

S. J. ACHESON.
INGRAIN CARPET FABRIC.

No. 497,294.

Patented May 16, 1893.

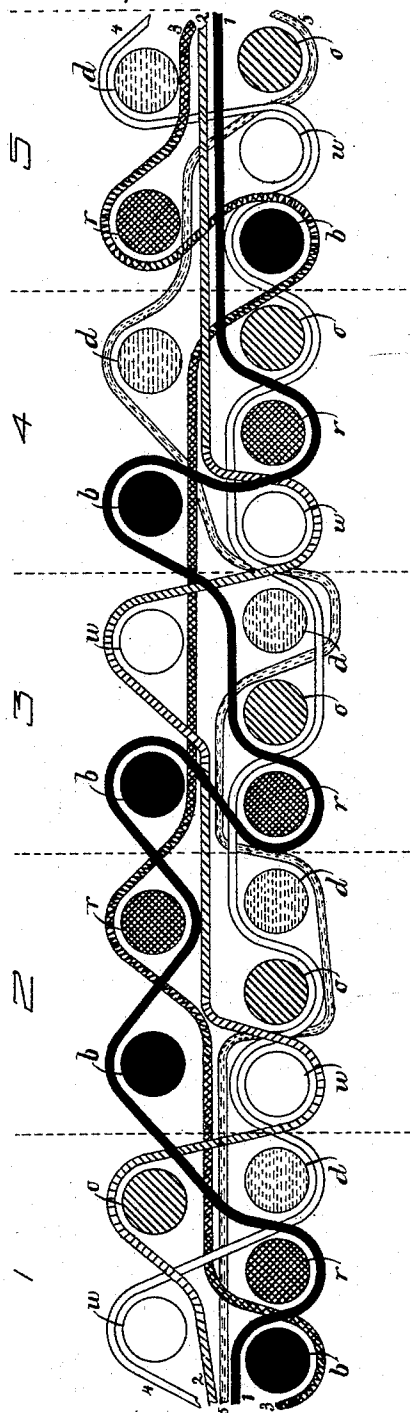
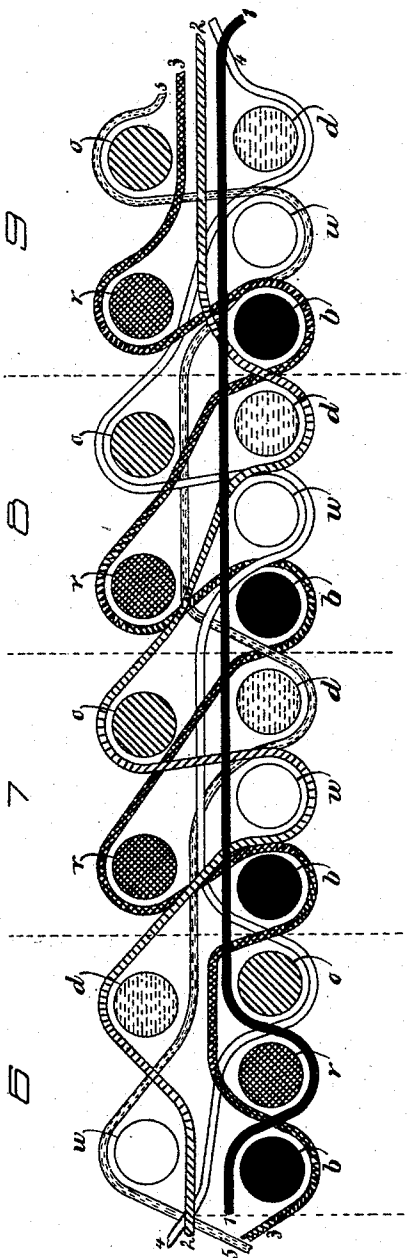


