A description of the principal picturesque beauties, antiquities, and geological phoenomena, of the Isle of Wight

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Chapter III. Particular description of the range of chalk hills.

CHAPTER III.

PARTICULAR DESCRIPTION OF THE RANGE OF CHALK HILLS.

THE great chalk range, which runs through the island from east to west, deserves a more particular description than has hitherto been given of it. It has already been stated, that the position of its two extremities is very accurately in an eastern and western direction; it does not, however, run through the island in an exactly straight line, nor is it of an uniform breadth. From the Culver cliffs to Arreton down, a distance of about seven miles, it lies nearly in a right line, and its breadth is almost the same. It is a single ridge; and in general so narrow at the top, and falling with so quick a declivity on either side, that a person travelling along it, enjoys at once the extensive and beautiful view of the valley on each hand. At Arreton down its height decreases, and it takes rather a southern direction: this part is called St. George's down.* At Carisbrook it makes a sudden bend towards the south, and runs nearly in that direction for three miles. The chain is here double, or even triple; but at Brixton down it again resumes its western course; and from Mottiston to the Needles it runs nearly straight, and very narrow at the top, with steep declivities to the north and south, till it enters the sea, when

* Mr. Webster's further observations on this spot have discovered, that St. George's down is not chalk, but a breccia or pudding-stone which, in that part only, lies against the chalk, which runs straight to Carisbrook.

it presents on either hand the vast cliffs of Freshwater and Allum bay. This last part is nearly nine miles long.

In the line thus described, the chalk hills are divided by three great chasms, each descending to the level of the sea, and probably much deeper. The first or easternmost of these, is between Yaverland and Brading: this is about three quarters of a mile wide; and through it the waters of the south-eastern valley pass to the sea. The second is between St. George's down and Carisbrook: it is about half a mile wide, and the Medina runs through it. The third is at Freshwater gate: this is scarcely an hundred yards wide; and in it rises the little rill which runs into the sea at Yarmouth.

Besides these three great interruptions, there are several depressions of from one to two hundred feet, which divide the ridge into a succession of long eminences. Of these the principal are between Brading and Ashey downs, between Ashey and Knighton, Arreton and St. George's down, which latter is much less high than Arreton; then above Shorwell, Mottiston, and Brook.

The highest part of the chalk range is Mottiston down, which is seven hundred feet above the sea. Afton down, to the west of Mottiston, and Brook down, to the east of it, are not much lower; and the highest part of the hill between Freshwater and the Needles must exceed six hundred feet. The eastern part of the range is not so high as the western; but Ashey and Brading downs must be near six hundred feet. Yaverland down is something lower.

The chalk of which this range is composed is in general of a closer and harder texture than that of most of the chalk ranges in the south of England. Many of the strata are so hard as to stain

the fingers but slightly when handled, and afford a very beautiful material for walls, which, when sheltered from perpendicular drip, are extremely durable. In several parts, however, strata occur of sufficient softnesss and purity for drawing lines, and other uses to which it is applied by artificers. It universally burns into very good lime, and pits are opened in it in every part of the island, and worked to a great extent for that purpose, as well as those of building and manure, for which use, of late years, a great deal has been carried coast-wise to considerable distances. It is, however, to be observed, that in the immediate neighbourhood both of the three great openings, and the lesser depressions above described, the chalk is not so pure, nor in so solid a state, as in the higher hills; being of a rubbly nature, and considerably tinged with an ochreous stain. In every part it is divided into strata of different thickness, from two to four or five feet: these are very exactly parallel among themselves, and do not ever appear to bend or wave in the least: they are in general separated from each other by beds of flint in separate nodules, or masses; sometimes of considerable dimensions, in the direction of the bed, but very seldom above eight or ten inches in thickness. In some places, particularly in the great Arreton pit, the strata are often divided only by a thin layer of a soft powdery chalk, and sometimes, though rarely, the surfaces of the strata are in contact, each face having a sort of striated appearance; and not absolutely flat, but wavy.* This may also be seen in Arreton

* This wavy and striated appearance is observable in the chalk of the South down range, and it seems not easy to account for it. It much resembles in look the very singular surfaces found sometimes in the Derbyshire lead mines, which are there called Slikensides, and have the extraordinary property of exploding when scratched or bruised.

