WEAVING AND PATTERN DRAFTING

by

K. GRASETT

Volume 3

Fourth Impression
with additional illustrations and matter

THE LONDON SCHOOL OF WEAVING
&
KENSINGTON WEAVERS (ASSOCIATED)
136 Kensington Church Street, London, W.8

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WARP MAKING, SETTING-UP A LOOM WEAVING, FINISHING OR WAULKING AND PATTERN DRAFTING

ILLUSTRATED

by

K. GRASETT

Volume 3

PARTS VI, VII, VIII, IX & X

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FOREWORD

In the preceding two volumes it has been explained how to scour, card and spin a soft, pliable, and serviceable thread, and dye it a beautiful colour.

In Volume III will be taught how to weave up this thread into a good, plain, or patterned material.

A simple floor loom with six treadles will be used.

The most useful sized loom are those which weave 34, 38 and 42 inches wide material, and which only take up about six inches extra in floor space. These looms can be taken to pieces in ten minutes, and set up in working order in a quarter of an hour. Nevertheless, they are absolutely rigid and true when in work, which is so necessary if perfect weaving is to be produced.

The stoutest homespun, the finest gossamer rainbow silk, pliable linen or charming cotton and lustre materials can be woven equally well on these little looms. Also pile rugs and reversible carpets. Using all six treadles, over a hundred patterns can be worked out with a minimum of trouble.

The charm of weaving is that either a beautiful, simple cloth, using two treadles only (which a child can weave) can be produced, or an intricate pattern which taxes the ingenuity of an old-time weaver.

And the most ignorant could never confuse a hand-woven length with a machine-woven cloth, the pliability, the appearance, and the texture being so utterly different.

One of the greatest essentials in weaving is great accuracy. Without this no one can become a really good and proficient weaver. However beautiful the colour and texture may be, the handwoven length is quite spoiled if there are faults and

inaccuracies to be seen running through it. So to avoid this be careful from the very beginning, as often mistakes cannot be rectified, and even when they can be, it generally means a great loss of time and waste labour. If the skeins are wound loosely, and unevenly on to the bobbins, the warper will find it difficult to make a good warp, so that the threads should be exactly the same tension and without breaks. And again if the threads of the warp are of irregular lengths when taken off the warping mill, the weaver will find it very difficult to turn on the warp evenly on to the warp roller. And no weaver, however proficient and however experienced, can produce a good piece of handwoven material unless the loom is perfectly set up. The warp must be rolled on without breaks, and with a perfectly even tension, and unless this is done imperfect weaving is the result. When a weaver sits down to weave off a length there are two reasons why it is essential that the loom should be perfectly adjusted. First, for pleasure, and secondly from a business point of view. It is no pleasure, but on the contrary, extremely irritating to have to be continually jumping up off the weaving stool either to mend a broken thread, or to adjust something in order to get a clear opening for the shuttle to pass through, and unless every thread is in its exact place, and all the threads exactly the same tension, this is the result. From a business point of view it is even worse, as the waste of time is enormous. At the end of the day instead of several yards of perfect weaving, one or two yards only of badly woven material is the result. So, to recapitulate : take the greatest care from the very beginning ; be sure that every cord on the loom is perfectly adjusted, and that every thread is in its exact position, and of precisely even tension. If there are 20,000 threads in the warp every single one of these threads has its exact place and no other. If placed wrongly, even one thread will soon be the means of breaking other threads, besides marking the material that is to be woven. But if everything is in order, the weaver can rest assured that by the end of the day a nice length of homespun linen, or silk, as the case may be, will be the result with no delays or irritating intervals of adjustments, or of seeking and mending broken threads.

WINDING THE YARN FROM A RICE

Now, to begin at the beginning, take a hand or skein of cotton, or wool, give it a careful shake, and slip it on to the rice (*Fig.* 1). A rice is an upright stand holding two revolving wheels on which the skeins are hung. The two revolving wheels can be adjusted according to the size of the skeins. Be very careful in putting the hank or skein on to the rice, or it will become entangled and refuse to run properly. If a hank, this can be divided up into several skeins which is then much easier to manage, as there is not so much on the rice, and therefore the two rollers revolve very much more lightly and quickly. Every hank is encircled by a loose thread, this can be cut, and it will then come off and can be thrown away, but be sure before doing this that there is no thread belonging to any of the skeins running across it. All must be quite clear. When this is done the skeins will separate of themselves if revolved on the rice. Remove all but one skein. Revolve the remaining skein several times so as to separate the threads as much as possible. Find the knot where the two ends are tied together, cut this very carefully, as if any extra threads are cut it will be very difficult to unwind, or run off the skein. Then see which of the two ends runs the easiest—the one that comes from under the skein, or the one that comes over the top of the skein.

THE WARPING MILL

There are many ways of making a warp, but the principle is always the same. A warping frame, or board can be used instead of a mill. This is a much slower method, and only short lengths can be made on it. Instead of the mill revolving and making the length itself, while the warper just guides the two threads, in the case of a board or frame, the person who is making the warp has to walk backwards and forwards, making the length by passing the threads over and round the various pegs on the warping frame.

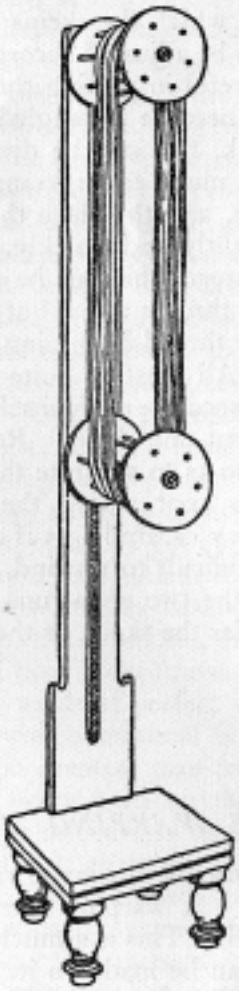
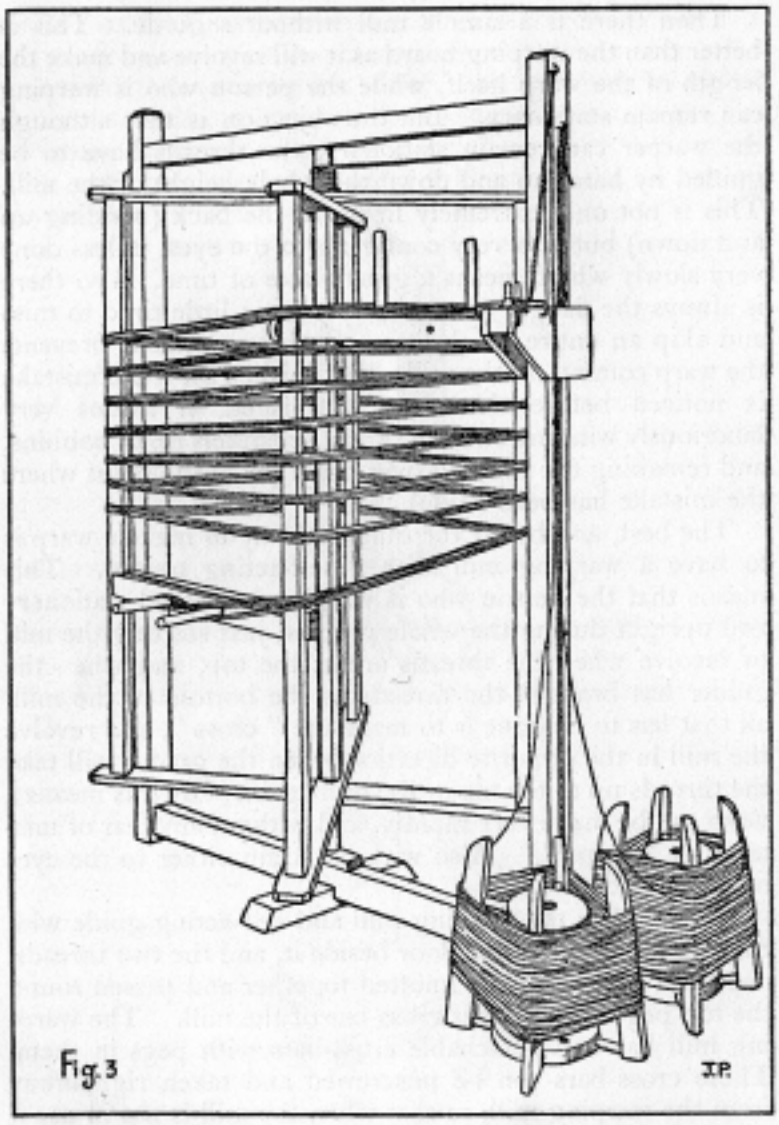


Fig. 1

Then there is a simple mill without a guide. This is better than the warping board as it will revolve and make the length of the warp itself, while the person who is warping can remain stationary. But the objection is that although the warper can remain stationary, the threads have to be guided by hand up and down the whole height of the mill. This is not only extremely tiring to the back (bending up and down) but also very confusing to the eyes, unless done very slowly which means a great waste of time. Also there is always the danger when the eyes get a little tired to miss and skip an entire revolution. Such an accident prevents the warp coming off the mill when finished or, if the mistake is noticed before the warp is finished, it means very laboriously winding off each thread separately on to bobbins, and remaking the warp all over again (from the point where the mistake has been made).

The best, and by far the quickest, way to make a warp is to have a warping mill with a self-acting guider. This means that the person who is warping can stand stationary and upright during the whole process, just starting the mill to revolve when the threads are at the top, and when the guider has brought the threads to the bottom of the mill, all that has to be done is to make the " cross ", and revolve the mill in the opposite direction when the guider will take the threads up to the top of the mill again. By this means a warp can be made very rapidly, and without any fear of mistakes or " skips ". Also with no strain either to the eyes or to the back.

Fig. 3. See the warping mill and self-acting guide with the two bobbinas on the floor beside it, and the two threads, one from each bobbina, knotted together and passed round the top peg on the upper cross-bar of the mill. The warping mill has two detachable cross-bars with pegs in them. These cross-bars can be unscrewed and taken right away from the warping mill, so that when the mill is not in use it can be closed up similar to a clothes-horse (therefore taking up very little space). The two cross-bars are different, and attached to the mill at different angles. The upper cross-bar on the mill on which the warp is started has two pegs standing up vertically, but the lower cross-bar has its two



pegs placed horizontally. The lower cross-bar is a very important part of the warping mill as it is not only the part where the length of the warp terminates, but also on which the " cross " of the warp is made. The " cross " of a warp

is very important, as by it the threads are kept in perfect order, and each couple of threads can be separated from the rest in proper rotation. If the wrong couple are taken, it will not be possible to divide them from the other threads on the warp, but if the right couple are pulled they will separate themselves and come away from the rest without any difficulty whatever. This is necessary as it enables the threads to be counted without difficulty while warping.

THE WARP

The length and number of threads to be warped

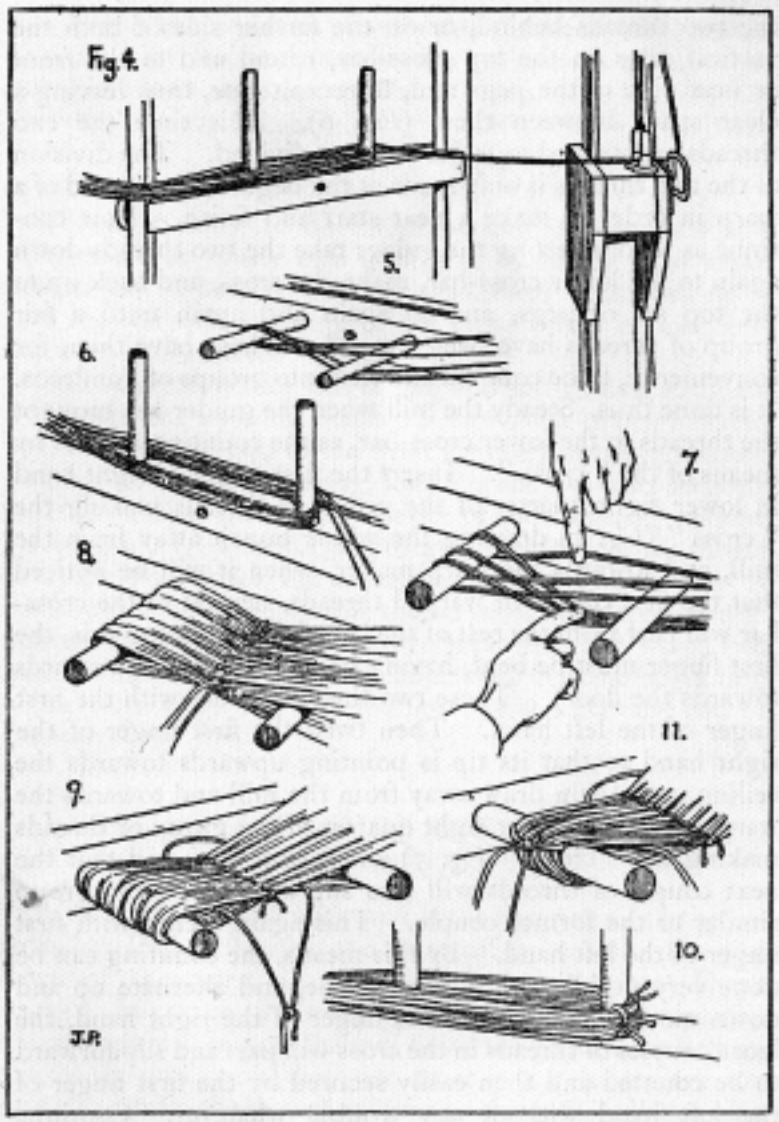
When the length of the material to be woven has been decided on, a good extra yard must be allowed for shrinkage and " waste " on the loom. If longer than five yards, or the yarn (like wool) very elastic, it is safer to add an extra yard to every additional five yards. After the length comes the width. First the width of the material to be woven, say twenty-seven inches wide, then an allowance of three inches for shrinkage, which brings it up to thirty inches wide. Now comes the important consideration of how many threads there are to be to the inch. This of course depends on the texture of the material to be woven. If a fine silk, about fifty threads to the inch, or a loose homespun about sixteen. We will choose a medium-sized cotton which requires twenty-five threads to each inch. Multiply the number of threads to the inch by the width of the material to be woven, and we get the correct number of threads to be warped, *i.e.* seven-hundred-and-fifty threads. A warp nine yards long and containing seven-hundred-and-fifty threads has to be made. First the length has to be made out on the mill. This is done by means of the cross-bar before mentioned. The top cross-bar can be fixed between any of the ribs of the mill at a reasonable height, as the warp to be made is not a long one, but there has to be a calculation before it can be decided between which ribs the lower cross-bar can be placed. The warping mill measures three yards in circumference, so in order to make the warp a nine-yard length, the warp threads have to be taken round the entire mill three times. When this has been achieved

fix the lower cross-bar there firmly with the two pegs pointing directly towards the warp-maker, while the upper cross-bar should have been so placed that the pegs on it are standing vertically (*Fig.* 3). It is round these two pegs that the warp is started.

