

THE ETHNOGRAPHICAL MUSEUM OF SWEDEN, STOCKHOLM  
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AN UNFINISHED TUBULAR FABRIC  
FROM THE CHIRIGUANO  
INDIANS, BOLIVIA

BY

MARGRETHE HALD

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*To Dr. Sigvald Linné, director of the Ethnographical Museum of Sweden, Stockholm, my sincere thanks for enabling me to study the Swedish material and for placing an important part of it at my disposal in the National Museum, Copenhagen. I am indebted to Dr. Stig Rydén, curator at the Ethnographical Museum of Sweden, for much valuable help.*

*I am also grateful to the Chicago History Museum, the University Museum, University of Pennsylvania, Philadelphia, and the Ethnographical Museum of Gothenburg for photographs kindly supplied to me.*

*Nationalmuseet, Copenhagen, 1st June, 1962.*

*Margrethe Hald*

AN UNFINISHED TUBULAR FABRIC FROM  
THE CHIRIGUANO INDIANS  
BOLIVIA

The great Swedish scientist and explorer Erland Nordenskiöld praised the women of the Chiriguano and Chané tribes for their skill at weaving in his book "Indianlif" 1910, but he added: "As quantities of cloth have been introduced to the Indians by the Whites, domestic weaving is becoming more and more rare. Indeed, I saw no looms among the Chané in the Itiyuro Valley and indigenous textiles were very scarce."<sup>1</sup> It appears that it was high time even then, for a collection to be made of good, original Indian textiles in South America. Therefore it is of great significance that the vast collections with which Erland Nordenskiöld enriched the museums of his homeland also included textiles. It is one of these, a Chiriguano fabric now in the Ethnographical Museum of Sweden, Stockholm, which is the subject of this article.<sup>2</sup>

The piece (fig. 1) is unfinished, in fact only c. 25 cm. has been woven, and this is in certain respects an advantage for research purposes. Luckily the whole system is intact, but unfortunately the matching loom is not present; presumably due to the difficulty of transporting it from the finding place. This shortcoming is to some extent recompensed by a photograph (fig. 2) taken by Erland Nordenskiöld during his expedition in 1908—09 to the Chiriguano at the mission station Tihuipa, West Chaco, Bolivia.<sup>3</sup> The attached product resembles the fabric brought to Sweden (fig. 1) to such a degree, that it must be the same fabric in both pictures.

<sup>1</sup> Erland Nordenskiöld: *Indianlif*, Stockholm 1910, p. 228.

Erland Nordenskiöld also brought home looms from his expeditions in South America from the Chané, Mataco, Yuracaré, Chacobo and Baure tribes, as well as from the highland Indians in the west. However, owing to lack of display space, this interesting research material, together with the other Nordenskiöld collections, are only available to scholars. The Etnografiska Museum in Gothenburg has several looms collected on Nordenskiöld's later journeys in South America. The studies made by Nordenskiöld of these looms place him as one of the first scientists in the field of research dealing with the weaving techniques of the Indians.

<sup>2</sup> Mus. No. 13.13. 1037.

<sup>3</sup> Kindly pointed out to me by fil. dr. Stig Rydén.



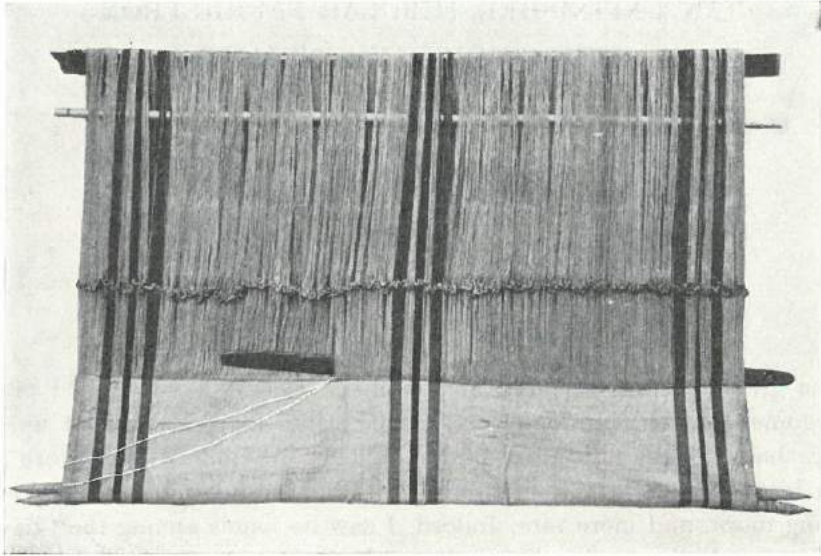


Fig. 1. Unfinished tubular fabric from the Chiriguano Indians. (The Ethnographical Museum of Sweden, Stockholm).

The loom in the photograph (fig. 2) is of exceedingly modest appearance, just a simple framed rack, sloping slightly backward. The uprights seem to have consisted only of a pair of roughly trimmed branches or saplings, terminating at the top in natural forks which support a cross bar or upper beam. This beam carries the whole weaving device. The lower beam lies just above the ground and is lashed with thongs to the uprights. At the base of these is a stump, or probably a piece of wood driven into the ground with cut surface uppermost, presumably wedges which had to be pulled up and driven in again every time a readjustment was necessary. The beams were presumably stripped of bark and smoothed, but they do not appear to have a completely even surface. A circumstance which must have influenced the uniformity of the warp's tension.

The attachments for use during the actual weaving can be seen across the face of the warp. First, taken in order from the top, there is a thin cord which is pulled tightly, straight across the warp and then tied to the uprights. The narrow bar immediately under this is a shed rod which serves to keep one shed clear. This is also attached to the uprights (possibly to keep it in position there and to prevent it from moving up and down). It appears to have sagged in the middle, perhaps under pressure from adjustments to the warp. A good distance below this is the heddle, the

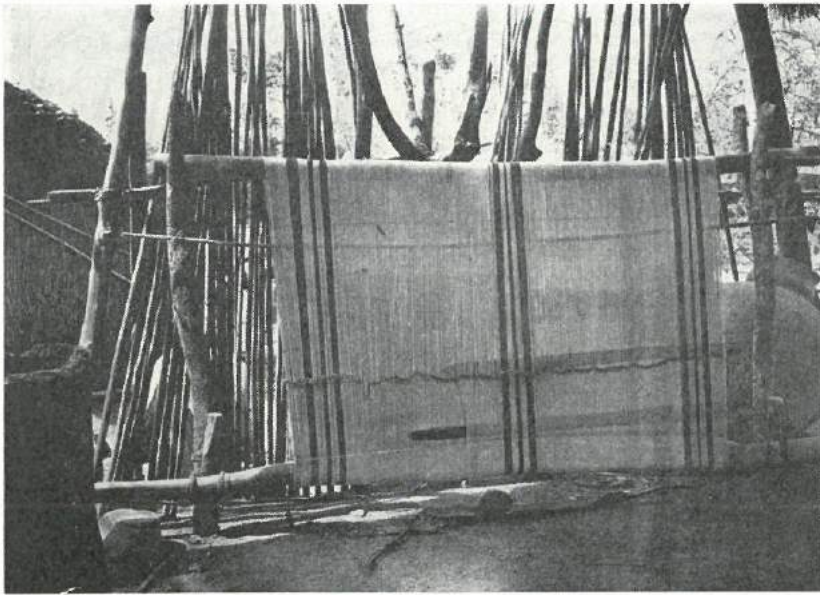


Fig. 2. Chiriguano loom photographed in situ. (E. Nordenskiöld: *Indianlif*, fig. 123. Photograph from the Ethnographical Museum, Gothenburg).

row of leashes which directs the other shed, in that it keeps the threads behind the shed rod under control. In this way, the two factors for plain weave are apparent.

The photograph shows two swords belonging to the loom, but unfortunately they are not very clear because they are thrust into the warp — one immediately above the heddle and the other at the working edge of the woven area below. Only a small part of the uppermost sword is visible as it sticks out of the right edge, while the one below, the longer of the two, has both points showing. A curious feature of this sword is that its contours seem to bulge towards the edge. It is not feasible to suppose that the breadth of the sword varies, and it is more probable that the impression is caused by a spool temporarily lying on top of the sword. Possibly another spool lies just below, on the lower beam under the foremost warp layer. Two weft threads in the web become pronounced a little to the left of the centre stripe. However as they follow each other so closely, it is impossible to distinguish them from one another. They vanish at the left edge, presumably because they are attached to spools which rest on top of the lower beam. These details are very indistinct in the reproduction.



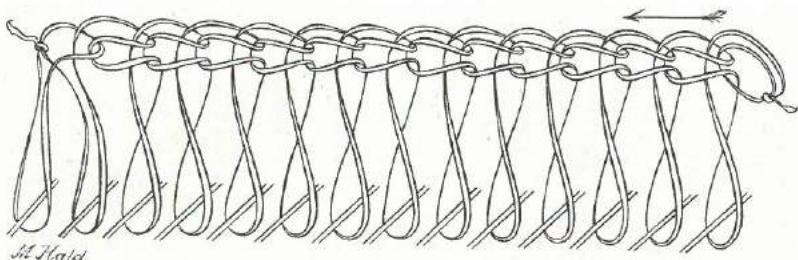


Fig. 3. Analysis of the heddle in the Chiriguano fabric, fig. 1.

## THE FABRIC

*Material:* Cotton yarn. 2-ply and z-twisted both in warp and weft.

*Colours:* Light ground, now almost sand-coloured, which is possibly the natural colour of the material. In the group of three stripes along the warp, a golden brown yarn is used for the outer stripes and dark brown for the centre stripes. The weft is natural and unbleached.

*Mounting:* Tubular weave Type A. (See figs. 5—6).

*Circumference of Warp:* 192 cm.

*Weave:* Plain.

*Shed Rod:* This must have presumably been left behind. The rod found in the loom's upper shed, when this investigation began, could not have been the original one. It was too short, and consequently the warp threads slipped out at the side-edges, whereupon one of greater length had to be substituted in order to maintain the shed.

*Heddle:* The heddle consists of a row of leashes as shown in fig. 3. The loops encircle every alternate thread in the warp, i. e. all those which are under the shed rod. There has never been a shaft. The loops are noticeably short, hardly  $1\frac{1}{2}$  cm. in length. See diagrams — figs. 3 and 13—16.

*The width of the fabric:* At the beginning of the completed portion the width measures 137 cm., but already at the last pick this is reduced to 132 cm., i. e. a reduction of 5 cm. has occurred after the completion of c.  $\frac{1}{4}$  metre fabric.

The height of the woven portion measures at the left edge  $24\frac{1}{2}$  cm., in the middle  $27\frac{1}{2}$  cm. and at the right edge 26 cm.

*Thread count:* Always taken in an area 5 cm.  $\times$  5 cm.

I Series taken 6 cm. from the web's starting line below.

- a) 37 wefts 102 warps (3 cm. inside the left side-edge).
- b) 32 wefts 112 warps (middle of web in the coloured stripe).
- c) 34 wefts 104 warps (3 cm. inside the right side-edge).

II Series taken immediately below the stripe under the last shed which is analyzed in the diagram (fig. 17).

- a) 35 wefts 106 warps (3 cm. inside the left side-edge).
- b) 32 wefts 114 warps (middle of web in the coloured stripe).
- c) 34 wefts 106 warps (3 cm. from the right side-edge).

III Series The positions are given in relation to the numbers in the diagram, fig. 17.

- a) 37 wefts 90 warps (immediately below No. 21).
- b) 37 wefts 100 warps (under No. 18).
- c) 41 wefts 102 warps (under No. 8).
- d) 38 wefts 100 warps (in the space between Nos. 5 and 7).

*Accessories:* Only one sword and four spools now remain of the accessories brought to Sweden with the fabric.

*The sword:* 114 cm. long and c.  $4\frac{1}{2}$  cm. broad, rounded at both ends and with no sharp edges.

*The spools:* consist of thin sticks, from 62—72 cm. in length, round which the weft yarn is wound. The spools are connected to the fabric, in that two are joined by the thread to the right side-edge, and two to that part of the fabric just a little to the left of the centre stripe; each thread is in its shed. See fig. 22.

### *The Warping Arrangement*

The most conspicuous feature of the unfinished Chiriguano fabric and of the kind of weaving to which it belongs as a whole is that the finished product is in the shape of a sack, but open at both ends; this is because the transverse edges are joined and only the side-edges are free. The term *tubular weaving* is used in this article to describe a fabric with this characteristic.<sup>1</sup>

Two types of this tubular weaving are known. Erland Nordenskiöld<sup>2</sup> had the opportunity of observing both types among the Chané Indians, and he gives diagrams which explain them and show their differences. The type represented by the Chiriguano textile in question (figs. 4 & 6) is characterized by the warp thread, which is passed *outside* the two beams in an

<sup>1</sup> It being understood that this concerns the warp setting. For the sake of clarity, it should be mentioned that it is also possible to obtain a tubular effect by the weft system joining the two layers of the weave. In that case the result is a tubular weave in the opposite direction. Perhaps it would be more correct to use the term "warp tubular weaving" as opposed to "weft tubular weaving". However, in order to keep the terminology simple the latter is ignored, as it is not under discussion in this article. The term "tubular loom" is used to describe the weaving device.

<sup>2</sup> Erland Nordenskiöld: Comparative Ethnographical Studies, II, 1920, p. 175. Fig. 55<sup>1-3</sup>.

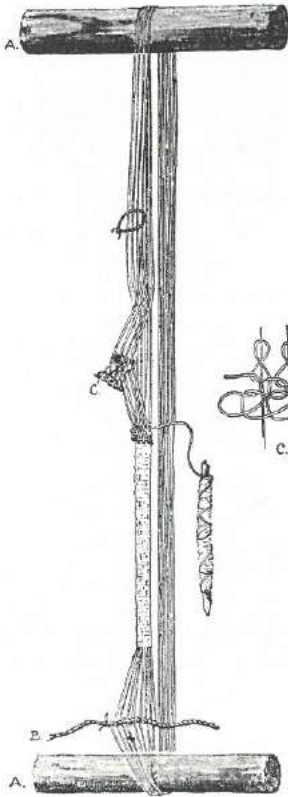


Fig. 4.