FIG. 1



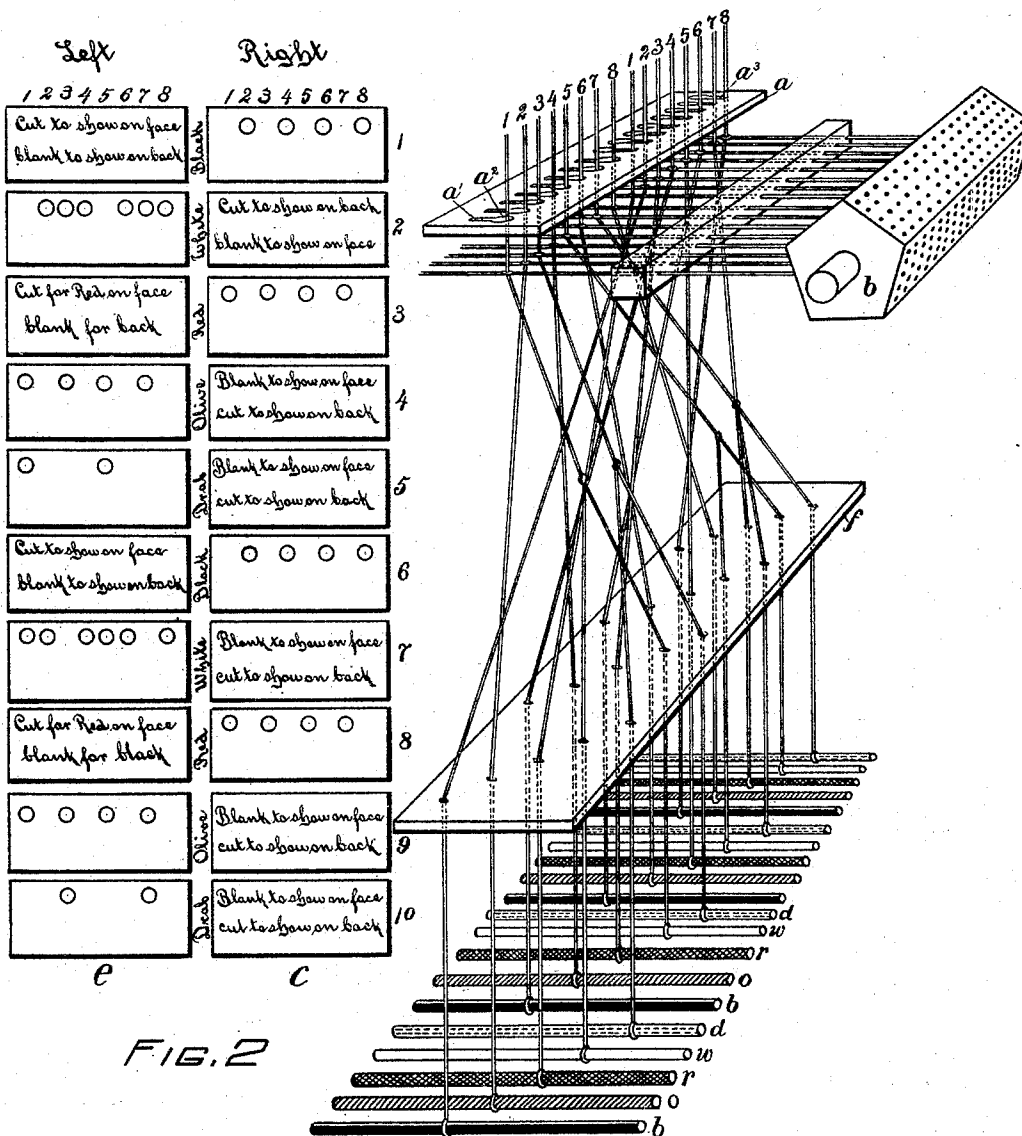
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UNITED STATES PATENT OFFICE.

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INGRAIN CARPET FABRIC.

SPECIFICATION forming part of Letters Patent No. 497,294, dated May 16, 1893.

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To all whom it may concern:

Be it known that I, SAMUEL J. ACHESON, a citizen of the United States, residing at Plainfield, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Ingrain Carpet Fabrics, of which the following is a specification.

