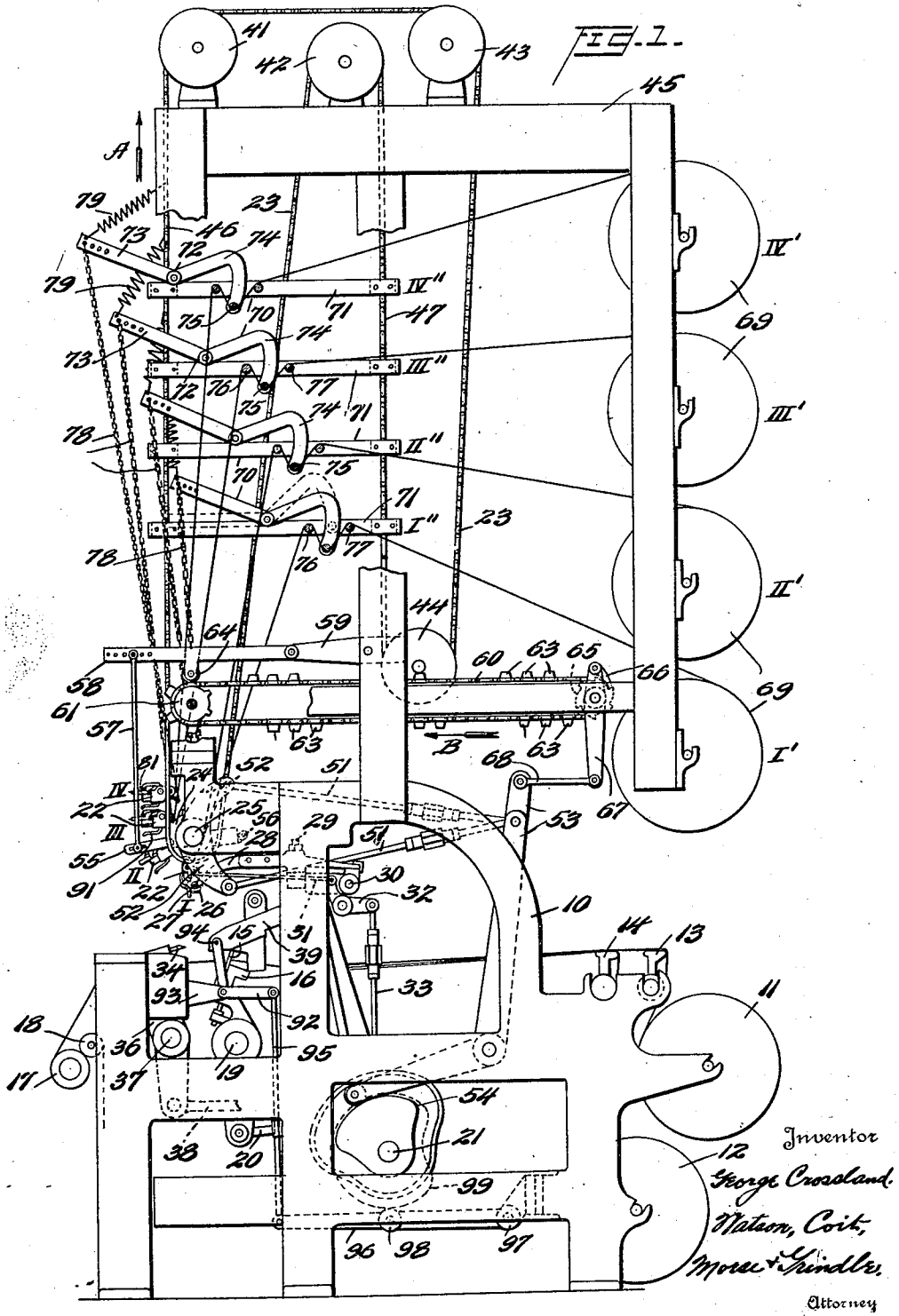
Dec. 6, 1927. 1,651,809

G. CROSSLAND

AXMINSTER LOOM

Filed April 3, 1925 2 Sheets-Sheet 1

FIG. 1.



Inventor
George Crossland.
Watson, Coit,
Morse & Grindle.
Attorney

Dec. 6, 1927. 1,651,809

G. CROSSLAND

AXMINSTER LOOM

Filed April 3, 1925 2 Sheets-Sheet 2

FIG. 2.

