W. J. PINE.

WIRE FABRIC MACHINE.

APPLICATION FILED JAN. 15, 1915.

1,293,540.

Patented Feb. 4, 1919.

22 SHEETS—SHEET 1.

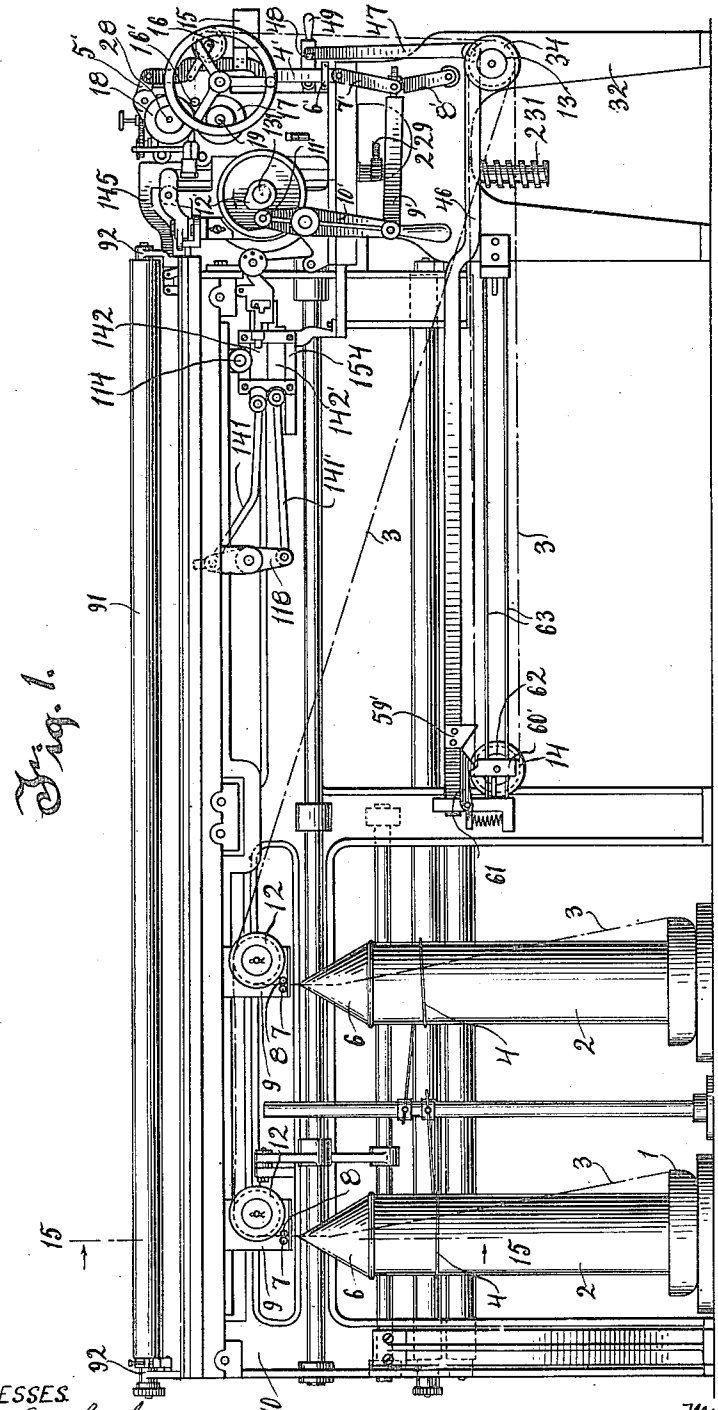

Fig. 1.

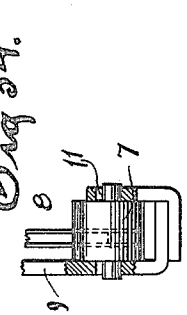

Fig. 34.

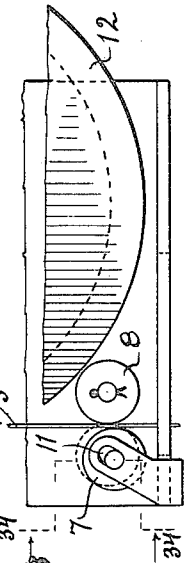

Fig. 33.

WITNESSES.
T. M. Borchard
E. Schowalter.

INVENTOR
Wilber J. Pine
BY
Mussell, Kenney & French
ATTORNEY

W. J. PINE.

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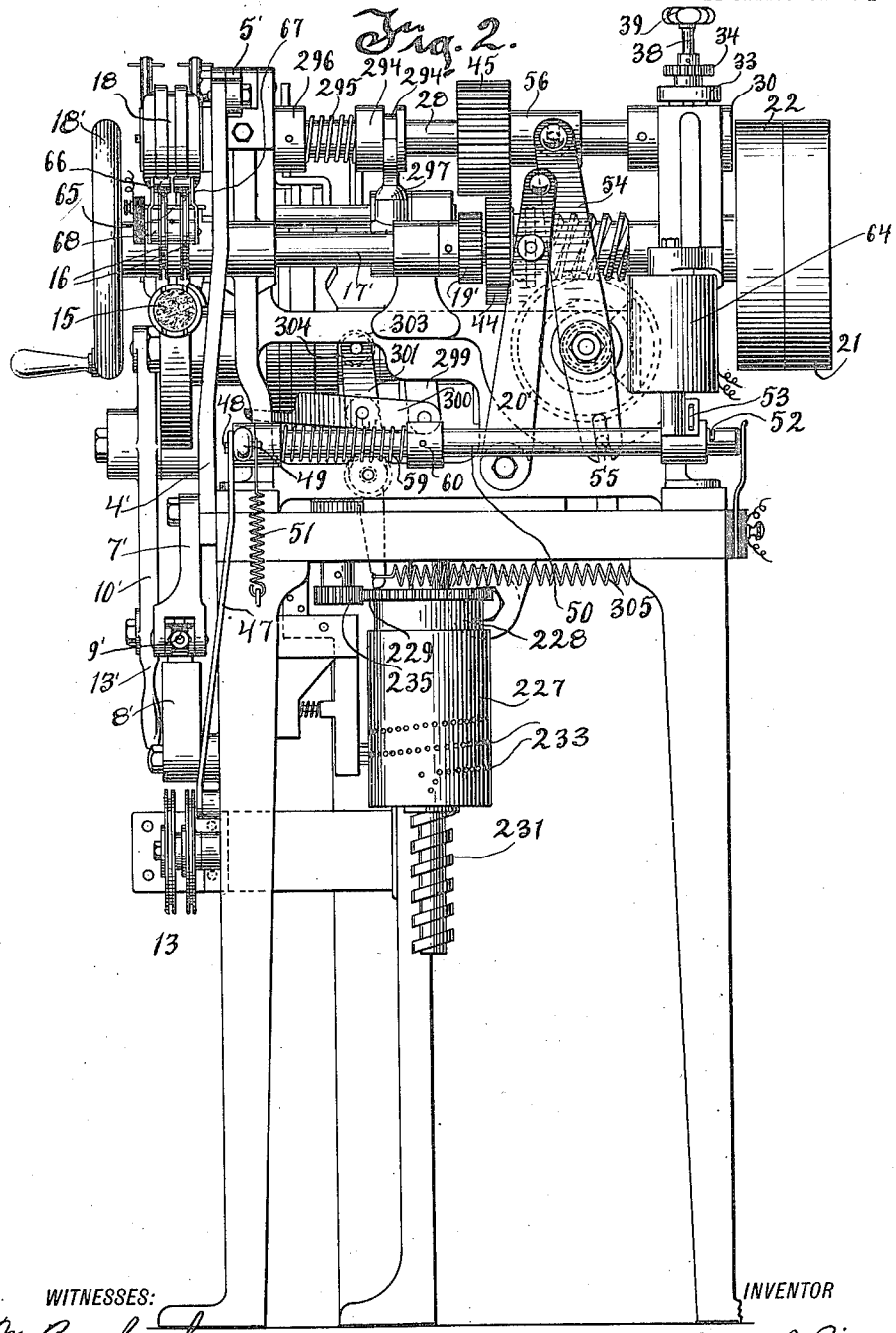
22 SHEETS—SHEET 2.

Fig. 2.



WITNESSES:

F. M. Bonchard

E. Schowalter.

INVENTOR

Wilbur J. Pine

BY

Monsell, Keeney & French

ATTORNEY

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22 SHEETS—SHEET 3.

Fig. 3.

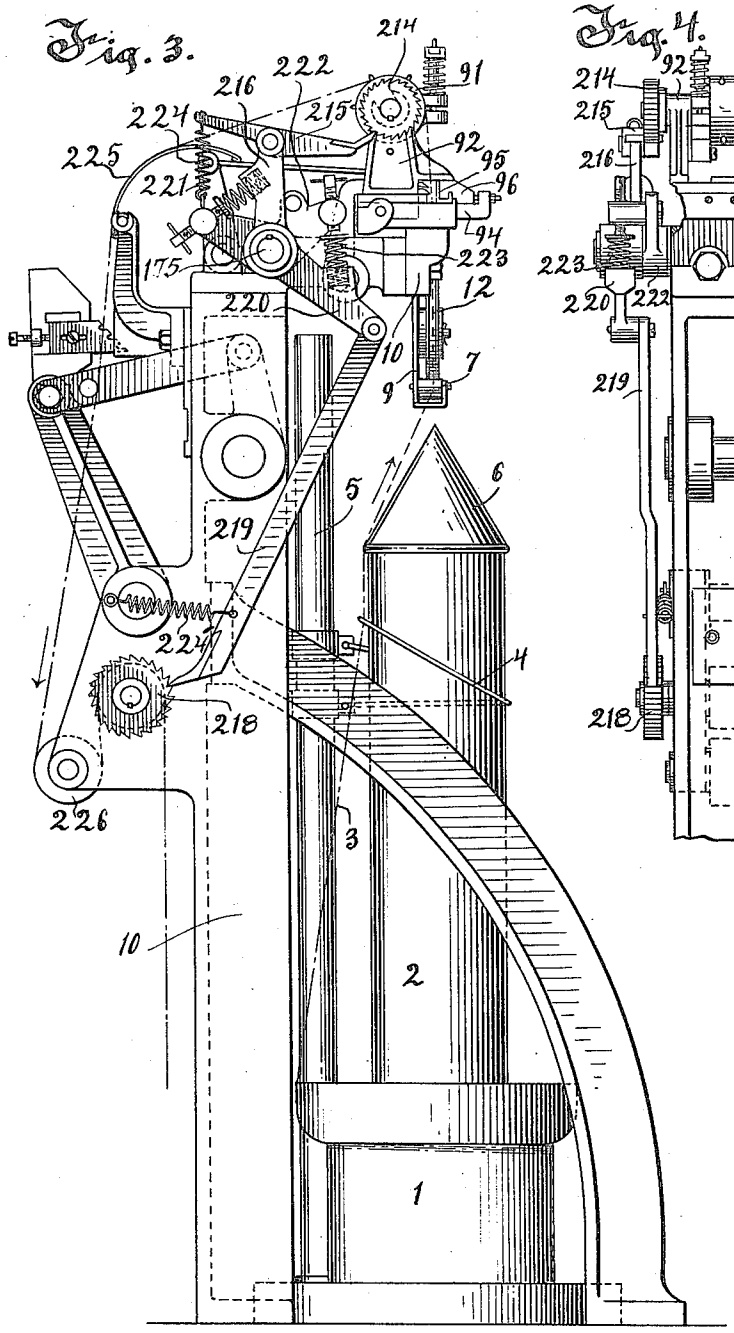

Fig. 4.

Witnesses:
F. M. Bonchard
E. Schowalter

Inventor
Wilbur J. Pine

By Attorneys
Mysell, Reavy & Franch.

W. J. PINE.

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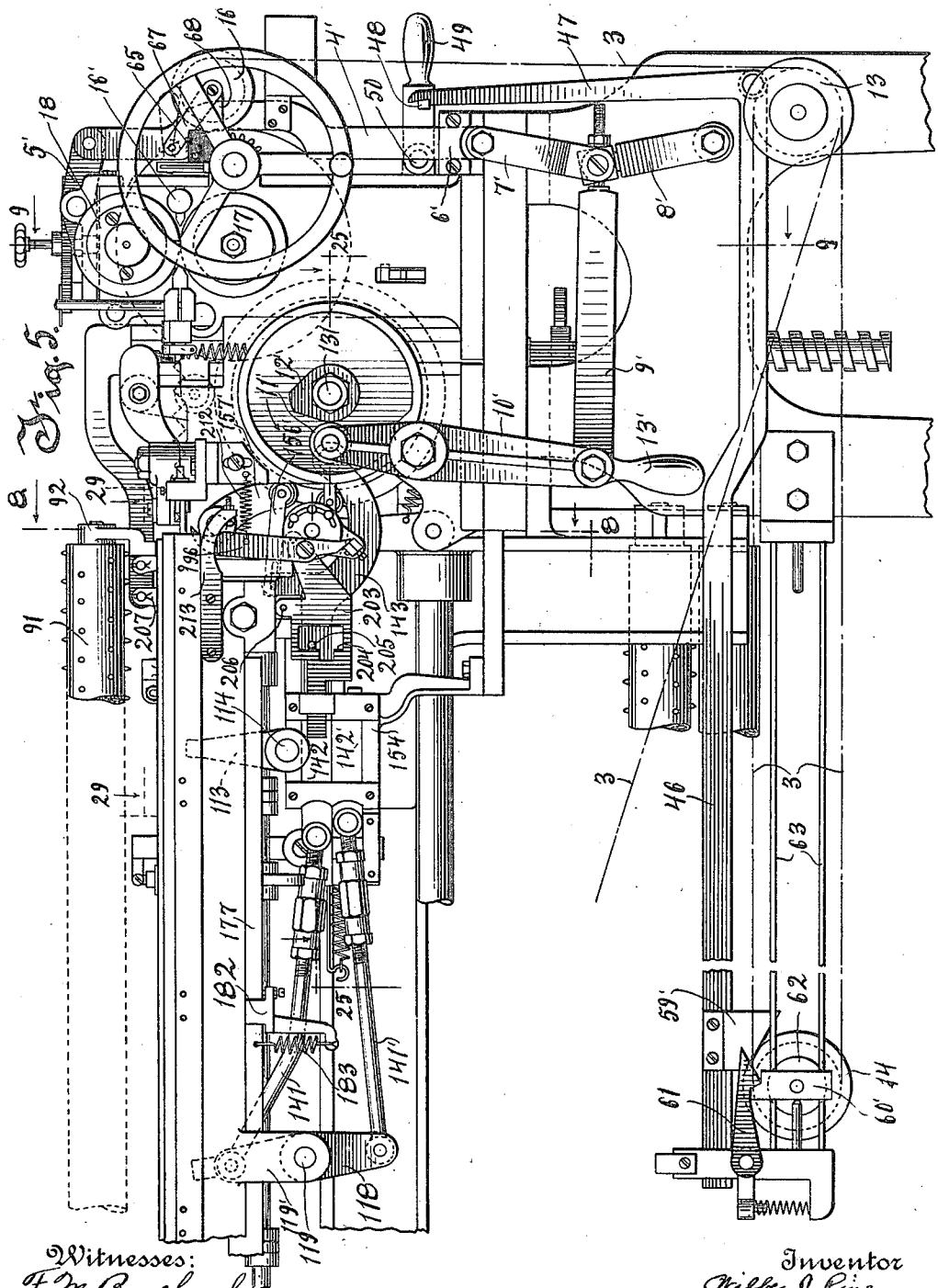
22 SHEETS—SHEET 4.

Fig. 5.



Witnesses:
F. M. Bouchard
E. Schowalter.

Inventor
Wilbur J. Pine
By Attorneys
Mussell, Kenway & French.

W. J. PINE.

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22 SHEETS—SHEET 5.

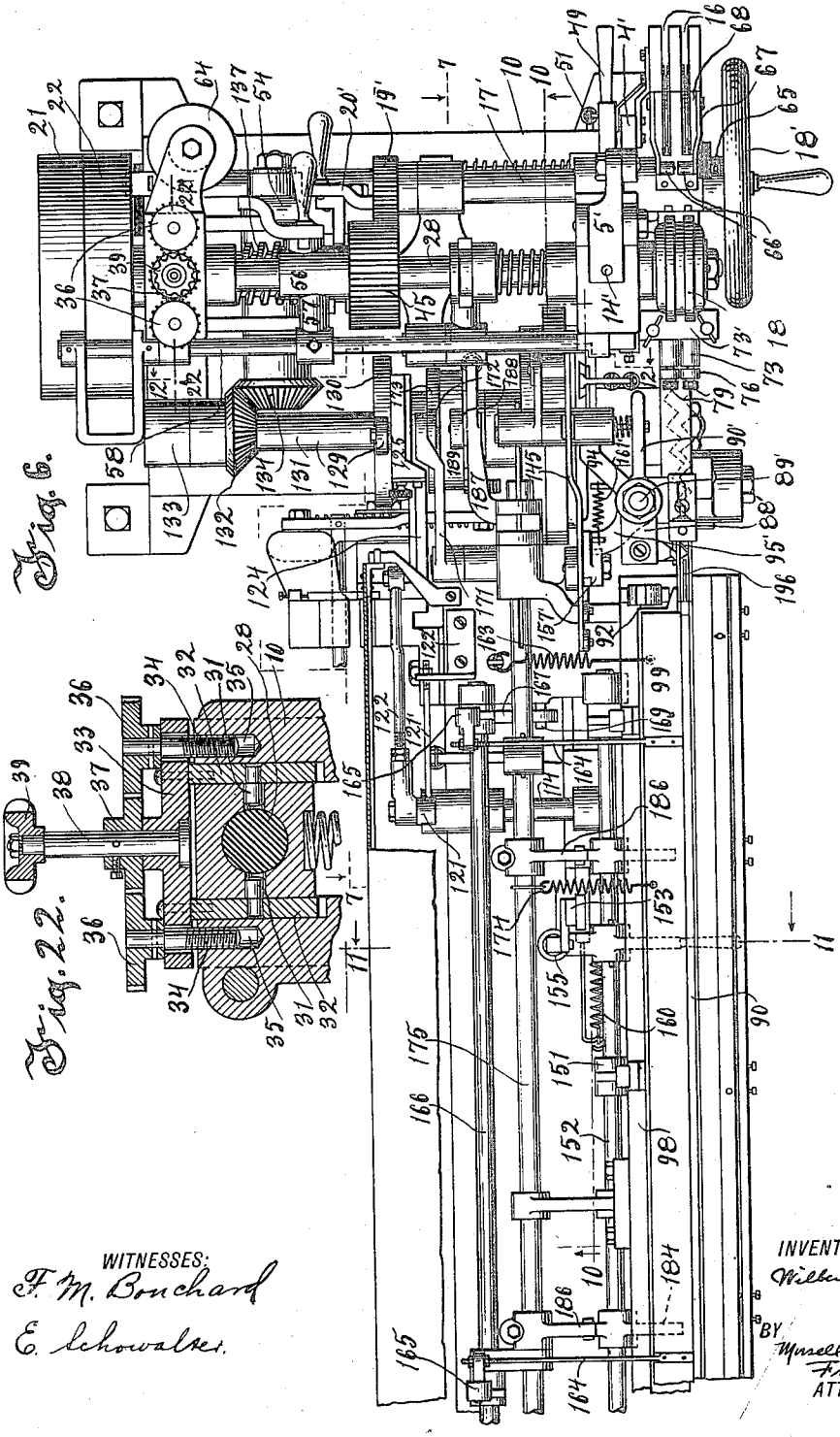

Fig. 6.

Fig. 22.

WITNESSES:

F. M. Bouchard

E. Schowalter.

INVENTOR

Wilbur J. Pine

BY

Murrell, Keeney & French

ATTORNEY

W. J. PINE.

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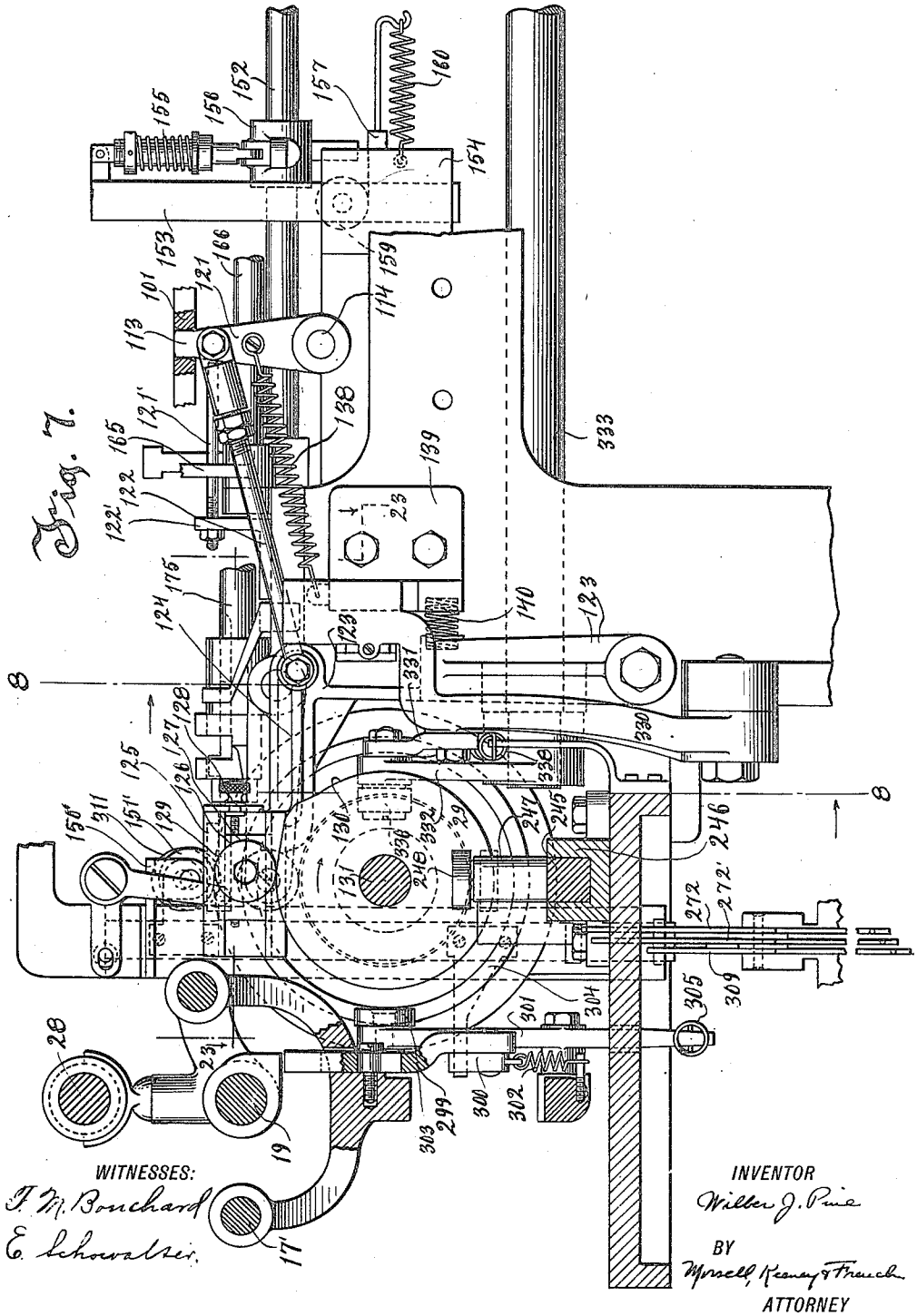
22 SHEETS—SHEET 6.

