

## I.

ON SOME OF THE VITRIFIED FORTS OF SCOTLAND, WITH REFERENCE TO DESCRIPTIONS OF SIMILAR REMAINS IN BOHEMIA, IN A COMMUNICATION FROM DR FERDINAND KELLER OF ZURICH. BY JOHN STUART, Esq., LL.D., SEC. S.A. SCOT. (PLATE XIII.)

It is now nearly a century since Mr John Williams, mineral engineer, in a series of letters published in the year 1777, first drew attention to the vitrified forts of Scotland. Mr Williams was employed by the Commissioners of Forfeited Estates in his official capacity; and while so engaged he, for the first time, came to know of these remains. At the desire of the commissioners, he made a section through the walls of the fort on Knockfarril, near Dingwall, and the results are recorded in the second and third of his published Letters. This gentleman examined many other vitrified walls in the north of Scotland, with great attention to the details of each, and his observations are marked by singular candour and good sense.

The result of these investigations led Mr Williams to believe that the walls of these forts had been vitrified by the action of fire applied for the purpose, and that they were only to be found in that part of Scotland on the north of the Forth.

That the walls had been designed for forts he felt sure, because he found that they corresponded in every particular with the ordinary hill

forts of the country, except that they had been rendered cohesive by the action of fire. This applied to situation, plan, and constructional idea, even in minute details. The copy of Mr Williams' little volume, belonging to the Society, was presented by the author, and he has added to it a letter in his own handwriting, which, so far as I know, is unprinted. In it he says—"I wish to engage your attention to the perfect similarity in the choice of situation, and in the plan and figure of the ancient British fortified camps upon the north and south sides of the Forth, whether vitrified or not. Where such a spot was to be had conveniently, they always made choice of a small hill or rising ground, with a level area upon the summit of it, which they enclosed with a wall or building carried round the outer verge of that area; and where they had room enough upon the summit, they had a lesser enclosure upon the south side of the main body of the fort, if the ground allowed of its being upon the south; and this everywhere occurs, whether the fort was vitrified or not."<sup>1</sup>

After several years devoted to a study of the subject, and the mode of construction of these walls, Mr Williams could think of no satisfactory solution of the question but the following:—

"I imagine they have raised two parallel dykes of earth or sods, in the direction or course of their intended wall or building, and left a space between them just wide enough for the wall. I suppose these two parallel dykes, the groove or mould in which they were to run their wall. This groove between the two dykes I suppose they packed full of fuel, on which they would lay a proper quantity of the materials to be vitrified. There is no doubt but a hot fire would melt down the stones, especially if they were of the plumpudding kind, and not too large. And the frame of earth would keep the materials, when in fusion, from running without the breadth of their intended wall.

"This being the foundation, I suppose they have added new fires and more materials, and raised their mould of earth by degrees, till they brought the whole to the intended height, and then have removed the earth from both sides the vitrified wall.

"I am confident, from the appearance of the ruins, that the materials were run down by the fire in some such method as this. In all the

<sup>1</sup> Letter (MS.), pp. 14, 15.

sections of the larger and smaller fragments of the vitrified ruins I have seen, I never saw the least appearance of a stone being laid in any particular way. I never saw a large stone in any fragment of these ruins; nor any stone, nor piece of a stone, that was not affected by the fire, and some part of it vitrified; and all the bits of stone that appear in these fragments appear higgledy-piggledy,—just as we would suppose they would fall down in the fire when the materials were in a state of fusion.”<sup>1</sup>

The artificial character of the vitrification was rejected by Mr Pennant and other inquirers, who ascribed it to volcanic agency. And Lord Woodhouselee, while admitting that the walls had been vitrified by the hands of man, would not believe that this had been accomplished at the time of their construction, but of their demolition.

To those who have seen the regularity and extent of some of these vitrified walls, it will seem surprising that the volcanic theory could have gained any footing.

It indeed requires us to believe that the volcanoes threw out in all cases just enough of material for the construction of the walls, without any other traces of their action, and that the lava always took the shape of a wall which adapted its direction to the variously-shaped platforms on the hill tops. It is equally impossible to give any weight to the suggestion that the vitrified walls were the result of occasional peat fires, for the action of these, however intense, could never account for the enormous masses of compacted and partially melted stones of which the walls are formed.

As to Lord Woodhouselee’s suggestion, it does not seem to rest on any better foundation; for it is easier to conceive of it, if artificial vitrification be admitted, as part of the tedious process of construction than as the result of one great conflagration at the hand of enemies.

