T. P. WALSH.

LOOM FOR WEAVING CANE, &c.

APPLICATION FILED MAR. 16, 1911.

1,119,332.

Patented Dec. 1, 1914

5 SHEETS—SHEET 1.

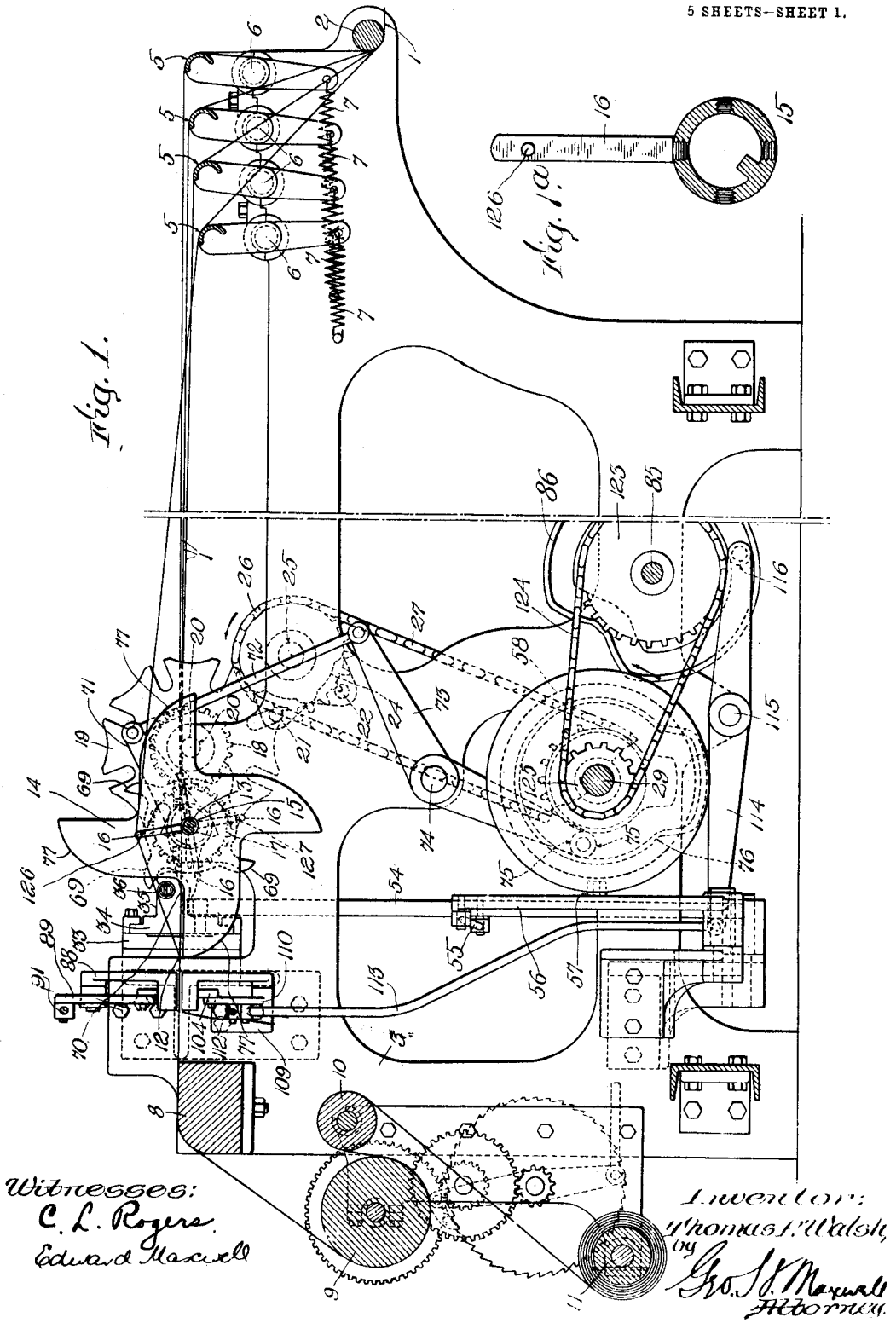


Fig. 1.

Fig. 1a.

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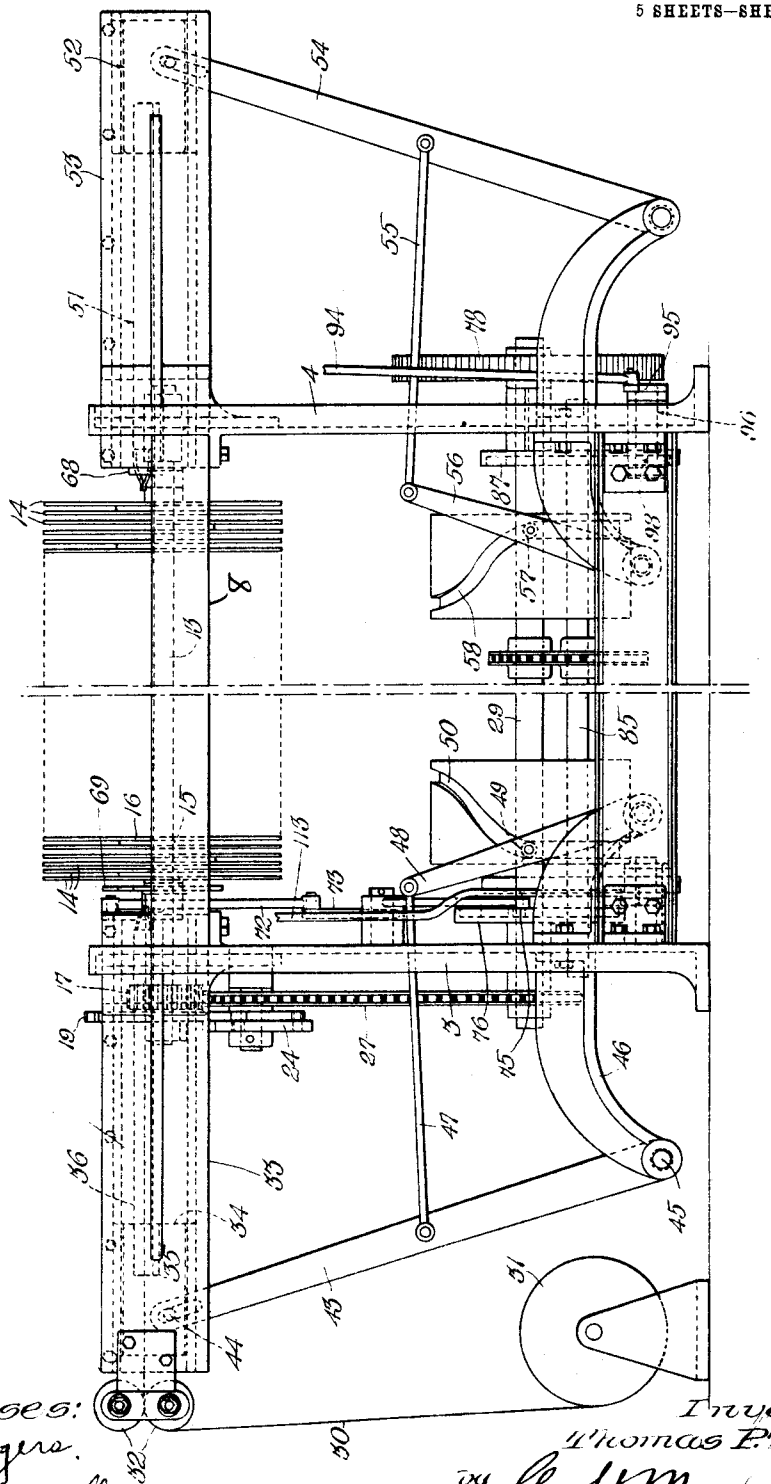


