

TWILLS, TWEEDS
and ALL-WOOL FABRICS

A Shuttle-Craft Guild Guide for Weaving
Woolen and Worsted Yardages

by

Harriet C Douglas



The Shuttle-Craft Guild
Virginia City, Montana

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Tweeds and Twills --- yarns of wool and a good, solid handloom, and the handweaver is ready to produce suit fabrics of exclusive design and remarkable wearing quality. The birthplace of the Tweeds, many centuries ago, was along the Tweed River which separates Scotland and England, a region where sheep were numerous and where the people became famous for their hand-spun woollen yarns, dyed with natural pigments, and hand woven into clothing yardages. Through centuries of word use, Tweed has come to mean the simple, rough, durable twill fabric, woven of handspun or handspun-type yarn; and the word has also been distorted into "Twill" which generally refers to the type of weave used for producing tweeds. Though Tweed retains its restricted meaning, the word Twill, referring to a type of weave, has extended to almost limitless horizons. The weaves which are based on, and derived from, the simple Twill, are so multitudinous that to cover them exhaustively would require a lifetime of study and many volumes of writing. No small work can do more than cover one phase of the subject; this one is concerned with the use of the Twill weave in producing Tweeds and other woollen and worsted fabrics suitable for men's and women's clothing.

WOOL AND WOOLEN FABRICS

Wool, the fiber which comes from sheep, has been spun and woven into clothing textiles since before the so-called dawn of civilization, but it is to the Romans that we owe the fine wool which is used for spinning today. The conquering Roman Legions introduced sheep into Spain in the days of the Caesars and in the course of centuries these sheep were cross-bred with rams from Northern Africa -- a happy combination which produced the best wool known, the Spanish Merino. The Roman travelers in the British Isles, finding the climate damp and cold, introduced the spinning and weaving of wool, thereby starting the great English wool industry. In Spain the fine flocks were carefully guarded by the later-invading Saracens, who made Spain the wool-weaving center of the world. After the retreat of the Moors, Merinos from the Royal Rambouillet flocks were distributed as royal gifts from the crown of Spain to the rulers of other European countries. Thus the Merino-Rambouillet strain spread through Europe and was introduced into Australia where it found particularly favorable living conditions. The Spanish Conquistadores brought Merinos with them when they conquered Central America, first introducing sheep to America. The English too brought sheep, as early as 1609, to the American colony of Jamestown. And so developed, and spread through the world, the clothing fiber known as wool, desirable for its physical characteristics: elasticity, crimp, resiliency, felting properties, absorption, and insulation.

Wool is spun into two kinds of yarn, known as woollen and worsted, the woollen yarn being of a much softer quality, with greater felting properties. In woollen yarn the individual fibers, some short, some long, lie in all directions; while worsted yarn is carefully combed, with all short ends removed, so that the individual fibers lie parallel. Worsteds are smoother, have less elasticity and greater luster, and are considerably more expensive than woolens. The rough, tweed yarns are woolens, the silky yarns, worsteds.

In addition to standard Merino-Rambouillet types of wool, a number of specialized animal fibers are incorporated into particular types of woollen fabrics for modern clothing textiles. There is Saxony wool, a fine, short-

staple Merino, strong and elastic with good felting properties. Shetland is a fine, lustrous fiber which comes from the characteristic sheep breed of the Shetland Islands. These sheep have two coats, a long, coarse outer coat, and a fine under coat, which is hand pulled to give the very expensive Shetland wool. Botany is fine Merino from the Botany Bay, Australia region. This name should not be confused with the Botany textiles, which is the trade name of a New Jersey mill and it does not necessarily denote the use of Botany Bay wool. Other fibers, usually mixed with wool for special fabrics, are Angora Goat, Cashmere Goat, Angora Rabbit, Camel Hair, Alpaca, Llama, and various furs. The term "Virgin Wool" refers to a yarn spun of all new wool, while "Shoddy" is used wool which has been reworked.

Wools are spun according to specified weights and sizes of yarn. Standard lengths of yarn have been selected and numbers assigned to different weights according to the number of these standard lengths in a pound, the higher the number, the finer the yarn. For woollens, the standard "cut" is hanks of 300 yards, so a #1-cut yarn has 300 yards per pound, a 12-cut has 3600 yards per pound. Woollens are sometimes denoted by "run" which has 1600 yards per pound, so a #1-run has 1600 yards per pound, a 3-run yarn has 4800 yards per pound. Worsteded are usually denoted by hanks of 560 yards, so #1 worsted has 560 yards per pound. But worsteds are sometimes measured by 1000 yard per pound lengths. Since the standardized wool measurements have so many complexities, the average handweaver finds size numbers too complicated and usually resorts to the use of trade names. Common sizes of tweed yarns are 9-cut with 2700 yards per pound, and 12-cut (2 1/4-run) with 3600 yards.

Yarn for handweaving is usually dyed in the skein but exceptions to this exist. Heather mixture is dyed before spinning and differently colored fibers are blended to give a desired color. Natural grey yarns are the undyed yarns from grey, black or brown sheep, or a blend of these. Oxford mixtures are blended black and white wools. Salt and Pepper is a two-ply yarn with one strand of black and one of white. In addition to dying, wools are sometimes mercerized by treating them with caustic soda. This process gives a high luster to the fiber and reduces the felting property of the wool.

WOOL TEXTILE TERMS

The textiles produced from woolen and worsted yarns, for suitings, on the twill weaves, are almost as numerous in interpretation as are the weavers who throw shuttles. But through textile history certain standard terms have developed and some arrangements have proved so lastingly good, that they are perpetuated through specific names. Some of these are:

Broken Twills are twills in which one or more harnesses are regularly omitted in the threading, but the weaving is regular. Dornik is an example.

Cheviot Tweed, originally from the Cheviot Hills of Scotland. Made of the rough, coarse, cheviot wool, woven in plain weave or in 2-2 twill, with warp and weft of the same color. Often piece dyed rather than skein dyed.

Combined Twills are Fancy twills woven in small patterns with broken diagonals and irregular warp and weft skips.

Corkscrew Twills are warp or weft rib twills produced on an uneven number of harnesses, by weaving semi-opposites. One of the few twills which is not a balanced weave.

Curved Twills are Fancy twills in which the twill lines have a waved or curved nature.

District Checks is the general name applied to the Scotch Tweed checks developed during the reign of Queen Victoria for hunting and sport

wear. They are characterized by a certain boldness of small figures, but "protective coloration". They include such checks as the Glens, the Glen Urquharts and the Shepherd check, woven on two, three or four colors.

Donegal Tweed has two types. One is a herringbone weave on a white warp with a dark weft; the other, a plain weave fabric woven with a weft which has colored nubs.

Dornik is a broken Herringbone, woven like a straight 2-2 twill.

Entwining Twills are Fancy twills with twill lines running to both left and right.

Glen Plaid or Check has a two-color warp, usually light and dark, arranged 4 and 4 and 2 and 2, woven in a 2-2 twill with the same color arrangement.

Glen Urquhart Plaid or Check is basically arranged like the Glen Plaid but with an added over-plaid of narrow stripes in a third color.

Glengarry Tweed is woven in either homespun or twill, of coarse, hit or miss yarns which often utilize waste materials.

Granite Weaves are small, indistinct twill patterns produced on dark and light yarns. They are sometimes produced by weaving regular twills in satin order.

Gun Club Check is similar to the Glen Plaid but is of American origin.

It is a three-color check with one half white ground and two dark colored checks. The arrangement for men's clothing is usually 6-6-6-6, and for women's clothing 12-12-12-12. Directly derived from the Shepherd's Check.

Harris Tweed is a name which has been standardized by the Federal Trade Commission and the British Board of Trade and refers only to the handwoven tweeds produced in the Outer Hebrides. Traditionally these were hand spun and dyed with vegetable dyes over a peat fire, which gave the characteristic peat-smoke odor to the yarn. Now, most Harris Tweed is machine spun, but handwoven. Handweavers may sometimes purchase Harris yarn, but their tweeds cannot legally be called Harris Tweeds. Harris Tweed always carries a trade-mark.

Herringbone is a point twill produced by reversing the direction of the warp threading at specified intervals. Dornik herringbone breaks the threading by skipping one harness at the reverse point to maintain the 2-2 arrangement of weaving.

Hopsacking, the name given to a rough Homespun fabric, is sometimes woven in a basket weave.

Homespun is the name applied to a rough, tweed fabric, woven in plain, or tabby weave.

Hound's Tooth seems to have several interpretations. Commonly, it is a two-color, four-thread check woven so that the third and fourth harnesses are raised at the start of each check. The name is sometimes applied to the small, four-thread, broken twill woven on a warp of one color with a weft of another color. The same break is produced by the weft on a regular threading, by breaking the treadling order.

Irish Tweed is produced in 2-2 twill on a white warp with a dark weft, usually blue, grey, brown or black. Traditionally woven of Irish handspun yarn.

Normal Twill is the common 2-2 twill produced on four harnesses with two threads up, two down, progressing one thread to the left or right each shot to form a 45 degree twill angle.

Overplaid or Overcheck is a balanced warp and weft figure made by introducing a few threads of a strong color on a neutral, two-color base.

Scotch Tweed is a rough, heavy material woven in 2-2 twill of irregular yarn. Woven on a white warp with a bright colored weft or the reverse. Traditionally of handspun Scotch yarn.

