No. 626,878. Patented June 13, 1899.

E. TYMESON & R. BORLAND.

WOVEN FABRIC AND THE ART OF PRODUCING SAME.

(Application filed May 26, 1897.)

(No Model.) 3 Sheets—Sheet 1.

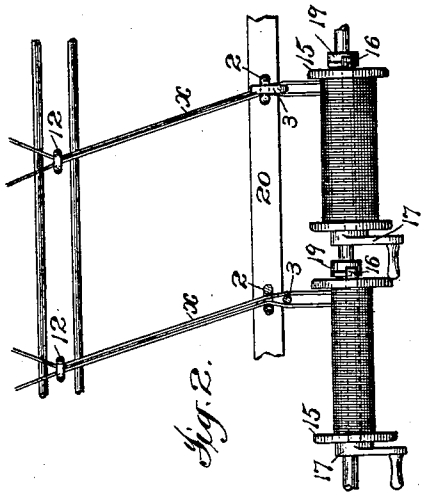


Fig. 2.

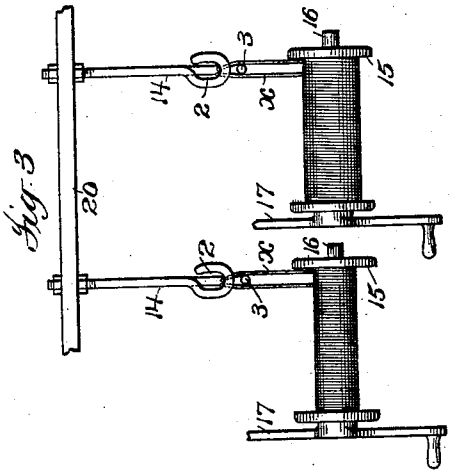


Fig. 3.

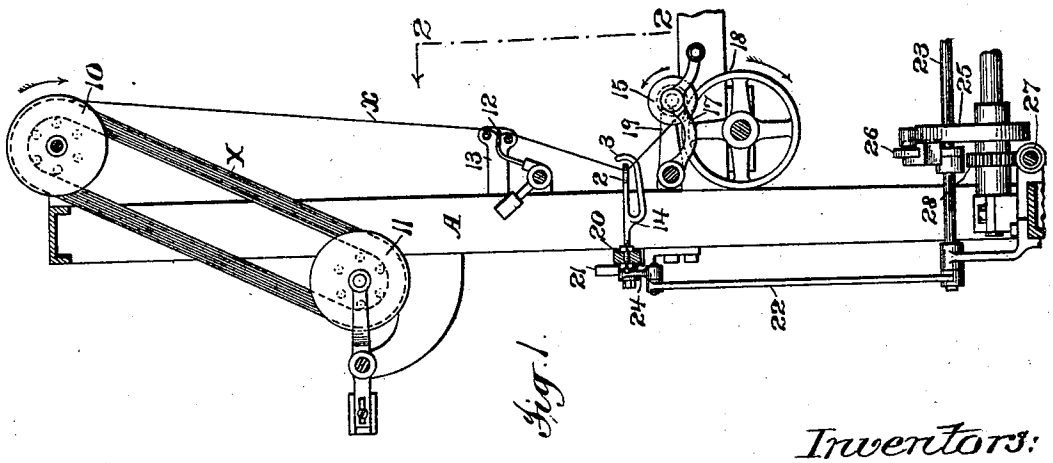


Fig. 1.

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(No Model.) 3 Sheets—Sheet 2.

Fig. 4.