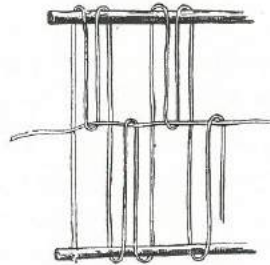


Fig. 5.

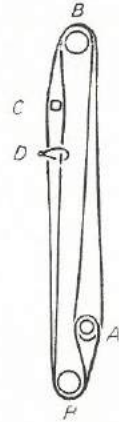


Fig. 6.

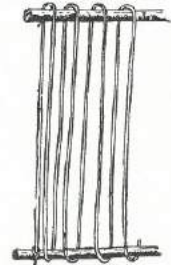


Fig. 8.

Fig. 4. Sketch of a band-loom. The warp is put up in "the loop method". Type A. Chané, Rio Parapiti. (E. Nordenskiöld, 1920, p. 175).

Fig. 5. Diagram of the loom mounting, "the loop method", fig. 4. (E. Nordenskiöld, 1920, p. 175).

Fig. 6. Side-view of a warp, put up in "the loop method" or Type A.

Fig. 8. Diagram of warping in "the spiral method". Type B. (E. Nordenskiöld, 1920, p. 175).

*alternating* direction during the warping operation. This means that an extra rod or a cord must be placed between the beams and parallel to them. The warp thread is passed so that it alternately loops the cord from above and from below, with the result that a row of loops is formed, which face each other alternately along the cord. Indeed this method produces a kind of "lock" which keeps the two transverse edges of the weave together (fig. 7). Pull this cord out, and "the lock" is opened enabling the fabric to be spread out flat. In this way four closed edges are preserved intact, and the use of a knife or scissors is not necessary. Consequently



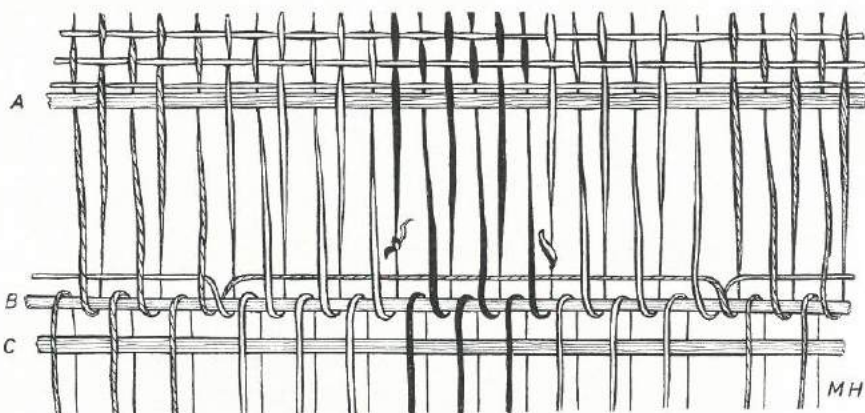


Fig. 7. Analysis of "the lock" in the Chiriguano fabric, fig. 1.

the fabric can either be used in an open or a closed state, whichever is preferred. For the sake of convenience, this truly ingenious system will be called "the loop method" or *Type A*. in the following. The other type of "tubular weaving" with a warp where the thread runs in only *one direction*, — in fact the single thread runs spirally — (see fig. 8.) will be called "the spiral method" or *Type B*.

It naturally follows that a warping arrangement of a tubular kind must be stretched around two beams in order to achieve the necessary tension for the weaving operation to be carried out. The photograph (fig. 2) shows the fabric duly stretched and brought into a vertical or slightly sloping position. As work proceeds and it becomes necessary to move the woven area along, the wedges by the lower beam are loosened and the fabric is simply pulled over the beams as required.

Although the circumstances for this study seem favourable, in that the fabric is not completed and a photograph of it in the loom exists, it cannot be denied that these assets would have been even greater if there were a description of the Chiriguano woman's working method during the different phases of the weaving procedure. Unfortunately no such description seems to exist. Written sources were studied in the hope that weaving methods might be mentioned which would throw some light on the missing details. To begin with for example, there is W. B. Grubb's book published in 1911,<sup>1</sup> in which the author gives some rather scanty accounts of the Lengua Indians who live to the east of the Chiriguanos. Grubb's photo-

<sup>1</sup> W. B. Grubb: *An Unknown People in an Unknown Land, The Lengua Indians of the Paraguayan Chaco*, London 1911, p. 67, and frontisplate.

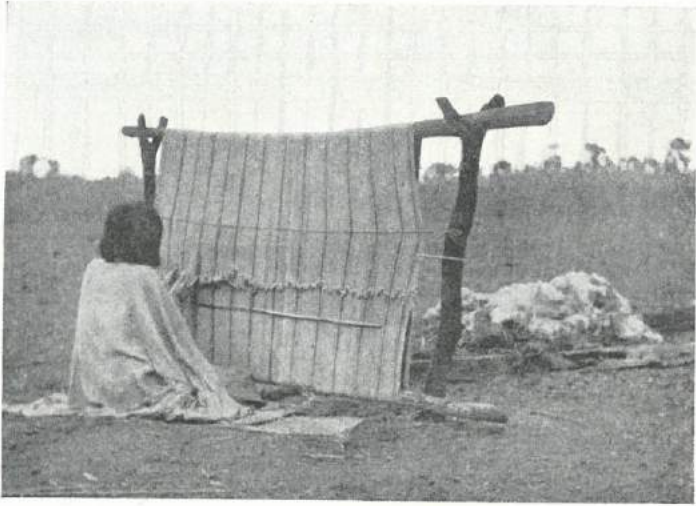


Fig. 9. Lengua woman working on a tubular cloth. (W. Barbrook-Grubb: *An Unknown People in an Unknown Land*, p. 66).

graph of the loom and the fabric (fig. 9) as well as his description of the weaving operation seem somewhat similar to the Chiriguano loom and method (figs. 2 & 1). In any event, here are the words of W.B. Grubb:

The lower beam he writes, lies very near the ground, "barely sufficient space being allowed for the ball of yarn to pass between — indeed, a hole is usually scooped in the ground for this purpose. As the woman sits on the ground, she can just reach to drop the ball of wool over the top pole and catch it as it falls, she then passes it underneath the lower one, and repeats the operation till the warp is finished. The threads are placed closely side by side . . . ."

As there is no mention of the thread being passed in two alternating directions, it must be assumed that it is a tubular warp, Type B., which is being put up, and that there was apparently only one person carrying out the warping.

In the meantime Lila O'Neale briefly mentions weaving among the Lenguas in a treatise published in 1949.<sup>1</sup> She writes that two women work at the warping together, one sitting in front of the loom and one behind. It must be assumed that she knows of another source or perhaps of another example.

<sup>1</sup> Lila O'Neale: *Weaving — Handbook of South American Indians*, Smithsonian Institution, Bureau of American Ethnology, Bull. 143, 1949. Vol. V., p. 115. Unfortunately references are not given in notes in the text, but only a bibliography at the end of the publication. Therefore sources concerning this question apart from W. B. Grubb's book cannot be seen.



### *The Heddle System*

W. B. Grubb writes the following: —

“By an ingenious contrivance of loops of wool, which pass across the entire face of the warp in a continuous line and pick up each alternate strand, the weaver is able to separate them, and pass a fine cane between the divided threads . . .”<sup>1</sup>

Naturally one dares not assume on the basis of this, that the heddle system is identical with that of the Chiriguanos, but as it consists of an unbroken wavy line of leashes the possibility is always there.

Indeed this type (fig. 3) could not have been a speciality unique to the Chiriguanos. Appended to Erland Nordenskiöld's diagram reproduced here (fig. 4) is an analysis of the leash knotting in the band weaving of the Chané Indians. It is not surprising that this closely corresponds to that shown in fig. 3, when the proximity of the Chané and Chiriguano folk to each other is considered. On the other hand, there is a considerable distance between them and the Goajiro Indians who inhabit the north coast of South America at approximately latitude 12° north, while the Chiriguano/Chané region is circa latitude 20° south. A textile in the possession of Gothenburg's Ethnographic Museum<sup>2</sup> shows that the Goajiros practise tubular weaving Type A., and the heddle arrangement in this case is identical to that of the Chiriguanos. Unfortunately details of the manner in which the Goajiros knotted the leashes do not appear to exist, therefore nothing could be gained from that source. However in two different publications Walter E. Roth deals with the arts and crafts of the Guiana Indians,<sup>3</sup> and the author describes a warping arrangement used in the production of hammocks and loin-cloths, which is the same as “the loop method” (figs. 4—5). In connection with this he describes a method of leash knotting for the heddle which admittedly does not completely correspond to that of the Chiriguano Indians, but which does resemble it in that the leashes are linked out in one row; this is worth studying a little closer.

In Walter Roth's diagram<sup>4</sup> (fig. 202) of the loom, here fig. 10., the shed rod (ps) can be seen in the rearmost shed — Shed I. A flat, pointed stick or narrow cane (ts) is inserted in the foremost shed — Shed II. The cane is

<sup>1</sup> W. B. Grubb: *An Unknown People*, p. 67.

<sup>2</sup> Gothenburg Ethnographic Museum. No. 24.2. 469.

<sup>3</sup> Walter Edmund Roth: *An Introductory Study of the Arts, Crafts, and Customs of the Guiana Indians*, 38th Annual Report of the Bureau of American Ethnology, 1916—1917, Washington 1924, p. 386 ff. Diagrams 201 ff. spec. 202 & 203.

Same author: *Additional Studies of the Arts, Crafts, and Customs of the Guiana Indians*, Smithsonian Institution, Bureau of Ethnology, Bulletin 91, Washington 1929, p. 82 ff., figs. 77—80 and fig. 62.

<sup>4</sup> Same author: *Arts and Crafts*, p. 389, figs. 202—204.

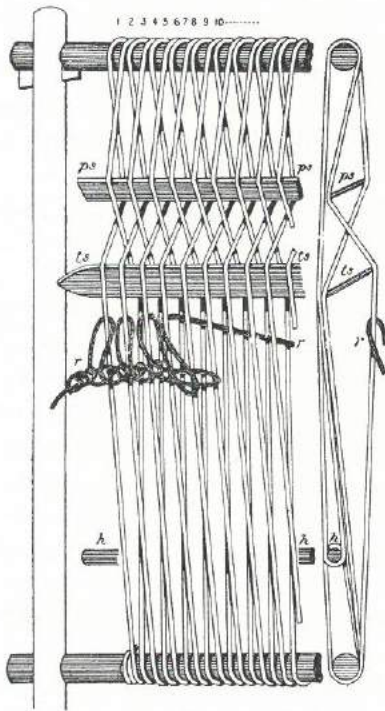


Fig. 10.

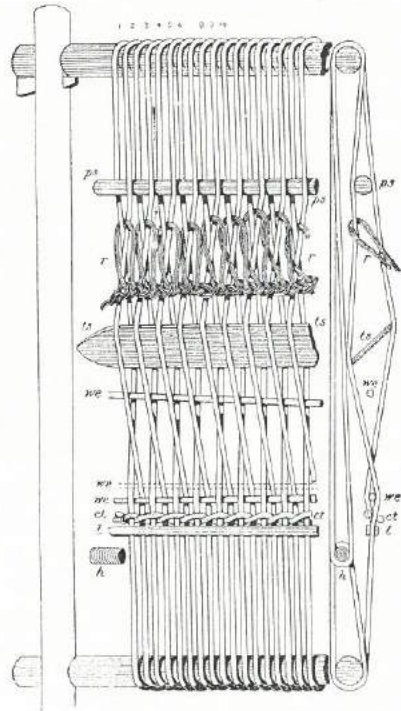


Fig. 11.

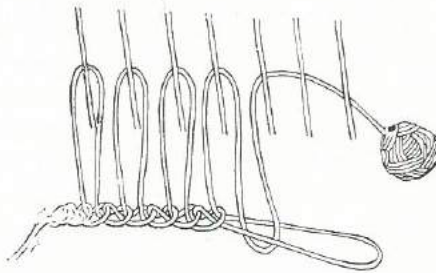


Fig. 12.

Fig. 10. Example of leash knotting for a heddle. Guiana. (W. E. Roth, 1924, fig. 202).

Fig. 11. Heddle in position. Guiana. (W. E. Roth, 1924, fig. 204).

Fig. 12. Method of leash knotting for a heddle. Guiana. (W. E. Roth, 1924, fig. 203).

put in flat and then turned edgeways, whereby the shed can be opened and the working thread passed through in such a way that the link with the ball of yarn is maintained (fig. 203) fig. 12.

The row of leashes is now made from the left side, and the working thread is successively picked up from the spaces between the uppermost warp threads in Shed II. That is to say, that as the stitch is made it encircles the thread and a leash is formed. However only every other stitch functions as a leash, the rest serve as intermediary links presumably to give the necessary length. When the heddle is completed in this way across the whole face of the warp, the cane is pulled out of Shed II and the upper layer of threads falls back into the undershed but now controlled by the heddle, fig. 11. Walter Roth describes this operation as simple and he could well be right, but it would have been of interest to know whether the work was done with a tool or with the fingers alone.<sup>1</sup>

In accordance with Walter Roth's diagram, my experiments with the Chiriguano method of leash knotting were arranged with the thread in Shed II, but with the difference that the work was done from right to left. This seemed to come more naturally, however work from the other direction was also possible.

The start is made from the right side-edge of the warp, where the working thread is first folded to form the small circle or stitch which is to carry the first loop. The circle must be wide enough to allow a new loop to pass easily through it.

An attempt has been made in the diagrams (figs. 13—16) to illustrate the mode of procedure. — Fig. 13 shows 3 completed stitches and one loop  $A^I$  pulled up onto the right index finger. — Fig. 14 the right index finger hooks up the working thread which is to rest in front of  $A^I$  at B. The left index finger and thumb pull the working thread up from the following space Y and secure Loop C. — Fig. 15 loop C is now picked up by the right index finger and thumb at about point X, and pulled through loops B and  $A^I$ ; the fingers of the left hand aid the operation when necessary. — Fig. 16 loop C has now become loop  $A^{II}$ , but upon being transferred to the right index finger note that the point marked X which is behind on the left index finger (figs. 14—15) lies foremost on the right index finger

<sup>1</sup> In Arts and Crafts Walter E. Roth writes (p. 105) that the women of the Carib, Makusi and other tribes used a hooked needle for some handicrafts, and that the Warrau women make a type of crochet work with two hooked needles 2 1/4 inches long and very similar to our crochet hook. Fig. 22, p. 106. On the other hand no mention is made of the use of hooks in connection with leash knotting.

