

CITY AND GUILDS OF LONDON INSTITUTE.—The annual meeting of the governors and friends interested in the institute was held at Mercers' Hall, Cheapside, on Wednesday, Lord Selborne (chairman of the council) presiding. The report shewed that the income for the past year had amounted to £30,940, made up as follows:—Subscriptions and donations, £22,715; school fees and sundry amounts received from students for materials, £8,225. The total expenditure had been £30,226, thus leaving a balance of £714. The amount voted by the council for the central institution at the beginning of the year was £12,000, and the expenditure £11,489; the students' fees amounted to £4,086, and the net cost of the institution, after deducting the students' fees, etc., was £7,403. The amount voted by the council for the maintenance of the Technical College, Finsbury, was £8,794, and the expenditure there had been £8,786. The students' fees amounted to £3,032, and the net cost of the college, after deducting students' fees, etc., was £5,754. The amount voted in connection with the technological classes and examinations was £6,230, and the expenditure under this head amounted to £6,152; while the net cost of the examinations, after deducting candidates' fees, was £5,620. The expected income available for general purposes for the present year amounted to £31,870. Lord Selborne, in the course of an address, reported very favourably upon the work accomplished in all departments. The work carried out at the central institution during the past year compared most favourably with that attained by any science institution in the country. He concluded by moving the adoption of the report and balance sheet. Mr. D. Watney (treasurer) seconded the motion, which was adopted unanimously. The treasurer, the auditors, and the members of the council were then reappointed, and the meeting concluded with a vote of thanks to the chairman.

Designing.

NEW DESIGNS.

VESTINGS, Etc.

This is a season of novelties. All the well-known weaves are in demand, but the search is still for novel combination patterns. The old styles of by-gone decades are now brought to the front and made fashionable in the new shades of mauve, melon, fawn, and violet. We give a suggestive design *A*, which may be utilised for many fabrics either in silk, cotton, or linen; the ground, which is shewn in the design undotted, may be plain or a 7-shaft satin warp face. If a fine-set reed is used the ground may remain as it is, the warp and weft being made nearly equal. The repeat takes place every 147 threads, 42 to the round, all solid colours, piece dyed, or bleached.

A very stylish fabric could be produced for vestings by the use of fancy-coloured spun silk for the weft. We indicate a few arrangements; warp all a positive colour or tint, say, light fawn, light buff, dove, light green nearly approaching yellow; then the spun silk weft mixed

as a multicolour—that is, two or three-fold wound together on a bobbin without any twist—red and white, brown and white, lemon and dark green; the diagonal by this means would be merely as it were outlined with a graceful charming effect.

Design B is on 6-shafts, 18-end draft, 12 to the round. The following particulars will give a good combination in two colours for a large plaid, in zephyr cotton cloths, the monotony of the rectangle being well broken up by the weave: 40 dents per inch, 30's twist, two in a dent, 80 picks per inch, 30's weft. Warp pattern: 300 light drab or dark buff, 24 cream, 24 coral, 24 cream, 24 coral, 24 cream, 24 coral, 6 dark moss green, 6 white, 24 coral, 24 cream, 24 coral, 24 cream, 24 coral, 24 cream, and repeat from "300 light drab." Weft the same pattern as warp. We need scarcely observe that other colour arrangements may be made as required, or a smaller plaid produced. For instance, 36 green, 6 white, 36 green, 36 white, 6 green, 36 white, and repeat with the first "36 of green"; weft the same pattern. This would give a simple check, but one very graceful, neat, and effective. Little finishing, such as cold calendaring, will suffice; no stiffening.

SHIRTING PATTERN.

A matting on four shafts, 1 and 2 for first shed, 3 and 4 for second shed, all two in a head, of 20's cotton for warp; 20's cotton weft, 16 dents per inch, four in a dent. Pattern of warp:—

- | | | |
|---------------|-------------------------------|---------------|
| 2 white, | } Repeat for 20 ends of each. | 2 white, |
| 2 light blue, | | 2 light blue, |
| 4 dark blue, | | 2 dark blue, |
| 2 light blue, | | 2 light blue, |
| 2 white, | | 2 white, |
| 2 orange, | | 2 orange, |
| 2 white, | | 2 white, |
| 2 light blue, | | 2 orange, |
| 2 dark blue, | | 2 white, |
| 2 light blue, | | 2 light blue, |
| 2 white, | | 4 dark blue. |
| 2 orange, | | |

And repeat from the first "2 white and 2 light blue." The weft pattern the same; two picks in a shed, 64 picks per inch.