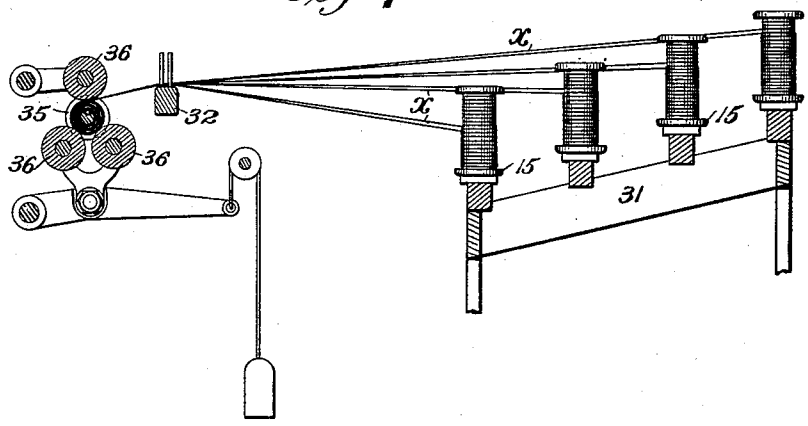


Fig. 5.

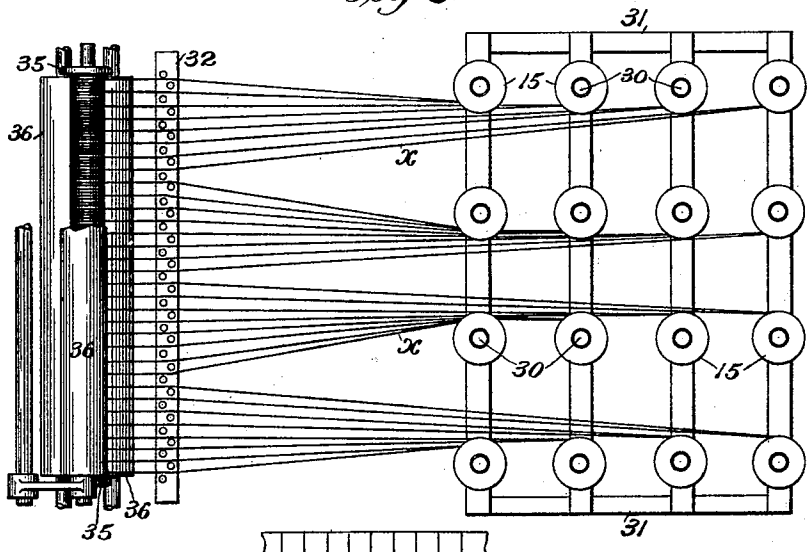


Fig. 6a.

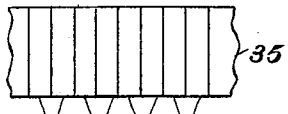


Fig. 6b.

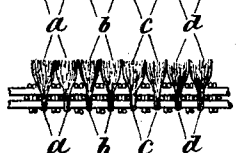
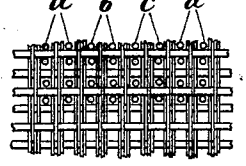


Fig. 6c.



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Fig. 7.

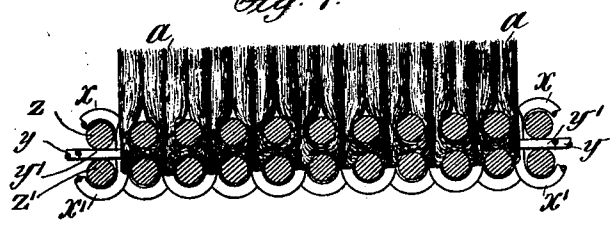


Fig. 8.

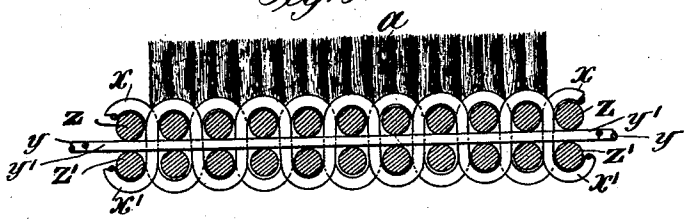


Fig. 9.