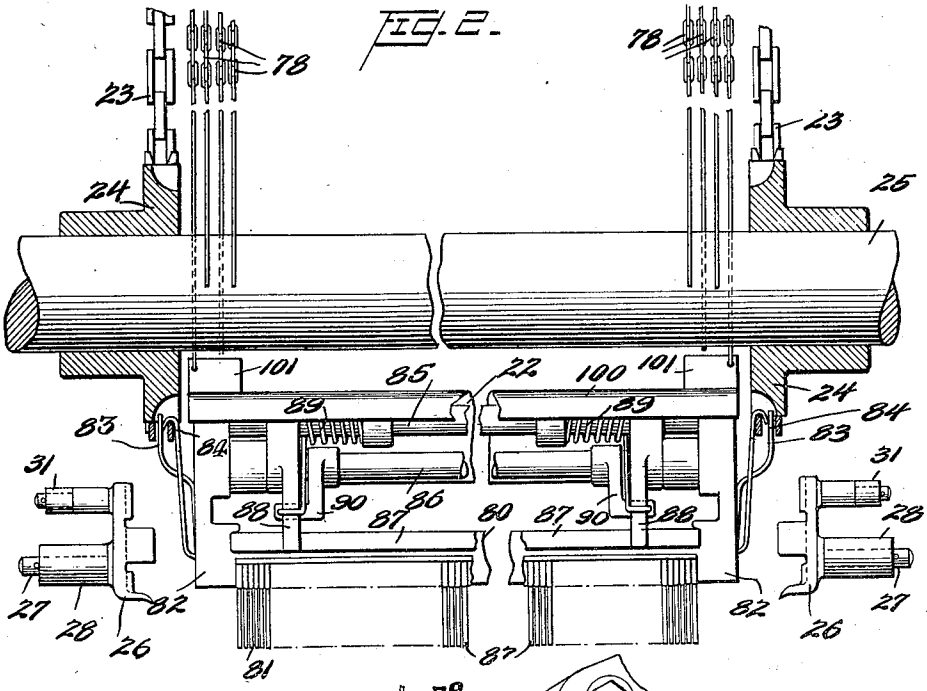
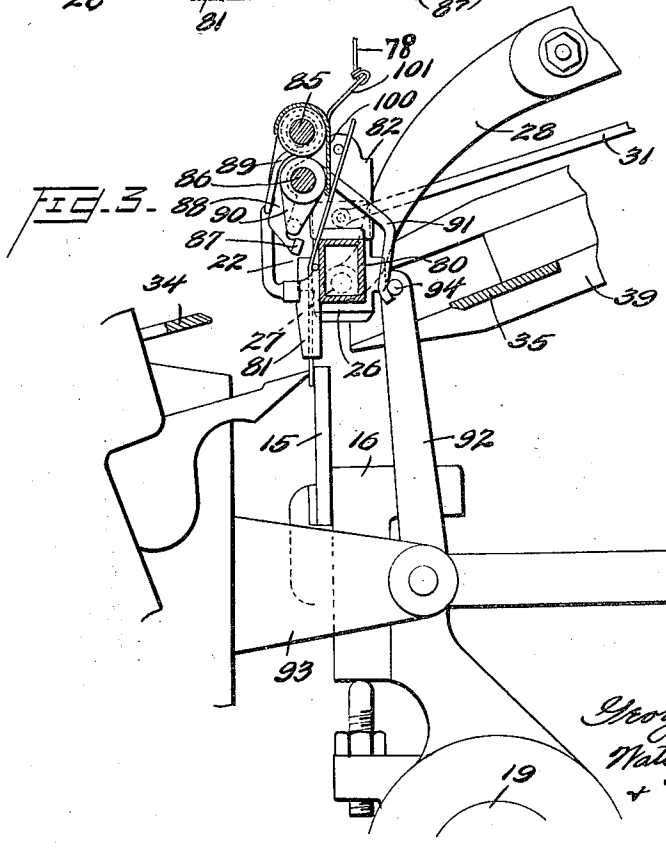


FIG. 3.



Inventor

George Crossland,

Watson, Coit, Moser & Grindle.

Attorney

Patented Dec. 6, 1927. 1,651,809

UNITED STATES PATENT OFFICE.

GEORGE CROSSLAND, OF AMSTERDAM, NEW YORK, ASSIGNOR TO MOHAWK CARPET MILLS, INC., OF AMSTERDAM, NEW YORK, A CORPORATION OF NEW YORK.

AXMINSTER LOOM.

Application filed April 3, 1925. Serial No. 20,534.

This invention relates to a loom for weaving tufted fabrics, such as Axminster rugs, and relates more particularly to an improved means for supplying yarn to the tubes or presenters that introduce the tufts between the warp threads.

The primary aim of this invention is to provide a pile fabric loom in which the tufting yarn is drawn from a source of supply mounted independently of the tube frames.

It is a further object of this invention to provide a loom of this character which will eliminate streaks in the woven fabric.

It is a still further object of this invention to provide a loom wherein the number of tube frames used is very greatly reduced, and also to provide means for automatically reversing the tube frame carrying chain.

Another object is to provide a loom adapted to be used with the clamp tube frame described and claimed in my copending application, Serial No. 20,533, filed concurrently herewith, and to provide means on the loom to cooperate with the releasable clamp on said tube frame.

A still further object is to provide improved means for automatically tensioning the yarn.