Fig. 7.



WITNESSES:

F. M. Bouchard

E. Schwalbe.

INVENTOR

Willet J. Pine

BY

Morsell, Kenney & French

ATTORNEY

W. J. PINE.

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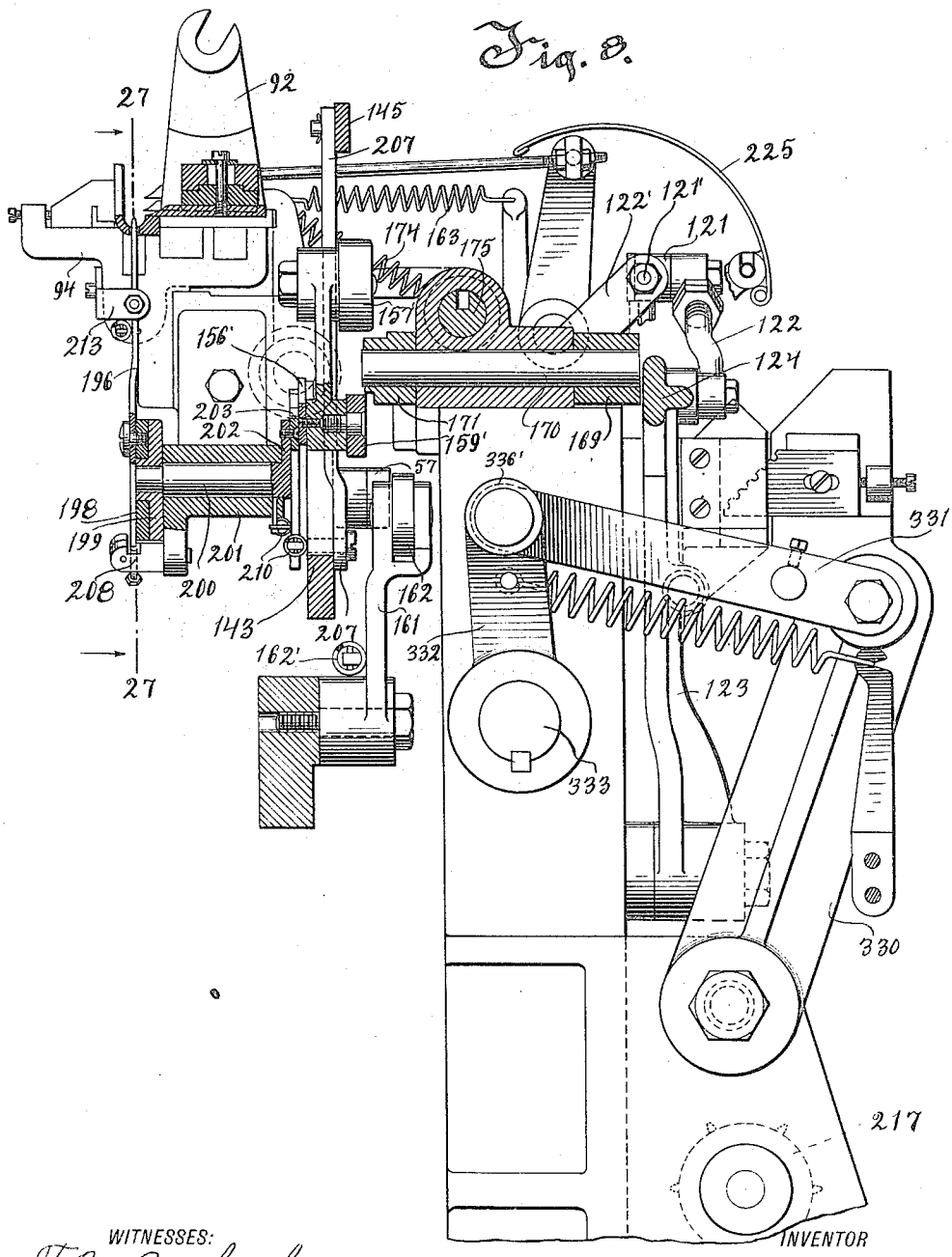
22 SHEETS—SHEET 7.

Fig. 8.



WITNESSES:

F. M. Bouchard

E. Schowalter.

INVENTOR

Wilber J. Pine

BY

Mursell, Keeney & French

ATTORNEY

W. J. PINE.

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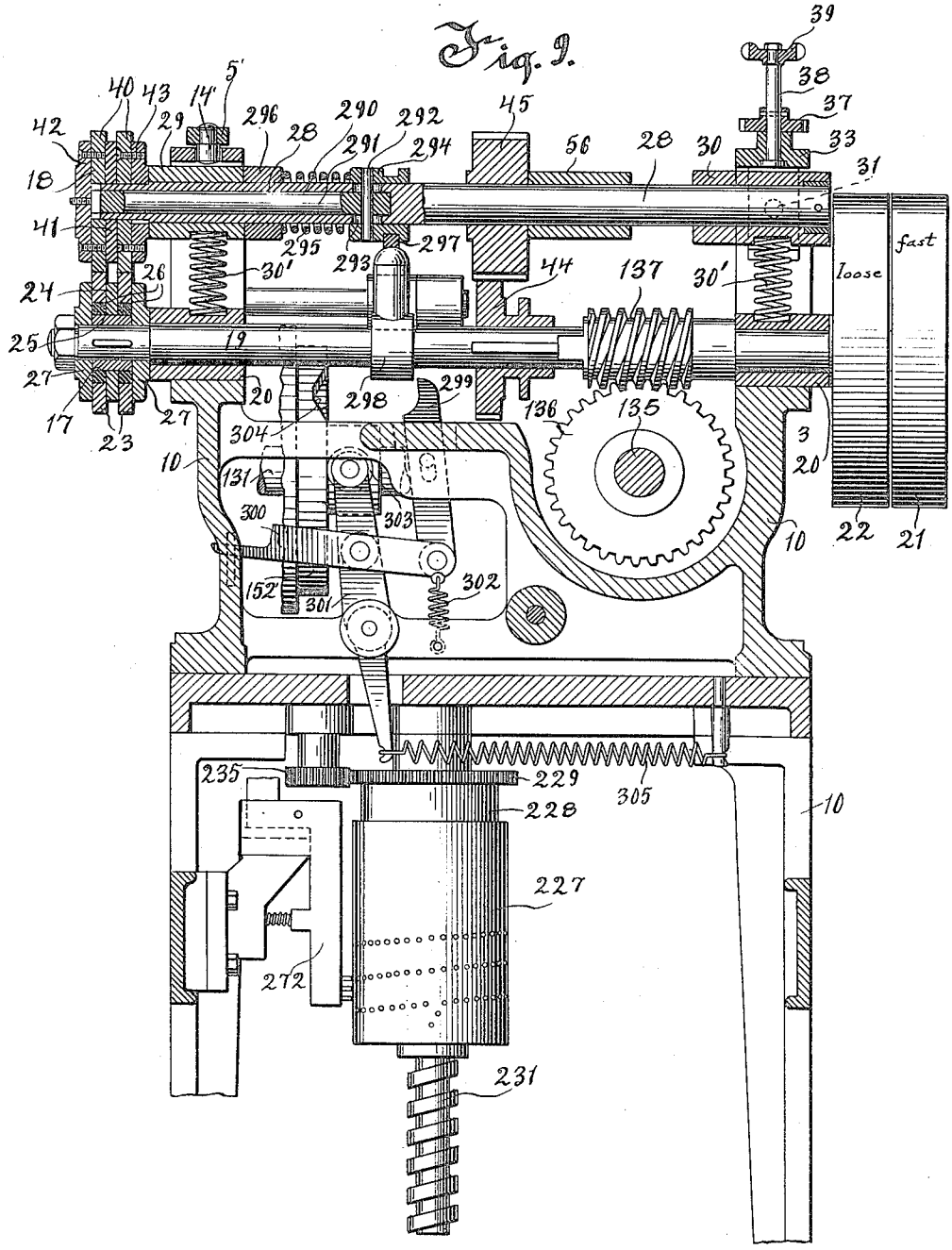
22 SHEETS—SHEET 8.

Fig. 9.



Witnesses:
F. M. Bonchard
E. Schowalter.

Inventor
Wilbur J. Pine

By Attorneys
Morsell, Keeney & French

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22 SHEETS—SHEET 9.

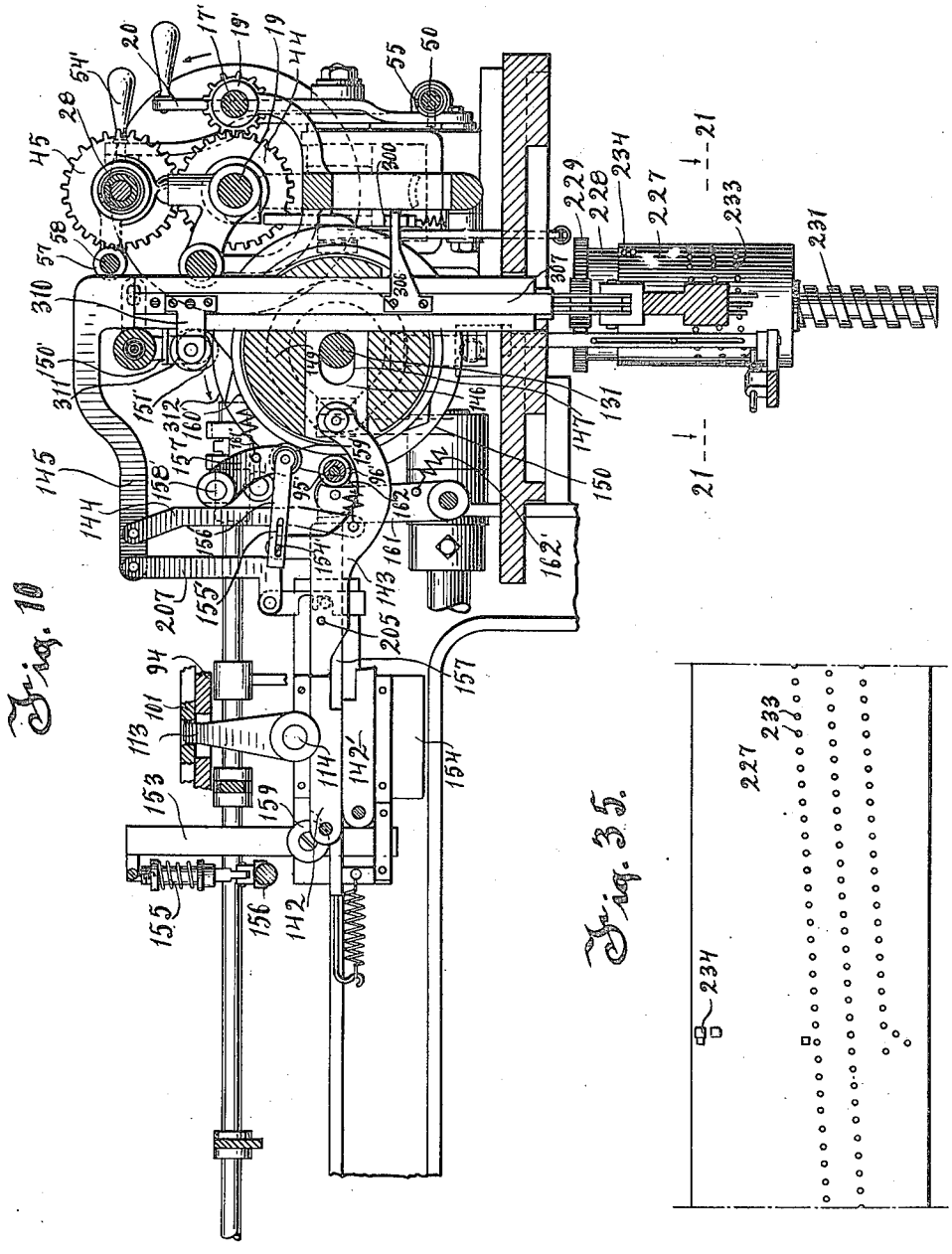

Fig. 10

Fig. 35.

Witnesses:
F. M. Bonchard
E. Schowalter.

Inventor
Wilbur J. Pine

By Attorneys
Mirsell, Kenway & French

W. J. PINE.

WIRE FABRIC MACHINE.

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22 SHEETS—SHEET 10.

Fig. 11.

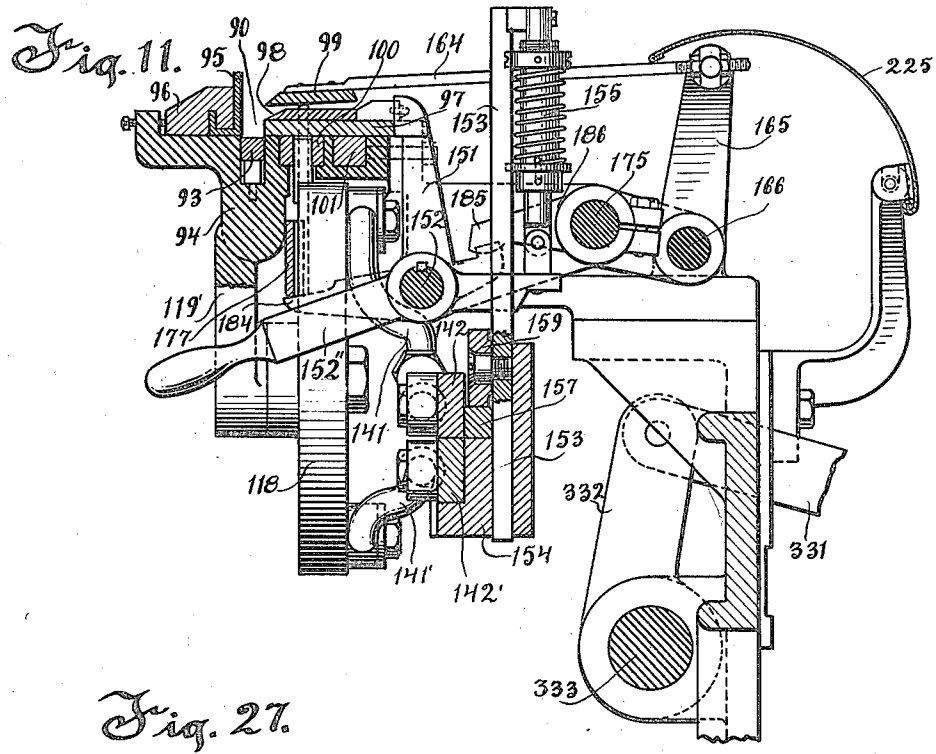
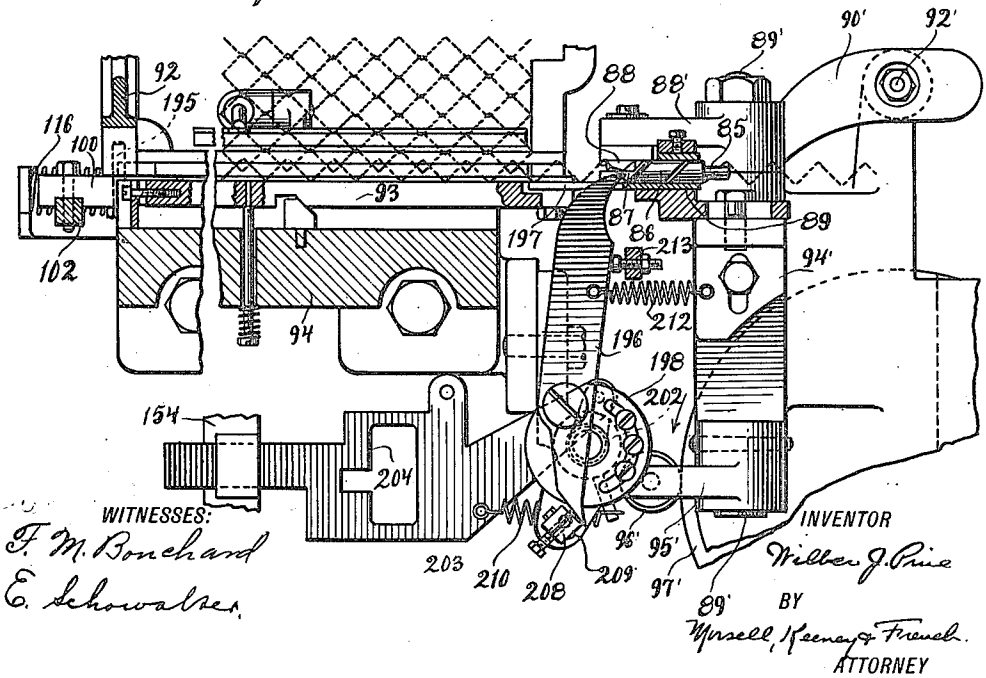


Fig. 27.



WITNESSES:

F. M. Bouchard

E. Schowalter.

INVENTOR

Wilbur J. Pine

BY

Mynell, Keeney & French.

ATTORNEY

W. J. PINE.

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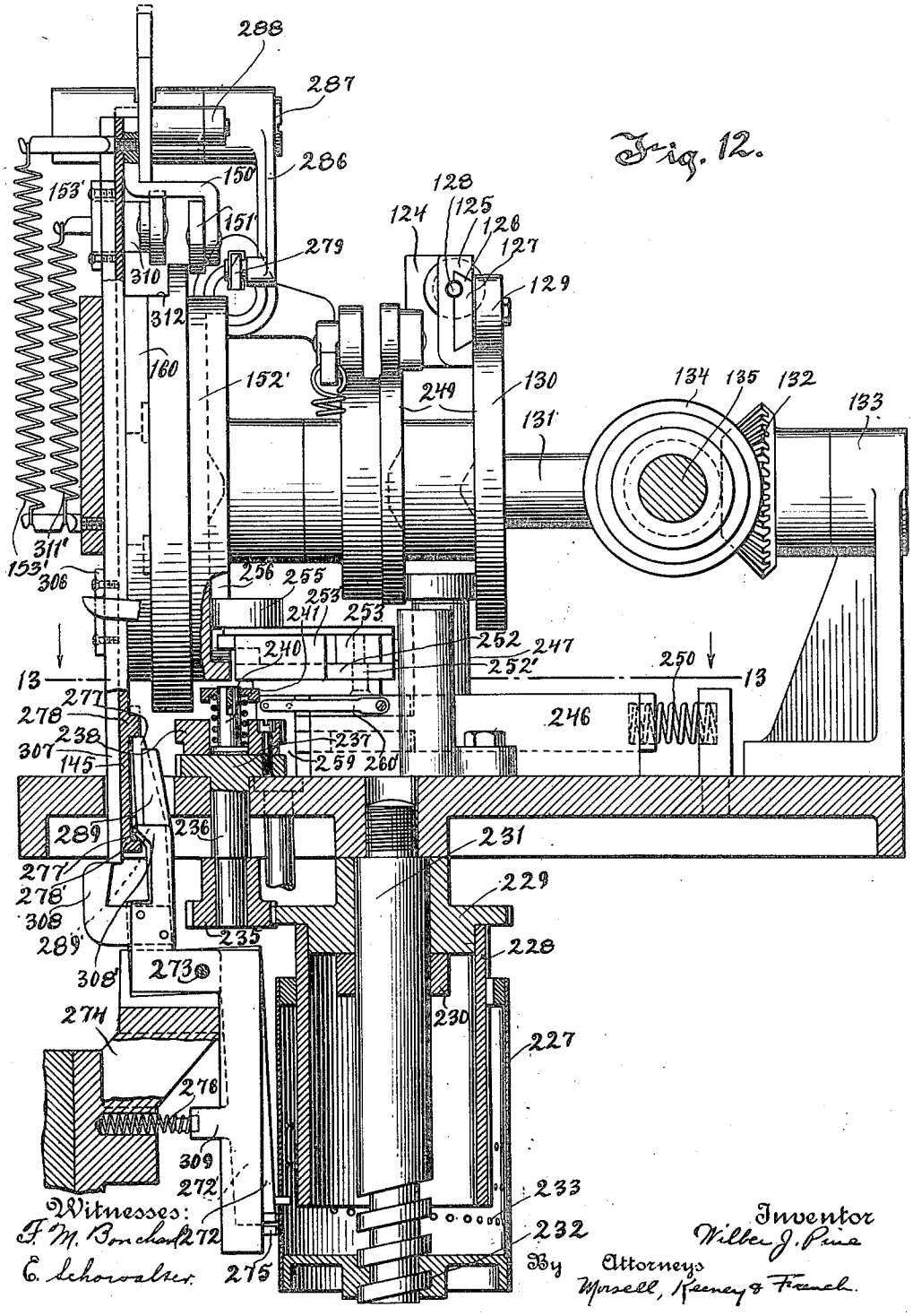
22 SHEETS—SHEET 11.

Fig. 12.



Witnesses:
F. M. Bonchard
C. Schowalter.

Inventor
Wilbur J. Pine

By Attorneys
Mosell, Keeney & French.

W. J. PINE.

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22 SHEETS—SHEET 12.

