Nov. 20, 1923 **1,474,416**

E. F. HATHAWAY

COMBINED COUNTING MECHANISM AND WEFT CONTROLLING MECHANISM GOVERNED THEREBY

Filed March 25, 1921 6 Sheets-Sheet 1

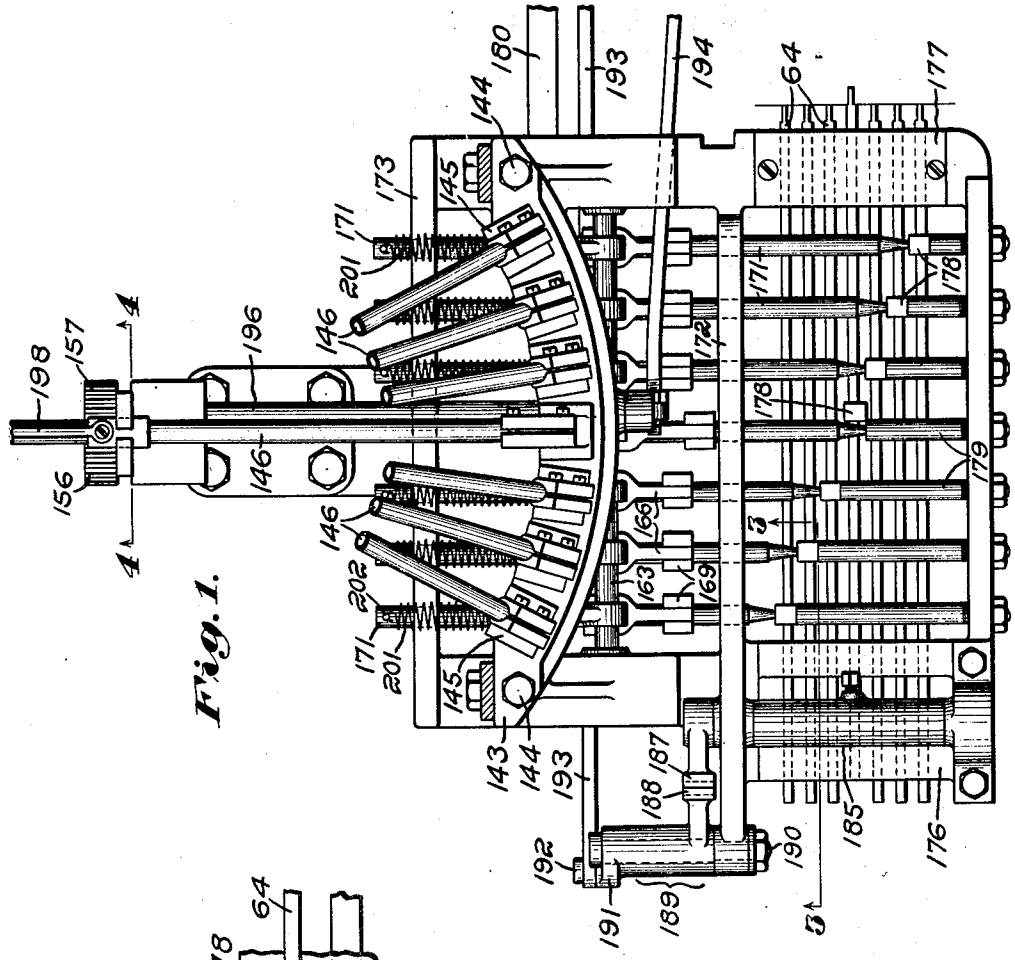


Fig. 1.

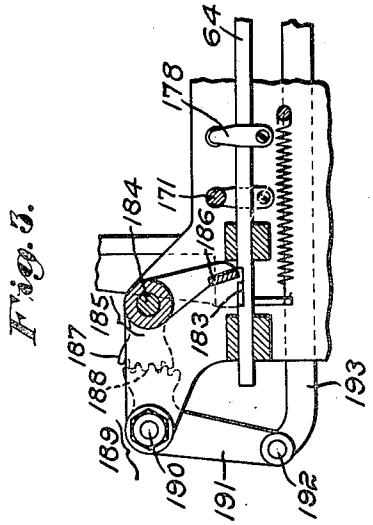


Fig. 3.

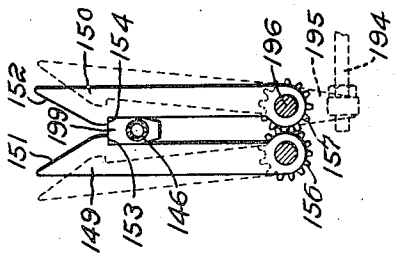


Fig. 4.

Inventor:
Edgar F. Hathaway,
by Emery, Booth, Janney and Varney
Attys.

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Filed March 25, 1921 6 Sheets-Sheet 2

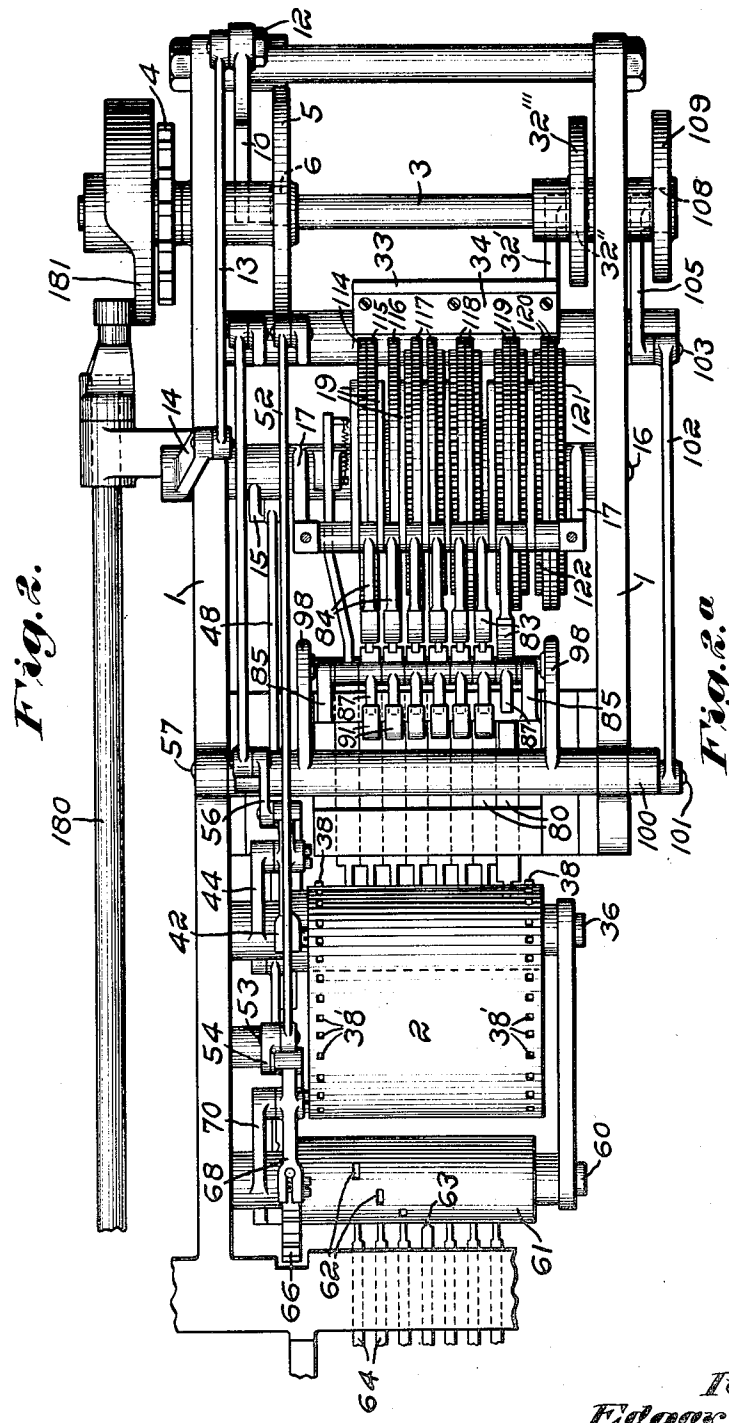


Fig. 2.