Shepherd's Check is a small, two-color check, set with six ends of light and six of dark and woven the same, in a 2-2 twill. It may have

four ends of each color. The minute two-harness check, set 2 and 2, and woven in the same manner, is also known as Shepherd's Check. Tartans are the characteristic, stylized, plaid fabrics of the various Scottish clans, standardized by the regiments. They are woven in 2-2 twill, of rather fine yarn, using bold plaids in the characteristic Tartan colors which are chiefly moss green, dark brilliant blue, bright yellow, bright red, black, and white. The word "Plaid" formerly meant the scarf which was part of the Highland dress, but it has come to mean the pattern made by the color arrangement of warp and weft yarns.

Tweed is the general name applied to rough, heavy, woolen fabrics woven in 2-2 twill.

Unbalanced Twills are twills which have either the warp or the weft dominant. The corkscrews are an example.

CREATING THE TEXTILE

Designing the Textile

Appropriateness of the textile to its purpose is the basis of good designing. Therefore the first step in weaving a wool yardage is designing the fabric according to the use for which it is intended. Is it to be for a man's suit, or overcoat, a woman's suit, a dress coat, a sport coat, a formal or a sport suit, a summer or a winter suit, a rough and ready or a business suit, a conservative or a gay suit? Have as many sample color cards from yarn companies as possible, to compare weights and textures of yarn and colors. Along with the selection of yarn and colors, must be considered a suitable weave for the fabric. For a very sporty tweed, nothing is better than one of the Scotch District Checks, and gay over-plaids, as well as the neutral backgrounds, may be introduced. For a conservative, business tweed, a simple twill or Dornik is appropriate. A sport jacket may be as gaily colored and as complexly woven as one desires, the multiple-harness twills being well suited. In fabrics for women's clothing the range in color, suitable material and weave, is far greater than in men's, though most women do not care for the heavy tweeds except in sport clothes. It is usually advisable to select a style or pattern before planning the textile, to be sure that the yarns and weave are the best possible for the desired style, and also to have an estimate of the yardage requirement. With these points determined, the next step is estimating the yarn requirements for the order. Be sure to estimate and order generously. Nothing is more distressing than having to wait several weeks for a re-order of yarn to arrive for weaving the last yarn, particularly when it comes in a different dye lot.

Warp Width

The width of a finished material is determined by the requirements of the tailor's pattern. These are arranged to cut most economically for a double width material of 56 inches, or a single width of 28 inches. For a very large, broad shouldered man, a tailor will sometimes need a width up to 29 inches. But anything wider than this is unnecessary and wasteful. It is well for the handweaver to aim at a finished width of about 28 inches. Two inches of weaving width may be allowed for take-up in the weaving and another two inches for shrinkage in the fulling process, which means that the width of the warp in the reed should be four inches wider than the finished material. (If the warp is set properly and the weaving technique is correct, there will be much less proportional shrinkage in width than in length.) A warp width of 32 inches is sufficient for any tweed project. Most dressmaker patterns are laid out for 36 inch widths, so a weaver producing a women's suit or coat length will

often wish to make the warp 38 or 40 inches wide, though this is not necessary.

Warp Length The length of the warp must be computed before ordering the yarn. Seven yards of finished material are usually required for a man's suit length, eight yards for a very tall man. Eighteen to twenty four inches must be allowed for warp wastage in tie-ins, according to the nature of the loom and the wastage habits of the weaver. Shrinkage of the fabric in fulling must be taken into consideration. This will vary according to the type of yarn and the openness of the weave, as well as the final "finish" put on the material. Woolens shrink more than worsteds. One may make a loose generalization that the ratio of loss in a woolen material is one yard of shrinkage to every seven to ten woven. The weaver should therefore weave eight yards of perfect material to be sure of securing seven yards of finished goods. The inexperienced tweed weaver will usually produce a yardage which has a few unsightly streaks in the weaving. It is therefore wise, in weaving ones first yardage, to weave an extra yard so that the tailor may adjust his pattern to eliminate any streaks. An allowance should also be made for practicing at the beginning. All this adds up to a warp yardage of about ten yards, advised for the inexperienced wool fabric weaver, for one suit length. The experienced weaver will find eight to eight and a half yards sufficient. If the fabric is to be used for a woman's suit or coat, the basic seven yard finished length should be adjusted according to the pattern requirements. About five yards will usually be enough.

Sources of Yarns A weaver may not simply go to a department store and pick out her yarn for a suit length as she would select yarn for knitting a sweater. There are relatively few distributors of good woolen and worsted weaving yarns and orders must be placed by mail. The following suggestions of sources by no means exhaust the list, but they cover a few yarns which have been tested and found excellent for their purpose. Splendid imported tweeds in beautiful colors, nubs and heather mixtures (Beehive brand) are available from the Royal Society, Inc, 230 Fifth Avenue, New York 1, or 770 Mission Street, San Francisco 3, Calif. Very fine, light weight tweed (and also heavy tweeds) and Botany (English, Scotch and Australian) are available from the Searle Grain Weaving Department, Grain Exchange Building, Winnipeg, Manitoba, Canada. Canadian tweed yarns in an interesting color range are distributed by the St Stephen Woolen Mills, St Stephen, New Brunswick, Canada. Some excellent tweed yarns are now being produced in the United States. One of the most reliable sources is the Handweaving Yarn Company, P O Box 7145, Elkins Park, Pennsylvania. The Frankenmuth Woolen Mill Co, Frankenmuth, Michigan, and Thomas Sheehy and Co, Phillips, Maine, both have good tweed yarns in beautiful colors. The Lily Mills Co, Handweaving Department, Shelby, North Carolina distributes a lovely 2-ply woolen yarn which weaves into beautiful, soft woolen fabrics. Among worsteds or semi-worsteds there is no more satisfactory yarn than the Bernat Fabri (mothproofed), distributed by the Shuttle-Craft Guild, Virginia City, Montana. The color range is exceptional and includes the true Tartan colors. A satisfactory worsted is distributed by the Royal Society, Inc. Weaverite is a similar English worsted distributed by most Canadian firms.

Yarn Calculations Exact advice cannot be given on warp settings for individual yarns, as different weaves take different settings. A suggestion can be given for plain 2-2 twill for each yarn (which can be varied about two threads more or less). The homespun-type (or hopsacking) tabby material may be set more widely and the fancy, looser twills usually require a closer setting. The Beehive tweed, which has about 2700 yards per pound (9-cut) may be set at about 18 per inch. A 32-inch, 576-thread warp requires 576 yards of thread per yard of warp, and an equal amount of weft, or slightly

under one-half pound of yarn for one yard of material. The Searle imported yarns are various, so standard yardages and settings cannot be given; however, the Weaving Department will provide information with yarn orders. St Stephens is a rougher yarn, slightly lighter than Beehive, and sets at 18 to 20 per inch. Frankenmuth and Sheehy yarns may also be set at 18 to 20. The Handweaving Yarn sets well at 20 for a light weight suit, but makes a better, firmer fabric at 24; it is a 12-cut with 3600 yards per pound. Fabri and Tam O'Shanter (the Royal Society worsted) are 18/2 worsteds with about 4800 yards per pound. A splendid, firm, hard fabric is produced on a setting of 30 to the inch, but a setting as wide as 24 per inch may be used, particularly when weaving tabby. A safe estimate of quantity for almost any woolen fabric is one-half pound of yarn for each yard of woven fabric, with a little more warp than weft material.

Sample The wise yardage weaver will do well to set up a sample warp about eight inches wide and two yards long, to try out the weave, determine the color effects and the proper warp setting, before preparing the warp for the final yardage. Then take the sample to your tailor and get his advice and reaction. The sample warp is particularly important if one is producing an unusual stripe, plaid or check arrangement or is combining several colors. The interacting effects of colors and proportions in stripes cannot possibly be detected from seeing the yarns together or from making a colored drawing.

Preparing the Warp The first step in the actual production is the preparation of the warp. Wind warps for single suit lengths, or warps which contain many color changes, on a warping board. Wind longer, simple warps sectionally. Some weavers prefer drum, or mill, warping, but this method requires greater skill and cumbersome equipment, even though it is more speedy than using the warping board. In winding the warp be sure to make a perfect cross (or leash). Chains of any convenient number of ends may be wound, but about 150 ends per chain is usually satisfactory. If anything happens during the winding to spoil the tension of the warp, chain the warp off the board immediately, as small chains, as long as there are not too many of them, cause no difficulty. Tie a loose loop of heavy cotton or linen around the cross before starting the chaining. Tie a cord tightly at the side of the last peg before removing the loop from the peg, to mark the exact point where the warp is to be cut. If a knot occurs in the yarn being warped, break the yarn at the knot and take it back to either the first or the last peg, re-tying the knot at that point. No knots should be permitted in the warp as they are apt to break in the heddles or reed, or to disfigure the woven textile.

Chain Warping In beaming chained warps there are two common methods; the first is spreading the warp ends through a rattle attached to the back beam and beaming directly; the other is slewing, threading and tying-in the warp and beaming from front to back. The weaver's experience will determine which method to use, but we prefer the latter method because the warp is more controlled, the reed and heddles act as mild tensioners for the entire warp width, there are never any dangerous tangles between warp beam and harnesses, and if necessary, one person may perform the entire beaming operation unassisted. The method is recommended particularly to beginners, and experienced yardage weavers often warp more efficiently by the first method. It is advisable for the tweed weaver to have several reeds of different dentages available, as tweeds weave better when sleyed regularly, two per dent. When the slewing, threading and tying-in are completed, hold the warp chains taught in front of the loom and treadle to produce a tabby shed. Insert a dowel stick (wider than the warp) in the shed and treadle the opposite shed. Four dowels may be inserted in tabby sheds and tied in pairs at the ends so that they do not touch each

other and cannot fall out of the sheds. Pull out as many yards of warp as possible and draw the front two dowel sticks the length of the free warp, to straighten the threads. At this point an assistant, to hold the warp chains under tension, is useful. If any combing is necessary, hold the warp under tension and run the comb through gently. When several yards of warp have been straightened, merely lay the chains on the floor and turn the warp beam until both pairs of dowels meet in front of the beater. It is not necessary to hold the chains under tension during the beaming, as the two front dowels, the reed and the heddles act as tensioners for the full warp width. Again, an assistant to keep a sharp eye for knots in front of the reed dowels is useful. Handle the warp as little as possible. If one has sufficient space, it is advisable to pull out and straighten at least five yards of warp at one time.

