No. 781,407. PATENTED JAN. 31, 1905.

T. B. DORNAN.

WOVEN FABRIC.

APPLICATION FILED SEPT. 14, 1904.

2 SHEETS—SHEET 1.

Fig. 3

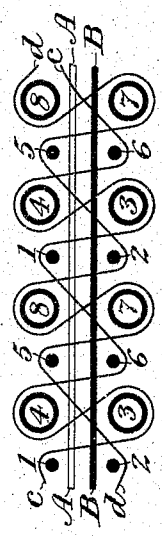


Fig. 5

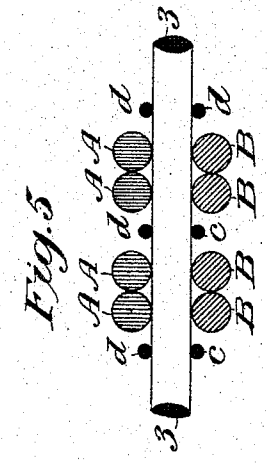


Fig. 6

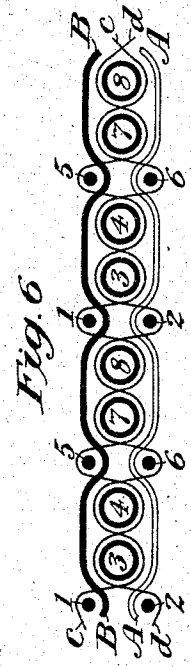


Fig. 1

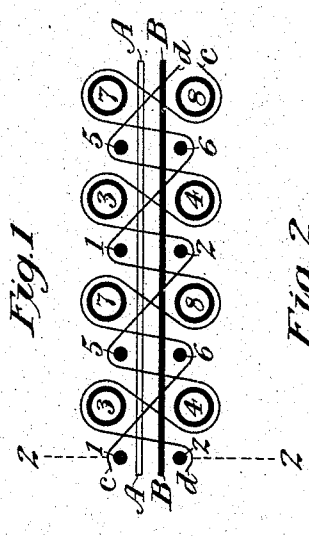


Fig. 2

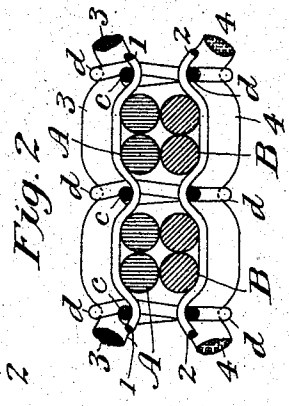


Fig. 4

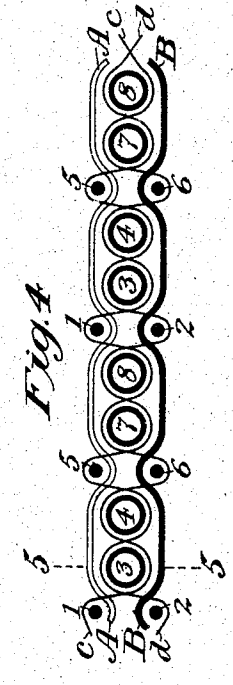
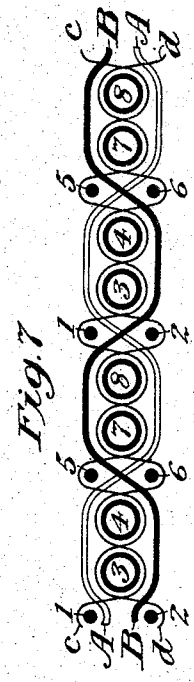


Fig. 7



Witnesses:
Albert V. Day
Henry Barnes

Inventor:
Thomas Benton Dornan
by Henry D. Williams
Atty.

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2 SHEETS—SHEET 2.

