

III.

NOTES (1) ON TWO TRIBULA, OR THRESHING-SLEDGES, HAVING THEIR UNDER SURFACES STUDDED WITH ROWS OF CHIPPED FLINTS, FOR THRESHING CORN ON A THRESHING-FLOOR, FROM CAVALLA, IN EUROPEAN TURKEY, NOW PRESENTED TO THE MUSEUM; AND (2) ON PRIMITIVE IMPLEMENTS AND WEAPONS MADE OF FLAKES OF FLINT OR OTHER STONE SET IN WOOD OR OTHER SUBSTANCES. BY LUDOVIC M'LELLAN MANN, F.S.A. Scot.

SUMMARY.

I. *The Flint-toothed Threshing Sledge.*

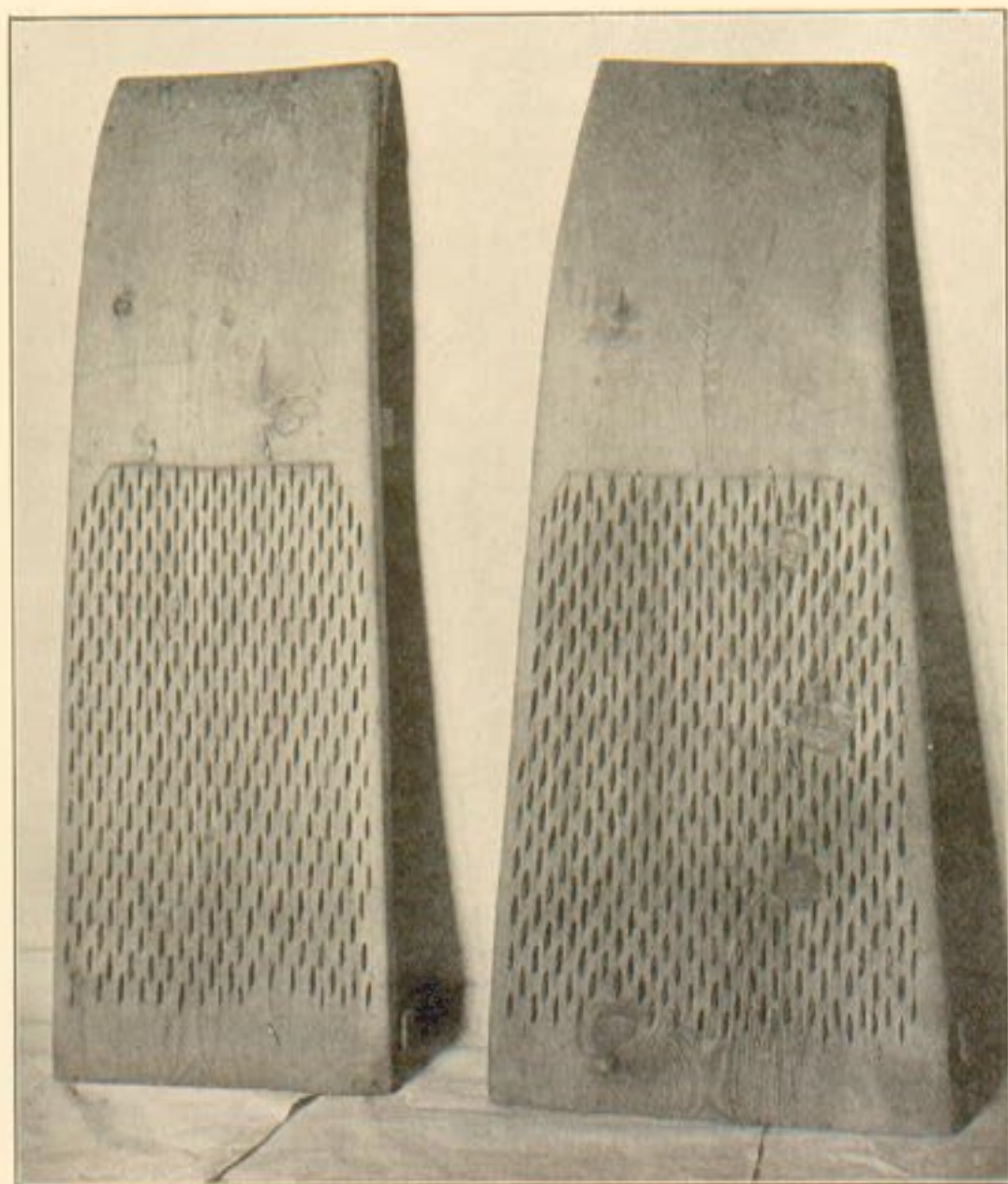
Method of using it—Its dimensions—The threshing-floor—The white ox—The driver—Horses sometimes employed—Teeth sometimes of iron. Stone teeth secondarily worked—How trimmed. The method of fixing the teeth—The *tribulum* probably never employed in Britain—Ancient British harvesting methods—Eastern methods mentioned in the Bible—Classical writers refer to the *tribulum*. This implement not apparently in vogue at Thebes in the 16th century B.C.

