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## BLANKET AND PROCESS OF MANUFACTURING BLANKETS.

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*To all whom it may concern:*

Be it known that I, ROBERT AMORY, a citizen of the United States, residing at Milton, in the county of Norfolk and State of Massachusetts, have invented certain new and useful Improvements in Blankets and Processes of Manufacturing Blankets, of which the following is a specification.

This invention relates to blankets and to processes of manufacturing blankets. The invention is especially concerned with the manufacture of cotton blankets, although some features of the invention are applicable also to the manufacture of woolen blankets or to those blankets known to the trade as woolen blankets but which include a substantial percentage of cotton.

It is the general commercial practice to produce designs in blankets entirely by the weaving process, using yarns made from dyed cotton or wool or yarns which have been dyed in the yarn. Designs consisting essentially of checks and stripes are produced economically by this process, but other designs involving irregular figures of any kind, such as the so-called Indian or floral designs, and "infants' blankets" bearing figures or rabbits, chickens, kittens, etc., must be made through the use of the jacquard mechanism or dobby attachment. Consequently, such blankets are much more expensive blankets to manufacture.

It has always been considered impossible to print designs on blankets for the reason that the fabric has been considered too heavy to print through and the duplex printing machine, which prints on both sides, is a very difficult and expensive machine to operate, besides being tremendously expensive to build in the size that it would be necessary for a blanket. Furthermore, it has been considered impossible to obtain a satisfactory registration of the design by duplex printing on a blanket fabric due to the peculiar nature of this material. A still further objection to the printing of cotton blankets has been the obvious difficulty in making the printing ink penetrate the heavy blanket fabric uniformly especially without first giving the fabric some special treatment, such as bleaching, to promote penetration. This treatment spoils the feel of the blanket and reduces the heat insulation value due to the matting of fibers. Usually blankets are not given such treatment; the plain white blankets being woven "in the gray," i. e., from stock which has not been bleached and which does not present a pure white color but has a creamy or grayish tint. This color is entirely satisfactory for blankets although it would not be suitable for making other goods. The bleaching or other treatment of the fabric to facilitate penetration of the ink or color would further be objectionable because of the increased expense of manufacture and the additional equipment that would be required.

It is the chief object of the present invention to devise an entirely practical process of manufacturing printed blankets. The invention also involves a novel blanket.

The nature of the invention will be readily understood from the following description, and the novel features will be particularly pointed out in the appended claims.

Preliminary to a detailed description of the present process it should be noted that cotton blankets, or blankets composed largely of cotton, must be made with warp threads of relatively fine numbers or gage and a filling or weft thread of much coarser and loosely twisted yarn so that the filling can be napped or teazeled. A hard twisted yarn cannot be napped or teazeled satisfactorily and soft twisted warp yarn would not be strong enough to stand the process of weaving. Therefore, the characteristics of the cotton blankets are determined largely by the nature of the material which is napped, the warp yarn being simply a frame work to hold the napped filling together. In blankets composed largely of wool the warp yarn can be loosely twisted and, owing to the longer fibers of wool, be strong enough to stand weaving so that the nap occurs both on warp and filling.

No change whatever in the usual process of manufacturing a plain blanket is required by the present invention up to the point of completion of the weaving operation. Usually a plain white blanket fabric is woven, the stock of which the blanket is made being unbleached or "in the gray." The web of blanket fabric, while unnapped, is next printed on one side with the aid of any convenient form of printing apparatus, the design being applied, however, through

the use of an unusually large quantity of ink so that the ink will penetrate deeply into the fabric. This printing operation preferably is performed in a rotary machine so that the operation is continuous, the design being engraved on a roll to which ink is supplied in the usual manner, and the fabric being pressed against the engraved roll or printing roll by a suitable pressure roll. No change is required in the usual printing machines for this purpose except that the machines must be unusually large in order to handle fabric of the regular blanket width, the printing roll must be equal in circumference to the length of a blanket if a complete individual design for each blanket is required, and the engraving should be cut unusually deep so that a much greater quantity of ink will be applied to the goods than is usual in the ordinary printing processes. The ink, of course, may be of any suitable character.

After the printing operation has been completed the fabric is dried and the color is "set" in any usual or convenient manner, no change in the regular printing practice being required in this respect except that a somewhat longer drying period may be necessary since the fabric is very heavy.

After these operations have been completed the fabric presents a very good appearance on the printed side, the design being clear and distinct, but the unprinted side presents an exceedingly unsatisfactory appearance since the ink does not penetrate through to the latter side evenly and, consequently, this side of the goods has a very "blotchy" appearance. I have found, however, that if the printed fabric is now napped on both sides, this napping operation produces the surprising result of drawing through to the unprinted side of the fabric sufficient fibers which have been colored by the printing ink to reproduce the design clearly on this side of the goods. Consequently, when the napping operation has been completed the blanket presents substantially the same appearance on both sides.

