

# COLOR IN TEXTILE DESIGNING

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# COLOR IN TEXTILE DESIGNING

(PART 1)

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## PRINCIPLES OF COLORING

### THEORY OF COLOR

1. Many theories of light and color phenomena have been advanced from time to time by eminent artists and scientists, but while many of these seem to be based on fundamental laws, there has been much disagreement. It may be safely stated, therefore, that at the present time there is no universally accepted theory of color or system of color nomenclature.

2. **Light.**—The great majority of bodies emit no light of themselves and are therefore known as **non-luminous bodies**; but some, as for instance the sun, have the property of emitting light and are therefore known as **luminous bodies**. Luminous bodies, as the sun, or a gas or electric light, etc., are visible because of their own luminosity, but non-luminous bodies are visible only because of the property they have of reflecting the light that falls on them from luminous bodies. This is proved by the fact that the eye is unable to see non-luminous bodies at night or any other time when they are not illuminated by natural or artificial means.

White light, which is considered as pure light, is composed of all the colors found naturally or made artificially. If a

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beam of white light is allowed to pass through a glass prism, the light is decomposed, or separated, into colors. If these colors are allowed to fall on a screen in a room that has been darkened, a beautiful band of color will be produced. This band of color is known as the **solar spectrum** and contains every gradation of pure color, but for convenience the following division is usually made, the colors being given in the order in which they are arranged: violet, indigo, blue, green, yellow, orange, and red.

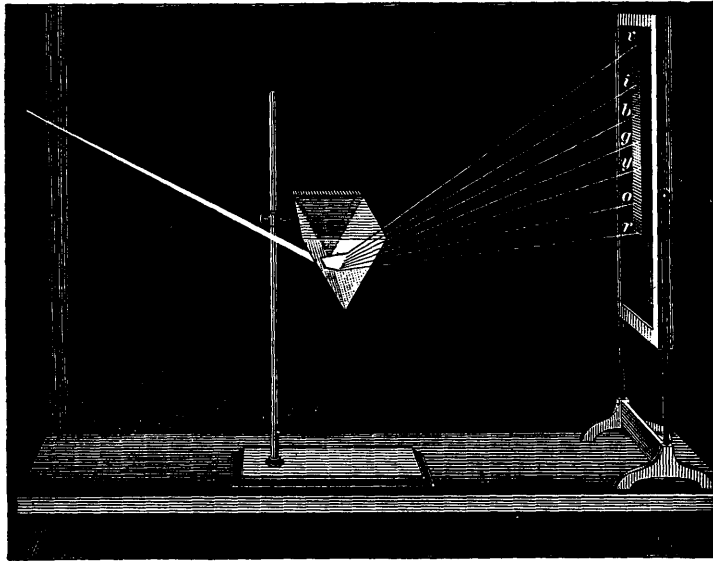


FIG. 1

A simple arrangement for the dispersion of white light into its component parts is shown in Fig. 1. A beam of white light is admitted into a darkened room through a hole in a shutter, and passing through a glass prism, is decomposed so that a spectrum is thrown on a screen. The positions of the various colors of the spectrum are indicated on this screen, in Fig. 1, by their initial letters. The decomposition of the white light is due to the refractive power of the prism. As some colors are refracted to a greater degree than others,

the light is divided into its component colors, each of which assumes its proper relative position in the spectrum. It will be noticed that the red light is refracted, or bent, from its true course the least, and the violet the most.

The seven spectrum colors are known as the *prismatic*, or *primary*, colors. Sometimes the spectrum is so divided as to make only six primary colors, the indigo being left out, as it is considered by some to be only a gradation of the blue. Red, yellow, and blue are sometimes considered as the *primary spectrum* colors, and orange, green, and violet as *secondary spectrum* colors.

The **pigment theory** of color is the one that is made use of industrially; it is based on the assumption that there are three primary colors—red, yellow, and blue—that are independent and separate pigments, differing widely from each other. These pigments are made as nearly like the spectrum colors as possible, but it is impossible to manufacture a pigment that will exactly match a spectrum color. With these three pigments and the passive colors black and white, any color, hue, shade, or tint may be produced by proper admixture.

#### CLASSIFICATION OF COLORS

**3. Definitions.**—All colors are divisible into two classes; namely, *simple*, or *primary*, colors and *compound* colors.

**Simple colors** are those that cannot be split up into other colors; in other words, they are fundamental colors, the term being practically synonymous with primary colors, and in the pigment theory includes red, yellow, and blue.

**Compound colors** are those that are obtained by mixing two colors together. There are two important classes of compound colors; namely, *secondary* and *tertiary* colors.

The **secondary colors** are produced by mixing primary colors, and consist of orange, green, and purple. Orange is obtained by mixing red and yellow. Green is obtained by mixing yellow and blue. Purple is obtained by mixing blue and red.

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The **tertiary colors** are russet, citrine (or citron), and olive, and are each composed of two secondary colors. Russet is obtained by mixing orange and purple. Citrine is obtained by mixing orange and green. Olive is obtained by mixing green and purple.

**NOTE.**—This color theory is not absolutely satisfactory to many color experts, but is the one most generally accepted from an industrial point of view.

A **pure, or full, color** may be said to be an unadulterated color; that is, the most intense expression of a color without any addition of black or white.

A **broken color** is one produced by the mixture of two or more pure colors.

While black and white are not really colors, yet since they are used in producing shades and tints of colors, they are often spoken of as colors. The term **passive colors** has therefore been suggested for these two colors, together with silver, gold, and very gray colors, but this term is very indefinite, as is also the term **neutral colors**, which is sometimes used.

A **shade** is a pure color mixed with black.

A **tint** is a pure color mixed with white.

The **tone** of a color is an expression that, in the strict consideration of color, is confined to the shades and tints of a full color. The pure, or full, color is known as the normal tone of that color. Tone is sometimes considered as referring to the combined effect of several colors placed in juxtaposition, or to the general effect of a single color. In either case reference may be had to the prevailing tone, or to such qualities as luminosity, purity, warmth, shade, tint, etc. For instance, it may be said of one color combination that its tone is cold, of another that it is warm, etc. Or, a single color may be spoken of as being a deep tone of green, a warm tone of red, a bright tone of orange, etc.

The **hue** of a color may be said to be that color mixed with a small amount of another color; thus, an orange hue of red is made by adding a small amount of orange to a pure red. The term hue is sometimes used to refer to that quality

which distinguishes one color from another, be they primary or compound. For instance, red differs in hue from green, yellow from orange, etc.

Red, orange, and yellow, and combinations in which they predominate, are known as **warm colors** because of their great luminosity.

The term **cool colors** is somewhat indefinite, but is generally considered to include green, blue, and violet, and color combinations in which they predominate.

Theoretically, the **complement** of a color is a color that, when mixed with it in equal proportions, will produce white. While this is possible to accomplish with spectrum colors by means of mirrors and lenses, it is impossible with pigments, owing to the imperfection of the colors. As white light is the sum of all colors, if any color is taken from it, the remaining color is the complement of that color. An interesting experiment in this connection may be performed by gazing intently at a red spot on a white surface for two or three minutes or until the eye becomes fatigued. If the eye is now turned from the red spot toward a white surface, a faint tint of bluish green is seen. This is called the **accidental color** of red, and is practically the same thing as its complementary color.

There are many pairs of complementary colors, but the simplest ones, which are most frequently met with, are as follows: The complementary color of red is a bluish green; of yellow, ultramarine blue; of violet, greenish yellow; of orange, deep blue; of green, reddish violet.

**4. Color Sensation.**—As already explained, pure light, as it comes from the sun, is white. A colored light is a light that is incomplete, that is to say, it is lacking in one or more of the colors that constitute white light. It may therefore be said that colored light is the result of subtraction. For instance, if we perceive a red light, it is to be supposed that the other principal colors (blue and yellow) that, combined with red, produce white light, have been removed from the white light and that red is all that remains. Similarly, if a

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green light is visible, we may conclude that red light from some cause has been withheld. In other words, whatever color is visible is a result of its complementary color being subtracted from pure white light.

It should be remembered that color does not exist in and by itself, but is simply a matter of sensation, that is, an impression produced on the optic nerves of the eye. If, therefore, the eye is not affected by any light it cannot perceive any color.

An object painted white is not in itself really white, but appears so because the paint with which it is covered has the property of reflecting nearly all the light it has received from the sun. Whatever quantity of light that has not been reflected is absorbed by its surface. An object painted black appears black because nearly all the light it receives is absorbed by it. For that reason it is unable to send any, or but little, light to the eye, and the latter cannot be affected by it, or only to a very small extent.

It is not to be supposed that color is a quality that a substance retains under all conditions and that is inseparable from it. If such should be the case, an object, for instance, painted green, should always remain green, even when in the dark or when exposed to other than white light. We have seen that it can appear green only when green is contained in the light to which it is exposed. The paint with which it is covered serves simply the purpose of absorbing all but the green rays, which are reflected. This can easily be proved if we expose it to a very strong light from which the green rays have been removed, as for instance, by letting the light pass through a red glass. In this case the object will be unable to send out green rays because none have been received, and it will therefore appear black.

It is a familiar fact that it is impossible to judge the true values of colors when seen with artificial light. The reason for this is the same as that just given. They are exposed to light that is lacking in certain rays, and the objects are therefore unable to reflect all the colors that would be reflected under normal conditions. With ordinary gas light, greens



may appear blue, and under a Welsbach burner reddish tints may lose their red, because this light is deficient in red rays.

**5. Harmony.**—Two colors may be said to harmonize when they produce a pleasing effect in juxtaposition or are

Color Pairs	Modification by Contrast
{ Red . . . . .	Inclines to violet
{ Orange . . . . .	Inclines to yellow
{ Red . . . . .	Inclines to violet
{ Yellow . . . . .	Inclines to greenish yellow
{ Red . . . . .	Becomes more brilliant
{ Green . . . . .	Becomes more brilliant
{ Red . . . . .	Inclines to orange
{ Blue . . . . .	Inclines to green
{ Red . . . . .	Inclines to orange
{ Violet . . . . .	Inclines to blue
{ Orange . . . . .	Inclines to red orange
{ Yellow . . . . .	Inclines to greenish yellow
{ Orange . . . . .	Inclines to red orange
{ Green . . . . .	Inclines to bluish green
{ Orange . . . . .	Inclines to yellow
{ Violet . . . . .	Inclines to blue
{ Yellow . . . . .	Inclines to orange
{ Green . . . . .	Inclines to blue
{ Yellow . . . . .	Becomes more brilliant
{ Blue . . . . .	Becomes more brilliant
{ Green . . . . .	Inclines to yellow
{ Blue . . . . .	Inclines to violet
{ Blue . . . . .	Inclines to green
{ Violet . . . . .	Inclines to red
{ Greenish yellow . . . . .	Becomes more brilliant
{ Violet . . . . .	Becomes more brilliant

used together in suitable proportions in a design. Colors that do not harmonize when associated together produce effects that are displeasing to the eye.

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**6. Contrast.**—If two colors are placed side by side or associated in a design, the eye will no longer see the same tone of either color, because each becomes modified by its adjacent color. The effect of contrast is one of utmost importance to textile designing, since the designer should know what effect will be produced when two colors are placed together in a fabric. For instance, if red and blue are used in the fabric, the red will appear to be an orange red and the blue a green blue, the true tone of each color being modified by contrast with the other.

**7.** The preceding table, prepared by a well-known color expert, shows the modifications of various colors when combined with another color. From this table, it will be seen that, in general, if two colors are placed together, each appears to be tinged with the complementary color of the other.

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### ATTRIBUTES OF COLORS

**8.** For want of a better word, the term **attributes of a color** is applied to certain distinctive qualities and properties of each color that govern its appropriateness for certain purposes.

**9. Red.**—Red, orange, and yellow have been classified as warm colors, and of the three it may be said that red is the most aggressive. Red is a very useful color to the textile designer, but, owing to its strength, must be applied with care to conventional fabrics where quiet, subdued effects are desired. Care must be taken in applying not only red but any primary color in its full strength, on account of the vivid effects obtained from the use of unadulterated colors. Primary colors are therefore but little used in textile fabrics, especially in men's wear and other fabrics where quiet effects are desired. Red, when used with care, imparts a bright, clean appearance to a fabric. It is used largely in printed fabrics and to some extent in piece-dyed goods for women and children's wear. As a color for forming spots on men's vestings and also on dress goods, red is largely used; but in

conventional men's wear it is not often applied except as a double-and-twist yarn, being usually twisted with a black thread. The darker shades of red are sometimes used as the ground of fabrics, but excellent results are difficult to obtain except in carpets and oriental effects. Tints of red are quite extensively applied in connection with vestings, silk neckties, ribbons, dress fabrics, buntings, etc. In the ordinary run of woolen and worsted fabrics, however, especially in the men's-wear trade, red or its derivatives are but sparingly employed.

In using red in combination with other colors, great care should be taken not to destroy the harmony of the design by using too much red or a tone that is too strong and brilliant. Very pure and warm tones of red are better employed in piece-dyed goods than in combination with other colors, although brilliant reds do not produce bad effects with the passive colors black and white, if used in suitable proportion.

**10. Yellow.**—This is a very vivid and bright color, although it does not possess the strength and warmth of red. Yellow may be said to be the most luminous color and has a great tendency to produce lustrous effects. The vivid brilliance of this color necessarily limits its application to textile fabrics, although it is a useful color for fancy threads and for overchecks in complicated plaid patterns. It also finds a limited use in oriental fabrics and their imitations, carpets, ginghams, and to some extent in woolen blankets. Care must be taken when using yellow in textile fabrics to limit the quantity used. It is rare that a large quantity of this color will produce harmonious results, yet if used in small quantities it is useful in brightening the fabric, especially in plaid designs, in which it is principally used in the ordinary run of designing. It is seldom that yellow or any tone of yellow is used for piece-dyed goods, but this is occasionally met with in silk fabrics.

**11. Orange.**—This color, like red, is vivid and strong, and is second only to red in warmth and strength. The use of orange for the great majority of textile fabrics is limited;

it may be used, however, in a manner similar to yellow, and is also a very useful color for fancy twist yarns, being often twisted with black or white yarns. Orange is very similar to both red and yellow, and is a very lustrous color, although not to such an extent as yellow. The luminosity and vivid character of orange makes it retain its individuality when used in combination with almost any color, and it is but little affected in tone by either light or dark grounds.

**12. Blue.**—Blue, being a primary color, is strong and distinctive, but unlike red, which is warm and aggressive, blue is cold and retiring, and for this reason is of value in producing quiet effects, which are still strong and pronounced. Blue is one of the most useful colors in textile fabrics and has always been highly esteemed. The ancients were particularly fond of this color, and robes of blue and purple were symbols of the highest rank. Pure blue has a certain aspect of freshness that is readily imparted to fabrics into which it is introduced. This quality is sometimes called the *bloom*, a term that is only used in this connection to indicate freshness and force of coloring. Dark shades of blue are largely used for the ground of fabrics and also in piece-dyed goods, while the lighter shades are useful for figures and spots, as well as for light-colored silk fabrics, gingham, plaids, and many other dress-goods fabrics. Its property of coldness makes blue a useful color for subduing fabrics that would otherwise be too brilliant and for those fabrics where inconspicuous effects are desired. Blue, although not used to any great extent for fancy threads in men's-wear fabrics, is largely used for piece-dyed suitings. For ladies' dress goods, blue is a color that may be used in a variety of ways.

**13. Green.**—This color is of a retiring and inconspicuous nature, its principal characteristic being an appearance of freshness that is readily imparted to fabrics to which it is applied. Green is a very restful color to the eye, and is the most common color found in nature. According to the spectrum theory green is a primary color, but according to the pigment theory it is a secondary color, being

composed of the primary colors blue and yellow. For this reason green is an easier color with which to produce harmonious effects than the primary colors, since the more broken a color is the easier it usually is to make it combine with other colors with good effect. Many of the shades, tints, and hues of green are very useful in textile designing; among those most commonly used may be mentioned olive green, slate green, pea green, and dark green. The greens form excellent combinations with the shades and tints of red, when used in proper quantities, and also with black and white. Green is largely used for suitings, dress goods, shawls, broadcloths, billiard cloths, carriage cloths, etc., and is also employed as a fancy thread in men's wear, suitings, and trouserings.

**14. Purple.**—This color is not largely employed for textile fabrics at the present day, but in ancient times was the royal color and the most highly esteemed. The characteristics of purple are its richness of tone, bloom, and softness. This color finds a limited use in silk fabrics, furniture cloths, and draperies, but otherwise it is of very little importance at the present time.

**15. Russet, Citrine, and Olive.**—The tertiary colors, being still more broken, are more easily combined with harmonious results than either the primary or secondary colors, and, since they are quiet and subdued, they are the most useful colors in the ordinary run of designing, being especially adapted to men's wear.

**16.** It must be remembered that there are hundreds of shades, tints, and hues of either primary, secondary, or tertiary colors, and that the best combinations for quiet effects are obtained from such broken or modified colors. The pure, or full, colors rarely produce pleasing effects when used in combination.

**FACTORS MODIFYING THE COLORING OF  
TEXTILE FABRICS**

**17.** There are many factors that will modify the appearance of a color when applied to a fabric, but the principal ones may be said to be: (*a*) The nature of the raw material from which the fabric is constructed; (*b*) the structure of the yarn; (*c*) the build of the fabric; and (*d*) the finish of the cloth.

**18.** Dealing first with the **raw material**, it may be said that the difference in the structure of the fiber largely affects and, in fact, is the basis of the difference in the tones of color in textile fabrics of different materials.

With **wool** it is possible to obtain not only full, dull tones, but also bright and lustrous effects, depending on whether the yarn is woolen or worsted. With short wool fibers having a large number of serrations and being crimped and curled to a great extent, the resultant tones are deep, full, and somewhat dull. With the longer wool fibers, which have fewer serrations and, consequently, smoother surfaces, the reflecting power of the fiber is much greater and the colors obtained are therefore bright and lustrous.

**Cotton** is a fiber that is not so easily colored as wool, having less affinity for most dyestuffs. In general, the colors obtained on cotton are dull and have a flat, dead appearance, with the exception of mercerized cotton, which has a luster almost equal to silk.

**Flax** is a straight, compact, semitransparent fiber, on which colors appear bright and full, but not so lustrous as on silk or mercerized cotton.