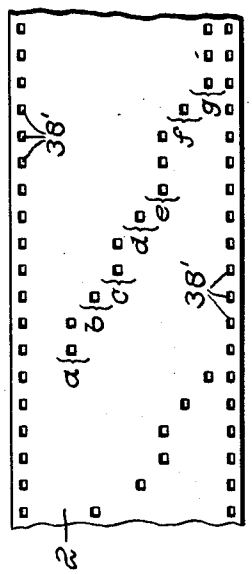


Fig. 2.a

Inventor:
Edgar F. Hathaway,
by Emery, Booth, Jarmey and Varney
Attys.

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E. F. HATHAWAY

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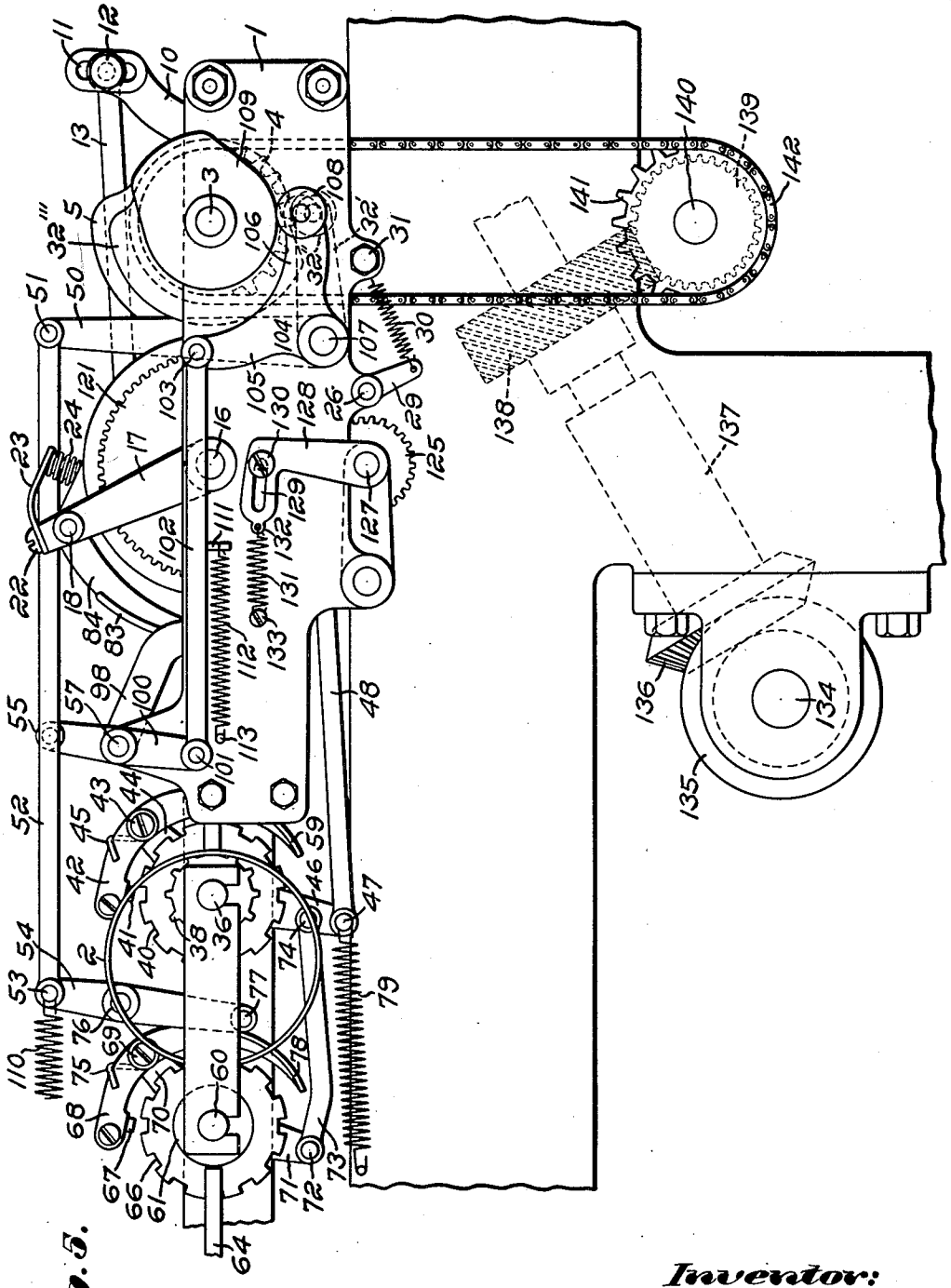


Fig. 3.

Inventor:
Edgar F. Hathaway,
by Emery, Booth, Janney and Varney
Attys.

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Filed March 25, 1921 6 Sheets-Sheet 4

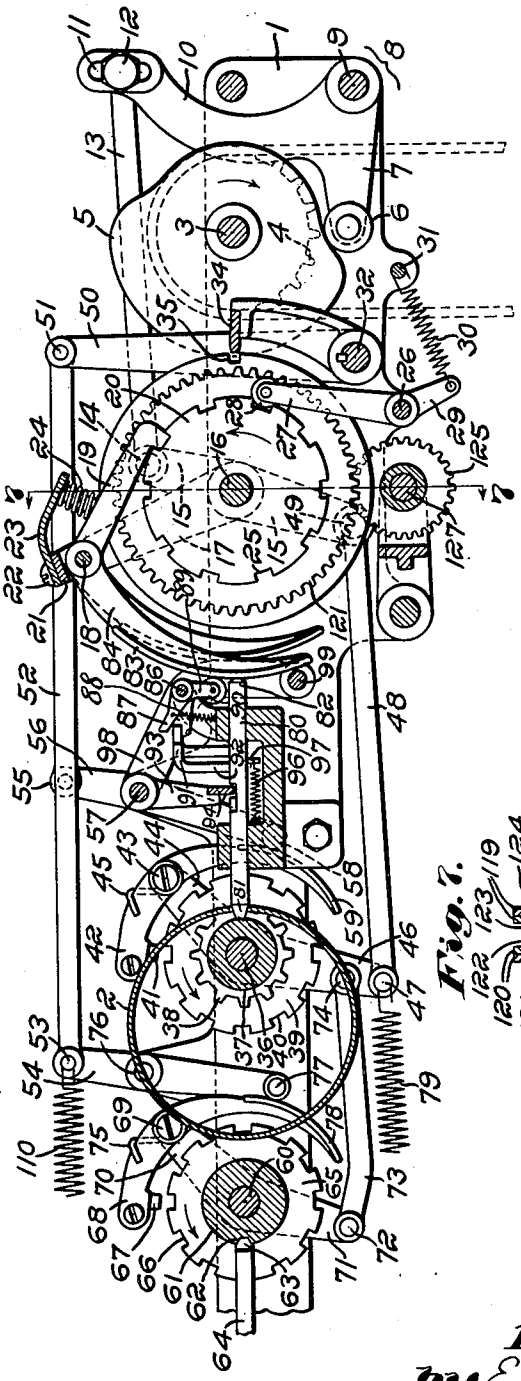


Fig. 6.

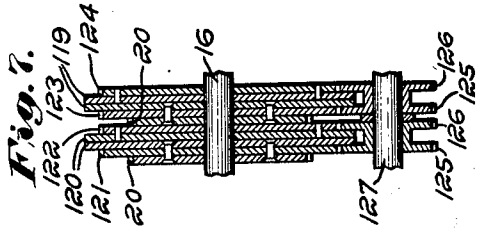


Fig. 7.

Inventor:
Edgar F. Hathaway,
by Emery, Booth, Jamey and Varney
Attys.

