color for each of these four effects quoted. For instance, consider

Dot type = *Green* paint
Cross type = *Red* paint
Shaded type = *Orange* paint
Empty type = *Brown* paint

This procedure will result in the foundation for diagram Fig. 32^a.

Next introduce the double plain in its (2 warp-threads × 2 picks) four possible different positions (as shown respectively in diagram Fig. 32^b, 32^c, 32^d and 32^e) upon the plan originally prepared for weave Fig. 32^a.

With reference to the four positions, *b*, *c*, *d* and *e*, of the double plain shown in Fig. 32,

b shows starting warp and filling with face.
c shows starting with back warp and back filling.
d shows starting with back warp and face filling.
e shows starting with face warp and back filling.

Next insert these four combinations of the double plain, all four in black, each combination all over its respective foundation as painted in the four colors on your weave plan as previously referred to, and when weave Fig. 32^a will result.

In this instance we added the four combinations as follows:

b upon *dot* type or *green* color
c " *cross* type or *red* color
d " *empty* type or *brown* color
e " *shaded* type or *orange* color.

Diagram *f* shows the drawing in draft of weave *a*, to be executed on the loom with 24 harnesses.

Using in connection with motive Fig. 31 or weave Fig. 32 the arrangement of the warp for example to be 1 end white to alternate with 1 end red and that of the filling 1 pick yellow to alternate with 1 pick red, we then obtain a four color effect, *viz:*

(1) pure red
(2) white — yellow
(3) White — red
(4) red — yellow.

It will be readily understood that any number of additional combinations in three and four colors can be made.

(To be continued.)

Waterproofing Goods.

A cheap, easy, and efficient method of waterproofing fabrics and threads, dyed or undyed is the object of a late English patent. The process consists in first treating the material with a solution of 3 to 20 lb. soap per 100 gallons of water, running the goods through this liquor as many times as considered desirable. They are next treated with a solution of metallic salt, in the proportion of 3 to 20 lb. of salt per 100 gallons of water. If desired, 3 to 20 lb. of bichromate may be added to this solution, or a separate solution may be prepared and subsequently applied, or it may be dispensed with altogether. The goods are passed several times through the metallic salt solution so as to thoroughly precipitate the fatty acid from the soap solution. It is claimed by the patentees that the treatment improves the fastness of dyed goods, and that goods remain impervious to moisture even if subsequently subjected to repeated washings.

FABRIC ANALYSIS.

(Continued from May issue.)

Ascertaining Texture of Finished Fabric.

Having obtained the weave for sample submitted, the next point to ascertain is the number of warp-threads and picks there are in the unit of one inch, in the fabric, the result being what is known as the texture of the (finished) sample. In expressing the same, the texture of the warp-threads refers to the first numeral, thus 42×36 means that there are 42 warp-threads and 36 picks per inch in the sample.

Multiplying warp-threads per inch in (finished) sample with the width of the finished fabric the sample picked out refers to, gives us then the number of threads to use in the complete warp.

From the picks per inch in (finished) sample, by carefully examining the construction of the fabric (texture, weave, finish, handle etc.) under consideration, by experience we then have to judge how many picks per inch to put in the cloth, on the loom. This subject will be later on dealt with in detail.

There are two ways of ascertaining warp and filling texture (in the finished fabric) from a sample, one by counting the individual threads in one inch or fraction of an inch, the other by calculating from the design-effect in the fabric after the repeat of the weave has been ascertained by picking-out. Some samples can be handled easier by one or the other procedure, using both in some instances in order to verify counting.

