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Dr. Robertson's Guide TO BUXTON AND THE PEAK OF DERBYSHIRE.

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A HAND-BOOK

OF THE

PEAK OF DERBYSHIRE,

AND TO THE USE OF

THE BUXTON MINERAL WATERS.

BY

WILLIAM HENRY ROBERTSON, M.D., F.R.C.P.,

FORMERLY SENIOR PHYSICIAN, AND NOW CONSULTING PHYSICIAN, TO THE BUXTON BATH CHARITY AND DEVONSHIRE HOSPITAL.

ELEVENTH EDITION;

WITH THE SUCCESSIVE ANALYSES OF THE BUXTON THERMAL WATER, BY DR. PEARSON, SIR CHARLES SCUDAMORE, SIR LYON PLAYFAIR, M. OTTO HEHNER, DR. THRESH, AND OTHERS; THE SANITARY AND HOSPITAL STATISTICS, ETC.;

A Botanical Commentary & List of Plants

BY THE LATE MISS HAWKINS;

AND A MAP OF THE ENVIRONS.

BUXTON:

C. F. WARDLEY, "ADVERTISER" OFFICE;

MISS BATES, THE LIBRARY, HOT BATH COLONNADE;
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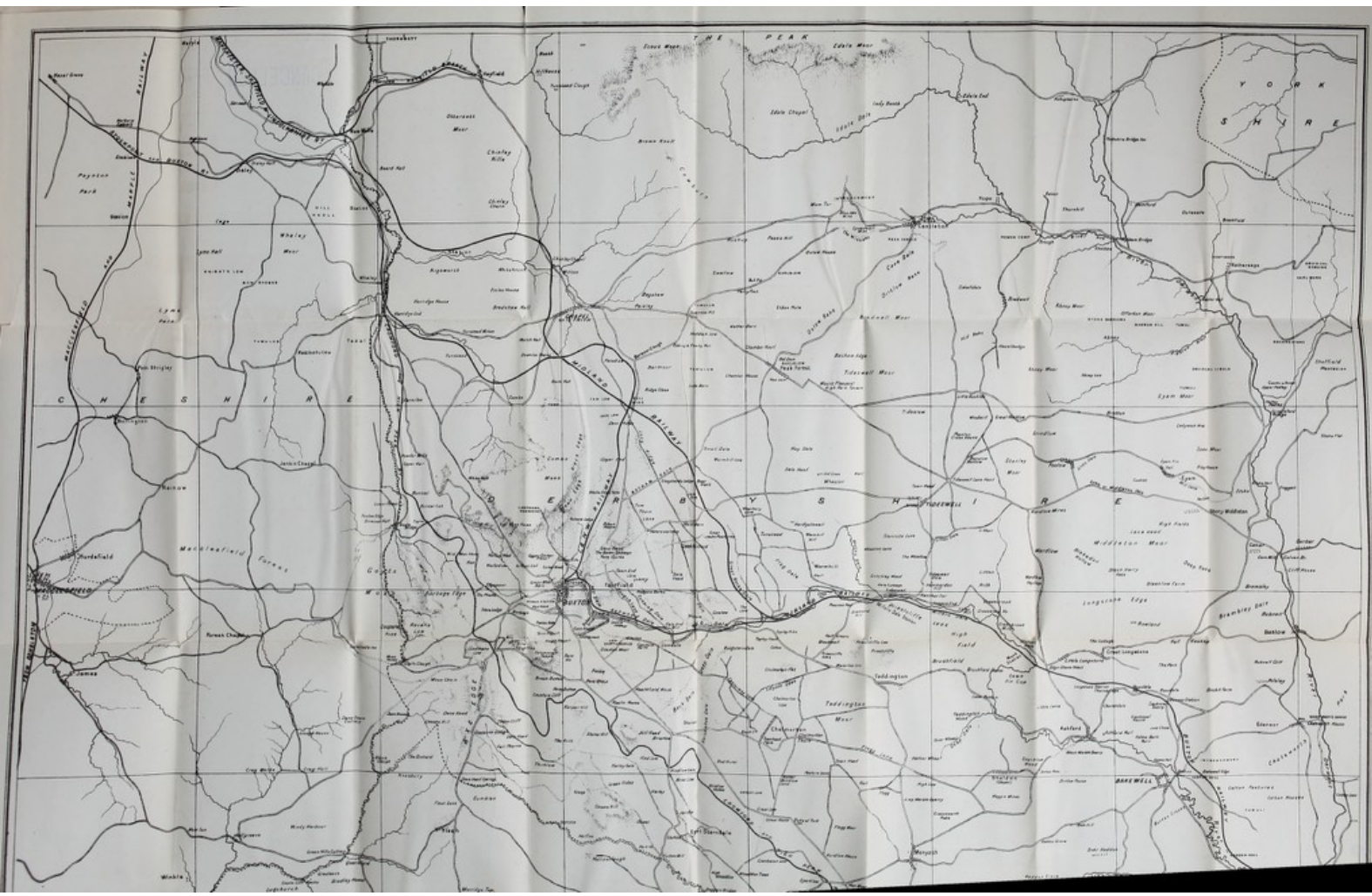
