THE ELLICE ISLANDS CANOE.

It was found inconvenient to make a study of the canoes of all islands of the Ellice Group, so, for the purposes of this paper, only those of one island, viz. Vaitupu, were studied in detail. Owing largely to the facilities of inter-island communication of latter years, the differentiations in construction that may have developed on isolated islands are now to be found in the various styles in use among different families on any one island. The island of Nui, the people of which are descended from Gilbertese stock, is excepted from the above statement. Gilbertese innovations may, through communication with Nui, have been incorporated into the true Ellice Islands canoe, but it has been impossible to estimate the extent of Gilbertese influence, since no opportunity has occurred of studying the construction of the Nui Island canoes.

The large sailing-canoes of ancient times *(lualua* and *foulua)* are now no longer made. Tradition merely preserves incidental details of their construction such as that method of lacing the planks known as *fou take.* The canoes at present in use on Vaitupu are dugouts, and may be classified in three divisions. The local names will serve readily to distinguish the one from the other.

(i) The *Vaitupu* type. According to local builders this is the traditional type of the Southern Islands.

(ii) The *Nanumea* type. Named after the northernmost island of the group. This type which is now becoming popular in the southern islands is said to be the traditional type of the northern islands of the group.

(iii) The *paopao. Paopao,* in the local dialect, signifies a small canoe of any type. *Paopao,* except in the few instances in which they are intended for use in the open sea, are roughly and somewhat carelessly constructed.

Trees of suitable proportions and possessing wood of sufficient durability out of which hulls may be fashioned are extremely scarce on all the lagoon islands. The only

trees used in the Ellice Group are *te fetau (Callophyllum inophyllum)* and *te puka (Hernandia peltata). Kanava (Cordia subcordata),* which is used in the neighbouring Union Group, does not, in the Ellice Islands, attain suitable proportions for canoe-building. *Puka,* although not so durable, is greatly preferred to the brittle and heavy *fetau,* on account of the ease with which it may be worked, its lightness, and its ability to stand rough usage on the reef without cracking. Breadfruit logs have been used successfully, but for obvious reasons their use could not become general.

In ancient times on Vaitupu, it is said, the making of a new canoe was an event of some considerable importance. The skilled woodworker *(tufunga)* of the fortunate family possessing the suitable tree would call in the aid of the *tufunga* of allied families to the number of ten. On the day before that set for the felling of the tree, each *tufunga* would collect and sharpen as many shell and stone adzes *(toki fasua* and *toki uli)* as he could muster. On the following day, all the *tufunga* with other members of their families would proceed to the tree. The members of the family owning the tree would not be present, as it was their duty to provide food for the *kau tufunga.*

The tree was felled by making a series of parallel vertical incisions on opposite sides of the trunk and then chipping away with adzes the solid ridges between these. When the tree had fallen and the log had been trimmed, the leading *tufunga* would decide on which side the keel was to be. This side was turned under and the upper surface *(te alo)* was then trimmed down to what was subsequently to become the gunwale of the canoe *(te ngutu o te vaka).* When this had been accomplished, the *kau tufunga* had a rough estimate of the line on which they were to trim the outside of the body *(te tua).* The log was now turned over so that the keel was uppermost, and was raised a few inches from the ground by two transverse supports called *lango.* The *kau tufunga* took up their positions, one at each end and one or more on each side. The leading *tufunga* indicated port *(ama* or outrigger side) and starboard *(katea).* This was necessary as, although the central part of the body and the rounded keel of that part were trimmed straight with the log, the sharp keel line *(kalisi)* commencing about a

fathom from the bow and terminating at the bow was set parallel with the medial line, but slightly towards the outrigger side, while the other *kalisi,* about three-quarters of a fathom in length, and terminating in the stern, was set similarly to the opposite or starboard side of the central line, Fig. 36. When a certain amount of rough trimming had been accomplished, the log was dragged to a convenient place in the village.

Early in the morning of the following day the *kau tufunga* again commenced work. The exterior was trimmed to its final shape. Here it might be noted that the ideal shape of the Ellice Islands canoe is that of the body of a whale. Some *tufunga* occasionally attempt to fashion a hull after the shape of the bonito *(atu)* or of the *pāla,* but the bodies of almost all canoes bear a strong resemblance to that of the whale *(tafola).* The shell and stone adzes rapidly became blunt, and each *tufunga* fashioning the body was assisted by another who was continually at work sharpening the edges of one adze after another as they were passed to him.

It was naturally to the advantage of the family providing the food to hasten the completion of the work, and in this connection it is interesting to note a traditional saying still quoted sententiously to the malingering *tufunga.*

> " E a te toki e solo nofo!
> E oti ei afea?"
>
> " How the adze creeps up and sits waiting!
> When will it be finished?"

When the outside of the hull had been trimmed to the desired shape, the log was turned over and the *tufunga* commenced to hollow out the interior *(te liu).* Extreme care was necessary for this part of the work, as a single false stroke with the adze might ruin the canoe. Large heavy adzes were used to hollow out roughly the central part of the log, leaving the sides about two inches thick. Small light adzes with a curved blade *(atu pa*—Northern Ellice dialect *fakatipa)* so arranged as to be reversible laterally for trimming either side or the bottom were then employed.

Some ceremonial attached to the conduct of the members of the *kau tufunga* during the course of the work. They lived together, and as stated, were fed by the family whose

canoe they were building. Stipulated quantities of food had to be brought to them at certain times. A quantity of food would be brought as early as possible and offered to the leading *tufunga* who would pray (?) over it. This daily ceremony was referred to as *lotu a toki* (religious ceremony of the adzes). The *tufunga* did not partake of this food, but ordered it away for distribution to their families. They then proceeded with the work. At about 9 a.m. *(fangainga o lupe*—lit. feeding of pigeons) the builders would make their breakfast of a second quantity of food provided. The work would then proceed. During the day two more quantities of food would be brought, one for a mid-day meal *(te kainaki tutonu)* and the other to be eaten on the completion of the day's work *(kai o moe)*. Immediately after this the *kau tufunga* proceeded together to bathe.

Inquiries as to the religious aspect of the ceremony have failed to elicit any information, probably owing to the strict *tapu* imposed by the native Samoan missionaries who christianized the group, on all reference to the customs of ancient times.

In modern times, the procedure is in general the same. Two *tufunga*, however (using modern tools), are usually considered sufficient. The adzes used are made from plane-irons bound to the old-style helve. The reversible adze mentioned above has the traditional helve, while the blade is made from that of a gouge-chisel. In trimming the interior sides and bottom *(te liu)*, the proper thickness is judged by sound. The finger-nail is flicked against the place to be tested and the resulting sound compared with that obtained by flicking another similar place already finished satisfactorily. Sometimes one hand is held on the exterior face to feel the resonance when the interior face is flicked. The upper edges of the sides are made about $1\frac{1}{2}$ ins. thick while the sides themselves are chipped down to little more than $\frac{1}{2}$ in. The bottom again thickens out to 2 ins. or more at the keel-line.

It is rarely a log is obtained of such dimensions and so free from faults that the whole body of the canoe can be fashioned in one piece. The most common fault is a cleft or depression in the surface, which leaves a corresponding depression in the side of the canoe. When the depression occurs near the upper edge, the practice is to cut away the

side at that place. The upper edge is then raised to the required height by superimposing and lacing down a top-strake of the same wood. These raised sides are called *oa*. The sides of a canoe made from a small log are always raised to the required height by means of *oa*. The fitting of the *oa* to the body is an operation requiring nice judgment and skilful workmanship.

The method of trimming any two surfaces to make an exact fit merits notice. The fitting surfaces are trimmed with the adze to the approximate shape. One surface is then smeared with a black mixture of powdered charcoal and water. This surface is then applied to the other, and, on their being separated, the projecting irregularities of the unsmeared surface are indicated by black marks. These black marks are cut away with the adze and the two surfaces are again placed together. This operation continues until one surface makes contact with the other at every point of its length.

On the Nanumea type of canoe, before *oa* are fitted and laced down the limits of the bow and stern covers *(puke-mua* and *puke-tua)* are marked. The *puke-mua* is usually given a length of one fathom *(ngafa tasi)* from the bow, while the *puke-tua* has a length of three-quarters of a fathom from the stern *(fatuli*—i.e. the distance from the finger tips of one extended arm to the flexed elbow joint of the other extended on the opposite side of the body). Further consideration of the two *puke* is deferred in order that they may be described in their proper place in the order of the assembly of the various parts of the canoe.

The *oa*, then, on the Nanumea type of canoe do not project, fore and aft, beyond points marked for the inner edges of the *puke (ngutu-puke)*, but on the Vaitupu type, they may extend to within a few inches of the bow or stern.

The height of *oa* is determined approximately by the height of the knee-joint when the foot is placed on the bottom inside the body. Variations in this measurement, when intentional, are for the purpose of fitting the subsequent height of the seats to the stature of the persons who will normally form the crew. The natives hold the theory that endurance in paddling long distances after bonito is determined largely by a comfortable posture with legs neither too straight nor too cramped. A further consideration which

tends to limit the height of the side is the fact that a canoe with high sides requires long-handled paddles, which are more difficult to wield than short-handled ones. In fitting the *oa* to the sides, both are given a very slight inclination towards the outrigger side in respect to the plane of the medial, longitudinal, vertical section of the body. This inclination, which is so slight as to be scarcely noticeable, is said to enable the joints of the *oa* with their respective sides better to withstand the strain of the outrigger-booms. A method of ensuring rigidity in these important seams is so to shape the fitting surface of the *oa* plank that when placed lightly in position it rests on its ends while the central portion shows a small space between the two surfaces. When the *oa* is laced down to the side there is, then, a permanent tension which helps in resisting the tendency to lateral play under the strain applied by the leverage of the outrigger-booms. Tradition states that in ancient times a strip of pandanus leaf was placed in the seam throughout its length, not so much to prevent leaking as to keep the seam itself dry and so prevent rot. This strip of leaf was replaced from time to time. Modern canoes rely on a coating of coal-tar on the outside of the joint and joint-lashing to perform the same service. In spite of this many modern canoes quickly become unserviceable through softening of the wood and consequent slackness in this region.

The *oa* is held in place before lashing by means of three string-and-wood clamps known as *fakafiti,* one at each end of the *oa* and one in the middle. A *fakafiti* consists of a loop of cord threaded through two lashing-holes in the side of the canoe. The inner and outer sides of the loop are drawn up and clamped over the top of the *oa* by means of two sticks each of which holds the other from slipping out of place. See Fig. 37.

The *oa* is lashed to the side by means of three-ply coconut sennit *(tuli kafa)* passed three *(tua-tolu)* or four *(tua-fa)* times through pairs of holes spaced a short thumb-to-index-finger span *(anga foliki)* between pairs. Usually the hole in the *oa,* in each pair, is situated vertically above the hole in the side and each is spaced about .7 in. from the seam. The sennit is threaded though the holes by means of a needle made from the stem of a coconut-leaf pinnule. Each turn is drawn tightly. The inner end is not knotted

but is caught fast under the second turn. The outer end is drawn several times around the binding-turns in the region of the depression on the outer side of the seam. It is then knotted and neatly cut off. Finally the holes are plugged tightly with wooden pegs *(pono)* which hold the lashing securely and also prevent leakage.

Sometimes it is necessary, before fitting the main *oa*, to build up a piece of the side where it has been cut away on account of a deep depression or other fault in the material of the original log. This inserted piece is known as *te fono*. The word *kautaka* is applied to the projecting bulge on the upper edge of the body which does not lie in the same line as the outer surface of the *oa* (See Figs. 38 and 38a). The obtuse angle formed by the junction of a bulging side and the *oa*-plank, when it is so pronounced as to cause the binding-cords to stand away from the wood, is sometimes packed with a long sliver of *puka* wood (Fig. 39). The purpose of this, one *tufunga* has informed me, is to give the canoe a more finished appearance, but I am inclined to think, having regard to the meagre development of decorative art in the Ellice Group, that the *taka-oa*, as this sliver is called, was originally introduced to pack the lashing and to prevent the knotted outer end of the binding cord from working loose.

Since the order of assembly and the system of determining measurements are, in general, the same for both main types of canoe, I propose, in this account of the making and assembling of the various parts, to confine the remainder of the description to the Vaitupu, or southern islands type and, later, to consider the essential points of difference in the Nanumea, or northern islands type.

At this point in the construction, the canoe has the appearance shown in the outline sketches in Figs. 41 and 42.

It may be well to remark here the shape of the sides of the body as shown in the cross-sectional sketch in Fig. 40. It will be noticed that the lateral bulge *(inaki)* on the outrigger side is in a lower horizontal plane than the bulge *(inaki)* on the starboard side. The explanation of this is that the former is usually the natural bulge of the original log while the latter is purposely made as high as possible in order to resist any tendency to capsize to starboard *(mafuli)*, an accident which frequently happens at exciting moments

when all the crew inadvertently lean over to starboard to watch or take part in some fishing operation.

With regard to the shape of the body, it is necessary to record another point which easily escapes casual observation. A horizontal section at any level within several inches of the waterline of a well-built canoe would show a slightly greater curvature on the outrigger side than on the starboard side. Reference to Fig. 36 will show more clearly what is meant.

I think that this pronounced curvature of the longitudinal arc of the port side and the flattening of that of the starboard side really explains the difference in the levels of the cross-sectional bulges or *inaki* shown in Fig. 40, although *tufunga* on the island of Vaitupu have found the convenient explanation given above.

It is interesting to note that the fast, carvel-built sailing canoes of the Gilbert Islands have the curvature on the outrigger side so pronounced as to give the body an appearance of asymmetry.

The reason for this is obvious. A small piece of wood cut in this shape, but having no outrigger attached, will, when pushed through water, persistently steer towards the straighter side. The body of the canoe therefore has a tendency always to steer away from the outrigger, which tendency in a well-built canoe is exactly counterbalanced by the drag of the outrigger itself.

To proceed with the assembly, the *tufunga*, having fitted and laced down the *oa*, next prepares the booms *(kiato)* and float *(ama)* for the outrigger. All present-day canoes have the boom, and what might be called the boom-leg *(tapuvae)* in one piece. This is obtained from a bough and branch of *pua (Guetarda speciosa)* or *tausunu (Taunefortia argentea)*. The bough must be fairly straight for about a fathom of its length, with a diameter of about 3 ins., and with a substantial straight branch at the outer end. The angle of the branch with the bough may vary for different canoes between approximately 120 and 160 degrees, but the branch-angles of all boughs chosen to make the booms of one canoe are the same. The method adopted by one *tufunga* on Vaitupu to ensure the approximate equality of these angles is to cut first a small bough of *ngasu (Scaevola Koenigii)* having a branch at the angle he requires. This he uses to

gauge the branch-angles of such boughs as he may discover in the bush. The number of booms required for a canoe varies from 1 to 5 according to size. Both extremes are rare. The usual numbers employed on ocean-going canoes are 3 and 4, while lagoon *paopao* are made commonly with 2 or 3. A canoe having 3 booms requires, normally, 4 paddlers *(ta-fa)*, while one with 4 booms requires 5 paddlers *(ta-lima)*.

The outrigger-float is made almost invariably of *puka (Hernandia peltata)*. It may be cut from a bough of the tree from which the body of the canoe is fashioned, but it is sometimes necessary to cut another small *puka* tree.

The float is trimmed to a maximum diameter of from 5 to 9 ins. according to the size of the canoe. It is usually given such a length that the forward end will, when in place, be laterally opposite the feet of the bow-paddler *(tino i mua)*, and the after end opposite those of the fishing captain *(tautai)* who occupies the seat in the stern. The general shape of the float can best be illustrated by diagram (Fig. 43a, b, c and d).