Fig. 2.

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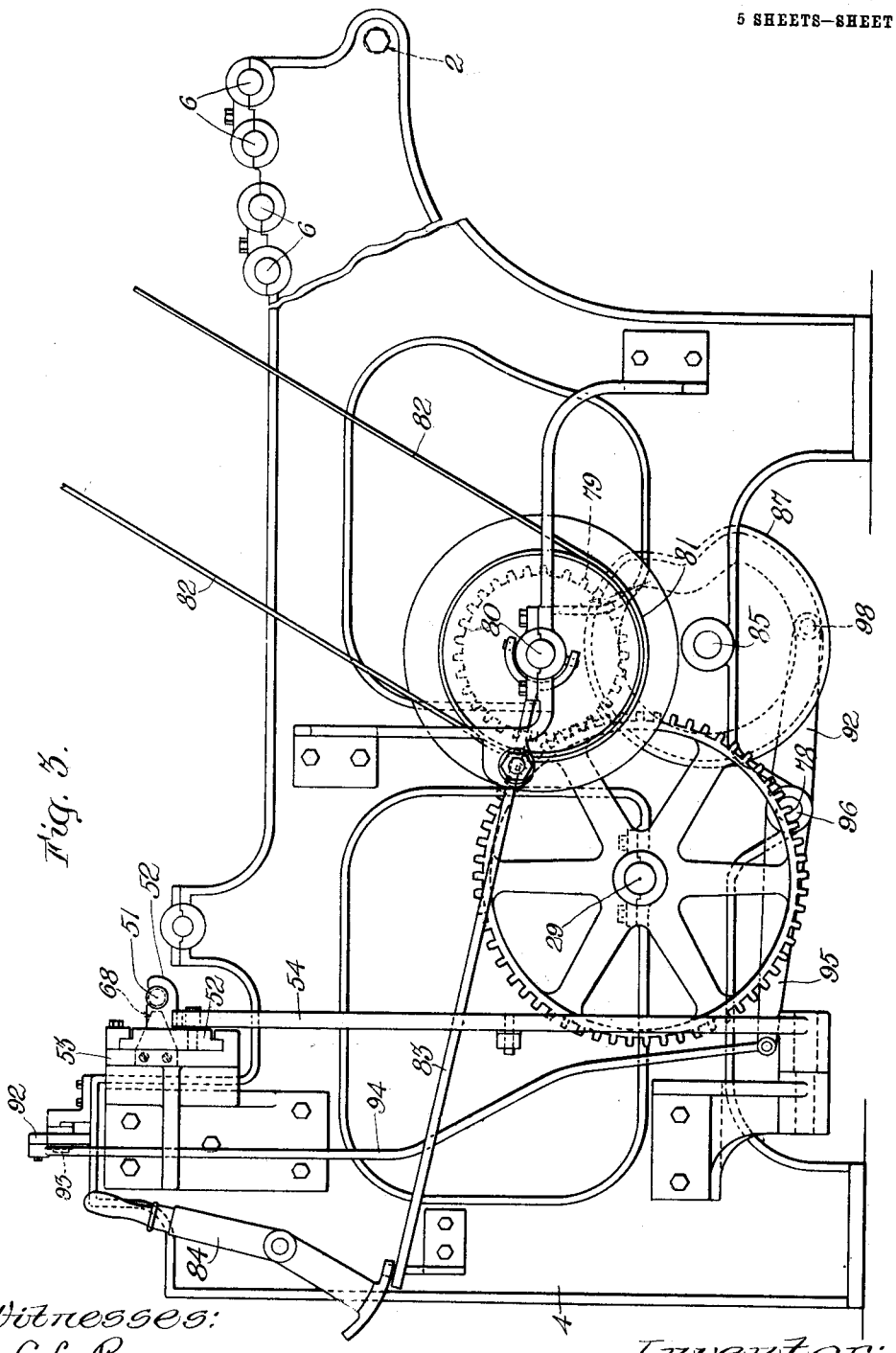


Fig. 3.

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Fig. 4.

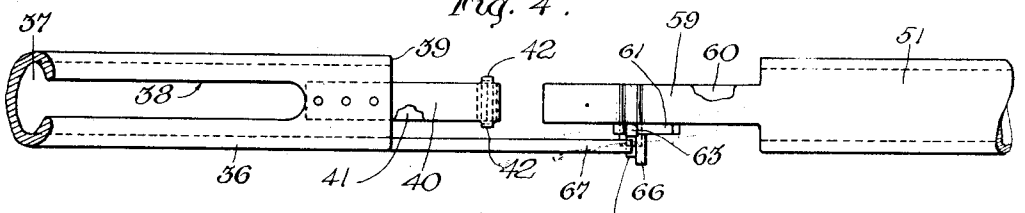
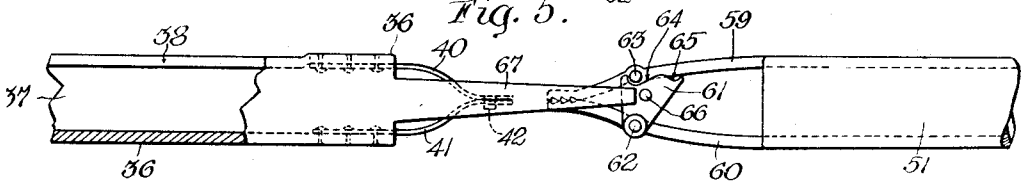


Fig. 5.



