STUDIES IN PRIMITIVE LOOMS.

By H. Ling Roth.

Part IV (Conclusion).

7.—The Solomon Island Loom.

Before discussing the Solomon Island loom, it may be as well to clear the atmosphere by calling attention to an article on an alleged South Sea Loom, by A. Jannasch,[1] who gives an extraordinarily imaginative account of its development. Not understanding this, I wrote to F. von Luschan for enlightenment. He was kind enough to answer under date of 28th November, 1912, stating that, on writing to Jannasch, he only got an evasive reply, that Jannasch was probably mystified by some account of an Homeric or Greek loom, and that Jannasch is not to be taken seriously, and wound up by saying: "Anyhow, I think you need not trouble about his statement; I am sure it is apocryphal, and I rather wonder that it has so long escaped the notice of ethnographers."

The Solomon Island Loom was first described by Curt Danneil in a paper entitled "The Transition from Plaiting to Weaving."[2] He had found it on the island of Nissan (Sir Charles Hardy group). A similar loom, but from Buka island, exists in the Leiden Museum and there are four specimens, also from Buka, in the Dresden Museum. It is not clear whether the illustrations Danneil gives, reproduced in Figs. 173A and B, are those of the original article, but taking it for granted that he could not have produced such a delicate apparatus, we may accept the drawing as a representation of the native article. The loom is made up of a split piece of wood about 43 inches (or 110 cm.) long, the two halves tied together at the ends to prevent further splitting and kept asunder in the middle by two stays about 3¼ to 4 inches (or 8 to 10 cm.) long. A continuous yarn of bast is wound round that part of the frame which lies between the two stays, and this forms the warp; the pick is made in the usual way, apparently by means of the fingers and a needle. To raise the warp

[1] *Verh. Berl. Ges. f. Anthr.*, 1888, xx, pp. 90–91.

[2] "Der Uebergang vom Flechten zum Weben," *Archives Intern. d'Ethn.*, 1901, xiv, pp. 227–238.

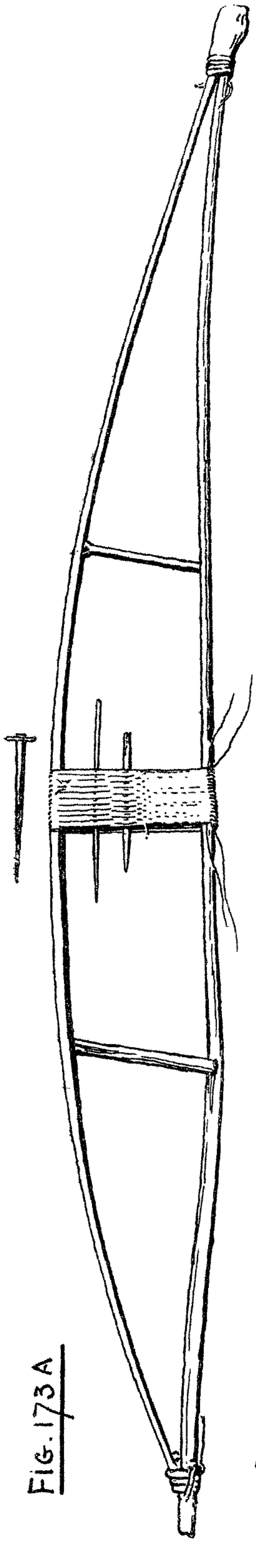
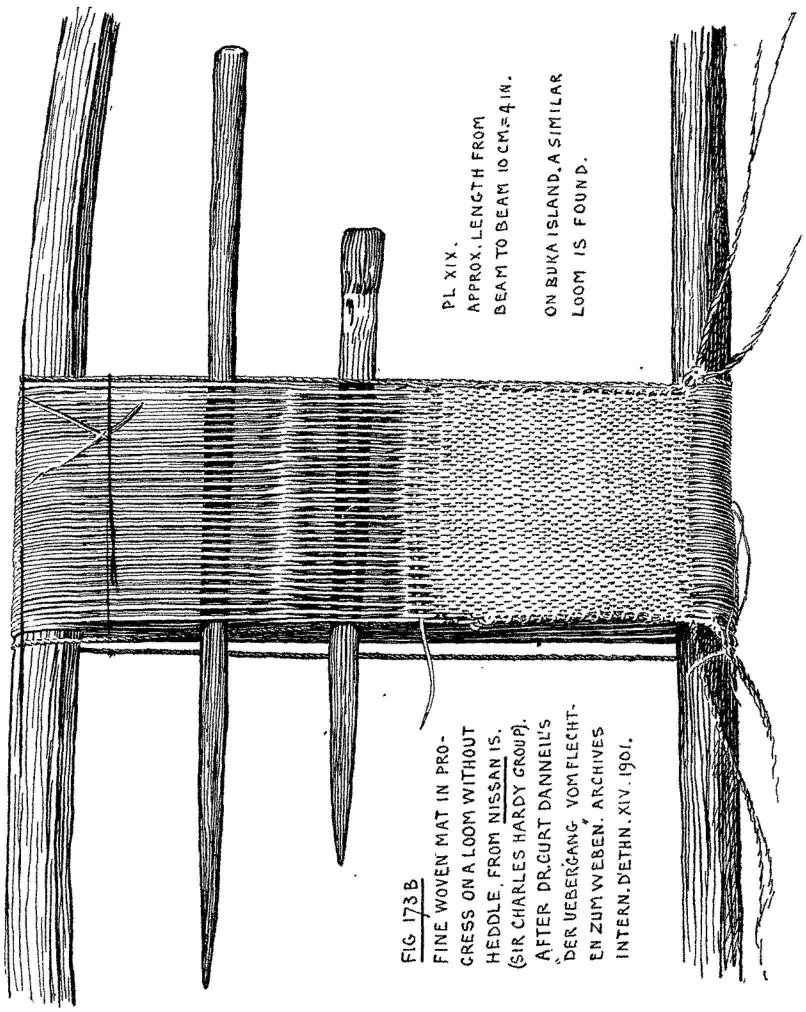


FIG. 173 A

FINE MAT LOOM WITHOUT HEDDLE. NISSAN IS. FROM C. DANNEIL, ARCHIVES INTERN. D'ETHN. XIV. 1901. PL XIX, LENGTH 110 CM.



PL XIX.
APPROX. LENGTH FROM BEAM TO BEAM 10 CM.=4 IN.

ON BUKA ISLAND, A SIMILAR LOOM IS FOUND.

FIG 173 B

FINE WOVEN MAT IN PROCRESS ON A LOOM WITHOUT HEDDLE, FROM NISSAN IS. (SIR CHARLES HARDY GROUP). AFTER DR. CURT DANNEIL'S "DER UEBERGANG VOM FLECHTEN ZUM WEBEN." ARCHIVES INTERN. D'ETHN. XIV. 1901.

and make the shed when necessary a pointed piece of wood is used. There is no mention nor indication of any heddle.

Danneil says of this loom:[1] "As it lies before us it represents for all time an original invention—an original transition from plaiting to weaving." He leads up to this claim by pointing out the difference between plaiting and weaving, saying that the first condition of weaving is the laying of the warp with the help of a warping frame (*Spannrahm*) and continues: "It was without doubt the nature of the material which put primitive man on to the idea to 'lay' it and to construct a frame with that end in view. For fineness and want of stiffness made any material useless for free hand plaiting. It being necessary that one portion of the filaments should be 'laid' once over *it resulted of itself* that another form of intercrossing of the filaments took place. Man already knew the material, either he had used it in making thread or had adopted it in a stiffer form (that is, not split up into such fine slips) for free-hand plaiting. With frame and warp primitive man had discovered the art of weaving, etc., etc." In all this there is no trace of any attempt to show how weaving arose out of plaiting or that it did so.[2] The connection is a close one, but as I have endeavoured to show later on, plaiting is not in the direct line of the evolution of weaving.

On the other hand, Meyer and Richter[3] aver that "this apparatus is no loom at all, as Danneil thinks, but a plaiting frame (*Der Apparat ist kein Webegestell wie er meint, sondern ein Geflechtrahmen*),[4] which opinion is apparently founded on the fact that it is not supplied with a heddle. But the correctness of the drawing being

[1] *Op cit.*, p. 230.

[2] This want of demonstration on the part of Danneil in presenting his notion as to how weaving developed out of plaiting is on a par with Julius Lippert's presentation of his notion of the development of the shuttle. "The tedious passing of the weft with the fingers corresponded with the oldest art of sewing. The oldest stone needle was only an awl, with which a hole was made in order to put the thread through with the fingers. The more modern needle is, however, an awl which not only makes the hole but carries through the attached thread. Now in carrying this progress forward from plaiting (*Bandflechten*) to weaving *the shuttle developed itself*, the shuttle being nothing else than a needle fully specialised for this object. The completion consisting in the fact that it carried with it a lengthened thread wound round lengthwise in the same way as in our modern netting needles." (*Die Kulturgeschichte in einzelnen Hauptstücken.* Part I. Wohnung u. Kleidung, 8vo, Leipzig, 1885, p. 170.)

[3] *Op. cit.*, p. 61.

[4] Writers do not always discriminate in the use of the words weaving and plaiting—*Weberei* and *Flechten.* Buschan, in describing some plain weaving, gives an illustration of a loom on which such weaving is done and calls it a *Flecht-rahmen, i.e.*, a plaiting frame. (*Die Anfaenge u. Entwickelung der Weberei der Vorzeit. Verh. d. Berl. Ges. Anthr.* 1889.) W. H. Holmes, in referring to a pair of sandals which as he says "shows the method of *plaiting* practised by the ancient inhabitants of Kentucky," goes on to tell us that these sandals are "beautifully *woven.*" Then he illustrates a "similar method of plaiting practised by the Lake Dwellers of Switzerland," and in the legend to the illustration calls it "*braiding*" (*Rep. Bureau of Ethnology*, 1882 p. 418). The italics are mine. The difference between weaving and plaiting has been explained in

accepted, we have here a frame on which a web can be constructed by means of interlacing of one set of filaments at right angles to another set of filaments with the possibility of the attachment of a heddle, and it is this possibility which helps to confirm the fact that the apparatus, however primitive, is a weaver's loom.

Fine mat work made of delicate coloured strips of bast is one of the characteristic arts of the Solomon Islanders, and we find almost throughout their islands that it is largely in use as decoration for weapons such as spears, clubs, arrows, and also for combs. The work is extremely beautiful and I very much doubt whether it has been surpassed anywhere, and this is especially the case with the ornamental head combs. Some years ago, in describing a few of the native weapons from these islands, I had occasion to remark: "It is curious to note that this matwork apparently all runs parallel with the outlines of the article ornamented, while in most cases in Borneo and wholly so far as I am aware in British Guiana,[1] the pattern is made to run diagonally across the article."[2] In other words, in the Solomon Islands we have to do with matwork, the basis of weaving, while elsewhere we have to deal with plaitwork. In so far as I can ascertain no one has yet described the method of

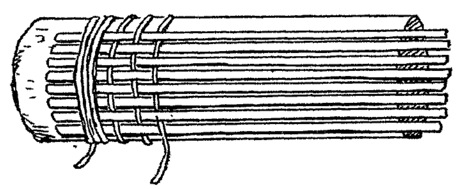


FIG. 174

DIAGRAM TO SHOW POSSIBLE METHOD OF MAKING SOLOMON ISLAND MATWORK.

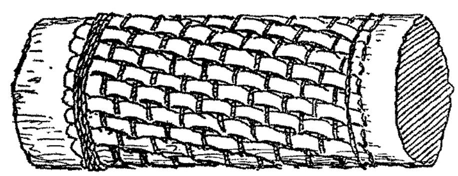


FIG. 175

MAT WORK DECORATION ON A SHARK-TOOTH SPEAR. KINGSMILL ISLANDS. KENNEDY COLL. BANKFIELD MUSEUM.

working, nor the seat of the manufacture, which still remains unknown,[3] at least, in so far as the beautiful coloured matwork combs are concerned.

An examination of the finished matwork on a flat club from Guadalcanar in

Ancient Egyptian and Greek Looms, p. 36. Similarly many writers speak of a spindle when a spool or bobbin is meant: the explanation may be that the article was once a spindle, but if its use is turned into that of a weft-carrier it is no longer a spindle.

[1] Not wholly so in Brit. Guiana.

[2] "Spears and Other Articles from the Solomon Islands," *Archives Intern. d'Ethn.*, vi, 1898, pp. 154–61.

[3] *Op. cit.*, p. 8.

the Kennedy Collection in Bankfield Museum tends to show that in its manufacture two methods are possible, but by both methods we get cylindrical or tubular or seamless garment weaving. One method is to wind a continuous filament spirally round the club, thus making it into a warp and then passing the other set of filaments at right angles through the warp as in making a pick. The other method is to tie the one end of a series of filaments side by side parallel with the outline lengthwise of the club and then wind a continuous filament spirally round the club in and out of the set of filaments as one would make a pick as indicated in the illustration, Fig. 174, a method which is accomplished in a cruder way in the Kingsmill Islands, as shown in Fig. 175.[1]

The same method—tubular weaving or seamless garment weaving[2]—appears to be followed in making the fine matwork covering of a Uganda child's cylindrical girdle, in making the coarse outer sheath of a British Guiana quiver, in making a small Andaman basket, and so on.[3] By this method a club can be covered with matwork from end to end as in this case, Fig. 174, for a length of 28½ inches (or 72·4 cm.). This is where, I think, the Nissan and Buka loom comes in. It comes in as an apparatus for weaving the matwork and has developed as a side issue to the Solomon Island tubular matwork ornamentation, the loom giving us as a product an enlargement of the club matwork with this difference, that what was originally the spiral continuous *weft* has become the spiral continuous *warp*. The loom described by Danneil and illustrated in Figs. 172A and B, is thus of local origin and has arrived at that stage where a heddle could be applied, but its development is now for ever arrested by the intrusion of the white man. Although it was present in close proximity to the Santa Cruz loom it evidently had nothing whatever to do with that exotic article.

8. A LAPP WOMAN'S BELT LOOM.

This little loom (Figs 176, 177, 178) comes from the River Tana, Finmark, Norway, and is now in the Victoria and Albert Museum. The interesting point about the loom is the secondary heddle arrangement for weaving the floating pattern by means of the warp, a method rare in primitive looms, but of course common enough

[1] In Bankfield Museum there is a gourd stopper similarly decorated, obtained in New Guinea about 1886 by my brother, Dr. F. Norman-Roth, which Dr. Haddon assigns to the Massim District.

[2] M. D. C. Crawford (*Peruvian Textiles, Anthrop. Papers Amer. Mus. Nat. Hist.*, Vol. xii, Part iii, New York, 1915, p. 95) says of tubular weaving that it "seems the most unlikely for the primitive craftsman to stumble upon," but here we have it in almost its very first stages among a very savage but artistic people.

