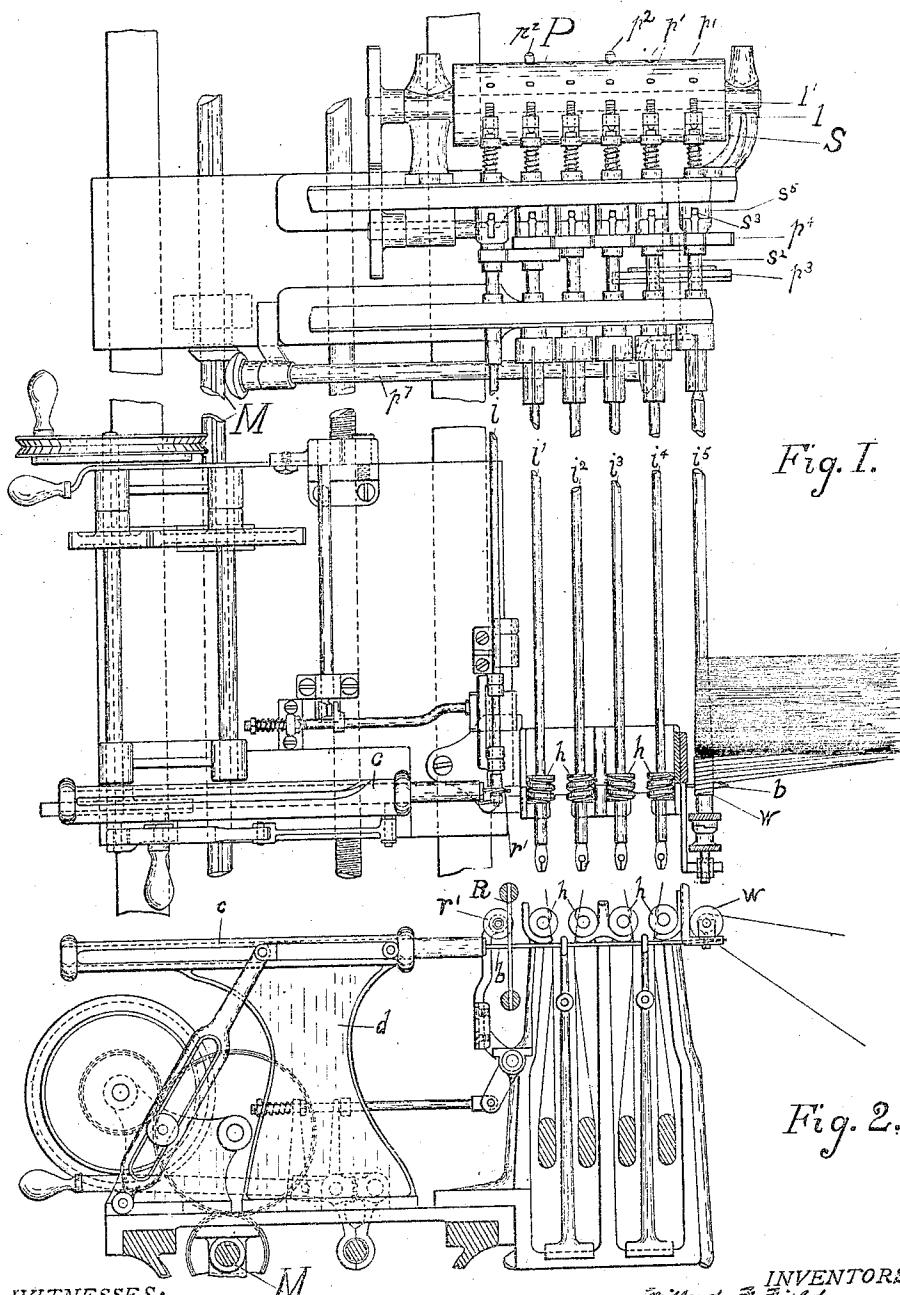


M. F. FIELD, C. D. LANNING, E. F. HATHAWAY & F. C. BLANCHARD.
 PATTERN DRUM ACTUATED DRIVING MECHANISM.
 APPLICATION FILED FEB. 6, 1903.