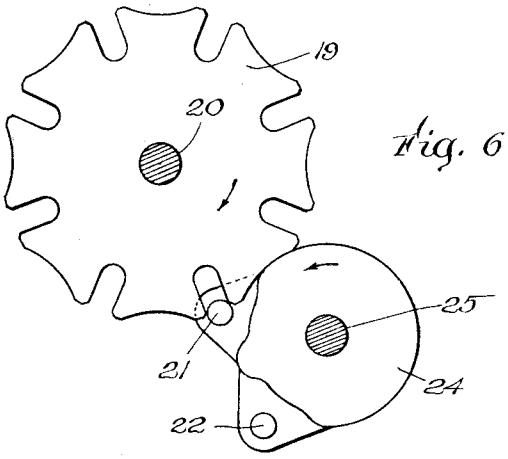


Fig. 6.

Fig. 7.

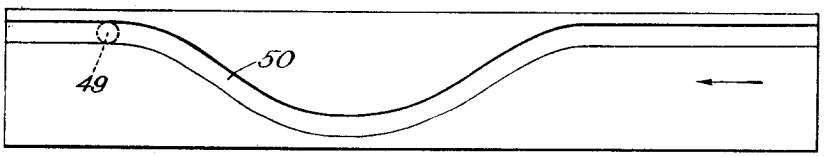
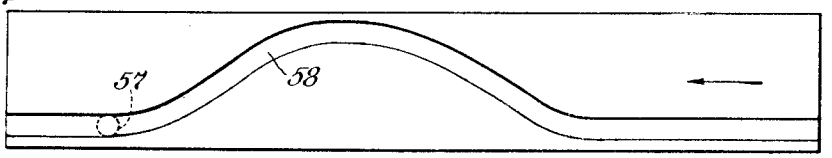


Fig. 8.



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5 SHEETS—SHEET 5.

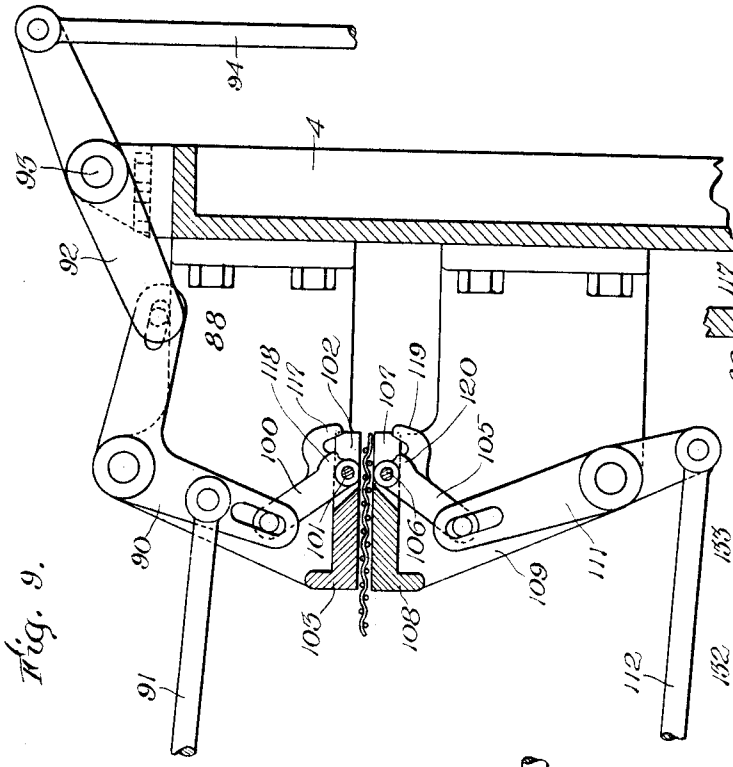


Fig. 9.

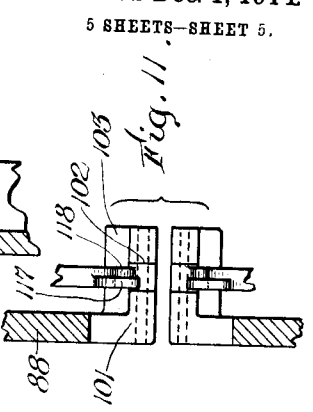


Fig. 11.

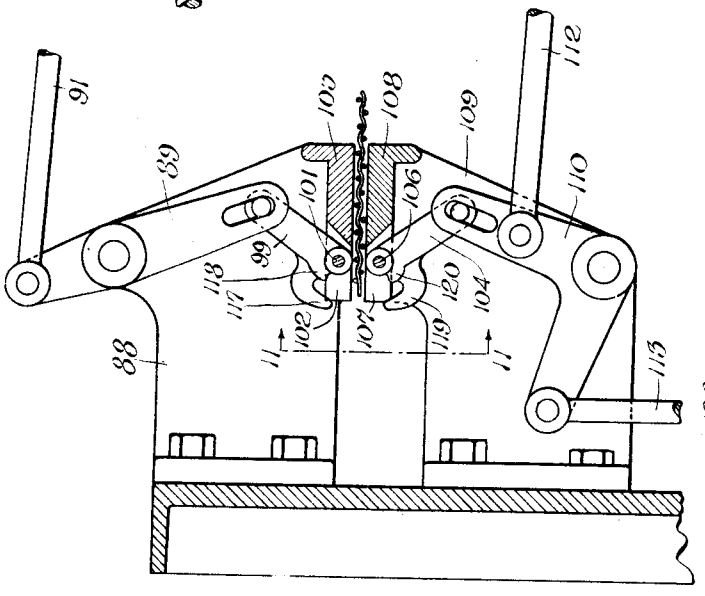


Fig. 12.

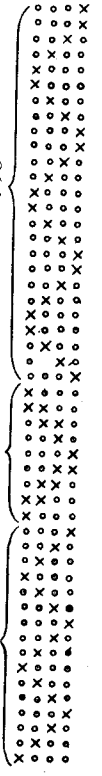


Fig. 13.

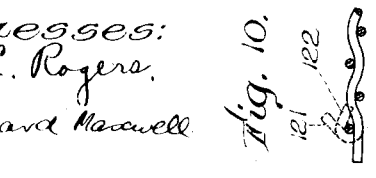


Fig. 10.

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UNITED STATES PATENT OFFICE.

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LOOM FOR WEAVING CANE, &c.

1,119,332. Specification of Letters Patent. Patented Dec. 1, 1914.

Application filed March 16, 1911. Serial No. 614,887.

To all whom it may concern:

Be it known that I, THOMAS P. WALSH, a citizen of the United States, and resident of Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Looms for Weaving Cane, &c., of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention is a loom specially adapted to weaving coarse fabrics such as are produced with cane, willow, wire, etc.

