No. 686,076. Patented Nov. 5, 1901.

C. HUGHES.

LOOM FOR WEAVING TUFTED FABRICS.

(Application filed June 17, 1901.)

(No Model.) 7 Sheets—Sheet 1.

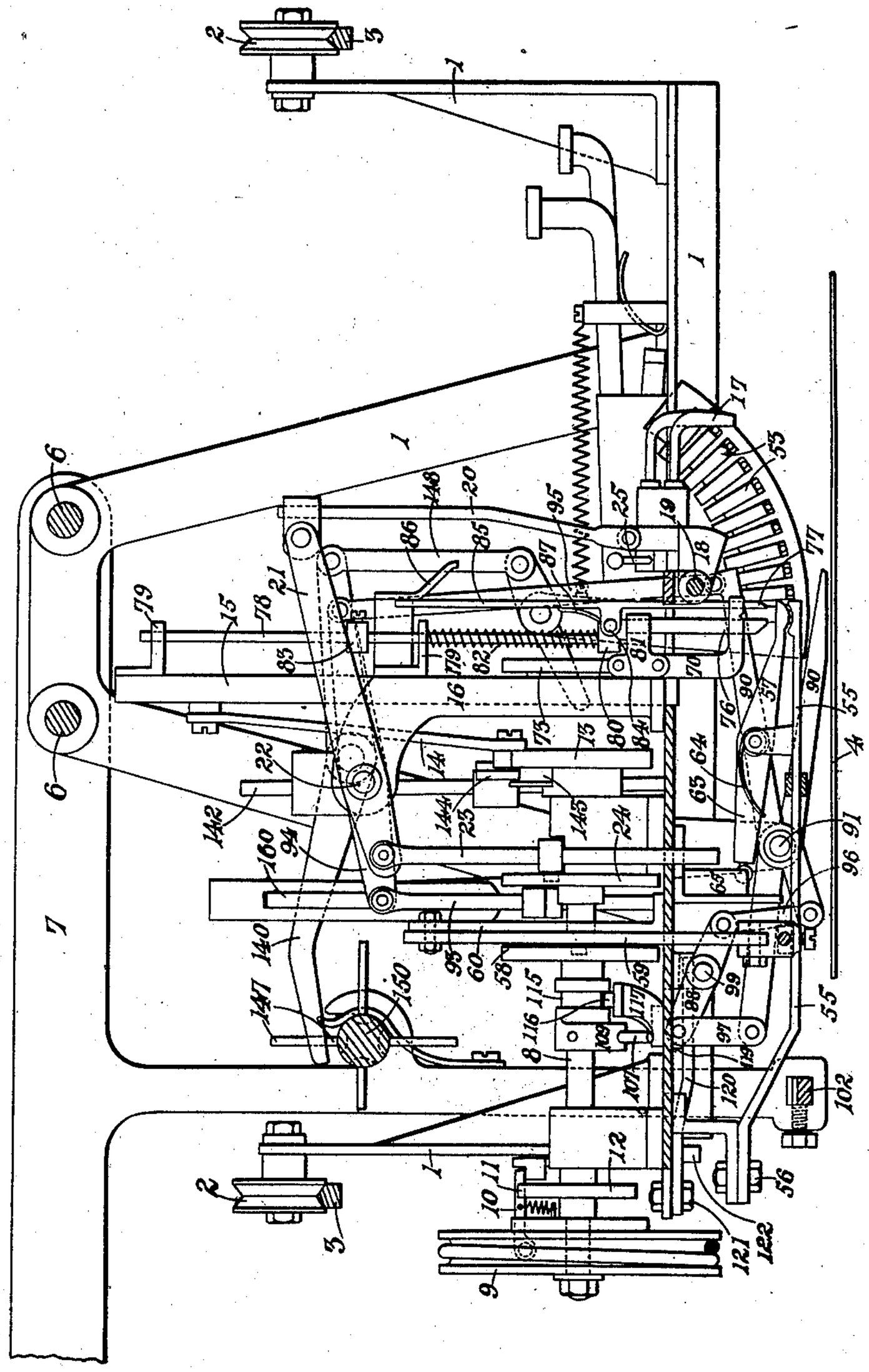

Fig. 1.

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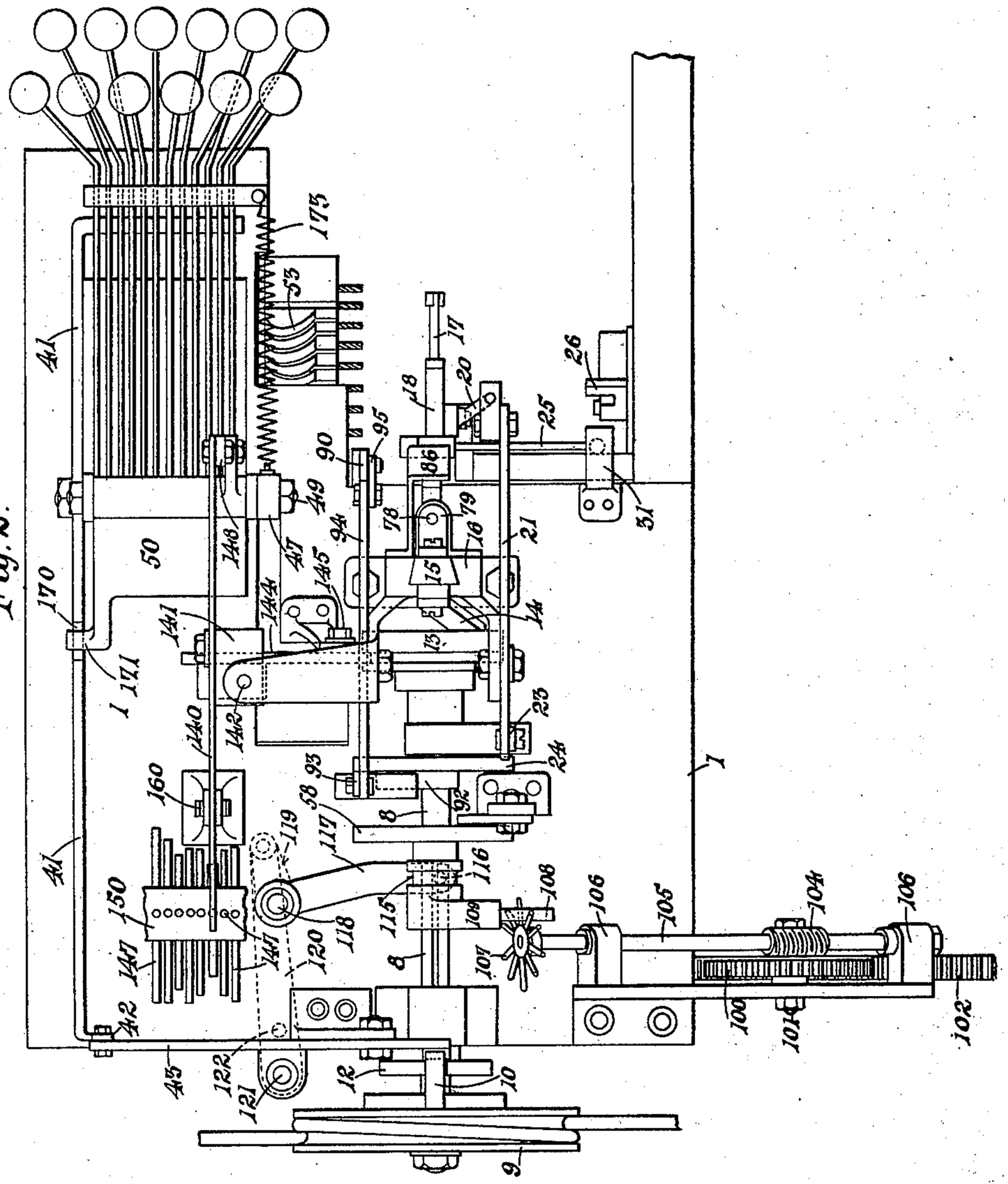
(No Model.) 7 Sheets—Sheet 2.