[3] The examples quoted and others can be seen in Bankfield Museum.

in our manufactures. The length of warp as illustrated is 57 inches (or 145 cm.), and the width of the web is $1\frac{5}{8}$ inch (or 4 cm.). The number of warp is 55 to the inch (or 22 to the cm.), and the number of picks to the inch is 22·5 (or 9 to the cm.).

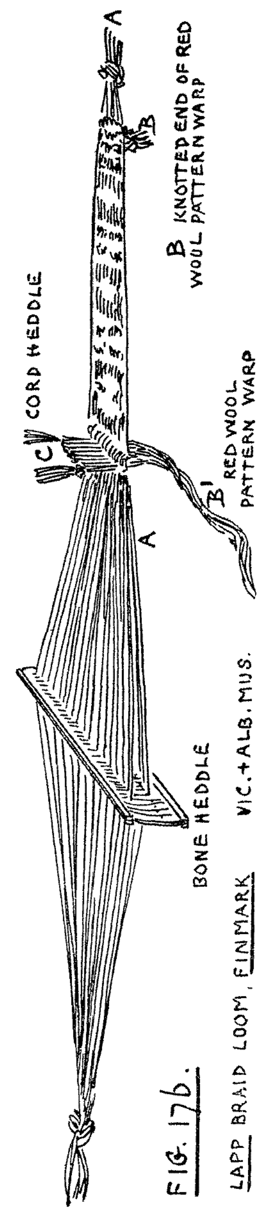
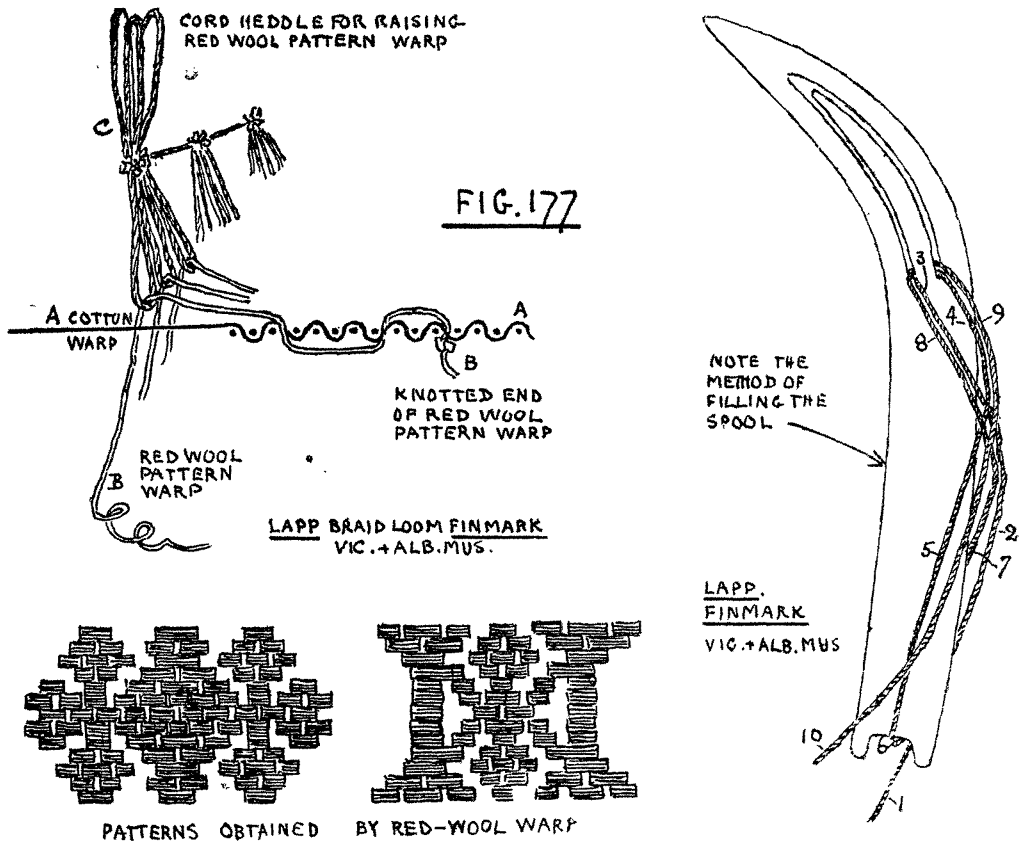


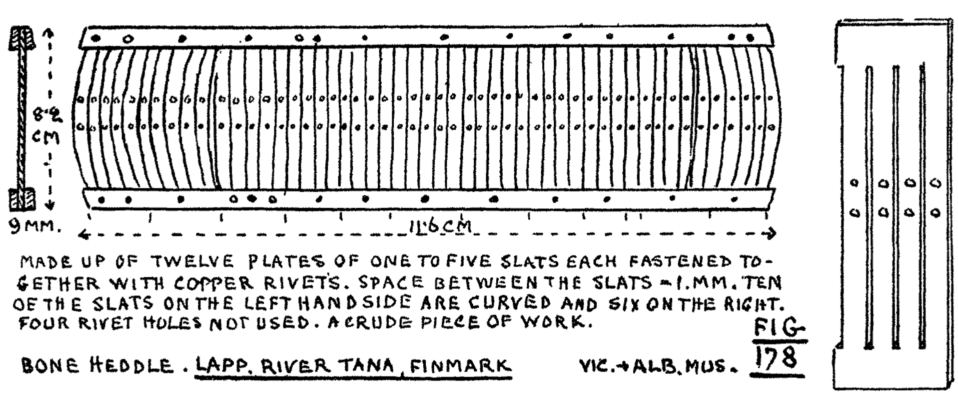
FIG. 176.

LAPP BRAID LOOM, FINMARK.

It consists of eighty-eight warp threads, which are laid through a free rigid bone heddle, forty-four passing through the slots in the heddle and forty-four passing through small holes in the bars of the same, the shed being made by alternately raising and lowering the bone heddle. When the heddle is lowered or raised the warp threads passing through the holes are those which get lowered or raised, at the



same time the threads passing through the slots practically remaining stationary. The movement is quite simple.



To obtain the pattern in this case, gotten by means of red spun wool, a series of eighty-seven red threads of equal length to the cotton warp are knotted under the warp at the breast beam end (Fig. 176B), and as soon as the three or four picks have been made, every red thread is drawn upwards separately between the warp threads until the knot stops its progress. Then, say, as a start, a couple of picks are made and the loose ends of the red thread brought down between and below the warp. To facilitate this process a very primitive cord heddle is brought into use (Figs. 176C, 177C), every leash of which holds one red thread just as with ordinary primitive heddles. The leashes are bunched in threes and tied together at requisite intervals with special loops at each end of the row, apparently intended to be used for raising the red threads altogether. In working, every leash will be raised separately, or in threes, and, when the pick has been made, the red threads are pulled down underneath separately by the fingers. Naturally as the work progresses the cord heddle must be pushed further and further away. The pattern is worked on the wrong side, *i.e.*, the pattern appears on the under surface while the work is in progress.

Otis T. Mason[1] has given us descriptions of the free rigid heddle in use among the Pueblo and other Indians and the white population of the United States, Germany, Finland, etc. In the Pueblo heddle the cross bars are tied on to the rectangular frame, but among Europeans, and also in Indonesia, the frame is carved out of one piece of wood. In the Lapp specimen (Fig. 178) the cross bars are cut out of twelve pieces of bone which are riveted on to a top and bottom bar.

There is no frame to the Lapp loom, otherwise apart from the warp pattern it belongs to the Norwegian type of belt loom in Bankfield Museum (Fig. 179), with a similar free rigid heddle. In the English eighteenth to nineteenth century ladies' ribbon loom (Fig. 180), instead of the rigid heddle being free it is fixed at the end of its frame box, and hence, as it cannot be raised or lowered to make the shed, the warp has to be raised and lowered instead; but in this case the warp passing through the holes will remain stationary while the warp passing through the slots gets moved up and down. The same procedure is followed in the use of the rigid heddle when it stands by itself, as it still apparently exists in some parts of Germany and Indonesia.[2]

Specialisation in primitive looms, as in the above, is not uncommon, as we shall see in the next chapter.

[1] "A Primitive Frame for Weaving Narrow Fabrics," *Rep. U. S. Nat. Museum*, 1899, pp. 487–510.

[2] R. Stettiner: *Das Webebild in der Manesse Handschrift*, Berlin, 1911, p. 7; Meyer und Richter, *op. cit.*, Pl. II

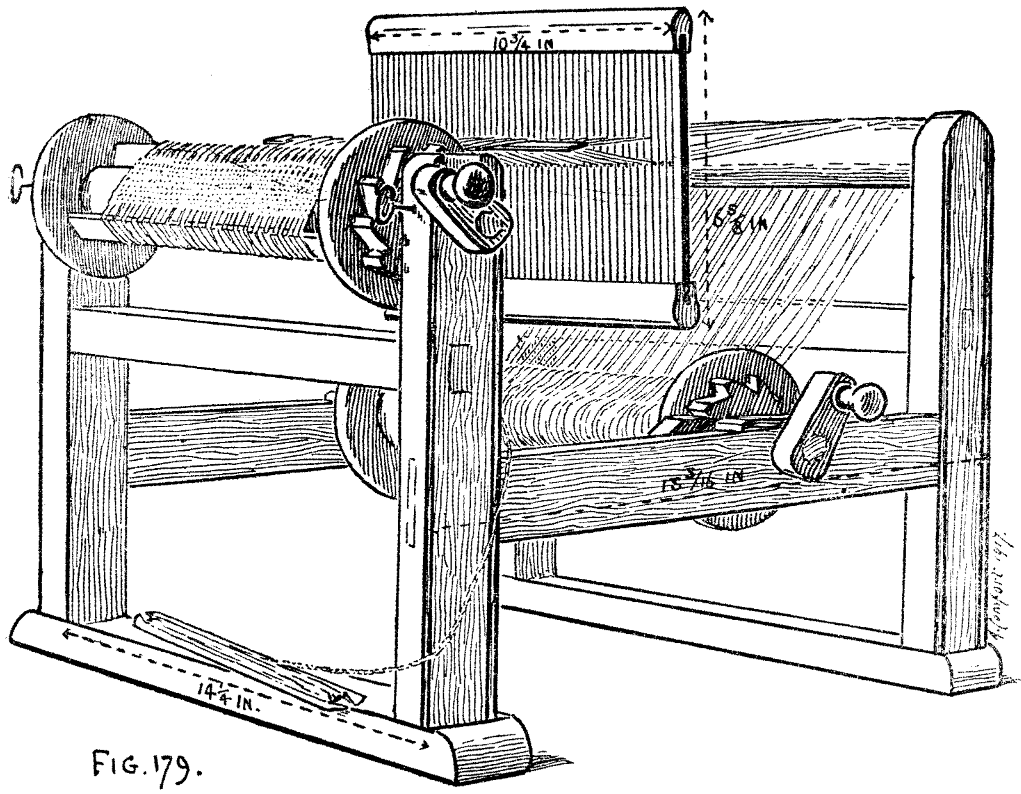


FIG. 179.

XXTH. CENTURY NORWEGIAN LOOM WITH FREE RIGID HEDDLE. BANKFIELD MUS.

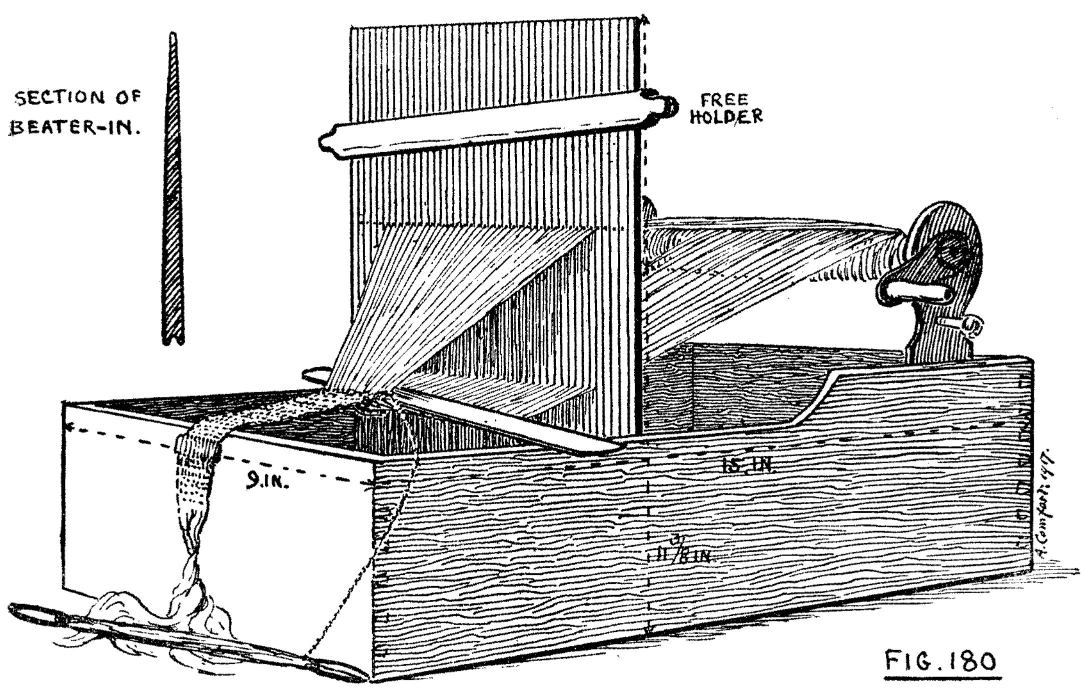


FIG. 180

LATE XVIIITH. CENTURY ENGLISH LOOM WITH FIXED RIGID HEDDLE. BANKFIELD MUS.

9. Oriental Vertical Mat Looms.

The Upright Oriental mat looms on which large and thick floor mats are made are of special interest because of the peculiar development of the beater-in, which consists of a heavy bar of wood with transverse slots for the warp threads to pass through. This development appears to be due to the springy nature of the material,

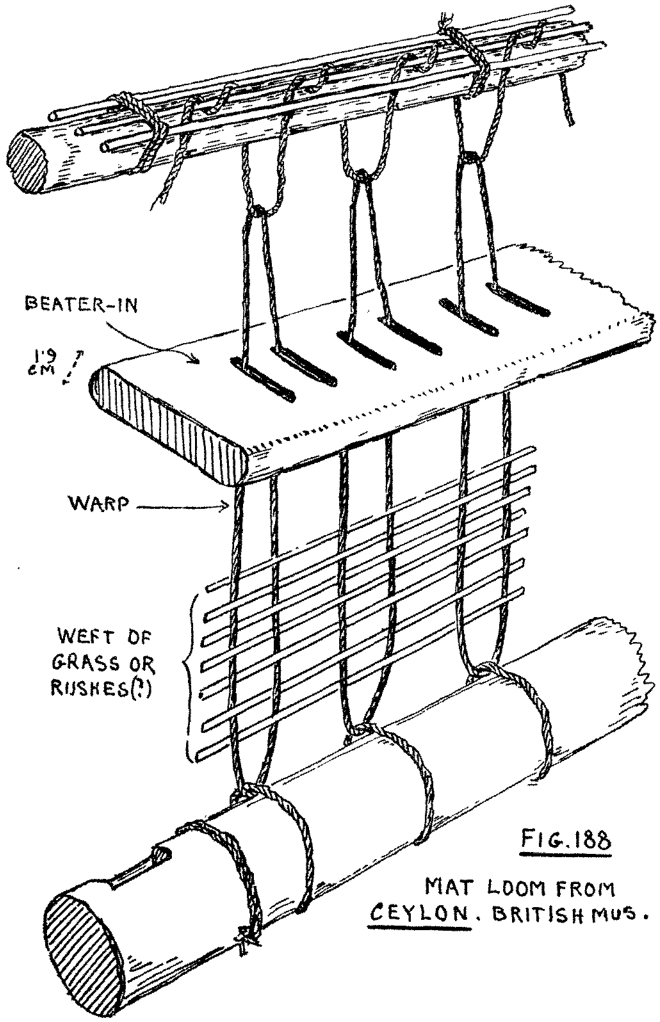


FIG. 188
MAT LOOM FROM CEYLON. BRITISH MUS.

straw, rushes, thick grass, etc., of which the weft is composed which requires something heavy to hold it in position as the work proceeds.