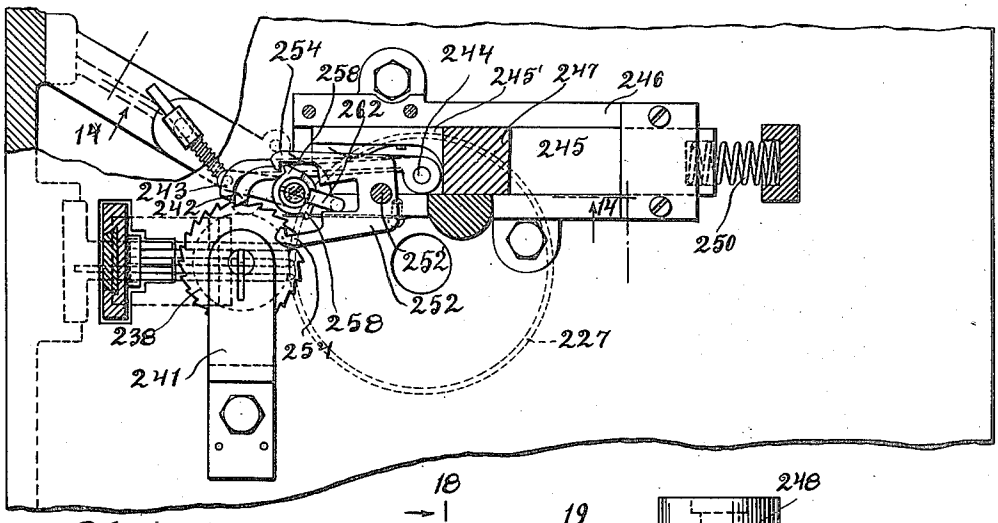

Fig. 13

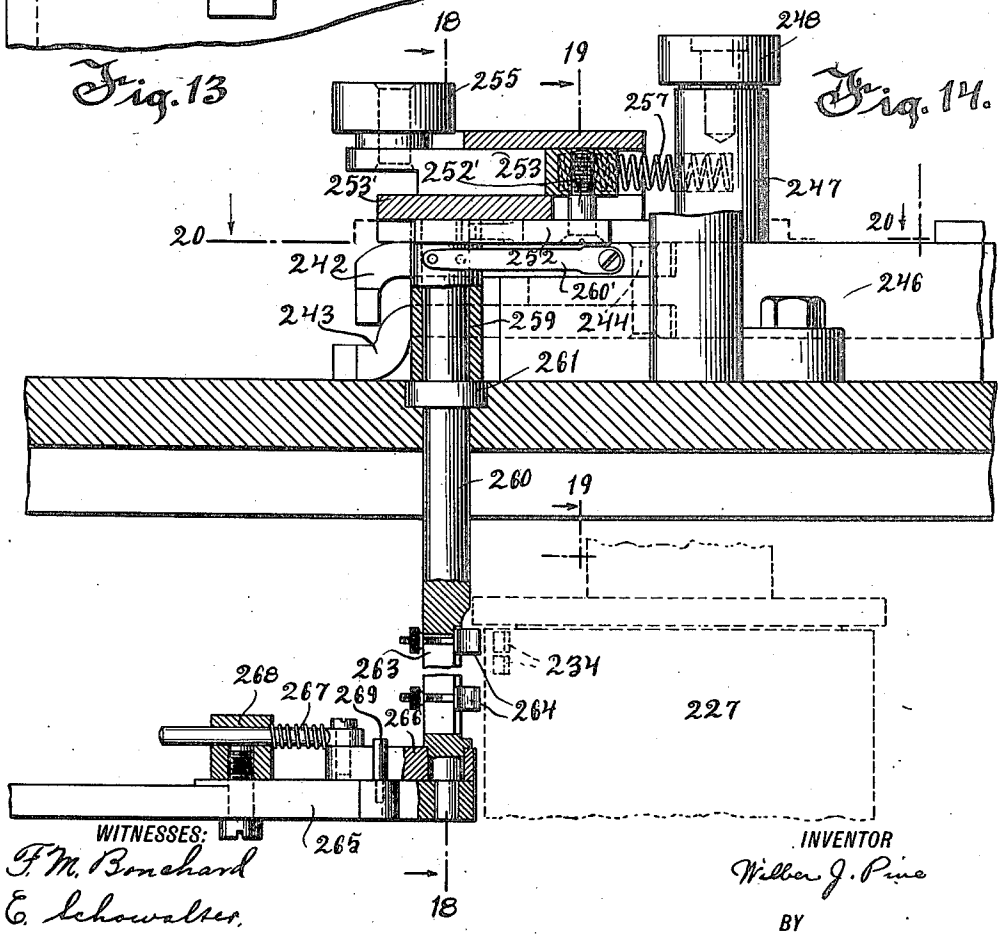

Fig. 14.

WITNESSES:

F. M. Borchard

E. Schowalter.

INVENTOR

Wilbur J. Pine

BY

Morsell, Kenney & French

ATTORNEY

W. J. PINE.

WIRE FABRIC MACHINE.

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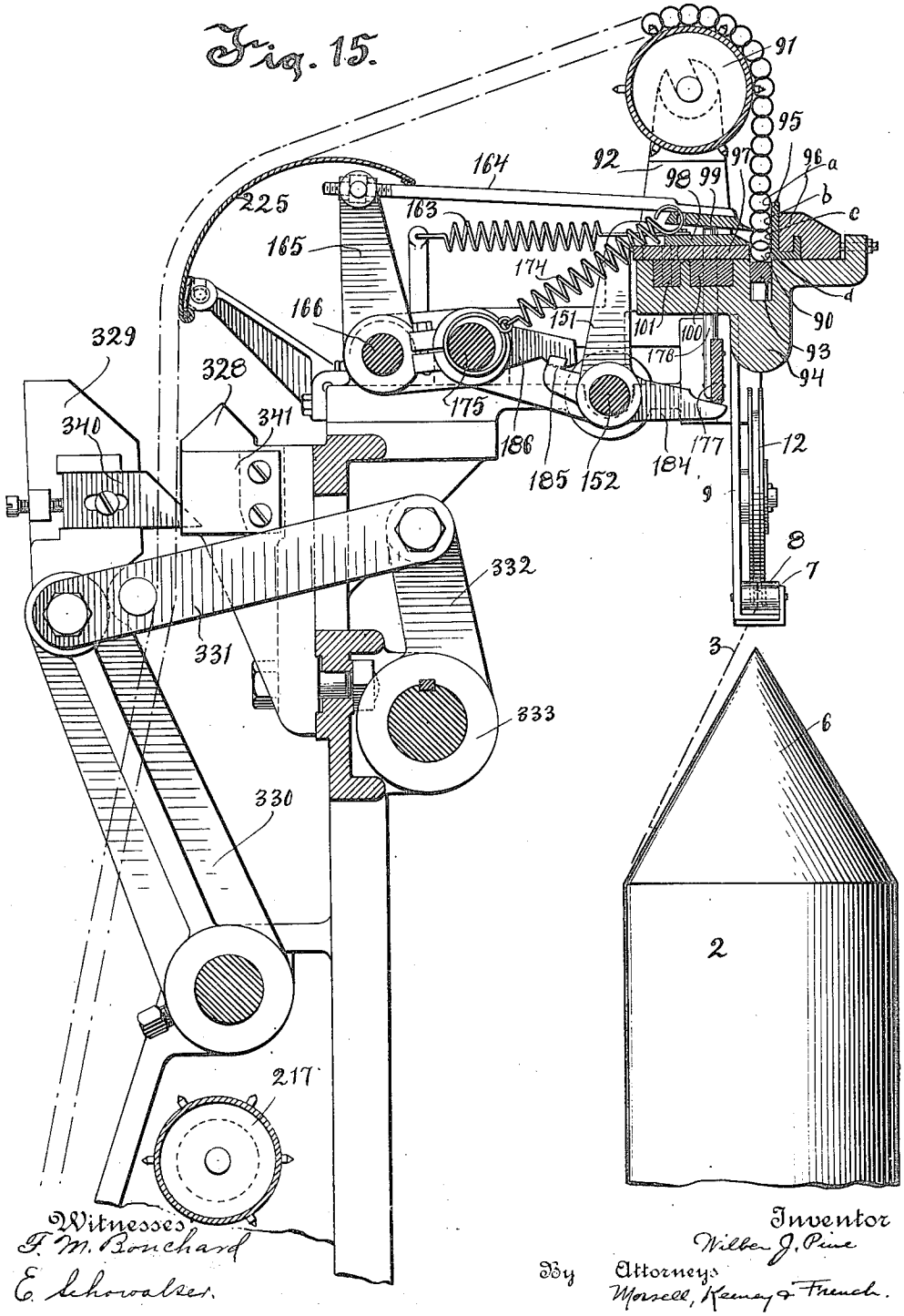
22 SHEETS—SHEET 13.

Fig. 15.



Witnesses
F. M. Bouchard
E. Schowalter.

Inventor
Wilber J. Pine

By Attorneys
Morsell, Kenway & French.

W. J. PINE.

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22 SHEETS—SHEET 14.

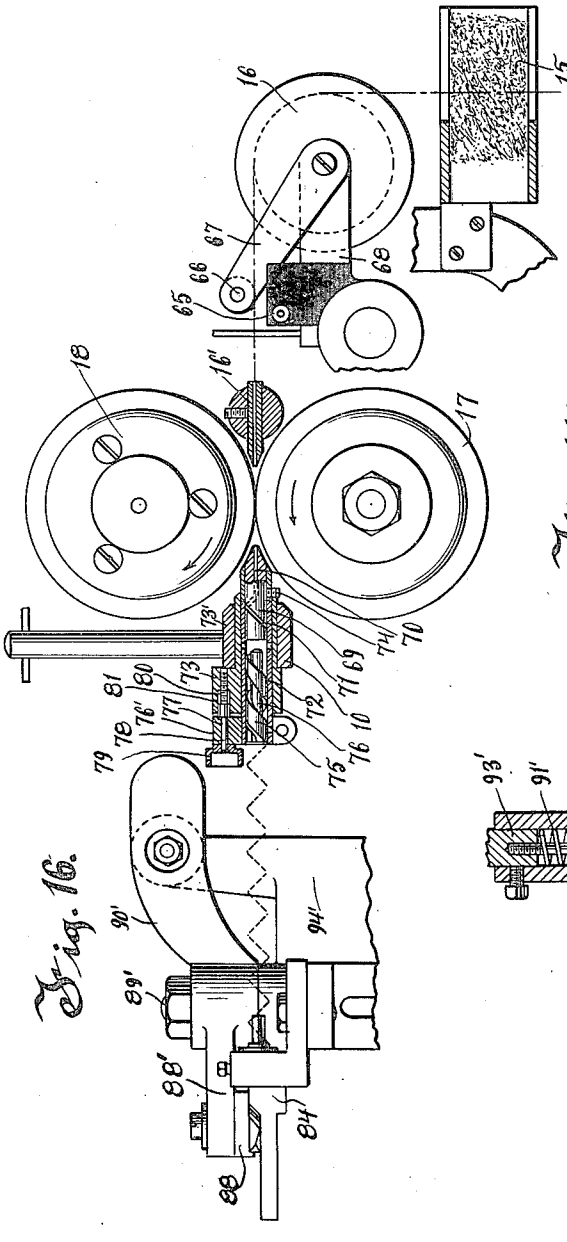

Fig. 16.

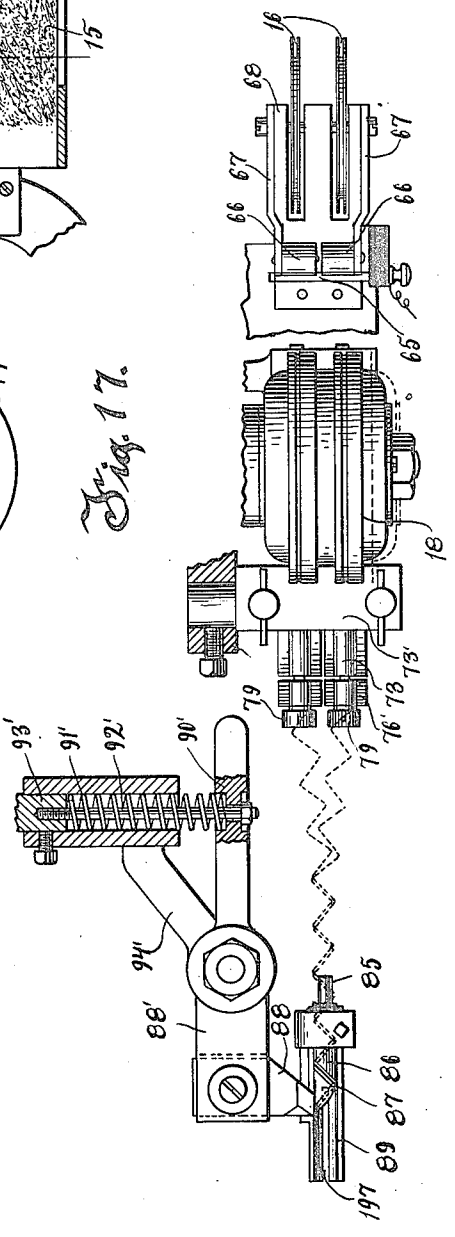

Fig. 17.

WITNESSES:

F. M. Bonchard

E. Schowalter.

INVENTOR

Wilber J. Pine

BY

Mrsell, Keeney & French

ATTORNEY

W. J. PINE.

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22 SHEETS—SHEET 15.

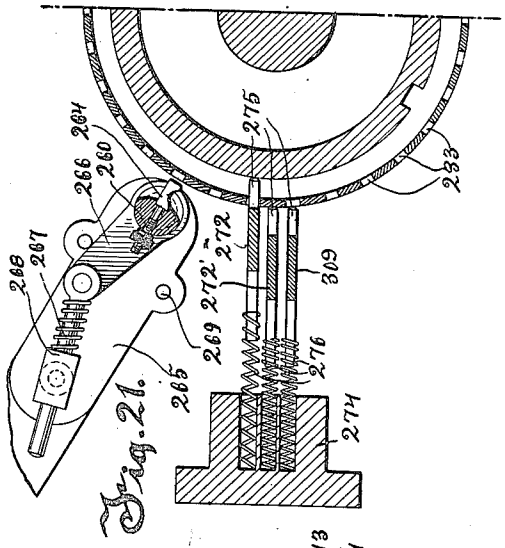
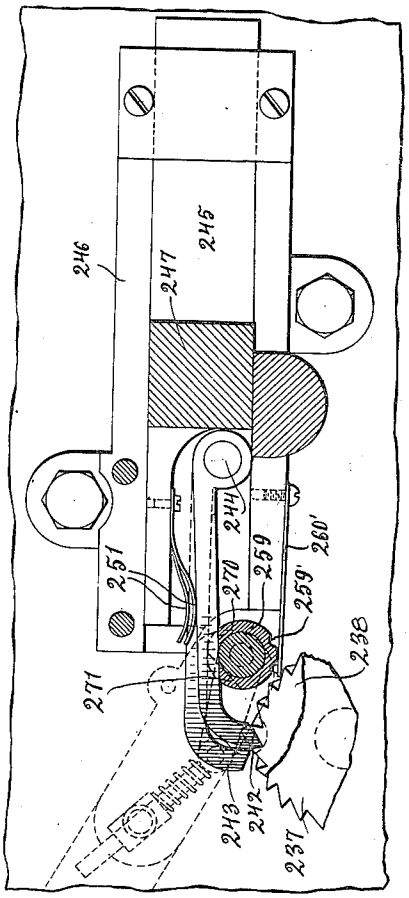


Fig. 21.



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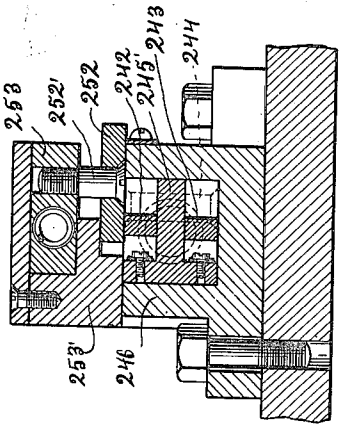


Fig. 19.

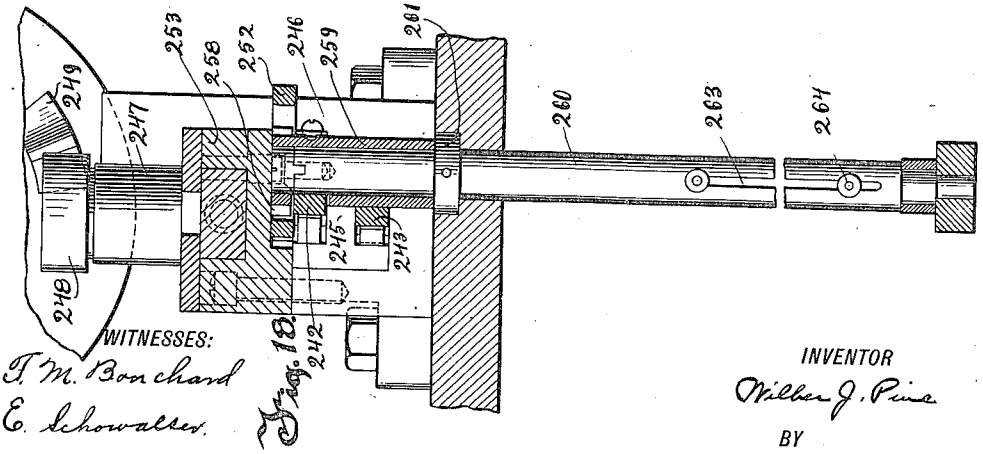


Fig. 18.

WITNESSES:

F. M. Bonchard

E. Schowalter.

INVENTOR

Wilbur J. Pine

BY

Mossell, Keenan & French

ATTORNEY

W. J. PINE.

WIRE FABRIC MACHINE.

APPLICATION FILED JAN. 15, 1915.

1,293,540.

Patented Feb. 4, 1919.

22 SHEETS—SHEET 16.

Fig. 24.

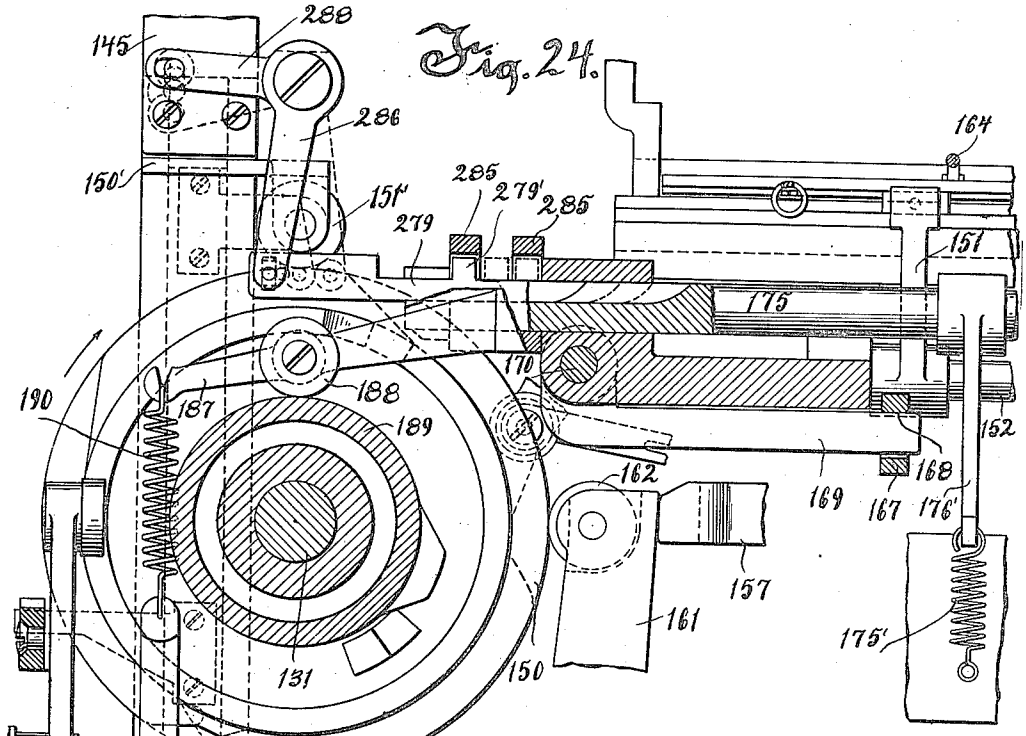
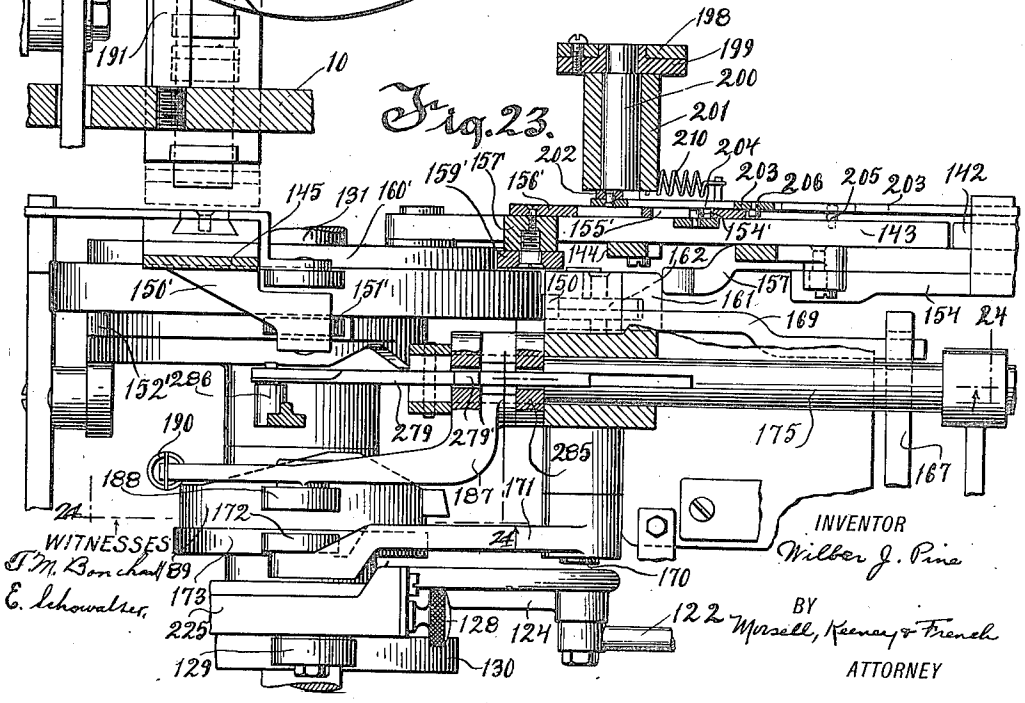


Fig. 23.



WITNESSES

T. M. Bonchard

E. Schowalter.

INVENTOR

Wilber J. Pine

BY

Morsell, Keeney & French

ATTORNEY

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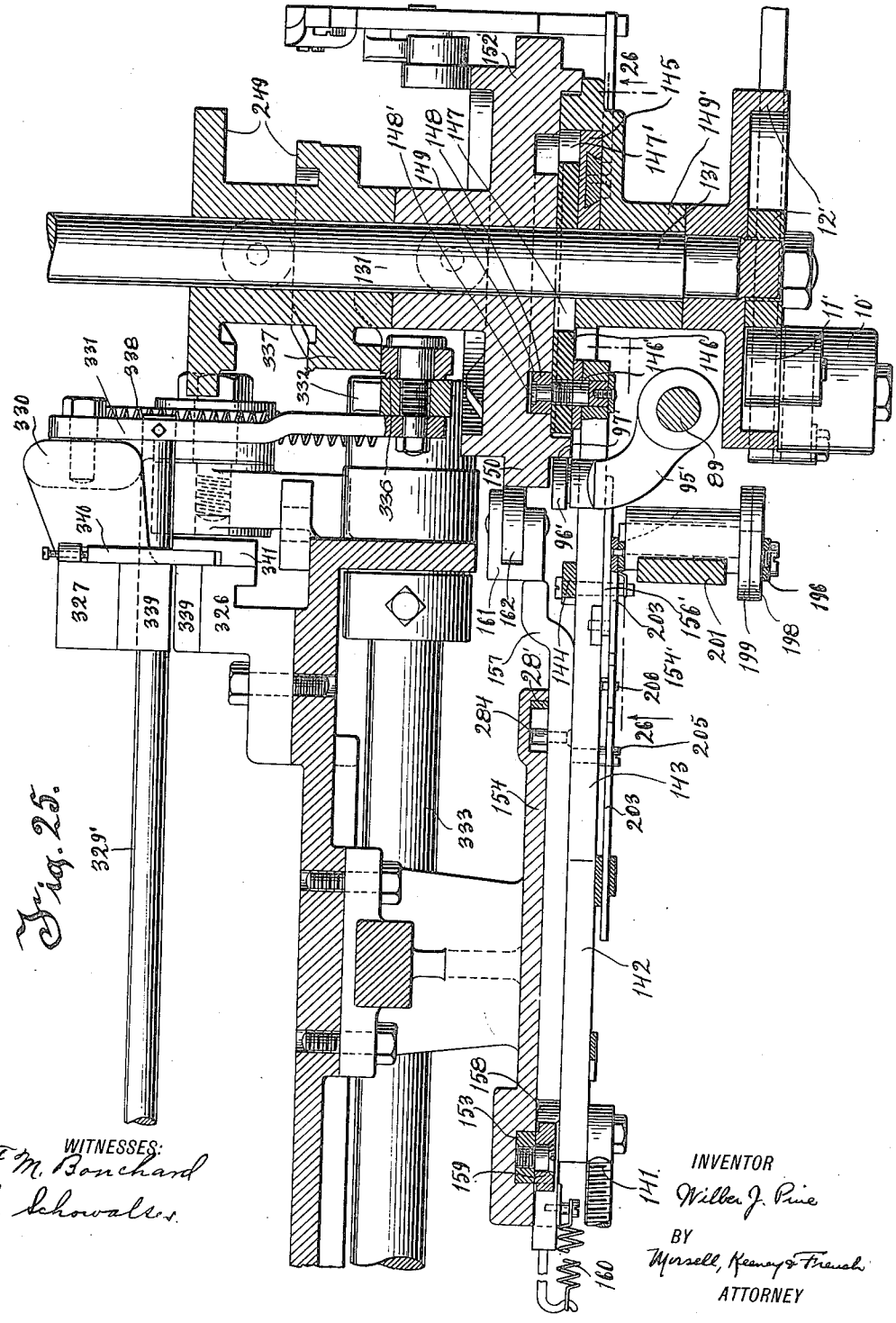

Fig. 25.