Fig. 2.



Witnesses
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LOOM FOR WEAVING TUFTED FABRICS.

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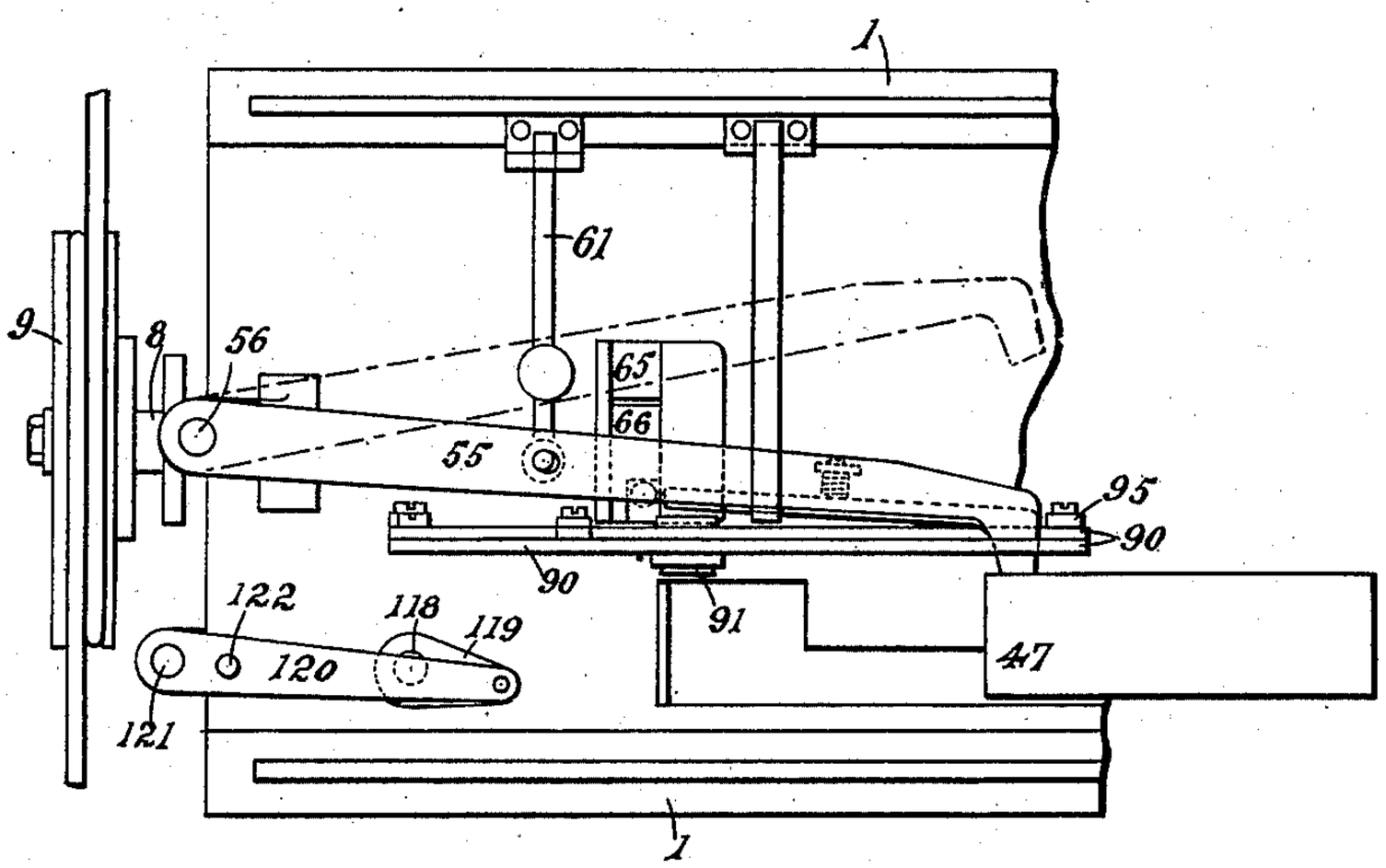
(No Model.) 7 Sheets—Sheet 3.

Fig. 3.



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No. 686,076. Patented Nov. 5, 1901.

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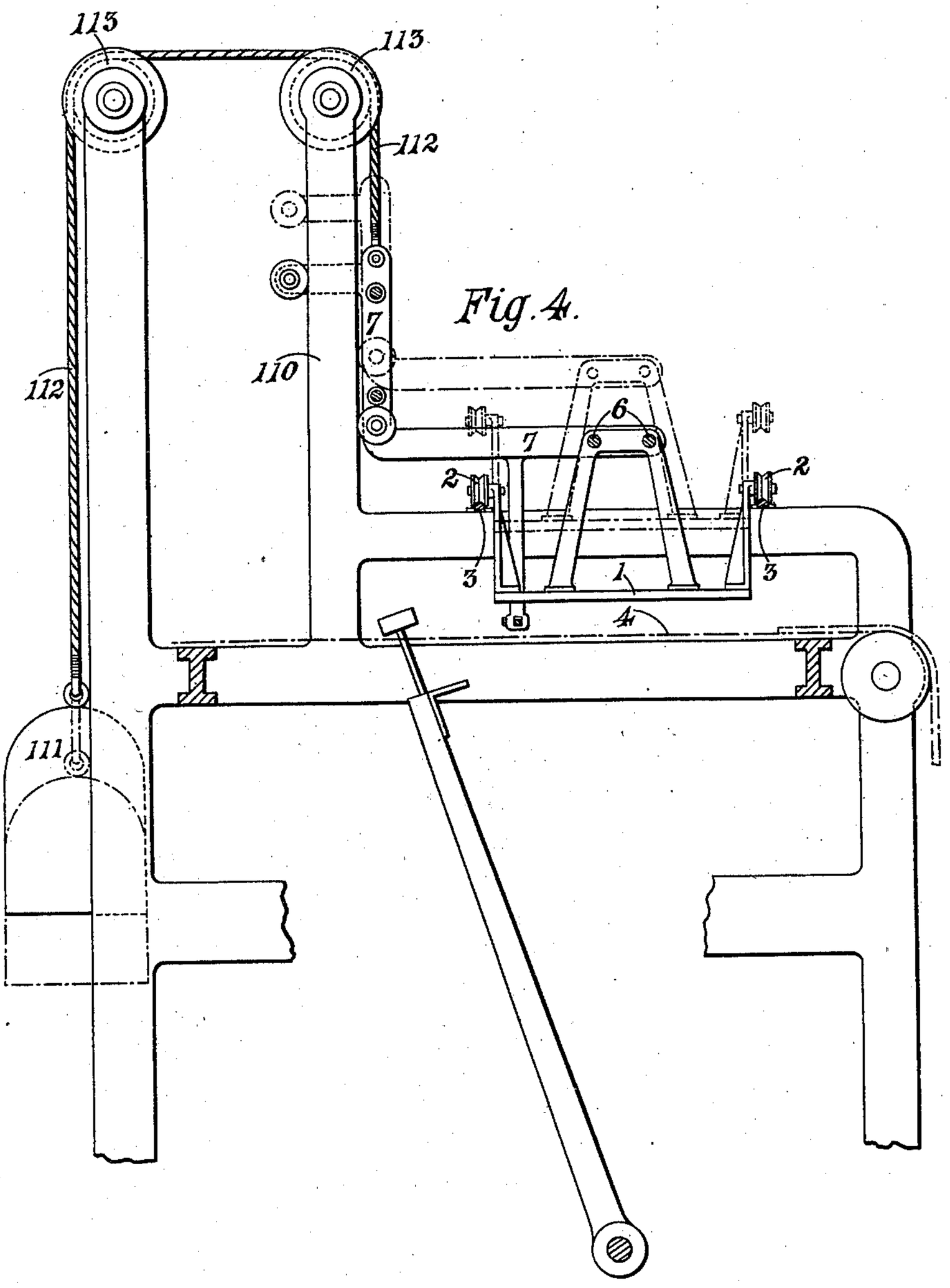
LOOM FOR WEAVING TUFTED FABRICS.