Now revolve the mill until the self-acting guider belonging to it, is exactly level with the upper cross-bar. It is important that the bases of both should be of even height in order that the two threads can lie flat on each while being warped.

Knot together the threads from the two bobbinas placed on the ground conveniently near, and exactly opposite the self-acting guide of the warping mill, and pass them under the wire and between the two little revolving reels on the guide, and so on to the right-hand peg of the cross-bar. Divide the two threads to that each one comes on either side (right and left) of the two pegs (*Fig.* 4) leaving a clear space between them. Then while the right hand of the warp maker holds the threads directly above the bobbinas, and on a level with the guider, let the left hand revolve the mill to the right, and continue so doing until the lower cross-bar is reached. When this is done stop the mill and keep it steady with either foot or knee. Now comes the making of the "cross". This must be done with great care and exactitude, as by means of the "cross" the amount of threads in the warp are counted, and also by the same means the warp is rolled on to the loom evenly, each group of four threads having its exact place and no other.

The warp-maker is warping with two threads at a time which the guide has brought down to the lower cross-bar While the right hand is still holding the two threads taut, and the knee or foot is keeping the mill steady, the left hand is free to take hold of the two threads and pass them over the right-hand, or first peg on the cross-bar, under and over the second peg and under the first peg, thus making the cross (*Fig.* 5). By this means there is a group of four threads divided in twos. Thus the first length of nine yards, containing four threads towards the width of thirty inches has been accomplished. Now start the mill going again, but instead of revolving it to the right as when starting,



revolve it in the opposite direction, *i.e.* to the left, holding the two threads quite taut as before. When the guider has brought the threads up again to the top cross-bar let the knee or foot again steady the mill while the left hand puts

the two threads behind, or on the farther side of both the vertical pegs on the top cross-bar, round and to the front or near side of the pegs and, to recapitulate, thus leaving a clear space between them (*Fig.* 6). This time the two threads are warped together and not divided. The division of the two threads is only made at the beginning and end of a warp in order to make a neat start and finish. Now continue as before, letting the guider take the two threads down again to the lower cross-bar, make the cross, and back up to the top set of pegs, and so again and again until a fair group of threads have been warped. These have then, for convenience, to be counted and tied into groups of hundreds. It is done thus. Steady the mill when the guider has brought the threads to the lower cross-bar, as the counting is done by means of the " cross ". Insert the first finger of right hand in lower right quarter of the group of threads making the " cross " (*Fig.* 7) drawing the whole bunch away from the mill, and towards the warp maker, when it will be noticed that the first couple of warped threads, nearest to the cross-bar will part from the rest of the bunch (when doing this, the first finger must be bent, having its tip pointing downwards towards the floor). These two threads secure with the first finger of the left hand. Then twist the first finger of the right hand so that its tip is pointing upwards towards the ceiling, and again draw away from the mill and towards the warp maker the upper right quarter of the group of threads making the " cross " (*Fig.* 7) and it will be found that the next couple of threads will also slip apart from the group similar to the former couple. This again secure with first finger of the left hand. By this means, the counting can be done very rapidly, as by the pressue, and alternate up and down motion of the bent first finger of the right hand, the loose couples of threads in the cross will part and slip forward to be counted and then easily secured by the first finger of the left hand without any trouble whatever. Continue doing this until one-hundred threads have been counted which then tie in a group with a different coloured thread from that of the warp so that it can be detected easily. Have long enough ends to this same length of thread, as remember, seven more groups have thus to be counted and

tied, as the warp consists of seven-hundred-and-fifty threads (*Fig.* 8). By this means it is easy to see at a glance how many hundreds a warp contains.

SECURING THE "CROSS"

The next thing to do after counting the threads and tying these up neatly into groups of hundreds is to make sure of the "cross". Until this is done, it is impossible to take the warp off the mill, or the cross would be lost, and the warp made useless.

Take a piece of thin, but strong and soft thread, and pass it through the opening marked A alongside the right-hand peg, to the back, and to the front again by opening marked B alongside the left-hand peg, knotting the two ends securely together so that there is no chance of their coming undone Looking at *Fig.* 9 it will be observed that the tie-up thread completely encircles the cross, so that when the warp is withdrawn from the pegs this thread takes their place, and so makes the cross secure. Before removing the warp, two more tie-ups have to be made, one at the extreme beginning of the warp (*Fig.* 10), and the other at the extreme end of the warp (*Fig.* 11).

TAKING THE WARP OFF THE MILL AND "CHAINING" IT

After the warp is securely tied at the first peg on the upper cross-bar (*Fig.* 10), push the warp off it, and slip the end loops of the warp on to the right-hand wrist. Don't slacken, but keep the warp quite taut, as otherwise the entire warp will slip off the mill on to the ground (as before, steady the mill with the knee or it is apt to revolve too quickly while the warp is being chained). When the right hand has been slipped through the loop, and the end of the warp (the loop) is lying on the right wrist, let the right-hand fingers grasp the warp a little farther on, and draw a little of the warp through the loop lying on the wrist. The left hand pulls each new loop over the right hand.

Continue to make this chain to the end of the warp when secure carefully, so that the chain does not come unchained until desired. To make the chain is really crocheting with the hand, the right hand acting the part of the crochet hook. (*Fig.* 12).

COLOURED STRIPES IN A WARP

If coloured stripes in a warp are desired, the coloured threads are joined by knotting at either of the extreme end pegs of the cross-bars. Work out first how the stripes are to be placed. For instance to introduce a small red striped border into the warp just made. A stripe an inch wide means using twenty-five threads for it, as the material is to be woven in a twenty-five-to-the-inch reed. Twelve threads for half-an-inch, and six threads for a quarter-inch stripe. Therefore, warp first thirty-eight white threads (1½ inches) ; six red threads (¼ inch) ; twelve white (½ inch) ; twenty-six red (1 inch) ; twelve white (½ inch) ; six red (¼ inch) ; five-hundred-and-fifty white threads for the centre, and starting for a similar border at the other side with the six red ; twelve white ; twenty-six red ; twelve white ; six red ; and finishing with the thirty-eight white threads the same as at the beginning of the warp.

THE WARPING FRAME

As explained elsewhere, the warping frame is an alternative for a warping mill. The method of warping is exactly the same, though warping on the frame is a much longer business than warping on a mill, and also on the frame it is much more difficult to keep the same even tension of threads.

Only short warps can be made on a frame.

However it has the great advantage of taking up very little space, and a frame can either be hung on a wall, or placed on a table or just leaned against anything firm.

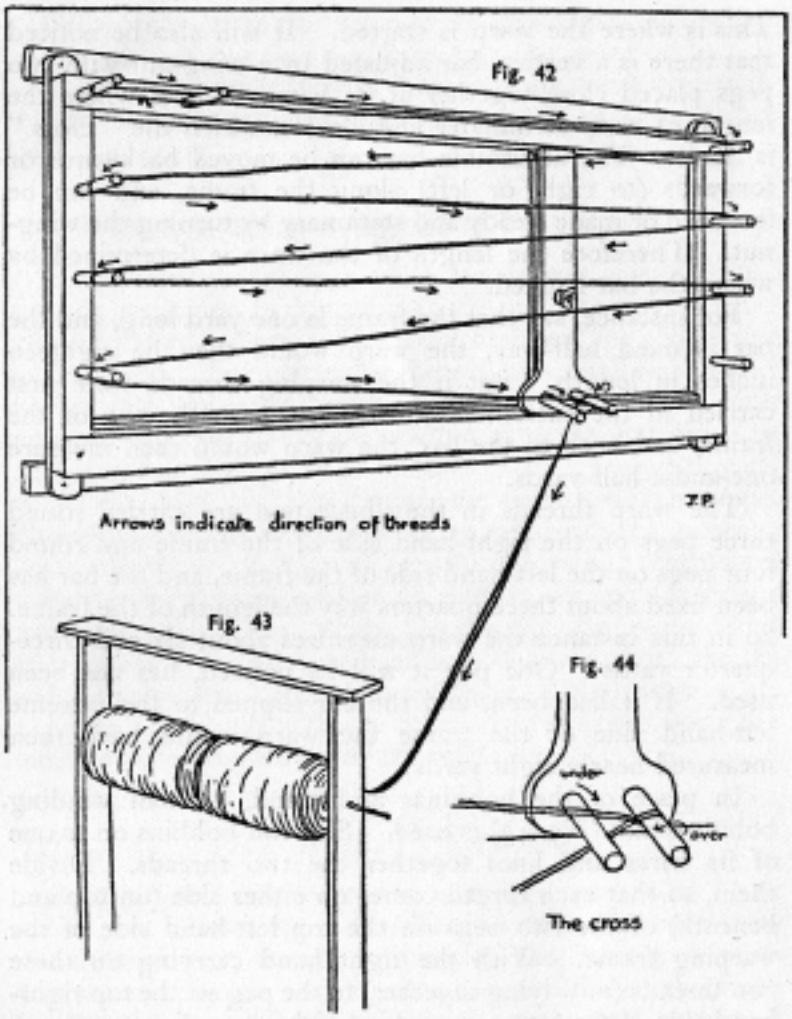
On examining the illustration of the warping frame (*Fig.* 42) it will be observed that on the extreme top of the left-hand side of the frame there are two pegs close together.

This is where the warp is started. It will also be noticed that there is a vertical bar adjusted by a wing-nut with two pegs placed close together at its base. This is where the length of warp terminates and also on which the " cross " is made. The adjustable bar can be moved backwards or forwards (to right or left) along the frame, and can be loosened or made steady and stationary by turning the wing-nut. Therefore the length of the warp is determined by where the bar is fixed.

For instance, say that the frame is one yard long, and the bar is fixed half-way, the warp would then be eighteen inches in length. But if the warping threads were first carried to the extreme right-hand peg on the top of the frame, and back to the bar, the warp would then measure one-and-a-half yards.

The warp threads in the illustration are carried round three pegs on the right-hand side of the frame and round four pegs on the left-hand side of the frame, and the bar has been fixed about three-quarters way the length of the frame. So in this instance the warp measures about six and three-quarter yards. One peg it will be noticed, has not been used. If it had been, and the bar slipped to the extreme left-hand side of the frame the warp would have then measured nearly eight yards.

In place of the bobbinas and stand, a small winding bobbin-stand (*Fig.* 43) is used. Slip two bobbins on to one of its wires and knot together the two threads. Divide them, so that each thread comes on either side (on top and beneath) of the two pegs on the top left-hand side of the warping frame. With the right hand carrying on these two threads (now lying together) to the peg on the top right-hand side of the frame, round it and back to the second peg on the left-hand side of the frame, and so on backwards and forwards until the two pegs at the base of the vertical bar are reached. On these two pegs the " cross " (*Fig.* 44) has to be made. Do this with great care. Pass the two threads over the first, or nearest of the two pegs, under, round, and over the second peg and back under the first peg thus making the cross. When this is done pass the two threads back to the lowest peg on the left-hand side of the warping



frame, round it, and up to the lower peg on the right-hand side of the frame, back to the left again covering the same ground as when starting, only doing in the opposite direction *i.e.*, up instead of down.

When the two top starting pegs are reached, carry together the two threads that are being warped under the two pegs, round number one peg, over it, and also over number

two peg, so that the warp threads are divided and that there is a clear space between the two pegs. See page 19, (*Figs.* 4 and 6).

In the case of the mill the pegs are vertical instead of horizontal, but the warp threads are carried round in exactly the same manner.

When this is done continue warping as before until the number of threads desired has been warped. Then count the threads and tie up in exactly the same manner as explained on pages 16 to 19. Take off the warp and chain it as directed on pages 20 and 21.

THE LOOM

Its different parts

Before the beaming, or turning-on of the warp, it will be better first to be sure of the names of each part of the loom.

1 Warp roller, or beam
2 Cloth roller, or beam
3 Frame
4 Batten
5 Reed, or sley
6 Jacks, or headle horses
7 Lamms, or headle sticks
8 Headles
9 Breast beam, or front bar
10 Back beam, or back bar
11 Treadles
12 Pulley bar, or top cross-bar.