The view entertained by Mr Williams met with the support of two celebrated men—James Watt, and Dr Joseph Black, professor of chemistry in the University of Edinburgh. In a letter to Mr Williams from the latter, he says—“There are in most parts of Scotland different kinds of stone, which can without much difficulty be melted or softened by fire to such a degree as to make them cohere together. Such is the

<sup>1</sup> Williams, pp. 48, 49.

greystone called whinstone, which for some time past has been carried to London to pave the streets. Such also is the granite or moss-stone, which is applied to the same use, and pieces of which are plainly visible in some specimens of these vitrified walls which I received from my friends. There are also many limestones which, in consequence of their containing certain proportions of sand and clay, are very fusible; and there is no doubt that sandstone and pudding-stone, when they happen to contain certain proportions of iron, mixed with the sand and gravel of which they are composed, must have the same quality. A pudding-stone, composed of pieces of granite, must necessarily have it. There is abundance of one or other of these kinds of stone in many parts of Scotland; and as the whole country was anciently a forest, and the greater part of it overgrown with wood, it is easy to understand how those who erected these works got the materials necessary for their purposes."<sup>1</sup>

James Watt, after a survey of Craig Phadric, near Inverness, writes—  
“I think it a work of art, probably formed by piling up layers of stones and wood, and setting them on fire.”<sup>2</sup>

The result of later investigation has only strengthened the conclusions to which Mr Williams had been led.

The late Dr John Jamieson spent much time in the examination of the vitrified fort on the hill of Finhaven, in Forfarshire. On one occasion his opportunity was specially favourable, as the tenant was engaged in clearing away part of the principal wall for the erection of fences. After piercing through a mass of external rubbish of 8 or 10 feet in width, the vitrified wall was reached, and was found to be regularly built. It stood from 10 to 14 feet in height, being much the same as that of the north wall at Knockfarril, when examined by Mr Williams; and as seen in a section, was from 20 to 30 feet broad at the base.

The stones of which this wall at Finhaven was formed had been brought from various quarters. In one small heap Dr Jamieson counted seven or eight kinds of stone.<sup>3</sup> Many of the stones appeared to have been quarried, and these not on the outside, but in the very heart of the

<sup>1</sup> Williams, p. 82.

<sup>2</sup> Ibid. p. 79.

<sup>3</sup> Dr McCulloch has remarked that stones of different kinds appear in the vitrified walls of Dun MacSniachain and Dunadeer.—*Highlands and Western Islands of Scotland*, vol. i. p. 292.

wall. One stone in the wall bore marks of dressing, and from its description appears to have been part of a quern.<sup>1</sup>

At the bottom of the wall a great quantity of the ashes of burnt wood was found mixed with the stones, exactly in the situation in which they must have been had the wall been originally built with stones and wood intermixed, as having sunk down through the crevices left in consequence of the wood being consumed.

The influence of the fire had not produced the homogeneous appearance which attends volcanic agency. Some of the stones had been thoroughly fused; others bore marks of burning, but not of fusion. At times the outer part of the stone was vitrified, the middle merely scorched, and the centre untouched by fire. Parts of the wall were observed, which from top to bottom afforded no vestiges of fire, while others were completely burnt.

The conclusion to which all the appearances at Finhaven seemed to tend is thus expressed by Dr Jamieson:—"A wall of about 4 feet in depth, consisting of large stones, pretty regular in their shapes, has been built as high as it might be supposed to stand. Great quantities of wood have been laid around the foundation, and transversely through the wall; wood and faggots have been piled on each side, with smaller stones of every kind intermixed, and the mass has then been brought into a state of ignition. While it was burning, more fuel would be thrown on it, and additional quantities of stones, till the irregular concrete mass formed a buttress on each side for the regular intermediate wall; for here the wall is vitrified both within and without. It might afterwards be raised to a greater height, and its buttresses be also elevated by the same process as before. The fact of the wood having appeared thoroughly burnt at the foundation, and in the inmost part of the wall, strongly confirms the idea that the vitrification was the result of design, and carried on gradually."

Dr Jamieson has in the same paper described the vitrified walls on the Laws, near Dundee. It is unnecessary, however, to refer to his re-

<sup>1</sup> "This in form resembled a mill-stone, with a hole bored in the centre, not, however, perforating the stone. Around this orifice was a circular groove, with diagonal lines proceeding from it all the way to the circumference."—*Trans. Roy. Soc. of Literature*, p. 243.

marks on these, further than to draw attention to his statement that the greater part of the western division of the fort had been occupied by buildings of a small size, of which the foundations remained untouched. He adds—"All the buildings have been as regularly vitrified as the walls, for the stones, as far as can be judged, retain their original foundations, and have no appearance of having been collected from fallen masses huddled together in haste on the spur of the occasion."

Vitrified buildings were also observed by Mr Williams at Knockfarril. "Immediately," he says, "on the inside of this surrounding wall there are ruins of vitrified buildings, which seem to have been worse done, and so are fallen into more decay than the outer walls. I imagine these inner works have been a range of habitations, reared against or under the shade of the outer wall."

As bearing on the questions of design and mode of construction, I am permitted by our learned associate, Dr John Hill Burton, to quote from a letter recently addressed to him by Mr Andrew Ramsay, Director of the Geological Survey of England.