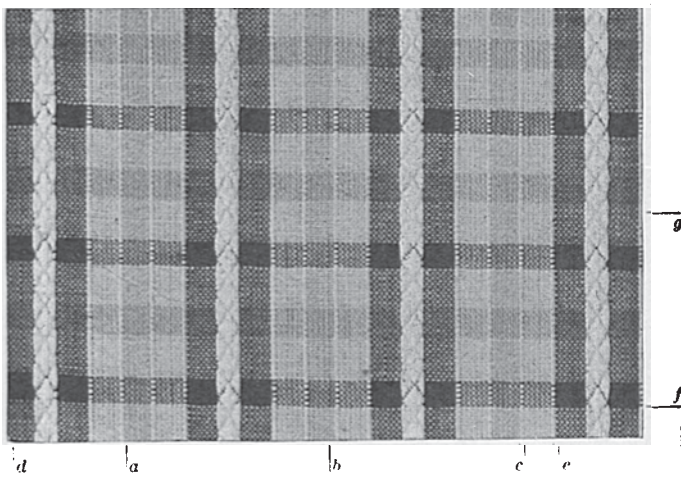

Fig. 13

Obtaining Texture by Counting.

For this purpose use the protruding fringe of the warp-threads as left to you after picking-out the weave, straighten them carefully between your fingers so they rest (protruding from the fabric) perfectly parallel, side by side, the same as they were resting in the woven sample.

Next, with a compass set one inch wide, indicate carefully this distance on your sample close to the last pick as left in the latter, and with your picking-out needle carefully arrange the loose ends, designating which ones on each side of the arms of the compass belong to the *one inch to be counted*. Either mark or paint the first and last thread of this one inch wide fringe with your red paint brush, or indicate them in any other way; again you may clip the fringe of those threads which do not belong to the *one inch unit* on either side. This will give you a chance to handle, *i. e.*, count the threads in the unit of one inch at your leisure; repeat your count while at it, so as to be sure of no error.

Duplicate the same procedure with the filling so as to ascertain the filling texture, *i. e.*, picks per inch in finished sample.

Provided the fringe as left from the picking-out process is too much disturbed or mixed up, prepare such fringes of warp and filling specially for counting texture, on a different place from that where you picked-out.

In some instances, more particularly with heavy felted woolen samples, you may have to use less than one inch fringe for counting, since you may not be able to get the threads in one inch of the sample clear.

With expert work it may be advisable to count each tex-

ture in two different places of the sample, provided the size of the latter permits it. In this way you verify your count: if both counts differ, a third count will settle any possible dispute.

Fabrics having a fancy arrangement, either in the warp or in the filling or in both systems of threads, *i. e.*, containing different counts or colors of yarns, may compel you to count more than one inch; again, in some patterns you may find it advisable to count the number of threads in one repeat of

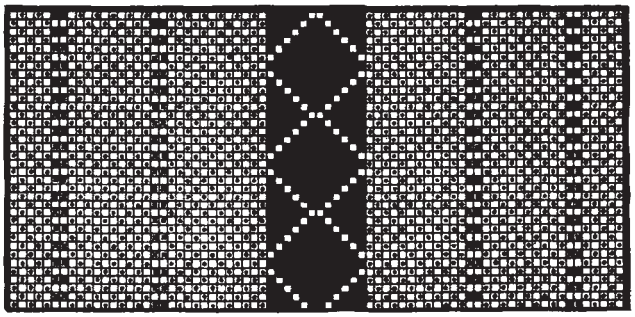

Fig. 14

the pattern and then ascertain its width in inches or fraction of inches, and in turn calculate texture by proportion, a feature later on referred to in detail.

In some instances you may facilitate your work by placing a cardboard, or paper, contrasting in color below sample, in order that the liberated ends, to be counted by you, show up distinctly. By this we mean, have for example a black background if dealing with white or light colored yarns, or a white background if dealing with black or dark colors for your yarns.

Obtaining Texture by Calculations.

When dealing with fancy, loud or pronounced patterns, we can readily ascertain warp and filling texture by the use of a pair of compasses, taking by means of the latter, either one or more inches or fraction of an inch, as a unit for measurement of the pattern and ascertain result by counting; again, we may take one or more repeats or fraction of repeats of the pattern in the grasp of the compass, ascertain its measure expressed in inches and fractions of an inch, and from it ascertain the texture of the threads in the sample, by calculation. Both procedures will be referred to.

