June 24, 1941. J. N. MOECKEL 2,246,749

BLANKET

Filed July 14, 1939 4 Sheets-Sheet 1

Fig. 1

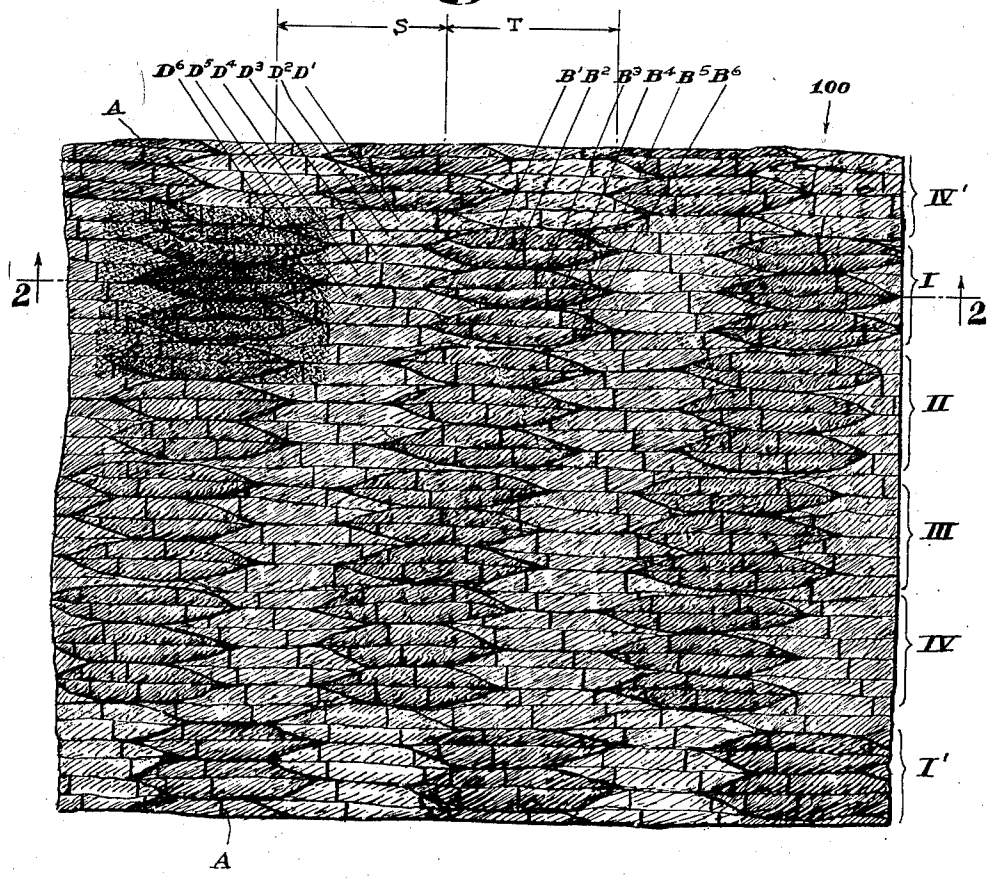
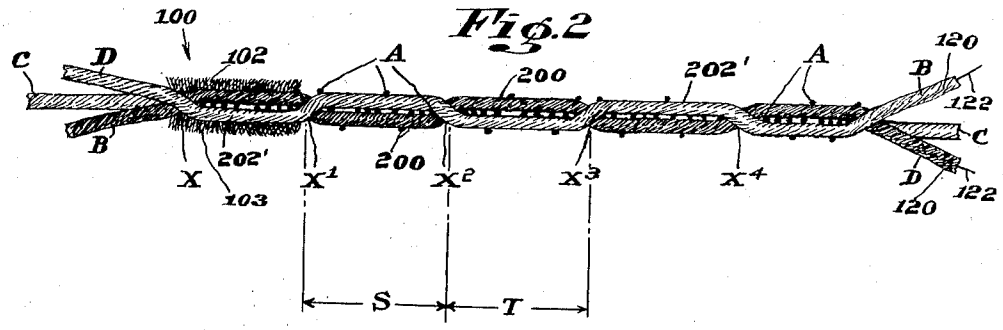