Beaming

Various methods are used to separate the layers of warp as they are rolled onto the warp beam. Each weaver has his own system, and in most cases each weaver thinks his own is the best -- which it probably is, for him. One method is to place leash sticks every few inches between the warp and the beam. Sticks must be made of smoothly sanded hardwood, so that there are no splinters or rough surfaces to harm the yarn, and they must be at least two inches longer than the total warp width. A great many sticks are required. Another method is to use a roll of wide, stiff wrapping paper by inserting the end, with the edge lying perfectly straight, between the beam and the warp and rolling the paper and warp together so that a layer of paper lies between each two layers of warp. Newspapers may be so used, but at least two thicknesses should be inserted together because of the softness of the paper. The chief difficulty with paper is that it is apt to form wrinkles in the center and the edges do not give sufficient support, either of which situation will ruin the warp tension. Some weavers fold strips of newspaper to eight or twelve thicknesses and use these strips like leash sticks. The system which we find best is the use of corrugated cardboard cut into strips at least two inches longer than the warp width and wide enough to go around the beam. A strip may be rolled on for one round, and then several turns made without any separation of warp, then another strip inserted. The corrugated cardboard pieces may be used over and over.

Sectional Warping

Sectional warping, requiring as many tubes or spools of warp as there are warp ends in two inches, usually necessitates a ball-winding project. Some yarns come on half pound tubes and some on quarter pound tubes, which are fine for the commercial weaver who is to produce many yardages on the same warp. The amateur weaver who plans to produce several yardages may advantageously plan a similar, neutral colored warp for all, and purchase sufficient quarter pound tubes for the warp. Usually the weaver winds spools of warp yarn. The problem here is getting the exact amount of yardage on the spools. Some weavers devise measuring devices, but these are usually "Rube Goldburghs" which involve wires, door bells, bird cages and batteries, and are not practical for manufacture. The most satisfactory method is to make estimates by weighing the yarn. Determine the exact yardage required for each spool first. For instance, if a warp for two suits, seventeen yards, is required, and the width is to be the standard 32 inches, each spool will need 16 times 17 yards, or a total of 272 yards. Measure out 272 yards on the warping board -- and the wise warper will be generous and allow 300 yards. Wind this from the warping board to a previously weighed spool, weigh the loaded spool to determine the exact weight (a sensitive postal scale is best). Wind all other spools until they have exactly the same weight of yarn, or a little more to be perfectly safe. If one knows the yardage per pound of the yarn, one can figure the spooled weight from this. For instance, if the yarn has 3600 yards per pound, there would be 12 300-yard lengths per pound, or 1 1/4 ounces per spool. This method is less accurate as

there is often some variation from the standard yardage. Instead of spools, we use a small ball winder which weighs seven ounces, and weigh winder and all to determine the required amount of yarn. When sufficient yarn has been wound on a ball, the ball is slipped from the winder shaft to a tube from a half-pound yarn tube. The advantage of this winder is that well-shaped balls, all having the same tension, may be produced. After the tubes of yarn are on the spool rack, some weavers prefer to warp yarns using merely a gathering board to hold the individual threads in the right positions, and a comb to spread the ribbon of warp to the correct width. Because of the natural friction of wool, the tensioner may not be necessary, but if used, some of the tension pegs should be removed to reduce the tension.

If, in beaming, a warp thread should break and be undetected, it is possible to substitute a weighted ball of warp yarn, hung over the back beam and threaded through the proper heddle and reed dent. When the broken end turns up on the beam, the ball is removed and the two ends tied together. Always use Weaver's Knots in tying warp ends. If a harness is omitted in the threading, the above system may be used to introduce the missing thread, drawing it through a string heddle on the proper harness; but the slewing must then be corrected to the nearest edge. Errors in threading harnesses may be corrected by merely tying a string heddle on the proper harness and rethreading the offending warp end. Correction heddles may be purchased but these are seldom practical except for slight usage because they have a tendency to pull off the harnesses and become entangled in the warp, often causing serious trouble. It takes only a moment to tie a string heddle. Correction balls should be used with moderation, as several of these hanging at the back of the loom will provide such a nuisance that time is ultimately saved by doing a rethreading job in the first place. Crosses between heddles and reed are caused by twists in threading and are corrected by taking out the two twisted threads and rethreading them correctly. An error in slewing will make a fabric unusable by creating a streak the entire length of the goods. The only way to correct a slewing error is to resley from the point of error to the nearest edge.

Correcting Errors

The tie-up for the treadles is given in the tie-up draft, with the treadles indicated, in the order of the weaving, from left to right. The standard tie-up, without tabbys, is used for the simple 2-2 twill: treadle 1 sinks harnesses 1 and 2, treadle 2 sinks harnesses 2-3, treadle 3 sinks harnesses 3-4, and treadle 4 sinks 4-1. For a rising shed (jack-type loom) this order is reversed so that treadle 1 raises 3-4, treadle 2 raises 4-1, treadle 3 raises 1-2, treadle 4 raises 2-3. With this set-up all the treadling is done with the left foot, or treadles 1 and 2 are operated with the left foot, 3 and 4 with the right foot. This is neither reasonable nor rhythmic, and it slows the weaving considerably. The normal and easiest treadling motion is a "walking" rhythm: left, right, left, right, until one has walked out miles of steps on a yardage. How much easier than hopping two or three steps on one foot and then hopping a few steps on the other. To convert the standard tie-up for "walking" merely reverse the tie-ups on treadles 2 and 3 so that tie-up 3 is on treadle 2, and tie-up 2 on treadle 3. If a 6-treadle tie-up is being used, tie the treadles in the order of 1, 3, 5, 2, 4, 6, and treadle 1, 4, 2, 5, 3, 6, over and over. For an 8-treadle tie-up, arrange the treadles 1, 3, 5, 7, 2, 4, 6, 8, and treadle 1, 5, 2, 6, 3, 7, 4, 8. Uneven, or off balance, tie-ups are used in weaving the fancy twills. Since the operation of the counter-balanced loom requires that the harnesses always work in pairs, the interesting potentialities of the fancy twills are not open to the weaver who uses a counter-balanced loom. Such a loom, however, is quite practical for weaving traditional tweeds.

Treadle Tie-Up

The Weaving

All tweeds and most woolen fabrics are woven with an exact balance between warp and weft. Care must be taken to develop a beat which gives one a final fabric with exactly as many weft shots per inch as there are warp ends. The warp-weft balance cannot be judged when the material is held under tension. It must be remembered that in tweed and woolen yarns, there is greater shrinkage in the warp than in the weft, so this must be compensated by weaving slightly fewer weft shots per inch than there are warp ends. For a warp set at 20 per inch, 17 to 18 shots per inch, with the warp under tension, are sufficient. For any new warp material, the weaver usually has to waste the first few inches of weaving in developing the right touch for a perfectly balanced weave. If it is necessary to pound the beater unduly to achieve this balance, the warp is set too closely. If great delicacy is required and the slightest deviation produces a weft streak, then the set is too wide. The proper beat will usually be one stroke of the beater after the shuttle is thrown, and a second stroke after the shed is changed. If the first beat is omitted, the weft will have no take-up and will lie in the shed under tension, causing undue narrowing-in of the fabric. If the second beat, the one which actually places the weft in position, is omitted, the warp threads may not separate perfectly, as this beat also clears the shed. Special care must be taken to keep the balance of the weaving perfect at the points where the warp position is changed. The weft will usually beat in more easily when the weaving surface is near the breast beam, so it may be necessary to employ a lighter beat at this point. If the loom makes a good, wide shed and has a wide weaving space, there is a tightening of the warp tension as the weaving surface approaches the beater. Alleviate this by releasing the cloth beam ratchet one notch.

Good Weaving Practice

The highly elastic quality of wool with its tendency to stretch as it is wound tightly onto the beam, necessitates the immediate weaving of the fabric. The wool loses its elasticity and becomes somewhat brittle if it remains under tension for any period of time, and with this weakening, the warp threads develop a tendency to break when subjected to the weaving strain. Therefore, a woolen warp is not one which can be put on the loom in the fall and the weaving picked up at odd moments through the winter and spring. When a wool project is started, the weaver should be able to plan a comparatively free period ahead, so that the work can proceed with little interruption. About a week of concentration, in the part-time way that most weavers work, can usually see a wool yardage warped, threaded and woven. Whenever the weaver leaves the loom, the tension on the cloth beam should be released to reduce the warp tension as much as possible. Never rest shuttles on the woven cloth when the weaving is not in progress, as this too distorts the tension. Release the tension before measuring the weaving on the loom. Markers of small pieces of cotton thread inserted into the selvage shed every twelve or eighteen inches obviate the necessity of unrolling the material for measuring. Different colors may indicate progressing yardage.