This loom, as can be seen by the illustration (*Fig.* 13), is very simple in construction. It consists of two frames, and the cross pieces, which are simply fitted into the frames either by means of sockets, or wedges. Each crosspiece is either numbered or lettered at right angles to where it is to be fitted, so that the setting up of the loom can be accomplished without any difficulty whatever. Nevertheless it stands rigid when complete which is absolutely necessary if

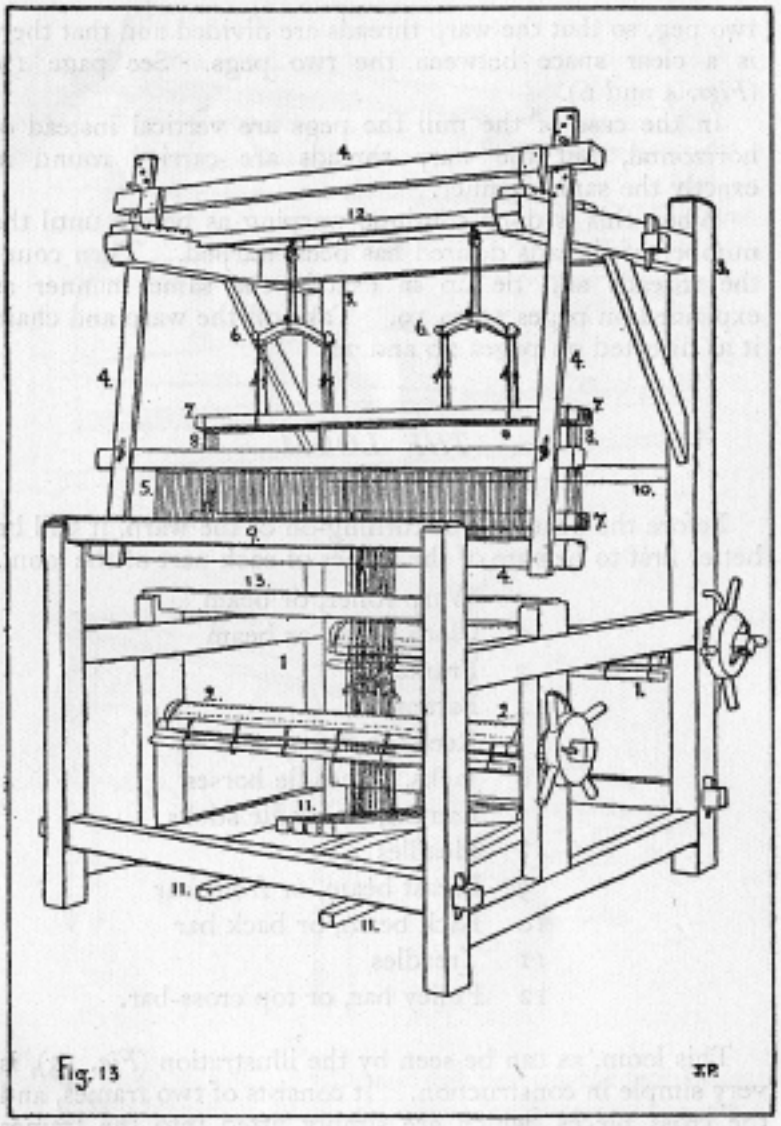


Fig. 13

good materials are to woven thereon. The loom can be taken to pieces in ten minutes, and set up again in fifteen, which is very convenient for exhibition purposes when the woven piece is already started on it.

BEAMING, OR TURNING ON

This has to be done with the greatest care and exactitude ; no matter how experienced the weaver, a perfect piece of material cannot be produced unless the warp is rolled on perfectly evenly, all threads exactly the same tension, and the threads coming singly, and direct from warp roller to cloth roller, not a single thread interlaced, or twisted round another.

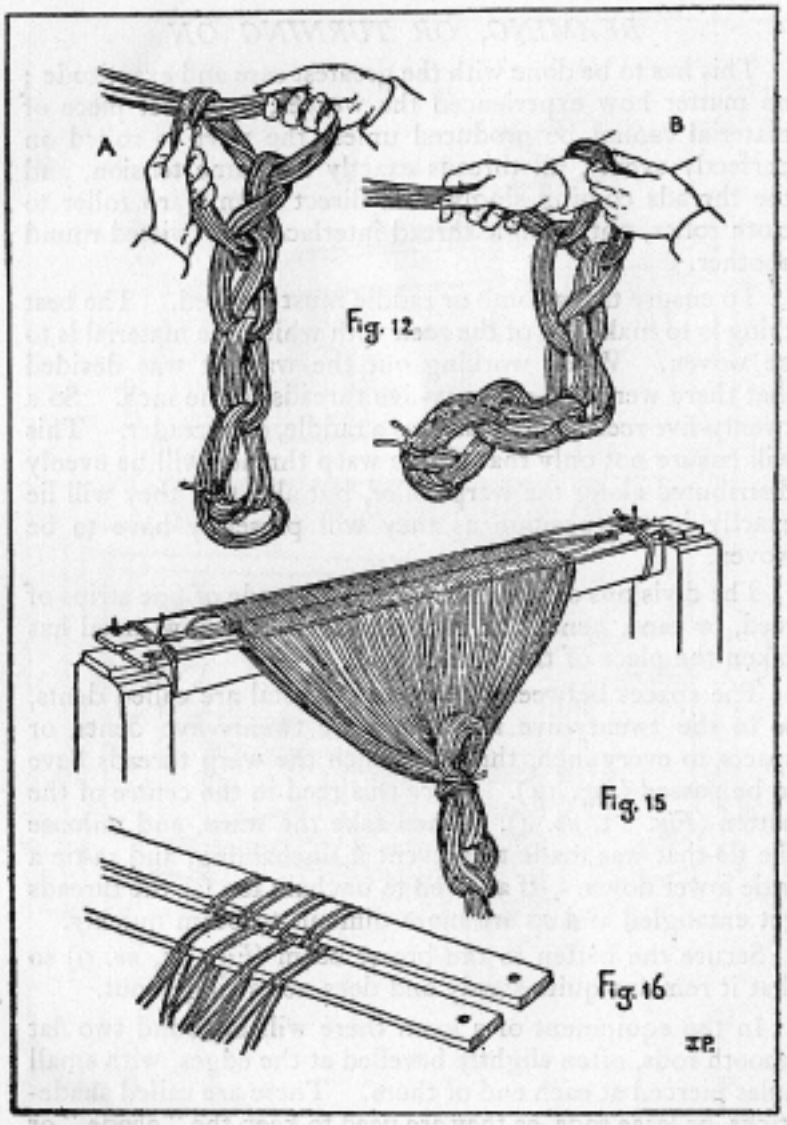
To ensure this a comb or raddle must be used. The best thing is to make use of the reed with which the material is to be woven. When working out the warp it was decided that there were to be twenty-five threads to the inch. So a twenty-five reed shall be used as a raddle, or spreader. This will ensure not only that all the warp threads will be evenly distributed along the warp roller, but also that they will lie exactly in the position as they will presently have to be woven.

The divisions of the reed used to be made of fine strips of reed, or cane, hence the name reed, though now metal has taken the place of the reed strips.

The spaces between the strips of metal are called dents, so in the twenty-five reed there are twenty-five dents, or spaces to every inch, through which the warp threads have to be passed (*Fig.* 14). Place this reed in the centre of the batten (*Fig.* 13, *no.* 4). Then take the warp, and unloose the tie that was made to prevent it unchaining, and re-tie a little lower down. If allowed to unchain too far the threads get entangled and so are more difficult to beam quickly.

Secure the batten to the breast beam (*Fig.* 13, *no.* 9) so that it remains quite steady and does not swing about.

In the equipment of a loom there will be found two flat smooth rods, often slightly bevelled at the edges, with small holes pierced at each end of them. These are called shade-sticks, or lease rods, as they are used to keep the " shade " or " cross " secure. It will be remembered that before taking the warp off the mill the cross was secured by a piece of thread (*Fig.* 9). When turning-on the warp, it will be necessary to spread it out thirty inches on the roller. To do this the thread securing the cross (and also those tying up



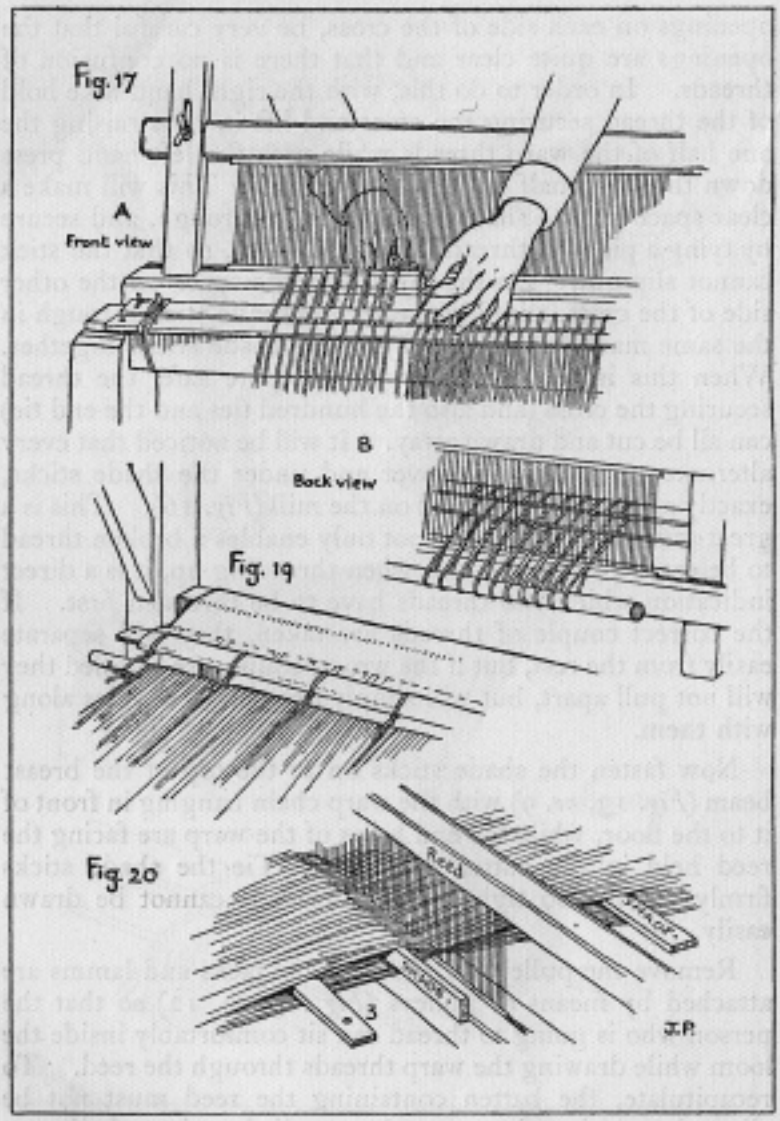
the hundred groups, and the loop at the end) will have to be cut. But the cross must not be lost, so in order to keep it safely, the shade sticks will have to take the place of the thread (*Fig.* 15). When slipping the shade sticks into the

openings on each side of the cross, be very careful that the openings are quite clear and that there is no confusion of threads. In order to do this, with the right hand take hold of the thread securing the cross and lift it, thus raising the one half of the warp threads while with the left hand press down the other half of the warp threads. This will make a clear space for the shade stick. Put it through, and secure by tying a piece of thread from end to end, so that the stick cannot slip out. Do the same with the space on the other side of the cross, slipping the second shade stick through in the same manner. Then tie the two shade sticks together. When this is done and everything quite safe, the thread securing the cross (and also the hundred ties and the end tie) can all be cut and drawn away. It will be noticed that every alternate two threads go over and under the shade sticks, exactly as they were warped on the mill (*Fig.* 16). This is a great guide and help, as it not only enables a broken thread to be easily traced, but also when threading up, it is a direct indication which two threads have to be threaded first. If the correct couple of threads are taken, they will separate easily from the rest, but if the wrong couple are handled they will not pull apart, but will simply drag other couples along with them.

Now fasten the shade sticks on to the top of the breast beam (*Fig.* 13, *no.* 9) with the warp chain hanging in front of it to the floor, while the end loops of the warp are facing the reed held in the batten (*Fig.* 17). Tie the shade sticks firmly but not so tight that the threads cannot be drawn easily.

Remove the pulley bar to which the jacks and lamms are attached by means of pulleys (*Fig.* 13, *no.* 12) so that the person who is going to thread can sit comfortably inside the loom while drawing the warp threads through the reed. To recapitulate, the batten containing the reed must not be allowed to swing, but must be steadied against the breast bar of the loom.

As the reed, in this instance, is only acting as a raddle to enable the warp to be turned on evenly, and also to be spread out to the correct width on to the warp roller, it will not be



necessary to thread each thread separately into every dent of the reed. It will be sufficient therefore to take a group of four threads and draw them all together through every fourth dent of the reed. This will leave one thread for each

dent, in the final threading when the loops will be cut (for *double* threading, thread two loops, 4 threads, in every second hole, so that there will be two threads for each dent in the final threading). The groups of four will separate particularly easily, as it will be remembered that two threads were warped together, one passed over and under the pegs on the lower cross-bar, thus making a group of four.

Find the centre of the reed and measure off fifteen inches on either side. Before sitting down to thread, get a reed hook (*Fig.* 18), and also a smooth round stick (a dowel) on which to slip the threads directly they are passed through the reed. Start to thread on the right-hand side of the reed, sitting inside the loom facing the loop of the warp tied on to the breast bar. Reach the left arm over the batten, and separate a group of four threads from the others on the shade sticks, and with the right hand pass the hooked end of the reed hook through the first dent in the reed, place the threads on the end of the hook rather firmly, and draw them through the space. When this is done slip the dowel, lying ready on the knee, through the loops. Continue doing this until all the threads have been passed through the reed. Take care not to get the threads twisted, and that they are taken in their proper rotation, as when once threaded it is very irksome and also wastes a great deal of time to set them right. Be sure that the dowel does not slip through the loops before it is fastened to the warp roller.

