

# Bolivia Cloth: Analysis of Weave and Finish

## Possibilities in Fancy Effects—Difficult to Imitate in Cheaper Fabrics

By RETLAW

AMONG several special fabrics, which are at the present time attracting attention, "Bolivia" cloth is a leader. Some idea of the construction and manufacture of this cloth is given in the following analysis of a fabric retailing at \$5.50 to \$7 per yard, 6/4 width. In appearance, the fabric resembles chinchilla, but whereas the latter is a woolen cloth with soft, rich, if somewhat dull finish, Bolivia is a worsted fabric, with a lively handle and bright lustrous finish. The curl on the Bolivia will last much longer. The sample before us weighs 15½ ounces per yard, on a basis of 57 to 58 inches width.

### WARP PARTICULARS

The warp contains 47 to 48 ends to the inch in the finished cloth, which gives a total of 2,772 ends in the full warp. The count of the yarn is 2/60s, and in our judgment was made on the Bradford system. It seems superfluous to advise the use of a first-class warp yarn, but having in memory an instance within our own knowledge where a mill was using 2/60s from three different yarn spinners, where of the three yarns, one was of outstanding excellence with correspondingly good results in weaving, we would advise that quality be considered first and price second, for in the case mentioned the highest priced yarn was by far the cheapest in the finished cloth. Better dressing and weaving, greater production, much less burling and sewing; all these advantages by far overcome the difference in the cost of the yarn per pound. This applies to all yarns, but particularly so to yarns of such high counts as 2/60s.

A warp made of 2/60s can be run without sizing, if it is a well spun yarn, but better results can be obtained by sizing. Mere weight and stiffness in sizing do not necessarily mean better weaving, in fact, they very frequently result in poorer weaving. The best results are obtained by a light size, which just lays the fiber, and renders it more compact, thus reducing friction, without impairing the yarn's natural elasticity.

In a mill of considerable size, and spinning its own yarn, the warp for Bolivia cloth would probably be prepared by the cotton slasher system, where the yarn is put on section beams, and a large number of cuts run on to loom beams without change. Under this system, full broad warps are run in succession through the slasher, sized, dried and beamed in one operation.

The average mill on worsted work buys the yarn required from a spinner and in all probability such yarns would be delivered on dresser spools with any numbers of ends on the spool according to the wants and convenience of the weaver. In this instance, 36 ends per spool seems a convenient number. The warp of 2,772

ends would be run in 7 sections of 396 ends each, taking 11 spools to a section.

The average mill, if it sizes warps at all, uses a sizing dresser, and this number of ends to a section (396) would permit of a fair rate of speed in dressing, and at the same time allow the yarn to be well dried before it leaves the drying chamber, and is run on to the reel. In some mills the warps are

dressed and beamed dry and then run through a sizing slasher on to another beam, which method permits of a larger production. In our opinion, however, a warp yarn suitable for this Bolivia fabric can be obtained, which may be used without sizing.

The warp should be put on the beam about 78 inches wide. In beaming, particular care should be exercised against

warp ends. It is held by only a few threads at intervals, and around these few ends the pile filling is curled. The warp chain is of compound construction, consisting of a basic or foundation weave with warp and filling, and also a pile filling weave, which is to be cut and so treated in the finishing as to form the small curl on the face of the cloth.



FIG. 1

undue tension, which might result in the yarn on the beam being too hard. The warp should be beamed firm, but not hard. A hard beamed warp will weave poorly, particularly so in the case of fine yarns. A set of good straight heddles of fine light wire should be used. Old worn heddles are responsible for much loss of production in weaving, and for a great deal of expensive sewing.

### DRAWING-IN

The draft is straight over on 18 harnesses, which calls for 154 heddles on each harness. A reed with 12½ dents to the inch is called for, with three threads in each dent. This will give a width in the reed of practically 74 inches, and care should be taken to see that the warp occupies the center of the reed.

In setting in the loom, see that harnesses are level and hung evenly at both ends. The jacks should be set so that the lower shed at its maximum of separation rests lightly on the race plate. See that the beam spindles rest in well oiled bearings; that the friction bands are well covered with cloth, and that in no place has the cloth been worn through, permitting the contact of the metal of the band with the metal of the beam friction head. Ordinarily, little or no attention is paid to the spindle bearings of the whiproll. These should be well oiled, so that the whip-

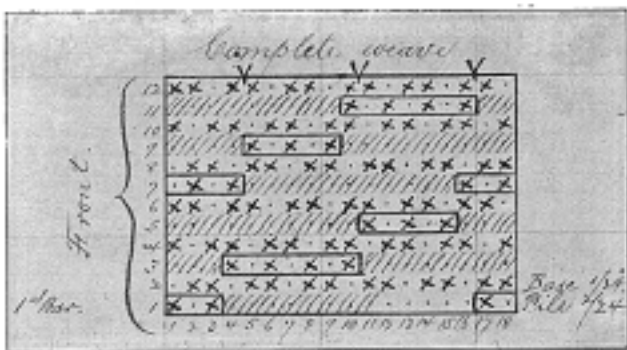


FIG. 3

roll can effectively play the part for which it is intended, viz., easing the warp at the beating-in of the pick, and the strain of the changing of the shed.