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E. F. HATHAWAY

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Filed March 25, 1921 6 Sheets-Sheet 5

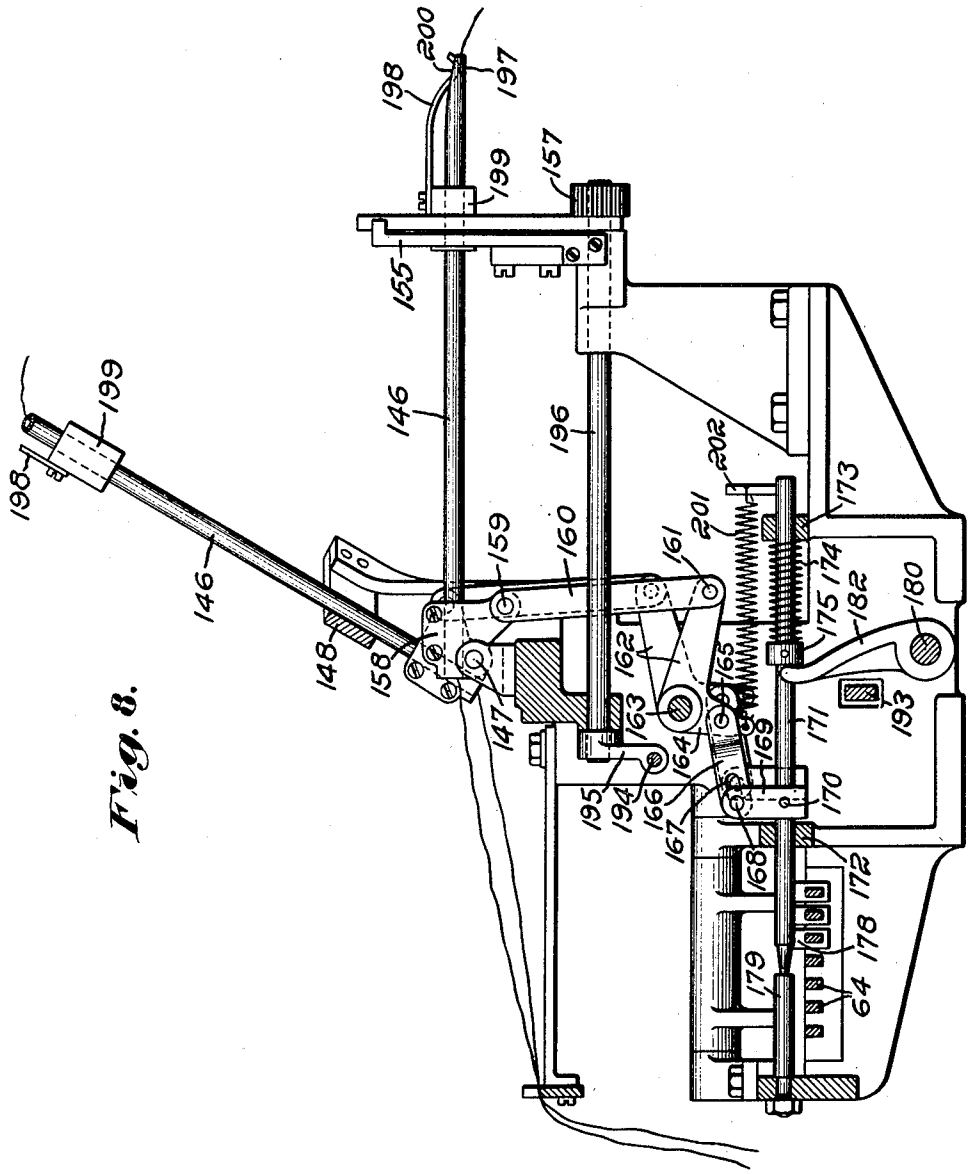


Fig. 8.

Inventor:
Edgar F. Hathaway,
by Emley, Booth, Janney and Varney
Attys.

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E. F. HATHAWAY

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Filed March 25, 1921 6 Sheets-Sheet 6

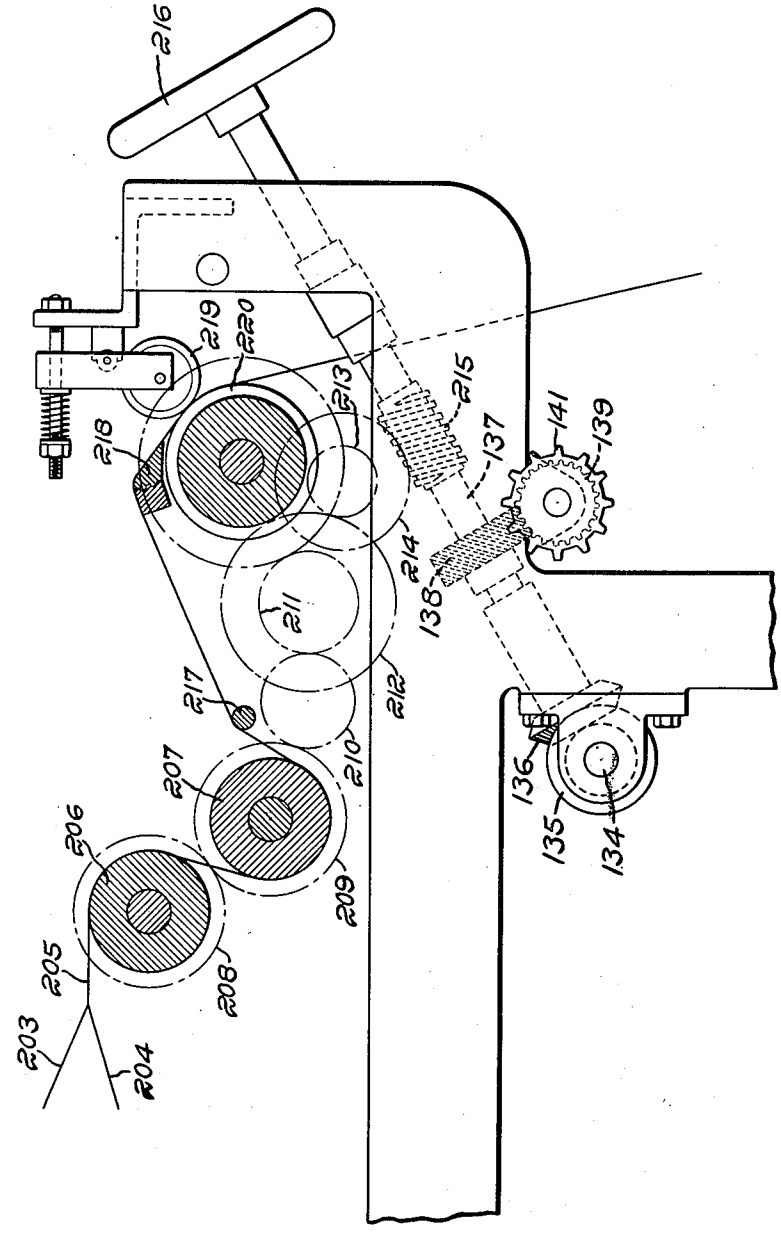


Fig. 9.

Inventor:
Edgar F. Hathaway,
by Emery, Booth, Janney and Varney,
Attys.

Patented Nov. 20, 1923. 1,474,416

UNITED STATES PATENT OFFICE

EDGAR F. HATHAWAY, OF DORCHESTER, MASSACHUSETTS, ASSIGNOR TO MOHAWK CARPET MILLS, INC., OF AMSTERDAM, NEW YORK, A CORPORATION OF NEW YORK.

COMBINED COUNTING MECHANISM AND WEFT-CONTROLLING MECHANISM GOVERNED THEREBY.

Application filed March 25, 1921. Serial No. 455,503.

To all whom it may concern:

Be it known that I, EDGAR F. HATHAWAY, a citizen of the United States, and a resident of Dorchester, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Combined Counting Mechanism and Weft-Controlling Mechanism Governed Thereby, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to combined counting mechanism and weft control mechanism governed thereby. In order that the principle of the invention may be readily understood I have disclosed a single embodiment thereof in the accompanying drawings, wherein—

Fig. 1 is a plan view of that part of the mechanism that is most directly related to the weft or thread control;

Fig. 2 is a plan view of the counting mechanism, and said Figs. 1 and 2 together constitute a plan view of the entire organization;

Fig. 2ª is a plan view of a part of the main pattern member;

Fig. 3 is a detail in vertical section upon the line 3—3 of Fig. 1 and looking in the direction of the arrows there indicated;

Fig. 4 is a detail in vertical section upon the line 4—4 of Fig. 1 and looking in the same direction;

Fig. 5 is a side elevation of the counting mechanism and of the means for imparting movement thereto from the main drive shaft of the entire mechanism;

Fig. 6 is a vertical longitudinal section of the counting mechanism shown in Fig. 5;

Fig. 7 is a view in vertical section taken through certain of the counters of the counting mechanism;

Fig. 8 is a view in longitudinal section and in elevation of the weft positioning mechanism shown in Fig. 1.

Fig. 9 is a view mainly in longitudinal section and partly in elevation, of the driving means for the mechanism and including means for the backward rotation of the counter mechanism.

