

VI.—*Notes of the Brochs or “Pictish Towers” of Mousa, Clickemin, &c., in Shetland, illustrative of part of the series of Plans and Sections deposited in the Library of the Society. (Plates XVII.—XXII.)*

By SIR HENRY DRYDEN, Bart., Hon. Mem. S.A. Scot.

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BROCHS IN SHETLAND.

The peculiar kind of fort known in the north of Scotland by the name of “Brough” is found only in Scotland and the Scottish Islands, and is almost entirely confined to the north-west of that country, including the islands to the north and west; but the area in which these forts are found, and the comparative numbers in different parts of that area, are shown more exactly in the list of brochs in this volume, p. 179. They are probably as numerous in Shetland as in any part. Most of them are within a few yards of the shore, often on little promontories, but some are on little holms in the sea, or in lakes near the shore. Many are on ground only a few feet above the sea. In Caithness and Sutherland, however, many are far inland. Shetland possesses the most perfect example extant.

The Editors of the Society have decided to adopt the spelling “broch” as the name of these forts in the present volume. This word is an approximation to the pronunciation of the word *brough*, which apparently is by metathesis from *burgh*. Icelandic, *Borg*, a town, fort; gen. *burge*, dat. *byrig*.

Ang. Sax., *Bur* or *Burh*, a city. Hence our words *Burgh* and *Borough*. So we have again in old authors by metathesis *Brugh*, as *Edinbrugh*.

It is necessary to observe the difference between the word *Burra* in some cases and in others. In some it is a corrupt spelling of *Burrey*—*Burgh-ey*, the “fort island,” whilst in other cases it is a corrupt spelling and pronunciation of *Burgh* or *Borough*. In Orkney *Burra* is a corruption of *Bur-ey* the fort island. In Shetland *Burraness* is of the second meaning—the

promontory of the fort. In the first the *a* should be close, and in the second should be open.

A broch is a circular tower formed of wall from 10 to 16^f thick at the base, enclosing a court from 24 to 38^f diameter, with one entrance from the outside into the court. The usual thickness of wall is about 15^f, and the usual diameter of court about 28^f. All were in outline truncated cones—that is, the outer face of the wall “batters” or inclines inwards. The wall is also decreased in thickness towards the top by set-offs inside. The chambers of the broch proper are in the thickness of the walls, but there are usually partitions in the court of later construction. The original height of these towers of course varied, and except Mousa, we have no broch more than 20^f high, but Mousa is still 40^f high, and was somewhat more. No mortar was used in them, but probably the chinks were stopped with moss or mud just as in modern Shetland cottages.

The stones of the Shetland examples are of a laminated texture—commonly micaceous schist, roughly shaped; laid in courses at the inner and outer faces as regularly as the materials admitted without mortar. There are no marks of hammer or chisel, though probably some tools were used. The courses vary in thickness from 3ⁱ to 1^f. As the outer face of the wall is conical, and as the stones have their outward faces at right angles to their beds, the wall forms a number of minute steps on which wet lodges and lichen grows. This circumstance has done much to disintegrate the stone. The interstices between the large stones in the faces of the wall were filled with smaller stones so as to make an even bed for the next course above. The walls of the chambers were also built as regularly and smoothly as the materials allowed. The core of the wall was filled less regularly. The batter of the outer face varies in different examples from 2^f in 12^f of height (the steepest), to 2^f in 6^f 6ⁱ (the flattest.) Probably the mean batter is about 1^f 2ⁱ in 6^f, which forms with the perpendicular an angle of 11°.

There are two methods of constructing the shelter in the walls—1st, By making bee-hive chambers of stones laid horizontally, each successive course over-hanging the course below, till the four sides were near enough to be closed by one slab or two slabs. This kind of vault is found in the “Picts’ houses.”¹ The access to these chambers is usually separately from the court, but exceptions will be noticed hereafter. 2nd, By making two concentric

¹ In such structures as Maeshow, and in some chambered sepulchral cairns.

walls at 2^f or 3^f or 4^f apart, and joining them at intervals of 4^f or 5^f in height by floors of flag-stones. The access to these galleries is by stairs in the wall, leading from the court. This mode affords more shelter in proportion to the stone used than the former one. In most brochs the two systems are combined, but in different proportions.

The entrances to the isolated chambers, as well as those to the galleries, were not always close to the ground. The entrances from the exterior into the court, as well as the entrances to cells and the passages in the walls, are all nearly rectangular and horizontal in the head, covered by large slabs. The original entrances from the outside have, about half way along them, a rebate for a door.

Near this rebate, on the inside of it, are in many cases bar-holes, and a gap between the covering-stones, just where the door would be. The door must have been loose, not hinged. It was probably made of wood, and barred with wood or with slate. The bars were in one piece, for the hole is always long on one side and short on the other.

In many brochs are found tanks or wells ; but some are dry and may have been store-holes, or may have been made for water and failed.

It is a matter of dispute whether the courts were roofed or not ; whether such roofs were put on in the first or second occupation ; whether there were floors also. Captain Thomas and Mr Irvine, whose observations have been accurate and extensive, with some others, suppose that they had in the first occupation floors and roofs. If they had *floors*, the roofs would be a consequence. The evidences on which these gentlemen depend are the set-offs and ledges which in most brochs are to be observed inside, the fire-places in the courts, and the position of some brochs below heights from which missiles might be shot into the courts. The roofs are by them supposed to have been conical, with an aperture for smoke in the centre, and with the eave of the roof on the outer edge of the tower.

