

Aug. 7, 1945.

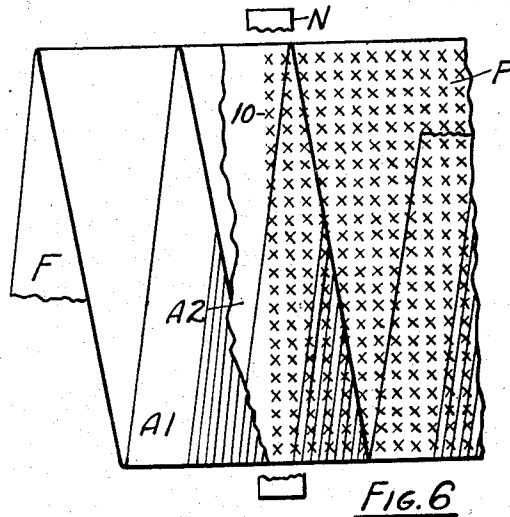
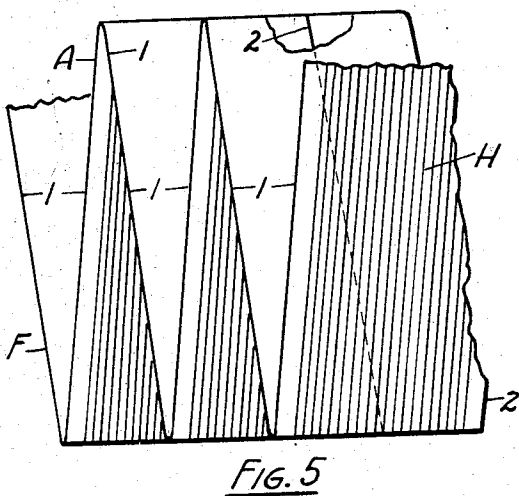
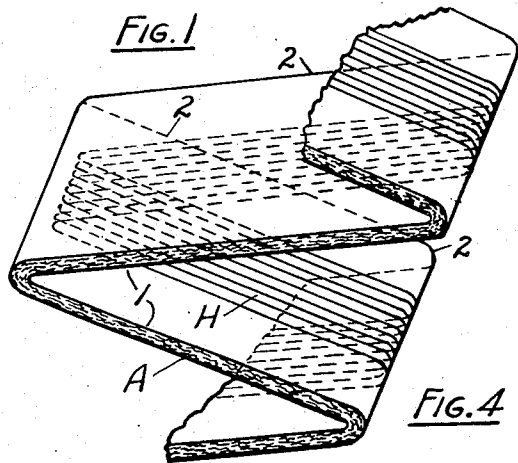
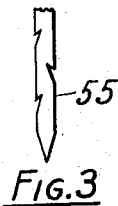
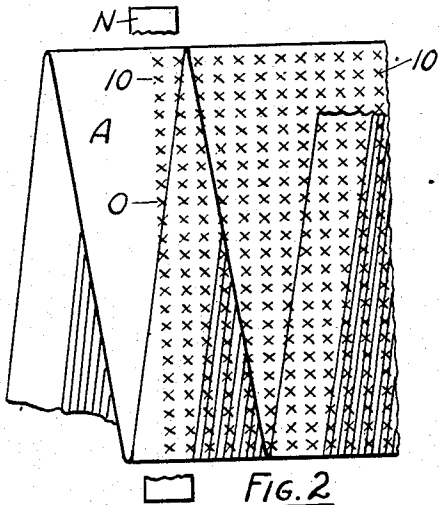
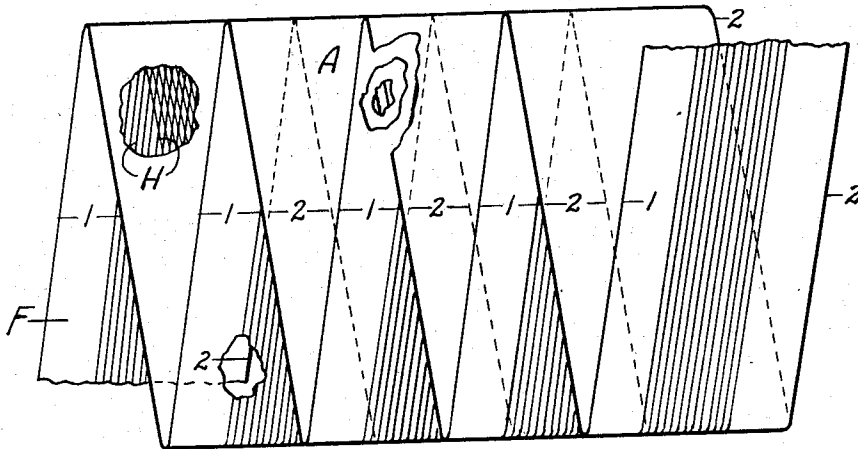
G. K. RIPLEY

2,381,184

REINFORCED TEXTILE FABRIC AND PROCESS OF MAKING

Filed Nov. 23, 1943

4 Sheets-Sheet 1



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George K. Ripley
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Aug. 7, 1945.

