whenever the cam-block is presented to the cam-follower.

As indicated in Figs. 53 and 54, I have provided means for automatically stopping the machine in case of any kinking of the wire before entrance to the rolls. As shown, the wire A as it comes from a reel is passed over two rolls 317 and 318, at the bottom and top, respectively, of a frame 319, pivoted at its lower end to a base-plate 320. This frame is kept outwardly pressed with a yielding pressure in suitable manner, as by means of the loop or arms 321, pivoted at one end to the frame 319 and having its other end passing and movable between the upper ends of two spring-plates 322, which supply frictional resistance to such arms 321. These plates are held toward each other with a yielding pressure by springs 323, Fig. 54, bearing, respectively, against such plates and nuts 324 on the transverse rod 325. Normally the frame 319 is held as indicated in Fig. 53; but in case of any resistance in the pulling of the wire from the reel or otherwise such frame is drawn by the wire forwardly toward the feed-rolls. I employ this movement to cause the frame 319 to act as a circuit-closer by providing it with a terminal 326, connected with an electrical circuit in which the magnet 297 is interposed. This terminal is adapted to coöperate with a contact-plate 327 on the base 320 and also on said circuit. When the frame 319 is drawn forwardly, as described, the electrical circuit will be established, the electromagnet energized, and the machine stopped.

As detailed in Fig. 42, the rod 254, which operates the trippers for the rolling key, is secured to a plate 328, arranged to slide in the frame 289 and provided with a slot 329 at a forty-five-degree angle, so that by reason of the pin 330 on the plate 288 and received by such slot the plate 328 is caused to reciprocate horizontally as the plate or blade 288 is reciprocated vertically, with the result that the rod 254 is actuated for the purposes already described.

In Fig. 55 I have illustrated a modified form of construction for simultaneously adjusting the tension of the rings or bands of the lower feed-roll, the operating mechanism instead of handles 19 comprising a cam 331, having a flange working between two rollers 332 for the purpose of reciprocating a bar 333. On the upper edge of this bar is a series of inclined cam-blocks 334, which blocks are adapted to coöperate with a series of rollers 335, mounted on the lower ends of the rods or pins 336, corresponding to the pins 24 in the form illustrated in Fig. 13. These cam-blocks may be made independently adjustable longitudinally of the bar.

I claim—

1. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of intermittently-operated mechanism for feeding the wire to the coiling device and means for controlling the movements of such mechanism and adjustable to vary the length of period of operation thereof.

2. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of intermittently-operated feed-rolls having independent operable pressure-surfaces for feeding the wire to the coiling device.

3. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of intermittently-operated mechanism for feeding the wire to the coiling device, and adjustable means for varying the length of the period of operation of such mechanism.

4. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls and means for intermittently rotating said rolls comprising, in connection with a driving member and a driven shaft operatively connected with the feed-rolls, a clutch device automatically and intermittently connecting the driving member and the driven shaft.

5. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls and means for intermittently rotating said rolls comprising, in connection with a driving member and a driven shaft operatively connected with the feed-roller, a clutch device automatically and intermittently connecting the driving member and the driven shaft, and means for varying the length of the period of operative connection made by the clutch.

6. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls and means for intermittently rotating said rolls comprising, in connection with a driving member and a driven shaft operatively connected with the feed-roller, a clutch device automatically and intermittently connecting the driving member and the driven shaft, and adjustable mechanism coöperating with the clutch for varying the length of the periods of operative connection made by the clutch.

7. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls and means for intermittently rotating said rolls comprising, in connection with a driving member and a driven shaft operatively connected with the feed-roller, a clutch device comprising a ratchet-wheel secured to the shaft, a ratchet-carrying hub coöperating with the ratchet-wheel and arranged to be intermittently driven by the driving member.

8. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls and means for intermittently rotating said rolls comprising, in connection with a driving member and a driven

shaft operatively connected with the feed-roller, a clutch device comprising a ratchet-wheel secured to the shaft, a ratchet-carrying hub coöperating with the ratchet-wheel and arranged to be intermittently driven by the driving member, and means for automatically releasing the ratchets and returning the hub.

9. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls and means for intermittently rotating said rolls comprising, in connection with a driving member and a driven shaft operatively connected with the feed-roller, and a clutch device comprising a ratchet-wheel secured to the shaft, a rotatable hub having ratchets coöperating with said wheel, and a dog actuated by the driving member and adapted to engage said hub at intervals.

10. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls and means for intermittently rotating said rolls comprising, in connection with a driving member and a driven shaft operatively connected with the feed-roller, and a clutch device comprising a ratchet-wheel secured to the shaft, a rotatable hub having ratchets coöperating with said wheel, a dog actuated by the driving member and adapted to engage said hub, and means for causing disengagement of said dog from the hub.

11. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls and means for intermittently rotating said rolls comprising, in connection with a driving member and a driven shaft operatively connected with the feed-roller, and a clutch device comprising a ratchet-wheel secured to the shaft, a rotatable hub having ratchets coöperating with said wheel, a dog actuated by the driving member and adapted to engage said hub, and adjustable means for causing disengagement of said dog from the hub at a predetermined time.

12. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls and means for intermittently rotating said rolls comprising, in connection with a driving member and a driven shaft operatively connected with the feed-roller, and a clutch device comprising a ratchet-wheel secured to the shaft, a rotatable hub having ratchets coöperating with said wheel, a dog actuated by the driving member and adapted to engage said hub, and an adjustable tripping-pin coöperating with the dog to release it from engagement with said hub at a predetermined time.

13. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls and means for intermittently rotating said rolls comprising, in connection with a driving member and a driven shaft operatively connected with the feed-roller, and a clutch device comprising a ratchet-wheel secured to the shaft, a rotatable hub having ratchets coöperating with said wheel, a dog actuated by the driving member and adapted to engage said hub, said dog being rotatable with the driving member and normally held in operative position with a yielding pressure, and means arranged in the path of movement of the dog to release it from engagement with the hub.

14. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls and means for intermittently rotating said rolls comprising, in connection with a driving member and a driven shaft operatively connected with the feed-roller, and a clutch device comprising a ratchet-wheel secured to the shaft, a rotatable hub having ratchets coöperating with said wheel, a dog actuated by the driving member and adapted to engage said hub, said dog being rotatable with the driving member and normally held in operative position with a yielding pressure, and an adjustable pin arranged in the path of movement of the dog to release it against such pressure from engagement with the hub.

15. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls and means for intermittently rotating said rolls comprising, in connection with a driving member and a driven shaft operatively connected with the feed-roller, and a clutch device comprising a ratchet-wheel secured to the shaft, a rotatable hub having ratchets coöperating with said wheel, a dog actuated by the driving member and adapted to engage said hub, said dog being rotatable with the driving member and normally held in operative position with a yielding pressure, a fixed plate provided with a slot, and a pin adjustably secured in the slot and arranged to trip the dog at a predetermined time.

16. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls and means for intermittently rotating said rolls comprising, in connection with a driving member and a driven shaft operatively connected with the feed-roller, and a clutch device comprising a ratchet-wheel secured to the shaft, a rotatable hub having ratchets coöperating with said wheel, a dog actuated by the driving member and adapted to engage said hub, and means for returning the hub and ratchets to initial position.

17. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls and means for intermittently rotating said rolls comprising, in connection with a driving member and a driven shaft operatively connected with the feed-

roller, and a clutch device comprising a ratchet-wheel secured to the shaft, a rotatable hub having ratchets coöperating with said wheel, a dog actuated by the driving member and adapted to engage said hub, a ring coöperating with said ratchets to release them from gagement, and means for returning the hub to initial position after a forward movement.

18. In a coiled-wire-fabric machine, the combination, with coiling and weaving deviecs, of feed-rolls and means for intermittently rotating said rolls comprising, in connection with a driving member and a driven shaft operatively connected with the feed-roller, and a clutch device comprising a ratchet-wheel secured to the shaft, a rotatable hub having ratchets coöperating with said wheel, a dog actuated by the driving member and adapted to engage said hub, said ratchets having beveled lateral extensions, a releasing-ring having a correspondingly-beveled inner edge cooperating with said extensions, means for preliminarily operating the ring to release the ratchets and then for returning the hub to initial position after a forward movement.

19. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls and means for intermittently rotating said rolls comprising, in connection with a driving member and a driven shaft operatively connected with the feed-roller, and a clutch device comprising a ratchet-wheel secured to the shaft, a rotatable hub having ratchets coöperating with said wheel, a dog actuated by the driving member and adapted to engage said hub, said ratchets having beveled lateral extensions, a releasing-ring having a correspondingly-beveled inner edge coöperating with said extensions, pins projecting from the releasing-ring, a slotted ring or band coöperating with the pins and thereby moving the releasing-ring, means for slightly rotating said band, and means for returning the hub to initial position.

20. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls and means for intermittently rotating said rolls comprising, in connection with a driving member and a driven shaft operatively connected with the feed-roller, and a clutch device comprising a ratchet-wheel secured to the shaft, a rotatable hub having ratchets coöperating with said wheel, a dog actuated by the driving member and adapted to engage said hub, said ratchets having beveled lateral extensions, a releasing-ring having a correspondingly-beveled inner edge coöperating with said extensions, means for operating the ring to release the ratchets, and means for returning the hub to initial position after the releasing of the ratchets comprising a gear-wheel adapted to be actuated by the dog and operatively connected with said hub.

21. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls and means for intermittently rotating said rolls comprising, in connection with a driving member and a driven shaft operatively connected with the feed-roller and a clutch device comprising a ratchet-wheel secured to the shaft, a rotatable hub having ratchets coöperating with said wheel, a dog actuated by the driving member and adapted to engage said hub, said ratchets having beveled lateral extensions, a releasing-ring having a correspondingly-beveled inner edge coöperating with said extensions, means for operating the ring to release the ratchets, and means for returning the hub to initial position after the releasing of the ratchets comprising a gear-wheel and a pinion intermediate such gear-wheel and the hub which is engaged thereby.

22. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls and means for intermittently rotating said rolls comprising, in connection with a driving member and a driven shaft operatively connected with the feed-roller, and a clutch device comprising a ratchet-wheel secured to the shaft, a rotatable hub having ratchets coöperating with said wheel, a dog actuated by the driving member and adapted to engage said hub, a releasing-ring arranged to release said ratchets from engagement, a ring or band operatively connected with said releasing-ring and provided with a lug projecting into the path of movement of said dog, and a gear-wheel operatively connected with the hub and provided with a lug arranged to coöperate with the first-named lug.

23. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls and means for intermittently rotating said rolls comprising, in connection with a driving member and a driven shaft operatively connected with the feed-roller, and a clutch device comprising a ratchet-wheel secured to the shaft, a rotatable hub having ratchets coöperating with said wheel, a dog actuated by the driving member and adapted to engage said hub, a releasing-ring arranged to release said ratchets from engagement, a ring or band operatively connected with said releasing-ring and provided with a lug projecting into the path of movement of said dog, a gear-wheel operatively connected with the hub and provided with a lug arranged to coöperate with the first-named lug, and a spring carried by one of the lugs and adapted to restore said band to normal position.

24. In a coiled-wire-fabric machine, the combination, with coiling and weaving de-

vices, of feed-rolls and means for intermittently rotating said rolls comprising, in connection with a driving member and a driven shaft operatively connected with the feed-roller, and a clutch device comprising a ratchet-wheel secured to the shaft, a rotatable hub having ratchets coöperating with said wheel, a dog actuated by the driving member and adapted to engage said hub, a releasing-ring arranged to release said ratchets from engagement, a ring or band operatively connected with said releasing-ring and provided with a lug projecting into the path of movement of said dog, a gear-wheel operatively connected with the hub and provided with a lug arranged to coöperate with the first-named lug, a lug on the hub, said dog being normally spring-pressed toward said hub to engage the lug on the hub, means for disengaging the dog from said last-named lug and permitting such dog to then engage the lug on the releasing-ring.

25. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls for feeding the wire thereto, and a guide arranged adjacent the rolls for guiding the wire before entering the rolls, said guide having means for exerting a pressure upon the wire.

26. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls for feeding the wire thereto, and a guide arranged adjacent the rolls for guiding the wire before entering the rolls said guide comprising two blocks, one of which is grooved to receive the wire and the other of which has a projection to rest upon the wire.

27. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls for feeding the wire thereto, and a guide arranged adjacent the rolls for guiding the wire before entering the rolls, said guide comprising two blocks, one of which is longitudinally grooved to receive the wire and the other of which has a longitudinal fin arranged to fit into said groove and to rest upon the wire.

28. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls for feeding the wire thereto, and a guide arranged adjacent the rolls for guiding the wire before entering the rolls, said guide comprising two blocks, one of which is longitudinally grooved to receive the wire and the other of which has a longitudinal fin arranged to fit into said groove and to rest upon the wire, and adjustable means for holding the second block against the wire.

29. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a pair of feed-rolls for feeding the wire thereto, and means for holding one of said rolls against the other and against the wire with a yielding pressure.

30. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a pair of feed-rolls for feeding the wire thereto, and adjustable means for holding one of said rolls against the other and against the wire with a yielding pressure adjustable in degree.

31. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a pair of feed-rolls for feeding the wire thereto, the pressure-surface of one of the rolls having a yielding connection with its driving-shaft.

32. In a coiled-wire-fabric machine, the combination with coiling and weaving devices, of a pair of feed-rolls for feeding the wire thereto, the driving-shaft of one of the rolls having a yielding connection with the pressure-surface of such roll comprising a spring connecting said shaft and surface.

33. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a pair of feed-rolls for feeding the wire thereto, the pressure-surface of one of said rolls being in the form of a ring, a driving-shaft for said ring, and a spring interposed between said shaft and ring and connected with them.

34. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a pair of feed-rolls for feeding the wire thereto, the pressure-surface of one of said rolls being in the form of a ring, a driving-shaft for said ring, means for adjusting said ring to move eccentric to the shaft, and a spring driving connection between the shaft and ring.

35. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a pair of feed-rolls for feeding the wire thereto, the pressure-surface of one of said rolls being in the form of a ring, a driving-shaft for said ring, and a coiled spring encircling said shaft and connected at one end with the ring and at the other end with the shaft to form a yielding driving connection therebetween.

36. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a pair of feed-rolls for feeding the wire thereto, the pressure-surface of one of said rolls consisting of a series of rings separated by distance-sleeves, a driving-shaft for said rings and a series of springs interposed between the rings and shaft and operatively connected therewith.

37. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a pair of feed-rolls for feeding the wire thereto, the pressure-surface of one of said rolls being it the form of a ring, a driving-shaft having a spring connection with said ring and adjustable means arranged to press against the ring to force it toward the other feed-roll.

38. In a coiled-wire-fabric machine, the

combination, with coiling and weaving devices, of a pair of feed-rolls for feeding the wire thereto, the pressure-surface of one of said rolls being in the form of a ring, a driving-shaft having a spring connection with the ring, and adjustable pressure-rollers bearing against the ring to force it toward the other feed-roll.

39. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a pair of feed-rolls for feeding the wires thereto, the pressure-surface of one of said rolls being in the form of a ring, a driving-shaft having a spring connection with the ring, a pair of rollers bearing against the ring, a frame or cradle for said rollers, and means for adjusting the position of such frame.

40. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a pair of feed-rolls for feeding the wires thereto, the pressure-surface of one of said rolls being in the form of a ring, a driving-shaft having a spring connection with the ring, a pair of rollers bearing against the ring, a frame or cradle for said rollers, a handle operatively connected with said frame, and means for locking the same in operative position.

41. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a pair of feed-rolls for feeding the wires thereto, the pressure-surface of one of said rolls being in the form of a ring, a driving-shaft having a spring connection with the ring, a pair of rollers bearing against the ring, a frame or cradle for said rollers, a handle operatively connected with said frame and having a locking-arm 27, and a locking-lever 26 engaging said arm.

42. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a pair of feed-rolls for feeding the wires thereto, the pressure-surface of one of said rolls being in the form of a ring, a driving-shaft having a spring connection with the ring, a pair of rollers bearing against the ring, a frame or cradle for said rollers, a pivoted handle operatively connected with said frame and having a spring-pressed locking-arm, and a locking-lever 26 engaging said arm.

43. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls for feeding the wire thereto, shafts for said rolls, and means for adjusting the shafts, the pressure-surface of one of said rolls being adjustable independent of its shaft.

44. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls for feeding the wire thereto, shafts for said rolls, and means for adjusting the shafts, the pressure-surface of one of said rolls being held toward the other with a yielding pressure.

45. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls for feeding the wire thereto, shafts for said rolls, and means for adjusting the shafts, the pressure-surface of one of said rolls being held toward the other roll with a yielding pressure independent of the shaft adjustment and adjustable in degree.

46. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls for feeding the wire thereto, shafts for said rolls, and means for adjusting the shafts, the pressure-surface of one of said rolls being adjustable independent of its shaft and having a yielding connection therewith.

47. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls for feeding the wire thereto, shafts for said rolls, and means for adjusting the shafts, the pressure-surface of one of said rolls being adjustable independent of its shaft and having a spring driving connection with its shaft.

48. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls for feeding the wire thereto, shafts for driving the rolls, the pressure-surface of one of said rolls consisting of a pair of rings yieldingly connected with its driving-shaft, pressure-applying rollers for each pressure-ring, adjustable frames or cradles in which the rollers are mounted, a fulcrum-bar on which said frames are pivoted, and a single adjustable pin coöperating with said bar to support the same and said frames.

49. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls for feeding the wire thereto, shafts for driving the rolls, the pressure-surface of one of said rolls consisting of a pair of rings yieldingly connected with its driving-shaft, pressure-applying rollers for each pressure-ring, adjustable frames or cradles in which the rollers are mounted, a fulcrum-bar on which said frames are pivoted, and two vertically-adjusting pins having an interposed spring and adapted to coöperate with said bar to support the same and said frame.

50. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, and electrical means for retaining the wire last run in the channel.

51. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, and an electromagnet arranged in the channel to attract and thereby clamp the wire last run in the channel.

52. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, and an electromagnet forming the bottom of the channel and adapted, when energized, to attract and retain the wire last run in the channel.

53. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, and which consists of parallel strips in alinement with the coiling device, and an electromagnet arranged between such strips and extending substantially throughout their length to attract and thereby clamp the coil or wire last run in the channel.

54. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, an electromagnet arranged in the channel to attract and thereby clamp the last wire run in the channel, and automatic means for energizing and deënergizing said magnet.

55. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, parallel plates of non-magnetic material lining the opposite longitudinal walls of the channel, and an electromagnet arranged in the channel between said plates to attract and clamp the wire last run in the channel.

56. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, means for holding the last wire run in the channel, and shutters alternately movable partially across the channel to engage the wire fabric in the weaving operation

57. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, one side of said channel being movable vertically, means for holding the last wire run in the channel, and shutters mounted on both sides of the channel and movable partially across the channel to engage and feed the wire fabric.

58. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, one side of said channel being fixed and the other movable vertically, means carried by both sides of said channel for coöperating with the fabric in the weaving operation, and mechanism for actuating said means.

59. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, one side of said channel being fixed and the other movable vertically, an electromagnet secured to the fixed side of the channel and adapted, when energized, to clamp the wire last run in the channel.

60. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, one side of said channel being fixed and the other movable vertically, an electromagnet secured to the fixed side of the channel with a pole forming the bottom of such channel, and shutters movable on the walls or sides of the channel to coöperate with the fabric in the weaving operation.

61. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, and shutters mounted on both sides of the channel and movable partially across the channel, one side of said channel being fixed and the other movable bodily vertically together with its shutter.

62. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, and shutters alternately movable partially across the channel to engage the wire fabric and comprising plates or strips arranged to slide upon the walls of said channel and extending substantially throughout the length thereof.

63. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, shutters alternately movable partially across the channel to engage the wire fabric, bars arranged to slide in the walls of the channel and operatively connected with the shutters, and means for actuating said bars.

64. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, shutters alternately movable partially across the channel to engage the wire fabric, bars arranged to slide in the walls of the channel and having a slot-and-pin connection with the shutters, and means for actuating said bars.

65. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, shutters alternately movable partially across the channel to engage the wire fabric, bars arranged to slide in the walls of the channel and operatively connected with the shutters, means for actuating said bars, and an abutment-plate arranged above one of the shutters.

66. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in

which the wires as coiled are run, shutters movable partially across the channel to engage the wire fabric in the weaving operation, and a cam-wheel for alternately operating said shutters.

67. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, shutters movable partially across the channel to engage the wire fabric in the weaving operation, a wheel provided with a series of cam-teeth, and operating connections between the cam-teeth and the shutters.

68. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, shutters movable partially across the channel to engage the wire fabric in the weaving operation, and a cam-wheel common to both shutters and operatively connected therewith.

69. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, one of the sides of the channel being movable bodily vertically, shutters movable partially across the channel to engage the wire fabric in the weaving operation, and means common to said shutters and movable side of the channel for operating them.

70. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, one of the sides of the channel being movable bodily vertically, shutters movable partially across the channel to engage the wire fabric in the weaving operation, and a wheel having a series of cam-teeth operatively connected with the shutters and the movable side of the channel for alternately operating them.

71. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, one of the sides of the channel being movable bodily vertically, shutters movable partially across the channel to engage the wire fabric in the weaving operation, a wheel having a series of cam-teeth, and cam-pins coöperating with said teeth and operatively connected with the shutters and movable side of the channel.

72. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, one of the sides of the channel being movable bodily vertically, shutters movable partially across the channel to engage the wire fabric in the weaving operation, a wheel having a series of cam-teeth, and cam-pins normally pressed with a yielding pressure against said wheel and forced in the opposite direction by said cam-teeth.

73. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, shutters movable partially across said channel, sliding bars extending longitudinally of the sides of said channel and operatively connected with said shutters, and a cam-wheel operatively connected with said bars for alternately actuating them.

74. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, said channel comprising a pair of plates outwardly flanged at their upper ends, shutters arranged to slide upon said flanges and, when operated, to project partially across the channel, sliding bars extending longitudinally of said plates and operatively connected with the shutters, and means for actuating said bars.

75. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, said channel comprising a pair of plates outwardly flanged at their upper ends, shutters arranged to slide upon said flanges and, when operated, to project partially across the channel, a horizontal strip connected with one of said plates and provided with a flange forming a continuation of one wall of the channel, and sliding bars extending longitudinally of said plates and operatively connected with the shutters, and means for actuating said bars.

76. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, said channel being formed of one fixed member and a parallel but movable member, and means for moving said last-named member in the weaving operation.

77. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, said channel being formed of one fixed side and a parallel but movable side, and means arranged near the opposite ends of the movable side for operating the same.

78. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, said channel being formed of one fixed plate and a parallel but movable plate, and rocking cams arranged to operate said movable plate.

79. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, said chan-

nel being formed of one fixed plate and a parallel but movable plate normally held to a depressed position by spring-pressure, and rocking cams coöperating with the movable plate for raising the latter.

80. In a coiled-wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a channel in which the wires as coiled are run, said channel being formed of one fixed plate and a parallel but vertically-movable plate normally held to a depressed position by spring-pressure, rocking cams adapted to bear against the opposite ends of the movable plate to raise the latter, and means for operating said cams.

81. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of movable means for temporarily receiving and thereby starting the first coil.

82. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of adjustable means for temporarily receiving and thereby starting the first coil.

83. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a frame adjustable to a position adjacent the weaving device and arranged to receive the first coil and thereby start the fabric.

84. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a frame having a depending wire adapted to be adjusted to a position adjacent the weaving device and arranged to receive the first coil and thereby start the fabric.

85. In a coiled-wire-fabric machine, the combination, with a coiling device, of a weaving-channel into which the coiled wires are run and woven, and means adapted to be inserted into said channel to temporarily receive the first wire to start the fabric.

86. In a coiled-wire-fabric machine, the combination, with a coiling device, of a weaving-channel into which the coiled wires are run and woven, mechanism adapted to be inserted into said channel to temporarily receive the first wire, and means for applying tension to said mechanism.

87. In a coiled-wire-fabric machine, the combination, with a coiling device, of a weaving-channel into which the coiled wires are run and woven, and a frame carrying a wire extending longitudinally of the weaving-channel and arranged to be inserted in the channel to receive the first wire to start the fabric.

88. In a coiled-wire-fabric machine, the combination, with a coiling device, of a weaving-channel into which the coiled wires are run and woven, and a movable frame under tension and provided with a depending wire arranged to be inserted in the channel to receive the first wire to start the fabric.

89. In a coiled-wire-fabric machine, the combination, with a coiling device, of a weaving-channel into which the coiled wires are run and woven, a movable frame provided with a depending wire arranged to be inserted in the channel to receive the first wire to start the fabric, and means for adjusting the wire independent of its frame.

90. In a coiled-wire-fabric machine, the combination, with a coiling device, of a weaving-channel into which the coiled wires are run and woven, a movable frame under tension and provided with a wire adapted to be inserted into the channel to receive the first wire coiled therein, and means for adjusting the position of the wire relative to its frame.

91. In a coiled-wire-fabric machine, the combination, with a coiling device, of a weaving-channel into which the coiled wires are run and woven, a movable frame, and a wire having a pinion and rack connection with the frame and adapted to be inserted into the channel to receive the first coil.

92. In a coiled-wire-fabric machine, the combination, with a coiling device, of a weaving-channel into which the coiled wires are run and woven, a frame under tension and movable in sequence with the movements of the coiling and weaving devices, and means carried thereby for receiving the first wire coiled.

93. In a coiled-wire-fabric machine, the combination, with a coiling device, of a weaving-channel into which the coiled wires are run and woven, a frame under tension and movable in sequence with the movements of the coiling and weaving devices, and a wire depending from said frame in the same vertical plane as said channel and adapted to enter the latter to receive the first wire coiled.

94. In a coiled-wire-fabric machine, the combination, with a coiling device, of a weaving-channel into which the coiled wires are run and woven, a plate or bar, a wire depending therefrom in a longitudinal relation, and means for raising and lowering the plate or bar, such wire being arranged to be inserted in the weaving-channel to receive the first coiled wire.

95. In a coiled-wire-fabric machine, the combination, with a coiling device, of a weaving-channel into which the coiled wires are run and woven, a supporting-frame, a plate or bar carried by said frame and extending longitudinally of the weaving-channel, and means carried by said plate for receiving the first wire coiled.

96. In a coiled-wire-fabric machine, the combination, with a coiling device, of a weaving-channel into which the coiled wires are run and woven, a supporting-frame, a plate or bar carried by said frame and extending longitudinally of the weaving-channel, and a wire connected with the plate longitudinally

thereof and adapted to be inserted into the weaving-channel to receive the first wire coiled.

97. In a coiled-wire-fabric machine, the combination, with a coiling device, of a weaving-channel into which the coiled wires are run and woven, a supporitng-frame, a plate or bar carried by said frame and extending longitudinally of the weaving-channel, and a wire depending from the lower edge of the plate longitudinally thereof and adapted to be inserted into the weaving-channel to receive the first wire coiled.

98. In a coiled-wire-fabric machine, the combination, with a coiling device, of a weaving-channel into which the coiled wires are run and woven, a frame, a plate or bar carried thereby and adjustable relatively thereto, and a wire depending from the plate longitudinally thereof and adapted to be inserted into the weaving-channel to receive the first wire coiled.

99. In a coiled-wire-fabric machine, the combination, with a coiling device, of a weaving-channel into which the coiled wires are run and woven, a frame, a plate or bar carried thereby through a pinion-and-rack connection and thereby adjustable in relation thereto, and a wire depending from said plate or bar longitudinally thereof and arranged to be inserted into the weaving-channel to receive the first wire coiled.