Inserting Weft Ends

Insert all new weft ends only in the selvage of the weaving. In weaving twills it is sufficient merely to carry the old end under two or three warps of the new shed and let the new end hang out an inch or two at the edge. Since the material is to be cut, it is not even necessary to do this; just leave both ends dangling. The point is, never cross weft ends in the body of the weaving. If knots occur in the weft, cut them out and start the weft again at the edge. All knots in both warp and weft must ultimately be removed, and it is easier to eliminate them during the weaving.

If a warp end should break during the weaving, a length of warp yarn should be tied, always with a Weaver's Knot, to the broken end; it is then correctly threaded and sleyed and fastened by wrapping it crosswise around

Broken Warps

a straight pin inserted in the cloth near the weaving edge. If the yarn and the reed are so balanced that a knot in the warp will not pass freely through the reed, use a long length of warp yarn and tie it to the broken warp in a large bow, at the point where the warp end comes off the beam. When the bow travels up high enough, the original warp end may be pulled through the heddle and fastened by a pin to the weaving edge. Be sure that the loops or ends of the bow do not become tangled in the shed, back of the harnesses.

Selvaqe Problems

Remembering that wool yardages are to be cut and therefore do not require beautiful, even selvages, producing a satisfactory selvaqe is still one of the wool weaver's greatest problems. The better the edge control, the more efficient the weaving. The greatest hazard in edges, and the one which causes loss of untold time, is the breaking of edge warp threads. Wool warps, particularly wide ones, are much more susceptible to broken warp threads than cotton or linen warps because of the weakness of fine wool yarns, combined with the sticky quality of the yarns which increases the tendency for the weaving to draw in. Edge threads may lie perfectly parallel and pulled no closer together than the inner warp threads, and yet a considerable narrowing-in may be detected occurring all the way across the weaving surface. Thus, good weaving practice is necessary for keeping edges straight. Permit the weft to lie loosely in the shed as it is beaten into place. Always make the first beat on an open shed, and never place any tension on the weft while beating. The greater the deviation from parallel in the warp when the beater is pulled forward, the greater is the strain and friction on the edge threads. This situation snaps edge warp threads, and broken warps require time out for repair. A good, firm edge is made by doubling the four selvaqe threads on each side, threading two ends in each heddle. This practice is quite acceptable. Occasionally beginners in weaving will try to eliminate edge difficulties by threading two stronger warp ends, such as carpet warp at each side. This should never be done. The difference in elasticity between two types of material will cause distortions of the weaving, and it does not provide a solution because the difference in tension seems to increase the breaking tendency of the edge wool threads. In reputable exhibits, a yardage which has a selvaqe of a different type of material will be thrown out on a technicality, regardless of the quality or design of the fabric. In weaving twills with one shuttle, one or the other or both edge threads often will not be caught in the weaving. In a straight 2-2 twill, if both edge threads lie loose, they will be caught if the weft yarn is broken and started from the other side. If only one thread is left loose, either remove the thread or disregard it. In weaving a twill with a reverse, two threads will be loose while weaving in one direction and both will be caught when the direction is reversed, or one loose thread will shift from one side to the other. Simply forget about the loose threads. They will be caught in at intervals, and the material is to be cut anyway. If weaving a 4-harness, 2-2 twill, the best practice is to thread the four selvaqe threads at each side to weave a tabby selvaqe. This is done by threading them 1, 3, 2, 4, instead of 1, 2, 3, 4. Selvages require patience, but in most cases the "touch" will come in time.

Shuttles

Proper shuttles require some consideration, though the type of shuttle to use is largely a matter of personal preference, and is partly determined by the type of warp yarn. Many professional weavers prefer to use the large, commercial-type shuttle because the weight provided by the heavy steel tips makes the shuttle carry smoothly and easily through the shed. These shuttles have tapered, fixed bobbins, which must be wound with great care to permit the yarn to slip easily off the free end. Other weavers avoid shuttles of this type because the weight of the shuttle puts a tension on the weft and draws in the edges unduly. The consideration

here is probably the type of material being woven. For a heavy, strong tweed yarn, the large shuttles are advisable; for delicate wools and worsteds, a light shuttle of the Swedish type is better. Of course, the larger the shuttle, the larger the bobbins may be wound, and constantly changing bobbins takes time. But fingering selvages and mending broken warp ends take a lot more time in the long run.

Spreader The use of a spreader, or template, is not advisable in weaving. The adjustable template which lies on the weaving, with brads hooking it into the selvages, is awkward to weave over, requires constant adjustment, and is apt to tear the selvages. A satisfactory spreading device may be made from two screw eyes, two heavy spring-type, round, office paper clamps, and two short lengths of picture wire. Screw the screw eyes into the ends of the breast beam. With a pair of pliers, bend back the steel plates at the mouths of the clamps until they mesh. Fasten the picture wire firmly to the thumb hold of the clamps. Fasten the free end of each wire to a screw eye allowing exactly the sufficient length of wire to permit the clamps to hold the selvages between the breast beam and the closest weaving edge. The clamps must be released before the warp tension is released, and are replaced after the warp is tightened.

Warp Dressing It is well to avoid woolen yarns which are not strong enough to weave without constant warp thread breakage. Some manufacturers make special warp yarns which have more twists per inch and are consequently stronger than weft yarns. In most cases the same yarn is used for warp and weft. If a warp happens to be too weak to weave properly, it is possible to remedy the situation to a certain extent by applying a warp dressing. The most common, and easiest made warp dressing is prepared by boiling flax seeds in water, straining the seeds off and adding water until the solution has the consistency of starch. This sours very quickly, but may be kept for some time if a pinch of sodium benzoate or some other commercial preservative is added. In an emergency, hairdresser's wave set may be substituted. Usually the weaver will discover during the warping process if the warp is too weak. In this case, the chains may be soaked in the dressing, but must be thoroughly dried before the warp is beamed. If the trouble becomes evident only after the weaving has started, the dressing may be brushed onto the warp, in front of the harnesses and in back of the harnesses, as the weaving proceeds.

Finishing When the cloth is removed from the loom, it should be gone over carefully and any knots removed and the ends darned under two or three threads, following the weaving pattern exactly. The loose ends from broken warps should be darned in the same way. Loose threads at the edges are clipped close. If there is an error in the weaving which makes a horizontal stripe across the fabric, it is wise to cut the material at that point, unless you have complete faith in your tailor. It is more than disconcerting to find a weaving error conspicuously crossing the shoulder of ones new suit.

Fulling Don't be discouraged if your woven fabric on the loom seems to resemble a burlap sack more than the fine suiting you had planned. Except when using fine worsteds and fine, soft woolens, the final effect is produced by the finishing or fulling process. Tweed yarns are commonly spun in oil so they are apt to have a disagreeable oily feel and odor. The oil content improves the yarn for weaving, but it must be removed when the yardage is taken from the loom. A washing in luke warm water with a mild soap is the only way to finish the goods. Since the woolen fabrics must be washed, a dry cleaning to remove the oil is an unnecessary waste of time and money. In addition to removing the oil, the washing process also felts the wool, raises the nap, and compensates minor irregularities in the weave. But do not rely too heavily on this last. Washing the fabric will not correct your weaving errors, and no processing can make poor weaving look like

good weaving. The amount of felting and nap which the washing produces is determined by the length of time the washing is carried on and by the roughness of treatment the goods receives in the bath. A material which is to have no nap should be washed gently and only long enough to remove the oil. Probably the most satisfactory method for finishing woolen fabrics at home is in a Bendix or other automatic washer which has a good water-temperature control so that nothing but luke warm water touches the fabric. The washer should also be adjustable for different lengths of washing time. The automatic washer is good because the material is tossed gently in the water, the rinse water flows through it freely, and the extraction is carried to 70 to 90 percent. On removing the material from the washer it must be dried immediately and as quickly as possible. The best arrangement is a series of clothes lines over which the material can be hung with not more than twelve inches between lines. Lacking this, if the material is well extracted it may be hung by one selvage with a clamp clothes pin every three or four inches. Since the drying should be accomplished as quickly as possible, this should be done out of doors, on a good drying day, preferably with a slight breeze, and the material should never be hung where the sun can touch it. The only process remaining when the fabric is dried is a good, professional steam pressing. Lacking an automatic washing machine, the bathtub method of fulling is an excellent one, provided arrangements can be made with a dry cleaner or laundry to put the yardage into an extractor as soon as it is removed from the bath. Fill the bath tub with enough luke warm water to more than cover the material and dissolve in it a box of good, mild soap flakes. Put the material in the bath and press it gently under water, constantly turning and lifting it so that the soapy water will flow through all the folds, but never lifting any of it out of the water. It is amusing, and also excellent practice, to get into the bath tub with bare feet and tromp the material gently. Five to ten minutes of this is usually enough. Let the soapy water drain out, pressing it gently, but never lifting, squeezing or wringing. Let a great deal of luke warm rinse water run through the material, changing it several times, keeping the material in motion and gently turning it under water, until the rinse water comes out clear with no excess dye showing. Notice that the emphasis is on being gentle. Do not be alarmed by the dye which flows into the water bath. This is excess dye which coats the surface of the fibers and must be removed, but it does not mean that the yarn is not color fast. Lift the fabric from the bath, into a large wash tub and rush it to the nearest laundry where arrangements have been made to have the extractor ready to receive it. Occasionally two washings will be necessary to remove all the grease and to raise the desired nap. If the quick tie-up between bathtub and laundry cannot be arranged, the only solution is to explain the problem thoroughly to a competent laundryman (it is amazing, the interest which most people who deal with fabrics will show in a fine, handwoven yardage) and trust the entire fulling process to him. Yardages woven of the Lily wool, of Bernat Fabri, and of some other worsteds, require only steam pressing for the finishing.