Fig. 9

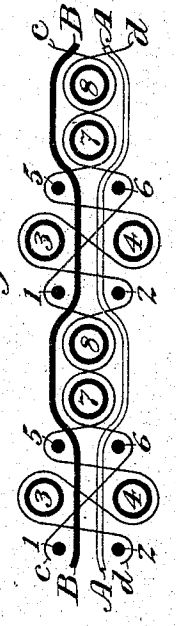


Fig. 11

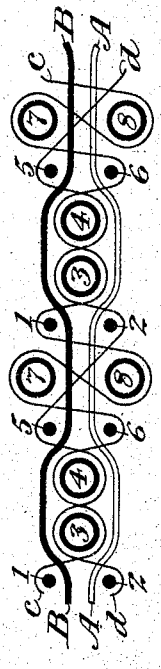


Fig. 13

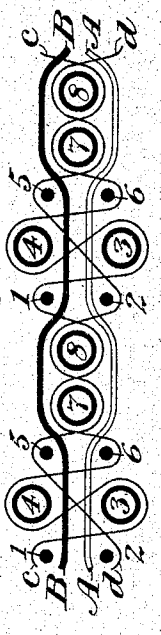


Fig. 15

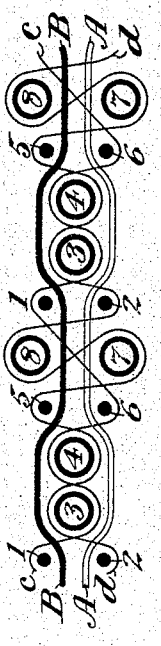


Fig. 8

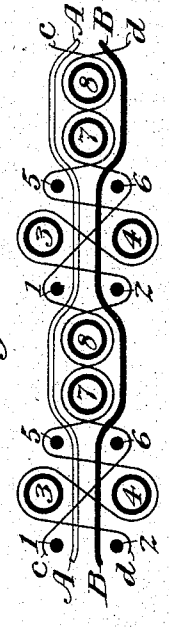


Fig. 10

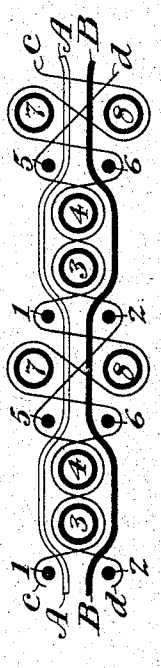


Fig. 12

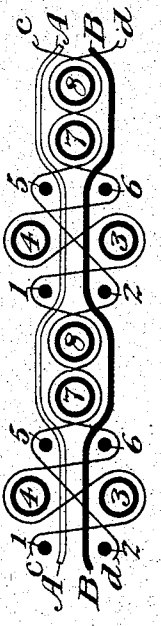
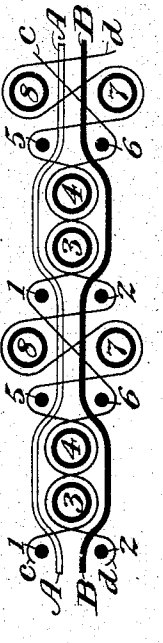


Fig. 14



Witnesses:
Albert V. T. Day
Henry Barnes

Inventor:
Thomas Benton Dornan
by Henry D. Williams
Atty.

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No. 781,407. Patented January 31, 1905.

UNITED STATES PATENT OFFICE.

THOMAS BENTON DORNAN, OF PHILADELPHIA, PENNSYLVANIA.

WOVEN FABRIC.

SPECIFICATION forming part of Letters Patent No. 781,407, dated January 31, 1905.

Application filed September 14, 1904. Serial No. 224,448.

To all whom it may concern:

Be it known that I, THOMAS BENTON DORNAN, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Woven Fabrics, of which the following is a specification, reference being had therein to the accompanying drawings, forming a part thereof.

My invention relates to woven fabrics, such as are used for carpets and rugs, and more particularly to that class of such fabrics in which the pattern and color effects are produced by figuring weft-threads and figuring warp-threads associated with suitable binder-threads.

My invention has for its objects tight weaving and homogeneity with consequent durability and strength, an arrangement whereby the binder warp-threads are drawn very tightly at the points where they cross the figuring weft-threads, thus effectually indenting the figuring weft-threads and producing a pile-like appearance of the figuring weft-threads, reversibility of the fabric, economy in the cost of production, purity of color effects, and embossed or pile-like appearance, and the attainment of a considerable number and variety of colors and contrasting varieties of structural appearance.