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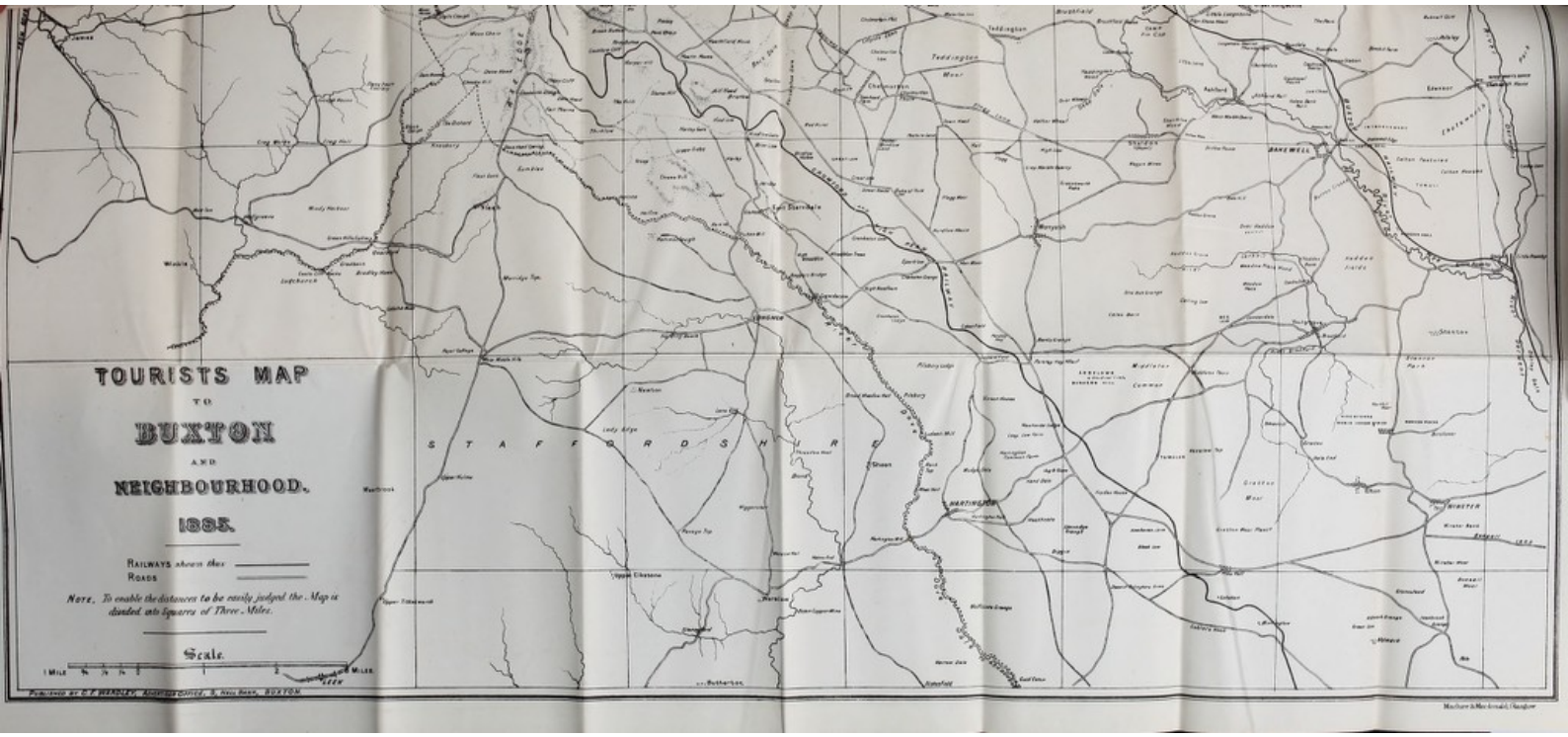
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Gatley
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Haydock
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Upholland
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Great Crosby
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Halewood
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Crewe
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Middlewich
Northwich
Winsford
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Lostock Gralam
Davenham
Sandiway
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Delamere
Kelsall
Tarvin
Chester
Hoole
Saltney
Broughton
Hawarden
Mold
Buckley
Ewloe
Connah's Quay
Shotton
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Ellesmere
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Malpas
Hanmer
Overton
Bangor-on-Dee