Besides providing weaving mechanism capable of handling the coarse, heavy, stiff strands mentioned, one object of my invention is to provide means for accomplishing the weaving rapidly, means having a considerable range of pattern variety, means for facilitating the ease of handling the warp strands whereby, for instance, in the shedding operation, they are subjected to a minimum bending strain, and moreover such bending strain as is necessary is an easy strain and not tense.

The constructional details of the preferred embodiment of my invention herein contained will appear more fully from the following description, taken in connection with the accompanying drawings, in which I have shown a preferred embodiment of the invention.

In the drawings, Figure 1 is a central vertical longitudinal sectional view of my preferred loom; Fig. 1ª is a detail in side elevation of one of the pattern pins and spacers; Fig. 2 is a view thereof in front elevation; Fig. 3 is a right hand side elevation; Figs. 4 and 5 are enlarged fragmentary views in top plan and front elevation respectively of the two filling carriers or needles preferably used in the loom, shown in their coöperating position at the middle of the loom or end of their inner throw; Fig. 6 is a sectional view showing the pin-wheel drive or Geneva movement in side elevation; Figs. 7 and 8 are developments of the periphery of the respective cams for operating the needles, the former for operating the supply needle and the latter for operating the nipper needle. Fig. 9 is a vertical transverse sectional view showing the selvage mechanism in front elevation; Fig. 10 is an enlarged section of the weave at the selvage; Fig. 11 is a cross-sectional detail on the line 11—11, Fig. 9; and Figs. 12 and 13 are diagrammatic views showing various combinations of arranging the pins of the pattern mechanism for different weaves.

The warp strands 1 (of wire, for instance) pass from a usual source of supply under a stationary rod 2 mounted in suitable loom sides or frames 3, 4 and thence over whip rolls 5 pivoted at 6 in the frame and herein shown as held yieldingly by springs 7, there being as many of these whip rolls as the pattern may require or the convenience of the weaver and goods may demand. From these whip rolls the warp strands pass to the front of the loom over a usual guiding and supporting device, herein shown for convenience as a breast beam 8, to any desired and suitable kind of take-up mechanism, herein shown as comprising a take-up roll 9, guide roll 10 and winding roll 11, the train of operating mechanism and actuating devices therefor being of the usual kind and therefore not fully shown and not described.

At a suitable distance back of the fell 12 is mounted a rotary shaft 13 on which is keyed a series of winged plates or wheel like separators 14, spaced apart by spacers 15 to receive and properly position the respective warp strands. Pins 16 extend from the spacers radially of the shaft, said pins being herein shown as having four positions or arranged in four series at equal distances apart to correspond to the four steps or successive equal movements of the shaft. It will be understood, however, that this arrangement is shown simply to illustrate the general idea and that the total rotation of the shaft will be divided into such a number of steps or separate movements and the number of series of pins or equivalent devices will be correspondingly varied to suit the requirements or preferences of the weaver within the scope of the invention. As the shaft is rotated to the position shown, for instance, in Fig. 1, those pins 16 which are thereby raised into upright position serve to lift those warp strands which are engaged by the upright pins, thus forming a shed. The raised warp strands are lifted by the upright pins from the horizontal level of the remaining warp strands, which level constitutes the lower part of the shed and is the normal position of all the warp strands. As herein shown, the innermost give-away whip roll 5 is engaged by all

those warp strands which are raised by the upright pins 16, as shown in Fig. 1, and yields when these pins raise said warp strands, and it may be considered that the next whip roll 5 is engaged by those warp strands which are controlled by the series of pins which is indicated as extending approximately horizontally rearward, Fig. 1, and the next whip roll as engaged by those warp strands which are controlled by the downwardly extending series of pins 16, Fig 1, and the remaining or rearmost whip roll as engaged by the warp strands indicated in Fig. 1 as extending approximately horizontally forward from the shaft 13. The pattern being woven depends upon the position of these pins with reference to the shaft 13 and with reference to each other so that by varying the relative positions of these pins 16, the pattern of the cane weaving may be varied widely so that a large variety of combinations of different weaves may readily be effected by my loom, and all on the one shaft or in connection with the one shedding and pattern mechanism, as will more fully appear presently with reference to Figs. 9 and 10. Any suitable driving means for this pattern and shedding mechanism may be provided, being herein shown as comprising a gear 17 on the shaft 13, meshing with a gear 18 secured to a star wheel 19 and loose on a stud 20 projecting from the frame 3. The star wheel is driven by engagement with pins 21, 22 of a pin wheel 24 loose on a stud 25 and driven by a sprocket 26 fast to said pin wheel and engaged by a chain 27 passing over a sprocket wheel 28 fast on a cam shaft 29.

The weft or filling strand 30 of wire or the like is derived from any suitable source, as a spool 31, Fig. 2, whence it passes between rotary guides or press rolls 32 mounted at the rear end of a stationary bracket 33 which extends laterally from the frame side 3. This bracket 33 has a T-track, see Fig. 1, in which a slide block 34 is mounted to travel lengthwise. Immovably held in a projecting ear 35 of this slide block is a weft carrier or needle 36. This carrier or needle is best shown in Figs. 4 and 5, where it will be seen that it is tubular or provided with a hollow interior 37 for receiving the weft strand, 30, open or provided with a longitudinal slot 38 at its upper side, preferably extending to within a short distance of the inner end 39 of the carrier or needle 36, said slot 38 being also preferably, although not necessarily, continuous throughout its length. At the inner end 39 of the carrier I provide any suitable means for frictionally engaging and clamping the free forward end of the filling strand, herein shown as comprising an upper spring member 40 and a lower member 41, the former preferably having downwardly extending ears 42 at its opposite sides so as to maintain the two springs in alinement and prevent the cane or weft strand from slipping out sidewise. The inner gripping surfaces of the spring jaws 40, 41 are preferably provided with oblique teeth so as to permit free relative movement thereof over the weft strand in one direction while preventing said movement in the opposite direction. This weft carrier or needle is actuated by any convenient mechanism, being herein shown as comprising a lever 43 having a pin and slot connection 44 with the block 34 of said carrier at one end and pivoted at 45 to a bracket 46 of the frame 3 at the other end, and actuated by a link 47 and cam lever 48 whose cam roll 49 engages a cam 50 on the cam shaft 29. At the opposite side of the loom, a somewhat similar hollow weft-carrier or needle 51 is provided, secured in a block 52 which travels in a lateral bracket 53 the same in construction as the bracket 33, said block being actuated by a lever 54, link 55 and cam lever 56 whose roll 57 travels in a path cam 58, all substantially the same as the corresponding parts already described at the opposite side of the loom. The carrier or needle 51 differs from the carrier or needle 36 in having provision for receiving the weft strand from the needle 36, the mechanism provided for this purpose being herein shown as comprising relatively heavy upper and lower spring jaws 59, 60 under constant tendency to close. Any suitable means is provided for maintaining these jaws 59, 60 open when going inwardly or toward the left, Fig. 2, and permitting them to be closed when going toward the right, Fig. 2, said means being herein shown as consisting of a cam or spreader 61 pivoted at 62 to the lower jaw 60 and having its upper cam edge in position to engage a pin 63 projecting from the upper jaw 59. Preferably the cam edge of the spreader 61 is shaped adjacent its forward end 64 to be entirely out of engagement with the pin 63 when in the position shown in Fig. 5 so as to permit the gripping jaws 59, 60 to exert their extreme gripping tension or pressure on the weft strand when required to pull the weft strand back across the loom toward the right, Fig. 2, and said cam edge is preferably provided with a slight depression 65 at its opposite end, so that when then engaged with the pin 63 it will tend positively to maintain the jaws open so as not to be closed accidentally by vibration or accidental movement. A pin 66 projects laterally from the spreader 61 in position to be engaged by the forward end of a projecting finger 67, herein shown as extending rigidly from the front end 39 of the carrier or finger 36, in position to strike the pin 66 just as the needle 51 has arrived into position to engage the free end of the weft