pit. Besides the beds of flints which separate the strata, detached nodules are also found scattered sparingly through the most solid parts of the beds; and sometimes flint may be seen in a third state; namely, filling, in thin sheets of very considerable extent, the fissures which run through many of the strata, cutting them in general at nearly right angles to the plane of the strata. These fissures are seldom above two inches wide, and the plate of flint which fills them, seems to have been formed from each side towards the centre, which often contains some loose, calcareous powder inclosed between the two silicious plates. The flints are not in general quite so black as those of other chalk strata, but full as fine grained and pellucid, except where they are debased by iron, which not unfrequently happens; and sometimes the iron is in such quantity as to cause the flints to decompose rapidly on exposure to the air. Pyrites are not unfrequently found in the chalk in nearly spherical nodules radiated to the centre.

All the flints above described, except those detached nodules in the body of the strata, are universally found in a most extraordinary state: they are broken in every direction into pieces of every size, from three inches diameter down to an absolutely impalpable powder. The flints thus shivered, as if by a blow of inconceivable force, retain their complete form and position in their bed. The chalk closely invests them on every side, and till removed, nothing different from other flints can be perceived, excepting fine lines indicating the fracture, as in a broken glass; but when moved they fall at once to pieces. The fragments are all as sharp as possible, and quite irregular, being certainly not the effect of any peculiar crystallization or internal arrangement of the materials, but merely to external violence. This

new and most extraordinary appearance was first observed in a small pit on the Shorwell road, just beyond the parting of the road to Yarmouth, but no opportunity was afterward omitted of examining both the cliffs and the pits in many parts of the whole range, and the appearances were every where nearly similar, differing only in the circumstance that in some places the flint seemed to have been more generally and completely shattered than in others. It may not be improper to mention the places where these phenomena were the most particularly investigated, as they may guide others in their researches. Beginning at the eastern point, and proceeding westward; 1. Whitecliff bay; 2. Brading shute; 3. Pit on Brading down; 4. Hollow road at Knighton; 5. Arreton pit; 6. Pit above Shide bridge; 7. Pit just out of Carisbrook town; 8. Pit south of Carisbrook castle; 9. Freshwater cliffs; 10. Cliffs in Allum bay.

The extraneous fossils common in chalk are found in the pits, but in very small quantity. A repeated examination of the pits in almost every part of the island afforded only one echinus in flint; but in several of the less pure strata in the cliff immediately to the east of Freshwater gate, many specimens are to be seen of a very large shell, which seems to bear a resemblance to the great pinna. The shells are so crushed, and adhere so closely to the chalk, that it would be perhaps impossible, with the greatest care, to obtain a specimen nearly perfect, or even to decide whether it is a bivalve or not; but a portion of shell was measured above a foot long, as it lay partially exposed by the action of the sea; and several portions were detached nearly half an inch thick. The exterior surface was smooth,

with slight curved lines, apparently as in the pinna, marking the progressive growth of the shell. Those shells which lay in the chalk were of a calcareous substance striated or fibrous at right angles to the surface of the shell: but those specimens which lay near flints, were in some degree silicious, a portion resisting the action of acids, and retaining their form, though so honeycombed as to be easily crushed in the fingers. Some fragments were found in the middle of black flints; not imbedded, but perfectly immersed in the silicious substance.

Having thus described the strata and their contents, it remains to mention their position, and that of the adjacent clay strata. The chalk strata lie inclined to the horizon at an angle of nearly seventy degrees, dipping north, and their inclination seems very regularly to follow the line of the hills themselves.* Wherever I have been able to see the strata in a fair section, this great inclination appears constant, and the whole mass has been moved apparently at once, without any fissure or chasm in consequence of it; for the fissures already described to be filled in many parts with flint, bear certain marks of having existed previous to the period of the subversion of the whole mass.

The chalk is not the only substance which has been thus overset; for the clay strata to the north and south of the chalk, to the extent of about a quarter of a mile to the north, and

* Mr. Webster has discovered that this inclination of the strata varies much in different parts of the island. In a pit on the north side of Brading down, the strata are quite perpendicular, though on the south side of the same pit, the strata are a little inclined to th southward. In the wide part of the range, between Apes down and Shorwell, the strata about Apes down are very highly inclined, while at Shorwell they are almost horizontal. At the Needle point the strata are also inclined about 70°, but on the south side of Scratchell's bay, they have a much lower inclination.