Further objects and advantages of my invention will be apparent from the following description, taken in conjunction with the accompanying drawings, which form a part of this specification, and in which:

Figure 1 is a diagrammatic side elevation of an Axminster loom embodying my invention, parts being omitted for the sake of clarity;

Figure 2 is a front elevation on an enlarged scale of the lowermost tube frame of Figure 1 and its associated parts, the other tube frames being omitted, and parts being broken away; and

Figure 3 is a diagrammatic view of a portion of Figure 1 on the same scale as Figure 2, parts being broken away and parts being shown in different positions.

Referring more particularly to the drawings, in which like reference characters denote like parts throughout the several views thereof, 10 represents the frame of an Axminster loom of standard type, having a binder warp beam 11 and a stuffer warp beam 12. The binder warp threads from the beam 11 pass over the whip roll 13, and the stuffer warp threads pass over whip roll 14, both sets of warp threads passing through heddles (not shown), which are adapted to form a suitable shed upon manipulation of the shedding mechanism. The various warp threads, together with the selvage threads (not shown), pass forward through reed 15 mounted on lay 16, and are united at the fell of the fabric. The usual needle mechanism (not shown) is mounted on one side of the loom, and serves to insert the filling into the sheds as is customary in this type of loom. The woven fabric passes around spike roll 17 and over stripper roll 18, and thence down to a suitable wind-up mechanism (not shown). The lay 16 is pivotally mounted on a shaft 19, and is actuated by connectors 20 through suitable mechanism (not shown), including cams on the main cam shaft 21.

The tuft yarns or pile forming threads are inserted between the stuffer and binder warp threads by means of tube frames 22 of novel construction, which are fully disclosed and claimed in my copending application, Serial No. 20,533, filed concurrently herewith, and which are described in greater detail below.

The tube frames 22 are mounted in the usual manner on continuous or endless carrying chains 23, which pass over sprockets 24 secured to a shaft 25 rotatably mounted in the upper part of the loom frame 10. A friction brake of the usual type may be mounted on shaft 25 to prevent unintentional movement or slipping of the chains 23 due to the unbalanced weight of the tube frames. This friction brake is not shown in the drawings as its construction and use are well known in the art.

The lowermost tube frame 22 may be removed from the carrying chains 23 for the insertion of tufts in the fabric, by clutches 26 pivoted at 27 to transfer or clutch arms 28. The clutch arms 28 are movable about vertical studs 29 and a horizontal dip shaft 30 in the usual manner, so that the tube frame may be released from the carrying chains, presented at the fell of the fabric, and returned to the chains. These movements are controlled by suitable mechanism operated by cams on the cam shaft 21. The tube frame is given a wiping movement in the warp, which aids materially in inserting the tufts, by means of connectors 31 pivoted to the clutches 26. Each connector 31 is operated by a bell crank lever 32 which is

in turn moved by a connector 33 operatively connected to a suitable cam on the cam shaft 21.

After the tufts are inserted, the yarn is cut by means of shears 34 and 35. Shear 34 is mounted on arms 36 secured to shaft 37, which may be rotated by a suitable cam (not shown) on shaft 21 through the medium of connector 38. Shear 35 moves in slide 39, and is similarly controlled by a cam.

The parts thus far described may all be of the usual type and construction, and as they are well known to persons skilled in the art and form no part of the present invention, further description is deemed unnecessary.

Those parts which are more intimately associated with the present invention will now be described.

The endless chains 23 are also supported upon sprockets 41, 42, 43 and 44 mounted upon a suitable super-structure 45 secured to the loom frame 10. The arrangement shown in Figure 1 is employed in order that two of the passes or sections of the chain may be substantially vertical and moving in the same direction. These sections are marked 46 and 47, and their function will be stated below.

The shaft 25 may be rotated to feed the chains 23 by means of a tube frame chain feeding mechanism of known type, such as that disclosed in the patent to Clark, No. 1,472,459, dated Oct. 30, 1923. This mechanism comprises a pair of ratchet wheels (not shown) fixed to the shaft 25 and having ratchet teeth facing in opposed directions. A pair of feed pawls (not shown) are regularly moved angularly about the axis of the shaft 25 by links 51 which connect the feed pawl supports 52 with a bell crank 53 actuated by a cam 54 on the loom cam shaft 21. A guard plate or shield 55 is mounted on a fixed pivot 56 and engages studs in the pawls. The guard plate is movable upward or downward, and in each extreme position it permits one of the pawls to become operative and holds the other inoperative. In Figure 1 the guard plate is shown in its downward position, in which position it permits the chains 23 to be fed in the direction of the arrow A, Figure 1.

The guard plate 55 is connected by a link 57 to a reversing arm 58 pivoted to a bracket 59 secured to the superstructure 45. A reversing chain 60 passes over sprockets 61 rotatably mounted on studs secured to a lower longitudinal member of the frame 45. The chain 60 carries a plurality of cams 63 which are adapted to engage a roller 64 mounted on the reversing arm 58. The arm 58 will thus be raised when the roller 64 is on top of one of the cams 63, and will therefore reverse the direction of feed of the chains 23.