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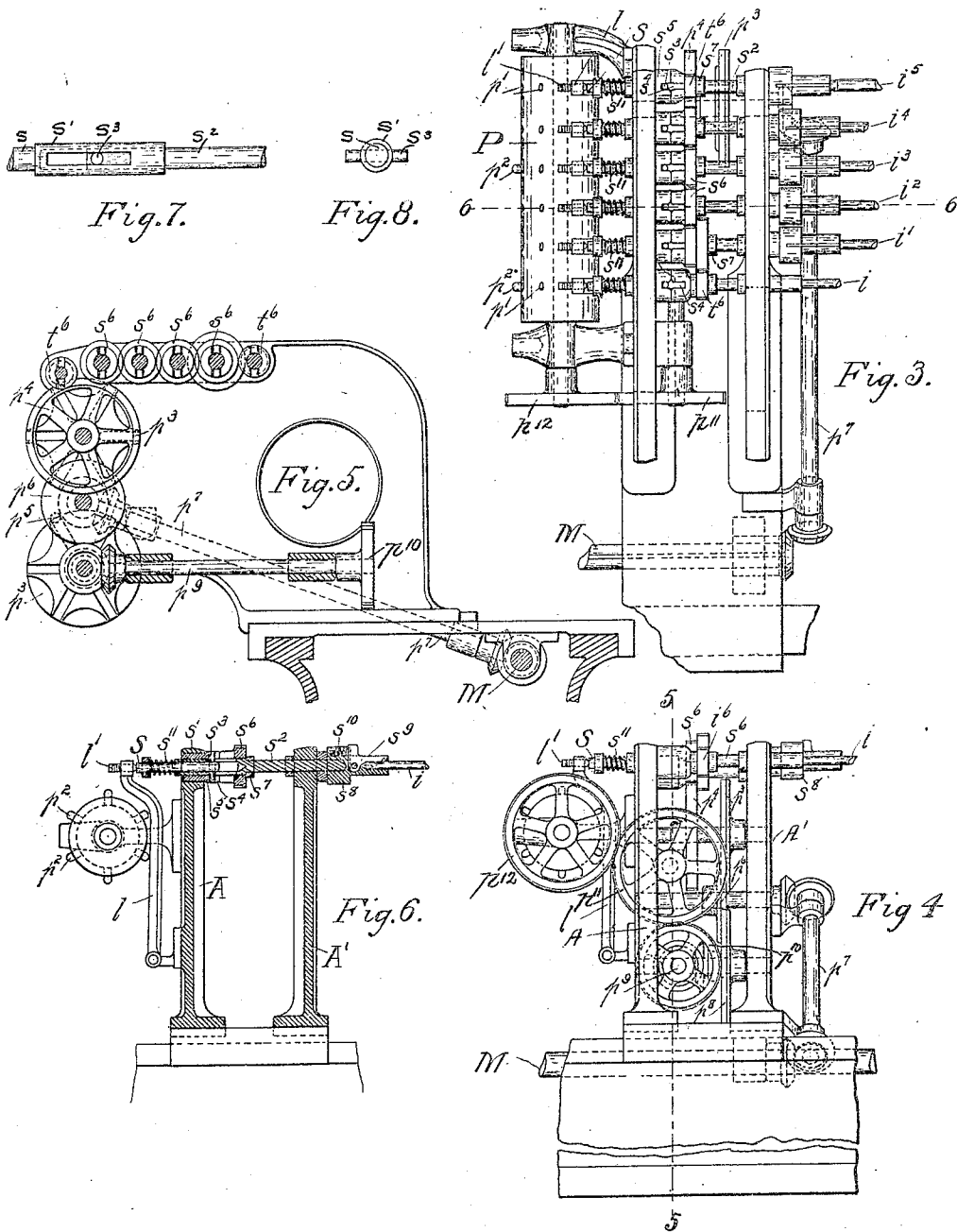
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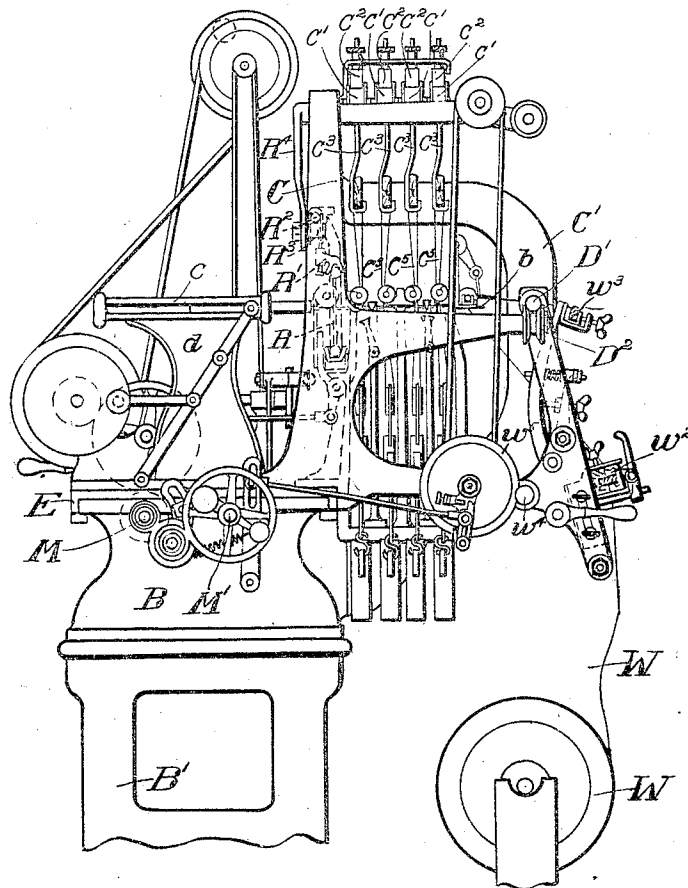
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Fig. 9.



Witnesses

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PATTERN DRUM ACTUATED DRIVING MECHANISM