Drawn by Sir H.C.Englefield Bart.

Engraved by W.B.Cooke.

CLAY CLIFFS, WHITE CLIFF BAY. I.W.

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CHALK CLIFFS, WHITE CLIFF BAY, I.W.

Engraved by W.B.Cooke.

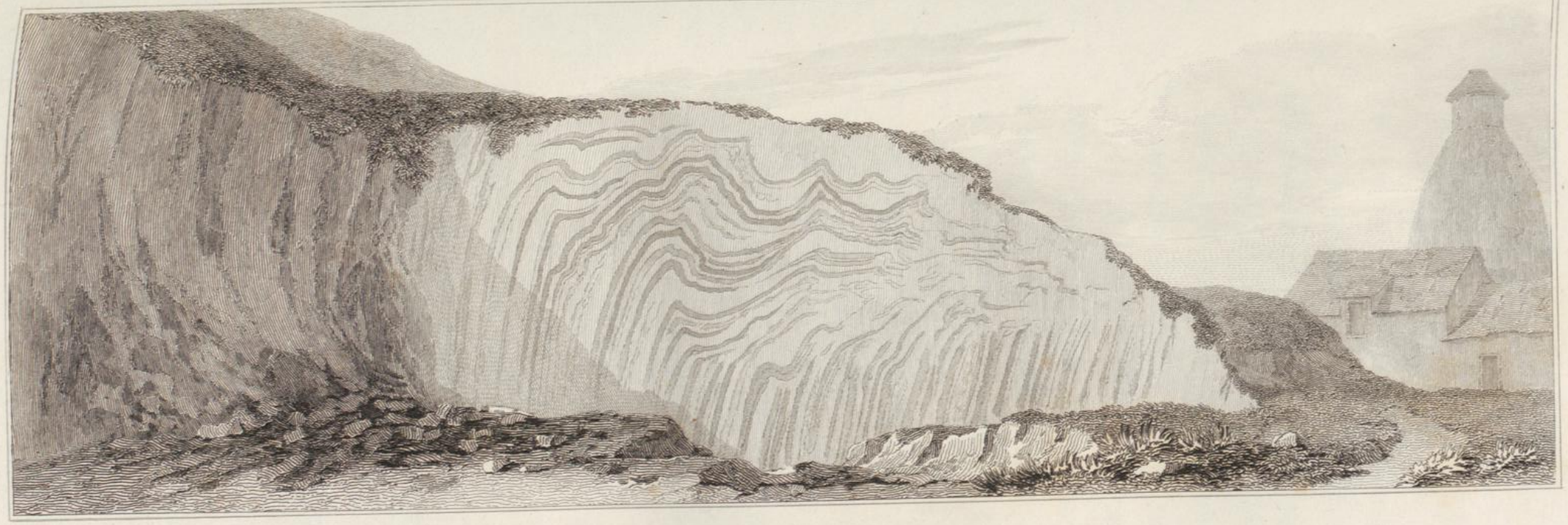
rather more to the south, are in like manner inclined, but with this difference, that those to the north, which, if the whole mass fell in from south to north, were originally the uppermost strata, have, as it was natural to suppose they might, parted off from the chalk, so as to leave a narrow chasm between them, and now stand in a position nearly, if not absolutely, vertical; while the southern strata have a less inclination to the horizon than the chalk, owing to the chalk having in the same manner parted from them, which leaves a similar ravine between the chalk and the clay on the southern side of the chalk.* These appearances may be most perfectly seen both at the eastern and western termination of the ranges. We shall first describe the appearances on the two sides of the Culver cliffs at the east end.