II. *Primitive Implements and Weapons made of Flakes of Stone set in Wood and other substances.*

Their classification and purpose—Knives and swords—Ancient American—Ancient Prussian—Javelins, spears, and harpoons—Australian—Ancient Scandinavian—Mexican—Saws and sickles—Prehistoric Italian—Ancient Egyptian—Discoveries of flint flakes in sets—In Northern Europe—In Britain—Fish-hooks—The past and present methods of fixing the teeth contrasted.

Before I left last summer for a journey through European and Asiatic Turkey, Dr Joseph Anderson suggested that I might endeavour to secure a specimen of the flint-toothed threshing-sledge, one of the most interesting of the surviving implements in the construction of which flint is used. In this I succeeded, and I have had the pleasure of presenting two specimens (figs. 1, 2) to the National Scottish Collection. They are probably the first examples sent to Scotland.

As is well known, the threshing-sledge has been in use from very early times in the East, and an instrument which must have been very similar to, if not identical with, the present-day threshing-sledge is mentioned in the Bible and in other ancient writings.



Figs. 1 and 2. Two Threshing-Sledges from Cavalla, each about five feet in length, showing the under surfaces set with chipped flints.

The sledge is drawn by draught animals over the material to be threshed, which is spread in the open air upon a prepared floor. The sledge, by the bruising action of its teeth, separates the grain from the ear. It also at the same time cuts the straw into short lengths.

The modern threshing-sledge, armed on the under side with flakes of stone, and having a different name in various parts of Asia and the Mediterranean countries, seems to differ in no way in each country, and must be almost identical with the *tribulum* of the Romans, and may have been like the *moreg* of the Hebrews.

The machine is still used in some parts of Turkey, and is there called "duyen." It varies slightly in size, and is a slab of wood usually 5 feet long, 3 inches thick, and varying in width from $1\frac{1}{2}$ to 2 feet. It is rectangular, but narrows slightly towards the front portion, which is recurved upwards a little. On the upper side are two cross bars, usually of wood, rarely of iron, while about three-fourths of the under face (comprising the middle and back or rear portions) is set with about 350 flakes of flint, quartz, or other hard stone. The pieces of stone protrude from the face about $\frac{1}{2}$ to $\frac{3}{4}$ of an inch, and are set at short distances apart and in diagonal rows. The specimens obtained for the Scottish National Museum differ slightly in size; the larger was said to have been used with a horse, the smaller with a couple of oxen. I bought them on 14th October 1903 from Mr Almed Hamdy, at his farm of Tcharpinti, about two and a half hours' drive north-east of Cavalla, European Turkey. While the specimens bear traces of wear, they are in good condition. Mr Hamdy had several toothless specimens in his steading. It is no doubt a weakness of the "duyen" that the teeth break and become dislocated after much usage.