Other objects of my invention will appear from the following description of the carpet fabric shown in the accompanying drawings and embodying my invention. I will now describe such fabric and will thereafter point out my invention in claims.

Figures 1, 3, and 4 and 6 to 15, inclusive, are diagrammatical longitudinal sections, or sections taken on planes parallel to the warp-threads and at right angles to the weft-threads, of portions of the fabric, each view showing two consecutive sets of weft-threads and the different views showing different arrangements or color effects attainable in one fabric with one sequence of threads. Fig. 2 is a transverse section of a portion of the fabric on a plane indicated by the line 2 2, Fig. 1. Fig. 5 is a similar view on a plane indicated by the line 5 5, Fig. 4. In Figs. 1, 3, and 4 and 6 to 15, inclusive, the threads shown in cross-section are exaggerated in size relatively to the threads longitudinally shown, and the threads longitudinally shown are vertically separated for clearness of illustration. In Figs. 2 and 5 the threads are shown of their approximate relative sizes and in their approximate relative positions.

The fabric is provided with binder weft-threads and figuring weft-threads in sets of eight weft-threads each, each set comprising in succession two binder weft-threads 1 and 2, two figuring weft-threads 3 and 4, two binder weft-threads 5 and 6, and two figuring weft-threads 7 and 8. Where solid color effects are desirable, the two figuring weft-threads 3 and 7 will both be of the same color and the two figuring weft-threads 4 and 8 will both be of the same color. Assuming such a disposition of colors, the figuring weft-threads 3 and 7 may be black and the figuring weft-threads 4 and 8 may be écru. The binder weft-threads contribute to the color effects only in that they form transverse lines between the figuring-threads; but as such transverse lines they replace the shadows which usually appear between transverse lines of pile-loops of a Brussels fabric, and it is therefore usually desirable that they should be of a dark color, and black is frequently a desirable color for these threads. We may assume, therefore, that all the binder weft-threads are black. As, however, the binder weft-threads may be maintained always in the same ply throughout a fabric, they may be differently colored to harmonize with prevailing color effects at the face and back of the fabric. The fabric is provided with binder warp-threads and figuring warp-threads. We may assume that the figuring warp-thread A is red and that the figuring warp-thread B is green. The binder warp-threads *c* and *d* merely form thin longitudinal lines between the figuring threads, and we may assume that they are black. They repeatedly pass from ply to ply throughout the fabric. The sequence of the weft-threads is indicated by their numbers. The arrangement of warp-threads is shown in Figs. 3 and 5. The arrangement shown would provide in each dent of the reed in succession a figuring warp-thread A, a fig-

uring warp-thread B, two binder warp-threads *c* and *d*, a figuring warp-thread A, and a figuring warp-thread B. This enables the figuring warp-threads to be brought to the surface in pairs of the same color, the several pairs of figuring warp-threads on each surface being separated by binder warp-threads. In the weaving of the fabric shown the binder warp-threads may be controlled by journals or heddles. The lifts of the binder warp-threads are the same throughout the fabric and are as follows: first shot, binder *c* up; second shot, binder *c* up; third shot, binder *d* up; fourth shot, binder *c* up; fifth shot, binder *d* up; sixth shot, binder *d* up; seventh shot, binder *c* up; eighth shot, binder *d* up. The figuring warp-threads are preferably controlled by jacquard mechanism for selecting and lifting the threads to produce the desired pattern and color effects.