WITNESSES:

F. M. Bouchard

E. Schowalter.

INVENTOR

Wilbur J. Pine

BY

Mursell, Kenway & French

ATTORNEY

W. J. PINE.

WIRE FABRIC MACHINE.

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22 SHEETS—SHEET 18.

Fig. 26.

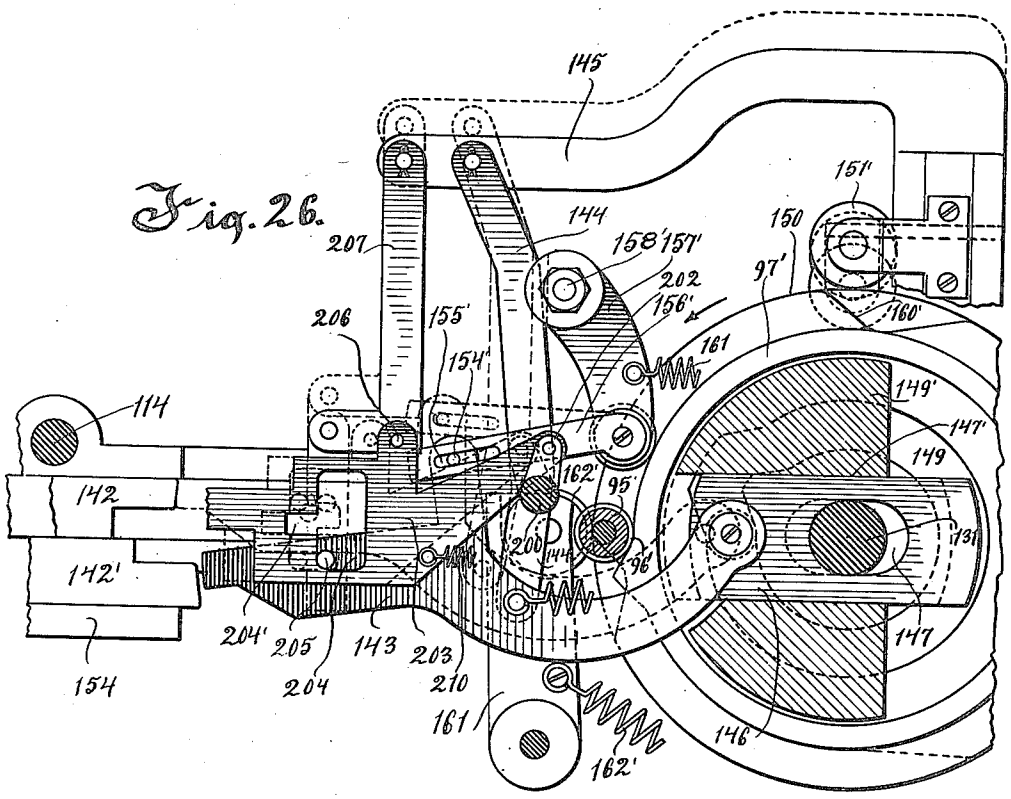
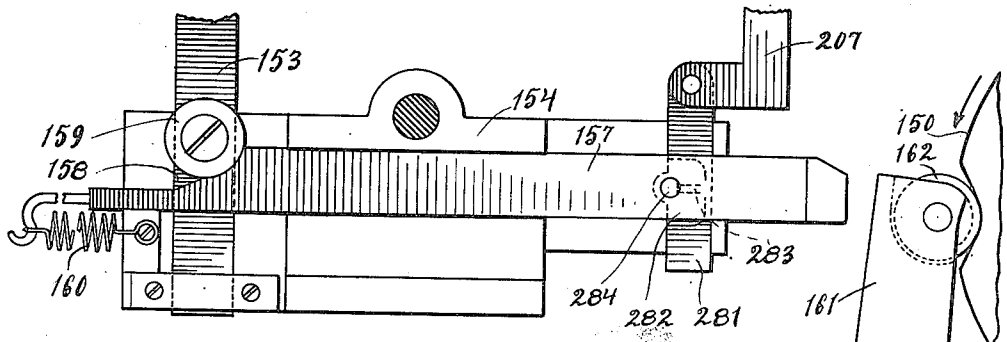


Fig. 28.



WITNESSES:

F. M. Borchard

E. Schroalter.

INVENTOR

Wilber J. Pine

BY

Morsell, Keeney & Franck.

ATTORNEY

W. J. PINE.

WIRE FABRIC MACHINE.

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Patented Feb. 4, 1919.

22 SHEETS—SHEET 19.

Fig. 30.

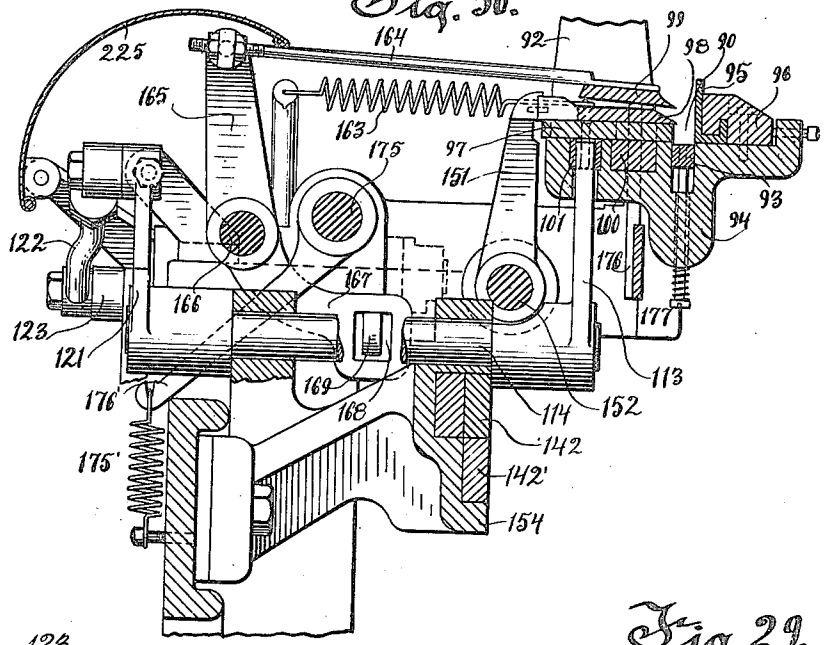
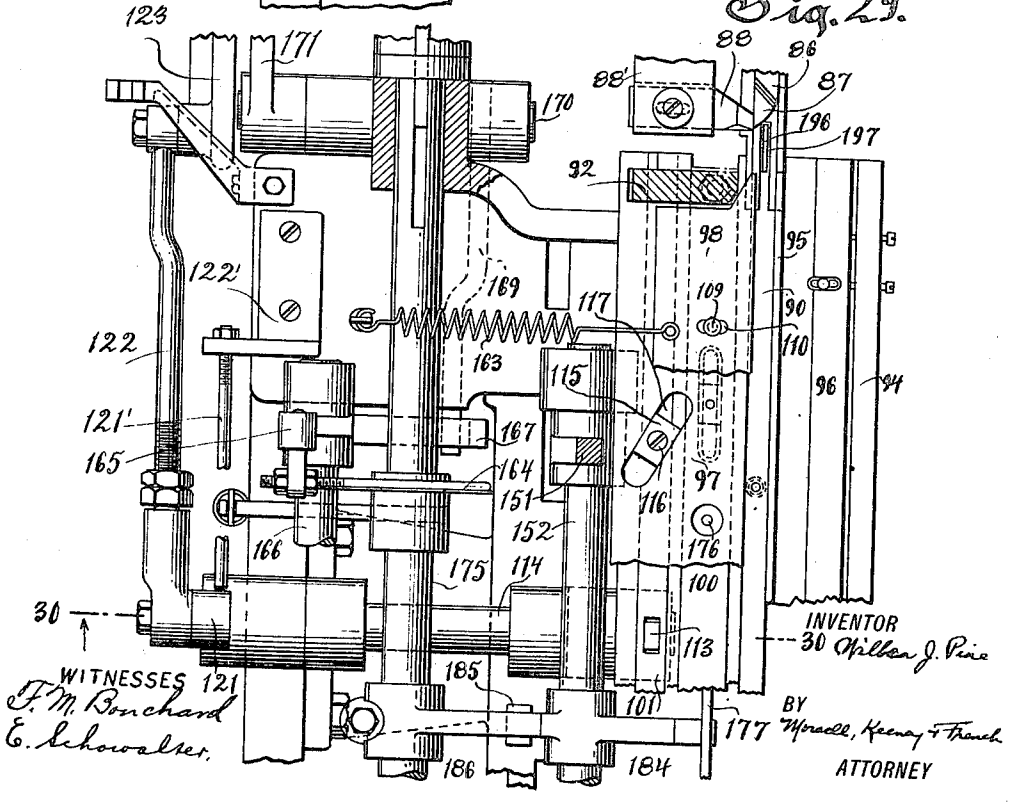


Fig. 29.



WITNESSES

F. M. Bouchard

E. Schowalter.

INVENTOR

30 Wilbur J. Pine

BY

Mynadell, Keeney & French

ATTORNEY

W. J. PINE.

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APPLICATION FILED JAN. 15, 1915.

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22 SHEETS—SHEET 20.

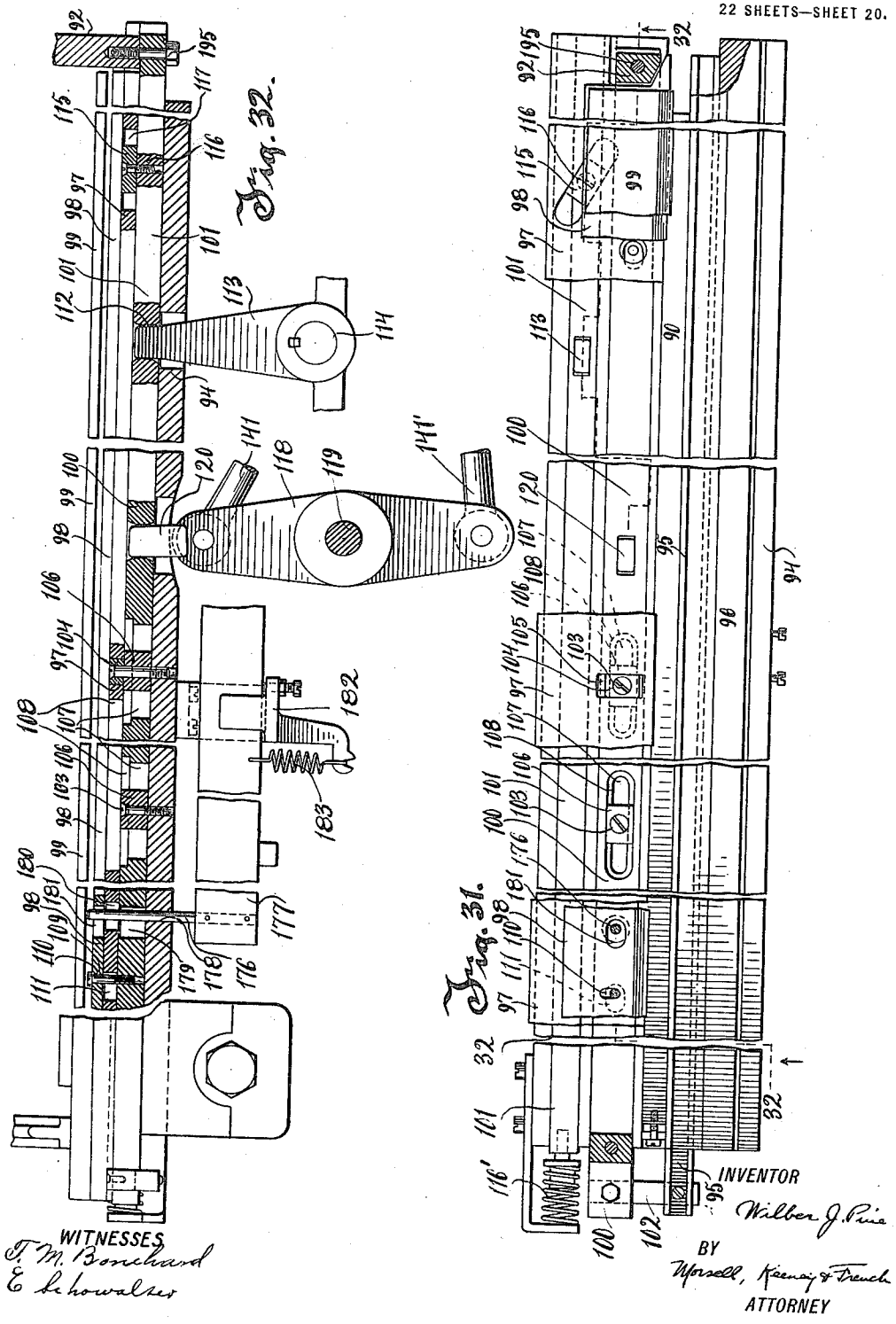

Fig. 32.

Fig. 31.

WITNESSES

T. M. Borchard

E. Schowalter

INVENTOR

Wilber J. Pine

BY

Morsell, Kenney & French

ATTORNEY

W. J. PINE.

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APPLICATION FILED JAN. 15, 1915.

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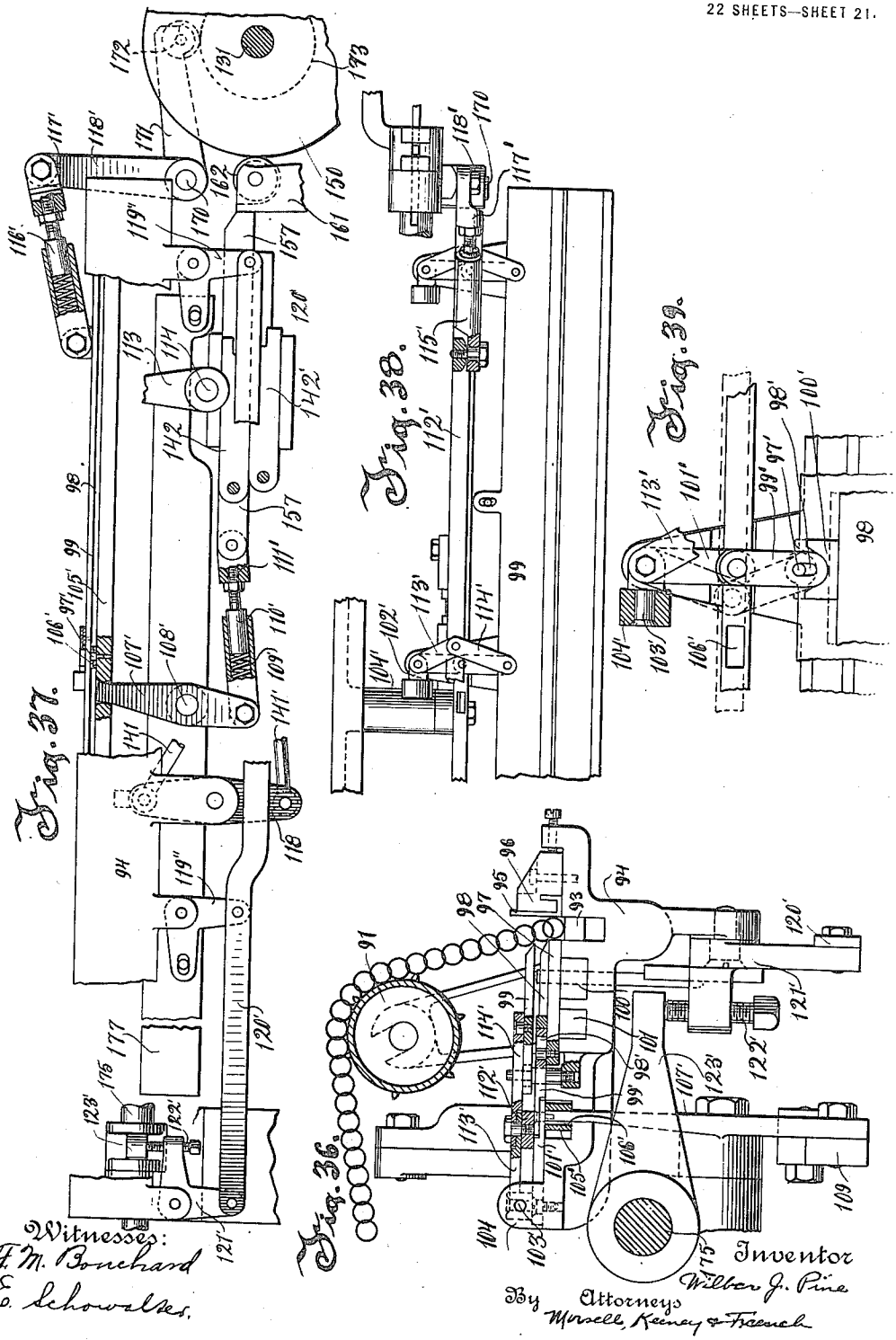
22 SHEETS—SHEET 21.



Witnesses:
F. M. Bouchard
E. Schowalter.

Inventor
Wilbur J. Pine
By Attorneys
Mussell, Kenney & French

W. J. PINE.

WIRE FABRIC MACHINE.

APPLICATION FILED JAN. 15, 1915.

1,293,540.

Patented Feb. 4, 1919.

22 SHEETS—SHEET 22.

Fig. 40.

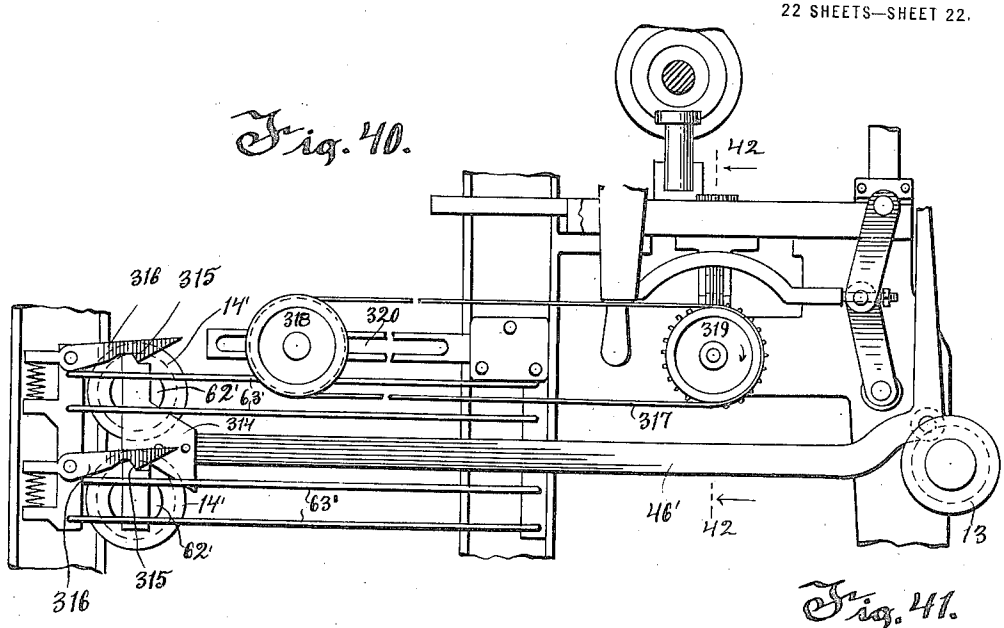


Fig. 41.

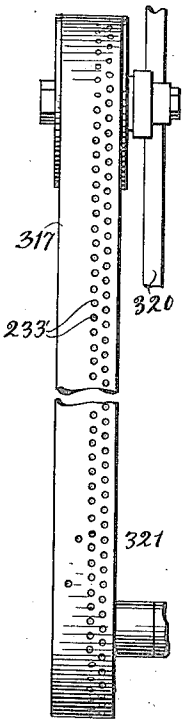
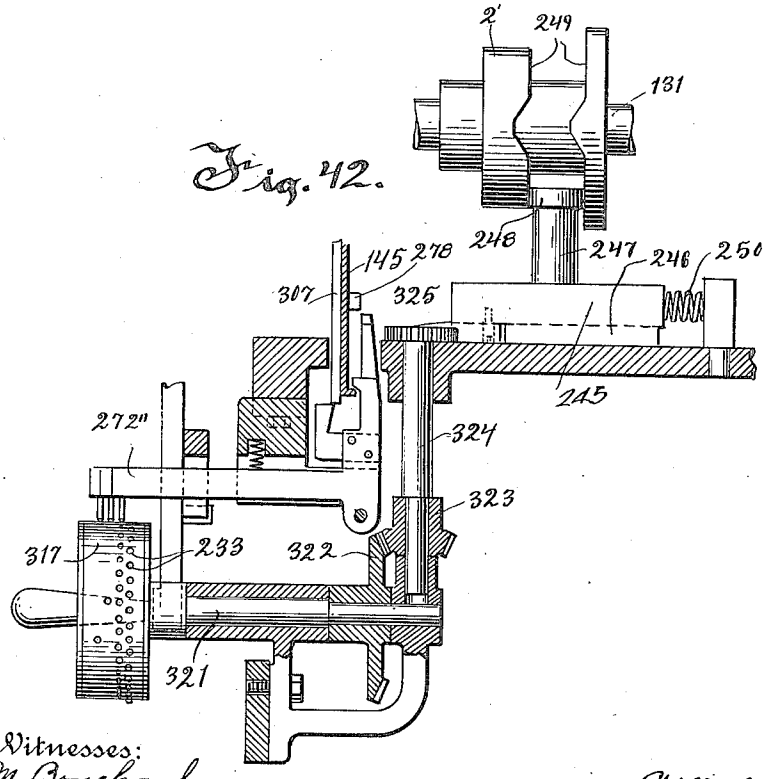


Fig. 42.