The chain 60 is intermittently fed in the direction of the arrow B of Figure 1 by means of a ratchet 65 and pawl 66. The pawl 66 is moved by an arm 67 connected to the bell crank 53 by a link 68. It will be noted that the construction is such that the chain 60 is moved one link on the forward throw of the bell crank 53 and the chains 23 are moved one link on the rearward throw of the same. These chains 60 and 23 are moved alternately in this manner in order that the reversing arm 58 and consequently the guard plate 55 may be stationary in the position necessary to secure the desired direction of movement at the time when the chains 23 are to be moved.

In the preferred embodiment of my invention four tube frames 22 are employed, but it is of course obvious that this number may be varied as desired. These tube frames are designated by the Roman numerals I, II, III, and IV. Each tube frame is supplied with yarn from an independent beam 69 rotatably mounted on the superstructure 45. The beams are marked I′, II′, III′, and IV′ to correspond with the tube frames which they supply. The yarns from the beams I′ and II′ pass around the rear side of the shaft 25 to their respective tube frames, and the yarns from beams III′ and IV′ pass around the forward side of the shaft. All of the yarn is disposed between the sprockets 24, the shaft 25 being clear between these sprockets, thereby avoiding interference with the various moving parts of the loom, as is clearly shown in Figure 2.

It is evident that when a tube frame is removed from the chains 23 by the clutches 26 and presented at the fell of the fabric for the tufting operation, considerable yarn must be drawn from the supply beam. Then when the tube frame is replaced on the carrying chains, the yarn would be left slack. To take up this slackness I employ novel yarn tensioners or eveners 70, one acting on the yarn passing from each supply beam to its tube frame. These eveners are denoted I″, II″, III″, and IV″, to correspond with the lettering of the beams and tube frames with which they cooperate.

Each evener 70 comprises a pair of bars 71 arranged in the same horizontal plane at opposite sides of the loom, the extremities of each bar 71 being secured to the vertical passes 46 and 47 of the chain 23 adjacent its side of the loom. A member 72 is pivoted to each bar 71, and may have a straight portion 73 extending forward from the pivot and a hook-shaped portion 74 extending rearwardly therefrom. A rod 75 connects the free ends of the hooks 74. Two yarn supporting rods 76 and 77 are mounted between the bars 71, and are spaced on either side of the rod 75. The rods 75, 76 and 77 are preferably round and rotatably

mounted in their supports. The yarn is arranged so as to pass over the rods 76 and 77 and below the rod 75. The free end of the arm 73 of each member 72 is connected to one end of the corresponding tube frame by means of a chain 78. The lower end of this chain is preferably replaced by a soft wire cable, as this portion must at times bend around and bear against the shaft 25.

The member 72 of evener I'' is shown in full lines in the position which it assumes when the tube frame I is in place on the carrying chains 23, and in dotted lines in the position it occupies when the tube frame I is presented at the fell of the fabric by the clutch arms 26. It is apparent that when the tube frame is lowered by the clutch arms, the chain 78 will exert a pull on the member 72 which will raise the rod 75, thereby relieving the tension on the yarn supplied to the tube frame and releasing sufficient slack to take care of the movement of the tube frame. Similarly, when the tube frame is replaced on the carrying chains the slack thus produced will be taken up by the lowering of the rod 75. The movement of the member 72 in the return direction may be assured by using springs 79, or any other equivalent arrangement may be employed.

By securing the eveners to the vertical passes 46 and 47 of the chains 23, the eveners are lowered or raised horizontally when the chain is fed in either direction, and consequently the relative positions of each evener and its corresponding tube frame remain unchanged. The tension on the yarn is therefore kept substantially constant. The eveners 70 also help to maintain the yarn in proper spaced relation while passing from the beam to the tube frame.

The ordinary type of tube frame would entirely fail to function if used with the loom above described, because the yarn would be pulled out of the tubes when the tube frame was moved toward the fell of the fabric. I have therefore devised a novel form of tube frame which is described and claimed in my copending application referred to above. This tube frame is provided with a releasable clamp adapted to grip the yarn and prevent it from being pulled out of the tubes, the clamp being released by a cooperating part on the loom at the proper time to permit relative movement of the yarn and the tube frame.

The details of the construction of the tube frame 22 are shown quite clearly in Figures 2 and 3, and for a further exposition reference is made to my above mentioned copending application.