100. In a coiled-wire-fabric machine, the combination, with a coiling device, of a weaving-channel into which the coiled wires are run and woven, a movable supporting-frame, a supplemental frame adjustably carried thereby, and a wire carried by the supplemental frame and adapted to receive the wire first coiled.

101. In a coiled-wire-fabric machine, the combination, with a coiling device, of a weaving-channel into which the coiled wires are run and woven, a movable supporting-frame, a supplemental frame adjustably carried thereby, and a wire having a pinion-and-rack connection with the supplemental frame, such wire being arranged to be inserted into the weaving-channel to receive the first wire coiled.

102. In a coiled-wire-fabric machine, the combination, with a coiling device, of a weaving-channel into which the coiled wires are run and woven, a movable supporting-frame, a supplemental frame adjustably carried thereby, a plate or bar adjustably supported by the supplemental frame, and a wire carried by the plate or bar longitudinally thereof and adapted to be inserted into the weaving-channel to receive the first wire coiled.

103. In a coiled-wire-fabric machine, the combination, with a coiling device, of a weaving-channel into which the coiled wires are run and woven, a movable supporting-frame, a supplemental frame adjustably carried thereby, a plate or bar having its ends adjustably connected with the supplemental frame by a rack-and-pinion connection, and a wire carried by the plate or bar longitudinally thereof and arranged to receive the first wire coiled.

104. In a coiled-wire-fabric machine, the combination, with a plurality of coiling devices, of a corresponding plurality of weaving-channels into which the coiled wires are run and woven to simultaneously produce a plurality of wire fabrics, and a fabric-starting frame having a corresponding plurality of starting-wires adapted to be inserted into the channels to receive the first wire coiled.

105. In a coiled-wire-fabric machine, the combination, with a plurality of coiling devices, of a corresponding plurality of weaving-channels into which the coiled wires are run and woven to simultaneously produce a plurality of wire fabrics, and a fabric-starting frame having a corresponding plurality of independently-adjustable starting-wires adapted to be inserted into the channels to receive the first wire coiled.

106. In a coiled-wire-fabric machine, the combination, with a plurality of coiling devices, of a corresponding plurality of weaving-channels into which the coiled wires are run and woven to simultaneously produce a plurality of wire fabrics, and a fabric-starting frame having a corresponding plurality of starting-wires adapted to be inserted into the channels to receive the first wire coiled, said starting-frame being adjustable to adjust said wires in unison and the wires being independently adjustable on the frame.

107. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of mechanism for operating the weaving device, and a pattern device determining the pattern or place of insertion of cords in the fabric and coöperating with the weaving device.

108. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of mechanism for operating the weaving device, and a pattern device determining the pattern or place of insertion of cords in the fabric and arranged to stop the weaving device at intervals.

109. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of mechanism for operating the weaving device, and a pattern device comprising a movable member provided with a series of projections and depressions, and means cooperating therewith and controlling the movements of the weaving device.

110. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of mechanism for operating the weaving device, and a pattern device comprising a longitudinally-movable member provided on one edge with a series of projections and de-

pressions, and means coöperating therewith and controlling the movements of the weaving device.

111. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of mechanism for operating the weaving device, and a pattern device comprising a movable member having a series of projections and depressions, a movable plate or blade coöperating therewith and operatively connected with the operating mechanism for the weaving device to stop such mechanism at predetermined intervals.

112. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of mechanism for operating the weaving device, and a pattern device comprising a series of racks having a series of holes, pins arranged to be inserted in said holes according to a predetermined arrangement, and means coöperating with said pins and racks for stopping the operating mechanism for the weaving device at predetermined intervals.

113. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of mechanism for operating the weaving device, and a pattern device comprising a series of racks having a series of holes, pins adapted to be inserted in said holes according to a predetermined arrangement, said racks being operatively connected with each other for extension purposes, and means coöperating with the pins and racks for stopping the operating mechanism for the weaving device at predetermined intervals.

114. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of mechanism for operating the weaving device, and a pattern device comprising a series of racks having a series of holes, pins adapted to be inserted in said holes according to a predetermined arrangement, a reciprocating plate or blade movable transversely of the racks and arranged to have its full movement interfered with by a pin when presented thereto, and a connection between the plate and the mechanism for operating the weaving device.

115. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of mechanism for operating the weaving device, and a pattern device comprising a series of racks having a series of holes, pins adapted to be inserted in said holes according to a predetermined arrangement, a pinion for actuating the racks, means for operating the pinion with a step-by-step movement, and means coöperating with the racks for stopping the mechanism for operating the weaving device.

116. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of mechanism for operating the weaving device, and a pattern device comprising a series of racks having a series of holes, pins adapted to be inserted in said holes according to a predetermined arrangement, a pinion for actuating the racks, a pin-wheel operatively connected with the pinion, means for actuating the pin-wheel, and means coöperating with the racks for stopping the mechanism for operating the weaving device.

117. In a coiled-wire-fabric machine, the combination, with the coiling and weaving devices, and with the feed-rolls, of mechanism for actuating said devices and rolls, a clutch device coöperating with such mechanism, and electrically-controlled mechanism actuated by the running-wires when entangled and arranged to coöperate with the clutch.

118. In a coiled-wire-fabric machine, the combination, with the coiling and weaving devices, and with the feed-rolls, of mechanism for actuating said devices and rolls, a clutch device coöperating with such mechanism, and electrically-controlled mechanism actuated by the running-wires when entangled and arranged to coöperate with the clutch and comprising electrodes arranged adjacent the running-wires and in an electrical circuit, and an electromagnet in said circuit and controlling the clutch device.

119. In a coiled-wire-fabric machine, the combination, with the coiling and weaving devices, and with the feed-rolls, of mechanism for actuating said devices and rolls, a clutch device coöperating with such mechanism, and electrically-controlled mechanism actuated by the running-wires when entangled and arranged to coöperate with the clutch and comprising flexible electrodes arranged adjacent the running-wires and in an electrical circuit, and an electromagnet in said circuit coöperating with the clutch device.

120. In a coiled-wire-fabric machine, the combination, with the coiling and weaving devices, and with the feed-rolls, of mechanism for actuating said devices and rolls, a clutch device coöperating with such mechanism, and electrically-controlled mechanism actuated by the running-wires when entangled and arranged to coöperate with the clutch and comprising electrodes arranged adjacent the running-wires and in an electrical circuit, a shifting-lever connected with the clutch, a notched rod on said lever, an armature adapted to engage said notch, and an electromagnet interposed in said circuit and adapted to coöperate with the armature.

121. In a coiled-wire-fabric machine, the combination, with the coiling and weaving devices, and with the feed-rolls, of mechanism for actuating said devices and rolls, a clutch device coöperating with such mechanism, and electrically-controlled mechanism actuated by the running-wires when entangled and arranged to coöperate with the clutch and comprising electrodes arranged adjacent the running-wires and in an elec-

trical circuit, a shifting-lever connected with the clutch, a notched rod on said lever, an armature adapted to engage said notch, an electromagnet interposed in said circuit and adapted to coöperate with the armature, and a circuit-breaker operated by said rod.