THE FANCY TWILLS

Far from restricted to the simple four-harness, balanced arrangement characteristic of the Tweeds, the twill is one of the most versatile and most widely used weave there is. Commercial twills are drafted from left to right and are commonly woven with the diagonal extending to the right. Handweaving drafts are written from right to left and woven with a left diagonal. The twill variations include steep, reclining, broken, modified, point, diamond, entwining, patterned, herringbone, basket, combined, curved, and many other twills.

In producing handwoven woolen and worsted fabrics, the four-harness, 2-2 balanced twill is used more commonly than any other weave. The homespun, or plain tabby weave is also common because it produces a firm quality, closely interwoven fabric which can be woven lighter weight than the twills. Therefore the drafts start with the two-harness weave, though this is not strictly a twill. The plain weave is desirable when using a novelty wool or worsted weft, or a yarn with a colored nub, as nothing in the weaves detracts from the concentration of interest in the yarn.

The lowest number of harnesses on which a twill may be produced is three, which gives the familiar "Jeans" twill. This is woven to give a warp emphasis by raising the harnesses consecutively in pairs: 1-2, 2-3, 3-1; or to give a weft emphasis by raising the harnesses alone: 1, 2, 3.

With the four-harness twills, the treadling and pattern variations emerge. These are devised by using the harnesses in various combinations and in different orders. The possible combinations include the single harnesses raised alone, the opposite of this made by raising three harnesses together, and the six two-harness combinations, a total of fourteen possible combinations. These fourteen treadles may be put together in different arrangements to form hundreds of different four-harness twill patterns. As harnesses are added to form the multiple-harness twills, the possible combinations increase and the pattern potentialities increase in geometric ratio until they become far too numerous to even conceive.

On pages 15 to 19 are shown a number of designs which may be produced on 4, 5, 6, 7 and 8 harnesses. From the thousands of arrangements possible, only a few have been given. Many of the twill patterns are impractical for weaving because of their long skips in both warp and weft. Many others are unattractive. The selection of patterns was made on the basis of the practicality of the weave for a fabric -- some more practical than others. Those with long skips should be woven only in fine, closely set material. In selecting a pattern to weave, it should be kept in mind that the twills which are most closely interwoven give the most practical clothing fabrics. Those combinations which at intervals use the plain weave sheds, or sheds which approximate the plain weaves, will give a strong fabric which will hold its shape and retain a press. Closely woven twills may be set wider in the reed than loose twills. Eliminated from the diagrams are the fancy weaves which require an unreasonable number of treadles. The closely woven, fancy twills are very handsome for women's suits and coats and for men's sport suits. The splashy figures make unusual sport jackets and women's coats.

Since the point twills are little used in clothing fabrics because of their balanced, "patterny" effect, they have not been included in the diagrams. Simple herringbone is widely used, usually in its Dornik form, and almost always woven as a straight 2-2 twill. When the straight herringbone (or point twill) is woven on standard combinations, there is a zone of weakness in the fabric at every point where the direction of the twill reverses, caused by every fourth weft thread skipping over three warp ends. In the Dornik this weakness is eliminated by skipping one harness at the turning point in the threading. The dornik threadings are given on the draft sheet, page . Modified twills in which the pattern is threaded in the warp and the weaving is done on the straight twill tie-up, have some of the Dornik characteristics.

The diagrams given on pages 15 through 19 indicate the draft, the treadle tie-up, and the resulting weave pattern. Patterns 1 through 56 are for four harnesses, 57 through 74 for five harnesses, 75 through 99 for six harnesses, 100 through 114 for seven harnesses, and 115 through 142 for eight harnesses. Interpretation of the pattern diagrams is simple. The drawings are made as though woven with a black weft, on a white warp. The white squares therefore indicate raised harnesses, and the dark spaces indicate sunk harnesses over which the weft passes. The figures for the tie-up of each harness, in the

treading order, are given at the top right of each figure. These are indicated for a rising shed, since the jack-type loom is required for producing most of them. The color effect of the diagram is reversed by threading a dark warp and weaving with a light weft, or by making the sinking shed tie-up (tie to the missing figures) rather than the rising shed one given. The five and seven harness twills are of particular interest when woven, because of their slight off-balance nature. Patterns 101 and 102 are Corkscrew twills which do not weave to produce the patterns indicated because they are woven off balance. Pattern 101 is a weft corkscrew which should be woven with about twice as many shots per inch as there are warp ends (very handsome and a remarkable fabric when one uses an 18/2 worsted set at 30 per inch and woven close). Pattern 102 is a warp corkscrew which should be produced on a very closely set warp. These, of course, may be woven to balance, but they give a somewhat salt-and-pepper effect, without the characteristic rib.

The pattern twills show up to best advantage when woven in strongly contrasting colors, one color for the warp, with a second color for the weft. In some cases a third color may be added to make a small check, or over-plaid, or a warp or weft stripe. For instance, patterns 6 and 8 may be warped with the first two ends of one color, the second two of another color. Patterns 7 and 9 may be warped with one color and woven with two colors, alternating two shots of each, one of which may be the same as the warp. Pattern 34 may be warped with one color on harnesses 1 and 4, the second on 2 and 3. Pattern 45 may be woven with 3 shots of one color and then 3 of another. Pattern 48 may be woven with one color on shots 1, 2, 3, 4, 5, and a second color, or a shot of the warp color, on 6. Similar color arrangements may be devised for the multiple-harness patterns.

There are a few guides to follow in selecting colors for weaving the twills. Select contrasting values rather than contrasting colors. Two values of the same color, such as beige and dark brown, natural white and oxford grey, light and dark green, combine well in equal amounts, giving a strong contrast. Colors which have even a touch of contrast, such as beige and blue, or light green and dark red, when closely mixed in equal amounts, tend to grey out at a distance, often creating a very unpleasant color effect. Mixing colors in very small areas in the fancy twills can also create very stunning color effects, but there is absolutely no way to determine what the effect will be without trying out the weave. The Heather-mixture yarns, spun of different colored fibers which have been carded together, provide a safer means of mixing colors than do the skein dyed yarns. A neutral color may be used with almost any strong color, the effect being a toning down of the strong color. For instance, a grey or a natural warp are always safe, as anything can be used with them. Beige becomes dangerous because of its yellow content. Strong and contrasting colors may be used in small areas for overplaids or narrow stripes, particularly with a rather neutral background such as two tones of brown or two tones of grey. Twisting two lengths of yarn together will not indicate how the colors will combine in weaving. If unconventionality of color is desired, the only way to determine how specific colors will combine, and what the final color effect will be, is to weave a sample in the actual yarn and colors desired, remembering that different fancy twills will produce different color effects with the same material. And a small, three or four inch sample is not large enough to indicate the effect in a yardage. The best plan is to play safe, be conservative when mixing colors closely, or to make a definite program of experimenting.

The diagonal twill line extending from right to left is one of the distinguishing features of the handwoven fabric. In commercially woven twills, however, this diagonal extends from left to right. If it is desirable to weave the right hand diagonal, this is done by reversing the treading order to 4-1, 3-4, 2-3, 1-2, or by reversing the threading to 4, 3, 2, 1.