(Application filed June 17, 1901.)

(No Model.) 7 Sheets—Sheet 4.

Fig. 4.



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(No Model.) 7 Sheets—Sheet 5.

Fig. 5.

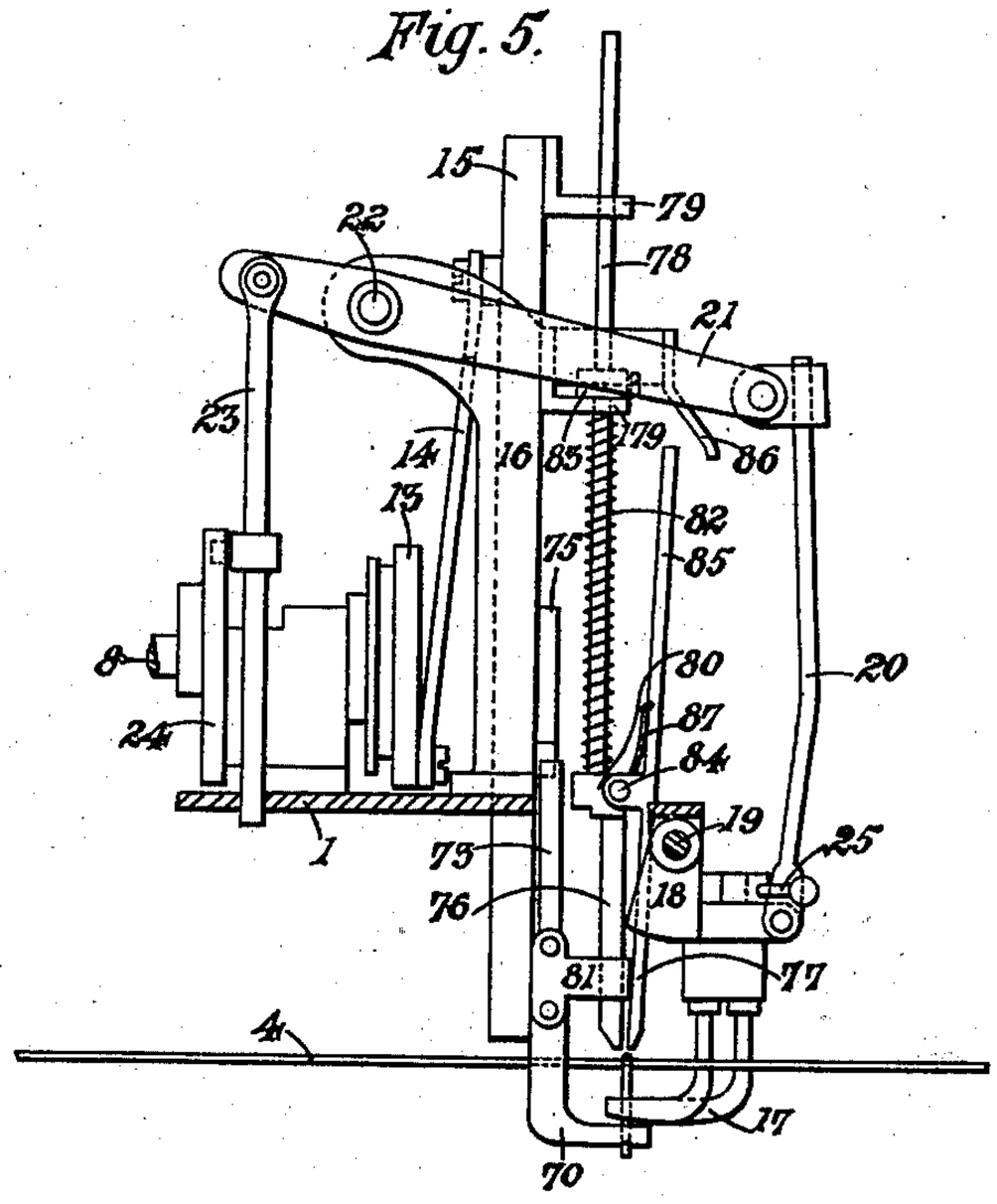
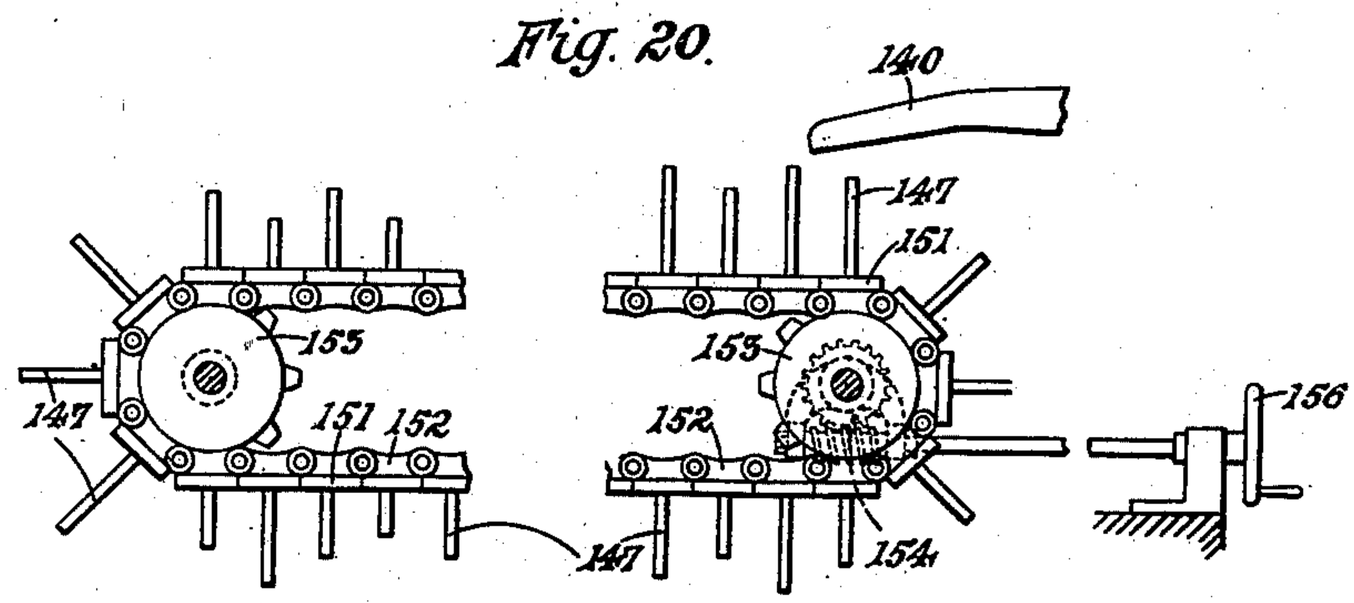


Fig. 20.