122. A coiled-wire-fabric machine comprising a plurality of coiling devices for producing the coils of a plurality of separate and complete fabrics, each coiling device being separate and independent and arranged to produce all of the coils of its particular fabric, a corresponding plurality of weaving devices separate and independent of each other and coöperating with said coiling devices, and mechanism common to all of said coiling and weaving devices for operating them.

123. A coiled-wire-fabric machine comprising a plurality of gangs of coiling and weaving devices for producing a plurality of fabrics, and feed-rolls adapted to feed the wires into the machine, one of which rolls has a series of independent pressure-surfaces.

124. A coiled-wire-fabric machine comprising a plurality of gangs of coiling and weaving devices for producing a plurality of fabrics, and feed-rolls adapted to feed the wires into the machine, one of which rolls has a series of independently-adjustable pressure-surfaces.

125. A coiled-wire-fabric machine comprising a plurality of gangs of coiling and weaving devices for producing a plurality of fabrics, and feed-rolls adapted to feed the wires into the machine, one of which rolls has a series of separate pressure-rings for the wires.

126. A coiled-wire-fabric machine comprising a plurality of gangs of coiling and weaving devices for producing a plurality of fabrics, and feed-rolls adapted to feed the wires into the machine, one of which rolls has a series of independently-adjustable rings forming pressure-surfaces for the wires.

127. A coiled-wire-fabric machine comprising a plurality of gangs of coiling and weaving devices for producing a plurality of fabrics, and feed-rolls adapted to feed the wires into the machine, one of which rolls has a series of rings arranged and adjustable in pairs to form the pressure-surfaces for the wires.

128. A coiled-wire-fabric machine comprising a plurality of gangs of coiling and weaving devices for producing a plurality of fabrics, and a starting or developing frame having a series of starting-wires adapted to coöperate with the weaving-channel to start or develop the fabric.

129. A coiled-wire-fabric machine comprising a plurality of gangs of coiling and weaving devices for producing a plurality of fabrics, and a starting or developing frame having a series of starting-wires independently adjustable on said frame and adapted to coöperate with the weaving-channels to start or develop the fabric.

130. A coiled-wire-fabric machine comprising a plurality of gangs of coiling and weaving devices for producing a plurality of fabrics, and a starting or developing frame having a series of starting-wires arranged to be lowered into the channels, said starting-wires being adjustable as a unit by movement of the frame and also adjustable independently on the frame.

131. In a coiled-wire-fabric machine the combination with the coiling and weaving devices, of intermittently-operated feed-rolls for the wire, and automatic means for braking the movements of the feed-rolls.

132. In a coiled-wire-fabric machine, the combination, with the coiling and weaving devices, of intermittently-operated feed-rolls for the wire, gearing for actuating the feed-rolls, and automatic means coöperating with said gearing for braking the movements thereof.

133. In a coiled-wire-fabric machine, the combination, with the coiling and weaving devices, of intermittently-operated feed-rolls for the wire, gearing for actuating the feed-rolls and an automatically-operated brake-shoe adapted to be applied to one of the gearing members to stop the movements thereof.

134. In a coiled-wire-fabric machine, the combination, with the coiling and weaving devices, of intermittently-operated feed-rolls for the wire, gearing for actuating the feed-rolls, driving mechanism for said gearing, and a brake-shoe intermittently actuated by said mechanism and adapted to coöperate with said gearing to stop it.

135. In a coiled-wire-fabric machine, the combination, with the coiling and weaving devices, of intermittently-operated feed-rolls for the wire, gearing for actuating the feed-rolls, a brake-shoe arranged to coöperate with the gearing, a rock-shaft operatively connected with the shoe, and means for intermittently operating the rock-shaft.

136. In a coiled-wire-fabric machine, the combination, with the coiling and weaving devices, of intermittently-operated feed-rolls for the wire, gearing for actuating the feed-rolls, a brake-shoe arranged to be applied to the edge of one of the members of the gearing, a rock-shaft operatively connected with the shoe, and a cam device operatively connected with the rock-shaft.

137. In a coiled-wire-fabric machine, the combination, with the coiling and weaving devices, of intermittently-operated feed-rolls for the wire, gearing for actuating the feed-rolls, a brake-shoe arranged to be applied to one of the members of the gearing, a rock-shaft operatively connected with the shoe, a rotatable cam-disk, and an arm adapted to press on the edge of such disk and connected with said rock-shaft.

138. In a coiled-wire-fabric machine, the combination with coiling and weaving devices, and with power or driving mechanism for the machine, of means coöperating with the wire before its entrance to the machine for automatically stopping said mechanism when the strain on the wire exceeds a predetermined amount.

139. In a coiled-wire-fabric machine, the combination with coiling and weaving devices, and with power or driving mechanism for the machine, of electrically-controlled means coöperating with said mechanism, and a circuit-closer controlling the electrical circuit of said means and arranged to coöperate with the wire before its entrance to the machine.

140. In a coiled-wire-fabric machine, the combination with coiling and weaving devices, and with power or driving mechanism for the machine, of electrically-controlled means coöperating with said mechanism, and a circuit-closer controlling the electrical circuit of said means and comprising a pivoted arm having operative connection with the wire before entrance to the machine, an electrical terminal carried by said arm, and a contact-plate coöperating with said terminal.

141. In a coiled-wire-fabric machine, the combination with coiling and weaving devices, and with power or driving mechanism for the machine, of electrically-controlled means coöperating with said mechanism, and a circuit-closer controlling the electrical circuit of said means and comprising a pivoted arm having operative connection with the wire before entrance to the machine, an electrical terminal carried by said arm, a contact-plate coöperating with said terminal, and means for applying tension to said arm and adjusting such tension.

142. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of means for feeding the wire into the machine comprising a shaft or roll and a yielding pressure-surface operated by the shaft or roll.

143. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of means for feeding the wire into the machine comprising a shaft or roll and a yielding pressure-surface operated by the shaft or roll and encircling the same.

144. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of means for feeding the wire into the machine comprising a shaft or roll and a yielding pressure-surface operated by the shaft or roll and, in operation, arranged eccentric thereto.

145. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of means for feeding the wire into the machine comprising a shaft or roll having a normal fixed position and a yielding pressure-surface having a yielding connection with the shaft and, in operation, arranged eccentric thereto.

146. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of means for feeding the wire into the machine comprising a shaft or roll, a yielding pressure-surface operated thereby, and means for forcing said surface to travel eccentric of the shaft.

147. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of means for feeding the wire into the machine comprising a shaft or roll, a yielding pressure-surface operated thereby and encircling the same, and means for forcing said surface to travel eccentric of the shaft and for varying the degree of pressure or tension of said surface.

148. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of means for feeding the wire into the machine comprising a shaft or roll, a yielding pressure-surface operated thereby, and adjustable means for forcing said surface to travel eccentric of the shaft.

149. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of means for feeding the wire into the machine comprising a shaft or roll, a yielding pressure-surface operated thereby, and a movable abutment for forcing said surface to travel eccentric of the shaft.

150. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of means for feeding the wire into the machine comprising a shaft or roll, and a pressure-surface having a spring connection with the shaft.

151. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of means for feeding the wire into the machine comprising a shaft or roll, a pressure-surface operatively connected with the shaft by a spring normally tending to keep such surface concentric, and means for forcing said surface to a position eccentric of the shaft.

152. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of means for feeding the wire into the machine comprising a shaft or roll, a yielding pressure-surface consisting of a ring arranged around the shaft, and a spring forming a yielding connection between the shaft and ring.

153. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of means for feeding the wire into the machine comprising a shaft or roll, a yielding pressure-surface consisting of a ring arranged around the shaft, a coiled spring forming a yielding connection between the shaft and

ring, and a movable device arranged to bear against the ring at one side of the shaft to force such ring to travel eccentric of the shaft.

154. A coiled-wire-fabric machine comprising a plurality of gangs of coiling and weaving devices for producing a plurality of fabrics, and feeding mechanism having a series of independent pressure-surfaces for feeding the different wires into the machine.

155. A coiled-wire-fabric machine comprising a plurality of gangs of coiling and weaving devices for producing a plurality of fabrics, and feeding mechanism having a shaft or roll and independent pressure-surfaces provided with a yielding connection with the shaft or roll.

156. A coiled-wire-fabric machine comprising a plurality of gangs of coiling and weaving devices for producing a plurality of fabrics, and feeding mechanism having a shaft and a plurality of independent pressure-surfaces corresponding in number with the number of wires used and provided with a yielding driving connection with the shaft or roll.

157. A coiled-wire-fabric machine comprising a plurality of gangs of coiling and weaving devices for producing a plurality of fabrics, and feeding mechanism having a shaft or roll and a plurality of independent pressure-surfaces provided with independent spring driving connections with the shaft or roll.

158. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of means for intermittently operating said devices, comprising, in connection with a driving member and a driven member operatively connected with said devices, a clutch device automatically and intermittently connecting the said members.

159. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls, and means for intermittently rotating said rolls comprising, in connection with a driving member and a driven member operatively connected with the feed-rolls, a clutch device intermittently connecting said members.

160. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a clutch for intermittently operating said devices and means for varying the length of the periods of intermission.

161. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of feed-rolls, and a clutch device having operating devices under its control arranged to coöperate with and actuate the feed-rolls and the coiling and weaving devices with an intermittent operation and means for varying the length of the periods of intermission.

162. A coiled-wire-fabric machine comprising a plurality of coiling devices for producing the coils of a plurality of separate and complete fabrics, each coiling device being separate and independent and arranged to produce all of the coils of its particular fabric, a corresponding plurality of weaving devices comprising separate and independent channels arranged in advance of and coöperating with the coiling devices and also comprising shutters working from opposite sides of the channels, and mechanism common to said coiling and weaving devices for operating them.

163. In a coiled-wire-fabric machine, the combination, with the wire coiling and weaving devices, of electrical means for holding the wire or coil last run while the weaving device is acting upon preceding coils.

164. In a coiled-wire-fabric machine, the combination, with the wire coiling and weaving devices, of an electromagnet for attracting and clamping the wire or coil last run while the weaving device is acting upon preceding coils.

165. In a coiled-wire-fabric machine, the combination, with the wire coiling and weaving devices, of an electromagnet for attracting and clamping the wire or coil last run while the weaving device is acting upon the preceding coils, and automatic means for alternately energizing and deënergizing the electromagnet.

166. In a coiled-wire-fabric machine, the combination, with the coiling and weaving devices, of a pattern device comprising a member provided with an edge which is irregular according to the particular character of fabric as regards the cords, and means cooperating with said edge to control the movements of the weaving device and consequently the place of insertion of the cords in the fabric.

167. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a pattern device comprising a movable member having a step-by-step movement, and means coöperating therewith and controlling the movements of the weaving device.

168. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a pattern device comprising a movable member having a step-by-step movement, and having a series of depressions spaced according to the particular plan or pattern of fabric as regards the place of insertion of the cords, and means coöperating with said depressions and arranged to control the movements of the weaving device.

169. In a coiled-wire-fabric machine, the combination, with the coiling and weaving devices, of a movable trigger located intermediate said devices and arranged to coöperate with the coils, means for moving such trigger downwardly below the range of the coils and then upwardly and finally for-

wardly in engagement therewith, comprising a reciprocating plate, a swinging shaft actuated thereby, and a rock-shaft also actuated by the plate, said trigger being operatively connected with both of said shafts.

170. In a coiled-wire-fabric machine, the combination, with the coiling and weaving devices, of a movable trigger located intermediate said devices and arranged to coöperate with the coils, means for moving such trigger downwardly below the range of the coils and then upwardly and finally forwardly in engagement therewith, comprising a reciprocating plate, a swinging shaft actuated thereby, and a rock-shaft also actuated by the plate, said trigger being operatively connected with both of said shafts, and cut-off mechanism also operatively connected with the plate.

171. In a coiled-wire-fabric machine, the combination, with the coiling and weaving devices, of a trigger 83 arranged intermediate said devices, a swinging shaft 84 on which the trigger is mounted, a rock-shaft 86 connected with shaft 84, a sliding plate 76, and an operating connection between said plate and rock-shaft.

172. In a coiled-wire-fabric machine, the combination, with the coiling and weaving devices, of a trigger 83 arranged intermediate said devices, a swinging-shaft 84 on which the trigger is mounted, a rock-shaft 86 connected with shaft 84, a sliding plate 76, and a lever 92 operatively connected with the rock-shaft and controlled by said plate.

173. In a coiled-wire-fabric machine, the combination, with the coiling and weaving devices, of a trigger 83 arranged intermediate said devices, a swinging shaft 84 on which the trigger is mounted, a rock-shaft 86 connected with shaft 84, a sliding plate 76, a lever 92 operatively connected with the rock-shaft, said plate having a cam-slot, and a stud on the lever to coöperate with the cam-slot.

174. In a coiled-wire-fabric machine, the combination, with the coiling and weaving devices, of a trigger 83 arranged intermediate said devices, a swinging shaft 84 on which the trigger is mounted, a rock-shaft 86 connected with shaft 84, a sliding plate 76, a link 85 connecting said shafts and extended beyond the shaft 86, and a lever 92 pivotally connected with link 85 and actuated by said plate.

175. In a coiled-wire-fabric machine, the combination, with the coiling and weaving devices, of a trigger 83 arranged intermediate said devices, a swinging shaft 84 on which the trigger is mounted, a rock-shaft 86 connected with shaft 84, a sliding plate 76, an operating connection between said plate and rock-shaft, a strip or plate 90 having a slot through which the trigger passes, and an operating connection between said strip and the sliding plate.