When the float has been trimmed roughly to shape, it is set in position on the port side parallel with the body and distant from it about three-quarters of a fathom *(fatuli*—see above). The forward end is then set in towards the body a short distance that varies with different makers from a few fingers' breadths to a span. Thus in its final position the lateral space between the keel and the outrigger at its after end exceeds its distance from the keel at the forward end. This is a most important point in the construction, as it determines the ease with which the canoe may be turned to starboard when at sea. Reference to the tables of measurement given below will show that of 13 canoes chosen at random from among the canoes at the main village on Vaitupu, all but one (an unimportant lagoon *paopao)* have the forward end of the float nearer to the keel than the after end. I have personally experienced that a canoe with parallel outrigger float is extraordinarily difficult to steer to starboard, although it is quite as easy to steer to port as one with a properly set float. The parallel float, theoretically, offers less resistance to forward motion, but one of the chief requirements in a fishing-canoe is ease of handling, especially when one of the almost daily uses to which it is put is

the hunting of flying-fish at sunset in a precarious position within a few feet of the edge of the reef.

When the float has been set in place, the leg-end *(tapu-vae)* of the forward boom *(kiato)* is cut so that it is about equal in length to the interior depth of the body at the place the boom will subsequently occupy. The body of the canoe is set exactly upright on its keel. Then, from the bow, the positions of various objects of the superstructure are marked.

This is the system used by one *tufunga* in marking the various positions in, for example, a 4-paddle canoe *(vaka-ta-fa)* i.e. a canoe having three booms.

One fathom from the bow a mark is made for the inner end of the bow-cover *(ngutu o te puke-mua)*. Proceeding aft from this mark, another mark is made at a distance of two thumb-joints for the *manu mua* (a transverse stick used as a grip in lifting the canoe).

Three spans aft of the mark for the *manu mua* is the position of the forward boom *(kiato mua)* at present under consideration.

Three-quarters of a fathom *(fatuli)* from the stern is marked the inner end of the stern-cover *(ngutu o te puke-tua)*. One hand's breadth plus extended thumb *(tapalima)* forward of this the position of the fishing-captain's seat *(nofoanga o tautai)* is marked. Three spans forward of this gives the position of the *manu tua* (a transverse stick used in lifting the canoe), while one hand's breadth plus extended thumb forward of the *manu tua* is the position of the after boom *(kiato muli* or *kiato ta-fa)*.

Slightly forward of the central spot between forward and after-booms is marked the position of the central boom. The reason for placing the central boom forward of the central spot is to allow plenty of room to the paddler who occupies the seat on the after-boom whose duty it is to operate the bailer *(te asu)*.

To return to the fitting of the forward boom, the supports *(lango)* are removed from beneath the body of the canoe so that both body and float are resting on the ground, and the body is given a scarcely noticeable inclination from the vertical towards the outrigger. The purpose of this inclination is to set the outrigger booms at a right angle to the vertical plane of the body so that they will be parallel

to the plane of the waterline when the crew is aboard. A well-built canoe, when floating empty, has a cant towards the outrigger. When the crew go agoard, the subsidence of the hull caused by their weight brings the booms into a horizontal position. The amount of cant allowed in thus fixing the outrigger is determined by the length of the *tapuvae* and varies considerably. It can be judged by the *tufunga* only by estimating the probable displacement. The horizontal part of the boom is then placed in the position already marked for it. To make it rest on both sides of the canoe, it is usually necessary to pare the under surface of the boom so that it tapers towards the starboard end.

The after-boom *(kiato muli)* is next fitted. Its leg *(tapuvae)* is cut to fit exactly on the upper surface of the after end of the float when the boom is resting evenly on both gunwales of the canoe. The inner boom is then similarly fitted. The upper surfaces of all booms are kept as nearly as possible in one plane so that the superstructure *(kaupalepale)* and carrying-piece *(sawnga)* will lie evenly along them and so permit of firm binding in this region, a point of great importance to the strength of the whole outrigger.

The booms are now lashed to both gunwales. Usually they are kept square with the medial line, but on some canoes they are set forward at the outer ends so that the angle abaft the boom with the medial line of the body is slightly obtuse. This forward set is scarcely noticeable, but in the cases in which it occurs it is not accidental. One *tufunga* has stated that it assists the canoe-captain *(tautai)* to keep his course against the buffetting of a head sea. Immediately beneath the boom, in the side of the canoe at a distance of about two finger-joints *(e lua fatinga a maikao)* is drilled a hole of sufficient diameter to contain six thicknesses of lashing cord. If the *tufunga's* boring instrument (now-a-days a gimlet) is of small diameter, two holes may be bored at the same distance and spaced laterally by about the thickness of the boom. The lashing is done with three-plait coconut sennit. One end is held on the upper surface of the boom and the free end is fastened to the midrib of a coconut-leaf pinnule and threaded from the inside through the hole in the side of the canoe. It is then drawn tightly up over the boom, catching and holding its own

inner end as it passes down on the other side of the boom, to be threaded again through the hole. The second turn is brought up on the opposite side of the boom from the first turn, and so with alternate turns, so that on the completion of the lashing, the crossed cords on the upper surface of the boom present the appearance of a neat, woven figure (i.e. *e sumu* or *e manu tua o te kiato)*. Six turns *(tua ono)* is the usual number. The lashing is finished by taking two transverse turns round the joint so as to enclose all the vertical lashing-turns, and then several turns around the boom itself, the last of which pass over and secure the free end of the cord. In those cases referred to above in which two holes are bored in the side of the canoe for each boom-lashing, the turns seen from the side have a forked appearance (See Fig. 44b) and this style of lashing is consequently known as *manga-lua* (forked).

The next operation is the lashing of the float to the ends of the boom-legs. There are two methods by which this may be accomplished. The first and usual method is by means of pegs *(suki, tuki* or *tona)* driven into holes around the periphery of the lower end of the boom-leg which is then lashed to them with three-plait sennit. The second method is by drilling a downward slanting hole from each side of the float in such a way that the two holes meet immediately under the boom-leg, which is then lashed by many turns of cord passed alternately round the leg and through the drilled passage in the float. This method is seldom used now-a-days.

For the pegging method, one, two or three pegs may be used for each boom-leg. The traditional number for the northern islands style of canoe was three, and that for the southern islands two. I have seen one example of a strong ocean-going canoe utilizing only one peg for each boom-leg (Fig. 46). Typical arrangements of pegs are shown in Fig. 45a, b and c. The heads of the pegs are made to slope from the perpendicular outwards in respect to the boom-leg; this prevents the lashing from working upwards. It has also the effect, I presume, although the *tufunga* do not say so, of wedging the pegs and so preventing their becoming loose in their sockets. The lashing of the boom-leg to the pegs is first by the figure-of-eight method, each peg in turn with

the boom-leg. The number of turns varies with the thickness and strength of the lashing-cord, which is of three-plait sennit. Usually the lashing is completed by several turns taken around all the pegs. The free end is bound several times around the boom-leg and secured in the usual manner.

In the second method, employing direct lashing (Fig. 47), the lashing-cord is bound several times round the boom-leg, then taken through the drilled passage in the float, again several times round the boom-leg and back through the drilled passage in the opposite direction. This is varied with a criss-cross lashing designed to cover the whole of the lower end of the boom-leg and hold it firmly on the flat upper surface of the float. Thus it tends to prevent that lateral motion of the float with respect to the boom-legs which in most cases loosens the lashing and necessitates re-lashing every three or four months. Some canoes employ both methods, one or more boom-legs being lashed directly by means of holes drilled in the float and the remainder being lashed to pegs.

The small lifting-grips *(manu)*, mentioned above and shown in Fig. 48, are often set in place before the booms. They are lashed to the gunwales in a manner identical with that of the lashing of the booms.

These lifting-grips are usually made of small branches of the *milo* tree *(Thespasia populnea)*.

The *tufunga* next turns his attention to the preparation and attachment of the outrigger lifting-piece *(saunga)* (See Fig. 48). This is made of *milo* wood or *pua (Guetarda speciosa)*. It should be strong enough to bear the weight of the outrigger and long enough to afford a comfortable grip for the left hands of the carriers while their right hands are gripping the lifting-pieces attached to the body of the canoe. It is lashed securely to the outrigger-booms at a distance from the port side of the body that varies with individual requirements from about 14 ins. to 21 ins. The lashing to each boom is composed usually of six turns taken figure-of-eight fashion round both *kiato* and *saunga*.

After the *saunga* is in place a number of small straight branches of the *pua* tree, having an average diameter of less than one inch are bound to the booms, on the farther side of the *saunga* from the body, at intervals that may vary from less than one inch to several inches. These small

sticks form a shelf, or platform, on which fishing lines and other light gear may conveniently be carried. They are named *kaupalepale.*

Sometimes it is necessary to raise the level of the upper surface of one or more booms where they curve away into their respective boom-legs in order to present a level surface for the attachment of the *kaupalepale.* This is done by the insertion of a wedge-shaped piece of *pua* wood known as *te langa* (See Fig. 49).

The outrigger is completed by the attachment of two vertical forks of *tiale (Gardenia taitensis* D.C.), *ngie (Pemphis acidula)* or *milo (Thespasia populnea).* These are best illustrated by diagram (Fig. 46). One is placed at each end of the *saunga* at the junction of the latter with the outrigger boom, to both of which pieces it is securely lashed. They are known as *langa kofe,* and their purpose is to hold the long rod *(kofe)* used for bonito-fishing, or the long-handled net *(tae)* used for catching flying-fish. Their extreme height does not usually exceed 1 ft., while the space between the extremities of the forks, which always have a wide angle, is about 9 ins.

The lifting-grip for the right hand of the person carrying the after end of the canoe is shown in Fig. 48, where it is marked (a). It will be noticed that the *manu* to which it is attached has been allowed to project a few inches beyond the port side of the body. The *saunga* (a) is lashed to the projecting end of this *manu,* and the distance from the side of the canoe is just sufficient to give easy clearance to the fingers using the grip. The forward end of the *saunga* is made to fit flush with the after boom in order to obviate all chance of interference with the free operation of fishing gear.

The lashing employed on this *saunga* is worthy of notice in that it was held, in ancient times, to have some considerable effect on the luck of the fishing. The actual lashing of the *saunga* to the *manu* was known as the *li* of the canoe. It was believed, and there is still some remnant of the superstition, that on the care with which this lashing was made depended the canoe's ability to attract fish. One old *tufunga* informed me that if the *li* were carelessly fashioned, such fish as were attracted to the canoe by the bait thrown out would devour the bait and swim away; but

on the other hand, if the *li* lashing were made with due care, the fish having devoured the bait, would wait angrily for a chance to seize more and so were easily caught. The lashing itself, now-a-days, seems to differ in no wise from lashings already described except that some *tufunga* invariably use only one unbroken length of *tuli kafa* sennit to accomplish the three lashings on the after *manu* (i.e. the lashing to each side of the canoe and that to the *saunga)*.

The bow and stern-covers *(puke mua* and *puke tua)* are now made. They are cut each from one solid piece of the same wood as that used for the body of the canoe. Different styles, and the measurements of the main parts, are shown in the diagrams, Figs. 50 to 53. Both *puke mua* and *puke tua* are attached to the body by tying-strings so that they can be taken off easily when ashore, in order that the canoe may be dried out thoroughly to prevent rot.

The main part of the *puke mua* is the wave-guard *(palengalu)*. This was not found on Vaitupu canoes in former days, but has been borrowed, according to *tufunga*, from Nukulaelae, the southernmost inhabited island.

The raised portions of the *puke tua* named *tokoulu, suke* and *tukungane* are intended, the first for holding the bonito-fishing rod while the canoe is under way (See Fig. 53), and the others for holding prepared bait for line-fishing, etc.

Important differences in the bow and stern-covers of the Northern Islands' or Nanumea type of canoe will be discussed later.

The pointed knobs shown on some of the stern-covers are said to be shaped like a maiden's breasts, and are used in fishing for *pāla* as convenient projections on which to hang the line attached to the bonito-head which is thrown out to attract the fish.

The last operation is the placing of the canoe-captain's seat *(te nofongā o tautai)*. This is sometimes "let in" *(faka-to ifo)* so that the upper surface is level with the gunwale. It is lashed to the canoe by one lashing at each end. These lashings are set rather towards the after-edge of the seat in order better to take the strain of the bonito-rod when this is set in the *mata pili* (See Fig. 48). The lashing-cord is laced several times through two holes, one bored in the end of the seat and one in the side of the canoe.

To the after-edge of the *tautai's* seat is fastened the *mata pili*, a stout sennit ring made by winding about four turns of three-plait sennit *(tuli kafa)* around two or three fingers and then stiffening the ring by a single or double layer of seizing turns. This grummet is lashed to the *tautai's* seat by means of one or two holes drilled in the after-edge of the latter through which are passed several turns of lashing-cord. These lashing-turns are finally wrapped by several turns of the free end of the same cord. The *mata pili* is then held in position as regards its after-edge by means of guide-strings laced twice through small holes in the upper edge of the side of the body near the forward edge of the stern-cover (See Fig. 48).

The butt end of a bonito-rod is placed in the *mata pili* and rested against the highest projection *(tokoulu)* on the stern-cover, the slope is noted and a groove cut of dimensions sufficient to hold the bonito-rod in place.

A loose detachable seat made of *puka*, about .7 in. in thickness and from 4 to 6 ins. wide is sometimes placed on the forward side of each boom where it rests on the gunwales. It is seldom tied down.

THE NANUMEA TYPE.

This type of canoe is commonly found in the northern islands of the group where, owing to a dearth of *puka* trees *(Hernandia peltata)* it is usually made of the heavy, brittle *fetau (Callophyllum inophyllum)*. As previously stated, it is now becoming popular in the southern islands where it is made usually of *puka*. On the island of Vaitupu, this type has so gained in popularity as to occur now-a-days in about equal proportions with the Vaitupu type. Figs. 58 and 59 show an ideal canoe of each type so arranged as to show clearly the principal points of difference in construction.

It will be noticed that all the main differences are in the superstructure. These may be enumerated as follows with initial reference to the Nanumea type.

(1) The bow and stern-covers *(puke mua* and *puke tua)* have deep sides, and are laced permanently to the body.

(2) The stern-cover *(puke tua)* has no *tokoulu*, or built-up rest for carrying the bonito fishing-rod at a trolling-angle while hunting for a shoal of bonito. The place of this is taken by a cross-piece *(lango kofe)* set immediately

in front of the inner edge of the stern-cover. This cross-piece has a groove in the centre in which the rod lies during this fishing operation.

(3) Extending from the raised inner edges of the bow-cover to those of the stern-cover a long straight branch of *fetau (Callophyllum inophyllum)*, trimmed to an even diameter of about two inches, is superimposed on each side. These are known as *kaufuatanga*. They cover the *tautai's* seat as well as all the outrigger-booms at the attachment of these pieces to the sides of the canoe. Each *kaufuatanga* is lashed at both ends as well as at the points of contact with the outrigger-booms, at which points the lashing is usually in one piece with that of the booms.

The details of the lashing, varying as they do with different *tufunga* merit no special notice. All lashings in this, as in the Vaitupu type, are usually made with the strong three-plait sennit *(tuli kafa)*. The less durable two-ply twist sennit *(kolokolo)* is sometimes seen in canoe-lashings but usually in unimportant places or in cases of emergency.

It should here be noted that the *lango kofe* mentioned above is lashed on top of the *kaufuatanga*.