Witnesses:
F. M. Borchard
E. Schowalter.

Inventor
William J. Pine
By Attorneys.
Worsell, Kearney & French.

UNITED STATES PATENT OFFICE.

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

WIRE-FABRIC MACHINE.

1,293,540. Specification of Letters Patent. Patented Feb. 4, 1919.

Application filed January 15, 1915. Serial No. 2,493.

To all whom it may concern:

Be it known that I, WILBER J. PINE, a citizen of the United States, and resident of Oshkosh, in the county of Winnebago and State of Wisconsin, have invented new and useful Improvements in Wire-Fabric Machines, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

The invention relates to wire fabric machines.

The invention is designed more particularly to provide a machine for coiling and weaving wire into a fabric which may be used for spring mattresses and other purposes.

Machines of this character take the wire from the wire spools and by a series of operations the wire is coiled and woven into a finished wire fabric.

To produce a machine which is thoroughly practical and efficient in operation it must embody the following features: weaving mechanism constructed so as to properly interlock the preceding coil with the next coil of the fabric; a tensioner so as to give the coils the proper pitch before they are woven into a fabric; a coiler to coil the wire constituting the fabric; feeding mechanism for feeding the wire to the coilers, tensioner and weaving mechanism, comprising feed rolls and means for conducting the wire to said rolls; means for stopping the feeding mechanism in case the wire does not run properly; and all these features must be automatic in operation. This invention designs to embody all of the above-mentioned features.

The machine is shown provided with two spools of wire from which wire is fed through separate coilers from which both wires converge in a common wire-way as a single coil. With this arrangement wire fabric is woven, each of the coils in the fabric being made up of two strands of wire. It may, however, be desired to make a fabric having alternating coils of varying numbers of strands or any multiple of these strands which will permit the adjacent coils to properly interlock. Thus the weaving of the fabric may be double, alternating or single, and these again may be varied by multiplying the numbers of strands in each coil of the fabric. To accomplish this feature of making coils of different number of strands and fabric in which adjacent coils have varying numbers of strands, two conditions are necessary, first, one of the coils must be stopped in the wire-way so that the next coil may be superimposed upon it, and to do this the operation of the weaving mechanism must be suspended; second, the feeding of one of the wires forming the coil must be stopped by the automatic regulation of the feeding mechanism. Thus by the feeding of one or two wires to the coiler and weaving mechanism, the suspension of operations on the coil after it has left the coiler and the continuance of the operation of the coiler and wire feed, fabric of varying textures is made, being either double, alternating or single or any multiple of these. With this object in view the invention designs to provide mechanism automatically operated and regulated by a pattern device which suspends the movement of the weaving mechanism and which regulates the operation of the feeding mechanism.

The pattern device also provides for the insertion at intervals corresponding to a division line between the mattresses of extra wires or so called border cords in the continuous roll of fabric, the mattresses being separated, as usual, by the withdrawal of the strand connecting its border cord to that of the adjacent mattress in the roll of fabric.

The invention further designs to provide a coiled-wire-fabric machine comprising a weaving mechanism provided with mechanically operating means for clamping the last run coil in the wire-way to receive the next run coil.

The invention further designs to provide a new and improved form of coiled-wire-fabric machine.

The invention consists in the several features hereinafter set forth and more particularly defined by claims at the conclusion hereof.

In the drawings, Figure 1 is a front elevation of the machine embodying the invention;

Fig. 2 is a view of the front end of the machine;

Fig. 3 is a view of the rear end of the machine;

Fig. 4 is a fragmentary plan view of the structure shown in Fig. 3;

Fig. 5 is an enlarged front elevation of the machine adjacent the front end thereof;

Fig. 6 is a plan view of the front end of the machine, parts being broken away;

Fig. 7 is a section taken on the line 7—7 of Fig. 6;

Fig. 8 is a section taken on the line 8—8 of Fig. 7; and on the line 8—8 of Fig. 5;

Fig. 9 is a section taken on the line 9—9 of Fig. 5;

Fig. 10 is a section taken on the line 10—10 of Fig. 6;

Fig. 11 is a section taken on the line 11—11 of Fig. 6;

Fig. 12 is a section taken on the line 12—12 of Fig. 6;

Fig. 13 is a section taken on the line 13—13 of Fig. 12;

Fig. 14 is a section taken on the line 14—14 of Fig. 13;

Fig. 15 is a section taken on the line 15—15 of Fig. 1;

Fig. 16 is a detail elevation view of the feeding mechanism coiler, tensioner, and cut off, parts being shown in section;

Fig. 17 is a detail plan view of the parts shown in Fig. 16;

Fig. 18 is a section taken on the line 18—18 of Fig. 14;

Fig. 19 is a section taken on the line 19—19 of Fig. 14;

Fig. 20 is a section taken on the line 20—20 of Fig. 14;

Fig. 21 is a section taken on the line 21—21 of Fig. 10;

Fig. 22 is a section taken on the line 22—22 of Fig. 6; showing detail view of the upper feed-roll shaft;

Fig. 23 is a section taken on the line 23—23 of Fig. 7;

Fig. 24 is a section taken on the line 24—24 of Fig. 23;

Fig. 25 is a section taken on the line 25—25 of Fig. 5;

Fig. 26 is a section taken on the line 26—26 of Fig. 25;

Fig. 27 is a section taken on the line 27—27 of Fig. 8;

Fig. 28 is a detail elevation of the holding-shutter slide with cam arm with the vertical slide which suspends the movement of the cam arm;

Fig. 29 is a section taken on the line 29—29 of Fig. 5;

Fig. 30 is a section taken on the line 30—30 of Fig. 29;

Fig. 31 is a detail plan view of a section of the table;

Fig. 32 is a section taken on the line 32—32 of Fig. 31;

Fig. 33 is a detail view of the knot-catcher;

Fig. 34 is a section taken on the line 34—34 of Fig. 33;

Fig. 35 is a detail view of the pattern drum;

Fig. 36 is a view showing a modified form of shutter mechanism, parts being shown in section;

Fig. 37 is a side view of the modified form of shutter mechanism, parts being shown in section and parts being broken away;

Fig. 38 is a detail view of a modified form of the holding shutter mechanism;

Fig. 39 is a detail view of structure shown in Fig. 38;

Fig. 40 is an elevation view of a modified form of pattern device;

Fig. 41 is a plan view of the modified form of pattern band;

Fig. 42 is a section taken on the line 42—42 of Fig. 40.

Before proceeding with the detail description of the construction and mode of operation of the 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 the operation of the coiling and weaving devices, the two wires taken from the reels are fed by means of the 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 helical groove of the coilers. The wires as thus coiled are brought together as a single wire and are passed through the knife block and also passed or run into the weaving channel. After the two wires thus forming, in effect, the single wire or strand are run into the weaving channel the same are woven or interlocked with the coils of the 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. Then the last completed wire is cut off by the cutting device.

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 strands 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 shall have simply a double set of strands; but to feed the fabric corresponding to what will become the middle line of the wire mattress it is desired that the strengthening cords shall alternate with the usual strands, as the construction and arrangement of the 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 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.

For the purpose of simplicity and of obtaining a clear understanding of the various features of the machine, it will first be considered as one which weaves fabric of two-wire coils, and the wire will be followed through from the spool to its conversion into a finished wire fabric after which the mechanism for varying texture of fabric will be considered though it will be understood that certain of the parts of the machine described in connection with the simple two-wire coil above mentioned will be used and operated in the same manner when fabric of varying textures is produced.

The device for making fabric of coils consisting of two strands of wire comprises weaving mechanism which will cause the preceding coil to be properly interlocked with the next coil to form the fabric, a tensioner to give the coils the proper pitch before they are woven into a fabric, a coiler to coil the wires constituting the fabric, feeding mechanism for feeding the wires to the coilers, tensioner and weaving mechanism comprising feed rolls, means for controlling the operation of said rolls, means for conducting the wire to said rolls, and means for stopping the feeding mechanism in case the wire does not run properly.

The wire spools 1 are mounted on cylinders 2 adjacent the machine and the wire 3 is unwound from the spools by the feeding mechanism comprising feed rolls, means for controlling the operation of said rolls, and means for conducting the wire to said rolls.

The means, shown in Figs. 1 and 3, for conducting each wire 3 to the feed rolls comprises guide loop 4 encircling the cylinder 2 and secured to a standard 5. The cylinder 2 is provided with a conical head 6 and the wire passes from the spool through the guide loop over the bottom edge of the head 6 and upwardly along its conical surface and thence between knot-catcher rollers 7 and 8 mounted in a bracket 9 secured to the frame 10 of the machine, the roller 7 being also slidably mounted in a slot 11 in a bracket 9 (see Figs. 33 and 34) so that should the wire have a knot in it the roller 7 will be moved upwardly and against the roller 8 to stop the further feed of wire from the spool. From the rollers 7 and 8 the wire passes upwardly into the groove of a grooved wheel 12 mounted in the bracket 9 and from thence to a grooved wheel 13 mounted on the frame 10 at the other end of the machine and thence around said wheel and backwardly around a grooved wheel 14 forwardly to the wheel 13 and thence upwardly through a cleaning box 15 to a grooved wheel 16 from which it passes through an adjustable guide 16′ to the feed rolls 17 and 18 which grip it and feed it along as required, (Figs. 1, 5, 16 and 17).

The feed roll 17 (see Fig. 9) is mounted upon a shaft 19 which is journaled in bearings 20 in the frame 10 and carries a drive wheel or fast pulley 21 and a loose pulley 22. The feed roll 17 consists of grooved disks 23 spaced from each other by a disk 24 and spaced from a collar 25, keyed to the shaft 19, by rubber disks 26. The disks and collar are held in proper relation by collars 27 on either side thereof and the whole roll is detachably secured to the shaft 19. The rubber disks 26 permit the feed disks 23 to be compressed and to exert a yielding pressure on the wire passing through the rolls.

The feed roll 18 (see Figs. 2 and 9) is mounted upon a shaft 28 which is journaled in bearings 29 and 30 yieldingly mounted upon the bearings 20 by means of spring 30′.

Means are provided for pivotally and adjustably securing the journal bearing 30 in the frame of the machine, said means comprising (see Figs. 6, 9 and 22) pins 31 rotatably mounted in the bearing 30 and secured to depending members 32 of a cap 33, said members being slidably mounted in the frame 10, said cap 33 being adjustably mounted above the journal bearing 30 by means of threaded studs 34 passing loosely through said cap, registering in threaded apertures 35 in the frame 10 and provided with gears 36 at their upper ends meshing with a gear 37 secured to a pin 38 journaled in the cap 33 and carrying an operating handle 39. Consequently when the handle 39 and shaft pin 38 are turned the gear 37 will turn the gears 36 and studs 34 to move the cap 33 toward or away from the frame 10 and the bearing 30 upwardly or downwardly within the frame, the pins 31 permitting vertical movement of the shaft 28 and the bearing 30. The feed roll 18 consists of grooved feed disks 40 similar to the disks 23 spaced from each other by a disk 41, said feed disks being secured to collars 42 and 43 which collars are detachably

mounted on the shaft 28 and secure the disks 40 and 41 to it.

The feed roll 18 is driven by the feed roll shaft 19 through a gear 44 slidably mounted upon the shaft 19 meshing with a gear 45 secured to the shaft 28. Thus the pulley 21 being driven by belt (not shown) actuated by a suitable source of power will continuously rotate the shafts 19 and 28 and feed rolls 17 and 18, (Fig. 9).

The feed rolls 17 and 18 may also be driven by hand by a shaft 17′ journaled in the frame and carrying a hand wheel 18′ and a gear 19′ which gear may be thrown into mesh with the gear 44 by sliding the gear 44 forward along the shaft 19 which is accomplished by a hand lever 20′ pivotally secured to the frame and to the hub of the gear 44. When the gear 19′ is in mesh with the gear 44, the gear 44 will still be in mesh with the gear 45 as the gear 45 is wide enough to permit the sliding movement of the gear 44 (Figs. 2, 6 and 9).

During the feeding of the wire to the feed rolls, the disks 40 and 23 will be in engagement with each other but during the operation of the weaving mechanism further feed of the wire must be stopped, and this is accomplished by the means for automatically regulating the operation of the feed rolls which comprises a vertically disposed bar 4′ which is pivotally secured at its upper end to a lever 5′ which is pivotally mounted upon the upper part of the frame 10 and means for operating said lever and bar (see Figs. 1, 2, 5, 6 and 9). This bar 4 passes through a guide 6′ on the frame and is pivotally secured at its lower end to a toggle link 7′ which is pivotally secured to a toggle link 8′ pivotally secured to the frame and both of said links 7′ and 8′ are adjustably and pivotally secured to one end of a link 9′ which is pivotally secured to one end of a lever 10′ which is pivotally secured to the frame and carries a cam roller 11′ at its upper end, adapted to contact with a cam 12′ mounted on a shaft 131 which is rotated by mechanism hereinafter described and which lever 10′ is also provided with a handle 13′ for manually operating it. The lever 5′ carries a pin 14′ which is slidably mounted in the frame of the machine (see Figs. 5 and 9) and is adapted to bear upon the journal bearing 29 of the shaft 28. Consequently the oscillation of the lever 10′ by the cam 12′ will through the bar 9′ and links 7′ and 8′ cause the vertical reciprocation of the bar 4′ to cause the vertical oscillation of the lever 5′ and the downward or upward movement of the pin 14′ upon the journal box 29 and shaft 28 to cause the feed rolls to engage and feed the wire or a release of this pressure upon said shaft 28 and feed rolls by the upward movement of the pin 14′ to cause the springs 30 to raise the shaft 28 and release the feed roll 18 from engagement with the feed roll 17 and stop the feed of the wire to the weaving mechanism. This vertical movement of the shaft 28 is permitted by the pivotal connection of the journal box 30 previously described.

Sometimes a knot occurs in the wire and as previously pointed out further feed from the spools is stopped by the rolls 7 and 8 and at the same time means are provided for automatically stopping the drive of the feed rolls by shifting the belt from the drive pulley 21 to the loose pulley 22 and in this instance both mechanical and electrical means are provided.

The mechanical means, shown in Figs. 1, 2, 5 and 6, for automatically stopping the drive of the feed rolls comprises a bell-crank 46 pivotally secured to the frame of the machine adjacent the wheel 13, one of whose arms 47 has a notched end engaging with a projection 48 on a lever 49 which is secured to a shaft 50 journaled in the frame of the machine. The lever 49 is held in engagement with the arm 47 by a spring 51. The shaft 50 has a notch 52 (see Fig. 2) therein which when the belt is on the pulley 21 for continuously operating the feed rolls is engaged by a latch 53. As the notch 52 only extends partially through the shaft 50 it is evident that a partial rotation of this shaft will cause the bottom of the notch to release the latch 53 and this release is mechanically accomplished by the movement of the bell-crank arm 47 out of engagement with the lug 48 on the lever 49 so that the spring 51 will operate the lever to turn the shaft and throw the latch 53 out of engagement therewith. A lever 54 is pivotally and slidably connected at one end to the shaft 50 by a pin 55 thereon and is pivotally secured to the machine intermediate its ends and is pivotally secured at its other end to a sleeve 56 slidably mounted on the shaft 28. An arm 57 is secured to this sleeve and carries a belt shifter 58. A spring 59 is interposed between one of the bearings of the shaft 50 and a collar 60 secured to the shaft which on the release of the latch 53 will cause the shaft to move lengthwise in its bearings. Now should the upper arm 47 of the bell crank 46 be shifted from engagement with the projection 48 on the lever 49 and the latch 53 be thereby lifted out of the shaft 50 as previously described, the spring 59 will cause the shaft 50 to move backwardly causing the lower end of the lever 54 to move backwardly moving the collar 56 therewith and thereby moving the belt shifter 58 so that the belt registers with the loose pulley 22 and stops the drive of the feed rolls. The means for moving the bell-crank 46 to stop the machine as above described comprises a cam 59′ secured to said bell-crank lever

which is adapted to engage a cam member 60′ secured to the roller 14, which cam member is normally held in engagement with a spring-pressed latch 61 secured to the frame (Figs. 1 and 5). The roller 14 is provided with a grooved hub 62 which is slidably mounted on longitudinally extending parallel rods 63 secured to the frame. If the wire should be caught by the knot catcher rolls as previously pointed out, that part of the wire which lies between the wheels 12, 13 and 14 will be put under tension and a force exerted against the hub of the roller 62 which, if sufficient, will cause the cam member 60′ to automatically lift the latch 61 and the hub with its roller 14 will now move laterally and the cam member 60′ will engage the bevel surface of the projection 59′, causing the longitudinally extending arm of the bell-crank 46 to rise upwardly and thereby causing the release of the arm 47 of said bell-crank 46 to accomplish the stopping operation previously described.

Although by this means the belt has been shifted from the tight to the loose pulley this does not actually stop the movement of the feed rolls so that there will be a tension on the wire which, if allowed to persist, would break the same so that slack wire must be supplied to the feed rolls before they come to a stop and this is accomplished by the construction just described in which the roller 14 by reason of the hub 62 running in the guide moves toward the roller 13 thereby permitting the slack wire between these wheels to be fed to the feed rolls.

The means for electrically stopping the drive of the feed rolls actuates when one of the wires breaks between the spools and the feed rolls and comprises a solenoid 64 which acts upon the latch 53 and which is deënergized when the machine is running but which is automatically energized when the wire breaks and on its energization lifts the latch 53 from the notch 52 in the shaft 50 to permit of the rearward movement of said shaft under the action of the spring 59 to move the lever 54, in the same manner as previously described in connection with the mechanical means, to stop the rolls, and ultimately in this manner to shift the belt from the tight to the loose pulley, Fig. 2. Means are provided for automatically energinzing and deënergizing said solenoid to accomplish these operations. The means, shown more particularly in Figs. 2, 5, 6, 16 and 17, comprises a pair of contacts which are automatically moved together to close the circuit through the solenoid when either one of the wires breaks. One of these contacts comprises a pin 65 insulated from the machine, the other a pair of rollers 66, each pivotally secured to one end of an arm 67 which is pivotally secured at its other end to a supporting bracket 68 for the grooved wheel 16. The wire passes around the wheel 16 and under the rolls 66 so that when the machine is running the wires are in constant engagement with the rollers 66. If either of the wires should be broken, the roll 66 and the arm 67 supported by this wire will under the action of gravity drop down and contact with the pin 65 thus closing the circuit through the solenoid 64 to which the contacts are electrically connected and stop the machine by lifting the latch 53 as previously pointed out.

The wires as they pass through the feed rolls 17 and 18 are fed through 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 69 having a straight groove 70 cut in its periphery for a portion of its length and a helical groove 71 also cut therein and forming a continuation of the straight groove. The helical groove 71 is cut to the pitch to be imparted to the wire (see Fig. 16). The cylinder 69 is incased in a shell 72 which is slidably mounted in a block 73 secured to a clamp 73′ on the machine. The cylinder 69 is secured to the block 73 by a set screw 74 and as the shell 72 is slidably secured to the clamp 73′ this shell is free to move with respect to the coiler 69.

To further determine the pitch of the coils so that they may be of uniform pitch to properly register with each other during the weaving operation, a tension device is provided which acts upon the coils as a resistance by destroying the regularity of the helical path to be taken by the coils after they leave the coilers. This tensioner comprises a cylinder 75 secured to the shell 72 adjacent the coil and provided with a helical groove 76 as shown in Fig. 16, and means are provided for moving the cylinder 75 toward or away from the coiler 69 which consists of a clamp collar 76′ carried by one end of the shell 72 and provided with an aperture 77 for receiving a pin 78 having a thumb nut 79 secured at one end and having its other end threaded to engage a stud 80 in a recess 81 of the block 73 so that the thumb nut 79 will cause the collar 76′ and therefore the cylinder 75 to move toward or away from the coiler 69 so that the coil from the coiler 69 will strike the helical groove of the cylinder 75 at different points, depending upon the distance between the coiler and the tensioner and thereby vary the tension of the coils to provide a uniform pitch for the two companion wires so that they will keep close together and run in harmony.

The wires as coiled by the two companion coilers are fed along and then threaded

through a knife block 84, Figs. 16, 17 and 27. Each knife or cutter block 84 has a reduced forward or cylindrical portion 85, a cylindrical portion 86, and a reduced rearward portion 87 which is cut down through half a diameter to present a flat horizontal cutting surface over which a knife 88 passes. As seen from Fig. 27 the periphery or outer surface of the portion 86 of the knife block, is helically grooved in order to receive the pair of wires which pass together thereto from the coilers, and in order to form an opening through which said pairs of wires shall emerge, this portion 86 of the knife block is surrounded with a circular band 89 adjustably secured to a bracket on the frame of the machine for securing the cutting block thereto.

The knife block is provided with a knife 88, which is moved at the proper predetermined time with the result that the coiled wires are cut off by a shear cut between the flat surface of the portion 87 of the block 84 and the knife 88 after a certain length thereof has been fed or run through the helical groove in the knife block.

The knife 88 is detachably secured to a lever 88′ which is provided with an arm 90′, (Figs. 6, 16, 17 and 27). The lever 88′ is mounted on a pin 89′ which is pivotally secured in a bracket 94′ mounted on the machine. The arm 90′ is acted upon by a spring 91′ surrounding a rod 92, which is secured to a block 93′ in the hollow end of the bracket 94′ and which rod is also secured to the arm 90′ to permit said arm to move against the action of the spring 91′. The lower end of the stud 89′ (Figs. 6, 25 and 27) carries an arm 95′ which extends backwardly and carries a roller 96, which contacts with a cam surface 97′ in a cam 150 mounted on a shaft 131, with the result that the rotation of the shaft 131 will cause the cam 97′ to oscillate the arm 95′ and thereby rock the stud 89′ and thereby reciprocate the lever 88′ and a knife 88 to cut the wire as above described.

After the two companion wires are brought together in the knife block, they are fed along lengthwise through a longitudinally extending wire-way 90 which is formed by a longitudinally extending bar 93 resiliently supported in a recess in a supporting table 94 to form the bottom of the wireway, a longitudinally extending guide and clamping bar 95 forming one side of the wire-way or channel, which member is secured in a block 96 which in turn is adjustably secured to the table 94, and a clamping bar 97 which is mounted to slide laterally upon the supporting table 94 forming the other side of the channel (Figs. 11, 15, 29 and 30).

Thus each coil constituting the fabric is fed into the wire-way, but to form the fabric itself each coil must interlock at each convolution with the lower margin of the previously formed coil and this is accomplished by the various parts of the weaving mechanism and mechanism for operating these parts which will now be described.

The weaving mechanism comprises the wire-way just described, a laterally and longitudinally movable holding shutter 98, a laterally and vertically movable ejecting shutter 99 and mechanism for operating the guide 95, clamping bar 97, holding shutter 98, and ejecting shutter 99 (Figs. 11, 15, 29, 30, 31 and 32).