In the specimen of the Ceylon mat loom (Fig. 188) in the British Museum, the beater-in is made out of one solid piece of wood of the following dimensions, $37 \times 3 \times \frac{3}{4}$ inches (or $94 \times 7{\cdot}6 \times 1{\cdot}9$ cm.). There are 112 slots for the warp to pass through; the slots begin at a distance of about $2\frac{3}{8}$ inches (or 6 cm.) from each end and are approximately $\frac{9}{32}$ inch (or 71 mm.) apart. In the specimen from Hong-kong (Fig. 189), at the Imperial Institute, the beater-in is more massive, to correspond with the heavy elaborate frame and thicker weft used, and is provided with special handles $5\frac{1}{2}$ inches (or 14 cm.) long; the slots alternate in two lengths, the object of the longer ones is to allow more play and so obtain alternate long and short weft surface, as shown in Fig. 190. The action is clear enough and I am unable to follow Otis Mason when he says "the Chinese have a large block of wood with saw cuts inclined so as to throw the warp up and down in weaving the Canton matting,"[1] but there is no throwing the warp up and down, for it consists of rigid, strong yarn, as in ordinary looms. In this Hong-kong mat loom there are eighty-four warp threads in a mat-width of three feet.

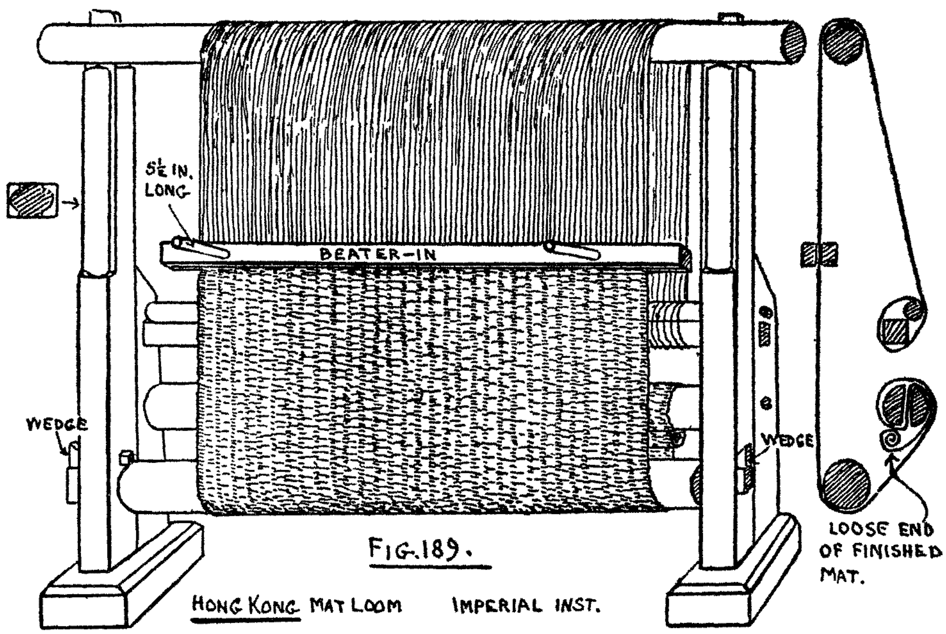


FIG. 189.

HONG KONG MAT LOOM IMPERIAL INST.

WIDTH BETWEEN POSTS 5 FT. WIDTH OF MAT 3FT. 84 WARP.

The mats obtained on both of these looms are true weaves and differ, therefore, from those made on the vertical mat-making frame of the Ainu. This consists of a ground beam and an upper beam supported by two uprights, the whole having the appearance of a rectangular frame, stood upright, resting on the ground-beam side. Two threads are fixed at intervals on the ground-beam opposite each other; these threads are somewhat longer than the intended length of the mat and have each a stone fastened at the loose end. The work begins by placing rushes along the ground-beam between the opposing threads, raising these threads over the rushes, twisting them half round each other and then throwing them over the upper beam so that

[1] *Origins of Inventions*, London, 1895, p. 247.

one thread end with its stone hangs over one side and one thread end with its stone over the other. Then a second row of rushes is laid on top of the first row between the opposing threads and as before the threads are twisted over them and thrown over the upper bar, and so on—the twist always being made in the same direction. As the work proceeds and the mat is completed as far as the upper beam, it is rolled round the ground-beam, leaving a similar clear space as there was at first between the last or top row of rushes and upper beam to allow the work to be continued. By lengthening the threads the mat can be made of almost any length. Hitchcock's verbal description[1] not appearing, to me at least, as sufficiently explanatory, I had a frame made at Bankfield Museum according to the illustration he supplies us with, and have taken the above description from the actual working on this model.

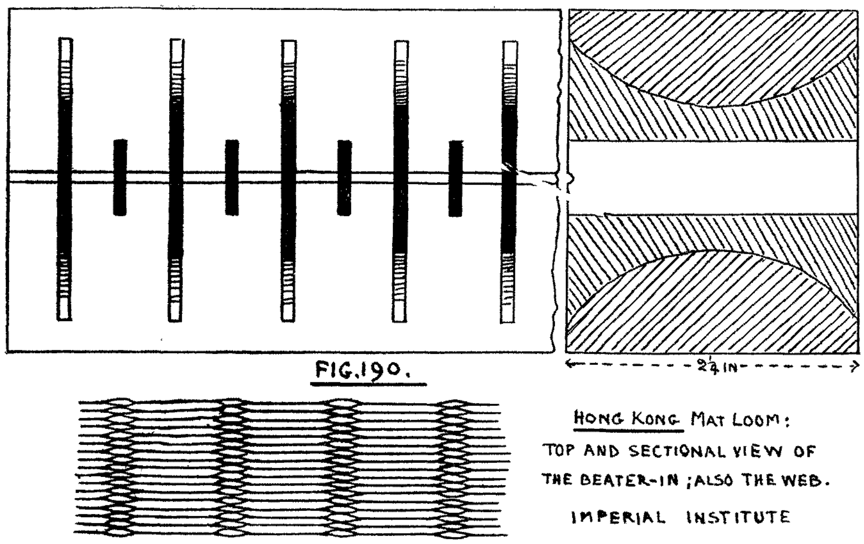


FIG. 190.

HONG KONG MAT LOOM: TOP AND SECTIONAL VIEW OF THE BEATER-IN; ALSO THE WEB. IMPERIAL INSTITUTE

In the Ainu mat frame the laying of the warp, if one can so call it, as the work proceeds is again probably due to the springy nature of the weft, which seems to require something more than mere interlacing to be kept in position. This something more is attained by twisting the warp threads after every piece of rush weft has been placed in position. With this method no beater-in is required. The loom and frame give a somewhat striking example of achieving the same result by different means. The Ainu frame appears to be the more primitive of the two and has differentiated at an earlier stage, but the mat-loom has probably an origin closely allied to that of the upright looms met with elsewhere. To get at the bottom of this we must hark back a bit.

[1] *Op. cit.*, p. 463.

10. Some Vertical Looms.

In the Vatican library there exists an illustrated MS. book of Virgil's *Æneid*, of which photographic reproductions[1] have been made and distributed to various libraries in different parts of the world. The original is generally considered to be a production of about the fourth century A.D. On Fol. 38, Pictura 39 gives a representation of the magic doings of Kirke and on the upper right-hand corner there is depicted a wooden structure (Fig. 191), which may be likened to a vertical loom. It consists of two uprights on feet connected by three equidistant horizontal bars with an irregular clear patch just above the lowest bar. The middle bar probably

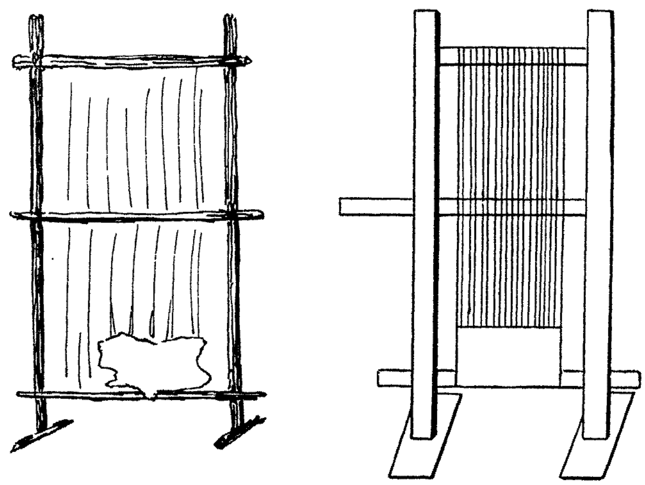


FIG. 191.

THE VIRGIL LOOM ACCORDING TO:—

FRAGMENTA ET PICTURAE CODICIS VATICANI. 3225. .. .... ROMAE. 1899. PICT. 39. FOL. 58

ANTIQBISSIMI VIRGILIANI CODICIS FRAGMENTA ET PICTURAE EX BIBLIOTHECA VATICANA. ROMAE CIƆIƆCCXLI. P 129.

represents the heddle rod. The drawing of the structure is only about 24 mm. high, and this minuteness, together with the wear and tear of ages and the final photographic reprint, make it by no means a clear representation. A female figure (Kirke) standing to the left of the loom is depicted with her right hand on the junction of the heddle rod and upright post; her left hand is probably also on the post lower down but not clearly shown. In neither hand does she appear to hold anything. Johannes Braunius[2] gave a very much larger illustration of this loom with the female on the right hand holding a wand in her right hand and showing a large

[1] *Fragmenta et Picturae Vergiliana Codicis Vaticani* 3225. Romae, 1899.

[2] *Vestibus Sacerdotum Hebraeorum*, 1680.

rectangular piece of cloth at the bottom of the loom. For a representation of this piece of cloth there is little warranty—for it is difficult at the present day to be certain what the white blotch was intended to represent in the original *pictura*. However, the Vatican published in 1741 an edition of the above-named copy of Virgil,[1] and in this Kirke and her loom are illustrated fairly distinctly, though on the same minute scale as the original (*see* Fig. 191). She is depicted not quite as in the original with her right hand on the heddle rod extension, while the left hand is not shown at all. In the meanwhile B. de Montfaucon[2] published a reverse of the illustration of the loom as it appears in Braunius, showing Kirke on the left again. Johannis Ciampini[3] follows Montfaucon almost to a line. Since then the illustration has been fancifully and thoughtlessly copied times out of number. But we have to come back to the point that this illustration probably represents a fourth century A.D. upright loom, in which the warp weights have already been replaced by a breast or cloth beam and the weaving begins from the bottom and not from the top. It is, in fact, an earlier form of the upright loom as we meet with it in the East, between Asia Minor and India, and also in Africa at the present day. Yates and Marindin[4] consider the making the web to begin at the bottom as an anachronism, that is if we consider the period of Æneid's travels, but it really represents the artist's limited local knowledge of a loom in his days.

The loom referred to by Yates and Marindin is the well-known warp-weighted loom, a highly specialised form of which was depicted by Johannes Braunius, above referred to, over two hundred years ago (*see* Fig. 192). Both Bluemner and Marquardt condemn this as a piece of fiction, but give no reason for doing so. I have submitted the illustration to several practical weavers, and their opinion is that the working is quite feasible and to anyone who takes the trouble to examine the details of the illustration the feasibility quickly becomes manifest. Montfaucon, in copying Braunius, gives an incorrect version of it and Johannes Ciampini has again apparently used Montfaucon's plate, reproducing the same mistakes both in essentials and in details. It has been re-illustrated many times until it has reached its final stage of degradation in an extraordinary work by Perry Walton.[5]

[1] *Antiquissimi Virgilium Codicis Fragmenta et Picturae ex Bibliotheca Vaticani*, p. 129.

[2] *L'Antiquité Expliquée.* Paris, 1719, Part iii., Pl. 195.

[3] *Romani Vetera Monimenti*, Romæ, 1747, Pl. 35.

[4] Smith's *Dictionary of Greek and Roman Antiquities*, 3rd Ed., 1890.

[5] *The Story of the Textiles*, Boston, Mass., 1912. The adjective "extraordinary" has not been used inadvisedly. What is one to think of such statements as the following: "Fabrics dating back to a period thousands of years ago have been unearthed in England (p. 14)." "On the walls of Nineveh, Babylon, Thebes, and the ancient cities of Peru and Mexico, throughout most of the ruins of Assyria, Persia, Egypt, and among similar ruins of both North and South America, is depicted the whole process of the textile industry, from the raising of the sheep or growing of the flax to the spinning of the yarn and weaving of the fabrics" (p. 16).

