No. 630,573. Patented Aug. 8, 1899.

R. R. SMITH.

FABRIC.

(Application filed Jan. 24, 1899.)

(Specimens.)

Fig. 1.

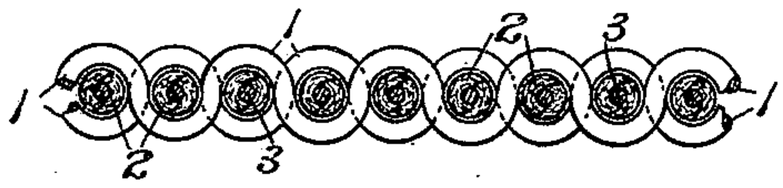

Fig. 2.

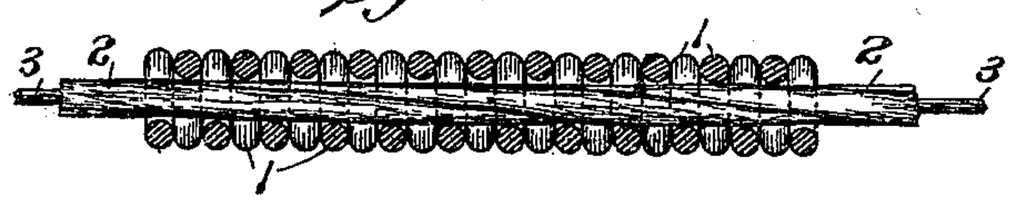

Fig. 3.

Fig. 4.

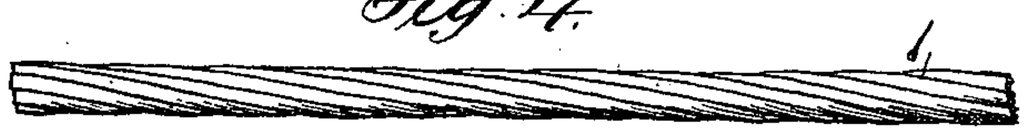

Fig. 5.

Fig. 6.

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UNITED STATES PATENT OFFICE.

ROBERT R. SMITH, OF NEW HARTFORD, CONNECTICUT.

FABRIC.

SPECIFICATION forming part of Letters Patent No. 630,573, dated August 8, 1899.

Application filed January 24, 1899. Serial No. 703,277. (Specimens.)

To all whom it may concern:

Be it known that I, ROBERT R. SMITH, a citizen of the United States, residing at New Hartford, county of Litchfield, and State of Connecticut, have invented certain new and useful Improvements in Fabrics, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to certain improvements in the manufacture of duck fabrics, which while more particularly designed to be used as felts for paper-making machines are also useful in laundry-machines and in other situations where a material or fabric of unusual moisture extractive and absorptive qualities is required.

As is well known, in the paper-making art the wet pulp after having been roughly put into web form in various ways, according to the style of machine employed, passes to the felts, which serve to support and carry it onward as it is subjected to various subsequent paper-making processes. It is desirable to get as much water out of the pulp as possible while it is on the felt. For this reason, therefore, one of the requisites of a good felt is that it shall have a high absorptive power, so as to take up as much water as is possible from the wet stock, and this absorptive power must exist coincidently with strength and durability. In order, furthermore, that the felt may not leave any marks on the paper-stock, it is desirable either to form the fabric with a napped surface in the first instance or else to so make it that it shall acquire as soon as possible a smooth or matted surface—that is, the warp-threads and the filling which constitute the felt fabric shall become so nearly homogeneous that the marks of the weave will not appear on the paper. Finally, since the strain upon such felts or fabrics is practically wholly in the direction of the warp-threads these threads should be formed with the object of withstanding this strain and at the same time possess as far as is possible the other requirements for a fabric of the character described.

It is the object of this invention to produce a very durable duck fabric for paper-making felts and other analogous purposes which shall be in a high degree absorptive, so that it may readily take up the water from the wet paper-stock or other wet material placed thereon and from which after the wet material has been removed the water may be quickly extracted and the felt dried and so put into condition to receive another charge of wet material, and to produce such a fabric cheaply and by ordinary weaving processes.