In my co-pending applications, Serial Nos. 449,887 and 481,416, I have represented mechanism whereby a chenille fabric is formed by interweaving warp threads with weft threads, such fabric being severed by the mechanism into strips in which the warp threads extend longitudinally, such strips being accumulated in receptacles for further use. In my application Serial No. 449,888, I have disclosed a series of weft positioning fingers or elements adapted to supply wefts of differing characteristics, such, for example, as wefts of different colors. In this application, I have disclosed such weft positioning elements or fingers and counting or pattern mechanism for controlling the position thereof, such pattern or counting mechanism being in itself of general application, but being in this application claimed in combination with and as a part of the weft controlling mechanism with which it peculiarly cooperates. To this end, I will therefore first disclose the counting mechanism and then the weft control mechanism governed thereby, the former mechanism being disclosed in Fig. 2 and Figs. 5 to 9 inclusive.

Referring more particularly to the drawings, the framing of the mechanism is indicated generally at 1 and for the purposes of the description it may be regarded as a part of the framing of the mechanism shown in said co-pending applications wherein is disclosed means for forming a chenille fabric that is cut into chenille strips. In such an organization, I desirably provide means for supplying any one of a series of differentiated weft threads to a weft laying device. While such wefts may be differentiated by reason of any selected characteristics, they are desirably contrasted in color. In such an organization each weft thread or yarn is supplied to the weft carrier by an element which may be a tube or finger, and the functioning element is positioned in such relation to the weft carrier that its yarn or thread is supplied thereto. The functioning position of such element is controlled by a pattern organization and for purposes of this description, the master pattern may be assumed to be the pattern surface 2 represented in the several figures of the drawing. It is clearly to be understood, however, that the application of my inven-

tion is broad and such specific description as is herein given does not constitute a limitation in this respect.

In Figs. 2, 5 and 6, I have indicated at 3 a shaft mounted in the framing and having fast thereon a sprocket gear 4 that is adapted to be driven from some suitable part of the mechanism. Fast upon the shaft 3 is a cam 5. In the referred to application of my invention, the cam 5 makes one complete rotation to one complete reciprocation of the lay of the mechanism by which the wefts are beaten up. Engaging with the periphery of the cam 5 is a roll 6 upon the arm 7 of a lever 8 pivoted at 9 upon the framing 1 and having an arm 10 provided with a slot 11 in its free end. Pivotally mounted in the said slot at 12 is the end of a link 13 which at its other end is pivotally connected at 14 to a lever arm 15 loosely mounted upon a shaft 16 but fast with two lever arms 17 also pivotally mounted on said shaft 16 at opposite ends thereof, and near their outer ends each having a pin or pivotal support 18 for a series of pawls 19, which correspond in number with the number of counters or members hereinafter more fully referred to, and which in the present instance are the unit counter and the five, the ten, the fifty, the one hundred, the five hundred and the one thousand counters. All of said counters, which will be described more fully hereinafter, are loosely mounted upon said shaft 16 for step-by-step rotation and are shown in plan in Fig. 2.

It will be understood from the foregoing description that the levers 17 are constantly reciprocated from the cam 5 and that they tend constantly to impart a step-by-step movement through the series of pawls 19 to the various counters. As hereinafter set forth the functioning of the pawls 19 is controlled by certain pattern mechanism, so that according to the dictates of the pattern, the selected counter member may be caused to function and to count in accordance with the dictates of the pattern and in accordance with its own formation.

As shown most clearly in Figs. 5 and 6, I provide means tending normally to move the several pawls 19 into engagement with their ratchets, one of which latter is indicated at 20 in Fig. 6, and the number thereof equalling the number of counters. For this purpose, the outer ends of the levers 17 are represented as having a cross piece 21 thereon to which is secured by screws 22 a plate 23 extending across the mechanism and supporting a series of coiled springs 24 positioned above the respective pawls 19, the lower ends of said springs pressing upon the said pawls and corresponding in number thereto. As will be pointed out hereinafter, only a single pawl 19 is permitted to function at a given time, and then only in accordance with the dictates of the pattern mechanism.

The ratchet 20 shown in Fig. 6 is provided with a series of pawl receiving notches 25 and to prevent over movement of the ratchet, I provide a lever pivoted at 26, one arm 27 of said lever having a roll 28 adapted to engage the notches 25 and the other arm 29 of said lever having connected thereto a coil spring 30, the opposite end of which is connected to a cross rod or stud 31 upon the framing 1. The entire series of ratchets 20 is similarly constructed.

In the side members of the framing 1, there is supported for rocking movement a shaft 32 adapted to be rocked by a lever arm 32′ fast thereon and provided with a roll 32″ bearing upon the periphery of the cam 32‴ fast upon the shaft 3, and shown most clearly in Figs. 5 and 6. Said shaft is constantly rocked at regularly intervals, and in the disclosed embodiment of the invention once for each revolution of the shaft 3, and has fast thereon a feeler arm 33 extending entirely across the series of counter elements, as indicated most clearly in Fig. 2. Secured to the upper end of said arm 33 is a feeler 34 preferably in the form of a plate or bar and adapted constantly to be rocked toward and from the series of counter elements and to enter into the series of notches, one of which is indicated at 35 in Fig. 6, when the entire series of notches is brought into transverse alignment.

As pointed out more fully hereinafter, the number of said notches 35 upon the several counter elements depends upon the counting capacity of that element. For example, in the unit counter, there may be provided ten such notches 35 whereas the tens counter may be provided with but one such notch. In the counter elements that are adapted to count higher numbers, as for example the thousand, I may and preferably do provide for a duplex organization wherein at the end of the count, two notches of that duplex organization are themselves brought into transverse alignment, as well as with notches in the other counters of the series.

Suitably mounted in the framing is a shaft 36 preferably in substantially the same horizontal plane as the shafts 3 and 16, and fast thereon is a drum or barrel 37 having thereon at its opposite ends teeth 38 adapted to engage the rows of perforations 38′ in the opposite ends of the pattern surface or roll 2 so as to move the latter in a step-by-step manner as hereinafter set forth, it being noted that the surface 2 may when formed as a cylinder be of any suitable diameter and is supported loosely or tightly as the case may be, by the drum 37. Also fast upon the shaft 36 is a ratchet 39 having spaces 40 adapted to be engaged at desig-

nated times by a tooth or pawl 41 upon a lever 42 pivoted at 43 upon the arm 44 of a lever which is itself loosely mounted upon the shaft 36. A suitable spring 45 is provided tending normally to hold the tooth 41 in functioning relation to the ratchet 39. Rigid with the lever arm 44 is a lever arm 46 which at its outer end 47 is pivotally connected to a link 48 itself pivotally connected at 49 to one end of the lever 15 and which as heretofore stated is constantly operated through the agency of the cam 5. Thus a constant movement of oscillation is imparted to the pawl lever 42 and a constant step-by-step movement would thereby be imparted to the pattern surface 2 were not means provided, which will now be described, to hold the pawl lever 42 out of functioning relation with the ratchet 39, excepting at the times said ratchet 39 is to receive movement in accordance with the count.

Fast upon the rock shaft 32 and hence rigid with the feeler bar 34, and which latter is permitted to make a complete movement to the left viewing Fig. 6 only when the notches 35 are all brought into transverse alignment, is a lever arm 50 to the outer end whereof is pivotally connected at 51 a link 52 which at its opposite end is pivotally connected at 53 to a lever 54. Between its ends and as indicated at 55, there is pivotally connected to the link 52 a lever 56 which is loosely mounted for rocking movement upon a stud or short shaft 57. The lower end of said lever 56 is represented in dotted lines in Fig. 6 as having a head or enlargement 58 which is adapted to bear against a flange 59 upon the lower end of the pawl lever 42, the construction being such that until the link 52 is permitted to move to the full extent of its movement to the left viewing Fig. 6 (and which can occur only when the notches 35 come into transverse alignment), the projection 58 on the lever 56 will, because of its engagement with the flange 59 of the pawl lever 42, hold the tooth or pawl 41 out of engagement with the ratchet 39 throughout the oscillating movements of the lever 44, and hence no movement is imparted to the said ratchet 39 and therefore the pattern surface 2 remains stationary. When, however, the notches 35 are brought into transverse alignment, then the link 52 makes its full movement toward the left viewing Fig. 6, upon the ensuing feeling movement of the feeler 34, thus withdrawing the projection 58 from the flange 59 of the pawl lever 42 and the spring 45 thereupon moves the tooth or pawl 41 into functioning relation with the ratchet 39 and moves the latter one step, thus moving the pattern surface 2 one step with the result that by intermediate devices to be hereinafter referred to, the notches 35 no longer remain in transverse alignment.