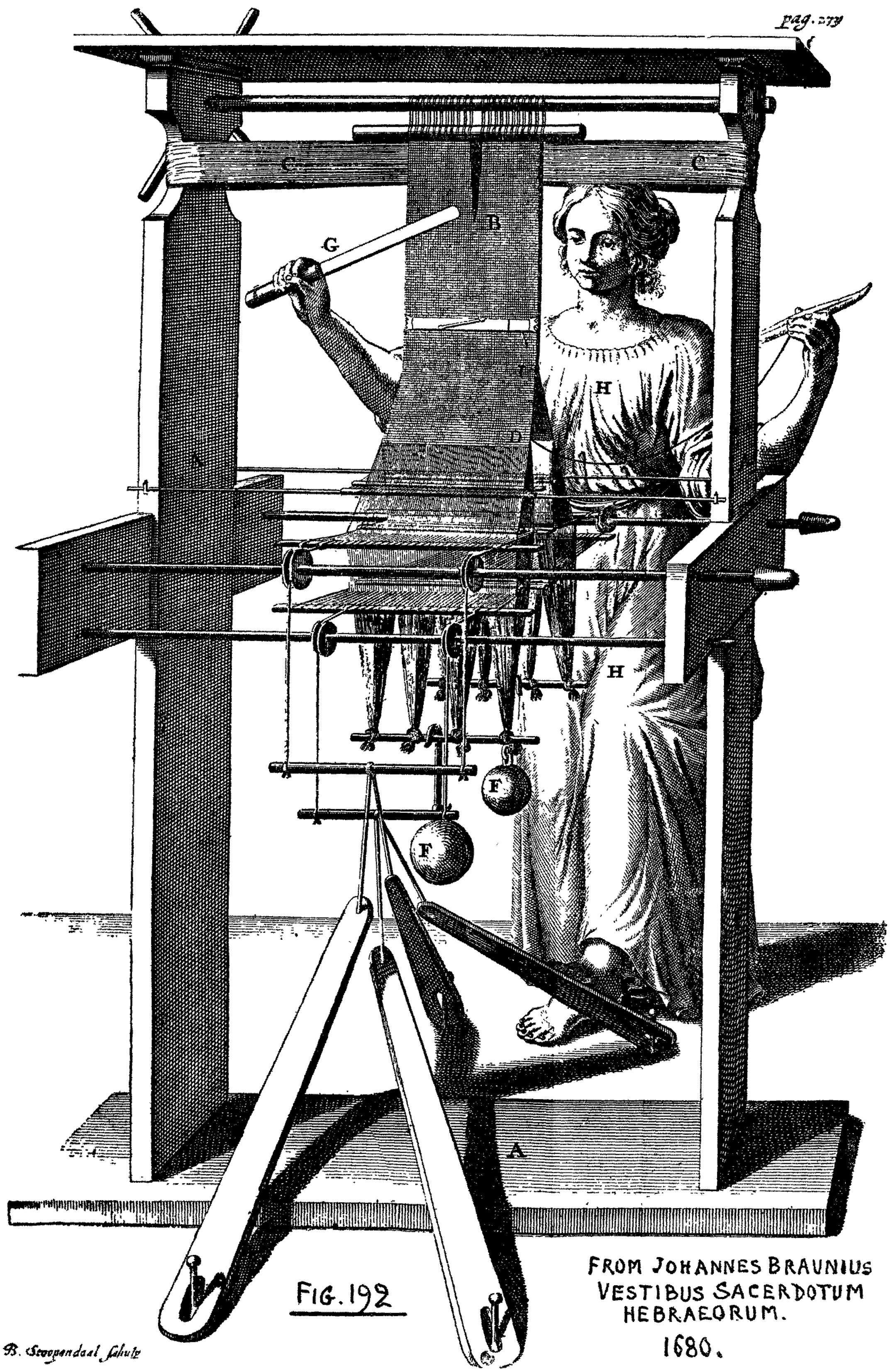


FIG. 192

FROM JOHANNES BRAUNIUS VESTIBUS SACERDOTUM HEBRAEORUM. 1680.

The following is the description of this loom as given by Braunius. It is worth reproducing, quite apart from the rarity of the book and its inaccessibility to the general public and even to students.[1]

AAAA.—Loom, or ancient weaver's beam. An *upright* loom (Artemidorus, Bk. iii, Chap. 36). Perhaps called "jugum" by Ovid on account of its shape, which is not unlike a yoke. In what manner a yoke was constructed, and what was meant by "sent under the yoke," may be clearly seen from Cicero, *De Officiis*, Bk. iii, and Livius, Bk. iii, etc.

B.—Shirt, rounded and closed without seam; "seamless" (ἄρραφος) as was the shirt of Christ (John, chap. xix). Otherwise "tunica recta." (Isidorus, Orig. Bk. xix, chap. xxii). This shirt is woven in an upward direction; for the weaving begins from the topmost thread CC and gradually works down to D. (Herod., Bk. ii, Theophylactus "In Johannem," Festus Chrysostomus "In Johannem Homil." lxxxv. Isidorus Pelusiota, Epist. lxxiv, Bk. i). The shirt is rounded and closed from B to I; then, however, it is divided to D and E, as men's undergarments usually are to-day.

CC.—Threads, which are part of the weft (trama), but so prolonged beyond the body of the shirt that at last they can be made the warp (stamen) of the shirt-sleeves. When the finished shirt is taken off the loom, the threads CC are cut at the ends; they are afterwards turned in, and finished off in the same way as BD.

DE.—Two warp-threads, of which D is the anterior, and E the posterior; they are joined by one and the same thread to the weft, and plaited together: "δυὸ ῥάκη συμβάλλειν," "duos pannos committere." (Chrysostomos "In Johannem Homil." lxxxv; Theophanes Cerameus, "Homil. in Passion Domin." xxvii. Josephus, Bk. iii, chap. 8).

FF.—Weights with which the warp threads in this manner of weaving were weighted (Seneca, Epist. xc; Pollux, Bk. vii, x.)

G.—Spatha, σπάθη, an instrument used for keeping the threads of the weft together (Seneca, Epist. xc.; Pollux, Bk. vii, chap. x).

H.—The woman-weaver, holding the spatha in her right hand for the purpose of bringing the weft together, by pushing the threads upward; in the left hand she holds the weaver's shuttle. Moreover, she weaves standing, not sitting (Isidorus, Orig. Bk. xix, chap. xxii. Servius Aen., Bk. vii; Eustathius,

[1] For instance, the librarian of the Chetham Library refused to grant me permission to have the plate photographed, although the copy there is, I believe, the only one in the north of England.

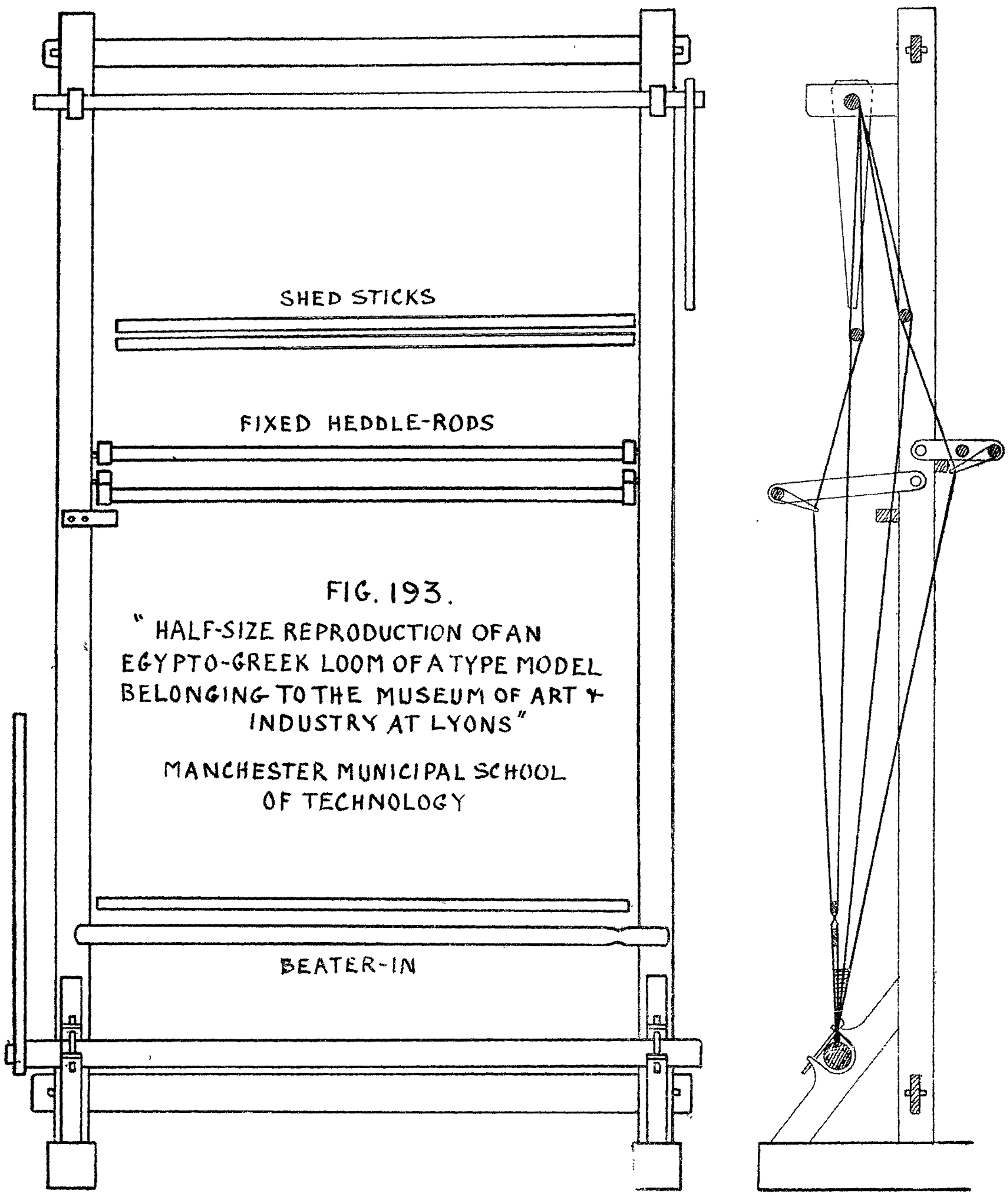


FIG. 193.
"HALF-SIZE REPRODUCTION OF AN EGYPTO-GREEK LOOM OF A TYPE MODEL BELONGING TO THE MUSEUM OF ART & INDUSTRY AT LYONS"
MANCHESTER MUNICIPAL SCHOOL OF TECHNOLOGY

"Ad Homer Odyss.," Bk. v; Hesiod, "Ergon"; Artemidorus, Bk. iii, xxxvi). As she weaves she walks round in a circle; for when she has passed the shuttle or weft through the web or threads D, she has to go round the whole loom, so that she may pass the same shuttle and weft through the threads E, in order that the webs D and E may be woven together (Theophylactus, "In Johannem"; Virgil, "Aen.," Bk. vii; Isidorus, "Orig." Bk. xix, chap. xxiv; Artemidorus, Bk. iii, chap. xxxvi).[1]

The loom is one designed for making a seamless garment, and in fact produces what is called tubular weaving. That it has not survived is no doubt due to its complicated nature, coupled with the warp weight system. It remains, however, of considerable interest, inasmuch as the method of warp weighting depicted may perhaps indicate a transition from the use of simple warp weights to the adoption of a warp beam. Before proceeding further it may be as well to call attention to another form of tubular weaving as illustrated by a model in the Manchester Municipal School of Technology, of which the label reads "Half Size Reproduction of an Egypto-Greek Loom of a type model belonging to the Museum of Art and Industry of Lyons." The Textile Department cannot tell me anything as to its history, and owing to the War I am unable to obtain particulars. The accompanying illustrations (Figs. 193, A and B) will explain its details and at the same time indicate that it partakes of the nature of a fixed heddle loom (although the heddles are not completely fixed) somewhat like the Aures loom (Fig. 91B), which may, to a limited extent, explain the name Egypto-Greek.

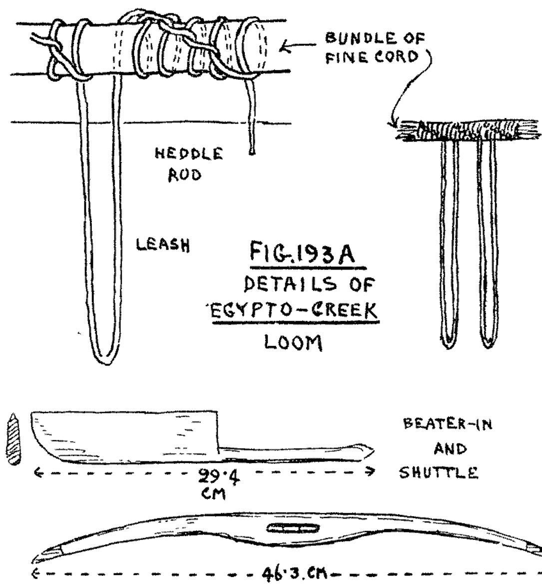


FIG. 193 A DETAILS OF EGYPTO-GREEK LOOM

[1] For assistance in the translation of this description I am much indebted to my friend, Lieut. Arthur Redford, late Bradford scholar, Manchester University.

Reference has been made above to the upright looms found in Asia Minor, etc., which, like the upright looms in North Africa, are in all probability the immediate successors of the ancient warp-weighted loom. A few remarks on two of such looms may not be out of place.

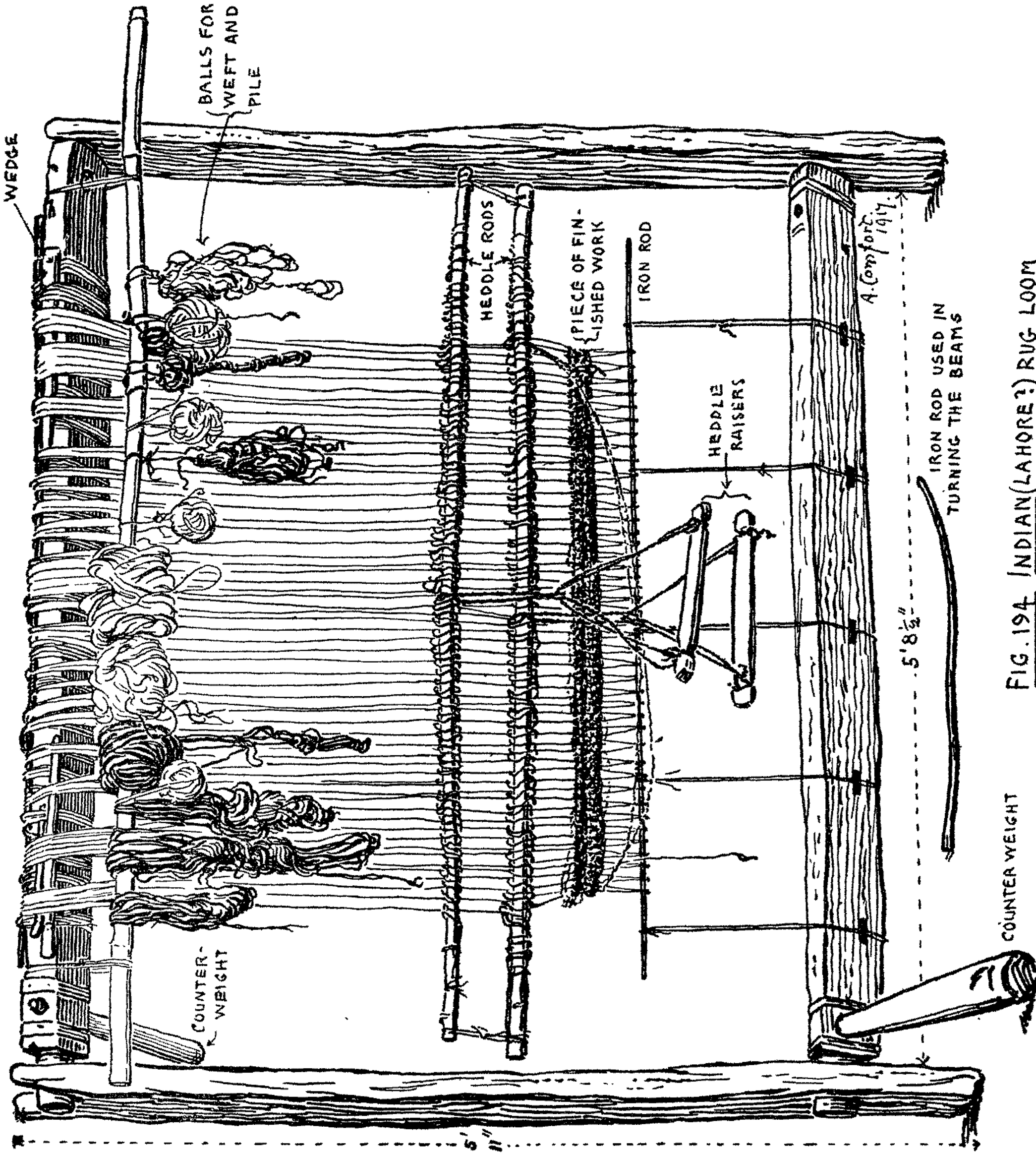


FIG. 194 INDIAN (LAHORE?) RUG LOOM BANKFIELD MUSEUM.