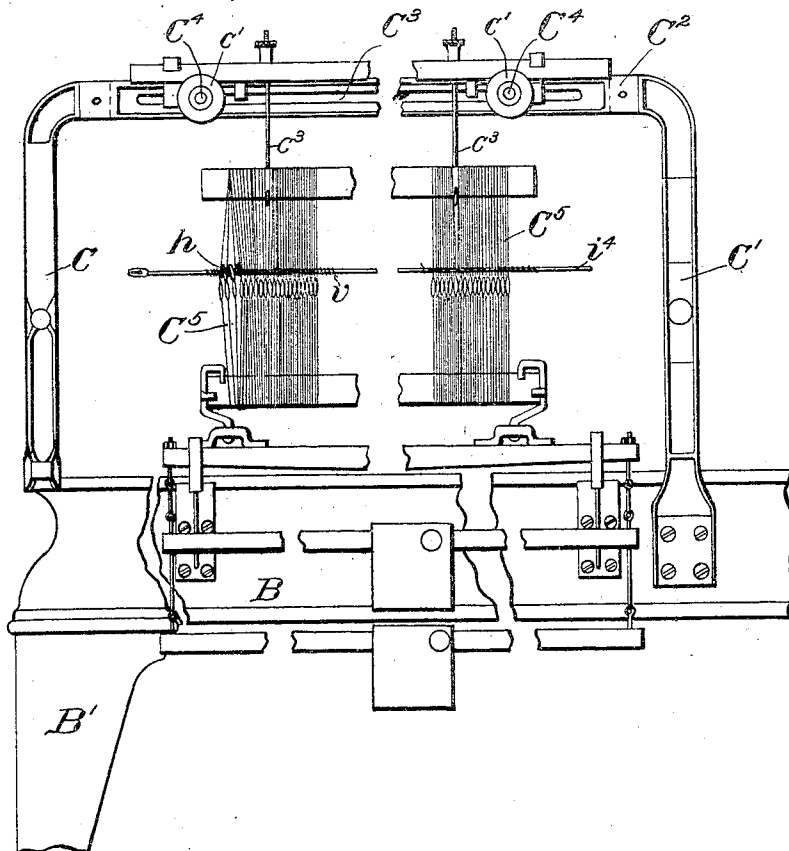
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Fig. 10.



Witnesses

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PATTERN DRUM ACTUATED DRIVING MECHANISM.

980,086.

5 SHEETS—SHEET 5.

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UNITED STATES PATENT OFFICE.

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PATTERN-DRUM-ACTUATED DRIVING MECHANISM.

980,086.

Specification of Letters Patent.

Patented Dec. 27, 1910.

Application filed February 6, 1903. Serial No. 142,250.

To all whom it may concern:

Be it known that we, MILLARD F. FIELD, of Winthrop, CHARLES D. LANNING and EDGAR F. HATHAWAY, of Boston, all in the 5 county of Suffolk and State of Massachusetts, and FREDERICK C. BLANCHARD, formerly of said Boston, but now of Fort Wayne, in the county of Allen and State of Indiana, have invented certain Improve- 10 ments in Pattern-Drum-Actuated Driving Mechanism, of which the following is a specification.

This invention relates to improvements in the mechanism by which the different parts 15 of machines which perform successive operations are put into motion intermittently and continued for definite intervals during each cycle of operation of the machine.

The improvements consist chiefly in a 20 pattern drum or pattern chain which at specified times operates clutch mechanism that imparts motion to the respective devices in the machine which are to perform definite operations. This mechanism will be under- 25 stood from the description hereinafter contained in connection with the accompanying drawings, wherein the invention is illustrated as applied to a warp drawing machine, in which there are devices to separate 30 and feed the eyes of four loom harnesses, into which warp threads are to be drawn, also a reed-feeding and dent-opening device, and warp-feeding and separating mechanism, each of which is to be operated inter- 35 mittently and independently of the others and a portion of them differentially to the others, during the process of drawing in warps.

In the drawings: Figure 1 is a plan view 40 of a warp-drawing machine with the ends and upper portion of the machine and other parts removed, to show clearly the improved pattern roll and clutch mechanism applied to the shafts of the several operating devices 45 mentioned. Fig. 2 is an end elevation of the parts shown in Fig. 1, viewed from the lower end of that figure. Fig. 3 is a detached plan view of the pattern roll, and the clutch mechanism of the machine. Fig. 4 50 is an end elevation of the parts shown in Fig. 3. Fig. 5 is a sectional elevation on line 5—5, Fig. 4 viewed from the left of that

figure. Fig. 6 is a sectional elevation on line 6—6, Fig. 3 viewed from the lower end of that figure. Figs. 7 and 8 are details show- 55 ing the internal construction of the shaft in the clutch mechanism. Fig. 9 is a left-hand elevation of one form of warp drawing machine to which our invention may be applied. Fig. 10 is a front elevation 60 of a harness with the harness feed-worm and its shaft in place, these parts being shown applied to the same warp drawing machine illustrated in Fig. 9, the middle portions of the machine and the harness be- 65 ing broken away. Fig. 11 is a front elevation of the warp drawing machine shown in Fig. 9, showing the upper part of the harness, the warp frame supports and the warp-feed screw, but having the middle portions 70 of the machine and numerous parts thereon removed.

Referring to the drawings and particularly to Figs. 9, 10 and 11, we have there 75 shown a well-known type of warp drawing machine, to which, for purposes of illustration, our invention may be applied, although it is to be understood that it may be use- 80 fully adapted to other machines, and to other types of machines for drawing or otherwise operating upon warp threads. In the illustrated type of machine there is provided a bed B sustained on legs B'. To support the reed, harness and warp in substantially parallel relation lengthwise the machine, there 85 are secured to the bed the uprights C, C', connected by the overhead cross-bar C². For the support of the harness, the cross-bar is provided with a slot C³, in which are adjust- 90 ably secured the two studs C⁴, provided each with an anti-friction roll c' for the frame of each harness C⁵, the latter in the present machine being four in number. Each har- 95 ness is hung upon a bar c² by means of the rods c³, and the bar rests upon a pair of the rollers c', thus permitting the harness to be easily moved and adjusted differentially with relation to the other elements, lengthwise the machine. The reed R is carried in an ad- 100 justable frame R' (shown on dotted lines in Fig. 9), the latter being secured to a longitudinal rod R², resting upon anti-friction rolls R³ journaled in straps R⁴ depending from the cross-bar whereby the reed also