(4) The upper surfaces of both bow and stern are trimmed to the general fish or whale-shape of the body. The stern is often forked like a caudal fin.

(5) There are usually no special lifting grips *(manu)* on the hull, the place of these being taken by the *kaufuatanga*. When a *manu tua* is provided, it is often set obliquely as in Fig. 59.

(6) It is traditional on Vaitupu, though not common practice in building, that the outrigger of the Nanumea type has three pegs to each boom-leg while that of the Vaitupu type has two (See Fig. 45 (c) for arrangement of pegs).

Here occurs a point of some interest. The *kaupalepale*, or platform on the outrigger, although it is identical on Nanumea canoes made on Vaitupu, with that described above for the Vaitupu type, is situated, on canoes actually built on some of the northern islands, between the outrigger lifting-grip *(saunga)* and the *kaufuatanga* on the port side of the canoe. This makes it impossible for the paddlers occupying the seats on the after and central booms to use their paddles on the outrigger side, and consequently renders them more liable to fatigue in paddling long distances.

THE LAGOON *PAOPAO*.

Reference to the tables of actual measurements given below will show that this type of canoe is much smaller than that used for the open sea. It occurs in both Vaitupu and Nanumea types, although the latter is rare, since no bow and stern-covers are necessary on the calm waters of the lagoon. The photograph (Fig. 75) shows a typical *paopao*.

EQUIPMENT.

Paddles—Two distinct types of paddle occur on Vaitupu. A specimen of each type is shown in Figs. 54 and 55; (a) is the common type of paddle, while (b) is a type frequently used by steersmen *(tautai)*. The chief woods used for paddles are *pua (Guetarda speciosa), puka (Hernandia peltata), kanava (Cordia subcordata), tausunu (Tournefortia argentea), milo (Thespasia populnea), fou (Hibiscus)* and *fetau (Callophyllum inophyllum)*.

The Bailer—This is made of any of the woods enumerated above for paddles. All bailers are of the shovel shape illustrated in Fig. 56. The bailer in each canoe is operated by the paddler who occupies the seat on the after-boom. As mentioned above, the space between the after-boom and that immediately in front of it is always greater than the space or spaces between the other booms, in order that the member operating the bailer should have clearance for his arm as it sweeps forward and upward shovelling the water up and over the side.

In this connection, it is interesting to note that the phrase meaning " to bail out " is the same as that meaning " to hollow out the interior " in building the canoe, viz. *o ta te liu.*

Te siki—Each fishing-canoe carries a club *(te siki)*. This is usually a branch of any heavy wood roughly trimmed and having a length of about 3 ft. and a thickness of some $2\frac{1}{2}$ ins. It is used for battering the skull of a large fish before it is hauled into the canoe.

Principal measurements of five canoes of the Vaitupu type, five of the Nanumea type and three lagoon *paopao*, actually in use on Vaitupu in 1928.

VAITUPU TYPE.

Measurements in feet and inches.

No. of Canoe	1		2		3		4		5	
	ft.	ins.	ft.	ins.	ft.	ins.	ft.	ins.	ft.	ins.
Length in feet	29	8	28	7.9	29	0.9	25	1.2	19	3 3
Maximum interior width of gunwale		14.9		13.3		14.1		13.5		13.2
Maximum interior width of body		18.2		16.9		20.1		15.5		14.2
Width of body at inner end of bow-cover		13.4		13.5		16.1		13.2		10.9
Width of body at inner end of stern-cover		11.6		13.5		13.6		11.3		8.9
No. of *kiato*		4		4		4		4		3
Dist. of forward boom from bow	7	6	7	7.5	7	7.1	7	8 9	6	1.2
Distance of after boom from stern	9	3	9	4.4	8	6.9	8	2.9	6	10 9
Average space between booms	4		3	7	4	0 5	3	10	2	11.2
Angle of boom with *tapuvae*, in degrees		140		145		125		120		140
Length of central boom from port side of body to angle with *tapuvae*		22.5		26.6		38.5		36.1		31.7
Length of *tapuvae*		25 5		24.7		21.7		18.2		19.7
Length of float	15	2	14	0.5	16		11	8.2	9	1.5
Greatest diameter of float		8.3		8.5		7		6.7		6.7
Lateral distance of float from keel—										
(a) forward	4	6.9	4	6.3	4	8.2	4	2.7	4	3.6
(b) Aft	4	9.9	4	9	4	11.6	4	5	4	6.2
Space between *saunga* and port side of body		14		18.7		21.7		21.5		17.8
Bow to inner end of bow-cover	4	1	4	11.1	5	3.7	5	6.3	3	5.5
Stern to inner end of stern-cover	4	3	4	11.2	4	2.5	4	4.2	3	4.5
Depth of body—										
(a) Central		19.8		20.6		20.9		18.2		15.1
(b) At inner end of bow-cover		17.5		17.5		17.8		15.2		14.5
(c) At inner end of stern-cover		14.7		16.1		15.4		12.6		12.8

NANUMEA TYPE.

Measurements in feet and inches.

No. of Canoe	1		2		3		4		5	
	ft.	ins.	ft.	ins.	ft.	ins.	ft.	ins.	ft.	ins.
Length in feet	29	7	26	0.2	25	11.1	28	3.5	13	9.3
Maximum interior width of gunwale		14.2		12.7		12.5		13		11
Maximum interior width of body		18.2		14.8		16.2		15		12.1
Width of body at inner end of bow-cover		12.2		12		11.1		11.6		9.6
Width of body at inner end of stern-cover		9.4		9.1		9.3		10		6.9
No. of *kiato*		4		3		3		4		2
Dist. of forward boom from bow	7	11	8	0.2	8	5.7	8	5.5	4	5
Distance of after boom from stern	9	1.5	9	10.5	9	0.2	9		4	4.7
Average space between booms	4		3	10	3	11.5	3	4	4	8.8
Angle of boom with *tapuvae*, in degrees ..		140		145		145		130		155
Length of central boom from port side of body to angle with *tapuvae*		27		26.3		30		29.7		25
Length of *tapuvae*		20.9		25		23.2		23		20.5
Length of float	16	0.5	11	7.7	11		12	11.2	7	4.5
Greatest diameter of float		7.1		7.6		7.5		7.5		6.3
Lateral distance of float from keel—										
(a) Forward	4	4.2	4	5.7	4	6	4	3.7	3	9.2
(b) Aft	4	9.9	5	1.6	4	10	4	9.3	4	1
Space between *saunga* and port side of body		17.7		17		20.2		19.5		17
Bow to inner end of bow-cover	5	1	4	3	4	5.3	4	7.4	3	
Stern to inner end of stern-cover	3	1	2	9	3	8.8	3	3.2	2	2.9
Depth of body—										
(a) Central		22.4		18.6		17.8		19		14.2
(b) At inner end of bow-cover		17.5		17		15.5		16.5		14
(c) At inner end of stern-cover		13		12.4		14		12.7		11

LAGOON *PAOPAO*.

Measurements in feet and inches.

No. of canoe	1	2	3
	ft. ins.	ft. ins.	ft. ins.
Length in feet	15 7	17 8	14 5.2
Maximum interior width of gunwale	12	12 5	10.2
Maximum interior width of body	13.7	14.2	11.9
Width of body at inner end of bow-cover	10	11.4	9.2
Width of body at inner end of stern-cover	9.2	10	6.4
No. of *kiato*	3	3	3
Distance of forward boom from bow	4 3.5	5 4	4 7.6
Distance of after boom from stern	5 5	6 0.2	4 5
Average space between booms	2 8	2 11	2 5.8
Angle of boom with *tapuvae*, in degrees	135	155	150
Length of central boom from port side of body to angle with *tapuvae*	27.2	25.7	27.9
Length of *tapuvae*	20	20.3	14.2
Length of float	7 2	8 4.3	7 2.1
Greatest diameter of float	5.5	6.3	5.9
Lateral distance of float from keel—			
(a) Forward	4 0.5	4 2.4	3 8
(b) Aft	4 1	4 2.3	3 9.7
Space between *saunga* and port side of body	15.4	——	16.3
Bow to inner end of bow-cover	——	——	3 1.3
Stern to inner end of stern-cover	——	——	1 11.9
Depth of body—			
(a) Central	15	15.7	13.6
(b) At inner end of bow-cover	12.8	13	11.3
(c) At inner end of stern-cover	10.6	11.3	8 9

DIFFERENTIATIONS.

The canoes made on one island seem to preserve the same general proportions as regards the relative size and position of the various parts. The canoe-builders in each family group, however, have their own inherited style and any experienced *tufunga* can recognise at a glance certain peculiarities of workmanship which indicate the family by which a canoe has been produced. Most of the idiosyncrasies and small departures from the composite or ideal type which make possible this recognition are scarcely worthy of notice. There are two family traits, however, that merit description. One is the employment of a double after-boom as shown in Fig. 58. The additional boom is

spaced some four to six inches forward from the true after-boom. It is usually identical in all respects with the booms already described, but sometimes it lacks a boom-leg *(tapu-vae)*.

The second is a longitudinal brace lashed on the outer side of the boom-legs and known as *te taofi* (See Fig. 46).

The majority of canoes, being made for use on the lee-ward side of the island, have not the double alignment of *kalisi* (Fig. 36), the use of which in a rough head sea will be explained in the succeeding section.

Again, the paucity of suitable trees is responsible for a number of freak shapes where the builders have had to follow the lines of badly-shaped logs. Canoes are not infre-quently seen with the greater part of the bow or stern cut from another block of wood and laced to the hull. Such inserted pieces are termed *tao*.

About five years ago I saw, on Vaitupu, an outrigger of the type shown in Fig. 60. This canoe has long since broken up, and the sketch was drawn from a model made for me by the *tufunga* who built the original.

There is at present one canoe among the twenty or more which line the beach in front of the village, which has been cut from a log large enough to give the sides the requisite height without the addition of *oa*. This canoe has been executed in the traditional Vaitupu style. It is remark-able in two respects: the gunwales are half as thick again as those of the average canoe, and there are two thwarts, in one piece with the hull, in the neighbourhood of the forward and after-booms. These were left solid when the interior was hollowed out. This canoe is said to have been built about fourteen years ago, and is now the oldest canoe in use on the island.

Of somewhat greater importance are the differences in construction existing on different islands throughout the group. As was stated in the introduction to this paper, no detailed examination of the canoes in use on the other islands has been possible. Two points, however, in which canoes made on the northern islands of the group differ from those already described have been brought to my notice by an old *tufunga* on Vaitupu. One of these, the position of the out-rigger platform which has already been noted, I remember

having seen on my visits to the northern islands. For the other I have only the word of the *tufunga*. He claims that the Vaitupu arrangement of a short bow and a long stern, as figured throughout this paper, is sometimes reversed. In other words, some canoes, on other islands of the group, may be found to have the outrigger set much farther towards the stern than any canoe herein described.

Lastly, of latter years, several Nanumea type canoes have been built on Vaitupu, to which the bow and stern-covers are not permanently lashed in the traditional Northern Islands style, but are detachable as is the Vaitupu fashion, for the more efficient drying-out of the hull. A specimen pair of this new type of *puke* is to be seen in the background of the photograph in Fig. 69. The small projections at the front of the bow-cover and the rear of the stern-cover are to prevent the forward and after ends respectively from slipping sideways, since only the inner ends can be conveniently tied down. The lashings of the other covers in this photograph had to be cut in order to detach them from canoes.

THE THEORY ON WHICH THE CONSTRUCTION OF THE CANOE IS BASED.

It may fairly be assumed that whether the outrigger was developed from the double canoe or vice versa, it has reached its present form only after many years of cut-and-try experiment. And there is some attraction in setting forth the reasons for the various shapes and angles of adjustment in the probable order of their development.

The addition, always on the port side, be it noted, of an outrigger to a canoe for the sake of stability brought with it several disadvantages, the chief of which was an increased difficulty in swinging the canoe to starboard even from a stationary position. The farther the float was set from the hull the greater was this difficulty. On the other hand, the nearer the float was set to the hull, the less was the stability of the canoe. The result of this has been the setting of the float at the minimum lateral distance for safety in the open sea. Reference to the tables given above

will show that this distance is about three quarters of a fathom *(fatuli)*.*

The difficulty of steering to starboard was found to be lessened further by setting the forward end of the float in towards the hull in such a manner that the medial lines of both hull and float would, if produced forward, intersect (See Fig. 36). The greater the angle at which the float is set, the easier it becomes to swing the bow to starboard. Here again, however, there was a limiting objection. It was found that setting the float at an angle to the hull increased the resistance of the outrigger during the forward motion of the canoe. The result of this has been to limit the amount by which the forward end of the float is set to starboard to about one hand's breadth from a line through the after end of the float parallel with the hull.

The assymetrical shape of a well-built hull which serves to counteract the tendency of the outrigger-float to steer the canoe to port while moving on a straight course has already been noted (Figs. 36 and 48). It was found, however, that when the canoe was being paddled against a head wind and sea, the thrust of successive waves against the more rounded longitudinal arc of the port bow threw the bow to starboard much more than was necessary to balance the pull of the outrigger-float. Thus the action of a canoe moving against the sea was extremely erratic, and the steering consequently difficult.

The problem then was to find a method of shaping the hull which would preserve its outrigger-balancing property and at the same time resist any increase in this function caused by the action of a head sea.

The ingenious system of setting the V-shaped keels *(kalisi)* at the bow and stern on different but parallel alignments (Fig. 36) was the method by which this difficulty was

* It should be remembered that this refers to paddling-canoes only. Sailing-canoes naturally require a greater lateral space between hull and float. In the carvel-built sailing-canoes of the Gilbert Group, this space is usually made equal to half the length of the canoe. Nowadays, except in the lagoons of the islands of Nukufetau and Nukulailai, there are no proper sailing-canoes in the Ellice Group. At the two islands mentioned, I have seen ordinary dug-out canoes using mat-sails under the ordinary reversible mast-and-gaff system, but I had no oportunity of taking measurements.

met. It will readily be seen that the swift pitching motion imparted to the canoe by the action of a head sea causes the hull to have a seesaw motion with the rounded bottom amidships for a fulcrum, as it were. Thus the bow and stern have alternately a short sharp downward plunge through the water. There are therefore two directions from which the waves of a head sea cause a movement of water relative to the sides of the bow and stern. The first is the ordinary motion of the water towards the stern caused by the movement of the canoe, and accentuated by the thrust of the waves which, as has been shown above, tends to throw the bow to starboard. The second is the *upward* motion of the water relative to the bow and stern alternately, caused by the pitching of the canoe. Now with the V of the forward keel *(kalisi)* pointing, not vertically downward as would be expected, but set, and therefore pointing, somewhat to the port side, the downward plunge of the bow of the canoe in motion causes a lateral deflection to port. Similarly the set of the after keel *(kalisi)* to starboard of the longitudinal medial line of the hull causes the stern to be pushed to starboard by the upward thrust of the water. Here then we have forces acting on both bow and stern which tend to steer the canoe to port and therefore counteract the tendency of a head sea to thrust the bow to starboard.

In calm water these keels have no steering-action since they are set parallel to the longitudinal medial line of the hull; while with a following sea there is little of the seesaw motion and certainly no swift upward thrust of water which would cause their steering-properties to operate.

PLACE OF THE CANOE IN THE COMMUNAL LIFE.

In other times, each canoe had its proper name, and in some songs recording the prowess of a particular captain and his crew only the name of the canoe may be expressed.