THE ANALYSIS OF PATTERN.—XI.

THE SETTING OF CLOTHS (continued). THE WEAVE

In considering the influence of weave on the sett of a cloth, two questions at once present themselves: Firstly, is the diameter of yarn modified at all in weaving? and secondly, in any given weave is it possible to ascertain the precise influence of the bending of warp and weft on the sett? Respecting the diameters of yarns much could be written, but for the present we need only again remark that common-sense is a most necessary adjunct in the application of the rules respecting the diameters of yarns.

Class of material, soft or hard twist, old or new spun yarns, are a few of the most noteworthy modifying influences; but notwithstanding this, the diameters of yarns as given may practically be made as the basis of all calculations for setts.

The influence of weave is still more remarkable, and, as in the case of the yarns, common-sense is most necessary, although it is now a recognised fact that this matter may be dealt with on scientific principles. All cloths may be classed under one of three heads—viz., cloths woven on the square; weft-rib cloths, in which the warp lies straight and the weft does all the bending; and warp-rib cloths, in which the weft lies straight and the warp does all the bending. The influence of the weave on the sett in each of these cases must now be considered.

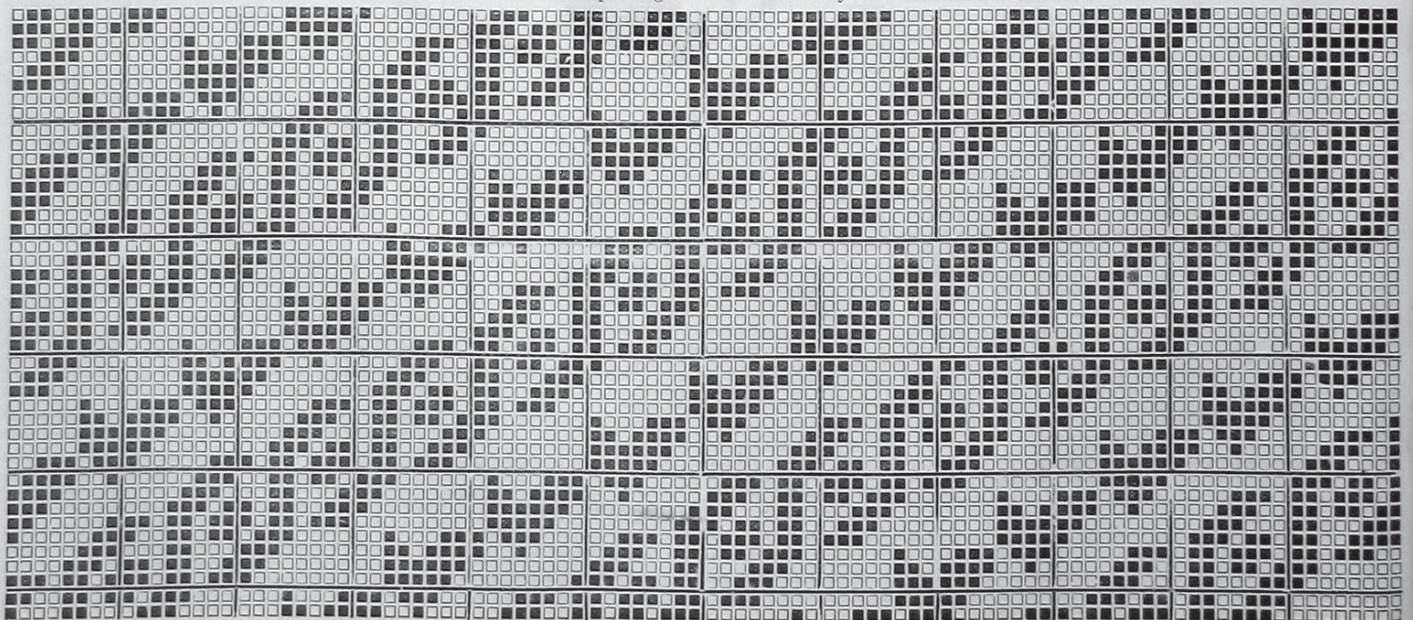
In cloths woven on the square—i.e., an equal number of threads and picks—if warp and weft are the same counts, as is usually the case, the threads and picks will do an equal amount of bending, as shewn in *Diagram 25*. Now a glance at this diagram shews that the warp threads *a a*, are separated from each other by the picks, so that taking both warp and weft to have a diameter of, say, $\frac{1}{30}$ th of an inch (i.e., 80 threads can be laid side by side in one inch), only 40 threads can be used, since there will also be 40 intersections of weft. The following rule may be made the basis for ascertaining the approximate sett required for any weave:—