**Silk** is a smooth, glass-like fiber on which color appears bright and true and with an incomparable luster.

**19.** The **structure of the yarn** is also an important factor in modifying the color effect of a fabric. A good example of this may be observed by comparing a woolen and a worsted yarn dyed in the same bath. The worsted yarn cannot fail to appear brighter in color than the woolen

yarn, because of the yarn structure. In the worsted yarn, the fibers are all laid parallel to the direction of the thread; thus, the sides of the fibers are exposed to the light, and, by reflection, heighten the lustrous effect and brighten the color. In the woolen yarn, the fibers are laid in all directions, and, projecting from the bulk of the thread, give it a fuzzy appearance. The effect of this is to partly absorb the light instead of reflecting it, thus giving the yarn a duller and deeper color.

The amount of twist in a thread also affects its color, slack-twisted yarns appearing brighter than hard-twisted yarns dyed the same color.

**20.** The effect of the **build of the fabric** in modifying the tone of the color is also apparent to an experienced designer. The more intersections of warp and filling there are in a fabric, the greater the tendency will be for the production of full but dull colors; and vice versa, the longer the floats of warp or filling, or both, the brighter the color and the more lustrous the fabric. That this is true may be readily seen by comparing a fabric woven with the plain weave and a similar cloth woven with a satin weave.

Another good illustration of how the build of a fabric affects the colors may be obtained by comparing a Brussels carpet, in which the pile is uncut, with a Wilton, or velvet, carpet, in which the pile is cut. In the latter the color always appears duller and more softly toned and possesses fulness and depth, while in the former the colors appear brighter and more pronounced, although the yarn may be dyed exactly the same. This is due, of course, to the one reflecting the light from the sides of the uncut pile, while the other, having the pile cut, absorbs the light to a great extent. That the colors are not dull in a cut-pile carpet may be readily seen by bending the pile over so that the light will fall on the sides of the pile instead of on the cut ends. Figured pile fabrics are sometimes made by utilizing this principle and combining cut and uncut pile according to the figure desired.

**21.** The character of the **finishing process** also has much to do with the appearance of the colors in a fabric,

and they may be made to appear bright and lustrous or dull and full according to the finish and the nature of the fabric. Many woolen fabrics are steamed, which, combined with the brushing and other processes through which they go, gives them great luster. Those fabrics that are sheared and singed close show the colors bright and true, while those having a short, thick nap show duller and fuller tones of color. Cloths with long and sparsely raised naps that are brushed and laid flat are very lustrous.

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#### METHODS OF APPLYING COLOR TO TEXTILES

**22.** Color is applied to textiles in several ways, the method of application and the character of the design depending largely on the class of fabric desired and whether it is to be made of cotton, woolen, worsted, or silk yarns. Piece-dyed fabrics are woven white and then dyed a solid color; or a fabric all one color may be made by dyeing either the raw stock or the yarn. Mixture yarns and fabrics are made in woolen and other goods by mixing raw materials of different colors. In woven fancy patterns, the fabric is colored and the pattern formed in the majority of cases by the use of colored yarns in the warp or filling, or in both warp and filling, in combination with a definite method of interlacing the warp and filling. Printed goods are those to which the color is applied by a stamping or printing process. Usually the pattern is engraved on a series of copper rolls that are afterwards placed in a machine that prints the desired colors on the cloth.

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#### COLOR EFFECTS

**23. Definition.**—Distinction is made between a *weave effect* and a *color effect*. The effect produced by the interlacing of warp and filling, when both are of the same color, or the warp one color and the filling another, is said to be a **weave effect**. If, on the other hand, either the warp or the filling, or both, consists of an arrangement, or pattern, of colored yarns, the effect produced by their interlacing is



termed a **color effect**. It may therefore be stated that a weave effect is the effect of the interlacing of the warp and filling alone, whereas a color effect is the effect of colored yarns combined with a suitable weave.

In a color effect, the weave is lost and is hardly noticeable in the pattern or design. This is, of course, due to the weave effect being broken up by the colors used in the composition of the pattern. Color effects are often—in fact, generally—produced with very simple weaves and with warp and filling patterns with few ends and picks in a repeat. Figures and effects may thus be produced that, although small, may be combined with other small but different figures or effects to produce large and effective stripes and checks.

**24. Method of Making Color Effects.**—It often happens that the designer, when making a design, desires to ascertain what the exact effect of a certain weave together with certain warp and filling patterns will be when the cloth is woven in the loom. When this is the case he proceeds to make a sketch of the effect, using colored pencils, paints, or inks as nearly like the colors to be used in the cloth as possible, or if he only desires to know the form of the pattern or the size of the spot or figure to be produced, he may simply sketch it out in pencil or ink and make a black-and-white effect, provided that not more than two colors are used in either warp or filling. If three colors are used, one color must be indicated in some other manner.

In making a color effect, the first process is to dot the weave very lightly on design paper. Instead of dotting the weave, a very convenient method is to prick it on the design paper with a dissecting needle or other sharp instrument. The manner of arranging the colors of the warp may then be indicated for convenience on a horizontal line of squares above or below the weave. Then mark with the proper color each warp end where it covers the filling. The filling pattern may then be arranged in the same manner and each pick of filling marked with its proper color wherever it floats over the warp.

To illustrate this process, suppose that Fig. 2 represents a weave that is to be warped and picked 1 of black and 1 of white, as indicated by the horizontal and vertical rows of squares at the sides in which the coloring of the pattern is represented. It will be noticed that this weave is a check design on 24 ends and 24 picks, formed by cutting the cassimere twill.

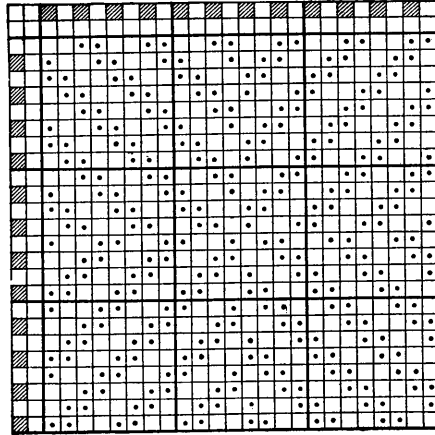


FIG. 2

It will be noticed that this weave is a check design on 24 ends and 24 picks, formed by cutting the cassimere twill. The effect of this weave when warped and picked as indicated is found, according to the method

previously explained, as follows: The black warp ends are first marked with black wherever they float on the face of the cloth; this is shown in

Fig. 3. It is not necessary to mark the white warp ends, as they will be white wherever they are on the surface, and in this connection it should be noted that, wherever a warp end is white in a color effect, it will be necessary to erase the dots indicating the weave or the interlacing of that end with the filling before the color effect is finished. The next

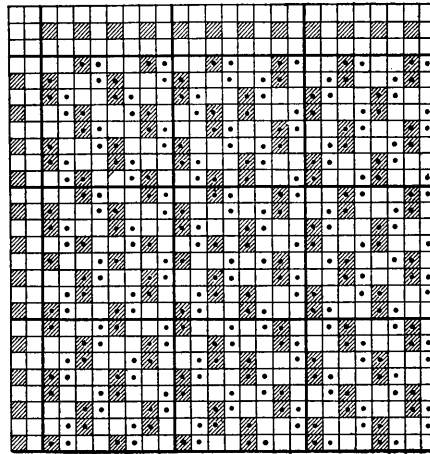


FIG. 3

step is to mark the picks of filling, wherever they pass over

the warp ends, with the proper color, as indicated by the scheme of filling, or filling pattern. This being accomplished, the color effect as shown in Fig. 4 is obtained, but, as some of the warp ends are white and show the dots that indicate their interlacings with the filling, it will be necessary to erase these, after which the completed color effect, as shown in Fig. 5, will be obtained. The same method of making a color effect is employed whether only two colors are used or several, and whatever may be the warp and filling patterns.

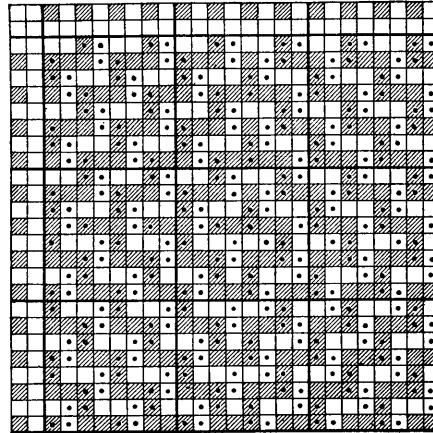


FIG. 4

**25. Repeats.**—A color effect may require a greater number of ends and picks to show one repeat than either the weave or the warp and filling patterns require. If the patterns of warp and filling do not require more ends and picks than the weave, and if the number of ends and picks required for the patterns are exactly divisible into the number of ends and picks required for the weave, the color effect will be complete on the same number of ends and picks as the weave. The number

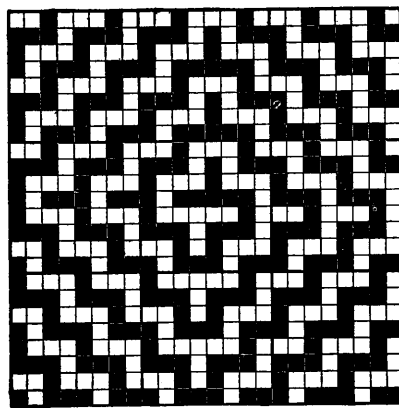


FIG. 5

same number of ends and picks as the weave. The number

of ends required to show one repeat of a color effect is equal to the least common multiple of the ends required for the weave and the ends in the warp pattern. Similarly, the number of picks required is the least common multiple of the picks in one repeat of the filling pattern and the picks in one repeat of the weave. For instance, if a cloth is to be woven with a weave complete on 8 ends and 6 picks and the pattern of the warp contains 10 ends while the filling pattern requires 7 picks, then 40 ends and 42 picks will be required to show one repeat of the color effect because 40 is the least common multiple of 8 and 10, while 42 is the least common multiple of 6 and 7; that is, in every case the pattern of the warp and the pattern of the filling must repeat with the weave before one repeat of the color effect is obtained.

**26. Importance of Records.**—It is of the utmost importance that the designer shall keep detailed records of the color schemes of all the fabrics manufactured by the mill, since if there is a slight change in the order of the coloring, or if the colors are not inserted in the cloth on the proper pick of the weave, the entire color effect may be changed. The importance of this may be seen by making two color effects with the plain weave, both to be arranged 1 black and 1 white in the warp, one effect to be arranged 1 white and 1 black in the filling and the other, 1 black and 1 white. One of these color effects will be a fine hair-line stripe running in the direction of the warp, while the other will be a similar stripe but running across the cloth.

Although this may seem to be an exceptional case, it may be stated that, in almost every instance, a radical change is made in a color effect by inserting the colors on the wrong picks.

---

#### EXAMPLES FOR PRACTICE

1. Show the effects produced by warping and picking the plain weave as explained in Art. 26.
2. Show the color effect on 16 ends and 16 picks obtained by warping and picking the plain weave 2 black and 2 white.

3. Show the effect on 12 ends and 12 picks of coloring the cassimere twill 1 black and 1 white in both warp and filling.
4. Show the effect on 16 ends and 16 picks of coloring the 8-end twill (Weave 184, *Glossary of Weaves*), 1 white, 1 black, 1 green, and 1 red in both warp and filling.
5. Show the effect of a 3 and 3 coloring in both warp and filling with the 8-harness twilled basket (Weave 189, *Glossary of Weaves*).

---

**ANALYZING COLOR EFFECTS**

**27.** It sometimes becomes necessary for the designer not only to make a color effect, but to analyze one in order to find the warp and filling patterns and the weave. If these items are to be obtained from a sample of cloth, no difficulty will be experienced, since in this case the fabric may be dissected and the warp and filling patterns indicated on the pick-out as the analysis proceeds. If, however, it is desired to find the weave and the warp and filling patterns of a color effect that is represented on design paper in a conventional manner, greater difficulty will be met with since in this case there is no method of directly ascertaining the weave or whether any given portion of the color effect is due to warp or filling yarns. There is no method of accurately analyzing a color effect other than that based on the judgment of the designer who, after becoming acquainted with the effects produced by certain orders of coloring and certain weaves, is often able to analyze the color effect off-hand, as it were. It is not meant by this that it is impossible to find a weave and orders of coloring that will give a certain color effect, but that there is no method of knowing whether this was the original scheme or not, since different weaves combined with different orders of coloring may give the same color effect. For instance, if the plain weave  $\frac{1}{1}$  is arranged in the warp 1 black, 1 white, 1 black, 1 white, and in the filling, 1 white, 1 black, 1 white, 1 black, a color effect known as a hair-line stripe will be produced, and if the crow twill  $\frac{3}{1}$  is arranged 1 black, 1 white, 1 black, 1 white in both warp and filling, exactly the same color effect is produced. In analyzing a color effect, therefore, although neither the original scheme

of warp and filling nor the original weave may be obtained, yet the results will be correct. Care should be taken in this connection, however, to obtain as simple warp and filling patterns and as regular a weave as possible, since this is always an advantage and in all probability will be more apt to be the original scheme.

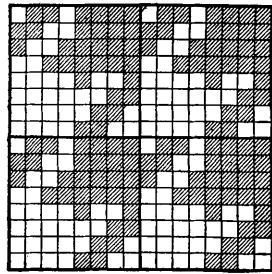


FIG. 6

In order to explain the method employed in analyzing a color effect, an example will be taken, and it will be supposed that Fig. 6 represents a color effect that it is desired to know how to produce. The first operation in analyzing a color effect is to decide on the warp and filling pattern.

As a general rule, the order of arranging the colors in the warp and filling may be recognized by certain ends and picks having a preponderance of a certain color on the surface. Thus, in Fig. 6, it will be noticed that the first, second, third, fourth, ninth, tenth, eleventh, and twelfth ends are mostly white, each having only 4 black risers, while the fifth, sixth, seventh, eighth, thirteenth, fourteenth, fifteenth, and sixteenth ends are nearly all black, only 4 risers being white. From this it would be judged that the warp in this color effect was arranged 4 white, 4 black, 4 white, 4 black. By the same method it would be judged that the filling pattern was also arranged in the same order, since the first 4 picks appear to be white and the next 4, black, etc.

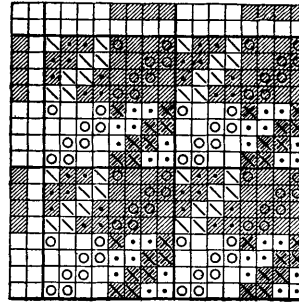


FIG. 7

Having decided on the warp and filling patterns, they should be indicated along two sides of the design as shown in Fig. 7.

**28.** The next operation is to mark where the black warp ends cover the white picks; this is shown in Fig. 7 by the

crosses. As the color effect is black at this point, it is evident that the warp must be raised here, since if the filling were raised at this point, the effect would be white.

The next operation is to mark all the places where the white warp is raised over the black picks; this is shown by the oblique marks on Fig. 7. Before going further with the analysis it is best for the beginner, in all cases, and for the more experienced designer, on complicated effects, to place distinguishing marks on those parts of the design where the warp must be depressed; that is, in this case where white filling must cover black warp and where black filling must cover white warp. These distinguishing marks are not a part of the weave, since they represent filling up, but are here used simply to prevent confusion. They are represented in Fig. 7 by the small dots.

It is evident that the weave as now obtained would produce the required color effect (not considering, of course, the dots as part of the weave), since, in those parts of the design that have not been marked, color covers color; that is, the warp and filling are of the same color. How-

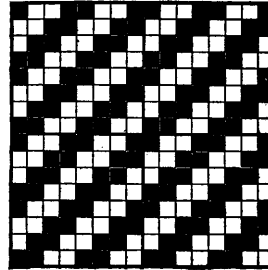


FIG. 8

ever, the cloth would not be firmly nor regularly built with such a weave, and so it is necessary to make a more regular weave.

Since, in all those parts of the design not marked, color covers color, it makes no difference whether warp or filling is on the surface so far as the color effect is concerned, and so the warp may be raised or lowered at these points in the manner best suited for producing a regular weave. By adding risers to this design, as shown by the small circles in Fig. 7, we produce the most regular weave possible in this case, being simply the 4-harness twill as shown in Fig. 8. This figure is obtained by copying all of the marks in Fig. 7 with the exception of the dots, which, as previously explained, mean that the filling is up, and of course have no place in the weave.

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In order to make the method of analyzing a color effect clearer, another example will be given, of a slightly more

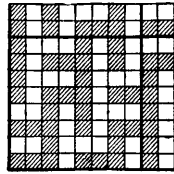


FIG. 9

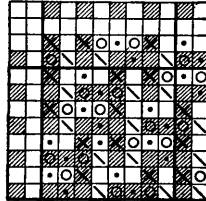


FIG. 10

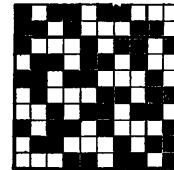


FIG. 11

complicated nature, although the method employed in its analysis is the same. Suppose that it is desired to analyze

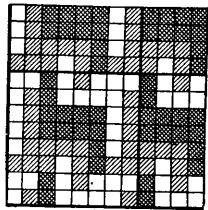


FIG. 12

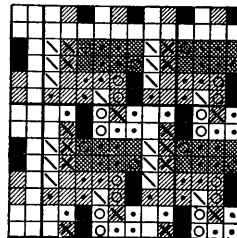


FIG. 13

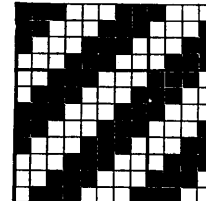


FIG. 14

the effect shown in Fig. 9. Carefully studying this, as in the previous example, it will be seen that it is warped and picked

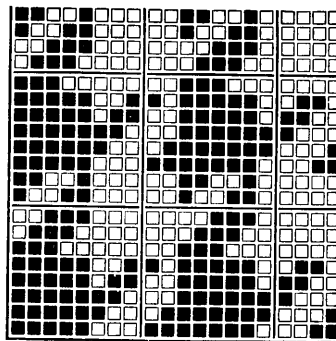


FIG. 15

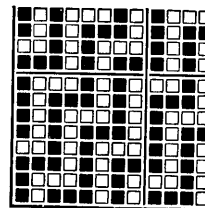


FIG. 16

1 and 1. Then proceeding with the analysis, the crosses in Fig. 10 show where the black warp is raised over the white



filling; the oblique marks, where the white warp is raised over the black filling; the dots show where the filling must float over the warp and do not enter into the weave; and the small circles show the risers that have been added to make a regular weave. Fig. 11 shows the weave obtained by copying all the marks except the dots.