Te Ikalelau ne fanatu
Ko sasalaka te Pua Foua
Tela e Pala i lunga
Tau tu fua i te manu
I te mea se langa kamai

Te Ikalelau (a canoe named after a legendary Gilbert Islands warrior) went out
Looking for te Pua Foua (another canoe lost in bad weather).

It is lying inactive there on the ocean (i.e. the crew are not paddling)
Waiting for the shoal of bonito (to show in what direction it is moving that they may follow)
Because (they think perhaps) it is only shoal of *kamai* (another fish).

The following two lines are the beginning of a very ancient canoe-building song, the rest of which is not known to the present generation.

Ta ki mata o te vale
Muli vaka ki te folifoli.

These references may, or may not, indicate that the canoe was held in greater reverence in former times than is the case to-day. Certainly one would expect that, when the building of a canoe was a laborious operation occupying many days of fatiguing work with soft shell adzes, some care would have been taken in its preservation. It is therefore strange to find that the only protection against the elements provided for the canoe while it was lying ashore was a covering of coconut leaves *(taomanga)* bound in twos or threes *(taolua* or *taotolu)* and thrown lengthwise over the hull, sometimes weighted down by a few large stones or pieces of wood.

The average canoe is in use almost every day. It may be uncovered *(suke)* as early as 4.30 a.m. and taken many miles out to sea to be on hand at the bonito grounds when the rising sun brings flocks of hungry noddies *(ngongo* and *lakia)* swarming out after the shoals of tiny fish *(kavaliki* and *o)* on which the bonito feed. If the bonito catch is poor, the canoe may proceed to the *pala* and other fishing grounds and remain occupied in snaring *pala* or in deep-line fishing for the albacore *(takua)* until late afternoon, when it will return to the village. At evening again it may be required to engage in the communal herding of flying-fish beyond the edge of the outer reef just as the sun is setting and when the flying-fish are packed in shoals unable either to fly, or to swim more than a few feet below the surface.

Then at the dark of the moon several hours may be spent each night torch-fishing for flying-fish and later a *palu (Ruvettus)* fishing expedition may at times be organised, and the canoe will not get back to the *langa* (the two small

transversely placed logs upon which it rests when not in use) until sunrise.

It thus may be that a canoe is used occasionally with changes of crew for almost twenty-four hours in the day.

At the end of a fishing expedition, after the canoe has " shot " the breakers of the outer reef and has been carried, or at high tide been paddled through the comparatively tranquil shallow water on the reef up to the village beach, it is reversed and the stern is grounded on the sand of the beach. The " catch " is then carried ashore, the canoe bailed out, and carried, stern first, to its *langō* on the sand some few feet above high water mark. Here the bow and stern-covers (on the Vaitupu type canoe) are removed and the interior is thoroughly dried out. The *taomœnga* is then thrown on to the hull and paddles, bailer and all fishing gear are taken away by their respective owners.

On a day unsuitable for fishing the whole fleet (on Vaitupu some 20 to 30 canoes) may be seen lying on their *langō*, covered by *taomanga*, bows pointing to the sea. This is a favourite playground for the young folk of the village, but all canoes are protected by a strictly enforced *tapu*.

REPAIRS.

1. An ordinary hole, stove in the side, if of small dimensions is repaired by plugging with a piece of *puka* wood cut to fit tightly and exactly.

2. A crack or split in the hull is repaired thus:—A sliver *(tuatika)* of the rounded back of a dry coconut-midrib *(lafo)* is split off *(isi)*. This has a width of about .8 in. It is placed, rounded surface upwards, lengthwise, over the crack inside the hull, and holes are bored through the hull in pairs, one on either side of the *tuatika* along its periphery at intervals of one span. The sides of the crack are then reeved together by several turns of fine *uka-lau-fou* (line made from hibiscus bark) through each pair of holes and over the *tuatika*. The holes, which are of very small diameter are afterwards plugged with *fou* (hibiscus) wood. This wood is chosen because it has the property of breaking off neatly and easily, flush with the surface of the hull. This operation is known as *fakatuatika*.

TERMS APPLIED TO THE NEIGHBOURHOOD OF A CANOE WHEN AT SEA.

taumua, ahead.
mata-ama, ahead of the outrigger (i.e. port bow).
mata-katea, starboard bow.
katea, abeam—on the starboard beam.
tua-ama, abeam—on the port beam (lit. beyond the outrigger-float).
te alovasa, beneath the outrigger.
mulivaka, astern.
muli ama, abaft the outrigger-float (i.e. the port quarter).
muli-nofonga, the starboard quarter.

LIST OF WORDS OF THE ELLICE ISLANDS DIALECT USED IN THE FOREGOING DESCRIPTION OF CANOES.

afea, when?
alo, upper surface of log, front of body.
ama, outrigger-float.
anga, span.
asu, bailer.
atu, bonito.
atu-pa, adze with curved, laterally-reversible blade.

faka to ifo, to "let in"; mortice.
fakafiti, clamp made of a loop of cord and two sticks.
fakatipa, Northern Ellice dialect for *atu-pa*.
fangainga-o-lupe, about 9 a.m.
fatinga-a-maikao, a unit of measurement; a finger-joint.
fatuli, a unit of measurement. Length from tips of extended fingers of one arm to flexed elbow-joint of the other.
fetau, *Callophyllum inophyllum*.
foe, paddle.
foe-uli, steering-paddle.
foliki, small.
fono, inserted piece in side of canoe.
fou, hibiscus.
foulua, double canoe.
foutake, ancient method of lacing planks.

inaki, the bulge on the side of a canoe.

kainaki-tutonu, mid-day or afternoon meal.
kai-o-moe, evening meal.
kalisi, keel having a V-edge.
kanava, *Cordia subcordata*.
katea, starboard.
kaufuatanga, long hand-grip superimposed on the sides of the Nanumea type canoe.
kaupalepale, shelf of small sticks on the outrigger-booms.
kautaka, projecting bulge of the side in the region of the *oa* seam.
kau-tufunga, squad of canoe builders.
kavaliki, tiny fish on which bonito feed.
kiato, outrigger-booms.
kofe, fishing-rod.
kolokolo, two-ply twisted sennit.

lakia, noddy (*Micranous leucocapillus*).
langa: (1) Transverse rests placed under canoe and float fore and aft to raise them off the ground. (2) Piece superimposed on boom under the *kaupalepale*.
langa-kofe: (1) Forked rests for carrying the bonito-rod on the outrigger when not in use. (2) The cross-piece on the Nanumea type canoe used as a rest for the bonito-rod.
li, the lashing fastening the *saunga* on the hull to a projecting cross-piece from the gunwale.
liu, the interior of the hull.
lotu-a-toki, a religious ceremonial performed over the canoe-building adzes before the commencement of the day's work.
lua, two.
lualua, double canoe.

mafuli, to capsize.
maikao, finger.
manga-lua, forked.
manu: (1) v.i., see *sumu*. (2) Lifting-grip lashed across gunwales.

mata-pili, a sennit grummet in which the butt of the bonito-rod is placed in order that the lure may troll while the captain is paddling.
milo, *Thespasia populnea.*
mua, fore.
muli, aft.

ngafa, fathom.
ngasu, *Scaevola Koenigii.*
ngie, *Pemphis acidula.*
ngongo, noddy *(Anous stolidus).*
ngutu, mouth, edge, gunwale.
ngutu-puke, inner edge of (bow or stern) cover.
nofoanga, seat.

o, small fish on which bonito feed.
oa, top-strake or plank superimposed to raise the side of the canoe.

pūla, a large fish.
palu, *Ruvettus.*
palengalu, wave-guard, the sloping surface of a Nanumea style bow-cover.
pono, peg driven into lacing-hole to clamp the lashing-cord.
paopao, small canoe.
pua, *Guetarda speciosa.*
puka, *Hernandia peltata.*
puke-mua, bow-cover.
puke-tua, stern-cover.

saunga: (1) Lifting-piece on outrigger.
(2) Lifting-grip on port side of body, aft.
siki, club.
suke: (1) The lower of two raised platforms on the stern-cover (a rare occurrence— the upper is the *tukungane).*
(2) v.t., to uncover (a canoe).
suki, peg in outrigger-float to which boom-leg is attached.
sumu, v.i. (of lashing) to have a diamond-shaped woven figure.

tae, hand-net for catching flying-fish.
ta-fa, adj., having four paddlers.
tafola, whale, porpoise.
taka-oa, long sliver of wood packing the lashings of the *oa* seam where they are made to stand out from the side by the *kau-taka.*
takua, large kind of bonito.
ta-lima, adj. (of a canoe) having five paddlers.
tao, a piece shaped from another log and reeved to the hull of a canoe to build up the bow or the stern.
taofi, a brace lashed to the boom-legs.
taomanga, covering of coconut-leaves bound in twos or threes and thrown on the hull when the canoe is lying ashore.
tao-lua, (of coconut leaves used for covering a canoe) bound in twos.
taotaoama, the stick forming the outer edge of the *kaupalepale*-shelf.
tao-tolu, (of coconut leaves used for covering a canoe) bound in threes.
tapalima, hand's breadth plus extended thumb.
tapuvae, boom-leg.
taumua, bow.
taumuli, stern.
tausunu, *Tournefortia argentea.*
tautai, canoe-captain, steersman.
tiale, *Gardenia taitensis.*
tino-imua, bow-paddler.
toki-fasua, shell adze (made from clam shell).
toki-uli, stone adze (not obtained locally) (lit. black adze).
tokoulu, the raised portion on the Vaitupu type stern-cover, containing a groove for the bonito-rod.
tona, see *suki.*
tua, exterior of hull; keel, amidships.
tua-fa, having four turns of lashing-cord.
tua-ono, having six turns of lashing cord.
tua-tolu, having three turns of lashing-cord.
tufunga, canoe-builder.
tuki, see *suki.*
tukungane, raised platform on stern-cover for bait.
tuli-kafa, three-plait sennit.
tutonu, mid-day.

vaka, canoe.

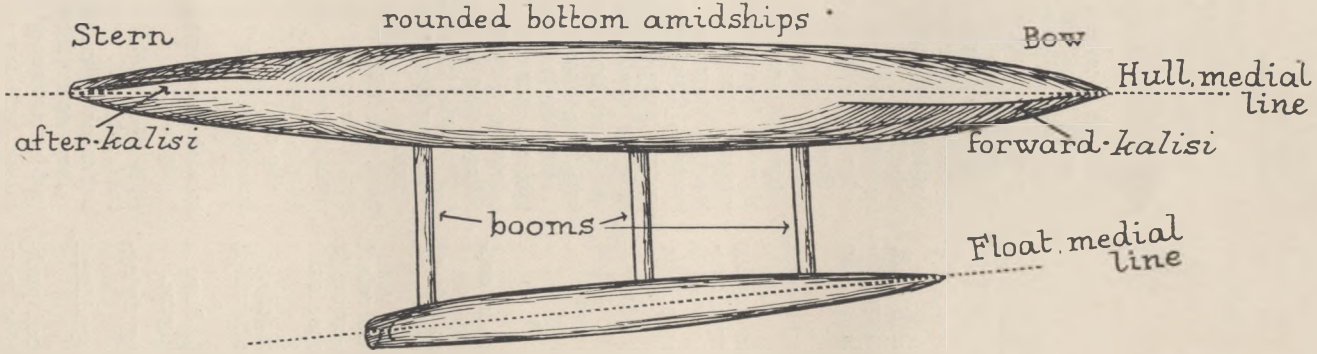


FIG. 36.

Schematic diagram of inverted canoe showing *kalisi*, inward set of float, uneven spacing between booms and greater curvature of the arc on the outrigger side.

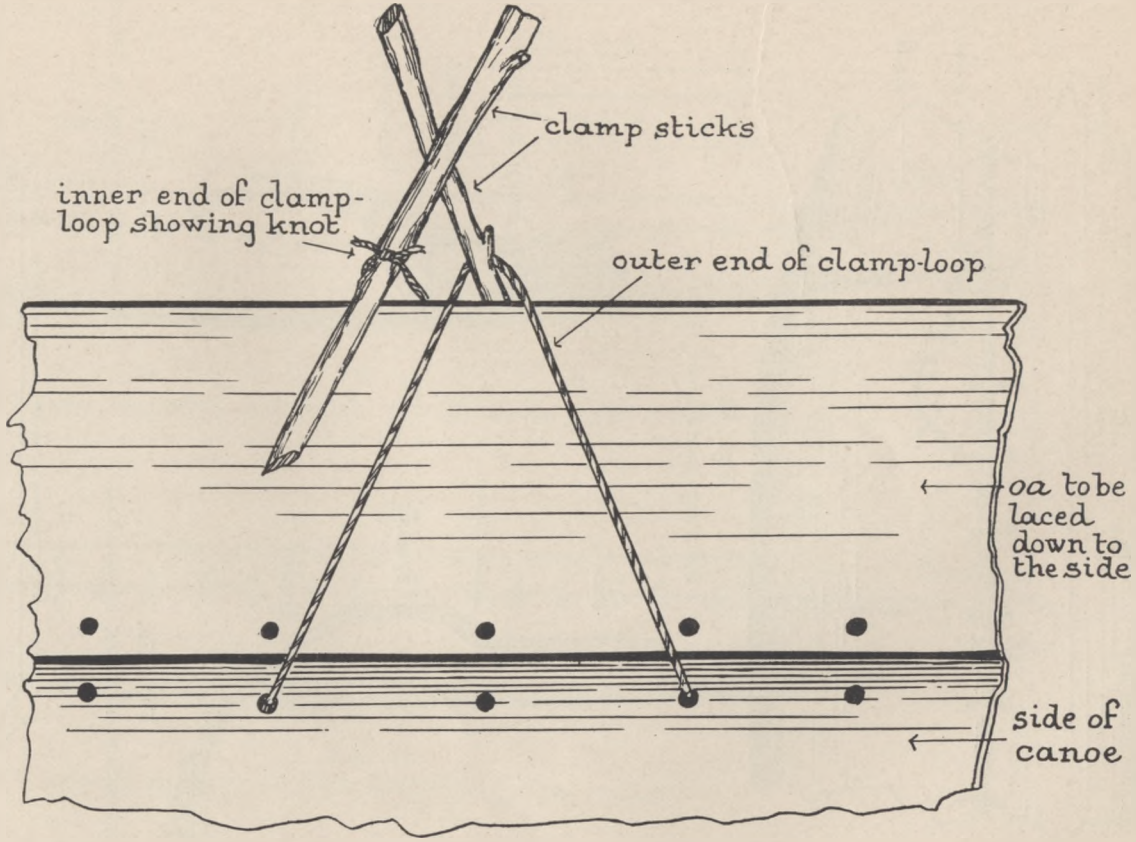


FIG. 37.

Diagram showing the principle of the *fakafiti*. For the sake of clearness, only one strand of cord is shown; usually it is quadrupled. To increase the clamping-pressure exerted by the cord, the set of the sticks is altered so that the point at which they engage is nearer their upper extremities.

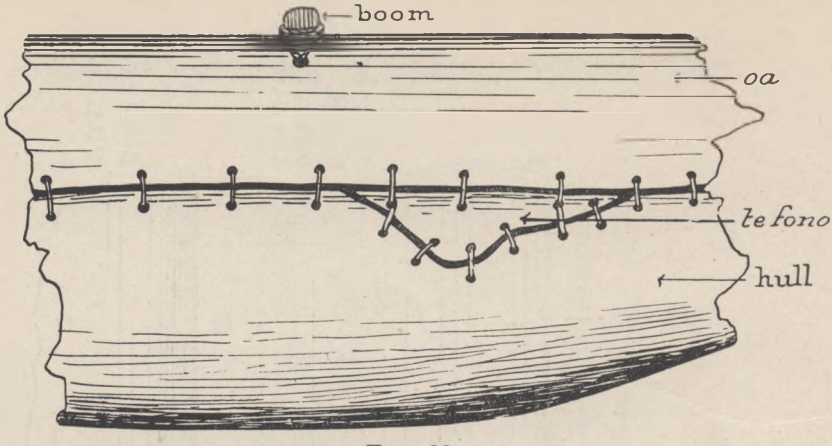


FIG. 38.
Showing insertion of *fono*.