The Bankfield specimen, said to come from Lahore, is depicted in Fig. 194. It is a rug loom, 71 inches (or 1·8 m.) high by 67 inches (or 1·7 m.) between the uprights. To a certain extent the warp is kept taut by means of heavy timber levers or counterweights as shown, the lower one of which, when in use, was apparently tied down to the ground. To increase the tautness, but only in a very inefficient way, wedges are driven into the coils of warp on the upper beam. On a bambu rod placed across the loom are hung variously coloured balls, with which to make the pile and weft, the threads being pulled out as required by the worker. At the lower end the warp is attached to an iron rod, which in turn is attached to the lower beam by means of cords let into small rectangular holes cut into one edge of the beam. The heddles are provided with raisers. For every one row of pile there are three of weft. The pile ends are cut level by means of a pair of shears which are provided with special lugs to keep them level when the loose ends of the pile are being trimmed. The picks are driven home by means of a bent iron beater-in. It is altogether a very crude loom.

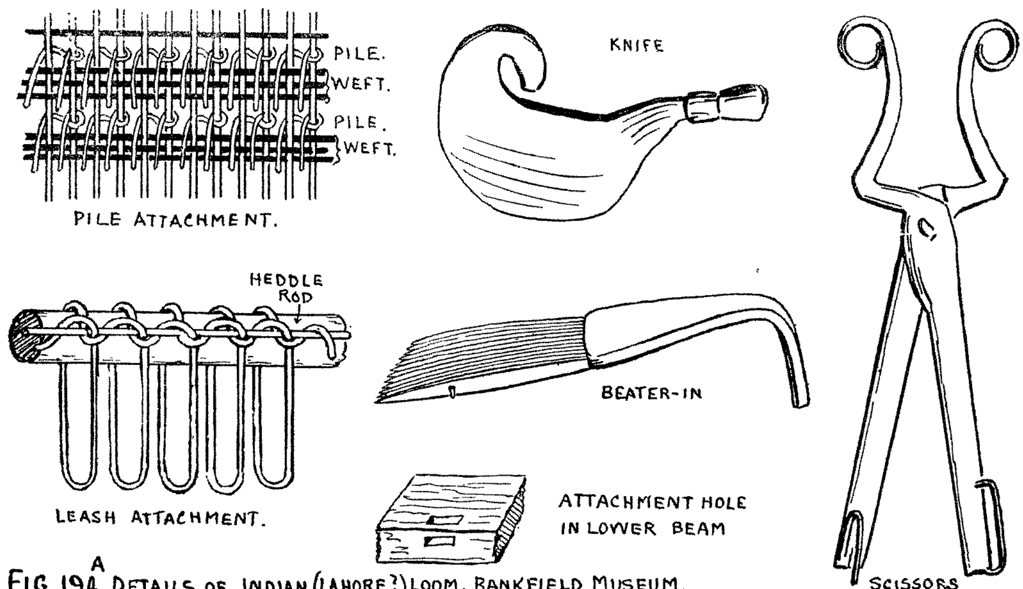


FIG. 194A. DETAILS OF INDIAN (LAHORE?) LOOM. BANKFIELD MUSEUM.

But quite as crude is the rug loom illustrated by O. Benndorf,[1] reproduced in Fig. 195. Here the lower beam is fastened down by a cross bar passed through a hole at the end of the beam. The beater-in is very crude, and is similar to one in the Victoria and Albert Museum (Fig 195A) said to be Persian.

The frame of the two looms just described consists of two upright posts and two cross pieces which join the uprights at top and bottom respectively. The frame of the Oriental mat loom with its specially developed beater-in belongs to this form. In the warp-weighted loom there is only one cross piece which joins the uprights at the top. As incidentally mentioned when discussing Braunius' loom, there is an indication of a transition between these two looms, which consists in bunching the

[1] *Reisen in Lykien u. Karien,* 1884, p. 18.

lower warp ends to a loose rod, on to which one weight only is attached, which keeps all the threads taut. But there must have been an earlier or simpler frame than that of the warp-weighted loom. An example of this is the Kwakiutl loom, figured by

Fig. 12 Türkin am Webstuhl

FIG. 195. FROM O. BENNDORF'S REISEN IN LYKIEN U. KARIEN. 1884.

Mary L. Kissell,[1] or the Ojibway loom figured by M. D. C. Crawford.[2] It consists of two uprights stuck into the ground about 2 feet apart and joined at the top by a piece of yarn, or perhaps originally sinew. The weaving naturally proceeds

[1] *Aboriginal American Weaving,* Nat. Assoc. Cotton Manufacturers, Boston, Mass., 1910, p. 4, Fig. 1.

[2] *Amer. Museum Journ.*, Oct., 1916, p. 382.

downwards. On the Ojibway loom the cloth is apparently made in one piece. On the Kwakiutl loom the weaving is done at twice, that is to say, the cloth is woven for the full length of one half of the warp and then the weaving continues or rather recommences on the top of the second half, and the two finished pieces are laced together at the adjoining edges. On the well-known Chilcat loom[1] the cloth is woven in several strips, instead of two only, and then joined up.

Besides the Kwakiutl loom, Miss Kissel illustrates[2] a similar frame to the above, but with a wooden cross-piece at top, instead of a piece of string, on which mats are *plaited.* In Bankfield Museum there is a piece of plaited work of bison hair yarn given me several years ago by Miss M. A. Owen,[3] which has apparently been made on such a frame in narrow strips which have been laced together, and I have had a facsimile piece of plaitwork made on such a frame. In the Pitt-Rivers Collection, Oxford, there is a larger piece of the bison hair plaitwork which, until one examined the selvedge, has the appearance of diagonal weaving! Advocates of the theory that weaving was evolved from plaiting would no doubt consider that these examples of primitive frames, so identical in construction on which both plaiting and weaving can be done, supports their theory. Both plaiting and weaving require some sort of simple framework support, so there is nothing in the coincidence. The presence of two sets of elements in weaving does not necessarily mean an advance over the one set of elements in plaiting. The initial step in plaiting, the selvedge, which is a *sine qua non* of plaiting, is a secondary matter in primitive weaving and has, as it were, to be undone or dropped or ignored if we are going to weave ; this would be a retrogressive step and places plaiting in the position of a side product rather than in the direct line of the evolution of weaving.

11. THE ALLEGED "WEAVER'S COMB."[4]

In Figs. 181 and 182, outline illustrations are given of two of these tools now in the British Museum ; the larger one was found at Mortlake on Thames and the

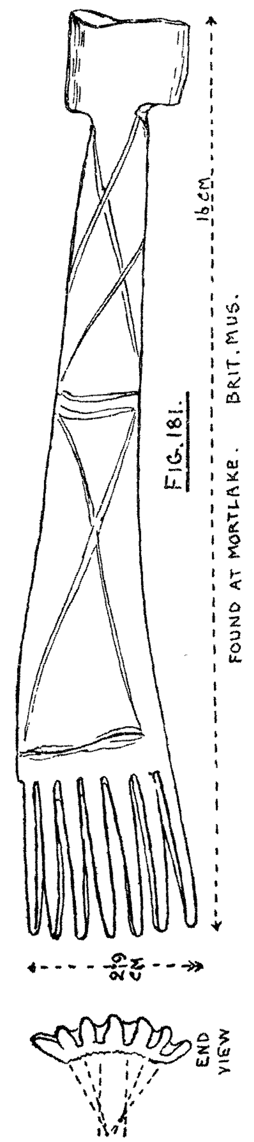
[1] Emmons, *op. cit.*, p. 343.

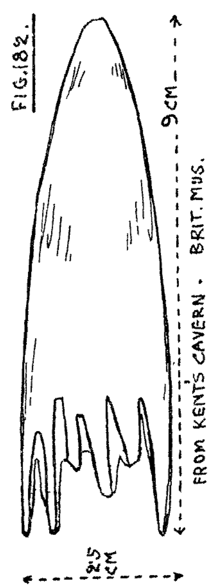
[2] *Op. cit.*, p. 6.

[3] Author of "The Folklore of the Musquakie Indians," *Folklore Society's Journal*, 1904.

[4] Even if the Glastonbury and other similar tools were intended for beating-in the weft, and this is what is claimed as their function, it is a misnomer to call them "weavers' *combs*." The name comb implies an instrument for straightening or separating out any more or less tangled fibres by drawing it through the entanglement. In driving home the weft the action is not that of combing, but of a decided tapping or pressing down—there is no separating or straightening out of fibres, for this is not wanted, or if it were wanted it would be exceptional. When A. Barlow (*History of Weaving*, Lond. 1878, p. 58) wrote : "It is far from being uncommon for weavers at the present day to use a comb, especially when they have a sticky warp to weave, or a warp that, owing to the felting property of the material, requires to be separated frequently," he was dealing with exceptional circumstances. A more appropriate designation of the tool would be a toothed beater-in.

smaller one in Kent's Cavern. Both are of bone and both are concavo-convex in cross section and in both dents the (spaces between the teeth) are of varying depth. The Mortlake specimen has fairly regular teeth of equal length ; in the Kent's Cavern





specimen the teeth are apparently slightly more varied in shape, but owing to three of them having been broken off it is not possible to say anything as to their original length. They are both very rough on the concave side due to the exposure of the spongy interior portion of the bone of which they are made. The ornamentation is crude, consisting of crossed lines, etc., and the common circled dot.

E. T. Stevens, in referring to the collection of this class of tool from the Highfield Pit Dwelling, Salisbury, now in the Blackmore Museum, Salisbury, speaks of them as "bone and horn (red deer's antler) combs," and says regarding them: "These implements closely resemble some in recent use by the Esquimaux for scraping fat, etc., from the backs of skins. The Esquimaux tools are made of wood, with the sharp claws of birds lashed to them. In the Christy Museum there are examples of these; in the same collection there is a Basuto tool used for a similar purpose, the short thick teeth of which are of iron, bound to a wooden handle with twisted fibres. These modern implements help us to understand the use of the ancient tools."[1] From this one must infer that Stevens thought these instruments might have been made for skin-dressing purposes, although he was too cautious to commit himself.

Eleven years later Pitt-Rivers, in describing the excavations at Mount Caburn Camp, near Lewes,[2] devoted several pages to a description and record of finds of these tools in various parts of England, referred to Stevens' comparison between them and the Esquimo and Basuto skin-scraping tools[3] and said of one of them: "the seven teeth in this comb are blunt and rounded at the points, showing that it could not have been employed for combing the hair, and may possibly have been used for driving the weft against the cloth in weaving; the association of such combs in the broch [Pictish tower] of Burrian, where fifteen of them were found, with seven rubbing-bones or calendering implements made of the jawbones of whale, and used for smoothing the web after it is woven, appears to confirm this opinion as to their use."[4] He spoke of another comb found in the island of Bjorko and continued: "It was believed to have been used in weaving ribbon, and was ornamented with the dot and circle pattern. The small looms in which ribbons are woven are still in use in Norway and parts of Sweden; a drawing of one from Dr. Hazelius's museum of native utensils at Stockholm is annexed. (*See* cut.) It is 1½ foot in length, and 8 inches high; the ribbon is about 2 inches wide, and the comb of wood that presses up the woof has numerous teeth. As the bone combs under consideration have seldom more than ten teeth, some other system must have been employed than that in vogue in Norway. They may also have been employed in combing flax or wool."[5] In the cut he gives an illustration of a modern Norwegian ribbon loom, which, in all probability, has long since out-distanced any loom that may have been in existence when the toothed instrument we are discussing was in use, so that the tentative

[1] *Flint Chips*, London, 1870, pp. 64–65.
[2] *Archæologia*, xlvi, 1881.
[3] *Ib.*, p. 10.
[4] *Ib.*, p. 11.
[5] *Ib.*, p. 11.

comparison cannot hold good. He also gives illustrations " of four deer-horn combs of like form from Greenland, in the Ethnographical Museum at Copenhagen ; they have ten, eight, eight, and seven teeth respectively, and are said to be used for combing flax."[1] Unfortunately, Pitt-Rivers omits to note that flax does not grow wild, if at all, in Greenland, hence it is not likely that the natives required a tool for combing it. One gathers from his statements that he favoured the opinion that these instruments were beaters-in.

We now come to the Glastonbury Lake Village explorers, Messrs. Bulleid and Gray, who found a large quantity of these implements at this settlement. After stating that, as recently as 1872, opinions were divided as to the purpose of the tools, they continue : " But it is now generally accepted that they were employed by the weaver in the upright loom for pushing home the weft (or woof) worked in by a shuttle, and so closing up the threads of the woven fabric—an operation absolutely essential in all kinds of looms. This process is now caried out in the horizontal loom by the swinging sley. These early weaving combs, therefore, served the same purpose as the reed, lay, or batten of our own time."[2] Here we have a positive opinion as to the function of this peculiar tool, of which many illustrations are supplied. To support their view the authors give us a diagrammatic representation, showing how the teeth of the tool, fitting into the warp dents, act both as a warp spacer and a beater-in. On examining their illustrations of these tools one is struck at once by the difference in the number of teeth—they vary from five to fourteen—and with the wide diversity in the form of the dents ; most are naturally wedge shaped, but with varying depths on one and the same tool, a variation which also applies to the dent head which, in a few cases, runs to an extremely acute angle and in others is somewhat more open.

In the Mortlake tool in the British Museum (Fig. 181), owing to the rounded surface of the bone having been left in its natural state, the teeth are not in the same plane, being built on a base concavo-convex in section, hence only the centre portion of the tool beats-in when the convex side is used and only the outer teeth beat-in when the concave surface is used. Then, also owing to the rounded nature of the bone, the sides of the dents converge towards a point about an inch or so on the concave side, instead of every one being parallel to its neighbour, so that, when used to beat-in the warp threads are drawn out of position. As a matter of fact, on trying to use this tool (a facsimile in so far as possible of the Mortlake specimen) instead of obtaining the flawless result illustrated in Bulleid and Gray's diagram (Fig. 183), I got the distorted result shown in my illustration (Fig. 184). But not only was the warp alignment distorted, but in beating-in considerable friction was evoked between the

[1] *Ib.*, p. 12.