In weaving ordinary two ply ingrain or Scotch carpets four warps and four wefts are employed in each set or weave. Two of these wefts and their corresponding warps are interwoven to form one ply or cloth and the other two wefts and warps are interwoven to form another ply or cloth. These cloths are usually of different shades and are bound together to form the pattern by being reversed, so that one ply or cloth is at the face at one point in the carpet and the other ply is at the face at other parts thereof. In such a carpet four wefts are employed in each set so that only four colors are possible. In order to increase the number of colors in the fabric the use of five instead of four wefts has been suggested and hitherto this fifth or extra weft has been inserted in the set and located in the back ply. In some cases two of the regular warps of the set have been caused to perform extra duty in binding in the additional weft; such a fabric possessed obvious disadvantages, for example, the two regular warps that served to tie in the fifth or extra weft were necessarily passed very frequently from the face to the back of the fabric, and consequently a greater length of them was required than of the other two regular warps, so that these two warps by reason of their extra duty were subjected to considerable strain and were required to stretch to accommodate themselves to the excessive looping to which they were subjected. Moreover, in binding five wefts with four warps, it is necessary that two wefts should occupy the same shed at various points in the fabric and that the adjacent or contiguous face wefts of two succeeding sets should be tied by warps that pass between them and around underlying back wefts, whereby the face wefts are drawn apart and thus exposing the underlying wefts. These disadvantageous features resulted in an impaired quality and affected the usefulness of the finished fabric, because the drawing apart of certain of the contiguous face

weft threads exposed the underlying wefts to view, thus giving a fabric of motley appearance and of a character commonly designated as having grinning effects, and the unequal use of two of the warps, that is, those doing extra duty in the binding of the additional or fifth weft, required that such should be of elastic and strong yarn or thread, which is very expensive. In this connection it may be remarked that even when such yarn was employed it became necessary frequently to reverse the plies in order to equalize all the warps utilized and this frequent reversal of the plies limits and greatly restricts the choice of pattern, because only small figures of frequent occurrence can be employed, in order to permit of the accomplishment of these frequent reversals. In other cases the extra or fifth weft has been inserted into the same shed with one of the four regular wefts at the back of the fabric and only three warps were employed for binding in the fifth weft. In such cases the warps were used unequally and consequently were subjected to unequal strain and had to be of good quality, but were expensive. The insertion of the two wefts in one shed on the back of the fabric and beneath one weft on the face thereof causes the back wefts to be visible from the face and thus gives rise to "grinning" which produces a motley effect. Moreover, in this fabric the pattern must be frequently changed, otherwise the excessively unequal use of certain of the warps causes the fabric to be drawn and puckered. In both of these five weft fabrics an attempt is frequently made to obviate grinning by utilizing an extra number of wefts to the inch on the face and driving or beating up the wefts very hard. This excessive beating up in a measure corrects the grinning, but it also results in the production of a comparatively short length of carpet in comparison with the excessive quantity of both warp and weft employed. Moreover, the employment of an extra number of wefts to the inch on the face, results in the production of a heavy and expensive fabric.

The principal objects of my invention are first, to obviate the above mentioned defects and disadvantages and to provide a durable and comparatively inexpensive carpet fabric having five wefts in each set and having an

increased length in proportion to its weight; second, to improve the capacity of such a fabric for effective and perfect coloring; and third, to weave the carpet in such manner that it may be made of a heavy or light weight as required and with a smooth unmottled face free from grinning effects.

My invention consists of the improved carpet fabric hereinafter described and claimed.

The nature, characteristic features and scope of my invention will be more fully understood from the following description taken in connection with the accompanying drawings forming part hereof; and in which—

Figure 1, is a diagrammatic view drawn in two parts of which the one at the bottom is a continuation of the right hand end of the one at the top and showing a section taken in the direction of the warps, *i. e.*, a section through the wefts, illustrating various arrangements of threads in a carpet fabric embodying features of my invention and illustrating each weft knit or bound in a separate shed and also illustrating three sets of warps that interchangeably bind certain wefts at the back and face of the fabric; and Fig. 2, is a diagrammatic view illustrating the tie-up of a loom and the cards for producing the first two sets of the fabric embodying my invention and illustrated in Fig. 1.

In my improved fabric the warp is divided into five divisions, of which four, 1, 2, 3, 4, may be regarded as the usual four warps of an ordinary ingrain carpet, that is, the black, olive, red and white warps. The fifth division may be of any color, for example, drab, and is employed interchangeably with two of said four warps, for example, with the white warp 4 and olive warp 2, for tying in certain of the wefts on the back. Ordinarily a thread appertaining to each set passes through each dent or split in the reed and consequently only five warps are shown in Fig. 1, but any other preferred arrangement of the warps in respect to the dents or splits of the reed may be employed, provided it permits of the operation of the warps in the manner hereinafter described.