In the year 1859, Mr Ramsay examined Knockfarril, in the neighbourhood of Brahan Castle. "I then came to the conclusion," he writes, "that the vitrification had been done of set purpose, and that this effect had been produced by burning wood. A circumstance which clearly proves the possibility of such vitrification came under my notice last year, and has tended to confirm my first impression. Near Barnsley, in Yorkshire, the country affords no good stone for road metal. The rocks of that district, west of Barnsley, consist of the Gannistic beds, or lower Coal Measures, which rest upon the millstone grit. These strata are chiefly formed of sandstones, composed of granules of quartz and felspar, and flakes of mica: they were, in fact, made from the debris of granite gneiss, similar to that of the Scotch Highlands. In their natural state, when broken, they yield but a very poor material for road-making, as they pound up rapidly under cart wheels. To obviate this defect, the following process is adopted:—The stone being quarried in small slabs and fragments, is built in a pile about 30 feet square, and 12 or 14 feet high, somewhat loosely; and while the building is in progress, brushwood is mingled with the stones, but not in any great quantity. Two thin layers of coal, about 3 inches thick, at equal distances, are, so to

speak, interstratified with the sandstones, and a third thin layer is strewn over the top. At the bottom, facing the prevalent wind, an opening about 2 feet high, is left, something like the mouth of an oven. Into this brushwood and a little coal is put and lighted. The fire slowly spreads through the whole pile, and continues burning for about six weeks. After cooling the stack is pulled down, and the stones are found to be vitrified. This, of course, greatly adds to their durability as road metal. I examined them carefully. Slabs originally flat had become bent and contorted; and in numerous instances stones originally separated had become, so to speak, glazed together in the process of vitrification, which I imagine could not have been effected but for the presence of the soda or potash, and of the iron, which are part of the constituents of felspar and mica. These acted as a flux, and the same would hold good in the gneissic rock, of which some of the vitrified forts have been constructed."

I have on various occasions inspected some of the vitrified forts in Scotland, including those of Knockfarril, Finhaven, Dunadeer, Dun MacSniochain, Anwoth, and Hill of Noath.

The latter, on the top of a lofty cone overlooking the rich vale of the Garioch, is perhaps the most remarkable of these curious remains. On approaching it from the north-east we first come to one of those walls which Mr Williams found connected with all the British forts which he examined. It begins here at a point on the west where the slope of the hill ceases to be steep, and runs round to the south-east side, where it again becomes so abrupt as to afford protection.

The wall on the top presents a confused and ruinous appearance, the stones, which are mostly small, covering a great central core of vitrified foundations. The small stones have no appearance of having been under the action of fire; while the vitrified core or foundation consists of large compact masses of stones cemented together by heat, and cohering as firmly as ever. All round the fort are great stones, which were probably in the wall, but have no appearance of vitrification.

A hole in the area of the fort is said to have been a well; it measures about 6 feet across, and is rudely lined with stones, but is now mostly filled up.

While, on the whole, I see no reason to doubt that the walls of these

forts were intentionally vitrified in some such way as has been suggested by Dr Jamieson, I am inclined to doubt whether the vitrified portion was in general more than a central wall, buttressed by external masses of stone on each side, or in some cases the foundation for a superstructure of ordinary walling.

I am drawn to believe that this was the case, partly from my own observation of the walls and fragments of forts, and also from finding that in the vitrified forts in Bohemia, to which our attention is now called by Dr Keller, it was in the centre of the walls only that the vitrified matter appeared.

Both in Scotland and in Bohemia the vitrified forts occur amid other strengths of unvitrified building, of like constructional arrangement; and there is no reason to believe that they are marks of different eras or different people, any more than we can conclude that long and short cists, or burnt and unburnt bodies, are tests by which to judge of their age, since we are sure that in some cases at least they must have been used contemporaneously.

Mr Williams was led to believe that all the Scottish vitrified forts occurred in that part of the country on the north of the Forth, and that no similar remains were to be found in other countries, and his statement until now required very slight modification in its acceptance.

Of forty-four vitrified forts or sites noted by Dr Hibbert, all but four are placed on the north side of the firths. Of these four, one is at Cowdenknowes, in Berwickshire, and the other three are in Gallo-way.

The late Dr Petrie, in his Essay on the Military Antiquities of Ireland (which unfortunately is as yet unpublished, but of which Dr Stokes has given a digest in his life of the author), has noted one vitrified fort in the county of Cavan, and four in the county of Londonderry, in that portion of it anciently possessed by the Cruithne—the Irish Picts—and he conjectured that they all belonged to that people.

The occurrence of only four examples in a country where raths and duns and caiseols are so numerous is certainly a very remarkable circumstance in the history of these forts.