In the weaving of the color effect shown in Figs. 1 and 2, which is a weft effect and would be solid black on the face and solid écru on the back with the colors above mentioned, the lifting of the binder warp-threads would be as above stated, the binder warp-threads *c* being up and the binder warp-thread *d* and the figuring warp-threads A and B down for the first shot, the binder-warp *c* and the figuring-warps A and B up and the binder-warp *d* down for the second shot, the binder-warp *d* up and the binder *c* and the figuring-warps A and B down for the third shot, the binder-warp *c* and the figuring-warps A and B up and the binder-warp *d* down for the fourth shot, the binder-warp *d* up and the binder-warp *c* and the figuring-warps A and B down for the fifth shot, the binder-warp *d* and the figuring-warps A and B up and the binder-warp *c* down for the sixth shot, the binder-warp *c* up and the binder-warp *d* and the figuring-warps A and B down for the seventh shot, and the binder-warp *d* and the figuring warps A and B up and the binder-warp *c* down for the eighth shot. This completes one set or unit of weaving and is exactly repeated in the second set shown. By reason of the alternate lifting of the figuring warp-threads the successive shots will go to the different plies and alternate shots to the same ply, the wefts 1, 3, 5, and 7 being in the upper ply and the wefts 2, 4, 6, and 8 in the lower ply. The binder warp-thread *c* is woven first over the upper-ply binder weft-thread 1 and then between the upper and lower plies until it binds the lower-ply binder weft-thread 6. The binder warp-thread *d* is woven first under the binder weft-thread 2 and binds this thread in the lower ply and then over the figuring weft-thread 3 and then through the fabric and backward and under the lower-ply figuring weft-thread 4 and then again through the fabric and over the binder weft-thread 5, and thus this binder warp-thread successively binds in the upper and lower plies the binder weft-thread 2, the figuring weft-threads 3 and 4, and the binder weft-thread 5. The binder warp-thread *c*, as aforesaid, passes around and binds the lower-ply binder weft-thread 6 and then it passes through the fabric and over the upper-ply figuring weft-thread 7 and then through the fabric and backward and under the lower-ply figuring weft-thread 8 and then again through the fabric and over the upper-ply binder weft-thread 1 of the next set, and thus the binder warp-thread *c* successively binds the lower-ply binder weft-thread 6 and the upper-ply figuring weft-thread 7, the lower-ply figuring weft-thread 8, and the upper-ply binder weft-thread 1. Thus in this set each binder warp-thread binds an equal number of weft-threads and performs an equal amount of work, but is very tightly drawn at the points where it binds the figuring weft-threads by reason of the fact that it successively binds four threads which are successively in opposite plies and that it is drawn backward in passing from one to the other of the two figuring weft-threads. The consequence of this construction is that the figuring weft-threads are very tightly drawn at the points where they are bound by the binder warp-threads and are therefore deeply indented, so that the fabric has a pile-like appearance, such as is highly desirable. It will be observed that this construction places each figuring weft-thread in a separate loop of binder warp-threads, in which loop it is very tightly drawn. It will also be observed that the binder weft-threads are arranged with two binder weft-threads in each loop of binder warp-threads and that the binder weft-threads are not so tightly drawn as the figuring weft-threads. This, however, enhances the appearance of the fabric, since it produces transverse dark lines imitating the shadows of a Brussels fabric. The relative thicknesses of the figuring and binder threads may be so adjusted that this shadow effect will greatly add to the appearance of the fabric, associated as it is with such tight tying of the figuring-threads that the figuring-threads are looped or of pile-like appearance. The binder warp-threads are individually so tightly drawn that they are but slightly visible on the face of the fabric, and in this construction they are most tightly drawn on what would otherwise be their most prominent points. Thus uniformity of appearance is attained and their visibility is equalized and as a whole is minimized.

In the arrangement of threads shown in Fig. 3 the color effect with the colors above mentioned would be solid écru at the face and solid black at the back of the fabric. This also is a weft effect. The different manipulations of the figuring warp-threads to weave this structure will be obvious from the drawings and from the description above given. In the weft effects the figuring warp-threads are within the fabric and act as stuffers to

separate the figuring weft-threads and produce an embossed appearance, the binder warp-threads acting as binders for the figuring weft-threads.