strand which projects from the jaws 40, 41 of the needle 36. This permits the jaws 59, 60 to close hard upon said free ends so as to hold the weft strand positively as the needle 51 starts back on its return or weft-pulling movement. A stop or operating lug 68 projects from the bracket 53 in position to engage the pin 66 at the end of the pulling movement of the needle 51 and thereby restore the cam spreader 61 to spreading position with the pin 63 occupying the depression 65 so as to open the jaws 59, 60 and keep them open during their return movement to the left, Fig. 2, for another weft strand. The jaws 40, 41 are made lighter than the jaws 59, 60 because the resistance of the weft strands 30 tends continually to pull them closed on the inner or drawing movement, whereas the resistance of said weft strand to the jaws 59, 60 on the drawing movement thereof tends to open said jaws, thus requiring that said jaws 59, 60 shall be heavier than the jaws 40, 41.

To sever each transverse strand of filling as it is laid, I preferably provide at the end of the shaft 13 a rotary shear blade or severing device 69, herein shown as having four teeth or cutting members corresponding to the step movements and shedding operations of the shaft 13 and parts carried thereby) to coöperate with an under shear blade 70 pivotally mounted on the same shaft 13 and having a rearwardly extending end 71 actuated by a rod or link 72 and cam lever 73 pivoted at 74 to the frame side 3 and having its roll 75 actuated by a path cam 76 on the cam shaft 29.

Preferably the beating-up operation is accomplished in connection with the rotation of the shaft 13 and by means carried thereby. Said means, as herein shown in this preferred embodiment of the invention, consists of wings or cam shaped projections 77 projecting from the separators or warp-directing plates 14 and corresponding in number and arrangement to the number of series and arrangement of the pins 16, so that as soon as a pick of filling strand has been laid across the loom, the shaft 13 rotates, thereby lowering the shedding pins 16, then in an upright position, and simultaneously turning the upright cam wings 77 over forward and downwardly toward the left, Fig. 1, so as to move the laid strand of filling gently but positively forward to the fell, the shearing mechanism severing said strand just before the upright wings 77 engage it.

It will be understood that the driving mechanism of the loom may be of any usual or preferred kind, a gear wheel 78 being herein shown, Fig. 3, as fast on the outer end of the cam shaft 29 and driven by a gear 79 on a driving shaft 80 actuated by a driving pulley 81 and belt 82, the whole under the usual control of a shipper lever 83 and shipper 84.

At some convenient point, herein shown as just below the drive shaft 80, is a shaft 85 provided with cams 86, 87 for actuating the selvage-forming mechanism used when the loom is making a wire fabric. This mechanism is shown best in Figs. 9 and 11, the selvage being shown in Fig. 10. Pivotally mounted on inwardly projecting brackets 88 are levers 89, 90 connected by a link 91 to operate in unison, and receiving their movement from a lever 92 pivoted intermediately at 93 on the loom side 4 and connected by a rod 94 to an arm 95 fast on a rock shaft 96 provided with a cam lever 97 whose roll 98 travels in the path of the cam 87. The bending devices proper 99 and 100 are operated respectively by the levers 89, 90 with which they have pin and slot connection, being mounted on pivots 101 in slots formed in lateral flanges 103 which extend forward from the brackets 88. Below these upper bending devices 99, 100 are similar lower bending devices 104, 105 mounted on pivots 106 in slots 107 formed in forwardly projecting flanges 108 of lower brackets 109 corresponding in general construction to the brackets 88. These mechanisms are located at some convenient point between the fell and the breast beam, and the laterally extending flanges or ledges 103 and 108 serve as guides for the opposite edges of the fabric as clearly shown in Figs. 9 and 11, and also serve to maintain the proper certainty of position of the edge warp strand and cut ends of the filling which are to form the selvage. The lower bending devices 104, 105 are operated in substantially the same way as the upper ones by levers 110, 111 connected by a link 112 and receiving movement from a rod 113 and crank lever 114 pivoted at 115 whose roll 116 travels in the path of the cam 86. The two actuating cams 86, 87 are timed so as to actuate the upper bending devices on one pick and the lower bending devices on the other pick. Each upper bending device is provided with a relatively long bending finger 117 and a short bending finger or clenching finger 118, and each lower bending device is provided with a similar long bending finger 119 and short bending finger or clenching member 120. The slots 102, 107 are wide enough for two picks, *i. e.* they have a width to accommodate both the bending finger and the clenching finger of the bending devices, so that when a weft strand comes into alinement with said slots and with the long fingers or preliminary bending fingers 117, 119, the result is that said strand is engaged by one of said fingers, being engaged for instance by the finger 117 if the end of the strand should be bent downwardly to form the selvage, and by the finger 119 if said

end should be bent upwardly to form the selvage. For instance, in Fig. 10, I have shown in dotted lines a strand as having been engaged by the finger 119 and bent upwardly from the full-line position to the dotted-line position 121 and then engaged by the clenching finger 118 of the other bending device on the next pick and clenched into a tight selvage as shown in 122. In other words, each long finger 117 gives the adjacent cut end of the weft strand a preliminary bend toward the opposite bending device to a sufficient extent to permit the short finger of said opposite bending device to engage this partially bent wire-end on the next swinging movement of said opposite short finger and thereby crimp down or clench the partially bent end to its completely bent position. This forms the selvage and makes a smooth, neat, strong edge. The bending of the wires is accomplished alternately in opposite directions, as required by their position alternately above and below the outermost warp strand or selvage wire, and said alternate wrapping of the weft strands around this selvage wire takes place automatically in unison with the weaving operations. The shaft 85 which carries the two cams for driving this selvage-forming mechanism is herein shown as operated by a sprocket wheel 123 and chain 124 engaging a sprocket pinion 125 on the cam shaft 29, see Figs. 1 and 2.