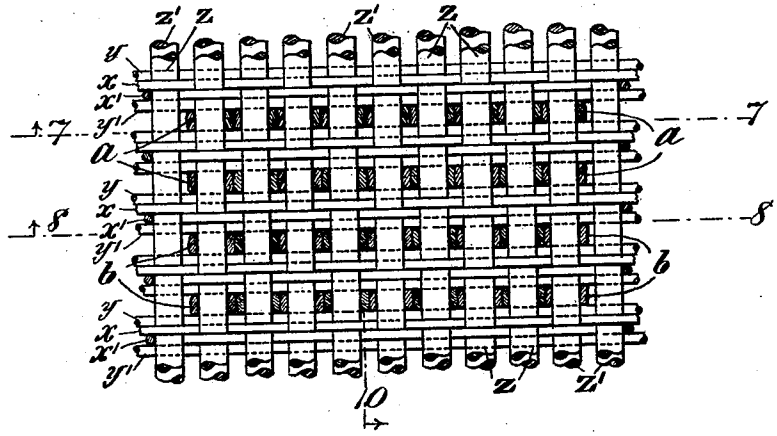
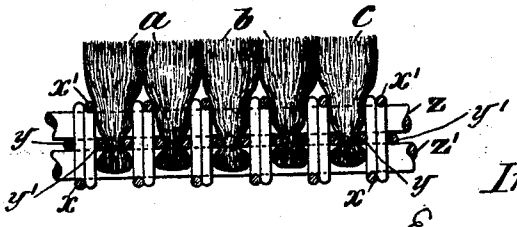


Fig. 10.



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UNITED STATES PATENT OFFICE.

EUGENE TYMESON AND REUBEN BORLAND, OF YONKERS, NEW YORK, ASSIGNORS TO THE ALEXANDER SMITH & SONS CARPET COMPANY, OF SAME PLACE.

WOVEN FABRIC AND THE ART OF PRODUCING SAME.

SPECIFICATION forming part of Letters Patent No. 626,878, dated June 13, 1899.

Application filed May 26, 1897. Serial No. 638,216. (No specimens.)

To all whom it may concern:

Be it known that we, EUGENE TYMESON and REUBEN BORLAND, citizens of the United States, residing in Yonkers, county of Westchester, and State of New York, have invented certain new and useful Improvements in Woven Fabrics and the Art of Producing the Same, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

In weaving fabrics from dyed yarn in solid colors or in weaving a solid-color portion of any considerable size in figured fabrics the close matching of the yarn from which the solid-color portions are formed is a matter of great importance, since a very slight variation in shade of the yarn woven into adjacent portions of the solid-color fabric will be noticeable and of course very objectionable. It has been a matter of great difficulty and expense to secure the proper matching of the yarn in weaving solid colors, since it is practically impossible to dye yarn exactly to a desired shade or to dye two batches of yarn to exactly the same shade, so that it has been necessary to dye and select the yarn with great care to get that which is dyed to a sufficiently good match, and a great portion of the yarn which has been dyed for the solid color desired has necessarily been rejected. This difficulty has been overcome to a great extent in the weaving of the coarser grades of carpet by weaving the carpet with strands formed by combining into a single strand two "ends" of yarn, as the strands of yarn in the hank as they come from the dyer are called, each of these ends of yarn in the hank usually being formed of two or more of the strands in which the yarn is spun. These ends of yarn in the hank as they come from the dyer will sometimes be termed herein "single" ends to distinguish from the "double" ends, which are formed by combining the ends from two hanks, as in the old process now being described. These two single ends of yarn to form the combined strand or double end in the carpet are matched double in the hanks—that is, so that the two ends combined match the color and shade desired in the fabric and are then treated as a single end in winding from the hanks and weaving the carpet. Thus one of the ends of the combined strand may be of yarn lighter and the other end of yarn darker than the shade desired; but when combined into a double end they will blend together and the difference in shade between the individual ends will not be noticeable, although such as to be very apparent if the two ends were woven in separate parts of the fabric. A solid color of the desired shade is thus secured without the very accurate matching of the shades otherwise necessary, and yarn may be used which under the method of single matching must be rejected. It has been impracticable, however, to use this double-end method in weaving the finer grades of carpets, as the number of separate strands required to the inch compels the use of separate strands about the same size as a single end of the yarn as it comes from the hanks.