Rule.—(1) Ascertain the number of units (i.e., threads and intersections) the given plan contains. (2) Divide the number of units as obtained in (1) into the diameter of the yarn to be used, thus obtaining the number of repeats of the plan in one inch. (3) Multiply (2) by the threads in the given plan, thus obtaining the threads per inch.

Example.—Required the ends per inch to use with the 3-and-3 twill (*Diagram 26*). Counts of warp and weft. 32's worsted = $\frac{1}{30}$ th of an inch diameter.

- (1) 6 threads + 2 intersections give 8 units in one repeat of pattern.
- (2) 120 (diameter of thread) ÷ 8 = 15 repeats of 3-and-3 twill in one inch.
- (3) 15 × 6 = 90 ends per inch to use, the other 30 units of space being occupied by weft intersections.

This is a very simple method, and gives fairly approximate results; but in some classes of goods, particularly lustre dress fabrics, greater accuracy is necessary, an essential condition for the most lustrous effect being that the weft shall make with the warp an angle of 60°. Taking *Diagram 25* again as our example, observe in the first place that although the threads are undoubtedly distant from one another by the full diameter of the weft yarn, yet horizontally they are not distant from each other the full diameter of the weft. Now proceed as follows:—1st, Draw a line *A* running with the centre of the weft; 2nd, draw a line *B* connecting the lowest positions of the lines *A*, and consequently through the centre of the



DESIGN A.

warp threads. Then the angle of weft with warp—i.e., $\angle C$ —must be one of 60° , and the sett must be selected to give this result. To obtain this it is evident that the length AB —i.e., the base of the triangle—must be ascertained, since this will represent the space required for each thread plus the intersection.

The length of B may be deduced as follows:—The perpendicular c is half the diameter of both warp and weft—i.e., it equals the diameter of either warp or weft—which for simplicity may be taken as 1 inch. Now, since the angle $\angle C$ is one of 60° and $\angle B$ 30° , the triangle ABC is evidently half an equilateral triangle, as shewn in *Diagram 25a*, and consequently the side AB (the hypotenuse) is exactly twice the length of c , which is taken at 1 inch; thus $AB = 2$ inches. From this data proceed as follows to obtain the length of B . Since the angle $\angle B$ is a right angle, the following formula is correct:—

$$B^2 + C^2 = A^2$$

Now, inserting the figures given above—

$$B^2 + 1^2 = 2^2, \text{ or } B^2 + 1 = 4$$

Therefore, $B^2 = 4 - 1 = 3$, and $B = \sqrt{3} = 1.732$. That is, if the diameter of the yarn = c , then the space occupied by a thread and intersection = $c \times 1.732$.

Example 1.—A 2/40's yarn has a diameter of $\frac{1}{40}$. Find the number of ends per inch for plain. Then $\frac{1}{40} \times 1.732 = 95 \div 1.732 = 55$ triangles, or 55 threads per inch.

Should the previous rule be adhered to, $95 \div 2 = 47\frac{1}{2}$ ends per inch only would be employed, so that there is evidently a considerable difference in the case of the plain weave.

Another example may be taken to show the application to other weaves:—

Example 2.—A 32's worsted = $\frac{1}{32}$ th part of an inch in diameter. Find the number of ends per inch to use with the 3-and-3 twill.