Now see that the warp roller is ready to receive the warp. The warp roller should have a piece of strong unbleached calico nailed on to it. This calico ought to be, within a fraction, as wide as the roller, and long enough to be rolled once round it, and carried up and well over the back beam of the loom (*Fig.* 13, *no.* 10). At this end of the warping-cloth, as it is called, there ought to be a hem about two inches wide through which a flat rod is slipped. This rod should be made of oak, or of some very strong wood which will not bend, or curve with the strain of the warp. To secure this rod from slipping in the hem, pierce the hem in about eight places, and secure with fine shaft cord, each of the eight pieces of cord being about fifteen inches long. Leave ends

to each of these eight tyings, as they in turn have to tie the dowel which holds the warp that has just been threaded through the reed. Before attaching the dowel to the flat stick in the warp roller cloth, the warp itself has to be drawn very gently on through the reed towards the warp roller. To make this easier, unloose the shade sticks from where they were tied on to the breast beam, and ease them carefully towards the reed. By this means it will be found that the warp can be drawn without difficulty towards the warp roller.

Now tie the two rods together with the eight pieces of shaft cord hanging from the flat rod. The flat rod in the hem, and the dowel holding the warp should be parallel to one another, and about one inch apart (*Fig.* 19).

The shade sticks with the cross between them which are at present on the front side of the reed, must now be changed to the back of the reed. To do this a third stick must be used. Go round to the front of the loom where the chain is hanging on the breast beam, gather it up, straighten the threads and hold them quite taut. A second person must then separate the two shade sticks, which are tied together, and turn the nearest stick to the reed on edge, pushing it against the reed so that the warp threads are divided in half, and the opening thus caused in the threads will be seen on the other side of the reed. Take the temporary stick and slip it through this opening. Then withdraw the permanent shade stick, which is on edge, out of the warp, and place it now at the back of the reed where number three, or temporary stick has just been placed. Make the permanent shade stick safe from slipping by fastening a thread across it from end to end and knotting it at the two holes. Remove the temporary stick and change the second shade stick in the same way (*Fig.* 20). The cross and shade sticks being now in their rightful position, *i.e.* at the back of the reed instead of at the front, the warp can be turned on.

Unloose the batten.

One person must hold the warp with both hands while a second person turns the warp roller by means of the handle at one end of it. The warp must be held very firmly indeed

and just given out slowly, little by little as required, the chain unravelling as it is wound round the beam. Be sure when holding the warp that the outside threads are as tight as the central ones, as they are apt to go slack, and if this is the case they will break badly when they come to be woven, besides preventing a clear shed. At intervals the shade sticks will have to be shifted as the warp passes on, but it will be found they can be moved forward at once with no catch or difficulty. Each time, just before moving the shade sticks forward, give the warp a gentle shake where it is being held before the next turn on. This will help to straighten the threads. Then comb down the warp with the fingers and see that no threads are twisted by the reed which would be liable to make them snap. From beginning to end in turning on a warp there ought not to be a single broken thread.

When first starting to turn on the warp, fold a newspaper about thirty-two inches long, and about ten inches deep. This is to be placed on the top of the two warp sticks and to prevent their strings cutting the warp threads as they are rolled round the warp beam. Also during the process of turning on, place thin laths every few turns from end to end of the roller for the warp to wind on. This keeps the warp even, and prevents the threads getting loose, and overlapping at each end of the beam.

Continue winding until the loops of the warp reach the reed. Before cutting them (the loops) which will enable them to be drawn through the reed, sling up the shade sticks securely by tying a piece of string with two ends on the top bar, on either side of the frame (*Fig.* 13, *no.* 3). This places the shade sticks in an easy position, not only for the tying of the warp into bunches, but afterwards for the threading. Tie each shade stick separately with an end of the cord, the back shade stick hanging a little higher than the other, so that the threads can be moved easily.

The ends of the warp are in loops. These must be cut, drawn through the reed, and tied in small bunches which will be left hanging from the shade sticks (*Fig.* 21).

Remove the batten and the reed.

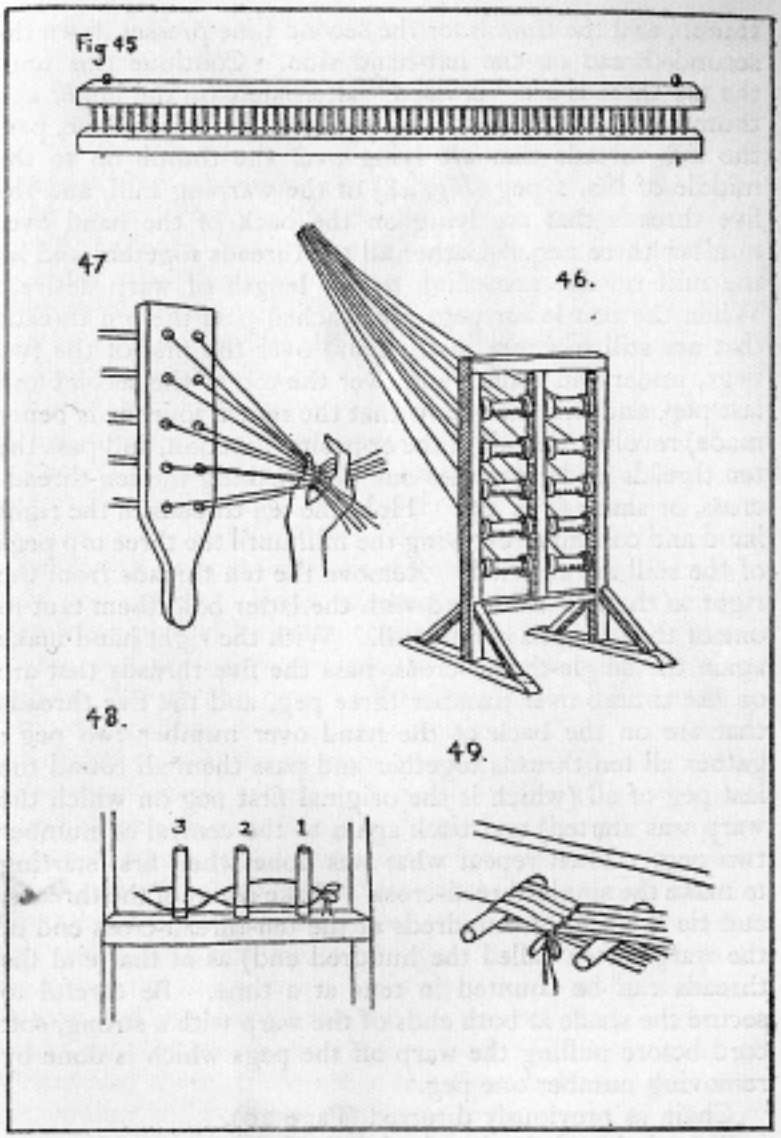
BEAMING, OR TURNING ON WITH A RADDLE

An alternative way of rolling on the warp by means of a raddle, (*Fig.* 45), instead of by means of the reed (as previously explained) is preferred sometimes as being the quicker method of the two. The warp can either be made by warping with must the two threads, from the two bobbinas, or warping with ten, sixteen, and twenty threads at once. This latter way a warp can be made very quickly.

When only a few threads are warped at a time, they can be passed together over and under the two pegs of the warping mill, but when, say ten, threads are warped at a time, it is necessary to have a Bobbin Rack (*Fig.* 46) to keep the threads separate, and to enable alternate threads to be picked up easily for the " cross " or " shade ". It is not necessary, but sometimes a Paddle (*Fig.* 47) is used, when the five threads from the five bobbins on the right side of the rack are threaded through the holes on the right side of the Paddle, and the five threads coming from the five bobbins on the left side of the rack are threaded through the five holes on the left side of the Paddle. Be sure that all the bobbins unwind in the same direction, *i.e.* all the threads coming together either from under the bobbins, or all coming together from the top of the bobbins, or spools.

It is not *necessary* to use a paddle as the threads can be picked up alternately quite easily without, but it is much easier (though not absolutely requisite) to have a third removable peg on the upper cross-bar of the warping mill, and also an open metal bar on to the guide of the warping mill when the threads are warped together ; the reason for this will be apparent on making the " cross " or " shade ".

Knot together the ends of the ten threads to be warped, divide equally, and pass them over the first of the three top pegs, No. 1 peg (*Fig.* 48) on the upper cross-bar of the warping mill. Hold them taut in the left-hand either against the guide, or on to one of the uprights of the mill. With the right hand finger and thumb make the single thread-cross, *i.e.* place the first finger on the lowest thread on the right side, and press it down so that its position is under the finger and over the thumb. The thumb must



now press down the lowest thread on the left hand, and this thread passed under the thumb and over the finger. Let the first finger again press down the second thread on the right which again passed under the finger and over the

thumb, and the thumb for the second time presses down the second-thread on the left-hand side. Continue this until the ten threads are " crossed " alternately on the finger and thumb of the right hand (*Fig.* 47). When this is done, pass the five threads that are lying over the thumb on to the middle of No. 2 peg (*Fig.* 48) of the warping mill, and the five threads that are lying on the back of the hand over number three peg. Gather all ten threads together and let the mill revolve according to the length of warp desired. When the two lower pegs are reached pass the ten threads that are still together in the hand over the first of the two pegs, under and round, and over the top of the second and last peg, and this time (now that the return journey is being made) revolve the mill in the opposite direction, and pass the ten threads under number one peg, making the ten-thread-cross, or shade (*Fig.* 49). Hold the ten threads in the right hand and continue revolving the mill until the three top pegs of the mill are reached. Remove the ten threads from the right to the left hand, and with the latter hold them taut to one of the uprights of the mill. With the right hand make again the single-thread-cross, pass the five threads that are on the thumb over number three peg, and the five threads that are on the back of the hand over number two peg ; gather all ten threads together and pass them all round the last peg of all (which is the original first peg on which the warp was started) and back again to the central or number two peg. Then repeat what was done when first starting to make the single-thread-cross. Take count of the threads, and tie them up in hundreds at the ten-thread-cross end of the warp (often called the hundred end) as at that end the threads can be counted in tens at a time. Be careful to secure the shade at both ends of the warp with a strong, soft cord before pulling the warp off the pegs which is done by removing number one peg.

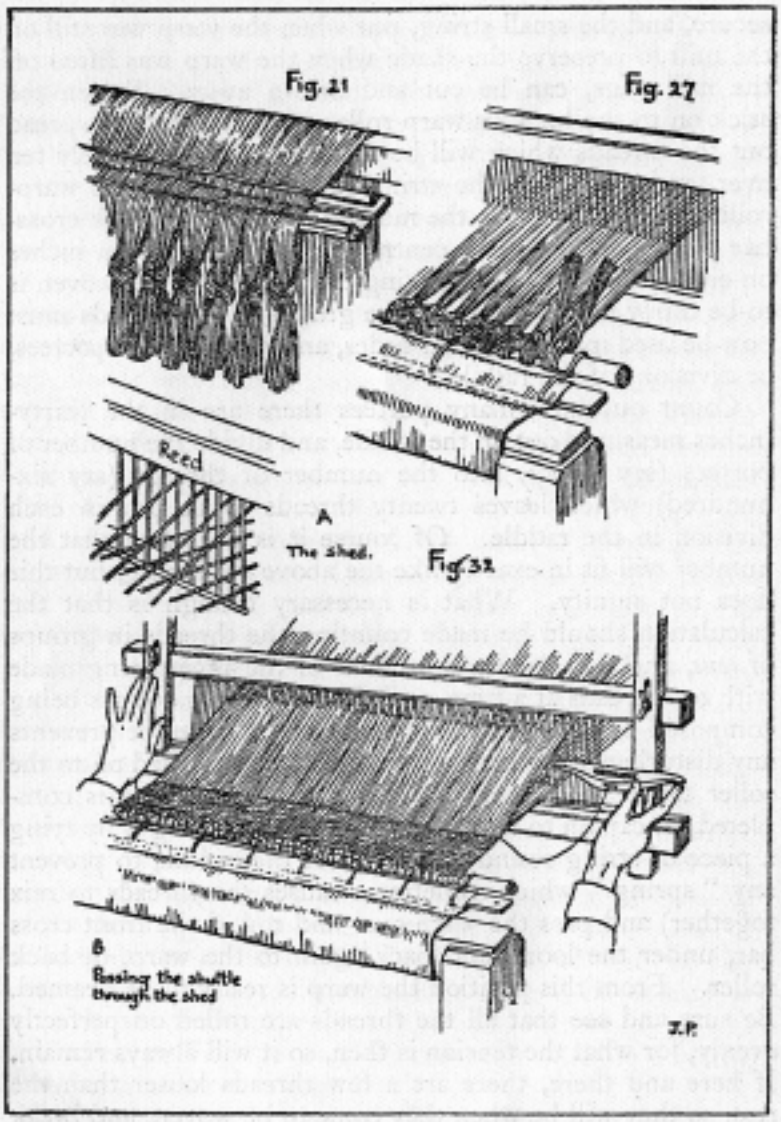
Chain as previously directed (Page 20).