On the other side, it is argued that no signs of insertion of beams or rafters exist in any one. If the builders had timber and skill to floor and roof them, why did they spend so much labour in making thick walls and chambers in them ? If floored and roofed, why should they have these heavy stone divisions in the court ? These probably belong to the second occupation, and it may be held that the roofs were gone by that time. We cannot assume that these forts are of as early a date as the age of timber in Shetland and

Orkney;¹ and if not, how did they get beams for 20^f span, and rafters 15^f in length, and boards for floors? The smoke of fires might get through a hole in the apex of the roof, but how through the floors, unless there were large apertures left in them? If floored, there could be no light in the lower part, and even if roofed without floors there would be but little light. At Mousa there are numerous openings to the court evidently for light; but if floored or roofed they would be of no use. There are no openings to the outside as far as we know, except three at Clickemin, and these do not light *chambers*. Probably if the brochs had been roofed they would have had at least slits to the outside for light.

The idea that a conical roof fitted *inside* the tower, and rested on the ledge at 10^f high, cannot be correct, for the wet would have poured down the wall and rendered the entrances to the cells very wet.

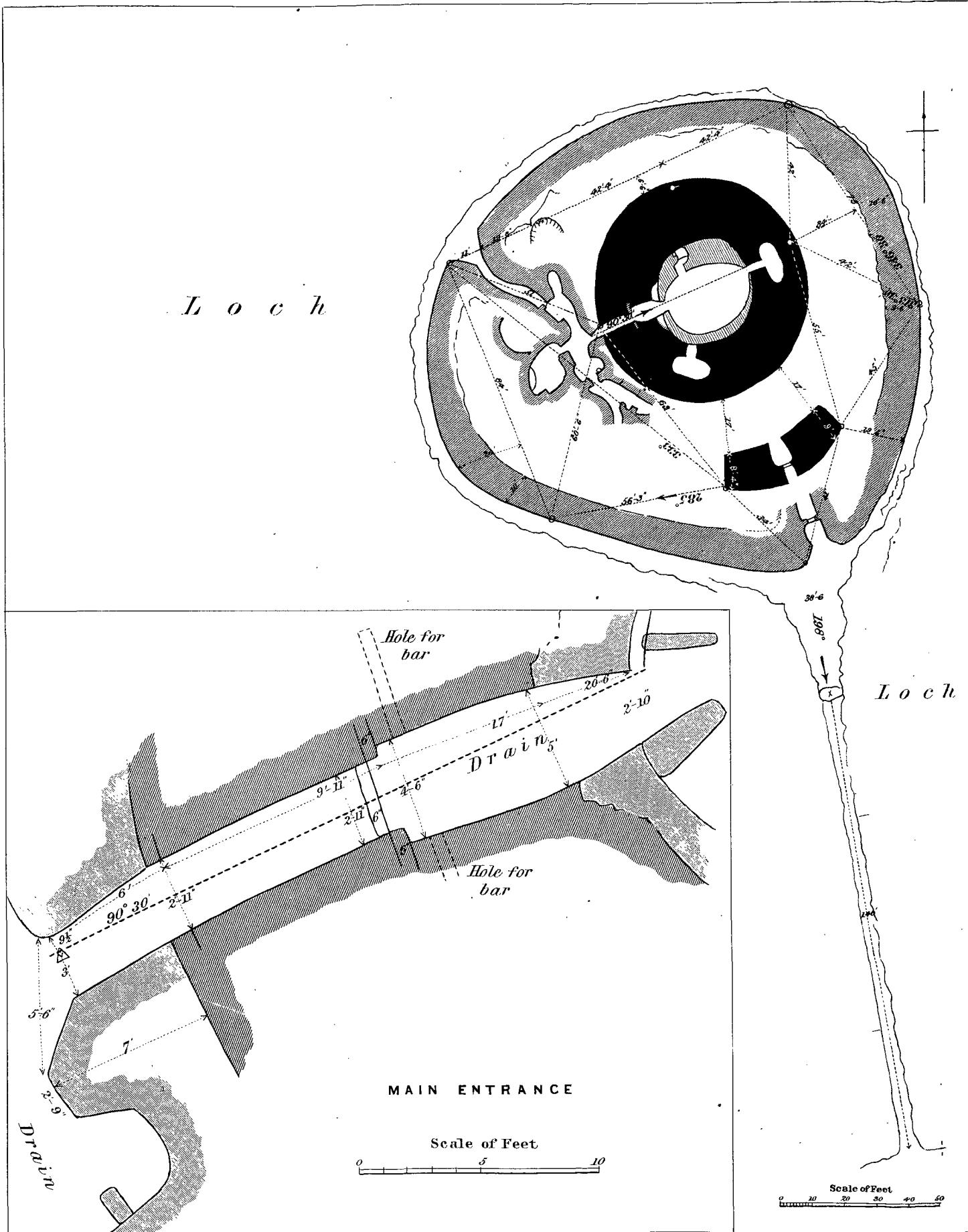
We know that the cells in the court and in the outworks of the second occupation, had, in many cases, lean-to roofs, and there is no reason why such should not have been used in the court in the first occupation. In many brochs the courts have drains—useless if roofed—but these may be of the second occupation. If the roof had reached to the outside of the tower, the use of the wide top, as a position for defenders, would have been prevented. This cannot be supposed; the roof, if conical, must have reached on to the flat top and must have had a passage and parapet outside it, just as the roofs of the Irish castles are. On the whole, it seems that the evidence in favour of roofs is outweighed by that against them.

BROCH OF CLICKEMIN.

(See Plates XVII.—XX.)