Fig. 2



INVENTOR

BY John N. Moeckel

Richard Whitney

ATTORNEY

June 24, 1941. J. N. MOECKEL 2,246,749

BLANKET

Filed July 14, 1939 4 Sheets-Sheet 2

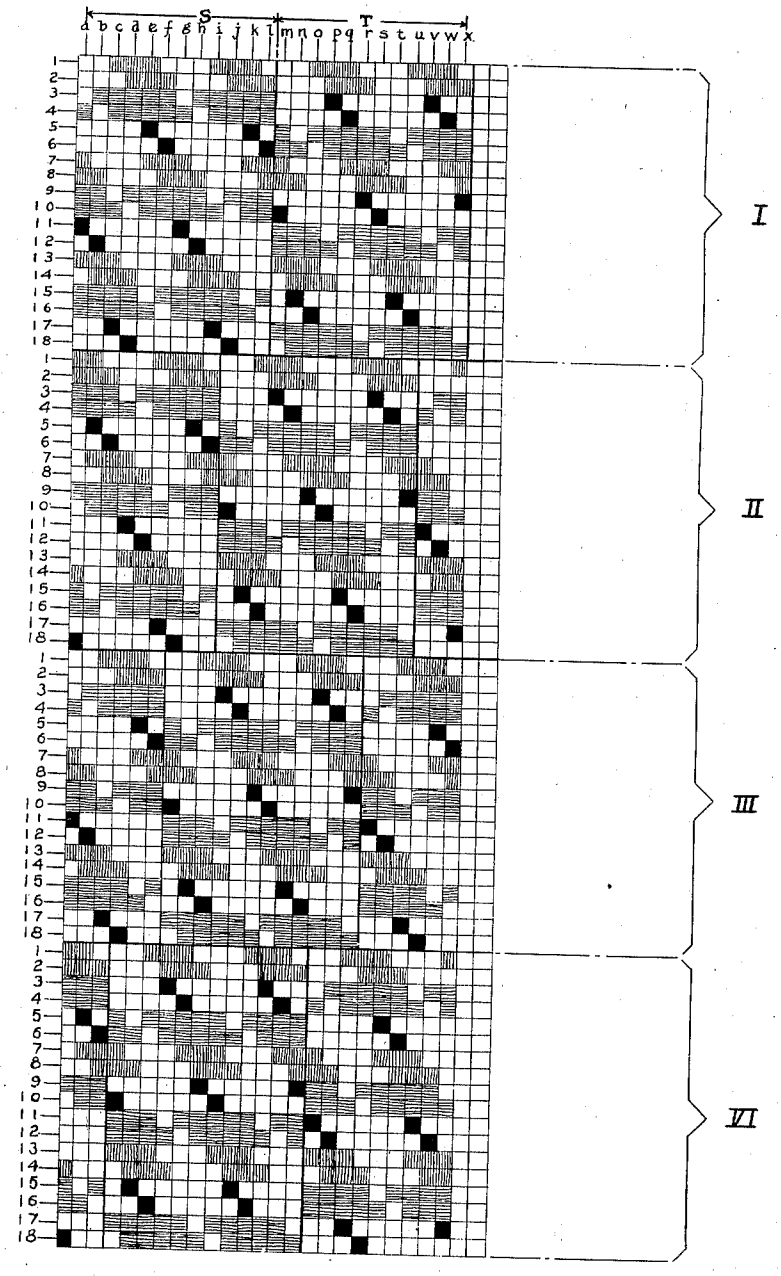


Fig. 3

INVENTOR
John N. Moeckel
BY
ATTORNEY

June 24, 1941. J. N. MOECKEL 2,246,749

BLANKET