Lila O'Neale: Weaving. Handbook of South American Indians. Vol. 5. 1949, p. 137. There is also mention here of hooked needles, but the author writes that woollen bags described as a kind of crocheting appear to be made by finger-looping methods. (Quillacinga, Pasto, Coaiquer).



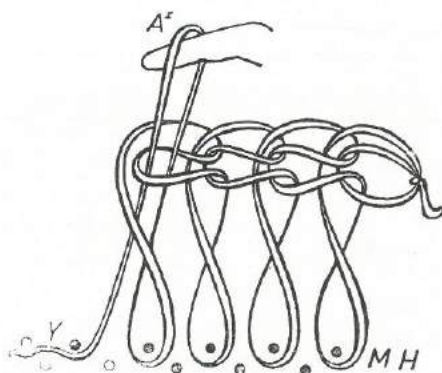


Fig. 13.

when loop C (fig. 16) falls into place as  $A^{II}$ ,  $A^I$  and B slide down together, and a new leash is made.

The most difficult part of the operation seems to be to achieve an even tension. It is essential that the leashes are equal in length and that the loops in the "back" are equally firm. The heddle of the Chiriguano fabric follows a wavy course across the face of the warp; this apparent overabundance in length however has no doubt had its functional purpose. See below p. 27 and 48.

#### *Passage of Weft*

The presence of four spools actually joined to the fabric is of great significance in that a definite basis is given for analysis. This is made from the last shed and backwards down, as shown in the diagram (fig. 17) by num-

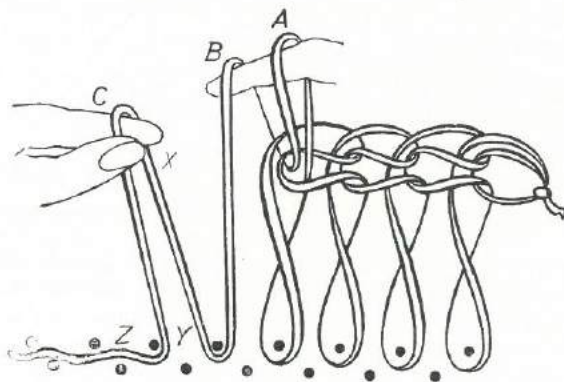


Fig. 14.

Figs. 13-14. Reconstruction attempts at leash knotting for a heddle in the Chiriguano manner, fig. 3.

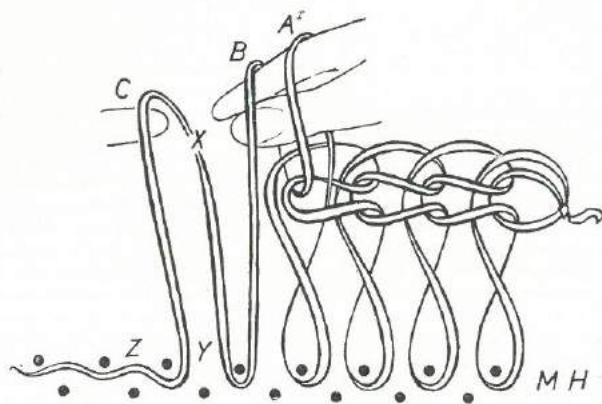


Fig. 15.

bering the weft turns beginning at the top. Each of the four weft threads is marked differently, and each shed is drawn in regardless of whether it is completely or only partially filled by the weft. The area on which the drawing is based appears in the photograph (fig. 22) as a dark belt across the fabric, immediately under the upper line of the web; this is because the working threads used during the experiment are still in position. The height of the belt in reality only measures 4 cm. Unfortunately the numbered marks of the turning points of the weft are rather faint in the reproduction.

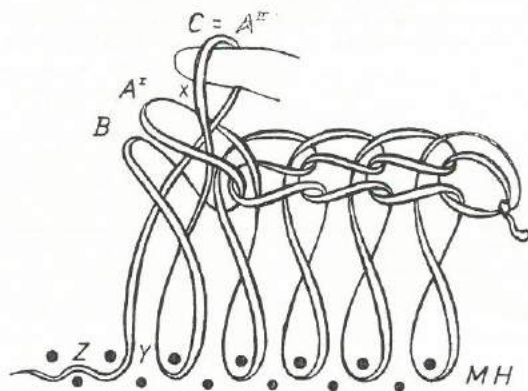
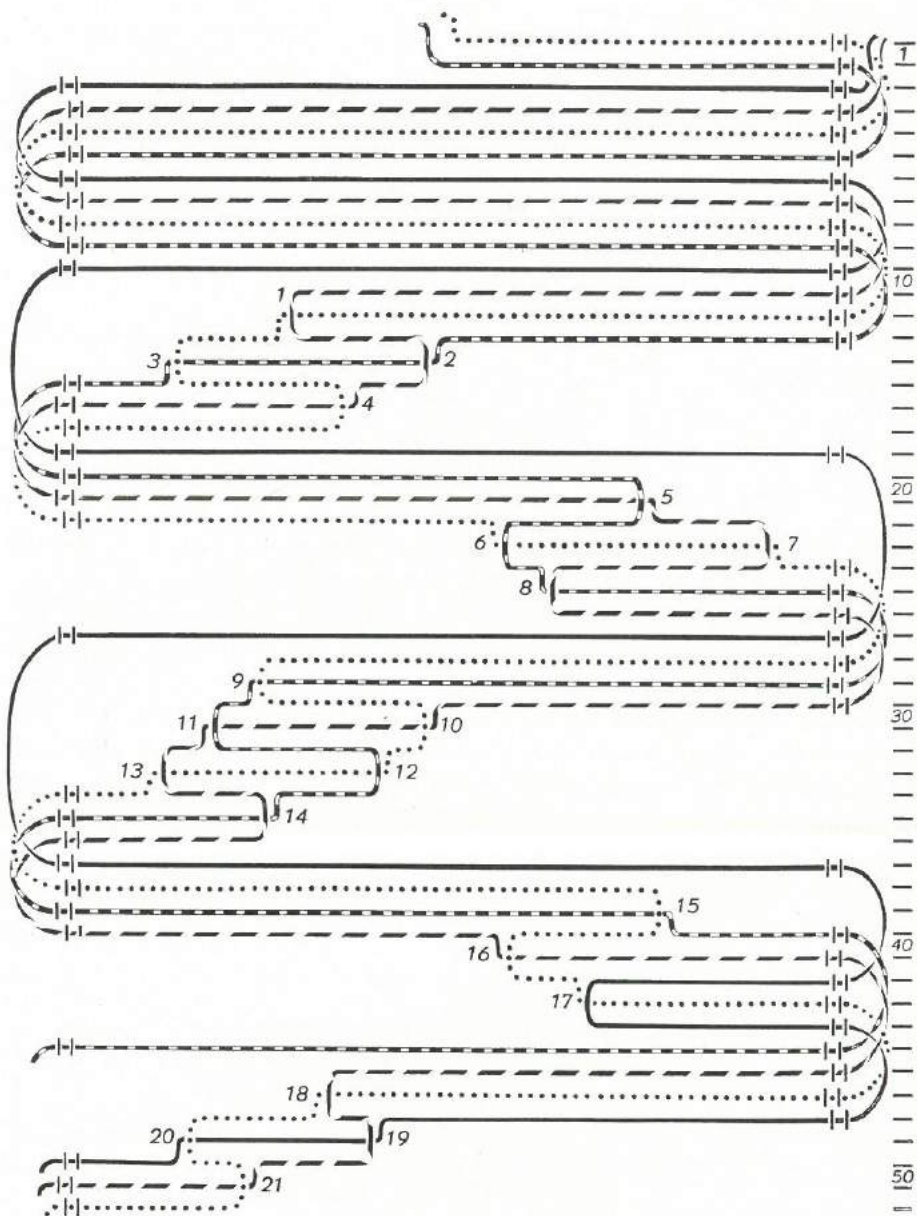


Fig. 16.

Figs. 15—16. Reconstruction attempts at leash knotting for a heddle in the Chiriguano manner, fig. 3.





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Fig. 17. Analysis of the weft course in the specially woven section of the Chiriguano fabric just under the working edge. Comp. fig. 22.

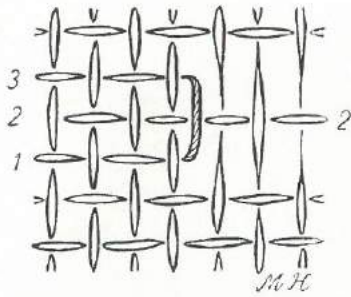


Fig. 18.

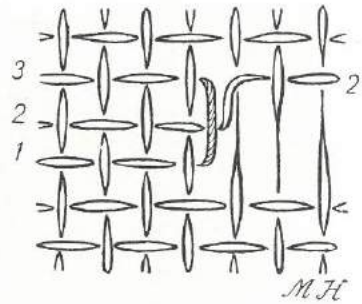


Fig. 19.

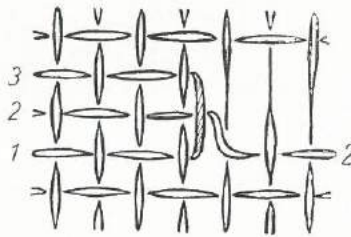


Fig. 20.

Figs. 18—20. Weft threads at the turning point. Comp. fig. 17.

The diagram (fig. 17) shows that the last eight weft threads in the upper area to be worked follow an unbroken course from edge to edge, while the passages recorded below are irregular.

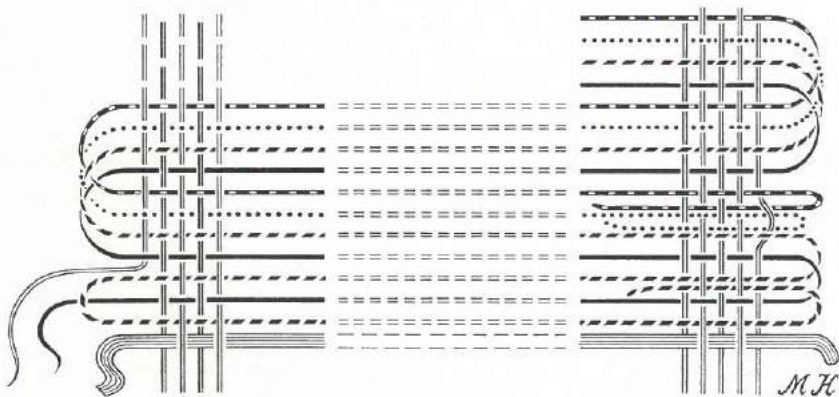


Fig. 21. Weft course in the first woven area of the Chiriguano fabric.

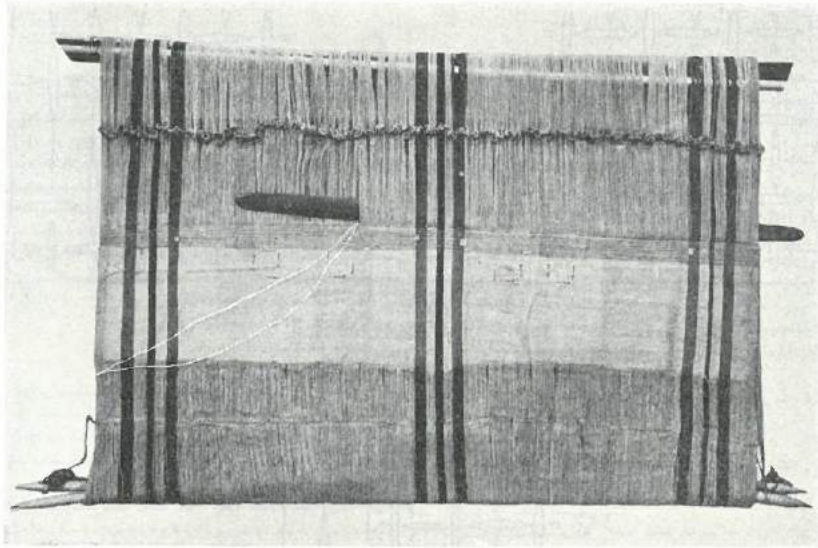


Fig. 22. Chiriguano fabric with the working threads for the investigation in the last woven part, comp. fig. 17. The pins mark some of the sections for thread counting. The joining cord of "the lock" is seen by the side-edge below.

The difference is brought about by some of the weft threads which form two turns in their passage. The principle of the turns of the single thread is explained in diagrams (figs. 18—20). A weft thread — called No. 1 — is passed along its shed to the place where the turn is to be made. It rests here until thread No. 2 follows it up in the next shed. After which the sheds are changed once more, and both threads continue their course — No. 2 forwards and No. 1 back. At thread 2's change of shed, two neighbouring warp threads simultaneously come into the undershed, which is not in agreement with the system for plain weaving. However the deficiency is compensated for by the turning thread — No. 1 —, in that the loop formed by the turn serves as a warp thread and fastens No. 2 with a stitch, which is hatched in the diagram for the sake of clarity. Theoretically, there should be too much room for thread 2 after this as the diagram shows, but in practice the finish is even.

A certain regularity seems to have been the aim, as shown in the diagram (fig. 17), as the thread depicted as a thick black line passes into the same shed from side-edge to side-edge of the fabric, and forms a kind of division. However a change has taken place down at point 17 and it is one of the stippled threads indicated which runs in a straight passage from there.