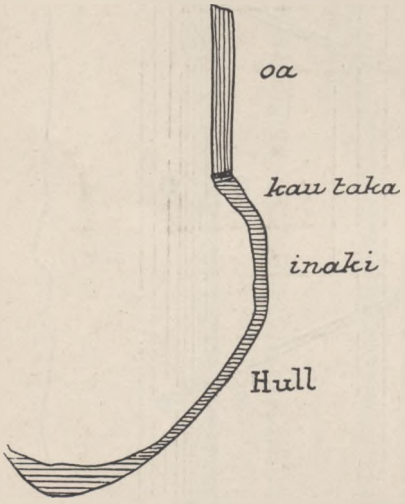


FIG. 38a.
Cross-section showing *te kautaka*.

FIG. 39.
Cross-section showing *te takaoa*.

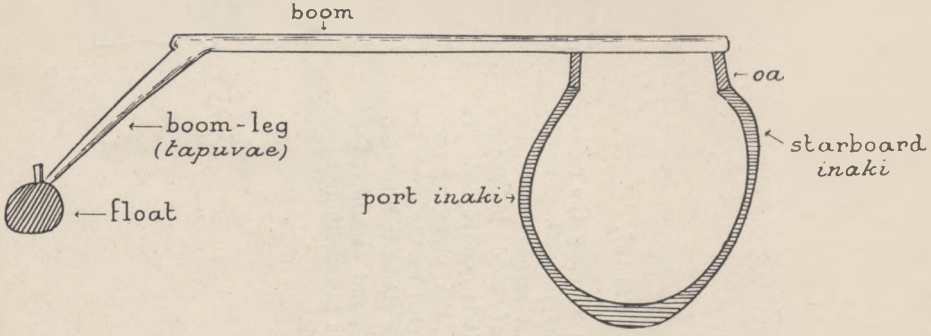


FIG. 40.

Schematic cross-sectional sketch amidships showing the difference in the levels of the bulges *(inaki)* on the port *(ama)* or starboard *(katea)* sides.

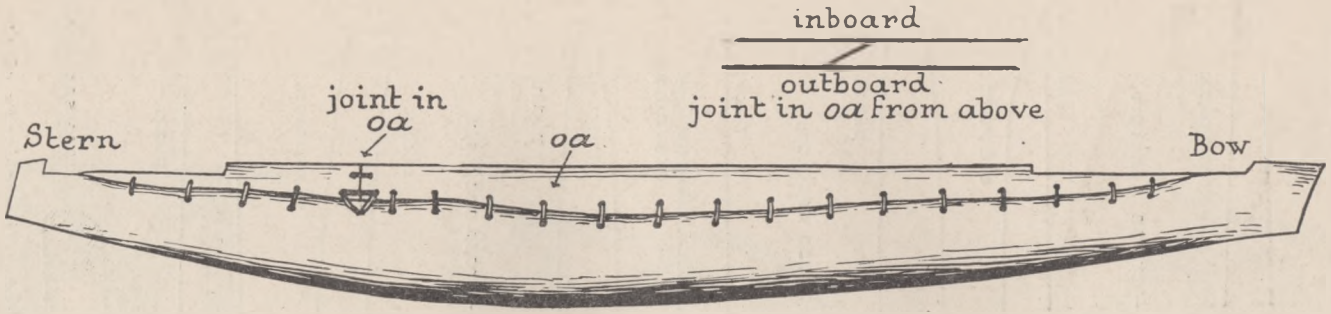


FIG. 41.
Vaitupu type canoe immediately after the fitting of the *oa*-planks.

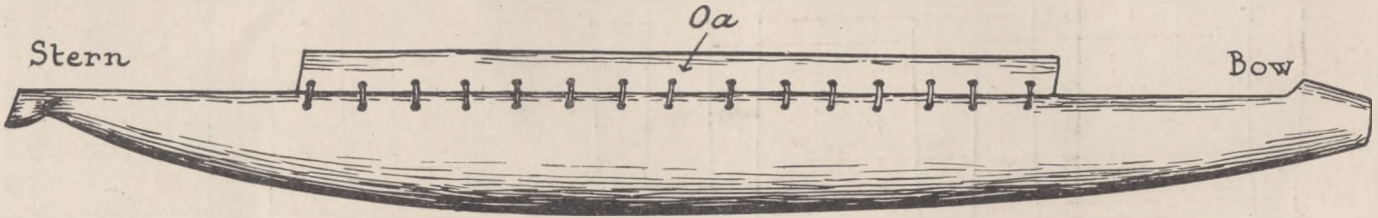
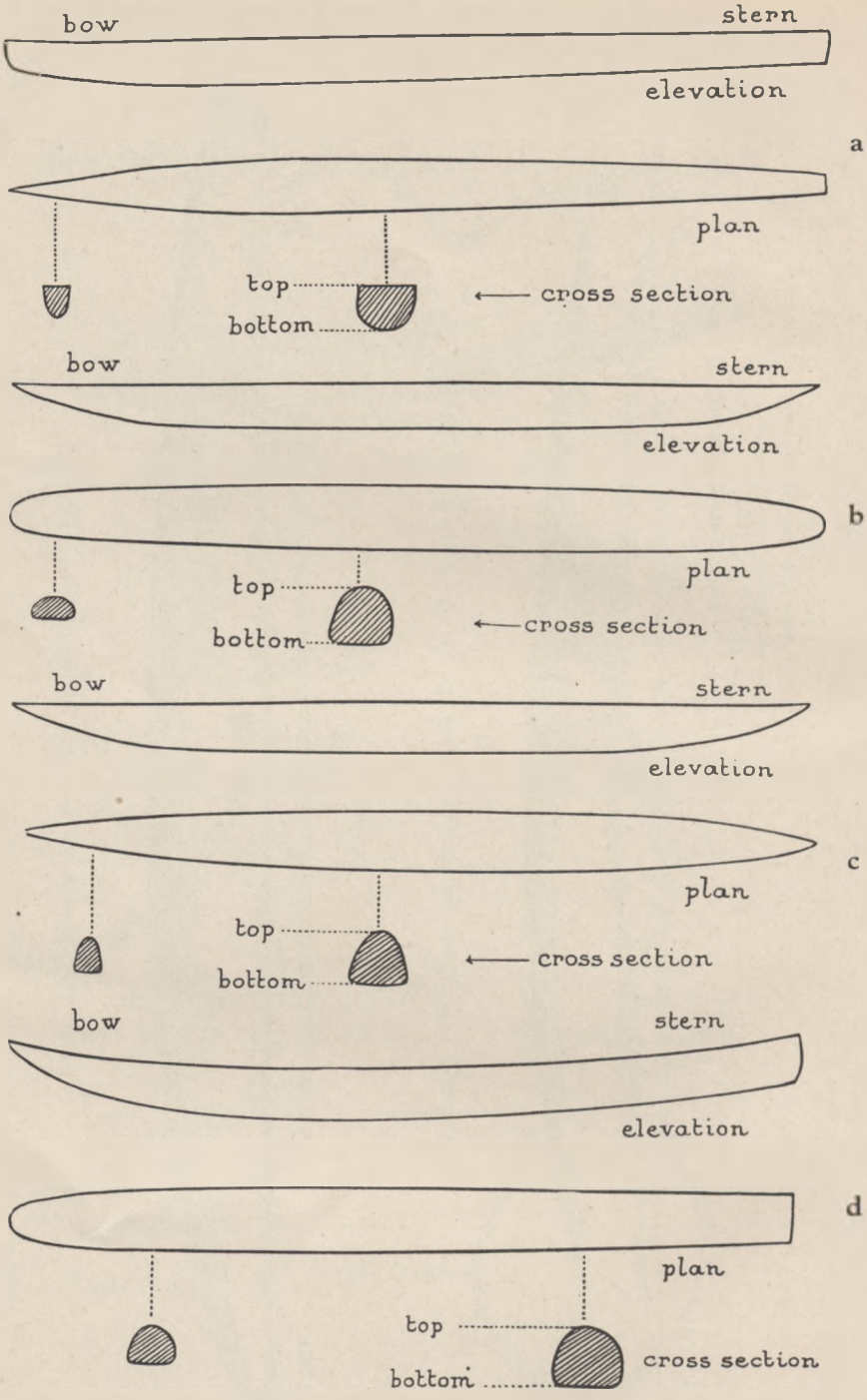


FIG. 42.
Typical Nanumea canoe after the fitting of the *oa*-planks.



Figs. 43a, b, c, d.—Types of outrigger float. The majority of the floats in use on Vaitupu are but roughly finished. The diagrams above illustrate the general lines of one of the better specimens of each type.

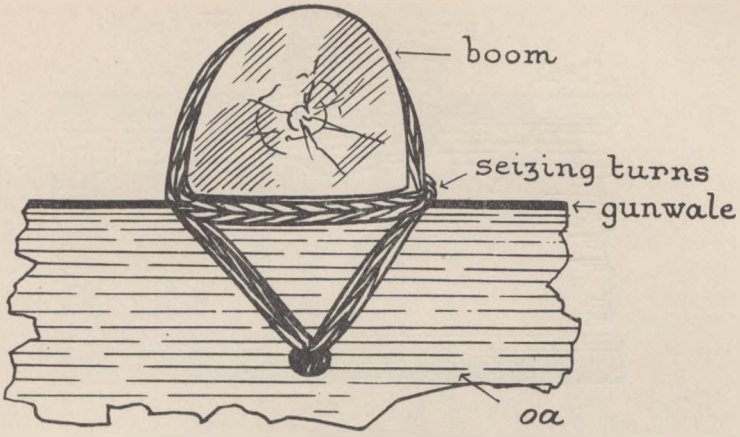


FIG. 44a.
Ordinary lashing of boom to side.

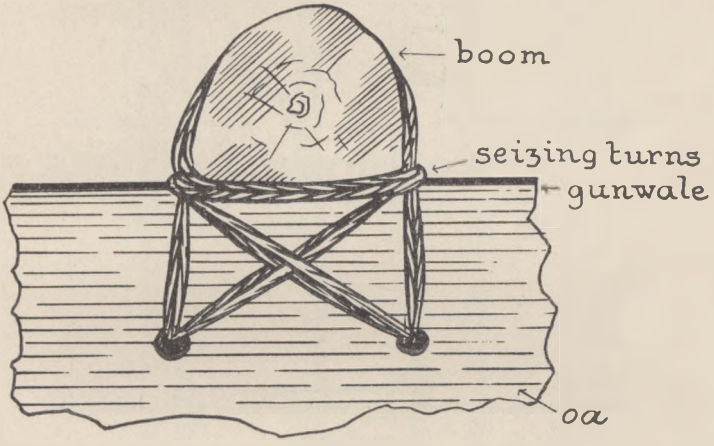


FIG. 44b.
Manga-lua lashing.

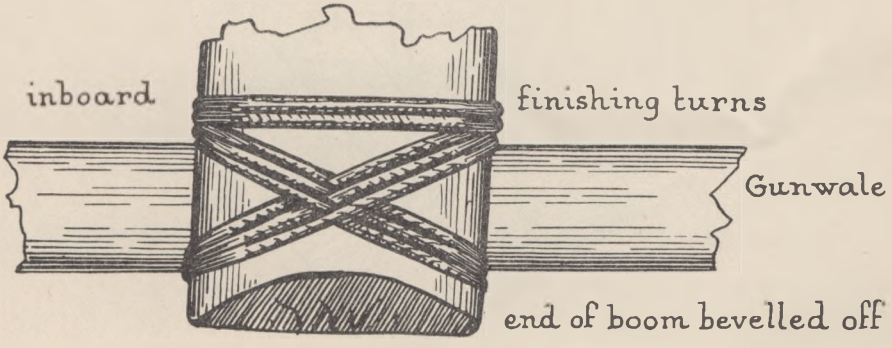


FIG. 44c.
Boom-lashing from above.

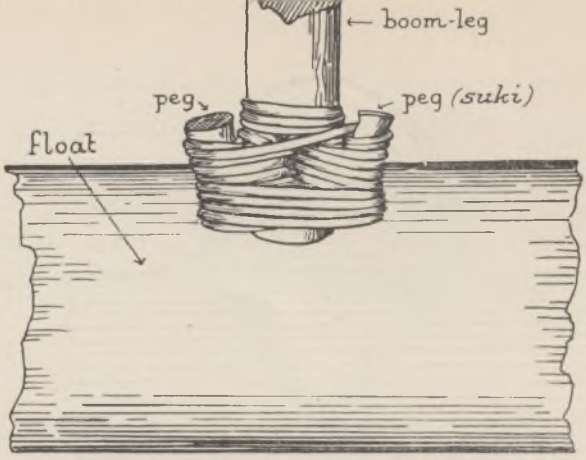


FIG. 45a.
Showing traditional Vaitupu-style lashing.

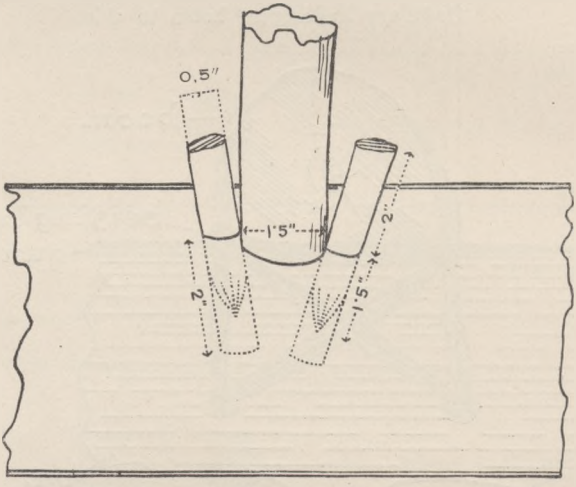


FIG. 45b.
With lashing removed. The measurements were taken on a small canoe. They may vary within 100 per cent. of those shown.

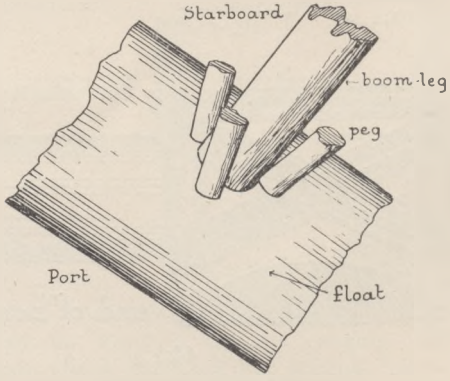


FIG. 45c.
Three-peg arrangement said to have been borrowed from the northern islands (lashing removed).