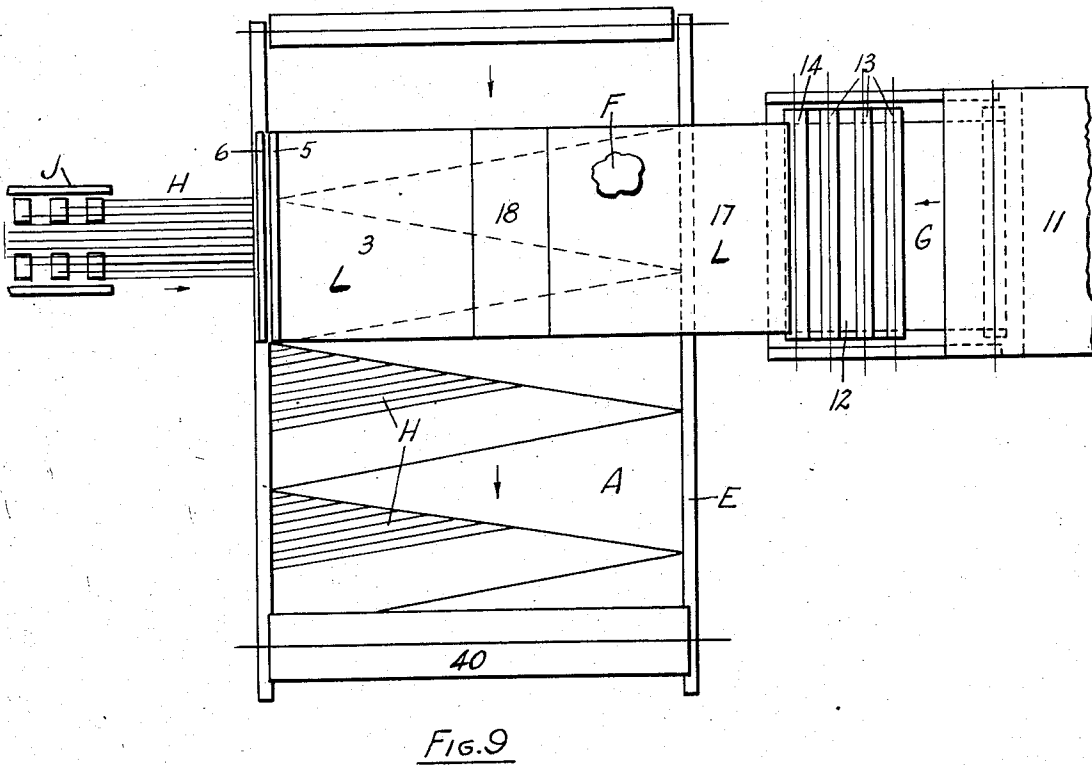
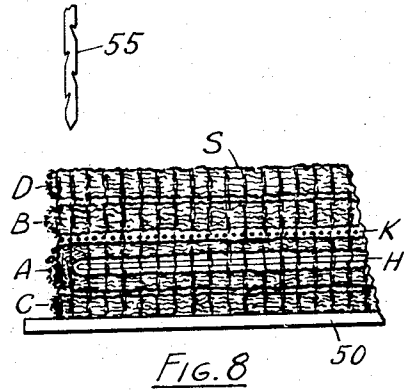
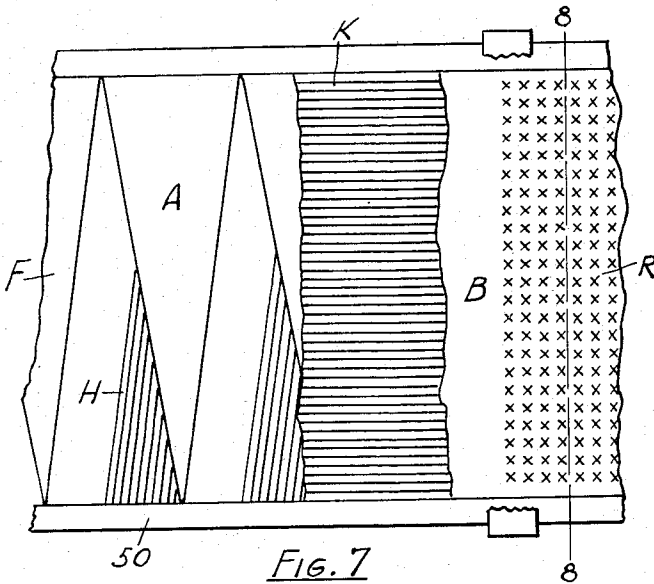
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2,381,184