In use, it being understood that the loom is provided with the warp strands passing lengthwise thereof in position between the separators or positioning plates 14 and engaging the respective whip rolls 5, and the weft strand being in place in the left hand weft carrier 36, the shaft 13 rotates over forward so as to bring one series of lifting pins 16 into upright position as shown in Fig. 1, thereby correspondingly lifting those warp strands which the pattern calls for according to the particular weave or weaves being woven in any given fabric. Thereupon both needles or weft carriers 36, 51 move inwardly from the outermost positions in which they are shown in Fig. 2. The carrier or needle 36 carries forward from the left toward the right a strand of weft or filling and the carrier 51 moves forward from the right toward the left with its jaws 59, 60 open to receive said strand of filling. As said two carriers reach approximately the middle of the loom and the jaws 59, 60 of the right hand carrier 51 have embraced the free end of the filling strand which projects from the jaws 40, 41 of the carrier 36, the trip 67 strikes against the pin 66 of the cam plate or spreader 61 of the right hand carrier 51 and thereby permits the jaws 59, 60 of the latter to clamp down forcibly upon said free end of the filling so as to grip the same tenaciously. At the same instant, the carriers retreat from each other, the strand of filling being now immovably engaged by the right hand carrier, which pulls it freely forward, the jaws 40, 41 yielding readily to permit this relative forward movement of the filling strand with relation to the carrier 36 as the latter moves back to its original position at the extreme left side of the loom. When the two carriers have thus retreated to their original position at the opposite sides of the loom and the filling strand has been laid in proper weaving position, the shear blade 70 begins to move upward under the influence of its actuating mechanism 71—76, and the shaft 13 starts its next step by step movement or rotary impulse, the first effect of which is to bring the overhanging knife or shear blade 69 down upon the strand of laid filling as the under blade 70 rises against the under side of said strand, thereby severing the strand (wire, cane, willow, or other relatively intractable weft). The further rotation of the shaft 13 immediately brings the cam surfaces of the upright beating-up wings 77 into engagement with the laid strand of filling, which is thereby beaten up to the fell at 12. Meanwhile the same rotary movement of the shaft 13 has lowered the pins 16, thereby restoring the raised warp strands to their normal horizontal position, where they are maintained taut by their yielding whip roll, and the next series of warp strands is raised to shed position by the next or previously rearwardly extending horizontal series of pins as the latter arrive in upright position while the former upright pins 16 arrive at approximately forward horizontal position. As soon as this next selection of warp strands has been raised by said pins to form the next shed, the carriers 36, 51 again start forward, the latter grabbing the free end of the strand of filling from the former as the two carriers reach the end of their inward movement, and then the carriers at once separate back again away from each other. The carrier 51 moves back so as to carry the strand of filling the second half of its travel across the loom, while the carrier 36, having carried said strand the first half of the distance across the loom, yields up said strand to the carrier 51 and retreats out of the way of the succeeding severing and beating up operation into position to deliver the next strand of filling. As the successive weaving movements take place, the take-up moves the fabric forward step by step, and at each step the selvage-making mechanism operates to bind the projecting weft wires alternately in opposite directions tightly around the longitudinal selvage wire at the opposite edges of the fabric. This cycle of weaving movements is repeated automatically and with extreme rapidity, con-

sidering the relatively stiff unmanageable character of the material being woven. By having the needles or carriers arranged to move to the center of the goods and back again, I accomplish a number of advantages. In the first place, the needles themselves are thereby shorter than if they had to move the entire width of the loom and are consequently under better control and the loom is in better balance or shape and capable of more rapid and accurate work and adapted to handle heavier fabrics. In the second place, the weaving is increased at least double, inasmuch as the complete laying of one strand of filling is accomplished in the time required for one needle to move halfway across the loom and back again, as distinguished from requiring the time for a needle to move twice that distance, and moreover the needle-operating mechanisms at both sides of the loom operate simultaneously and in opposition to each other, and as the movements are relatively short it is feasible to run the loom at relatively high speed. As already stated, one of the principal objects of my invention is to make it feasible to weave these comparatively unmanageable materials at relatively high speed, and, besides the features already mentioned as coöperating to this end, another important means for increasing the practicable speed of such weaving resides in combining the beating-up and the shedding movements in one mechanism which is preferably rotary. Instead of the ordinary lay and harness mechanism, the single rotary movement of the shaft 13 simultaneously beats up the weft (by the cam wings 77 of said shaft) and lowers the shed (by the pins 16 of said shaft), and at the same time the same rotary movement shears off the end of the wire (by the coöperating blades 69, 70) and furthermore the same rotary movement instantly raises the next shed by the next set of pins 16 which come up just as the laid weft strand has reached the fell. In other words, my mechanism succeeds in accomplishing a rapid weaving movement of such difficult materials as wire, cane, etc., notwithstanding the necessity for strong positive controlling movements throughout all portions of each weaving movement of the loom. The pins 16 (which are preferably although not necessarily formed separately from the spacers 15 and are rectangular in cross section and removably secured adjacent their free ends to the adjacent separators 14, as by pins 126 which enter holes 127 therein) are provided for the double purpose of affording a strong positive and quick, yet easy or gradual shedding movement, and at the same time making it possible to produce all the usual variety of weaves commonly desired in cane fabrics, etc., and in Figs. 12 and 13 I have illustrated some of the various arrangements of weaves possible with this mechanism, notwithstanding that such difficult material is being handled as, say, cane. Referring to said Figs. 12 and 13, I have indicated at 128 a border of plain weave, followed by a two-and-two twill 129, a three-and-one twill 130, a coarse-basket weave 131, a mixed or granite weave 132, and a fine basket weave 133. In Fig. 13 I have shown varieties of herringbone effects, a simple, single-point herringbone 134, next to which is a double, blunt-pointed herringbone 135 and then a single, blunt-pointed herringbone 136. These varieties are illustrative merely, to indicate to some extent the capacity of the pin 16 kind of shedding-pattern control which, while providing the positive and yet gentle and strong operation required, yet affords a wide range of variation. Preferably the pins are arranged in quarters as shown, but this also may be varied. It will be understood that all the weaves shown for instance in Fig. 12, take place simultaneously across the loom and are accomplished in four picks or one revolution of the shaft 13, these variations being due simply to the arrangement of the pins 16, a pin being indicated by each x.