In Whitecliff bay, on the north-west side, the clay strata form a succession of headlands, separated from each other by deep ravines quite down to the sea: these ravines, however, run but a very little way up from the shore; the clay which composes them is of various colours and hardness. Next to the chalk is a bed of bright red and blue clay, like that soon to be described in Allum bay, but much less thick; this stratum has here mouldered away from the action of springs, so that its stratification is not visible. The second detached cliff has strata of extreme thinness, many of them not exceeding an inch or two, much resembling the diurnal depositions of the tides. Down the

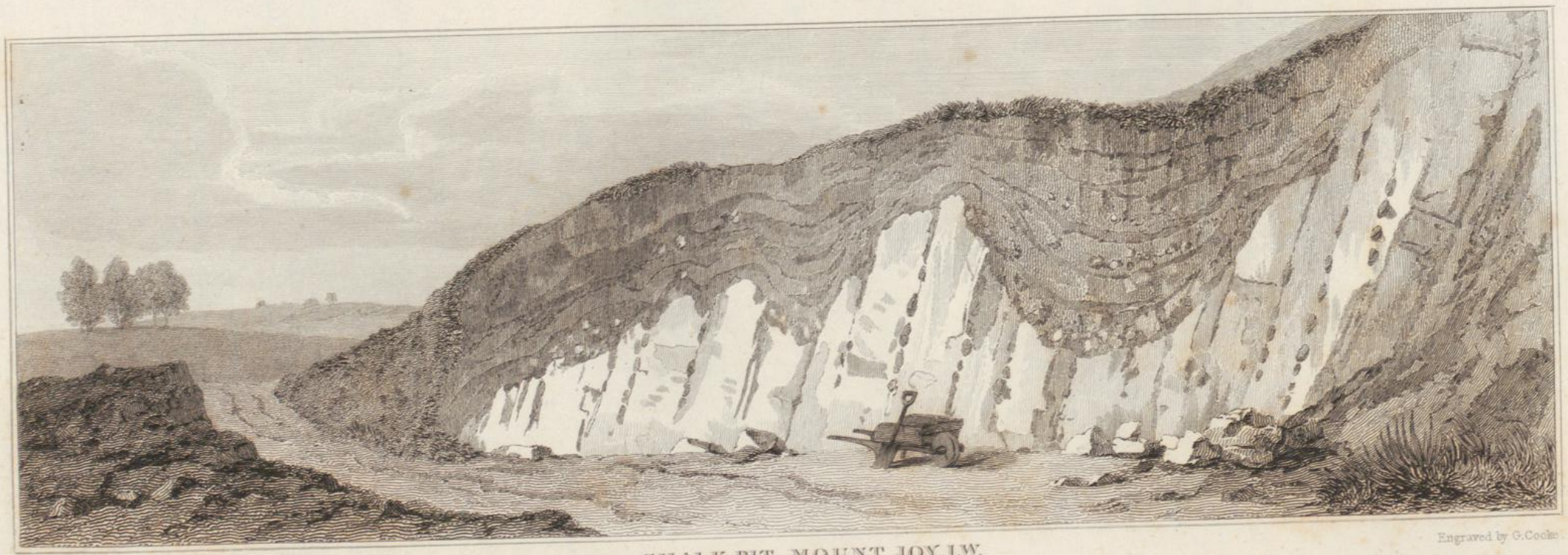
* The further observations of Mr. Webster seem to account for this latter chasm or ravine by the circumstance of a very easily decomposable stratum of marle, lying directly beneath the chalk. This stratum being acted on by rain and frost, is much washed away, leaving the appearance of a ravine mentioned above. Mr. Webster's observations, given hereafter, will more fully describe the stratum and its appearances.

centre of the cliff runs a thick stratum. These strata are singularly bent, and, as it were rumpled at the top of the cliff; having much the look of the leaves of a book which had been pressed inwards by a weight, when standing upright. The third cliff has also thin strata, though not so thin as those of the second cliff. On the top of this cliff, directly over the vertical strata, which appear cut off horizontally, lies a bed of alluvial gravel. Beyond these cliffs are strata quite of a different formation, which have many beds of rock in them, that lie nearly horizontal, but as they approach the vertical cliffs, their strata heave gently to the south, as if they had been lifted up by a protrusion of the chalk range through them. These strata of stone appear to be the same which project into the sea at the Priory and Nettlestone points, and they probably continue under the whole northern part of the Island, as they appear at Egypt, Colwell, and Allum bays.