The paper which has been communicated to us by our esteemed asso-



ciate, Dr Ferdinand Keller, for the first time makes us acquainted with the occurrence of vitrified forts in Bohemia.<sup>1</sup>

These, with one exception, are situated in the west and north-west of that country.

The first which he describes, placed on the mountain Hradischt, near the city of Strakenitz, is a rampart of stones surrounding the top of 500 paces in circumference. The wall varies in height from 2 to 5 fathoms, according to the inequality of the surface, and is from 2 to 4 fathoms in thickness at its base, where it is formed of blocks of granite a cwt. in weight, with other blocks above. "The centre of the rampart is scorified in such a manner that the stones which lie at the base and immediately above it have, from a long exposure to fire, been vitrified at their surface, and are in consequence closely linked to one another. Above these stones at the bottom there lies again a layer of stones which are not scorified."

From this hill another of the same name is visible, isolated, and of a striking appearance. On its top is a fort formed of three stone ramparts, the innermost of which is scorified. The base is formed of large blocks of granite, the gaps being filled up with sand. The lower layers are molten into one mass; above them lie rubble stones and layers which are not scorified. The outer rampart is from 12 to 15 feet in height, while the inner is from 15 to 20 feet high.

After noting other eleven vitrified ramparts, attention is drawn to a fortified site at Wladar, near Luditz. A wall of basalt surrounds the hill at its base, and a similar rampart is on the top following the plateau of the hill. Its greatest height of 8 feet is on the west, and on an excavation being made on this side, it was discovered that the centre of the rampart had been molten by fire. It appeared to have been constructed in the following manner:—"Its mass consists of large blocks of basalt, the gaps being filled up with smaller stones and quartz dust, which made it susceptible of the influence of fire. Between the single blocks of stone such layers of quartz sand, almost vitrified, are still to be found. Above

<sup>1</sup> The paper was written by Dr Jul. Ernest Fodisch, and appeared in the Reports of the Imperial Austrian Commission for the Investigation and Preservation of the Monuments of the Empire, May and June 1868. It was translated for me by Dr Keller.

this portion of the rampart is laid a layer of round pieces of basalt which were unscorified."

The writer of this paper concludes generally, on the subject of these hill-forts, that they must be attributed to a people who were not nomadic, but resided permanently in the country. From the articles of clay, bronze, and gold found in connection with the forts, or in barrows in their neighbourhood, he believes that they agree with the civilisation of the bronze age, and that they were probably erected by the Celtic race.

From this description of the vitrified walls in Bohemia, it certainly may be inferred that the idea of strengthening them by the application of fire was known; but it does not appear that the efforts of the builders enabled them to do more than cement the *foundation stones*, that is, to link together great blocks of stone, or that they have left masses of walls vitrified, more or less perfectly *throughout*, as in the Scottish forts.

The only other instance out of Britain of what has been called a vitrified fort which I can remember is that of the camp of Peran, in Brittany. It consists of an enclosure, composed of two enclosures, each formed of a parapet and fosse. The outer wall is of earth, while the inner is of granite, in the condition of pumice-stone, very porous, and very light. The upper part of this wall is not calcined, nor the lower part; even the surfaces are in general untouched. The action of the fire, therefore, appears to have been internal. Of an excavation made under the eye of M. Anatole Bartholemy in 1846, he has noted the following results:—"We find first the foundations made without cement or mortar, and untouched; then a layer of cinders, then a layer of charcoal, then a mass of granite, of which all the fusible part has run between the stones, so as to fill up the interstices, and to hang down in the form of stalactite; and then, lastly, the upper part, which is little or not at all burnt. It seems to me therefore evident, until I see a proof of the contrary, that in constructing the wall, they first placed a layer of wood, that then they covered the whole with earth, and thus effected a choked combustion. In fact, the charcoal is often found in the midst of this kind of lava, so as to make us think that during the combustion the stones rendered fusible had fallen in upon the layer of wood."<sup>1</sup>

<sup>1</sup> Journ. Brit. Arch. Assoc. vol. ii. p. 278.

If the idea of designed vitrification can be traced in this description, it was carried out in a very different mode from that adopted by the Scotch builders; and it must be said that the fort of Peran has little in common with the vitrified forts of Scotland.

As bearing on the date of this Breton fort, I may state that a fragment of a Roman roofing tile, firmly attached to the melted stones of the vitrified wall, has been recently discovered.<sup>1</sup>

In the country on the north of the Forth we have at least two classes of ancient remains, of which no examples have yet been found in other countries, viz., the Sculptured Pillars and the Brochs. Until we can obtain detailed descriptions of the vitrified forts in Ireland, we shall be unable to say whether the examples discovered in the country of the Irish Picts agree in idea and execution with those of their Scottish namesakes; but if they should prove to be different, then I feel inclined still to add to our indigenous and peculiar remains the vitrified forts, for the examples in Bohemia and Brittany, of which only we have heard, although they exhibit analogies, can hardly be regarded as identical with our own.