may be adjustably and differentially fed within the required limits lengthwise the machine. The warp threads W^2 passing up from the warp beam W are carried in substantially parallel relation through the warp clamp w^2 over the separator shaft i^5 and thence backward to the frictional clamp w^3 . The two clamps w^2 and w^3 are carried between the end frame members D , which latter hang suspended from the rods D' resting upon the anti-friction rolls D^2 journaled in the uprights C and C' . This permits an independent and differential adjustment of the warp and the warp frame lengthwise of the machine by any suitable means, either manually or automatically. Automatic adjustment in the present machine is effected by a step-by-step movement imparted to the rack bar w^4 , the latter secured to the warp frame D and engaging with a worm w^5 of low pitch journaled in the frame of the machine. The worm is given intermittently a slight movement through suitable ratchet and pawl mechanism, which latter is indicated in Fig. 9, but which it is unnecessary to describe in detail, the same, however, being driven primarily from the main driving shaft M of the machine.

During the drawing operation the needle b (Fig. 2) mounted upon the carriage E , the latter supported for sliding movement upon the bed B , is caused to traverse the warp threads and draw successive threads through selected harness eyes and between selected reed splits. The needle is guided in the guide c carried by the standard d mounted on the carriage E , suitable devices being provided for causing a properly timed and reciprocatory movement of the needle, such devices being driven from the splined driving shaft M on the carriage, which latter is advanced simultaneously by means of the rotating lead screw M' . Upon the carriage E , and movable with the latter, there are also supported in journals a plurality of operating rods or shafts (six in number in the illustrated machine). These rods extend lengthwise the machine and act to select and feed according to predetermined arrangement, the warp threads, reed dents and harness eyes with reference to the path of the drawing-in needle, or such other device or devices as may be employed for operating upon the threads. The thread separating rod i^5 (the outer one of the series) carries at the needle end of the carriage suitable thread separating mechanism, herein consisting of the thread separating and selecting screw w , which, under each full rotation of the rod presents the next warp thread to the action of the drawing needle. Another of the rods i at the opposite end of the series (Fig. 1) is connected to a suitable reed opener, herein consisting of the rotary spiral

opener r' , which, also under a full rotation of the shaft, spreads and opens the reed splits, this serving also to adjust the reed longitudinally by a slight increment, if the selected reed dent is not in direct alinement with the needle path. The remaining and intervening shafts i' , i^2 , i^3 and i^4 pass to their respective separating and feeding devices for the several harnesses, which latter in the machine illustrated are supposed to be four in number, and arranged in sets of two each. In the illustrated machine the particular type of harness-eye separating and feeding device employed for each harness consists of a harness-eye separating worm h with its co-operating wire helix v engaging the harness strands and of the general construction shown in the prior patent to Field No. 755,861, although other suitable devices may be employed for this purpose. For each semi-revolution of a harness separator shaft an eye of its respective harness is presented within the path of the drawing needle. Another semi-revolution places the harness eye out of and beyond the path of the drawing needle.

Referring now more particularly to the means for controlling the succession or order of operation of the various feeding and separating devices; P is the pattern drum, provided with a number of series of holes p' arranged around its periphery with each series in the same vertical plane or a chain may be used in place of the drum. In one or more of these holes in each series are secured projecting pins p^2 , their frequency depending upon the frequency with which it is desired that the clutch mechanism should act upon each operating device in the machine.

1 are levers, pivoted at their lower ends to the frame of the machine, and each located in the same vertical plane with one series of holes p' . Adjusting screws $1'$ in the upper ends of the levers 1 bear against the ends of plunger shafts s which constitute one part of the clutch mechanism for each operating shaft. The plunger shafts s are arranged to slide in the sleeved end s' of other short shafts s^2 which have bearings upon the standards A , A' , as shown in Figs. 6 and 7, and which shafts s^2 constitute another part of the clutch mechanism. The sleeves s' are slotted and pins s^3 secured in the plunger shafts s near their inner ends project through these slots, and sufficiently beyond to engage slots s^4 in collars s^5 around the sleeves s' , which collars are made fast to the frame. Upon the sleeves s' immediately adjoining the collars s^5 are four loose pinions s^6 and two smaller pinions s^7 , all of which are held in position by nuts s^7 . The hubs of these pinions are also slotted to receive the pins s^3 . The se-

ries of pinions s^6 , t^6 are geared in a continuous train from a large gear p^4 beneath the two pinions at the top, as illustrated in Fig. 3, or at the left in Fig. 5. The gear p^4 is driven by intermediate connections from the cross shaft p^7 which is geared to the driving shaft M.