### WEAVE

It is a most difficult matter to ascertain the interlacings of this weave, as in the finishing process the pile filling has been so thoroughly cut that it is free from the greater number of the

making a 2-ply slack twist, putting in on the reverse twist just enough turns to form a soft thread, not more than 3 or 4 turns per inch, thus producing a soft bulky yarn, readily susceptible to the process of cutting by gigging, which forms an important part of finishing.

Particular care should be given to the adjustment of the filling stop motion, for the filling of the foundation weave cannot be seen by the weaver. It goes on the back of the cloth. Mispicks and broken picks cannot be detected, except by the stop motion. While as a rule, imperfections on the back of a cloth are not considered as very detrimental in ordinary fabrics, in the case of such a high priced fabric as Bolivia, perfection is desirable both on face and back.

Few mills care to take up the manufacture of such a fabric as this, because of the very high number of picks per inch for which it calls, viz., 130. A production of 10 to 12 yards per day would be considered good. The estimated cost of this fabric is \$2.38, and the mill may get a profit of 50c. per yard; a profit of \$6 per loom per day. Contrast this with another special novelty, of which the writer has knowledge, start costing around \$2.25 at the mill, and on which a profit of 30c. per yard is obtained. The second fabric calls for only 24 picks per inch, and comes from the loom at the rate of 40 to 50 yards per day, a profit

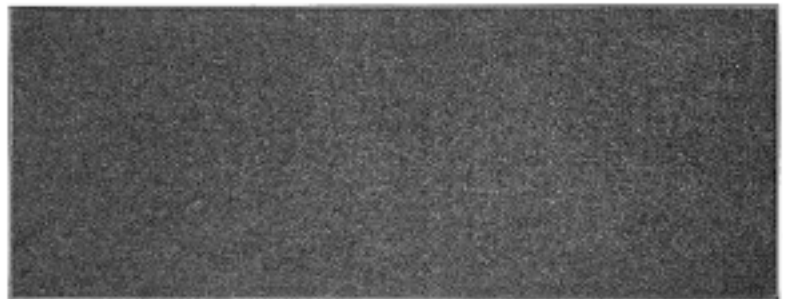


FIG. 4. SAMPLE OF BOLIVIA CLOTH

chain. It cannot be reduced to less harnesses by crossing drafting. For practical purposes it should be built 24 bars long, as a chain of 12 bars and 18 harnesses by have a tendency to catch and cause serious breakage.

The diagonal lines on bars 1, 3, 5, 7, 9 and 11 indicate the floats which are to be cut to provide material to form the curl. The spaces enclosed by heavy lines on bars 1, 3, 5, 7, 9 and 11 indicate the places where the warp threads hold and bind the floated pile filling into the foundation fabric, and it is around these threads that the cut filling, under the finishing processes, forms the small curls characteristic of the Bolivia fabric. The marks, V, at the top of Fig. 3, indicate the points at which the indentations appear, which form the longitudinal rib effect in the fabric; but these do not appear on the cloth as it comes from the loom. They also are developed in the final finishing processes.

### FILLING PARTICULARS

There are two fillings in Bolivia cloth. A filling for the foundation fabric to give strength, and a filling for the formation of the pile. Both are French spun worsted yarns. The basic yarn which is woven on bars 2, 4, 6, 8, 10 and 12 is a 1/24s, ¾ blood, of ordinary standard twist. The pile filling, which is woven in on bars 1, 3, 5, 7, 9 and 11, is a 2/24s, high ¾ quality, of good lustrous stock. The yarns forming the pile are first spun as single 24s, and then two threads twisted together in the reverse direction to the single twist,

of \$12 per loom per day. However, it is a question of proportion, the mill should ask and we believe may obtain, a higher profit per yard for specially high pick fabrics.

### FINISHING PROCESSES

The cloth should come from the loom weighing 20 ounces, according to calculations, but may vary between 19 and 20 ounces per yard. After being perched, measured and weighed, it enters upon the finishing processes. The first of these are burling and sewing. There should be very little of either on such a fabric. The pieces should be cleared of ends and prominent knots on the face, burling on the back, the knots drawn up and cut off, leaving ends sufficiently long to make up for the stretch effected in subsequent handling.