One object and in fact necessity of the shaft-and-pin shedding mechanism is that thereby it becomes possible to have the shedding mechanism close to the fell and the heavy warp strands have a very short lift, and this lift is at a uniform height for all the strands, so that, notwithstanding the kind of fabric that is being woven, the danger of breaking the strands is practically eliminated. But I do not herein make claim, broadly considered, to the provision, in connection with warp-supporting means, of a series of separators spaced apart to enter between the warp strands and hold them in position to be shedded, and rotary shedding means extending between the separators for lifting and lowering said warp strands in desired order for the shedding operation, as this combination is duly claimed in my Patent No. 1,067,205, of July 8, 1913.

Without enumerating at this point those features which I consider broadly novel, I deem it proper to point out that it will be understood from the claims that in a number of important respects certain features of my invention are of a broadly novel and pioneer character for this class of weaving.

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

1. In a loom, weaving mechanism, including weft-placing mechanism containing a plurality of weft-carrying devices, provided with means for engaging and holding the end of a single strand of weft parallel to the lengthwise direction of the device and

of its direction of travel, separately operable upon said weft-ends lengthwise of the weft strand in succession for each moving the weft a portion of its travel across the loom.

2. In a loom, weaving mechanism, including a weft-pushing device and weft-pulling device for respectively delivering a weft part way across the loom, and means enabling the pulling device to receive the weft endwise of the weft from the pushing device and to maintain the weft end straight in the direction of travel across the loom.

3. In a loom, weaving mechanism, including opposite weft-placing means located respectively at the opposite sides of the loom, and means for reciprocating said placing means toward and from each other, one of said placing means containing means for receiving a weft longitudinally from the other, and said opposite placing means being constructed and arranged to maintain and transfer the weft at its engaged portion in lengthwise alinement with its direction of movement across the loom.

4. In a loom, weaving mechanism, including weft-placing devices movable simultaneously through the shed from opposite sides of the loom and back again, each of said devices having weft-engaging mechanism for engaging a weft end in lengthwise alinement with the direction of placing movement, and automatic means for permitting one of said devices to deliver a weft to the other for permitting said other device to receive and retain said weft upon its backward movement.

5. In a loom, weaving mechanism, including a weft-placer having weft-grabbing and releasing means for grabbing and holding a weft in alinement with its direction of travel at the part thus engaged and moving it transversely of the loom and then releasing it, and moving devices for progressively engaging and moving said placer first in one direction and then in the other transversely of the loom while permitting the weft to follow in longitudinal alinement with the placer.

6. In a loom, weaving mechanism, including a needle-like weft-placer provided with a hollow extending lengthwise of the placer for holding the weft, and clamping means for removably clamping the weft in the said lengthwise position when moving in one direction across the loom, and means for moving said weft-placer transversely of the loom for placing the weft.

7. In a loom, weaving mechanism, including a needle-like weft-placer having weft gripping means at one end and provided lengthwise thereof with a hollow for holding the weft, open at one side to enable the operator to move the weft along the placer into proper position and means for traversing said weft-placer transversely of the loom.

8. In a loom, weaving mechanism, including a weft-placer provided with means for engaging a weft lengthwise in alinement with its travel and engaging a weft lengthwise in alinement with its travel and pushing a weft forward transversely of the loom.

9. In a loom, weaving mechanism, including a weft-placer provided with jaws for engaging the weft on its opposite sides, and having a free open space across the loom in the direction of strain on the weft, said jaws opening in the direction of weft-propelling movement across the loom whereby the tension of the weft tends to tighten the grip of the jaws on the weft, and means for moving said weft-placer transversely of the loom.

10. In a loom, weaving mechanism, including a placer having weft-embracing jaws opening in the direction away from the leading end of the weft, and means mounted on the jaws for holding said jaws open to receive the weft.

11. In a loom, weaving mechanism, including a placer having weft-embracing jaws opening in the direction away from the leading end of the weft, means for holding said jaws open to receive the weft, an oppositely moving placer, and automatic tripping means carried by the latter placer for permitting said jaws to close on the weft when received.

12. In a loom, weaving mechanism, including opposite weft-placers, one for delivering the weft from one side of the loom to the other placer and the latter for carrying said weft from the said point to the opposite side of the loom, said first mentioned placer having readily yielding means embracing the weft lengthwise of the weft in the direction of movement across the loom, and means for moving said first mentioned placer back to its starting point over the weft strand without wholly disengaging the latter, whereby it is left in engaging relation to the strand when restored to its starting point.

13. In a loom, weaving mechanism, including a weft placer movable transversely across the loom and having means embracing a weft strand and provided with means automatically tightening upon the weft strand for feeding movement and automatically yielding to the movement of the weft strand upon return movement.

14. In a loom, weaving mechanism, including a weft placer having means continuously embracing a weft strand and capable of having non-slipping engagement with the latter for feeding movement and freely moving over the strand for returning movement, and means for reciprocating said placer transversely of the loom.

15. In a loom for handling heavy intractable strands, weaving mechanism, including a weft placer movable transversely across the loom for delivering a weft to be woven, said placer having a normal position at one side of the loom, and automatic weft-severing means for severing the laid weft at a point outside and beyond the edge of the fabric and between said placer and the edge of the fabric.

16. In a loom for handling heavy intractable strands, weaving mechanism, including a weft placer movable transversely across the loom for delivering a weft to be woven, said placer having a normal position at one side of the loom, and automatic weft-severing means for severing the laid weft at a point outside and beyond the edge of the fabric and between said placer and the edge of the fabric prior to the beating-up of the weft.

17. In a loom, weaving mechanism, including a weft placer movable transversely across the loom and having opposite jaws relatively yielding, and a cam plate movably mounted on one of the jaws to engage the other jaw for separating and holding said jaws separated, when in one position, and for permitting said jaws to close on the weft, when in another position.

18. In a loom, weaving mechanism, including a weft placer movable transversely across the loom and having opposite jaws relatively yielding, a cam plate movably mounted on one of the jaws to engage the other jaw for separating and holding said jaws separated, when in one position, and for permitting said jaws to close on the weft, when in another position, and a second weft placer for coöperating with said first mentioned weft placer in placing a weft across the loom, said second placer carrying means for engaging and shifting said cam plate from one position to the other.