The clamping bar 97 rests upon the table 94 and is laterally movable with respect thereto. The holding shutter 98 rests upon the clamping bar 97 and is laterally and longitudinally movable with respect to the table 94. The ejecting shutter 99 is disposed above the holding shutter 98 and is vertically and laterally movable with respect to the table 94. These parts of the weaving mechanism together with the guide 95 are operatively connected together by means hereinafter described.

The clamping bar 97 rests upon the table and also upon longitudinally extending longitudinally movable feed bars 100 and 101 which are seated in recesses in the supporting table 94, the bar 100 being connected to the guide 95 by a cross piece 102. The clamping bar 97 is secured in position by screws 103 which carry cleats 104 at their headed ends engaging in transverse slots 105 in said bar 100. The screws 103 also pass through cleats 106 and into the table 94 (Figs. 31 and 32). The cleats 106 are slidably mounted in longitudinally extending slots 107 in the feed bar 100, their heads engaging recesses 108 adjacent said slots. Thus the cleats 106 secure the feed bar 100 to the table 94 so that it may be moved longitudinally thereof and the clamping bar 97, though mounted upon the feed bar, is not free to move with it longitudinally by reason of the slots 107 in said bar 100, but is free to move transversely with respect to said bar 100 and the table 94 by reason of the slots 105 (Figs. 31 and 32). Thus the clamping bar 97, though resting upon the feed bar 100, is free to move laterally independently of said bar and the mechanism is provided for moving said clamping bar.

The mechanism for moving the clamping bar 97 laterally comprises the feed bar 101 which has an aperture 112 therein for receiving one end of an arm 113 secured to a rock shaft 114 which is operated by mechanism hereinafter described. This feed bar is provided with cleats 115 pivotally secured

thereto by screws 116, and these cleats are disposed in the slots 117 in the clamping bar 97 so that when the feed bar 101 is moved longitudinally by the arms 113 through the shaft 114 the cleats 115 will move the clamping bar laterally upon the table and toward or away from the wire-way. The return movement of the clamping bar 97 is accelerated by the action of a spring 116′ secured to the bar 101, (Figs. 29, 31 and 32).

The mechanism for rocking the shaft 114 to reciprocate the feed bar 101 (see Figs. 6, 7, 8, 29 and 30) comprises an arm 121 secured to said shaft and to the free end of which a rod 122, having a turnbuckle for adjusting its length for coils of different pitch is pivotally secured. The other end of the rod 122 is pivotally secured to the free end of a lever 123 which is pivotally mounted upon the frame (see Figs. 7 and 8). The free end of the lever 123 is provided with an extension 124 carrying a box 125 having guideways 126 in which a block 127 is slidably mounted and is held in adjusted position by a thumb-screw 128 passing through said box and block. A cam roller 129 is pivotally mounted on the block 127 and engages a cam 130 which is mounted upon a shaft 131. The adjustment of the block 127 will vary the time of actuating the roller by the cam 130. A bevel gear 132 is mounted upon the shaft 131 adjacent a bearing bracket 133, (Figs. 6 and 12). This bevel gear 132 meshes with a bevel gear 134 mounted upon a shaft 135 which carries a gear 136 in mesh with the worm 137 on the drive shaft 19, (Figs. 6 and 9). The movement of the arm 121 is restrained in one direction by a spring 138 secured at one end to said arm and at the other to a bracket 139 secured to the frame of the machine. The lever 123 is cushioned by a spring 140 interposed between the bracket 139 and lever 123 and secured thereto. The movement of the arm 121 and consequently the shaft 114 is limited in one direction by a stop rod 121′ adjustably secured in a bracket 122′ mounted upon the frame of the machine, (Figs. 6, 7, 8 and 29). Resultantly, the rotation of the feed roll shaft 19 will, through the gear 136, gear 134, shaft 135, gear 133 and shaft 131, rotate the cam 130 and thus oscillate the lever 123 and through the rod 122 and crank 121 oscillate or rock the shaft 114 and thereby longitudinally reciprocate the feed bar 101 which through the slots 117 and cleats 115 (see Figs. 29, 30, 31 and 32) will move the clamping bar 97 laterally.

The holding shutter 98 is connected to the feed bar 100 by screws 109 whose heads are slidably mounted in transverse slots 110 in said shutter 98 and which extend through elongated slots 111 in the clamping bar 97 and are secured to the feed bar 100. As the shutter 98 is secured to the feed bar 100 by the screws 109 it will move longitudinally with the feed bar 100 upon the clamping bar 97 and is also free to be moved laterally with respect to the bar 100 and the table 94 and transversely across the clamping bar by reason of the slots 110 and mechanism hereinafter described, (Figs. 29, 31 and 32).

The means for longitudinally reciprocating the holding shutter 98, guide 95 and the feed bar 100 consists of a lever 118 which is pivotally mounted on the shaft 119, journaled in a bracket 119′, and which carries a lug 120 engaging in an aperture in the bar 100, and this lever 118 is operated by the mechanism hereinafter described to reciprocate said feed bar longitudinally of the table 94 and consequently the holding shutter 98 connected to operate with it as previously described.

The mechanism for operating the lever 118 comprises links 141 and 141′ each pivotally secured at one of their ends to opposite ends of the lever 118 and provided with adjustable turnbuckles for adjusting them for coils of different pitch, and pivotally secured at their other ends to action slide blocks 142 and 142′ slidably mounted in a guide member 154 (Figs. 5 and 10) and which are adapted to be engaged by an action slide link 143 pivotally secured intermediate its ends to a link 144 which is pivotally secured on an action slide 145 supported in a guide on the machine, and which slide is moved vertically by mechanism hereinafter described to cause said link 143 to engage either one of the blocks 142 or 142′. The link 143 is pivotally secured to a block 146 by a stud 146′, (Figs. 10, 25 and 26). The block 146 is provided with an elongated bearing 147 through which the shaft 131 passes, and is slidably mounted in a slot 147′ in a bearing block 149′ adjacent a cam 150. A cam roller 148 is secured to this block by a stud 148′ secured to the stud 146′. This cam roller 148 engages and is seated in a cam recess 149 in a cam 150 upon the shaft 131. Resultantly, the rotation of the shaft 131 and cam 150 will move the link 143 and one of the slide blocks 142 or 142′ which through their respective links 141 and 141′ will move the lever 118 to cause the longitudinal movement of the bar 100, feeding drum 91, holding shutter 98, and guide 95. It will be noted that the block 142 and link 141 are acted upon to move the bar 100 in one direction and the block 142′ and link 141′ are acted upon to move said bar in the reverse direction.

The mechanism for actuating the action slide 145 comprises mechanism for actuating said slide to cause the link 143 to engage the block 142′ and while so engaged to move the lever 118 in one direction during one cycle

of operations of the machine, and mechanism for actuating said slide to cause the link 143 to engage the block 142 and while so engaged move the lever 118 in the reverse direction during the next cycle of operations.

The mechanism for actuating the action slide 145 to cause the link 143 to engage the block 142′ to accomplish the functions above mentioned comprises an arm 150′ secured to the slide 145 and carrying a cam roller 151′ and a cam 152′ for moving said arm and slide. The roller 151′ is spring-pressed against the cam 152′ mounted upon the shaft 131 by a spring 153′ connected to the slide and to the bearing bracket 149′, (Figs. 10, 12, 23 and 26). The cam 152′ will during a portion of the travel of the roller 151′ thereon, cause the lowering of the action slide 145 and consequently the lowering of the link 144 and link 143 to cause said link 143 to engage with the block 142′ and the shape of the cam is such as to permit said link 143 to engage said block 142′ and move it in one direction during one cycle of operations of the machine.

The mechanism for actuating the slide 145 to cause the link 143 to engage the block 142 and while so engaged move the lever 118 in the reverse direction comprises the cam 152′ which, as previously pointed out, acts upon the roller 151′ to move the slide and means for holding the slide 145 in a slightly lower position than its highest position after it has been raised to its highest position by the highest point of the cam 152′, so that when it is in its raised position, as shown in dotted lines in Fig. 26, the link 143 will engage with the action slide block 142′ during one cycle of operations of the machine to move said block and lever 118. The means for arresting the movement of the slide in this upper position comprises a pattern device.

The pattern device comprises a cylindrical drum 227, (Figs. 2, 12, and 9,) which is keyed at its upper end to a cylindrical sleeve 228 which sleeve is mounted at its upper end on the hub of a gear 229 which is rotatably mounted upon a collar 230 and a stud shaft 231 to which the collar 230 is secured. The lower end of the stud shaft 231 is threaded to engage in a threaded aperture 232 in the bottom end of the drum 227. The drum is provided with a series of apertures 233 arranged in a helical path and adapted to be engaged by means hereinafter described and with a plurality of stops 234, (Figs. 10 and 35.) The rotation of the sleeve 228 through the gear 229 by a step-by-step movement by means hereinafter described will cause the drum 227 keyed thereto to rotate therewith by a step-by-step movement and at the same time, by reason of the threaded shaft 231, be moved longitudinally with respect to said sleeve 228.

The means for rotating the gear 229 step-by-step comprises a gear 235, in mesh with the gear 229 and mounted on a shaft 236, carrying a ratchet wheel 237, a ratchet wheel 238 secured to said wheel 237, and means for engaging said ratchet wheels to rotate said shaft 236 and gear, (Figs. 12, 13 and 14). The shaft 236 is prevented from any rotation due to momentum by a spring-pressed plunger or brake 240 engaging the end of the gear 237 through a recess in the gear 238 which plunger is carried by a bracket 241. The teeth on the ratchet wheel 237 are disposed in the opposite direction to those of the ratchet wheel 238 and the means for engaging said ratchet wheels comprises a thrust pawl 242 engaging the wheel 238 and a pull pawl 243 engaging the wheel 237 and both these pawls are pivotally connected by a pin 244 to a slide 245 having an extension 245′ disposed between the pawls which is mounted in a guide member 246, (Figs. 13, 14, 18 to 21). This slide 245 carries a pin 247 which carries a roller 248 held in engagement with cam 249 by a spring 250 secured to the slide and to the frame of the machine. Each pawl is adapted to be held in engagement with its respective ratchet wheel by a spring 251. Resultantly the movement of the slide 245 will cause the pawl in engagement with its ratchet wheel to rotate step-by-step the gear 235 and consequently through the gear 229 and sleeve 228, the drum 227 but as the pawls drive the shaft 236 in opposite directions means are provided for automatically keeping one pawl out of engagement with its ratchet wheel while the other pawl is in engagement and for automatically shifting the drive from one pawl to the other to reverse the movement of the drum upon the sleeve after it has moved a predetermined distance in one direction. This means comprises a forked latch 252 which is pivotally secured by a pin 252′ to a slide 253 in a guide member 253′ and is provided with hooked ends 254, (Figs. 13, 14, 18 to 21). The slide 253 is disposed in a guide in the member 253′ and is reciprocated by the engagement of a roller 255 carried by the slide with a cam 256 (Fig. 12), the roller being held against the cam by a spring 257 which is secured to said slide and to the pin 247 on the slide 245. The hooked ends 254 of the latch 252 are adapted to engage diametrically disposed projections 258 on a sleeve 259 loosely mounted on a shaft 260 adjacent a collar 261 on said shaft, said shaft 260 carrying an arm 262 which arm is mounted in a slot in the sleeve 259 and is adapted to engage either one of hooked ends 254. The sleeve 259 is provided with recesses 259′ adapted to be engaged by a projection on a spring 260′ secured to the guide 246 to hold the sleeve in set position. The shaft 260 extends downwardly and is provided with a

longitudinal slot 263 in which a plurality of notched stop lugs 264 are adjustably and slidably mounted and adapted to engage the stops 234. The lower end of the shaft 260 is pivotally secured in a bracket 265 secured to the machine and carries an arm 266 whose free end is secured to a spring-pressed rod 267 slidably mounted in a block 268 secured to the bracket 265 and whose movement is limited by pins 269 on said bracket, (Figs. 14 and 21). The arm 266 together with the spring-pressed rod 267 imparts a quick turning movement to the shaft 260 to cause the arm 262 to shift the latch 252 quickly. Resultantly when the drum 227 has been moved longitudinally of the sleeve 228 a predetermined distance one of the stops 234 will strike a stop lug 264 on the shaft 260 and move said shaft to cause the arm 262 under the action of the arm 266 and spring-pressed rod 267 to engage the latch 252 to shift one of the hooked ends out of engagement with its projection 258 to permit the other hooked end to engage the other projection and thus shift the sleeve 259.

This sleeve is provided with notches 270 and 271 adjacent the pawls 242 and 243 respectively and so that when the pawl 242 is in its notch 270 it will be in engagement with its ratchet wheel, as shown in Fig. 20, but when the sleeve is turned slightly it will be lifed out of its notch and ride upon the outer surface of the sleeve, as shown of the pawl 243 in Fig. 20, and at this time the pawl 243 comes into register with the notch 271 and into engagement with its ratchet wheel. Thus by the shifting of the sleeve 259 by the means just described either one of the pawls 243 or 242 is brought into engagement with its ratchet wheel to rotate the shaft 236, gear 235 and gear 229 in the desired direction.

The means controlled by the pattern device for sustaining the action slide 145 in this upper position comprises a finger 272 which is pivotally mounted on a pin 273 secured to a bracket 274 on the frame of the machine (Figs. 2 and 12); and this finger 272 carries a pin 275 which is held in contact with the face of the drum 227 by a spring 276 secured to a lug on said finger and to the bracket 274. This finger has a vertical extension 277 which is adapted to engage a projection 278 on the action slide 145. Resultantly, if the pin 275 on this finger in passing over the drum engages in one of the apertures 233 and is moved into this aperture by the spring 276, the slide 145 which has now been raised into its upper position by the cam 152′ and is moving down will have it projection 278 engaged by the extension 277 and be held in this position for one cycle of the operations of the machine. On the next cycle of operations the projection 277 on the finger 272 registering with the projection 278 on the slide 145 is moved from engagement therewith by a projection 278′ on the lower end of the slide which engages the projection 277′ on the finger on the upward movement of the slide under the action of the cam 152′ causing said finger to move inwardly against the action of the spring 276 and the pin 275 to remove outwardly from engagement with the drum 227 thereby permitting the slide 145 to move downwardly to be acted upon by the cam 152′ during the next cycle of operations.

As previously stated mechanism is provided for laterally moving the holding shutter 98 with respect to the clamping bar 97 and the feed bar 100. This mechanism comprises an arm 151 mounted on a rock shaft 152 and connected at its free end to the holding shutter 98 (see Figs. 7, 10, 11, 29 and 30), and means for rocking said shaft 152. This means consists of a holding shutter bar 153 slidably mounted in a guide member 154 and connected to the shaft 152 by an adjustable spring link connection 155 pivotally connected to an extension on the holding shutter bar 153 and to a lug on a collar 156 secured to the shaft, and means for vertically reciprocating said bar 153. This means consists of a holding shutter action slide 157 which has a cam surface 158 engaged by a cam roller 159 on the bar 153 and means for operating said slide. This action slide 157 is guided in the guide member 154 and is spring pressed in one direction by a spring 160 connected to it and to the guide member, (Figs. 7, 11 and 28). The shaft 152 may also be manually actuated by the operating lever 152″.

The means for operating the slide 157 comprises a lever 161, (Figs. 8, 24, 26 and 28), pivotally secured to the frame and carrying a cam roller 162 which is held in contact with a cam 150 mounted upon the shaft 131 by a spring 162′. Resultantly the rotation of the shaft 131 and the cam 150 will longitudinally reciprocate the slide 157 which through the cam surface 158 will vertically reciprocate the bar 153 which through the link 155 and the lug member 156 will rock the shaft 152 and thus laterally reciprocate the holding shutter 98 whose movement is restrained in one direction by springs 163.

The mechanism for laterally reciprocating the ejecting shutter 99 comprises rods 164 connected to said shutter and adjustably connected to cranks 165 mounted on a rock shaft 166, and means for operating said rock shaft. This means comprises a crank 167 having a slot 168 therein for receiving one end of a bar 169 which is secured at its other end to a shaft 170 which shaft carries an arm 171 provided with a cam roller 172 contacting with a cam 173 mounted on the shaft

131 (Figs. 6, 23, 29 and 30). Resultantly the rotation of the shaft 131 and cam 173 will rock the shaft 170 and bar 169, crank 167, shaft 166, cranks 65 and thereby laterally reciprocate the ejecting shutter 99 whose movement is restrained in one direction by a spring 174 secured to said shutter and loosely mounted on a shaft 175 (Fig. 15).

The mechanism for vertically reciprocating the ejecting shutter 99 comprises a series of pins 176 secured to an ejecting bar 177 disposed beneath the table 94 (Figs. 15 and 30), said pins passing upwardly through apertures 178 in the table 94, slots 179 in the feed bar 100, slots 180 in the clamping bar 98, slots 181 in the holding shutter 99, (Figs. 31 and 32) and means for actuating said bar 177. The bar 177 is mounted in guide brackets 182 and resiliently held adjacent the bottoms of said brackets by springs 183. The means for actuating the bar 177 comprises levers 184 one of the ends of which engages with said bar 177 and which levers are loosely mounted upon the shaft 152, the other ends 185 of said levers being bifurcated, which bifurcations receive the free ends of cranks 186 mounted on the shaft 175 whose movement is restrained in one direction by springs 175′ secured to arms 176′ on said shaft and to the machine and which shaft is rocked by an arm 187 keyed to the forward end of the shaft carrying a cam roller 188 which is held in engagement with a cam 189 by a spring 190 secured to the arm 187 and to a support 191 mounted on the frame of the machine, which cam 189 is mounted on the shaft 131, (Figs. 15, 24 and 29). Resultantly the rotation of the shaft 131 and cam 189 will lift the arm 187 which will rotate the shaft 175 and thereby oscillate the cranks 186 and 184 and thereby vertically reciprocate the bar 177 and consequently the ejecting shutter 99.

In Figs. 37 to 39 I have shown a modified form of weaving mechanism in which the means for moving the holding shutter 98 laterally with respect to the table 94 and the feed bars 100 and 101, and the means for laterally and vertically moving the ejecting shutter, differ from that previously described.

In this instance the means for laterally moving the holding shutter 98 comprises horizontally disposed toggle links 99′ pivotally and slidably secured by a slot 98′ and stud 97′ to the clamping bar 97 and the curved end of said link adjacent said stud registers with a grooved extension 100′ on the holding shutter 98. The other end of the link 99′ is pivotally secured to one end of the horizontally disposed toggle link 101′ which is pivotally secured at its other end to the table 94′ and both of said links 99′ and 101′ are pivotally secured to a bar 105′ which has an aperture 106′ therein for receiving one end of a lever 107′ pivotally secured to a pin 108′. A member 109′ is pivotally secured to the other end of the lever 107′ and carries a spring pressed plunger 110′ connected to a rod 111′ which is pivotally secured to the holding shutter action slide 157 which is operated by the lever 161 carrying the roller 162 in engagement with the cam 150. Resultantly the reciprocation of the slide 157 will, through the lever 107′ and its connections, reciprocate the bar 105′ which through the links 99′ and 101′ will cause the lateral movement of the holding shutter 98.

In the modified form the means for laterally moving the ejecting shutter 99 comprises a bar 112′ which is pivotally secured to horizontally disposed toggle links 113′ and 114′ and means for operating said bar 112′. The link 113′ is pivotally secured to one end of the link 114′ and to a lug 102′ secured to a pin 103′ pivotally secured for vertical movement in a bracket 104′. The other end of the link 114′ is pivotally secured to the ejecting shutter 99. The means for operating the bar 112′ comprises a member 115′ pivotally secured to said bar 112′ at one end and carrying a spring pressed plunger 116′ connected to a rod 117′ which is pivotally secured to a crank 118′ mounted on the shaft 170 which is operated, as previously described, through the crank 171, roller 172 and cam 173 on the shaft 131. Resultantly the rocking of the shaft 170 will through the crank 118′ and its connections reciprocate the bar 112′ through the links 113′ and 114′ and thereby cause the lateral movement of the ejecting shutter 99.

In this modification the means for vertically reciprocating the ejecting shutter 99 and the bar 177 comprises a plurality of bell-crank levers 119″ pivotally and slidably secured at one of their ends to the bar 177, pivotally secured intermediate their ends to the table 94 and pivotally secured at their other ends to a link 120′ which is pivotally secured to one end of a bell crank lever 121′ pivotally secured to the table and carrying an adjustable contact screw 122′ which is adapted to contact with a crank 123′ on the shaft 175. Resultantly the rocking of the shaft 175 by the mechanism previously described will through the crank 123′, bell-crank 121′, link 120′, and bell-crank levers 119″ cause the vertical reciprocation of the bar 177 and the ejecting shutter 99. This vertical movement of the shutter 99 is permitted owing to the pivotal connection of the links 113′ with the studs 103′.

Means are also provided in connection with the weaving mechanism for removing the finished product from the machine and this means comprises a fabric feeding drum 91 which is pivotally secured to brackets 92 secured to the feed bar 100 by screws 195,

(Figs. 31 and 32) so that when the feed bar is moved the drum will be moved with it and mechanism for rotating said feed drum 91 simultaneously with the raising of the ejecting shutter 99 hereinafter described and means for conveying the fabric away from the machine hereinafter described.

The means for operating the drum 91 comprises a ratchet wheel 214 mounted on the drum shaft, a broad-faced pawl 215 engaging with said wheel 214 and means for operating said pawl comprising an arm 216 secured to the rock shaft 175 which vertically reciprocates the ejecting shutter 99 (Figs. 3 and 4).

The means for conveying the fabric away from the machine includes the drum 91 and its mechanism, above described, and another drum 217 and means for operating said drum 217 coincidentally with the operation of the drum 91. This means comprises a ratchet wheel 218 mounted on the drum shaft, a pawl 219 engaging with said wheel 218 and means for operating said pawl comprising a lever 220 to which the pawl is pivotally connected, which lever is loosely mounted upon the shaft 166 and is resiliently connected on one side to the arm 216 by an adjustable spring connection 221 and resiliently connected on the other side to an arm 222 mounted on the shaft 166 by an adjustable spring connection 223. The lever 220 is operatively connected to the pawl 215 by a spring 224, which holds the pawl 215 in engagement with the ratchet wheel 214. A spring 224′ holds the pawl 219 in engagement with the ratchet wheel 218. Resultantly the rocking of the shaft 166 will reciprocate the pawls 215 and 219 and give the drums 91 and 217 a partial turn and the fabric passes from the wire-way over the drum 91, over a plate 225 secured to the machine thence around an idler roller 226 and over the drum 217.