Witnesses
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LOOM FOR WEAVING TUFTED FABRICS.

(Application filed June 17, 1901.)

(No Model.) 7 Sheets—Sheet 6.

Fig. 7.

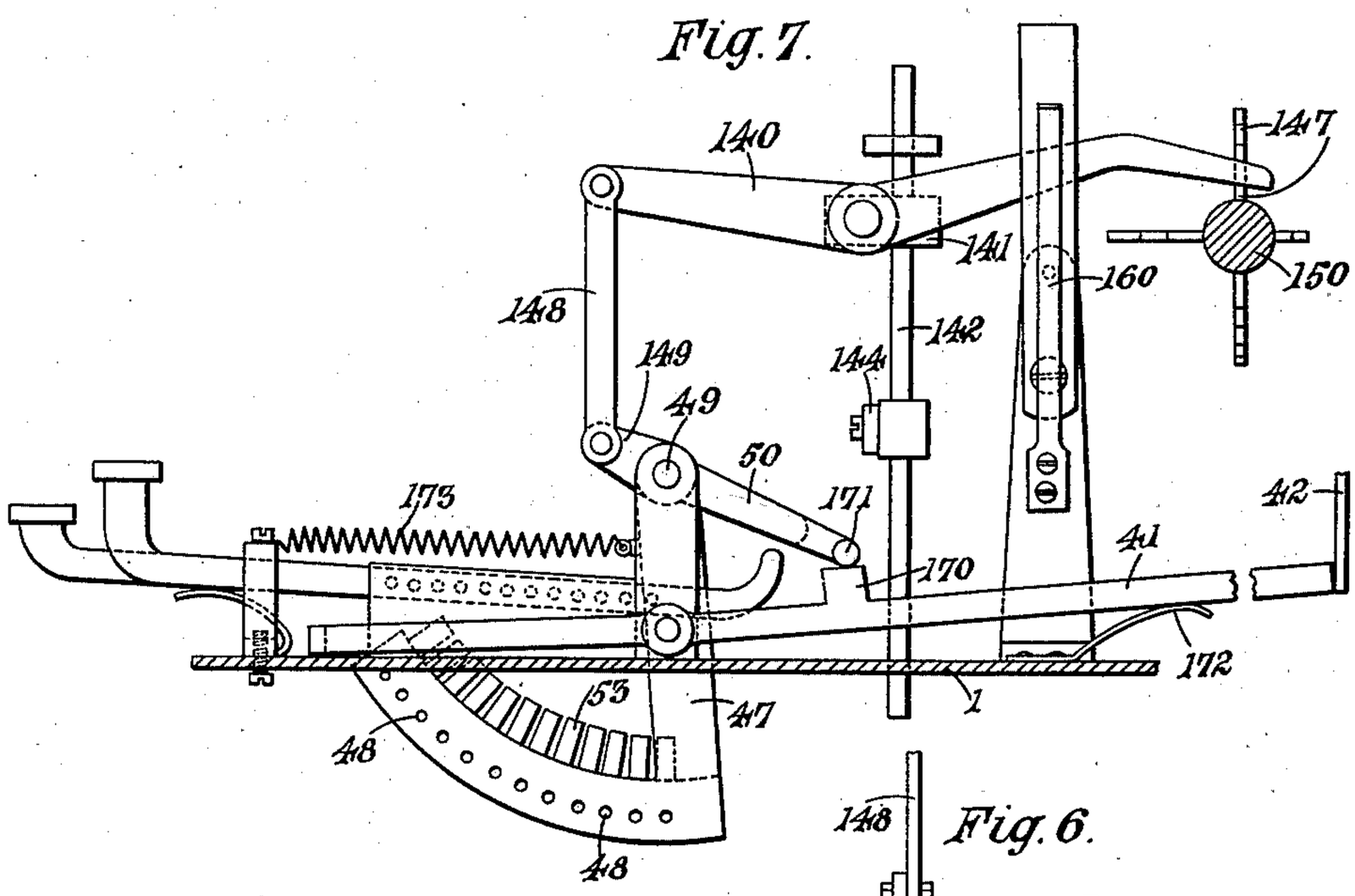


Fig. 6.

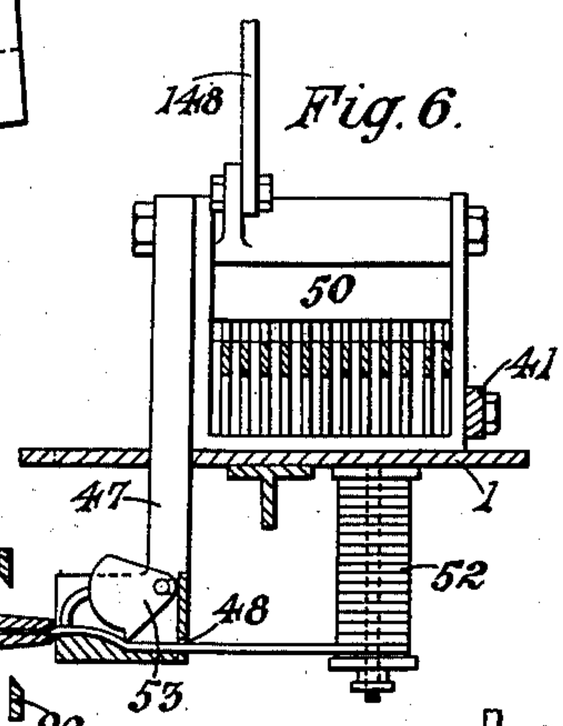


Fig. 18.