REINFORCED TEXTILE FABRIC AND PROCESS OF MAKING

Filed Nov. 23, 1943

4 Sheets-Sheet 2



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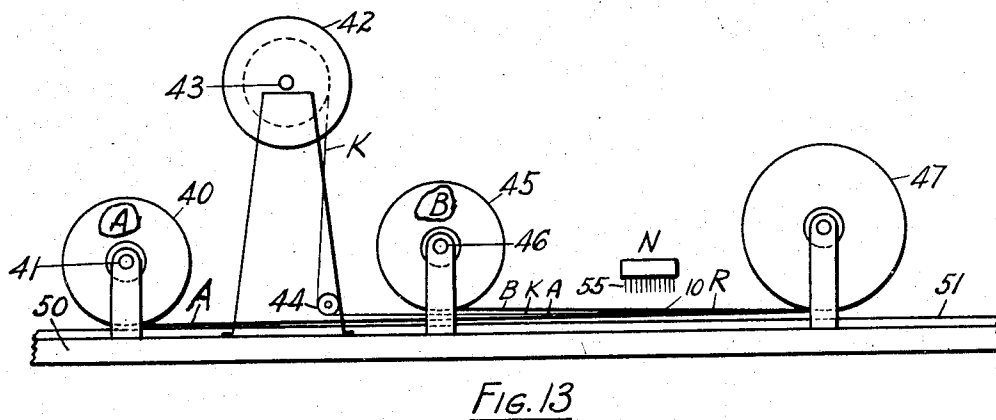
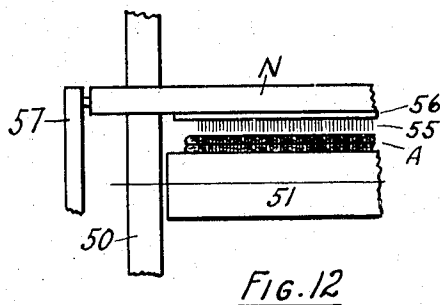
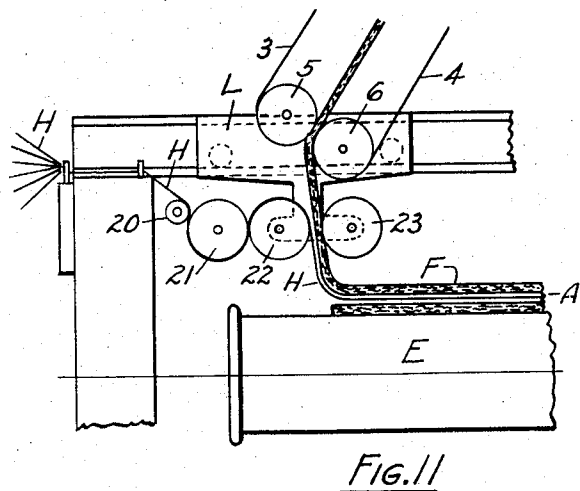
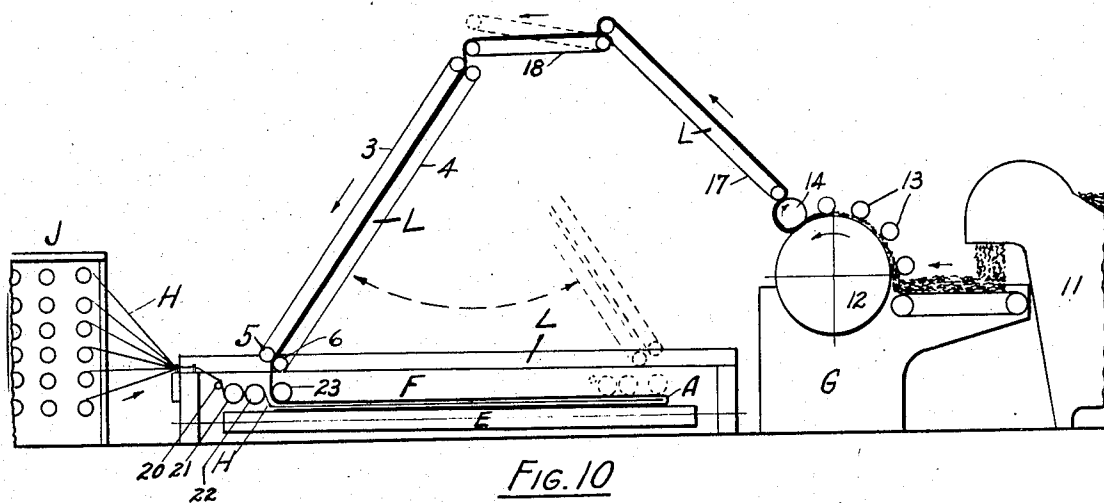
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2,381,184