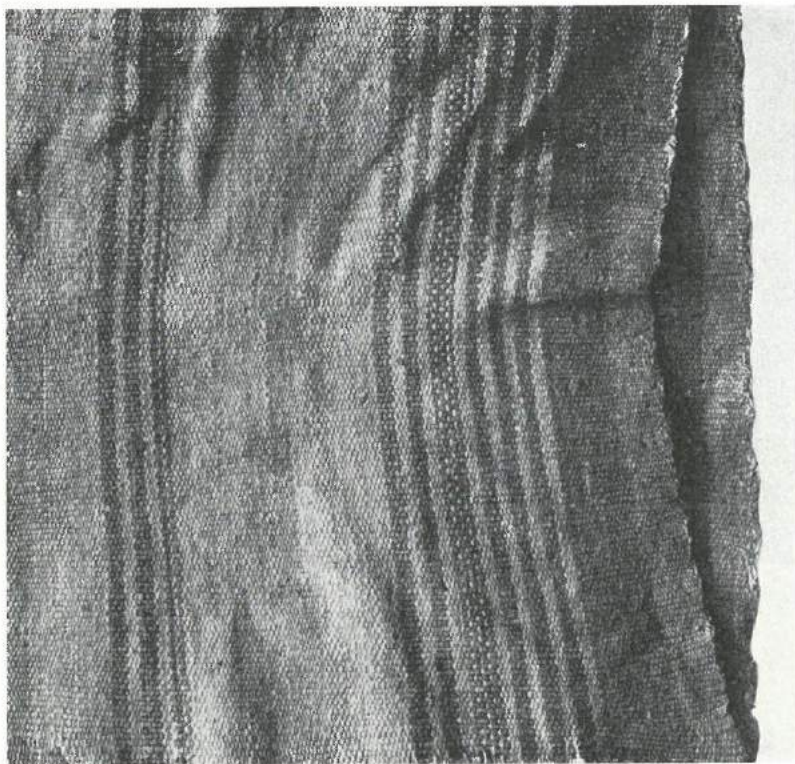


Fig. 23. Detail of scallops on the edge of a garment (Tipoy) from the Chané Indians. (The Ethnographical Museum of Sweden, Stockholm. Mus. No. 13.24.130).

The reason for these curious variations in the course of the weft must now be sought for, but it should also be remembered that there is only a very limited completed portion, c.  $\frac{1}{4}$  metre, on which to judge. However it can safely be said that when the weft passage is regular at the beginning and likewise at the last eight sheds, this must be deliberate and meant to be maintained (compare figs. 17 & 21). Indeed, this particular manoeuvre in the weft must presumably be due to an irregularity which had to be corrected. Either the tension of the warp or its density must have become uneven; perhaps both faults occurred, as this could cause unevenness in the weft. An understandable occurrence when an implement as primitive as the Chiriguano loom (fig. 2) is considered. If the effect became very pronounced and the working edge forced back across one or more sections, it could be counteracted by filling the "runnels" with an increase in the weft.<sup>1</sup>

<sup>1</sup> Comp. Margrethe Hald: *Ancient Textile Techniques in Egypt and Scandinavia*. Acta Archaeologica, Vol. XVII, Copenhagen 1946, p. 80. — *Olddanske Tekstiler*, 1950, p. 155, figs. 146—147.



Fig. 24. Scallops oat the edge of the armhole in a man's garment from the Chiriguano Indians. (The Ethnographical Museum of Sweden, Stockholm. Mus. No. 13.13.11).

Various technical details are listed on page 10—11. It can be seen that the number of warp threads in an area 5 cm.  $\times$  5 cm. varies from 90 to 114 and that of the wefts from 32 to 41. Anyhow, the tendency is that a small number in the weft corresponds to a large number in the warp.

The use of four spools is recognizable in the uneven and slightly scalloped effect at the side-edges. This is caused by the four different weft threads which cannot immediately be passed back because they have to run successively in the given order. They therefore collect at the edge in groups of four, eight in all — four forwards and four back. They bend in turn, the last thread passed inwards in the one group and the first outwards in the next group, each pulled in its own direction; with the result that a little apex is formed. The number of bends in each scallop does not necessarily give the number of different weft threads in the whole fabric. This is illustrated by an example at point 17 in the edge (fig. 17). Here the



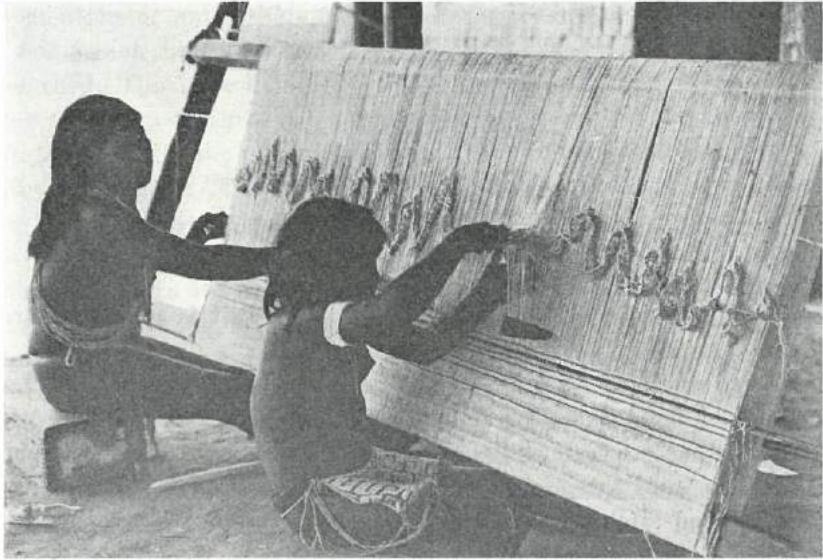


Fig. 25. Two Wapisiana women weaving a hammock. (Farabee pl. VII and Roth, 1924, pl. 128. Photograph from The University Museum, Philadelphia).

turning of the thick black line and its return passage to the edge causes the formation of *five* loops in the scallop. In other words, deviations in the weft passage can occur.

The Chiriguano fabric in question has this feature in common with other textiles in the Nordenskiöld collection. For instance there is a woman's garment, a tipoy, from the Chané tribe,<sup>1</sup> a detail of its edge is shown in fig. 23. Bends can be seen in the weft of the fabric similar to those in figs. 17—20, but there are also weft threads which pass back through the neighbouring sheds. The weaving in this garment is otherwise very irregular. A man's garment from the Chiriguano<sup>2</sup> (fig. 24) must also be mentioned. It is woven in very firm, tight plain weave with black cotton yarn. The edges are partially sewn into the side seams, but scallop effects can be seen at the arm openings made by the use of several different weft threads and affecting as previously mentioned, the last and first thread in the group. Turns in the weft similar to those in No. 13.13.1037 can also be seen (figs. 18—20).

What then are the advantages of using *four* spools? There is no colour

<sup>1</sup> In the possession of the Ethnographical Museum of Sweden, Stockholm. Mus. No. 13.24.130. E. Nordenskiöld's Coll. Comp. Ethn. Stud. II, 1920, p. 65, fig. 22 no 5. Tipoy, tubular weave put up in the spiral method.

<sup>2</sup> Mus. No. 13.13.11. The Ethnographical Museum of Sweden, Stockholm.

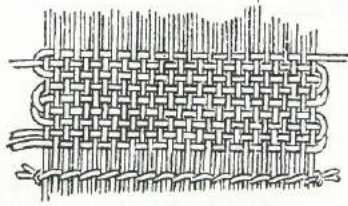


Fig. 26. Weaving with two wefts. Guiana. (E. Roth, 1924, fig. 207).

scheme in the fabric to be considered and the weft is practically totally hidden by the warp, almost a repp effect.

Reference is again made to W. B. Grubb's description<sup>1</sup> of the Lengua woman and her method of weaving: — "The shuttle is the ball of wool, which is passed between the warp threads as far as can be conveniently reached. The wool thread is then battened down into place with a short, smooth-pointed stick. This done in sections of about twelve inches at a time, until the whole face of the web has been traversed. On this crude loom a web 7 feet 6 inches  $\times$  6 feet 6 inches can be produced." Here then, the weaver (as seen in fig. 9) has to change her position whenever the thread is passed forwards, i. e. about every 30 cm, and with a width of roughly 200—230 cm. she would have to move a number of times. There

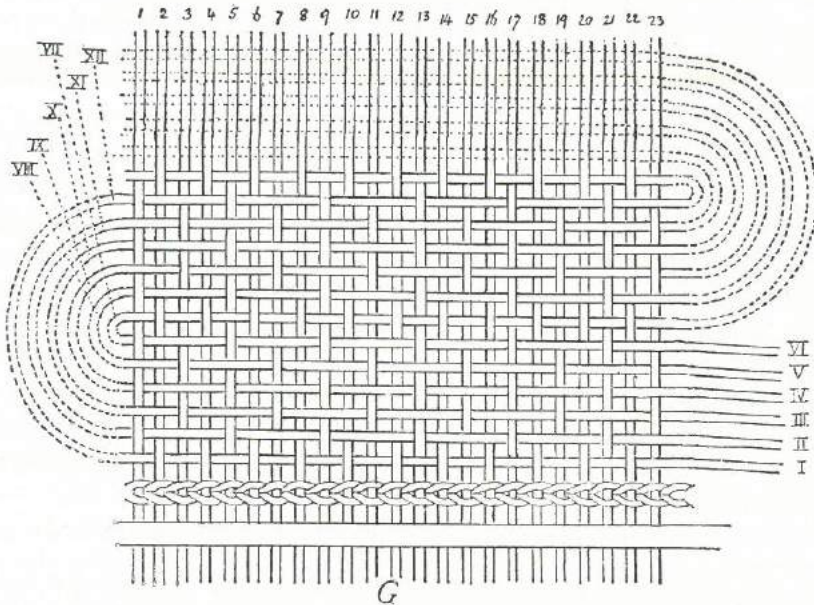


Fig. 27. Diagram for a hammock woven with 6 wefts. Guiana. (W. E. Roth, 1929, fig. 64).

<sup>1</sup> W. B. Grubb: *An Unknown People in an Unknown Land*, p. 67.



is no mention of more than one weft thread, and the illustration shows only one which hangs down slantingly from approximately the middle of the shed. The horizontal stick under the heddle seems partly to lie outside the warp and partly in the shed. This is assumed because the right side of the sword in the picture appears lighter and sharper than that to the left. Indeed, it must be assumed that she slowly worked her way across the whole face of the web with only the thread to be seen at her disposal. Again unfortunately no information was given which could explain the motive behind the use of four different spools, and the search must therefore be continued.

A photograph of a weaving scene with two Wapisiana women working together has been reproduced by several people engaged in research, including W. C. Farabee and W. E. Roth (fig. 25). Farabee writes: — "The women sit on the ground and put the woof threads through from side to side, two women often working at the same hammock".<sup>1</sup> Here the task of the shed rod appears to be done by a thick cord, and the heddle which stretches in a wavy line across the face of the warp resembles the heddle system in the Chiriguano fabric. The weaver behind sits on a block of wood. She is apparently just watching at the time of the photograph, but perhaps it is her job to push the sword into the shed as this is gradually opened. Her partner has a small object in her right hand, probably a thin stick or something similar, which she thrusts between the thread layers. It looks as though the set of threads controlled by the heddle is about to be brought forward. The heddle forms a broad concave curve across the area being worked. The weaver apparently moves the heddle up or down whenever necessary for the progress of her work. The changing of the sheds is done in rather small sections, and the threads brought forward are pushed little by little over the front of the sword, which can be seen near the working edge. A spool lying on the ground between the two women presumably indicates an interruption in the shed, but apart from this the picture gives no definite information concerning the weft, and without knowledge of the various manoeuvres entailed in passing the weft, it is difficult to judge the method. But Walter E. Roth<sup>2</sup> mentions the use also of several weft threads which pass successively across the whole face of the weave. He includes a diagram of a Makusi hammock in which two weft threads are alternately worked (fig. 26). He writes: — "For instance, at the present time, the Atorai manufacture hammocks of from one to six wefts (fig. 207) passing forward and backward across the warp. That with three wefts is fairly common, but neither this nor the others similar

<sup>1</sup> William Curtis Farabee: *The Central Arawaks*. Philadelphia, The University Museum, 1918, p. 30 and pl. VII. W. E. Roth 1924, pl. 128.

<sup>2</sup> W. E. Roth: *Arts and Crafts*, p. 393.

to it are made for trade and barter — there is too much work in them (JO). They are all woven with the long flat shuttle (see 471). I am also giving the pattern with two continuous weft strands, as made by old Makusi (fig. 207), whose men used to weave them. Jimmy, the head of Inongkong village, at the back of Toka, upper Rupununi, who had been taught by his father, worked it for me." The diagram is quite clear, and although it only shows two different weft threads in use, the weft is principally in agreement with that in the Chiriguano fabric. No mention is made of any possible advantages of this method or whether there is any definite purpose behind it. It can be gathered though from the text that 'Jimmy' gave the demonstration alone.

Walter Roth does not give up his research at this point. In a later work entitled "Additional Studies" 1929,<sup>1</sup> he gives a detailed description of a hammock weaving technique using six weft threads. One of the diagrams is reproduced here (fig. 27), and the description concludes as follows: — "Furthermore, whereas in the diagram the wefts when about to return on their crosswise journey are represented more or less concentrically, the arrangement is really such that each weft loop projects quite six inches or so from each side, all six loops being rolled into one another to form a sort of tassel. Such a hammock may be of great size and occupy the attention of two women at a time. This, combined with the skill displayed and the labor entailed, causes it to be rarely made, and, when made, to command a high price."

It is a strikingly complicated analysis after those hitherto quoted, but as the particular requirements of the binding could just as well have been met by one thread instead of six, this could not be the reason for the large number of wefts. The fact that the loops formed at the edge by the six threads serve as an elaborate fringing technique can have no significance when ordinary weaving is under discussion. Neither is a general motive for using several different weft threads apparent, and there is no information as to how the work was organized and the tasks divided between the two weavers. The value of the above example concerning this investigation is then really limited to the fact that weaving *has actually been carried out* with as large a number of weft threads as six, and that the custom is an old one which is now dying out.

We turn now to a picture of a Motilon woman weaving (fig. 28) published in a paper by A. Métraux and Paul Kirchoff.<sup>2</sup> Unfortunately the full

<sup>1</sup> Walter E. Roth: *Additional Studies of the Arts, Crafts and Customs of the Guiana Indians*, Smithsonian Institution, Bureau of American Ethnology, Bull. 91. Washington 1929, p. 63—67, fig. 64.