Suitably mounted in the framing 1 and as here shown in substantially the same horizontal plane as the shafts 3, 16, 36 is a shaft 60 having fast thereon a drum 61 which may and preferably does correspond with a drum shown in my co-pending application Serial No. 449,888, said drum desirably being composed of a series of disks placed in face to face contact and each provided with one or more sockets 62 according to the desired pattern, said sockets being adapted to receive the tapered ends 63 of a series of rods or spindles 64 by which the mechanism may be controlled.

Fast upon the shaft 60 is a ratchet 65 having notches or spaces 66 with which at the proper times is adapted to engage a tooth 67 upon a pawl lever 68 itself pivotally mounted at 69 upon a lever arm 70 loose upon the shaft 60 but fast with a lever arm 71 which is pivotally connected at 72 to a link 73 itself pivotally connected at its opposite end at 74 to the lever arm 46 between its ends.

As heretofore stated, the lever 46 is constantly oscillated through the described connections from the cam 5. Thus the lever arm 70 with its pawl lever 68 is constantly oscillated and would impart a constant step-by-step movement of rotation to the ratchet 65 were it not that I have provided means whereby only at certain times is the tooth or pawl 67 permitted to enter a notch in the ratchet 65 and to function by imparting a stepped movement to said ratchet 65 and consequently to the drum 61. I provide a suitable spring 75 tending constantly to move the tooth or pawl 67 into engagement with the ratchet 65.

The lever 54 is pivoted intermediate its ends upon the frame at 76 and at its lower end has a roll or head 77 which is adapted to bear against a flange 78 upon the lower end of the pawl lever 68, the construction being similar to that provided for the pawl lever 42 and so that a movement of oscillation may be imparted to the lever 70 with a bodily movement of the pawl lever 68 and throughout such movement the pawl 67 may and will be held out of functioning relation to the ratchet 65 excepting in the event that the lever 54 is rocked so as to withdraw the roll or projection 77 from the flange 78. In such event the pawl 67 is permitted to function and a movement of one step is imparted to the drum 61, the rods or plungers 64 being at the same time withdrawn from functioning relation with the said drum in a manner hereinafter more fully pointed out.

Preferably I provide a coiled or other spring 79 connected to the framing and to the lever 46 tending to rock said lever in a clockwise direction and through the connections thereto to hold the roll 6 in contact with the cam 5.

The pattern surface 2 as represented most

clearly in Fig. 2ª is provided with series of perforations which I have generally indicated respectively at *a*, *b*, *c*, *d*, *e*, *f* and *g*, and cooperating respectively with the disks for counting units, fives, ten, fifties, one hundreds, five hundreds and thousands. It will be understood that counters of any desired denomination may be provided, those herein represented being indicative merely of counters that may be employed. For each of said counters I provide as most clearly represented in Fig. 6 a plunger or spindle 80 which are herein shown as having tapered ends 81 to enter openings in the pattern surface 2 or to ride on said surface. Said plungers or spindles at their opposite ends 82 are respectively adapted to engage flanges 83 upon a corresponding number of lever arms 84 respectively fast with the pawl levers 19 mounted upon the stud or pin 18. As heretofore set forth, the several ratchets 20 of the series of counters are adapted to be rotated in a step-by-step manner by the corresponding pawls 19. While the coil springs 24 tend normally to hold the pawls 19 in functioning relation with the ratches 20, it is to be understood that the respective plungers or spindles 80 under the dictates of the pattern 2 will, when riding upon the surface of the said pattern, hold the corresponding pawls 19 out of functioning relation with the ratchet 20. When, however, and as indicated in Fig. 6, a spindle or plunger 80 is received in an opening in the pattern surface 2, it moves to the left viewing Fig. 6, and permits the corresponding pawl 19 to enter a notch in the corresponding ratchet 20 and to turn the same one step. This operation is repeated according to the dictates of the pattern surface 2.

The pattern surface 2 may be made of any suitable material such as metal or even paper. If, however, the pattern surface be made of paper or some like material, there is a tendency on the part of the spindles or plungers 80 in their constant axial movements to wear holes in the surface 2. I therefore find it desirable to take strain off the said spindles or plungers 80 which in the disclosed embodiment of my invention are employed to rock the pawls 19. While for this purpose any suitable means may be provided, I have employed the following mechanism.

Upon an upstanding part 85 of the framing, there is provided a stud or pin 86 upon which are loosely mounted a series of bell crank levers corresponding in number to the number of pawls 19 and each having one arm 87 to which is connected a spring 88 tending to rock said levers in a contra-clockwise direction and an arm 89 having thereon a roll 90 adapted to take against the corresponding flange 83 on the corresponding lever arm 84. Thus each lever arm 84 when rocked to the left viewing Fig. 6 rocks the corresponding bell crank lever 87, 89 upon the stud or pin 86 so as to bring the corresponding arm 87 into contact with the under side of the bent end 91 of a corresponding pin 92 fast on and upstanding from the corresponding spindle or plunger 80. This upward pressure against the pin 92 relieves largely the pressure in an axial direction upon the corresponding spindle or plunger 80 and permits me to employ pattern surfaces 2 of relatively light material such as paper without danger of wearing holes in such pattern surfaces. Any other suitable means may be provided to accomplish this result.

I provide means whereby periodically, and preferably once at each revolution of the cam shaft 3, all the plungers or spindles 80 are momentarily withdrawn from the pattern surface 2 so as to permit the latter to be turned if such movement is called for, and also to withdraw the several pawls 19 from, or to move them outwardly with respect to, the ratchets 20. While for this purpose any suitable means may be provided, I have herein provided the following organization of parts.

Upon the stud or pin 57 I loosely mount a pair of similar bell crank levers, one arm 93 of each of which is provided at its lower end with a cross bar or actuator 94 connecting said levers and adapted to move to and fro in a series of slots or elongated recesses 95 in the upper surface of the several spindles or rods 80, thereby when said bell crank levers are rocked, to move said spindles or rods 80 in an axial direction and thus momentarily to withdraw their ends 81 from the pattern surface 2 and to cause them momentarily to swing the pawls 19 out of functioning relation with or away from the ratchets 20. The said spindles or rods 80 are, however, normally held in engagement with the surface 2 by means of a corresponding number of coiled springs 96 connected at one end to pins 97 depending therefrom and at their other ends to the framing 1.

As most clearly shown in Fig. 6, the opposite arms 98 of said bell crank levers at their lower ends are connected by a cross pin 99 which, when said levers 93, 98 are rocked so as to move in a contraclockwise direction, engage all the lever arms 84 and rock them in a contraclockwise direction thus withdrawing the pawls 19 from or moving them away from the several ratchets 20. Fast with the pair of levers 93, 98 is a lever arm 100 to which is pivotally connected at its end 101 a link 102 to the opposite end 103 whereof is pivotally connected a bell crank lever 104 having arms 105, 106, said lever being pivoted at 107 and provided at the end of the arm 106 with a roll 108 adapted to bear upon the periphery of a cam 109 fast upon

the shaft 3, and therefore rotating once to each complete reciprocation of the lay in the described application of the invention. The link 52 has connected to its left hand end viewing Fig. 6, a coil spring 110, the opposite end whereof is connected to the framing and tending normally to hold the feeler 34 against the series of counters and to cause it to enter the notches 35 therein when in alignment.

The feeler 34 is so controlled by the cam 32''' that it is normally out of contact with the periphery of the counter disks or elements, but is periodically—that is, at each revolution of the shaft 3—rocked toward said counter elements so as to enter the slots 35 if in alignment.

Unless the said slots 35 be in alignment, the periodic movement of said feeler is through a small arc and consequently the movement of the link 52 and the parts connected thereto is also slight. The full movement of said link is, as heretofore stated, performed only when the feeler 32 enters the aligned slots 35.

The cross pin 99 is periodically moved by the lever arms 98, which in turn are moved from the cam 109, so as to swing all the pawls 19 away from the ratchets 20. Thus all strain, or substantially all strain, is taken off the plungers or spindles 80, it being understood that said plungers or spindles are employed to prevent all the pawls 19 from engaging the respective ratchets 20, excepting that pawl that is called into action by reason of an opening in the pattern surface 2, as indicated in Fig. 6. Thus, if desired, the spindles or plungers 80 may be made somewhat shorter than indicated, and so that at times there will be clearance between their ends and the flanges 83 upon the lower arms 84.