REINFORCED TEXTILE FABRIC AND PROCESS OF MAKING

Filed Nov. 23, 1943

4 Sheets-Sheet 3



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2,381,184

REINFORCED TEXTILE FABRIC AND PROCESS OF MAKING

Filed Nov. 23, 1943

4 Sheets-Sheet 4

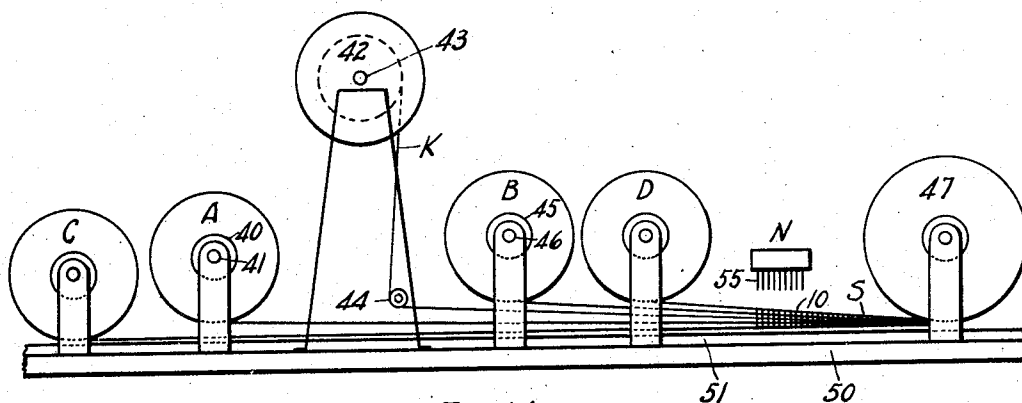


FIG. 14

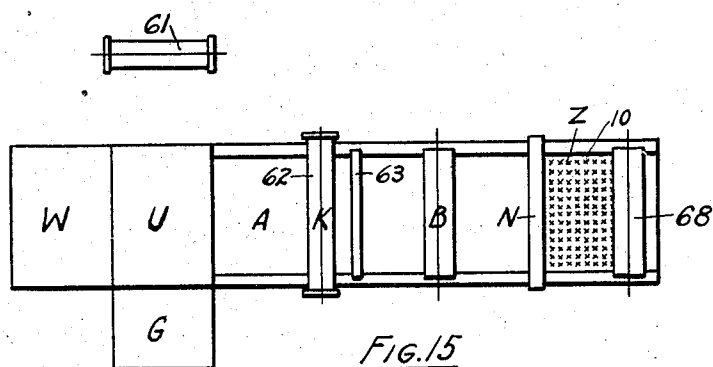


FIG. 15

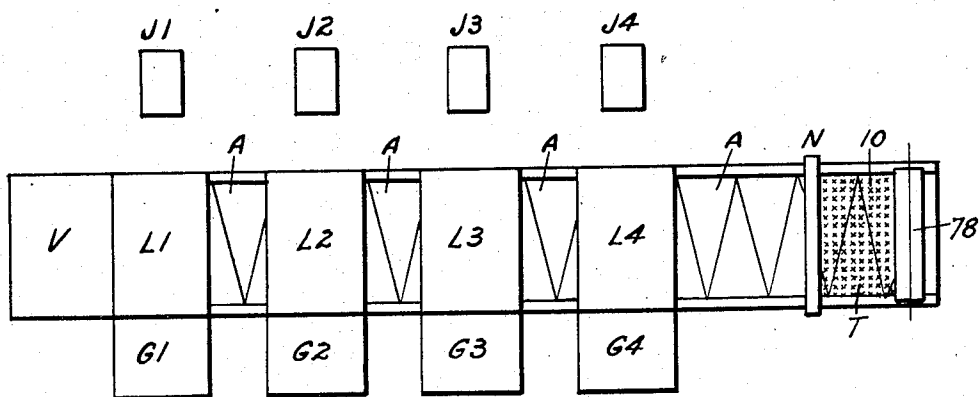


FIG. 16

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UNITED STATES PATENT OFFICE

2,381,184

REINFORCED TEXTILE FABRIC AND
PROCESS OF MAKINGGeorge K. Ripley, Troy, N. H., assignor to Troy
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Application November 23, 1943, Serial No. 511,422

4 Claims. (Cl. 28—72.2)

This invention has to do with the manufacture of fabrics and material made up of unspun textile fibres.