This broch is on a holm or small island in the Loch of Clickemin, about three quarters of a mile west of Lerwick. The loch is within a short distance of the sea, and nearly level with it. A narrow passage of stepping-stones, 170^f long, connects the holm with the south shore of the loch. On the west of the loch the ground rises for some distance. The name Clickemin is applied to several roadside inns in Scotland, and is a contraction of “click-them-in”—catch them, *i.e.*, the travellers. Formerly there was a whisky

¹ Those who have examined the evidence assert that there is no trace of an age of timber in Orkney and Shetland.



Sir H. Dryden, delt.

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BROCH IN THE LOCH OF CLICKEMIN, NEAR LERWICK, SHETLAND.

shop by the side of the main road near the loch, which gave its name to the loch.

The tower or broch proper is about the centre of the holm, which is 150^f N. and S. by 154^f E. and W., and is surrounded by a wall, now varying from 1^f to 3^f in height, and in some places 10^f wide. (See Plate XVII.)

On a stone on the causeway there are two sinkings in the shape of two human feet, whether cotemporary with the occupation of the fort is uncertain. The entrance through the outer wall is on the S. and E. The holm is of rock, and the centre of it is only about 1^f 3ⁱ above the average water-level of the loch. The interior of the tower and some chambers on the W, and S.W. of it were excavated in 1861-2 by some gentlemen in Lerwick with assistance from the Society of Antiquaries and others. The plans were made by the writer partly in 1855, and the remainder in 1866. The scales of the original plans are—General plans, 4-8thsⁱ to 10^f; detailed plans and sections, 3-8thsⁱ to 2^f; some portions, 3-8thsⁱ to 1^f.¹ The magnetic meridian was taken to be 25° W. of N. Several sketches inside and outside were taken. Copies of all are in the library of the Society. Between the entrance and the outer wall of the tower or broch proper is an outwork, described hereafter, and outside the tower on the W. and S.W., between this outwork of the entrance to the tower, are chambers, also described hereafter.



The base of the tower is hidden on the outside by fallen rubbish, and its contour is not a perfect circle. The external diameter, W. by S. and E. by N., is 67^f 6ⁱ; the walls, 19^f 6ⁱ and 19^f thick; and the diameter of the court in the same direction, 29^f. But a considerable block of masonry was inserted in later times, which reduces the court to an irregular oval 26^f 10ⁱ W. by S. and E. by N., by 20^f 9ⁱ N. by W. and S. by E. The height of the wall on the west (the highest part) is 19^f 4ⁱ from the floor of the court.

The building is of the schist of the district, in courses from 3ⁱ to 10ⁱ thick. The outer face inclines in most places about 2^f 6ⁱ in 10^f of height. The entrance into the tower is on the W. by S., and a passage 50^f long leads

¹ The scales used in the plates are—General plans, 1-4th inch to 10 feet; common plans and elevations, 1-16th inch to 1 foot. Some parts, 3-16ths inch to 1 foot.

N.W. from the outer end of it to the loch. About half-way along the entrance passage are as usual two projecting slabs of stone, leaving a passage between them 2^f 11ⁱ wide at bottom and 2^f 6ⁱ at top. The passage to the west of them is the same width, but on the east side of them it is 4^f 6ⁱ wide at bottom, and 5^f wide further east. A strong sill is placed on the west side of the jambs. The entrance passage is 4^f 10ⁱ high. On the east side of the jambs before mentioned, and at about 6ⁱ from them, are holes for a bar to fasten the door. Over the internal part of the entrance passage is an ambry or store hole, with an opening into the court. It is usual to find such openings over entrances to chambers, and doubtless one reason for the position was to lighten the pressure on the lintels of the entrances. The floor of this ambry, which is also the roof of the east part of the entrance-passage, does not reach quite up to the jambs of the doorway. This opening is found in some other brochs. The door must have been a loose shutter, probably of rude pieces of wood pinned together, just pushed up a little way through this slit, and then let down into its place, and fastened with the bar. On the east of the court, and opposite the main entrance, is the entrance into a chamber constructed in the thickness of the wall. The sill of the entrance is raised a step from the floor of the court. The entrance is 2^f 6ⁱ wide at the bottom, 2^f 3ⁱ wide at top, and 2^f 11ⁱ high. The chamber is 12^f 6ⁱ N. by W. and S. by E., 5^f E. by N. and W. by S., and 7^f 3ⁱ high in the centre, constructed in the usual bee-hive way, by stones laid horizontally and overhanging the course below till within 2^f 6ⁱ of each other. On the south is a chamber 11^f 6ⁱ E. by W., and 5^f N. by S., and originally about 7^f high, constructed as the last. The original entrance from the court is visible from the inside, but is blocked by the insertion before mentioned, and the only access to the chamber now is near the top of it, as shown in the section in Plate XX.

It is probable, judging by other examples, that there is a chamber in the north-west part of the tower, the entrance to which has been blocked up by the insertion. At 10^f average above the floor of the court is a ledge about 1^f wide. At 4^f 9ⁱ above the floor in the north wall of the tower is an entrance 2^f 7ⁱ wide, which passes through the wall to an opening in the outer face 3^f 7ⁱ high by 2^f 5ⁱ, the sill of which is 7^f 4ⁱ above the water. Midway along this passage a flight of twenty-one steps leads up eastward, and a chamber is attached westward. Of these stairs the risers are commonly 7ⁱ or 8ⁱ, and

the treads from 5ⁱ to 8ⁱ. At about 6^f 6ⁱ above the floor in the south wall of the tower is an entrance from which access is gained to the chamber before mentioned (not the original entrance of the chamber), and to a landing on the wall, from which a flight of fourteen steps leads up westward to galleries now destroyed, and from which a gallery 4^f high leads eastward for about 50^f, and then turns at right angles to an opening 2^f 11ⁱ high by 2^f 4ⁱ, in the outer face, the sill of which is 9^f 5ⁱ above the level of the water. (See plan half-way up, Plate XIX.)