In Sandown bay, to the south of the chalk, the clay and loamy strata which accompany it are cut by the sea at an angle of near 45° from a perpendicular to their direction; and of course the apparent is not the true inclination of the strata. Their apparent inclination is under 50°, from whence their real inclination may be pretty nearly deduced, and it is not more than 60°. The separation before described between the chalk and clay, is here distinctly visible, and it forms a narrow valley. Next to the chalk (which in the part contiguous to the other strata is considerably debased by mixture of brownish clay), is a broad stratum of black shaly clay, which is in so mouldering a state that its structure is scarcely to be traced. Then vast beds of red loamy clay, and soft yellow sand-stone, with thin layers of iron-stone and some narrow strata of black shale, form a series of



CLAY PIT, NEAR NEWPORT, I. W.



CHALK PIT, MOUNT JOY, I.W.

Drawn by T.Webster.

Engraved by G.Cooke.

London. Published by Payne & Foss, Pall Mall, 1818.

high perpendicular cliffs, whose upper parts are in a most singular manner corroded by the weather. These cliffs gradually diminish in elevation as they recede from the chalk, and die away to the sea level at Sandown. After a small space of flat coast, which seems formed by alluvion filling up the chasm occasioned by the subsidence of the cliffs, or at least their change of position, the coast to the south of Sandown fort, again presents a perpendicular face to the sea, composed of beds of loam and sand-stone in nearly an horizontal position; but these strata are at their northern end heaved to the north, just as those north of Culver are heaved to the south; and in both of these places they appear to rise with a gently concave curvature, as a tough substance would do, if pressed up from beneath, till it breaks.

The western termination of the range at the Needles, offers appearances in all essential parts exactly similar to the eastern. The chalk is here, as at the Culver cliffs, formed by the sea into high and steep faces on both the north and south sides. The northern face, which forms one side of Allum bay, is a series of flat surfaces produced by the chalk having parted most easily at the flint strata; their general tendency is therefore not perpendicular; but the inferior part being more abraded than the superior, the outline of the cliff itself is in many places projecting beyond the perpendicular, and the strata appear one under the other, like tiles on the wall of an house.* From the fissures in these cliffs very small springs of excellent water trickle out in several places. Between the chalk and the clay to the north of

* Several parts of this face of cliffs project beyond the general outline, forming projections like great buttresses, which seen from the sea when the sun shines obliquely on the cliff, have a very singular appearance.

it, there is a deep hollow filled up in a great measure by rubbish and the mouldering of each side. Immediately beyond this chasm, the clay strata appear in a directly vertical position, not however as in Whitecliff bay, separated by ravines, and clothed on the top and sides by vegetation, but as an immense series of points with a sort of concave sides, bare, rugged, and continually mouldering down. The colours of these singular points are most striking. The blue and red clay seen in a small quantity at Whitecliff, here form vast separate strata, and when the sun shines they look like striped silk. To these tints are added several strata of the brightest ochreous yellow, and some of clay and sand quite white, among which a thick bed of black, aluminous shale forms a striking contrast to all the rest. These vertical stripes of the richest colours seen from a little distance at sea, form a spectacle more extraordinary than can be imagined. These erect strata do not continue for above a quarter of a mile, and a deep narrow ravine separates them from the undisturbed and horizontal strata in the cliff which divides Allum bay from that of Totland.* From among these strata several small springs issue, strongly impregnated with iron, and leaving in their course a copious ochreous sediment; and from the stratum of black shale rises a spring, which besides the chalybeate taste, has in a strong degree the sweetish austere savour of allum.

The southern face of this end of the chalk range, is a series of very high cliffs from the Needle point to Compton, a distance of

* The horizontal strata are heaved, or lifted up, and are abruptly broken off at this point, exactly as the same strata are heaved and broken in the northern part of Whitecliff bay, already described. A fuller detail of both these points will be found in Mr. Webster's observations.

four miles, interrupted only by Freshwater gate, the great break already mentioned. As this face of the cliffs presents the rising side of the strata, it is of course more broken in its appearance than the northern side, nor is it in general so perpendicular. The part called Mainbench is, however, rather more than upright, as it overhangs considerably in some parts, and can scarcely be less than six hundred feet high in that beetling form.

As the cliffs approach Freshwater gate, they decrease rapidly in height, and within a quarter of a mile of the Gate, they recede inwards, forming a small bay. In the western face of this bay, which is a nearly perpendicular cliff of about two hundred feet high, the inclined position of the strata is more distinctly seen than in any other part of the whole range. At the point of the head is the cave known to all the visitors of the island. It is a considerable excavation, made by the force of the waves on this exposed part of the chalk cliff, and is supported by rude pillars with openings between them, which within form several galleries in the direction of the strata.