Basically in its simplest form it is a reinforced textile fabric made of a batt of textile fibers, usually formed by a carding machine into a sheet of substantially uniform thickness and evenness, folded back and forth on itself with a plurality of reinforcing threads which run parallel with the side edges of the batt or sheet. Preferably the fabric is passed through a needling machine to fasten it more firmly together but it may be held together by pressure or sizing, or by treating the threads with an adhesive.

In a needling machine, there is no shuttle and the resulting fabric is not woven by criss-crossing the warp threads with filling threads. As now made, there is usually a back bone or foundation layer of woven burlap or similar material in which the warp threads and the filling threads are interlaced while a sheet or batt of unspun fibres positioned above or below, or both above and below the burlap layers, is needled or forced in spots through and through so that the layers are locked together in a relatively homogeneous sheet.

By a textile fibre or material, I include whatever can be carded such as sisal, ramie, cotton, wool, asbestos, etc.

I am aware that similar sheets of unspun fibres have been reinforced by positioning relatively widely spaced threads lengthwise as in patent to Hawley, No. 340,667 of April 27, 1886, and I am aware that lateral threads or wires have been laid between two webs as shown in patent to Young of January 19, 1943, Patent No. 2,308,849. I am also familiar with the construction such as shown by J. Offermann and T. Jegler of November 20, 1883, No. 288,726, in which there are two or more woven layers, the threads of which are at various angles making a criss-cross effect.

Preferably my material or fabric is needled together in a manner similar to the showing of Rasch, Fibrous fabric, September 20, 1910, No. 970,950, on a needling machine which might be similar to one described by W. H. Wagner, Patent No. 1,326,236, of December 30, 1919, on Needling machine.

This invention is in the product, in the machines for making the product and in the process. The product is a fabric such as described above, or a material in which it is a part, made up of one or more layers of such fabric, or with one or more sheets of unspun fibres and, positioned between them, a plurality of longitudinal threads.

For clearness, the words "batt" or "sheet" of textile fibres mean what comes from a card; reinforced textile "fabric" means such a sheet, with threads parallel with its edges which reinforce it both folded back and forth in a zigzag manner; and laminated textile "material" means such a "fabric" combined with other layers of "sheets" or threads.

Some parts of the machines for producing the desired result are new and some are old.

The sheets of fibre which are used for the various layers are such as are or can be delivered from a carding machine preferably of the garnett type by which the fibres are spread out evenly. Each sheet may be relatively very thin or relatively thick, the thicker sheets being known as batts.

The foundation fabric is conveniently formed on and carried along by what might be called a longitudinal endless apron to a winding head which winds it up with criss-cross, diagonal reinforcing threads imbedded in it.

As a convenient way to make my product, I use what is known in the trade as a camel back lapper which delivers the sheet of fibres onto such apron from a garnett carding machine to which the unspun stock is fed by any of the well known feeds.

This garnett card is set on one side of the longitudinal feed apron and the delivery speed of the lapper is so proportioned as to be much faster than the speed of the longitudinal apron so that when the delivery rolls of the lapper move laterally across the longitudinal feed apron, this sheet or layer will be laid diagonally in a manner similar to the well known Scotch feed between the units of a set of woolen cards.

This sheet after it is laid forms a zig-zag pattern with more or less overlapping of the folds as desired.

On the side of the longitudinal apron opposite from the garnett card is a yarn creel which carries spools or bobbins for the desired number of reinforcing threads. These parallel threads are fed in between the delivery rolls of the moving delivery apron of the lapper and are therefore incorporated in and become substantially part of a zigzag lateral sheet of fibres. The width of the assembly of threads is less than the width or space between the edges of the zigzag or lateral sheet, and the width and number of threads may vary according to the final result desired.

The reinforced fabric thus formed with its imbedded threads can be used for some purposes without being rolled or folded. Preferably, its

folds and threads are needled together to form a stronger fabric or, without needling, it can be carried along by the longitudinal apron to a winding head which forms it successively into rolls on beams each of which can be removed to be used in a second step to make a laminated textile material, or the fabric may continue with other layers of sheet material and of threads in a single step process.