When a color effect contains more than two colors, the same method of analysis is followed out, except that three or more colors must be considered instead of two. For instance, suppose that it is desired to analyze the color effect shown at Fig. 12, which is composed of three colors—white,

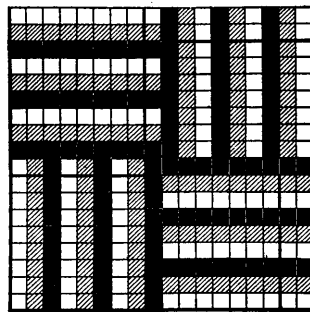


FIG. 17

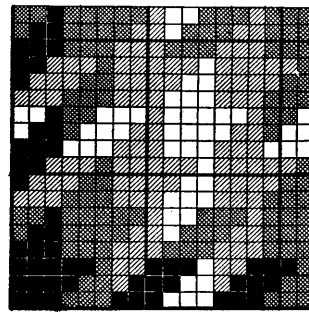


FIG. 18

gray, and black. Carefully studying this color effect, it will be seen that the warp pattern is arranged 1 white, 1 gray, and 1 black and the filling pattern 2 white, 2 gray, and 2 black. Proceeding with the analysis, the oblique marks in Fig. 13 show where the white warp must be raised over the gray and black picks; the crosses show where the gray warp must be raised over the white and black filling; and the filled squares where the black warp must be raised. The dots show where the color effect calls for filling up, while the small circles are the risers added for the purpose of marking a regular weave. Fig. 14 is the weave used, and is obtained by copying all the marks placed on Fig. 13, except the dots.

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**EXAMPLES FOR PRACTICE**

1. Analyze the color effect shown in Fig. 15.
2. Give weave and order of coloring for producing the color effect in Fig. 16.
3. Analyze the effect in three colors shown in Fig. 17, giving the weave and the warp and filling patterns.
4. Analyze the effect in four colors shown in Fig. 18.

# COLOR IN TEXTILE DESIGNING

(PART 2)

Serial 514B

Edition 1

## SIMPLE AND COMPOUND COLORINGS

### INTRODUCTION

**1. Definitions.**—There are certain well-known orders of coloring that, when applied to simple weaves, produce what might be termed *standard effects*. These orders of coloring may be divided into two classes; namely, *simple* and *compound colorings*, each of which may in turn be divided into *regular* and *irregular* arrangements.

Generally speaking, a **simple** order of coloring may be said to be one in which the colors are arranged on a regular and comparatively simple system, while a **compound** order may be considered as an arrangement obtained by uniting two or more simple arrangements. For instance, if the yarns in a certain piece of cloth are arranged 4 white, 4 blue, 4 red, 4 black, the order of coloring is said to be simple. If, however, the yarns are arranged

$$\begin{array}{r} 4 \text{ white} \\ 4 \text{ blue} \end{array} \left. \vphantom{\begin{array}{r} 4 \text{ white} \\ 4 \text{ blue} \end{array}} \right\} \text{for 24 threads}$$
$$\begin{array}{r} 4 \text{ red} \\ 4 \text{ black} \end{array} \left. \vphantom{\begin{array}{r} 4 \text{ red} \\ 4 \text{ black} \end{array}} \right\} \text{for 24 threads}$$

the order of coloring is said to be compound, since it is really the result of combining two 4 and 4 simple colorings.

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**2. Regular and Irregular Simple Colorings.**—A **regular simple coloring** is one in which the amount of each color is the same and the order of their arrangement is regular. Thus, if a cloth is colored 2 red, 2 white, 2 black, the order of coloring is regular and simple. **Irregular simple colorings** are those in which the regular structure is somewhat broken up, but which are still simple colorings as opposed to compound colorings.

There are three ways of forming irregular simple arrangements: (1) By rearranging the order of the colors in a regular simple pattern; (2) by varying the amount of each color; (3) by combining the first two methods.

As an illustration of the first method, suppose that the regular simple coloring given above were arranged 2 red, 2 black, 2 white, 2 black, then it would be changed to an irregular simple coloring. If the pattern were arranged 6 red, 4 white, 2 black, it would be changed into an irregular coloring by the second method; while if arranged 8 red, 6 black, 4 white, 2 black, or in some similar manner, it would be made irregular by the third method. It will be understood that in the pattern obtained by the first method the amount of black yarn is doubled, although the amount of color in any one part of the pattern remains the same.

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## REGULAR SIMPLE COLORINGS

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### TWO-COLOR PATTERNS

**3.** The most elementary **regular simple colorings** are the **two-color effects**, which are generally arranged on the *one and one, two and two, three and three, or four and four* system.

**4. One and One Colorings.**—If the plain weave, with the first warp end raised over the first pick, is warped and picked 1 white and 1 black, a hair line running across the cloth is formed; if warped 1 white and 1 black and picked 1 black and 1 white, a hair-line stripe running in the direction of the warp is formed. Reversing the weave will also have the effect of reversing the direction of the stripe. If

the plain weave is warped 1 white and 1 black and picked with black filling, an effect is formed consisting of small white spots distributed on a black ground, and if woven with white filling, a black spot is formed on a white ground.

**5. Figured Effects With the Plain Weave.**—Use is sometimes made of the hair-line effects produced with the plain weave for forming figures. This is accomplished by reversing the plain weave in certain portions of the design where the figure is desired, and warping and picking the

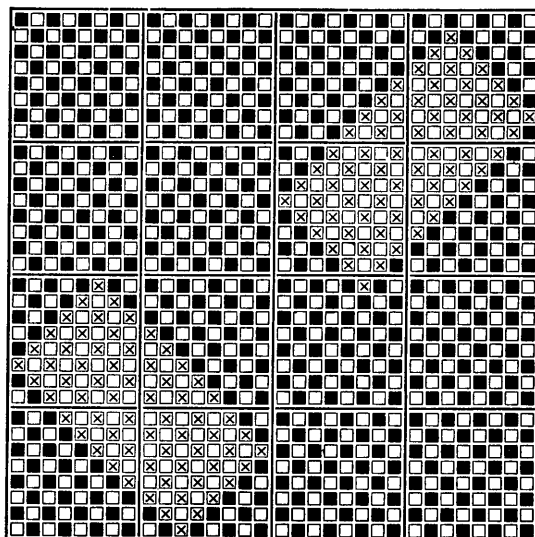


FIG. 1

cloth on the one and one system. The effect of this is to make a figure of fine lines of color running in one direction on a ground consisting of fine lines running at right angles. Fig. 1 shows a weave made on this principle, and Fig. 2 shows the effect produced by warping and picking 1 white and 1 black.

**6. Two-Color Step Effects.**—One and one colorings in both warp and filling produce with the cassimere twill what are known as **step effects**. Fig. 3 shows a two-color step

4 COLOR IN TEXTILE DESIGNING, PART 2

effect obtained by warping and picking this twill 1 white and 1 black. This step effect can be made to twill in the opposite direction by reversing the twill of the weave so that it will run to the left. Fig. 4 shows another step effect of a slightly

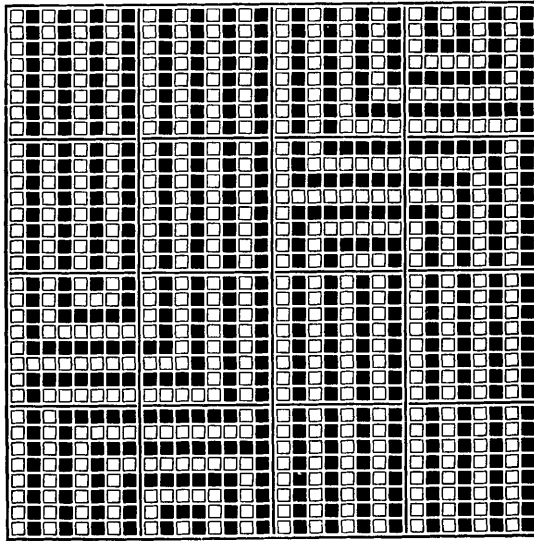


FIG. 2

different character, obtained by warping and picking the  $\frac{3}{8}$  twill 1 white and 1 black. An upright step effect obtained with this same weave is shown in Fig. 5. This is produced by

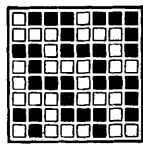


FIG. 3

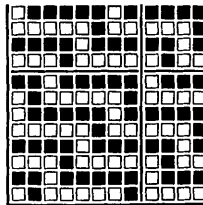


FIG. 4

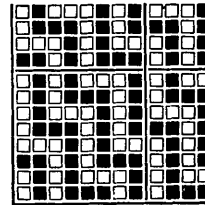


FIG. 5

warping 1 white and 1 black and picking 1 black and 1 white. Two-color step effects twilling at an even steeper angle than Fig. 5, or a flatter angle than Fig. 4, may be obtained by using a one and one warping and picking with the  $\frac{4}{4}$  twill.

**7. Figured Step Effects.**—Quite novel effects may be obtained with the cassimere and other twills, together with a one and one warping and picking, by altering the positions of the weaves in the same manner as was done when making the figured design with the plain weave. Fig. 6 shows a weave arranged for a design on this principle, the shaded part indicating where the weave has been reversed according to a motive. Fig. 7 shows the effect produced by warping and picking 1 white and 1 black. In designs like

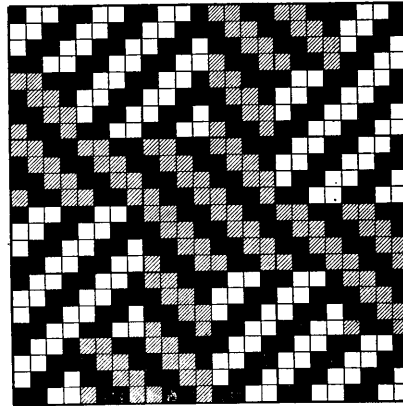


FIG. 6

Fig. 6, if the figure is made larger it will be more pronounced, but even small figures give a unique pattern of a somewhat all-over effect, as is shown in Fig. 7.

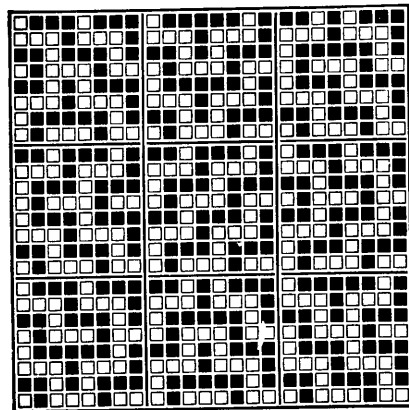


FIG. 7

In Fig. 8, another rather unique color effect is shown. This is obtained by warping and picking a cut check design on 24 ends and 24 picks made with the  $\frac{2}{3}$  twill, 1 white and 1 black. The effect shown in Fig. 8 is an especially good one for a cloth containing more ends than picks per inch, on account of the long floats of color running in the direction of

the filling. An excellent effect can be produced by this method with the cassimere instead of the  $\frac{2}{3}$  twill. If,

instead of making a check design with the cassimere, a cut stripe weave is formed, a very unique stripe, or wave, effect is produced by warping and picking on the one and one system. Fig. 9 shows a stripe weave made with the cassimere

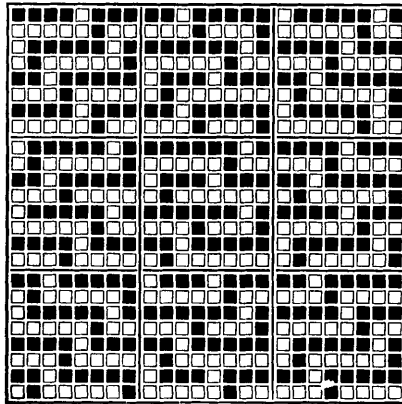


FIG. 8

twill, and Fig. 10 shows the effect of warping and picking 1 white and 1 black. By reversing and cutting the cassimere twill warp-way instead of filling-way the wave effect will be produced lengthwise of the cloth instead of across the fabric.

**8. Two and Two Colorings.**—Many good effects may be obtained with two and two colorings in connection with

simple weaves and with weave combinations. In Fig. 11, the effect produced with the plain weave by warping and picking 2 white and 2 black is shown. This produces a small check effect used in worsted suitings and dress goods

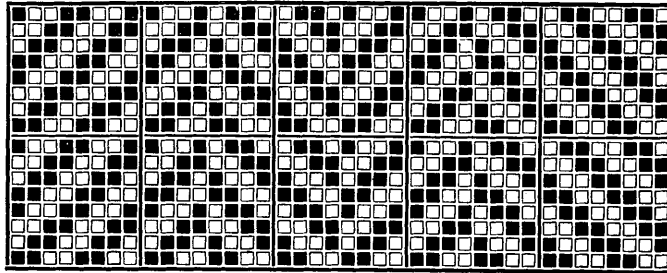


FIG. 9

to some extent. A variety of effects may be obtained with any one weave by using a two and two warping together with solid filling or with two and two picking. For instance, Fig. 12 shows the effect produced by warping the cassimere



twill 2 white and 2 black and using white filling; Fig. 13 shows the effect obtained by using black filling; and Fig. 14, the effect obtained by picking 2 black and 2 white. In Fig. 12, a broken black stripe is formed on a white ground; while in Fig. 13, a broken white stripe on a black

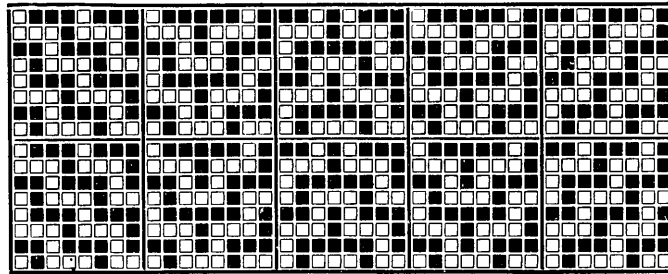


FIG. 10

ground is produced. In Fig. 14, continuous black and white stripes running lengthwise of the piece are formed, but if the cassimere weave were picked as warped, the effect would run crosswise of the goods.

With the 4-end basket weave, a continuous stripe similar to the hair line, but containing two ends of each color, may

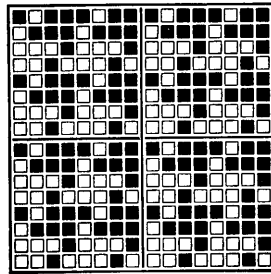


FIG. 11

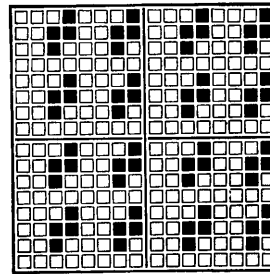


FIG. 12

be obtained by warping 2 white and 2 black, and arranging the filling on the two and two principle in such a manner that color will cover color; that is, so that black filling will cover black warp where the latter is depressed and white filling will cover white warp in the same manner. For instance, by warping 2 white and 2 black and picking 2 black

and 2 white the stripes will run lengthwise, if the first two ends of the weave are raised over the first two picks.

**9. Three and Three Colorings.**—The three and three system of coloring yields with the 6-end twill  $\frac{3}{3}$ , to which it is well adapted, effects somewhat analogous to those

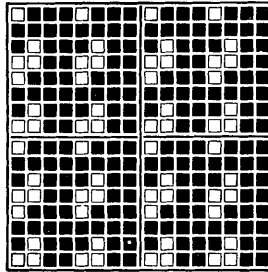


FIG. 13

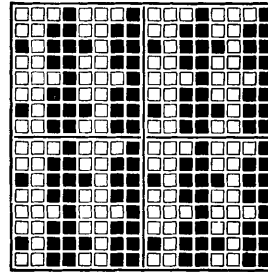


FIG. 14

obtained with a two and two coloring and the cassimere twill. Fig. 15 shows the effect of a 3 white and 3 black warp arrangement and a black filling with the 6-end twill. In this case, a broken white stripe on a black ground is formed, but if white filling were used, the effect would be

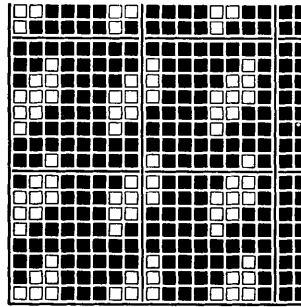


FIG. 15

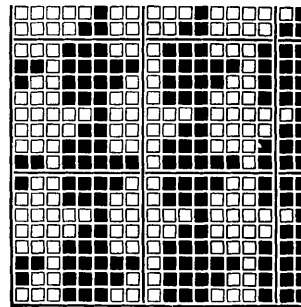


FIG. 16

reversed. Fig. 16 shows the effect of warping the 6-end twill 3 white and 3 black and picking 3 black and 3 white. It will be noticed that the spots are connected, in this figure, to form stripes lengthwise of the piece, while if the weave were picked 3 white and 3 black, the same general effect would be obtained, but they would be connected in the

direction of the width of the fabric. Quite an effective stripe is shown in Fig. 17, being obtained by coloring the warp prunelle twill 3 white and 3 black in both warp and filling.

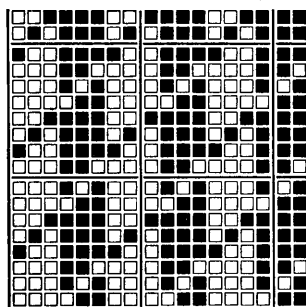


FIG. 17

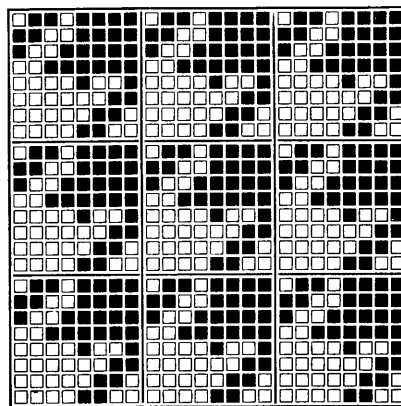


FIG. 18

**10. Four and Four Colorings.**—Four and four colorings produce good color effects both with the cassimere and with the 8-end  $\frac{4}{4}$  twill. In Fig. 18, a very common effect in woolen suitings known as the *shepherd's check* is shown. This is made by warping and picking the cassimere twill 4 white and 4 black. Fig. 19 shows the effect obtained by warping the  $\frac{4}{4}$  regular twill 4 white and 4 black and picking 4 black and 4 white. The effects in either Fig. 18 or Fig. 19 may be connected filling-way instead of warp-way by simply altering the picking plan. Broken stripes may be made with either the cassimere or the  $\frac{4}{4}$  twill by warping on the four and four system and picking with solid color filling.