Take hold of the hundred-end of the warp and pass a stick (dowel) through the extreme end loop. Fasten a string on to the said stick and pass the string through the opening made by the " cross ", and fasten the string securely on to the opposite end of the stick. Thus the cross is made

secure, and the small string, put when the warp was still on the mill to preserve the shade when the warp was lifted off the mill pegs, can be cut and drawn away. Fasten the stick on to the back or warp roller of the loom, and spread out the threads which will be found coming alternately ten over, and ten under the string just fastened on the warp-roller stick. Hang up the raddle level with the back cross-bar of the loom, find its centre, and measure fifteen inches on either side (this is supposing the material to be woven is to be thirty inches wide). The groups of ten threads must now be used in their regular order, and placed in the portees, or divisions of the raddle.

Count out how many portees there are in the thirty-inches measured out on the raddle, and divide the number of portees (say thirty) into the number of threads (say six-hundred) which leaves twenty threads to be put in each division in the raddle. Of course it is not often that the number will fit in exactly like the above reckoning, but this does not signify. What is necessary though is that the calculation should be made counting the threads in groups of *tens*, and not *singly*, on account of the warp being made with ten threads at a time, and the hundred-end-cross being composed of threads in groups of tens. Thus it prevents any disturbance of the threads, and they are rolled on to the roller much more evenly and easily. When this is completed, fit cap on to raddle (also further fastening it by tying a piece of string round the centre of the raddle, to prevent any "spring" which sometimes causes the threads to mix together) and pass the warp over and round the front cross bar, under the loom, and back again to the warp, or back roller. From this position the warp is ready to be beamed. Be sure and see that all the threads are rolled on perfectly evenly, for what the tension is then, so it will always remain. If here and there, there are a few threads looser than the rest, so they will be when they come to be woven, and break unceasingly, causing great delay, and very probably marking the material when woven.

When the warp is rolled on as far as possible, very carefully undo the little string that keeps the single-thread-cross safe, and slip in its place the two shade-sticks. When these



are secure, cut the small temporary string and draw it out, but be sure that the shade-sticks are secured by tying them together, as if the shade is once lost it cannot be recovered. Straighten out the warp threads evenly, cut the ends and tie in groups all along the shade sticks. (*Fig.* 21).

TYING-UP, OR GATING THE LOOM

It will be remembered that before turning on the warp, the cross-bar holding the two pulleys, which in turn holds the jacks, was taken away so that there should be a clear space in the centre of the loom for the tuning-on. This bar must now be replaced. On the bar will be found two metal pulleys. These, and the other parts of the loom have now to be tied up, which is called " gating the loom ".

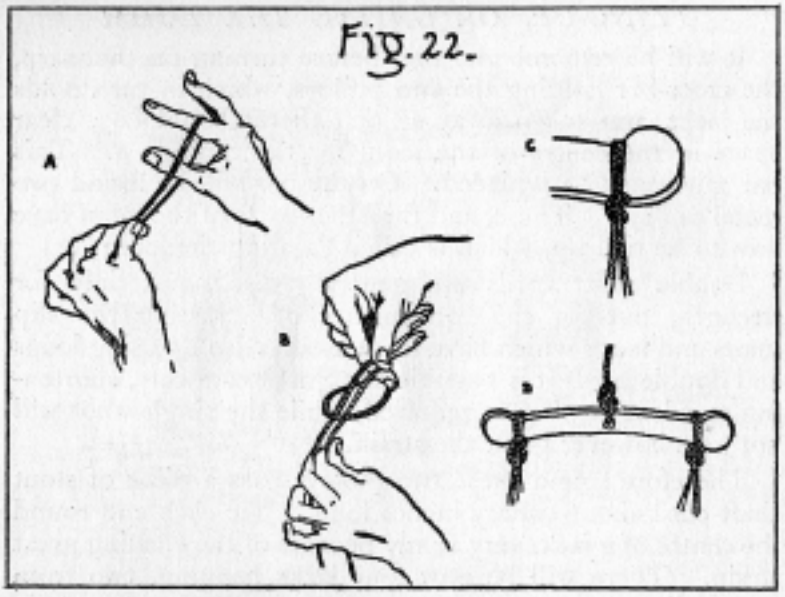
Double shaft cords are generally used, not only for strength, but for the convenience of adjusting the slip knots and loops which have to be used. Also by using loops and double cords it is possible to adjust to a nicety, shortening and lengthening as required, while the single knot will not give however great the strain.

Therefore round these two pulleys pass a piece of stout shaft cord about twenty inches long. Tie each end round the centre of a jack, very firmly because of the ensuing great strain. There will be now four jacks hanging, two from each pulley.

Measure off now eight pieces of shaft cord about eleven inches long, double it and make a slip knot at the end of the looped cord. Don't just place the slip-knot over the end of the jack, but put it on the farther side of it, then bring up the two ends of the cord on the near side of the jack slipping then the two ends through the slip-knot with the jack between them. Draw tight and the cords will never slip whether there is a weight at the ends or not. (*Fig.* 22).

These ends left hanging from the jacks are for securing the loops on the lamms. There are eight lamms, and on these the headles are slung. A headle is made of string, finely twisted tap-cotton of various sizes. If a carpet had to be woven a much coarses headle would be used than for a homespun. And again very much finer for silk. The eye in the centre is for the threads, and the two loops on either side of the eye are for the lamms (*Fig.* 23).

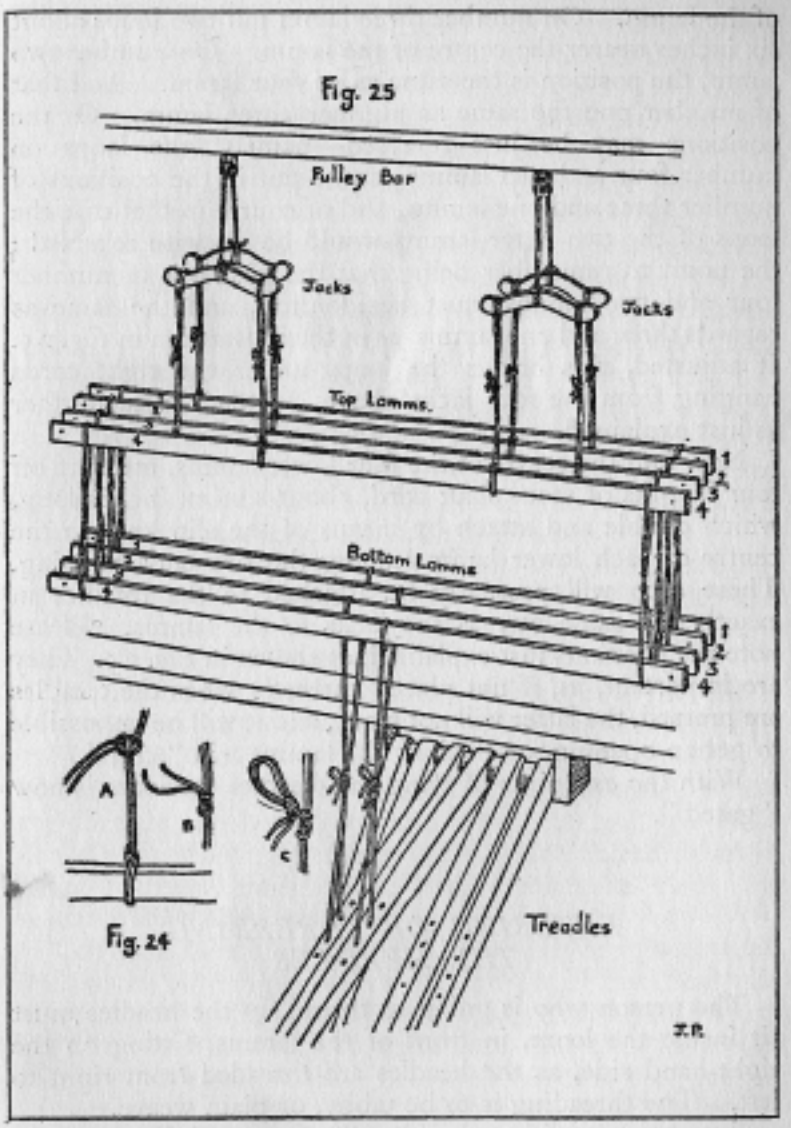
There must be as many headles as there are threads in the warp. In the present case there will have to be seven hundred and fifty headles. These will be divided in four. A hundred and eighty-eight headles on each pair of lamms



will leave two headles over in case of an accident. The fringe of the headles must lie on the top lamms, and not be hanging from the bottom ones.

Measure off eight pieces of shaft cord, about eighteen inches long, and make into loops. These attach to the top of the lamms by means of the slip-knot, using the same method exactly as in the case of the jacks, *i.e.* having the slip-knot ready formed on the farther side of the lamm, and bringing, in this case, the knotted ends to the near side of the lamms which insert in the slip-knot and pull. A little ingenuity has to be used not to have the knotted ends quite in the centre of the loop. The lamms are attached to the jacks by making another slip knot at the head of this loop, through which the two ends from the jacks are passed. By pulling these two ends the knot is drawn close to the loop, then make a single tie. Also by this means, the cord can be adjusted easily without untying, either lowering or raising the lamms as required (*Fig.* 24).

The jacks, the lamms and the headles are called the harness of a loom.



In *Fig.* 25 will be seen where exactly to place the eight loops on the four upper lamms so as to work easily with the four jacks above. The two loops on lamm four (which is the lamm nearest to the weaver), place each at nearly the end

of the lamm. On number three lamm put two loops about six inches nearer the centre of the lamm. On number two lamm, the position is the same as on four lamm. And that of number one the same as number three lamm. Or the positions may be just reversed—namely, the loops on number four and two lamms can be put in the positions of number three and one lamms, and of course in that case the loops of the two latter lamms would be likewise reversed ; the point to remember being that the positions of number four and two lamms must be identical, and the same as regards three and one lamms, as in the illustration in *Fig.* 25. If adjusted, this brings the loops under the eight cords hanging from the four jacks above. Attach to each other as just explained.

Now find the centre of the four lower lamms, measure off four lengths of stout shaft cord, about sixteen inches long, which double and attach by means of the slip knot to the centre of each lower lamm leaving the two ends hanging. These each will presently be attached to the treadles in exactly the same way as the jacks to the lamms. Please note the positions just explained, as shown in *Fig.* 25. They are important, as, if not placed correctly when the treadles are pressed, the latter will not move, and it will be impossible to get an opening, or shed, as the lamms will " clip ".

With the exception of tying the treadles the loom is now " gated ".

ENTERING OR THREADING THE HEADLES

The person who is going to thread up the headles must sit inside the loom, in front of the lamms, sitting on the right-hand side, as the headles are threaded from right to left. The threading is to be tabby, or plain weave.

Separate a small bunch of headles from each lamm, pushing away the rest. Then separate and untie a small bunch of threads, giving them two or three sharp pulls which clear the cross between the shade sticks, thus making it quite easy to separate the threads for threading.

When this is done put the little finger of the left hand through the lower loops of the headles on number four lamm (the nearest to the threader) and the third, second and first fingers respectively through numbers three, two and one lamms. Then, with the right hand, separate the first two threads in the shade sticks and pull the ends through the eye of the first headle on the first finger, and when done push it along to the right, and take the next two threads, threading them through the headle on the second finger of the left hand, then the next two threads the first headle on the third finger, and lastly on the fourth finger, pushing each headle along to the right when threaded, out of the way.

If the fourth, third, second and first fingers are always kept respectively in the bunches of headles on the fourth, third, second and first lamms there will be no mixing and threading through the wrong headles, besides being much easier and quicker to thread in regular order.

The first four headles on the lamms are always threaded double, as are the last four, in order to make a strong selvage. Otherwise take the threads singly and thread each singly through the eye of the headle.

Be sure when threading to take the first thread that comes away *clear* at the cross without dragging other threads with it. Likewise, whichever headle is to be threaded, see that it is the one that separates clearly from the others. If not, the threads will be twisted and when the reed has to be threaded it will be difficult to know which thread to select. Every thread through each headle must be clear, and separate from the next.

Continue threading until all the threads have been used, and as the entering proceeds, tie into small bunches. Do this first to prevent the threads slipping back again through the eyes, and secondly to make sure that they have been threaded in regular order. Correct threading is of greatest importance as one mistake will throw out the whole succession of remaining threads. In plain weaving sometimes a mistake can be rectified, but in pattern weaving all the threads beyond the faulty place have to be pulled out, and re-threaded. So before tying up a bunch count the threads carefully over, and be sure they are correct before starting to

thread the next lot. This does not take long, and will probably save much labour later on.

Fig. 26. Each thread passed successively through headles on lamms one, two, three and four.

ENTERING, OR THREADING THE REED

When all the headles are threaded, the batten must be put back again, that is, hung in front of the lamms.

Against the two swords of the batten is hung a cross-bar with two wedges screwed at each end. The tips of these wedges are rested in two of the series of grooves or notches on either side of the front frame of the loom. By this means the swing of the batten is effected. Be sure that the reed is exactly in the centre of the race-board of the batten, lying evenly and quite firmly in the groove, and also in that of the reed-cap. The latter is screwed to the swords of the batten by wing-nuts. Secure the batten from swinging by tying it to the breast beam which has to be replaced after the headles have been threaded. As in the previous threading, find the centre of the reed, and then measure fifteen inches on either side, which mark off with a piece of cotton.