The difficulties in matching yarn above pointed out and which have led to the use of the double ends in coarse fabrics are especially objectionable in producing tufted fabrics of the classes known as "moquette" and "Axminster," in which separate and independent rows of yarn tufts are inserted and bound in by a body of warp and weft strands, being looped about the weft or warp strands; but they exist also in connection with tufted fabrics of the classes known as "pile fabrics," more especially in cut pile fabrics, although to a less degree in uncut pile fabrics, and to some extent in fabrics of other classes woven from dyed yarns, whether tufted or not.

The object of the present invention is to provide an improved solid-color fabric and method of producing the same by which the exact matching of yarn shall be avoided without the use of double ends, so that it shall be applicable to fine as well as coarse grades of carpets, and more especially to provide such a method of producing tufted fabrics of those classes in which rows of separate tufts are inserted from tuft-yarn spools during the process of weaving and bound in by a body of warp and weft strands. In weaving such tufted fabrics by the double-end method here-

tofore employed to some extent in coarse fabrics each tuft has consisted of two ends of yarn combined to form a double end, as above described, and in winding the yarn onto the tuft-spools for such weaving it has been the practice to run two ends of yarn from different hanks together and wind them together onto the bank-spool and then to treat the two ends thus wound on the bank-spool as one end or strand in winding from the bank-spools to the loom tuft-yarn spools. According to our improved method of producing solid-color woven fabric as applied to tufted fabrics of the classes referred to we use tufts formed of single ends of yarn; but the tufts are woven in pairs throughout the row of tufts or that portion of the row that is to form solid-color fabric, the ends forming the tufts of each pair being matched double, so that the two tufts of each pair of tufts match the shade desired in the fabric accurately, although one tuft of each pair may be a little lighter and the other tuft of each pair a little darker than the shade desired. In winding the yarn according to this method we wind onto a single bank-spool two ends of yarn from different hanks matched double—that is, as above explained, so that the two ends combined match the shade desired; but instead of running the ends together as they are wound onto the bank-spool, as previously in connection with yarn matched double, the ends are run to the bank-spool separated, and thus wound, so that the two ends are prevented from becoming matted or felted together, as heretofore, and may be treated as separate ends as they are unwound from the bank-spools and run through the winding-reed, so as to be wound separately onto the tuft loom-spools. Then in the further operation of winding onto the loom or weaving spool from the bank-spools the two ends from each bank-spool are led separately through the reed of the setting-frame and wound onto the loom-spool in separate but contiguous zones or rings, the zones or rings on the tuft loom-spool or a part thereof thus being matched double or arranged in pairs of contiguous zones or rings, the two zones or rings being of yarn of such shades that, although varying, they blend into the shade desired in the fabric.

When tuft-yarn spools wound as above stated are employed in weaving tufted fabric, each tuft is formed of a single end from one of the zones or rings and the tufts are arranged in pairs in the same way as the zones or rings on the tuft-yarn spools through the whole of the row or that part of the row which forms solid color. Thus although the surface of the fabric will be of tufts or ends which individually may not exactly match the desired shade yet the tufts of lighter and darker shades will be so intermingled that the effect to the eye will be that of an even solid color of a shade between the lighter and darker shades of the individual tufts and producing to the eye the appearance of the desired shade.

The invention includes an improved fabric and improvement in the art of producing the same and a method of winding yarn for use in such art, all of which will be fully described in the following specification and specifically pointed out in the claims.

We have shown in the drawings the preferred form of apparatus for winding the yarn in carrying out our invention and the preferred form of tuft-yarn spools and fabric.

Referring to the drawings, Figure 1 is an end elevation of an apparatus for winding yarn from hanks onto bank-spools partially broken away, but showing so much of the apparatus as is necessary for the purpose of illustrating the invention. Fig. 2 is a partial front view taken as indicated by line 2 of Fig. 1. Fig. 3 is a diagrammatic plan view taken as indicated by line 3 of Fig. 2. Fig. 4 is a diagrammatic vertical section of Fig. 5, taken on a line between two rows of bank-spools. Fig. 5 is a diagrammatic plan view of a bank and setting-frame for winding the yarn from the bank-spools to the loom tuft-yarn spools. Figs. 6^a, 6^b, and 6^c are diagrammatic views showing, respectively, a portion of a tuft-yarn spool used in producing the fabric, a transverse section of the fabric at one side of a row of tufts, and a plan view of the fabric-body with two rows of tufts indicated. Figs. 7 to 10 show one of the preferred forms of fabric embodying the invention. Figs. 7 and 8 are sections on respectively the lines 7 and 8 of Fig. 9. Fig. 9 is a plan view of the fabric with the tufts sectioned to show the construction. Fig. 10 is a section on the line 10 of Fig. 9.