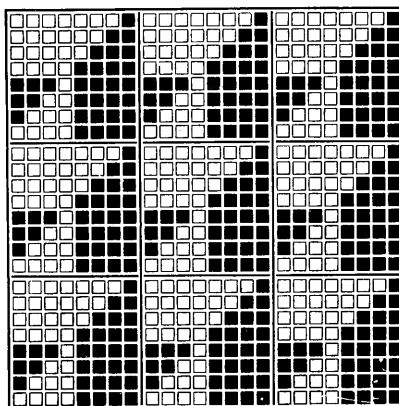


FIG. 19

A good effect for a dress-goods pattern is shown in Fig. 20. This is obtained by coloring the 10-end weave shown in Fig. 21, 4 black and 4 white in both warp and filling. As the

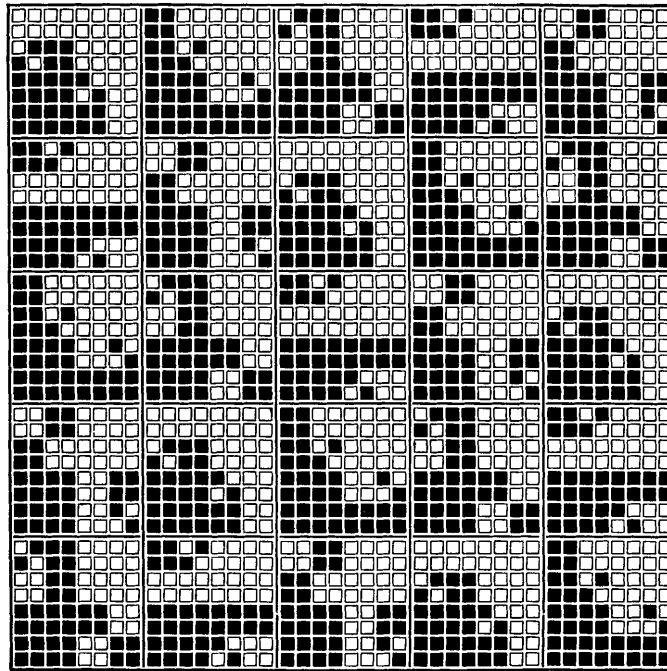


FIG. 20

coloring is complete on 8 ends and 8 picks, and the weave requires 10 ends and 10 picks, it is evident that 40 ends and 40 picks will be required to show one repeat of the color effect, since 40 is the least common multiple of 8 and 10.

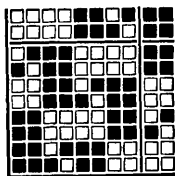


FIG. 21

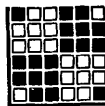


FIG. 22

**11. Extensions of Regular Two-Color Patterns.**

The principle of coloring discussed is often extended to six and six, and eight and eight, and as high as, or even higher than, sixteen and sixteen colorings. These may be employed to advantage with

simple weaves and also with check weaves made by combining

twill, twill and basket, or twill and plain weaves, etc. It will be understood that the effects given are only a few of the desirable patterns that may be obtained, since small fancy weaves

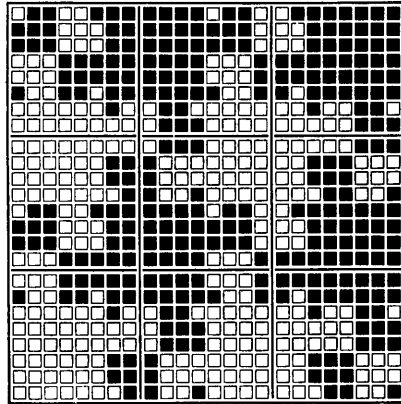


FIG. 23

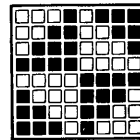


FIG. 24

and ingenious groupings of weaves and colorings will often produce excellent effects. The limit of patterns that may

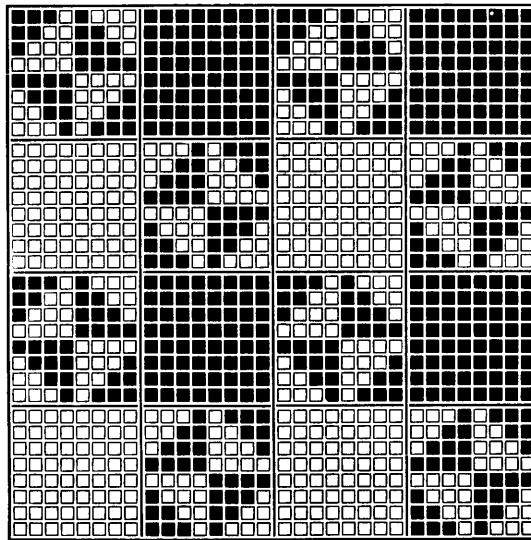


FIG. 25

be obtained may be said to exist only in the limit of the

## 12 COLOR IN TEXTILE DESIGNING, PART 2

designer's ingenuity. A few examples will suffice to illustrate the patterns that may be obtained by the extension of the principle of two-shade regular colorings.

In Fig. 22, a small basket weave is illustrated, while Fig. 23 shows the effect of warping and picking this weave 6 white and 6 black. This is a very neat effect, suitable for worsted or woolen dress goods or suitings. An effect obtained in a somewhat similar manner with the weave shown in Fig. 24 and an eight and eight coloring in both warp and filling is shown in Fig. 25.

---

### EXAMPLES FOR PRACTICE

1. Make an original one and one two-color figured effect with the plain weave.
2. (a) Make a two-color step effect with the 10-harness regular twill  $\frac{5}{5}$ . (b) Change the picking plan so as to alter the angle at which the effect is twilled.
3. Make a cut check weave on 32 ends and 32 picks with the cassimere twill and show the effect by warping and picking on the one and one two-color system.
4. Show the effect of a two and two coloring with the 4-end regular basket weave.
5. Show the effect of a three and three two-color warping and picking with the cassimere twill.
6. Make an original color effect on the principle of Fig. 23.

---

### THREE-COLOR PATTERNS

**12.** In three-color regular colorings, the same methods are followed as with two-color patterns except that three colors are used. For instance, a one and one coloring consists of 3 ends or 3 picks, each of a different color and arranged in regular order in the cloth. A two and two coloring is the same thing, only there are 2 ends of each color together, etc.

**13. One and One Colorings.**—In one and one colorings on this system, there are several desirable effects that may be produced. With the warp prunelle weave, a three-color

hair-line stripe may be produced by arranging the warp 1 white, 1 gray, 1 black, or any other suitable colors, and so arranging the filling with the same colors that each pick of

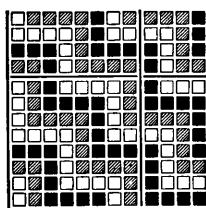


FIG. 26

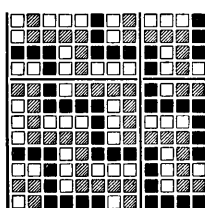


FIG. 27

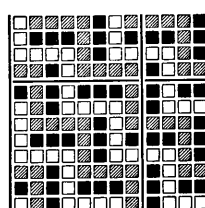


FIG. 28

filling will cover its own color of warp when the latter is depressed.

In Fig. 26, a three-color step effect is shown. This is made by warping the 6-end twill  $\frac{3}{2}$  1 white, 1 gray, 1 black

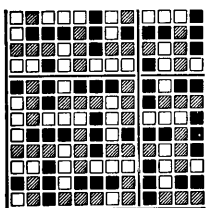


FIG. 29

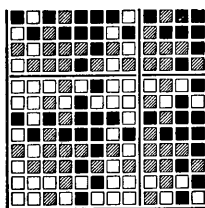


FIG. 30

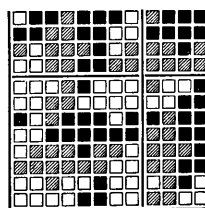


FIG. 31

and arranging the filling 1 black, 1 white, 1 gray. Figs. 27 to 29, inclusive, show three useful modifications of the step effect obtained with the same weave and warp arrangement

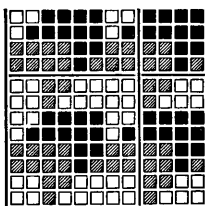


FIG. 32

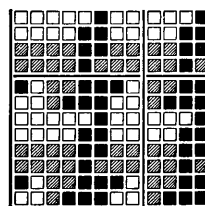


FIG. 33

by altering the arrangement of the filling. In Fig. 27, the white effect is broken up and the black and gray colors only form continuous step effects. This is obtained by

picking 1 black, 1 gray, 1 white. In Fig. 28, the black effect is broken and the gray and white are continuous; this is

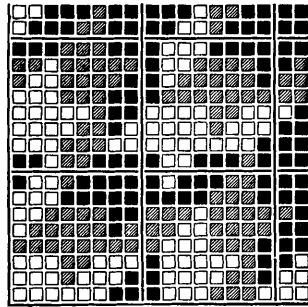


FIG. 34

obtained by picking 1 white, 1 black, 1 gray. By picking 1 gray, 1 black, 1 white, as in Fig. 29, the step effect is entirely destroyed, each of the three colors being broken up.

**14. Two and Two Colorings.**—Many desirable patterns are produced by this method of coloring. In Fig. 30, the effect is shown of warping and picking

the plain weave 2 white, 2 gray, 2 black. In Fig. 31, a very neat effect is shown, obtained by warping and picking

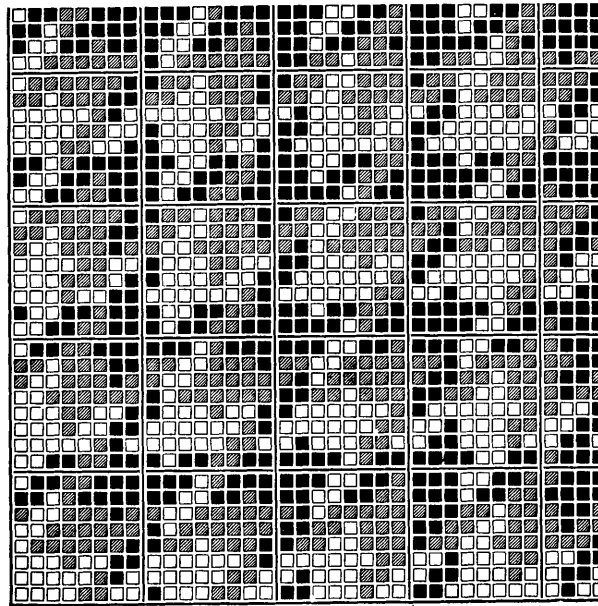


FIG. 35

the cassimere twill 2 white, 2 gray, 2 black. Fig. 32 shows the effect obtained by using the same arrangement of colors



and the 6-harness regular twill. Fig. 33 shows another very useful effect obtained with the same weave and arrangement of colors in the warp as Fig. 32. The color in the filling of this effect is arranged, however, 2 black, 2 gray, 2 white.

**15. Three and Three Colorings.**

Like other simple colorings, this arrangement is one that, if used with suitable colors, is capable of producing very neat and useful effects. Fig. 34 shows a neat check effect obtained by warping and picking the 6-end regular twill  $\frac{3}{3}$  3 white, 3 gray, 3 black.

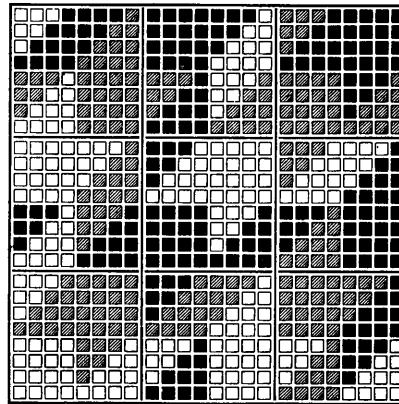


FIG. 36

Fig. 35 shows a somewhat broken check effect obtained with the same warping and picking as Fig. 34, but made with the cassimere twill. Since,

in this effect, the weave requires 4 ends and 4 picks, while the warp and filling patterns require 9 ends and 9 picks, 36 ends and 36 picks are required for one repeat of the color effect, as this number is the least common multiple of 4 and 9. This is a very suitable effect for fine worsted suitings if the colors used harmonize well.

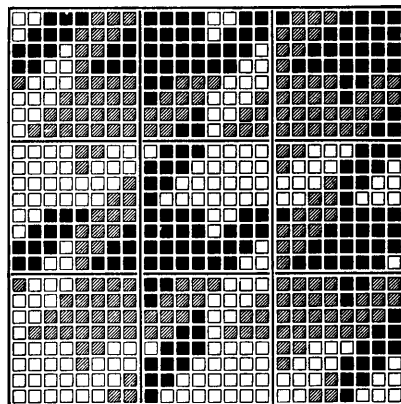


FIG. 37

**16. Four and Four Colorings.**—Effects obtained on this principle are somewhat bolder, since the color is applied in larger amounts, but the effects produced may be adapted

to almost any fabric by using suitable colors. Three effects of this method of coloring are shown in Figs. 36, 37, and 38,

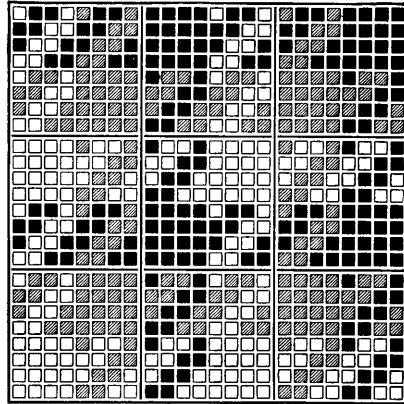


FIG. 38

in all of which the order of coloring in both warp and filling is 4 white, 4 gray, 4 black. Fig. 36 is based on the 8-end regular twill  $\frac{4}{4}$ ; Fig. 37, on the 6-end twill  $\frac{3}{3}$ ; and Fig. 38, on the cassimere twill. Many other effects may be made with this order of coloring by using different weaves or weave combinations.

As in two-color patterns, the four and four order of coloring is often extended to six and six, eight and eight, etc.

#### FOUR-COLOR PATTERNS

17. A greater variety of patterns may be obtained with four colors than with either two or three, and, generally speaking, the effects obtained are more broken and the

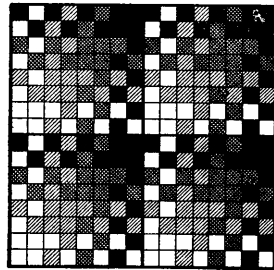


FIG. 39

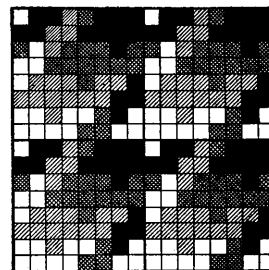


FIG. 40

patterns more diversified in form and grouping. The same methods of grouping the colors are employed with four-color regular simple colorings as with the two- and three-color patterns.

**18. One and One Colorings.**—In one and one colorings in this system, there are several desirable effects that may be obtained. With the warp-flush crow twill, a four-color hair-line stripe may be produced by arranging the warp, 1 white, 1 light gray, 1 dark gray, 1 black, (or any other suitable colors), and so arranging the filling that each color will cover its own color warp when the latter is depressed. Step effects may also be made on this principle after the style of Figs. 26, 27, 28, and 29, by using the  $\frac{3}{4}$  regular twill.

**19. Two and Two Colorings.**—The effect obtained by coloring the plain weave 2 white, 2 light gray, 2 dark gray, 2 black, in both warp and filling, is shown in Fig. 39, while in Fig. 40 the effect is shown of the same coloring on the cassimere twill. Good effects may also be obtained on this system by the use of other weaves and by using any four harmonious colors.

**20. Three and Three Colorings.** Colors arranged on this system are adapted to the cassimere and 6-harness twills, and to small, neat, fancy weaves with which they give good results.

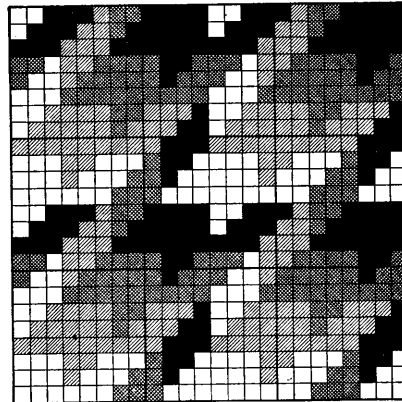


FIG. 41

Fig. 41 shows the effect of warping and picking the 6-harness twill 3 white, 3 light gray, 3 dark gray, 3 black.

**21. Four and Four Colorings.**—Like those previously described, this system of applying color may be employed with a variety of weaves or weave combinations and with any colors suitable for the fabric being made. In Fig. 42, the effect is shown of warping and picking the cassimere twill 4 white, 4 light gray, 4 dark gray, 4 black. In most cases, the size and diversity of the patterns produced by

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regular simple colorings are greatly increased by using weaves that are not exactly divisible into, or by, the pattern used.

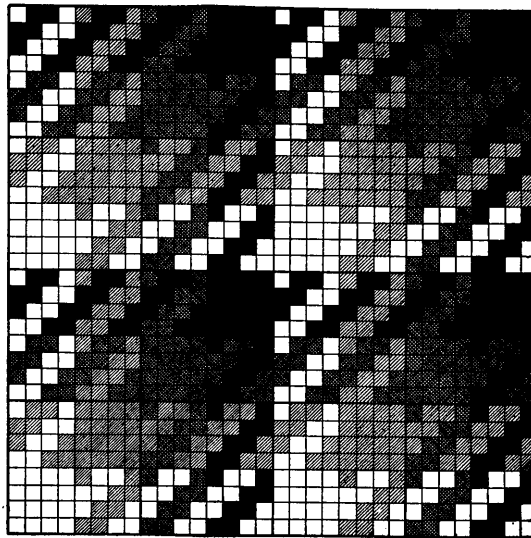


FIG. 42

### EXAMPLES FOR PRACTICE

1. Make a broken three-color step effect similar to Figs. 27 and 28, but having only the gray effect broken, the black and white forming continuous steps.
2. Show an original color effect on the two and two three-color system.
3. Show the effect produced by a three and three three-color arrangement with the 4-end basket weave.
4. Make an original two and two four-color effect.
5. Show the effect produced by a three and three four-color arrangement with the 8-harness twilled basket weave.