TOURISTS MAP
TO
BUXTON
AND
NEIGHBOURHOOD.
1885.
RAILWAYS shewn thus
ROADS
Note. To enable the distances to be easily judged the Map is divided into Squares of Three Miles.
Scale.
1 MILE
STAFFORDSHIRE
BUXTON
BAKEWELL
MIDDLETON
MONYASH
HARTINGTON
ASHBOURN
Published by C. F. HEYWOOD, Advertising Office, 5, High Road, BUXTON.

PREFACE TO THE ELEVENTH EDITION.

I AM asked to revise an Eleventh Edition of this Handbook to Buxton and the Peak of Derbyshire. Every edition has indicated progress. Buxton and its interests have advanced with the requirements of the public. Placed within easy reach from the manufacturing centres of the Midland and Northern districts of the Kingdom, it has always been the great resort of rheumatic invalids seeking relief from the use of its mineral waters; and as these centres of mining and manufacturing population have grown and multiplied, the numbers of those who resort to Buxton have become greater and greater. It has been roughly computed, that, on the average, one hundred thousand persons resort to Buxton year by year; and this is probably by no means an extravagant estimate. Many of these accompany invalids; many do not resort to Buxton for the use of the waters, but for the restorative effect of the pure air of the mountain limestone; but a very large and important number use the baths, or drink the mineral waters, for the relief of rheumatism, or its allied infirmities. As the railway facilities have rendered the access to Buxton by invalids more easy, there are few cases so severe as to preclude the journey; and the use of the baths has had to be modified to meet the varying requirements. Not much more than half a century ago, those who were able to reach Buxton at all were commonly able to use the baths at the natural temperature of 82 degrees; and until the year 1818, no baths of the water

at any other than the natural temperature were obtainable. At that time the need of milder baths of the mineral water, so far weakened as to the presence of nitrogen gas by the heating of the water, was sufficiently evident to occasion the provision of carefully-planned warm baths, under the skilled constructive direction of Mr. Sylvester; and these proved to be a helpful addition in the treatment of the more severe cases. Gradually, the greater and greater severity of the cases led to more use of the warmer baths, and their multiplication; chiefly in the year 1852, when the whole of the baths, both as to the natural and the warmer baths, were entirely reconstructed, and much increased in number. Again, in 1875, both the natural baths and the warmer baths were increased in number, to meet the needs of increasing requirement on the part of the public, with the constant result of a larger and larger proportion of the warmer baths being needed, and a correspondingly smaller relative demand for baths at the natural temperature.

Immersion of the body has always been held to be the great efficient means of bringing morbid conditions within the reach of the remedial action of the mineral water; and it has always been held to increase the probability of sure and lasting effect, if the baths could be taken at the natural temperature. Gradually, as the number of severe cases has become greater, and the complications with cardiac and other allied morbid states have increased in number, more frequent use has been made of a partial immersion; instead of immersion of the whole body, only three-fourths, or one-half, or one-fourth of the body, being immersed in the water. Still more recently, under the pressure of extreme balneological requirements, and with the example of important mineral water resorts, as at

Aix les Bains, Mont Dore, etc., a still more partial external use of mineral water has been resorted to; and jets, or streams, or showers, or sprays, have been directed, more or less specially, to the parts affected, instead of any immersion in the water at all; and these adaptations of treatment have been introduced for most of the greater health-resorts of Great Britain, and so are allowed to be added to the Buxton means of treatment. How far this may be necessary, or may be found to be useful or expedient, time only can determine. But it is only fair, that this great curative mineral water should be given every means that can be asked for, to satisfy medical requirement. The only anxiety allowable may be, lest total or partial immersion of the body in the water, which has produced and maintained the name and fame of Buxton through successive centuries, by the relief or the cure of a large proportion of those who have resorted to it for rheumatic infirmities, should be less trusted to and made use of, or needlessly neglected; a number of bathers which, through the centuries, must have been well nigh beyond the guesses of imagination; and which, year by year, must have amounted to many thousands, of whom there is no record; but a fraction of whom, under the action of the Buxton Bath Charity, and more recently of its Devonshire Hospital, have been recorded during the last sixty-five years, and give a total of 78,921 cases, of which 70,563 derived more or less substantial relief or cure, and 8,358 appeared to have derived no relief.