Although my invention relates particularly to the manipulation and disposition of the fifth and two of the regular four warps, in the present instance the white warp 4, olive warp 2, and drab warp 5, still for the sake of a further description, it will be assumed that certain wefts are introduced into the fabric in accordance with a required pattern, yet nevertheless it must be distinctly understood that my invention is not limited to the employment of any particular color or wefts. Assuming therefore that the pattern illustrated in Fig. 1, is employed and referring to said figures, *b* is a black weft, *w* is a white weft, *r*, is a red weft, *o*, is an olive weft, and *d*, is a fifth or extra weft that may be of any color and is in the present instance assumed to be of a drab color. These wefts are assumed to be thrown or shot into the fabric in the order

named. In Fig. 1, nine sets, numbered from 1 to 9 inclusive, are shown as separated by dotted lines, and each set comprises five warps and five wefts, whereof two are in the face ply or weft plane and three are in the back ply or weft plane. In the face ply or weft plane, the red warp 3 always ties in a red weft *r*, and the olive, white and drab warps 2, 4 and 5 interchangeably tie in the wefts *w*, *o* and *d*, so that the warps 2, 4 and 5, share the work of tying in the extra weft. This is important, because it enables equal lengths of said warps 2, 4 and 5 to be employed. In the back ply or weft plane the red warp 3, ties in the black weft *b*, the black warp 1, ties in the red weft *r*, and the warps 2, 4 and 5 are employed for interchangeably tying in the wefts *w*, *o* and *d*, whereby equal lengths of all the warps are employed in the production of the fabric.

From the foregoing description it appears that the drab or extra warp 5, affords means interchangeable with two of the warps 1, 2, 3 and 4, in the present instance the warps 2 and 4, for binding in three of the wefts, in the present instance, the wefts *d*, *o* and *w*, so that each of the five wefts is tied or bound in a shed by itself and so that the quantity of the warps employed is equalized, because the extra or drab warp 5, is passed around certain of the wefts instead of the warps 2 and 4, whereby the latter are relieved of this duty. This substitution of the warp 5, for one of the warps 2 and 4, also prevents the drawing of the face wefts apart and the consequent grinning that occurs in a fabric having five wefts and four warps in a set and hereinabove referred to, because it obviates the necessity for passing two warps around two back wefts and between two face wefts. Inasmuch as each weft is tied in a separate shed and all the warps are used equally or substantially so, it follows that an extra number of wefts to the inch need not be employed on the face and that the wefts of the fabric need not be beaten up hard in order to prevent grinning, so that a comparatively great length of good fabric is obtained from a given weight of yarn, and so that light or heavy weight fabrics having perfectly smooth faces free from grinning, may be produced to meet the different demands of trade. Assuming that the extra warp 5, is employed in connection with the regular warps 4 and 2, as has been hereinabove explained and for the sake of a further description of the interchangeable use of the warps 4, 2 and 5, for binding in the wefts *w*, *o* and *d*, reference may be had to Fig. 1. In said figure the white weft *w*, is tied on the face at set 1, by the white warp 4, at set 3, by the olive warp 2, and at set 6, by the drab warp 5. The olive weft *o*, is tied on the face at sets 1 and 7 by the olive warp 2, at set 8, by the white warp 4, and at set 9, by the drab warp 5. The drab weft *d*, is tied on the face at set 4 by the drab warp 5, at set 5 by the white warp 4, and at

set 6 by the olive warp 2. From the foregoing description it is apparent that the warps 2, 4 and 5 interchangeably bind in one of the three wefts *w*, *o* and *d* on the face. In the present instance each of the wefts *w*, *o* and *d*, is tied in on the face at different sets by each of the warps 2, 4 and 5. On the back at set 2, the wefts *o* and *d*, are both tied in by the drab warp 5 and the weft *o*, is also tied in by the white warp 4. At set 3 on the back the wefts *o* and *d*, are both tied in by the white warp 4, and the weft *d*, is also tied in by the drab warp 5. On the back at set 7, the wefts *w* and *d*, are tied in by the olive warp 2 and drab warp 5, at set 8, by the white warp 4 and olive warp 2, and at set 9, by the drab warp 5 and white warp 4, so that the warps 2, 4 and 5, interchangeably tie in two of the wefts *w*, *o* and *d*, on the back.