When two steps are used, the next step is to place a beam with a roll of this reinforced textile fabric on suitable bearings over the feed apron of a needling machine, with the end of the fabric resting on the feed apron or on a sheet of textile fibres which is not folded and not reinforced.

A beam carrying a plurality of longitudinal threads is then placed in bearings and its threads are guided between the reinforced fabric and a longitudinal sheet of textile fibres, the end of which rests on the reinforced fabric, and which is carried by a beam in suitable bearings. One or more longitudinal batts can be positioned on or under the reinforced fabric.

The longitudinal batt or batts, the reinforced fabric with reinforcing threads and the longitudinal threads are unrolled together by the feed apron of the needling machine and by a final wind up roll and are caused by them to pass under the multiple needles of the needling machine, the needles of which force the loops and fibres from the face of the top batt down into and if necessary through the bottom face of the bottom batt thus binding all the layers of the laminated material together.

The basic improvement which I have made and which I call the foundation fabric is a batt or sheet of textile fibres with a plurality of lateral threads both laid down in a zigzag pattern. It may or may not be needled in that condition or it can be used without needling or it may form one or more layers with other layers all needled together to form a laminated material.

Two or more re-inforced sheets, with or without needling, can be used.

Substantially all the drawings are diagrammatic because the thinness of the material and the merging together of the layers make it difficult to show anything in proportion.

As most of the machines shown are old, the drawings merely indicate their construction with the new parts if any shown more in detail. The drawings show the product, the process and the processes.

In the drawings,

Fig. 1 is a plan view of the reinforced fabric.

Fig. 2 is a similar view of the fabric after being needled.

Fig. 3 is a detail of a needle of a needling machine.

Fig. 4 is an isometric diagram showing the relation of the threads to the batt.

Fig. 5 is a plan view of a fabric slightly different from that shown in Fig. 1 and Fig. 6 of one slightly different from Fig. 2.

Fig. 7 is a plan view with parts broken away of one of my laminated textile materials.

Fig. 8 is a greatly exaggerated sectional view on line 8-8 of Fig. 7 of the material shown in Fig. 7 but with two extra sheets of fibre.

Fig. 9 is a plan view showing one arrangement of the machines employed.

Fig. 10 is a substantially diagrammatic elevation from the delivery end of the machines shown in Fig. 9 with the wind up roll omitted.

Fig. 11 is a detail of the feed rolls for the lateral threads.

Fig. 12 is a detail view showing part of a needling machine.

Fig. 13 is a side elevation showing diagrammatically the arrangement of the parts in the second process where the second process is used.

Fig. 14 is a view similar to Fig. 13 showing another arrangement and Figs. 15 and 16 are diagrammatic plan views showing other arrangements of the various machines to produce different results.

The first step or process in making my fabric A or the laminated material M in which it can be embodied is to provide a sheet or batt of textile fibres of uniform consistency and thickness. Such a sheet F is preferably made by a garnett card G or by a card of any other type.

The fibres may be dumped into a card feed 11 for a garnett card G of any well known type and when delivered by the card delivery means, they are carried up and along and then laid back and forth from side to side or laterally on a longitudinally moving apron. At the same time, a plurality of what I will call lateral threads are fed in with the lateral sheet to produce the fabric shown at A in Fig. 1 to Fig. 9.

As the slatted feed apron E moves longitudinally, the lateral sheet F is laid down in a zig-zag or diagonal course and the lateral threads H from a creel J are laid with it. Fig. 9.

1 represents one edge and 2 the other edge of sheet F. See Figs. 1, 4 and 5.

As shown in Figs. 1 and 4 these threads are laid on one face and as the fold comes back with that same face, the threads cross each other diagonally but do not interweave. The amount of crossing depends on the width of the sheet F, the speed of the longitudinal apron and the speed of laying laterally and also on the number and width of the plurality of threads H with reference to the width of lateral sheet F.

If this assembly was merely wound up on a beam such as 40 or if it was squeezed by pressure rolls, it would form what I believe to be a new fabric A which is useful for some purposes.

The threads H can be treated with some sort of adhesive or sizing or the whole formed fabric can be sized and will hold together and will be useful for some purposes.

I prefer to pass the fabric through or under the needles 55 of a needling machine N whereby loops and fibres 10 of the sheet and of the threads are forced perpendicularly from one face of the fabric into the body of the material thereby locking it together as shown in Fig. 2, at O.