But, all this long continued and favourable result notwithstanding, as to the curative effect of immersion in the Buxton mineral water, it may well be that exceptional or complicated cases may require special and exceptional means, as to the use or application of the water; and these means may be of value, either as to

the safety in the use, or as to curative result. The efficiency of the douches, or other means of local application, in whatever form or degree they may be given, is added to, if desired, by shampooing, kneading, or *massaging*, the parts affected, by skilled manipulation. How far the effect thus produced may result from the mechanical action of the pressure on the vessels near the surface, or on the muscular or other tissues, or on the nerves of the part, or may be intensified by the greater absorption of the mineral water thus obtained, can be probably only conjectured, even when the good result may be unquestioned. The single wish must be, that any means of using the Buxton water should be methodical, based upon the morbid condition, and duly considering the age, sex, temperament, habits, structural state, disease, and degree; as far removed as possible from a rule of thumb treatment, applicable to all alike. The more strictly the use of the mineral water is defined by accuracy of diagnosis and orthodox deductions, and is free from quackery, the more stable will be its medical position, and the more successful its results.

The future of Buxton as a health-resort has been still more effectually earned by the extension and completion of its drainage and sewerage, which has now, in all probability, been rendered well nigh complete; the product being no longer passed unaltered into the river Wye, even at the important distance of nearly a mile from the town; but, under the guiding and suggesting action of Dr. Thresh, being defecated by the united action of a ferruginous stream and of lime; the effluent being pronounced to be chemically more pure than the water had been before its contamination; the residual sludge being dried by extreme pressure, and otherwise so dealt with as professedly to obviate, if not annihilate, risk of nuisance or injury; and the insoluble

remainder being burned. It is difficult to foresee how far this may enhance the sanitary character of the district, which had previously reduced its liabilities below all expectation.

The mineral water of Buxton has been fortunate in finding a new analyser, who enjoys the distinction of being a Doctor in Science of the University of London. Thirty years had elapsed since the water was fully and carefully analysed by Sir Lyon Playfair; and in 1882, Dr. Thresh, versed in all the means of accurate investigation, and with all the advantages of a local laboratory, and local residence, was able to devote time and attention to the analysis. The details of this important investigation are given in the body of the work; but it is highly gratifying to find, and important to the interests of the public, that Dr. Thresh was able to confirm the reports of the previous analysts, that the Buxton mineral thermal water is surcharged with nitrogen gas, and, as is believed, in a greater degree than any other known mineral water. This may be only chemically interesting; the medical effects may be independent of any analytical considerations whatever; but it is again proved, that it possesses a salient chemical character, and is a mineral water of determinate composition, unvarying outflow, unvarying temperature, and unvarying medical qualities.

Within the last five years the extension and enlargement of the Devonshire Hospital, for the patients of the ancient Buxton Bath Charity, have been completed, under the kind and large action of the Governors of the Cotton Districts Convalescent Fund, who have devoted £24,000 to this great means of extending the use of the Buxton mineral water to the necessitous classes of the neighbouring industrial centres. This extension has involved a total expenditure of £36,000 on the magnificent building, which the munificence and

charity of the sixth and seventh Dukes of Devonshire have granted to the sick and suffering poor. The details of this extension are given in the body of this work, by which the number of the beds for patients has been doubled, and the future of the remedial use of the Buxton water, by poor people, has been hopefully secured for all time to come.

Within these five years the buildings, gardens, and attractions of the Buxton Improvements Company have been added to in all ways. The grounds have become the arena of one of the most successful of the annual open Lawn Tennis Tournaments, and possess, probably, the best lawn and gravel tennis courts in the Kingdom. The band of music is believed to be unexceptionably good, and performs twice every day, except Sunday, throughout the year, either in the grounds or in the buildings, which are warmed with hot-water pipes and lighted with gas, as required.

