F. E. ARROUQUIER.

LOOM FOR WEAVING SEPARATE WEFTS.

APPLICATION FILED OCT. 7, 1903.

907,946.

Patented Dec. 29, 1908.

7 SHEETS—SHEET 1.

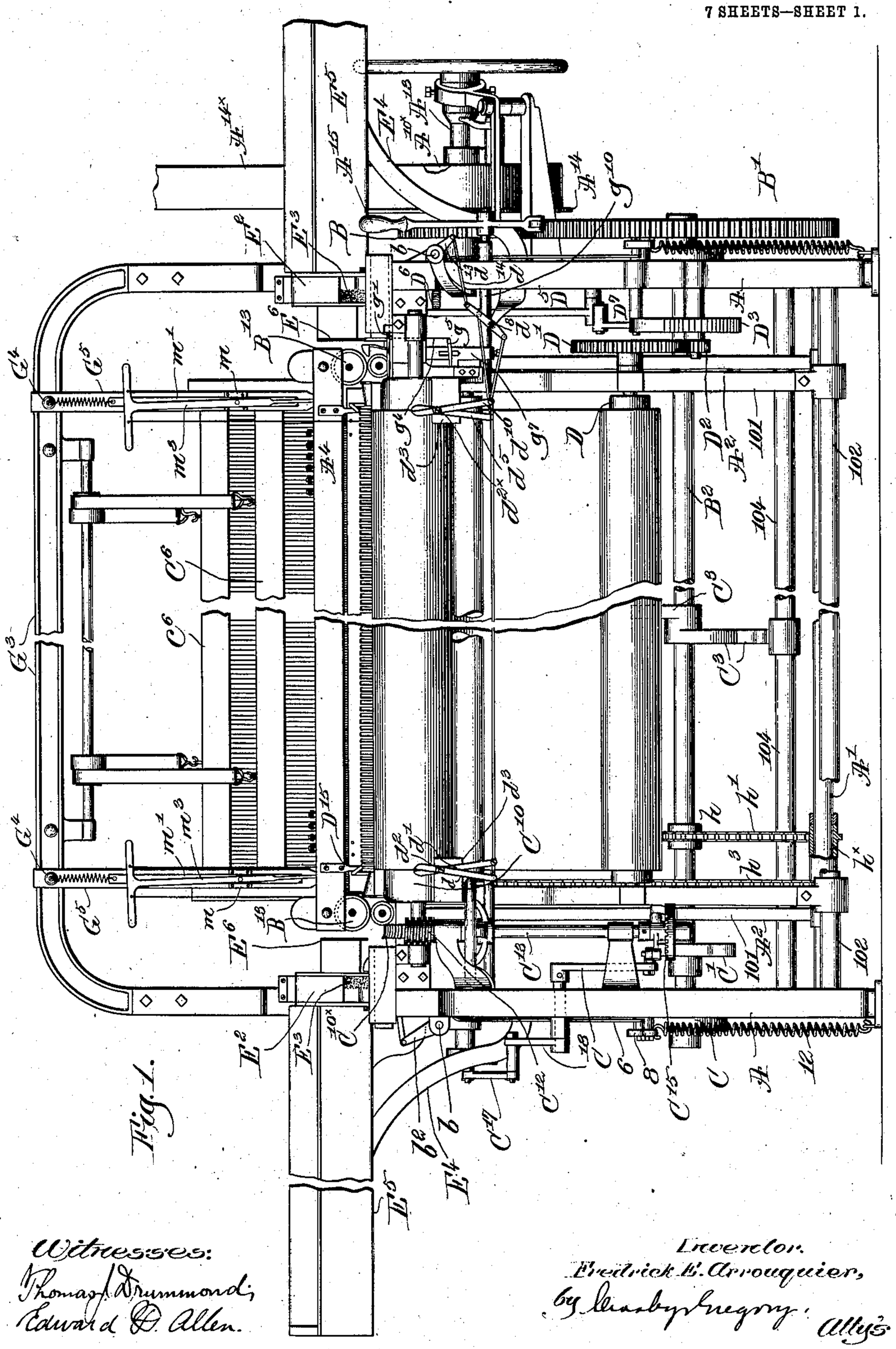

Fig. 1.

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Inventor:
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by Mosby & Gregory, Atty's.

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Fig. 2.

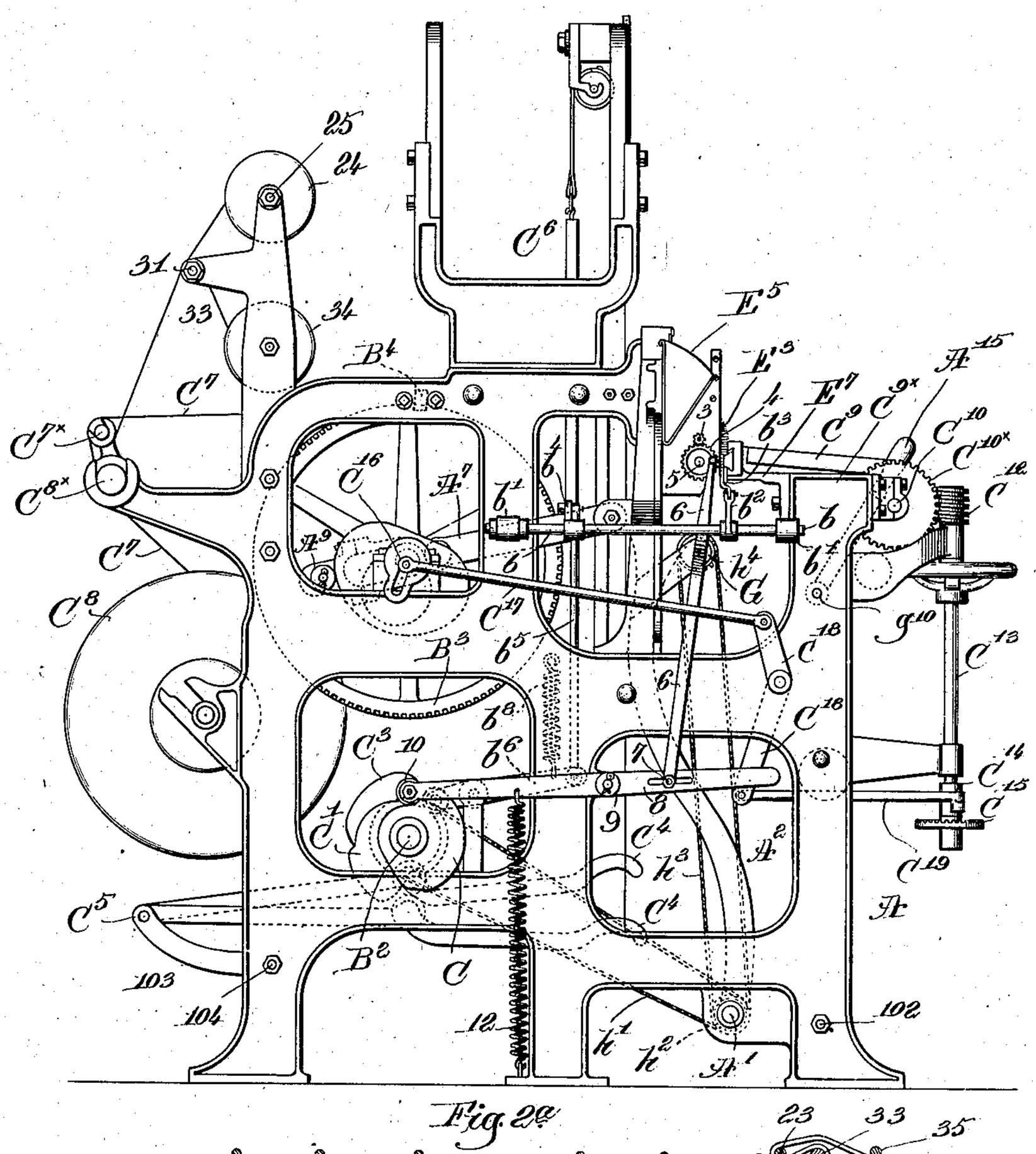

Fig. 2a

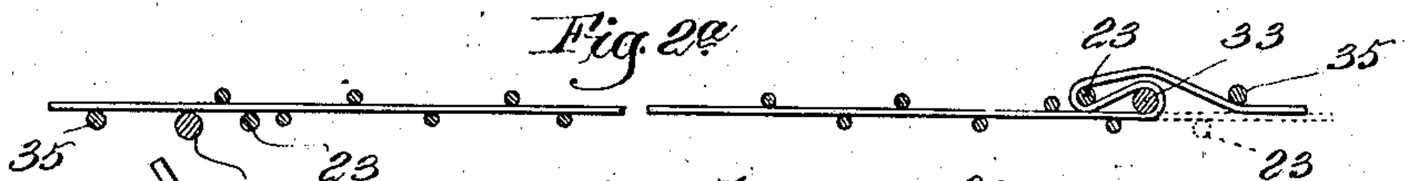

Fig. 2b

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7 SHEETS—SHEET 3.

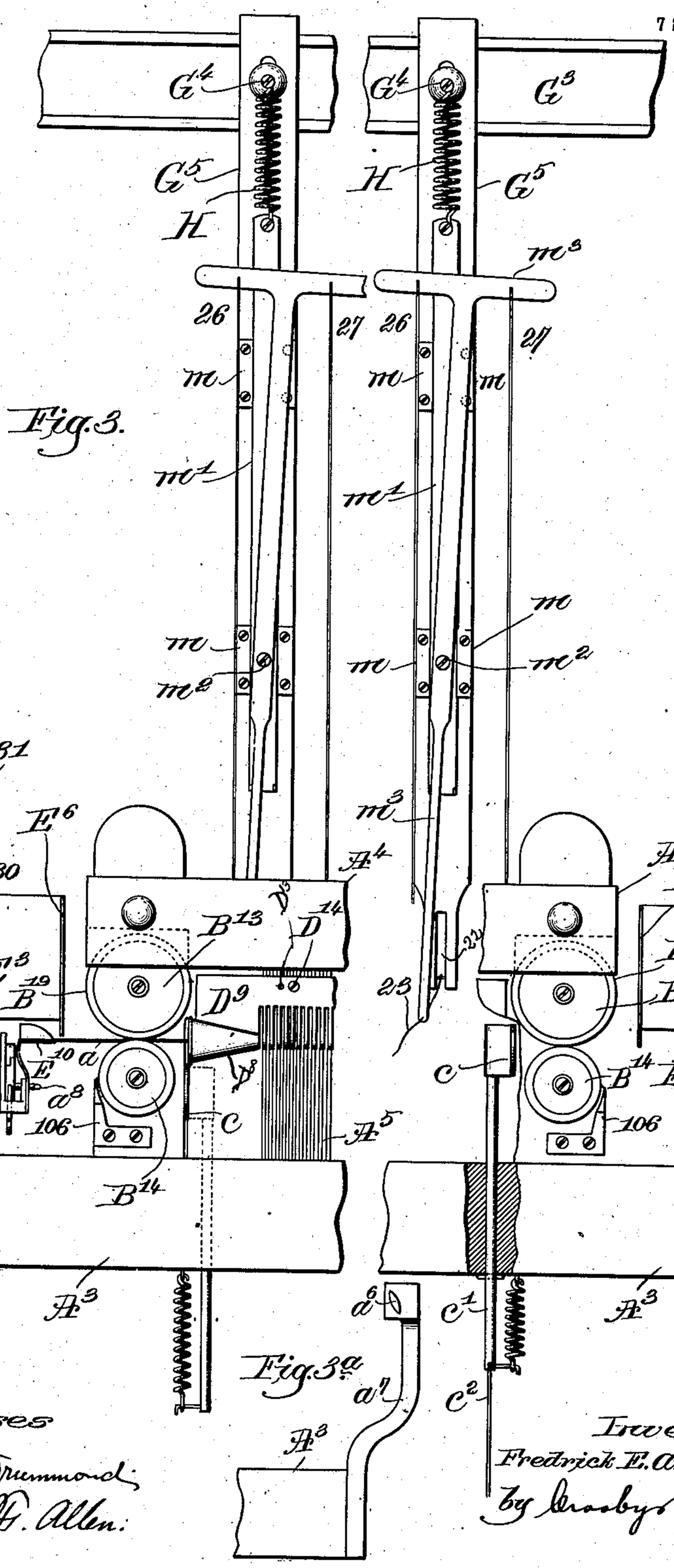

Fig. 3.