Over this gallery is the lower part of another gallery nearly similar in form and extent, which at its east end has an opening into the court, as well as in the outer face. The upper part of this gallery is gone.

There is nothing to guide us in conjecturing the height of the tower originally. Mousa is now 40^f, and was more. We may fairly assume that Clickemin was at least 30^f.

In nearly all the brochs which have been excavated have been found constructions, more or less extensive, inside and outside, apparently of a later date than the original towers; at least the various persons who have conducted the examinations have independently come to the same conclusion. The evidence appears to prove that this second occupation took place at a considerable interval from the end of the first occupation, and by a people of less mechanical skill, and to whom the power of defence was less necessary. The broch of Clickemin affords good evidence in this matter. The interior addition is, on the average, 7^f 8ⁱ high, on the N.W. it is 7^f 3ⁱ wide, on the S. 2^f 10ⁱ wide, on the E. only 1^f. The constructors of this addition continued to use the original E. chamber, and formed a chamber on the N.W. side in the addition. On the S. they built their wall against the entrance to the original S. chamber, so as to block it up, and made an access (unless it was broken through previously) near the top of the chamber. It is very probable that they blocked up an entrance to an original chamber on the N.W. Inside this addition, and projecting from it, are slabs of stone edgeways, making compartments round the court, as in most other brochs. These slabs are from 1^f to 3^f high. On the S. of the court is a stone construction like a bed, locally termed "Bink," about 5^f 7ⁱ long by 2^f 9ⁱ wide, and 2^f 2ⁱ high. In this addition, at 4^f 6ⁱ above the floor of the court, and entered from the passage before mentioned, is a chamber 2^f high, 2^f 9ⁱ wide, and 8^f 3ⁱ long, roofed with slabs of stone. This large mass of inserted

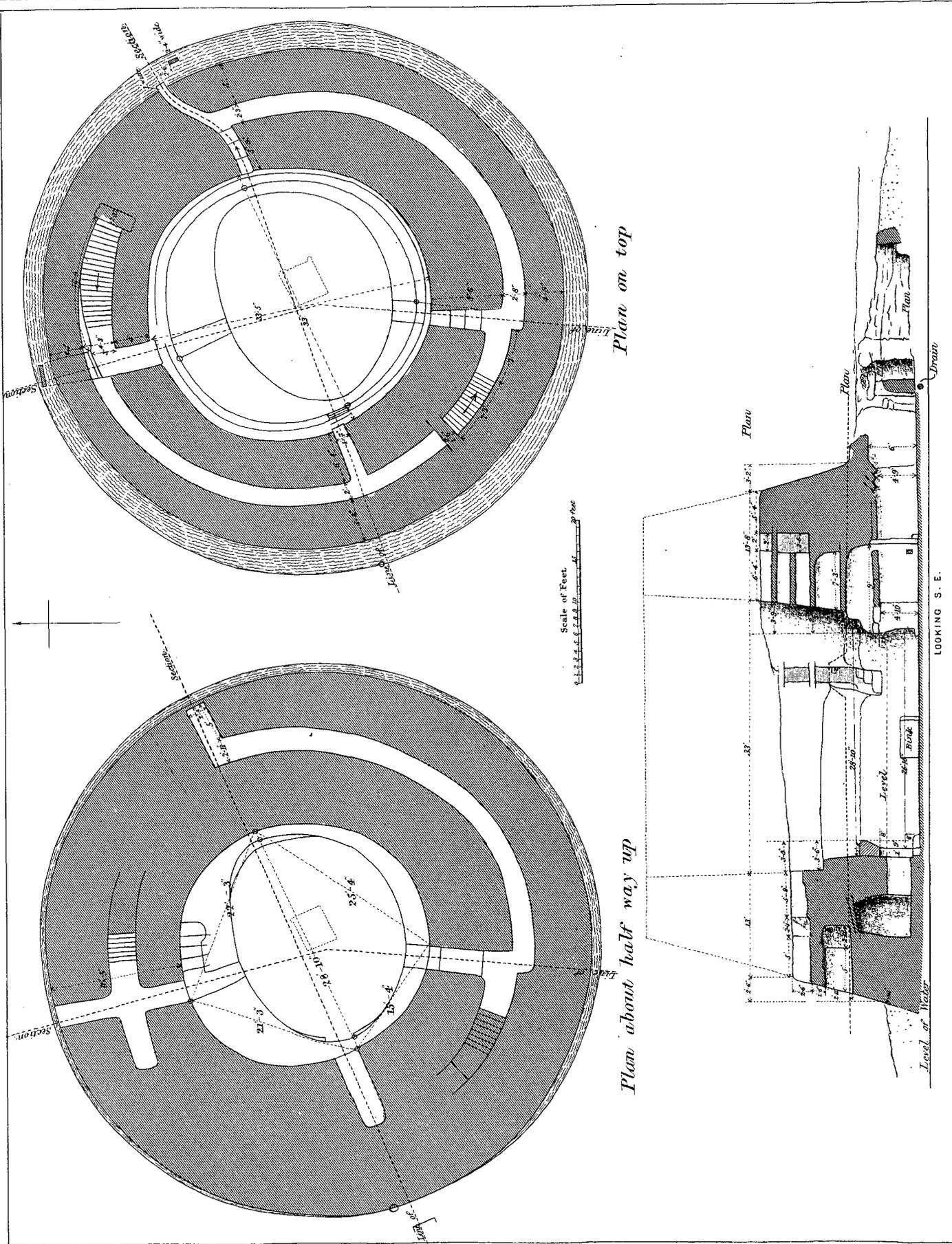
masonry contains only two small chambers, and it is probable that the second occupants found the interior of the tower much incumbered with fallen stones, and, therefore, built them up in this form to put them out of the way, just as a Galway farmer makes a wall 15^f wide in his field.