[2] A. Bulleid and Harold St. George Gray, *The Glastonbury Lake Village.* Glastonbury Antiquarian Soc., 1911, I, pp. 268–9.

warp and the teeth. The curved base of the teeth of the beater-in brings the outer dents closer together and their sectional lines instead of remaining parallel become radii, converging at a point on the concave side, thence we have not only the negligible slight occasional contact between every warp and the teeth on either side of it, but a very close contact indeed. In fact so great is this that it amounts to a positive

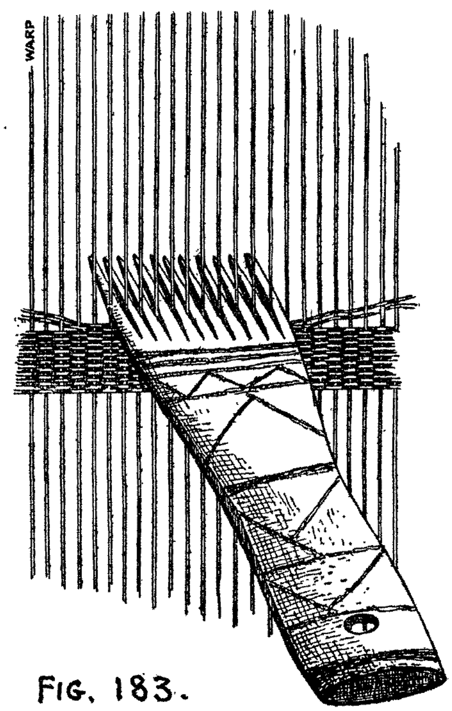


FIG. 183.

FROM BULLEID & GRAY'S GLASTONBURY LAKE VILLAGE

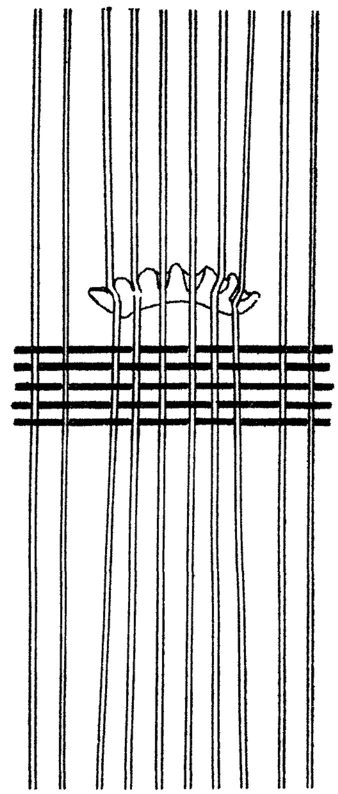


FIG. 184.
WARP DRAWN OUT OF POSITION BY THE DENTS (OF THE MORTLAKE QUASI WEAVERS' COMB) WHICH PARTLY CONVERGE AT POINTS ON THE CONCAVE SIDE INSTEAD OF RUNNING PARALLEL TO ONE AN-OTHER.

hindrance to the work, necessitating greater hand pressure and decided wear and weakening of the warp. With a beater-in on which the teeth are in a straight base, even if not well spaced, the friction is minute, but, of course, the greater the number of teeth the greater the friction, and this is again intensified with a concavo-convex base. I obtained the same results on warp placed horizontally or vertically, and I may add I tried the original tool on some primitive looms in the British Museum, which trial first raised my doubts as to the alleged use of the implement. Anyone can make these trials for himself.

In any case Bulleid and Gray's diagram is an anachronism, for if the Glastonbury people used warp-weights (and I think the perforated articles the authors call loom weights are such and not net sinkers) then the vertical loom with these weights was in use. As is well known in these upright warp-weighted looms, the weaving proceeded from above downwards, hence the beating-in must be from below upwards. In Bulleid and Gray's diagram the beating-in is from above downwards—what the Glastonbury people, it is safe to say in the present state of our knowledge, never did on warp-weighted looms. The Copenhagen Museum's Scandinavian warp-weighted loom, as illustrated by Montelius, and the Iceland loom illustrated by Olafsson,[1] show a sword- or dagger-shaped beater-in and so does the Icelandic loom in the Reykjavik Museum.[2] In the manufacture of the Chilkat blanket on an *apparently* warp-weighted loom, the author mentions no such a tool as a beater-in, saying the whole of the work is done by the fingers.[3] In their diagram, too, the authors make the tool flat, forgetting their statement that in cross section these tools "are for the most part concavo-convex."[4] By this oversight they overcome the difficulty inherent where the dents converge to one point on the concave side instead of being in parallel lines. The very acute angle at which some of the dents terminate must cause the yarn to get wedged and on the withdrawal of the tool some of the warp will get lifted up and so displace the work, thereby encompassing the very object which is most to be avoided. As a minor objection the roughness of the concave portion of the bone where the cancellous tissue of the horn or bone has not been removed is liable to catch both warp and weft and disarrange them.

The chief objections to the use of the "combs" as beaters-in of the weft are :—

1. The concavo-convex base of the teeth, which—
    (*a*) Cause the warp to be displaced laterally and thereby
    (*b*) Cause excessive friction.
2. The great irregularity in the width of the dents culminating in the acuteness of the dent heads which have the tendency to "bite" the warp and obstruct working.

[1] Both reproduced in *Ancient Egyptian and Greek Looms*, pp. 34 and 35.

[2] Daniel Bruun, *Faeroerne, Island og Gronland paa Verdensudstillingen i Paris*, 1900, Kjobenhavn, 1901, p. 25.

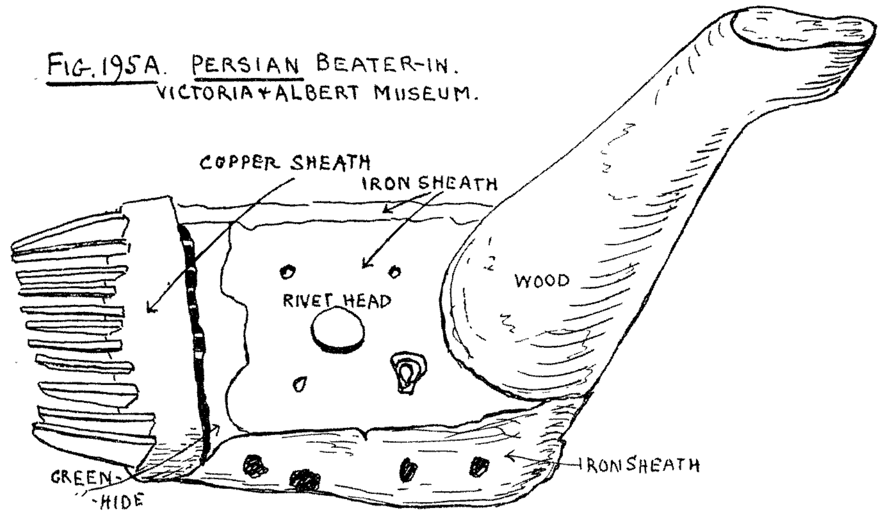
[3] Emmons, *op. cit.*, pp. 343–4.

[4] Of the numerous illustrations of these articles with which they supply us only two, numbered B232 and H33, Pl. xlvi, appear useable as weft beaters-in. *Op. cit.*, p. 270.

Hence the conclusion one comes to is that the tool is unsuitable for beating-in the pick and was, therefore, not intended for that sort of work. There may be a few of these instruments which can be made to do the work, but in that case it will be because the obstacles I point out are by chance minimised or absent.

The so-called Egyptian weaver's comb, with its parallel semi-teeth, is quite a different article from the Glastonbury tool, and as I have practically shown,[1] is of

FIG. 195A. PERSIAN BEATER-IN. VICTORIA & ALBERT MUSEUM.



no use for weaving purposes on a warp-weighted loom. A similar article to the Egyptian tool, but with full teeth like the Roman "comb" found at Fort Donald, which may have been used on a loom, is the Wilton carpet-weavers' beater-in. As Wilton carpet weaving is an introduced trade, this tool was no doubt introduced with it and can have no connection with the Glastonbury article. We have toothed beaters-in in India, Persia, Asia Minor, North Africa, etc., but some are almost perfectly straight like the Wilton tool, others are bent like the Aures tool (Fig. 91B) or Lahore tool (Fig. 194A), and others again are doubly bent as the Persian (?) tool (Fig. 195A). As to the alleged comb carved on a panel of a bench-end in Spaxton Church, Somerset,[2] all the tools there represented seem to me to be cloth-finishing and not cloth-weaving implements, and the article specially referred to by Bulleid and Gray has the appearance of the brush used for putting on paste on certain cloths. But in any case a woodcut illustration of a church wood carving is hardly sufficiently accurate evidence on which to base or support a theory.

[1] "Bishop Blaize, Saint, Martyr and Woolcombers' Patron," *Proc. Soc. Antiq. Lond.*, 1914 and *Bankfield Museum Notes*, 2nd Ser., No. 6, Fig. 11, p. 31.

[2] J. R. Green, *A Short Hist. of the English People*, illustr. Ed., Lond., 1904, p. 783.

According to the discoveries made on the sites of the Swiss Lake Dwellings,[1] anything like the Glastonbury tool seems to have been very rare—it is possibly mentioned twice. On the site of the Stone Age village of Moossee, where no record is made of metal articles, nor spindle-whorls, nor warp-weights, although it is highly probable weaving was carried on there, " a comb of yew-wood, $2\frac{1}{2}$ inches (or 7·6 cm.) broad and nearly 5 inches (or 12·7 cm.) long " was found.[2] It is depicted as flat, with nine very regular teeth or eight dents, which, if intended for beating-in, would indicate about 3·2 warp to the inch,[3] so that the author appears to be correct in stating that it "was probably used as a comb for keeping up the hair." From the Nussdorf site of a somewhat later age, where no metals were met with, but plenty of spindle-whorls and warp-weights, " three combs were also found, made out of a flat piece of stag's horn."[4] The teeth of the one specimen depicted look decidedly like those of the Glastonbury instrument and the tool is shown to be convex on one side at least. It appears to be about 3 inches (or 7·6 cm.) long and about $1\frac{1}{4}$ inch (or 3·2 cm.) broad, with seven very irregular teeth or six dents, which, if intended for beating-in, would indicate about 4·8 warp to the inch, but, as in the Glastonbury specimens, the dent-heads run out to such a fine point that great difficulty must have been experienced with them if they were used as beaters-in. No such articles are recorded to have been found at Robenhausen, also a Stone Age site of nearly the same age as that of Nussdorf, with traces of bronze and copper, where, no doubt, owing to special circumstances, a large amount of evidence as to the existence of weaving has been found in the form of charred cloth. At this place was recovered an article described as a wooden knife about 6 inches (or 15 cm.) long, which has all the appearance of a sword beater-in,[5] as we see it in Peru, etc. The evidence of the Swiss Lake Dwellings is thus not very illuminative for this our enquiry. There is, however, a big field still open for any investigator who wishes to take up the study of the Swiss Lake Dwellers from the weaver's point of view.[6]

There are two tools which bear a close resemblance to the Glastonbury so-called weaver's comb, viz., the Pueblo Indians' toothed beater-in and the Eskimo skin softener (Fig. 186). The Glastonbury and Pueblo instruments are much alike superficially and hence they have been easily confounded. I have in Bankfield Museum two specimens of the American Indian toothed beater-in, one

[1] Ferd. Keller, *The Lake Dwellings of Switzerland*, transl. by J. E. Lee, 2nd Ed., Lond., 1878.

[2] *Op. cit.*, p. 38, Pl. v, No. 21.

[3] I cannot find in the illustrations of cloths given by Keller any in which two warp are laid through one dent as in the Sangir cloth, Fig. 132A, although naturally this does not mean that the Swiss Lake Dwellers did not use this method occasionally.

[4] *Op. cit.*, p. 119, Pl. xxviii, No. 8.

[5] *Op. cit.*, p. 52, Pl. x, No. 2.

[6] On Pl. xli, No. 9, of Keller's work there is an illustration of an article which is described as a "shuttle," but there seems to be no reason why it should not be called a whistle!

from the Navajos, well finished with seven teeth, obtained by exchange from the American Museum of Natural History, and the other (Fig. 185) a rather crude production with six teeth, given me by Miss Mary A. Owen, obtained from some Apaches, who no doubt adopted it from the Pueblo peoples. The Pitt-Rivers, Oxford, Museum's specimen dated 1884, obtained from the Zuni by Prof. Moseley, is a rough specimen provided with eight teeth. Miss B. Freire-Marreco, of Somerville College, has in her possession a sketch of a fairly well finished one with five teeth seen in use by a Hopi Indian at Oraibo.

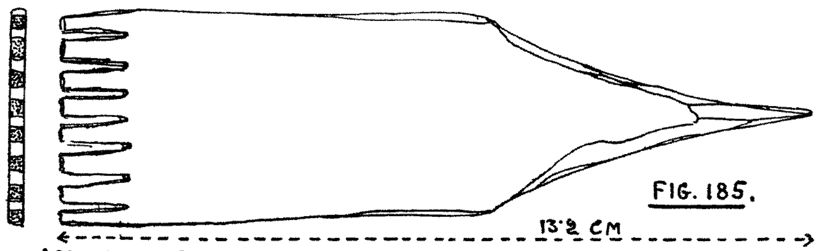


FIG. 185.

APACHE LOOM BEATER-IN —PROBABLY FROM PUEBLO INDIANS — BANKFIELD MUS.

All these tools are more or less flat and have a more open dent head than the Glastonbury instruments. Washington Mathews gives two small illustrations of the toothed beater-in, which he calls a reed-fork ; both are depicted as being flat in section.[1] Miss B. Freire-Marreco, who has studied weaving amongst the Pueblo Indians, very kindly writes me in answer to my enquiries :

" As far as I know, toothed beaters-in used by the Hopi Indians and their Tewa neighbours are more or less flat in section, except for the teeth themselves, which are tapered in section as well as in plan. I know of no direct evidence for the tool being indigenous or introduced into the Pueblo area. On the one hand, the pre-Conquest sites of the Pueblo area have not, as far as I know, yielded specimens of this or any other weaving tool which can be possibly identified as such ; on the other hand it seems highly improbable that the Indians should have derived this beater-in from the Spaniards, who introduced the European hand-loom with swinging reed or batten. On the whole I am disposed to consider the toothed beater-in as indigenous to America. Its use appears to be associated characteristically with the vertical blanket loom of the Pueblo and Navajo Indians, which (in spite of Otis Mason's opinion) I believe to be an entirely native development, rather than with the belt loom (rigid heddle) which Otis Mason shows to be probably derived from European models, for, although the miniature beater-in in the Pitt-Rivers collection is associated with a belt loom, I have always seen the weft of the belt loom pushed home with the fingers without any tool, whereas with the vertical blanket loom the toothed beater-in seems to be indispensable."