Fig. 3a.

Witnesses
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7 SHEETS—SHEET 4.

Fig. 4.

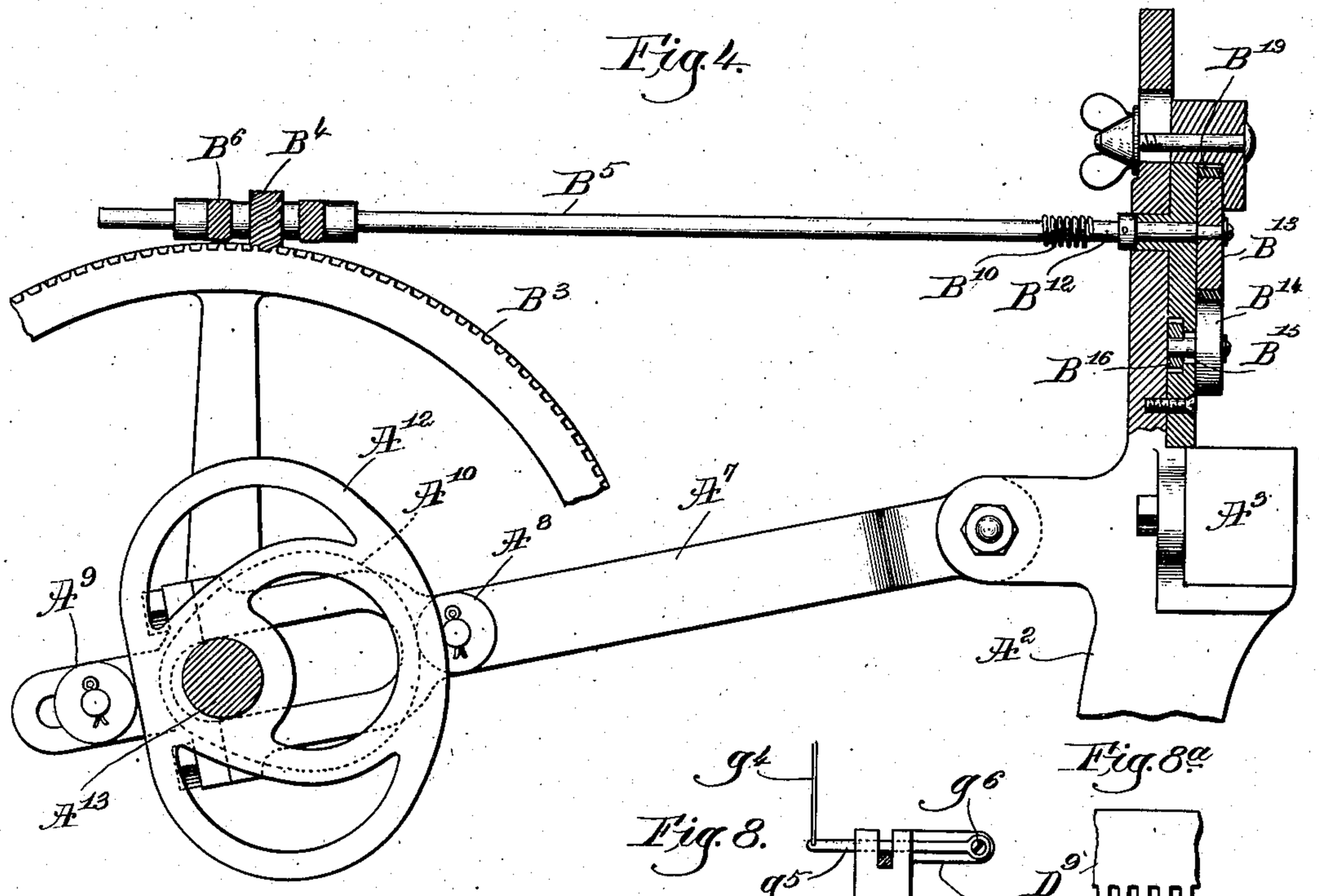


Fig. 8a.

Fig. 8.

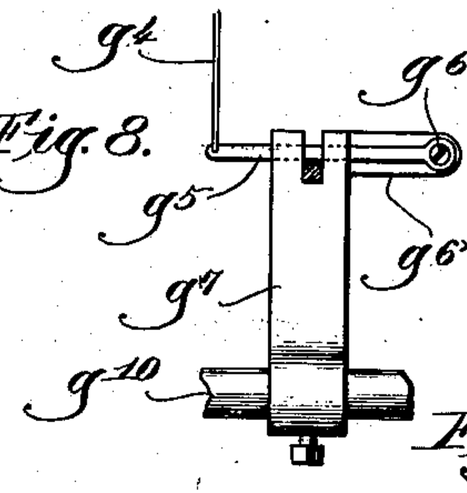


Fig. 5.

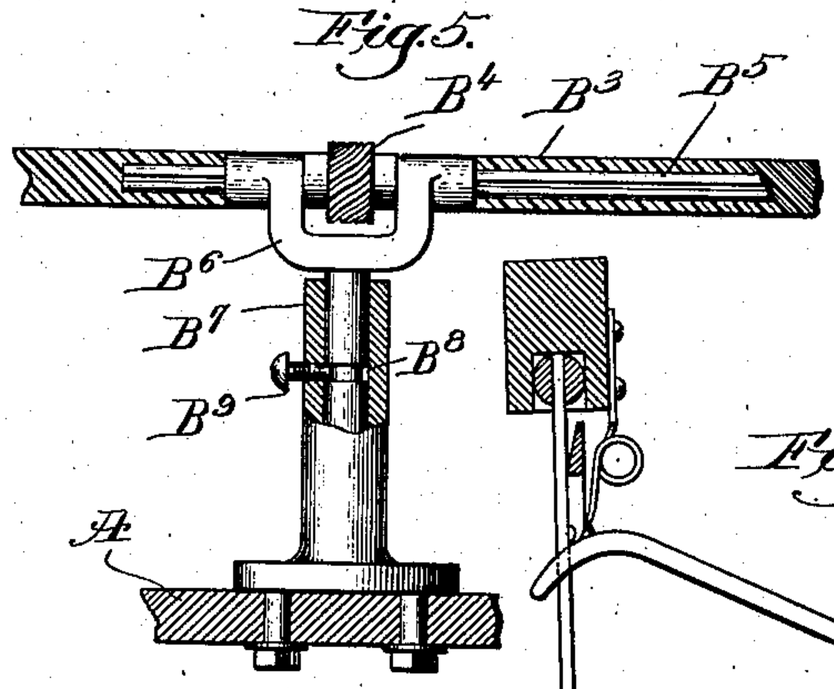


Fig. 6.

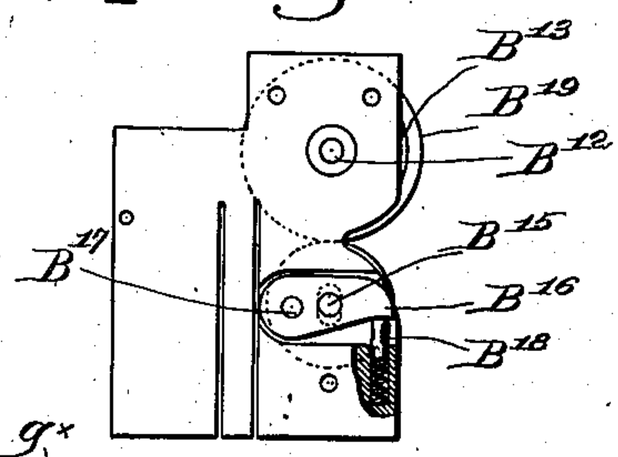
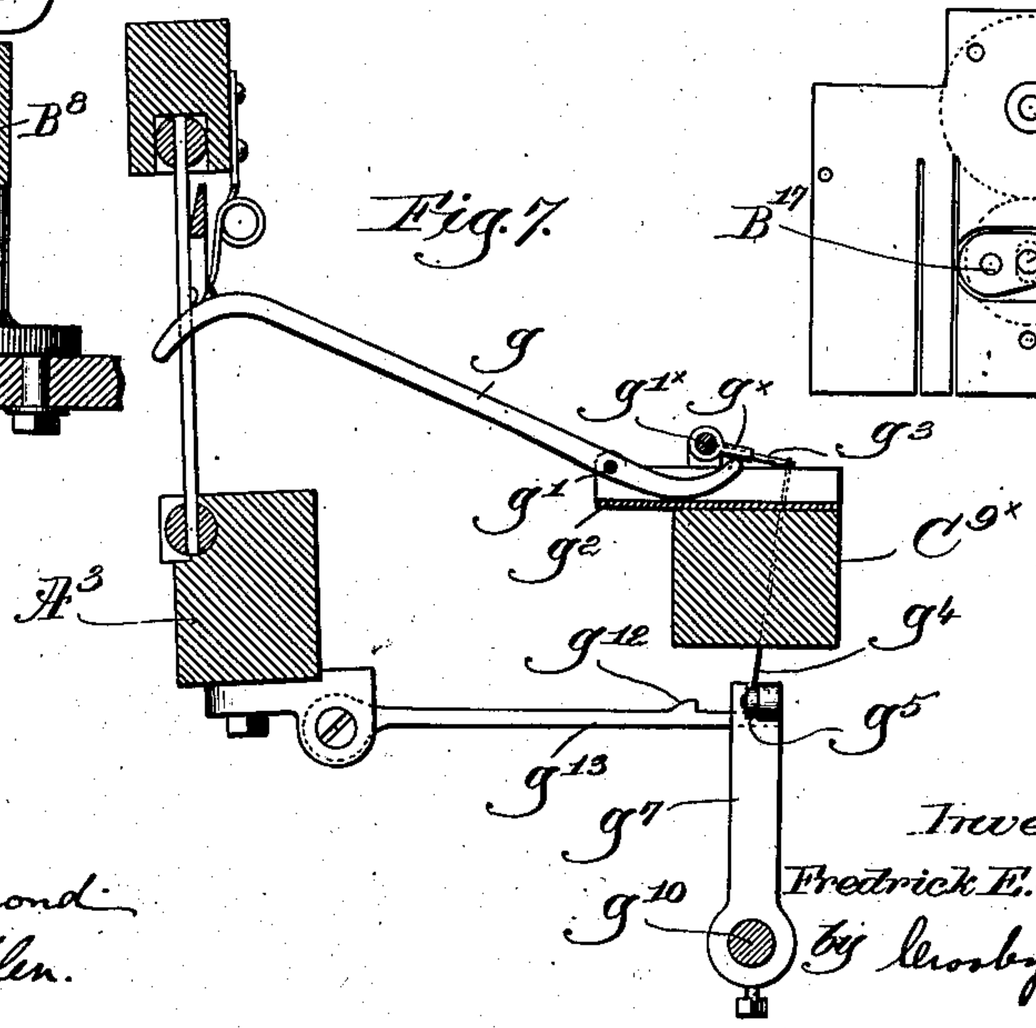


Fig. 7.



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7 SHEETS—SHEET 5.

Fig. 10.

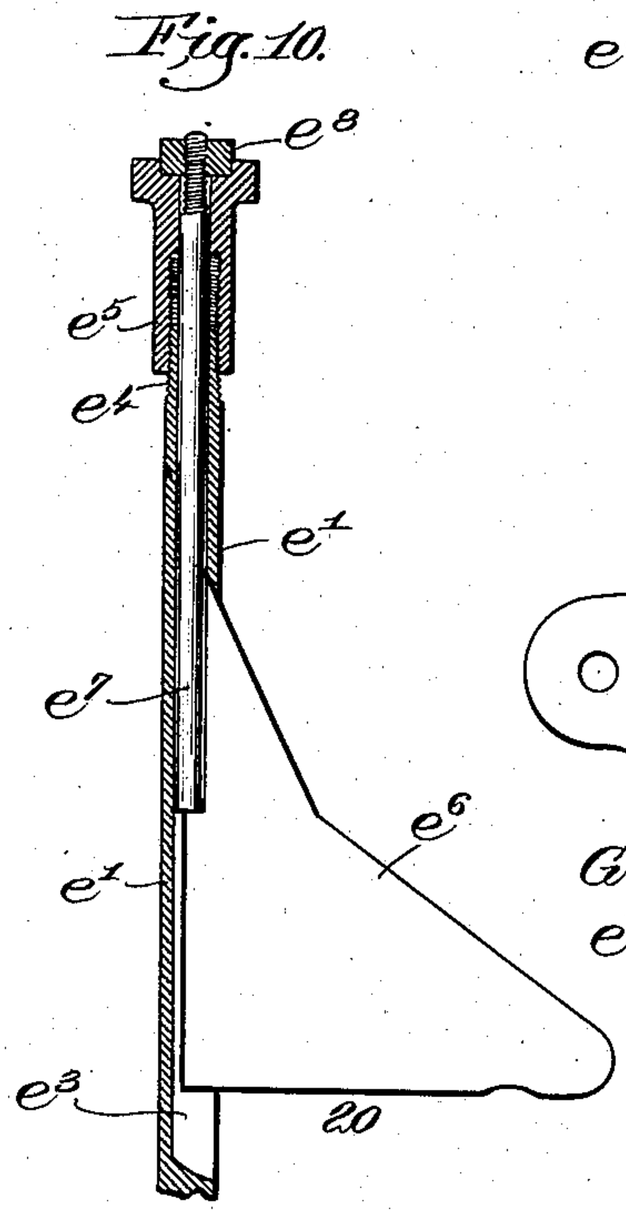

Fig. 9.