**IRREGULAR SIMPLE COLORINGS**

**22.** There is a large variety of **irregular simple colorings**, and, in general, it may be said that they are usually adopted in connection with specific weaves to form certain effects. The number of standard irregular simple colorings, however, is small; in fact, this system of coloring is less sharply defined than that of regular simple colorings, and in some cases the arrangement of color may almost be mistaken for a compound coloring.

**IRREGULAR TWO-COLOR SIMPLE PATTERNS**

**23.** There are a large number of effects that may be obtained with two colors and irregular simple arrangements. For instance, Fig. 43 shows a stripe design obtained with the warp prunelle twill by warping 2 black and 1 white and picking 1 white and 2 black. By using the filling-flush prunelle and arranging the filling the same

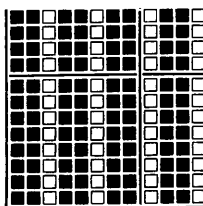


FIG. 43

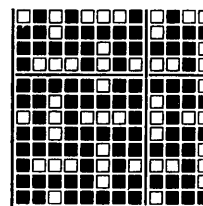


FIG. 44

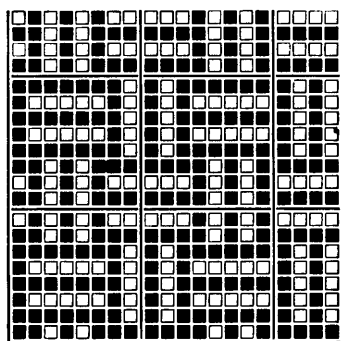


FIG. 45

as the warp, the effect may be made to run across instead of lengthwise of the cloth. Similar stripe effects may be obtained with crow weaves or with the 5-harness  $\frac{4}{1}$  or  $\frac{1}{4}$  twill with 3 and 1 or 4 and 1 arrangements of the colors. The effect is shown in Fig. 44 of a 2 black and 1 white warping and picking with the plain weave. The effect may be reversed, of course, by warping and picking 2 white and 1 black instead of 2 black and 1 white. Fig. 45 shows another effect

obtained with the plain weave by warping and picking 2 black, 1 white, 1 black, 1 white. A very unique effect may be obtained with the plain weave by combining the warping

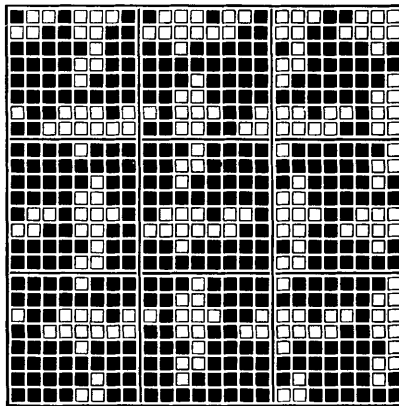


FIG. 46

of Fig. 44 with the picking of Fig. 45. A neat effect is shown in Fig. 46, which is obtained by arranging the yarns 4 black and 2 white in both warp and filling, the weave being

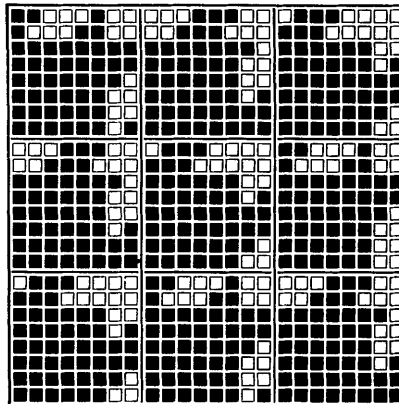


FIG. 47

the cassimere twill. An effect suitable for a suiting pattern is shown in Fig. 47, and is produced by warping and picking the 6-end regular twill 6 black and 2 white.

IRREGULAR THREE-COLOR SIMPLE PATTERNS

24. An effect produced on this plan is shown in Fig. 48, being obtained by warping and picking the 5-end regular twill  $\frac{3}{2}$  2 black, 2 gray, 1 white. Another neat pattern made on this principle and suitable for a suiting or dress-goods

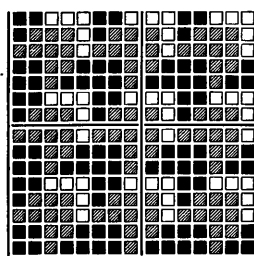


FIG. 48

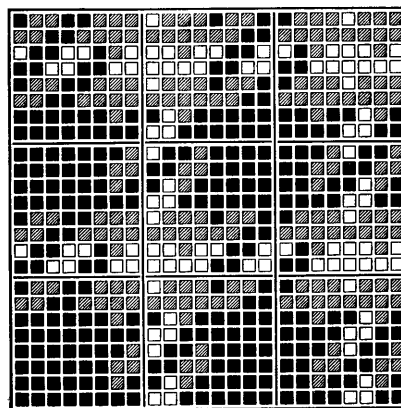


FIG. 49

pattern is shown in Fig. 49. This is obtained with the common 4-harness cassimere twill, the warping and picking being 6 black, 2 gray, 2 white, 2 gray.

IRREGULAR FOUR-COLOR SIMPLE PATTERNS

25. As is the case in all the other simple colorings, a great variety of patterns may be produced with four-color irregular arrangements, one or two of which will be sufficient to demonstrate the style of patterns that may be obtained. Fig. 50 shows an effect obtained by warping and picking 4 black, 2 dark gray, 4 light gray, 2 white. The weave used is the 6-harness regular twill. In Fig. 51, a very neat irregular four-color pattern of a somewhat shaded character is shown, the yarns being arranged 4 black, 2 dark gray, 2 light gray, 4 white, 2 light gray, 2 dark gray in both warp and filling. The weave employed in this effect is an 8-harness twill, shown in Fig. 52.

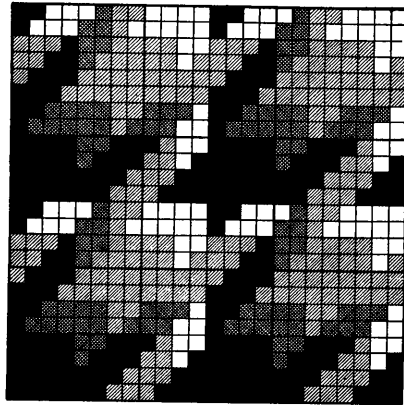


FIG. 50

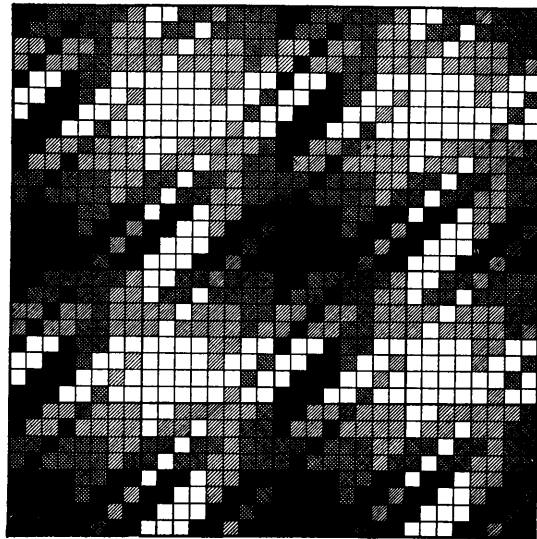


FIG. 51



**SUMMARY**

**26.** It will be understood that the regular and irregular colorings given illustrate but a few of the unlimited number of possible and actual patterns obtained with simple colorings. With any of the arrangements given, the colors and yarns may be selected according to the coloring and fabric desired. The weaves, too, may be varied, and in many cases new and original weaves will be found to produce excellent effects. The effects may also be varied by using double-and-twist yarns composed of two single yarns of different colors or by using mixture or fancy yarns instead of solid-colored threads.

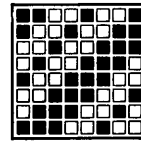


FIG. 52

As far as possible, the colorings given have been what might be termed standard, and many of the effects obtained will be found on the market woven with yarns of various materials and colors. Many of the effects are shown comparatively small on account of the difficulty of illustrating large patterns, but patterns of any extent can be produced by applying the same principles and increasing the number of ends and picks of each color, etc.

**EXAMPLES FOR PRACTICE**

1. Make a color effect arranged 2 black and 1 white in both warp and filling, the effect to be complete on 12 ends and 12 picks. Show weave used.
2. Make an irregular two-color simple effect with the 5-harness  $\frac{3}{2}$  regular twill.
3. How many ends and picks are required to show one repeat of a color effect with the yarns arranged 2 black, 2 gray, 2 black, 1 gray in both warp and filling if the weave used is complete on 8 ends and 8 picks?
4. Show an original three-color irregular simple color effect.
5. Make a color effect with the 16-end regular twill  $\frac{2}{4} \frac{3}{1} \frac{1}{2} \frac{3}{8}$ , the colors to be arranged in both warp and filling 4 white, 2 light gray, 2 dark gray, 4 black, 2 dark gray, 2 light gray.

## COMPOUND COLORINGS

**27.** A **compound coloring** is an arrangement of colors obtained by combining two or more simple colorings. The effects thus produced are usually quite diversified in composition, the degree of complication varying with the number of simple colorings amalgamated and the number of colors employed. There are *regular* and *irregular* compound colorings similarly as with simple colorings. A **regular compound coloring** is one composed of two or more regular simple colorings, while an **irregular compound coloring** is composed of two or more irregular simple arrangements, or of regular and irregular simple colorings. Compound colorings are also sometimes classified as those composed of two simple arrangements, those composed of three simple arrangements, etc. They are also classified as two-color, three-color, etc. patterns, as was the case with simple colorings.

It is not necessary to give examples of all the different types and styles of compound patterns, and, in fact, from the outline of the numerous types given above, it will be seen that this is hardly possible. Some of the most common patterns and the methods of obtaining them will be explained, however, so that no difficulty will be experienced in making original patterns of any type of compound coloring.

## REGULAR COMPOUND COLORINGS

**28.** In Fig. 53, a compound check is shown made with the cassimere twill by combining 2 and 2 and 1 and 1 simple colorings in both warp and filling. In this pattern, the warp

is arranged	2 black	}	for 16 ends
	2 white		
	1 black	}	for 16 ends
	1 white		

The filling is arranged

	2 white	}	for 16 picks
	2 black		

1 white } for 16 picks  
 1 black }

It will be noticed that there are four distinct effects formed by this compound order of coloring, since there are two simple colorings combined in both warp and filling. In the upper left-hand corner, the effect is produced by a 2 and 2 warping crossed by a 1 and 1 picking; in the lower left-hand corner, the effect is produced by a 2 and 2 warping and

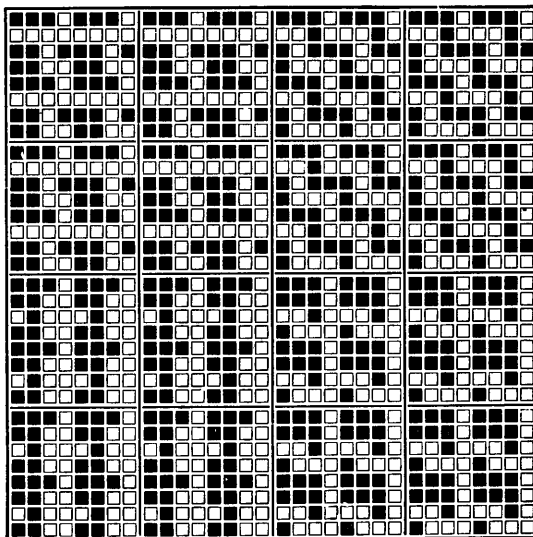


FIG. 53

picking; in the upper right-hand corner, the effect is due to a 1 and 1 warping and picking; while in the lower right-hand corner, the effect is produced by a 1 and 1 warping crossed by a 2 and 2 order of picking. This pattern is suitable for suiting, overcoat, or dress-goods fabrics.

In the effect given, each order of coloring is repeated for only 16 ends and 16 picks, but it will be readily understood that the check may be made larger or smaller by simply repeating each coloring for the requisite number of ends and picks. The checks also may be made of unequal sizes, and it is unnecessary for them to be exactly square unless it is so desired.

In Fig. 54, another check effect is shown, which combines three simple colorings in both warp and filling. In this pattern the yarns in the warp are arranged

1 black } for 12 threads  
1 white }

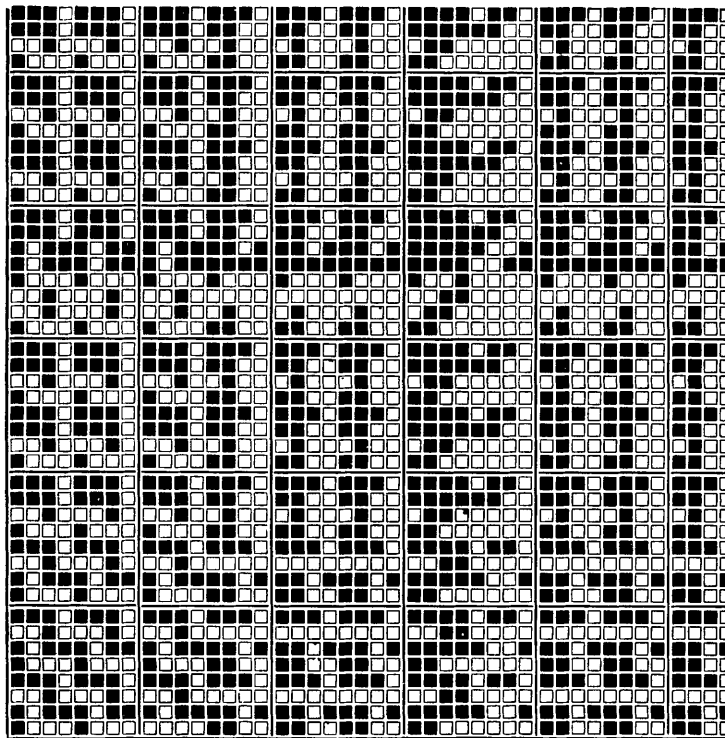


FIG. 54

2 black } for 12 threads  
2 white }

4 black } for 8 threads  
4 white }

2 black } for 12 threads  
2 white }

The weave used is the cassimere twill and the filling arrangement is the reverse of the warp arrangement. The

size of the pattern is, of course, dependent on the number of times that each order of coloring is repeated. The com-

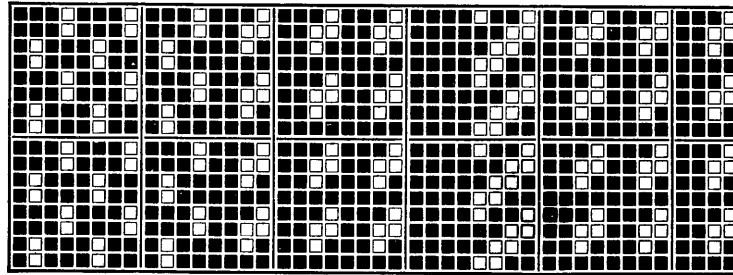


FIG. 55

pound stripe shown in Fig. 55 is made with the same warp coloring and weave as shown in Fig. 54, but with black filling yarn. This produces quite an effective and strong stripe.

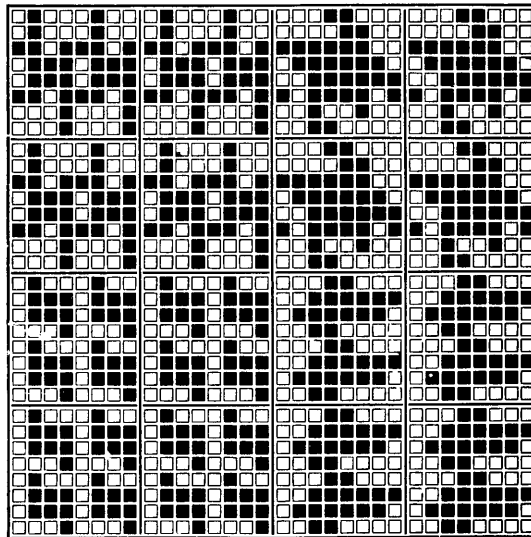


FIG. 56

**29.** Fig. 56 shows the effect of a compound coloring on a special weave combination. The weave used is shown in Fig. 57, and the colors are arranged in the warp

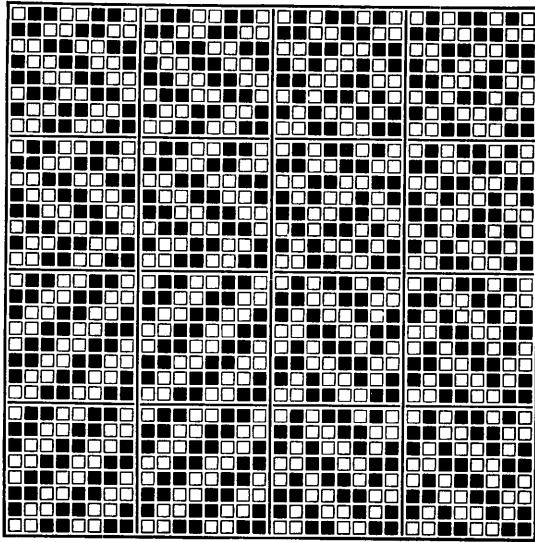


FIG. 57

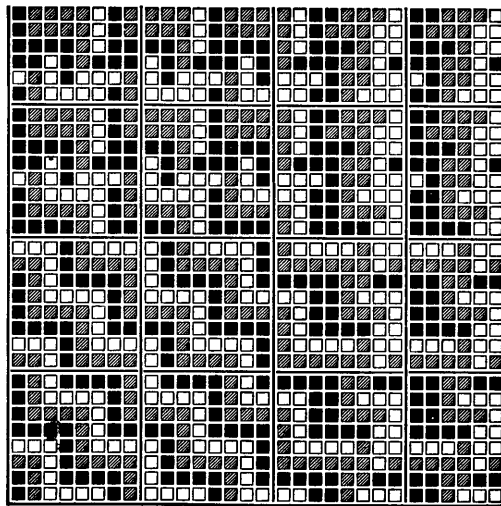


FIG. 58

1 white }  
 1 black } for 16 ends  
 2 white }  
 4 black } for 16 ends  
 2 white }

The filling pattern is as follows:

1 white }  
 2 black } for 16 picks  
 1 white }  
 2 white }  
 4 black } for 16 picks  
 2 white }

In Fig. 58, an example of a compound coloring with three colors is shown. The warp is arranged

1 black }  
 1 gray } for 18 ends  
 1 white }  
 2 black }  
 2 gray } for 12 ends  
 2 white }

The filling of this pattern is arranged

1 white }  
 1 black } for 18 picks  
 1 gray }  
 2 white }  
 2 black } for 12 picks  
 2 gray }

The weave is the 6-harness twill  $\frac{3}{3}$ , and the size of the check is, of course, regulated according to the number of ends and picks on which the colorings are repeated.