While my fabric such as A might possibly be produced by hand or in some other way, I prefer to start with a garnett card indicated by G with a feed box 11 of the Bramwell type. This is of the weighing type and delivers to the garnett card G, which is shown as having a main cylinder 12, workers 13, and doffer 14. The stock is picked up from doffer 14 on its delivery apron 17 by a camel back lapper L of the type known in the trade as a camel back lapper.

The garnett card G and lapper L are positioned on one side of the longitudinal travelling receiving apron E at the end of which is a winding head and a wind up beam 40 to receive the compound fabric A. This apron E may be ten feet wide while the lapper delivery aprons 3, 4, may be five feet wide and the width of the collection of lateral threads H may be twenty-four inches. Figs. 9, 10, 11.

This lapper L includes an elevating spiked apron 17 which receives the stock from the doffer 14 of garnett card G and carries it up on to a secondary apron 18 which is so made that its delivery end can rise up and down to accommodate the back and forth movements of the delivery aprons 3 and 4 which travel over the delivery rolls 5 and 6 delivering the lateral sheet F from between them to the assembly of thread rolls 20, 21, 22, and 23 which unwind a plurality of threads H from a creel J, these threads being merged with and imbedded in lateral sheet F so that they are both laid across the delivery apron E and form the basic fabric A. Figs. 1, 2, 4, and 5.

As that apron E is moving at a relatively slow speed, this combination A of sheet F and threads H is laid diagonally as shown in Fig. 4. As there shown, the aprons 3, 4, and E are so timed that at the sides of the fabric sheet A there may be only two thicknesses but in Figs. 1 and 5, there are four thicknesses. The fabric sheet A is wound up on a beam 40 which can easily be removed.

The width of the assembly of threads H is shown as less than the width of the sheet F but there might be sufficient of these lateral threads to extend almost entirely across the lateral sheet F, as see Fig. 5, or the width of their assembly might be substantially less.

The second step of the process is as shown in Figs. 12, 13, and 14. These show a needling machine N with a frame 50 which is provided with a feed apron 51 driven by rollers 52 and 53. It has a battery of needles 55, 55, carried by a holder 56 reciprocated by an arm 57 in a manner similar to that shown in patent to Wagner, No. 1,326,236.

A beam 40 carrying the fabric sheet A is first partly unrolled and an end of the sheet is laid down on feed apron 51, the beam being carried by suitable bearings 41 on frame 50. Next a beam 42 carrying a plurality of longitudinal threads K is placed behind suitable bearings 43 the threads K going under a guide 44. Then a beam 45 with a longitudinal sheet or batt B of evenly spread fibre is placed behind suitable bearings 46 and the end of batt B is placed on threads H and on fabric sheet A.

This is shown in Fig. 13 and the materials are shown in Fig. 7.

The fabric A and longitudinal threads K and longitudinal sheet B are carried under the needle members 55 of the needling machine N and to the wind up roll 47 so that there will be, as shown, first the fabric sheet A, then the longitudinal threads K and then the longitudinal sheet B.

As these pass under the needles of the needle loom, the needles are driven into or through the whole or part of the layers thus holding the whole fabric together by forcing loops and fibres 10, 10, of the material and some of the threads vertically, or at right angles to the top or bottom face of the material, into the body of the material thereby locking or tying it together as laminated textile material R.

The basic fabric A is made up of the zig-zag lateral sheet F with threads H as shown in Figs. 1, 4 and 5 and I claim this as new.

However, I find it advantageous to use various additions to and combinations with this basic fabric sheet.

In Fig. 2 at the left of the needling machine N is shown a single fabric sheet A which at the right after needling is indicated by O.

Fig. 5 shows a variation in the assembling of

lateral sheet F and threads H but forming a similar basic sheet A.

Fig. 6 shows two sheets of fabric A¹, A², which after passing the needling machine N are needled together to form the laminated material P.

Fig. 7 shows a laminated material R made up of a fabric sheet A with the threads H and lateral sheet F, then longitudinal threads K and a batt B, the whole being needled together as indicated to form R.

In Fig. 8, the laminated material S is made up of a bottom sheet or batt C, then the fabric sheet A, then longitudinal threads K, then a sheet B and then a top sheet D. These are all needled together forming the laminated material S.

As indicated in Fig. 16, four sets of fabric A may be laid one on top of the other by a battery of lappers and these can pass through the needling machine N to form a laminated material T. In this case the four garnett cards G¹, G², G³, G⁴ are set in a row with their lappers L¹, L², L³, L⁴ on one side of an apron V and four creels J¹, J², J³, J⁴ are set in a row on the opposite side of apron V. The four layers of sheet fabric and lateral threads are carried along through a needling machine N and become the laminated material T and are wound up on any suitable wind up roll or beam 78.