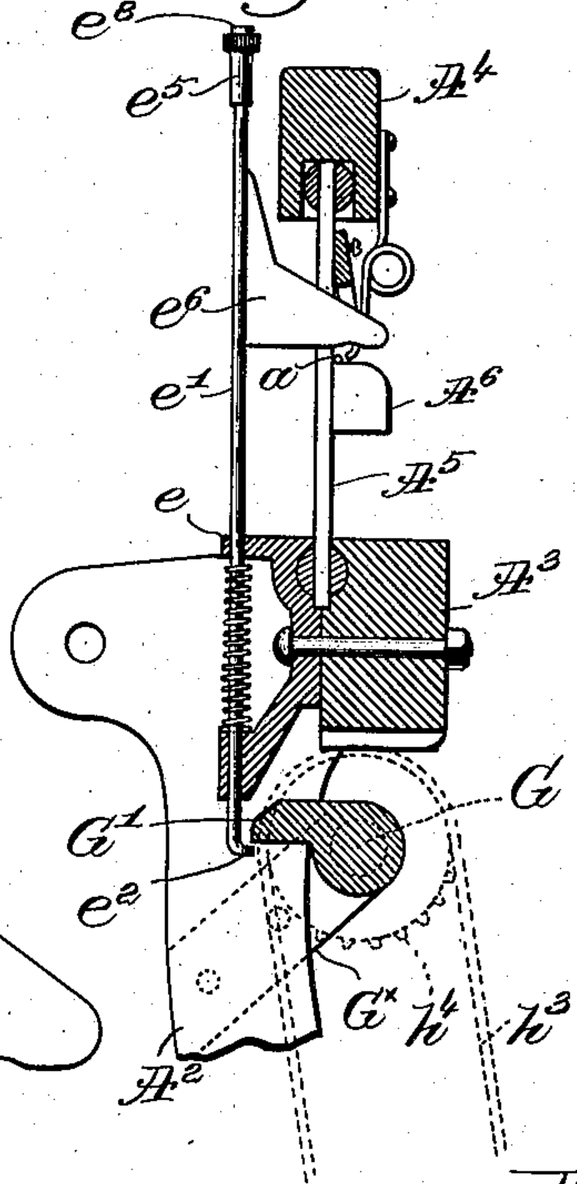

Fig. 12a.

Fig. 11.

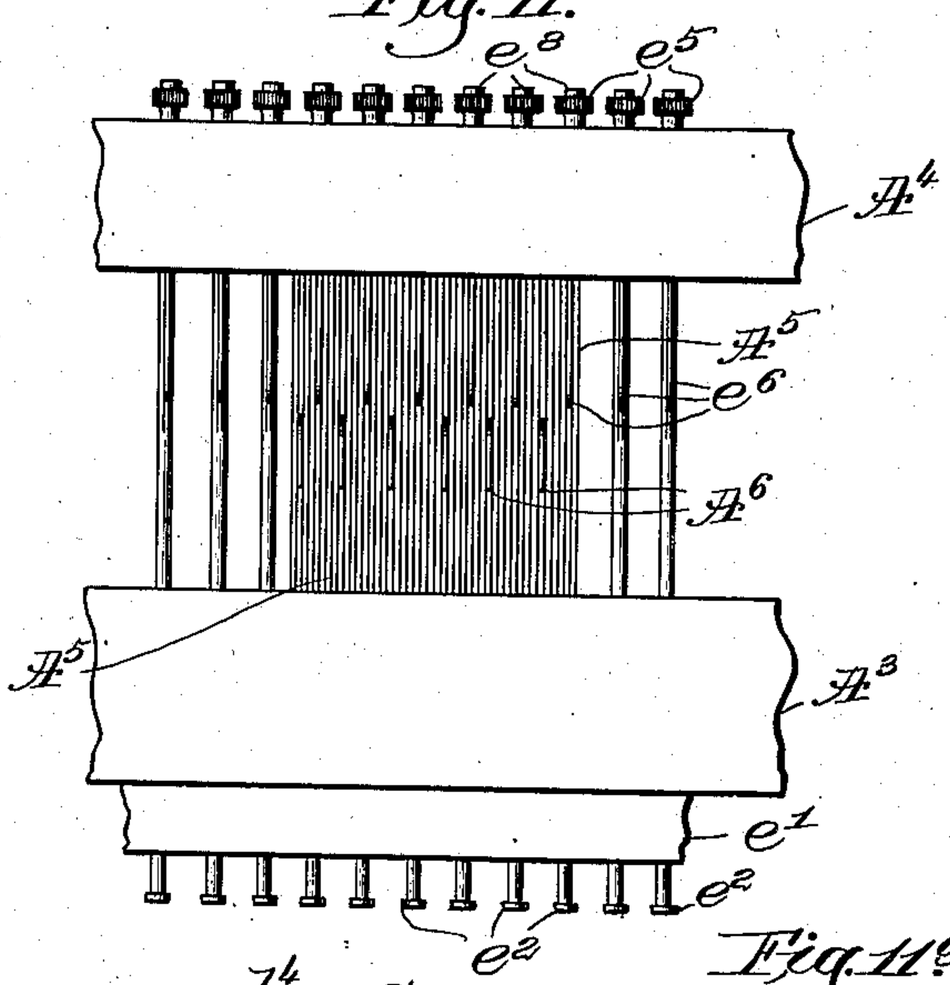

Fig. 12.

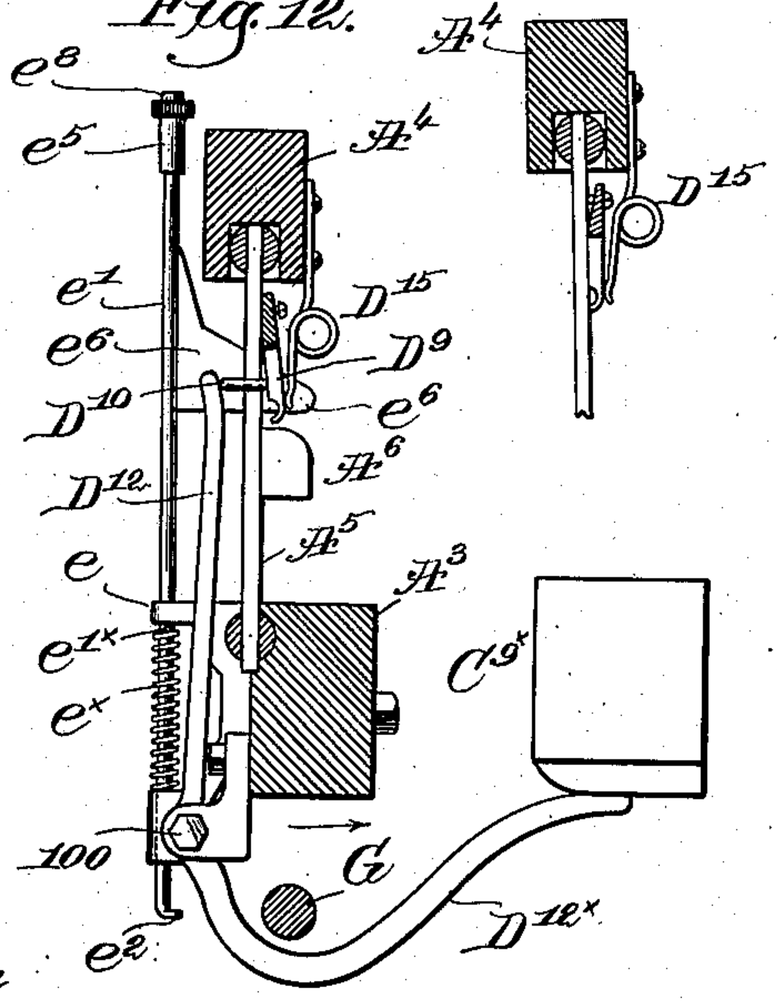

Fig. 11a.

Witnesses.

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7 SHEETS—SHEET 6.

Fig. 14.

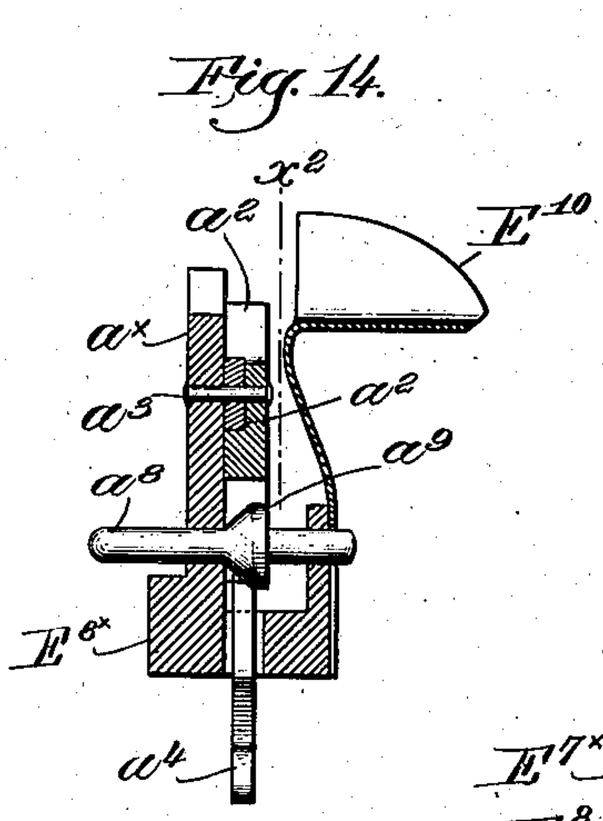


Fig. 13.