<sup>2</sup> A. Métraux and Paul Kirchoff: *The Northeastern Extension of Andean Culture*, *Handb. of South American Indians*. Vol. 4, 1948, pl. 66.



dimensions of the loom are not seen, but part of a solid lower beam is visible and this could indicate that the loom itself is of considerable proportions. The point of a flat object can be seen by the hands of the woman — a short sword which she presses down towards the working edge. The heddle is free, i. e. with no heddle rod, and it curves across the warp.

The picture does not yield indisputable evidence concerning the presence of a shed rod, and it seems very possible that this is missing altogether. A faint line across the warp a little above the heddle possibly indicates the presence of a cord which has taken the place of a shed rod, and which controls the shed. The line terminates out at the right-hand upright, at a spot where some of the thread ends hang down. Still higher up the warp another line can be seen, which runs out to the right side-edge of the fabric and ends tied to the upright. I assume that this is the cord which holds "the lock" of the tubular weave together, because here and there near the line, some hanging thread ends can be seen. This would naturally occur at colour changes at the ends of the stripes, as well as in close proximity to "the lock", which marks the starting border of the fabric. See fig. 7 B.

Several weft threads hang down from the working edge. The foremost thread falls obliquely out of sight, while three others are joined to the spools, two lying on the ground, the third supported by the weaver's left knee. Furthermore two faint lines which can be seen for a short distance behind her right arm could be weft threads joined to two spools behind her. One thing is certain: the procedure must be such that the woman works alone with *several* spools which she passes forwards in sections. When all of them are brought forward, each in its shed within the area she can most conveniently work, she must then herself move as far as is convenient. This method would leave no visible traces such as skippings in the passages of the weft threads etc., as each thread completes its course directly in its own shed as though it had been passed through at one throw.

Assuming that one Chiriguano woman alone works a minimum width of 130 cm. on her loom on this principle, she must divide it up into say two parts, working one at a time. Does she therefore work her four spools — each in its shed — out from the middle to a side-edge and back to the middle again? Thus completing eight half sheds before it becomes necessary to move over to the other half, where the process is repeated.

It would also be logical for her to work it in three or more stages. In which case she could only take four sheds at a time in the centre portions against eight in every outer one. Naturally these remarks only concern those areas where the weft passage follows the same shed from edge to edge.

What about the parts where the special weft manoeuvre is carried out? Here it would be undeniably impracticable with two weavers. The



special interrupted and turning of the weft passage would mean that the weft threads are engaged in the area being worked for a relatively long time — i. e. alternately first in one half and then in the other as shown in fig. 17. Because of this a second person would have a corresponding period "sitting out" while waiting for the working thread and this certainly does not seem to be a very effective procedure. If Indian women are remotely aware of time wastage we can then assume that in this case only one weaver has been occupied with the work.

However there is an additional picture from the Motilons which shows two women working at a loom (fig. 29) and a closer study of this is also needed. The loom is apparently of the same kind as the preceding one. No shed rod is to be seen here either, and the light line which runs top left round the upright probably gives the continuation of the collective string of the fabric's 'lock'. In the original picture — but alas not in this reproduction — there is a very faint indication of a fastening by the left upright a little below the first one, together with a hint of a line inwards, in the warp. Perhaps this is a string with the same function as a fast shed rod. The heddle here is also free and forms a wavy line across the warp. The sword is short, which must be practical when the work is done in small sections. The work seems to have progressed so far that the fabric is completed from the woman's hands downwards, round the back of the loom and from the top down to the collective string. Small curves at the edges resemble the scallops at the side-edges of the Chiriguano fabric which, as earlier discussed, occur when several weft threads are used. It is also clearly evident that the Motilon women have a considerable number of weft threads at their disposal, perhaps 7—8. Otherwise, just as in the photograph of the two Wapisiana women (fig. 25), it is difficult to judge what the woman sitting behind is engaged in. However we can at least imagine how the two Motilon women may have shared the work when producing a piece of weaving where each weft passes in its own shed from edge to edge; as we know from the 'normal' area in the Chiriguano textile.

An attempt has been made to illustrate this by a diagram (fig. 30), but for the sake of simplicity the number of wefts is four; the principle remains the same.

*A* represents the weaver in the background and *B* the one in the foreground. *A* begins and guides her thread forwards to the middle of the weaving. This course is marked 1. *B* has no thread and for the present must wait. — *B* then takes the same thread and passes it out to the right side-edge, while *A* works in a new thread in her area. Both these wefts are marked with the number 2 because they are worked at the same time. — The same operation is repeated with 3 and 3: 4 and 4, after which *A* is free because she has no weft thread. — *B* now fills the last passage of the



Fig. 28. Motilon woman (Macoa Indians, Venezuela), weaving with 6 spools. (Métraux and Kirchhoff. *Handb. of South Americ. Indians IV*, pl. 66. Photograph from The University Museum, Philadelphia).



group with 5 and embarks on a new section with weft 6 by reintroducing the bottommost thread in the work. A minus sign for 5 and 6 out at the left side of the section indicates that *A* is sitting out. After this the two participants again work together with 7 and 7: 8 and 8: 9 and 9, but at 10 and 11 *B* has no working thread and sits out. At 12 both are engaged again and so on. In other words: for both of the participants there is always an interval after every eighth weft, and the scallops at the side-edges begin and finish in the places where the weaver rests.

The term "normal weft passage" has been used before in this article in the same connection. The result appears perfectly normal, because one weft thread follows the same shed from edge to edge. However the correctness of this characteristic could be open to discussion, as a method which demands that two sheds be partially open at the same time must surely be described as rather irregular for fabric weaving; in any event by present day conceptions. However it is the technique of the Indians which is under discussion, and perhaps to them the method is not abnormal. However this may be, it seems that we can almost glimpse the motive for the free heddle: two or more weavers can work simultaneously in different sheds without disturbing each other. Quite the opposite would be the case with leashes knotted on a moveable rod, as this would open the shed across the entire width at once. The free heddle must also be practical for someone weaving alone across a considerable width, the more weft threads she uses, the more rarely she needs to change her position, and there is no need for her to open the shed across the full width of the warp when she puts in the weft threads in sections.

## COMPARISON

The Chiriguano fabric dealt with in this paper has relations both in distant lands and in distant times, and we must now travel great distances in time and place in order to collect material which will help in this study.

*DENMARK* There are to begin with some prehistoric textiles which have been recovered from Danish bogs; the first being a remarkable piece of clothing from Rønbjerg in Jutland. Unfortunately no dating elements were present with this find, and its state of preservation is not good, nevertheless certain important characteristics can be recognized. The material is dark sheep's wool, decidedly rough and hard. The analysis showed plain weave, almost repp in type, and woven with two different weft threads, their course is illustrated in fig. 31. Furthermore, in some places turns in

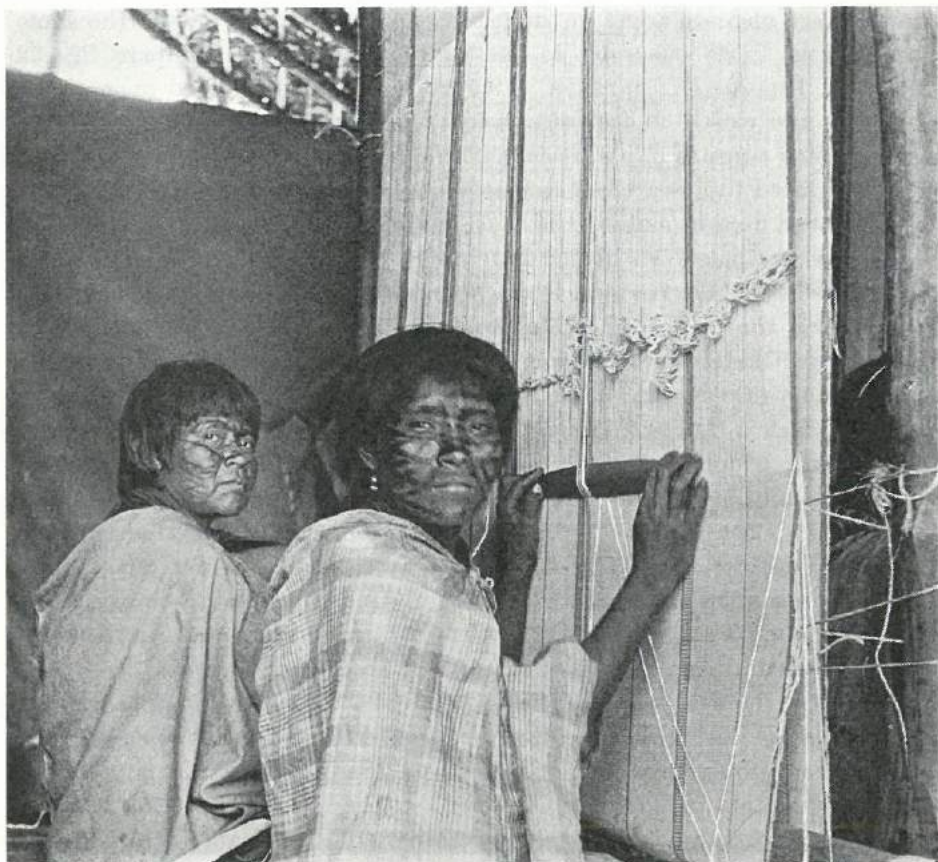


Fig. 29. Two Motilon Women (Macoa Indians), working together a tubular fabric. (Photograph from The University Museum, Philadelphia).

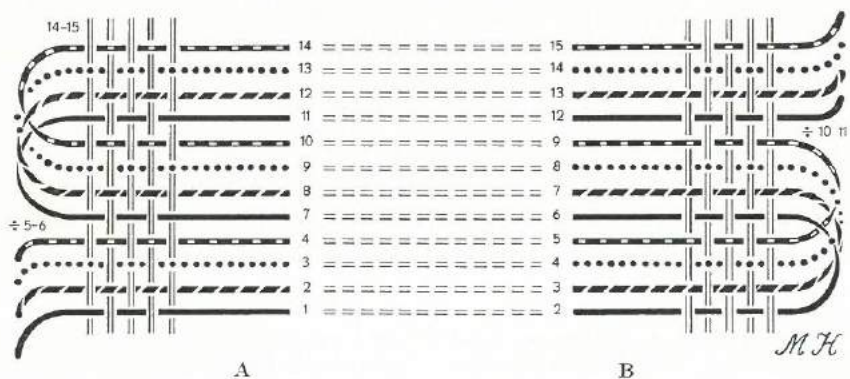


Fig. 30. Diagram for two women working together with four spools.



the weft are also apparent in the fabric, and are carried out on the same principle as those observed in the Chiriguano textile. Compare fig. 32 with figs. 18—20. The garment is woven as a poncho, folded over at the shoulders and closed at each side below the arm openings and down. The neck opening consists of a vertical slit, the borders of which have a natural edge, produced by the wefts turns at the middle of the fabric. This method has also been used in making the neck opening of the Chiriguano garment of which a part is shown by fig. 24.

Perhaps it should be interposed here that the Rønbjerg garment has earlier been the object of comparison with textiles from South America namely in "Olddanske Textiler", 1950, with English summary.<sup>1</sup> However at that time other peculiarities were examined and not those dealt with here. The fact is that rather special characteristics are present in the Rønbjerg fabric, which make it interesting both typologically as a garment, and technically as a piece of weaving i.e. extra warp threads have been introduced in the shoulder area, with the result that here the width of the weave is increased. The manoeuvre is clumsily carried out, but is nevertheless similar to a method applied in some appreciably more elegant garments found near Arica in Peru.<sup>2</sup> The Rønbjerg garment at the moment, stands isolated among Danish textiles from archaeological finds.

Moreover, there is a whole group of woven cloths from other Danish bog finds which are closely related to the Chiriguano fabric because they are made as tubular weaves put up in the "loop method".<sup>3</sup> It is true, the number which exists closed or with parts of the lock intact is low, but on the other hand these few pieces are extremely significant, because they solve the mystery of the warping process for the whole group. See figs. 33—34. As mentioned before, tubular weaves can be used either in a closed (primary) or open (secondary) state. In instances where they are flat and unfolded, rectangular in shape, they do not immediately reveal their method of manufacture. It is on the basis of a series of common features with the existing closed tubular weaves that a quantity of rectangular textiles can now be added to the group.

Unfortunately Danish archaeological finds have not yielded implements of equal calibre to the textiles, and it is doubtful whether they will ever do so. Therefore Erland Nordenskiöld's photograph of the Chiriguano textile is also of considerable interest to us, because it shows how the need of tools can in fact be greatly reduced. Although it should be remem-

<sup>1</sup> M. Hald: *Olddanske Textiler*, 1950, pp. 61, 153, 180 and 337, 414, 465, 481.

<sup>2</sup> Gösta Montell: *Dress and Ornaments in Ancient Peru*, Gothenburg, 1929, p. 169, fig. 82.  
— Carl Skottsberg: *Notes on the Old Indian Necropolis of Arica, Meddelanden från Geografiska Föreningen: Göteborg III 1924*, fig. 18.

<sup>3</sup> M. Hald: *Olddanske Textiler*, 1950, p. 188 ff.