Filed July 14, 1939 4 Sheets-Sheet 3

Fig. 4a Fig. 4b Fig. 4c Fig. 4d Fig. 4e Fig. 4f Fig. 4g Fig. 4h

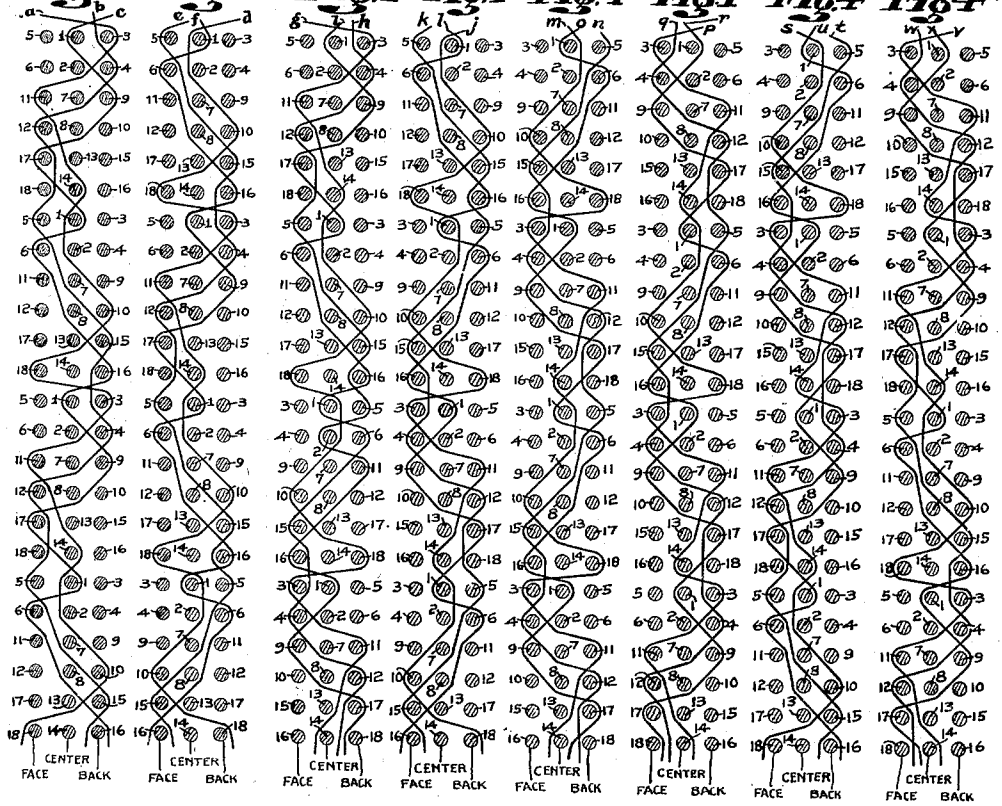


Fig. 5a

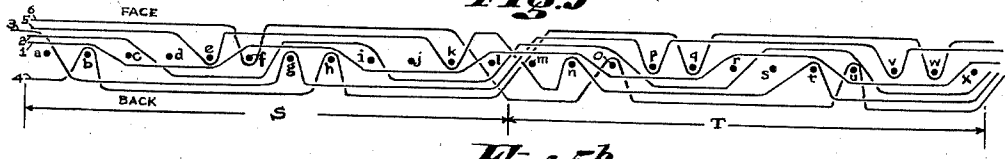


Fig. 5b

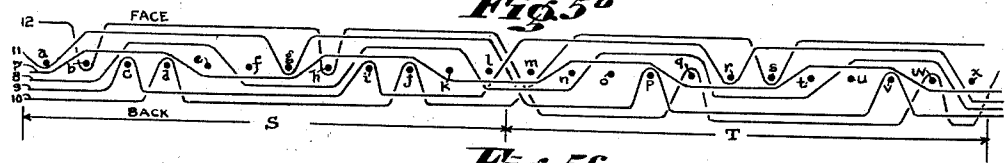
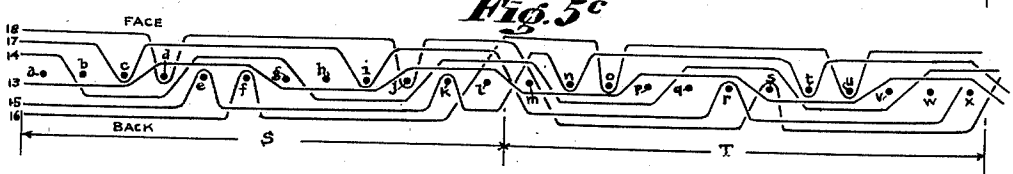