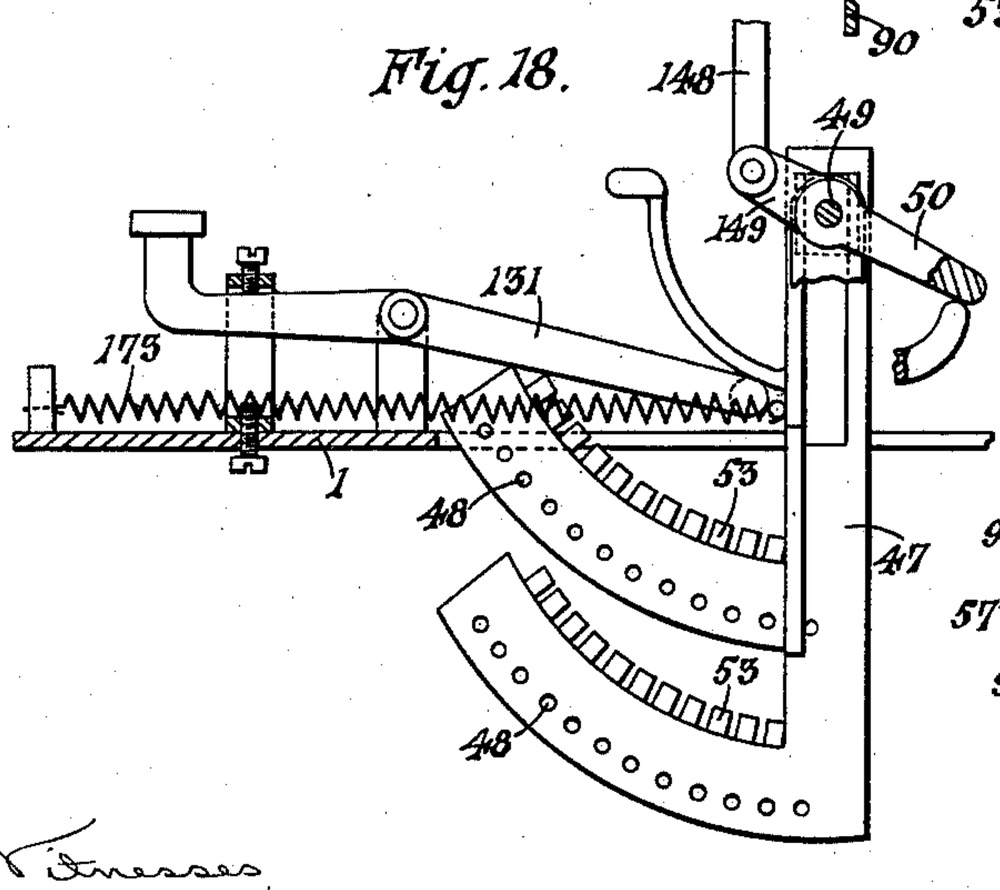
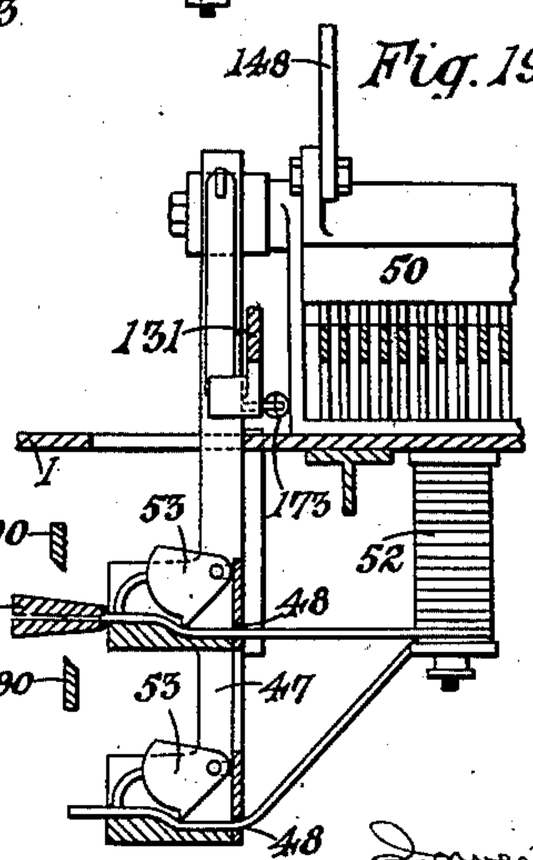


Fig. 19.



Witnesses
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LOOM FOR WEAVING TUFTED FABRICS.

(Application filed June 17, 1901.)

(No Model.) 7 Sheets—Sheet 7.

Fig. 8.

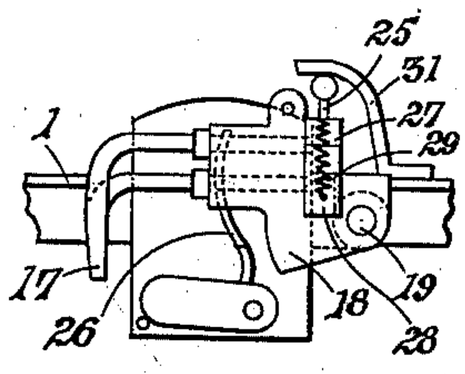

Fig. 9.

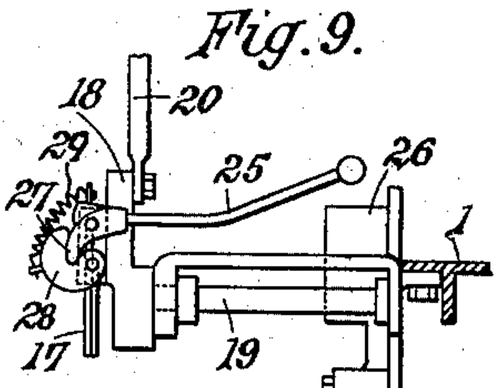

Fig. 10.

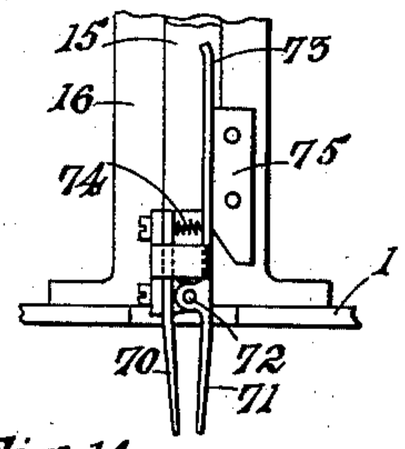

Fig. 12.

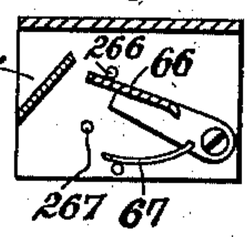

Fig. 11.

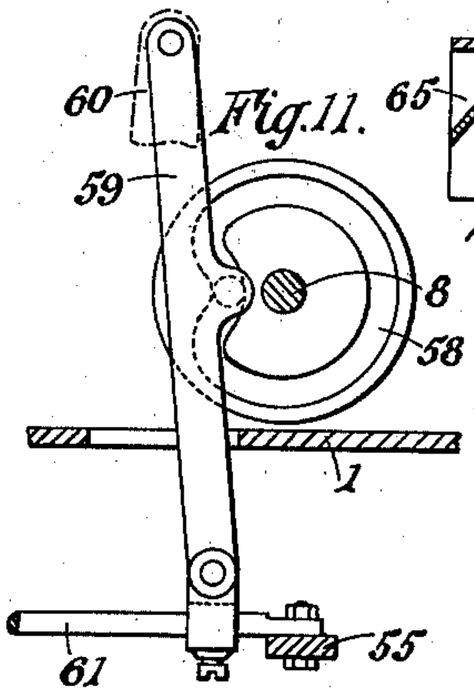

Fig. 14.

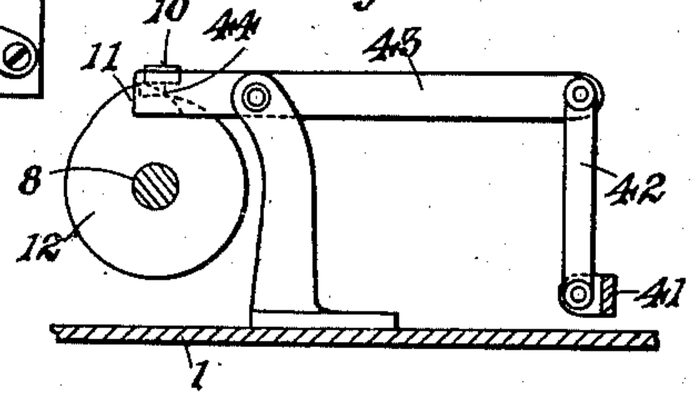

Fig. 13.