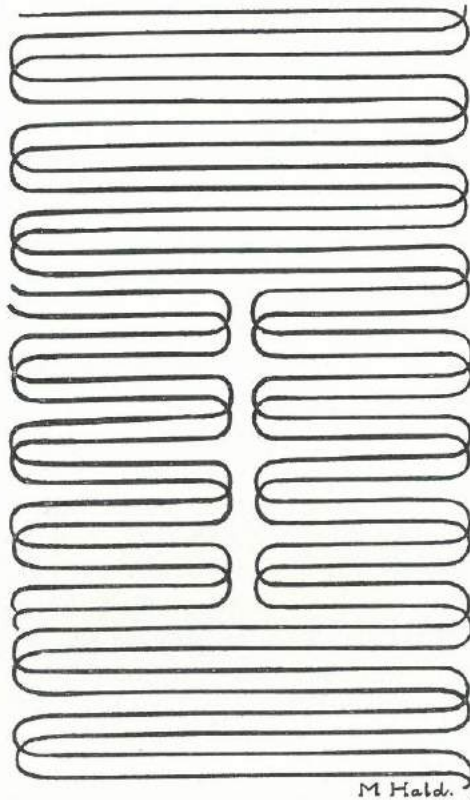


Fig. 31

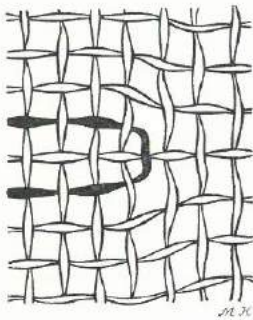


Fig. 32

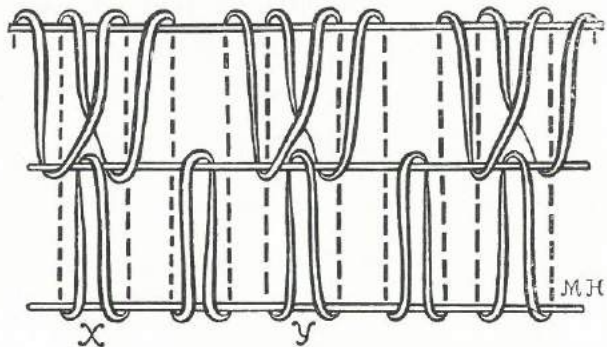


Fig. 33

Fig. 31. Weft course in a dress from a bog find at Rønbjerg, Denmark. (Olddanske Tekstiler, 1950, fig. 144. The National Museum Copenhagen).

Fig. 32. Turning point of a weft in a dress from Rønbjerg. (Olddanske Tekstiler 1950, p. 154).

Fig. 33. Diagram of warping arrangement in a fabric remnant from Huldremose, fig. 34.

bered that the Danish textiles are woven in 2/2 twill, while the Chiriguano fabric is in plain weave.

The tubular weaves from the Danish bog finds belong to a period which can be said to span approximately from the close of the Bronze Age, i. e. 500 B.C. and up into the Roman Period.<sup>1</sup>

*PERU* The Chiriguano fabric is also related to textiles in archæological finds from an area nearer its own home, namely in Peru. A tubular woven bag with Type A warping (figs. 35—36) was found in 1925 at Cerro del Oro by Dr. A. L. Kroeber.<sup>2</sup> Its technique was explained by the American textile researcher Lila M. O'Neale, who described it in a paper published in 1937, but it has also been mentioned in other publications.<sup>3</sup>

In my opinion the most epoch-making event in recent years within the field of ancient textile research are the results achieved by two American scientists, Junius Bird and Joy Mahler<sup>4</sup> during the examination of textiles excavated on the coast of Peru. The "loop method" occurs in these also, and with the help of Carbon 14 tests they feel able to date the group of finds back to a very primitive stadium of a Stone Age culture. In any event the Chiriguano textile has in one respect, *the warping arrangement*, a cultural element with an origin so deeply buried in the past that there is little chance of ever recovering evidence which could solve the mystery of its antiquity and source.

However, the results achieved by the American scientists are in my opinion also of significance in another respect: the evaluation of Peruvian textiles from later periods. The case being, as already discussed before (pages 12—13), that a tubular weave in type A, which is opened by withdrawing the collective cord, loses that characteristic which is the decisive and absolute criterion for the method. The fact that tubular weaving is

<sup>1</sup> M. Hald: *Olddanske Textiler* 1955, pp. 41—43 and pp. 58—59.

<sup>2</sup> Lila M. O'Neale and A. L. Kroeber: *Textile Periods in Ancient Peru*, *American Archaeology and Ethnology*, University of California Press, Vol. 28, no. 2, Berkeley 1930, pl. 11 c. — *Field Museum*, (169702). I would like to thank the Chicago Natural History Museum for the information in their letter of the 25/3/1958. I also thank Irmgard Johnson for communications in a letter of 7/3/1955.

<sup>3</sup> Lila M. O'Neale: Appendix VI to *Archæological Explorations in Peru*, Part IV, Cañete Valley, Chicago 1937, p. 271, point 11, together with pl. 88<sup>1</sup> and 1 A. — Lila M. O'Neale: *Textile Periods in Ancient Peru II. Paracas Caverns and the Grand Necropolis*, Univ. of California Press, Berkeley, 1942, p. 144 ff, 171 and 189. — Also mentioned by R. L. Olson: *The Possible Middle American Origin of Northwest Coast Weaving*, *American Anthropologist*, new ser. 31, 1929, p. 118, note 14.

<sup>4</sup> Junius Bird and Joy Mahler: *America's Oldest Cotton Fabrics*. A report on textiles made in Peru prior to the domestication of the South American Cameloids, *American Fabrics*, no. 20. Winter 1951—52. See also J. Bird and Louisa Bellinger: *Paracas Fabrics and Nazca Needlework*, *The Textile Museum*, Washington 1954, p. 2.



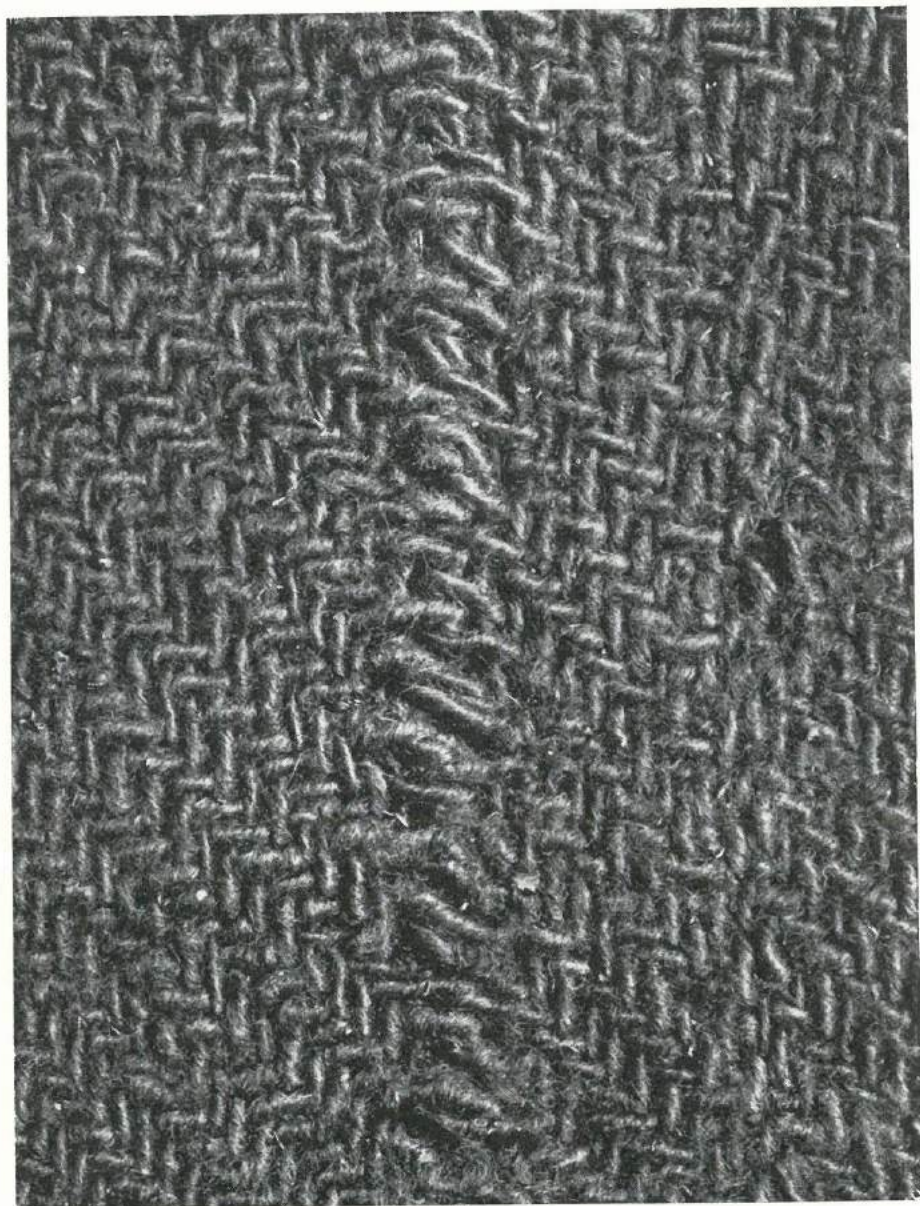


Fig. 34. "Lock" in a fabric from Huldremose, East Jutland. (The National Museum, Copenhagen). Sz. 2/1.



often, perhaps one can say for the most part, used in an open state must also be considered. In this way, complete rectangular fabrics or remnants of such from among the finds could have been produced on tubular looms, even though this may not be apparent. In other words, the tubular loom *could have* played a more important role in Peruvian weaving than is immediately manifest from the material.

This is worth bearing in mind, particularly in respect of one special point regarding Peruvian weaving: the exceptionally large size of some of the textiles excavated.

Several scholars engaged in research have been concerned by their striking proportions. In 1936 Lila O'Neale dealt with this and the problems involved in a study entitled "Wide-Loom Fabrics of the Early Nazca Period".<sup>1</sup> In this she refers to widths of 230 cm. and 250 cm. mentioned by E. Yacovleff and I. C. Muelle,<sup>2</sup> and in a later work "Textiles of the Paracas Caverns and Necropolis" she quotes from Carrión Cachot (Lima) . . . "dimensions for two wrappings from bundles 157 and 290 as 12.55 m. long by 2.75 m. wide and 20.70 m. long by 4.89 m. wide respectively. A recent Peabody Museum report mentions a textile 47 feet long and 12 feet wide".<sup>3</sup>

Junius Bird and Louisa Bellinger<sup>4</sup> also describe this feature in their book published in 1954. On Page 16 they mention from among diverse textiles of a mummy (Necropolis No. 49) a fabric measuring 87½ feet in length and 11 feet 3 inches in breadth (c. 26.5 m. × 3.5 m.), and on page 94 they write: — "Since the whole shed did open at once in Peru, there are a few instances where many weavers must have worked side by side, for fabrics have been found with a loom width of 5.37 m."

The possibility of several weavers collaborating in weaving textiles of this size and the possible implements used in the operation has already been discussed by Lila M. O'Neale<sup>5</sup> in 1936. Several types of loom known from ancient cultures or aboriginal peoples have also been suggested in an endeavour to solve the mystery.

However all these suggestions do not fall within the framework of this article. On the other hand as the subject here is a South American tubular

<sup>1</sup> Lila M. O'Neale: *Wide-Loom Fabrics of the Early Nazca Period*, University of California Press, Berkeley 1936, pp. 215—228.

<sup>2</sup> *Ibid.*, p. 216. E. Yacovleff and I. C. Muelle, *Un fardo funerario de Paracas*, *Revista del Museo Nacional*, 3: 63—153, 1934.

<sup>3</sup> L. M. O'Neale: *Textile Periods in Ancient Peru: II, Paracas Caverns and the Grand Necropolis*, 1942, p. 152. — Carrión Cachot: *Seventy-third Report on the Peabody Museum of Archaeology and Ethnology*, Harvard University, 1938—39, Cambridge, 1940.

<sup>4</sup> Junius Bird and Louisa Bellinger: *Paracas Fabrics and Nazca Needlework*, 3rd century B. C. — 3rd century A. D. (Washington 1954), pp. 16 and 94.

<sup>5</sup> Lila M. O'Neale: *Wide-Loom Fabrics* pp. 218—219; and: *Textiles of the Paracas Caverns*, pp. 151—152 and 187.

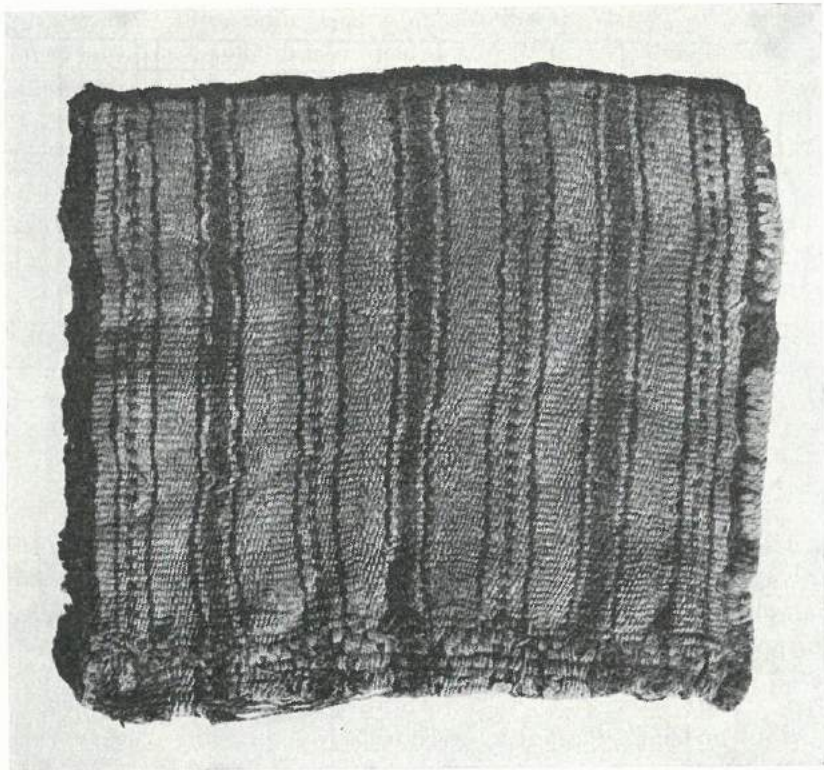


Fig. 35. Bag from Cerro del Oro, Peru. (Chicago Natural History Museum, No. 169702. Photograph from the same museum).

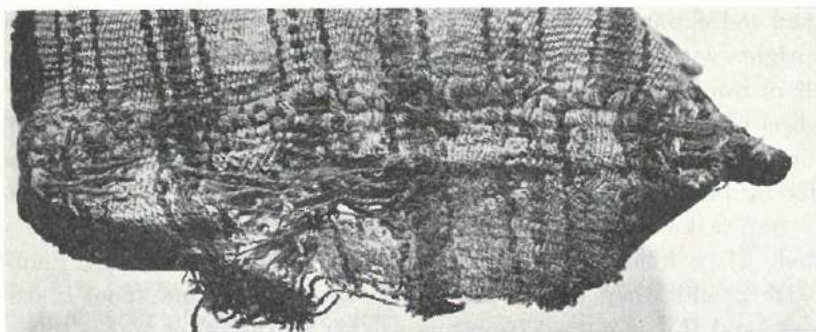


Fig. 36. Detail of "the lock" in the bag from Cerro del Oro, fig. 35. (Photograph from The Chicago Natural History Museum).