In Fig. 58, there are three colors used while only two orders of coloring are compounded; but in Fig. 59, an effect is shown composed of three colors and three simple orders of coloring and with the same weave. Color effects such as these are very often employed in producing fancy wool suitings and other fabrics of a similar nature, or in any cloths where broken effects of this kind are desired.

Although black, gray, and white are used in these cases for convenience in illustration, any suitable combination of colors may be employed, depending on the character of the fabric that is desired. It should be noted, also, that the size of the pattern in the cloth will depend, not only on the ends and picks per inch

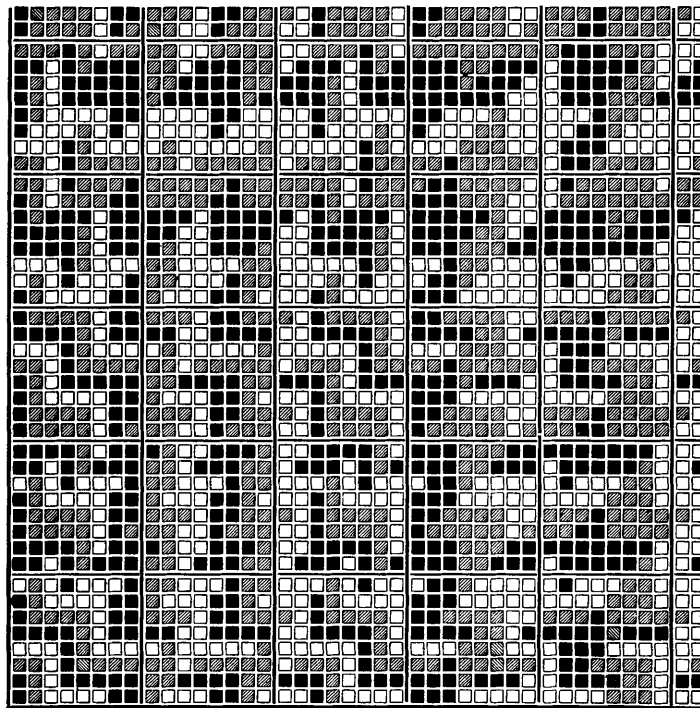


FIG. 59

in the fabric, but also on the number of times the simple colorings are repeated. In Fig. 59 only three simple orders of coloring are used, but one of these orders is employed twice in both the warp pattern and in the filling pattern. The warp in this illustration is arranged

1 black	}	for 6 ends
1 gray		
1 white		



2 black	}	for 12 ends
2 gray		
2 white		
1 black	}	for 6 ends
1 gray		
1 white		
3 black	}	for 18 ends
3 gray		
3 white		

The filling is arranged as follows:

1 white	}	for 6 picks
1 black		
1 gray		
2 white	}	for 12 picks
2 black		
2 gray		
1 white	}	for 6 picks
1 black		
1 gray		
3 white	}	for 18 picks
3 black		
3 gray		

**IRREGULAR COMPOUND COLORINGS**

**30.** The compound colorings given have been made by compounding regular simple colorings, but some of the best compound patterns are made by compounding irregular simple colorings and also by compounding regular simple with irregular simple colorings. In the latter case, it may be said that the patterns produced are generally more decided and pronounced than when two or more regular or irregular colorings are combined. Fig. 60 shows an irregular compound composed of regular and irregular compound colorings. The weave used is the cassimere twill, and the warp is arranged

2 black	}	for 24 ends
2 white		

4 black }  
 2 white } for 12 ends

The filling is arranged on the same system; thus:

2 white }  
 2 black } for 24 picks  
 2 white }  
 4 black } for 12 picks

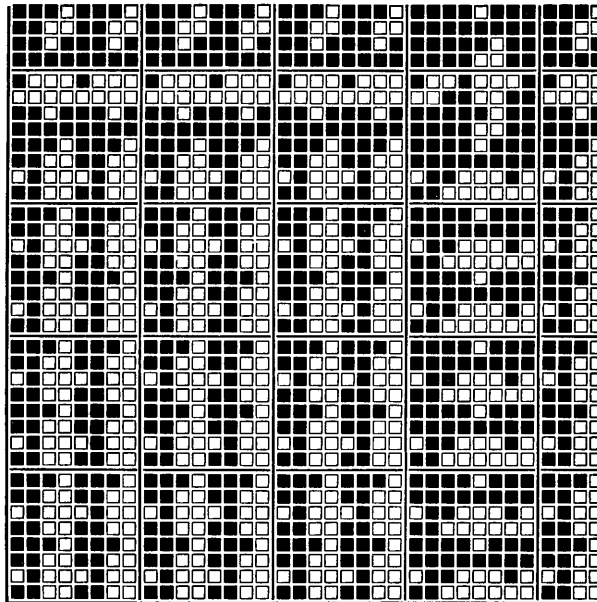


FIG. 60

Fig. 61 shows a very neat and quiet stripe effect produced with the cassimere twill by warping as follows:

2 black }  
 2 white } for 16 ends  
 3 black }  
 1 white } for 8 ends  
 2 black }  
 2 white } for 8 ends  
 3 black }  
 1 white } for 8 ends



The filling is arranged in this effect, 2 white and 2 black.  
 An irregular compound arrangement of colors is used to produce the pattern shown in Fig. 62, consisting of an amal-

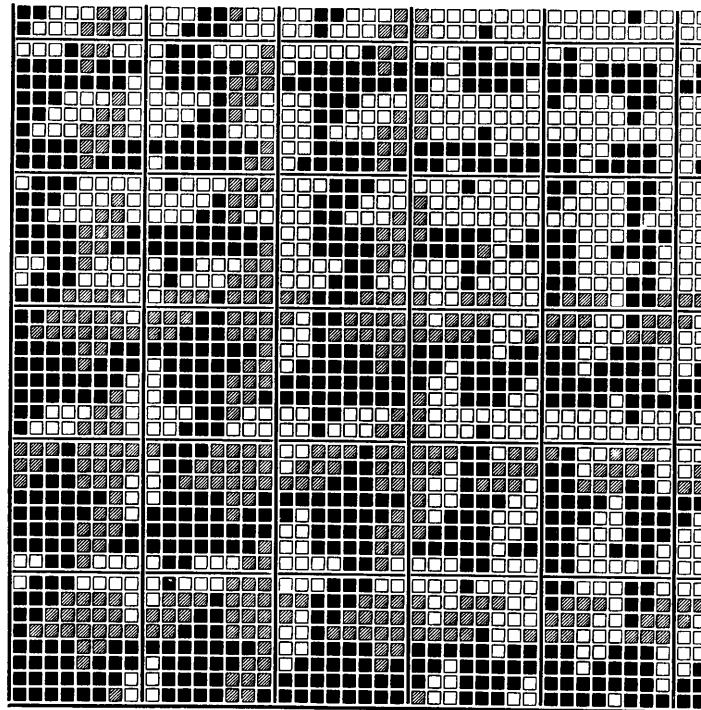


FIG. 63

gamation of three simple colorings. The same colors are used in the filling pattern as in the warp pattern, and in the same amounts, but the arrangement of the colors in the filling is reversed. The weave used is the  $\frac{2}{1} \frac{1}{2}$  regular twill, and the yarns are arranged in the warp

2 black	}	for 18 ends
1 white		
3 black	}	for 12 ends
3 white		
2 black	}	for 12 ends
4 white		

The filling is arranged as follows:

1 white	}	for 18 picks
2 black		
3 white	}	for 12 picks
3 black		
4 white	}	for 12 picks
2 black		

Fig. 63 shows a compound pattern of irregular nature obtained by the use of three colors. The yarns are arranged in the warp as follows:

4 black	}	for 27 ends
3 gray		
2 white		
2 black	}	for 15 ends
3 white		

The filling is placed in the cloth in the same order as the warp, and the weave employed is the 6-harness regular twill  $\frac{2}{3}$ .

**EXAMPLES FOR PRACTICE**

1. Make an original compound check effect by combining two simple orders of coloring. Give warp and filling patterns.

2. Make a compound stripe effect with the warp prunelle twill, the warp to be arranged

2 black	}	for 48 ends
1 white		
4 black	}	for 24 ends
4 white		

The filling is to be arranged 1 white, 2 black.

3. Make an original compound stripe effect combining two simple colorings. Give warp and filling patterns.

4. Show the effect obtained with the  $\frac{3}{1} \frac{2}{2}$  regular twill by warping and picking as follows:

WARP PATTERN

2 black	}	for 32 ends
2 white		
4 black	}	for 16 ends
4 white		

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FILLING PATTERN

2 white } for 32 picks  
2 black }  
4 white } for 16 picks  
4 black }

5. Make an original compound stripe effect employing two regular and one irregular simple coloring in the warp. Give warping and picking plans.

# COLOR IN TEXTILE DESIGNING

Serial 514 C

(PART 3)

Edition 1

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## STRIPES, CHECKS, AND SPOTS

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### STRIPES

**1. Introduction.**—The term **stripe** is used in textile designing to indicate the effect produced in a fabric by several bands, or lines (usually, but not necessarily, of different colors) running in the direction of the warp, or from end to end, of the piece of cloth. When the effect runs across the cloth, from selvage to selvage, it is known as a **bar effect** and is not designated by the term stripe unless definitely indicated as a stripe across the cloth. As a general rule, bar effects, or (as they are sometimes called) **barry cloths**, are not satisfactory patterns and are rarely manufactured. Stripes are especially adapted to trouserings and fancy shirtings, and to a less extent to certain classes of dress goods. In suitings, they are not very much in demand, although certain styles have been found to take well. Generally speaking, the style of a stripe is governed by the character of the fabric to which it is applied; thus, for a trousering pattern, small, neat, irregular stripes are in vogue, while for shirtings more prominent effects with stronger colorings are in demand. The very broad stripes of pronounced coloring are limited to tickings and awning ducks, while broad stripes of not very

## 2 COLOR IN TEXTILE DESIGNING, PART 3

pronounced coloring are met with in some styles of dress goods. The majority of stripe patterns are due to warp coloring alone, the weave bringing the colored warp ends to the surface in suitable proportions, while the filling is generally of some solid color chosen with a view of either toning down or accentuating the colors of the warp pattern. The number of patterns that can be made, even if only two colors are used, is without limit, since the width of the stripe may be varied from the width of a single thread to stripes several inches in breadth if it is desired, and again, broad and narrow stripes may be grouped in various ways, each new arrangement of the warp yarns forming a new pattern.

The scope and range of stripe patterns, together with the methods of their production, are so varied that great difficulty is experienced in grouping the different effects under appropriate heads. Still it is possible to make two general divisions of the various stripe patterns due to warp coloring alone; namely, *regular* and *irregular stripes*. In the former class may be included those patterns in which the bands of color, without regard to the number of colors used, are of equal widths. In irregular stripes, the size and arrangement of the stripes vary to a great extent. Both regular- and irregular-stripe patterns are very useful in textile designing and very appropriate for certain classes of goods.

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### REGULAR STRIPES DUE TO WARP COLORING ONLY

**2. Two-Color Stripes.**—As in regular stripe patterns the lines of color must be of the same width, the scope of designs is somewhat limited in two-color patterns, the only leeway the designer has being in the choice of harmonious colors and in obtaining a suitable width of stripe for the class of goods desired. These are the most elementary stripe patterns and, in fact, the simplest color effects possible to make. Regular two-color stripes are employed in cotton shirtings, gingham, and tickings to a large extent, but they find only a limited use in the woolen and worsted branches of the textile industry. In order to make



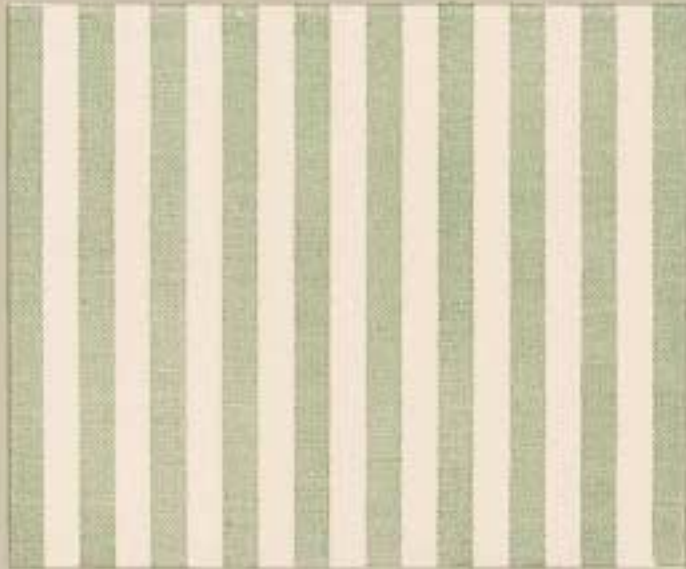


FIG. 1

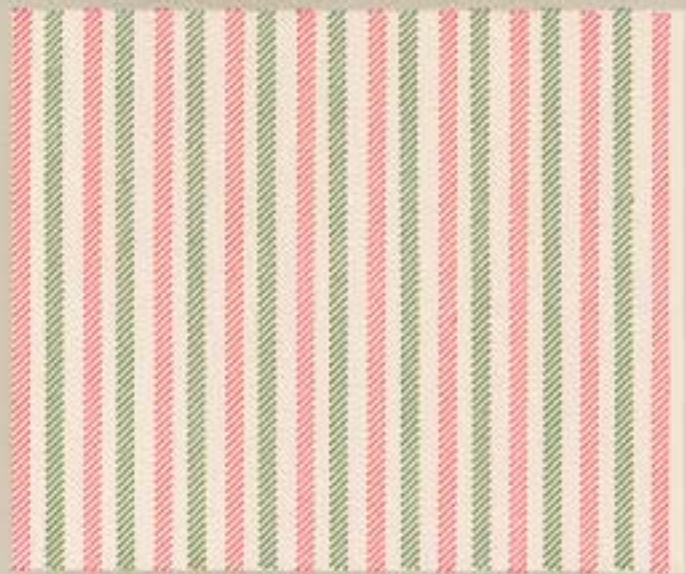


FIG. 2

good-selling patterns on this system, great care must be taken to have the effect suitable for the character of the goods and uses to which they are put.

For instance, a neat gingham stripe can be made by arranging the warp 16 ends of white and 16 ends of green and using white filling. This will make each stripe, in a texture suitable for ginghams, about  $\frac{3}{8}$  inch in width. The appearance of this pattern in the cloth is shown in Fig. 1, the weave used being plain. On the other hand, a stripe for awning cloth might be arranged 80 ends of orange and 80 ends of white in the warp, and the filling all white. This will make each stripe, in a texture suitable for this kind of cloth, about 2 inches in width. It is always necessary to consider the adaptability of the fabric to the purpose for which it is designed. Regular two-color stripes, being of such simple construction, are generally woven with simple weaves, as the plain weave and 3- and 4-harness regular twills.

The color of the filling always alters the color of one of the stripes when using weaves of this description, since the filling floats on the face of the goods in both stripes and, as in this class of goods the filling is generally of the same color as one of the stripes, that stripe will be of a solid color, while the other will be of a color resulting from the mingling of its own color with that of the filling.

**3. Three-, or More, Color Stripes.**—Regular stripes in three or more colors, while requiring somewhat more skill in arranging the colors harmoniously, are very similar to two-color stripes. Since the weaves used are of the simplest types, as with two-color stripes, no great amount of technical skill is required in the production of patterns of this class. Yet, as more colors are used in the construction of three-, or more, color stripes, it is evident that the patterns produced are somewhat more complicated, and the designer, while not varying the width of the stripes, may use considerable ingenuity in selecting and grouping colors. For instance, suppose that it is desired to get the effect of a red and a green stripe on a white ground and yet have a regular stripe

pattern. If the stripe is arranged so that there will be a white stripe on each side of both the red and the green stripes there will be twice as much white in the pattern as either red or green; this will give the effect of a white ground and yet the pattern will be a regular stripe. This pattern is shown in Fig. 2 as it would appear in the cloth, being woven with the 4-harness twill.

Many groupings of colors can be made with regular stripes, yet, in general, it may be said that the patterns produced are apt to be stiff and bold and the effect rather set. In certain fabrics, however, regular stripes are useful.

**4. Regular Shaded Stripes.**—Shaded stripes may be produced in regular stripes by using different shades and tints of a color or colors. The pattern may be arranged to vary from a light tint to a dark shade and back again, if desired, simply by employing varying tones of color and arranging them properly in the warp. For instance, the following arrangement of colors will produce a stripe shading from light to dark, and back again to light: Warp, 4 white, 4 light gray, 4 medium gray, 4 dark gray, 4 black, 4 dark gray, 4 medium gray, 4 light gray; filling, either white, black, or medium gray. The color of the filling will, of course, alter the tone of the stripe somewhat, since white filling will lighten all the portions of the stripe except the white ones, while black filling will darken all but the black portions of the stripe. Medium-gray filling will both darken the lighter stripes and lighten the darker stripes.