In the middle of the court is a fire-place, 3^f 6ⁱ by 2^f 11ⁱ, of which the sides are now only 5ⁱ or 6ⁱ high. On the S. side of the court the original wall had decayed and fallen, so that several courses which had not actually fallen had inclined. At some subsequent period (probably at the second occupation) courses of masonry, *laid level*, were placed on the top of these sloping courses, which shows that considerable decay had taken place in the original tower when the second occupants took up their abode in it.

Outside the main entrance are many irregular chambers and passages, of which the upper parts have been destroyed. Many of these were covered, and others were not, and it is now impossible accurately to determine which were covered and which were open. The passage leading to the water is for the most part about 2^f 10ⁱ wide, with walls 2^f 4ⁱ high. About midway a projecting jamb looks as if a door was placed there, and probably the part between it and the main entrance was covered, especially as there is in it a "bink." A drain runs from the court, through the main entrance and under the floor of this passage, to the loch.

W. of the main entrance is a large chamber, perhaps partially covered, in which is another "bink." The space (13^f span) seems too large to have been covered by a bee-hive roof, and there are no pillars which might have supported lean-to roofs. S. of the entrance to the tower is a passage or chamber, which has at its S. end a doorway or entrance 1^f 8ⁱ wide, and 5^f high, on which the roof remains. At 7^f S.E. of this the passage forks, and between this point and the outwork or guardhouse, the chambers and passages are in great ruin, and have not been cleared. Probably these constructions are of the same date as the large interior addition.

Between the entrance in the outer wall surrounding the holm and the tower, is the guard-house (Plate XX.), in form a segment of a circle, 43^f on its convex face, connected with the outer wall by a passage, in which is a doorway, but not connected with the tower, at least no connecting walls appear. This outwork is about 13^f wide at bottom, 19^f at top at the passage through it, which is near the centre, and about 8^f high, but it is irregular in width. There is a chamber on each side the entrance. About 5^f in from the outer



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face the entrance passage is diminished to 2^f 11ⁱ, by the usual jambs for a door, inside of which the passage is wider. Holes remain for the fastening bar, and a slit in the roof, as in the entrance to the tower. The E. chamber is 9^f 6ⁱ long. The only access to it is from the space over the entrance, through the top of the chamber. The W. chamber is on a higher level, and entered from the same landing on a level. At the W. end of the guard-house are steps leading to the top of it, and doubtless there was a parapet, which is now destroyed. The wall is broken away over the outer end of the entrance, but was solid. We must suppose that the outer wall and the walls forming the passage to the guard-house were several feet high, so that the only access to the tower was through the guard-house. It is doubtful whether this building is of the date of the original tower, or of the external chambers, or of some intermediate date. Judging by the work it is rather to be attributed to the builders of the tower, than to those of the external chambers. No other example is known, though so few brochs have been examined by the spade and pick that we cannot affirm that no example exists.

The interior addition was probably built out of materials fallen or taken from the upper part of the tower, and many of the external chambers may have been made from the surrounding wall, not as in the former case to get rid of the stones, but to save the labour of transporting stones. Although the builders of the original broch had some mechanical skill, we may infer by the chambers, passages, and especially the steps, that they were people of small stature. When the tower was cleared in 1861, there were found stone troughs or mortars, used for bruising grain; oval beach stones, used as pestles; coarse black pottery, whorls for the distaff, stone pot-covers, and quantities of shells.

There is a short paper on this broch by J. T. Irvine, F.S.A. Scot., in the *Journal of the British Archæological Association*, of December 1866.

BROCH OF MOUSA.

(*See Plates XXI.-XXII.*)

This is on the W. side of the little island Mousa, properly Mous-ey, which is the S.E. of the Shetland group. It is on a small rocky promontory, at the point nearest to the mainland of Shetland. The bottom of the tower is about 20 feet above high water mark, and is only 19 feet from the edge of the plateau. The rocks slope down to the water. The point of the promon-

tory is on the N.W., about 80^f from the tower. On the S.E. are the remains of an intrenchment, and on the N.E. another less distinct. The ground round the tower has been disturbed. It is stated that there were remains of bee-hive huts round it, as round Burriland on the opposite side of the strait, but these were taken away many years ago to build the farm-house.

In a view of the tower in Lowe's Tour, is shown a circle of boulder stones round the tower. It is built of schistose slate, varying from 1^f to 2ⁱ in thickness, averaging 6ⁱ at bottom and 4ⁱ at top. No lime is used in it, but probably the chinks in the chambers were filled with mud or moss.

Plans and sections were made by the writer in 1852, but at that time the interior was filled with rubbish to a depth of 9^f, and the lower chambers, of course, were not visible. In 1861, through the exertions of the owner, Mr Bruce, and some members of the Society of Antiquaries of Scotland, the interior was cleared, and some repairs done to the walls, so as to check further decay. The plans and sections of the lower portion of the tower were made by the writer in 1866. The scales of the original plans are—general plan, 4-8thsⁱ to 10^f; detailed plans and sections, 3-8thsⁱ to 2^f; portions, 3-8thsⁱ to 1^f. The magnetic meridian is taken to be 25° W. of N. Several sketches inside and outside were taken. Copies of all are in the library of the Society.