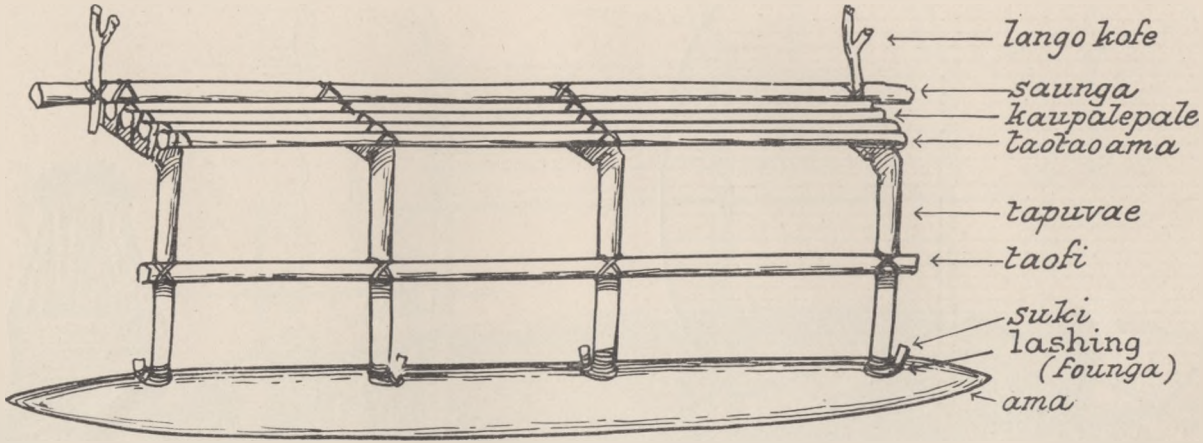


FIG. 46.

Showing arrangement of pegs in a case in which each of the outrigger booms is lashed to the float by only one peg. Note the spacing of the booms, and the brace *(taofi)* lashed to the boom legs.

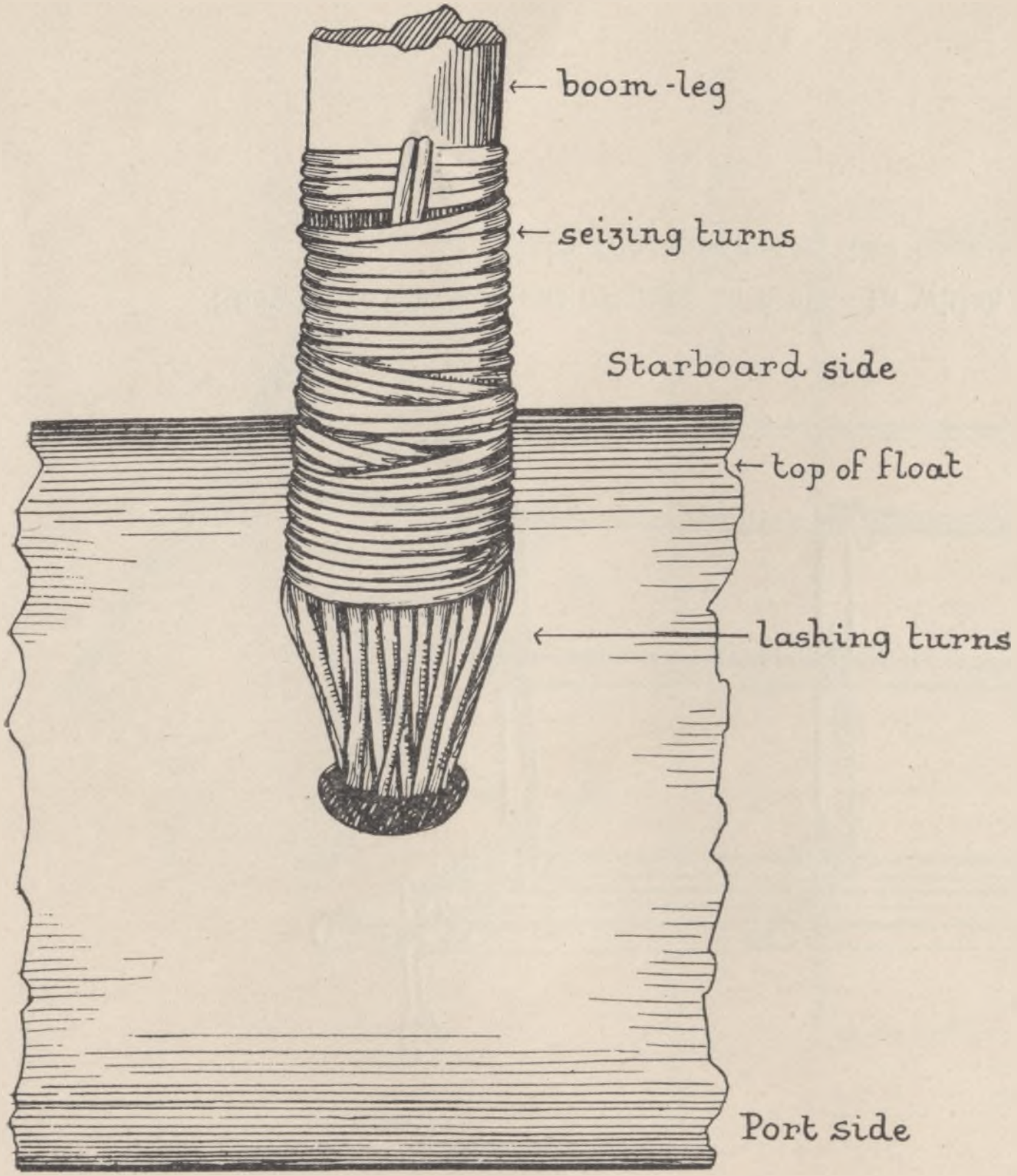


FIG. 47a.

Direct lashing (looking downward from port side of float.

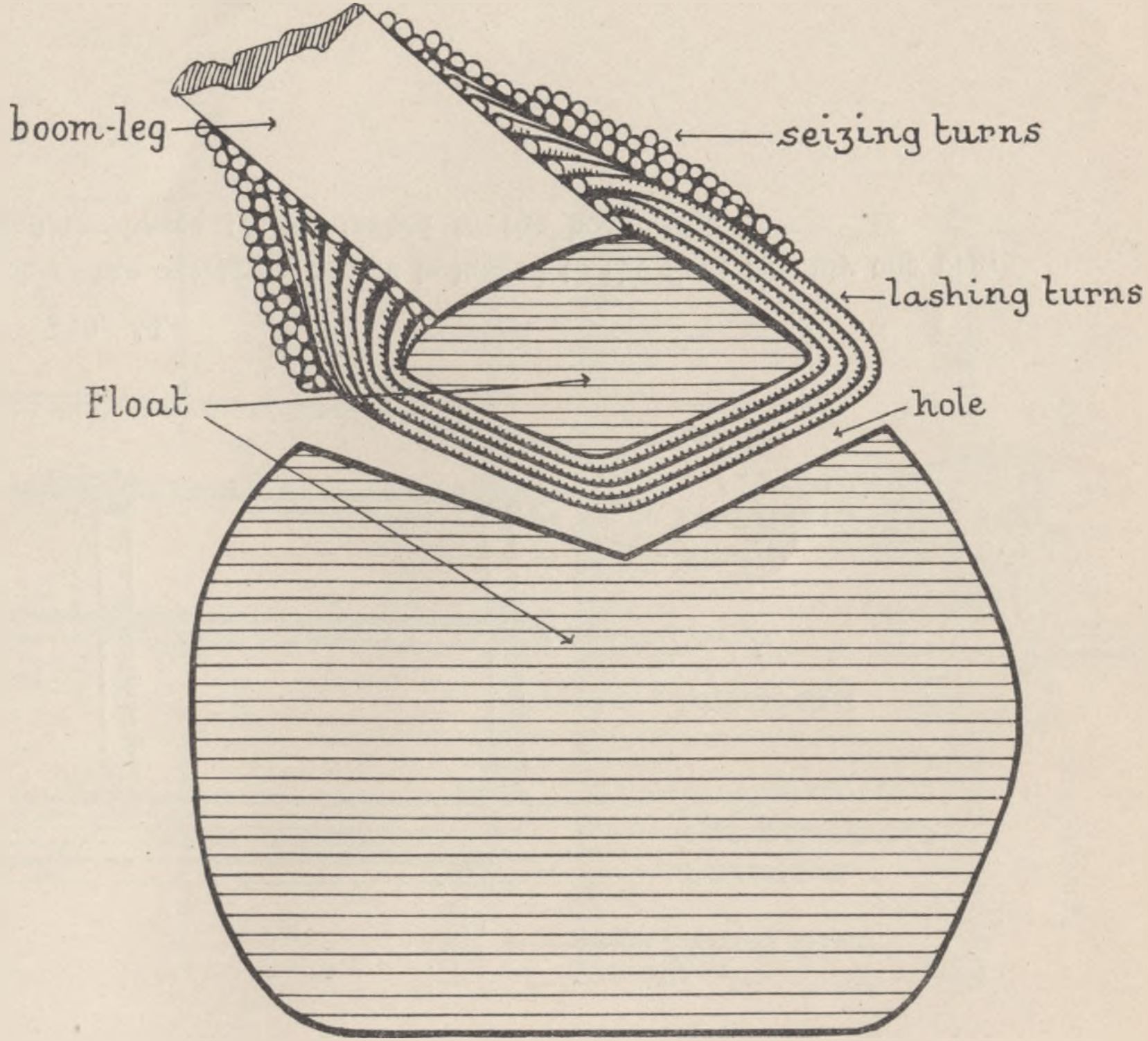


FIG. 47b.

Schematic diagram of cross-section of float to show method of direct lashing.

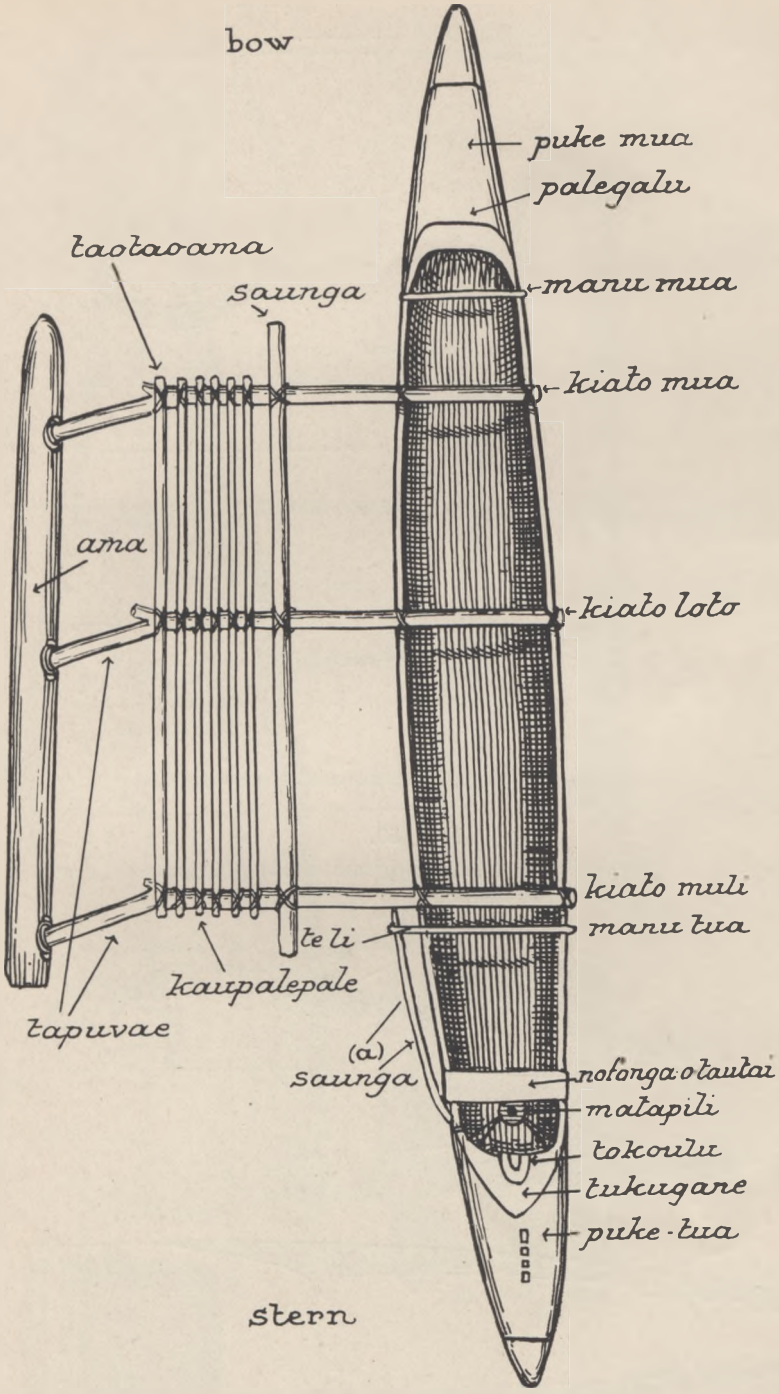


FIG. 48.

Typical Vaitupu canoe showing various parts named in text.

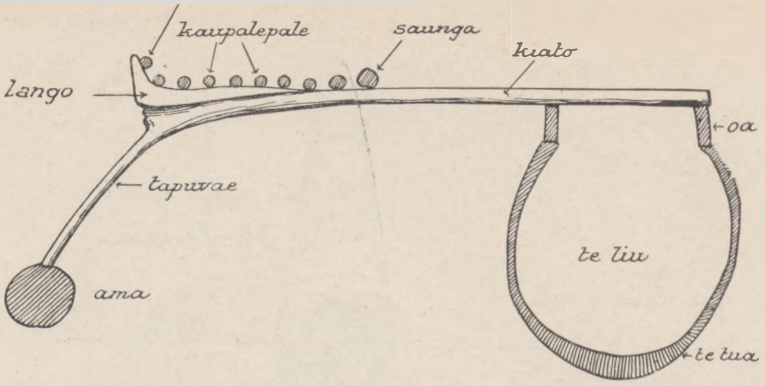


FIG. 49.

One style of *langa*. The upward projection at the outer end is unusual.

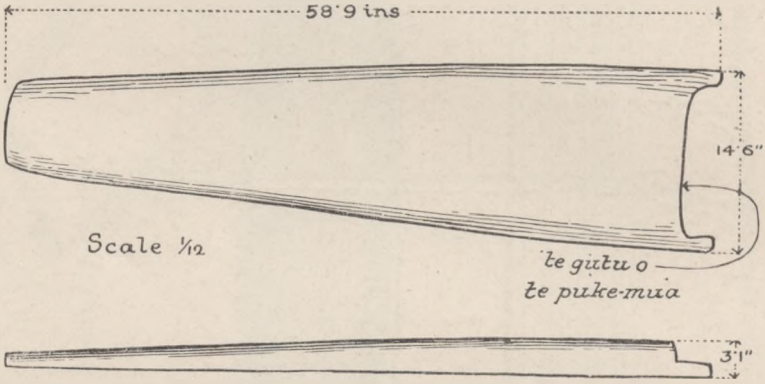


FIG. 50.

Vaitupu type bow-cover (This diagram shows the bow-cover of Vaitupu canoe No. 4 of the tables.

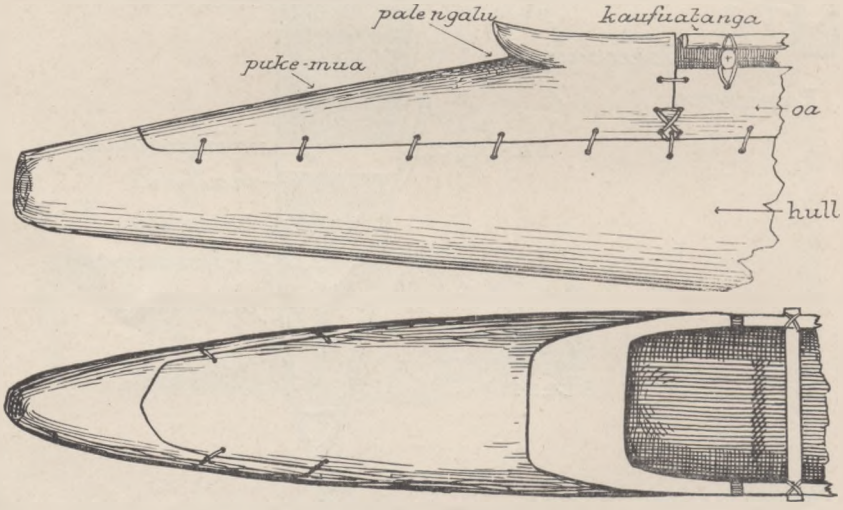


FIG. 51.