The threading of the reed is exactly opposite to that of the headles. The headles were threaded from right to left. The reed has to be threaded from left to right. Therefore the threader or enterer must sit on the left side. Untie the first bunch of threads hanging against the headles, taking the first two threads (the selvage threads) on the left. Push the reed hook through the dent marked by the cotton, and with the left hand place the first two threads on the hook firmly, and draw them through. Three other sets of double selvage threads have to be drawn through, the remainder being single threads in each dent of the reed with the exception of the four last sets, which are double, being the selvage threads of the right-hand side of the cloth to be woven. When putting the threads on the reed hook, be sure to trace out the thread coming through the first eye of the headles. If it is the right thread, the headle it is threaded through will pull away separately from the rest, but if it is the wrong thread, it will drag several other headles

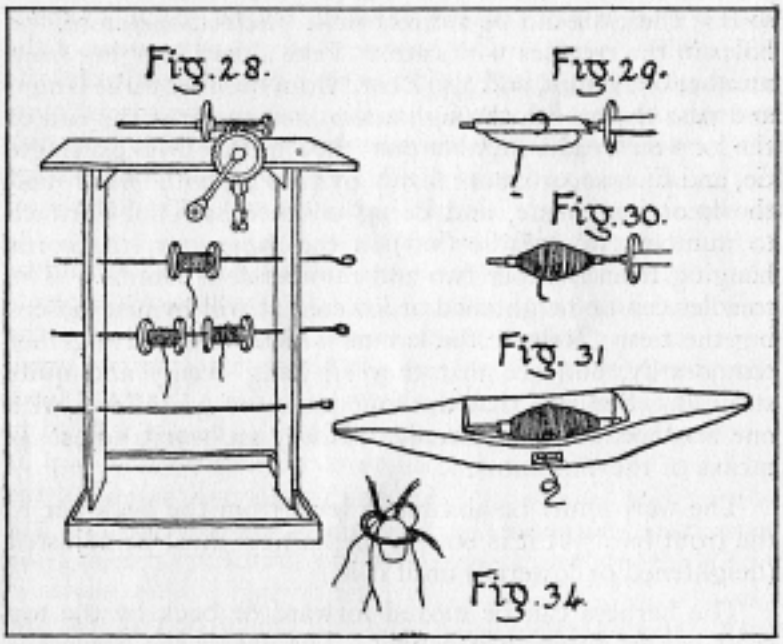
so that there should be a direct pull. Select, therefore, the holes in the treadles with care. Take a cord hanging from number one lamm, and also a cord from number three lamm, and pass them both through a slip knot made at the end of the loop on treadle number one (the right). Make a single tie, and then secure more firmly by passing both ends round the knot just made, and doing another half tie. Attach to number two treadle (left) in the same way, the cords hanging from number two and number four lamms. The treadles can be heightened or lowered at will by just loosening the ties. Release the lamms which were tied together temporarily, and see that they all hang evenly and quite straight. See also that the four jacks are quite level with one another and hang evenly. If any are awry, adjust by means of the slip knots.

The warp must be absolutely level from the back bar to the front bar. If it is not so, the harness must be adjusted (heightened or lowered) until it is.

The harness can be moved forward or back by the top cross-bar from which it hangs. The nearer the harness is to the reed the better, but care must be taken that it does not interfere with the swing of the batten. If there is much space between the harness and the batten a larger opening has to be made in order to get one large enough on the other side of the reed for the shuttle to pass through, and a large opening is a great strain on the warp threads.

The warp threads must be exactly in the centre of the reed. This can be adjusted by means of the batten swords, there being little pegs near the top of each by means of which the base of the batten can be heightened or lowered.

Before sitting down on the weaving stool, be certain of three points. *Number one :* that the warp is lying perfectly straight from warp roller to cloth roller, and that the threads are not being hitched up a little by the harness. *Number two :* that the warp threads are lying in the centre of each headle-eye. *Number three :* that the warp is lying exactly in the centre (half-way down) of the reed. If these points are correct the weaver can look for the weft and start winding bobbins for the shuttle.



WINDING THE "BOBBIN", "SPOOL" OR "QUILL" FOR THE SHUTTLE

Small wooden or cardboard spools, or quills, can be used but these being easily chipped, broken or lost it is more, economical to use paper which serves its purpose equally well. Therefore cut an oval piece of paper, strong but not too stiff, as it has to be wrapped round the spindle of the bobbin winder. Screw the bobbin winder on to the top of the bobbin stand. The cotton to be wound may be either in skein form, coming from off a rice (*Fig.* 1), or from a cheese hung on one of the wires on the bobbin stand (*Fig.* 28). (The small table skeiners are not recommended for the large skeins used in weaving).

Take the oval piece of paper and roll it lengthways round the spindle of the bobbin winder catching the end of the thread in the last wrap of the paper (*Fig.* 29). Turn the handle of the winder slowly at first, making a small pile in the centre of the paper, very gradually elongating at each

end. The bobbin when finished, ought to be cylinder shaped, and *very* hard, otherwise with the movement of the shuttle the yarn is apt to loosen and get twisted round the wire in the shuttle. For the same reason, the thread must not be wound quite to the edge of the paper bobbin (*Fig.* 30). When a good sized bobbin has been made, but not too large to slip easily into the shuttle, break the thread and slip it off the spindle of the winder.

Shuttles are of various shapes and weights and should be selected with care, as when throwing a shuttle much depends upon its weight and proportions. Running through the centre of a shuttle is a steel pin which fits into two small holes at eigher end of the hollow. In one of these a small spiral spring is fixed and by this means the pin is kept in position. Take the pin out of the shuttle and slip it through the paper roll of the bobbin, thread the end of the yarn through the slot in the side of the shuttle and put back both pin and bobbin into the shuttle by pressing the pin into the hole which has the spring. This makes it quite easy for the other end of the pin to be put into the opposite hole (*Fig.* 31).

STARTING TO WEAVE

Everything is now in readiness to start weaving a plain piece of material. Plain or tabby weaving is the simple interlacement of warp and weft. Two series of threads cross one another at right angles, and are interlaced one over and one under another like a simple darn.

The longitudinal threads on the loom are called the warp and the thread crossing and interlacing with the warp is called weft, woof or pick. It is necessary for the warp threads to be strong because of the strain of being stretched tightly on the loom (hence the name warp). The weft thread can be softer. But the proper selection of the correct warp, and the correct weft to be woven with it, depend on the kind of material it is desired to produce, and vary according to the arrangement of the warp and weft threads.

Variations can be made in plain or tabby weave by varying the size of the warp and the weft. Use a thicker weft

thread and the surface is formed by weft more than warp, like alpaca. Weave with a tightly twisted warp and an equally tightly twisted weft, both the same size, and an open canvas is the result, which, with coloured stripes makes very attractive curtains. In weaving homespuns use a very soft and loosely spun weft and a very supple woollen is produced. Warp two colours in equal numbers and use the same two colours for the weft, also in the same proportions as the warp, and a plain check is obtainable.

So even using only two treadles, and a tabby weave, with thought and ingenuity many varied and pleasing effects can be obtained.

HOW TO USE THE TREADLES

The weaver can now sit down on the weaving stool with a foot lightly resting on each treadle. Some weavers prefer using both feet in rotation, while others like to rest one foot on the lower cross beam, and work solely for a time with one foot or the other. This is simply a matter of preference, as equally good and rapid weaving can be done either way.

THE SHED

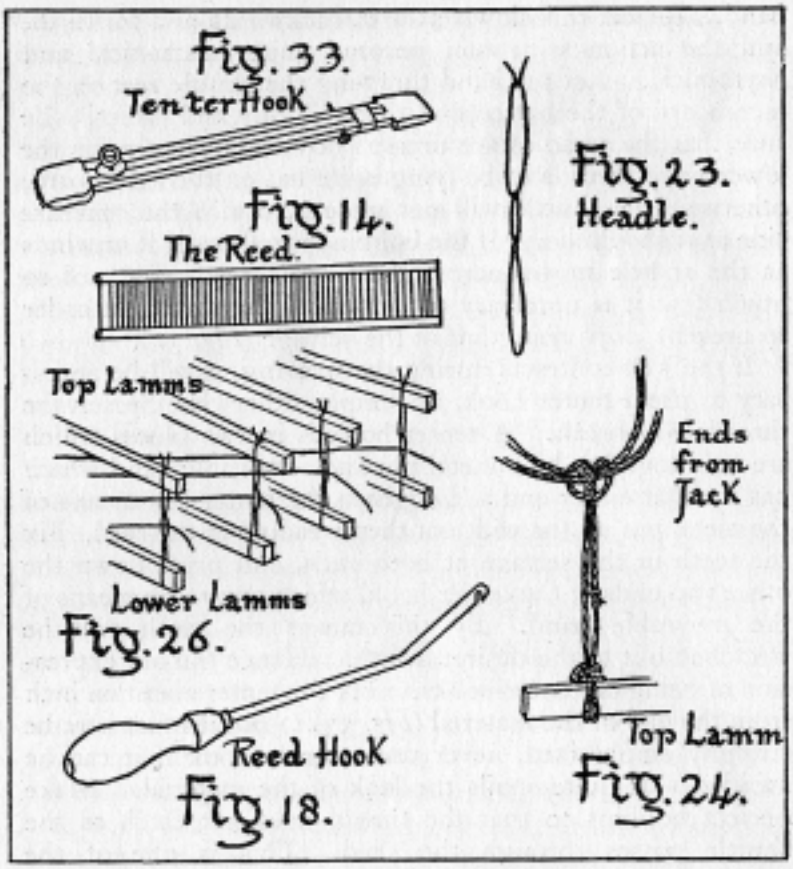
Press the right treadle down and all the threads in the headles on number one and number three lamms are pressed down, thus dividing the warp threads exactly in half. This opening is called the " shed ". Push back the batten a few inches by pressing the thumb of the left hand against it, and a part of the shed will appear in front of the reed. Through this opening the shuttle is thrown with the right hand to be caught by the left. Directly the shuttle is out of the shed pull the batten forward and by so doing the reed presses home the weft thread just thrown across. Press down the left treadle and the threads in all the headles on number two and number four lamms are pressed down, again dividing the warp threads exactly in half. This time the shuttle passes through the shed from the left and is caught by the right hand while the thumb of the right hand presses back the batten. This time pull the batten forward with the left

hand. Repeat this slowly at first, backwards and forwards, and the action will soon become quite mechanical and rhythmical. Let the hand throwing the shuttle rest on the race-board of the batten and throw lightly and direct. Be sure that the treadles are pressed down sufficiently for the lower warp threads to be lying quite flat on the race-board, otherwise the shuttle will not glide across to the opposite side as it should do. If the bobbin is well made it unwinds as the shuttle moves across the warp threads, but not so much that it is necessary to "tweak" the thread in order to prevent loops being left at the selvage (*Fig.* 32).

If the web contracts during the weaving, it will be necessary to use a tenter hook, or temple, otherwise the selvage threads will break. A tenter hook is in two pieces which are held together by a metal pin and a movable band which has teeth at either end. Lengthen the tenter (by means of the metal pin) to the width of the threading at the reed. Fix the teeth in the selvage at both ends, and press down the other two ends of the tenter hook, which secure by means of the moveable band. By this means the cloth will be stretched out to the desired width. Hence the old expression of being on tenter-hooks. Fix the tenter about an inch from the end of the material (*Fig.* 33). But it must here be strongly emphasized, never use a tenter hook if it can be avoided. It quite spoils the look of the material. Make perfect bobbins so that the thread does not catch as the shuttle passes through the shed. This is one of the principal reasons for a contracted web. Secondly practice throwing the shuttle lightly. A good piece of woven material depends so much on the way in which a shuttle is thrown and caught and the thread drawn through the shed.

RENEWING BOBBINS &c.

When the weft has been used up and it is necessary to renew the bobbin, the old thread must not be left hanging by the selvage. Press down the treadle that has next to be used, and with the hand draw the end of the old thread into the shed, and up on to the surface of the woven cloth. Then throw the shuttle across and catch the end of the new thread



and cross it with the old one (about three threads) also bringing up the new end on to the surface of the cloth. When about an inch has been woven, the two ends can be cut close to the cloth's surface with perfect safety, and there will be no mark where the threads were crossed and cut.

Continue weaving and renewing the bobbins in the shuttle until the woven material has crept so close to the reed that if more is woven it will be difficult to throw the shuttle across without damaging or breaking the warp threads. Then get up from the weaving stool and raise the pawl holding the ratchet on the warp roller and move the handle forward which will release the warp. Fix back the

pawl again safely, and turn on the cloth roller. Move the shade sticks back as the winding of the warp will have brought them close to the headles. Continue weaving as before.

For most warps it is better to have the tension on the tight side. For one thing it is easier to throw a shuttle across a firm warp than a loose one, and again, threads break much more easily when the warp is loose. Directly a thread is broken mend it at once, or the material will be marked. Mend always with a weaver's knot, as it is the smallest bodied knot there is, which is important for two reasons. First, being small there is less chance of it being noticed. And secondly, it will pass through the dent in the reed when probably another knot would not do so without breaking.

To make a weaver's knot hold the end of the broken thread in the left hand between the first finger and thumb. With the right hand pass the end of the new thread behind the other holding both tightly, leaving the two tails standing upright in the left hand. With the right hand bring the new thread across the left hand thumb, and behind the left thread, and bringing it forward again between the two upright tails. This leaves a small loop hanging on the left hand thumb nail. Hold all secure. Then press *back* the left tail across the first finger of the left hand, and secure it with the second finger. Don't let it slip. With the right hand bring *forward* the right tail, slip it under the loop on the left thumb and secure with the left hand second finger as done with the left tail. Then pull the new thread which will draw tight the loop on the left thumb. Both the tails must be held tightly until the loop is drawn. Then cut off the two tails close to the knot (*Fig.* 34).

Be sure when mending a thread to see that it is not twisted round any other threads. Thread it through the empty eye in the headle, then through the empty space in the reed and lastly secure it with a pin placed in the cloth exactly opposite the dent through which the new thread is passed. Disregard the broken end which is attached to the woven piece, just pulling it down so that it hangs loose under the web.