The diameter at the ground is about 50^f 2ⁱ, and at top about 38^f. The wall, at bottom, at the entrance is about 15^f 6ⁱ thick. The entrance from the outside to the court is on the W. by S. It is 5^f 3ⁱ high by 2^f 11ⁱ wide. The roof of the passage slopes upwards towards the court. There has been some mutilation about the entrance, and there is a good deal of new work (before 1851) about the inside and outside. Midway along the passage were the usual projecting jambs, within which (eastward) the passage was wider. No bar holes are now visible.

There is a set off course or ledge, 7¹/₂ⁱ wide, on an average, from the wall above it, all round the court, about level with the inner roof stone of the entrance passage, and two or three large stones projecting inwards 1^f or 1^f 6ⁱ. Above the ledge the diameter of the court is 22^f 6ⁱ N. and S., and 21^f 3ⁱ E. and W. At the floor, about 2^f 6ⁱ less each way. The top of the tower is not complete at any part, but is highest on the E., and measures there 41^f from ground outside, and 45^f from the floor inside. The upper part is so much decayed that the construction of the top of the walls, and of

the head of the stairs, cannot be ascertained. Probably the top of the tower was flat, or nearly so, except a parapet wall at its outer edge, like many of our old castle walls. Round the floor of the court attached to the wall, or rather forming part of it, is a bench or ledge about 1^f high, near entrance, and rising to 3^f high at farther side. This served as the step to reach the entrance to the stairs on the N.

On the ground floor are three isolated bee-hive chambers, roofed as usual by horizontal stones overhanging the course below, till near enough to be closed by one slab at top. These have entrances from the court. The chamber on the N.W. is 14^f long by 5^f 6ⁱ wide, and 9^f 6ⁱ high. The entrance is 3^f 2ⁱ high and 2^f 3ⁱ wide. The chamber on the E. is 14^f by 6^f 10ⁱ and 10^f 6ⁱ high. The entrance is 3^f 4ⁱ high and 2^f 9ⁱ wide. The chamber on the S.W. is 16 by 5^f 9ⁱ and 9^f 9ⁱ high. The entrance is 3^f high and 2^f wide. Each chamber has two or more ambries or store-holes in it. Each entrance has over it apertures, which not only relieve the pressure on the lintels, but give light to the chamber. In this lower compartment of the building are three ambries recessed, 4^f 9ⁱ, 4^f 4ⁱ, and 2^f respectively. (See Plate XXI.)

At 4^f higher level than the entrance to the chambers on the N.E. is the entrance to the stairs, 5^f 4ⁱ high by 3^f wide. The stairs lead up S.E., and give access to the galleries. Opposite the foot of the stairs is a chamber. The stairs are of stones, from 10ⁱ to 2^f wide, and average 4 $\frac{1}{2}$ ⁱ rise, and only 5ⁱ tread.

There are now six galleries, as shown in elevations (Plate XXII.). The roofs or floors of the galleries are of stones from 10ⁱ to 2^f wide, and 4ⁱ or 6ⁱ thick, reaching into both walls. The height of the galleries varies from 4^f to 5^f 6ⁱ, and the width from 1^f 6ⁱ to 3^f 2ⁱ; but probably none were originally so narrow as 1^f 6ⁱ, for reasons given hereafter. The access to them is by getting off the stairs, facing downwards. The floors of the galleries could not come within about 3^f 9ⁱ of the stairs, or there would have been too little head-room for persons going up or down

The galleries and stairs are lit by four sets of windows opening into the court. One set of windows is over the main entrance. It had fourteen openings (one division is now gone), in all 16^f 4ⁱ high, varying in width from 2^f 9ⁱ to 10ⁱ. Another set is on the east, over the entrance to the stairs. This consists of eighteen openings, in all 20^f 7ⁱ high, varying from 2^f 9ⁱ to 10ⁱ in width. The next set is nearly over the east chamber, in all 16^f 9ⁱ