Then, as shewn in *Diagram 26*, in the 3-and-3 twill, there are 2 triangles + 4 diameters of the yarn. There-

fore, $4 + (2 \times 1.732) = 7.464$ and $\frac{1}{32} \times 7.464 = 120 \div 7.464 = 16$, and 16×6 (threads in repeat of weave) = 96 ends per inch.

In this case, owing to the few intersections, there is not such a marked difference as in the plain weave.

Weft-rib cloths must be treated in a different manner from the foregoing. As shewn in *Diagram 27*, the warp lies straight, and the weft does all the bending. Therefore, the weft picks may lie close to one another, while the threads will be separated from each other by at least the diameter of the weft. In plain cloth, for example, the picks per inch to use will be, with a 2/40's yarn with $\frac{1}{40}$ th part of an inch diameter, 95, while the threads per inch will be $95 \div 2 = 47$. These, however, are theoretical conditions. If the angle of 60° be obtained, then the altitude of the triangle formed, as shewn in *Diagram 27*, = the diameter of both warp and weft; thus the threads per inch will be $(\frac{1}{40} + \frac{1}{40}) \times 1.732 = 47 \div 1.732 = 27$ threads per inch. These, again, are theoretical conditions, since the warp and weft would bend equally, being the same counts, but a thick warp and thin weft would fulfil these conditions. For example, in a French cashmere made as follows:—

Warp.

All 56's botany. 64 threads per inch.

Weft.

All 92's botany. Picks according to quality.

Taking the warp threads to be quite straight, the following result is obtained: Since 56's botany has a diameter of $\frac{1}{56}$ th part of an inch and 92's botany $\frac{1}{92}$ th part of an inch, the altitude of the triangle will be—

$\frac{1}{56} + \frac{1}{92} = \frac{1}{39}$, and $\frac{1}{39} \times 1.732 = 89 \div 1.732 = 52$ of an inch for base of triangle.

Then, since the cashmere twill occupies two triangles and are thread, as shewn in *Diagram 28*—

$$(\frac{52}{2} + \frac{1}{92}) \div \frac{1}{92} = \frac{26}{1} + \frac{1}{92} = \frac{26 \times 92 + 1}{92} = \frac{2392 + 1}{92} = \frac{2393}{92} = 26.01087$$

for each repeat of twill, and since each twill contains three threads, $22 \times 3 = 66$ threads per inch. This is supposing the warp to lie quite straight, which it does not, as will be seen on referring to the micro-photograph of a thread and pick from a cashmere cloth given in *Diagram 4*; consequently, it may be taken for granted that a few threads should be added to the above for this reflection in the warp.

Now, if the warp and weft did an equal amount of bending, the following would be the result:—

$$(\frac{1}{56} + \frac{1}{92}) \div 2 = \frac{1}{78}$$

$\frac{1}{78} \times 1.732 = 178 \div 1.732 = 102\frac{1}{2}$ th of an inch for base of triangle, and $\frac{1}{102\frac{1}{2}} + \frac{1}{102\frac{1}{2}} + \frac{1}{102\frac{1}{2}} = \frac{3}{102\frac{1}{2}} = \frac{6}{205} = \frac{96}{205 \times 3} = \frac{96}{615} =$ about $\frac{1}{6}$, and $39 \times 3 = 117$ ends per inch.

This latter result is very far from correct, while the former is practically correct, for the practical sett given—i.e., 64 threads per inch—is for the loom, while the 66–70 ends found by calculation is for the finished state, so that they practically coincide. The following is a clear statement of all the results:—

Ends per inch ascertained by adding diameters together	89
Ends per inch ascertained by equal bending of warp and weft and angle of 60°	102
Ends per inch ascertained by warp straight, weft bending and angle of 60°	66
Ends per inch used in practice in loom	64

It is evident, then, that a strict adherence to the principles laid down gives results that practice fully confirms.

The treatment of warp-rib cloths will be exactly the reverse of weft-rib cloths, so there is practically no need to exemplify them here, since our space is somewhat limited.