---

**IRREGULAR STRIPES DUE TO WARP COLORING ONLY**

**5. Two-Color Stripes.**—In irregular stripes, the widest scope is allowed in the choice of patterns and even with only two colors at his command a skilful designer will be able to produce an almost unlimited number of patterns. Irregular stripes due to warp coloring only are produced with simple weaves, as in the case of regular stripes. In Fig. 3, an irregular stripe in two colors is shown. This is a pattern suitable for suitings or trouserings, the warp



FIG. 2



FIG. 4

pattern being 21 dark blue, 1 white, 1 dark blue, 1 white, and the filling all blue. If a less pronounced stripe effect were desired in this pattern, only one white thread might be used instead of two, or blue-and-white twist yarns used instead of pure white. The weave in this pattern is the cassimere twill. One example is sufficient to represent this type of stripe design, since it will be understood that the choice of two colors and their arrangement and quantity offer such chances for variation that many styles are obtained.

**6. Shaded Irregular Stripes.**—Shaded effects are usually produced in irregular stripes by means of two colors only, the shading being obtained by altering the quantities of color used instead of changing the tone of the color, as is necessary in shaded stripes made on the regular system. In Fig. 4, a shaded blue and white irregular stripe is shown, which will serve to illustrate one method of obtaining a shaded stripe on this principle. The filling is all white and the weave is the warp prunelle. The yarns are arranged in the warp as follows:

White		2		4		6		8		10		10		8		6		4		2	60
Blue	89		5		4		3		2		1		2		3		4		5		118
Total number of ends in pattern . . . . . 178																					

**7. Three-, or More, Color Stripes.**—Irregular stripes in three or more colors are made in all classes of textiles in a great variety of forms and colorings. Stripes of this type are found in trouserings, gingham, tickings, and, in fact, in practically all cloths where a stripe pattern is requisite or desirable. Care must be taken in designing stripes of this type to have the character of the stripe and the coloring suitable for the use to which the fabric is to be put; thus, stripes for trouserings should be small and neat and the colors soft, mellow, and perfectly harmonized, while bed ticking can be made with larger and bolder stripes and with the coloring stronger and more pronounced. In order to tone down the effect of

## 6 COLOR IN TEXTILE DESIGNING, PART 3

stripe patterns in trouserings, dark fillings are generally used, black, various shades of slate and blue, and occasionally brown shades being preferred in the majority of cases. In Fig. 5, a trousering pattern is shown that illustrates this class of stripes. This pattern is made with the cassimere twill, the filling being black and the warp arranged as follows:

Black . . . . .	3																		3
Red-and-black twist . . . . .		1																	1
Dark slate . .			2		2		2		2		2		2		2		2		16
Light slate . .				2		2		2		2		2		2		2		2	14
Total number of ends in pattern . . . . .																			34

One more illustration is given of a stripe pattern designed on this system in Fig. 6. This is a pattern suitable for ladies' dress goods or other cloths of like nature and furnishes another example of the wide diversity of patterns possible with stripes of this type. The filling in this pattern is white and the warp is arranged as follows:

Drab . . . . .	8		8		2		8		8		2								36
Scarlet . . . . .		2																	2
Brown . . . . .				2		2					2							2	8
Yellow . . . . .									2										2
Total number of ends in pattern . . . . .																			48

### STRIPES DUE TO WARP AND FILLING COLORING

8. It may be said that stripes due to warp and filling colorings may depend, in practically every case, on a suitable weave and a correct arrangement of the colors in the filling

for the production of a stripe effect. That this is true will be readily understood by remembering that the weave and the arrangement of color in the filling must be such that the filling color will cover the warp color when the latter is down, thus producing a lined effect in the direction of the warp.

Strictly speaking, a true **hair-line stripe** is produced with the double plain weave, since the stripes made with these weaves are better defined and the cloths are reversible, showing the same pattern on each side. However, small stripes known as hair lines are made in single cloths with certain simple weaves. Hair lines are the smallest stripes produced and are usually the width of a single warp thread only, although narrow striped patterns having stripes two or more threads in width are commonly given this term.

**9. Two-Color Hair Lines.**—These stripes are produced with the plain weave in both fine and coarse cloth and in cotton, woolen, and worsted textures. They are made with any two appropriate colors, warped and picked one and one in such a manner that each pick of filling will cover its own warp color when the latter is down. By arranging the filling in stripe effects that are woven with the plain weave so that the filling covers the other color of warp when it is down, bars, or stripes running from selvage to selvage, are produced, but these are not classed as hair lines and are rarely made except in connection with some other effects.

Stripes similar to those produced with the plain weave may be made with the 4-harness basket weave, except that the stripes produced are two threads in width instead of one. The warp is arranged two and two with any suitable colors and the filling arranged in the same manner so that color will cover color; that is, if the effect desired is lengthwise of the cloth.

**10. Three-, or More, Color Hair Lines.**—These are produced on the same principle as two-color hair lines except that warp-flush prunelle, crow, broken crow, and other small weaves are used, a weave being selected that is complete on the same number of ends as there are colors.



FIG. 1



FIG. 2



## 8 COLOR IN TEXTILE DESIGNING, PART 3

The warp and filling patterns may be arranged one and one with any suitable colors, but, as in two-color hair lines, care should be taken to have filling color cover warp color when the warp is down. Fig. 7 shows a four-color hair line made with the warp-flush broken-crow weave; the colors are arranged in the warp one of white, one of light gray, one of dark gray, one of black; and in the filling, one of white, one of light gray, one of black, one of dark gray.

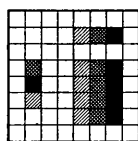


FIG. 7

11. Many stripe effects other than the hair lines may be obtained by the combination of simple warping and picking plans, together with a simple weave. One of these, shown in Fig. 8, is made with the cassimere twill, the warp being arranged 2 black and 2 white and the filling 2 white and 2 black. By altering either the warp or the filling pattern in this stripe, the effect can be made to run in the opposite direction, or from selvage to selvage.

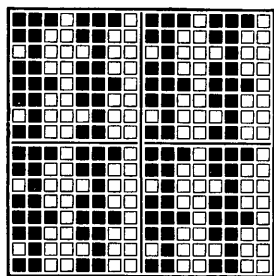


FIG. 8

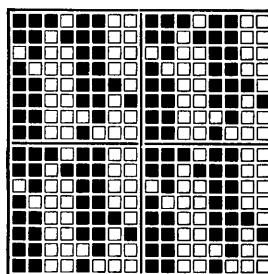


FIG. 9

A similar stripe to that shown in Fig. 8 is shown in Fig. 9. This is obtained with the 8-harness twilled basket weave by arranging the warp 2 black and 2 white and the filling 2 white and 2 black. Many stripe effects can be made on the same principle as Figs. 8 and 9 by using a little ingenuity in color arrangement.

12. **Compound Stripes.**—Fig. 10 shows a fancy stripe pattern made on the simple hair-line principle with the plain weave. As shown, the stripe consists of bands in which the

hair-line effect runs warp way alternating with bands in which the stripe runs filling way, thus forming a broad stripe effect. The effect is produced by simply varying the warping plan, which, in Fig. 10, is as follows:

1 white } for 16 ends  
 1 black }  
 1 black } for 8 ends  
 1 white }

The filling is arranged 1 black, 1 white. The width of the stripes may, of course, be varied at will by altering the warp pattern at the point where it is desired to change the effect.

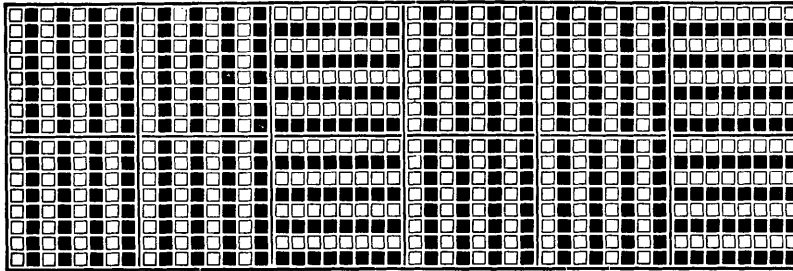


FIG. 10

Another stripe of this class is shown in Fig. 11, being made with the cassimere twill instead of the plain weave. The warp pattern is as follows:

2 black } for 16 ends  
 2 white }  
 2 white } for 8 ends  
 2 black }  
 4 white }

The filling is arranged 2 white, 2 black.

Another stripe pattern is shown in Fig. 12; this also is based on the cassimere weave. It will be seen that in the pattern the warp is arranged on a combination of the two and two and the one and one system, while the filling is

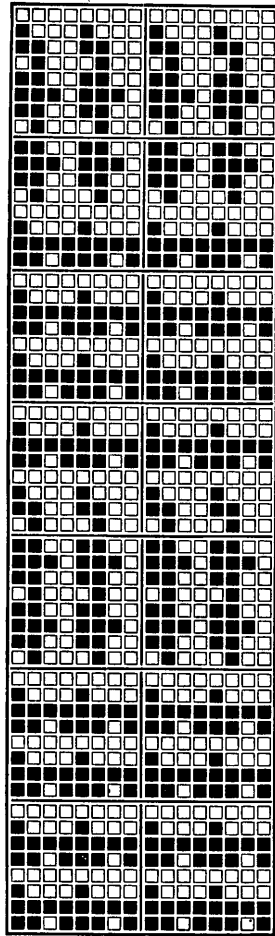


FIG. 11

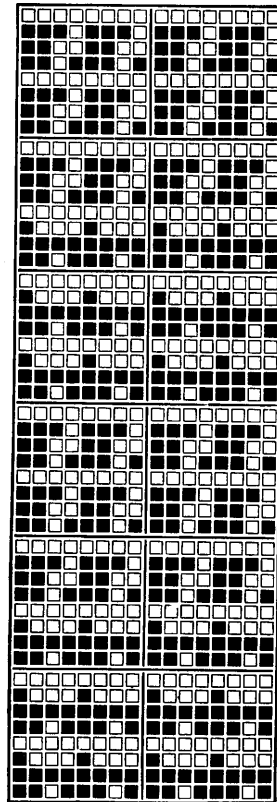


FIG. 12

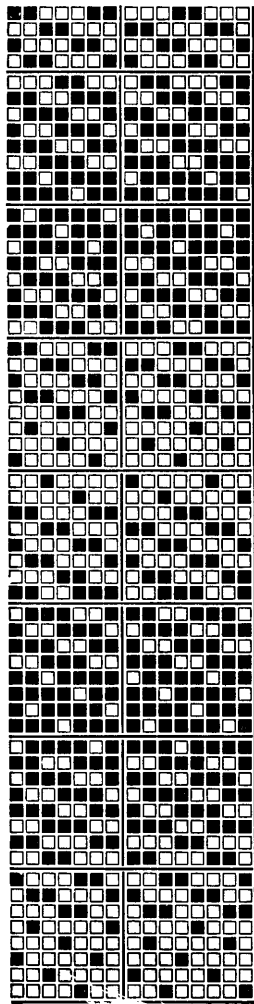
arranged on the two and two system only. The warp is arranged as follows:

2 black } for 12 ends  
 2 white }  
 1 black } for 12 ends  
 1 white }

The filling is arranged 2 white, 2 black.

The examples given of stripe patterns, due to warp and filling coloring combined with a simple weave, are sufficient to explain the method of forming this class of stripes, and it will readily be seen that with some ingenuity on the part of the designer an unlimited number of stripes may be produced in this manner.

FIG. 13



STRIPES DUE TO THE WEAVE ALONE

13. Many stripe patterns are due to the weave alone without the use of colored yarns for warp or filling patterns and without using differently colored warp and filling. A good example of this method of producing stripes is found in the satin stripes so common in the cotton trade. These stripes are made by simply combining warp- and filling-flush satin weaves or warp-flush satins with the plain weave. Warp-

flush and filling-flush twills and warp-flush twills and plain weaves are also combined in this manner. Although a great number of stripe weaves are woven all one color, there are many patterns that, in addition to the weave design, use colored yarns in the warp either on the regular or on the irregular

system. Often these weaves are woven with a warp of one solid color and a filling of another, thus accentuating the weave effect.

**14. Shaded Stripes.**—Shaded stripes due to the weave effect alone are made with a shaded-stripe weave and woven with a warp of one solid color and a filling of a different color. Fig. 13 shows two repeats in the ends of a shaded-stripe weave made on a 5-end satin basis and shaded from light to dark and back again to light. For the first 5 ends, the weave is the 5-end filling-flush satin; the next 5 ends, the 5-end satin with one riser added to each of the satin risers; the next 5 ends have two risers added; and the next, three; whereupon the weave grades back to light again. If this weave were woven with a black warp and a white filling, the color effect in the cloth would be exactly the same as the weave in Fig. 13.

---

#### EXAMPLES FOR PRACTICE

1. Give a warp and filling arrangement for a regular three-color stripe.
2. Show the effect on 16 ends and 16 picks obtained by warping the cassimere twill 2 white, 2 black and using solid black filling.
3. Give a warp pattern for an irregular stripe in four colors and state for what kind of a fabric it would be suitable.
4. Give warp patterns for two shaded stripes, one made on the regular and one on the irregular system.
5. Make a weave that, if woven with a black warp and a white filling, will produce a shaded stripe.

---

#### CHECKS

**15. Introduction.**—A check may be said to be the effect produced in a fabric by several bands or lines, usually, but not necessarily, of different colors, running in the direction of the warp and crossed at right angles by similar bands running in the direction of the filling. In the great majority of cases, checks are produced by crossing a colored warp pattern with a colored filling pattern and generally,

although not always, the filling pattern is the same as the warp pattern. The pattern may be of the very simplest construction, being complete on a few ends and picks and with only two colors, or it may be very complicated and require many ends and picks and many colors. Checking may be applied to almost any class of fabric and in silks, cottons, linens, woolens, and worsteds it is a standard method of applying color. Check designs that are in any way complicated in composition are most generally known as **plaids** when woven in woolen, worsted, or silk. In the cotton trade, the term **gingham** generally implies a check effect unless a *striped gingham* is especially designated.

**16.** Although there are many systems of forming check patterns and the number of patterns that may be produced is without limit, there are certain elements that govern all check patterns:

1. In order to produce a perfect and regular check, the filling pattern should be the same as the warp pattern, provided that the fabric is squarely built, that is, with approximately as many picks as ends per inch. If there are less picks than ends per inch in the fabric, the number of picks of each color in the filling pattern should be correspondingly reduced so as to keep the bands of color in the filling of approximately the same width as those in the warp, thus making the checks square. In this connection it may be noted, however, that many patterns having a slightly greater length than width make a better appearance than when exactly square, since a check that is actually square often appears broader than it really is. This applies more to large check patterns than to small ones. The difference in the length and width of a check pattern should never be excessive, but when a difference does exist, the pattern should have a greater length than width.

2. If the check is to be a perfect one, the weave used should be such that the warp and filling will be equally flushed at regular distances on the face of the fabric. The reason for this is that if a warp-flush weave is used, the warp pattern

will show much more prominently on the face of the goods in proportion to the amount of the warp on the face and, vice versa, if the weave is a filling-flush, the filling pattern will show more prominently than the warp. It is because of this that the plain weave and cassimere and 6-harness twills are largely used for developing the best check and plaid effects.

The check effects generally met with may be roughly divided into two classes; namely, those into the composition of which only two colors enter and those composed of three or more colors. The former class is by far the larger, considering the quantity of the patterns on the market, but the latter class includes some of the best and most popular plaid and check patterns.

---

#### TWO-COLOR CHECKS

**17. Common Checks.**—The simplest possible check effect is produced with a simple weave and equal quantities of two colors in both warp and filling. An example of what is known as the **simple, or common, check** is shown in Fig. 14. This is a common, or *staple*, gingham pattern made with the plain weave and arranged twelve threads of blue and twelve threads of white in both warp and filling. Checks of this nature are made not only in cotton, but in all kinds of textile fabrics. The weaves generally employed are the plain, cassimere twill, 6-harness regular twill, and various basket weaves.

**18. Common-Check Modifications.**—Common checks may be easily varied so that the entire effect will be changed by simply altering the arrangement of the colors to a very slight extent. For instance, if the simple check in Fig. 14 is altered by running a narrow band of blue through the center of each white stripe and a band of white of the same width through the center of each blue stripe in both warp and filling, the effect of the pattern is totally changed, as shown in Fig. 15. The pattern of both warp and filling for this sample is as follows:



FIG. 14



FIG. 16



FIG. 15



FIG. 17



Blue . . . . .	6		6		2		14
White . . . . .		2		6		6	14
Total number of ends or picks in pattern . . . . .							28

Another and even more simple modification of the common check is made by altering the number of ends and picks of each color. Thus, if the warp and filling patterns of the common check in Fig. 14 were changed to 6 blue and 18 white, the appearance of the pattern would be totally different, as shown in Fig. 16.

**19. Overchecks.**—A common, or simple, check may be easily modified by means of overchecking. An **overcheck** may be defined as a large square marked off by a few threads in the warp and filling patterns and enclosing smaller squares of the check effect. If the common check shown in Fig. 14 is modified by a white overcheck, the effect is as shown in Fig. 17. The warp and filling patterns for this check are as follows:

Blue . . . . .	6		6		12		24
White . . . . .		2		12		12	26
Total number of ends or picks in pattern . . . . .							50

The size of the overcheck may, of course, be varied at will and the pattern may also be overchecked with blue by dividing white stripes. The reason for modifying the common check in so many ways is that a common check presents a stiff appearance and lacks diversity, especially if the size of the check is at all large. Therefore, the more the colors are broken up, the softer will be the effect, even if only two colors are used.

**20. Counterchange Checks.**—In a counterchange check, the colors are reversed in different parts of both the

warp and filling patterns; that is, the number of threads is the same, but one color is inserted in the place of the other.

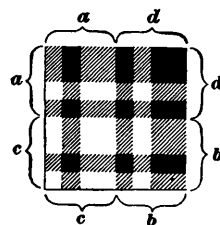


FIG. 18

The effect of this is to make certain portions of the pattern the exact reverse of other portions. For instance, if the first half of the pattern is arranged 6 white, 6 black, 12 white, the last half of the pattern will be arranged 6 black, 6 white, 12 black; that is, with the arrangement the same but with the colors counterchanged.