Fig. 5c



INVENTOR
John N. Moeckel
BY Richard Whiting
ATTORNEY

June 24, 1941. J. N. MOECKEL 2,246,749

BLANKET

Filed July 14, 1939 4 Sheets-Sheet 4

Fig. 6

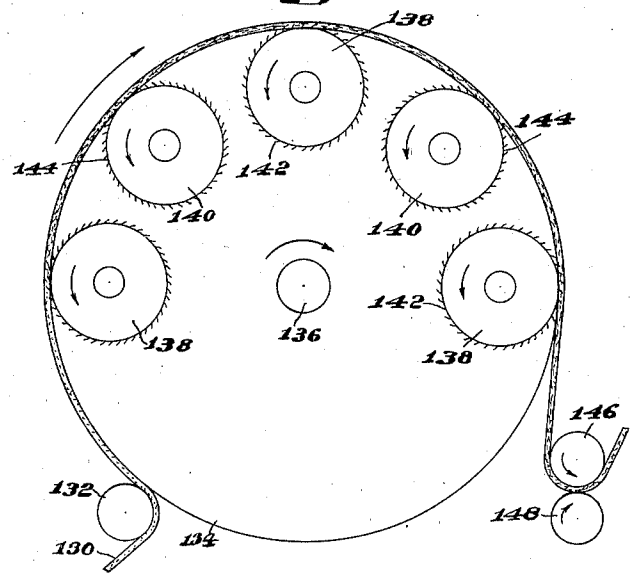


Fig. 7

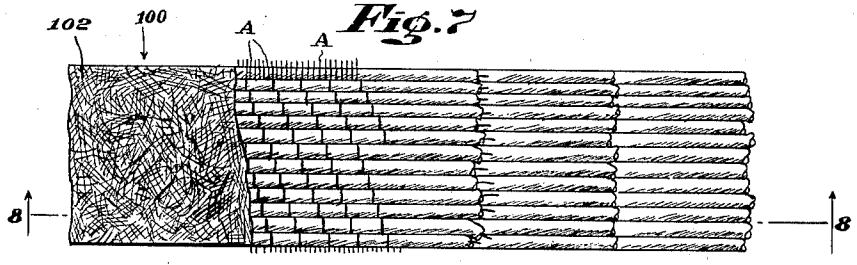
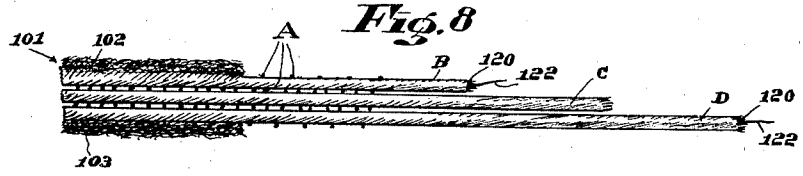


Fig. 8



INVENTOR

BY John N. Moeckel

Richard Whiting

ATTORNEY

Patented June 24, 1941 2,246,749

UNITED STATES PATENT OFFICE

2,246,749

BLANKET

John N. Moeckel, Saco, Maine, assignor to Pepperell Manufacturing Company, Boston, Mass., a corporation of Massachusetts

Application July 14, 1939, Serial No. 284,470

6 Claims. (Cl. 139—411)

The object of this invention is to produce a blanket of greater warmth at less cost to manufacture as compared with the best present blankets of the same grade (i. e. percentage of wool) and of the same weight. My blanket is also stronger filling-wise.

I obtain greater warmth with desired light weight by the production of a longer and denser nap than has been obtainable on prior comparable blanket fabrics. As is well known, the nap is raised from the exposed portions of the filling threads by traversing the woven fabric with napper clothing in a warpwise direction. I have found that by using sets of filling threads of the character hereinafter described and by weaving them as set forth, the filling to be napped is loosely laid side by side, or uncompacted, on the surfaces of the fabric, so that a less energetic napping than usual will raise a longer and denser nap than heretofore obtainable on blankets of the same grade and weight. Preferably this long nap is bound into the fabric by crossing the filling threads to be napped from one surface to the other at intervals that are shorter than the average length of fiber remaining in the body of the yarn after napping.

As a result of such less energetic napping, there is less fiber breakage with less waste in napping, and accordingly I can make my fabric with filling threads to be napped having less allowance for waste. I thereby save both in the amount of material needed and in the cost of napping.

In addition to the filling threads which are exposed to napping, my blanket includes a set of comparatively hard and strong, but light, filling threads which are buried in the fabric and are not exposed on either surface so that they are inaccessible to the napper clothing. They serve to impart filling-wise strength to the fabric.

In the drawings:

Fig. 1 is a plan view of a fabric embodying my invention;

Fig. 2 is a filling-wise section showing the exposed filling and indicating the warp, as taken on the line 2—2 of Fig. 1;

Fig. 3 is a card diagram of the chain draft that operates the dobby harnesses to make the fabric of Fig. 1;

Figs. 4*a* through 4*h* are warpwise diagrams of the fabric of Fig. 1, each including three successive warp ends and together showing the 24 ends constituting a repeat widthwise of the fabric.

Figs. 5*a*, 5*b* and 5*c* are diagrams of the filling interlacings for the first eighteen picks;

Fig. 6 is a diagram of a napping machine;

Fig. 7 is a plan view of another weave embodying my invention, and

Fig. 8 is a filling-wise section taken on the line 8—8 of Fig. 7.