The hereinabove described carpet fabric may be produced in the following manner, reference being had more especially to Fig. 2, of the drawings.

In weaving my improved fabric use may be made of a loom provided with a single lifter board *a*, having the tails *a'*, of one half of the slots *a²*, turned in one direction and the tails *a³*, of the other half of the slots *a²*, turned in the other direction, and with a five sided card cylinder *b*. On one side of this card cylinder is a right hand set of cards *c*, which make the figure, and on the other side of this cylinder is a left hand set of cards *e*, which make the ground. Two sets of small cards are employed, because they are more convenient than one set of large cards. The jacquard has eight rows of needles for each card, *i. e.*, eight rows of needles on each side. On the right hand side the needles appertaining to the rows 2, 4, 6 and 8 are connected respectively with a single tail attached to a single black warp 1, and the needles appertaining to the four rows 1, 3, 5 and 7, are provided respectively with a single tail connected with a single red warp 3. On the left hand side four rows of needles 2, 4, 6 and 8 each control a single olive warp 2, and the other four do double duty and control two tails. The rows 1 and 5, appertain respectively to two white warps 2, and the rows 3 and 7, appertain respectively to two extra or drab warps 5. The five sets of tails appertaining to the five sets of warps are disposed in a cumber board *f*, equal to five journals at rest, in such manner that the tails of the black warp 1, are at the back, olive 2 next, red 3 next, white 4 next, and drab or extra 5, at the front. It being understood that there is one lift of the board *a*, and a new pair of cards for each shot of weft and that the warps are operated solely by the Jacquard machine and cards.

In order that the manipulation of the drab warp 5, and of two of the warps 1, 2, 3 and 4, in the present instance the olive warp 2 and white warp 4, whereby they are used interchangeably, may be fully understood, a de-

scription will now be given of the way in which the cards are cut.

The black weft *b*: The first card right side, the rows 2, 4, 6 and 8 appertaining to the black warp 1, are cut; this causes the black warp threads to be lifted when the board rises and constitutes the equivalent of the back journal lift. First card left side, where black weft is to go to the back or wrong side of the fabric, as at sets 1, 5, 6, 7, Fig. 1. This card is blank so that warps 2, 4 and 5 are lifted, and where the black weft *b*, is to go to the face or right side of the fabric, as at sets 2, 3 and 4 Fig. 1. This card is cut so that warps 2, 4 and 5 are at rest.

The white weft *w*, the second card left side: On this card the first and fifth rows are left blank, the other rows cut. This causes the white warp to be lifted when the board rises and gives the equivalent of a white journal lift as at sets 1, 3 and 6, Fig. 1, in which the white weft goes to the face. However, the rows 3 and 7, of this card, may be left blank and all the other rows cut, in order to lift the extra or drab warp 5, as at set 7, or the rows 2, 4, 6 and 8, may be left blank and the other rows cut, in order to lift the olive warp 2, or the rows 1 and 5 may be cut in order to lift the extra or drab warp 5 and white warp 4, as at set 2, in which the white weft is at the back, so that the warps 3, 4 and 5, may be used interchangeably for binding in the white weft. Second card, right side: All that part of this card where the white weft is to go to the face is blank and all that part where the white weft is to go to the back is cut.

Red weft, third card, right side: The rows 1, 3, 5 and 7 are cut to lift the red warp in an equivalent manner to a journal lift. Third card, left side: This card is cut where the red weft is to go to the face and is blank where the red weft is to go to the back.

Olive weft, fourth card, left side: The rows 1, 3, 5 and 7, are cut and the other rows are blank to lift the olive warp 2, in substantially the manner that a journal lift would do. All the rest of this card is blank so that the white and extra warps 4 and 5 are down. Fourth card, right hand side: This card is uncut where the olive weft is to go to the face and is cut where the olive weft is to go to the back.