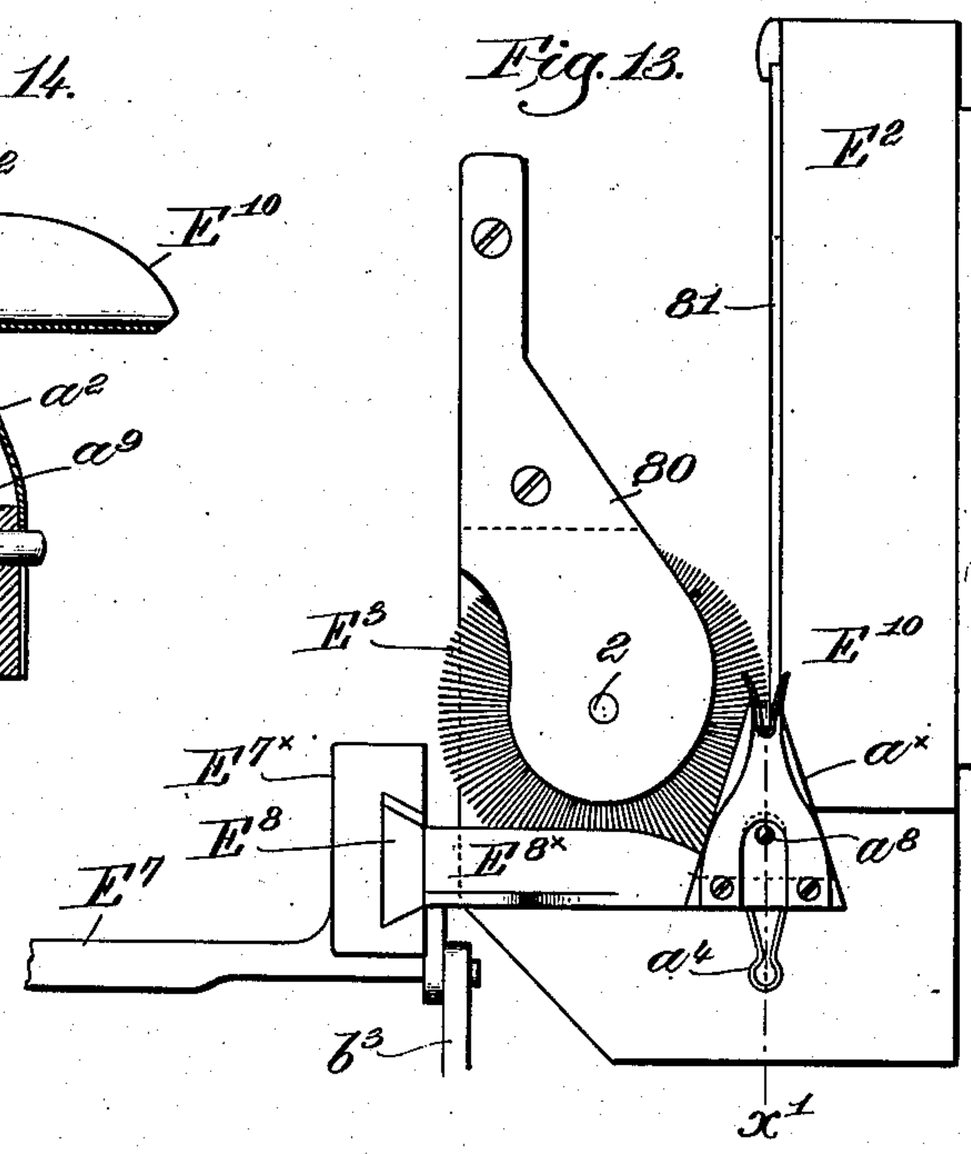


Fig. 15.

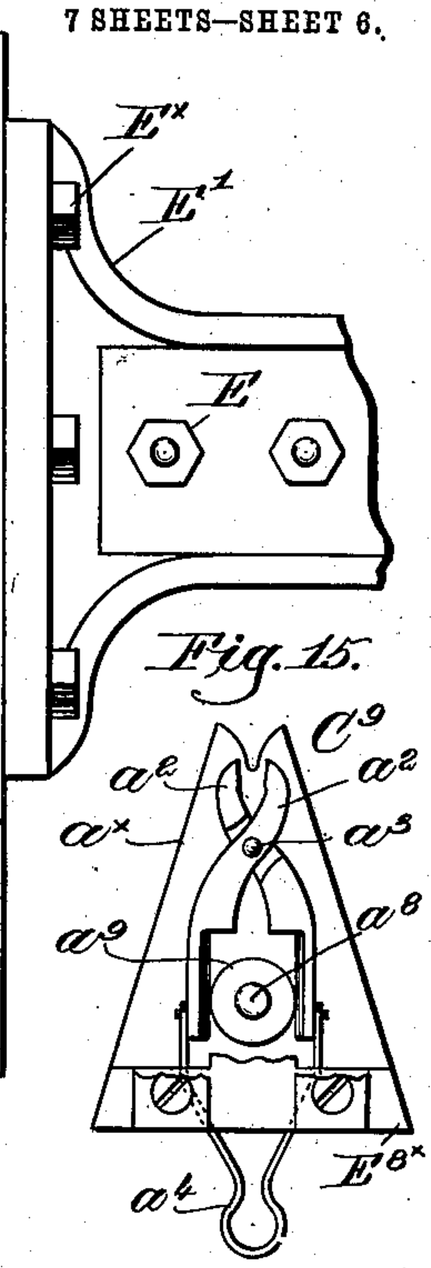
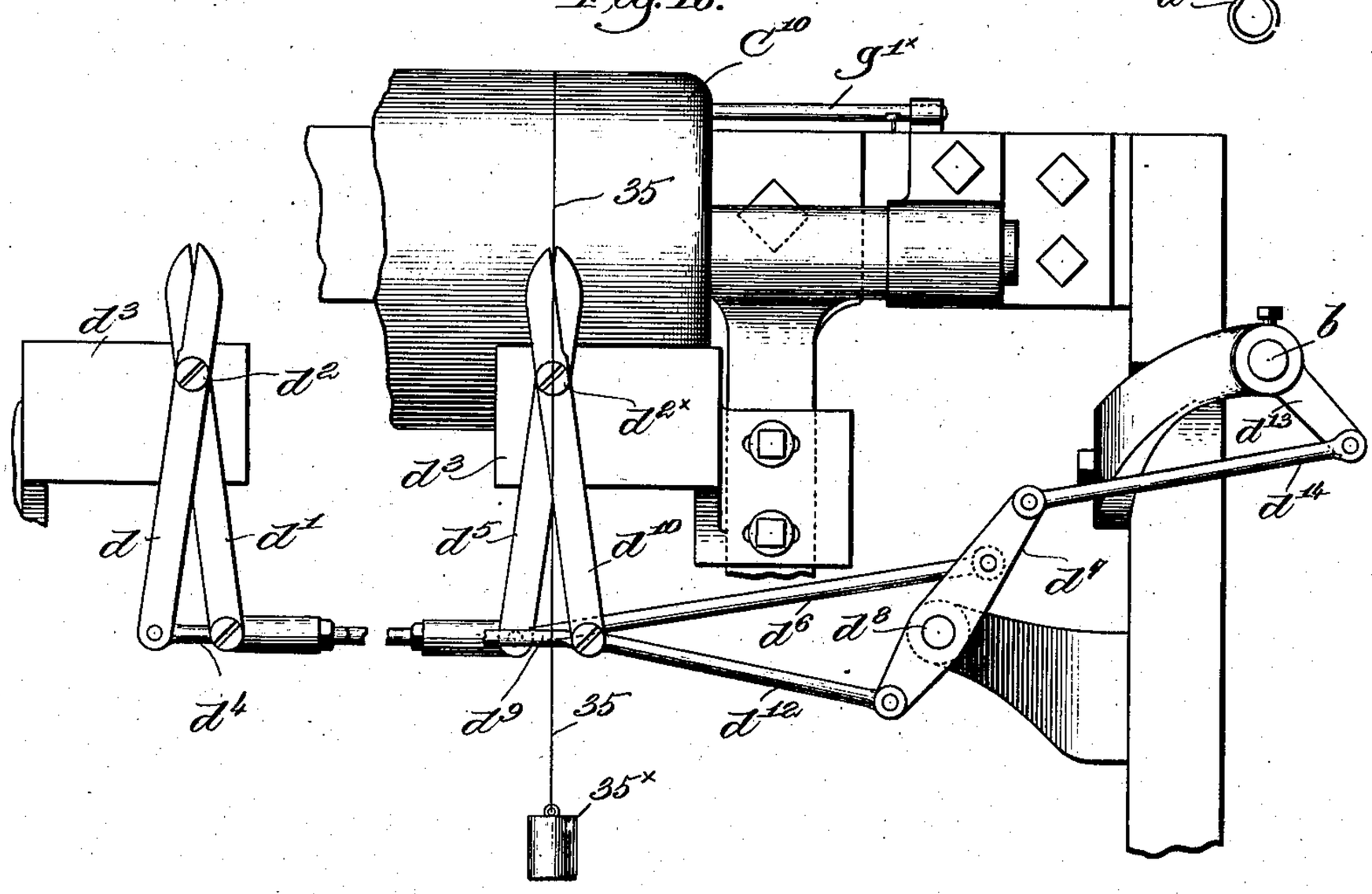


Fig. 16.



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7 SHEETS—SHEET 7.

Fig. 18.

Fig. 17.

Witnesses.

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UNITED STATES PATENT OFFICE.

FREDRICK E. ARROUQUIER, OF WESTBROOK, MAINE, ASSIGNOR, BY MESNE ASSIGNMENTS, TO GOODALL MATTING COMPANY, A CORPORATION OF MAINE.

LOOM FOR WEAVING SEPARATE WEFTS.

No. 907,946. Specification of Letters Patent. Patented Dec. 29, 1908.

Application filed October 7, 1903. Serial No. 176,075.

To all whom it may concern:

Be it known that I, FREDRICK E. ARROUQUIER, a citizen of the United States, residing at Westbrook, county of Cumberland, State of Maine, have invented an Improvement in Looms for Weaving Separate Wefts, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention has for its object the construction of a novel loom for weaving fabrics wherein the weft in separate weft lengths is inserted singly between the warps when the shed is open.

My invention is illustrated as adapted for weaving matting composed of fibrous warps and a weft of straw, the weft being inserted alternately from opposite sides of the shed.

A most essential and novel feature of my invention comprehends means for crimping the separate weft lengths before they are beaten into the fell. By crimping the weft it is possible to weave a matting having a selvage and yet keep the matting of uniform width, and the slack made in the weft by the crimping means enables the weft to be beaten closely into the shed to cover and conceal the warp without any tendency to strain and break the straw as would be the case if it were not crimped before the warps are closed on the straw.

The crimping means in the specific form illustrated as an embodiment of my invention comprises a series of independent blades each movable separately of the other. One of these blades is made to descend upon the weft or straw at a point midway its length, and thereafter the other blades at each side the first blade to be actuated, are made to descend on the straw progressively from near its middle towards its ends. This gradual crimping of the straw results in drawing the free ends of the straw toward the point where the first blade to act meets and yet holds the straw.

Another novel feature of the invention resides in the mechanism for forming the selvage at each edge of the matting. This mechanism includes wires at each selvage to stand between the protruding ends of the wefts.

Another feature of the invention resides in the means for feeding the separate wefts into the shed. In this feature of the invention the weft to be fed is selected by suitable means from a bunch of wefts, and is then carried from its point of selection to a position between a pair of feed rolls which move it endwise into the shed. The reed of the loom is provided at its face with rests which maintain the separate wefts supported above the lower part of the shed. The reed also has located at its face a weft-guide into which the weft is shot by the feed rolls, and from which it is automatically dropped upon the rests preparatory to beating up. This feeding mechanism comprises various novel features which will be described and pointed out in the claims.

Another novel feature of my invention resides in the mechanism for trimming off the protruding ends of the weft at the selvage edges. This mechanism comprises in its preferred form scissors-like cutters at opposite edges of the matting, and operating in a plane parallel to the face of the matting.

All these and other novel features will be fully described in the following specification and particularly pointed out in the claims.

The drawings show assembled and in detail a loom embodying the preferred form of the invention, but it is obvious that many of the novel features of the invention are not confined to any specific construction of mechanical parts, and the specific illustration of the invention is not to be taken as limiting the invention.

Figure 1 in front elevation, broken out centrally, represents a loom containing my invention in the best form now known to me; Fig. 2 is a left-hand end view of the loom shown in Fig. 1; Figs. 2^a and 2^b show in cross section a diagram of the fabric illustrating the position and action of the turning cord and wires in the formation of the selvage. Fig. 3 is a detail showing in front elevation part of the lay-beam, reed, and straw-feeding devices, the center of the lay-beam and reed being broken out, the brush and part of the yoke E^2 shown at the left being omitted, the nipper and straw-sustainer at the right being shown in straw-receiving position, while the same parts at the left are shown in the position in which they present straw to the feeding rollers; Fig. 3^a is a detail showing in plan view the device for sliding the cone to permit the nippers to close on a straw; Fig. 4 is a detail showing the cams for moving the lay and devices for actuating the straw-feeding

means; Fig. 5 is a detail showing in plan view part of the spiral gear, Fig. 4, and rod rotated therewith; Fig. 6 shows details of the straw-feeding means; Figs. 7 and 8 are details of the stop-motion devices; Fig. 8ª shows part of the straw-guide in the line of movement of the straw-detecting lever; Fig. 9 is a vertical section through the lay showing in detail the crimping means and means for actuating the same; Fig. 10 is an enlarged detail of part of one of the crimpers; Fig. 11 is a detail looking at the front of the lay near its central part, some of the dents being omitted to show the crimping means behind the same, the straw-guide being also omitted; Fig. 11ª is a face view of the cam-shaft for actuating the crimping means; Fig. 12 is a vertical section taken through the lay and crimping means at a point to show means for opening the straw-guide to deliver the straw, the guide being represented as opened; Fig. 12ª is a detail showing the straw-guide closed; Fig. 13 is a detail looking from the center of the loom toward one of the two like straw-selecting means; Fig. 14 is a section in the line x', Fig. 13, showing a detail of the straw-selecting means, nipper, and end-sustaining device; Fig. 15 is a view of the parts shown in Fig. 14, to the left of the dotted line x^2; Fig. 16 is a detail at the front of the loom chiefly to show the selvage trimming means, the loom being shown as broken away to represent the selvage trimmers at both sides of the loom; Fig. 17 is a cross-section through the loom to show the needles carrying the turning cords and the cams and levers for moving said needles, and Fig. 18 is an enlarged detail of the take-up mechanism.