A blanket 100 embodying my invention is composed of warp threads A and three sets of filling threads B, C and D, Figs. 2 and 8., The sets B and D are exposed on the face and back and are napped by raising the nap shown at 102 and 103. The blanket of Figs. 1 and 2 has the filling threads B and D crossing from face to back. The blanket of Figs. 7 and 8 has the filling B on the face only and the filling D on the back only. The set C of filling is buried in the fabric inaccessible to the napper clothing.

The composition of the warp and filling threads of my blanket will, of course, vary with its grade and weight, but I shall describe, as one specific example, a 50% wool blanket weighing, before finishing, .60 yd. per lb. or 1.66 lbs. per yd., it being understood that my invention is applicable as well to other usual grades of wool or of wool and cotton mix.

To make such a blanket, the warp threads A are of 22's cotton yarn or thereabouts. Each of the filling threads of the sets B and D is preferably composed of soft roving 120 of approximately 90% virgin wool and 10% high grade China cotton with a core 122 of 30's cotton yarn forming, for example, a thread of 2.65's size or thereabouts. The roving 120 of the sets B and D may, of course, be composed entirely of wool to give an "all wool plated" blanket, but I have included a slight amount of cotton to make, with the intermediate filling C, a blanket exactly 50% wool. The filling C is entirely of low grade China cotton 3.25's slightly twisted to impart strength.

The weave which I employ to lay properly the exposed filling threads B and D and to conceal, from the napper clothing, the intermediate filling C, may vary somewhat in its specific construction of which I have shown two examples. I prefer the weave of Figs. 1–5c for reasons that are later explained. As both weaves have some features of my invention in common, and as that of Figs. 7 and 8 is less complicated, I shall describe it first.

The weave illustrated in Figs. 7 and 8 is a three-ply weave of the type known as a six-harness twill. In such a weave the warps are in sets of six and the weave is symmetrical, each warp thread coming to each surface once every six picks of each surface filling. The exposed parts of the warps extend obliquely of the length of the fabric in twill formation. Each of the filling threads B and D floats over five warps for each

warp that lies over it, thus exposing a large unconfined filling surface, and such threads are loosely laid side by side, there being not over eighteen picks and preferably about fifteen picks to the inch for each of the exposed sets B and D.

It is important that the individual fibers of the nap raised from the filling be securely bound into the fabric so as not to pull out unduly during use. I have achieved that result in the blanket of Figs. 7 and 8 with a sley as low as 32 warp ends per inch. But a higher sley, such as 60 ends per inch or above, may be used.

In my preferred blanket, illustrated in Figs. 1 and 2, the filling threads B and D, to be napped, cross simultaneously from one surface to the other as indicated at X, X^1, X^2, X^3 and X^4. These crossings are at intervals considerably shorter than the average length of that portion of the wool fiber remaining a part of the body of the thread or yarn after napping. For example, if the wool fibers average 3½ inches in length, the crossings are effectively made at intervals of approximately ½ inch. By so anchoring the fibers I am able to use low warp sleys such as 32 ends per inch or lower and thereby produce a light weight blanket. At the same time I provide long filling floats which yield a lofty nap.

From Fig. 1 it will be noted that the crossings are not aligned with each other lengthwise of the fabric but the rows of crossings are broken up as I have indicated by the stepped sections I, II, III and IV, constituting one warpwise repeat of the fabric, followed by the first section I′ of the next repeat, and so on throughout the length of the fabric. In this manner the possibility of noticeable rows of crossings in the napped fabric is obviated. The length of the intervals, warpwise of the fabric, at which the rows of crossings should be interrupted for this purpose is, of course, a matter of choice but I have employed with success intervals of eighteen picks. Thus in section I on the face as seen in Fig. 1 there are six picks of filling marked B^1 to B^6 inclusive, on the opposite side of the fabric from which are picks D^1 to D^6 inclusive which come to the face in Fig. 1 at the left and right of picks B^1 to B^6. The center ply C of six picks completes the eighteen picks of the unit. One complete warpwise repeat including the four units is therefore 72 picks. A repeat unit filling-wise of the fabric comprises section S plus section T composed respectively of the exposed portion of fillings D^1 and B^1. It includes 24 warp ends and the fabric, for convenience may be woven on a 24 harness dobby loom.