As shown in Fig. 15, the two processes of combining and making laminated material such as P, R, S, or T with longitudinal threads such as K as well as lateral threads such as H can be made continuous by connecting up the garnett, lapper and creel of the first process with the needling machine of the second.

The feed apron such as E can be combined as W with the feed apron 51 of the needling machine N or it may deliver to that apron. One or more garnett cards such as G each with its lapper U and in place of a creel, such as J, any other device for supplying parallel longitudinal threads such as a warp beam or back beam 61 can be positioned on each side of an apron such as W and its fabric A can pass under the beam 62 for the threads K and under any suitable guide 63 and can go along with a sheet such as B, or with more similar sheets, all going continuously through the needling machine N and being wound up on any suitable wind up roll or beam 68 as a fabric Z.

Instead of the arrangement shown in Fig. 15, I can of course omit some of the threads so that there may be one or more layers such as A including the lateral threads while other layers are folded diagonally without the threads, or there may be numerous other combinations of foundations sheets like A forming part of a laminated material including straight longitudinal batts and one or more sets of longitudinal threads. In fact the number of combinations is very large.

I claim as the basis of all these the zigzag batt or sheet laid with the lateral thread whether needled or not needled.

Instead of a lapper of the type shown at L known as the camel back, a lapper such as shown at U in Fig. 15, known in the trade as a "Blamire" can be used, or one known as a "stationary" lapper. In every case one lap is or several laps running side by side are carried and laid across a feed apron such as E or 50 and the lateral threads can be fed in any convenient way provided they go along with and on one face of a sheet of fibre.

It is obvious also that any of the fabrics such as indicated not only by A but by P, R, or S can be used with the needling omitted because the nature of the unspun stock used may be such that

the sheets will cling together. For many purposes a mass of laminated material will hold together without needling.

In speaking of an unspun textile material, it is usually such a material as is delivered from a card or carding machine in the form of a flat sheet but such a sheet may be of greater or less thickness and it might be produced by some machine other than what we know as a card or a garnett card.

I claim:

1. A laminated textile material made up of a flat reinforced textile fabric having a top face, a bottom face, ends and substantially parallel sides made of unspun textile fibres and a plurality of lateral threads, comprising a lateral sheet of unspun textile fibres folded diagonally back and forth between the sides of the fabric and a plurality of lateral threads substantially parallel with the edges of and positioned on one face of said sheet; a plurality of longitudinal threads which do not penetrate and which are parallel with the sides of and which rest on one face of said fabric; and a longitudinal sheet of unspun textile fibres extending between the sides of the fabric and over said longitudinal threads.

2. A laminated textile material made up of a flat reinforced textile fabric having a top face, a bottom face, ends and substantially parallel sides made of unspun textile fibres and a plurality of lateral threads, comprising a lateral sheet of unspun textile fibres folded diagonally back and forth between the sides of the fabric and a plurality of lateral threads substantially parallel with the edges of and positioned on one face of said sheet; a plurality of longitudinal threads which do not penetrate and which are parallel with the sides of and which rest on one face of

said fabric; and a longitudinal sheet of unspun textile fibres extending between the sides of the fabric and over said longitudinal threads, the material embodying in its structure loops and fibres of said sheets and of threads carried vertically from a face of the material into the body of the material.

3. The method of making a laminated textile material, having a top face, a bottom face, ends and substantially parallel sides which consists of folding a sheet of unspun textile fibres diagonally back and forth laterally together with a plurality of lateral threads which are parallel with the edges of the folds of said sheet; of laying a plurality of longitudinal threads on one face of said fabric together with a longitudinal sheet of similar material and of forcing loops and fibres of the material and of the threads perpendicularly from one face into the body of the material.

4. A laminated textile material made up of a flat reinforced textile fabric having a top face, a bottom face, ends and substantially parallel sides made of unspun textile fibres and a plurality of lateral threads, comprising a lateral sheet of unspun textile fibres folded diagonally back and forth between the sides of the fabric and a plurality of lateral threads substantially parallel with the edges of and positioned on one face of said sheet; a plurality of longitudinal threads which do not penetrate and which are parallel with the sides of and which rest on one face of said fabric; and a longitudinal sheet of unspun textile fibres extending between the sides of the fabric and over said longitudinal threads; and other means to hold together the reinforced textile fabric and the longitudinal sheet with the longitudinal threads between them.

GEORGE K. RIPLEY.