The tube frame as shown comprises a bar 80 having tubes 81, end brackets 82, ears 83 and spring hooks 84 secured thereto. The tube frame is detachably mounted on the chains 23 by means of the ears 83 and spring hooks 84 in the usual manner. The end brackets 82 carry between them a fixed shaft 85 and a rotatable shaft 86. The bar-shaped yarn clamps 87 are secured to arms 88 rotatably mounted on the fixed shaft 85, and are held against the bar 80 so as to clamp the yarn by the pressure of the coil springs 89, one end of each of which is secured to fixed shaft 85 while the other end bears upon one of the arms 88. Dogs 90 are fixed to the rotatable shaft 86 and engage the arms 88. Triggers 91 are also secured to the rotatable shaft 86, and are adapted to be engaged by mechanism on the loom to rotate the shaft 86. Upon such movement of the shaft 86, the dogs will force the arms 88 outwardly against the action of the springs 89, thereby releasing the clamps 87 and permitting relative movement of the tube frame and the yarn. The tube frame is shown in Figures 1 and 2 with the clamp closed, and in Figure 3 with it open.

As above stated, mechanism is provided on the loom to engage the triggers 91 and release the clamps 87 at suitable times. This mechanism comprises two bell cranks 92, each pivoted to a bracket 93 secured to the breast plate of the loom, one of the brackets 93 being positioned near each side of the loom below one end of the tube frame. Each bell crank 92 carries a pin 94 at its upper end which is adapted to engage a trigger 91 of the tube frame when the parts are in the position shown in Figure 3. The other end of the bell crank is connected by a link 95 to a lever 96 pivoted to a bracket 97 secured to the loom frame 10. The lever 96 carries a roller 98 which engages a cam 99 on the cam shaft 21.

Each of the tube frames is provided with a sheet metal guard 100, which is secured to the end brackets 82 of the tube frame, and, as is clearly shown in Figure 3, prevents the yarn from catching on the parts mounted on the shafts 85 and 86. These guards are provided at each end with a projecting tongue 101, to which the chains 78 connecting the tube frame with the corresponding evener 70 may be secured. These tongues 101 may be bent to the right as shown in Figure 3 for tube frames I and II, and to the left for tube frames III and IV. The purpose of this is to hold the chains 78 as far as possible clear of shaft 25.

The operation of my improved loom will be described in so far as it differs from that of an Axminster loom of the usual type. Starting from the position of the parts shown in Figure 1, the first half rotation of the cam shaft 21 will move the bell crank 53 from the extreme rearward position in which it is there shown to its extreme forward position. During this movement, the pawl 66 and ratchet 65 will advance the chain 60 one link in the direction of the

arrow B, thereby bringing one of the cams 63 beneath the roller 64 and raising the arm 58. The guard plate 55 is raised by the arm 58 and therefore is in position to permit the chains 23 to be fed in the direction opposite to that of the arrow A. During this movement the pawls carried by the pawl supports 52 have been moving in such a direction as to slide over their respective ratchets without engaging the same. The chains 23 have consequently remained stationary.

While the chains 23 have thus been stationary, the tube frame I has not. The clutch arms 28 remove the tube frame I from the carrying chains 23, present it at the fell of the fabric for the tufting operation, and replace it on the chains during this half-revolution of the cam shaft. The weaving and tufting operations are performed in the usual manner, and will therefore not be described herein.

The clamps 87 on the tube frame hold the yarn securely to the tube frame while the latter is being lowered and the tufts inserted in the fabric. When the tufts have been completely formed and are held firmly in place by the reed 16 beating up against the filling, the bell cranks 92 are actuated by their cams to force the pins 94 against the triggers 91, thereby releasing the yarn clamps 87. The tube frame is then raised through a slight distance by the clutch arms while the lower ends of the yarn are securely held in the fabric, thus causing a relative movement of the yarn and the tube frame. The pins 94 next release the triggers 91, thereby reclamping the yarn, and the shears 34 and 35 then come together and sever the yarn, leaving yarn ends projecting below the tubes which are long enough to form another row of tufts. The clutch arms 28 continue their upward movement and replace the tube frame I on the chain.

When the tube frame is lowered, the chains 78 secured thereto will move the members 72 of the eveners 70 in the manner above described, and thereby release enough slack to enable the tube frame to be readily lowered. During this lowering operation yarn will be drawn from the supply beam to compensate for that cut off during the previous tufting operation in which that tube frame took part, the clamps 87 holding the yarn for this purpose. When the tube frame is replaced on chains 23, the members 72 will be returned to their original position by the springs 79, and the slack taken up.

The second half-revolution of the cam shaft will cause the bell crank 53 to move back again to the position shown in Figure 1. During this movement the chains 23 will be advanced one link in a direction opposite to that of the arrow A. The tube frame II will thus be brought into the operative or vertical position. At the same time the pawl 66 will travel backwards one tooth over the ratchet 65. The chain 60 thus remains stationary during this operation.