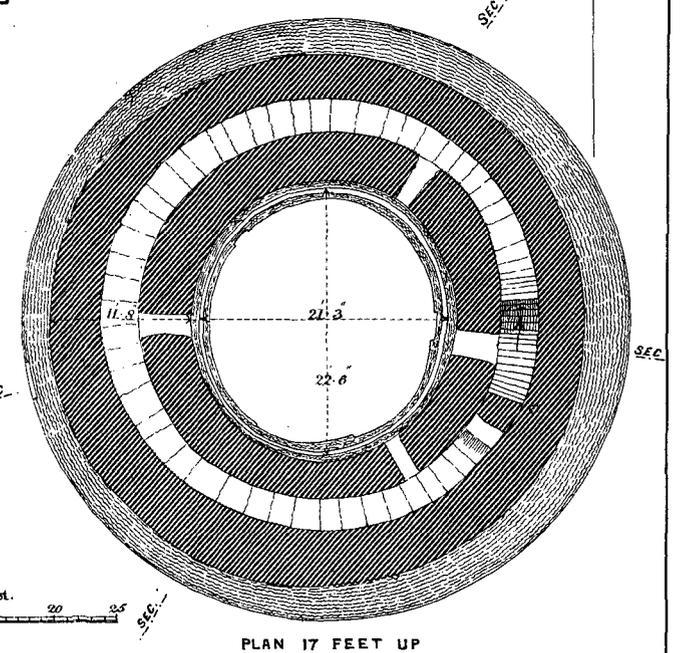
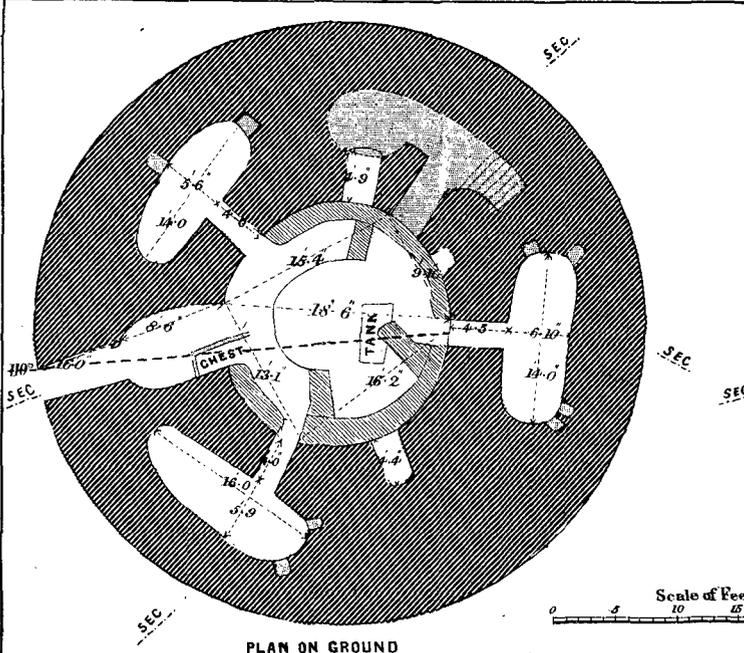
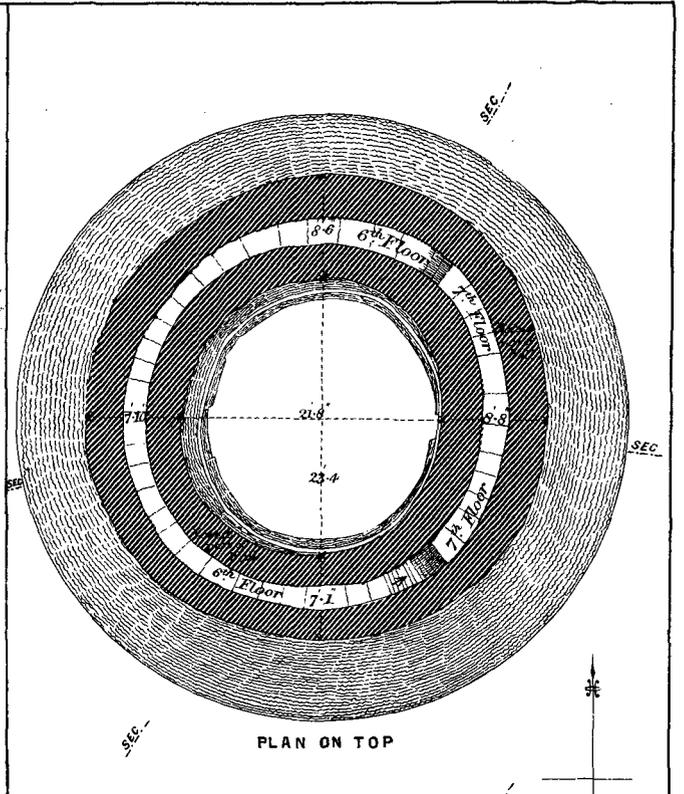
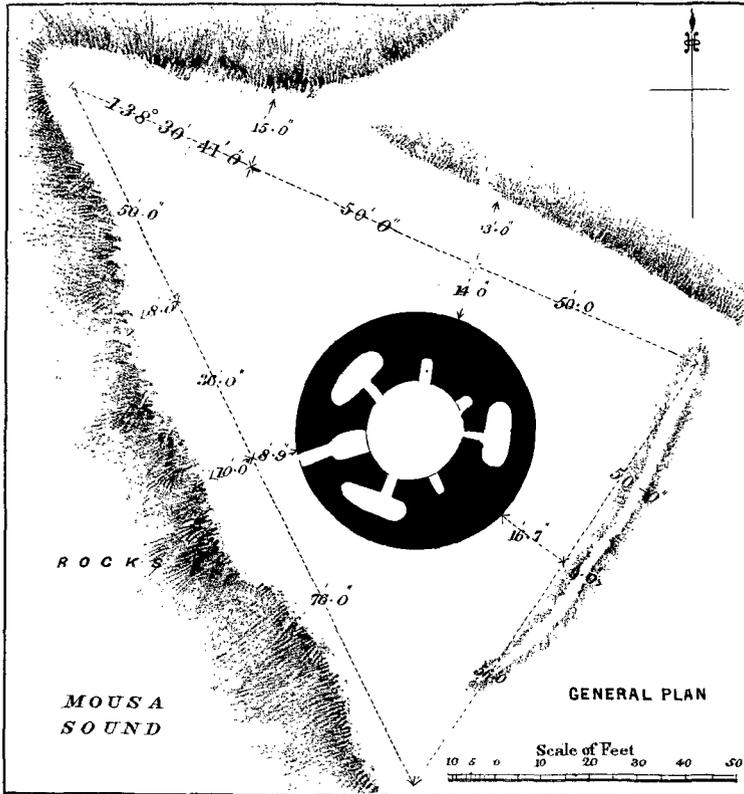
high. Several of the divisions have been broken into one, so that the number of original openings is uncertain. They vary from 3^f to 9ⁱ in width. The fourth set is on S.S.E. It consists of seventeen openings, in all 20^f 3ⁱ high, varying from 1^f 7ⁱ to 9ⁱ in width.