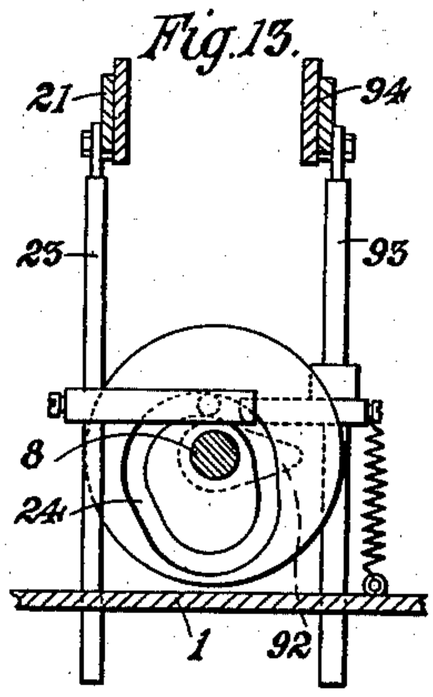

Fig. 16.

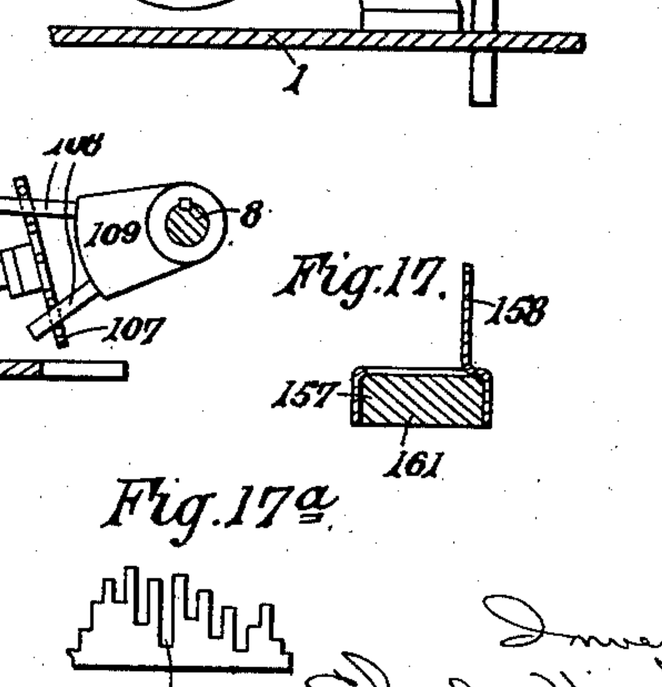

Fig. 15.

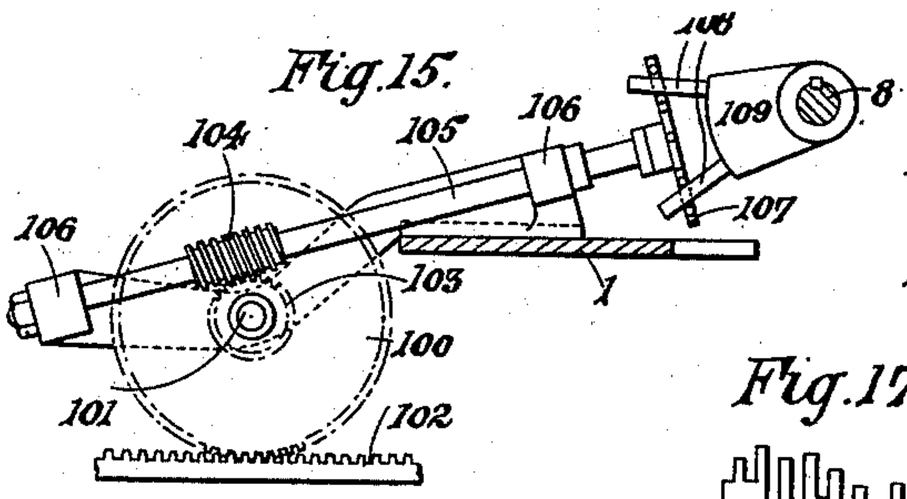

Fig. 17.

Fig. 17a.

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UNITED STATES PATENT OFFICE.

CHARLES HUGHES, OF LONDON, ENGLAND.

LOOM FOR WEAVING TUFTED FABRICS.

SPECIFICATION forming part of Letters Patent No. 686,076, dated November 5, 1901.

Original application filed March 26, 1901, Serial No. 52,997. Divided and this application filed June 17, 1901. Serial No. 64,898. (No model.)

To all whom it may concern:

Be it known that I, CHARLES HUGHES, a subject of the King of Great Britain, residing at London, England, have invented certain new and useful Improvements in Looms for Weaving Tufted Fabrics, of which the following is a specification, being a division of application Serial No. 52,997, filed March 26, 1901.

This invention relates to looms for weaving Turkey carpets and like tufted fabrics.

Heretofore a method of manufacturing Turkey carpets has been employed wherein the yarn of the desired colors for forming the successive tufts or knots is fed from bobbins and laid across the threads of the ground chain or warp, and after a piece of yarn of the required length has been cut off the ends of the said piece are pushed through the warp, so as to inclose two or more of the warp-threads thereof, and the said ends are then brought together beneath the warp and drawn up between the said threads, thus forming the knot. The different-colored yarns from the various bobbins are passed through a slide, which is adjusted as required after the formation of each knot for the purpose of properly selecting the yarn of the right color for the next knot as may be demanded by the pattern.

By the present invention I provide novel automatic mechanism for selecting the yarns. My said automatic mechanism is governed by a pattern-plate having a suitably-shaped stepped edge arranged to produce the required pattern or by a series of rods or pins or their equivalents, of varying heights, or by a series of perforated pattern cards or plates similar to those used in a Jacquard loom. With my improved apparatus a larger number of colors than heretofore can be used in the production of the pattern, besides which the speed of working is considerably increased and the attention required is reduced.

The invention is illustrated by way of example in the accompanying drawings, wherein—

Figure 1 is a sectional side elevation of the improved apparatus. Fig. 2 is a plan of the same, and Fig. 3 is an under side view of a portion of the apparatus. Fig. 4 is a diagrammatic view showing how the machine is raised to allow of a pick being taken. Fig. 5 is a view of the knotting mechanism, showing the knot partially formed. Figs. 6 and 7 are detail views of the apparatus for selecting the yarns to be used in the knot. Figs. 8 and 9 are detail views in side and rear elevation, respectively, of the knotting-tweezers. Fig. 10 is a front view of the plates for passing the yarns downward through the warp. Fig. 11 is a detail view of the cam and levers for operating the feeding-gripper. Fig. 12 is a detail view of the means for controlling said feeding-gripper. Fig. 13 is a detail of the cams and rods for operating the shears and knotting-tweezers. Fig. 14 is a detail view of the catch and connected parts for stopping and starting the feeding and knotting mechanisms. Fig. 15 is a detail view of the gear for feeding the machine intermittently across the loom. Fig. 16 is a detail of the cam for operating the color-selecting lever. Fig. 17 is a detail of the controlling-bars hereinafter described, and Fig. 17ª shows another form of plate for the same purpose. Figs. 18 and 19 are details of a modified form of apparatus for selecting the yarns, and Fig. 20 is a view of a part of a continuous automatic arrangement for selecting the yarns.

Like figures of reference denote corresponding parts in the several views.