In the meantime, I express the hope that careful investigations will be instituted in the best of the Scottish examples, and that our brethren on the Continent and in Ireland may be led to a like course, for at present the question of these forts, and their relation to each other, is not without its problems, which can only be satisfactorily solved by an accumulation of well-observed facts.

The following paper on vitrified ramparts in Bohemia is that referred to in Mr Stuart's remarks:—

SCORIFIED RAMPARTS IN BOHEMIA. BY DR JUL. ERNEST FODISCH.  
TRANSLATED FOR JOHN STUART, ESQ., BY DR F. KELLER. (PLATE XIII.)

(*From the Reports of the Imperial Austrian Central Commission for the Investigation and Preservation of the Monuments of the Empire, 1868, May and June, pp. 35-38.*)

Among those monuments of that remote time which is but slightly

<sup>1</sup> Mr Lukis, in Journ. of Brit. Arch. Assoc. for December 1867, p. 392.

illuminated by the rays of history, to which dolmens, cromlechs, giants' graves, &c., belong, may be classed those ramparts of stone, which have been raised without the aid of mortar, and encircle the summits of the mountains of Central and Northern Europe, extending even far into Siberia and the Caucasus. The antiquary's attention is, however, especially excited by those ramparts, *the mass of which has been designedly scorified by fire*. They are found on the British Isles (they are there called vitrified walls or forts), in France, Saxony, and Lusatia; also Bohemia possesses some remarkable ramparts of this kind. I intend giving some particulars about those which I myself have explored.

At the distance of about two English miles to the south-west of the city of Strakonitz (which is situated on the junction of the rivers Wollawa and Wolinka), there rises, just behind the village of Sansedowitz, a mountain which is covered with dense wood, and is called the Hradischt (Bohem. *Hradiste*).<sup>1</sup> It may be regarded as a spur of a long ridge of granite, which extends for many miles, and stretches as far as the Bohmerwald. The Hradischt itself forms on its top an oblong plateau, which is surrounded on all sides by a rampart of stones. The circumference of the rampart amounts to 500 paces; the height varies, according as the ground which the rampart follows is even or broken by ravines, from 2 to 5 fathoms; the thickness at the bottom from 2 to 4 fathoms. The material of the rampart consists of a fine-grained granite, which is found in this condition in the Hradischt; the base is formed of blocks of granite a cwt. in weight. Above there are lighter blocks. *The centre of the rampart is scorified* in such a manner that the stones which lie at the base, and immediately above it, have, from a long exposure to fire, been vitrified at their surface, and are, in consequence, closely linked

<sup>1</sup> Hradischt (*Hradiste*) denotes—1. Fortress; 2. Place of a fortress, district of a fortress, and is the general name of mountains in Bohemia which are surrounded by ramparts. The same denomination (*gorodiste*) is found in Russia; with this the German-Bohemian names Burberg, Burgberg, Burgstassel, agree. Such a Burberg is found near Komotan, and is surrounded with ramparts of stone and stone pits (punpits, margelles). Another Burberg near Kaaden, a Burgstattel near Saaz. Hradiste is derived from the Bohemian *hrad* (Polish *grad*, Russian *gorod*), an enclosed space or fortress; German *gard*, Greek *φύραξ*, Lat. *horus*, Old High German *gart*, sepimentum, cyclus; Old North *garde*, sepimentum, prædium; and Goth. *gairdan*, cingere, obsepire.

to one another. Above these stones, at the bottom, there lies again a layer of stones which are not scorified. Within the rampart (in the space enclosed by it), there lie some large blocks, which are piled in layers above one another; but besides ashes, coals, and fragments of clay vessels, no further traces of human settlements are apparent. To the south-west a tolerably spacious entrance leads inside the rampart (Plate XIII. fig. 1); close to this entrance the so-called smaller (malý), *i. e.* lower, rampart begins, so that it surrounds the entrance to the higher rampart for some fathoms. The extent of this rampart amounts to about 400 fathoms; its height varies from 6 to 9 feet; its breadth is 9 feet. It is not scorified. This rampart has likewise a broad entrance, which exactly corresponds with that of the higher rampart. An excavation to the west of this smaller rampart brought us to a layer of earth-like humus, which, being about 2 feet deep, was situated immediately beneath the surface, and was mixed up with the bones of animals (the thigh-bone and the shoulder-blade of a feeble stag), and several fragments of clay vessels. This part of the rampart is termed Zahravý, which name calls to mind the German expressions "Spielhugel" (playground), or "Tummelplatz" (scene of action), as some of the hills which are surrounded by ramparts of this sort are called. In the neighbourhood of the Hradischt articles of bronze (for instance, "celte," "paalstæbe," and fragments of a diadem of bronze) have repeatedly been found.