The weave will be more clearly understood from Figs. 3 to 5*c*. In Fig. 3 I have designated by the numerals I, II, III and IV those sections of the draft controlling the dobby chain for the 24 harnesses, corresponding to the similarly designated sections of the fabric of Fig. 1. The 24 warp ends constituting a warp repeat are designated by the letters *a* to *x* inclusive and the sections S and T, constituting 12 warps each, have been indicated to conform to Fig. 1. The 72 picks constituting one lengthwise repeat are numbered 1 to 18 for the four sections.

It should be stated that for convenience the fabric has been woven on an automatic shuttle changing loom having four shuttle boxes on one side and one on the other, known as a four by one box loom. As a result, two filling threads of a set (whether B, C or D) are laid before a filling thread of the next set is laid, which in the woven fabric gives the effect of paired groups of threads as noted at B^1 and B^2, at D^1 and D^2 etc. If a so-called pick and pick loom having four shuttle boxes on each side were used, as is a matter of choice, a single filling thread of one set could be introduced after a single filling thread of the preceding set, as is known in the art. Either type of loom will serve for my purpose.

Arbitrarily, I have chosen as pick **1** in Fig. 3 a pick of the middle set C of filling. The filled in blocks indicate warp up as is conventional, and for the first pick the shed is balanced with successive sets of three warps up and three down as indicated.

For pick **2**, the second pick of set C, the shed is also balanced with three warps up and three warps down, but the shed is displaced one warp end to the right from the shed for pick **1** to form a warp twill.

The shed for pick **3** (pick B^1 of Fig. 1) has ten warps up and two down for the first twelve warps, the S section of each repeat, and two warps up and ten down for the T section. For the fourth pick (pick B^2 of Fig. 1) the shed is the same as for pick **3**, but displaced one warp end to the right to produce a warp twill.

For pick **5** (pick D^1 of Fig. 1) two warp ends are up and ten down for the S section of the repeat and ten up and two down for the T section. For the sixth pick (pick D^2 of Fig. 1) the shed is the same as for pick **5**, but displaced one warp end to the right.

Diagram **5***a* indicates the relative positions which are assumed by the first six picks, Fig. 5*b* shows picks **7–12** and Fig. 5*c* shows picks **13–18**. As is conventional in such filling interlacing diagrams, the warp threads are shown in a single plane, although in the fabric they depart considerably from a plane. The diagram includes a complete 24 warp and repeat and the S and T sections have been indicated. The warp diagrams, Figs. 4*a* to 4*h*, show the three planes assumed by the filling. For convenience each of these eight views includes three warp ends so that together they constitute a warp diagram for the entire 24 end repeat. The face, center and back of the fabric are indicated at the bottom of each of these views.

Comparing the above described views with the chart of Fig. 3, it will be seen that due to the balanced formation of the shed for each of picks **1** and **2**, with successive groups of three warp ends up and three down, picks **1** and **2** will lie in the middle of the fabric with the warp threads in twill formation. The shed for the third pick is, however, considerably unbalanced. In the S section ten warp ends are up for each two warp ends that are down, and, as a result of the predominance of warps up, pick **3** will be forced to the back of the fabric in the S section. In the T section, due to the predominance of warp ends down, ten being down and two up, pick **3** will be forced to the face, crossing from back to face between warp ends *l* and *m*, as shown in Fig. 5*a*. The same type of shed is formed for pick **4** so that that pick goes to the back in the S section and to the face in the T section.

Pick **5** will be forced to the face in the S section due to the predominance of warp threads down, and to the back in the T section because of the predominance of warp threads up. The same is true of pick **6** except that, as warp ends *l* and *m* are both up, the crossing from face to back will occur between ends *k* and *l*, as indicated in Fig. 5*a*.

For the next six picks, picks **7** to **12** inclusive

(Figs. 3 and 5b), the sheds for the preceding six picks are repeated in the same order except that the shed formation is displaced one warp end to the right to produce a twill in each of the three planes of the fabric. Thus, pick 7 which (Figs. 4a to 4h) is the next middle pick of filling and will lie next to pick 2, has the same shed as that for pick 2 except displaced one warp end to the right. The shed for pick 8 is the same as that for pick 7 but displaced one warp end to the right from it so that the twill formation continues. The shed for pick 9 is the same as that for pick 4, but displaced one warp end to the right from it, and so on through pick 12. Each outer pick will cross from face to back between warp ends *l* and *m* except pick 10 which will cross between warps *m* and *n*, due to the fact that ends *l* and *m* are both up for that shed.

In like manner, the sheds for picks 13 to 18 inclusive repeat the sheds for picks 7 to 12 respectively except in each instance the shed is displaced one warp end to the right so that the twill continues in each plane to the end of section I.