176. In a coiled-wire-fabric machine, the combination, with the coiling and weaving devices, of a trigger 83 arranged intermediate said devices, a swinging shaft 84 on which the trigger is mounted, a rock-shaft 86 connected with shaft 84, a sliding plate 76, an operating connection between said plate and rock-shaft, a strip or plate 90 having a slot through which the trigger passes, and an operating connection between said strip and the sliding plate, said strip being spring-pressed to hold the trigger in a normal position as to its longitudinal movement.

177. In a coiled-wire-fabric machine, the combination, with the coiling and weaving devices, of a trigger 83 arranged intermediate said devices, a swinging shaft 84 on which the trigger is mounted, a rock-shaft 86 connected with shaft 84, a sliding plate 76, an operating connection between said plate and rock-shaft, a strip or plate 90 having a slot through which the trigger passes, and an operating connection between said strip and the sliding plate comprising a rock-arm 101, arranged to actuate or swing said strip, a rock-shaft 102 on which the rock-arm is mounted, and an arm 103 secured to the rock-shaft 102, said sliding plate 76 having a cam-slot to operate the arm 103.

178. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a reciprocating head on which the coiling device is stationarily supported.

179. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a head supporting the coiling device and arranged to reciprocate toward and away from the weaving device the coiling device being stationarily supported on said head.

180. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a head supporting the coiling device and arranged to be moved intermittently and to be reciprocated toward and away from the weaving device the coiling device being stationarily supported on said head.

181. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, and with wire-feeding mechanism for feeding the wire to the coiling device, of a head carrying said coiling device and wire-feeding mechanism and arranged to reciprocate toward and away from the weaving device the coiling device being stationarily supported on said head.

182. In a coiled-wire-fabric machine, the conmbination, with coiling and weaving devices, and with feed-rolls for feeding the wire to the coiling device, of a head carrying said feed-rolls and coiling device and arranged to be intermittently reciprocated toward and away from the weaving device the coiling device being stationarily supported on said head.

183. In a coiled-wire-fabric machine, the combination of a coiling device, a weaving device, cut-off mechanism, and a reciprocating

head on which the coiling device and cut-off mechanism are mounted.

184. In a coiled-wire-fabric machine, the combination of a coiling device, a weaving device, cut-off mechanism, feed-rolls for feeding the wire to the coiling device, and a reciprocating head on which the coiling device, cut-off mechanism and feed-rolls are mounted.

185. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a reciprocating head on which the coiling device is supported and actuating mechanism for such head comprising a driving-shaft, a rolling key operatively connected with the head and coöperating with the shaft, and means for controlling the position of such key.

186. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a reciprocating head on which the coiling device is supported and actuating mechanism for such head comprising a driving-shaft, a disk arranged on such shaft and operatively connected with the head, a rolling key coöperating with the shaft, and means for intermittently rolling said key to control the engagement between the disk and shaft to reciprocate the head.

187. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a reciprocating head on which the coiling device is supported and actuating mechanism for such head comprising a driving-shaft, a disk arranged on such shaft and operatively connected with the head, a rolling key coöperating with the shaft, and normally pressed to an active position, and means for intermittently rolling said key against such pressure to cause disengagement between the disk and shaft to reciprocate the head.

188. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a reciprocating head on which the coiling device is supported, and actuating mechanism for such head comprising a driving-shaft, a disk arranged on such shaft and operatively connected with the head, a rolling key coöperating with the shaft, said shaft having a keyway within which the key is held by spring-pressure to cause engagement between the disk and shaft, and means for intermittently rolling the key out of said keyway to cause disengagement between the disk and shaft for the suspension of operation of the head.

189. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a reciprocating head on which the coiling device is supported and actuating mechanism for such head comprising a driving-shaft, a disk arranged on such shaft and operatively connected with the head, a rolling key coöperating with the shaft, and means for intermittently rolling said key to cause disengagement between the disk and shaft to prevent reciprocation of the head, comprising an intermittently-operated tripper adapted to be interposed in the path of the key to so rock or roll the same.

190. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a reciprocating head on which the coiling device is supported and actuating mechanism for such head comprising a driving-shaft, a disk arranged on such shaft and operatively connected with the head, a rolling key coöperating with the shaft, and means for intermittently rolling said key to cause disengagement between the disk and shaft to prevent reciprocation of the head, comprising a pair of intermittently-operated trippers arranged at opposite sides of the shaft and adapted to be interposed in the path of the key to so rock or roll the same.

191. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a reciprocating head on which the coiling device is supported, and actuating mechanism for such head comprising a driving-shaft, a spring-pressed rolling key coöperating with the shaft, a driven member operatively connected with the head, and means for controlling the position of such key with respect to the disk and shaft.

192. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a reciprocating head on which the coiling device is supported, and actuating mechanism for such head comprising a driving-shaft, a spring-pressed rolling key coöperating with the shaft, a driven member operatively connected with the head, and means for controlling the position of such key with respect to the disk and shaft, said key being normally pressed to an active position to cause engagement between said member and shaft.

193. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a reciprocating head on which the coiling device is supported, and actuating mechanism for such head comprising a driving-shaft, a rolling key arranged to coöperate with the driving-shaft and driven member and normally pressed with a yielding pressure to a position to cause engagement between said shaft and driven member.

194. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a reciprocating head on which the coiling device is supported, and actuating mechanism for such head comprising a driving-shaft, a rolling-key arranged to coöperate with the shaft and driven member and provided with an arm, a spring pressing against said arm for the purpose of rolling and holding said key into position to cause engagement between the shaft and driven member, and means for intermittently rolling said key

to an inactive position against the pressure of said spring to cause disengagement between the shaft and driven member.

195. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices, of a reciprocating head on which the coiling device is supported, and actuating mechanism for such head comprising a driving-shaft, a rolling key arranged to coöperate with the shaft and driven member and provided with an arm, a spring pressing against said arm for the purpose of rolling and holding said key into position to cause engagement between the shaft and driven member, and a pair of intermittently-operated trippers arranged at opposite sides of the shaft and adapted to be interposed in the path of movement of said arm to cause disengagement between the shaft and driven member and the consequent suspension of reciprocation of the head.

196. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices and with the feed-rolls, of a reciprocating head supporting the coiling device and the feed-rolls.

197. In a coiled-wire-fabric machine, the combination, with coiling and weaving devices and with the feed-rolls, of a reciprocating head supporting the coiling device and the feed-rolls, said head being arranged to reciprocate toward and away from the weaving device in a direction at right angles to the axis of rotation of the feed-rolls.

198. In a coiled-wire-fabric machine, the combination, with the coiling device, of a reciprocating head on which such device is supported, and a weaving device including a weaving-channel whose bottom is in substantially the same horizontal plane as the said head.

199. In a coiled-wire-fabric machine, the combination, with the weaving device, of feed-rolls, wire-guides in the rear of the rolls for guiding the wire thereto, coilers arranged in advance of the feed-rolls, and a reciprocating head on which said guides, rolls and coilers are mounted to move in unison toward and away from the weaving device.

200. In a coiled-wire-fabric machine, the combination, with a plurality of coiling and weaving devices, of a single reciprocating head on which said coiling devices are supported, and means for reciprocating said head to move all of the coiling devices in unison toward and away from the weaving devices.

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