From the Hradischt an isolated mountain may be observed; it lies to the north-west, and has a most striking appearance. It is likewise called Hradischt, but bears besides the name of Knezihora (height of princes), or simply Hora, and rises in the immediate vicinity of the market town of *Katovic*, situated on the spot where a small rivulet falls into the Wottawa. This mountain is likewise surrounded by ramparts of stone. The extent of the outer rampart, which runs along the top of the mountain, amounts to 620 fathoms; that of the inner rampart is 192 fathoms. The latter has the shape of an irregular quadrilateral (length 65 fathoms, breadth 31 fathoms, superficies 2015 square fathoms). The outer rampart is from 12 to 15 feet, the inner rampart from 15 to 20 feet in height. On the west and on the north the mountain is very precipitous. There the pair of ramparts sufficed; but on the remaining sides, which are less steep, a third rampart has been raised, in a very peculiar manner, between the two

others. This third rampart commences on the eastern side of the mountain, where it meets the outer rampart, and extends, in the form of a belt, to the western side; from thence it makes a bend towards the north-east, round the top, and then stretches to the north, till it again reaches the outer rampart (Plate XIII. fig. 2). In this manner, the innermost rampart is covered on the side of the (more level) southern portion of the mountain by a pair of ramparts. Near the entrance, on the east side of the rampart, there are two pits, which are inlaid with stones. Such pits are found everywhere inside the stone circles of England and France. In the former case, they are called pitsteads or pennpits, in the latter margelles. *The innermost rampart of Katovic is scorified.* Its base is formed, as in the case of the Hradischt, near Strakonitz, of large blocks of granite, the gaps being filled up with sand. The lower layers are molten into one mass; above them lie rubble stones and layers, which are not scorified. The rampart is for the most part covered with a layer of humus, in which forest trees have taken root. The ramparts on the mountain of Katovic have been known already some time, and have been repeatedly described—for instance, in the Reports of the Imperial Central Commission of the year 1859, p. 218.

Besides the two ramparts just described, other scorified ramparts are found in Bohemia, namely, at the following places:—In the district of *Tabor*, in the forest of *Svakova*, near *Sobieslau*; in the district of *Pilsen*, close to the mountain *Tugoscht*, near *Schwichau*; and in the forest of *Birkowetz*, near *Pilsen*; and in the district of *Saaze*, close to the *Burberg*, near *Kaaden*, which, however, have not been explored by the writer himself.

Greater interest, however, attaches to the ramparts close to the mountain called *Wladar*, near *Luditz*, both as regards their extent and their shape. The *Wladar* is situate in the district of *Eger*, to the south-east of the city of *Luditz* (Plate XIII. fig. 3). It consists of basalt, and forms at the top a broad plateau, which is about two English miles in circumference. It is almost completely destitute of wood, and is principally sown with wheat, which gets on very well, in consequence of the excellent condition of the soil, which has been produced by the decomposition of the basalt. On this plateau there is besides a good-sized pond (Plate

XIII. fig. 4, *a*), which is surrounded by reeds and rushes, and is remarkable for its plentiful supply of water, which has never been known to fail, not even in dry years. Towards the east and south-east the mountain is precipitous, and can be ascended on this side only with difficulty; whereas the ascent from the west and north is less steep. On this side a gentle slope extends from the foot of the mountain to the Schnellabach [Schnellabrook (Bohem. *Strela*, arrow, dart)]. On this declivity, close to the foot of the mountain, and on its western side, the village of Fahorsch is situated (Bohem. *Zahor*, under the mountain). On that side where the mountain is less steep, *i. e.*, on the west and on the north, its foot is surrounded by ramparts. These ramparts commence at the north-east corner, and extend to about 440 paces from east to north down to the Schnellabach. A second rampart extends in a direction parallel to the course of this brook direct from north to west, stretches right across the declivity, and shuts it up towards the north-west. Opposite to the city of Luditz the rampart takes the form of a horse-shoe, and has the appearance of a bastion. From thence it runs straight from the west towards the south, and at last runs up the slope of the mountain, where the latter again begins to be very steep. Four broad entrances lead through into the rampart, which encloses the village of Zahorsch. This rampart has an extent of 3000 paces, and is *entirely built of stones*. The base of the rampart consists of good-sized blocks of stone; but the masses of basalt which lie at the surface [top? Germ. *Oberflacche*] are still from 1 to  $1\frac{1}{2}$  (Vienna) feet in diameter. The material is basalt, which has been procured in the immediate vicinity of the mountain, and is mixed up with pieces of quartz. On this part of the rampart there is no trace of vegetation; whereas that portion of the rampart which projects in the direction of Luditz consists principally of clay slate, which is found there in beds; some basalt, however, is intermixed with it.