When the length is finished and taken off the loom, it will probably be necessary to darn the loose ends in, certainly if the web is a coarse, openly woven one. With a fine, closely woven cloth it is not so essential.

If a new thread is not *at once* worked into the cloth, stop weaving immediately or there will be a mark on the material. The reason that the thread has not been caught in, is either that it is twisted round another thread, or that it has been passed through a loop in the headle, instead of in the headle eye proper.

Continue weaving carefully and gradually increasing in speed, until the dowel belonging to the warp roller is close to the headles, when it will be found impossible to get a wide enough shed to throw the shuttle through. Then relax the warp by moving the ratchet pawl, and cut the warp across about three inches from the end of the web. Unwind the cloth slowly, rolling the web neatly and looking out for any ends which ought to be cut off, or darned in. When the other end is reached, cut across the web close to the knots which tied up the warp.

FINISHING, OR WAULKING

Wool

Steep the length in water for about twenty-four hours.

The frame in which the cloth is waulked is a board which should be about twelve to twenty-four feet long and about two feet broad, and grooved lengthwise along its surface.

The waulking frame is raised upon trestles, and those who are going to waulk should sit around it about two feet apart.

Unroll the cloth, and lay it along the board. Then saturate it with ammonia, warm water and soap suds, working the cloth vigorously from side to side across the grooves of the frame. Slowly move it lengthwise also, so that each part of the cloth may receive due attention.

The lateral movement of the cloth to be sunwise.

When the web has been shrunk two or three inches rinse thoroughly in several warm waters. A little potash or borax in the rinsing water gives a very soft and diffusive feel to the wool.

Roll tightly on a board keeping the width even while doing so. If possible keep it under pressure. Re-roll in two or three days time in case there should be any creases, and dry gradually. If the web dries absolutely with a crease in it, it is very difficult to get the crease out.

COLOURED LINEN AND COTTON

These should be damped and ironed. If washed, use only curd soap in warm water. On no account should they be boiled, nor should soda, washing powders or patent soaps be used.

PATTERN WEAVINGS

Damp and iron.

If to be washed, dissolve the soap in boiling water ; then reduce in strength and temperature by adding cold. No soap can be rubbed on the pattern, but work the cloth well in the lather with as little rubbing as possible.

Rinse in warm water to remove soap ; then in cold in which a tablespoonful of table salt (to each half-gallon of water) has been dissolved ; squeeze gently in the hand, *but do not wring* ; then dry *at once and quickly.*

Materials with coloured patterns must not be allowed to lie in a wet condition after being washed. For ironing, lay the cloth with its right side on a soft blanket with a piece of fine linen interposed, and iron with a moderately hot iron.

PATTERN DRAFTING

This is a conventional form of drawing to convey to the weaver how to work out, and weave various patterns.

In this volume, only some very simple patterns will be represented. Therefore a single harness of four lamms only will be represented.

Ordinary point paper is used. Vertical spaces will represent the warp threads, while those crossing at right angles will represent the weft picks. The greater number of materials are woven with an equal number of warp threads

and weft picks in the same space, and are usually counted as so many to the inch. But of course at any given point of intersection there may be warp or weft on the surface. Therefore if the square is left blank it will represent the warp, but if the square is filled in black it will represent the weft coming over the warp.

In the following patterns, for the sake of simplicity, there are an equal number of warp threads and weft picks to the inch, but there are many cloths woven with a different number of warp threads per inch, to picks per inch, and whatever this number may be, it must be represented by the design paper. Many designs of point paper can be bought or the weaver can rule off the requisite number of lines very easily himself.

Cloth I—Fig. 35

PLAIN, OR TABBY WEAVE

This is plain, or tabby weave, so in the design paper there is an equal number of warp and weft represented on it.

Carry the eye along the lines running from each square of the design paper, and they will be met by the warp threads. The horizontal lines represent the weft. Note in number one line, that the warp thread first comes over the weft, and is represented on the design paper by a blank, then it passes under the weft, and it is represented on the paper by a black square, and so on alternately. Then is shown the usual draft used by the weaver.

The four horizontal lines represent the lamms, and the crochets on them show the order of threading the warp. This is quite plain, *i.e.* one, two, three and four alternately on each lamm. Drafts are generally read from right to left. It will be remembered in the instructions on how to set up a loom that the person who threaded the headles worked from right to left. The perpendicular lines represent the two treadles, and the crosses show the tie-up of the lamms to the treadles. In this instance it will be seen that number one treadle is crossed by number one and three lamms. Therefore tie up, in the usual way, number one treadle to number one and three lamms, and number two treadle to number two and four lamms.

The figures given beneath the treadle lines show the tread. Being plain weave, only one and two treadles are treadled alternately.

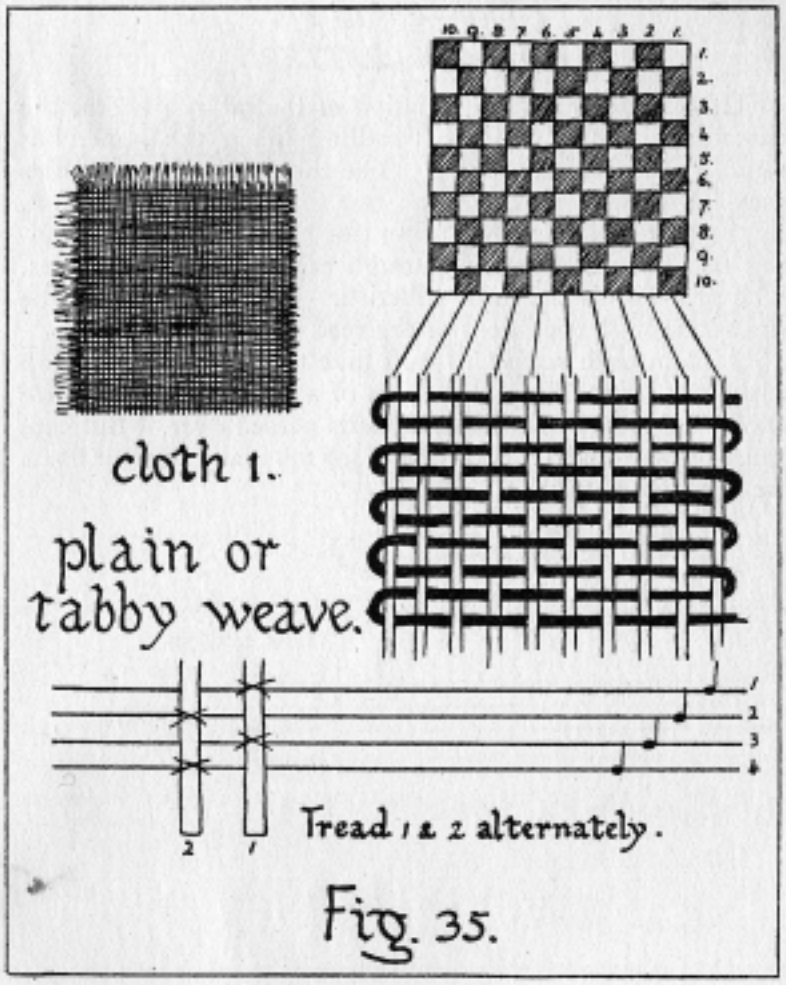


Fig. 35.

Cloth II—Fig. 36

HOPSACK PATTERN

This is a very simple variation of the tabby pattern, the threading, tie-up, and the treadling being the same, but doubled, as also is the weft. The threading of the headles may be done in either of the two following ways. First, by threading each eye but using two headles ; or by threading two threads together through each eye of the headles. The first way is the most effective. Two threads must be drawn through each dent of the reed afterwards.

Skips in both warp and weft give the loosely woven hop sacks the effect of equal squares of a smaller or larger size according to the number of threads passed over. But care must be taken as to this variation, for too many skips or floats weaken the material.

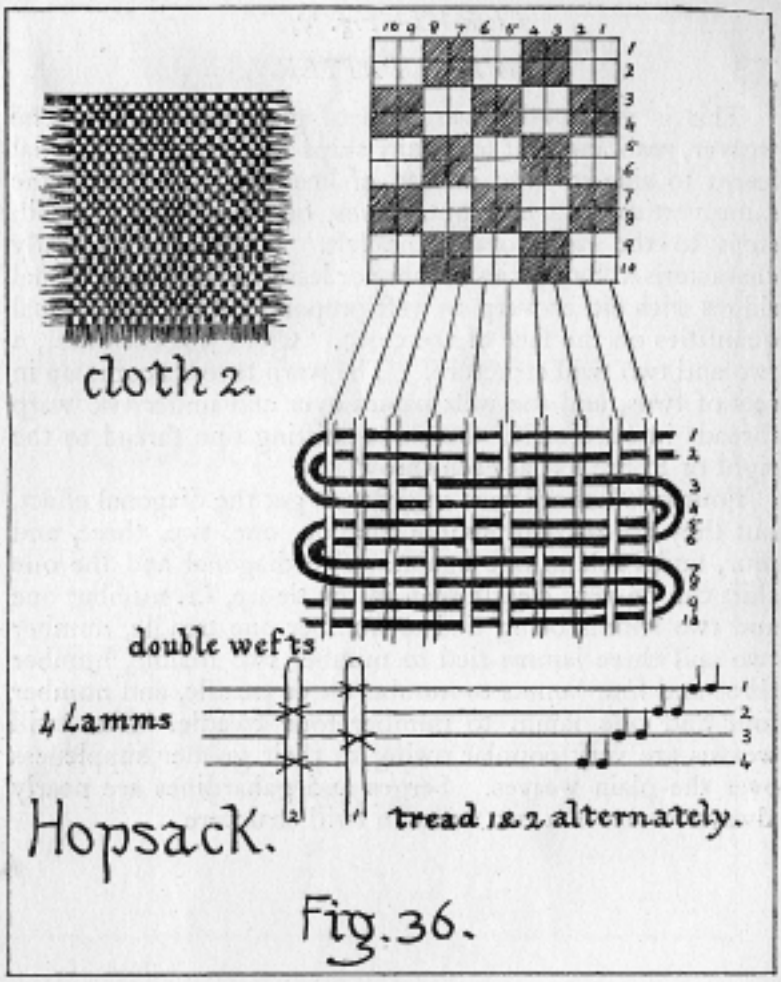


Fig. 36.

Cloth III—Fig. 37

TWILL PATTERN

This is yet another variation of plain threading. The weaver, realizing that too many skips weakened his material learnt to side-step, so instead of keeping the skips in the same vertical and horizontal lines, began to shift them in steps to the right or to the left. Twills are generally characterised by a series of more or less pronounced diagonal ridges with either warp or weft preponderating, or in equal quantities on the face of the cloth. Cloth 3 is the latter, a two and two twill structure. The warp threads come up in sets of twos, and the weft passes over and under two warp threads in succession, the skips shifting one thread to the right or to the left at each throw.

Four treadles are used in order to get the diagonal effect, but they are used in simple rotation, one, two, three, and four, and back to one again. The diagonal and the one shift can be very clearly seen in the tie-up, *i.e.* number one and two lamms being tied to number one treadle, number two and three lamms tied to number two treadle, number three and four lamms to number three treadle, and number four and one lamm to number four treadle. The twill weaves are very popular owing to their greater suppleness over the plain weaves. Serges and gabardines are nearly always woven in a two and two twill structure.

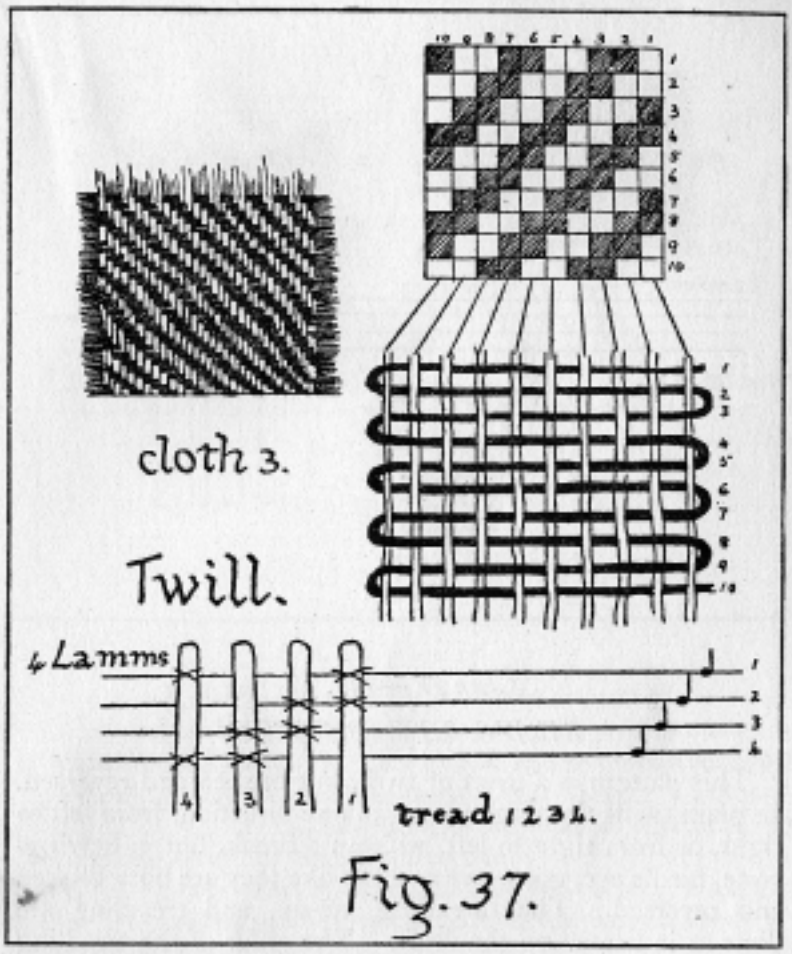


Fig. 37.