Enough has been written by way of preface, to prove the progressive advances of Buxton, to supply the increasing medical and general requirements of the public. It has been said, more especially of late, both in the newspapers and otherwise, and with scant courtesy, that Buxton has been standing still, if it have not retrograded, as to the advantages offered to invalids, and as to its general attractiveness as a health-resort. With the main view of showing the injustice of this charge, it has been a pleasing duty to state some of the more important of the efforts that have been made, within the five years, to maintain a time-honoured reputation. It seems to be no unreasonable opinion, that perhaps no other health-resort has obtained greater or more lasting development, than Buxton has realised during the last five years. The list that has been detailed in these prefatory pages must satisfy both residents and others, that Buxton need fear

no rivalry, either from a medical or general point of view. With the pre-eminent curative value of its mineral water, as proved by the continuous statistics of the Buxton Bath Charity and Devonshire Hospital, during sixty-five years; with the demonstration that its chemical character is exceptionally remarkable and unassailable, as confirmed by the recent analysis of Dr. Thresh; with its sanitary advantages and exceptionally low death-rate; with its mountain air; with its extensive acreage of gardens and pleasure-grounds; with its large Pavilion buildings; with its excellent roads and footpaths; with its surrounding hills and valleys; with the dense population to which it is accessible from short railway distances, Buxton can need only to be true to itself, as to meeting the requirements of the public.

May, 1886.

PREFACE TO THE FIRST EDITION.

The want of such a work as the present has been so continually and urgently complained of, that I hope this volume may prove to be acceptable. I have made occasional use of my work on *Buxton and its Waters*. The present handbook is, however, of a much more extensive character; at the same time it is not intended to answer all the more strictly medical purposes of the older publication. I am so much indebted to Miss Hawkins, for the excellent botanical commentary and catalogue; to Mr. Smithers, the able and indefatigable agent to His Grace the Duke of Devonshire, for valuable suggestions, and kind and efficient assistance in every way; and to Mr. Henry Currey, the architect of the

new baths and principal buildings, for permission to use the elevations and plans; that it is my grateful duty to record the obligations and express my thanks.

JUNE, 1854.

PREFACE TO THE NINTH EDITION.

A SALE of nearly twenty thousand copies of the various editions of this work in the course of the intervening twenty-four years, in addition to a still larger sale of smaller guide books to the use of the Buxton Mineral Waters, and the sale of many other guides to Derbyshire and the Buxton district, tell sufficiently of the large resort of the public to Buxton for the use of its Baths and Waters, and the healthful and strengthening influence of its mountain air. Every effort has again been made, in this ninth edition, to keep the work on a level with the rapid extension and progress of Buxton: an extension and progress which can only be limited by its hills and valleys and the wants of an ever-increasing national population, and need have no check from an unvarying outflow of mineral water, amounting to nearly two hundred gallons per minute.

It may well be an unmixed pleasure to all concerned, to look back upon Buxton as it was in 1854, and note its progress, as to size, population, and general prosperity, from that time to the present. The baths, then newly and entirely rebuilt, have since been added to again and again. The Buxton Bath Charity, then without hospital accommodation for its patients, by the kindness of the late and the present Dukes of Devonshire, has now a large hospital, to be immediately extended, by a grant

from the Governors of the Cotton Districts Convalescent Fund, to the provision of 300 beds for patients;—the Gardens, in the earlier days a charge upon the munificence of the Duke of Devonshire, are now, by a grant of the grounds to the Buxton Improvements Company, enlarged, newly and artistically laid out, embellished with all the aids of modern gardening, and supplied with extensive pavilion buildings for music rooms, conservatories, news room, promenade, &c.;—the Park and Valley of Buxton are gradually becoming studded with detached villas: and a Local Board has provided efficient drainage, water supply, gas supply, and the many advantages of the larger towns, securing high character in a sanitary point of view, in keeping with the advanced knowledge of the time. The maintenance of a sound policy as to such conditions and requirements, backed by the curative effects of the nitrogenous waters, and the restorative value of its dry mountainous elevation, will secure an advancing prosperity in the future, as it has promoted the well-doing of the past.

JULY, 1878.

PREFACE TO THE TENTH EDITION.

I AM asked by the Publisher to introduce this edition with some information as to the more recent advance of Buxton. The work contains details of its previous history and progress, and every successive edition has borne evidence of some important extension of its attractions and advantages.

Since the last issue of this work an additional area of more than seven acres has been secured from His Grace

the Duke of Devonshire, on a perpetual lease, for the gardens and grounds of the Buxton Improvements Company, adding not only so much varied ornamental grounds, so much of well-made footpaths, and so many more points of view from which the valley and surrounding uplands may be seen to advantage, but including a large addition to the surface that is covered by water, with all the charming variety of embellished effect that water only can give to the utmost efforts of the landscape gardener. In addition to this enlarged water-area, and the extension of the planted banks and borders, level lawns and asphalted spaces will supply any wants that may be indicated from time to time for the out-door games that may happen to be in vogue. It need not be added that the large concert hall and pavilion buildings remain as before, and that bulbs and bedding out plants supply an ample and varied floral decoration in the successive seasons of the year, and that musical performances every forenoon and every evening throughout the year, are provided at charges of admission which are as low, if not lower than are received at other places. A much extended water supply and gas supply are furnished, under the action of a most efficient Local Board; the gas works being now taken to a considerable distance from the town; and the good management by the Local Board of roads and footpaths, drainage and sanitary requirements, is believed to be in advance of most other places of Health Resort.