In order to maintain the roll 108 in contact with the cam 109, I provide the link 102 with a pin 111 to which is connected one end of a coil spring 112, the other end whereof is connected to a pin 113 upon the framing.

The pattern surface 2 may be of any suitable form or shape, and may be simply a sheet. Preferably, however, it is endless, and is herein shown as of cylindrical form.

Each of the said counters is provided with a ratchet 20 as indicated in side elevation in Fig. 6. In Fig. 7, I have indicated in vertical section two counter elements, namely, the thousands and the five hundreds counters. The two disks of the thousands counter are indicated at 120, 120 in said figure, and at the right and left sides respectively of said disks are represented gears 121, 122 which are respectively secured to the said disks 120, 120. The ratchet 20 is secured to one of the gears 121 and to its disk 120.

Gears 121 and 122 have respectively ninety-nine teeth and one hundred teeth. The five hundreds counter shown in Fig. 7 is of generally similar construction to the thousands. It is provided with a ratchet 20 and two gears 123, 124 having respectively ninety-nine teeth and one hundred teeth, and between them are positioned the two disks 119 respectively secured to the said gears. In order to convey motion from the ratchet 20 and its attached gear 121 to the gear 122, I provide a series of double pinions 125, 126, each formed as an integral member and loosely mounted upon a shaft 127 represented in Figs. 5, 6 and 7. The pinions 125, 126 have the same number of teeth, and it will be understood that because the gears 122 and 124 each have one more tooth than the gears 121 and 123, it will require in the case of the thousands counter one thousand impulses of the corresponding pawl 19 to bring the two notches 35 into transverse alignment, and in the case of the five hundreds counter, it will require five hundred impulses of the corresponding pawl 19 to bring two of the notches 35 into transverse alignment.

I may provide any suitable means to move the sets of pinions 125, 126 out of meshing relation with the pinions 121, 122, etc., so as to permit the manual resetting or reverse rotation of the various counters. For this purpose, I have in Fig. 5, represented the shaft 127 as mounted in two parallel arms 128 at its opposite ends, said arms being at their upper ends provided with eccentric or cam shaped slots 129 receiving pins or screws 130 mounted in the framing 1. A coil spring 131 connected to an ear 132 upon each lever 128 and to the screw 133 upon the framing tends to hold the levers in the position indicated in Fig. 5, and thus to hold the sets of pinions 125, 126 in meshing relation with the pinions 121, 122, etc. By moving the levers 128 in a clockwise direction against the tension of the spring 131, the springs 125, 126 are withdrawn from meshing relation with the said gears 121, 122, etc.

I have illustrated and described the use of a units counter among others. It is not necessary to employ a units counter, as will be evident from the following.

I have described the units counter as having ten notches 35. Each of the ratchets 20 for the several counters is shown in Fig. 6 as having ten notches. Thus it is evident that when the notches 35 are brought into transverse alignment, the proper counter is moved one step, that is, ratchet 20 is moved the distance of one notch 35. This, however, is the same as moving the units counter the distance between two adjacent notches 35 therein. Thus, the units counter may itself be omitted and the pattern 2 may be moved the distance between two adjacent openings in the units path a in Fig. 2^a.

In the said Figure 2^a, I have indicated a

series of openings *a* to *g* inclusive, which would count 3877.

It is evident from the foregoing description that during a single rotation of the shaft 3, the feeder 34 is oscillated once to feel for the notches 35. If they are found to be in alignment, the feeler 34 enters said notches, and as a consequence, the link 52 is moved fully to the left viewing Fig. 6, and thereby the head 58 of the lever 56 is withdrawn from the pawl lever 42 and the head 77 of the lever 54 is withdrawn from the pawl lever 68. Thereupon both of said pawls are thrown by their springs into engagement with their ratchets 39 and 65. Thereupon the pattern surface 2 is moved one step, and according to the arrangement of the perforations therein, the spindles or plungers 80 are positioned so as to determine which counter shall be turned one step through its ratchet 20 and its pawl 19. Thus the pattern 2 through the plungers 80 controls the actuation of the counters, and the counters in turn control the movement of the pattern 2. The drum 61, by which the parts to be ultimately controlled are positioned or moved, and which I term a subsidiary pattern, is itself governed in its movement by the counters, and therefore by the pattern 2.

It will also be evident that at each rotation of the shaft 3, all the spindles or plungers 80 are momentarily withdrawn from the pattern 2, thus freeing said pattern from the plungers and permitting it to be turned one step, if such movement is dictated by any one of the counters.

Furthermore, at each rotation of the shaft 3, all the pawls 19 are moved out of engagement or away from the ratchets 20, so that if the notches 35 are found by the feeler 34 to be in transverse alignment, then the proper pawl 19 may be permitted through the corresponding spindle or plunger 80 to be moved by its spring 24 into engagement with a notch in the corresponding ratchet 20. Futhermore at each rotation of the shaft 3, all of the pawls 19 are moved in a contraclockwise direction, so that if any one of said pawls has been brought into functioning relation to its ratchet 20, it will impart a movement of one step thereto, the other pawls moving idly because withheld from functioning relation by the position of the plungers or spindles 80.

Thus far I have described in detail the counting mechanism and disclosed how the counters are controlled by the main pattern member 2, and how the counters in themselves control the movement of the said pattern member 2. I have also set forth how the main pattern member 2 controls the movement of the subsidiary pattern member 61. I will now describe the preferred means for driving the shaft 3 whereon the controlling cams are mounted, and thereafter I will describe the weft elements or fingers which are the ultimate parts governed or controlled by the counters.

Referring to Fig. 5, I have therein represented the main driving shaft of the entire mechanism at 134. It is provided with a bevel gear 135 meshing with and driving a like gear 136 on an inclined shaft 137 mounted in suitable bearings and having fast thereon a spiral gear 138 meshing with a like gear 139 fast upon the shaft 140. Upon said shaft 140 is a sprocket gear 141 about which passes a sprocket chain 142, said chain extending to and passing about the sprocket gear 4 shown in dotted lines in Fig. 5 and in full lines in Fig. 2. In this or in any other suitable manner, the shaft 3 with its cams is constantly rotated and desirably at such a speed that the cams make one complete rotation to one complete reciprocation of the lay of the mechanism, by which the separate lengths of weft yarns or threads are beaten up.

The fabric that is formed by the mechanism controlled by the organization herein claimed is a chenille fabric wherein are straight warp threads, doup warp threads and weft or filling threads. A shed is formed by the warp and filling threads, and the weft or filling threads are inserted in separate lengths therein and beaten up, after which the fabric is cut into so-called chenille strips and desirably by mechanism shown in my co-pending application Serial No. 450,612.

In order to place the selected weft threads in position for beating up, I provide a series of elements or fingers each carrying a weft thread or yarn. These elements or fingers are governed or controlled by the counter mechanism, and each as required is brought into position to be seized by a weft carrier and drawn across the lay in the shed and in position to be beaten up.

The weft threads may and preferably do differ among themselves in color or otherwise. An important object of my invention is the provision of suitable means whereby any desired number of wefts of one characteristic may be positioned and whereby successively other wefts of other characteristics may be positioned in numbers corresponding to the requirements of the pattern. To this end, I have provided the following mechanism which is under control of the pattern member 2, and therefore is governed by the independent counter members of different denominations.

Upon a suitable part of the framing, I mount a curved bracket or support 143 held in place by bolts 144, 144. Said bracket is preferably arc shaped and is provided with a series of supports bolted to the bracket and having spaced, upstanding portions

145, 145, between which are secured split sockets adapted firmly to clamp or hold the inner ends of a series of elements 146 preferably in the form of tubes, though they may be of any suitable formation, and I herein generically term them yarn or thread positioning elements or fingers. Each of said tubes 146 is mounted for pivotal or rocking movement in the corresponding support, the clamping sockets having transverse pivotal pins, one of which is indicated at 147 in Fig. 8, there being a separate pin 147 for each one of the tubes 146, because of the preferred arcuate arrangement of the latter.