Referring to the drawings, A represents the loom-frame, A′ the rocker-shaft sustaining the lay-swords A^2, carrying the usual lay-beam A^3, and reed-cap A^4. The lay-beam and reed-cap sustain between them a reed A^5, and about every fourth reed has projecting forwardly from it a rest A^6, for the grass or straw *a* after the same has been thrust through the shed. These rests may vary in number according to the fineness of the weave.

The lay has to and fro movements imparted to it through a connecting rod A^7, jointed to the lay and having suitable rollers A^8, A^9, that are acted upon by a double cam A^{10}, A^{12}. These cams are so shaped as to move the lay positively backward and forward and to retain the lay in its backward position for about one-third of the time of each beat, or in other words, the lay is permitted to dwell in its backward position while the straw is crimped, as will be described.

The cams A^{10}, A^{12}, are on the crank-shaft A^{13}, sustained in bearings on the loom-frame and having applied to it any usual driving-pulley A^{14} that may be driven by a belt $A^{14\times}$, said pulley being loose on said shaft and being adapted to be connected with and disconnected from the pulley $A^{10\times}$ fast on said shaft when it is desired to start and stop the operation of the loom respectively. The pulley $A^{10\times}$ is thus moved into and out of engagement whenever desired through the action of a hand lever A^{15} mounted on a shipper rod g^{10}, see Fig. 2. The crank-shaft has applied to it a toothed gear B, that when the crank-shaft is rotated engages a gear B′ fast on the cam-shaft B^2.

The crank-shaft is provided with two like spiral-toothed gears B^3, that engage and in the rotation of said shaft rotate like spiral toothed pinions B^4, each splined loosely on a rod B^5 that is free to slide in yokes B^6, the shanks of which enter loosely holes in horizontal stands B^7 connected with and extended inwardly from the loom side, the shanks of the yokes, see Fig. 5, having each an annular groove B^8, that is entered by a screw B^9. The gear B^3 and pinion B^4 on the one side are arranged to give an opposite rotation to the rod B^5 from that on the other side, by having their spiral teeth cut in opposite directions, so that the pairs of feed rollers rotate in opposite directions. The front ends of the rods B^5, see Fig. 4, are connected by springs B^{10} with short shafts B^{12}, extended through to the front side of the lay where the shaft has clamped upon it a wheel B^{13}, constituting the positively driven member of the straw-feeding means, the other member being a wheel B^{14}, mounted on a stud B^{15}, extended from one side of an arm B^{16}, pivoted at B^{17}, see Fig. 6. The stud is movable up and down in a slot in the lay, see Fig. 4, and dotted lines Fig. 6, the outer end of said arm being acted upon by a spring-pressed pin B^{18}, the stress of the spring acting normally to keep the lowermost wheel of the straw-feeding means pressed yieldingly against the straw, thus enabling the feeding means to be self-adapting to the diameter of the straw. Both of these feeding-wheels will preferably have a yielding covering B^{19}, shown in section on the wheel B^{13}, which covering may be of india rubber. It will be understood that the rods B^5 as the lay is moved to and fro reciprocate in the stands B^6 and pinions B^4, and owing to the lay moving in the arc of a circle it is necessary to provide the spring B^{10} to avoid strains that otherwise would bend the rod and destroy its usefulness.

There are feeding means, such as described, at opposite ends of the lay, see Fig. 3, as in the loom herein to be described the straw or other like individual wefts are to be inserted alternately from opposite sides of the lay into the shed.

Referring now to the cam shaft B^2, and commencing at one end thereof, said shaft, see Fig. 2, has applied to it a brush-cam C, preferably located outside the loom-frame.

Just inside the loom-frame said shaft has a feed-cam C^1, and at the central portion of the shaft there are two like shed-forming cams C^3, so set one with relation to the other as to act upon usual treadles C^4, pivoted at C^5 on a bracket 103, sustained by a tie-rod 104, and actuate frames C^6, having usual heddles to receive the threads of the warp C^7 and move the same to open sheds for the introduction of the straw or weft. The harness or shed-forming mechanism is and may be of any usual or suitable construction.

The warp C^7, is shown as supplied from a warp-beam C^8, Fig. 2, extended over a whip roll $C^{7\times}$ carried by a shaft $C^{8\times}$, and the woven matting or fabric after crossing a fabric-board C^9, sustained above the usual breast-beam $C^{9\times}$ passes over a fabric-feeding roller C^{10}, having at one end a worm-toothed gear $C^{10\times}$, see Fig. 2, that is engaged and rotated by a worm C^{12}, on a shaft C^{13}, having imparted to it an intermitting movement from a suitable pawl of a pawl-carrier C^{14}, the pawl engaging a ratchet C^{15}, fast on said shaft. The pawl-carrier derives its movement from a suitable crank-pin C^{16}, herein shown as extended from the end of the crank-shaft A^{13} through a link C^{17}, connected with lever C^{18}, and link C^{19}, see Fig. 2.

The matting or other fabric after passing the fabric-feeding roller C^{10} goes onto a winding-roll D, shown only in Fig. 1, sustained in brackets 101 erected on a tie-rod 102. This roller is provided at one end with a gear D^1, that derives its movement from a pinion D^2 on a short shaft having an attached ratchet-wheel D^3. This ratchet-wheel derives its movement from a curved pawl D^4, see Fig. 18, suspended on a stud $D^{4\times}$ carried by an elbow-lever D^5, pivoted at $D^{5\times}$, said pawl having a hook $a^\times$. The hook of the pawl is maintained in constant engagement with the ratchet-wheel by a spring $D^\times$, see Fig. 18, said spring being also connected with a detent D^7.

The upper end of lever D^5 is acted upon by a strong spring D^6 that serves normally to move the lever and pawl in a direction to rotate the winding-roll in a direction to wind onto said roll all slack in the matting as the latter is woven. The spring D^6 moves the upper end of the lever D^5 away from the breast-beam and toward the crank-shaft for moving the lay, and consequently the lay in its forward beat strikes said lever during such beat, moving it and the pawl D^4 over the ratchet-wheel that the spring may be stretched and exert its power as needed in turning the winding-roll to wind the matting. The detent D^7 retains the ratchet-wheel in any position where it may be left by the pawl D^4.

Whenever the lay in its forward movement meets the lever D^5 it always carries the upper end of said lever to a fixed point, and when the lay retires the elbow-lever follows it for a greater or less distance, that depending upon the slack in the woven matting, and if there is insufficient slack to let the upper end of the lever D^5 follow back with the lay, it will be obvious that the lever D^5 by reason of the engagement of the pawl D^4 with the ratchet-wheel will remain forward toward the breast-beam as the lay retires, and the lever D^5 will not come again into the position to be struck and moved by the lay until substantially all the slack in the woven matting has been wound on the winding-roll. The winding-roll is, therefore, it will be noticed, held constantly under the action of the spring D^6 which effects the winding of the matting on the winding-roll. Going now again to the lay, see Fig. 3, it will be seen that the reed has located wholly in front of it a straw guiding-device D^4 that is sustained on the lay by pins D^{13}, one only of which is shown in Fig. 3, extended loosely through holes in the guiding-device, and alongside of said holes are other holes that receive headed screws D^{14}, that are screwed into the upper part of the dents of the reed. The heads of these screws prevent the guiding-device from being thrown off the pins.

The lower edge of the guiding-device D^1 is slitted to form a series of fingers each one of which is cut away or shaped at its lower end, as shown in Figs. 12 and 12^a, to form parts of a groove or space through which the grass or straw after leaving either funnel D^8, secured to the opposite ends of the guiding-device, enters in its passage across the lay between the warps.

The guiding-device is shown in section in Fig. 12^a, as closed, and in Fig. 12 as open to release the straw as the lay starts forward that the crimpers may descend and remove the straw from the guiding-device onto the rests to be crimped and beat into the warp at the fell. It will be noticed that the guiding-device is beveled at its rear side near its upper edge. To move the guiding device from the position Fig. 12^a, into the position Fig. 12, to release a weft, like pins D^{10} held loosely in the reeds are acted upon by fingers D^{12}, extended upwardly from a rock-shaft 100, see Figs. 11 and 12, carried by the lay, said rock-shaft having an arm $D^{12\times}$ that as the lay is being moved in the direction of the arrow, see Fig. 12, contacts with a plate at the underside of the breast-beam. Fig. 12 shows the lay in its forward position.

Suitable springs D^{15}, one preferably at each end of the guiding device at each side of the lay, act upon the guiding device to keep the latter normally in closed position, Fig. 12^a, as when the lay is on its back center, at which time the straw is inserted.

Immediately as the lay starts forward after feeding straw into the guiding-device, as will be described, the end of the lever $D^{12\times}$ meets

the plate at the underside of the breast-beam, and said lever acting through the pins D^{10} turns the guiding-device into position, Fig. 12, to permit the released straw to drop from the guiding-device onto the rests A^6, the warps in the lower part of the shed being open to a point below said rests.

The loom-frame has extended from its opposite ends suitable arms E^4, see Fig. 1, that sustain boxes E^5 for receiving the straw in weft lengths. These boxes taper in cross section, see Fig. 2, and have at a short distance from their inner ends inside the loom-frame, plates or gages E^6, connected with the yokes E^2, that act to arrest in the same vertical plane the inner ends of all the strands of straw in the box, and to be taken therefrom and fed into the guiding-device to be described across the warp of the open shed.

Each loom-side has attached to it by bolts E, see Fig. 13, a bracket E′, having in turn connected with it by screws $E^\times$ a yoke E^2 located between the inner end of the boxes E^5 and the gages E^6 and provided with depending metallic ears 80. The side of the yoke E^2 is provided with a piece of glass 81 against which the mass of straw at one side of the box E^5 contacts. The ears 80 sustain a short shaft 2 parallel with the lay and provided with a brush E^3 the bristles of which in the rotation of the brush sweep up and down over the glass plate. This plate obviates friction of the straw near its ends as would be the case if the surface opposed to the brush were of wood or metal. The shaft 2 has a pinion 3, see Figs. 2 and 3, that is engaged by an oscillating pinion 4, mounted on a stud 5 of the yoke, see Fig. 2. This pinion has a crank-pin that is engaged by a link 6, connected adjustably at its lower end by a screw 7, with a lever 8, pivoted at 9 on the loom-side, said lever having at its inner end a roller-stud 10, that is maintained normally in contact with the brush-cam C by a spring 12.

The breast-beam has connected with it an inwardly extended guiding-stand E^7, see Figs. 2 and 13, on a larger scale, having at its inner end an upright portion $E^{7\times}$ provided with a dove-tail-shaped guideway or groove in which enters a dove-tailed portion E^8 of a slide-bar $E^{8\times}$, that sustains at its inner end one member of the straw-selecting means, shown as nippers, and the straw-end sustainers E^{10}, to be described.

Viewing Figs. 13, 14 and 15, the straw-selecting device comprises the brush E^3 and a plate or upright $a^\times$ having at its upper end a V-shaped notch, the bottom of the notch terminating just below the engaging ends of the open straw-nippers composed of arms a^2 shaped as best shown in Fig. 15, and pivoted at a^3 to the plate $a^\times$, a spring a^4 connected with the arms acting normally to close the shorter arms of the nippers on a straw that is next to be taken from the weft-box and inserted through the shed. The bottom of the V-shaped notch is of a size to receive and position but one straw, so that but one straw may enter between the open jaws of the nippers, and when the nippers close they grasp but one strand of straw.

The V-shaped notch in the plate $a^\times$ is itself a practical continuation of the inclined walls of the metallic ears 80, and the face-plate 81 of the yoke E^2, and together these parts constitute a support for the bundle of weft, and guide one of the wefts down into the bottom of the V-shaped notch under the action of the rotary brush.