Upon the ends of the shafts s^2 opposite their sleeve ends, there is secured a hub socket s^8 to receive the ends of the shafts i , i' , i^2 , i^3 , i^4 , i^5 , or such other operating parts as are employed in the machine, and in order to make these shafts secure when inserted in the sockets of the hubs s^8 and easily removable therefrom when desired, a hooked latch s^9 is pivoted in a slot in each hub s^8 and the hooked ends of these latches project down into the socket and engage a notch or hole in the end of the shafts i . The latch is held down in engagement with the shaft by a spring s^{10} which presses against a projecting end of the latch. By compressing the spring the latch can be easily disengaged from the shafts. It will be understood, therefore, that after the machine is started whenever the pinions s^6 , t^6 are set in motion and one of the pins p^2 of the pattern drum P comes into contact with a lever 1, it will be pushed forward, and striking the end of a plunger shaft s will push that forward within its sleeve s' of a shaft s^2 , and thus slide the pin s^3 along the slot in a sleeve s' out of the slot in a collar s^5 and into the slot in the hub of a pinion s^6 or t^6 . When in this position the pin s^3 acts as a clutch to connect that pinion and a shaft s^2 together, and causes that shaft and one of the shafts, i , i' , &c., and the parts connected therewith to rotate and perform the required operation, for instance, that hereinafter described in a warp-drawing machine. As soon as that pin p^2 passes out of contact with the lever 1, a spring s^{11} , held between the end of a sleeve s' and a nut on the end of a plunger shaft s , pulls the pin s^3 of that shaft out of the slot in the hub of its pinion s^6 or t^6 and its shaft s^2 stops.

In the use of these improvements in connection with a warp-drawing machine as illustrated in the drawings, where the several shafts are intermittently rotated and some of them at longer intervening periods than others, it is found desirable to rotate the pinions s^6 , t^6 intermittently, and this is accomplished by means of an intermittent wheel p^3 , sometimes called a star wheel, on the same shaft with the gear p^4 . This intermittent wheel p^3 is constructed in the usual manner, in this case with six radial slots in its face, and between the outer extremities of each two slots the projecting part of the wheel is formed with concave depressions which are arcs of a circle of much smaller diameter than the wheel itself.

The wheel p^3 is driven by a pin p^7 on a wheel p^6 in gear with the cross-shaft p^7 . As the wheel p^6 rotates the pin p^7 moves up into and then out of one of the radial slots in the wheel p^3 , and acting against the side of the slot turns the wheel p^3 one-sixth of a revolution, and in the construction shown, the gear p^4 and the pinions s^6 , t^6 are so proportioned that the pinions s^6 make one revolution, and the pinions t^6 one-half a revolution, for each intermittent movement of the wheel p^3 . During the time when the pin p^7 is not in engagement with the wheel p^3 a segmental projection on the wheel p^6 engages the concave depressions between the extremities of the slots in the wheel p^3 and prevents it from turning.

As illustrated in the drawings, the pattern roll P is rotated intermittently by means of another star or intermittent wheel p^8 below the wheel p^6 , and which is caused to rotate by the engagement therewith of the pin p^5 . The intermittent movement of the wheel p^8 is communicated through a gear p^{10} on the counter-shaft p^9 to a gear p^{11} and thence to gear p^{12} on the shaft of the pattern roll P (see Figs. 3 and 4). This roll, however, may be rotated continuously and operate equally well. It will therefore be seen that by pegging out the pattern roll or drum P (or chain or chains, if the latter are used) in a suitable way, any desired pattern may be obtained and there may be imparted to the several operating shafts i , i' , etc., and therefore where a warp drawing machine is concerned, to the separating and positioning devices for the warp threads, harnesses and reed, any desired order or succession of action, and not only may the threads be drawn through the respective harness eyes and reed dents in accordance with any desired prearrangement, but such arrangement may be altered or modified by altering or modifying the pegging of the pattern device from time to time, as may be required.

It has heretofore been usual in machines of this class to draw regularly one thread through each harness eye and two threads through each reed-dent, but it will be seen that the present invention makes it possible to draw two or more threads to a harness eye or to a reed-dent. This is accomplished in the illustrated form of the invention by arranging the pattern so as to interrupt the action of the operating and separating shaft for the required harness or the reed, as the case may be, while continuing the action of the warp separating shaft, thus dwelling the positioning movement of the harness eye or reed relatively to the needle. On the other hand, at any desired intervals a harness eye or reed dent may be dropped or skipped by providing for the action of the requisite operating shaft while cutting out the action

of the warp separating shaft, so that, the warp thread-positioning screw being dwelled, the needle in its movement fails to draw a thread. This irregular drawing action may be necessary for many different purposes. For example, on corded work it may be required to dwell the harness feed and feed fed, while continuing the warp feed for a given number of picks to draw a number of threads through the same eye and the same dent. Or it may be required where a harness is used for weaving warps, the latter having a less number of threads per inch than there are harness eyes, so that it is necessary to skip certain harness eyes. For this purpose the reed positioning shaft and warp thread positioning shaft are dwelled, while the harness feed shaft is actuated to pass the harness eyes on relatively to the needle without drawing threads therethrough. Or it may be required to draw a number of threads in one reed dent varying from the number of threads in some other dent. In all these cases the result which demands the cessation of feeding action as to any one set of elements for one or more needle picks, either regularly or irregularly, may be readily obtained by the prearranged pattern control. Since this mechanism provides means for withholding from the line of drawing action the next eye to be operated upon in any given harness during a plurality of needle picks, and since this condition would usually be required in a machine employing more than two harnesses, this invention affords for the first time a practical mechanism for the control or utilization of more than two harnesses in a warp drawing machine in conjunction with a unitary thread drawing mechanism. It is also to be observed that our invention, in its broad aspects, is applicable to machines for acting or operating upon warp threads other than those which are specifically and customarily termed warp-drawing machines such, for example, as warp-twisting, tying or cementing machines, and that in referring to the warp-drawing operation we do not necessarily restrict the operation to machines where the warp threads are drawn through the dents of a reed and the eyes of one or more harnesses, but include within that term also the warp-drawing operation which results in other machines as of the types named, when the threads are successively drawn or placed for any purpose whatsoever, as for the subsequent action of a knotter or twisting or cementing devices. In referring also to the drawing-in needle, it is to be understood that we include within that term any equivalent thread-placing device.