1 4 3 2 1 2-3+ 1-3+ 1-2+ 1-2-3

2 4 3 2 1 4 1 2 3

3 4 3 2 1 3+ 2-3 2-2 2-3

4 4 3 2 1 1-3+ 2-3+ 1-2+ 1-2-3

5 4 3 2 1 2 1 3 4

6 4 3 2 1 3+ 2-3 1-2 1-3

7 4 3 2 1 3+ 2-3 1-2 1-3

8 3+ 2+ 1-2 2+ 3+ 4

9 2-3+ 3 1-2+ 1-2+ 1-2+ 1

10 2+ 1-3+ 2+ 1-2+ 1-2-3

11 3 2+ 1 2+ 3 2+ 4

12 3+ 4 1-2 2

13 3+ 2+ 1-3 1-2

14 3+ 2+ 1-2 3

15 2+ 4 1 1-3

16 1-3+ 1-2+ 1-2-3 2+ 2+ 4

17 3 1+ 1+ 2+ 4

18 2-3+ 1-2-3 4 1

19 1-2 1-2-3 2-3+ 3+ 4

20 3+ 4 1 1-2

21 1-4 1-3 1-2

22 2+ 2-3 1-3 2-3

23 1-2 1+ 1+ 1+ 3+ 4

24 1-2+ 1+ 1+ 1-3+ 4

25 3+ 1-2+ 1-4 2-3 1+ 1-2

26 2+ 3+ 1-3 2+ 1-2 1-3

27 3+ 2-3 1-2 3+ 1+ 1-2

28 1 3+ 2-3 3+ 1+ 1-2

29 3+ 4 2 1-2 1 3

30 3+ 3 2-3 1-4 1-2

31 3+ 3 3+ 1-2 1-3 1-2

32 1-3 4 2 1-3 2

33 2+ 3+ 1+ 2+ 1-2 2-3

34 1-3 4 1 2+ 3+ 1-2

35 2+ 3+ 1-3 1-4 1-2 1-2 1-3 2-3

36 3+ 1-2 1+ 3+ 1-2 3+ 1+ 1-2

37 2+ 3 1-3 4 2+ 1-3 2

38 3+ 4 1+ 1+ 2 2-3 3

39 3+ 3 1+ 1-2 1-3 2

40 3 2 1+ 2 3 4 1

41 3 1-3 2+ 1-3 1-3 2+ 4

42 3+ 2+ 1-2 2-3 1

43 2+ 1-2 1-3 2+ 1-2 1-3

44 1-3 2 1 2+ 3+ 4

45 3+ 1 1+ 1-2 3 1-2

46 3 1 3+ 2 4 1-2

47 1-2-3 2 1-3 2-3+ 3 2+ 4

48 2-3+ 3 1 1-2+ 1-2-3

49 3+ 2-3 3+ 1-2 2-3 1-2

50 3+ 1-3 1-3 1-3 1-2

51 1-3 3+ 1-3 1-2+ 4

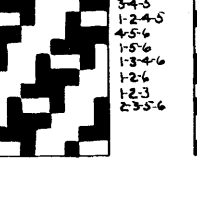
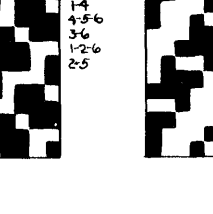
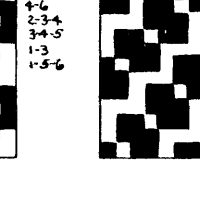
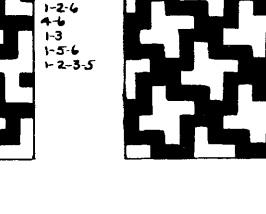
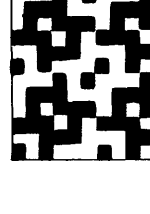
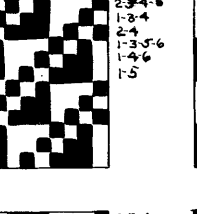
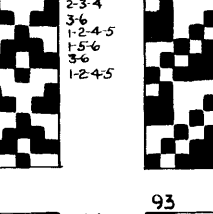
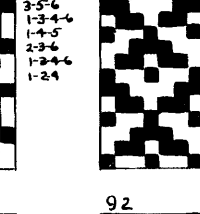
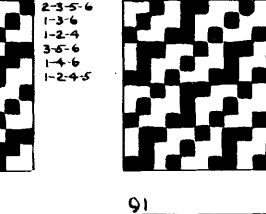
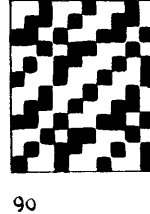
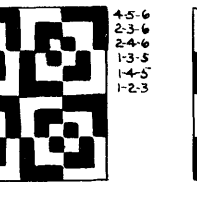
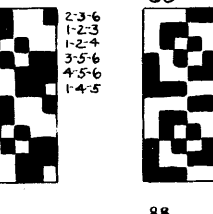
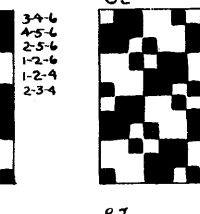
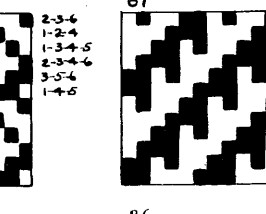
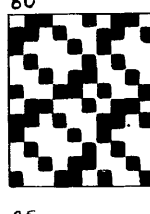
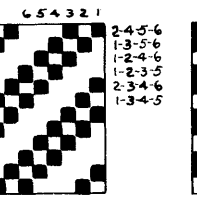
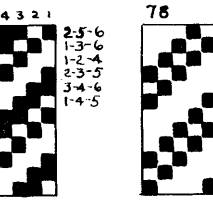
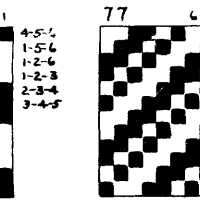
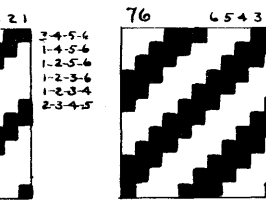
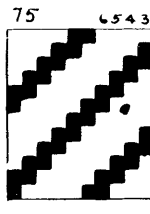
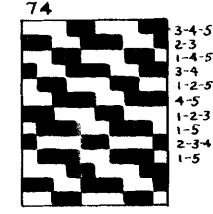
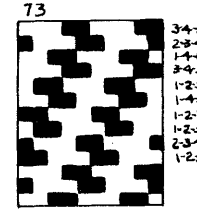
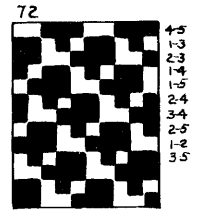
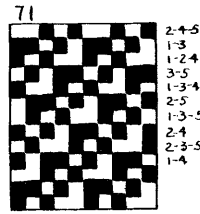
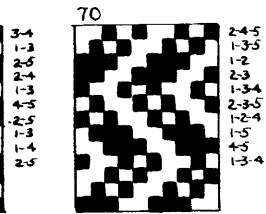
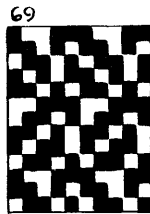
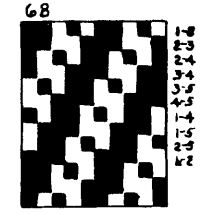
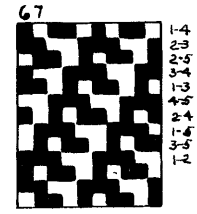
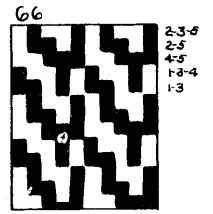
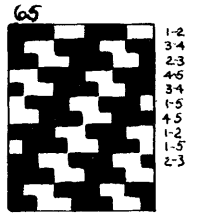
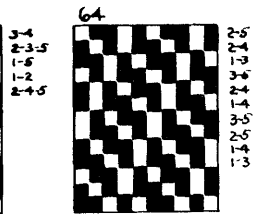
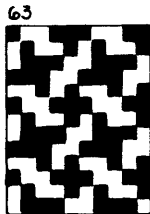
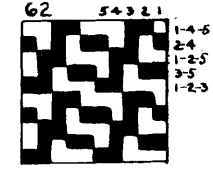
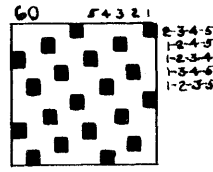
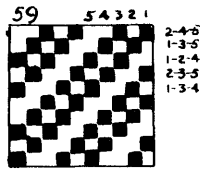
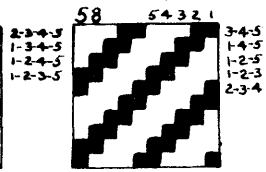
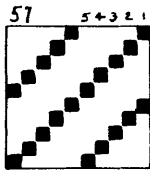
52 2 1-2-3 2 4 1