This Bolivia cloth is not fulled or milled. Only a good scouring with a good soap is required, and care should be observed, that the water is not warmer than can be comfortably borne on the hands. Too heavy a soap, and water too warm, will cause felting to an objectionable degree. Before scouring, the pieces should be tacked selvage to selvage with the floated face inside. Extra care should be taken to get rid of every trace of grease, though on such yarns there will be naturally very little oil to remove. Rinse off all traces of soap, then send to the dyehouse, where the goods should again be examined. In dyeing the pieces should again be tacked at the selvages, with filling face inside.

After dyeing, the pieces should be

After dyeing, the pieces should be dried and again inspected, then taken to the gig, where the pile filling must be cut open, to form the material for the small curls. This gigging should be carefully done. No attempt should be made to break records of production at this point. Violent work, with speed in view, would utterly ruin the face of the cloth, and all depends on the good judgment of the man in charge. The gigging should be continued until the floated filling is cut clean through to the foundation weave.

The pieces should then be placed on a whipping machine, such as is used for high grade chinchillas, and beaten on the back to straighten up the cut pile. The next step is to top off with the shear, but this is not absolutely necessary.

The piece should then be put through a regular chinchilla machine to curl up the pile. A fine, close plush should be used to cover the upper rub motion, while a good corduroy may be used for the bed plate of the machine. Once through the machine ought to be sufficient, as the chinchilla nub is not wanted in this case. The process is required only to give a curled direction or tendency to the pile.

The piece is then taken to the shear, and the nub effect shorn off gradually until only the small curl effect remains; and at the same time the longitudinal indentation should appear, forming the rib effect. The appearance of this indentation should guide the man at the shear as to the extent to which the shearing process should be carried. Again this last shearing ought to be a careful, gradual process. The piece can now be inspected, rolled, weighed and shipped.

This fabric will lose considerable weight in the finishing processes, for in addition to the usual loss, the napping and shearing will remove an unusual amount of fiber. The piece ought to weigh 20 ounces per yard from the loom. The pile fillings will lose a large percentage of fiber, and the total loss may be placed at 18 per cent., which reduces the weight per yard to 16 4/10 ounces. In addition to this, there must be taken into account the fact that the fabric gains in length in finishing, at least 5 per cent, possibly 7 per cent., which will still further reduce the weight per yard and make it 15 1/2 ounces finished.

LAYOUT AND COST

The layout and cost are as follows:

2772 ends warp, 2/60s white worsted, Bradford system.  
 12 1/2 x 3 reed = 73.9 inches wide over all.  
 130 picks filling { 1/24s white French spun.  
 woven 1 and 1 of { 2/24s white French spun  
 slack twist.  
 2.904 ozs. 2/60s @ \$1.72 1/2 per lb. . . . .3131  
 6.006 ozs. 1/24s @ \$1.25 per lb. . . . .4692  
 12.012 ozs. 2/24s @ \$1.27 1/2 per lb. . . . .9572

Cost of material. . . . . \$1.7395  
 Per yard dressing and drawing-in. . . . .0050  
 Per yard weaving. . . . .2600  
 Per yard finishing. . . . .0500  
 Per pound soap, scouring only. . . . .0150  
 Per pound dyeing. . . . .1200  
 Per yard fixed charges. . . . .3080

Cost of manufacturing. . . . .7580

Allow for gain in length of 5 per cent. 105. . . . . \$2.4975

Cost per yard. . . . . \$2.378

Some manufacturers contend that a gain in length should not be taken into consideration in calculating cost, but the same men would never dream of omitting to take into account any shrinkage, so we hold that so long as the gain is regular an allowance in calculating cost should be made.

POSSIBILITIES OF DEVELOPMENT

Bolivia fabric should lend itself very readily to fine fancy effects. For example, a black warp with a black base filling for bars 2, 4, 6, 8, 10, 12; a dark blue 2/24s pile yarn on bars 1, 3, 7, 9;

and a dark wine or green 2/24s pile yarn on bars 5 and 11, would give an effective color stripe effect.

With black warp and black filling for foundation weave, and making changes only in the pile filling yarns, a large variety of beautiful colorings and styles could be developed.

There is little chance of any duplication in a cheaper fabric, although the construction lends itself to, in fact in-

vites, manipulation. A cotton warp would scarcely be noticed, but the difference in the total cost would be so small, that this reduction is not worth consideration. The only manipulation which would pay would be a 2/40s black cotton warp; a 1/16s black cotton filling, and a pile filling of 3 1/2 run bright luster wool. This fabric would figure out around \$1.55 at the mill, reeding 13 1/2 x 3, reducing width to 68.4 inches.