The slide $E^{8\times}$ also carries, see Fig. 14, a straw-end-sustainer E^{10}, shown in cross section in Fig. 14, and side elevation in Fig. 3. This end-sustainer is substantially V-shaped in cross section so as to sustain each straw end and present it substantially central with relation to the contacting faces of the straw-feeding rollers. The end-sustainer always occupies the same position with relation to the nippers. The straws when their ends abut the plate E^6, cross the path of movement of the brush, and as the brush is rotated, its bristles contact with a number of straws and force the straw with a yielding pressure downwardly so that some of the straw enters the V-shaped notch in the upper end of the plate $a^\times$, and but one piece of straw, viz., the piece in the extreme bottom of the notch, is in position to be engaged by the nippers when the latter is closed. The nippers receive the one strand of straw when the lay is on its back center and at rest. As the lay is moved forward a cam stud a^6, see Figs. 3 and 3^a, carried by an arm a^7, connected with the lay, meets the outer end of a rod a^8, having a cone a^9, shown enlarged in Fig. 14, and pushes said cone forward from the position Fig. 14, permitting the spring a^4 to instantly close the nippers onto one piece of straw. This is done when the lay arrives at its forward movement and the nippers hold the straw while the lay retires. After the shed has been opened, the lay being on its back stroke, the nippers and end-sustainer must be moved forward toward the warp to insert the end of the straw seized by the nippers and extended beyond the end-sustainer to present the end of the straw into the bight of the feeding-rollers. This is done in the following manner, while the lay is on its back center.

To move each plate, nippers, and end-sustainer, I employ as herein provided for the following devices, viz:—a rock-shaft b, sustained in bearings b', secured to the loom-frame, and having an arm b^2, see Fig. 2, that is connected by a short link b^3, partially shown in Fig. 13, with a depending ear from the slide E^8. This rock-shaft has an arm b^4, see Fig. 2, that is connected by a link b^5 with a lever b^6 shown partially by dotted lines in said figure and provided at its opposite end

with a roller, that contacts with the cam C′, said roller being normally held in contact with said cam by a spring b^8.

There are like plates $a^\times$, nippers, and end-sustainers at each side of the loom, each working alternately to insert a piece of straw into the shed when the lay is at its back center, so that a piece of straw is inserted in the shed from one and then from the other side thereof.

After the nipper has been closed upon a piece of straw next to be inserted between the warp, the brush E^3 is rotated in reverse direction, it acting at such time to temporarily sweep up out of the V-shaped notch in said plate all the straws other than the one piece held by the nipper. This enables the nippers and parts instrumental in carrying the straw to the feeding-rollers to be moved without friction.

The rods B^5 for rotating the feeding rolls rotate, it will be understood, continuously but in opposite directions, this being necessary owing to the location of said rolls at opposite ends of the reed, and the different direction of movement required for the straw. When the end of a piece of straw is inserted into the bight of the feeding-rollers the straw is instantly caught and forced into the funnel and through the guiding-device, as has been described, the end of the piece of straw finally meeting a stop *c*, see Fig. 3, which at such time occupies its operative position, that is, it is elevated at the outer end of the opposite funnel. The end of the piece of straw meets this stop before the guiding-device is opened to permit the discharge of the straw. There is a like stop *c* movable vertically at the outer or enlarged end of each funnel, and the stop occupies its operative position when a straw is coming through the guiding-device from the opposite side of the lay and is entering the small end of the funnel, said stop occupying its inoperative or depressed position, see left of Fig. 3, when a piece of grass or straw is to be inserted into the shed and is to be entered into the outer or enlarged end of the funnel. These stops are each carried at the upper end of a rod *c′*, see Fig. 3, and each rod has a cord c^2 at its lower end that may be connected with one of the treadles C^4.

The nipper at the right, Fig. 3, is shown in straw receiving position, while said device at the left is shown as having been started toward the feed-roller. When the nipper at the left arrives near the end of its stroke, the pin a^8 meets the arm 106 which slides said pin into the position Fig. 14, to open the nippers.

The weft-selecting and feeding-in mechanism just described in the specific form selected as the preferred form of the invention herein is a novel and valuable part of the invention in its broad aspect. The brush rotating first in one direction to brush the straws down into a V-shaped notch and then in the opposite direction to brush back all but the selected straw, means for delivering the selected straw in between the feed rolls, as well as other features of this mechanism are novel and valuable in themselves.

Another novel and most essential feature of my invention resides in mechanism for crimping the weft before it is beaten into the fell. In fabrics of this character it is generally desirable to have the warp concealed as much as possible, and therefore the weft must be bent back and both over and under the warps. In any event, the weft is shortened when beaten into the fell, and this shortening of the weft breaks or injures it, unless it be given a preliminary crimp as provided for by this feature of my invention. The crimping of the weft may be secured in a variety of ways by a variety of mechanism. I consider it broadly new to crimp the weft preparatory to beating into the fell or to crimp it at any time after it is inserted into the shed. In the specific embodiment of the invention illustrated herein the weft is crimped mechanically by coöperating devices located at the reed, the operation taking place during the forward movement of the lay while the warp is being gradually closed on to the straw. I will now describe the construction shown for this purpose.

The lay, see Figs. 9, 10 and 11, has attached to its rear side a guide-bar *e*, through which is extended a series of rods *e′*, more or less in number according to the fineness of the weave of the fabric. The lower ends of these guide-rods are outturned to form lips e^2, and each guide-rod for a portion of its length from its top downwardly is grooved as at e^3, Fig. 10. The upper end of each guide-rod is threaded at e^4, and receives a long tubular nut e^5. The slotted portions e^3 of the rods receive the crimpers or blades e^6, shown as thin narrow metal plates extended from shanks e^7, guided in the grooves e^3, and extended upwardly therefrom through the nuts e^5, where the upper threaded ends of said shanks receive nuts e^8. By turning these nuts e^5 and e^8 the positions of the lower edges 20 of each crimper or blade with relation to the projections A^6 may be accurately determined, it being necessary to adjust these crimpers so that they will descend between the rests A^6 sustaining the straw for a greater or less distance below the surfaces of the rests A^6, in accordance with the closeness or fineness of the fabric being woven. To actuate these crimpers the lay is provided with a shaft G, mounted in brackets $G^\times$ on the lay-swords A^2 and having a cam-shaped projection G′, of such length and so shaped, see Fig. 11^a, that when rotated, it will act first upon the crimper occupying a position central with relation to the fabric being woven, and cause said

crimper to descend upon the straw, grass or other weft, and thereafter it being understood that the shed is open and the lay going forward, the crimpers at opposite sides of the one first depressed are brought down one at each side thereof until finally all of the crimpers have been brought down upon the weft.

The projection G′, see Fig. 11ª, is inclined from the center of its length oppositely towards the ends thereof. The shaft G derives its motion from a sprocket wheel *h*, Fig. 1, on the cam-shaft B², through a chain *h′*, that engages teeth of a sprocket-hub *h*×, mounted loosely on a cross-shaft, said hub having another sprocket *h*², see Fig. 2, that receives another sprocket-chain *h*³, that is extended upwardly over a sprocket-wheel *h*⁴, at the end of the shaft G. In this way it will be understood that while the straw is held centrally of its length, and substantially midway the width of the fabric, the crimpers act in succession one after the other away from the center as the lay is moving forward, and the crimped straw is shortened in its length that it may adapt itself to the warps preparatory to the warps closing upon it. This crimping action forms slack in each piece of straw that is taken up by the crossing of the warp in the closing of the shed to interlock the individual pieces of crimped straw, and as the straw is beat into the matting at the fell, the warps are fully covered and concealed from sight. This crimping action obviates the breaking of the straw, which if it were attempted to weave without crimping would break into pieces and a practical fabric could not be woven, whereas by crimping the straw as herein provided for, light, delicate-weight straw may be woven into the finest of matting.

In the production of a matting thirty-six inches wide I use straw of about forty inches in length, and the crimping of this straw before crossing the warps upon it and beating it into the shed shortens the straw about two inches, and sufficient slack is formed in the straw by this crimping operation to enable the straw when it is struck by the reed and beat into the fell to adapt itself to the requirements of the warp, leaving the warps parallel and straight at the selvage which would not be possible if the straw was woven into the warps without being crimped and covering and concealing all the body warps which is a matter of the greatest importance for the production of a first-class salable matting.

In the operation of the loom herein described the weft caught by the feeding rollers is inserted through the guiding devices until the leading end of the straw comes against a stop *c*, and while the lay is on its back center and the shed opened to place the lowermost warps below the rests A⁶, the guiding device is opened, leaving the straw weft in condition to be acted upon by the crimpers, said straw weft having been released by opening the weft-guiding device and having descended upon the rest. In the crimping action which then follows the centermost crimper descends and holds the straw substantially at its center, and thereafter during the forward movement of the lay the other crimpers descend in succession at opposite sides of the first crimper, and they act gradually to crimp the straw throughout its length, and just about as the reed is, say ¾ of an inch from the fell, the cam projection G′ having acted to depress all the crimpers, immediately passes from the inturned ends of the rods *e′*, letting the springs *e*×, the upper ends of which contact with pins *e′*× of the rods *e′*, act immediately to elevate quickly and preferably instantaneously all the crimpers from the straw, leaving it free between the warps so that the lay in the final part of its forward movement as the shed is closed, beats the crimped straw weft in at the fell.

The fabric woven on the loom described is fully described in United States Patent No. 842,053, granted Jan. 22, 1907.

A portion of each weft of straw at that selvage where the straw is inserted in the shed is acted upon between the selvage warps and the free end of the straw which is not inserted between the warps by a turning cord that bends the straw about the selvage warp and causes a part of the straw near its ends to be caught and held by the warps so that the straw is anchored in the fabric at that selvage. During this operation a wire overlapping the end of the straw left protruding from the selvage outside the part of the straw acted upon by the turning cord prevents the free end of the straw from occupying a position crossing the selvage warp. In the feeding of the woven matting the wire remains crossing the end of the straw outside the selvage cord. The end of each weft of straw as it emerges from the shed at one and then at the opposite selvage passes below the wire referred to, there being such a wire outside each selvage, the weft emerging from the selvage not being turned backwardly about the selvage cord. The wires for preventing the extremities of the straw weft crossing the warp stand, therefore, between the protruding ends of the straw of alternate picks, ends left wholly outside the selvage-warp when inserting the straw into the shed, and ends left protruding beyond the selvage-warp as the end emerges from the shed.

The wires hold and direct the protruding ends of the straw at each side the selvage, and at a distance from the fell these protruding ends are removed by cutters between the edges of which these ends are carried as the

fabric is fed toward the take-up or winding roll.

The fabric woven on the loom described is provided with a selvage which in one good form may be made as follows:—The upper cross-bar G^3, of the loom-frame, has secured to it by screws G^4, suitable depending bars G^5, each bar standing substantially vertically above the selvage. Each bar is slotted at its lower end, as at 22, to form a space in which may move up and down a turning-cord 23, during the operation of forming the selvage. Each bar has guides *m* that receive between them slide-bars *m'*, each having a stud m^2 on which is mounted a needle m^3 provided at its lower end with an eye through which is led a turning cord 23 taken from spool 24. The springs H, attached at one end to the slide bars *m'*, and at the other end to a fixed portion, as the screws G^4, serve to hold the slide bars normally elevated. The needles m^3 are T-shaped at their upper ends, and have connected to them respectively wires 26, 27, that are connected with like levers 28, 29, at opposite sides of the harness cams and having their fulcra on a stud 30, see Fig. 17, at the rear side of the loom, said stud being in line with the fulcrum C^5 for the treadles actuating the harness frames. The levers 28, 29, are acted upon by cams $28^\times$, $29^\times$, on the cam-shaft B^3, said cams being of substantially the same shape as the harness cams and working in the same time with the harnesses.

The turning cord 23 at each side of the loom is taken from a spool 24 mounted on a stud 25, see Fig. 2, at each side of the loom, and subjected to friction by wrapping it more or less around the reed 31 and then under and around the whip-roll shaft $C^{8\times}$, and is then led through the slot 22 in the depending bars and thence into the eye of the needle m^3, and will be woven into the matting at the selvage.