The third half-revolution causes a repetition of the movements described under the first half-revolution, the tube frame II merely being substituted for the tube frame I, and the second cam 63 being brought under the roller 64. The fourth half-revolution of the cam shaft brings the tube frame III into vertical position, and the fifth brings the third cam 63 under the roller. The sixth brings tube frame IV into vertical position, and during the seventh tufts are formed from this tube frame. The movement of the chain 60 which takes place during the seventh half-revolution does not bring another cam under roller 64, but allows the latter to drop down upon the chain, thereby lowering the guard plate 55 and reversing the direction of feed of the chains 23. The eighth half-revolution therefore brings the tube frame III back into operative position.

By thus arranging the cams 63 on the chain 60 in groups of three followed by three empty links, as shown, the tube frames will be presented in the regular sequence 1—2—3—4—3—2—1, etc. Of course, if the number of tube frames to be used is changed, the number of links in the chain 60 and the number and arrangement of the cams 63 must be altered to suit. In the embodiment shown, the chain 60 should have a number of links equal to some multiple of six, since the chain 60 is moved six links to complete an entire cycle. The cams 63 may be constructed so as to overlap, in order that the roller 64 will not drop down in passing from one cam to its neighbor.

It will be obvious that my invention presents many advantages over the usual type of Axminster loom. For example, the number of tube frames and the length of the endless carrying chain employed are enormously reduced. Indeed, a single one of my improved tube frames may be employed if desired. The use of a plurality of tube frames is preferred, however, for the reason that by this means the production of streaks in the woven fabric may be avoided. Variations in the color of the different skeins of yarns sometimes occur, and if every tuft in each longitudinal row is made from the same piece of yarn, as would be the case where only one tube frame is employed, a variation in the color of this piece of yarn will cause a streak in the finished fabric. Where four tube frames are used, only every fourth tuft will be made from the off-color skein, and consequently the slight variation in shade will pass entirely unnoticed. A more uniform blending of color is therefore achieved, and the face of the carpet appears perfectly uniform and even in color.

My invention is particularly adapted for the production of plain, mottled, or several tone Axminster rugs or carpets. Since the number of tube frames is greatly reduced, and the tube frames are supplied with yarn from independent beams, which may be of much larger capacity than the spools formerly mounted directly on the tube frame, it is apparent that the cost of spooling and threading the yarn is very greatly reduced.

I have shown all the yarns for each tube frame wound on a single beam, and this is my preferred construction. It will be readily apparent, however, that each thread of yarn might be drawn from an independent bobbin or spool.

Many other changes and alterations might be made in the structure above disclosed without affecting the spirit of my invention, and I therefore desire to be limited only by the prior art and the scope of the appended claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. In a loom for weaving tufted fabrics, means for inserting the pile tufts, comprising in combination, a tube frame, means for supporting a supply of yarn independently of said tube frame, means for moving said tube frame toward and from the fell of the fabric, continuously acting means associated with and mounted on the frame for clamping the yarn relative to said frame, and releasing means for rendering said clamping means ineffective during a part of the tuft inserting operation.

2. In a loom for weaving tufted fabrics, means for inserting the pile tufts, comprising in combination, a tube frame, means for supporting a supply of yarn independently of said tube frame, means for moving said tube frame toward and from the fell of the fabric, continuously acting means associated with and mounted on the frame for clamping the yarn relative to said frame, releasing means for rendering said clamping means ineffective during a part of the tuft inserting operation, and means on the loom frame for operating said releasing means.

3. In a loom for weaving tufted fabrics, means for inserting the pile tufts, comprising in combination, a tube frame, means for supporting a supply of yarn independently of said tube frame, means for moving said tube frame toward and from the fell of the fabric, yarn clamping means on said tube frame, means for taking up the slack caused by movements of the tube frame toward the source of supply, and means fixedly secured to and operated by the tube frame for automatically releasing said slack as the tube frame is moved from the source of supply.

4. In a loom for weaving tufted fabrics, means for inserting the pile tufts, comprising in combination, a tube frame, means for supporting a supply of pile tuft yarn independently of said tube frame, means for moving said tube frame toward and from the fell of the fabric, yarn clamping means on said tube frame, means for tensioning the yarn and taking up slack therein, said means being mounted independently of the tube frame, and means fixedly secured to said tube frame for operating said tensioning means in accordance with the movement of the tube frame relative to the source of supply.

5. In a loom for weaving tufted fabrics, means for inserting the pile tufts, comprising in combination, a tube frame, means for supporting a supply of pile tuft yarn independently of said tube frame, means for moving said tube frame toward and from the fell of the fabric, continuously acting clamping means on said tube frame for preventing movement of the yarn relative thereto, means for rendering said yarn clamping means ineffective at times, and means for maintaining a substantially even tension on the yarn.

6. In a loom for weaving tufted fabrics, means for inserting the pile tufts, comprising in combination, a tube frame, means for supporting a supply of yarn independently of said tube frame, means for moving said tube frame toward and from the fell of the fabric, continuously acting clamping means on said tube frame for preventing movement of the yarn relative thereto, means for rendering said yarn clamping means ineffective at times, and means for maintaining a substantially even tension on the yarn, said tensioning means being mounted independently of the tube frame and acting upon the yarn between the source of supply and the tube frame.