The breadth of the rampart amounts at the bottom to 5 fathoms, its height  $2\frac{1}{2}$  to 3 fathoms. On the south-eastern side of the mountain, where the ground is most even, and the basalt could most easily be procured, the breadth of the rampart at the base is 8 fathoms, and its height 4 fathoms (Vienna measure). Two ascents lead up to the top of the mountain—the one on the south-east, the other on the north-west. The former extends along the rampart which stretches up the ridge, the latter

is covered by two ridges of stones  $1\frac{1}{2}$  fathom in height. The last-named are 400 paces in length.<sup>1</sup>

The top of the mountain is, like the foot, encircled by a rampart of stones. The material of which it consists is principally basalt, which is but slightly intermixed with blocks of clay slate. This rampart closely follows the plateau of the mountain. It is 1200 paces in length, its height varies from 3 to 8 feet; its greatest height, namely 8 feet, is reached on the western side. On this side an excavation was made, from which it appeared *that the centre of the rampart had been molten by fire*; whence also the upper rampart of the Wladar *must be reckoned among those ramparts which are scorified*. This rampart is constructed in the following manner:—Its mass consists of large blocks of basalt, the gaps being filled up with smaller stones and quartz-dust, which caused it to be exposed to the influence of fire. Between the single blocks of stone such layers of quartz sand which have been almost vitrified are still found. Above this portion of the rampart, which had suffered from the effects of scorification, another layer of round pieces of basalt which were not scorified had been laid. Beneath the base of the rampart are found those masses of basalt which are peculiar to the surface of the Wladar, and were in this case mixed up with earth. It may be farther remarked, that there appear besides traces of ramparts which formerly stretched across the plateau of the mountain. It is highly probable that these ramparts ran along the west side of the mountain; but in consequence of the cultivation of the ground, they have disappeared. On comparing the directions of both ramparts, we find that the course taken by the outer (lower) rampart agrees with that taken by the inner (upper) rampart. Thus the protuberance, in the form of a horse-shoe, which characterises the lower rampart at the corner opposite to the city of Luditz, agrees with the prominent part of the mountain towards the west. Similarly the part of the mountain to the north is covered by two ramparts which meet. In this manner, the ramparts of the Wladar have great resemblance to those of the *Pleschivetz* (Plate XIII. fig. 5), a mountain near *Ginetz*. The size is about the same. The outer (lower) rampart is in this case also more massive along its whole extent, since it consists of stones of a considerable

<sup>1</sup> In fig. 4 (Plate XIII.) *b* is the woody height, *c* and *d* ascents to the forest, *e* embankments belonging to a later period.



size (greater than those which form the upper rampart), piled in such a way that in some places the stones are heaped up in masses, and their size is colossal; and in this case also the directions which the ramparts take correspond with one another. The ramparts of the Pleschietz are usually classed among the unscorified ramparts; but perhaps a closer examination will show that the upper rampart has suffered from scorification. The outer rampart of the Pleschietz is 4000 paces, the inner 1833 paces in circumference. Accordingly, both together amount in extent to nearly 6000 paces (about 2400 fathoms, or more than  $2\frac{1}{2}$  English miles). The ramparts of the Wladar both together extend to 5000 paces (about 2000 fathoms). They may be reckoned, accordingly, among the grandest structures of the kind in Bohemia and Germany, whereas in bulk the lower rampart of the Wladar is not exceeded by any other either in Bohemia or in Germany. The old legend, which takes the Pleschietz to be a fairy garden, speaks of giants' cellars as existing under the ramparts of the Wladar, which are said to be filled with treasures and with wine; and many holes in the earth prove that, in fact, attempts have been made to get at these treasures.

It may be observed that we are in possession of an account belonging to the sixteenth century, which proves that even then these extensive structures excited the attention of the inhabitants of the surrounding country. Hayek von Libocan relates, in his Chronicle of Bohemia, that a city of the Boji, called Brimota, had once been situated near the Wladar. He goes on to say that the city had afterwards fallen into decay, but had been restored in 805 by Rohowitz, an opponent of Duke Wogan, and had been called Wladar, and that a second destruction of the city had taken place in 812. The words of Hayek, in the German translation of J. Sandel of 1697, run as follows:—"At last he (Rohowitz) came to the top of a high mountain, Wladarz, and on it *he found a plentiful supply of water*. He ordered his men to fell trees, and to construct a cupboard. He found besides *that once upon a time there must have been buildings on this mountain*. And in the same manner old chronicles proved that the Boëmi had once built a town there, and called it Byzimota." On Schmitt's archæological map of Bohemia (Prague 1856), the village of Zahorsch, which lies at the foot of the Wladar, is marked as a heathen place of burial, and that because during the laying out of a garden in

1802 there were found here several skeletons, besides ashes and urns. Nothing further, however, has transpired concerning this discovery.