The various parts of the weaving mechanism, the mechanism for operating these parts and the means for conveying the finished fabric from the machine having been described, a brief description of the operation will be given to show how each coil of the fabric is interlocked at each convolution with the lower margin of the previously formed coil and that to accomplish this certain operations are necessary, first, the previously run coil must be moved up from the wire-way so as to draw up the last run coil; second, the previously run coil and the last run coil must be held in place so that the last coil may receive the next run coil; third, the coils already forming the fabric must be moved longitudinally so that the next run coil will properly interlock at each convolution with the lower margin of the previously formed coil after which the next coil is cut off and in connection with these operations it is to be borne in mind:—that the clamping bar 97 is laterally movable over the table 94 independently of the other parts of the weaving mechanism; that the holding shutter 98, feeding bar 100 and the guide bar 95 are operatively connected together so that all of these parts may be longitudinally reciprocated with respect to the table 94; that in addition to the longitudinal reciprocation of the holding shutter 98 means are provided for laterally reciprocating said holding shutter with respect to the table 94; that means are provided for both laterally and vertically reciprocating the ejecting shutter 99 independent of the other parts of the weaving mechanism; that the fabric feed drum is laterally movable over the table with the feed bar 100. In the description of the weaving operation we will assume that the weaving has progressed sufficiently to produce several coils of wire, such as the wires *a*, *b*, *c* and *d* as indicated in Fig. 15 and that the coil *d* is complete in the wire-way.

Under these conditions the clamping bar 97 moves laterally clamping the last coil *d* in the wire-way and at the same time the holding shutter 98 recedes and the ejecting shutter 99 moves laterally engaging between the intersections of the coils *b* and *c*. Then the ejecting shutter 99 moves upwardly simultaneously with a partial rotation of the drum 91 carrying the coils *a* and *b* upwardly. The holding shutter 98 now advances into the intersection formed by the coils *c* and *d*. Then the coil *d* is cut off. The clamping bar 97 recedes and the fabric, the last coil of which is now held between the holding shutter 98 and the guide bar 95, together with the feed bar 100, is moved longitudinally along the table so as to bring the last run coil *d* into proper relation with the next run coil so that this coil may engage at each convolution with the last run coil *d*. Then the next coil is run in, and the cycle of operations is again repeated thus forming the fabric.

It may be desired to make fabric having coils of one, two or three or any number of strands which will permit the adjacent coils to be interlocked, or fabric in which adjacent coils form varying numbers of strands so as to produce fabric in which the weave is double, alternating or any number of these.

If it is desired to produce fabric of double or multiple weave it is necessary to suspend the operations of the weaving mechanism upon a coil in the wireway so that another of the coils may be superimposed upon it but as the preceding coil has been cut off it is necessary to provide some means for preventing the severed end of this coil from interfering with the superposition of the next coil upon it. This is accomplished by a back feed arm 196 which is arranged in the advance of the knife 88 and is employed for the purpose of withdrawing or feeding back-

wardly the front end of the severed coil when another coil has to be run into it so that the severed coil may be held away from the knife and enable the next succeeding strand or set of wires forming the next coil to properly coöperate with the severed coil and to take the same place in the wireway.

The back feed arm or trigger finger 196 extends upwardly into a slot in the shell 89, (Figs. 17, 27 and 29), and is hook-shaped as shown in Fig. 27. The finger 196 is pivotally secured to a disk 198 secured to a collar 199 secured to one end of a pin 200 journaled in a bracket 201 secured to the frame (Figs. 23, 25 and 27). An arm 202 is secured to the other end of the pin 200 and its other end is pivotally secured to one end of a trigger slide 203, whose other end is slidably mounted in the guide member 154, (Figs. 1, 25, 26 and 27). The trigger slide 203 is provided with a T slot 204 in which a pin 205 on the link 143 is slidably mounted and with a pin 206 which is adapted to be engaged to actuate said slide 203 by mechanism hereinafter described, (Figs. 5, 8, 23, 25 and 26). The lower end of the trigger 196 abuts against an adjustable screw in a block 208 on a lug 209 on the collar 199. The rearward movement of the trigger slide 203 is restained by a spring 210 secured to it and to a pin secured to the bracket 201, and the rearward movement of the trigger 196 is restained by the spring 212 secured to it and to the bracket 94′ on the frame of the machine and its forward movement is limited by an adjustable stop 213. When the simple two-wire fabric is being woven the lateral reciprocation of the link 143 will, through the pin 205 thereon, engage in the slot 204 on the trigger slide 203, the pin 205 registering with the lower end of the T slot 204 when the link 143 is in engagement with the block 142′ and said pin registering with the upper portion of said slide when the link 143 is in engagement with the block 142, (see Fig. 26). The reciprocation of the trigger slide 203 will through the arm 202 rock the pin 200 and consequently the collar 199 and the disk 198 and thereby vertically reciprocate the trigger 196 to permit the last run coil to pass over said trigger in its longitudinal movement and the trigger will therefore not interfere with the running of the wire for simple weave fabric. If it is desired to superimpose one coil upon another in the case of double weave, mechanism is provided for actuating the trigger 196 to withdraw or feed backwardly the front end of the severed coil. As previously pointed out when one coil is to be superimposed upon another already in the wireway the longitudinal movement of the feed bar 100, holding shutter 98 and guide bar 95 must be suspended That suspension will occur when the link 143 is moved into intermediate position between the action blocks 142 and 142′, will be apparent from Fig. 26, when this link 143 is so disposed with the pin 205 on said link registering with the horizontally extending portion 204′ of the T slot 204, under which conditions the mechanism which engages the pin 206 will operate thereon. This mechanism comprises a link 156′ having the slot 155′ therein, in which the pin 154′ and link 143 is slidably mounted. The link 156′ is secured to an arm 157′ mounted on a pin 158′ journaled in a bracket on the frame and the arm 157′ carries a cam roller 159′ held in engagement with a cam 160′ mounted on the shaft 131 by a spring 161′. Resultantly when the pin 205 is disposed in the horizontally extending portion of the T slot 204 in the trigger slide 203 the rotation of the shaft 131 and the cam 160′ will through the arm 157′ cause the end of the link 156′ to engage the pin 206 on the trigger slide and move it laterally and thereby through the arm 202 and pin 200 move the trigger vertically up into the slot 197 on the shell 89 to accomplish the functions previously set forth. It will be noted then that the link 143 acts upon the trigger slide 203 to prevent the trigger 196 from performing its functions and that when this link 143 is in mid-position the trigger slide 203 is under the action of the link 156′ and the springs connected to the slide and trigger arm permit the trigger to accomplish its functions.

To produce fabric in which the weave is double or any multiple of strands of wire it is necessary that the last run coil be stopped so that another coil may be superimposed upon it and to do this the operation of the machine upon the first coil must be suspended. To produce fabric in which the weave is alternating it is necessary that the feeding of one of the wires forming the coil be stopped. Thus by the feeding of one or two of the wires to the wireway, the suspension of operations on the coil or coils in the wire, and the continuance of operations of the cams and the wire feeding fabric of double or alternating weave or any mutiple of these is produced and this is automatically accomplished by the pattern device which suspends the movement of the coils in the wireway and permits the feeding of one or two wires to the wireway.

To permit an additional coil or coils to be superimposed upon a coil in the wireway the longitudinal movement of the feed bar 100, guide bar 95 and holding shutter 98, the lateral movement of the holding shutter 98 and the lateral and vertical movement of the ejecting shutter and all the mechanism operating these parts must be

suspended and means are provided automatically regulated and operated by the pattern drum for accomplishing this.

The mechanism for suspending the longitudinal movement of the guide bar 95, feed bar 100 and holding shutter 98 comprises a finger 272′ which is pivotally mounted on the pin 273 secured to the bracket 274 on the frame of the machine, (Figs. 2 and 12). This finger 272′ carries a pin 275 which is held in contact with the face of the drum 227 by a spring 276 secured to a lug on the pin and to the bracket 274. This finger has a vertical extension 289 which is adapted to engage a projection 278 on the holding shutter action slide 145. If the pin 275, on this finger in passing over the drum, engages in one of the apertures 233 and is moved into this aperture by the spring 276 the slide 145 moving down under the action of the cam 152′ will have its projection 278 engaged by the extension 279 and thus be held in this position. At the same time when the slide 145 moves downwardly the link 144 of said slide also moves downwardly and carries the link 143 downwardly into mid position between recessed portions of the action slide blocks 142 and 142′ and consequently movement of the lever 118 and the bar 100 is prevented, (Figs. 12 and 26).

The mechanism for suspending the lateral movement of the holding shutter 98 comprises means for locking the slide 157 against movement by the lever 161. This comprises an arm 207 (see Figs. 26 and 28) of the slide 145 carrying a locking bar 281 having a slot 282 therein with an inwardly extending projection 283 therein which when the slide 145 is moved so that the projection 283 registers with a pin 284 on the action slide 157 and the action of the slide 145 is then arrested, the movement of the slide 157 is prevented and likewise that of the bar 153, shaft 152, arm 151 and holding shutter 98. The movement of the slide is arrested through the action of the finger 272′ engaging the projection 278 as described above.

After the longitudinal movement of the guide bar 95, feed bar 100 and holding shutter 98 and the lateral movement of the holding shutter 98 has been suspended to permit another or other coils to be superimposed upon the coil in the wireway the extension 289 is released from engagement with the projection 278 on the slide 145 by the projection 278′ on said slide striking a projection 289′ on said finger to move the upper end of said finger rearwardly and thereby move the lower end of the finger forwardly and move its pin out of the aperture in the drum. The movement of the projection 278′ against the projection 289′ on the finger takes place when the highest portion of the cam 152′ comes in contact with the roller 151′ secured to the slide 145.

The mechanism for suspending the vertical movement of the ejecting shutter comprises means for preventing the rotation of the shaft 175. It has been previously pointed out that the arm 187 is keyed to the shaft and this is done by means of a slidable key 279 which has an upwardly extending projection 279′ engaging either one of a set of upwardly extending projections 285 on both sides of a slot in the arm 187 and spaced from each other adjacent the keyway (Figs. 12, 23 and 24). If the projection 284 is moved from engagement with either set of the projections 285 in the arm 187 and between them, the movement of the shaft 175 by said arm will be prevented, and means are provided for moving the key 279 to accomplish this purpose. This means comprises an arm 286 which is slidably and pivotally secured to the key 279 and mounted on a shaft 287 which carries an arm 288 slidably and pivotally secured to the action slide 145. Resultantly, vertical movement of the action slide will cause longitudinal reciprocation of the keyway in the shaft 175 and if the movement of the slide and therefore the key is stopped when its projection 284 is free from engagement with the projection 285 on the arm 187 the rocking of the shaft will be prevented and the movement of the key is stopped at this point by the extension 289 engaging on the projection 278 of the slide to stop its movement as previously described.

The mechanism for suspending the operation of one of the feed rolls comprises mechanism for moving the outer disk 40 of the feed roll 18 laterally and out of alinement with the outer disk 23 of the feed roll 17. To accomplish this, the shaft 28 has a longitudinally extending recess 290 therein which is adapted to receive a slidable shaft 291, secured to the shaft 28 to rotate therewith by a pin 292 secured to the shaft 291 and slidably mounted in a slot 293 in the shaft 28 (Fig. 9). The shaft 291 carries the collar 42 and the outer feed disk 40 secured to the collar so that when the shaft 291 is moved forwardly the collar 42 and outer feed disk 40 will be moved with it, said disk thereby moving out of alinement with the outer disk 23 of the feed roll 17, and means are provided for moving the shaft 291 comprising a sleeve 294 having a groove 294′ therein and slidably secured to the shaft 28 and restrained from moving forward by a spring 295 surrounding the shaft 28 and interposed between said sleeve 294 and a collar 296 and means for moving said sleeve. This means comprises a bifurcated member 297 the forked ends of which are seated in the groove 294′ provided with a collar 298 slid-

ably mounted on the shaft 19 and means provided for sliding said member 297 forwardly to cause it to move the sleeve 294. This means comprises a finger 299 adapted to engage said collar 298 and slidably and pivotally connected to the frame of the machine. The lower end of this finger 299 is pivotally connected to one end of a finger 300 which is pivotally connected intermediate its ends to a cam lever 301. The movement of the finger 300 is restrained in one direction by a spring 302. The cam lever 301 is pivotally connected intermediate its ends to the frame of the machine and carries a cam roller 303 at one end adapted to be held in engagement with a cam 304 by a spring 305, Figs. 2, 7 and 9. The other end of the finger 300 is adapted to be engaged by an arm 306 mounted on a supplemental slide 307 slidably mounted in the action slide 145, (Figs. 10 and 12). This slide 307 under normal conditions is held in position with the action slide 145 by a projection 308 on a finger 309 provided with a pin 275 adapted to register with the pattern drum. When the pin on the finger 309 registers with one of the apertures 233 of the drum 227 the projection 308 moves out from engagement with the slide 307 allowing the slide to move downwardly. This slide is provided with an arm 310 carrying a cam roller 311 which, when the slide moves down, as just mentioned, aided by a spring 311′ contacts with a cam 312 on the shaft 131. At the same time this occurs the arm 306 on the slide 307 strikes the finger 300 thereby swinging the finger 299 upwardly and the lever 301 which is continuously operated by the cam 304 then causes the finger 299 to engage the member 297 and move it forwardly which as previously described shifts the outer disk 40 out of alinement with the outer disk 23 thereby stopping the feed of the wire between these disks and thus allowing only one strand of wire to be fed to the coiler and into the wireway.

After the operation of one of the feed rolls has been suspended the supplemental slide is again moved into normal position on the action slide by the cam 312 and the slide 145 is moved upwardly at the same time, the projection 278 on said slide 145 strikes a projection 308′ on the finger 309 and thereby moves the pin on the finger 309 out of the aperture in the pattern drum.

In Figs. 40, 41 and 42 I have shown a modified form of means for mechanically stopping the drive of the feed rolls and for supplying additional wire thereto and also a modified form of pattern device.

The means for mechanically stopping the machine shown in Fig. 40 comprises a bell-crank lever 46′ similar to the bell-crank lever 46 with the exception that it carries a member 314 which is provided with cam surface 315 at either end thereof which surfaces are adapted to be engage by spring-pressed latches 316 and instead of a single wheel 14 a plurality of wheels 14′ are provided each of whose hubs 62′ is slidably mounted on rods 63′ and the wire passes from the wheel 13 over one of the wheels 14′ back to the wheel 13 then over the other wheel 14′ and back to the wheel 13 and thence upwardly over the roll 16. The means for moving the bell-crank lever 46′ and its manner of operation is the same as that previously described for the bell-crank 46.

The modified form of pattern device comprises an endless pattern belt 317 mounted on wheels 318 and 319, the wheel 318 being adjustably mounted in a slotted bracket 320 secured to the frame for varying the distance of the wheel to accommodate the different lengths of belt.

The other wheel 319 is mounted on a shaft 321 journaled in a bracket on the frame and carrying a bevel gear 322 in mesh with a bevel gear 323 mounted on a shaft 324 journaled in the frame and carrying a gear 325 which is rotated by a thrust pawl similar to the pawl 242 carried by a slide 245 slidably mounted in the guide 246 which slide is actuated by the cam 249 through the roller 248 and pin 247, shown in Figs. 13 and 14. The pattern belt is provided with a plurality of apertures 233′ into which the pins on the fingers 272″, similar to the fingers 272, 272′ and 309, are adapted to pass. The fingers 272″ like those previously described in connection with the pattern drum 227 operate on the slides 145 and 307 to suspend the operations of the machine in the manner previously described.

After the fabric is made and before it leaves the machine it is necessary to cut and crush the side edges so that it may be in suitable condition for use as a spring mattress and this is accomplished by means which will now be described.

This means for trimming and crushing the side edges of the fabric consists of a fixed jaw 326 and a movable jaw 327 at one end of the machine and a fixed jaw 328 and movable jaw 329 at the other end of the machine, and means for operating said movable jaws, (Figs. 25, 7 and 8). The movable jaw 329 is adjustably mounted on a bar 329′ and the jaw 328 is adjustably mounted on the machine so that said jaws may be adjusted lengthwise of the machine to accommodate different lengths of fabric. This means comprises levers 330 to which the movable jaws 327 and 329 are connected, links 331 pivotally connected to said levers and to cranks 332 mounted on a shaft 333, and means for operating said shaft. The means for driving the shaft 333 comprises a cam roller 336 on one of the cranks 332 held

in engagement with a cam 337 by a spring 338, (Figs. 7, 8, 15 and 25). The jaws carry crushing blocks 339 and the movable jaws 327 and 329 carry shearing knives 340 adapted to coöperate with shear blocks 341 on the fixed jaws 326 and 328. As the side edges of the finished fabric pass between the jaws the shaft 333 through the cam 337 and crank 332 will move the movable jaw members against the fixed jaw members and thereby crush and trim the edges of the fabric.

The invention thus exemplifies a machine for making coiled-wire-fabric which embodies all of the features necessary to practically and efficiently accomplish this purpose.

I am aware that the specific construction herein shown is capable of considerable variation and modification, and such changes as come within the scope of the appended claims are within the spirit of my invention.

I claim—

1. In a coiled wire-fabric machine, the combination, with coiling and weaving devices, of wire feeding mechanism comprising feed rolls and means for conducting the wires to said feed rolls, and means for stopping the drive of said rolls comprising a shaft having a notch therein, a latch in engagement with said notch, and tripping means automatically operated by said wire-conducting means, if the wire does not feed properly, for operating said shaft to lift the latch from engagement therewith, as herein described.

2. In a coiled-wire fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a wire-way, means forming the sides of the wire-way for clamping the last run coil therein, means for moving the preceding coil upwardly while the clamping means is operating, and means for moving the last run coil lengthwise to receive the next run coil.

3. In a wire-fabric machine, the combination, with coiling and weaving devices, of wire-feeding mechanism comprising feed rolls and means for conducting the wires to said rolls, a shaft having a notch therein, a latch in engagement with said notch, means operatively connected to said shaft for stopping the drive of the feed-rolls, and mechanical means automatically operated by said wire-conducting means, if the wire does not feed properly, for operating said shaft to lift the latch from engagement with said notch to cause the means connected to said shaft to stop the drive of said rolls, as herein described.

4. In a coiled-wire fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a wire-way, means forming the sides of the wire-way for clamping the last run coil therein, means for moving the preceding coil upwardly while the clamping means is operating, means for removing the finished fabric from the wire-way coöperating with the means for moving the preceding coil upwardly, and means for moving the last run coil lengthwise to receive the next coil.

5. In a coiled-wire fabric machine, the combination, with coiling and weaving devices, of wire-feeding mechanism comprising feed rolls and means for conducting the wire to said rolls comprising knot-catcher rolls, and mechanical means automatically operated by the wire-conducting means for stopping the drive of said feed rolls when the wire is stopped by said knot-catcher rolls, as herein described.

6. In a coiled wire-fabric machine, the combination, with coiling and weaving devices, of wire-feeding mechanism comprising the feed rolls and means for conducting the wire to said feed rolls, comprising knot-catcher rolls, and of electrical means for stopping the drive of said feed rolls should a wire break when stopped by said knot-catcher rolls, as herein described.

7. In a coiled wire-fabric machine, the combination, with coiling and weaving devices, of wire-feeding mechanism comprising feed rolls and means for continuously driving the feed rolls, means for conducting the wires to the feed rolls and mechanical stopping means comprising a lengthwise movable rock shaft, means for locking said shaft against rocking motion, means for locking said shaft against lengthwise motion, means operatively connected to and automatically operated by the wire-conducting means for releasing said rocking movement locking means, and means operatively connected to said shaft and operated when the shaft is moved lengthwise to stop the drive of said feed rolls, as herein described.

8. In a coiled wire-fabric machine, the combination, with coiling and weaving devices, of continuously driven feed rolls, shafts upon which said feed rolls are mounted, one of said shafts being resiliently supported upon the other and vertically movable with respect thereto, and automatic means for intermittently moving said vertical shaft against the action of the said resilient supporting means to cause the feed rolls on said shaft to engage the feed roll on the other shaft to feed the wire to said coiling and weaving devices, as herein described.

9. In a wire-fabric machine, the combination, with coiling and weaving devices, of feed rolls, means for continuously driving said rolls, shafts upon which said feed rolls are mounted, one of said shafts being resiliently supported upon the other and vertically movable with respect thereto, and means for automatically and intermittently

moving said vertical shaft against the action of said resilient supporting means to bring the feed rolls into engagement with each other to feed wires therethrough comprising means operatively connected to the vertically movable shaft and intermittently operated by said driving means, as herein described.

10. In a coiled wire-fabric machine, the combination, with coiling and weaving devices, of feed rolls, means for continuously driving said rolls and means for intermittently and automatically bringing said feed rolls into feeding relation comprising a vertically reciprocating bar operatively connected to the shaft of one of said feed rolls and intermittently operated by said driving means, as herein described.

11. In a coiled wire-fabric machine, the combination, with coiling and weaving devices, of feed rolls, shafts upon which said rolls are mounted, one of said shafts being vertically movable, means for continuously driving said rolls, and means for intermittently moving said movable shaft to bring said feed rolls into feeding relation comprising a vertically reciprocating bar operatively connected to the shaft of one of said feed rolls and intermittently operated by said driving means, as herein described.

12. In a coiled wire-fabric machine, the combination, with coiling and weaving devices, of feed rolls, means for continuously driving said rolls, and means for intermittently bringing said feed rolls into feeding relation comprising a vertically reciprocating bar, operatively connected to the shaft of one of said feed rolls, an oscillating lever operatively connected to said bar, and means operated by said driving means for operating said lever, as herein described.

13. In a coiled wire-fabric machine, the combination, with coiling and weaving devices, of feed rolls, shafts upon which said feed rolls are mounted, one of said shafts being vertically movable and resiliently supported upon the other, means for continuously driving said rolls, and means for intermittently moving said movable shaft against the action of the resilient supporting means to bring said feed rolls into feeding relation comprising a vertically reciprocating bar operatively connected to the shaft of one of said feed rolls, an oscillating lever operatively connected to said bar, and means operated by said driving means for operating said lever, as herein described.

14. In a coiled wire-fabric machine, the combination, with coiling and weaving devices, of feed rolls, means for continuously driving said rolls, and means for intermittently bringing said feed rolls into feeding relation comprising a vertically reciprocating bar operatively connected to the shaft of one of said feed rolls, an oscillating lever operatively and adjustably connected to said bar, and means operated by said driving means for operating said lever, as herein described.

15. In a coiled wire-fabric machine, the combination, with coiling and weaving devices, of feed rolls, shafts upon which said feed rolls are mounted, one of said shafts being vertically movable and resiliently supported upon the other, means for continuously driving said rolls, and means for intermittently moving said movable shaft against the action of the resilient supporting means to bring said feed rolls into feeding relation comprising a vertically reciprocating bar operatively connected to the shaft of one of said feed rolls, an oscillating lever operatively and adjustably connected to said bar, and means operated by said driving means for operating said lever, as herein described.

16. In a coiled wire-fabric machine, the combination, with coiling and weaving devices, of a pair of shafts, bearings in which said shafts are journaled, the bearings for one of said shafts being resiliently supported upon the other, one of said resiliently supported bearings being pivotally supported upon the frame of the machine to permit the shaft carried thereby to be moved toward or away from the other shaft, feed rolls mounted on said shafts, and means for intermittently moving said resiliently supported shaft toward the other shaft to bring the feed rolls into driving relation, as herein described.

17. In a coiled wire-fabric machine, the combination, with coiling and weaving devices, of a pair of shafts, bearings in which said shafts are journaled, the bearings for one of said shafts being resiliently supported upon the other, one of said resiliently supported bearings being pivotally and adjustably supported upon the frame of the machine to permit the shaft carried thereby to be moved toward or away from the other shaft, feed rolls mounted on said shafts, and means for intermittently moving said resiliently supported shaft toward the other shaft to bring the rolls into driving relation, as herein described.