Bow of Nanumea type canoe, showing the *puke-mua*, or bow-cover, permanently laced to the hull.

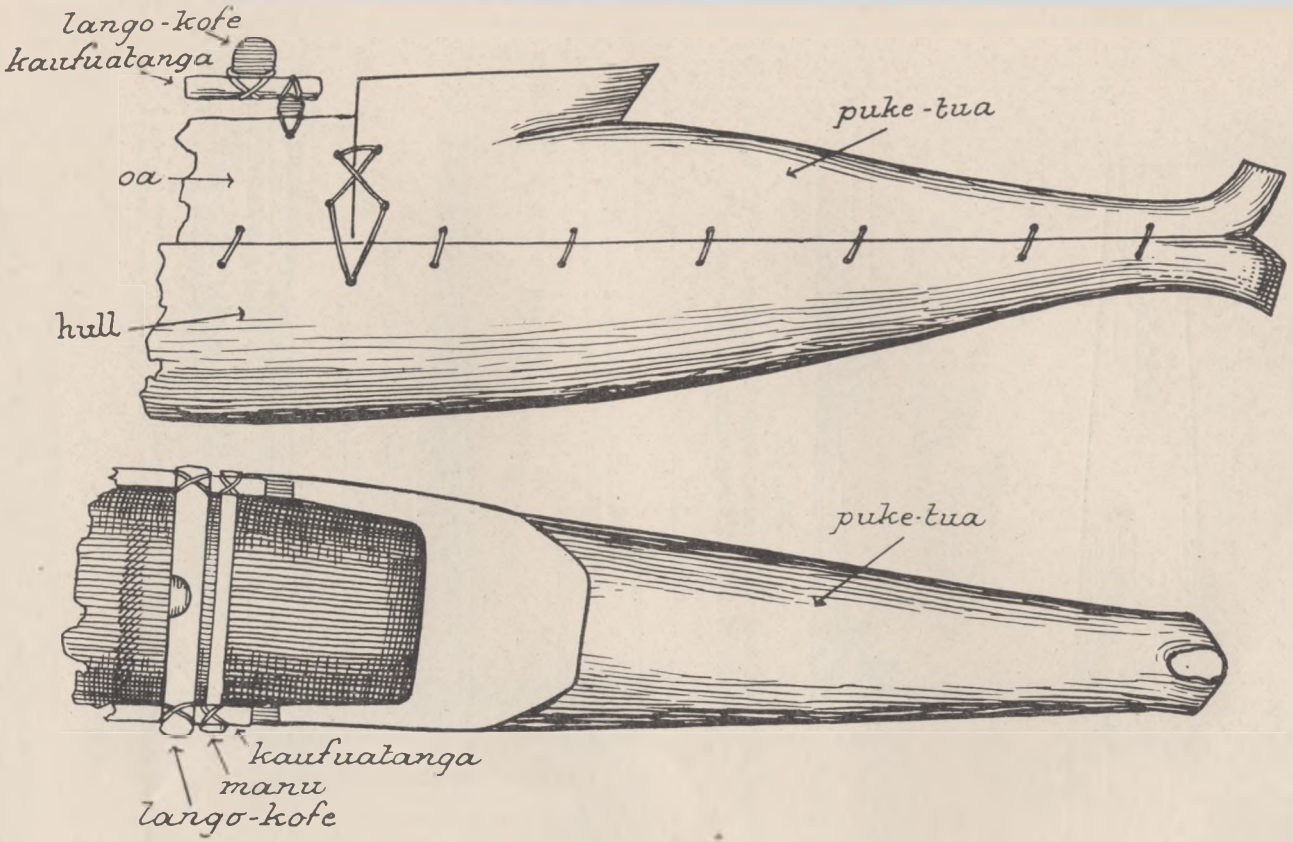


FIG. 52.

Stern of Nanumea type canoe, showing stern-cover permanently laced to the hull.

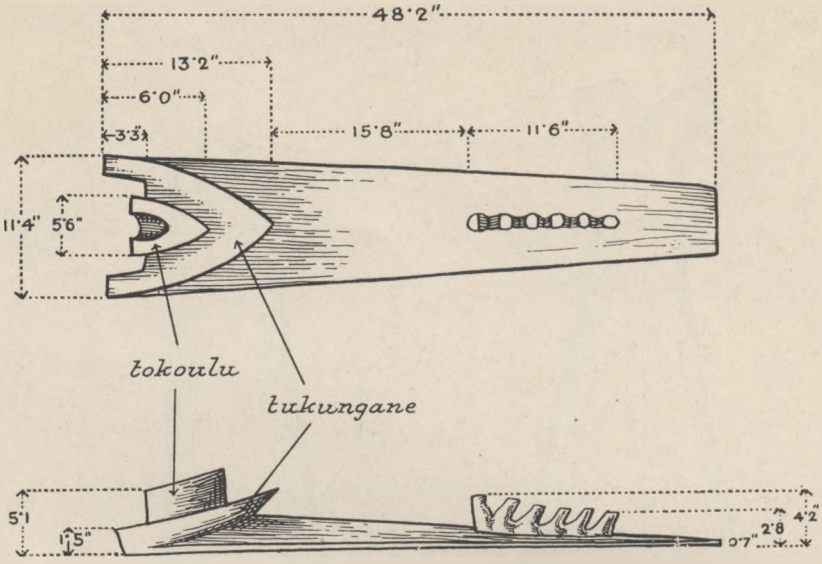


FIG. 53.

Vaitupu type stern-cover. Drawn from the stern-cover of Vaitupu canoe No. 4 of the measurement tables.

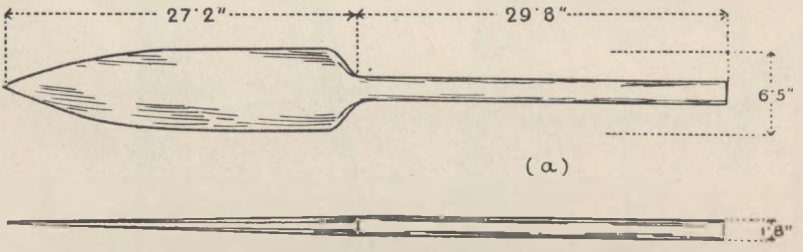


FIG. 54.

Steering paddle *(foe uli)* long, wide blade.

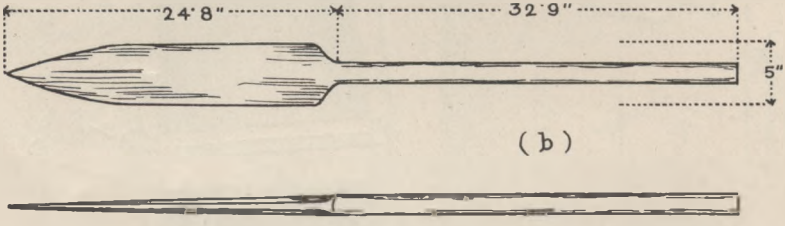
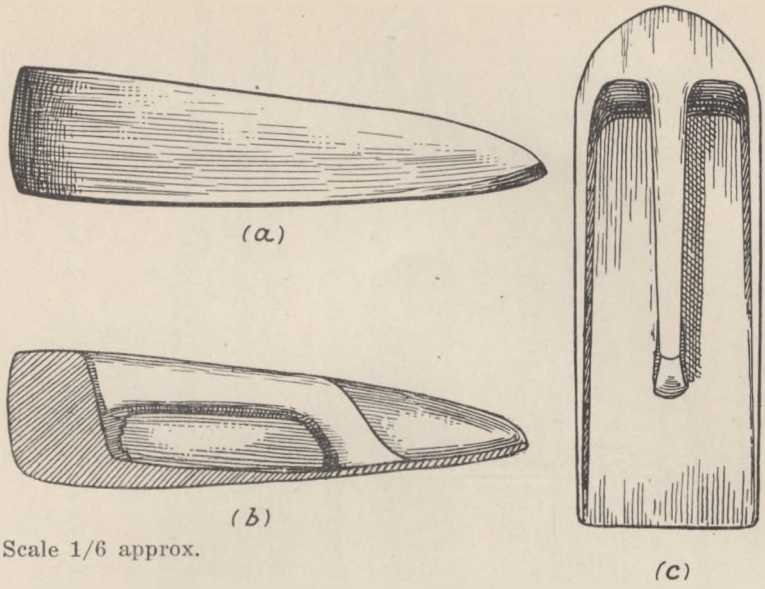


FIG. 55.

Ordinary paddle *(foe)* short, narrow blade.

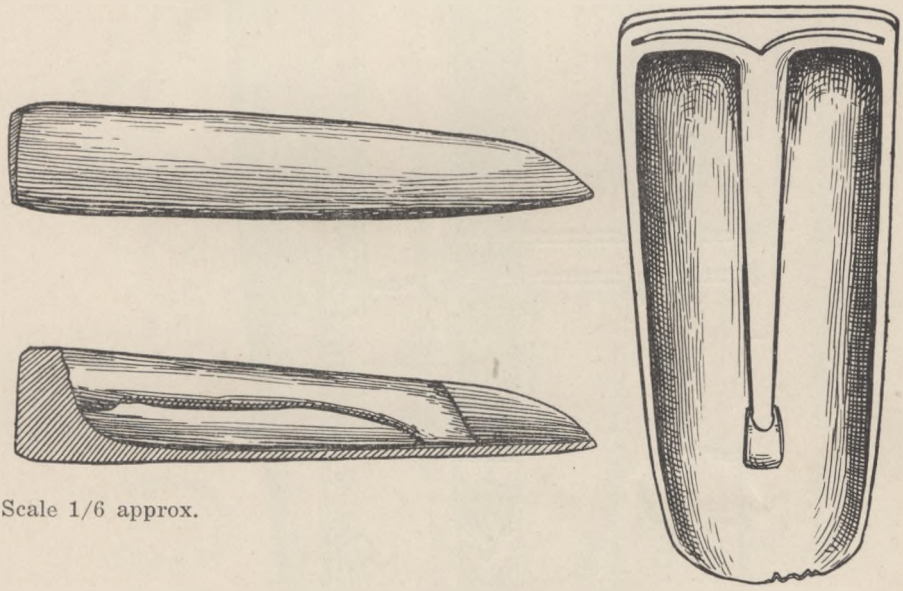
The measurements for Figs. 54 and 55 were taken from two typical specimens in use on Vaitupu. The longest paddle measured on that island was 71 1 ins., overall (blade 34.6 ins.) while the shortest was 52.5 ins. Scale 1/16.



Scale 1/6 approx.

FIG. 56.

The bailer *(te asu)*, usual type, with flat bottom. In (b), one side has been cut away to show the shape of the handle.



Scale 1/6 approx.

FIG. 57.

Another style of bailer. Rounded bottom. Uncommon. This bailer is remarkable in that it was the only object found during this investigation of canoes, which had a non-utilitarian ornamentation, viz. the double arc carved on the upper surface of the butt.

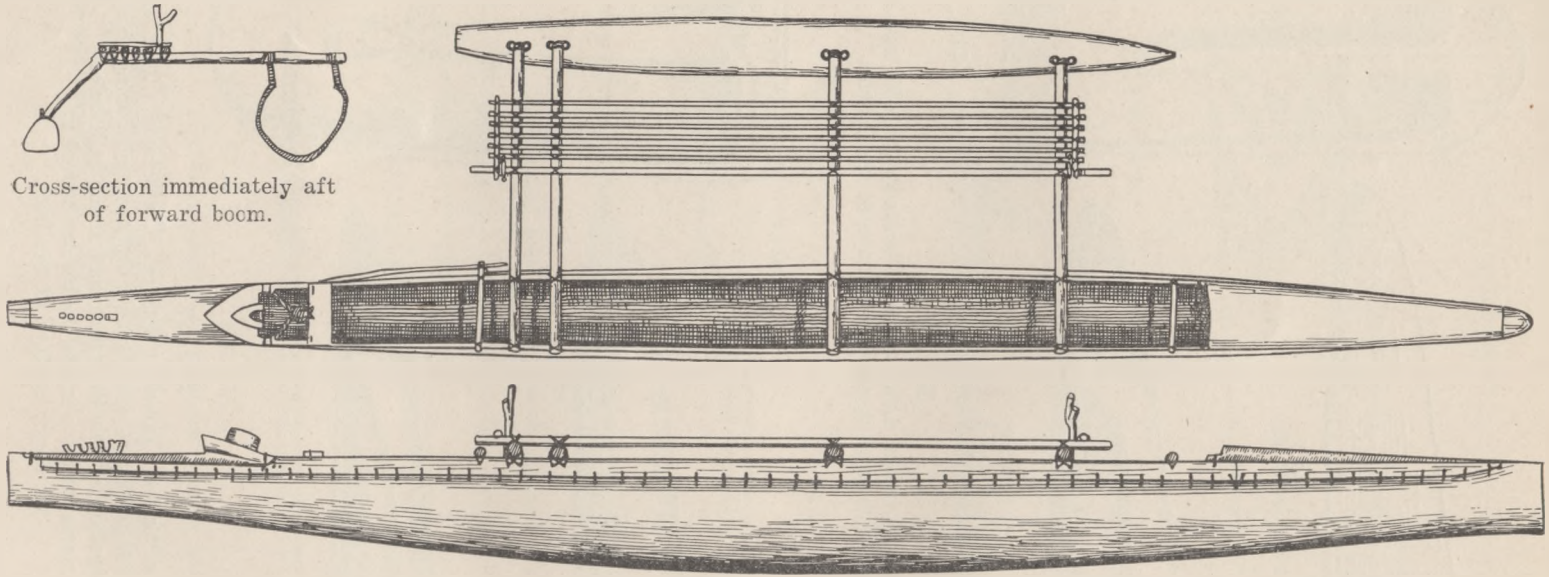


FIG. 58.

A Vaitupu canoe (No. 4 of the measurement tables). The bow and stern-covers of this canoe are shown in detail in Figs. 50 and 53. Scale 1/38 approx.