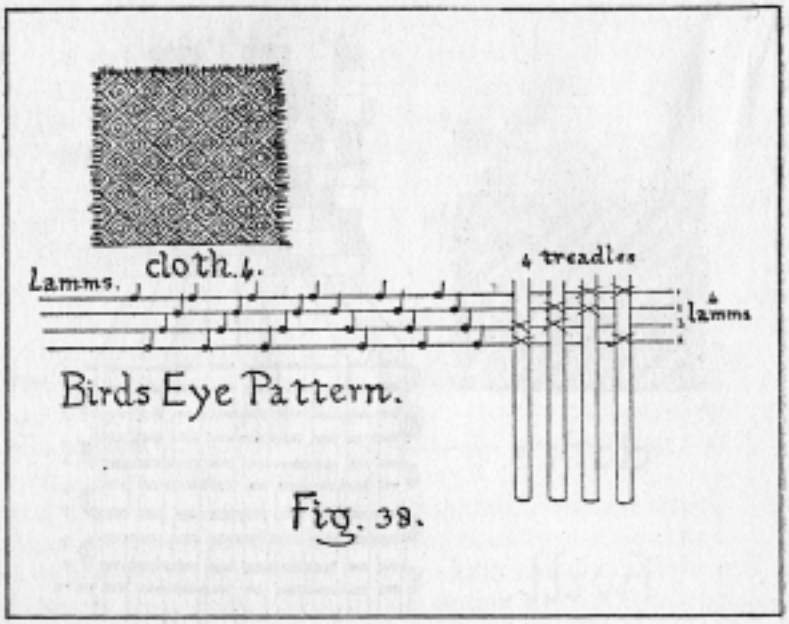
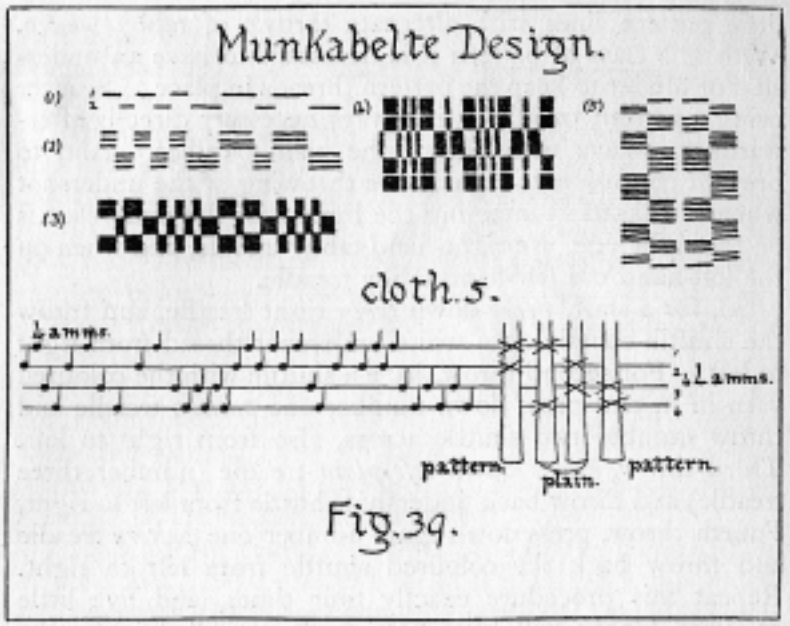


Fig. 38.

Cloth IV—Fig. 38

BIRD'S EYE PATTERN

This pattern is a form of twill, but broken and reversed. In plain twills the ridge moves in one direction, from left to right, or from right to left, without a break, but in herring-bone, bird's eye, goose eye and the like they are both broken and reversed. The threading, tie-up, and treadling are done as indicated on the draft. The order of the treadling is exactly the same as the threading, starting with treadle four. The horizontal lines always represent the lamms, number one always being the farthest from the weaver. The double vertical lines represent the four treadles, number one treadle always being the first on the right hand. The figures on the treadles represent the treadling. This is a very favourite pattern for linens, as well as wool, the materials woven thus being very supple.



Cloth V—Fig. 39
MUNKABELTE PATTERN

Thread and tie-up in the usual way, and follow the weaver's draft carefully. Two shuttles have to be used, one containing a white bobbin and another having a coloured bobbin in it. This pattern has four treadles similar to the preceding one, but with a difference.

Bird's eye is what is called an all-over pattern, and however the treadles are tied to the lamms, no plain tabby weave can be produced.

But with this tie, if number two and three treadles (the centre ones) are pressed down alternately, tabby can be woven, as only single threads come up and down alternately.

Press down either treadle one, or treadle four, and two quite different sets of threads come up and down. But only two, so it is not difficult to weave a very simple pattern at first, and gradually from that to work out more elaborate ones.

Look at the two first little pattern lines in *Fig.* 39 and there will be seen what represents treadle one, and treadle four. All the patterns which follow are built up from those two

little pattern lines with alternate throws of tabby weave. With this class of pattern it is necessary to have an undershot or binder to keep the pattern threads in place. So after using a pattern treadle, it is always necessary directly afterwards to weave with one of the plain treadles. And to prevent confusion as regards the throwing of the undershot when the shuttle containing the thread for the undershot is on the right side, use right-hand tabby treadle, and when on the left-hand use left-hand tabby treadle.

So, for a start, press down *tabby* right treadle, and throw the shuttle containing a white undershot thread from right to left. For second throw, have a shuttle with the coloured yarn in it, and press down number one *pattern* treadle and throw number two shuttle across, also from right to left. Third throw, press down *left plain* treadle (number three treadle) and throw back undershot shuttle from left to right, Fourth throw, press down again number one *pattern* treadle and throw back the coloured shuttle from left to right. Repeat this procedure exactly four times, and five little coloured blocks will have been built up, filled in by the white undershot.

Now press down number two *pattern* treadle (*i.e.* number four treadle) and throw the coloured shuttle across, from right to left. Return the two shuttles from left to right in their proper rotation and there will be two lines showing, representing the alternate pattern treadle. Now return to number one pattern treadle and for balance make a similar little pattern block of four threads as when starting. When this is done the first little woven design has been achieved.

The other patterns on *Fig.* 39 are made the same way. Copy these and then work out others. About two dozen can be produced from this one design.

A student will find it useful later on to make a sampler of the different patterns that can be worked out from this one threading. It is a very useful thing to refer to when a large thing has to be woven, such as curtains, portieres, or bedspreads. These can either have wide borders with widths of tabby weaving between each border, or an all-over design. Small articles such as bags, table runners and cushion covers look better woven with smaller borders.

A great many colours can be woven together, and when this is done, it is good practice to work out the design on point paper.

When weaving with two or more shuttles it is difficult to keep neat selvage edges unless care is taken with the manipulation of the shuttles. Let the threads, therefore, of the two shuttles be twisted before throwing. This does not mean that two threads have literally to be twisted round one another before each throw. It would take far too long. There is a much simpler method. That is, place one shuttle exactly above the other on the web and replace always in exactly the same position after throwing the shuttle. By doing this once or twice, it will soon be seen which positions make the natural twist of itself. Then pull the twisted thread that remains until the loop of the thread just thrown is neatly placed on the selvage edge.

It depends, of course, for what purpose the material is to be used, but a more effective result is obtained if the undershot thread is a little finer and softer than the thread used for the pattern.

Cloth VI—Fig. 40

ROSENGONG PATTERN

Follow the draft carefully when threading. It is shorter and simpler than munkabelte, but there are two extra treadles used in the tie-up ; six treadles in all. As with munkabelte, when tied up, it will be found that the two centre treadles (three and four) weave tabby, while one and two treadles, and five and six treadles weave pattern. Press down alternately one and two treadles, and it will be found that the threads are in groups of twos and twos, and threes and ones. Press down treadles five and six and the result is the same. But it is not really the same as, although the threads are grouped in the same fashion, it is done on different threads of the warp. By this means slants and small gradations can be woven that could not otherwise be obtained. This will easily be seen by making a few patterns at first which only require two pattern treadles, and gradually increase to three and four pattern treadles. By so doing,

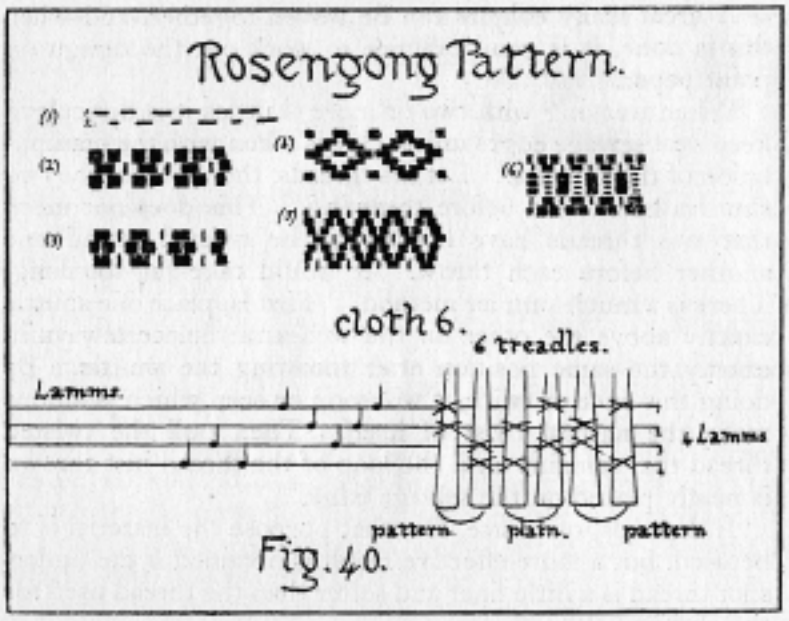


Fig. 40.

when it comes to working with all six treadles together there will be small difficulty in doing so.

The procedure is exactly the same as with munkabelte. An undershot must be used between each pattern throw.

For a very simple little pattern, use number one treadle five times with an undershot between each throw. Then use either number five or six treadles twice, also with an undershot between each throw, then back agan to number one treadle, making another little block of five throws.

A second pretty and very simple little pattern is to use the two treadles that when pressed down show the groups of twos and twos on the lower half of the shed.

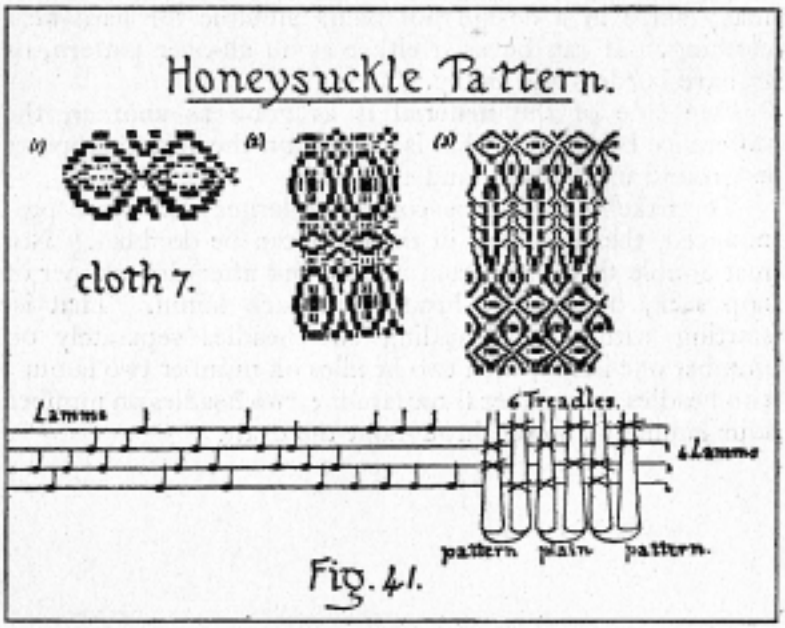
First of all make a little block of four threads (pattern). Then change over to the other pedal that when pressed down has also the two and two groups. On this latter make a block of sixteen threads. Then back again to the first treadle used, and cap with a block of four threads again.

About thirty combinations can be worked out this way. It is a particularly useful design for dress materials, the patterns being more compact than those of munkabelte, too

many skips in a design not being suitable for hard-wear clothing. It can be used either as an all-over pattern, or to have borders and tabby.

One side of the material is as good as another, the difference being that what is pattern on the surface appears as ground underneath, and *vice-versa*.

To make the patterns come out larger and more pronounced, the threading in the draft can be doubled. Not just double threads in each headle, but after the manner of hop sack, double the headles on each lamm. That is, starting with, and threading two headles separately on number one lamm, then two headles on number two lamm ; two headles on number three lamm ; two headles on number four lamm and so on throughout the draft.



Cloth VIII—Fig. 41

HONEYSUCKLE PATTERN

This pattern has many combinations, and is very useful for curtains, coats or borders for anything. It is more graceful and a little bit more difficult to work out than either of the two preceding drafts. But the procedure is exactly the same, so no explanations are necessary.

Press down each of the pattern treadles and make a little block (with an undershot, of course, between each) so that the weave of each treadle can be distinctly seen. Then start on one of the simplest patterns on *Fig.* 41 and build up from that. One of its prettiest all-over patterns for dress material is called the shell design. This is obtained by gradation, that is, starting with the treade that has the smallest number and gradually working out to the largest. Very graceful curves can be obtained by this means, by single throws, and not blocks.