The "duyen" is used on a prepared circular space of ground. The space is cleared and smoothed, and is then covered with a plaster of reddish moist clay, which soon dries and becomes as hard as brick. The larger the area, the more expeditiously is the material threshed. Round the outer portion of the area the grain (barley, rye, or oats) or beans is strewn—of course each crop being operated separately. The

stalks are placed, to a depth of about $1\frac{1}{2}$ feet, parallel with the radii of the circle, with the ears or seed receptacles inwards. The sledge is then driven round, over the material, yoked usually to a pair of white oxen—the white ox is preferred, as it has a lighter tread than the heavier and slower-moving black ox. The driver occupies the front portion of the sledge, while a large stone is placed at the other end. The stone gives additional weight to the back portion of the sledge, and allows the machine more easily to surmount obstacles such as extra high piles of straw, when, at such a juncture, the driver moves backwards for the moment and lightens the front portion as it rises. The Turkish boy is often allowed to take the place of the stone, much, of course, to his delight. After about half an hour the direction of the machine is reversed. As the sledge is driven round, an assistant is busy with a wooden fork turning the material, exposing and re-exposing the ears to the action of the flint teeth. The machine is occasionally stopped for a few minutes, when the opportunity is taken to build up the material, which should lie about 2 feet deep. Three or four times is this building up necessary. Sometimes on the same threshing-floor two sledges are used at the same time, each going in opposite directions, and of course following paths at different distances from the centre of the circular space. In this case two assistants are employed to turn the material. Where the amount of material to be threshed is very great, the floor is made so large as to accommodate at one time three, four, and even many more machines. From time to time the grain and chaff are swept into a heap at the side and the straw or stalks into another. After a sufficient number of successive rounds of the sledge there is found to be no grain in the stalk, and the operations, it is said, are so perfected that scarcely a single grain is lost. A stone roller is sometimes used to press down the straw first of all, especially if the material is difficult to work, as is the case should many weeds be present; and again, at the finish, the roller is used to bruise and loosen any grain which may still adhere to the ear.

While oxen are often employed to draw the machine, horses are

sometimes preferred, as they go more quickly and their feet assist the triturating process more than the feet of the oxen. The horse employed is a small hardy animal called the *Hergale*. It is seldom used for other work, and most of its energy is used up in drawing the threshing-sledge, which is, of course, a heavy drag. At times two horses are yoked together and draw two sledges. The smaller size of sledge is used in this case. The horses are said to be preferred unshod, but as a matter of fact the peasants are often too poor to have their horses shod.

In some parts of Turkey the sledge is armed with teeth of iron instead of flint or stone. The iron teeth seem to be large nails turned over. It is said that the stone teeth do the work better. If the iron teeth are placed as closely together as can be done with the flint teeth, it is found that the wood tends to split. The iron nails must therefore be set well apart, at intervals of about 4 inches, rendering the iron-toothed threshing machine less efficient than the machine with stone teeth. Again, the iron nails being so far apart do not cut the straw well, and the oxen do not care for the long pieces of straw which are produced. Another disadvantage of the iron nail is that it requires re-bending occasionally.

The "duyen" is made in various places in Turkey. The Pomaks, a people of Bulgarian origin, and who speak that language, make the machines near Eskidsche (Xanthi), where wood is plentiful.

As the flint teeth are of considerable value, and as they are apt to fall out when the machine is in use, a note is taken before beginning work for the day of the number of missing teeth, and a similar reckoning takes place at the close of the day's labour. If any should have gone amissing that day a lookout is kept, and the dropped teeth are often recovered at some stage or other of the operations. Lost teeth recovered are occasionally re-inserted by fixing them with rags.¹

¹ Specimens of the teeth of the "duyen" used in threshing operations in the neighbourhood of Smyrna, and brought accidentally to Scotland with harvested material, have been presented to the National Scottish Collection. *Proceedings*, vol. xxxvii, p. 241.

Recent writers on British Prehistory¹ refer to "the practical certainty that flakes for the *tribulum* would not possess fine secondary workings on their edges."