Figs. 4 to 7, inclusive, show three different warp effects. In the effect shown in Figs. 4 and 5 the figuring warp-thread A, which may be red, appears on the face of the fabric, and the figuring warp-thread B, which may be green, appears on the back of the fabric. In the weaving of this warp effect and, in fact, in all effects shown the disposition of the warp-threads for the first and second shots and for the fifth and sixth shots is the same as above described relative to the effect shown in Figs. 1 and 2. For the third shot the binder *d* is up and the figuring-warp A is up and the binder-warp *c* and the figuring-warp B are down. For the fourth shot the binder *c* is up, the figuring-warp A is up, and the binder *d* and the figuring-warp B are down. The shed for the seventh shot has the binder *c* up and the figuring-warp A up and the binder *d* and the figuring-warp B down. The shed for the eighth shot has the binder *d* up and the binder *c* down, but is otherwise the same as for the seventh shot. Thus the figuring weft-threads go to the center of the fabric and act as stuffers to separate the figuring warp-threads, and the binder weft-threads indent the figuring warp-threads and produce an embossed effect. This warp effect, which with the colors assumed would be solid red at the face and solid green at the back, is of exceptional purity and well adapted to be used as the ground for a design. Fig. 6 exhibits solid green at the face and solid red at the back of the fabric. This is also an effect of exceptional purity and well adapted for the ground of a pattern. Fig. 7 exhibits a combination within each set of the two color effects shown in Figs. 4 and 5 and in Fig. 6. Obviously the succession of the colors exhibited in the construction shown in Fig. 7 could be changed so that the effect would be green and red at the face and red and green at the back.

Figs. 8 to 15, inclusive, show the eight possible varieties of contrasting warp and weft effects, one warp effect and one weft effect being combined in each set or unit of weaving. In Fig. 8 the colors would be black and red at the face and écru and green at the back, in Fig. 9 black and green at the face and ecru and red at the back, in Fig. 10 red and black at the face and green and acru at the back, in Fig. 11 green and black at the face and red and écru at the back, in Fig. 12 écru and red at the face and black and green at the back, in Fig. 13 écru and green at the face and black and red at the back, in Fig. 14 red and écru at the face and green and black at the back, and in Fig. 15 green and écru at the face and red and black at the back. With different colors for each figuring weft-thread these several variations of structural arrangement would of course exhibit a greater variety of colorings.

It is obvious that various modifications may be made in the construction shown and above particularly described within the principles and scope of my invention.

What I claim as new, and desire to secure by Letters Patent, is—

1. A woven fabric having figuring weft-threads and binder weft-threads and binder warp-threads, the binder warp-threads binding the binder weft-threads with a plurality of binder weft-threads in each loop of binder warp-threads and binding the figuring weft-threads with a single figuring weft-thread in each loop of binder warp-threads.

2. A woven fabric having figuring weft-threads and binder weft-threads and figuring warp-threads and binder warp-threads, the binder warp-threads binding the binder weft-threads with a plurality of binder weft-threads in each loop of binder warp-threads and binding the figuring weft-threads with a single figuring weft-thread in each loop of binder warp-threads, the figuring warp-threads acting as stuffers between the surface-ply figuring weft-threads.

3. A woven fabric having figuring weft-threads and binder weft-threads and figuring warp-threads and binder warp-threads, the binder warp-threads binding the binder weft-threads with a plurality of binder weft-threads in each loop of binder warp-threads and binding the figuring weft-threads with a single figuring weft-thread in each loop of binder warp-threads, the figuring weft-threads acting as stuffers between the surface-ply figuring warp-threads.

4. A woven fabric having figuring weft-threads and binder weft-threads and figuring warp-threads and binder warp-threads, the binder warp-threads binding the binder weft-threads with a plurality of binder weft-threads in each loop of binder warp-threads and binding the figuring weft-threads with a single figuring weft-thread in each loop of binder warp-threads, the figuring warp-threads acting as stuffers between the surface-ply figuring weft-threads and the figuring weft-threads acting as stuffers between the surface-ply figuring warp-threads.

5. A woven fabric having figuring weft-threads and binder weft-threads and binder warp-threads, the binder warp-threads binding the binder weft-threads with two binder weft-threads in each loop of binder warp-threads and binding the figuring weft-threads with a single figuring weft-thread in each loop of binder warp-threads.

6. A woven fabric having figuring weft-threads and binder weft-threads and figuring warp-threads and binder warp-threads, the binder warp-threads binding the binder weft-threads with two binder weft-threads in each loop of binder warp-threads and binding the

figuring weft-threads with a single figuring weft-thread in each loop of binder warp-threads, the figuring warp-threads acting as stuffers between the surface-ply figuring weft-threads.