Fabrics for the purposes before named and having high absorptive qualities have been heretofore produced, but the goods have been made of fine yarn and have been woven in two, three, and four plies bound together by warp-threads arranged for the purpose. While these goods are effective for the purpose, the expense of producing them has been so large as to practically prohibit their use.

In the fabrics heretofore commonly used for the purposes for which this invention is intended the warp-threads have been tightly twisted and subjected to a hard beaming, with the idea that the tight twisting and hard beaming would increase their strength. In practical use, however, such fabrics, and particularly paper-making felts, are in the machines in which they are employed run over and around a very large number of rolls—that is to say, the fabric in the course of its travel through the machine is caused to change its direction of travel very frequently, and it is further subjected to considerable manipulation in order to get the water which it has absorbed from the wet material which it carries out of it. The result of these frequent changes of direction of travel is of course to cause the fabric to be continually bent and straightened, and this bending and straightening, together with the other manipulation, cause the several threads which constitute each tightly-twisted and beamed warp-thread to rub or chafe on each other. The tight twisting and hard beaming, therefore, instead of adding to the strength of a fabric which is to be used as a paper-making felt or other analogous purposes actually weakens the fabric, because the friction and rubbing upon each other of the several threads which constitute each warp-thread cause them to break, thus weakening the warp, and the fabric soon becomes useless.

Attempts have also been made heretofore to produce a fabric for the uses described

having a napped surface, such a surface being very desirable for the production of certain classes of paper. Owing, however, to the hard twist given to both warp and filling, such attempts have not been successful, as by the time sufficient nap is raised the goods have been very much weakened, owing to the injury to both the warp and filling threads.

In producing a fabric in accordance with my invention instead of tightly twisting the warp-threads and subjecting them to hard beaming I give the warp-threads as little twist as is compatible with warping purposes—*i. e.*, to enable them to be led from the spools to the beam or loom. The amount of the twist will vary in accordance with the fabric and stock; but it is intended to range from a half to one and one-half turns to the inch, whereas in similar fabrics as heretofore made the twist has usually been as great as four or five turns to the inch. The warp-threads of my fabric are therefore slack-twisted, and the several threads which constitute each warp-thread are as nearly as possible parallel to each other and as nearly as possible the same length. The strain upon them is consequently distributed more equally between them. Furthermore, as the fabric is bent and manipulated there is far less chafing and friction between the individual threads which constitute each warp-thread. The liability of breakage is therefore largely reduced. It will also be seen that by thus using a slack-twisted warp-thread I gain in absorptive qualities, since the slack-twisted warp absorbs water much more readily than a tightly-twisted warp and also gives it up much more readily.

The filling of a fabric constructed in accordance with my invention is composed mainly of rovings. The term "rovings" is a well-known one in the textile arts and is used to denote a substantially untwisted assemblage of fibers, the strands of roving being given only a slight twist for the purpose of enabling the untwisted fibers comprising the strands to hang together while the roving is being subjected to the various subsequent processes. It is to be understood that the strain in the direction of the filling of paper-making felts and similar fabrics is inconsiderable, and the question of strength in this direction does not therefore enter into the production of fabric of this class. The filling, which is much larger in cross-section than the warp-threads, is preferably formed of two or more strands of roving loosely laid around a fine supporting-thread, which I term a "carrier-thread." The invention is not, however, limited to any particular number of strands of roving. The carrier-thread is not wound upon or around the strands of the roving in order to hold them together. On the contrary, it simply serves to support and lead the strands of roving which are wound or laid upon it, as few turns as possible being given the strands, and yet cause them to adhere to the carrier-thread and pass with it through the shuttle of the loom. Inasmuch as the rovings are not twisted before they are wound upon the carrier-thread and are not spun or tightly twisted around the carrier-thread, it will be seen that the fibers of the cotton which constitutes the rovings are not twisted; but when they are in position on the carrier-thread they are as nearly as possible parallel to each other and to the thread—that is to say, while each strand of roving is wound around the carrier-thread, yet the fibers of the strands are not twisted, but lie in a fluffy mass on the carrier-thread. It will be seen that a filling of this character introduced between the slack-twisted warp-threads before described produces an exceedingly flexible and very absorptive fabric. The practical absence of all twist in the fibers which constitute the filling utilizes in the highest possible degree its susceptibility for the absorption of water and also renders it possible to get the water out of it much more quickly and thoroughly than would be the case if the rovings were twisted before being wrapped around the carrier-thread, and the same is true in a lesser degree of the slack-twisted warp-threads. Furthermore, a fabric composed of a slack-twisted warp and a filling such as has been described assumes the desired homogeneity of surface much quicker than a fabric in which the elements are twisted before the fabric is woven. Finally, such a fabric as has been described can be readily napped, especially if the number of warp-threads be somewhat reduced, so as to expose the filling, which can be readily done without weakening the fabric to such an extent as to impair its effectiveness for the purposes for which it is intended.