Now, looking to the severe work to be done by the flakes, it seems, on the contrary, to be probable that anciently every means of strengthening the exposed or bruising edges, if not also the other sides, of the flakes would be adopted, and this could best be done by trimming the edges. As a matter of fact the modern flint flakes are finely chipped by a secondary process, and this flint-knapping operation I witnessed at Broussa, an inland town in Asiatic Turkey, where some of the sledges are made. The workman squats on the earthen floor of his workshop. To his right, conveniently placed, lies a supply of roughly-shaped flakes. The flakes may be of some hard stone other than flint, and the material I saw used was quartz. Before him is an upright wooden stake, 3 or 4 inches in diameter, firmly embedded in the ground and rising above it about 7 inches. Inserted firmly, centrally and upright on the top of the stake, is a long iron nail with a small squarish head. The head of the nail is his anvil, and resting with his left hand the edge of the flake upon it, he strikes the portion of the edge to be removed with a mallet held in his right hand, and having a 6-inch shaft and a rather heavy iron head. Curiously, the quartz seemed to have worn away the iron to a considerable extent, as the iron head of the mallet I saw used had a large hollow worn in it on one side. At each stroke the position of the flake is slightly changed so as to bring another and neighbouring portion of the edge into the line of action of the mallet. In this manner working round the flake a finely wrought and usually symmetrical edge is obtained. When finished, the flakes are roughly oval, about 2 inches long, 1½ inches broad, and ¼ inch thick. Some specimens made in my presence are now in the National Scottish Collection.

I was informed in European Turkey that the prepared slab of wood

¹ *Neolithic Man in North-East Surrey*, by Messrs Walter Johnson and William Wright, 1904, p. 85.

is immersed in water for about ten days. When thus softened and swollen, holes are punched, or cuts made, in the portion which is to be armed with teeth, and the teeth inserted. The slab is then allowed to dry in the sun, when it gradually shrinks, causing the teeth to become firmly fixed in the wood. In Broussa, I was informed, however, that the method there practised is to use the wood green, and that as it dries the teeth become securely fixed in it.

Some writers have been bold enough to hint that the *tribulum* was used in Roman, and even in Pre-Roman, Britain. The evidence in favour of a Romano-British *tribulum* consists mainly of one fact referred to by Sir John Evans,¹ that rudely-chipped splinters of flint have been found in South Britain, on sites of Roman occupation; for example, in Wales, in Sussex, and at Reculver and St Albans. Again the same writer,² when discussing the harvesting methods of the Britons, states that "whether they made use of the *tribulum* before Roman times is doubtful."

I think, however, it can be shown to be extremely improbable that the *tribulum*, or even the treading-out process by animals' feet, was employed at any time in the British Islands. Pytheas, writing in the fourth century B.C., Belerion a little later, and Diodorus Siculus in the first century B.C., allude to the contemporary British methods of harvesting, and agree in mentioning that the ears of corn were cut off and stored and taken out of store from time to time as supplies were wanted. Presumably the straw, if preserved or used at all, was kept apart.

Now, the *tribulum* performs at one operation two functions—by bruising the ears or seed receptacles it loosens the seed from its covering, and it cuts up the straw. If the thresher has, however, to deal only with detached ears instead of ears and straw together, he has less inducement to use a *tribulum*-like machine, and therefore probably he did not use one in such circumstances.

In the lands bordering upon the Mediterranean, and in the East,

¹ *Anc. Stone Imp.*, p. 283.

² *Anc. Bronze Imp.*, p. 202.

the threshing-floor, as can be demonstrated, was in the open air from apparently the earliest times, but in Britain and the north-west of Europe the colder, more humid and changeable climate would render impracticable, as a rule, any such open-air threshing processes.

Information as to the methods of grain-threshing in ancient times in the East may be gleaned from various passages in the Bible and in classical writings, and from ancient Egyptian sculpturings.

While the barn was clearly a covered-in space, the threshing-floor was in the open air. The building of an altar on a threshing-floor¹ may indicate this, and the references to the wind carrying off the chaff from the floor point to the same conclusion.² Good evidence that the operations were carried on in the open air is that oxen and heifers were used, and are referred to as treading out the corn.³

Iron seems sometimes to have been anciently used for the teeth of the threshing implement.⁴

Varro (B.C. 60—A.D. 28) in one brief passage⁵ tells that “they make a table (*tabula*) pointed with stone or iron, upon which is placed a driver and a great weight, and which is drawn by draught animals yoked together in order to break down the ears of grain.” Other ancient writers refer to the same operation.