When said tubes 146 are in inactive or non-functioning position, they extend upwardly as indicated in Fig. 8 and are received against a backing or support 148. When, however, in accordance with the call of the pattern, a tube 146 is brought into alignment with the path of the thread grippers, it is moved into the horizontal position indicated most clearly in Fig. 8, and is preferably received between and supported by two jaw members 149, 150 having bevelled upper ends 151, 152 converging toward each other and having undercut portions forming shoulders 153, 154, so that when the positioned tube 146 is passed downward along the tapering ends 151, 152 of said jaw members below the shoulders 153, 154, the jaw members are moved toward each other by a plate spring 155, so as to hold the functioning tube 146 from escape and locking the same in position. Desirably the jaw members 149, 150 are provided at their lower ends with pinions 156, 157, meshing with each other, as indicated in Fig. 4. In a manner hereinafter described and shown most clearly in Fig. 4, one of the pinions, namely, the pinion 157 is adapted to be positively rocked by means under the control of the pattern member 2 and to impart opposite movement to the other pinion 156, so that the jaw members 151, 152 are opened for the reception of the tube 146 that is about to function.

Any suitable means may be provided to move the tubes 146 and herein to swing them upon their pivots into functioning position upon the call of the pattern. In the disclosed embodiment of the invention, I have provided the following means. As most clearly indicated in Fig. 8, each of the clamping sockets, one of which is indicated at 158 in Fig. 8, is of generally rectangular form, and has pivotally connected thereto at 159 a link 160, to the lower end of which is pivotally connected at 161 an arm 162 of a lever loosely pivoted at 163 upon a stationary rod. Rigid with each arm 162 is an arm 164, so that the arms 162, 164 in effect form a bell crank lever. To the lower end of each arm 164 is pivotally connected at 165 a link 166 having near its end opposite the point of connection 165 a slot 167 receiving a pin 168 upon an arm or member 169 having therein a transverse hole wherethrough is passed and wherein is secured by a pin 170 a spindle or rod 171. The number of spindles or rods corresponding with the number of tubes 146.

It will be evident from the foregoing description that upon axial movement toward the left viewing Fig. 8 of any pin or spindle 171, the corresponding yarn or thread tube 146 is lowered into functioning position as indicated in Fig. 8. The said spindles or pins 171 are guided for sliding movement in the framing as indicated at 172, 173, and each of them is normally spring pressed toward the left, viewing Fig. 8, by a coil spring 174 surrounding the same and positioned between the guide 173 and a collar 175 fast upon said spindle or pin. In order to determine the selection of the yarn or thread positioning elements, I have herein provided the following mechanism with which the said positioning elements peculiarly cooperate.

As heretofore stated, there is mounted upon the stationary shaft 60 a drum or barrel 61 in reality desirably formed of a series of disks placed in face to face relation, so as to form a solid barrel, each of said disks (if such construction be employed) having one or more recesses 62 as indicated, and arranged according to the desired pattern. The bars 64 which are suitably mounted for sliding movement in the parts 176, 177 of the framing are indicated most clearly in Fig. 1. The number of said bars 64 desirably correspond with the number of disks of the drum 61, and which is herein termed the subsidiary pattern member. The number of said bars 64 also corresponds with the number of elements or fingers 146.

Each of said bars 64 has fast thereon or formed therewith an abutment member 178, which, when the corresponding bar 64 rides at its end upon the concentric portion of the periphery of the corresponding disk of the subsidiary pattern member 61 is in alignment with the axis of a corresponding pin 179, said pins 179 being of increasing length, as clearly shown in Fig. 1, and distributed at intervals between the bearings or supports 176, 177. When, however, the end of a bar 64 enters a recess 62, then the corresponding abutment 178 is removed laterally from the end of the corresponding pin 179 and is no longer in axial alignment therewith, as indicated by the fourth abutment 178 reading either from the right or the left in Fig. 1.

The fixed pins 179 are in axial alignment with the movable spindles or pins 171, as clearly evident from both Figs. 1 and 8, and it will be evident that when an abutment

178 is interposed between a stationary pin 179 and a movable spindle or rod 171, the latter is held in an advanced position whereby the corresponding tube 146 is held in elevated or non-functioning position.

I provide means periodically to move all the spindles or rods 171. While for this purpose, any suitable means may be provided, I have herein provided a shaft 180 represented in Figs. 2 and 8, said shaft being periodically rocked in any suitable manner, as by a cam 181 upon the shaft 3. Upon the said shaft 180 I mount a wide rock arm or a series of rock arms 182 corresponding in number to the number of spindles or rods 171 and adapted to engage the collars 175 thereof, so as periodically to move said spindles or rods to the right, viewing Fig. 8, against the tension of the springs 174 and so as to permit the bars 64 to be moved in response to the call of the subsidiary pattern member 61.

I provide means to move the bars 64 periodically and preferably simultaneously or substantially simultaneously with each movement of partial rotation of the subsidiary pattern member 61, so as to move said bars away from the cylinder and thus to withdraw such of them as may be positioned in the recesses 62. For this purpose and as represented most clearly in Fig. 3, I provide each of said bars with a recess 183 upon the upper side thereof. Upon a stud 184 above said recesses, I mount a bell crank lever 185, one arm of which is provided with a laterally elongated terminal member 186 adapted to be moved into the recesses 183 and by engagement with the left hand end thereof viewing Fig. 3, to move said bars axially toward the left viewing said figure. Upon the other arm of said bell crank lever 185, I provide at its segmentally shaped end gear teeth 187, said teeth meshing with similar teeth 188 upon one arm of a lever 189 mounted upon a stud 190 for rocking movement. To the arm 191 of said lever is pivotally connected at 192 a rod 193 which is adapted to be reciprocated periodically from some suitable part of the mechanism, not herein claimed, but shown and claimed more particularly in my co-pending application Serial No. 449,888. The timing of parts is such that the rod 193 is moved periodically so as to withdraw the bars 64 from the subsidiary pattern member 61 just as said member is about to be rotated another step.

As heretofore set forth, the subsidiary pattern member 61 is rotated in a step-by-step manner by means under the control of the main pattern member 2. According to the dictates of the said main pattern 2, the subsidiary pattern 61 receives a step-by-step rotation.

Preferably I provide means whereby the jaws members 149, 150 are opened to receive a yarn finger as the latter is moved toward them from the elevated position shown in Fig. 8. While for this purpose any suitable means may be provided, I have herein represented a rod 194, shown most clearly in Figs. 1 and 4, and pivotally connected at one end to some suitable part of the mechanism, and shown most clearly in my co-pending application Serial No. 449,888, and at its other end suitably connected as by a threaded connection to a lever arm 195 fast upon the shaft 196 of the pinion 157 of the jaw member 151. The construction is such that as the pawl 67 engages with the ratchet 66, so as to impart a movement of partial rotation to the drum 61, and thereby through the appropriate bar 64 and spindle 171 to move the desired yarn finger 146 downward, the jaws 149 and 150 are swung apart to receive such descending yarn finger, and are then immediately swung toward each other by an opposite movement of the parts, to hold or lock the selected yarn finger in functioning relation.

I have stated that the yarn tubes or fingers 146 are mounted upon the curved bracket or support 143. Desirably, but not necessarily, one of the said yarn fingers 146 is mounted in alignment with or in the plane of the path of movement of the weft carrier.

I have herein represented one of the weft fingers or tubes 146 as mounted in the path of or in a vertical plane cutting the path of the weft carrier. This is clearly evident from Fig. 1. Such yarn finger is straight. The other yarn fingers or tubes 146 are mounted laterally beyond the path of the said weft carrier at one side or the other, as is also clearly evident from Fig. 1. In order that each of the yarn fingers or tubes in turn may be brought at its yarn delivery end into alignment with the path of the weft carrier and so as to be suitably received between the jaws 149, 150, I form such non-aligning yarn fingers or tubes with a bend or curve, so that the forward or yarn delivery end 197 thereof will lie when positioned in the path of the weft carrier. Obviously the ends of the several fingers or tubes 146 are bent to an extent corresponding to the distance of their supporting end from the path of movement of the weft carrier. Thus the central tube 146 is straight throughout, the next adjacent tubes 146 at either side are slightly bent, the tubes next beyond the last mentioned tubes are still further bent, and so on throughout the series. Preferably also I provide a spring 198 carried by an enlargement or collar 199 upon each yarn tube 146 to press upon the yarn, the extreme end of the yarn finger or tube being represented as cut away at its upper face at 200.

It will be evident that the pattern controlled means provided for moving the yarn

tubes 146 into and out of action effect a steady and certain movement of said tubes without lost motion and with extreme reliability.