[1] *Rep. Bureau of Ethnol.*, 1881-2, 1884, p 382.

Miss Freire-Marreco's experience practically confirms what Washington Mathews tells us about the tool. Although he depicts two of these toothed beaters-in in connection with a belt loom he does not mention it when describing the act of weaving on such a loom, but he does mention its use when describing the act of weaving on a Navajo blanket loom.[1] He tells us the toothed beater-in and sword beater-in are used in ordinary procedure, but that the latter has to be discarded when the cloth is so far finished as not to allow of its insertion any further, for it is too broad for the space left, but into which the toothed beater-in, owing to its narrow flat section, can easily be pushed. It must be remembered, as already explained (vol. XLVI, p. 303, Part I) that the Navajos and other American weavers have a distinct method of beginning their wefting at both ends, or of weaving right up to the warp beam. The toothed beater-in is consequently an instrument specially designed to assist a certain method more or less indigenous to America, and hence it most probably is also indigenous and cannot be the same tool as the Glastonbury and other prehistoric so-called weavers' combs, quite apart from the fact that a concavo-convex implement would not answer the purpose for which the Navajo toothed beater-in is necessary.

I think the above shows clearly that the Navajo toothed beater-in and the Glastonbury alleged "weavers' comb" are quite distinct from each other, and that the latter was not used by weavers for beating in the weft. Such being the case, what was the function of the Glastonbury tool ?

The accompanying illustration (Fig. 186) represents some bone tools used by the Eskimo in skin dressing. They differ from the alleged weavers' combs found in Britain in one respect only, namely, in that a portion of the whole cylindrical bone is used instead of a portion of the longitudinal section ; in all other respects they agree, so that it seems fairly evident that the peculiar implements we are dealing with were used for skin-dressing and that Stevens, in making the suggestion referred to, was correct in his surmise. I think, in addition, that the opinion that these instruments were skin-dressing tools is supported by the fact that so many of the teeth are broken, which would not occur with ordinary beating-in of weft, but would, and does occur, in the hard work the tool is put to in skin-dressing. The natives of South Africa formerly used very hard thorns wherewith to do the work, now they use iron spikes or nails.[2]

While we are told that the Glastonbury folk kept a considerable number of cattle and sheep and goats and, from the quantity of articles made of red deer antlers, we may infer they killed red deer, no mention is made in the Glastonbury Records of the dressing of skins, or of the use of skins in any way. The natives must have had skins, but no doubt all traces of any skin or leather have disappeared long ago and hence the explorers are unable to make any record of them. The natives may not

[1] *Op. cit.*, p. 382.

[2] F. Vaughan-Kirby: "Zululand Skin-Dressing." *Man*, Mar., 1918, 23.

have used skins for clothing purposes, for there is plenty of evidence, in the existence of warp weights and spindle whorls, that they were weavers, but the skins being there must have been made use of and here we have tools which were adapted for dressing the skins and were no doubt used for that purpose. This, so to speak, absence of first-hand evidence of the existence of dressed skins or leather in any form has also, I venture to think, misled Bulleid and Gray as regards the functions of certain pieces of worked wood which, they say, are "presumably parts of looms or appliances for making textile fabric."[1] In Plate LV they show some of this wood

FIG. 186.

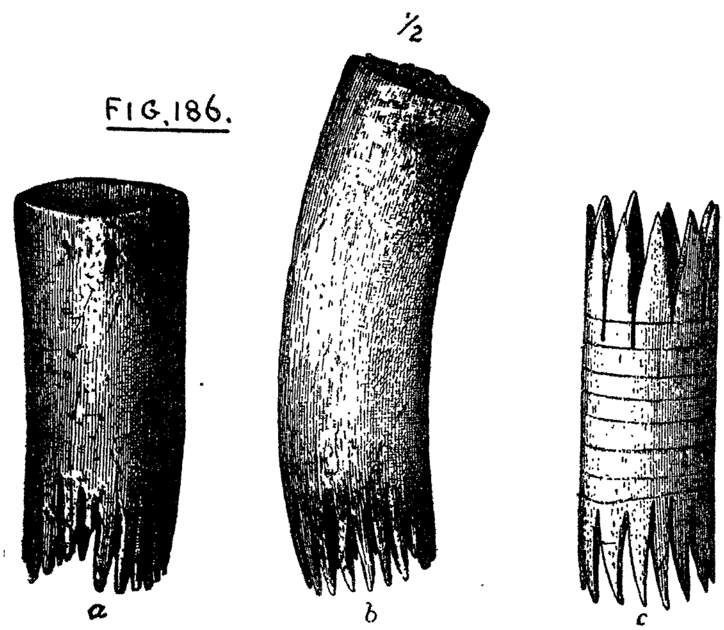


FIG. 301.—Combs for cleaning deerskins.

FROM JOHN MURDOCH'S ETHNOLOGICAL RESULTS OF THE POINT BARROW EXPEDITION. IXTH. ANN. REP. BUREAU OF ETHNOLOGY. 1892. P. 301.

made up into a frame as found *in situ*. I am quite unable to make it serve in any way as a *loom* frame. But if we complete it by merely filling in the twenty small round holes in the frame with pegs protruding on the upper surface we obtain what looks like a skin-dressing frame, such as we find in a primitive form among the Eskimo of Bering Strait as illustrated by Edward Wm. Nelson,[2] which is an advance on the Zulu method of ramming strong pegs into the ground as explained by E. Vaughan Kirby in his paper on Zulu skin-dressing.[3] The two lugs in the Glastonbury frame would not hinder the work of dressing the skin in any way, but

[1] *Op. cit.*, p. 340.
[2] xviii *Ann. Rep. Bur. Ethn.*, Part I, p. 116.
[3] *Man*, Mar., 1918, p. 36.

apart from them the frame is similar in almost every respect to the frame known as a *herse*, used by leather manufacturers in the middle of last century.[1]

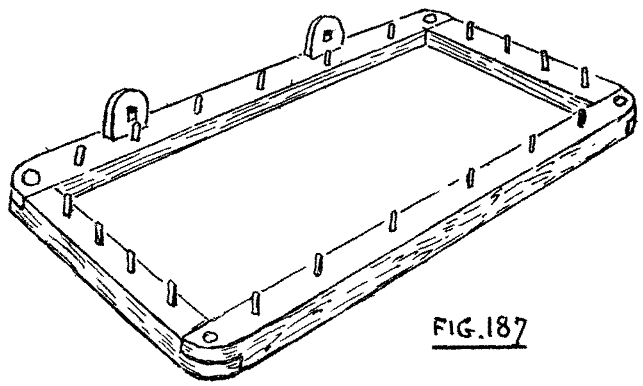


FIG. 187

A POSSIBLE SKIN STRETCHING FRAME RECONSTRUCTED FROM THE ILLUSTRATIONS OF SUPPOSED LOOM PARTS ON PL. LV. OF BULLEID & GRAY'S GLASTONBURY LAKE VILLAGE.

[Although I am obliged to dissent from some of the conclusions arrived at by Messrs. Bulleid and Gray, I hope my so doing will not be construed into any want of appreciation of the excellent piece of work they have accomplished.]

12. CONCLUSION :—ORIGIN AND DISTRIBUTION.

It will be fitting to close these studies with some remarks on the Evolution and Distribution of the Looms which have been under discussion, in so far as there is any evidence to go upon.

Tylor, in discussing the question as to how any particular piece of skill or knowledge has come into any particular place where it is found, says : "Three ways are open, independent invention, inheritance from ancestors in a distant region, transmission from one race to another ; but between these three ways the choice is commonly a difficult one."[2] It is a very difficult one. Not the least obstacle to coming to a decision is the apparent simplicity of the loom in its earliest stages; for so simple does it appear that one is tempted to pronounce judgment forthwith and say such a simple tool must have suggested itself to mankind in the remotest times and hence have had a common origin. On the other hand, being such a simple tool it must have been invented many times over. Origin or Invention must precede Distribution or copying and is consequently more remote and obscure than distribution, which in most cases is so obvious that it tends to increase the obscurity of origin.

[1] Chas. Tomlinson, *Illustrations of Useful Arts and Manufactures*, London [1858 ?], p. 61, Fig. 267.

[2] *Researches into the Early Hist. of Mankind*, London, 1878, 3rd Ed., p. 376.

Origin or Invention requires predisposing circumstances and material, self-control and imagination or mental alertness—the slow progress being due to the fact that the alert-minded portion of the community is generally in a minority. We do not know much about the circumstances conducive to an improvement, nor are we sure we understand the working of the primitive man's mind when brought into contact with circumstances favourable for innovation. It is also an open question whether among primitive peoples every invention is made "into some predetermined form," as maintained by Otis Mason.[1] It may not be possible to get but one result, and in so far the form must be predetermined. Otherwise it can hardly be correct to say the form is predetermined in the inventor's mind. Many inventions are haphazard results; others are results quite different from what was anticipated. Some inventors have only a very hazy notion of what the result is likely to be, whatever object they may have in view, and others again are very clear as to the actual form the invention is to take. Mason is probably nearer the mark when he contradicts himself a few lines lower down, and states that every invention commences "with the relief of discomfort through a happy thought by means of some modification or new use of a natural object." How far physical necessity or advantage urged early man forward is difficult to estimate, for, apart from such pressure, there is the desire to outshine one's fellows—a feeling, perhaps, as strong among primitive peoples as amongst the more highly civilised.

The lower the state of development of a people the lower will be the inventive or progressive situation, so that while we get simple inventions in early times we get simple and complex ones in later times—the reason being that in the later times man has a store of fore-knowledge on which to premeditate. It is not likely to be the case often that man would have the opportunity to invent a complex tool a second time, for complex tools appear late, *i.e.*, when transport, contact, etc., have been quickened, but he can go on inventing new applications of a principle. John Kay invented the Fly Shuttle in 1733, and in so doing adopted the same principle as is used by the Loyalty Islanders in their javelin propeller *Ounep* (Kennedy Collection, Bankfield Museum), of which he could not have known anything. At the start a principle will, generally speaking, not be clear to man, and he will experiment —often, unconsciously, thinking he is doing ordinary work—until out of a hazy conception the principle manifests itself to him. We have seen this in the development of the flying machine. Scheele and Priestley independently discovered oxygen, and Priestley did not know what he had discovered. Darwin and Wallace both formulated the theory of the Origin of Species independently. Professor E. H. Parker has shown that the Chinese script was evolved quite independently of any other.[2]

[1] *Origin of Inventions*, 1895, p. 15.

[2] "The Origin of Chinese Writing," *Journ. Manchester Egyptian and Oriental Society*, 1915-16, p. 61.

In this connection it may not be out of place to bring forward an analogous instance derived from the lower animals. Thus, we find in Insects that the faculty of producing silk has been independently acquired in certain cases. Among the caterpillars of the Lepidoptera, silk is the product of a pair of tubular glands which open into the mouth. The silk is liberated at the apex of an organ known as the spinneret. Among certain of the Neuropterous insects, on the other hand, the silk is derived from glands opening into the hind intestine, the threads being discharged through the anus. Whether the silk is identical from the chemical standpoint in all cases is very doubtful, but this point does not invalidate the analogy. The function of the silk is the same, both among the Lepidoptera and Neuroptera, viz., that of forming the cocoon in which the insect may transform into the pupal stage. When we find the principle of independent evolution among lower forms of life we may expect it among higher forms. Hence we have the two methods of shed making—that of "Carton" weaving (*Tissage aux Cartons*, *Brettchenweberei*) and that of heddle or ordinary weaving.

It is not necessary that inventions of a like nature should all be made at once. A Halifax man, named Hemingway, secured, in 1909, a copyright for a design for an anti-splash sink, that is a sink on which the sides at the top are made to bend over inwards in order to prevent water splashing over. He told me he was led to this invention by noticing the mess made in his scullery by water being splashed on to the floor, and was much astonished when informed later on that the Ancient Egyptians made pots with a rim which had the same effect—probably the forerunner of the vase—which I could show him in Bankfield Museum. Whether this rim was intended by the Egyptian potter to prevent oversplashing when in use we cannot say. It is possible, but, doubtful, whether there may be found in nature two independently evolved organs of like form which have quite different functions. However this may be, the Nicobar Islanders use a back scratcher, *Kanchuat-ok*, which may be correctly likened to a spindle and whorl, the whorl being made out of a disc of coco-nut shell—the specimen referred to is in the E. H. Man Collection in Bankfield Museum. The islanders are, or were, innocent of twisted or spun fibre, using finely split cane instead.

The loom is after all only the frame upon which a principle, weaving, is worked out, and, judging from what has been observed above, there is considerable reason for the supposition that it may have been invented more than once.

When I was in Queensland some years ago, 1878–1884, I found it was common knowledge among bushmen that where the aborigines had been unable to procure European-made axes or knives they had turned to broken glass bottles and converted these into suitable cutting tools. Not only did they make use of old bottles, but on the overland telegraph routes in the early days they used to climb the poles to appropriate the insulators for use as cutting tools, thereby frequently interrupting communications. In some cases they produced from old glass bottles an implement far superior to anything they had ever possessed before. An illustration of such a glass tool is given by Balfour in *Man*, 1903, No. 35. On the other hand, when, in a Reserve, other aborigines were shown how to set potatoes, they dug them up at night and ate them. This apparently contradictory conduct may be explained thus: In the first instance the aborigines had been accustomed to make cutting tools out of certain minerals, and when they found a new suitable material they proceeded to make use of it for the same purpose. In the second instance they knew nothing about setting tubers, or had only the haziest notions as regards planting of seed for the purpose of collecting a crop later on[1]; the prospective benefit of the setting appeared too far fetched to their limited experience and want of self-control, and they vitiated any possible results of their labour by satisfying a more immediate want. The presence of the new material with a cognate pre-existing industry and some mental alertness enabled them to produce an improved article which was a step forward, an invention, while on the other hand a new material without a cognate pre-existing industry failed to excite their imagination or control. In other words, in the discovery of making glass tools they were assisted by a preceding step, while in the potato setting they had no such assistance. To us, with our vast and slowly acquired experience in the matter, the planting of foodstuffs is a reasonable and necessary proceeding, but to these aborigines it was a huge jump from gathering ripe fruits in certain localities at certain seasons, and they had not the power of mind or imagination to carry them so far or to realise what the new action involved. It is when sudden innovations are sprung upon a primitive people that they are staggered —their mental equilibrium gets upset because they are accustomed to go forward slowly step by step. This anti-innovation attitude cannot therefore be attributed to conservatism or obstinacy, as Professor G. Elliot Smith thinks.[2] He points out how dividual this attitude is with many peoples in various parts of the world, which incidentally makes it a fair example of the " similarity of the working of the human mind," with which opinion, however, he does not agree.[3] This attitude is the same as that to which Professor Flinders Petrie refers when summarising the results of his investigations on Egyptian Tools and Weapons and calls the " remarkable resisting power " of certain countries against the introduction of the commonest types. It proves how strong and independent were the civilisations affected.[4] This attitude,[5]

[1] Although on the West Coast of Australia, according to information given me by the late well-known explorer, A. C. Gregory, the aborigines when digging up *ajuca* or *wirang* (wild yams) re-inserted the head so as to be sure of a future crop (See " Origin of Agriculture," by H. Ling Roth, *Journ. Anthrop. Inst.*, xvi, 1887, p. 131).