As stated above, I periodically interrupt the rows of filling crossings running lengthwise of the fabric so that they are not noticeable in the finished fabric. For the first 18 picks, constituting section I, the crossings occur between warp end *l* and *m* of each repeat, with the few exceptions noted. For section II I displace the shed formations so that the crossings will be formed three warp ends to the left from the crossings of section I, namely, between warp ends *i* and *j*. The chain pattern for the next 18 picks is, accordingly, the same as that for the first eighteen picks, except that it is displaced three warp ends to the left. Similarly section III is identical to section II, but displaced three warp ends to the left from it and section IV is the same as section III except for the same displacement. This completes the 72 pick repeat and the crossings for the first section I' of the next 72 pick repeat will, of course, appear directly in line with the crossings for section I of the repeat just described. Figs. 4a to 4h show the complete repeat and the manner in which the warp threads interweave with the filling. It also shows the planes that the filling assumes. It is considered unnecessary to continue the filling diagrams after the eighteenth pick.

I have found that this fabric, like that of Figs. 7 and 8, when napped in the manner now to be described, produces a lofty nap of long wool fibers. It is woven with not over eighteen picks and preferably about fifteen picks to the inch, thereby laying the surface picks side by side without compacting them. Taking the blanket as a whole, the filling in each surface covers five warps for each warp which lies over the filling. Moreover, in the case of any particular pick of filling on any surface, the pick covers five warps for each warp that covers the filling. There are therefore present on each surface of the blanket long floats of unconfined filling which are presented to the nappers.

The napper diagrammatically illustrated in Fig. 6 is of the type having alternate pile workers 138 and counter-pile workers 140, each rotating counter-clockwise at adjustable speeds and carried on a cylinder 134, driven clockwise. The fabric 130, passing under idler roll 132, is advanced clockwise, in engagement with the workers, by power rollers 146 and 148. The cylinder rotates at a peripheral speed considerably greater than the advance of the fabric, and the fabric is alternately napped and felted by workers 138 and 140 respectively whose clothing, for that purpose, extends in opposite directions, as shown. As is known, the so-called "energy" or amount of napping and felting, depends upon the relative speeds of the fabric and of the clothing carried by the workers which it engages. The energy is conveniently regulated by changing the speed of rotation of the workers. The energy of the pile workers 138 decreases as their rotative speed increases. The energy of the felting workers 140 increases as their peripheral speed increases above the speed at which they move over the fabric. By suitable speed adjustments, "neutral" speeds can be obtained at which no napping or felting occurs.

Whereas the ordinary cotton and wool mix blanket fabric requires for the desired napping of each surface a large number of runs with a high energy adjustment of the worker speeds, my fabric, because of the loosely laid or uncompacted filling threads and the large area of filling floats, requires only about half as many runs as has heretofore been used, and those runs may be with a less energy producing setting of the worker speeds. Thus, with the fabric described above, I need employ only two runs for napping each surface and one run for felting. During the first run the speeds of the pile workers 138 are adjusted to just slower than neutral for light energy napping and the counter-pile workers 140 may then be at a neutral speed so that no felting occurs. For the second run on a surface the pile workers are slowed down to provide sufficient energy to produce the final napping and the speed of the felting workers is not changed. For the third run the pile workers are set at the neutral speed and the counter-pile workers 140 are speeded up to produce the felting desired in the finished article.

The lofty nap of long wool fibers obtained on my blanket results partly from the high wool content of the filling threads which may be pure wool, although the blanket as a whole may be as much as half cotton. A further factor in the production of the lofty nap is that the napping has been effected with moderate energy on filling threads that have long surface floats and are loosely laid so that they yield their fibers readily to such moderate napping. Furthermore, since the energy of the napping is light, there is less fiber breakage than heretofore so that the fibers remaining on the surface are unusually long and the waste from broken fibers loading the clothing as before is considerably reduced. My fabric can be constructed with less allowance for waste and I thereby save both in the amount of material needed and in the cost of napping.

The intermediate filling yarns C of comparatively strong, but light, material, being buried in the fabric, are not touched by the napper clothing so that their strength is unimpaired. They greatly assist in imparting to the fabric sufficient filling-wise strength at the desired minimum weight. It should be noted that, as compared with prior blanket fabrics, before napping, of like grade, my fabric may be weaker filling-wise prior to napping, but after napping it is stronger than such prior napped fabrics, largely because of the middle filling threads which are inaccessible to and untouched by the napper clothing. Also in my blanket there are fewer warp threads exposed on the surface of the fabric for a given sley than in the conventional two and one ply

blankets. For this reason, and also because of the less energy required in the napping operations, there is less weakening of the warp threads during manufacture.