The magnificent provision for the extension of the Devonshire Hospital of Buxton, under the carefully considered action of the Governors of the Cotton Districts Convalescent Fund, at an outlay of twenty-four thousand pounds, which is mentioned in the body of the work as being in contemplation, is now in actual progress, and gives evidence of results that may

well content the fullest expectations of all well-wishers to this ancient and noble Charity. When all the circuit of building, around the half acre of ground contained in the centre area, is occupied by wards, lighted and ventilated from within the area and from the outside of the building, giving northern and southern, or eastern and western aspects and light to the respective interiors, and the whole of the half-acre is covered by a dome, well lighted and ventilated, and warmed according to requirements, surrounded by a gallery for convenience of access to all parts of the interior, but the great floor-space left undivided for all possible purposes of religious services, recreation, exercise in cold or wet weather, and general utility, the memory that all this was once a range of stables will be realised with difficulty; and the three hundred patients, with all the comfortable provision of space and offices, attendants and sanitary conditions, will have a hospital lodgment that can leave little to be wished for. It is something to be thankful for that after an occupation of the greater part of this building for hospital purposes during twenty years, such an extension and completion is thus offered to the poor sufferers from rheumatism who resort to Buxton for relief from the use of its mineral waters, the number of beds being three times that possessed by the hospital in the year 1860.

W. H. R.

May, 1880.

INTRODUCTION.

THE additions to this work, which have been made in its successive editions, may be left to speak in detail of the principal extensions and improvements which have been made in Buxton from 1854 to the present time. Buxton has advanced with the times, and in direct proportion to the facilities of access which have been afforded by railway extensions. It might have been expected that a place mainly dependent on the curative value of its Mineral Waters, would be especially influenced by a readier communication with other places; and more particularly, when the curative value applies chiefly to the crippling effects of rheumatism. The immediate effect of the railway extensions to Buxton upon the class of patients, the severity of the cases, and the distances of the localities from which they are derived, admitted year by year to the benefits of the Buxton Bath Charity and its Devonshire Hospital, has exemplified the influence thus exerted on the usefulness and prosperity of Buxton and its Waters. Degrees of suffering and disablement, which would have rendered the removal to Buxton, even from the adjacent towns, difficult, hazardous, or impossible, are now found to be easily brought to the Hospital from the more distant parts of the kingdom. As a rule, travelling by railway seems to task very slightly the strength or sensitiveness of invalids; and the roomy carriages and rapid transit lessen suffering and fatigue to a degree that scarcely could have been anticipated. Whether as regards the applicability of

Established 1773

the Buxton Waters to a more severely afflicted class of invalids than could have previously travelled to Buxton, or their use by invalids from more distant places than heretofore, the effect of the railways upon their medical character and value, is probably capable of indefinite development. This, however, by no means embraces the whole matter in all its bearing. The upland district of Buxton and the mountain limestone represent a vast sanatorium, where sufferers from the atmosphere and occupations of the larger towns, and from places of lower elevation and damper soil, might easily seek renewal of health and strength. Increasing railway facilities, and increasing outward pressure from the manufacturing towns which surround the Derbyshire uplands on all sides, must cause the district to become more and more utilized: to be selected as a locality in which the more delicate children may be reared, as a fitting district for schools, as the best location for the houses of those engaged in business in the larger towns day by day, and to which those unable to reside at a distance from their place of occupation, might easily resort for rest or recreation: supplying the best of restoratives for the weak or exhausted machinery of mind or body. With such views and expectations, it is gratifying to know that there are these vast and dry uplands, with millstone grit or mountain limestone as their subsoil, at a varying elevation from a few hundred to nearly two thousand feet, and with an average diameter of some thirty miles; and which must, eventually, become the physical safeguard of the dense populations that surround it on all sides. But, although the two great geological formations which meet at Buxton, and form the upland country of which Buxton is the centre, are thus mentioned together, it must not be inferred that they are considered to have an equal value in a sanitary point of view. I believe, on

