QUESTIONS AND ANSWERS

We invite subscribers to submit any questions they desire answered regarding the manufacture or sale of textile products. Any question sent to us will be answered at once if the information is in our possession. If it is not, we will submit the question to experts and their replies will be published promptly. In urgent cases we will, if practicable, send the inquirer an advance copy of the reply. Inquirers are requested to state their questions as clearly, concisely and fully as possible. This will save time and misunderstanding. The names of inquirers are held in confidence.

CALCULATING CHANGE GEARS FOR LOOMS.

Editor of "Textiles":

The ratchet gear on a plain loom has 80 teeth and the take-up pawl is driven by an eccentric on the cam shaft, which makes one revolution for every two picks. Fastened to the same shaft as the ratchet is a 20-tooth pinion that drives the change gear, the latter being compounded with a 16-tooth which in turn drives a 54-tooth gear on the shaft of the sand roll. If the actual circumference of the sand roll is 13¾ and 2 per cent. is allowed for contraction of the cloth after it is taken from the loom, what is the constant of the take-up motion? If a 38-tooth change gear is on the loom how many picks per inch does the cloth contain?

SIBLEY (193).

A good way to calculate the change gear for a required number of picks or the picks resulting from a given change gear is to calculate first the number of picks per tooth of the change gear. In the example stated by "Sibley" this calculation is as follows:

The cam shaft makes one revolution for every two picks. This is equivalent to 160 picks for one revolution of the 80-tooth ratchet gear. With a 100-tooth change gear the number of picks per revolution of the sand roll is:

$(160 \times 100 \times 54) \div (20 \times 16) = 2700$ picks per rev. of sand roll.

Allowing for contraction of cloth the effective circumference of the sand roll is:

$13.75 \times .98 = 13.5$ inches. Then:
$2700 \div 13.5 = 200$ picks per inch with 100-tooth change gear,
$200 \div 100 = 2$ picks per inch for each tooth of change gear.

With this constant, picks per tooth of change gear, the change gear for a given number of picks per inch or the number the picks per inch with a given change gear is easily found.

Referring to "Sibley's" example:

38 (change gear) $\times$ 2 = 76 picks per inch with 38 change gear.

Find change gear required for 60 picks per inch.
$60 \div 2 = 30$-tooth change gear for 60 picks per inch.

If, as in the example given by "Sibley," the change-gear is a driven gear, the number of picks per inch increases with the number of teeth in the change-gear and, consequently, the number of teeth is multiplied by the constant in order to determine the picks.

If the change-gear is a driver the number of picks decreases as the number of teeth in the gear increases, and the constant is divided by the number of teeth in order to determine the picks.

ANALYZING CLOTH.

Editor of "Textiles":

Please explain the method of analyzing a small sample of cloth to find how it is made, including number of ends and picks per inch, weight per yard, yards per pound, size of yarn and percentage of cotton and wool.

OHIO (98)

The best method of analyzing is that known under the name of "straight line" analysis. The "straight line" die has an area of 1-300th square yard (4.32 sq. in.) and may be of any desired form, a rectangle 1.8x2.4 in. being usually the most convenient. It is used in connection with the "straight line" system of analyzing cloth to determine the weight per yard, yards per pound, size of the yarn and threads per inch in a given sample of cloth.

If a cutting die is not available the sample can be cut with shears or a knife around a piece of tin or cardboard of the required size. In addition to the cutting die or template, an ordinary grain scale accurate to 1-10 grain, and a large needle for raveling the cloth are required. The number of threads per inch is found by cutting the threads projecting on each side of the sample and dividing the total number thus found by the length in inches of the respective side.

If it is desired to "boil out" mixed fabrics to determine the percentage of vegetable and animal fibers, an alcohol lamp, a small cup and a supply of caustic potash or caustic soda are required. The wool is dissolved by boiling in a solution of the caustic (¼ oz. caustic to ½ pint water) for fifteen minutes. The difference between the weight before and after boiling and drying is the weight of the animal fiber. The undissolved material is the vegetable fiber, the weight of which is usually increased 5 per cent. to allow for a shrinkage in weight by boiling. The sample to be boiled should be sewed up in a small sack of cotton cloth to prevent loss of the residue. This vegetable residue should be dried by exposure to the air at the ordinary temperature in order to retain the normal amount of moisture. The sample boiled out can be of any convenient size and need not be measured.