While we have shown one embodiment of our invention applied to a warp drawing

machine, it is to be understood that the same is not limited to the type of mechanism shown, nor to the details or construction of the parts disclosed, nor, in fact, in its application to a machine employed for this particular purpose.

We claim:

1. Driving mechanism for machines provided with a plurality of operating parts to be intermittently actuated, which consists of a pattern member, a series of plungers to be longitudinally actuated by the pattern, clutch members upon the ends of the plungers and intermittently rotated counter-clutch members upon the connections with the said operating parts.

2. Driving mechanism for machines having operating devices to be intermittently actuated, which consists of an intermittently rotated clutch member normally free to turn upon the shaft connection of each of such operating devices, a counter clutch member capable of longitudinal movement independent of the other member, a spring to disengage the clutch members, and a pattern member to cause them to engage, as predetermined.

3. Driving mechanism for machines having operating devices to be intermittently actuated, which consists of a clutch member normally free to rotate upon the shaft connection of such operating devices, a slotted sleeve at the end of such shaft, a plunger within the sleeve, provided with a pin which engages the slot and serves as the other clutch member, a pattern chain or drum to force the clutch members together and means to separate them.

4. Driving mechanism for machines having operating devices to be intermittently actuated, which consists of a pattern member, a clutch member normally free to rotate upon the shaft connection of each of such operating devices, counter clutch members longitudinally actuated by the pattern independently of the other clutch members, and mechanism to give a portion of said operating devices a movement differential to that of the other operating devices.

5. The combination with the shafts which operate the reed dent opener, the heddle-eye separating devices and the warp thread selecting and separating screw, in a warp-drawing machine, of clutch mechanism which is normally out of engagement and an adjustable pattern member with means to intermittently put such of the clutches into engagement to turn said shafts as predetermined by the pattern.

6. In a warp-drawing machine, the combination of devices to independently control and feed the reed-dents, the harness-eyes and the warp-threads and successively locate one of each for the drawing-in operation,

and adjustable operating mechanism to operate said devices as predetermined by its adjustment.

7. In a warp-drawing machine, the combination of devices to independently control and feed the reed-dents, the harness-eyes and warp-threads, main driving mechanism, and adjustable means adapted to connect the driving mechanism with the respective feeding devices as predetermined by the adjustment of such means.

8. In a warp-drawing machine, the combination of devices to separately control and feed the reed-dents, the harness-eyes and the warp-threads, main driving mechanism, and interconnecting means between the driving mechanism and said feeding devices, which means are adapted to intermittently operate the respective feeding devices alternately with the drawing-in operation.

9. In a warp-drawing machine employing a plurality of harnesses supported in substantially parallel relation, the combination with means to separate and position the successive heddle eyes of each harness, thread-separating and drawing mechanism, and main driving means for the thread drawing mechanism and the heddle eye positioning devices, said heddle eye positioning means providing for the withholding of the next eye to be operated upon in a given harness during a plurality of operations of the drawing-in mechanism upon the eyes of another harness or harnesses.

10. In a warp drawing machine employing a plurality of harnesses supported in substantially parallel relation, the combination with means to separate and position the successive heddle eyes of each harness, thread drawing means, main driving means for the thread drawing means and the heddle eye positioning devices, and means for causing a relative, traversing feeding movement between the thread-drawing means and the supporting means for the harness, said heddle eye positioning means providing for the withholding of the next eye to be operated upon in a given harness during a plurality of operations of the drawing-in means upon the eyes of another harness or harnesses.

11. In a warp drawing machine employing a plurality of harness and a warp supported in substantially parallel relation, the combination with means to separate and position the successive heddle eyes of each harness, means to select and separate the warp threads, thread drawing means, main driving means for the thread drawing means, thread selecting and separating means and the heddle eye positioning devices, and means for causing a relative traversing feeding movement between the thread drawing means and the supporting means for the harness, said heddle eye posi-

tioning means providing for the withholding of the next eye to be operated upon in a given harness during a plurality of operations of the drawing-in means upon the eyes of another harness or harnesses.

12. In a warp drawing machine employing a plurality of harnesses, the combination with means independently to separate and position the successive heddle eyes of each harness, thread drawing means, main driving mechanism, means to connect the elements of the harness eye positioning devices independently but coöperatively with the main driving mechanism, and adjustable means for governing variably by a predetermined adjustment the order of action of the harness eye separating and positioning devices.

13. In a warp drawing machine employing a plurality of harnesses, the combination with devices to separate and position the successive heddle eyes of each harness, thread drawing means, main driving mechanism, connecting clutch devices between the main driving mechanism and the respective harness eye positioning devices, and means for intermittently actuating said clutch devices.

14. In a warp drawing machine employing a plurality of harnesses, the combination with devices to separate and position the successive heddle eyes of each harness, thread drawing means, main driving mechanism, connecting clutch devices between the main driving mechanism and the respective harness eye positioning devices, and clutch-actuating devices to govern the action of said clutches.