In carrying out the present invention I provide a frame 1, Fig. 1, supported by rollers 2 2, running on rails 3 3 and arranged to be traversed after the formation of each knot a short distance across the loom just above the level of the ground chain or warp 4 by means hereinafter described. In such movement the frame 1 also slides on rods 6 6, carried by another frame 7, for a purpose that will presently appear. In the frame 1 is mounted a horizontal shaft 8, hereinafter referred to as the "driving-shaft," running parallel with the direction of the warp-threads and serving to convey motion to the various mechanisms which perform the operations of feeding and knotting. On the said shaft is loosely mounted a driving-pulley 9, which is continuously rotated, preferably by a rope, as shown. Said rope takes a complete turn around the pulley 9 and passes over pulleys arranged one at each side of the loom, one of which is the driver. The pulley 9 drives the shaft 8, pref-

erably by means of a spring-controlled catch 10, hinged to the pulley and engaging with a tooth 11, Figs. 1 and 14, of a disk 12, fixed on the shaft 8. Said catch is thrown out of action by a trip-lever, hereinafter described, when the feeding and knotting mechanisms are required to stop. At the front end of the driving-shaft 8 is an ordinary crank or a crank-disk 13, to which is connected a rod 14 for communicating motion to a vertical bar 15, Figs. 1, 2, and 5, which slides up and down in a guide 16. The lower end of this sliding bar 15 carries a pair of thin plates 70 71, Figs. 1 and 10, whose function is to convey the two ends of the piece of yarn which is to form the knot down through the ground-warp on the outside of two adjacent ground-threads ready to be pulled up between the said two threads by the knotting-tweezers 17, which are arranged just in front of the aforesaid sliding bar 15. The plate 70 is rigidly fixed to the bar 15; but the other plate, 71, is pivoted at 72, Fig. 10, and has an upward extension or arm 73, which is pressed by a spring 74 against a stationary stop 75, having an inclined face at its lower end. As the bar 15 completes its downward movement the arm 73 slides down the inclined face of the stop 75, whereupon the spring 74 operates to close the plate 71, and so brings the ends of the yarn together beneath the warp. The bar 15 also controls a pair or nippers 76 77, Figs. 1 and 5, carried by a rod 78, which can slide in guides 79, 179, and 81. The guides 79 and 81 are fixed to the sliding bar 15, while the guide 179 is fixed to the stationary guide 16 of the sliding bar 15. At the lower end of the rod 78 is a block 80, which rests upon the guide 81 during such time as the plates 70 and 71 are above the ground-threads and is pressed thereon by a spring 82, compressed between block 80 and the guide 179. When the bar 15 descends, the nippers 76 77 descend with it until a collar 83 on the rod 78 rests upon the stationary guide 179, whereupon the further downward movement of the bar 15 is continued without the nippers, the lower ends of which remain just above the level of the warp-threads. The nipper-jaw 77 is pivoted at 84, and said jaw has an upward extension 85, which is pressed against a stationary incline 86 by a spring 87. Said incline 86 is shaped to allow the jaw 77 to close and nip the yarn directly the same has been drawn across the warp, as hereinafter described, and the yarn is held by the nippers 76 and 77, while the required length of yarn for making the knot is cut off, and the ends are pushed down through the warp ready to be seized by the tweezers 17, Figs. 1, 5, 8, and 9. The spring 87 is so adjusted that the jaw 77 exerts just sufficient pressure to control the piece of yarn until the ends of the yarn are gripped by said tweezers, and in the upward movement of the tweezers the yarn is pulled out from nippers 76 77. The tweezers 17 are carried by a plate 18, which is pivoted at 19 and connected by a link 20 to one end of a lever 21, pivoted at 22. The other end of said lever 21 is connected by a link 23 to a cam 24, Figs. 1, 5, and 13, fixed on the shaft 8 and is actuated by said cam in such a manner as to cause the tweezers to oscillate about their pivot 19. The jaws of the tweezers are mounted with a capability of turning in the plate 18, so that they can open and close. The opening of the tweezer-jaws after the same have passed through the warp is effected by an arm or lever 25, Figs. 1, 8, and 9, which is attached to the stem of one of the jaws and which in the downward movement of the tweezers meets a pivoted inclined plane 26, Figs. 8 and 9, and in sliding over same is thereby moved laterally. The jaws are further controlled by short arms 27 28, Fig. 9, working together, so that when the jaw connected to the arm 25 is turned about its pivot, the arm 27 of said jaw presses against the arm 28 of the other jaw and so turns the second jaw in unison with the first. A spring 29 tends to close the jaws. The descent of the tweezers takes place simultaneously with the descent of the plates 70 71 aforesaid, and immediately they reach their lowest position the actuating-arm 25 escapes past the end of the incline 26, thereby releasing the jaws, which are then closed suddenly by the spring 29. In closing the jaws, as shown in Fig. 5, seize the ends of the piece of yarn which have been conveyed through the warp and drawn together by the plates 70 71, as above described. The tweezers then begin their upward movement, and in so doing draw the ends of the yarn up through the warp, and thus form the knot. A fixed incline 31, Fig. 8, operating upon the arm 25 causes the jaws to open as they complete their upward movement, thereby releasing the ends of the yarn. The pivoted incline 26 moves out of the way of the tweezer-arm 25 during the return movement of said arm.

The starting and stopping of the driving-shaft 8 by allowing the catch 10 to engage with the tooth 11 of the disk 12 and the selection of the colors to be employed in forming the pattern are effected by an automatic arrangement comprising a lever 140, Figs. 2, 7, and 16, pivoted on a block 141, carried by a sliding rod 142, which is raised and lowered in guides by means of a cam 143, Figs. 1 and 16, on the shaft 8. Said cam operates through a lever 144, pivoted at 145 and connected to the sliding rod 142. The said rod is raised by a spring 146 and is lowered every revolution of the shaft 8 by the cam 143, or the rod may be both raised and lowered by the cam, so as to bring the free end of the lever 140 upon one of a series of pins 147, Figs. 1, 2, 7, and 20. The continued descent of the rod 142 after the free end of the lever rests on the pin operates to tilt said lever, and thereby to turn a segment-wheel 47, which is connected to the rear end of the lever 140 by a link 148 and arm 149. This segment wheel or disk is provided with perforations 48, through which

the various yarns are threaded. The axis 49 of the said segment-wheel is arranged at right angles to the warp-threads, and the weight of the wheel tends to return it to its initial position when moved therefrom or it is returned by a spring 173.

The amount of rotation given to the segment-wheel depends on the height of the pin upon which the free end of the lever 140 descends, and therefore by a suitable arrangement of pins any desired color of yarn can be brought to the operative position. An extension 171 of the arm 50 of the segment-wheel normally rests upon a projection 170 of a pivoted lever 41 and keeps said lever depressed; but when the arm 50 is tilted the lever 41 is allowed to rise under the action of its spring 172. Said lever is connected by a link 42, Fig. 14, to one end of a pivoted lever 43, the other end of which is furnished with an inclined surface 44. At each revolution of the pulley 9 the catch 10, Figs. 1, 2, and 14, rides up said inclined surface 44 and is thereby raised and prevented from engaging with the tooth 11 of the disk 12; but when the lever 41 is allowed to rise, as above described, the inclined surface 44 of the lever 43 is depressed below the path of the catch 10, whereupon said catch not being raised will engage with the tooth 11 of the disk 12 and so rotate said disk and start the feeding and knotting mechanisms, the clutch remaining engaged so long as the lever 41 is raised. The various operations of drawing the yarn across the warp-threads, cutting off a portion of said yarn, and knotting this portion in the manner above described will be repeated for every revolution of the driving-shaft so long as the lever 41 is raised, but will stop as soon as the said lever is depressed.