19. In a loom, weaving mechanism, including opposite weft placers, one for delivering the weft from one side of the loom to the other placer and the latter for carrying said weft from the said point to the opposite side of the loom, said first mentioned placer having jaws opening in the direction of the leading end of the weft and provided with gripping surfaces tending to tighten onto the weft under the frictional resistance of the latter when being moved forward thereby, and said second mentioned placer having jaws opening in the direction away from the leading end of said weft, said two placers having their jaws and gripping surfaces constructed and arranged to engage the said leading end of the weft lengthwise of said weft and of the direction of movement across the loom and in alinement with the placers themselves.

20. In a loom, weaving mechanism, including opposite weft placers, one for delivering the weft from one side of the loom to the other placer and the latter for carrying said weft from the said point to the opposite side of the loom, said first mentioned placer having jaws opening in the direction of the leading end of the weft and provided with oblique teeth pointing forward in the direction of movement of the weft, and said second mentioned placer having jaws opening in the direction away from the leading end of said weft and provided with oblique teeth pointing in the same direction as the teeth of the other placer.

21. In a loom, means for supporting the warp strands, a transverse rotary shaft, beating-up means mounted on and operated by said shaft, a plurality of shedding mechanisms mounted on and operated by said shaft, and shearing means mounted on and operated by said shaft for shearing off the end of the weft strand when laid, combined with operating mechanism for rotating said shaft step by step, whereby a single rotary movement of the shaft simultaneously beats up the weft, lowers the shed and shears off the end of the weft and then raises the next shed.

22. In a loom, means for supporting the warp strands, a transverse rotary shaft, beating-up means mounted on and operated by said shaft, a plurality of shedding mechanisms mounted on and operated by said shaft, and shearing means operated by said shaft for shearing off the end of the weft strand when laid, combined with operating mechanism for rotating said shaft step by step, whereby a single rotary movement of the shaft simultaneously beats up the weft, lowers the shed and shears off the end of the weft and then raises the next shed.

23. In a loom, means for supporting the warp strands, a transverse rotary shaft, beating-up means operated by said shaft, a plurality of shedding mechanisms mounted on and operated by said shaft, and shearing means operated by said shaft for shearing off the end of the weft strand when laid, combined with operating mechanism for rotating said shaft step by step, whereby a single rotary movement of the shaft simultaneously beats up the weft, lowers the shed and shears off the end of the weft and then raises the next shed.

24. In a loom, weaving mechanism, including means for supporting the warp strands in weaving position, means for delivering a strand of weft through the shed close to the fell, a rotary shaft extending across the loom also close to the fell immediately behind the path of said weft strand, and provided with a series of separators spaced thereon to enter between the warp strands for holding them against displace-

ment during the heavy weaving movements, and pattern pins spanning the gaps between said separators for effecting the shedding operation with a slow, easy and short shedding movement close to the fell when the shaft is rotated.

25. In a loom, weaving mechanism, including means for supporting the warp strands in weaving position, means for delivering a strand of weft through the shed, a rotary shaft extending across the loom close to the fell, and provided with a series of separators spaced thereon to enter between the warp strands for holding them against displacement during the heavy weaving movements, pattern pins spanning the gaps between said separators for effecting the shedding operation with a slow, easy and short shedding movement close to the fell when the shaft is rotated, and means for rotating said shaft step by step in timed relation with the weft laying operation.

26. In a loom, weaving mechanism, including means for supporting the warp strands in weaving position, means for delivering a strand of weft through the shed, a rotary shaft extending across the loom close to the fell, and provided with a series of separators spaced thereon to enter between the warp strands for holding them against displacement during the heavy weaving movements, pattern pins spanning the gaps between said separators for effecting the shedding operation with a slow, easy and short shedding movement close to the fell when the shaft is rotated, shearing mechanism mounted on and operated by said shaft, and means for rotating said shaft step by step in timed relation with the weft laying operation.

27. In a loom, weaving mechanism, including means for supporting the warp strands in weaving position, means for delivering a strand of weft through the shed, a rotary shaft extending across the loom close to the fell, and provided with a series of separators spaced thereon to enter between the warp strands for holding them against displacement during the heavy weaving movements, shiftable pattern pins spanning the gaps between said separators capable of being shifted in their position on the shaft to lift the warp threads in different orders at different points transversely of the loom and for effecting the shedding operation with a slow, easy and short shedding movement close to the fell when the shaft is rotated, and means for rotating said shaft step by step in timed relation with the weft laying operation.

28. In a loom, weaving mechanism, including a rotary shaft extending across the loom, a series of separators spaced thereon to enter between the warp strands, and changeable pattern pins between said separators for effecting the shedding operation as the shaft is rotated, said separators having cam-shaped extension wings for effecting the beating up operation as the shaft is rotated and the shed is closing.

29. In a loom for weaving intractable strands, selvage-forming mechanism, comprising means for automatically bending the free ends of the weft strands alternately about the selvage warp strand in opposite directions.

30. In a loom for weaving intractable strands, selvage-forming mechanism, comprising means for automatically bending the free ends of the weft strands alternately about the selvage warp strand in opposite directions, and including a plurality of crimping devices, respectively accomplishing the weft end bending by a series of progressive bending movements.

31. In a loom for weaving intractable strands, selvage-forming mechanism, including opposite bending jaws, each having a preliminary bender and a finishing bender spaced apart to engage the weft-ends in succession, for giving a weft-end a preliminary bend about the selvage warp strand and then a finishing bend or crimp.

32. In a loom for weaving intractable strands, selvage-forming mechanism, including opposite bending jaws, each having a preliminary bender and a finishing bender spaced apart to engage the weft-ends in succession, for giving a weft-end a preliminary bend about the selvage warp strand and then a finishing bend or crimp, and means for operating said bending jaws alternately in the periods of rest between the take-up movements of the fabric.

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

THOMAS P. WALSH.

Witnesses:
EDWARD S. PARKER,
GEO. H. GRAVES.

Corrections in Letters Patent No. 1,119,332.

It is hereby certified that in Letters Patent No. 1,119,332, granted December 1, 1914, upon the application of Thomas P. Walsh, of Boston, Massachusetts, for an improvement in "Looms for Weaving Cane, &c.," errors appear in the printed specification requiring correction as follows: Page 6, line 41, after the word "engaged" and line 64, after the word "position" insert a comma; same page, lines 70–71, strike out the words "engaging a weft lengthwise in alinement with its travel and"; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 26th day of January, A. D., 1915.

[SEAL.]

R. F. WHITEHEAD,

Acting Commissioner of Patents