This process thus produces a blanket which is as pleasing in appearance and as serviceable as blankets made by prior processes, but at a substantial reduction in manufacturing expense. This is particularly true of figured designs, such as those hereinbefore mentioned, and which must be produced according to prior processes through the use of a jacquard mechanism or dobby attachment. It is obvious that an endless variety of designs can be made according to this process, and that color effects can be produced which it would be very difficult or impossible to obtain by weaving processes.

In the manufacture of cotton blankets I have found it preferable to make the filling yarn largely, if not wholly, of cotton of Asiatic type such as China, India, or Peruvian. Asiatic cotton is of an entirely different character botanically from the American cotton such as is grown in the United States, Egypt, Brazil, etc. This Asiatic grade of cotton has a relatively coarse and curly fiber, being much harsher and stiffer than the American. The China or India types are much shorter in staple than the American type while the Peruvian is long but has the same curly and harsh characteristics.

I find that this Asiatic cotton has the property of absorbing ink more readily than American cotton. Consequently, when an unnapped blanket fabric, in which Asiatic cotton predominates, is printed in the manner above described, the ink penetrates well through the fabric and a cleaner cut design is produced on the unprinted side of the blanket and much more satisfactory results are obtained than when American or Egyptian cotton predominates in the composition of the blanket.

I have found that the printing rolls can be cut much more deeply so as to hold a very great amount of ink because the soft twist Asiatic cotton absorbs the ink so readily. It is entirely feasible, however, to manufacture blankets according to this process from the American type of cotton.

I have found it entirely practical to manufacture blankets on a commercial scale by the process above described, and to produce goods which please the trade. The design on one side of the blanket must register accurately with that on the other side due to the fact that the blanket is printed originally on one side only, the design then being reproduced on the other side by drawing through colored fibers to the unprinted side in the napping of the goods. Results which have heretofore been considered utterly impossible by any printing process thus are produced by the process above described, and the blankets compare very favorably in every respect with those which could be produced heretofore only through the use of jacquard mechanisms. A blanket fabric or blanketing is sometimes used for other purposes than for blankets, but the particular use made of the fabric is immaterial so far as the present invention is concerned and such fabrics are herein designated as blankets.

Having thus described my invention, what I desire to claim as new is:

1. That improvement in the process of manufacturing blankets which consists in weaving a blanket fabric, printing a design on one side only of said fabric before the opposite side of said fabric has been napped, applying a sufficient quantity of ink to the fabric in performing said printing operation to cause the ink to penetrate the fabric to

such a depth that upon napping the fabric on the unprinted side, fibers colored by the ink will be drawn through to the unprinted side in such abundance as to reproduce the design clearly on said unprinted side, and subsequently napping the printed fabric on said unprinted side.

2. That improvement in the process of manufacturing blankets which consists in weaving a plain blanket fabric in the usual manner, printing a design on one side only of the fabric so woven while the fabric is in an unbleached condition, applying a sufficient quantity of ink to the fabric in performing said printing operation to cause the ink to penetrate the fabric to such a depth that upon subsequently napping the fabric on the unprinted side, fibers colored by the ink will be drawn through to the unprinted side in such abundance as to reproduce the design clearly on the unprinted side, and subsequently napping the printed fabric on both sides.

3. That improvement in the process of manufacturing cotton blankets which consists in weaving a blanket fabric from a stock, the greater part of which consists of Asiatic cotton, printing a design on one side only of said fabric, applying a sufficient quantity of ink to the fabric in performing said printing operation to cause the ink to penetrate the fabric to such a depth that upon napping the fabric on the unprinted side, fibers colored by the ink will be drawn through to the unprinted side in such abundance as to reproduce the design clearly on said unprinted side, and subsequently napping the printed fabric on both sides.

4. That improvement in the process of manufacturing blankets which consists in weaving a blanket fabric, printing a design on one side only of said fabric, performing said printing operation continuously, applying a sufficient quantity of ink to the fabric in performing said printing operation to cause the ink to penetrate the fabric to such a depth that upon napping the fabric on the unprinted side, fibers colored by the ink will be drawn through to said unprinted side in such abundance as to reproduce the design clearly on said unprinted side, drying the fabric after it has been printed, and then napping the printed fabric on both sides.

5. A blanket consisting of a heavy napped fabric bearing a design printed on one side thereof only but reproduced on the opposite side of the blanket by fibers of the nap colored during the printing of the first side and drawn through to the unprinted surface of the fabric.

6. A cotton blanket consisting of a heavy woven fabric, the filling of which consists mainly of Asiatic cotton, said fabric being napped on both sides and having a design printed on one side only thereof, said design being reproduced on the unprinted side by fibers of the nap which have been colored by the printing ink and drawn through to the unprinted side of the fabric.

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