15. In a warp drawing machine employing a plurality of harnesses, the combination with devices to separate and position the successive heddle eyes of each harness, thread drawing means, main driving mechanism, connecting clutch devices between the main driving mechanism and the respective harness eye positioning devices, and automatically driven clutch-actuating devices.

16. In a warp drawing machine employing a plurality of harnesses, the combination with devices to separate and position the successive heddle eyes of each harness, thread drawing means, main driving mechanism, connecting clutch devices between the main driving mechanism and the respective harness eye positioning devices, and means to control through said clutch devices the order of succession in the action of said harness eye separating and positioning devices.

17. In a warp drawing machine employing a plurality of harnesses supported in substantially parallel relation, the combination with a drawing-in device, means for supporting the warp in substantial parallel

relation with the harnesses, means for causing the drawing-in device to travel across the harnesses and warp, means to separate and position the successive heddle eye of each harness with reference to the drawing-in device, and means to separate and position successive warp threads, said heddle eye positioning means providing for the withholding of the next eye to be operated upon in a given harness during a plurality of operations of the drawing-in device upon the eyes of another harness or harnesses.

18. In a warp drawing machine the combination with a drawing-in device, means for independently and adjustably supporting a plurality of harnesses, a warp and a reed, main driving mechanism for causing the travel of said drawing-in device across the reed, harnesses and warp, independent means for separating and positioning respectively successive heddle eyes of each harness, successive warp threads and successive reed-dents, and means for intermittently actuating said several separating and positioning means from the main driving mechanism in accordance with a predetermined pattern arrangement.

19. A warp drawing machine having a drawing-in device, a loom-reed, loom heddles and a warp support, and means for differentially adjusting three of said elements in relation to a movement of a fourth and also in relation to each other, said means withholding the next successive reed-dent, harness eye or warp thread from the line of drawing-in action for a plurality of drawing-in movements of the drawing-in device.

20. A drawing-in machine having a drawing-in device, and means for supporting a reed, harness and warp, and for differentially adjusting the same relatively to the line of drawing-in action, said means withholding from the action of the drawing-in device for a plurality of successive drawing-in movements the next successive reed-dent, harness eye or warp thread.

21. A warp drawing machine having a drawing-in device, means for supporting a loom harness, and means for positioning successive harness eyes with reference to the line of drawing-in action, said means providing for the skipping of a predetermined harness eye or eyes in the drawing-in action.

22. A warp drawing machine having a drawing-in device, means for supporting a loom harness, means for positioning the successive eyes thereof with reference to the line of drawing-in action and means for governing said positioning means to cause a plurality of threads to be drawn through a given harness eye by successive drawing-in movements of the drawing-in device.

23. A warp drawing machine having a drawing-in device, means for supporting a loom harness, means for supporting a warp,

and means automatically to draw by successive movements of the drawing-in device a plurality of threads through a given harness eye.

24. A warp drawing machine having a drawing-in device, means for supporting a loom reed, and means for positioning successive reed dents with reference to the drawing-in action, said means providing for the skipping of a predetermined reed dent or dents in the drawing action.

25. A warp drawing machine having a drawing-in device, means for supporting a loom reed, means for positioning successive reed dents with reference to the line of drawing action, and means governing said positioning means to draw a varying number of threads through successive reed dents.

26. A warp drawing machine having a drawing-in device, means for supporting a series of warp threads, and means to position successive threads with reference to the line of drawing-in action, said means providing for withholding from the action of the drawing-in device at a predetermined time the next undrawn thread.

27. A warp drawing machine having a drawing-in device, a plurality of sets of elements, the elements of each set being arranged in succession, means for separating and positioning the successive elements of each set with reference to the line of drawing-in action, the said positioning means for one set of elements acting independently the positioning means for the other set or sets of elements, and means for adjustably predetermining the order of action of said positioning means.

28. A warp drawing machine having a drawing-in device, a plurality of sets of elements, the elements of each set being arranged in succession, and means for separating and positioning the successive elements of each set with reference to the line of drawing-in action, said means providing for withholding one of the elements in any given set from the line of the drawing-in action for a plurality of successive drawing-in movements of the drawing-in device.

29. A warp drawing machine having a drawing-in device, a plurality of devices for selecting and positioning elements with reference to the line of the drawing-in action, and adjustable pattern means for selecting and causing the actuation intermittently of one or more of said devices.

30. A warp drawing machine having a drawing needle, a plurality of devices for selecting and positioning elements with reference to the line of needle action, and means for selecting and causing the actuation intermittently of said devices in accordance with a predetermined but variable order of action.

31. A warp drawing machine having

drawing-in means, means for supporting a warp, reed and harness, and pattern means to cause prearranged selection of the harness eyes or reed-dents for successive thread drawings.

32. A warp drawing machine having drawing-in means, means for supporting a warp, a reed and harness, and means for adjustably governing the order of selection of the harness eyes for successive thread drawings.

33. A warp drawing machine having a warp, a reed and harnesses, each independently movable for feeding adjustment, and means to adjustably govern the order of selection of the harness eyes for successive thread drawings.

34. A machine for operating upon warps having a plurality of operating parts to be intermittently operated, means for operating successively upon the individual members of the series of warp threads, and means for connecting the operating mechanism of the machine with the respective parts in accordance with predetermined adjustment.