Only one threshing process—the treading-out by animals—is represented in the detailed scenes of harvesting represented on the tombs at Thebes⁶ assigned to the 18th dynasty—*circa* 1500 B.C. There seems indeed to be no evidence of the use of the *tribulum* in pre-Roman Egypt. In modern times in Egypt a sledge with circular iron plates, the *moreg*, has been used.⁷

If the *tribulum* had been employed in countries having intercourse with Egypt during pre-Roman periods, one is, on first consideration, inclined to believe that it would soon have been introduced into the

¹ 2 Samuel xxiv. 21 ; 1 Chron. xxi. 18.

² Hosea xiii. 3.

³ Deut. xxv. 4 ; Hosea x. 11 ; 1 Cor. ix ; Micah iv. 13.

⁴ Amos i. 3.

⁵ *De Re Rustica*, i. cap. 52.

⁶ See figs. in Wilkinson's *Anc. Egyptians*, vol. ii. pp. 471, 472, 474, 475, 477.

⁷ Wilkinson's *Anc. Egyptians*, pp. 422-3.

Nile Valley, as involving a method of threshing preferable to that of the simple treading-out of the corn by the feet of animals. But as the teeth of the *tribulum* cut up the straw as well as loosened the grain from the ear, it is conceivable that when the straw was desired uncut, either the flail or other hand process was employed, or that the animals were driven over the heap to triturate the material with their feet. Thus, while the treading-out and *tribulum* processes may have been known to the same people at the same period, yet only the one or other of the methods may have been adopted, according as the straw was to be preserved intact or cut up into short lengths.

It is somewhat astonishing at first sight that the threshing-sledge, which receives such hard usage, should have its teeth fixed in the wood without cement. The art of setting flakes securely in wood with the assistance of cement, resin, or other fixing substance may have been known to the early *tribulum* makers before a method had been discovered which rendered the cementing-in process unnecessary. The idea of an implement built up by the insertion of many pieces of stone in a framework of wood or other suitable material prevailed anciently in Egypt and in pre-historic times throughout Northern, Central, and Southern Europe, and until recent times in Northern and Central America, and Australia. The *tribulum* is one of the few surviving instances which demonstrate the power of the persistence of ancient and primitive methods. We have no positive knowledge of the place and period of its origin, but that it cannot much longer survive is certain.

In this connection it may not be uninteresting to review briefly the various implements and weapons in the construction of which pieces of flint or other stone have been used, fixed in a setting or frame of wood, bone or horn. These primitive implements and weapons may be classified as follows, according to the purposes for which they were employed:—

I. *In the chase and in warfare—*

As spears, swords, or javelins.

II. *In fishing*—

As harpoons or spears and as fish-hooks.

III. *In industrial operations*—

As saws, knives, and cutting tools.

IV. *In agricultural operations*—

As sickles and threshing-sledges.

Knives and Swords.—Prescott testifies¹ that the Mexicans “bore a two-handed staff, about 3½ feet long, in which, at regular distances, were inserted transversely sharp blades of *itztli*. The mineral *itztli* (obsidian), the hard vitreous substance already noticed, is capable of taking an edge like a razor, though easily blunted.”

Sir Daniel Wilson² mentions that “the historian of the Iroquois, when describing their arts and manufactures, remarks that in the western mounds rows of arrow-heads of flint-blades have been found lying side by side, like teeth, the row being about 2 feet long”; and quotes as follows from the historian—“This has suggested the idea that they were set in a frame, and fastened with thongs, thus making a species of sword.”

The same writer further³ mentions that the inhabitants of the coast of Yucatan had, as Herrera relates, “swords made of wood, having a gutter in the fore-part, in which were sharp-edged flints, strongly fixed with a sort of bitumen and thread.”

In some specimens of ancient Scandinavian knives the “flint flakes are let in on both edges of the blade.”⁴

In the Berlin Museum, and supposed to have been found in Prussia,⁵ is a lanceolate piece of bone, probably a knife, about 7¼ inches long, approximately oval in section, ¼ inch thick, and at the utmost ½ inch wide. In a narrow groove which has been worked along one of the

¹ *History of the Conquest of Mexico*, J. F. Kirk's revised edition, p. 210.