Its formation is evidently owing to the different hardness of the several strata, and to the fissures which, it has been already noticed, run through them at nearly right angles to their direction. These fissures, of course, in the present inverted situation of the strata, are nearly horizontal. When the sea has worn away the softer stratum to a certain depth, the part of that stratum above the excavation, and below the next great fissure, drops out for want of support, and is soon carried away by the eddies of the ingulfed waves, and the attrition of the loose flints in stormy weather; thus galleries are formed in the softer strata; but even the hardest parts are not of equal solidity throughout; they

also have fissures, and through them the waves gradually corrode their way, forming rude arches of various and beautiful forms, until by degrees the outer parts become too weak to support the incumbent hill, which falls in, and the cave assumes a new face. That this has repeatedly been the case, the numerous remains of pillars of different heights in that part of the bay contiguous to the cave, abundantly prove.

From the western face of the bay, the southern cliff falls very rapidly to the level of the sea, and is of a rubbly broken texture, with a yellow clayey mixture; yet it is singular that in this part the strata of flints are just as regular, and the flints themselves as much shattered, as in the most solid and pure parts of the cliff. From the western termination of the chalk to its emergence from the sea level to the east, is not above an hundred and fifty yards. What the substrata may be is not at all known; but the visible soil is a boggy peat in which there is a considerable spring, which, though with a very gentle fall, runs most singularly away from the sea, close to which it rises, and at the village of Freshwater, after turning a mill, meets the tide of the Yarmouth river. It is not easy to account for the appearance of this spring in this very narrow interruption of the chalk, unless it be supposed (which does not seem improbable) that in this place the chalk is on one or both sides of the opening, very thin and incumbent on clay, which would catch the waters filtering through the chalk and discharge them at the lowest point. A little clay does certainly appear in the flat, but there is nothing of it to be seen under the chalk on either side, so that this is merely conjecture.

In the eastern part of the bay, not far from the reappearance

of the chalk, which on this side also has the same rubbly and impure appearance that it has on the other, the great shells already described, are to be found.

Two masses of the cliff, harder than the rest, are now completely insulated by the sea, and form beautiful objects. In these also the inclination of the strata is seen to very great advantage.

The chalk cliffs continue for about a mile further east; and terminate at a place called Compton. I cannot but regret the not having visited this spot, where vegetable remains in an unaltered state, are found in the cliff in considerable quantities. I have, however, seen, though from a distance, that the clay strata are inclined in a manner very similar to those of Sandown bay.*

Having described the appearances of the two terminations of the chalk range, where the singularities of its position are the most strikingly apparent, it remains to mention the few peculiarities observable in other parts of it. Of these, the most worthy notice seems to be the valley visible in many parts between the chalk and the clay on the south side of it. This is very strongly marked at Knighton, where the beautiful woods which lie on either hand of the house, cover this second hill. The appearance of the clay and chalk cliffs in Sandown bay, seem perfectly to explain the formation of this valley. Above Mottiston also where the clay strata rise to a very considerable height, and their strata, as may be seen in the hollow road leading to Longstone from

* This deficiency is amply supplied by the observations made by Mr. Webster on this part of the coast; in which will be found a particular description of these remains, and also of a great quantity of large trees in different states of mineralization.

the church, follow the general law of inclination, this intermediate valley is both deep and wide. In many other parts the same appearance may be traced, but these are the two most remarkable points which have fallen under my own inspection. Another circumstance deserving notice in this chalk range, is the small quantity of water which it affords when compared with the southern hills. The springs rising at its foot are few in number, and in general small in their quantity of water. The spring at Calbourn is the only one of any consequence. This is indeed a most beautiful and copious source, and exceeded by few in any country, except in those mountainous tracts where springs seem often rather the mouths of subterraneous rivers than common sources. The spring at Calbourn rises in a small pond, and pours over the pond head in a stream, which, after the very dry summer of 1801, was fully equal to turning a very considerable mill. It is to be observed that this part of the range is the broadest by far, and this spring is at the opening of one of the valleys which runs deep into the hills.