Referring to the drawings, and first to Figs. 1 to 3, 10 and 11 are the usual runners, forming reels for the hanks of yarn X, being supported by a suitable frame A. From the reels the ends of yarn x are led downward through eyes 12 of the thread-stop-motion devices 13, thence through the traverse-eyes 14, and then farther downwardly and forwardly to the bank-spools 15, the bank-spools being supported on spindles 16, carried by pivoted brackets 17, and being driven by drums or disks 18, engaging the surface of the yarn on the spool, and being held in place on the spindles by outwardly-projecting arms 19 when the spindles and spools are in their lowered or running position, all in the usual manner in apparatus of this kind. The traverse-eyes 14 are carried by a traverse-bar 20, mounted in suitable guiding-brackets 21 and reciprocated longitudinally in the usual manner by a rock-arm 22, carried by a rock-shaft 23 and connected to the traverse-bar 20 by a link 24, the rock-arm 23 being rocked in the customary manner by a heart-shaped cam 25 engaging a weighted arm 26, carried by the shaft 23, and said cam being shown as driven by a worm 27, engaging a worm-wheel 28 on the

shaft carrying the cam. The ends of yarn from the hanks on two reels are led to a single traverse-eye and thence to a bank-spool. Each traverse-eye in the preferred construction is formed with an eye 2 and with a finger 3, forming a separator and projecting forward beneath the eye 2 in position so that two ends of yarn which pass through the eye 2 may pass one on either side of the finger 3, as shown in Figs. 2 and 3. The two ends of yarn are thus caused to run to the bank-spools slightly separated and are thus wound spirally on the spools in the usual manner, except that the two ends do not lie together, but are separated longitudinally of the spool and cannot become matted or felted together.

Instead of forming the traverse-eyes as shown and above described they may of course be made in any other suitable manner to secure the desired result, and formed either of a single piece or two ordinary traverse-eyes may be employed, set at the proper distance apart.

In using the above apparatus in carrying out the invention the hanks of yarn are matched double or in pairs in the manner before pointed out and the hanks of each pair are placed on two adjoining reels and led through one of the traverse-eyes to one of the bank-spools, the two ends of each pair thus being wound together on a bank-spool, but separated slightly by the separator 3 as they are wound. The bank-spools will thus be wound with two ends of yarn, which will blend in the fabric to form the desired shade, although separately they may vary from the shade and one of the ends be slightly lighter and the other slightly darker than the desired shade, the two ends being separated, so as to prevent the matting or felting together of the ends, and thus enabling the ends to be wound separated from the bank-spools to the tuft-yarn spools.

In winding from the bank-spools wound as before described to the loom or weaving tuft-yarn spools the bank-spools are set on the vertical spindles 30 of the usual bank-frame 31. (Shown in Figs. 4 and 5 and made for convenience and clearness of illustration of small capacity.) From the spools thus set on the spindles of the bank-frame the ends of yarn x are led through the reed 32, the two ends from each bank-spool being separated and passed separately through the reed, which is permitted by their separation on the bank-spool, and thus wound separately on the loom-tuft-yarn spool 35. (Shown as supported in the usual manner by automatically-adjustable presser-rolls 36.) The two strands from each bank-spool will thus form separate, but contiguous, zones on the loom-spool 35, the zones on the loom tuft-yarn spool thus being arranged in pairs of contiguous zones, the two zones of each pair being of yarn, which, even though of varying shades, has been matched double and will blend in the fabric to produce the shade desired. The loom tuft-yarn spool may be wound wholly or partially in this manner, according to the pattern and result desired in the fabric.