It will be noted that my blanket when made of specified percentages of wool and cotton will contain more wool on the surfaces for napping than the same grade of fabric which does not contain an intermediate set C of pure cotton filling.

Accordingly, my blanket is warmer and cheaper to make than prior blankets of the same grade and weight and it is also stronger.

It will be apparent that although I have described two specific embodiments of my invention, it is subject to further variation without departing from its scope which is to be limited only as the appended claims indicate. Thus, the fabric may, of course, be woven on a pick and pick loom. The percentage of wool may be varied at will. The pick is preferably that above noted but may be varied, particularly if the size of filling is also varied.

This application is a continuation-in-part of my prior application, Serial No. 218,357, filed July 9, 1938.

I claim:

1. A blanket of predetermined percentage wool content composed of three superposed weft layers tied together with warp, having little, if any wool in the center weft layer, the percentage wool content of the outer weft layers greatly exceeding said predetermined percentage, said outer layers being napped so that the percentage of wool in the nap greatly exceeds the percentage of wool in the entire blanket, the center layer being composed of wefts that remain in the center throughout the blanket and the napped weft threads being periodically crossed from one surface to the other through the center layer at intervals which are shorter than the length of that portion of the individual napped fibers forming the body of the napped weft after napping so that the individual napped fibers are tied into the blanket by being crossed through from one surface of the blanket to the other.

2. A blanket of predetermined percentage wool content composed of three superposed weft layers tied together with warp, having little, if any wool in the center weft layer, the percentage wool content of the outer weft layers greatly exceeding said predetermined percentage, said outer layers being napped so that the percentage of wool in the nap greatly exceeds the percentage of wool in the entire blanket, the center layer being composed of wefts that remain in the center throughout the blanket, the napped weft threads being periodically crossed from one surface to the other through the center layer at intervals which are shorter than the length of that portion of the individual napped fibers forming the body of the weft after napping so that individual napped fibers are tied into the blanket by being crossed through from one surface of the blanket to the other, and the crossings of said napped weft being out of alignment lengthwise of the blanket so that noticeable rows of crossings are obviated.

3. A blanket composed of three superposed weft layers tied together with warp, the outer weft layers being of soft material and having a lofty nap raised therefrom, the center layer being composed of wefts that remain in the center throughout the blanket, said napped outer weft being periodically crossed from one surface of the fabric to the other through the center layer at intervals which are shorter than the length of that portion of the individual napped fibers forming the body of the weft after napping, so that individual napped fibers are tied into the blanket by being crossed through from one surface of the blanket to the other.

4. A blanket composed of three superposed weft layers tied together with warp, the outer weft layers being of soft material and having a lofty nap raised therefrom, the center layer being composed of wefts that remain in the center throughout the blanket, the weft of both of said outer layers being periodically and simultaneously crossed from one surface of the fabric to the other through the center layer at intervals which are shorter than the length of that portion of the individual napped fibers forming the body of the weft after napping, so that individual napped fibers are tied into the blanket by being crossed through from one surface of the blanket to the other.

5. A blanket composed of three superposed weft layers tied together with warp, the outer weft layers being of soft material and having a lofty nap raised therefrom, the center layer being composed of wefts that remain in the center throughout the blanket, the weft of both of said outer layers being periodically and simultaneously crossed from one surface of the fabric to the other through the center layer at intervals which are shorter than the length of that portion of the individual napped fibers forming the body of the weft after napping so that individual napped fibers are tied into the blanket by being crossed through from one surface of the blanket to the other, the crossings of said napped weft being generally out of alignment lengthwise of the blanket to obviate noticeable rows of crossings.

6. A blanket having a center layer of weft and outer surface layers of weft tied together with warp, the said surface weft being composed of fibers of an approximate predetermined average length and being napped so that one portion of the individual fibers forms the body of the weft and the remainder is raised from the body as nap, the said surface weft being crossed from one surface of the blanket to the other through the center layer at intervals which are shorter than the length of said portion forming the body of the weft so that individual napped fibers are tied into the blanket by being crossed through from one surface of the blanket to the other and said crossings being arranged in steps lengthwise of the fabric so that there are no noticeable lengthwise rows of crossings.

JOHN N. MOECKEL.