the contrary, that there is a value in the air which is on the secondary limestone, and belonging to a residence on this formation, that is peculiar to it, and not elsewhere obtainable. I think, that, other things being equal, the chances of health and strength and life are greater on the secondary limestone than on the millstone grit; although it may be at least as true, that these chances are greater on the millstone grit than on any less elevated and less dry formation. On the other hand, districts covered by the primary rocks may offer situations equal or superior to the gritstone. But the mountain limestone not only affords a dry subsoil, but it is thinly covered with a layer of soil, mainly composed of its own detritus, and offers neither vegetative decay to taint, nor stagnant waters to infect its atmosphere. The claims of Buxton to be chosen as a place of residence or resort by others than those who seek the use of its mineral waters, rest upon its geological position; but especially, as I think, on the condition, that, on at least two of its sides, the mountain limestone supplies sites for indefinite extension, and covers a district of country large enough to give a special character to the atmosphere and climate.

A great part of the Peak of Derbyshire is within easy distance from any district of Great Britain, now that extensions of the Midland and the London and North Western Railways are completed to Buxton. These important constructions were opened to the public in June, 1863; and they represent respectively the triumph over great engineering difficulties. Carried through the valleys of the Derbyshire limestone, slicing and tunnelling the rocks of this formation, to secure the directness or the gradients of its course, the Midland Railway, from Ambergate to Buxton, traverses some of the loveliest scenery that this picturesque district has to offer, opening to the tourist the woods and valleys of Alderswasley,

Matlock Bath, Darley Dale, Rowsley, Chatsworth, Haddon, Bakewell, Hassop, Longstone, Monsal Dale, Cressbrook, Miller's Dale, Chee Tor, and Ashwood Dale. The railway route from Ambergate to Buxton is 27 miles in length. The branch railway from Blackwell Junction to Buxton is rather more than three miles in length. The main line of the Midland Railway to Manchester is continued from the Blackwell Junction at the end of Great Rocks Dale; follows the valley of Great Rocks, and reaches the valley of Chapel-en-le-Frith through a tunnel nearly two miles in length. With the exception of the bare and confined route through Great Rocks Dale, the Midland route from Blackwell Junction to Manchester is interesting,—passing close to the town of Chapel-en-le-Frith, and through various and fine valley scenery at Chapel-en-le-Frith, Bugsworth, New Mills, Marple, Guide Bridge, &c. The Buxton extension of the London and North Western Railway forms another but less picturesque route from Buxton to Manchester. In its short course of nine miles from Whaley Bridge, it passes through the beautiful valley of Chapel-en-le-Frith, and presents commanding views through the greater part of it.

Previously to the days of extensive railway communication, which may be dated from 1835 to 1845, or from forty to fifty years since, Buxton was situated on the old main line of road between the West of Scotland, Manchester, and London, and had been passed through daily by mail and stage coaches, carriers' waggons, &c., enjoying the full advantage of being on one of the greatest thoroughfares of the kingdom. At the time in question, the London and Glasgow mail coach passed through Buxton daily, to and fro; there were two well-known coaches, the "Bruce" and the "Peveril," between London and Manchester, and the "Lord Nelson" and the

"Lady Nelson" between Manchester and Nottingham. These coaches were appointed in the best manner, were drawn by the best horses, and were timed to travel at from eight to ten miles an hour. There was also a considerable number of small carriers to and from the neighbouring towns, Ashbourne, Derby, Bakewell, Chesterfield, Sheffield, Macclesfield, Manchester, &c.; and there were extensive carriers, whose large waggons and teams passed along this great commercial highway. Buxton had thus enjoyed immemorially a directness and facility of communication with other places, much greater than was due to its own relative importance. The effect of the introduction of the railway system was to place Buxton at much disadvantage in this respect, during many years. It was not until 1863, or until virtually after a lapse of a quarter of a century, that Buxton became in any adequate degree restored to its due level of easy communication with other places; and, even now, so far from being placed at the comparative advantage which it had originally enjoyed, it suffers much from difficulty of access in any but the two directions traversed by the existing railways. In order to reach Ashbourne, or Leek, or Macclesfield, or Congleton, or Castleton, or Sheffield, or the intervening or more distant districts in the directions of those towns, large circuits have to be made, and so much increased mileage has to be travelled over. But time, which has seen and done so much, will see and do more. After having been dragged round a circuit of some fifty miles, in order to reach a railway route to London, the traveller now, strange to say, proceeds by a railway which follows almost exactly the old highway route to the Metropolis; and so, after making detours of some fifty miles in the different instances, in order to reach Sheffield, or the Potteries, or Birmingham, or Lichfield, he will, by and by, be again

taken by the same routes that were followed by the Pack-horses or rude vehicles of bygone ages, to the great manufacturing centres of iron and coal, cutlery, pottery, and hardware. A new railway via Dore may probably soon open to Buxton the districts of Peak Forest, Castleton, Edale, Hope, Ashopton, Hathersage, Sheffield, and the adjoining districts of the West Riding of Yorkshire; and a new railway to Macclesfield has opened readier communication into the Pottery districts and the great Birmingham districts beyond them.