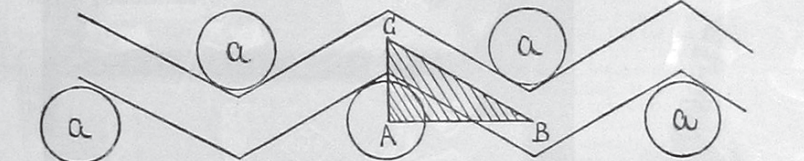


DIAGRAM 25.

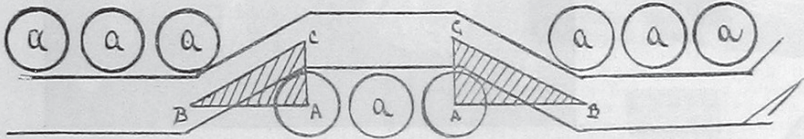
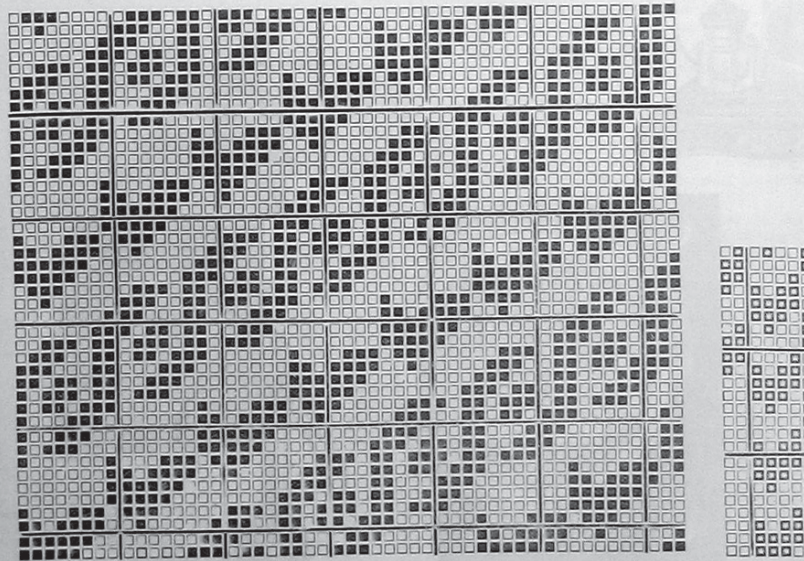


DIAGRAM 26.



DESIGN A (continues)

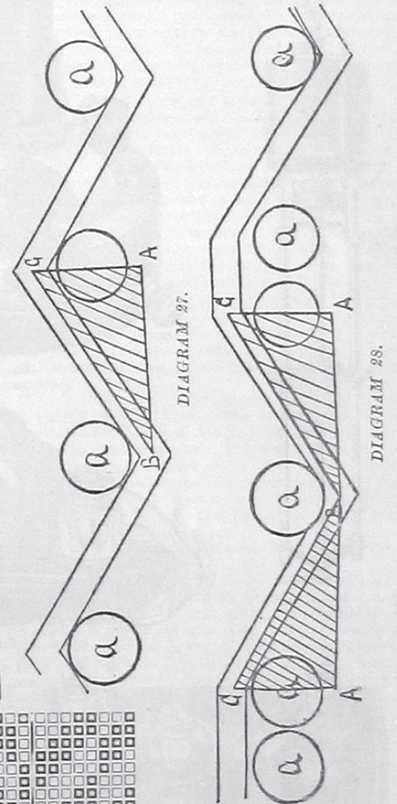
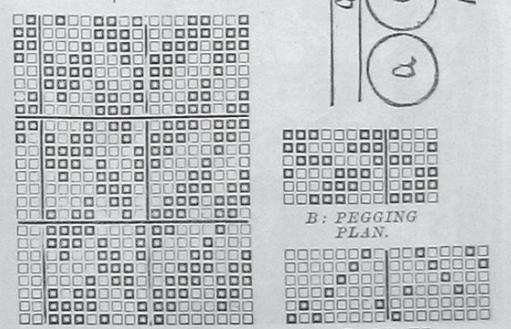


DIAGRAM 27.

DIAGRAM 28.



DESIGN B.

B: DRAFT.