7. In a loom for weaving tufted fabrics, means for inserting the pile tufts, comprising in combination, a tube frame, means for supporting a supply of yarn independently of said tube frame, means for moving said tube frame toward and from the fell of the fabric, continuously acting clamping means on said tube frame for preventing movement of the yarn relative thereto, means for rendering said yarn clamping means ineffective at times, means for tensioning the yarn and taking up slack therein, said means being mounted independently of the tube frame, and means fixedly secured to said tube frame for operating said tensioning means in accordance with the movement of the tube frame relative to the source of supply.

8. In combination with a loom for weaving tufted fabrics having a tube frame and a supply of yarn for said tube frame mounted independently thereof, a yarn tensioning means mounted independently of said tube frame and acting upon the yarn between said

supply and said tube frame, said tensioning means comprising means for taking up the slack caused by movements of the tube frame toward the source of supply, and means fixedly secured to and operated by the tube frame for automatically releasing said slack as the tube frame is moved from the source of supply.

9. In a loom for weaving tufted fabrics having a tube frame and a supply of yarn for said tube frame mounted independently thereof, a yarn tensioning means acting upon the yarn between said supply and said tube frame, and comprising in combination a transverse rod bearing on all the yarn ends and means fixedly secured to and operated by the tube frame for moving said rod in accordance with movement of the tube frame relative to the source of supply.

10. In a loom for weaving tufted fabrics having a tube frame and a supply of yarn for said tube frame mounted independently thereof, a yarn tensioning means acting upon the yarn between said supply and said tube frame, and comprising in combination, spaced horizontal yarn supports extending transversely of the yarn, a transverse horizontal rod positioned between said supports and movable relative thereto, said rod being adapted to bear on the yarn, and means fixedly secured to the tube frame for moving said rod in accordance with the movement of the tube frame relative to the source of supply.

11. In a loom for weaving tufted fabrics having a tube frame and a supply of yarn for said tube frame mounted independently thereof, a yarn tensioning means acting upon the yarn between said supply and said tube frame, and comprising in combination, a bar positioned near each side of the loom and extending longitudinally thereof, spaced horizontal yarn supporting rods mounted transversely between said bars, a member pivoted to each of said bars, a horizontal yarn tensioning rod carried between said members and positioned between said yarn supporting rods, said tensioning rod being adapted to bear on the yarn, and means secured to said tube frame and connecting said pivoted members to the tube frame, whereby said tensioning rod may be moved in accordance with the movement of the tube frame relative to the source of supply.

12. In a loom for weaving tufted fabrics, means for inserting the pile tufts, comprising in combination, a plurality of tube frames, means for supporting a supply of yarn for each of said tube frames independently thereof, means for presenting the tube frames at the fell of the fabric in a predetermined cycle, continuously acting clamping means on each of said tube frames for preventing movement of the yarn relative thereto, and means for rendering said yarn clamping means ineffective during a portion of the movement of the tube frames.

13. In a loom for weaving tufted fabrics, means for inserting the pile tufts, comprising in combination, a plurality of tube frames, means for supporting a supply of yarn for each of said tube frames independently thereof, means for presenting the tube frames at the fell of the fabric in a predetermined cycle, continuously acting clamping means on each of said tube frames for preventing movement of the yarn relative thereto, releasing means on each of said tube frames for rendering said yarn clamping means ineffective during a portion of the movement of the tube frame, and means on the loom for operating said releasing means.

14. The combination with a loom for weaving tufted fabrics having a plurality of tube frames and a yarn supply for each of said tube frames mounted independently thereof, of a chain for carrying said tube frames, and yarn tensioning means secured to said chain.

15. The combination with a loom for weaving tufted fabrics having a plurality of tube frames and a yarn supply for each of said tube frames mounted independently thereof, of a chain for carrying said tube frames having substantially vertical sections adapted to move simultaneously in the same direction, and yarn tensioning means secured to said vertical sections.

16. The combination with a loom for weaving tufted fabrics having a plurality of tube frames and a yarn supply for each of said tube frames mounted independently thereof, of a chain for carrying said tube frames having substantially vertical sections adapted to move simultaneously in the same direction, and a yarn tensioner for each tube frame acting on the yarn supplied thereto, each of said tensioners being secured to said vertical sections and being adapted to take up the slack caused by movements of the tube frame associated therewith relative to the source of supply.

17. The combination with a loom for weaving tufted fabrics having a plurality of tube frames and a yarn supply for each of said tube frames mounted independently thereof, of a chain for carrying said tube frames having substantially vertical sections adapted to move simultaneously in the same direction, and yarn tensioning means for each tube frame, each comprising a bar secured to said vertical sections, a member pivoted to said bar, a yarn tensioning rod carried by said member and adapted to bear on the yarn, and means for moving said pivoted member in accordance with the movement of the tube frame associated therewith relative to the source of supply.