The formulas for making the calculations are given below. The weight per yard and yards per pound can be found by formulas j, k, l, m, n, o, p, q and r.

(a) Average cotton yarn number = threads per inch ÷ grains per 1/300th sq. yd.

The cotton yarn number of any particular group of threads can be determined by the same method after counting and weighing separately.

(b) Average cotton yarn number = (threads per in. × sq. yds. per lb.) ÷ 23 1/3.
(c) Average cotton yarn number = (threads per inch × 24) ÷ (ozs. per sq. yd. × 35).
(d) Woolen runs = cotton yarn number × .52½.
(e) Worsted yarn number = cotton yarn number × 1⅓
(f) Linen lea or woolen cut = cotton yarn number × 2.8.

The spun yarn number is calculated for cotton, woolen, worsted and linen from the finished yarn number by allowing for changes that may have occurred in length and weight. In the following formulas these changes are expressed by the yield of finished colth in percentage. Thus, if the spun yarn shrinks 10 per cent. in length or weight in weaving and finishing, the yield of finished cloth is 90 per cent.

(g) Spun yarn number = finished yarn number ÷ yield % in length.
(h) Spun yarn number = finished yarn number × yield % in weight.
(i) Spun yarn number = (finished yarn number × yield in weight) ÷ yield % in length.
(j) Ounces per running yard 52½ in. wide = grains per 1/300th sq. yd. no calculation being necessary.
(k) Ounces per running yard = (grains per 1/300th sq. yd. × width in inches) ÷ 52½.
(l) Ounces per square yard = (grains per 1/300th sq. yd. × 36) ÷ 52½.
(m) Ounces per square yard = (grains per 1/300th sq. yd. × 300) ÷ 437½.

(Continued on page 32)

ANALYZING CLOTH.

(Continued from page 25.)

(n) Grains per square yard = 7,000 ÷ sq. yds. per lb.
(o) Square yards per pound = 16 ÷ ozs. per sq. yd.
(p) Square yards per pound = 840 ÷ (36 × grains per 1/300th sq. yd.)
(q) Square yards per pound = 7,000 ÷ (300 × grains per
(r) Running yards per pound = 840 ÷ (width in inches
1/300th sq. yd.)
(s) Weight after boiling × 1.05 = vegetable material.
× grains per 1/300th sq. yd.)
(t) Weight of vegetable material ÷ weight before boiling = % of vegetable material.
(u) 100 — % vegetable fibre = % animal fiber.

The use of these formulas for analyzing a cotton and wool mixed fabric is illustrated as follows:

Example—A sample of woolen cloth with an area of 1-300th square yard (1.8 in. x 2.4 in.) weighs 10.4 grains. There are 96 warp threads on the long side of the sample and 65 filling threads on the short side. The warp yarn weighs 5.4 grains, and the filling yarn 5 grains. The goods are finished 55 inches wide. A sample of the same cloth weighs 18 grains before boiling out and 3.6 grains after boiling. The shrinkage in finishing is estimated at 6 per cent. in length and 15 per cent. in weight. The shrinkage of filling yarn is estimated at 12 per cent.

96 ÷ 2.4 = 40 warp threads per inch
(a) 40 ÷ 5.4 = 7.4 cotton No. of woolen warp.
(d) 7.4 × .52½ = 3.9 runs, warp.
(g) (3.9 × .85) ÷ .94 = 3.5 runs, spun warp.
65 ÷ 1.8 = 36 filling threads per inch.
(a) 36 ÷ 5 = 7.2 cotton No. of woolen filling.
(d) 7.2 × .525 = 3.8 runs, filling.
(g) (3.8 × .85) ÷ .88 = 3.7 runs, spun filling.
(j) 10.4 grains = 10.4 ozs. per yard 52½ in. wide.
(s) 3.6 × 1.05 = 3.8 grains of cotton.
(t) 3.8 ÷ 18 = 21.1 per cent. of cotton.
(u) 100 — 21.1 = 78.9 per cent. of wool.