Besides the works referred to, there appear some entrenchments near the ramparts. These belong to a much later epoch. Before that portion of the greater rampart which resembles a horse-shoe, and is in the neighbourhood of Luditz, several embankments have been raised parallel to one another—three on the north-west, and two on the south-west. They resemble bastions, and are furnished with trenches; they descend, in the form of a terrace, towards the Schnella, but lock up (as is seen in the plan, Plate XIII. fig. 4, e) one of the principal entrances to the rampart. The arrangement of these embankments points to the history of modern warfare. During the thirty years' war, in the year 1639, Banner had occupied the environs of Wladar, and made an assault on the city of Luditz. The assault could be directed in the most efficient manner from that part of the rampart which was opposite to Luditz. The embankments are therefore rightly called the "entrenchments of the Swedes." That the large rampart was also made use of is proved by the fact that at this place the rampart shows many signs of destruction, whereas everywhere else its preservation is excellent.

All the ramparts which have been named here, and have suffered from the effects of scorification, are situated *in the west and south-west of Bohemia*, with the sole exception of that of Sobieslau, which is situated in the south-eastern part of the country. Those parts of the country which were treated of first also abound in *ramparts of stone which have not suffered from scorification*. Ramparts of this kind are found near Maidstein, on the Moldau, near Wienetz, on the Wolinka, near the mountain called Swatobor (sacred grove), near Schuttenhofen, near Zdorow, not far from Planitz, near the mountain called Zdar, near Rockytzan, near the Hradischt, in the neighbourhood of Brezina; but they appear in great numbers, especially in the so-called Brdy forest, which is situated between Horowitz and Pribram, and has a plentiful supply of water. Great numbers of these ramparts are found also near the Hradek, the Pleschiwetz, the Ostry, and the Tremschin, as well as in the neighbourhood of the city of Nischburg, on the Berann. In the north-west and north of Bohemia we meet with such ramparts near the Wladar, near Luditz, near the Burgberg (fortress), close to Komantar.

Lastly, may be named the Fenermauer (wall of fire), near Kremnoch, not far from Teplitz, and another rampart close to the Radelstein, near Bilin. As regards the south-easterly part of Bohemia, the only structures of this sort which we can name, besides the unscorified rampart of Sobieslau, are the extensive ramparts of stones which are called the Husittenschanzen (entrenchments of the Hussites), and are situated near the Blanik, close to Wlaschirn, which abounds in legends. These ramparts, however, appear again more frequently still in the northern part of Bohemia, near the upper course of the Elbe. Four such ramparts are found pretty near one another, at no great distance from Nenpaka, Pecka, and Neuschlovo. The ground-plan of the unscorified ramparts corresponds with that of the scorified ramparts.

The majority of these structures lie on mountains with extensive plateaus on the top, the foot of which is washed by a river or brook. All the peculiar traces which we have noticed, combined with the position of these ramparts on mountains, prove that the ramparts were real entrenchments, intended to serve as defences. Supposing them to have been mere temple grounds or fanes, why did not a simple construction, and a regular form, such as a circle or an oval, suffice? Why are they built so strongly, and why do they cling to the natural configuration of the mountain?

With regard to the people which possessed these structures, it may be observed that their erection implies the existence of a numerous population, which did not wander like nomads from place to place, *but remained in one place, and stuck to the soil.* The discoveries in the immediate vicinity of the mountains afford farther conclusions. Near Ginetz, and close to the Pleschiwetz, a whole collection of articles of bronze was found in 1825 ("celts," spear-heads, twenty-two rings, scythes, &c.) The localities about Ginetz and its ramparts of stone (Koervar, Neumetel, Zditz, Cerhovitz) are known as a district in which many articles of bronze and gold have been found. Above all, the barrows have yielded much. The country bordering on the Tugost is covered with barrows. In the neighbourhood of the Hradischt, near Romotan and Nischburg, articles of bronze have repeatedly been found, besides gold coins, similar to those which were found in 1771 near Podmoke, in a brazen kettle. Besides the neighbourhood of Kremnoch, near Teplitz, the environs of Radelstein,

near Bilin, are rich in tombs, with urns and articles of bronze. The neighbourhood of the Burberg, near Kaaden, may also be named. The fragments of clay vessels which I myself have dug up near the Hradischt, in the neighbourhood of Strakonitz, as well as near the Wladar, testify to a kind of workmanship in clay which has passed the first stages; they agree with the civilisation of the brazen age ("bronze-zeis"). All these particulars taken together lead me to the conclusion that these ramparts of stone on mountains belong to a people which had been settled in Bohemia for a long time, and may be referred to the brazen age, and probably to the Celtic race. *They were, in fact, the regular strongholds of the people which were settled on the fertile plain, and which retired to these fortifications when danger was impending.* In the same manner, numerous ramparts of this kind, which are spread over France and the British Isles (particularly over Scotland) point to a Celtic people. As regards Bohemia, the question will only be brought to a conclusion when all the ramparts in the country have become known, and have been explored in a scientific manner.