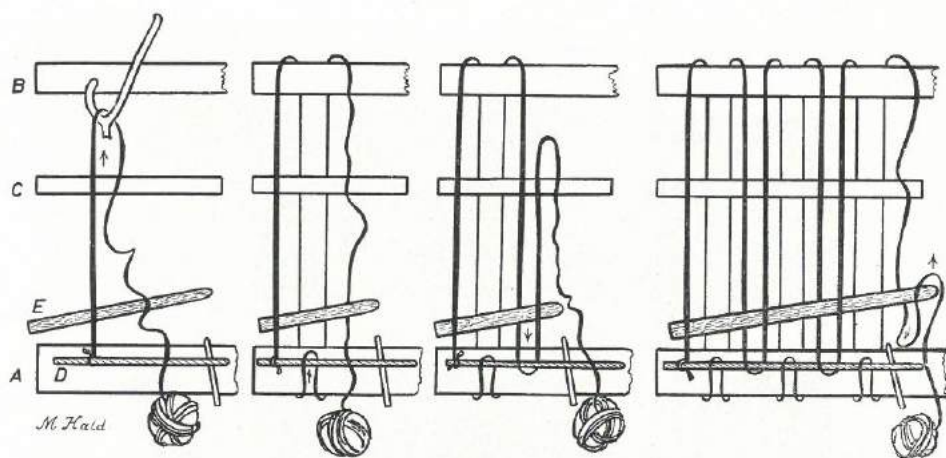


Fig. 37 a. Warping technique for loom, fig. 37 b.

loom, it is perhaps justifiable to investigate whether this could contribute towards clarifying the problems posed by these exceptionally large fabrics.

Examples will be collected from the Old World first, as it is here that the author had the opportunity of studying some tubular looms of considerable size and scope.

*SYRIA* The looms in question were still in use in many places during the summer of 1960 for instance in two small towns *Deir Aatiyé* and *Jabroud*. It was in the former that a rug put up in Type A could be seen. This loom had two beams and was 2.75 m. in height, therefore the completed rug (the width of which is 2.16 m.) would be 5.50 m. in length. The uprights measured c. 25 cm.  $\times$  9 cm. in cross section, the lower beam 22 cm.  $\times$  7 cm.; while the facing surface of the upper beam had a breadth of 16 cm. The heddle rod and the shed rod were both round with diameters of 5.5 cm. and 3.5 cm. respectively. The heddle rod was attached, which means that the shed rod should be moved. There was a thick bar halfway up between the uprights within the warp ring. Between this bar and the lower beam was a built-in iron stick with a screw arrangement for adjusting the warp. This fixture is obviously a modern addition of recent date, but it has definite advantages because the warp must have a considerable tension. A carpet of the size in question must become very heavy as work on it progresses.

The nap is knotted with Ghiordes knots, and usually four people work together. They follow the same shed, both when they tie the knots for the pattern and when they work in the wefts. Only one spool is used in the weft, and this is passed from one weaver to the other across the whole width. Each weaver has a heavy hammer and with this she hits the weft in her own section hard.

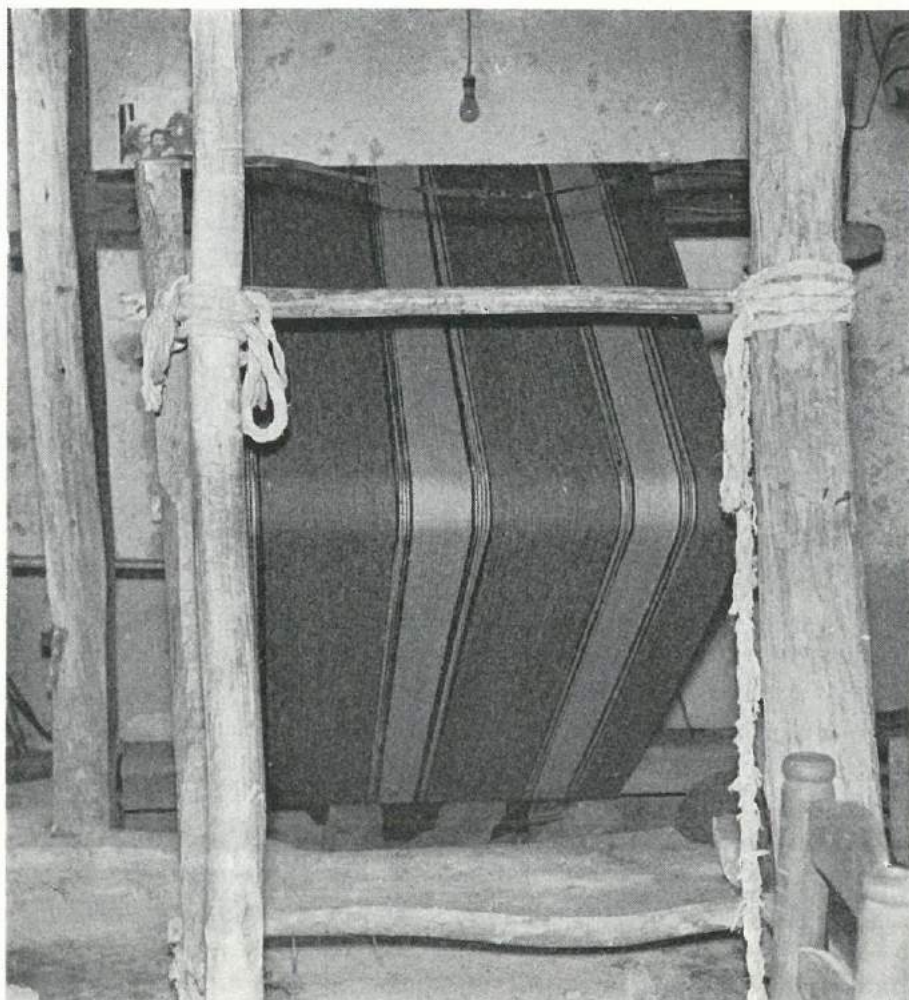


Fig. 37 b. Tubular loom with three beams seen from the back. Workshop in Jabroud, Syria, 1960. (M. Hald fot.).

As to the bearing capacity of this loom I am inclined to mean that an even heavier product than that mentioned above could be borne, however an increase should preferably be made in the width, as an addition to the height would cause some practical difficulties.

The little town *Jabroud* is known first and foremost as the place where "The Black Tent" is made, the shelter of the Bedouin, the covering of which consists of goat's hair cloth.<sup>1</sup>

<sup>1</sup> Margrethe Hald: I Libanons skygge. Fra Nationalmuseets Arbejdsmark, Copenhagen 1961.



The loom is exceptional in type, in that it has three beams and four — or better said — six uprights. The two foremost bearing uprights are slightly sloping and supported at the ceiling. They are firmly dug into a hole 37 cm. in depth. The two beams are movable but cannot revolve, and rest in slots in the uprights, secured with wedges. The lower beam is 11 cm. × 13 cm. thick, and the upper beam measures approximately the same. Their length between the uprights is 1.50 m., and this therefore is the limit of the weaving width. The usual width however does not exceed 70—80 cm.

The heddle rod consists of an iron rod tied to two supports which are fixed to the uprights, and this then is not movable. The shed rod is rounded and of wood and measures c. 5—6 cm. in diameter. A fine, smooth sword in walnut measures 118 cm. in length and 4½ cm. in breadth, while a simple little wooden stick, c. 10—12 cm. long with a rounded point, is always kept in the weaver's right hand during the work, and is passed backwards and forwards across the warp with lightning speed whenever the shed is changed. A heavy metal comb weighing 5 kg. and c. 55 cm. long is used for battening the weft.

These component parts as a whole actually correspond to the recently mentioned vertical loom. However the production of fabrics of great length must have led to an extension consisting of a third beam tied to a movable trestle which can be put behind the loom at any desired distance. The trestle consists of four posts, the two foremost ones which are c. 1.50 m. in height stand vertically. Between these lies the third beam which can revolve. The two outermost posts slope slightly forwards and reach from floor to ceiling. The two pairs of trestle posts are held together by stout rope and iron rings, while the front part of the loom and the two front posts of the trestle are joined only by the warping arrangement, which encircles the three beams.

During warping the weaver sits on the floor with his legs placed in a shallow pit, threading the warp loops over an iron rod; a boy guides the thread to the beam on the trestle with the help of a wooden hook, passes it around the beam and guides it back again to the weaver.<sup>1</sup> The yarn is very rough and strong two ply, usually of goat hair.

The workshop in Jabroud measured c. 10 m. in length, and therefore up to about 20 m. of tent cloth could be produced at one setting; which was said to be a little more than the usual measurement, but in special cases such as a tent for an Emir, a length of 25 m. for instance could be ordered.

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<sup>1</sup> A good description and diagrams are given by Grace Crowfoot: *The Vertical Loom in Palestine and Syria*, *Palestine Exploration Quarterly*, October 1941, p. 141 ff., chart pl. XIV.



Fig. 38. Tubular loom with three beams put up with a short cotton warp for one sack. From an open workshop. The weaver sits on the floor with his legs placed in a pit. The photograph is taken from the street in Hama, 1961. (M. Hald fot.).

There was no mention of whether the work for this was done out in the open, but tent weaving on similar looms can take place out-of-doors, as seen in some photographs from Shahim in Lebanon in 1961. Here the foremost posts of the loom must have been dug fairly deeply into the ground so that they could stand unsupported. In this case the third beam is not kept in position on a trestle but is close to the ground, kept in position by the tension of the warp pulling against some large stones. The lowest warp layer is very near the ground, figs. 39—41.

Obviously implements of this size and weight are not for nomadic folk, and the Bedouins in Syria do not themselves weave their tent cloth — they



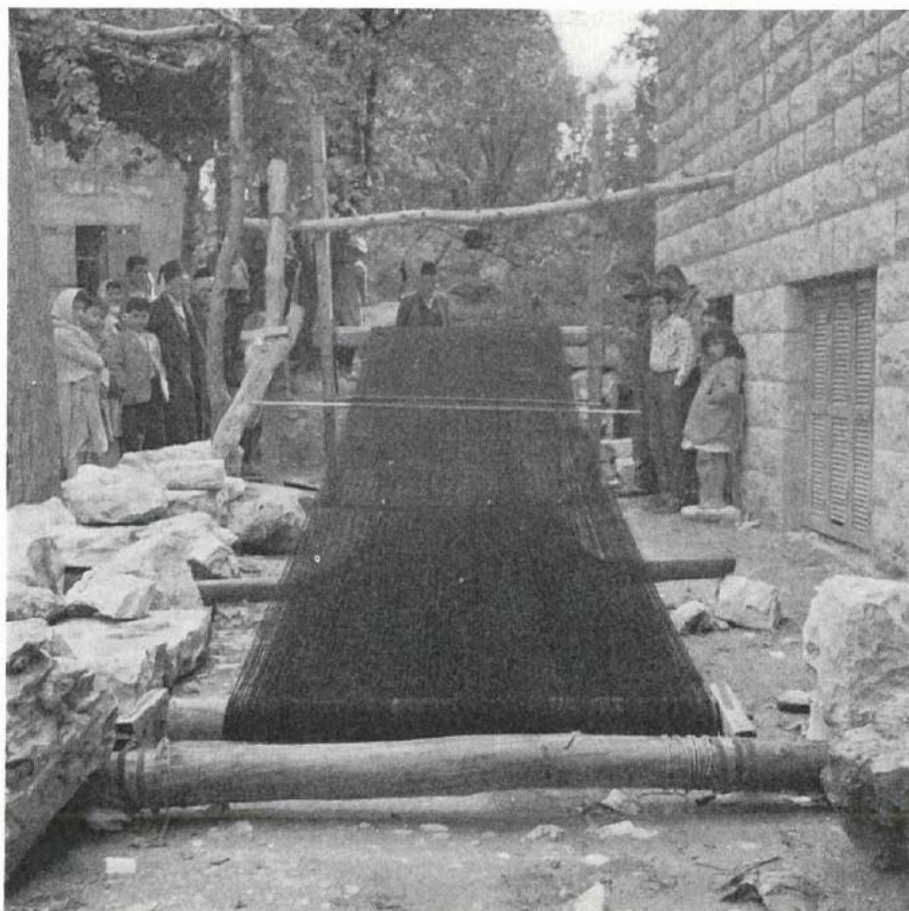


Fig. 39. Tubular loom with three beams seen from the back. The loom is put up for weaving oliveoil filters in goat's hair yarn. Shahime, Lebanon 1961. (M. Hald fot.).

buy it. The weaving of this cloth is done in special workshops and it is a specialized craft carried out by men. This fact can be quickly understood after oneself has made an attempt at their art — strong arms are needed even to turn the sword edgeways in order to open a shed, and presumably considerable strength is required when readjustments to the warp are made and a new section is moved forward for weaving.

The uppermost beam is first loosened and lowered a little. Behind this an upright post is placed, 6 cm. in diameter and 177 cm. in height, its top is slightly cleft and a bar c. 170 cm. long and 8.9 cm. thick is placed in the cleft at right angles to it. This tips up and down, functioning as a lever which can push the beam up into position again. Therefore it is not





Fig. 40. Tubular loom with three beams built up out of door. Shahime, Lebanon 1961.  
(M. Hald fot.).

only the weight of the beam itself but also the drag of the warp which affects the lever. In all its characteristics this arrangement clearly has a far earlier origin than the screw fixture of the other Syrian carpet loom mentioned earlier.

What does one dare conclude from this in connection with products of large size? In the first place, I would suppose that the tent loom could be arranged for producing lengths of up to about 27 m. for instance, and this is the greatest length recorded among the Peruvian cloths. Secondly, the loom must also be built so that the demands of considerable widths are met. Even the actual operation of putting up a broad warp does not seem overwhelming since the yarn is wound directly around the three

beams by two people, which means that thread is added to thread for as long as desired. But what is the bearing capacity of the loom? The dimensions I have seen make it appear very solid indeed, and even though the goat's hair cloth is only produced in relatively narrow strips, the weight is nevertheless considerable because of the thick and coarse nature of the yarn. If this were replaced by a finer and lighter quality yarn, the breadth of the warp could be increased somewhat without the weight altering drastically. Finally, if necessary, it would also be possible to strengthen the loom itself and to put the posts still deeper into the ground.