The pins 147 may be arranged in rows in a shaft 150, as shown in Fig. 7, the distances between them measured along the length of the shaft being the same as the distance moved by the frame 1 after each knot is made, so that the lever 140 descends successively on the whole of the pins in the row, which pins correspond in number to the number of knots to be formed across the fabric. Several rows of pins may be arranged in one shaft, which can be turned to bring up the next row as each row is worked off, or the rows of pins may be fixed in bars 151, Fig. 20, which bars are mounted on endless bands or chains 152, passing around pulleys 153 153. As many bars as are required to complete the pattern may thus be connected together. By turning said pulleys after each row of pins is worked off another row can be brought to the operative position. The endless bands may be driven by worm-gear 154, actuated by a hand-wheel 156, or they may be driven automatically.

In lieu of bars having separate pins fixed in them I may employ sheet-metal plates 157, bent, as shown in Fig. 17, and filled with wood 161, having points 158, formed by cutting and turning up portions of the metal, or I may use a plate 180, Fig. 17ª, having a notched or stepped edge cut to produce the desired pattern. The lever 140 descends successively upon the steps in the edge of this plate and is tilted more or less, according to the height of the step, thus governing the segmental wheel.

The lever 140 is guided by a flexible guide 160, Figs. 2 and 7.

The bobbins 52, Fig. 6, containing the different-colored yarns, are carried by the frame 1 in the position shown in Fig. 6 or in any other suitable position, and the same may be furnished with brakes to prevent them from turning too freely. A cam-like pivoted catch 53, Fig. 6, is provided to prevent the backward movement of each yarn through the segment-wheel after the same has been drawn forward. The catch allows the yarn to be drawn forward freely; but should any backward pull be exerted on the yarn the catch will nip the yarn against the wheel, as indicated in Fig. 6, and resist such backward pull.

For drawing the yarn forward a pair of grippers is provided, consisting of an arm 55, Figs. 1 and 2, pivoted at 56, and a jaw 57, pivoted on said arm. The arm 55 is oscillated just above the warp by a cam 58, Figs. 1 and 11, on the driving-shaft 8, operating through a lever 59, pivoted to a bracket 60 and coupled at its lower end to a rod 61, which is connected to the arm 55. The grippers at the proper time seize the protruding end of that yarn which by the movement of the segment-wheel has been brought to the operative position and draws the same across the warp-threads, after which a pair of shears or a knife operates to cut off a portion of such yarn. The jaws of the grippers are controlled by the device shown in Fig. 12, which comprises a fixed incline 65 and a pivoted incline 66, normally kept up against a stop-pin 266 by a spring 67. A stop-pin 267 regulates the distance that the incline 66 can be depressed. The jaw 57 (which is normally kept closed by the spring 64, Fig. 1) of the gripper is opened during the forward movement of the arm 55 by the tail end 63 of said jaw passing underneath the pivoted incline 66. Directly the arm 55 reaches the end of its forward movement the tail end 63 is forced upward by the spring 64 past the end of the pivoted incline 66, thus closing the jaws of the gripper upon the protruding yarn already brought into position. As the arm 55 moves backward the tail end 63 passes along the top side of the pivoted incline 66, depressing same upon the stop-pin 267, the amount of such depression being regulated, so as to cause the jaw 57 to be tightly closed upon the yarn which it is drawing across the ground-threads from the segmental wheel 47. As the arm 55 reaches the end of its backward movement the tail end 63 engages with the fixed incline 65 and opens the jaw 57 against the pressure of the

spring 64, thus releasing the yarn directly it has been gripped by grippers 76 and 77. The operations are then repeated.

The shears 90, Figs. 1 and 3, for cutting off the length of yarn are pivoted at 91 and are actuated by a cam 92, Fig. 13, on the shaft 8 operating through a rod 93, lever 94, and link 95. The rear ends of the shear-blades are coupled by links 96 97, connected to said rear ends of the blades and to opposite ends of a lever 98, pivoted at 99, so that the blades will work in harmony.

The means for moving the frame 1 laterally across the warp through a short distance after the formation of each knot comprises a toothed wheel 100, Figs. 2 and 15, mounted on a spindle 101, carried by the frame 1 and gearing with a rack 102, fixed in the frame 7, Fig. 1. On the said spindle 101 is fixed a worm-wheel 103, with which is geared a worm 104, fixed on a shaft 105, rotatable in bearings 106 in the frame 1. On the end of the shaft 105 is a star-wheel 107, which is turned intermittently by pins 108, projecting from a boss 109 on the driving-shaft 8. The frame 1 is thus moved after the formation of each knot a suitable distance across the warp and a fresh knot is made, the operations being repeated until a row of knots has been completed all across the width of the fabric. When a row of knots is completed, the whole apparatus is raised to allow of a pick being made by the shuttle of the loom in the usual manner. For this purpose the frame 7 may be arranged to travel up and down guides 110, Fig. 4, and be balanced by weights 111, attached to cords 112, passing over guide-pulleys 113. The rods 6 6 extend the full width of the loom, and the frame 1 can thus travel across the loom on said rods and be raised at any desired time to allow of a pick being taken. The next row of knots is, to save time, made in the reverse order, for which purpose the worm-shaft 105 must turn in the reverse direction. This may be effected by shifting the boss 109 by hand along the shaft 8 to cause the pins 108 to act on the other side of the star-wheel 107, or the said boss may be shifted automatically as follows—that is to say, the boss may have an annular groove 115, Figs. 1 and 2, in its periphery, with which groove is engaged a pin 116, fixed in an arm 117, carried by a pin 118. To another short arm 119, Figs. 1, 2, and 3, on said pin is coupled a lever 120, pivoted at 121. When the frame reaches the end of its travel, a pin 122 on the lever 120 presses against a fixed stop on the loom and the lever is turned through a suitable angle, thereby sliding the boss 109 along the shaft and reversing the movement of the frame when the key-levers are next depressed.

Figs. 6 and 7 illustrate a segmental wheel for twelve colors of yarn. The number of colors may be increased, if desired, as follows—that is to say, two or more segmental arcs may be connected together on a common arm, Figs. 18 and 19, which arm is slotted and can be raised and lowered by a change-key lever 131, so as to bring any desired arc into the operative position. Each segmental arc is furnished with its own set of colors, and the common arm is oscillated as above described with reference to Figs. 6 and 7. Instead of a common arm having two or more arcs projecting from it a plate may be employed with two or more rows of holes formed in it at different heights, so that by raising and lowering the plate any row of holes can be brought to the operative position. This construction allows of the rows of holes being made very close together.

What I claim is—

1. In a loom for weaving Turkey carpets and similar fabrics, the combination, with feeding and knotting mechanisms, of an oscillatory perforated segment through which the yarns are threaded, an automatic selecting apparatus comprising a rising-and-falling block, a lever pivoted on said block, means for raising and lowering said block at each rotation of the driving-shaft, a pattern-plate on which the free end of the pivoted lever descends, and a link coupling said lever to the segment, substantially as described.

2. In a loom for weaving Turkey carpets and similar fabrics, the combination, with feeding and knotting mechanisms, of an oscillatory perforated segment through which the yarns are threaded, an automatic selecting apparatus comprising a rising-and-falling block, a lever pivoted on said block, means for raising and lowering said block at each rotation of the driving-shaft, a pattern-plate on which the free end of the pivoted lever descends, endless bands for carrying a series of pattern-plates to complete a pattern, means for moving said endless bands to bring another pattern-plate to the operative position after each row of knots is completed, and a link coupling the lever to the segment, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

CHARLES HUGHES.

Witnesses:
GEORGE HARRISON,
ALEXANDER W. ALLEN.