In weaving the carpet in accordance with this invention the yarn is drawn from the loom tuft-yarn spools wound as described above and woven in by a loom of any suitable form—such, for instance, as the moquette loom shown in United States Letters Patent Nos. 186,374, 233,290, 233,291, 529,636, and 571,418, the ends from each pair of zones or rings on the tuft-yarn spools being led through two adjacent tuft-inserting tins or taken by two adjacent tuft-inserting fingers or needles in looms of other form, so that the two ends of each pair are kept separate, and are thus woven into the fabric to form separate tufts, each tuft in the fabric thus consisting of a single end of yarn, but the tufts being arranged in pairs of adjacent tufts, each pair of tufts consisting of yarn that has been matched double to the shade desired, so that although the two tufts of each pair are separate and vary in shade they blend together and produce the proper solid-color effect in the fabric.

A portion of a loom tuft-yarn spool wound in accordance with this invention is shown diagrammatically in Fig. 6^a and a piece of moquette carpet similar to that of Patent No. 529,635 is shown diagrammatically in section and plan in Figs. 6^b and 6^c, these figures reading together and $a\ b\ c\ d$ being the corresponding pairs of zones and tufts on the spool and in the fabric.

A piece of moquette carpet woven in the same manner as the carpet of Patent No. 529,635 and embodying the invention is illustrated in Figs. 7 to 10, this carpet having two wefts for each row of tufts, as in that patent. It will be understood, however, that in weaving tufted fabrics embodying the invention any other suitable weave may be used. As shown in these figures, $x\ x'$ represent the binding-warps, $y\ y'$ the dividing-warps, and $z\ z'$, respectively, the tuft-holding and tuft-binding wefts, and the tufts are shown as arranged in matched pairs throughout the portions of the rows shown, the respective pairs in a row being lettered a, b, &c., as in Figs. 6^a, 6^b, and 6^c. The warps are arranged in sets of four at short distances apart transversely of the fabric, and the binding-warps $x\ x'$ pass alternately above and below the wefts $z\ z'$ of each pair, while the dividing-warps $y\ y'$ extend through the fabric between the wefts $z\ z'$ of each pair. The tufts are carried by the upper tuft-holding wefts z, and each row of tufts is bound in place thereon by the tuft-binding weft z', and each tuft is bound at the sides by the warps between which the tufts are inserted. The operation of weaving this fabric is the same as fully described in Patents Nos. 529,635 and 529,636, above referred to, and need not be described herein.

By this invention it is possible to produce solid-color fabric of the finest weave without

the very expensive and difficult operation of matching the yarn solid to the shade desired, and it is found in practice that although the tufts are formed of separate ends of yarn the varying shades of the tufts in the different pairs blend together perfectly in the fabric, even though two lighter or darker shades of different pairs are contiguous, as the small size of each tuft makes even this increased amount of yarn differing in shade from the solid color unnoticeable. It will be seen that by this method of winding and weaving no more than two unmatched ends of yarn are ever brought adjacent in a row of tufts.

It will be understood that our invention is not to be limited to a fabric of the special class shown and described nor to methods for producing such tufted fabrics, but that the invention, considered broadly, includes also fabrics of other classes and methods of weaving them and preparing yarn therefor.

While all the matching, winding, and weaving steps of the method described are preferably used and such a complete method forms a part of this invention, it will be understood that the invention, considered broadly, includes also methods as defined by the claims in which all these specific steps are not employed.

Winding apparatus of other form than that shown also may be used in carrying out the invention, such apparatus being well known in various forms.

By the term "spool" used in the claims it is not intended to limit the invention to methods of weaving carried out by those classes of looms in connection with which the term "spool" is usually applied to the part carrying the yarn to be woven into the fabric, but this term is intended to include all yarn-carriers on which the yarn may be wound, as defined by the claims.

While the invention has been described and illustrated in connection with the matching of the ends of yarn in pairs, the invention, considered broadly, is not limited thereto, but may be applied also in connection with the ends matched to the shade desired in sets of more than two ends and is thus claimed.