It is scarcely possible to quit this subject without a few observations both on the formation of flint in general, and on the possible causes of the shattered state of the flints in the chalk range of the Isle of Wight, a state probably entirely peculiar to the island, and not hitherto noticed by any naturalist.

With respect to the formation of flint itself, it cannot be doubted that this separation of the silicious matter from the calcareous, took place after the formation of the strata, and that the flints were not, as it would appear at a first glance, deposited in alternate strata with the chalk. The extraneous fossils found in the chalk often afford singular proofs of this: many echini

are seen, filled with flint, which has, after completely filling the cavity of the shell, formed a large bulb at the orifice of it; as a viscid fluid would do. In many instances, the lamellated calcareous matter into which the echini are converted, is inclosed in flint, which therefore must have formed round it, and that at a period later than the inclosure of the shell in the chalk, as there had been time for the destruction of the original shell, or at least for its conversion into that peculiar substance, previous to its inclosure in flint. In the remains of the very large shells, already noticed in the Freshwater cliffs, some fragments of the same shell are imbedded in chalk, and others inclosed, or rather immersed in flint.

Many of the great fissures in the chalk, which must have taken place long after the whole mass had attained a great degree of hardness and solidity, as they run through many strata without in the least disturbing them, are invested with pure flint; sometimes totally filling them up, sometimes not, as has been before described. The plates of flint thus filling these fissures, must have been deposited in them at a period later than that of the formation of the nodules of flint, either those in strata, or those found separately scattered through the substance of the chalk. What agent has in this manner, at two different times, separated the silicious from the calcareous matter? and how could the flint, when separated, form itself into masses in the solid chalk? for it cannot be supposed, that the flint only ran into cavities before empty, as in that case, some of these cavities ought to be found either totally or partially void; but no such have ever been discovered in chalk.

With respect to the force which has so universally crushed to

pieces the flints in this range of Chalk hills, it seems only possible to seek for it, in the moment of the immense concussion which subverted the strata, and placed them in the position in which they now remain. That this change of situation was by their having fallen, can scarcely be doubted, as the dissimilar strata, whose cohesion was of course the least strong, have parted from each other, and are in consequence inclined in different angles, as has been already described.* The same tendency to part, and slide on each other, must have existed during the moment of the fall, in every stratum of the chalk, and have been felt the most strongly in those parts where the cohesion is weakest, that is, in the separations of the several strata where the beds of flints lie; and it seems very possible to conceive, that this almost immeasurable effort, although it did not proceed so far as to part the strata, may have been sufficient to burst to pieces the flints, whose texture, although extremely hard, and resisting uniform pressure or friction, is at the same time, brittle and easily shattered into very small parts by a blow or crushing force. This idea receives additional weight from the consideration, that of those few nodules of flint which are found insulated in the solid parts of the chalk strata, none are in the least shattered. A further confirmation of this hypothesis may be drawn from the appearances in those tracts of chalk where the strata lie in a position nearly horizontal. In these the chalk is traversed by large fissures running generally nearly perpendicular to the strata, and passing through many of them. The beds of flint near these fissures are

* There may be some reason to doubt the accuracy of this statement; but whether the strata were thus inverted by their having risen or fallen, the effect of the sudden and violent action would have been nearly the same.

almost always in a fractured state, and in some instances nearly reduced to powder, like those in the Isle of Wight. I have particularly noticed this appearance, in the great pit on the west side of Greenwich hill, and in the pits above Brighthelmstone. It is to be observed that these fissures are not the same as those in which the plates of flint are formed; on the contrary, these fractured fissures often traverse the fissures filled with plated flint, which under those circumstances is shattered as the nodules of flint are.

Perhaps, some idea may be formed of this instantaneous effect of enormous force, by what happened, when the vast stone which forms the base of the colossal statue of Peter the Great, at Petersburgh, was landed from the raft which carried it up the Neva. The raft was connected with the shore, by two beams, each composed of three main-masts lashed together by strong cordage. These formed an inclined plane, down which, the stone being first placed on rollers in its bed on the raft, was drawn by the united force of several powerful capstans, fixed and worked on shore. The distance from the raft to the quay was a very few feet, and the stone, aided in its motion by the descent, passed almost instantaneously; but such was the strain on the masts, that, although the stone went safely over them, two, out of one triplet, and one, out of the other, were, on examination, found to have been burst quite through.