² *Prehistoric Man*, vol. i. pp. 225-6.

³ *Id.*, vol. i. p. 226.

⁴ Evans' *Anc. Stone Imp.*, p. 294, refers to *Prim. Ants. of Denmark*, p. 17, Nilsson's *Stone Age*, pl. vi., 125, 126, and to Madsen's *Afbildninger*, pl. xl.

⁵ *Archiv. f. Anth.*, vol. v. p. 234, quoted in *Anc. Stone Imp.*, p. 294.

narrow sides is inserted a series of thin flakes of flint, evidently chosen carefully so as to be of uniform thickness, and so dexterously fitted together that their edges form a continuous sharp blade projecting about $\frac{3}{16}$ of an inch from the bone.

Javelins, Spears, and Harpoons.—Among the Australians there are, or were, used small splinters of flint and quartz secured to wooden handles by “black-boy” gum, and forming the teeth of rude saws and the barbs of javelins.¹ Again,² it is mentioned that some of the Australian savages about King George’s Sound make knives or saws and spears by attaching a number of small flakes in a row in a matrix of hard resin at one end of a stick. Spears from Australia, armed at the sides with quartz chips, are in the Blackmore Museum.³

Harpoon heads of bone, 6 to 10 inches long, with a groove on one side, and sometimes on two sides, in which, with the help of bitumen, chips of flint are fixed at short distances apart, the edges of the flakes outwards, have been found in Scania, in the peat bogs of the West Coast of Sweden, and in the Island of Oland.⁴ The Scandinavian harpoon differed from most other implements in which more than one flake of stone or flint was employed, in having the top portion of bone made separately from the lower section of the shaft, which was probably of wood.

Like the Australian spears, some of the ancient Mexican weapons had the wooden shaft or body of their implements and weapons in one piece, and in this was set numerous obsidian flakes. The shaft, when provided (sometimes on one edge and sometimes on both edges) with an armature of obsidian chips, was used as a sword, but when the end of the shaft was, in addition, furnished with a sharp tip of obsidian, the weapon was employed as a spear, dart, or javelin. The splinters of obsidian were usually set in grooves a short distance apart, the sharp

¹ Wood, *Nat. Hist. of Man*, vol. ii. pp. 36-38, referred to in Evans’ *Anc. Stone Imp.*, p. 227.

² In *Anc. Stone Imp.*, p. 293.

³ *Flint Chips*, p. 218.

⁴ Nilsson’s *Stone Age*, pp. xlvi.-xlviii., pl. vi. figs. 124-126, referred to in *Flint Chips*, pp. 218 and 300.

edges outward, but sometimes, according to Hernandez, the splinters were fixed in holes with a kind of gum.¹

Saws and Sickles.—Dr Robert Munro² has brought to light the existence in a private collection in Italy of a prehistoric saw or sickle. It consists of several serrated flint flakes fixed in a row in a semi-circular wooden handle, and was found many years ago at Polada.

In Egypt, during the fourth and many succeeding dynasties, curved pieces of wood with grooves into which were cemented rows of notched flint flakes were used, probably as sickles, and possibly as saws. Pictorial representations of them have been disclosed, and actual specimens, some complete, have been discovered.

As the shape of these implements very much resembles that of the jawbone of a horse or other large quadruped, it is not impossible that such a bone with its complement of teeth gave the inventor the idea that a useful implement could be produced were he to copy the shape in wood and substitute for the teeth a row of flint flakes. Professor Petrie³ described the notched flakes used in one specimen as "fine and thin," and that "the groove is filled with a grey brown cement to hold the teeth, formed of clay or mud and gum or glue. A quantity of this cement is smeared over the junction of the wood and the teeth, and resembles, and apparently does some of the duty of, the gums in animals. The teeth are buried in the groove, which in the Kahun examples was cut by metal chisels, and, so far as can be seen, the groove did not exceed half an inch in depth. A quarter of an inch of the flake was overlapped by the 'gum,' and about the same quantity projected. These measures are for the centre of the groove."