The selvage contains a large or selvage cord 33, see Fig. 2^a a cord heavier than the warp, and the straw weft is bent around this large cord which is held stiffly. The large or selvage cord 33 at the right-hand side of the matting passes through a heddle in the back harness, and the large or selvage cord at the left-hand side of the matting passes through a heddle of the front harness, so that these large or selvage cords move oppositely at all times. Each cord 33 supplied from spools 34 will be wrapped around bar 31, and then around the whip-roll-carrying-shaft on its way to and through the eyes of the heddles of the harness frames. Furthermore, in the production of the selvage I employ a wire 35, see Fig. 16 and Figs. 2^a and 2^b, one at each selvage. The inner ends of these wires, one inserted through a heddle of the front harness frame, and the other through a heddle of the back harness frame, may be fixed to any suitable part of the loom, and the front end of the wire may cross the breast-beam and have connected with it a weight $35^\times$. When a weft is to be inserted from, say, the right-hand side of the loom, the large cord and the wire at that side are up, see Fig. 2^a, and the turning cord occupies the position shown by dotted lines, see Fig. 2^a, at the level of the under warps of the sheds. On the left-hand side in the wire, selvage cord and the turning cord are all down, as shown in Fig. 2^a. The straw is then shot in from the right and occupies the position shown in Fig. 2^a, with the end lying in the dotted line position.

It is customary only to turn one end of the straw, and in the position illustrated it will be the end at the right-hand. The needle m^3, which in this position has been depressed against the tension of the spring H; by pulling on the cord 26, is now released and moves upwardly, carrying with it the turning cord 23, and bringing the end of the weft up between the wire 35 and the selvage cord 33; the cord 27 is then pulled, shifting the end of the needle to the left, and bringing the turning cord over the selvage cord 33; the needle m^3 is then pulled down by pulling on the cord 27 against the tension of the spring H, carrying with it the turning cord, and bringing the weft into substantially the position shown in Fig. 2^a. It will thus be seen that the turning cord passes over the selvage cord 33, and occupies a position between the next two warps, while the wire 35 prevents the extreme end of the weft from flying over into a position parallel with the fabric, where it could only with difficulty be trimmed off. Meanwhile the selvage motion on the left of the loom has been idle, and accordingly, when the shed shifts the two turning cords are woven in as warps, as shown in Fig. 2^b.

When the shed is entirely changed the various parts will occupy exactly the reverse position, that is, to say, the wire 35 and the selvage cord 33 on the left will be up with the turning cord down, and between them, while on the right the wire 35 and selvage cord 33 will be down, and the turning cord 23 will be down, and lying between the two warps next adjacent the selvage cord. The straw will then be shot in from the left, and thereafter the turning cord will have a movement similar to that already described, that is, it will pass up over the selvage and down into position between the next two adjacent warps, the free end of the weft being held outwardly by the wire 35 on the left, while on the right-hand end there will be no motion on these parts other than that caused in the shifting of the shed and the weaving in of the weft.

Each straw inserted into a shed crosses over the wire at that side of the shed from which the straw is inserted, and as the leading end of the straw emerges from the shed

it passes under the wire next that side of the shed where the straw emerges.

The mechanism for trimming the protruding ends of the straws at the edge of the fabric so as to leave the fabric in neat finished condition, is also a novel and important feature. A pair of scissors-like cutters are arranged at each edge and in a plane parallel with the matting. The wire of the selvage mechanism turns and holds the protruding ends in such position that with the scissors arranged as described the protruding ends pass in between the scissors and are cut off by the operation of the scissors. The shaft b is also employed for actuating the trimming means used to cut off the projecting ends of the straw weft. This trimming means comprises as shown two pairs of scissors, each comprising two levers d, d', d^5, d^{10}, pivoted at d^2, $d^{2\times}$, on suitable brackets d^3, sustained at the front of the loom. The lever d of the scissors shown at the left, Fig. 16, is connected with the lever d^5, of the scissors at the right, by a link d^4, and said lever is by a link d^6 connected with a lever d^7, above its fulcrum d^8. The lever d' of the scissors at the left, Fig. 16, is connected by a rod d^9 with the lever d^{10} of the scissors at the right, and said lever is in turn connected by a link d^{12}, with the lever d^7, at a point below its fulcrum. The lever d^7 derives its motion from the rock-shaft b at the right-hand side of the loom, through an arm d^{13}, and link d^{14}. From the connections described it will be understood that the scissors are open when the selecting and presenting device at the right-hand side of the loom is moving forward, and are closed when the lay is moving back, each pair of scissors remaining closed during one beat of the lay, so that the cutters act simultaneously to cut off the projecting weft ends outside the selvages at every other beat of the lay. The precise time of the operation of the scissors is not material so long as the protruding edges of the straw are trimmed off as the matting is wound up in finished condition. The ends of the straws project in different directions at each selvage according to the side of the loom from which they are fed, but the selvage wire employed in this loom serves to hold the protruding ends of the straws in such position as will be seen by reference to Fig. 2^b of the drawing, that when the scissors are placed parallel to the matting they will cut off all the ends protruding, regardless of the side from which the weft was fed.

I have provided a stop motion to stop the loom in case the weft being inserted should fail to be left properly in the open shed, or in case a short piece of straw should be engaged by the nipper, and should fill the shed but partway across. This stop motion comprises a weft feeler shown as a lever g, see Fig. 7, pivoted at g' in a groove block g^2, mounted on the breast beam.

The short, upwardly turned arm of the lever is crossed by the fabric being woven. The outer convexed end of the lever enters a space between the dents of the reed, and extends backwardly of the reed when the lay is on its back center, and a straw properly inserted crosses the rear end of this lever. As the lay is moved forward, a straw if present will act against the convexed end of the lever and depress the same, causing the short upturned arm thereof to rise and act against a projection $g^\times$ extended from a rod $g'^\times$ held in ears of the block g^2, thus causing the shaft to be turned and lift an arm g^3, see Figs. 1, 7, at the opposite end of said shaft outside the selvage, and through a cord g^4 connected therewith lift a latch g^5 represented best in the enlarged detail Fig. 8. This latch is pivoted at g^6 on a projection $g^{6\times}$ of an arm $g^{7\times}$ secured to the rock-shaft g^{10}, and as the lay is moved forward the projection g^{12} of the dagger g^{13} will pass under the latch g^5 and not turn the rock-shaft g^{10}, but on the contrary if a straw is not present when the lay starts forward, the end of the feeler or lever g remains up, and consequently the rod $g'^\times$ is not turned to lift the latch g^5, and as the lay comes forward the projection g^{10} of the dagger meets the latch g^5 and turns said rock-shaft causing the shipper handle A^{15} to be moved in a direction to unclutch the driving pulley from the crank or lay shaft when the shaft and loom are immediately stopped.

From the foregoing description of the various mechanisms comprising the loom, and their operation, the operation of the entire mechanism will readily be apparent. The straw or weft lying in the boxes E^5, is acted upon at one side of the loom by the straw selecting device or brush until a straw is dropped into the V-shaped notch at the bottom of the box. It is then seized by the nippers a^2, and the lay now being at its back center and at rest, these nippers carry the straw forward until it is grasped by the feeding rolls. The feeding rolls at once force the straw into the guiding funnel and shoot it in between the reed and the guiding device D^9, until the end of the straw reaches the stop c. As soon as the lay starts forward the guiding device is opened and the straw drops onto the rests A^6, and during the continued forward movement of the lay while the shed is gradually closing, the warp is crimped between the rests A^6 and the crimping blades e^6, which act progressively from the central crimper out toward each end of the lay. During this forward movement also the selvage mechanism on the side from which the straw has been fed acts to turn over the end of the straw. At

the end of the forward movement of the lay the straw is beaten in and the shed changed in the usual manner. As the completed fabric passes over the breast-beam the scissors d, d' d^5, d^{10} are actuated to trim off the ends of the weft.

Having described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In a loom for weaving with separate weft lengths, a lay, means for forming a shed in warps, a reed, and means for crimping the weft when in the shed.

2. In a loom for weaving with separate weft lengths, a lay, means for forming a shed in warps, a reed, means for inserting weft in separate weft lengths into the shed, and means for crimping the weft when in the shed.

3. In a loom for weaving with separate weft lengths, a lay, means for forming a shed in warps, a reed, and means for crimping the weft when in the shed comprising oppositely disposed coöperating members.

4. In a loom for weaving with separate weft lengths, means for forming a shed in warps, a lay and reed, and crimping means for the weft acting on the weft in the shed from a point between its ends progressively towards the ends thereof.

5. In a loom for weaving with separate weft lengths, means for forming a shed in warps, a lay and reed, and crimping means for the weft acting on the weft in the shed from a point between its ends progressively towards the ends thereof, said crimping means comprising oppositely disposed cooperating members.

6. In a loom for weaving with separate weft lengths, means for forming a shed in warps, a lay and reed, means for inserting weft in separate weft lengths into the shed, and crimping means for the weft acting on the weft in the shed from a point between its ends progressively towards the ends thereof.

7. In a loom, means for forming a shed, a lay, actuating means therefor to retain the lay substantially stationary when at its back center, a reed, and crimping means for the weft in the shed acting on the weft from a point between its ends progressively towards the ends thereof.

8. In a loom, means for forming a shed, a lay, actuating means therefor to retain the lay substantially stationary when at its back center, a reed, means for inserting weft in separate weft lengths into the shed, and crimping means for the weft in the shed acting on the weft from a point between its ends progressively towards the ends thereof.

9. In a loom, a lay having a reed, a series of crimping devices including blades extended forwardly of the reed to cross the weft in the shed, means to cause one of said blades to descend on the weft substantially midway its ends, means thereafter acting to cause said blades to descend progressively on the weft towards the opposite ends thereof to crimp and shorten the same.

10. In a loom, a lay having a reed, a series of crimping devices comprising weft rests and oppositely disposed blades, said blades extending forwardly oı the reed to cross the weft in the shed, means to cause one of said blades to descend on the weft substantially midway its ends, means thereafter acting to cause said blades to descend progressively on the weft towards the opposite ends thereof to crimp and shorten the same.

11. In a loom, a lay having a reed, weft rests sustained at the front of the reed, crimping devices, and means to actuate the same to descend upon and crimp the weft at points between said rests.

12. In a loom, a lay having a reed, weft rests sustained at the front of the reed, crimping blades coöperating with said rests, means to actuate the crimping blades, to descend upon and crimp the wefts at points between said rests, means for adjusting said blades with respect to said rests.

13. In a loom, a lay having a reed, weft rests sustained at the front of the reed, crimping blades coöperating with said rests, means to actuate the crimping blades to descend upon and crimp the wefts at points between said rests, means for independently adjusting each of said blades with respect to said rests.

14. In a loom, a lay having a reed, weft rests sustained at the front of the reed, a series of crimping blades oppositely disposed with respect to said rests and coöperating therewith to crimp the weft lengths, a series of rods mounted in the lay, each carrying one of said blades and each movable longitudinally, a cam for depressing said rods, said cam depressing said rods progressively from the middle toward both ends of the series.

15. In a loom, a lay having a reed, weft rests sustained at the front of the reed, a series of crimping blades oppositely disposed with respect to said rests and coöperating therewith to crimp the weft lengths, a series of rods mounted in the lay, each carrying one of said blades and each movable longitudinally, a cam for depressing said rods, said cam depressing said rods progressively from the middle toward both ends of the series, means for adjusting the blade on each bar longitudinally thereof.

16. In a loom, a lay having a reed, weft rests sustained at the front of the reed, a series of crimping blades oppositely disposed with respect to said rests and coöperating therewith to crimp the weft lengths, a series of rods mounted in the lay, each carrying

one of said blades and each movable longitudinally, a cam for depressing said rods, said cam depressing said rods progressively from the middle toward both ends of the series, and springs for holding said rods normally in elevated position.

17. In a loom for weaving with separate weft lengths, a lay, a reed, means for forming a shed in warps, means for crimping the weft after it is fed into the open shed and before it is beaten into the fell.

18. In a loom for weaving with separate weft lengths, a lay, a reed, means for forming a shed in warps, means independent of the warps for crimping the weft after it is fed into the open shed and before it is beaten into the fell.

19. In a loom for weaving with separate weft lengths, a lay, a reed, means for forming a shed in warps, means for crimping the weft after it is fed into the open shed and before the shed is changed.

20. In a loom for weaving with separate weft lengths, a lay, a reed, means for forming a shed in warps, means for crimping the weft after it is fed into the open shed and before it is beaten into the fell, means for adjusting the amount of crimp put into the weft.