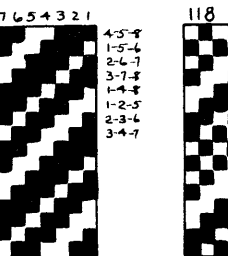
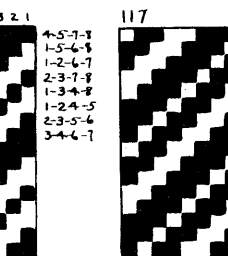
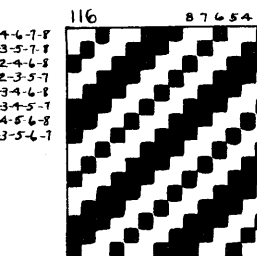
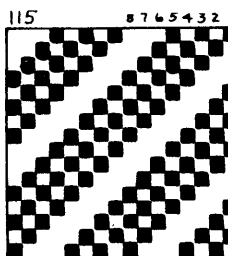
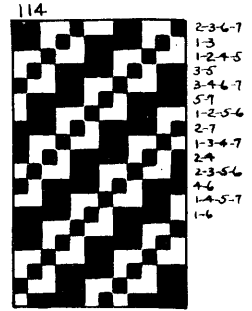
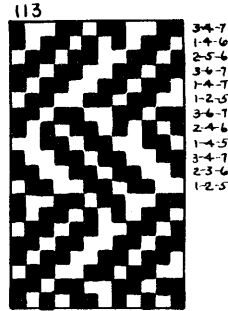
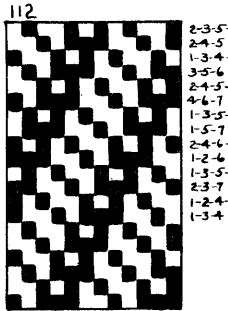
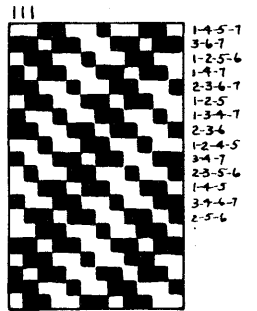
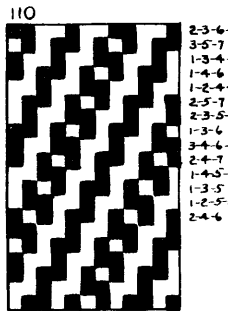
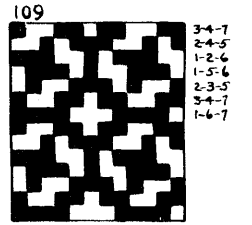
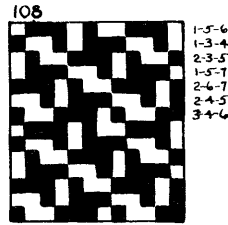
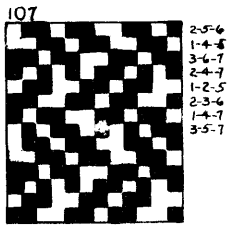
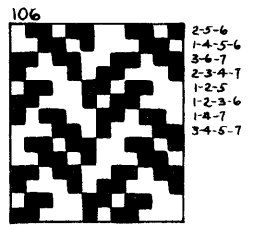
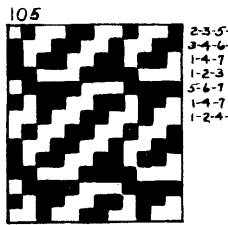
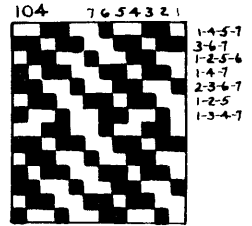
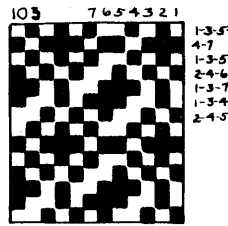
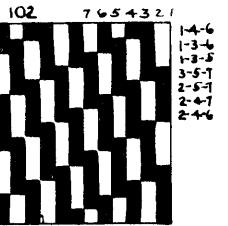
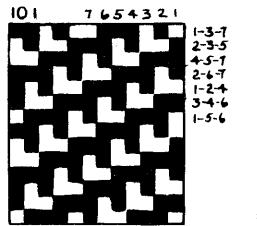
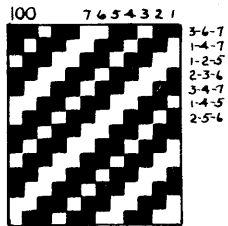
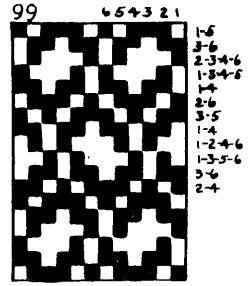
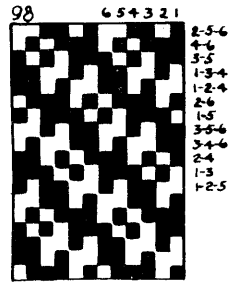
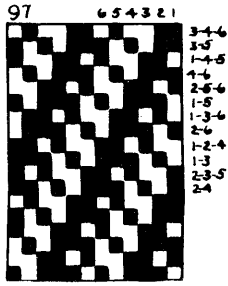
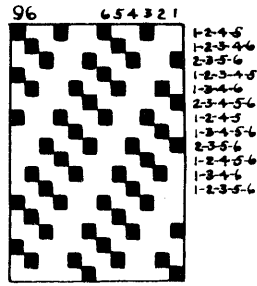
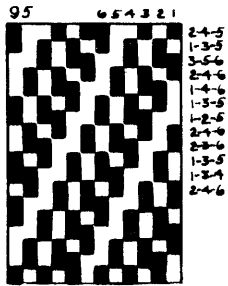
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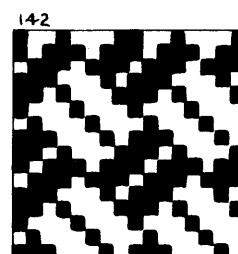
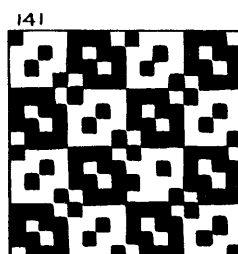
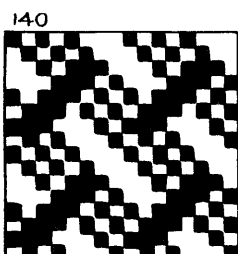
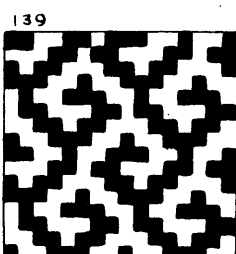
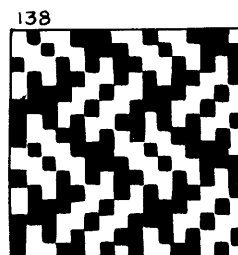
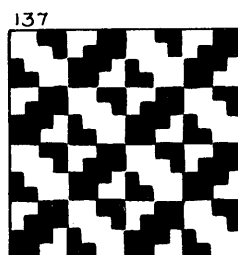
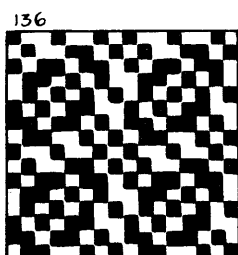
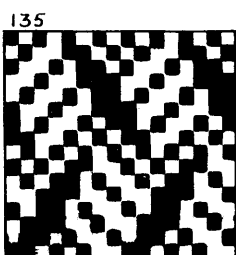
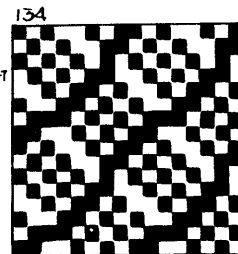
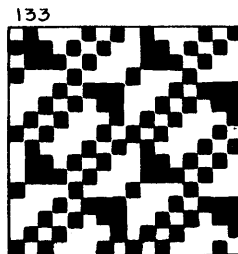
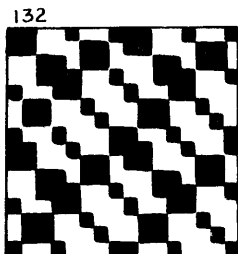
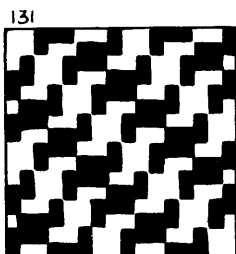
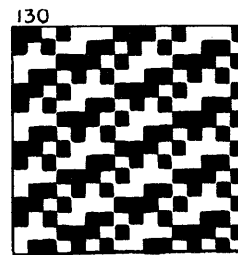
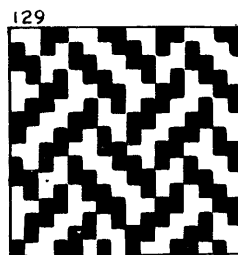
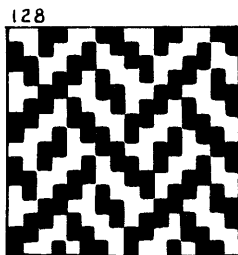
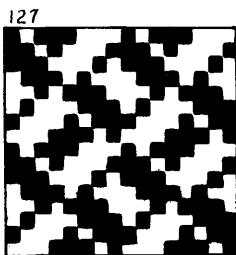
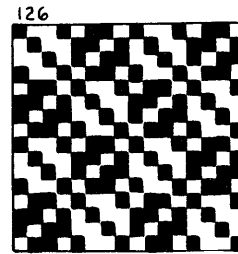
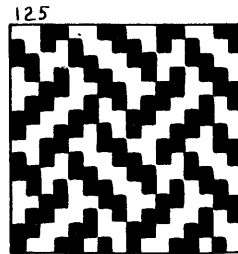
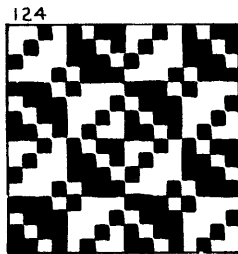
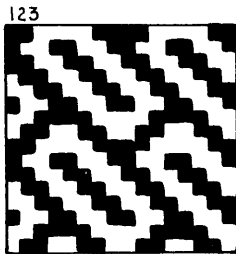
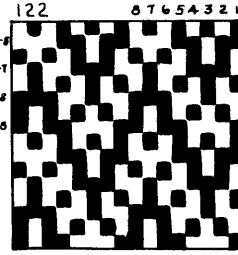
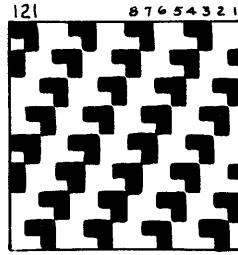
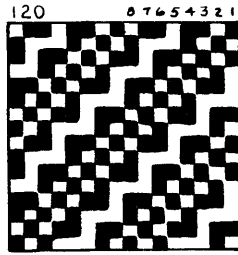
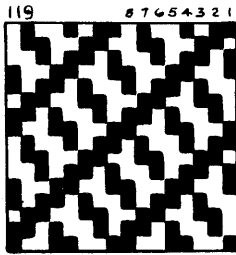
54 4 2 1-3

55 2-3 1-2 1+ 3+ 1-2 2-3 3+ 4 1-4

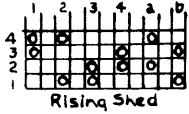
56 3+ 1-3 1-4 3+ 3+ 1-2 1-4



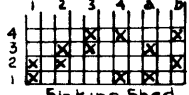




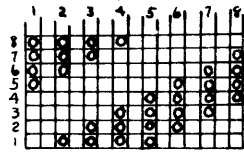
Standard Tie-Ups



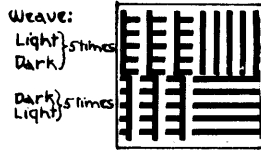
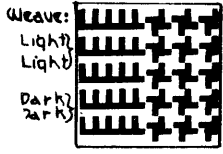
Rising Shed



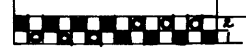
Sinking Shed



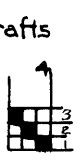
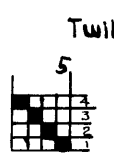
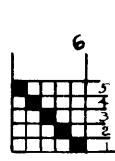
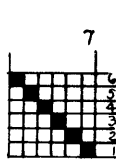
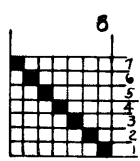
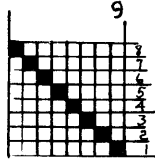
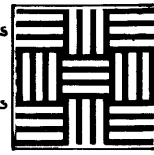
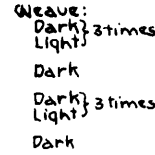
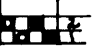
Combination 3