18. The combination with a loom for

weaving tufted fabrics having a plurality of tube frames and a yarn supply for each of said tube frames mounted independently thereof, of a pair of chains for carrying said tube frames, one chain being positioned near each side of the loom and each having substantially vertical sections adapted to move simultaneously in the same direction, and yarn tensioning means for each tube frame, each comprising two bars, one secured to the vertical sections of each chain, a plurality of yarn supporting rods mounted between said bars, members pivoted to each of said bars, a yarn tensioning rod carried by said members and positioned between said yarn supporting rods, and means for connecting said members to the corresponding tube frame.

19. In a loom for weaving tufted fabrics, means for inserting the pile tufts, comprising in combination, tube frame carrying chains, a tube chain feed shaft, sprockets on said shaft carrying said chains, means for angularly advancing said shaft intermittently in either direction, a plurality of tube frames detachably secured to said carrying chains, means for supporting a supply of yarn for each of said tube frames independently thereof, transferring means for successively presenting the tube frames at the fell of the fabric, a reversing arm pivotally mounted on the loom frame adapted to control the direction of feed of said shaft, and means for automatically operating said reversing arm to present said tube frames to the transferring means in a predetermined cycle.

20. In a loom for weaving tufted fabrics, means for inserting the pile tufts, comprising in combination, a plurality of tube frames, means for supporting a supply of yarn for each of said tube frames independently thereof, means for presenting the tube frames at the fell of the fabric in a predetermined cycle, continuously acting yarn clamping means on said tube frames for securing said yarn to said frames, releasing means on each of said tube frames for rendering said clamping means ineffective, slack tensioning means for the yarn supply of each tube frame acting on said yarn when said tube frames are moved toward said source of supply and means on the loom frame for operating said clamp releasing means during a part of the time said tensioning means is inactive.

21. In a loom for weaving tufted fabrics, means for inserting the pile tufts comprising in combination, a plurality of tube frames, supporting means for said frames, means for removing the tube frames from said supporting means and presenting them singly and in a predetermined cycle to the fell of the fabric, a distant yarn supplying means for each tube frame, continuously acting clamping means on each of said tube frames, distant slack tensioning means for the yarn supply of each frame, means secured to each frame for rendering said tensioning means ineffective while each frame is removed from said supporting means, and means for rendering said clamping means ineffective at the end of the outward movement of a tube frame and during a portion of the return movement toward its supporting means.

22. The combination with a loom for weaving tufted fabrics having a plurality of tube frames and a yarn supply for each of said tube frames mounted independently thereof, of a chain for carrying said tube frames having substantially vertical sections adapted to move simultaneously in the same direction, and yarn tensioning means for each tube frame, each comprising a bar secured to said vertical sections, a bell crank pivoted to said bar, a yarn tensioning rod secured to one arm of said bell crank and adapted to bear on the yarn, and a connection between the other arm of said bell crank and the corresponding tube frame.

23. A tube frame carrying chain operating mechanism, comprising in combination, a feed shaft operatively connected to the tube chain, means to angularly advance said shaft intermittently in either direction, a pivotally mounted reversing arm adapted to control the direction of feed of said shaft, and means for automatically operating said reversing arm in accordance with a definite plan, whereby the tube frames may be presented in a predetermined cycle, including a chain arranged adjacent said arm, and cams upon said chain adapted to raise and lower said arm in accordance with a predetermined cycle of operations.

24. A tube frame carrying chain operating mechanism, comprising in combination, a feed shaft operatively connected to the tube chain, means to angularly advance said shaft intermittently in either direction, a pivotally mounted reversing arm adapted to control the direction of feed of said shaft, and means for automatically operating said reversing arm in accordance with a definite plan, whereby the tube frames may be presented in a predetermined cycle, including a chain arranged adjacent said arm, a plurality of cams upon said chain adapted to operate said arm in accordance with a predetermined cycle of operations, and means for advancing said chain alternately with the movement of said tube chain feed shaft.

25. A tube frame carrying chain operating mechanism, comprising in combination, a feed shaft operatively connected to the tube chain, means to angularly advance said shaft intermittently in either direction, a pivotally mounted reversing arm adapted to control the direction of feed of said shaft,

and means for automatically operating said reversing arm in accordance with a definite plan, whereby the tube frames may be presented in a predetermined cycle, including a chain arranged adjacent said arm, a plurality of cams arranged upon said chain in a predetermined sequence and adapted to operate said arm, means for advancing said chain including a bell crank, said bell crank being also connected to the feed shaft advancing mechanism and being adapted to operate the feed shaft on one throw and the reversing arm operating chain on the other, and means for actuating said bell crank.

In testimony whereof I hereunto affix my signature.

GEORGE CROSSLAND.