[2] " Ships as Evidence of the Migrations of Early Culture," *Journ. Manchester Egyptian and Oriental Society*, 1915–16, p. 81.

[3] *Ibid.*, p. 97.

[4] *Tools and Weapons*, London, 1917, p. 65.

[5] In very late or much more civilised times the attitude becomes an economic one. " A peasant does not adopt a new process easily, because he cannot afford risks, while experience

then, which while opposing contact retards distribution, must have considerable effect in permitting the internal slow growing-up of new forms: in other words, must be a stimulus to local origins.

In the case before us the stone tool making industry paved the way for the glass tool industry. This was possibly only taking a first step, but every step, however small, is the forerunner of others, which when they have reached a certain stage are used as landmarks to indicate that a new position or a new form has been attained, which is designated the Origin or Invention of the article involved.

As mentioned at the outset of these papers, the consensus of opinion amongst those who have given attention to primitive weaving is that weaving is indebted for its origin to basketry and matmaking. I am more inclined to think that, owing to the difficulty of making the foundation or centre of baskets, not bags, basketry becomes a side-issue leaving mat-work in a more direct line of evolution from wattle-work. The evolution proceeded probably with intertwined branches to form a breakwind, developing into fairly regular wattle, or more pliable material was brought into use, and then a finer and softer material was used by which mats were produced, the work in the meanwhile dividing into plaiting and plain up and down woven matwork, until for the latter a frame was laid out and the origin of the loom was attained. In the meanwhile spinning in the form of making twine had been discovered and the spun yarn ultimately ousted the non-spun filament used in the matmaking. But long before any such progress could be recorded there were the wattle- or mat-work industries which paved the way. These industries are wide-spread amongst primitive or unrisen people, and the instances are rare in which such people have not yet begun to utilise the natural facilities of their surroundings in order to produce this class of work. Where they have not done so they might have proceeded to do so later on had they been left alone, but the impediment to estimating such a possibility is our want of knowledge of the continuous life of such people, for as soon as we or other races come in contact with them the continuity of their life is broken, the slow step by step Invention ceases, and Distribution with difficulty takes its place.

Throughout the Solomon Islands there is an important matwork industry, not so much of value from the utilitarian point of view as from the decorative point of view, for these people are endowed with considerable artistic feeling. Ornament with them is almost an essential to their well-being. The same material which is used in their decorative matwork is used as warp and weft in their loom. This loom is one step forward from their method of making decorative tubular matwork. In making this one forward step they still continue to produce the same tubular matwork, but now fabricate it on a specially designed frame—in other words, they

shows that an old mode continues to pay." (H. Ling Roth, "Arbère: A Short Contribution to the Study of Peasant Proprietorship," *Journ. Statistical Soc. London*, March, 1885.)

have now invented the loom. As already pointed out, the Solomon Islanders owe nothing to the far-travelled Santa Cruz loom; the whole arrangement, details and method of working of the two frames, are dissimilar, and all they have in common is the qualification that they are both looms. Although not so advanced as the Santa Cruz article, the Buka (Solomon Islanders) loom is clearly an article in the course of being built up as already explained, and the people who make it are, in spite of their savagery, very alert-minded. But the loom is only just a loom and still lacking that essential of all further developments, the heddle, which naturally points to recent evolution, which again precludes inheritance from ancestors in distant regions.

We have, then, the predisposing or preparatory industry in the form of decorative matwork, carrying with it the existence of suitable material, the mental alertness of the people, the extremely primitive form of the loom, freedom from exotic influence, and clean progressive workmanship, which all tend to point to a local independent origin of the Buka loom.

The case of the African vertical mat loom is somewhat different. We do not know how long this loom may have been in existence. The Bushongo have a tradition that a certain chief of one of their allied tribes taught his tribe how to weave, and the other tribes learnt the art from this one. Commenting on this, Torday and Joyce[1] consider that the art was learned before the people settled where they are now to be found. Assuming a possible migration from Ancient Egypt, or assuming a more immediate contact of the Ancient Egyptians and the Bantu-speaking peoples dating back some 4000 years or so, we should expect variations to suit the genius of the adopting party as well as to suit local conditions, and we should expect also to find that the greater the difference between the two, or any two, civilisations, the greater will probably be the variations at the end of the long lapse of time and migration or break of contact. Between Penelope's loom, as illustrated on the Chiusi skyphos and the Scandinavian looms in the Copenhagen or Reykjavik Museums—with a period of remote ancestry amounting to about 2600 years—there is a greater difference than between the Pacific type of loom as it exists on both sides of that ocean, although there is a closer connection between the Ancient Greeks and the Scandinavians than there is between the Ancient Mexicans and those Indonesians who use the Pacific form of loom.

The points in common between the Ancient Egyptian and African mat loom are verticality and the possession of heddles, and, in so far as the working result is concerned, the absence of selvedge in the earlier Egyptian productions. The Egyptian weaver used balls of weft hanging above his head from which he drew his lengths of filament as required, much as the Eastern rugmaker does at the present day: he used no spool in so far as is yet known. The African weaver makes use of an early specimen of the needle form of weft carrier. The Egyptian used fine spun

[1] *Op. cit.*, p. 183.

linen yarn ; the African uses non-spun split palm leaf filament. The African heddles are but two steps removed in development from the first use of fingers in the raising of the warp, and neither in width nor in length can the African loom-woven mat compare with that of the Ancient Egyptian cloth. These Africans have succeeded in producing artistic patterns as well as pile cloth,[1] results to which the Egyptians never seem to have attained, the whole being, of course, based on non-spun filaments. Some of the looms show improvements in detail over others, that is, they show various stages in building up.

If the African loom is the outcome of remote contact with the Ancient Egyptian, one must ask how is it that both Egyptian forms have not been preserved, for the African to-day only uses the vertical and semi-vertical (or semi-horizontal) form and not the horizontal form ? Also, are the divergences and persistences what we should expect to find ? As shown above, what we have reason to expect does not occur. Instead of searching so far afield, let us see what wide local influences may have accomplished. There exists among the Bushongo and the closely connected tribes an intensive and extensive mat-making industry, which owes its existence, continued if not original, to the natural abundance of the material provided by the Raphia palm leaf. Specimens of this mat-work when brought to Europe by the Torday Expedition showed it to be of very considerable merit, and as such proved a surprise to African students, who could not fail to see that here was a hitherto unknown African people which had attained to a comparatively high state of civilisation. The work is also, necessarily, in every respect quite a contrast to the degenerate products obtained from the West Coast.

We have the matwork industry which, with the concomitant suitable material, could pave the way for further developments, the still early form of the loom, the remoteness from a possible prototype coupled with the wide divergences exhibited between the two looms and the clean progressive workmanship, all of which tend in the direction of an independent local building-up rather than to a possible remote exotic ancestry.

The Egyptian wall paintings of the eleventh dynasty, of at least 2000 B.C., illustrate the horizontal form of loom.[2] Those of the eighteenth dynasty illustrate the vertical form of loom. In the interval between the earlier and later representations there was the Hyksos invasion as well as the Syrian campaigns of Thotmes III, with the result that alien people in large numbers began to make their appearance in the country. The Hyksos introduced horsemanship[3] and long

[1] In the Manchester Museum there is a specimen of pile cloth with an old label attached ndicating it to be ancient Egyptian; but Miss W. M. Crompton informs me that the cloth is probably Coptic, and not earlier than A.D. 300.

[2] *Anc. Egyptian and Greek Looms*, p. 41. On line 4 from top, *for* horizontal loom *read* vertical oom.

[3] Breasted, *A History of the Ancient Egyptians*, 1908, p. 184.

range archery.[1] It is possible that these aliens may have introduced the vertical loom. Or the second form may have developed out of the first, for we have indeed an intermediate form of loom among the above-mentioned far-off people, the Bushongo, which rests at an angle of 45° on the ground, the weaver squatting under the incline. There is no evidence to go upon beyond the fact that after a considerable turmoil in Egypt we find a vertical loom where previously only a horizontal loom was depicted. However this may be, Egypt gives us evidence of the existence of looms which goes back to extremely remote times, and the evidence is not outdistanced by that of the Sumerian tablets with their records of weaving work given out. The Egyptians were a progressive people : they had a big mat-making industry and *inter alia* at one period possessed bedsteads of which the foundation was strong twisted filament interlaced at right angles on a rectangular frame.[2] There is, however, a considerable gap between their matwork with its usual non-spun filament, and the linen cloths which have come down to us with their fine-spun filament, and so far we are unable to fill up the gap, but as this is in the line of evolution it presents no great obstacle. If the difference between the two looms is as great as that between the Buka Loom and the Santa Cruz Loom, both as regards form and development, then we can safely say, perhaps, that the Ancient Egyptians invented a loom, which fact would coincide with Professor Petrie's view of the want of Distribution between the two peoples. We have, however, no clue whatever as to the form of the Sumerian loom.

There is a broad, flat, semi-toothed, handled instrument,[3] generally spoken of as a weaver's comb, mentioned on p. 130, which appears to have made its first appearance in Egypt in Roman times, for it is not discoverable in any of the numerous Ancient Egyptian weaving scenes. As we see it, it is, of course, not in its original form, and I believe some writers, including myself, have imagined it to be the forerunner of the reed. It could not have been in use with warp-weighted looms. It may have come into use with the introduction of the cloth beam. I now think this so-called comb, this beater-in, was a special device evolved with the invention of pile rugs or carpets where the old sword beater-in would have the tendency to undo the "knotting." On the other hand, I have outlined above the whole course of the evolution of the reed from a notched stick to the complete article, an evolution which can be seen in full operation in Indonesia at the present day. The reed originated in an effort to keep the warp regularly spaced, and the effort ended up not only in thoroughly accomplishing the desideratum, but, outstripping the inceptive idea, made a perfect beater-in as well. There may

[1] W. M. Flinders Petrie, *Egypt and Israel*, 1912, p. 19.

[2] See the Specimen of a bedstead of the early part of the First Dynasty in the Manchester Museum.

[3] *Ancient Egyptian and Greek Looms*, Fig. 22.

possibly have been an embryo reed in the surmised Egyptian warp spacer,[1] but, as mentioned when dealing with it, we are quite without proof from India or Indonesia which would enable us to say it has travelled from Egypt. The cloth made on these looms is very broad and long, and something more than laze-rods is wanted to keep the warp threads spaced, and hence the invention or perhaps a migration from Egypt in later times. In Nigeria we find a peculiar warp spacer (Fig. 98), used with the vertical cotton looms, which may be an embryo reed.

The Pueblo Indians appear to have invented a special toothed instrument for pressing in the warp, originating in the necessity to overcome the difficulty created by their method of beginning to weave at both ends of the warp, which again may be due to their not using heading-rods.

The shuttle traces its origin to a transverse winding of the weft yarn, which tends to make spool and weft together thicker in diameter than when the yarn is wound round the spool longitudinally. At first sight one would think such a clumsy contrivance a poor sort of invention, for it hindered rather than helped the pickmaking. Its very clumsiness, however, led to the adoption of an easing sheath, which paved the way for the evolution of the modern shuttle. This evolution can be seen in various stages in Indonesia at the present day. Ancient Egypt has so far only produced balls of yarn, and at that stage, to the best of our knowledge, the Egyptians left it when their country was overrun by the Romans.[2]

The rectangular loom frame appears to have sprung from the bringing together and combination of two separately evolved parts of looms, viz., a frame for supporting reed and heddles and their harness to a frame supporting a warp beam. This was in Indonesia. It may very possibly have grown up in another way farther west, which perhaps accounts for its wide distribution in Asia Minor and the Shores of the Mediterranean, etc. Its isolated presence on the West Coast of Africa I have explained as due direct to European influence.

The Ainu have invented a special form of warp spacer, and the Chinese, Japanese, and Koreans make use of a C-spring arrangement for raising the heddles, a form of harness which is peculiar to themselves.

From the above it is clear enough that we have a fair amount of evidence to the effect that some looms and various portions of others have been more or less

[1] *Ancient Egyptian and Greek Looms*, Fig. 23.

[2] In his very useful book, *Tools and Weapons*, Lond., 1917, Professor Flinders Petrie illustrates, on Pl. lxvi, Fig. 127, a weft carrier which he calls a Roman shuttle. As the illustration is too small for examination, he has very kindly sent me particulars from which I gather that the article is an eighteenth-century English shuttle with exotic decoration. Professor Petrie has since further informed me that he does not know the provenance of this shuttle, which was purchased by him. The other weft carrier which he illustrates, Fig. 126, which he calls a shuttle, is a spool, and not a shuttle. Speaking presumably of Egyptian and Roman weft carriers, he says, on p. 53, "Shuttles are rather rare." Unfortunately, so far, none at all have been found.

invented *in situ*, and do not owe their existence to distribution or copying or from contact with other people, nor from remote ancestry. Of other looms, without our being able to indicate their origin, we can safely say that where they are now met with, they have found their way by migration or contact. Such looms are the African Fixed Heddle Loom, the African Pit Treadle Loom, and the African Horizontal Narrow Band Loom, all probably of Asiatic origin. As regards this Narrow Band Loom it has gone through so many changes during its migration that, compared with its prototype, it is almost unrecognisable. The warp-weighted loom was in evidence in Ancient Greece and also in the Swiss Lake Dwellings and England at the commencement of the Bronze Age. We have records of it in Scandinavian Saga in the eleventh century, and it was probably in use amongst the northern peoples several hundred years before then. It has lasted in Iceland until quite recent years, and may possibly still be worked there by the natives of the sparsely inhabited northern coasts, according to information I received, before the War, from Shetland fishermen who had been there.

To sum up, it seems almost as certain as can be ascertained from such limited studies as these that some looms are of independent invention, others are an inheritance from ancestors in a distant region, and others again have been transmitted from one race to another.

ADDENDUM.

Students having asked me to explain the wefting of the looms, Figs. 80 and 81, I give here the method by means of which I have been able to weave on the principle they typify.

I.—THE MADAGASCAR LOOM.—A pick is made in the shed as shown in No. 1. The shed stick A is moved up to the fixed heddle, as shown in No. 2, and a pick made. A is moved back to its position as in No. 1 and the original shed is re-formed.

II.—THE A-FIPA LOOM.—The position of the shed stick B, in No. 1, is obtained by placing it as shown in No. 3, where this shed stick carries on the countershed to the fabric. When position No. 1 is obtained a pick is made in the countershed and B is withdrawn when the shed is formed, as in No. 2; here another pick is made. Then position No. 1 is re-obtained by moving A up to the fixed heddle and carrying the countershed past the heddle by re-inserting B.