7. A woven fabric having figuring weft-threads and binder weft-threads and figuring warp-threads and binder warp-threads, the binder warp-threads binding the binder weft-threads with two binder weft-threads in each loop of binder warp-threads and binding the figuring weft-threads with a single weft-thread in each loop of binder warp-threads, the figuring weft-threads acting as stuffers between the surface-ply figuring warp-threads.

8. A woven fabric having figuring weft-threads and binder weft-threads and figuring warp-threads and binder warp-threads, the binder warp-threads binding the binder weft-threads with two binder weft-threads in each loop of binder warp-threads and binding the figuring weft-threads with a single figuring weft-thread in each loop of binder warp-threads, the figuring warp-threads acting as stuffers between the surface-ply figuring weft-threads and the figuring weft-threads acting as stuffers between the surface-ply figuring warp-threads.

9. A woven fabric having figuring weft-threads and binder weft-threads and binder warp-threads, each binder warp-thread passing from a binder weft-thread to a figuring weft-thread of one surface ply and binding the same and then passing backward through the fabric to a figuring weft-thread of the other surface ply and binding the same and then passing to a binder weft-thread, and passing from a binder weft-thread to another binder weft-thread between figuring weft-threads bound in like manner by another binder warp-thread.

10. A woven fabric having figuring weft-threads and binder weft-threads and binder warp-threads, the binder warp-threads being arranged in two sets, the binder warp-threads of one set passing from a binder weft-thread to a figuring weft-thread of one surface ply and binding the same and then passing backward through the fabric to a figuring weft-thread of the other surface ply and binding the same and then passing to a binder weft-thread, and passing from a binder weft-thread to another binder weft-thread between figuring weft-threads bound in like manner by the binder warp-threads of the other set.

11. A woven fabric having figuring weft-threads and binder weft-threads and binder warp-threads, the weft-threads being arranged in sets of eight weft-threads each, four figuring weft-threads and four binder weft-threads in each set, the binder warp-threads binding the binder weft-threads with two binder weft-threads in each loop of binder warp-threads and binding the figuring weft-threads with a single figuring weft-thread in each loop of binder warp-threads.

12. A woven fabric having figuring weft-threads and binder weft-threads and binder warp-threads, the weft-threads being arranged in sets of eight weft-threads each, four figuring weft-threads and four binder weft-threads in each set, and the binder warp-threads being arranged in two sets, the binder warp-threads of one set passing from a binder weft-thread to a figuring weft-thread of one surface ply and binding the same and then passing backward through the fabric to a figuring weft-thread of the other surface ply and binding the same and then passing to a binder weft-thread, and passing from a binder weft-thread to another binder weft-thread between figuring weft-threads bound in like manner by the binder warp-threads of the other set.

13. A woven fabric having figuring weft-threads and binder weft-threads and figuring warp-threads and binder warp-threads, the weft-threads being arranged in sets of eight weft-threads each, each set comprising, in succession, two binder weft-threads, two figuring weft-threads, two binder weft-threads and two figuring weft-threads, the binder warp-threads being arranged in two sets and binding the binder weft-threads with two binder weft-threads in each loop of binder warp-threads and binding the figuring weft-threads with a single figuring weft-thread in each loop of binder warp-threads.

14. A woven fabric having figuring weft-threads and binder weft-threads and figuring warp-threads and binder warp-threads, the weft-threads being arranged in sets of eight weft-threads each, each set comprising, in succession, two binder weft-threads, two figuring weft-threads, two binder weft-threads and two figuring weft-threads, the figuring warp-threads being arranged in pairs in two sets, and the binder warp-threads being arranged in two sets and binding the binder weft-threads with two binder weft-threads in each loop of binder warp-threads and binding the figuring weft-threads with a single figuring weft-thread in each loop of binder warp-threads, the figuring warp-threads acting as stuffers between the surface-ply figuring weft-threads and the figuring weft-threads acting as stuffers between the surface-ply figuring warp-threads, substantially as set forth.

In testimony whereof I have affixed my signature in presence of two witnesses.

THOMAS BENTON DORNAN.

Witnesses:

S. D. BAILEY,

E. G. SILBER.