Isolated notched flint flakes, conjectured to have formed part of some

¹ *Rev. Med. Nov. Hist. Thes.*, Rome, 1651, mentioned in *Flint Chips*, p. 297, in which work is also given a full list of reference to drawings of the Mexican obsidian-armed sword in Lord Kingsborough's *Ant. of Mexico*. Attention is also called in *Flint Chips*, p. 297, to General Pitt-Rivers' description of the same weapon in *Prim. Warfare*, in the *Jl. Roy. United Ser. Inst.*, Dec. 1867, p. 635.

² *Preh. Prob.*, p. 309.

³ *Illahun, Kahun and Gurob*, 1889-1890, p. 54, see pl. vii., No. 27.

such implements, have been found on the supposed site of Troy, and at Helouan and other places in Egypt.

Crescent-shaped serrated blades of flint, probably used as knives and at times as saws, which have been discovered in Northern Germany and in Scandinavia, are frequently found in pairs, one being smaller than the other, and Professor J. J. Steenstrup mentions that many appear to have had their convex edges inserted in wooden handles. They were probably often so used in sets of two or even more blades.¹

If more than one serrated flint flake (excepting the rare hollow serrated scraper of flint) is found in a deposit, even in Britain, it is not impossible that the flakes may have formed part of such a compound implement.

The following cases of the finding of a plurality of serrated flints on British sites may therefore be of interest.

Place.	Number of Serrated Flakes.	Reference.
Barrow at Rudstone, E. R. of Yorkshire.	79	Greenwell's <i>British Barrows</i> , p. 262.
Another at same place.	5	<i>Ibid.</i> , p. 252.
Another at same place.	Seven with a jet armlet, all "mixed with the material of the hill."	<i>Ibid.</i> , p. 251, and Edward Tyndall in <i>Arch. J.</i> , vol. xxvii. p. 74.
Barrow at Seaford	5	<i>Suss. Arch. Collens.</i> , vol. xxxii. p. 175.
Wigtownshire.	Five, with other flints and an urn.	Record not yet published.

Fish Hooks.—From a grave in Greenland is recorded "a fishing hook, the stem formed of bone, and the returning point made of flint bound

¹ Evans, *Anc. Stone Imp.*, p. 297.

at an acute angle to the end of the bone."¹ The fishing hooks of modern primitive tribes, to be seen in most ethnographic collections, have, however, seldom any of their parts of stone, the material of the barbs being either bone or shell.

Mr W. J. Lewis Abbott² suggests that the long, very narrow, pin-like, secondarily worked flints, now so frequently found in many parts of the British Islands and elsewhere in Europe, and in Asia and Africa, may have been used to form fish hooks.

On a prehistoric site in Wigtownshire, I discovered in 1901 two examples of these long, very thin, secondarily worked flints lying only two or three inches apart—that is, so closely together as to give rise to the suggestion that they had formed parts of a composite flint implement.

It is possible that several of such pin-like flints may have been inserted more or less upright in a frame or plaque of wood or bone, and used in some heckling or teasing operation, or in the converse process of building up a fabric or ligament, as in the modern instances of lace-making and plaiting-work.

It will be seen that there is evidence that in some of these cases the pieces of flint or other stone were fixed in a frame by means of thongs or some cementing material, and that the methods of prehistoric and modern primitive peoples do not appear to embrace the ingenious method in use by the modern makers of the flint-toothed threshing-sledge, who either use the wood green, or moistened before the insertion of the splinters of stone, and who rely upon the subsequent shrinking of the wood. It would be hazardous to state, however, that this last-mentioned method was unknown in prehistoric times, as naturally implements containing teeth inserted without cementing material would not so readily survive in their entirety to demonstrate the exact method of their fabrication.

¹ Klemm, *Cultur Wissenschaft*, vol. i. p. 61, and quoted by Evans, *Anc. Stone Imp.*, 2nd edition, p. 294.

² *Jl. Anth. Inst.*, vol. xxv. pp. 122, 137, and referred to in Evans' *Anc. Stone Imp.*, 2nd edition, p. 325.