Example: Ascertain warp and filling texture of

Fancy Cotton Dress Goods

shown in Fig. 13, actual size reproduction of fabric.

WARP CALCULATIONS.

Reading-off the arrangement of the warp from the left to the right in sample, we find the same to be:

12 ends dark
12 ends white, mercerized
12 ends dark
2 ends white (cord)
10 ends white
2 ends white (cord)
10 ends medium
2 ends white (cord)
10 ends white
2 ends white (cord)

74 ends repeat of pattern.

a to *b*, below fabric, shows unit of an inch.

a to *c* equals two inches (*Proof*). Neither measurement calls for a solid repeat, or repeats.

a to *b* = one repeat of the pattern plus (or half of the 10) 5 ends medium, or (74 + 5 =) 79 warp-threads per inch.

Proof: *d* to *e* below fabric comprises three repeats of the pattern and which measure exactly $2\frac{13}{16}$ inches.

$74 \times 3 = 222$ warp-threads in $2\frac{13}{16}$ inches, width of fabric.

$222 \div 2\frac{13}{16}$

$222 \times 16 = 3552$ and

$3552 \div 45 = 79$ ends per inch. *Ans.*

The finished texture of the fabric thus ascertained, multiplied by the finished width of the fabric, gives us the number of ends in the complete warp to use. Calculating the fabric to be 27 inches wide finished, then gives us $79 \times 27 =$ 2133 ends in warp, to which, for practical work, we can add 13 ends if so desired to obtain even repeats of patterns used, *i. e.* use 29 patterns @ 74 ends or 2146 ends in warp.

FILLING CALCULATIONS.

Distance of *f* to *g*, on side of fabric sample, equals one inch.

The arrangement of the filling, reading from *f* upwards, is:

10 picks dark
14 picks white
10 picks medium
14 picks white

48 picks, repeat of pattern; *plus*
10 picks dark and
9 picks white, giving us

67 picks per inch as the filling texture of the sample.

Fig. 14 shows the pick-out of the sample, showing one repeat widthways, three repeats in height.

Full type indicates white mercerized.

Dot type on either side of the above, indicates dark warp, the next section white, and the two outside half sections medium.

Cross type, the white cords as separating the dark, white and medium sections of plain weaving.

(*To be continued.*)

YARN CALCULATIONS.

The Diameters of Yarn.

(*Continued from June issue.*)

Another writer on the same subject, after stating Ashenhurst's fundamental formula, says: "But here we have another matter to deal with. The rule generally given makes no allowance for friction, but simply gives us the number of threads that would lie side by side in a given space if no motion of any kind were given to them. But in actual weaving we have not only the friction of the reed to consider, but also the friction of the threads among themselves when motion is imparted to them. To meet this friction we have certain allowances to make, which are called coefficients of friction. They are as follow:

For silk, cotton, and worsted.....10 per cent.
For woolen .....16 per cent."

These are the same coefficients as those suggested by Ashenhurst.

It is difficult to understand how the "coefficient of friction" can affect the diameter except by attrition; we are not considering power or tension. If, then, it is attrition which must be taken into account in the diameter (which undoubtedly it must be), then the diameter (the sensible diameter) will be less. But the application of the superstructure to Ashenhurst's formula is in every case to increase the sensible diameter.

This writer previously referred to, goes on to state an example: What is the diameter of a 60's cotton thread?

$60 \times 840 = \sqrt{50,400} - 10\% = \frac{1}{60}$ of an inch, which is an increased diameter from the fundamental formula $\sqrt{50,400} = \frac{1}{224.5}$.

I am of opinion that Ashenhurst's formula was based on the full extension of the surface fibres, and that the percentage should be deducted from the *fraction* and not from the *square root* of the product of length and counts. Thus we should get a more approximate sensible (in all meanings of the word) diameter. Thus:

$\sqrt{60 \times 840} = \sqrt{50,400} = \frac{1}{224.5}$ deduction of 10% $= \frac{1}{249}$ of an inch in diameter

which would indicate that the surface fibres are pressed