Fig. 18 shows a counterchange check made with the above pattern in both warp and filling. It will be seen that the portion of the check marked *a* is the exact reverse of that portion marked *b* and, similarly, *c* is the reverse of *d*; that is, where the pattern is white in one portion, it is black in the other and vice versa. Counterchange checks, like common checks, may be modified in many ways. In Fig. 19, a modification of the pattern in Fig. 18 is shown. This is obtained by dividing each broad black band of color in both warp and filling with a few white threads and each broad white band with a few black threads. The warp and filling patterns for Fig. 19 are as follows:

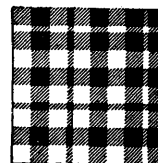


FIG. 19

White . . . . .	6	6	6	6	2	26
Black . . . . .		6	2	6	6	26
Total number of ends or picks in pattern . . . . . 52						

It will be noticed that, while Fig. 19 is a modification of Fig. 18, the counterchange character of the check is still retained. Fig. 18 could also have been modified by dividing the narrow black and white bands, or both systems could have been united and an even more complicated check obtained, although still retaining the counterchange feature.

**21. Compound Checks.**—The compound system of checking is commonly met with in all classes of designs. These checks are made by combining two or more systems of warping and picking. For instance, Fig. 20 shows a compound check made with three systems of warping and picking. The pattern is as follows:

16 black  
 16 white  
 8 black } for 32 threads  
 8 white }  
 4 black } for 32 threads  
 4 white }

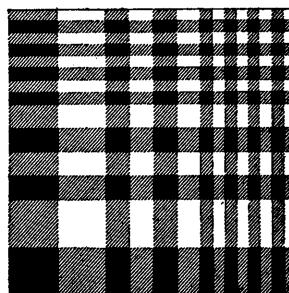


FIG. 20

Compound checks may be modified in many ways, which the ingenuity of the designer will readily suggest. The following pattern is a modification of the pattern in Fig. 20 and, as shown in Fig. 21, produces a far better check:

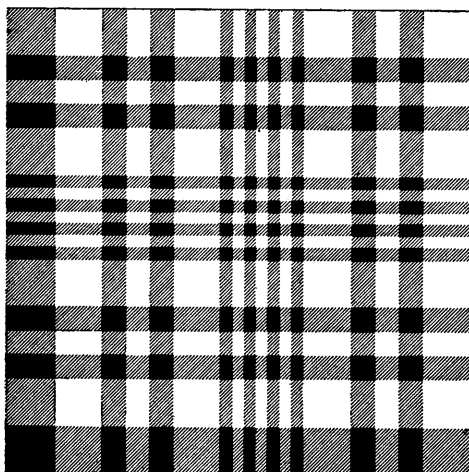


FIG. 21

16 black  
 16 white  
 8 black } for  
 8 white } 32 threads  
 8 white  
 4 black } for  
 4 white } 32 threads  
 12 white  
 8 black } for  
 8 white } 32 threads  
 8 white

Many styles of compound checks are obtained with the cassimere and 6-harness twills by grouping four and four and two and two colorings in the former case and six and six and three and three colorings in the latter case.

**22. Shaded Checks.**—Shaded-check effects may be produced in two colors by two methods: (1) By graduating the warp and filling patterns so that they will shade from dark to light and back again to dark if desired; (2) by

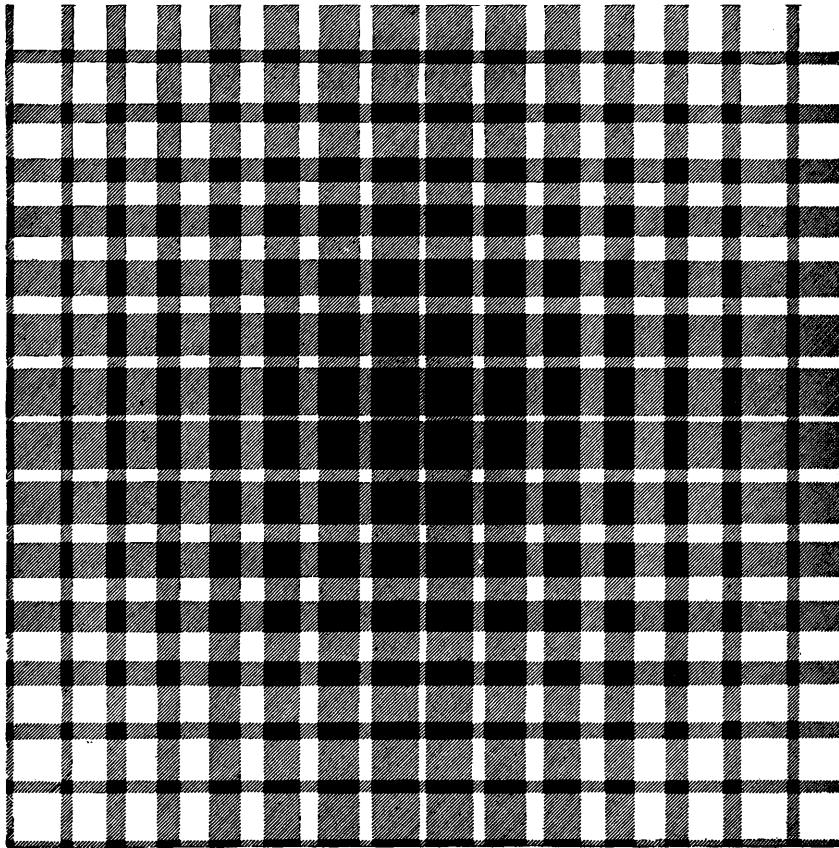


FIG. 22

using a shaded check weave. The following warp and filling pattern produces a neat shaded check effect according to the first method. This pattern is shown in Fig. 22. It may be subjected to modifications as, for instance, by grading the colors in larger stripes, say by fours

or it may be arranged with only half the number of threads of one color in each instance; that is, 2 black, 8 white, 4 black,

Black	2	4	6	8	10	12	14	16	16	14	12	10	8	6	4	142
White	16	14	12	10	8	6	4	2	4	6	8	10	12	14	16	142
Total number of ends or picks in pattern . . . . . 284																

7 white, etc.; but in this latter case a pick-and-pick loom will be required.

Shaded checks may be produced by using a shaded weave with a warp of one color and a filling of another. In Fig. 23,

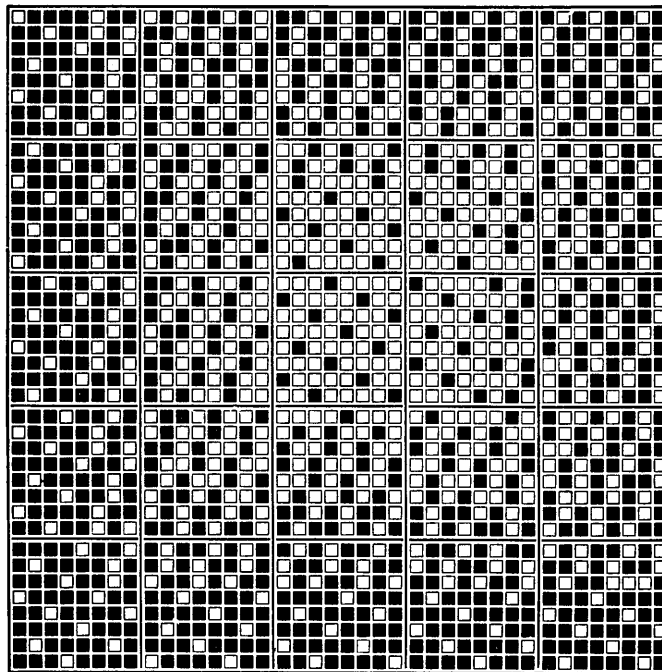


FIG. 23

a shaded weave suitable for producing checks by this method is given. The weave is made by adding risers to a

5-end satin base. A novel check effect may be obtained by combining into a check design shaded squares made on the aforesaid principle, but so constructed that the center of one square will be light and that of the next one dark.

#### THREE-COLOR CHECKS

**23.** When three or more colors are employed for checking, an almost endless variety of patterns can be easily made and, in general, it may be said that the patterns produced are more complicated, ingenious, and diversified than those obtained with only two colors. Check effects made on this principle are found in almost every class of textile fabrics where checks are of value, and may vary in size, arrangement, and coloring according to the character of the fabric to which they are applied.

**24. Common Three-Color Checks.**—The check shown in Fig. 24 and known as the **common three-color check** is the simplest form of a three-color check and, although not so stiff as the two-color common check, it is a stiff pattern

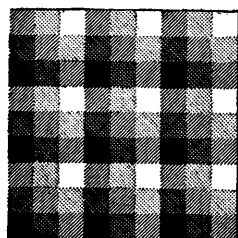


FIG. 24

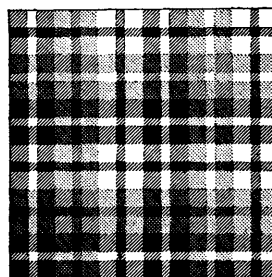


FIG. 25

and is liable to lack the neatness of the two-color common check. The pattern of Fig. 24 is arranged 8 black, 8 gray, 8 white in both warp and filling. Generally, better results are produced with this class of checks if small effects rather than large ones are made.

**25. Modifications of Three-Color Common Checks.** This style of checking may be modified in a similar manner to that explained in connection with the two-color common

check. In Fig. 25, a modification of Fig. 24 is shown; it is obtained by dividing each black band in both warp and filling with a narrow band of white, each white band with a narrow band of black, and every alternate band of gray with narrow bands of black and white. The pattern for this modification is as follows:

Black . .	4	4	2		2	4	4				2	22
Gray . .			4	4				4	4			16
White . .	2				4	4	2		2	4	4	22
Total number of ends or picks in pattern . . . . .												60

Many other modifications may be devised; for instance, each black stripe might be altered by dividing with white and each white stripe with black, leaving the gray stripe intact.

**26. Set Checks.**—Another modification of the common check is known as the *set check*; this is obtained by increasing the number of ends and picks of one of the colors. The effect of this is to produce predominating spots of that color at regular intervals, thus obtaining the set effect. Fig. 26

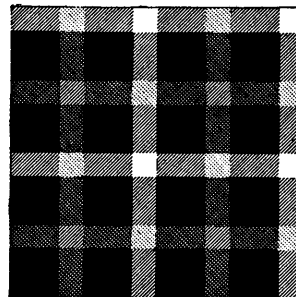


FIG. 26

is a set check produced from Fig. 24 by doubling the width of the black bands of color in warp and filling and arranging the warp and filling patterns as follows: 16 black, 8 gray, 16 black, 8 white. Set checks are not very useful in the ordinary run of textile designing, on account of the stiff appearance of the pattern; they may, however, be used for a base and modified so as to produce effects more diversified in character.

**27. Compound Checks.**—Compound checking with three or more colors yields the largest diversity of patterns

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of any principle employed. These checks result from crossing a compound warping pattern (composed usually of several orders of coloring) with a similar filling pattern. The effects produced are often of a large and showy nature, as, for instance, in the Scotch plaids, or tartans; and again they may be small and neat, as in some cotton gingham patterns. A good three-color compound check is shown in Fig. 27. The arrangement of the colors is as follows:

8 black }  
 8 white } for 32 threads  
 4 gray }  
 4 white } for 24 threads  
 4 white

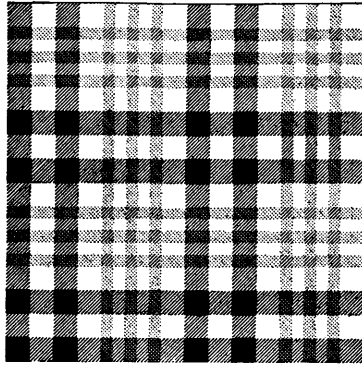


FIG. 27

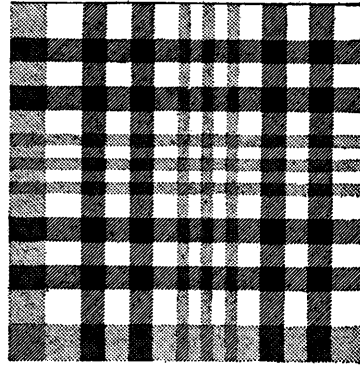


FIG. 28

Another neat check pattern on this system is shown in Fig. 28, the arrangement of warp and filling being as follows:

12 gray  
 12 white  
 8 black }  
 8 white } for 32 threads  
 4 gray }  
 4 white } for 24 threads  
 4 white  
 8 black }  
 8 white } for 32 threads  
 4 white



Checks of this description may be varied in many ways, as, for instance, by substituting one color for another, by overchecking, by dividing certain broad bands of color with a narrow band of color, etc. In Fig. 29, another compound check in three colors is shown, which illustrates a pattern very frequently met with in a wide range of fabrics. The warp and filling arrangement for this effect is as follows:

16 white  
 6 black  
 6 white  
 6 gray  
 6 white  
 6 gray  
 6 white  
 6 gray  
 6 white  
 6 black

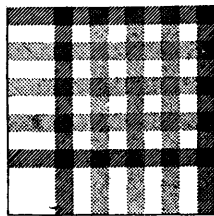


FIG. 29

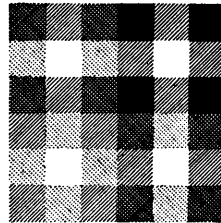


FIG. 30

**28. Three-Color Counterchange Checks.**—Counterchange checks may be made in three colors in a manner similar to that employed with two colors. The effect of the counterchange, however, is less perfect, on account of the more complicated nature of the pattern due to the use of three colors. Fig. 30 shows a counterchange check in three colors. The yarns are arranged as follows:

12 gray  
 12 white  
 12 gray  
 12 black  
 12 white  
 12 black

**29. Shaded Checks.**—Effects of a shaded character are produced in patterns employing three or more colors by using yarns of different shades, the quantity of each color being the same or, in many instances, being varied. The following warp and filling pattern will produce a shaded check design according to this method and serves to illustrate the principle employed:

56 white  
 8 light gray  
 8 medium gray  
 8 dark gray  
 8 black  
 8 dark gray  
 8 medium gray  
 8 light gray

**30. Scotch Plaids.**—The Scotch plaids, or tartans, are renowned for the beauty of their coloring and the ingenious arrangement of the different colors. Strictly speaking, the word *tartan* implies a woolen or worsted plaid cloth, but the same colorings are woven in silk and fine cottons as well as in worsted. The weave most generally employed is the cassimere twill, although the plain and other simple weaves are sometimes used. Each Scottish clan has its own particular tartan and the arrangement of the colors is distinctive of that clan. Some clans have two plaids, one for ordinary occasions and another for dress. The following are the warp and filling patterns of the tartans of a few of the more important clans, and which are frequently used in fabrics manufactured for the trade:

**CAMPBELL OF ARGYLE**

2 6 dark green  
 2 black  
 4 yellow  
 2 black  
 2 6 dark green  
 2 6 black  
 2 4 dark blue  
 4 white  
 2 4 dark blue  
 2 6 black  
 1 6 4

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ROYAL STUART	GORDON
1 2 red	2 8 black
4 black	6 Scotch blue
6 red	6 black
6 white	6 Scotch blue
6 red	6 black
4 black	2 4 Scotch blue
1 2 red	8 black
1 6 blue green	8 Scotch blue
6 black	8 black
4 white	8 Scotch blue
6 black	2 8 black
4 yellow	3 4 Scotch green
1 2 black	8 yellow
1 0 blue	3 4 Scotch green
1 8 red	2 8 black
1 0 blue	2 8 Scotch blue
1 2 black	6 black
4 yellow	6 Scotch blue
6 black	6 black
4 white	2 8 Scotch blue
6 black	2 8 black
1 6 blue green	3 4 Scotch green
<u>1 8 4</u>	8 yellow
	3 4 Scotch green
	<u>4 1 8</u>

NOTE.—Scotch blue is a blue with a greenish hue composed of 75 per cent. of normal blue mixed with 25 per cent. of green. In the same manner the Scotch green is composed of 75 per cent. of green mixed with 25 per cent. of blue.

MACGOWAN	MACPHERSON (DRESS)
2 2 black	3 6 dark gray mix
1 0 red	6 red
4 6 green	6 dark gray mix
4 4 red	6 red
4 6 green	3 6 dark gray mix
1 0 red	2 6 black
4 6 black	8 dark gray mix
4 4 red	1 0 black
2 4 black	4 yellow
<u>2 9 2</u>	1 0 black
	8 dark gray mix
	2 6 black
	<u>1 8 2</u>

NOTE.—The dark gray mixture yarn in the MacPherson tartan is composed of 90 per cent. black and 10 per cent. white.

CAMPBELL OF BREADALBANE	BLACK WATCH, OR 42D HIGH- LANDERS
2 6 black	2 6 black
4 2 Scotch green	2 8 Scotch green
2 black	6 black
6 red	2 8 Scotch green
2 black	2 6 black
4 2 Scotch green	2 6 Scotch blue
2 6 black	6 black
4 4 Scotch blue	6 Scotch blue
2 black	6 black
6 yellow	2 6 Scotch blue
2 black	<u>1 8 4</u>
4 4 Scotch blue	
<u>2 4 4</u>	

These patterns are those of only a few of the many Scotch clans, but as the patterns given are the more common ones they are sufficient for illustrating the general character of these plaids. Fig. 31 shows the appearance of the Campbell of Argyle plaid. It is customary by the trade to call all patterns resembling the Scotch plaids by that name whether they are true plaids or not.

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#### EXAMPLES FOR PRACTICE

1. Make an original check effect and state to what class of checks it belongs.
2. State a suitable warp and filling pattern for a shaded check in two colors.
3. Make a common check and show the effects of at least two modifications of it.
4. Make a compound check effect.

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#### SPOTS

**31.** Spots are almost invariably developed by means of special weaves, such as have been described. The coloring of each fabric, therefore, varies with the character of the weave. In the case of spot weaves in single cloths, the fabric is generally woven a solid color or else piece dyed after being woven white. Sometimes, however, the warp is



FIG. 31

of one color and the filling of another, in which case the color of the spots depends on whether it is made by a warp or a filling flush in the weave.

In extra warp spot effects the ground cloth is generally of a solid color, although it may be ornamented with a separate pattern of its own, and the extra warp ends are colored according to the color of the spot desired. Thus, an extra warp spot design might be arranged with the warp and filling of the ground cloth white and the extra warp ends blue, in which case the weave would be such as to form a blue spot on a white ground. In the same way extra filling designs are arranged usually with the warp and ground picks of one color and the extra, or figuring, picks of another color with which it is desired to produce a spot on the ground color. Spotted effects are sometimes produced in the cloth by the use of spotted fancy yarns, but the patterns and effects so produced are not true spots, but rather give the fabric the appearance of a mixture or an all-over effect.