Drab weft, fifth card, left side: In this card the four rows 2, 4, 6 and 8 are left blank, in order to lift the olive warp over the weft *d*, and this card is instrumental in effecting the peculiar arrangement of the warp threads that embody my invention, because the weft *d*, on the back is covered by the regular white warp 4, of the set. It being understood that in this instance the rows 1 and 5 are cut and the rows 3 and 7 are blank. Fifth card, right side, where the drab weft *d*, is to go to the face: This card is blank, so that the olive warp is up, and where the drab weft is to go to the back this card is cut, so that all the warps except the white are up.

Black weft: The sixth pair of cards are similar to the first.

White weft, seventh card, left side: On this card the rows 3 and 7 are blank to lift the extra warp 5 over the white weft, as shown at sets 2 and 7, in Fig. 1, so that the latter on the face as in the seventh set of Fig. 1, may be tied in by a different set of warps than was used for this purpose in the first five white wefts of Fig. 1, and in this instance the rows 1, 2, 4, 5, 6 and 8 are cut. It may be remarked that to let the olive warps 2 bind the white weft at the back, as in set 2, of Fig. 1, the rows 2, 4, 6 and 8 must be cut. Seventh card, right side: When the white weft is to go to the face the card is blank and when it is to go to the back, the card is cut.

Red weft: The eighth pair of cards is cut like the third pair of cards.

Olive weft: The ninth pair of cards is cut like the fourth pair of cards.

Drab weft, left side, tenth card: In this card a different set of warps are employed to bind on the back from those used in the fifth white weft of Fig. 1, by leaving the rows 1, 2, 4, 5, 6 and 8 blank and cutting the rows 3 and 7. This leaves the extra warps at rest and the other rows are cut or left blank according as the olive and the white warps are to be lifted, but in the present instance they are left blank. Tenth card, right side: This card is the same as the fifth card of the set.

From the foregoing description it appears that before the white weft *w*, olive weft *o*, and drab weft *d*, are shot or picked, a left hand card comes into action, and inasmuch as certain needles appertaining to this card control the white warps 4, certain other needles the olive warps 2, and certain other needles the drab warps 5, it follows that any one of these warps may be employed in each set for passing over any one of the three wefts or binding them in on the face by leaving blanks on the cards corresponding to the needles appertaining to the selected warps and perforating the card for the other needles. In the present instance this selection is assumed to have been made at sets 1 and 3 with relation to the white weft *w*, at sets 7, 8 and 9 with relation to the olive weft *o*, and at sets 4, 5 and 6 with relation to the

drab weft *d*, for example, in Fig. 1: 1 the olive weft *o*, is tied at set 7, by the warp 2, at set 8 by the warp 4, and at set 9, by the warp 5; the selection being made in the cutting of the cards as has already been explained. Since in each set one of the warps 2, 4 and 5 is selected to pass over one of the three wefts *w*, *o* and *d*, on the face, it follows that the warp so selected cannot also pass under such weft in the same set, so that the warps 2, 4 and 5, may be interchangeably passed under only the two remaining wefts. In the case of sets 7, 8 and 9, under the wefts *w* and *d*, or in other words interchangeably used to bind in the two remaining of the three wefts on the back. The choice or selection of the three warps is made in respect to the two wefts at the back in such manner that no two wefts occupy the shed and in such manner that substantially equal lengths of warps are employed throughout the fabric. For example in Fig. 1 at set 1, the warp 4, is selected to pass over the white weft *w*, and either of the warps 2, 4 and 5 might have been selected in the preparation of the corresponding left hand cards to pass under the two remaining wefts *o* and *d*. However, in this instance the warp 5, passes under the weft *o*, and the warp 4, under the weft *d*.

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

The herein described homogeneous two weft plane carpet fabric having in each set or weave five weft threads with five warp threads tying said wefts in separate sheds and three of said warps interchangeably binding in one of three of said wefts on the face and two of said three wefts on the back so that substantially equal lengths of warp threads are maintained throughout the fabric, substantially as and for the purposes set forth.

In witness whereof I have hereunto set my signature in the presence of two subscribing witnesses.

SAMUEL J. ACHESON.

Witnesses:

WM. ALLAN,
JOHN NEAGLE.