In the court and attached to the wall of the tower are rude irregular walls and benches of stone, the use of which is not apparent; but they answer to the slabs which are more commonly found. They vary from 1^f to 3^f 9ⁱ in height, and are doubtless additions. A circular space in the court is sunk 1^f below the portion next the wall of the tower. This possibly was to make the chambers and portion next the wall more dry. In the court is a tank, probably to hold water, 4^f 3ⁱ by 2^f 6ⁱ, and about 2^f deep, partly built and partly cut in the rock. It was at least partly covered, and part of a partition wall is over it.

In clearing the interior in 1861 great quantities of animals' bones, especially of otters, were found; the remains of a clay pot, black with use on the fire, flat round stone pot-covers; a slaty stone, about 1^f long, like a three-cornered file; and a carved model of a Norway boat in fir, about 3ⁱ long.

Reference to the plates will show that the outline of the tower has in a slight degree the form known as "ogee," and much has been said of this peculiar outline, which has been supposed to be original. It is certain that this form is the result of accident, and that the tower originally was a truncated cone. The outer wall has slipped down a little with regard to the inner one. Hence it bulged out near the bottom, and fell in nearer the top. The inner wall has bulged towards the outside about halfway up. The floors of the galleries incline downwards towards the outside, especially on the east. The inclination is greatest in the highest galleries. Many of the stones of the floors are torn asunder, and the two walls in the fifth gallery, where the double wall is now narrowest, so nearly meet as to prevent passage. The interior face of the wall near the top leans inwards, or overhangs to the court, from decay, and unequally in different parts.

The whole construction of this tower is doubtless very rude; but could a modern architect, with few tools, with no wood, or with only enough to make a door, and without lime, contrive a building which should more conveniently afford an open or perhaps roofed court, an unscalable and impenetrable wall (no guns being in use), and larger accommodation, in the same area, namely, four isolated cells, and about 460^f of gallery, sheltered from



wind and weather? The section of the tower, showing stairs, in Hibbert's "History of Shetland," copied by Worsaae in "The Danes and Northmen," is very erroneous.

In Glen-beg, district of Glenelg, county Inverness, are two brochs, of which considerable portions remain, which appear to be constructed on the same plan as Mousa. Both are rather larger in diameter than Mousa, Castle Ellye (in Gordon's "Itinerarium," called "Tellve")—Exterior diameter about 55^f; interior diameter about 33^f. Castle Troddan—Exterior diameter 53ⁱ; interior diameter, 29^f 6ⁱ.

OTHER BROCHS IN SHETLAND.

The writer visited and made plans and views of the following brochs in Shetland, as far as could be done without excavating; but there are numbers more :¹—

MAINLAND.

BRINDISTER.—Exterior diameter, 68^f; interior diameter, 34^f. Entrance on S.W., on which side the wall is 12^f 6ⁱ high. Internal additions, but centre is filled up.

LEVENWICK².—Exterior diameter, about 54^f 6ⁱ; interior diameter, 28^f 6ⁱ. Traces of outer wall and of ramparts beyond that on N.W. and S.

CULLSWICK.—Exterior diameter, 50^f 8ⁱ; interior diameter, 24^f 8ⁱ. Considerable portion of the tower remains, and traces of outer wall as at Clickemin. (See Hibbert's "Shetland.")

BURRALAND.—Exterior diameter, 55^f; interior diameter, 37^f. Much encumbered with debris. Entrance not visible. Apparently had galleries as Mousa. Near it remains of fifteen or twenty bee-hive huts, from 5^f to 12^f in diameter.

SUMBURGH.—A broch stood where the present lighthouse is.

DUNROSSNESS.—Grown over; no exact measures can be given. Two ramparts surrounded it; but little of the tower can remain.

HOULAND (Northmaven).—On a holm in a loch; much ruined; no measures taken.

¹ For a complete list of the Brochs in Shetland see the Appendix to the previous Paper by Mr Anderson, p. 179.

² See paper by Mr G. Goudie on the Broch of Levenwick, Proc. vol. ix. p. 212.

FETLAR.

HOUBIE. — Exterior diameter, 58^f; interior diameter, 33^f. Ruined and grown over. Nothing can be stated of chambers. Was defended by considerable ramparts on land side.

SNABURGH.—Nearly all the broch has been destroyed by the sea. Perhaps the piece of wall which remains is part of an outer concentric wall as at Cullswick. Was defended by two ramparts on land side. Hibbert has termed this a Roman camp.

UNST.

OGANESS.—What little remains of the tower is enveloped in rubbish and grown over. Has double rampart on land side.

TAFT, near Burrafirth.—On a small ness. Much ruined; no measures taken.

UNDERHOOL (from J. T. Irvine).—Exterior diameter, 55^f 9ⁱ; interior diameter, 25^f 9ⁱ. Entrance on W.; ramparts on N.E.

YELL.

BURRANESS.—Exterior diameter, 57^f; interior diameter, 27^f. Much destroyed; entrance not visible. The N.W. part about 16^f high. Traces of ramparts all round it. Appears to have had isolated chambers and galleries.

No doubt the building of brochs was carried on for many years—200 or 300, perhaps more—and we may fairly place latest those with long galleries and stairs as showing the greatest mechanical skill. The similarity of the towers from the north of Shetland to the south of the Western Isles shows that communication existed amongst the people who built them; and that a traditional and easily remembered measure was in use. Perhaps this measure was the cubit, which seems the most ancient, and one of the natural measures.

A cubit may be taken at 18ⁱ. This would make the walls 10 cubits thick, and the court 20 cubits in diameter—numbers easy to remember. The similarity of the additions, and of the remains found in and about the brochs, show a similarity of race amongst the second occupants.