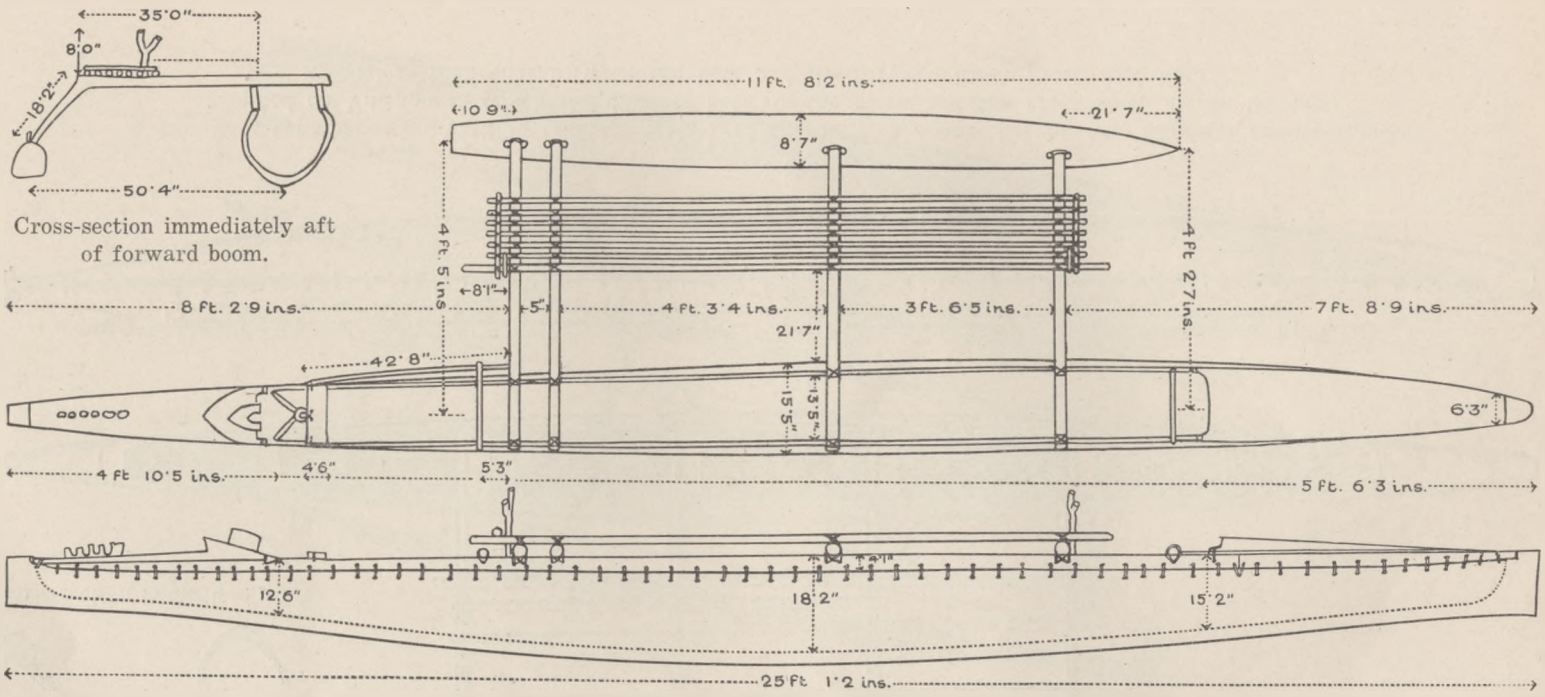


FIG. 58a.

Plan, elevation and cross-section of Vaitupu type canoe already shown in Fig. 58 and referred to in the table of measurements as No. 4.

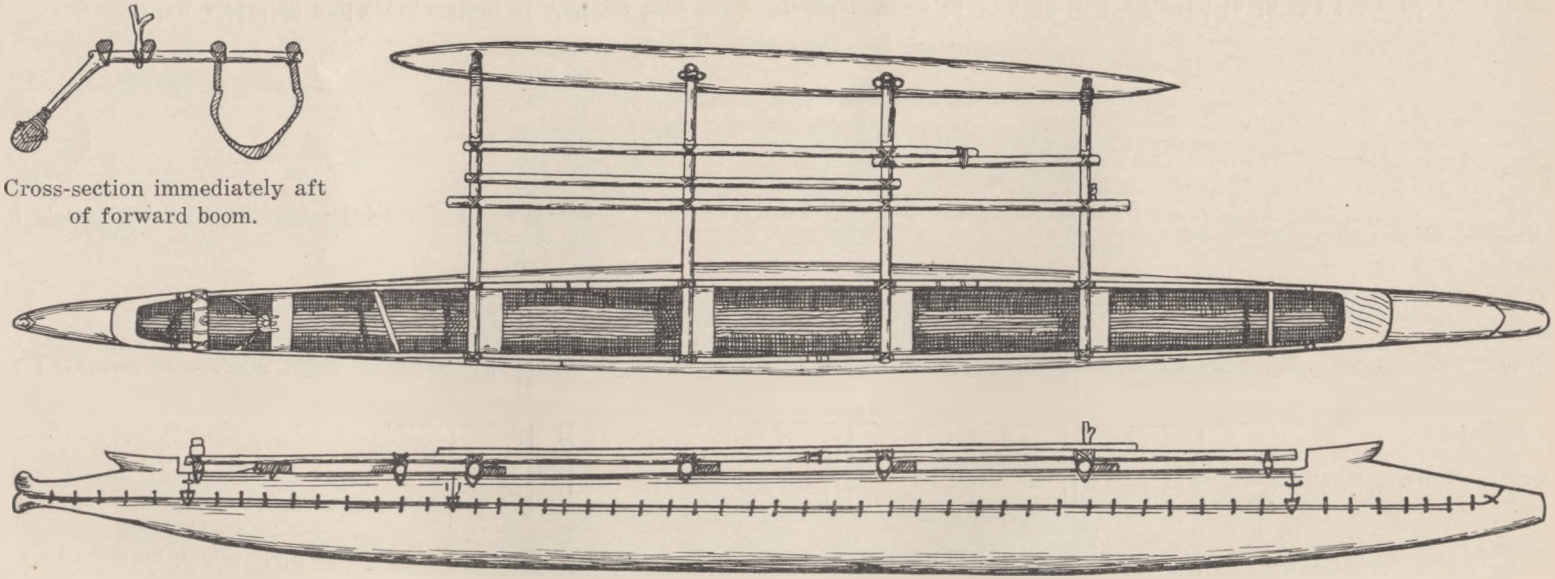


FIG. 59.

A Nanumea type canoe on Vaitupu Island. Scale 1/45 approx. This was the only one of about twenty canoes examined on Vaitupu in which the distance between the stern and the after boom (8 ft. 9.7 ins.) was less than that between the bow and the forward boom (8 ft. 11.4 ins.).

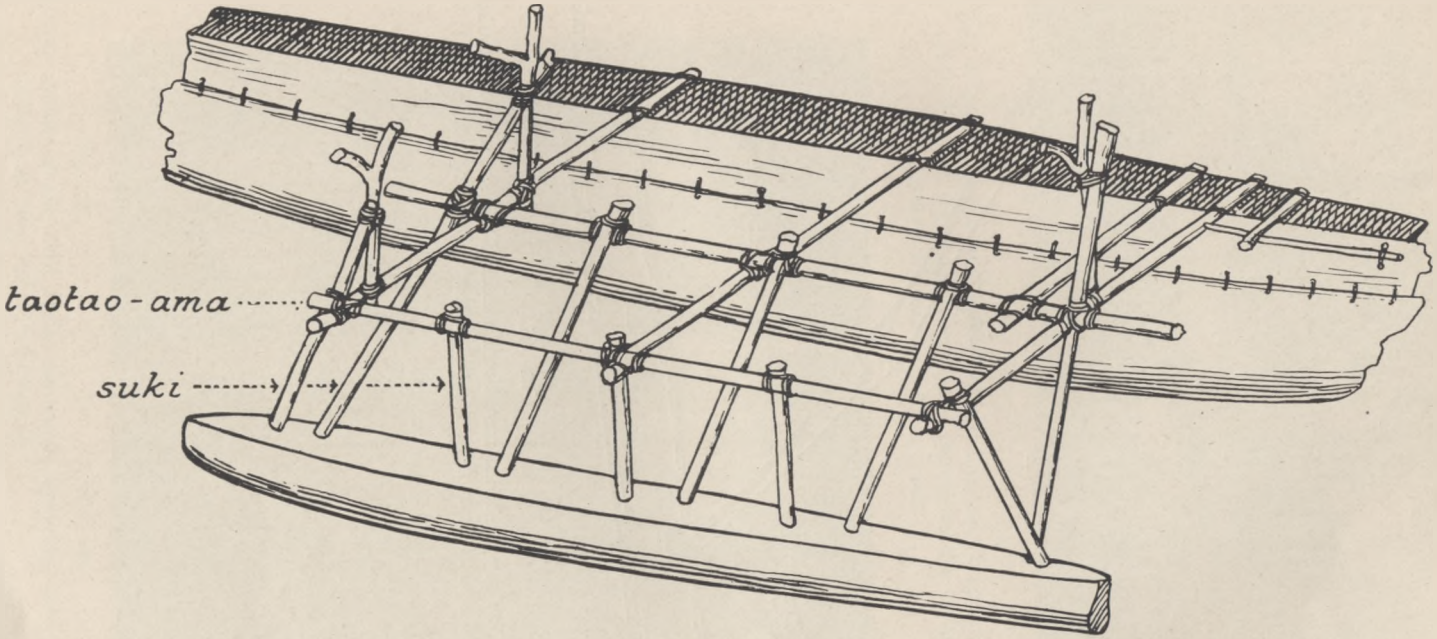


FIG. 60.

The *suki* are made *of* the iron-hard *ngie (Pemphis acidula)*. They are driven tightly into holes bored in the float.

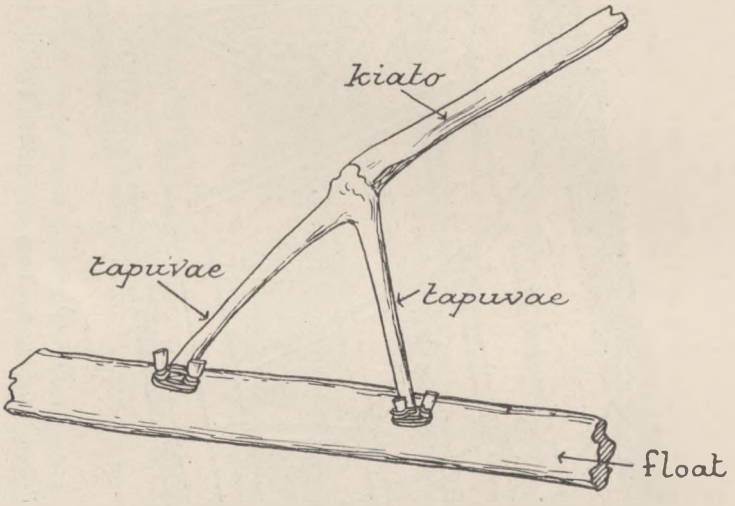


FIG. 61.

A style of outrigger-boom sometimes seen. It is made from a single branch and is known as *kiato mangalua* (i.e. forked boom).

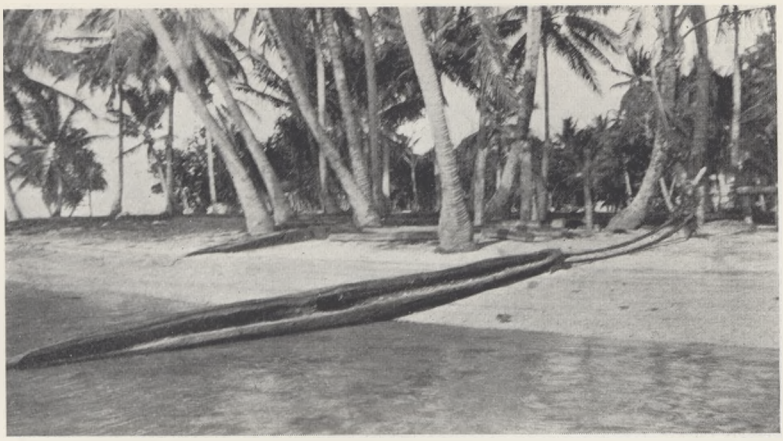


FIG. 62.

The log, roughly shaped and hollowed out, has just been brought in from the bush and towed across the lagoon to the village where the canoe is to be built.

FIG. 63. FIG. 64.

Fig. 63.—View of the hull from the stern, showing how the after *kalisi* has been set to starboard.

Fig. 64.—Similar view from the bow. The cord stretched longitudinally represents approximately the medial line of the hull. The deflection of the forward *kalisi* to the port side can be plainly discerned.

FIG. 65.

Finishing the interior with the *atu-pa* (adze with a curved blade fitted to a wooden axis which may be given a semi-rotary movement enabling the blade to present its convex surface to any part of the interior without necessitating an upward stroke).

FIG. 66.

The bow, from the port side, showing a fault which will necessitate the reeving down of a false bow *(tao)*.

FIG. 67.

The *oa* fitted and clamped down with *fakafiti*.

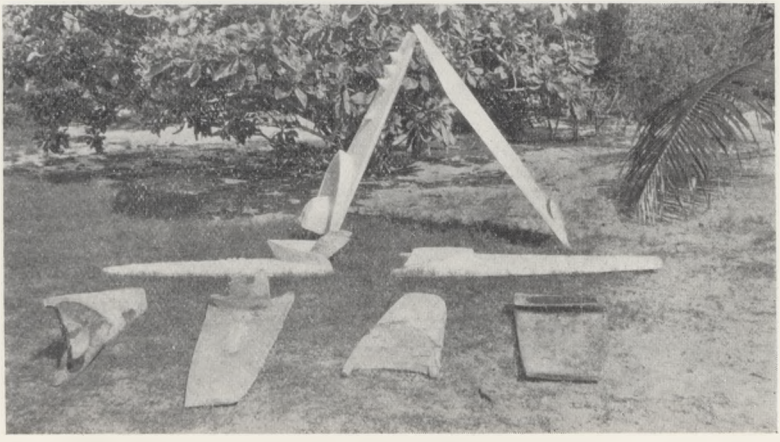


FIG. 68.

Vaitupu type bow and stern-covers (the stern-covers are on the left).

FIG. 69.

Nanumea type bow and stern-covers (the stern-covers are on the left).

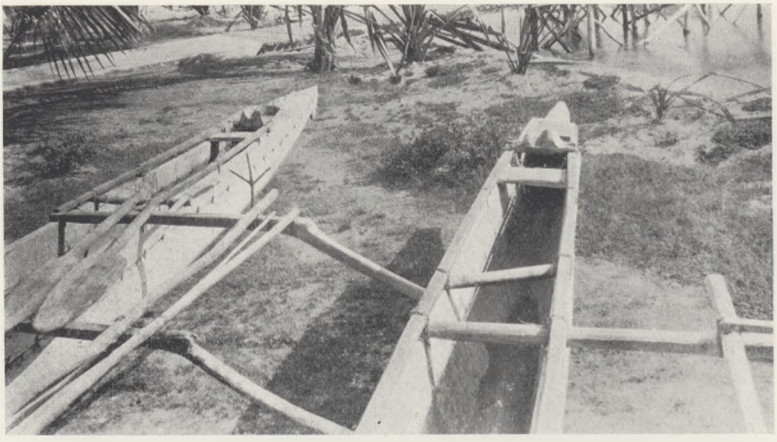


FIG. 70.

Showing the differences in the sterns of the Vaitupu type (left) and Nanumea type canoes. An unusual feature of the Vaitupu canoe here shown is that it is fitted with *kaufuatanga* (see glossary) aft of the after-boom.

FIG. 71.

The new canoe finished with an old-style outrigger. Note how the fault in the bow has been built up *(tao)*. The bird on the bow-cover *(te kena)* is extremely rare. Occasionally one is picked up at sea by the bonito fleet. This was the only one seen by the author in five years.

FIG. 72.

Vaitupu type canoe. This is a five-paddle canoe, although only four are here shown in the crew.

FIG. 73.

Nanumea canoe on Funafuti Island. Note the curved-bough booms and the position of the *kaupalepale* platform.

FIG. 74.

Launching a Nanumea type canoe (Vaitupu type canoe in the background).

FIG. 75.
Typical lagoon *paopao*.

FIG. 76.
Paopao with fish-trap on the lagoon.