21. In a loom for weaving with separate weft lengths, a lay, means for forming a shed in warps, a reed, means for crimping the weft when in the shed, means for adjusting the amount of crimp put into the weft.

22. In a loom for weaving with separate weft lengths, a lay, a reed, means for forming a shed in warps, crimping means for the weft acting on the weft in the shed from a point between its ends progressively towards the ends thereof, means for adjusting the amount of crimp put into the weft.

23. In a loom for weaving with separate weft lengths, a lay, a reed, means for forming a shed in warps, means for feeding a separate weft into the open shed, means for supporting said weft in the open shed, means for crimping said weft while supported in the open shed.

24. In a loom for weaving with separate weft lengths, a lay, a reed, means for forming a shed in warps, means for feeding a separate weft into the open shed, means for supporting said weft in the open shed, means for crimping said weft while supported in the open shed, means for removing the support at the completion of the crimping operation.

25. In a loom for weaving with separate weft lengths, a support for a bunch of weft having a V-shaped notch or recess, a rotary brush mounted to present its periphery at the bottom of said notch, means to rotate the brush in a direction to contact with a plurality of said wefts and insure the placing of one weft in the bottom of the notch, a lay, a pair of feed rolls mounted at the end of the lay, means for transferring the selected single weft from the said notch to the bight of the said feed rolls.

26. In a loom for weaving with separate weft lengths, a support for a bunch of weft having a V-shaped notch or recess, a rotary brush mounted to present its periphery at the bottom of said notch, means to rotate the brush in a direction to contact with a plurality of said wefts and insure the placing of one weft in the bottom of the notch, means for nipping the weft placed in the bottom of the notch, a lay, a pair of feed rolls mounted at the end of the lay, means for transferring the selected single weft from the said notch to the bight of the said feed rolls.

27. In a loom for weaving with separate weft lengths, a support for a bunch of weft having a V-shaped notch or recess, a rotary brush mounted to present its periphery at the bottom of said notch, means to rotate the brush in a direction to contact with a plurality of said wefts and insure the placing of one weft in the bottom of the notch, means for nipping the weft placed in the bottom of the notch, means for rotating the brush in the reverse direction to remove all the weft ends from the notch except the weft so nipped, a lay, a pair of feed rolls mounted at the end of the lay, means for transferring the selected single weft from the said notch to the bight of the said feed rolls.

28. In a loom for weaving with separate weft lengths, a support for a bunch of weft having a V-shaped notch or recess, a rotary brush mounted to present its periphery at the bottom of said notch, means to rotate the brush in a direction to contact with a plurality of said wefts and insure the placing of one weft in the bottom of the notch, means for nipping the weft placed in the bottom of the notch, a lay, a pair of feed rolls mounted at the end of the lay, means for releasing the said selected weft from the nipping means when the weft end is seized by the feed rolls.

29. In a loom, shed-forming mechanism, a lay and reed, means to move and positively arrest the motion of the lay on its back center, weft-feeding means mounted at opposite ends of the reed carried by the lay, and means to present weft in separate lengths alternately to said weft-feeding means that the weft may be inserted into the open shed from opposite sides thereof while the lay and reed are at rest.

30. In a loom, a lay having a reed, a pair of weft-feeding rollers at each end of the reed, means to rotate said pairs of rollers constantly in opposite directions to introduce into the sheds separate lengths of weft from opposite sides thereof, and weft-guiding means at the front of the reed to receive and guide the weft being inserted.

31. In a loom of the class described, a lay,

a reed, means to move the lay and reed, weft-feeding means carried by the lay, and means moving with the lay to actuate said weft-feeding means continuously.

32. In a loom of the class described, a lay, a reed, means to move the lay and reed, weft-feeding means carried by the lay at opposite ends of the reed, said weft-feeding means acting to feed the weft into the open shed alternately from opposite sides thereof, and weft-crimping means acting upon the weft after it is fed into the shed.

33. In a loom of the class described, shed-forming mechanism, a lay, a reed, means to insert alternately a weft strand into successive sheds from the opposite sides thereof, and wires at the selvages of the fabric being woven under which the end to be turned of the weft strand passes and is held thereby so that the alternate ends of the weft strands at each selvage stand in different planes and are separated by said wires.

34. In a loom, a lay having a reed, a pair of weft-feeding rollers at each end of the reed, means to rotate said pairs of rollers constantly in opposite directions to introduce into the shed separate lengths of weft from opposite sides thereof, weft-guiding-means at the front of the reed to receive and guide the weft being inserted, and means to open said weft-guiding-means to release the weft that it may be delivered between the warps and beat into the warps at the fell.

35. In a loom, a lay having a reed, a pair of weft-feeding rollers at each end of the reed, means to rotate said pairs of rollers constantly in opposite directions to introduce into the shed separate lengths of weft from opposite sides thereof, weft-guiding-means at the front of the reed to receive and guide the weft being inserted, means to open said weft-guiding-means to release the weft that it may be delivered between the warps and beat into the warps at the fell, and means to present weft alternately to said pairs of rollers.

36. In a loom, a lay having a reed provided at its front side with weft-rests, means located at the front of the reed above said rests to guide the weft as it is being inserted in the shed, and means to open said weft-guiding-means that the weft may be released therefrom and deposited on said rests.

37. In a loom, a lay having a reed provided at its front side with weft-rests, means located at the front of the reed above said rests to guide the weft as it is being inserted in the shed, and means to open said weft-guiding-means that the weft may be released therefrom and deposited on the rests, crimping devices, and means to actuate them after the weft has been released from the weft guiding means onto said rest, the crimping means acting to crimp the weft preparatory to beating the same into the fell of the fabric.

38. In a loom, a lay having a reed, weft-guiding-means suspended at the front of the reed, and inclined at its rear side next the reed, combined with springs acting normally to retain the weft-guiding-means closed against the reed as when the weft is being inserted into the shed, and devices acted upon as the lay is started forward toward the breast beam to move the lower end of said weft-guiding-means away from the reed to permit the discharge of the weft from the weft-guiding means.

39. In a loom, a lay having a reed, weft-feeding rollers located at opposite ends of the reed, and means operating constantly to rotate said pairs of weft-feeding rollers in opposite directions, said rollers receiving alternately at opposite sides of the reed the weft, and means for directing the weft as the same is being passed through the shed.

40. In a loom, a lay having a reed, weft-feeding rollers located at opposite ends of the reed, and means operating constantly to rotate said pairs of weft-feeding rollers in opposite directions, said rollers receiving alternately at opposite sides of the reed the weft, and means for directing the weft as the same is being passed through the shed, the means for rotating said feeding rollers comprising a spring to operate substantially as described.

41. In a loom of the class described, a trough to receive a bunch of weft, a weft-nipper, a plate having a notch, a brush, and means to rotate the brush in a direction to contact with a plurality of wefts and insure the placing of one weft in the bottom of the notch of the plate and between the open jaws of the nipper, and means to close the nipper on the weft.

42. In a loom of the class described, a trough to receive a bunch of weft, a weft-nipper, a plate having a notch, a brush, and means to rotate the brush in a direction to contact with a plurality of wefts and insure the placing of one weft in the bottom of the notch of the plate and between the open jaws of the nipper, and means to close the nipper on the weft, the direction of rotation of the brush being then reversed to remove all the weft ends from the notch of the plate except the weft caught by the nipper, and means to move said plate and nipper toward the center of the loom.

43. In a loom, weft-feeding rollers, means to actuate and engage a weft, weft-end-sustaining means, and means to move said parts that the end of the weft extended beyond the weft-end-sustaining means may be placed in the bight of the feeding-rollers.

44. In a loom, weft-feeding rollers, means to rotate them, and means to present the end of a weft to the bight of said rollers, said means acting as a guide for the weft while the feeding-rollers insert the weft into the shed.

45. In a loom for weaving with separate

weft lengths, a lay, a reed carried by the lay, a device located at the front of the reed and coöperating with the face of the reed to form a weft-guiding pocket, means to move said device away from the face of the reed to allow the weft to fall into the shed.

46. In a loom for weaving with separate weft lengths, a lay, a reed carried by the lay, a device located at and spring-pressed against the front of the reed and coöperating with the face of the reed to form a weft-guiding pocket, means to move said device away from the face of the reed to allow the weft to fall into the shed.

47. Selvage forming mechanism for a loom weaving in short weft lengths, comprising means for turning the weft around the selvage cord, and a wire located beyond and substantially parallel with the selvage cord for holding the weft end outwardly.

48. Selvage forming mechanism for a loom weaving in short weft lengths, comprising a needle for a turning cord, means for operating the needle to carry the turning cord from a position outside of and beyond the selvage cord to a position in the shed, whereby the weft is carried around the selvage cord, and a wire outside of and substantially parallel with the selvage cord for holding the weft end outwardly.

49. Selvage forming mechanism for a loom weaving in short weft lengths, comprising a needle for a turning cord, means for operating the needle to move it upwardly, inwardly and downwardly, and upwardly, outwardly and downwardly, whereby the weft is carried around the selvage cord, and a wire outside of and substantially parallel with the selvage cord for holding the weft end outwardly.

50. Selvage forming mechanism for a loom weaving in short weft lengths, comprising a needle for a turning cord supported upon the loom-frame independently of the lay, means for operating the needle to carry the turning cord from a position outside of and beyond the selvage cord to a position in the shed, whereby the weft is carried around the selvage cord.

51. Selvage forming mechanism for a loom weaving in short weft lengths, comprising a needle for a turning cord supported upon the loom-frame independently of the lay, means for operating the needle to carry the turning cord from a position outside of and beyond the selvage cord to a position in the shed, whereby the weft is carried around the selvage cord, and a wire outside of and substantially parallel with the selvage cord for holding the weft end outwardly.

52. Selvage forming mechanism for a loom weaving in short weft lengths, comprising a needle for a turning cord supported upon a bar adapted to be attached to the loom-frame and independent of the lay, said bar being provided at its lower end with a guide for the turning cord, and means for operating the needle to carry the turning cord from a position outside of and beyond the selvage cord to a position in the shed, whereby the weft is carried around the selvage cord.

53. In a loom for weaving with separate weft lengths, a cutter located in the path of the edge of the fabric and in a plane parallel to the fabric, means for operating the cutter to sever the projecting ends of the weft.

54. In a loom for weaving with separate weft lengths, a scissors-like cutter located in the path of the edge of the fabric and in a plane parallel to the fabric, means for operating the cutter to sever the projecting ends of the weft.

55. In a loom for weaving with separate weft lengths, a pair of cutters located one at each side of the loom in the path of the edge of the fabric and in a plane parallel to the fabric, means for operating the said cutters to sever the projecting ends of the weft.

56. In a loom for weaving with separate weft lengths, two pairs of scissors-like cutters, each mounted upon the loom and located in the path of the edge of the woven fabric and in a plane parallel with the face of the fabric, means for simultaneously operating said cutters to sever the projecting ends of the weft.

57. In a loom, a lay having a reed, rotary weft feeding means located on the lay at the ends of the reed, driving means mounted on a fixed part of the loom, a rod provided with a joint and connecting the said driving means with said rotary weft feeding means.

58. In a loom, a lay having a reed, rotary weft feeding means located on the lay at the ends of the reed, driving means mounted on a fixed part of the loom, a rod provided with a spring section and connecting the said driving means with said rotary weft feeding means.

59. In a loom, a lay having a reed, rotary weft feeding means located on the lay at the ends of the reed, a driving gear mounted on a fixed part of the loom, a pinion driven by said gear, a rod mounted to slide in but to turn with said pinion and provided with a joint, the said rod being connected with the said rotary weft feeding means.

60. In a loom, a lay having a reed, rotary weft feeding means located on the lay at the ends of the reed, a driving gear mounted on a fixed part of the loom, a pinion driven by said gear, a rod mounted to slide in but to turn with said pinion, and provided with a spring section, the said rod being connected with the said rotary weft feeding means.

61. In a loom, a lay having a reed, rotary weft-feeding means located on the lay at the end of the reed, driving means mounted on a fixed part of the loom, a rod provided with a joint and connecting the said driving means with said rotary weft-feeding means.

62. In a loom, a lay having a reed, rotary weft-feeding means located on the lay at the end of the reed, driving means mounted on a fixed part of the loom, a rod provided with a spring section and connecting the said driving means with said rotary weft-feeding means.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

FREDRICK E. ARROUQUIER.

Witnesses:

NATHAN HEARD,

MABEL PARTELOW.