The movement of the bars 64 to the left viewing Fig. 1 results in a movement of the spindles or rods 171 to the right viewing Fig. 8 with the result that the corresponding yarn guides 146 are lifted into non-functioning position. I may, if desired, and have herein provided means to assist in holding the yarn fingers elevated against the support 148, and for that purpose have represented a series of coiled springs 201, each connected at one end to the lower end of a lever arm 164, and at the other end to a pin 202 which may be upon the framing, but is here shown as upon the corresponding spindle or rod 171. A movement of any bar 64 to the right, viewing Fig. 1, in response to the presentation of a socket 62 to the bar results in a movement of the corresponding rod or spindle 171 to the left viewing Fig. 8, and the consequent lowering of the corresponding yarn finger 146 into functioning position.

Referring to Fig. 9, I have there indicated diagrammatically the upper and lower sheds 203, 204, the shed and the completed fabric at 205 as passing about rolls 206, 207, which are provided with intermeshing gears indicated at 208, 209, and which are driven by gearing diagrammatically indicated at 210, 211, 212, 213, 214 from the worm 215 upon the inclined shaft 137. The said shaft is mounted in suitable bearings in the main frame and is provided with a hand wheel 216 whereby the parts may be rotated backward manually for any reason, as, for example, a misplaced or defective pick. It will be observed that the backward rotation of the shaft 137 not only effects the backward rotation of the cloth rolls 206, 207, but also the backward rotation of the counters and the parts governed thereby.

The cloth after passing about the rolls 206, 207 passes over a guide 217 and thence over an inclined guide 218 from which it is directed between the cutting disks 219 and the rolls 220, which need not be herein further described, and by which the cloth is cut into chenille strips, as more fully pointed out in my co-pending application Serial No. 450,612.

It will be evident from the foregoing description that I have provided yarn or thread positioning mechanism for textile machinery including a series of yarn positioning elements or fingers, each adapted selectively to present its yarn to a yarn manipulating device (which desirably is the weft carrier of a chenille mechanism), means to support said elements or fingers for movement into and out of functioning relation, a counter, and desirably a plurality of counter members herein shown as independently mounted and independently driven, and as of higher and lower orders, a main pattern member controlled by the said counter or counter members, and operative connections including a subsidiary pattern member, whereby the main pattern member governs and effects the functioning movements of the said yarn positioning elements or fingers.

Having thus described one illustrative embodiment of my invention, I desire it to be understood that although specific terms are employed, they are used in a generic and descriptive sense and not for purposes of limitation, the scope of the invention being set forth in the following claims.

Claims—

1. Yarn or thread positioning mechanism for textile machinery comprising in combination, a series of yarn positioning elements or fingers, each adapted selectively to present its yarn to a yarn manipulating device, means to support said elements or fingers for movement into and out of functioning relation, a plurality of counter members of higher and lower order, a pattern member controlled by said counter members, and operative connections including a subsidiary pattern mechanism whereby said pattern member governs and effects the functioning of said yarn positioning elements or fingers.

2. Yarn or thread positioning mechanism for textile machinery comprising in combination, a series of yarn positioning elements or fingers each adapted selectively to present its yarn to a yarn manipulating device, a series of counter members, a main pattern member controlled by said counter members, a subsidiary pattern governed by said main pattern member, said subsidiary pattern member governing said yarn positioning elements or fingers.

3. Yarn or thread positioning mechanism for textile machines comprising in combination, a series of yarn positioning elements or fingers each adapted selectively to present its yarn to a yarn manipulating device, means to support said elements or fingers for movement into and out of functioning relation, a plurality of counter members, a main pattern member controlled by said counter members, and operative connections including a subsidiary pattern mechanism whereby said pattern member governs and effects the functioning movements of said yarn positioning elements or fingers.

4. Yarn or thread positioning mechanism for textile machinery comprising in combination, a series of yarn positioning elements or fingers each adapted selectively to present its yarn to a yarn manipulating device, means to support said elements or fingers for movement into and out of functioning relation, a plurality of counter members of higher and

lower order, a pattern member controlled by said counter members, and operative connections including a subsidiary pattern mechanism whereby said pattern member governs and effects the functioning movements of said yarn positioning elements or fingers.

5. Yarn or thread positioning mechanism for textile machinery comprising in combination, a series of yarn positioning elements or fingers each adapted selectively to present its yarn to a yarn manipulating device, means to support said elements or fingers for movement into and out of functioning relation, a plurality of counter members of higher or lower order, manually operable means whereby the said counter members may be driven backwardly, a pattern member controlled by said counter members, and operative connections whereby said pattern member governs and effects the functioning of said yarn positioning elements or fingers.

6. Yarn or thread positioning mechanism for textile machinery comprising in combination, a series of yarn positioning elements or fingers each adapted selectively to present its yarn to a yarn manipulating device, means to support said elements or fingers for movement into and out of functioning relation, a plurality of independent rotatable counter members, a rotatable main pattern member controlled by said counter members, a rotatable subsidiary pattern member controlled by said main pattern, said counters and said pattern members being mounted for step-by-step rotation under the described control, and operative connections whereby said subsidiary pattern member governs and effects the functioning movement of said yarn positioning elements or fingers.

7. Yarn or thread positioning mechanism for chenille machines, comprising in combination a series of weft yarn positioning fingers, each controlling a weft yarn pertaining to itself alone and adapted selectively to present its weft yarn to a weft yarn laying device for incorporation in the shed as a part of the weaving operation; means to support said fingers for movement into and out of functioning relation; a plurality of independently mounted and independently driven counter discs of predetermined denominations differing in numerical value among themselves; a pattern member controlled by said counter discs and operative connections whereby said pattern member governs and effects the functioning movement of said weft yarn positioning fingers.

8. Yarn or thread positioning mechanism for chenille machines, comprising in combination a series of weft yarn positioning fingers, each controlling a weft yarn pertaining to itself alone and adapted selectively to present its weft yarn to a weft yarn laying device for incorporation in the shed as a part of the weaving operation; means to support said fingers for movement into and out of functioning relation; a plurality of counter members of predetermined denominations differing in numerical value among themselves; a main pattern member controlled by said counter members; a subsidiary pattern member governed by said main pattern member and operative connections whereby said subsidiary pattern member governs and effects the functioning movement of said weft yarn positioning fingers.

9. Yarn or thread positioning mechanism for chenille machines, comprising in combination a series of weft yarn positioning fingers, each controlling a weft yarn pertaining to itself alone and adapted selectively to present its weft yarn to a weft yarn laying device for incorporation in the shed as a part of the weaving operation; means to support said fingers for movement into and out of functioning relation; a plurality of counter discs of predetermined denominations differing in numerical value among themselves and of higher and lower numerical values respectively; a main pattern member controlled by said counter members, a subsidiary pattern member governed by said main pattern member and operative connections whereby said subsidiary pattern member governs and effects the functioning movement of said weft yarn positioning fingers.

10. Yarn or thread positioning mechanism for textile machines comprising in combination, a series of independent yarn positioning elements or fingers each adapted selectively to present its yarn to a yarn manipulating device, means to support said elements or fingers for independent movement into and out of functioning relation, a plurality of counter members, a main pattern member governing said counter members and in turn moved under the control of said counter members, a subsidiary pattern governed by said main pattern member through said counter members and operative connection whereby said subsidiary pattern governs and effects the functioning movements of said yarn positioning elements or fingers

11. Yarn or thread positioning mechanism for textile machinery comprising in combination, a series of yarn positioning elements or fingers each adapted selectively to present its yarn to a yarn manipulating device, locking means adapted periodically to be opened to receive a functioning finger and to release the same, a series of counter members, a main pattern member controlled by said counter members, a subsidiary pattern governed by said main pattern member and operative connections whereby said sub-

sidiary pattern governs and effects the functioning movements of said yarn positioning elements or fingers and also governs the opening movement of said locking means.

12. Yarn or thread positioning mechanism for textile machinery comprising in combination, a series of yarn positioning elements or fingers each adapted selectively to present its yarn to a yarn manipulating device, locking means adapted periodically to be opened to receive a functioning finger and to release the same, a series of counter members, a pattern member controlled by said counter members and operative connections whereby said pattern member governs and effects the functioning movement of said yarn positioning elements or fingers and also governs the opening movement of said locking means.

In testimony whereof, I have signed my name to this specification.

EDGAR F. HATHAWAY.