In the accompanying drawings, which form a part of this specification and in which like characters of reference indicate the same parts, Figure 1 is a diagrammatic sectional view, on an enlarged scale, through the fabric, the plane of section being in the direction of the warp-threads. Fig. 2 is a section at right angles to Fig. 1. Fig. 3 is a diagrammatic elevation, on an enlarged scale, of the filling. Fig. 4 is a diagrammatic elevation, on an enlarged scale, of the improved warp-thread. Fig. 5 is a diagrammatic elevation, on a large scale, illustrating the old form of warp-thread. Fig. 6 is a diagrammatic sectional view, on an enlarged scale, illustrating a fabric constructed in accordance with the invention and having a napped surface.

Referring to the drawings, 1 indicates the warp-threads, and 2 the filling composed of rovings. The strands of rovings are, as has been before stated, wrapped around an interior or carrier thread 3 with as few turns as is possible, the arrangement being indicated in Fig. 3. It is to be observed that the strands of rovings are wrapped around the carrier-thread with long turns and the strands themselves are not twisted. The result is therefore that the fibers which compose the rovings

are not twisted. When, therefore, the rovings are in place on the carrier-thread, the fibers which compose the rovings are substantially parallel to each other.

The improved form of warp is indicated in Fig. 4. When this is compared with the warp marked 4, (see Fig. 5,) which represents the old form of warp, it will be seen that there is much less twist in the new warp and that consequently the warp is much looser in structure. So far as the filling is concerned, therefore, nearly the entire absorptive quality of the cotton is utilized, and the warp is also much more absorptive than the old form. Furthermore, the desirable matted surface is much sooner attained with a fabric of this description, as the warp sinks into the filling after little use.

In Fig. 6 is illustrated a fabric constructed in accordance with the invention, the fabric being here shown as having a napped surface, said surface being marked 5. It will be observed that the number of warp-threads in this fabric has been reduced as compared with the fabric shown in Figs. 1 and 2, so that the surface of the filling is exposed to the napping mechanism.

What I claim is—

1. A fabric consisting of slack-twisted warp-threads and a filling, the fibers of which are substantially untwisted, substantially as described.

2. A fabric consisting of slack-twisted warp-threads and having a filling of rovings which are supported by a carrier-thread, substantially as described.

3. A fabric consisting of warp-threads and having a filling of rovings supported by a carrier-thread, substantially as described.

4. A fabric consisting of warp-threads and a filling of rovings supported by an internal carrier-thread, substantially as described.

5. A fabric consisting of slack-twisted warp-threads and a filling of rovings supported by an internal carrier-thread, substantially as described.

6. A fabric consisting of warp-threads and a filling of rovings wrapped around a carrier-thread, substantially as described.

7. A fabric consisting of slack-twisted warp-threads and a filling of rovings loosely wrapped around a carrier-thread, substantially as described.

8. A fabric consisting of slack-twisted warp-threads and a filling the fibers of which are substantially untwisted said fabric having a napped surface, substantially as described.

9. A fabric consisting of warp-threads and a filling of rovings supported by a carrier-thread, said fabric having a napped surface, substantially as described.

10. A fabric consisting of warp-threads and a filling of rovings supported by an internal carrier-thread, said fabric having a napped surface, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

ROBERT R. SMITH.

Witnesses:

FRED O. CLARKE,

PALMER H. CHAMBERLAIN.