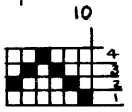
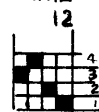
Log Cabin 2



Shepherd's Check 1



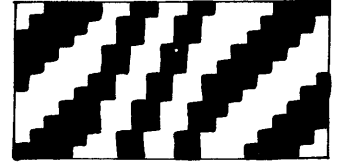
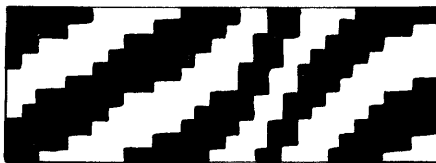
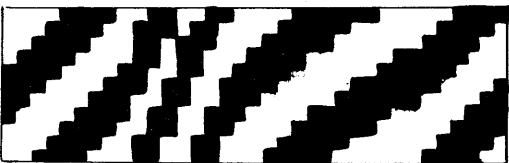
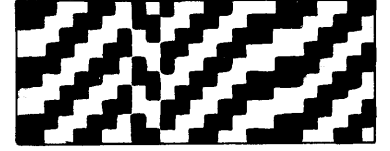
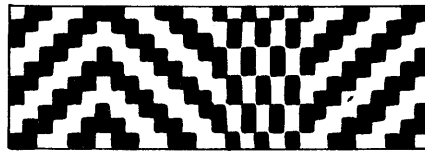
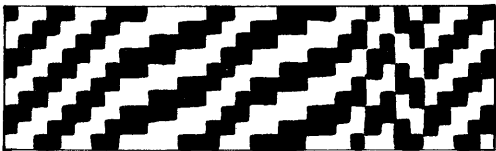
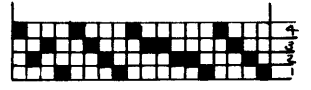
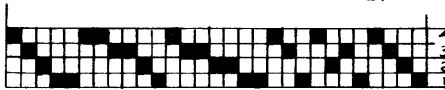
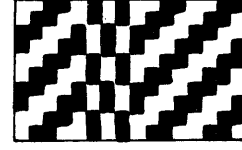
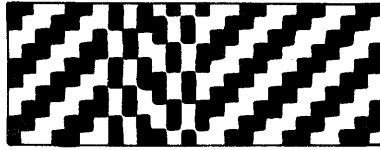
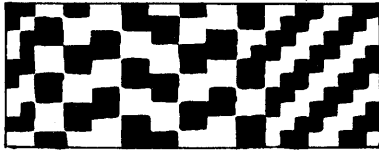
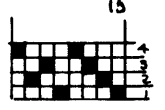
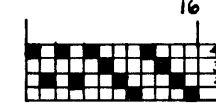
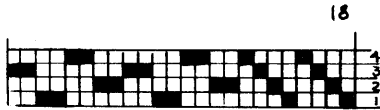
Twill Drafts



Dorviks

Herringbones

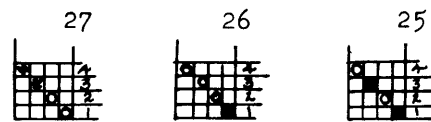
Modified Twills



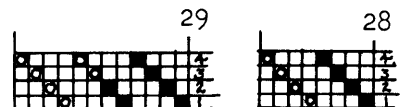
THE MULTIPLE-COLOR TWILLS

The Multiple-Color Twills are woven on a warp in which two or more colors are evenly spaced throughout. Since the focus of interest is in the colors rather than in the weave, they are usually produced on a plain 2-2 twill, or sometimes on tabby. They are usually woven in checks, with the weft color arrangement reproducing that of the warp. If woven with a one-color weft, either matching one of the warp colors or different, the effect is of warp stripes. Several suggestions for more or less standard warp-color arrangements are given below. The solid black squares in the drafts indicate black, oxford grey or a dark color; the circles usually mean natural white; other symbols are for various colors. These may be varied, of course.

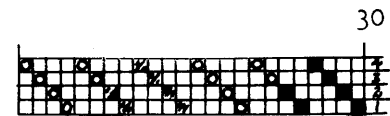
Draft 25 is commonly woven in white to give a "salt and pepper" effect. Draft 26 is woven as drafted, to give dots and dashes. Draft 27 is a Robert Galer Tweed warped with white, blue and red and woven with dove colored yarn throughout.



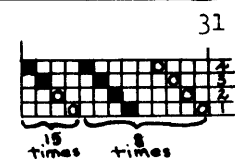
Drafts 28 and 29 are the common Shepherd Check. 28 gives "Hound's Tooth" when the first shot for each color is made with harnesses 2-3 or 3-4 raised.



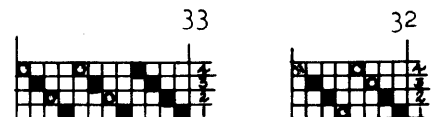
Draft 30 is the familiar "Gun Club Check" when warped with six ends each of oxford grey and dark red on a ground of natural white. The colors may be varied, light brown and dark brown on white being good. Twelve, instead of six-thread alternations are common.



Draft 31 gives the familiar and popular "Glen Urquhart Plaid" when the colors are woven exactly as they are drafted. An overplaid is often added by substituting two bright threads for the seventh pair of dark grey, and weaving the same.



Drafts 32 and 33 are novelty stripes, woven with a white weft. 32 has two ends of light grey, three of white, two of grey, and one of red. 33 is good with two tones of any color.



Draft 34 is pleasant woven as either a check or a stripe. It uses wavy brown and grey on a white base, or select your own colors. Particularly good when woven of a light worsted such as Fabri.



Draft 35 is a very successful check designed by Robert Galer. Colors: warm brown, tan and red overplaid. Woven as threaded.



These warp-color arrangements are merely a starting point for the weaver who likes to do his own designing. Such considerations as color combinations and stripe arrangement reflect the weaver's taste and individuality. Try your own hand at designing and make your suit fabrics truly individual.

REFERENCES ON THE TWILLS AND TWEEDS

The Twills, probably the weave most used by handweavers, have been sadly neglected in books for the handweaver. Technical information on the subject may be secured only in books written for the textile trade and for the designers of commercial textiles, and from a few now out-of-print articles. The Twill weave for the handweaver has been treated more thoroughly by Mary M Atwater than by any other experimenter and writer. Many of the following references are no longer available. (*) indicates out-of-print.

SHUTTLE-CRAFT BULLETINS:

- July 1939, Weaving Tweeds, by Mary M Atwater*
- April 1941, Scotch Tweeds, by Mary M Atwater*
- November 1944, Four and Eight-Harness Twills, by Mary M Atwater*
- February 1945, Modified Twills, by Mary M Atwater*
- August 1945, Point Twills and Dornik, by Mary M Atwater*
- February 1946, Colors in Twills, by Mary M Atwater*
- February 1947, Two-Color Twills, by Harriet C Douglas
- February 1948, Some Scotch Tartan Setts, by Harriet C Douglas

THE WEAVER, Magazine, (no longer published)

- July 1939, A Few Twills, by Mary M Atwater
- October 1939, Again the Twill Weave, by Mary M Atwater
- January 1940, Dornik and Some Fancy Twills, by Mary M Atwater

AMERICAN FABRICS (American Fabrics, Empire State Bldg, New York 1)

- Volumes V, VI and VII, A Condensed Dictionary of Wool and Worsted Textile Terms, 1948 (\$3.00 per copy)
- Volume X, Authentic District Checks, 1949
- Weave Construction and Cloth Analysis, by I C S Staff, International Textbook Co, Scranton, Pa (\$2.80)
- Textile Design and Colour, by William Watson, 5th Edition 1946, (\$7.50)
- Dictionary of Weaves, by Posselot, Published in Philadelphia about 1890*
- Weave Your Own Tweeds, by Roger Millen, Clifton Heights, Pa (\$5.00)
- Tartans of the Clans and Families of Scotland, by Thomas Innes, London and Edinburgh, 1948 (\$3.75) Color plates but no setts.

This booklet cannot be considered as complete instructions for handweaving. It deals with the specialized field of the art -- an introduction for both beginners and advanced weavers into the production of wool textiles for men's and women's clothing -- for weavers who already understand the operation of the loom. The Handweaver's INSTRUCTION MANUAL (available from the Shuttle-Craft Guild, Virginia City, Montana, \$3.00) teaches the weaver how to operate the loom, read drafts, and weave cottons and linens. No woolen textile is more delightful to produce than a traditional Scotch Tartan. Tartan setts have not been included here as many of them are given in Shuttle-Craft BULLETINS. They are best woven of Bernat Fabri, set at 30 ends per inch.

The Shuttle-Craft Guild (Virginia City, Montana, after October 1, 1949) is a correspondence service for handweavers. It offers a correspondence course in handweaving, and personal instruction at the Shuttle-Craft Studio, Virginia City, Montana. In addition to books and leaflets for handweavers, it publishes for Guild members a monthly BULLETIN on Handweaving and maintains a correspondence service to help them with their handweaving problems. Membership is \$5.00 a year. Samples of tweeds and other woolen materials with drafts and directions by Martha Colburn are available, and also exhibit material on various textiles.

The drawings in this booklet have been prepared by Martha Colburn.

Harriet C Douglas