What is claimed is—

1. The improvement in the art of producing woven fabric which consists in matching ends of yarn in sets to blend to the shade desired in the fabric, weaving said ends into the fabric with the ends arranged in the sets in which they are matched and with the ends of each set contiguous to each other, and maintaining the ends of each set separate from each other while they are being woven into the fabric, substantially as described.

2. The improvement in the art of producing tufted woven fabric which consists in matching ends of yarn in sets to blend to the shade desired in the fabric, weaving into the fabric tufts each formed from one of the matched ends of yarn and arranged in the sets in which they are matched with the tufts of each set contiguous to each other, and maintaining the ends of yarn separate from each other while they are being woven into the fabric, substantially as described.

3. The improvement in the art of producing tufted woven fabric which consists in matching single ends of yarn in pairs to blend to the shade desired in the fabric, weaving into the fabric successive rows of tufts, each tuft consisting of a single matched end of yarn and with the tufts arranged in the matched pairs, and maintaining the ends of each pair separate from each other while they are being woven into the fabric, substantially as described.

4. The improvement in the art of producing woven fabric which consists in matching ends of yarn in sets to blend to the shade desired in the fabric, winding the ends of yarn onto spools in separate zones each formed of one of the matched ends of yarn and arranged in the sets in which they are matched, drawing off said spools and weaving into the fabric the ends of yarn arranged in the sets in which they are matched, and maintaining the ends separate from each other while they are being drawn off from the spools and woven into the fabric, substantially as described.

5. The improvement in the art of producing woven fabric, which consists in matching ends of yarn in sets to blend to the shade desired in the fabric, winding each set of ends onto a single bank-spool simultaneously and maintaining the ends separate from each other as they are wound onto the spool, then winding the yarn from the bank-spools onto the weaving-spools with the ends of each set arranged in separate but contiguous zones to form sets of zones with the yarn in each set blending to the shade desired in the fabric, drawing off said spools and weaving into the fabric the ends of yarn arranged in the sets in which they are matched, and maintaining the ends separate from each other while they are being drawn off from the spools and woven into the fabric, substantially as described.

6. The improvement in the art of producing tufted woven fabric which consists in matching two ends of yarn from different hanks to blend to the shade desired in the fabric, winding each pair of ends onto a single bank-spool and maintaining the ends separate as they are wound onto the spool, then winding the tuft-yarn from the bank-spools onto the weaving tuft-yarn spools in separate zones with the two ends from each bank-spool arranged in separate but contiguous zones to form pairs of zones with the yarn in each pair blending to the shade desired in the fabric, drawing off from each pair of contiguous zones on the weaving-spools and weaving into the fabric the ends of yarn side by side to form rows of tufts arranged in pairs corresponding to the pairs of zones on the weaving-spool each tuft formed of one of the matched ends of yarn and with the tufts of each pair contiguous to each other, and maintaining the

ends of yarn separate from each other while they are being drawn off the weaving-spool and woven into the fabric, substantially as described.

7. The method of preparing yarn for looms which consists in matching ends of yarn in sets to blend to the shade desired in the fabric, winding each set of ends onto a single bank-spool and maintaining the ends separate from each other as they are wound onto the bank-spool, and then winding the yarn from the bank-spools onto the weaving-spool with the ends of each set arranged in separate but contiguous zones to form sets of zones with the yarn in each set of zones blending to the shade desired in the fabric, substantially as described.

8. A woven fabric having its face formed wholly or partially of separate ends of yarn arranged in sets of contiguous but separate ends varying in shade but matched in said sets to blend to the shade desired, substantially as described.

9. A tufted fabric having its face formed wholly or partially of tufts each formed of a single end of yarn, the tufts being arranged in sets of contiguous tufts and the tufts of each set varying in shade but matched in said sets to blend to the shade desired, substantially as described.

10. A tufted fabric having its face formed of successive rows of tufts, each tuft consisting of a single end of yarn and with some or all of the said rows of tufts wholly or partially formed of pairs of tufts varying in shade but matched in said pairs to blend to the shade desired, substantially as described.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

EUGENE TYMESON.
REUBEN BORLAND.

Witnesses:
RICHARD EDIE, Jr.,
ARTHUR LAUD.