18. In a coiled wire-fabric machine, the combination, with coiling and weaving devices, of a pair of horizontally disposed shafts, bearings in which said shafts are journaled, the bearings for one of said shafts being resiliently supported upon bearings of the other shaft, one of said resiliently supported bearings being pivotally supported upon the frame of the machine to permit the vertical movement of the shaft journaled therein, feed rolls mounted on said shafts, means for driving said shafts, and means for intermittently moving said resiliently supported shaft toward the other shaft to bring

the feed rolls into driving relation comprising a vertically reciprocating bar operatively connected to said resiliently supported shaft and intermittently operated by said driving means, as herein described.

19. In a coiled wire-fabric machine, the combination, with coiling and weaving devices, of a pair of horizontally disposed shafts, bearings in which said shafts are journaled, the bearings for one of said shafts being resiliently and adjustably supported upon the bearings of the other shaft, one of said resiliently supported bearings being pivotally supported upon the frame of the machine to permit vertical movement of the shaft journaled therein, feed rolls mounted on said shafts, means for driving said shafts, and means for intermittently moving said resiliently supported shaft toward the other shaft to bring the feed rolls into driving relation comprising a vertically reciprocating bar operatively connected to said resiliently supported shaft, an oscillating lever operatively and adjustably connected to said bar, and means operated by said driving means for operating said lever, as herein described.

20. In a coiled-wire fabric machine, the combination, with a wire-coiling device, of a weaving device including a wire-way, a lengthwise and laterally movable holding shutter, and mechanical means for clamping the wire last run in the wire-way.

21. In a coiled wire-fabric machine, the combination, with a wire-coiling device, of a weaving device including a wire-way, a lengthwise and laterally movable holding shutter, and a laterally movable clamping bar for retaining the wire last run in the wire-way.

22. In a coiled wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a wireway and horizontally movable clamping means forming one side of said wireway for retaining the wire last run therein, as herein described.

23. In a coiled wire-fabric machine, the combination, with a wire coiling device, of a weaving device comprising a wire-way and a horizontally movable clamping bar forming one side of said wireway for retaining the wire last run therein, as herein described.

24. In a coiled wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a wire-way in which the wires as coiled are run, a holding shutter, a clamping bar, means for removing the fabric from the wire-way, and mechanism for operating said holding shutter, clamping bar and fabric-removing means to accomplish the weaving operation.

25. In a coiled wire-fabric machine, the combination, with a wire-coiling device, of a weaving device including a wire-way the sides of which consist of a lengthwise movable guide bar and a clamping bar, said clamping bar being laterally movable to retain the wire last run between it and the guide bar, and a lengthwise movable holding shutter coöperating with said guide bar to move the last run coil lengthwise to receive the next run coil.

26. In a coiled wire-fabric machine, the combination, with a coiling device, of a weaving device including a wire-way, a lengthwise movable guide bar forming one of the sides of said wire-way, a lengthwise and laterally movable holding shutter cooperating with said guide bar to move the last run coil lengthwise to receive the next run coil, and a clamping bar laterally movable to retain the wire last run between it and the guide bar.

27. In a coiled wire fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a wire-way in which the wires as coiled are run, and a laterally movable bar forming one side of the wireway to clamp the wire last run therein between said bar and the other side of the wire-way.

28. In a coiled wire fabric machine, the combination, with a coiling device, of a weaving device comprising a table, a wire-way on said table, and a guide bar and a clamping bar on said table forming the sides of said wire-way, said clamping bar being laterally movable over said table to clamp the wire last run in said wire-way.

29. In a coiled wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a wire-way, a clamping bar, a holding shutter and an ejecting shutter, and mechanism for operating said clamping bar, holding shutter and ejecting shutter to accomplish the weaving operation, as herein described.

30. In a coiled wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a wire-way, a laterally movable holding shutter, a laterally and vertically movable ejecting shutter, and mechanical means for clamping the wire last run in the wire-way, as herein described.

31. In a coiled wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a wire-way, a laterally and longitudinally movable holding shutter, a laterally and vertically movable ejecting shutter, and mechanical means for clamping the wire last run in the wire-way, as herein described.

32. In a coiled wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a wire-way, a laterally movable holding shutter, a laterally and vertically movable ejecting shutter, and a clamping bar for clamping the wire last run in the wire-way, as herein described.

33. In a coiled wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a wire-way, a movable holding shutter, a laterally and vertically movable ejecting shutter, and a bar forming one side of the wireway for clamping the wire last run therein, as herein described.

34. In a coiled wire-fabric machine, the combination, with a wire coiling device, of a weaving device comprising a wireway, a laterally and lengthwise movable holding shutter, a laterally and vertically movable ejecting shutter, and a bar forming one side of the wireway for clamping the wire last run therein, as herein described.

35. In a coiled wire-fabric machine, the combination with a wire coiling device, of a weaving device comprising a wireway, a laterally and lengthwise movable holding shutter, a laterally and vertically movable ejecting shutter, a lengthwise movable guide bar forming one side of said wire-way, and a laterally movable bar forming the other side of said wire-way for clamping the wire last run therein, as herein described.

36. In a coiled wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a wireway, a guide bar, a clamping bar, a holding shutter and an ejecting shutter, and mechanism for operating said guide bar, clamping bar, holding shutter and ejecting shutter to accomplish the weaving operation, as herein described.

37. In a coiled wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a table, a wireway on said table, a bar forming one side of said wire-way and laterally movable over said table to clamp the wire last run in said wire-way, as herein described.

38. In a coiled wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a table, a wireway on said table, a feed bar seated within said table, a guide bar forming one side of said wire-way, a bar forming the other side of said wire-way and laterally movable over said table to clamp the wire last run in said wire-way, a holding shutter, means for connecting said feed bar, holding shutter and guide bar together, and means for moving said feed bar, holding shutter and guide bar lengthwise of said table, as herein described.

39. 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 drum having a plurality of apertures therein disposed in a helical path, and means adapted to enter said apertures and operatively connected to said weave-operating mechanism for determining the pattern of the fabric.

40. 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 member having a plurality of apertures therein, and means adapted to enter said apertures and operatively connected to said weaving mechanism for controlling the operation thereof to produce a pattern in the fabric, as herein described.

41. In a coiled wire-fabric machine, the combination, with coiling and weaving devices, of feed rolls for feeding a plurality of wires to said devices comprising a plurality of disks, and means for automatically shifting one of the disks on one of the rolls out of alinement with the disk on the other roll to stop the feed of one of the wires to said devices, as herein described.

42. In a coiled wire-fabric machine, the combination, with coiling and weaving devices, of feed rolls for feeding a plurality of wires to said devices comprising a plurality of disks, a pattern device, and means controlled by the pattern device, for automatically shifting one of the disks on one of the rolls out of alinement with a disk on the other roll to stop the feed of one of the wires to said devices.

43. In a coiled wire fabric machine, the combination, with coiling and weaving devices, of a pattern device comprising a pattern drum having a plurality of apertures therein, means for simultaneously rotating and longitudinally moving said drum to move said apertures in a helical path, and means coöperating with the apertures in said drum for controlling the operations of the weaving devices.

44. In a coiled wire-fabric machine, the combination, with weaving devices, of mechanism for operating the weaving devices, a pattern device comprising a member having a plurality of apertures therein, means for moving said pattern member to cause any one of said apertures to be operatively connected to said weaving mechanism for controlling the operation thereof to produce a pattern in the fabric, as herein described.

45. In a coiled wire-fabric machine, the combination, with a coiling device, of a weaving device including a laterally and vertically oscillated ejecting shutter, and means for automatically suspending the vertical oscillation of said ejecting shutter, as herein described.

46. In a coiled wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a wire-way, mechanical means for clamping the coil last run in the wire-way, means for moving the preceding coil from the wire-way to draw up the last run coil, and means comprising a laterally and longitudinally movable holding shutter for moving the last run coil in

the wireway to permit the next run coil to interlock with the convolutions of the last run coil, as herein described.

47. In a coiled wire-fabric machine, the combination, with a wire-coiling device, of a weaving device including a wire-way, and a laterally and vertically oscillated ejecting shutter for moving the preceding coil from the wire-way to draw up the last run coil, as herein described.

48. In a coiled wire-fabric machine, the combination, with a wire-coiling device, of a weaving device including a wire-way, a laterally and vertically oscillated ejecting shutter for moving the preceding coil from the wire-way to draw up the last run coil, and means for removing the finished fabric from the machine simultaneously operated with the upward movement of the ejecting shutter, as herein described.

49. In a coiled wire-fabric machine, the combination, with a wire-coiling device, of a weaving device including a wireway in which the wires as coiled are run, a holding shutter, a guide bar, and means for longitudinally moving said holding shutter and guide bar, to cause the wire last run in the wire-way to interlock with the convolutions of the next run coil, comprising a pair of action slide blocks, a reciprocating link for moving either of said slide blocks, and an action slide for moving said link into position to act on either slide block to move said holding shutter and guide bar, as herein described.

50. In a coiled wire-fabric machine, the combination, with a coiling device, of a weaving device including a wireway in which the wires as coiled are run, a holding shutter, a guide bar, means for longitudinally moving said holding shutter and guide bar comprising a pair of action slide blocks, a reciprocating link for moving either of said slide blocks, and means for suspending the longitudinal movement of said holding shutter and guide bar comprising means for moving said link into inoperative position, as herein described.

51. In a coiled wire-fabric machine, the combination, with a coiling device, of a weaving device including a wire-way in which the wires as coiled are run, a holding shutter, means for laterally moving said holding shutter to engage the intersection of the preceding coil and the last coil comprising a slide and means for reciprocating said slide, and means for suspending the lateral movement of said holding shutter comprising means for locking said slide against movement, as herein described.

52. In a coiled wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a wire-way, a longitudinally movable guide bar forming one side of said wireway, a clamping bar forming the other side of said wireway for retaining the last run coil therein between it and said guide bar, a laterally and longitudinally movable holding shutter operatively connected to said guide bar and means for moving said guide bar and holding shutter longitudinally to move the last run coil in the wireway to permit the next run coil to interlock with the convolutions of the last run coil, as herein described.

53. In a coiled wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a wire-way, a longitudinally movable guide bar forming one side of said wire-way, a clamping bar forming the other side of the said wireway for retaining the last run wire therein between it and said guide bar, a laterally and longitudinally movable holding shutter operatively connected to said guide bar, a longitudinally movable feed drum operatively connected to said guide bar, and means for moving said guide bar, holding shutter and feed drum longitudinally to move the last run coil in the wire-way to permit the next run coil to interlock with the convolutions of the last run coil, as herein described.

54. In a coiled wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a wireway, a laterally movable clamping bar, a laterally and longitudinally movable holding shutter, a longitudinally movable guide bar, a laterally and vertically oscillated ejecting shutter, and mechanism for operating said clamping bar, holding shutter, guide bar and ejecting shutter to accomplish the weaving operation, as herein described.

55. In a coiled wire-fabric machine, the combination, with a wire-coiling device of a weaving device comprising a laterally and longitudinally movable holding shutter, a laterally and vertically movable ejecting shutter, a pattern device, and means controlled by the pattern device for suspending the lateral and longitudinal movement of the holding shutter, as herein described.

56. In a coiled wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a holding shutter, means for longitudinally moving said holding shutter, to cause the wire last run in the wireway to interlock with the convolutions of the next run coil, comprising a reciprocating link and an action slide for controlling the operation of said link, as herein described.

57. In a coiled wire-fabric machine, the combination, with a wire-coiling device, of a weaving device comprising a wireway in which the wires as coiled are run, a holding shutter, a guide bar, and means for longitudinally moving said holding shutter and guide bar, to cause the wire last run in the

wireway to interlock with the convolutions of the next run coil, comprising action slide blocks, means for moving said action slide blocks, means for causing said moving means to act on one of said slide blocks during one cycle of operations of the machine to move said shutter and bar in one direction and to act on the other of said slide blocks during the next cycle of operations of the machine to move said shutter and bar in the reverse direction, as herein described.

58. In a coiled wire-fabric machine, the combination, with a coiling device, of a weaving device comprising a wireway in which the wires as coiled are run, a holding shutter, a guide bar, and means for longitudinally moving said holding shutter and guide bar, to cause the wire last run in the wireway to interlock with the convolutions of the next run coil, comprising action slide blocks, a reciprocating link for moving either of said slide blocks, means for moving said link into position to engage one of said blocks to move said block during one cycle of operations of the machine to move said shutter and bar in one direction, and to move said links into position to engage the other of said blocks to move said block during the next cycle of operations of the machine to move said shutter and bar in reverse direction, as herein described.

59. In a coiled wire-fabric machine, the combination, with a coiling device, of a weaving device comprising a wire-way in which the wires as coiled are run, an ejecting shutter disposed above the wireway for raising the fabric as coiled therefrom, means for vertically moving said ejecting shutter comprising a rock shaft, means keyed to said rock shaft for operating the same, and means for suspending the vertical movement of said ejecting shutter comprising means for withdrawing the key from operative engagement with the rock shaft, as herein described.

60. In a coiled wire-fabric machine, the combination, with coiling and weaving devices, of mechanism for operating said weaving devices, a pattern device comprising a member having a plurality of apertures therein, and a plurality of fingers having means adapted to engage said apertures, and an action slide controlled by said fingers, for controlling the operation of said weaving mechanism, as herein described.

61. In a coiled wire-fabric machine, the combination, with feed rolls and coiling and weaving devices, of mechanism for operating said weaving devices, a pattern device comprising a member having a plurality of apertures therein and a plurality of fingers provided with means for engaging said apertures, an action slide controlled by the operation of said fingers, and means controlled by said slide for stopping the feed of one of the wires to said coiling devices, as herein described.

62. In a coiled wire fabric machine, the combination, with a wire-coiling device, of a weaving device including a wire-way, mechanical means for clamping the last run coil in the wire-way, and an ejecting shutter for moving the preceding coil upwardly while the last run coil is held by the clamping means.

63. In a coiled wire fabric machine, the combination, with a wire-coiling device, of a weaving device including a wire-way, a laterally movable clamping bar for retaining the coil last run in the wire-way, and an ejecting shutter for moving the preceding coil upwardly while the last run coil is held by the clamping means.

64. In a coiled wire fabric machine, the combination, with a wire-coiling device, of a weaving device including a wire-way, a laterally movable clamping bar, a vertically and laterally movable ejecting shutter, and mechanism for simultaneously operating said clamping bar and ejecting shutter.

65. In a coiled wire fabric machine, the combination, with a wire-coiling device, of a weaving device including a wire-way, a laterally movable clamping bar, a vertically and laterally movable ejecting shutter, and means for automatically suspending the vertical movement of said shutter.

66. In a coiled wire fabric machine, the combination, with a coiling device, of a weaving device including a wire-way, a laterally movable clamping bar, a laterally and vertically movable ejecting shutter, and a feeding drum coöperating with said ejecting shutter to remove the fabric from the wireway.

67. In a coiled wire fabric machine, the combination, with a coiling device, of a weaving device including a wire-way, a laterally movable clamping bar, a laterally and vertically movable ejecting shutter, a feeding drum, and means for simultaneously suspending the vertical movement of the ejecting shutter and the movement of the feeding drum.

68. In a coiled wire fabric machine, the combination, with a coiling device, of a weaving device including a wire-way, a laterally movable clamping bar, a holding shutter, and means for suspending the movement of the holding shutter.

69. In a coiled wire-fabric machine, the combination, with a coiling device, of a weaving device including a wire-way, a laterally movable clamping bar, a lengthwise movable guide bar, a lengthwise and laterally movable holding shutter, means for moving said guide bar and holding shutter lengthwise, means for suspending the action of said means for moving said guide bar and holding shutter lengthwise, and means

for suspending the lateral movement of the holding shutter.

70. In a coiled wire-fabric machine, the combination, with a coiling device, of a weaving device, including a wire-way, a laterally and longitudinally movable holding shutter, and an action slide for controlling the operation of said holding shutter.

71. In a coiled wire-fabric machine, the combination, with a coiling device, of a weaving device including a wire-way, a laterally and longitudinally movable holding shutter, an action slide for controlling the operation of said holding shutter, and a pattern device for controlling the operation of said action slide.

72. In a coiled wire-fabric machine, the combination, with a wire-coiling device, of a weaving device including a wire-way, a longitudinally movable guide bar, a laterally and longitudinally movable holding shutter, and an action slide for controlling the operation of said guide bar and holding shutter.

73. In a coiled wire-fabric machine, the combination, with a wire-coiling and weaving device, of sets of feed rolls for feeding a plurality of wires to said devices, said weaving devices including a laterally and longitudinally movable holding shutter, an action slide for controlling the operation of said holding shutter, a supplemental action slide for controlling the operation of one set of feed rolls, and a pattern device for controlling the operation of said action slides.

74. In a coiled wire-fabric machine, the combination, with a coiling device, of a weaving device including a laterally and lengthwise movable holding shutter, and a vertically movable ejecting shutter, and means including an action slide for controlling the movements of said holding shutter and ejecting shutter, and a pattern device for controlling the operation of said action slide.

75. 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 said trigger downwardly below the range of the coils and then upwardly and finally forwardly in engagement therewith comprising a reciprocating trigger slide, a swinging shaft actuated thereby, a collar secured to said shaft and carrying a trigger engaging lug, and a disk pivotally secured to said trigger and slidably mounted with respect to said collar.

76. 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 including a reciprocating trigger slide for actuating said trigger, said trigger slide having a T-shaped slot therein, said weaving device including an action slide link and a pin on said link for engaging in said slot whereby the operation of said trigger slide will be controlled by said action slide link.

77. In a coiled wire fabric machine, the combination, with a coiling device, of a weaving device including a wireway, a clamping bar, means for laterally moving said clamping bar comprising a feed bar operatively connected to said clamping bar, and an oscillating lever for operating said feed bar.

78. In a coiled wire fabric machine, the combination, with a coiling device, of a weaving device including a wireway, a clamping bar, means for laterally moving said clamping bar comprising a feed bar operatively connected to said clamping bar, a swinging lever operatively connected to said feed bar, a block adjustably mounted on said lever, a cam roller mounted on said block, and a cam for operating said roller.

79. In a coiled wire-fabric machine, the combination with a coiling device, of a weaving device comprising a wire-way, a laterally movable clamping bar, a longitudinally movable guide bar, a laterally and longitudinally movable holding shutter, a laterally and vertically movable ejecting shutter, means for suspending the longitudinal movement of said guide bar and holding shutter, means for suspending the lateral movement of the holding shutter, and means for suspending the vertical movement of said ejecting shutter.

80. In a coiled wire-fabric machine, the combination with a coiling device, of a weaving device comprising a wire-way, a laterally movable clamping bar, a longitudinally movable guide bar, a laterally and longitudinally movable holding shutter, a laterally and vertically movable ejecting shutter, a rotary feed drum, means for suspending the longitudinal movement of said guide bar and holding shutter, means for suspending the lateral movement of the holding shutter, and means for suspending the vertical movement of said ejecting shutter and the rotary movement of the feed drum.

81. In a coiled wire-fabric machine, the combination, with a coiling device, of a weaving device including a wire-way and a laterally movable clamping bar, means for operating said bar, and means for varying the period of operation of said bar operating means.

82. In a coiled wire-fabric machine, the combination, with a coiling device, of a weaving device including a wire-way, a clamping bar, means for laterally moving said bar including a cam, and means for varying the period of operation of said cam.

83. In a coiled wire-fabric machine, the combination, with a coiling device, of a weaving device including a wire-way in which the wires as coiled are run, a clamping bar for retaining the wire last run in the wire-way, means for laterally moving said bar, and means for varying the time of operation of said bar-moving means.

84. In a coiled-wire fabric machine, the combination, with a coiling device, of a weaving device including a wire-way, a clamping bar for retaining the last run wire in the wire-way, means for laterally moving said bar including a cam and a cam roller riding on said cam, and means for varying the time of operation of said moving means comprising means for varying the position of said roller with respect to said cam.

85. In a coiled wire fabric machine, the combination, with a coiling device, of a weaving device including a wire-way, a longitudinally movable holding shutter, means for operating said shutter, and an action slide for controlling the operation of said shutter operating means.

86. In a coiled wire-fabric machine, the combination, with a coiling device, of a weaving device including a wire-way in which the wires as coiled are run, an ejecting shutter disposed above the wire-way for raising the fabric therefrom, means for vertically moving said ejecting shutter comprising a rock shaft, means keyed to said shaft for operating the same, means for withdrawing the key from operative engagement with the rock shaft to suspend the vertical movement of the ejecting shutter, and an action slide for controlling the operation of said key-withdrawing means.

87. In a wire-fabric machine, the combination, with a coiling device, of a weaving device including a wire-way, a laterally and longitudinally movable holding shutter, a longitudinally movable guide bar, a laterally and vertically movable ejecting shutter, means for suspending the longitudinal movement of said holding shutter and guide bar, means for suspending the lateral movement of said holding shutter, means for suspending the vertical movement of said ejecting shutter, and an action slide for controlling the operation of said movement-suspension-means.

88. In a coiled wire-fabric machine, the combination, with a coiling device, of a weaving device including a wire-way, a laterally and longitudinally movable holding shutter, a longitudinally movable guide bar, a laterally and vertically movable ejecting shutter, means for suspending the longitudinal movement of said holding shutter and guide bar, means for suspending the lateral movement of said holding shutter, means for suspending the vertical movement of said ejecting shutter, and an action slide for controlling the operation of said movement-suspension-means, and a pattern device for controlling the operation of the action slide.

89. In a coiled wire-fabric machine, the combination, with coiling and weaving devices, of mechanism for operating the weaving device, a pattern device comprising a revoluble and lengthwise movable pattern drum provided with a plurality of apertures and projections, means for operating said drum, means coöperating with said projections for controlling said operating means, and means coöperating with said pattern device and controlling the movements of the weaving device.

90. In a coiled wire-fabric machine, the combination with coiling and weaving devices, of mechanism for operating the weaving device including an action slide, and means for controlling the operation of said slide comprising a plurality of fingers and a pattern device coöperating with said fingers.

91. In a coiled wire-fabric machine, the combination with coiling and weaving devices, of mechanism for operating the weaving device including an action slide, and means for controlling the operation of said slide comprising a plurality of fingers provided with pins and a pattern device provided with a plurality of depressions in which said pins engage.

92. In a coiled wire fabric machine, the combination, with coiling and weaving devices, of mechanism for operating the weaving device, a pattern device comprising a revoluble and lengthwise movable pattern drum provided with a plurality of depressions and projections, a threaded shaft upon which said drum is mounted, a sleeve mounted on said shaft and slidably keyed to said drum, means for rotating said sleeve, means for reversing the direction of rotation of said sleeve after the drum has moved a predetermined distance, and means coöperating with said pattern device and controlling the movement of the weaving device.

In testimony whereof, I affix my signature, in presence of two witnesses.

WILBER J. PINE.

Witnesses:
A. W. KIRST,
E. MADEWALD.