35. A machine for acting upon warp threads having means for operating successively upon the individual members of the series of warp threads, a plurality of sets of elements, the elements of each set being arranged in succession, and means for positioning the elements of each set in succession with reference to the line of action thereof, the said positioning means for one set of elements acting independently of the positioning means for the other set or sets of elements, said means withholding from action for a plurality of cycles of operation the positioning and separating means for any given set of elements.

36. In a warp drawing machine having means to support more than two harnesses, the combination with drawing-in means and means for bringing the successive eyes of each of the respective harnesses severally into active position with reference to the drawing-in means.

37. In a warp drawing machine having means for supporting more than two harnesses, the combination with intermittently acting drawing means, of means for positioning the eyes of the respective harnesses with reference to the line of drawing action, and means governing said positioning means for withholding a given harness eye for a plurality of drawing actions.

38. In a warp drawing machine, the combination with drawing-in means, a plurality of independently supported harnesses, means for separating and positioning the eyes of the respective harnesses with reference to the line of drawing action, and means governing said positioning means for varying the order of succession in the drawing action with reference to the harness eyes.

39. In a warp drawing machine, the combination with drawing-in means, of a plurality of elements, positioning means to position the same with reference to the line of drawing action, means for dwelling the action of the positioning means, and means to control the period of dwell.

40. A warp treating machine having a main driving mechanism, means for acting upon successive warp threads, a plurality of sets of elements, means for positioning the same with reference to the thread acting means, said positioning means being intermittently driven from the main driving mechanism, and means to differentially time the intermittent driving movement thereof.

41. A warp drawing machine having means for supporting a warp, a reed and a plurality of harnesses, drawing-in means, means for selecting and positioning successive warp threads, harness eyes and reed-dents with reference to the line of drawing-in action, and means for suspending the action of any one of said positioning means while continuing the action of the drawing-in means.

42. A machine for operating upon warp threads, comprising means for acting successively upon the individual members of the series of warp threads, and means for positioning the threads relatively to the acting means according to a prearranged and variable adjustment.

43. A machine for operating upon warp threads having means for acting successively upon the individual members of the series of warp threads, a plurality of elements adapted to be coöperatively positioned, and means for positioning the same by a prearranged and variable adjustment.

44. A warp drawing machine having thread-separating and placing means, harness eye positioning means to position a harness eye to receive a single thread, and means providing automatically for the dwelling of a given harness eye to permit the placing of a plurality of threads therethrough while maintaining uniform the rate of action of said thread-separating means.

45. A warp-drawing machine having thread-separating and placing means and means to position successive harness eyes to receive a single thread, means governing said positioning means automatically to position a given eye to receive a plurality of threads while continuing the same rate of action of the thread-separating means.

46. A warp-drawing machine having thread-separating means, thread-placing means, harness eye positioning means, and means automatically to dwell the harness eye positioning means while continuing the normal operation of the separating means to cause the placing of a plurality of threads through a given harness eye.

47. In a warp drawing machine the com-

combination with thread-placing means, means for supporting a warp, reed, and harness, and pattern means to control the pattern of the drawn-in warp.

48. A drawing-in machine having thread-placing means, harness eye-positioning means to cause each harness eye to receive a single thread, and means to time the action of the harness-eye positioning means when desired to cause each harness eye to receive a plurality of threads predetermined in number.

49. A drawing-in machine having thread-placing means, harness supporting means, harness eye positioning means, members for actuating said harness eye positioning means, said members extending cross-wise the harnesses, and pattern means controlling the movements of said members located at the side of the harnesses.

50. In a drawing-in machine the combination with devices for supporting and progressively separating and drawing-in the warp threads, of means to support more than two harnesses; mutually independent harness-eye selecting mechanisms for each harness; and connecting, controlling mechanism for said harness eye selecting mechanisms, interposed between the latter and the main driving mechanism, said connecting and controlling mechanism being adapted to permit ready setting whereby the continuous, successive harness-eye selecting operation may be carried on in the designed whole number of harnesses or in a predetermined smaller number thereof.

51. In a drawing-in machine the combination with devices for supporting and progressively separating and drawing-in the warp threads, of holding means separately to support each of a plurality of harnesses in a parallel relation, devices adapted independently to select the successive heddle eyes of each harness; means to cause a relative traversing feed crosswise the warp between the thread-selecting and drawing-in mechanism as one element, and the warp and its common support as another element;

connecting and controlling mechanism interposed between the main driving mechanism and the associated group of harness-eye selecting devices and adapted to actuate or dwell the respective harness-eye selecting mechanisms in predetermined sequence; the harnesses being independently adjustable, whereby each harness may be given an independent longitudinal differential feeding movement responsively to the predetermined sequence of operation of the respective harness-eye selecting mechanisms.

52. In a drawing-in machine the combination with devices for supporting and progressively separating and drawing-in the warp threads, of holding means separately to support each of a plurality of harnesses in a parallel relation, devices adapted independently to select the successive heddle eyes of each harness, the heddle eye selecting devices of each harness being in constant engagement with the heddles thereof, both when active and inactive; means to cause a relative traversing feed crosswise the warp between the thread-selecting and drawing-in mechanism as one element, and the warp and its common support as another element; connecting and controlling mechanism interposed between the main driving mechanism and the associated group of harness-eye selecting devices and adapted to actuate or dwell the respective harness-eye selecting mechanisms in predetermined sequence; the harnesses being independently adjustable, whereby each harness may be given an independent longitudinal differential feeding movement responsively to the predetermined sequence of operation of the respective harness-eye selecting mechanisms.

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