*SOUTH AMERICA* However the large Peruvian textiles also pose considerable problems with regard to the weaving procedure itself, and the various phases during the course of work. Lila O'Neale was aware of this too, and already in 1936 she summed up the difficulties for us as follows: — "There is shedding, picking, and battening; in other words, separating the warps, passing the weft yarn through them, and finally, beating it down to the growing web of material . . ." And later on she adds: "It is incomprehensible to a modern craftsman how a heddle stick long enough for a 5 ft. 5 in. web, sufficiently heavy so as not to bend under the strain, and with the attached warps offering resistance could be pulled up by one hand".<sup>1</sup>

The measurement of 5ft. 5in. (c. 165 cm.) are now exceeded by more recent examples as we have seen, weaving breadths of up to 5.37 m. have been recorded, and the difficulties of producing these presumably increase correspondingly.

In fact the size of the textiles compels one to assume that an essential aid such as a heddle must have been used. Fortunately there is proof that the heddle was known in ancient Peru in the Paracas Caverns Period; Lila O'Neale mentions an example in her paper published in 1942,<sup>2</sup> an unfinished band weave in the National Museum, Lima, (specimen 8465 a.) and she writes: — "Each loop makes a simple turn around the particular warp it controls in the shedding." No heddle rod is mentioned, but as the warp is rather narrow in this case and the rod has probably been lost, no definite assumptions should be made; it seems far better to rely upon the tenacity of tradition and pay attention to our Chiriguano fabric with its free heddle still in position across the warp threads. When the use of a heddle system on a rod is assumed to involve almost insuperable difficulties in producing wide-loom cloths because of its weight and length, it therefore seems

<sup>1</sup> Lila O'Neale: *Wide-loom Fabrics of the Early Nazca Period*, 1936, p. 218.

<sup>2</sup> Lila O'Neale: *Textile Periods in Ancient Peru II, Paracas Caverns and the Grand Necropolis*, 1942, p. 151 and p. 187.



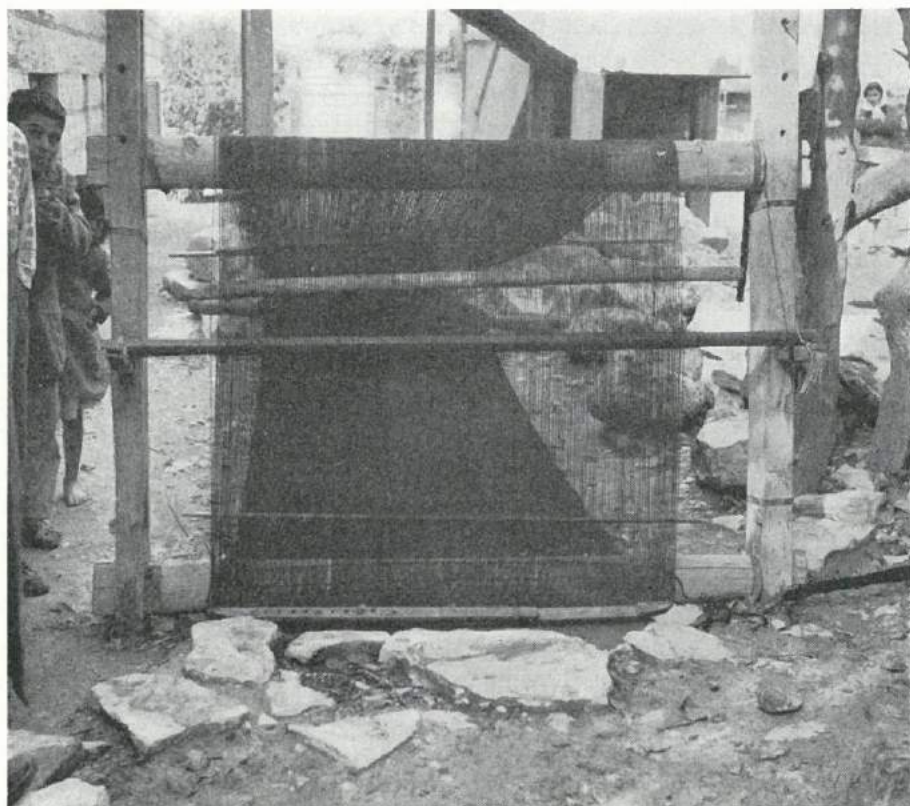


Fig. 41. Tubular loom with three beams seen from the front. The weaver sits on the ground with his legs placed in a shallow pit in front of the lower beam. Shahime, Lebanon 1961. (M. Hald fot.).

feasible to search for a solution in the use of a free heddle, which has none of these disadvantages. And does it not seem extremely probable that the Chiriguano fabric and its accessories are relics of antiquity which have survived unobserved for countless centuries among the Indians?

However, what of the shed rod? More or less the same difficulties are involved as those mentioned above for the heddle rod. It would be an extremely difficult task to move the long rod up and down through the warp each time the shed is changed. What does the Chiriguano loom reveal concerning this? In fig. 2 the shed rod can be seen secured to the uprights, and therefore its only purpose seems to have been to control the shed and not to move up and down in the warp. Is it not also extremely possible that there *is* a cord running through the warp in the Wai-Wai loom (fig. 25) and the Motilon looms (figs. 28, 29 and 42) where one expects to see a shed rod? With this arrangement the drawbacks of a long shed rod, which is also perhaps heavy to manipulate, are obviated.



However if these comments are correct a new question is thereby raised: how can the change of shed have taken place? Luckily we have one more photograph from the Motilon Indians which yields some information. In fig. 42 a woman is shown in front of a mounted loom but upon which weaving has not yet apparently started. In fact it looks as though it is the method of opening a shed which she is demonstrating.

Her left hand is raised, and in it she holds a small tool, which is unfortunately not easily discernable, it is probably some sort of little stick or bodkin which she puts between the two layers of threads. Above the threads which *are already in position* and which now can be seen on the front of the sword, the heddle forms a pronounced *upward* curve. The weaver is presumably engaged in bringing down the shed with her left hand, and at the same time with a contrasting movement of her right hand she pushes the heddle upwards. Considerable friction must be overcome at the change of the thread layers, and only when the shed is clear can she put in the sword.

Now compare this to the picture of the Guiana loom (fig. 25), and here too, the regular course of the heddle across the warp is interrupted above the area being worked, forming a large curve but this time in a *downward* direction. It also looks as though it is the layer of threads controlled by the leashes which is about to come forwards; i. e. the opposite shed to that worked by the women in figs. 29 and 42. The impression is that the heddle is partially pushed up or down on the warp as the sheds are shifted while the warp cord/rod is secured and passive during the procedure.

This presumably also explains why the heddle is of such apparently exaggerated length. It has to be both considerable in length and elastic in order to allow the necessary freedom of movement without disturbing the adjoining areas. Corresponding manoeuvrability is not obtained when the heddle is on a rod. As far as I can see, the linked free heddle is just the tool, for which Lila M. O'Neal is searching when she says: "There may have been some such division of the Early Nazca heddle into short lengths so that each of the several weavers could manipulate her own length."<sup>1</sup>

The incorporation of the weft in strikingly broad Peruvian fabrics still remains to be mentioned. It is self-evident that in order to arrive at any definite conclusion about this, an analysis of the weft threads' positions must be present in each case. Unfortunately I have not been able to find any analysis concerning the really large cloths mentioned above. However Lila O'Neale<sup>2</sup> in her article published in 1936, p. 216 ff. quotes part of an ex-

<sup>1</sup> Lila O'Neale: *Wide-Loom Fabrics of the Early Nazca Period*, Univ. of California Press, 1936, p. 219.

<sup>2</sup> *Idem*, p. 216. — E. Yacovleff and J. C. Muelle, *Un fardo funerario de Paracas*, *Revista del Museo Nacional*, 3: 63—153, 1934.



Fig. 42. Macoa Woman weaving a newly begun tubular fabric. She is pulling down the shed from the shed string. Photograph from the University Museum, Philadelphia.



amination which E. Yacovleff and J. C. Muelle made of a sizeable cloth in plain weave from the Paracas Mummy 217. Lila O'Neale quotes as follows: — "It was possible to follow the yarns of the weft the whole distance of the width of the weaving (230 cm.), and to establish that they bent (doblaban) at the edges to return in the ordinary manner. It was evident, then, that in the present case no extra yarns had been introduced. In order to clinch this observation, we have also examined a similar cloth (specimen 17 mummy 382: 690 cm. long by 250 cm. wide (8 ft. 3 in); 30 warps, 12—17 wefts per inch), but well-preserved, arriving at the same conclusion." By the words "ordinary manner" it can be presumably understood that only one thread was used, which followed the same shed from edge to edge, whereupon it was turned and passed back in the next shed. Theoretically, the possibility of a weaver lifting up the shed successively alone, and at the same time guiding her thread successively across the whole weaving breadth cannot be disregarded. Nevertheless it seems improbable because of the overwhelming difficulties involved when the cloths in question are of such large size. On the other hand, if several weavers<sup>1</sup> share the width of warp between them, each taking up their section of the shed at the same time, the spool can then be passed from one to the other along the row, in the same manner as that of the Syrian carpet loom. This operation must have taken time also, as pauses must ensue if the same spool is to pass through the whole shed, but the waste of time in this case must have been comparatively slight, as the work involved when opening a shed and getting it ready with the help of the free heddle as shown in figs. 25, 29 and 42 must be by far the most time consuming part of the procedure.

But what about the special characteristics of the Chiriguano fabric: — several different weft threads, scallops at the side-edges, interruptions in the weft course with skipping of the thread and return course in the next shed? Could these be the relics of ancient tradition, and are they to be found in the large cloths mentioned here? The interpretation of the problem must be based on analysis which, as far as I know, are not available, and it is to be hoped that one day the results of research concerning the large cloths will be published.

The chance of a really large loom or the conclusive parts of one being recovered from an archæological site can scarcely be hoped for, because

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<sup>1</sup> Junius Bird and Louisa Bellinger express their opinions thus: — "Since the whole shed did open at once in Peru, there are a few instances where many weavers must have worked side by side, for fabrics have been found with a loom width of 5.370 m. However, such fabrics are quite exceptional and the method was not generally used for weaving clothing, though two weavers abreast may have woven the field for mantle 91. 192, pl. I, as it is 0.835 m. wide." *Paracas Fabrics and Nazca Needlework*, 1954, p. 94.



if the chief components have only comprised a simple framed rack similar to the Chiriguano loom or if they have only consisted of some roughly shaped planks and posts corresponding to the tent cloth looms in the Near East, their fuel value would be the only remaining asset after their culmination as looms. Perhaps we can await with anticipation, the fruits of continuous collecting activities among aboriginal peoples or in areas where cultural conditions stagnate; places where ancient techniques are

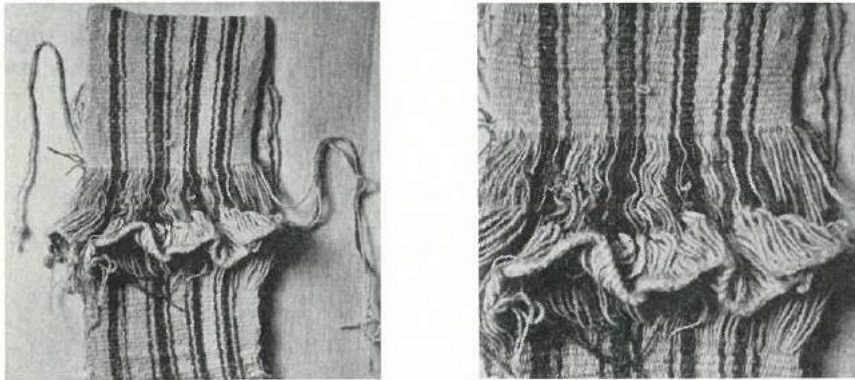


Fig. 43-44. Tubular weave, Type A. "Tipoy" from Mataco. About 70 cm. in circumference, 15-17 cm. in width. The collective cord protrudes from the side edges where the cloth has been begun. Free heddle (see fig. 45). (E. Nordenskiölds Collection, The Ethnographical Museum of Sweden, Stockholm, No 13.21.1232). M. Hald fot.

still in use, as seen in Syria for example. Unfortunately, and as mentioned before, the weakest link in the research of weaving as a craft seems to be the actual procedure: the phases of the work, the dexterity involved etc., and we know next to nothing about the inventiveness of the weaver herself.

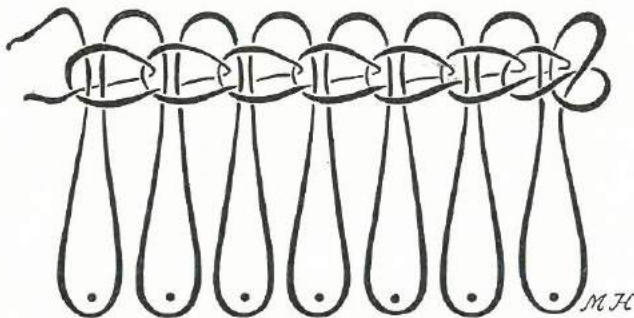


Fig. 45. Analysis of the free heddle in the "Tipoy" from Mataco, Fig. 43-44. The "ridge" of the heddle measures 57 cm. more than 3 times the width of the warp.

Even though 50 years have elapsed since Erland Nordenskiöld spoke of the rapid disappearance of weaving among the Chiriguanos, and the aspect today is even more bleak, it must be hoped that there are still places in South America where information about primitive weaving methods can be collected. That the Chiriguano fabric has contributed towards a better understanding of some Danish textiles has been shown above, and it could be expected to throw even more light on the ancient weaving techniques in South America itself. However whether future research either weakens or strengthens the suggestions put forward here, it seems to me that Erland Nordenskiöld's acquisitions are of tremendous value, and it is fitting in conclusion to remember gratefully the scope and insight of this great Swedish ethnographer.

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