In the meantime, thinking of the years between 1836 and 1863, the Buxton district has already a large amount of valuable railway communication for which to be thankful. It is already placed within easy railway reach from Liverpool and Manchester, and the whole intervening districts, and also from Ireland, Wales. and Cheshire, the West of Scotland, Cumberland, and the Lake district, on the one side; and, on the other side, within easy reach of London, via Bedford, Wellingboro', Leicester, Hitchin, Derby, Ambergate, Matlock, Rowsley, and Bakewell. As has been said, the Midland Railway system now connects Buxton with Chapel-en-le-Frith, New Mills, Glossop, and Manchester; and the same system now connects Buxton still more immediately with the Capital. Even as it is, Buxton is within a four and a half hours' journey from London; Derby is reached in less than an hour and a quarter; Nottingham in two hours; Bristol in seven hours; Cheltenham in five and a half hours; Norwich in eight and a half hours; Peterboro' in five hours; Birmingham in three hours; and so forth, by the Midland Railway; and, by both the London and North-Western and Midland Railways, Buxton is placed at less than one hour's distance from Manchester, and one and a half hours' distance from Liverpool. With easier gradients, and under the pressure

of competition, and with shorter routes in some instances, the facilities will be increased, and the time shortened, to a degree that will be probably important.

There are two railway stations at Buxton, belonging respectively to the London and North Western and the Midland Companies. They are unfortunately separated by a roadway from one another; and, there can be no question that, in the interest of the Companies, and for the reasonable accommodation of the public, the roadway between the two stations should be roofed over, so that the passage of passengers from one station to the other might be accomplished without exposure to the weather. In all other respects, the stations are quite equal to the wants of the public. The platforms are extensive, and well lighted and protected; the offices and waiting rooms leaving nothing to be desired.

An interesting feature in the railway management, as regards the interests of Buxton and its visitors, is the issue of what are called "tourists' tickets," which provide for the double journey, from almost every part of England, Scotland, and Ireland, and back again, at little more than the charge for the single journey, with permission to remain in Buxton during any shorter time than two months without extra charge. Facilities are, moreover, given, in the instance of families, to enable one of the members to return home as frequently as may be desirable, on very moderate charges. A drawback to this judicious liberality on the part of the Railway Companies, is that it is limited to the time of year, from June to October, inclusive. If the privilege were extended throughout the year, it would be eventually as much to the advantage of the Railway Companies, as it would be obviously advantageous to Buxton and its visitors Such an unrestricted arrangement has been long in operation in regard to the "Lake District," and it is

to be supposed with advantage to all the parties concerned. Why should it not be extended to the Buxton district?

The railway facilities are of great value to all visitors and tourists, as affording ready access to many of the most interesting places in the locality. A return ticket to the Miller's Dale station gives easy access to Miller's Dale, Chee Dale, Chee Tor, and even to Tideswell; a ticket to Hassop places the traveller within easy distance from Chatsworth, and at no great distance from Eyam, Stony-Middleton, and Baslow; a ticket to Bakewell enables the bearer to see Bakewell, the Vale of Haddon, Haddon Hall, the scenery of the river and valley of the Lathkil, and Youlgreave; a ticket to Rowsley takes the bearer to the opening scenery of Darley Dale, the extensive grounds of Sir Joseph Whitworth, not far from the South Eastern boundary of Chatsworth Park, and to the point of junction between the river Derwent and the Wye; a ticket to Darley Dale takes the bearer close to the church, with its old yew tree of immemorial distinction; a ticket to Matlock Bath gives ready access to Matlock with its river, and rocks, and heights, and interesting Via Gellia, and other walks and drives, with Willersley and its grounds, &c. Even Derby, with all its points of interest;—Chesterfield, with its crooked church-spire, collieries, iron works, &c.;—Sheffield, with its vast foundries, steel works, and cutlery manufacture, are all within easy accessibility during an ordinary summer day; and the same may be said in regard to the more important of the houses and parks in the neighbourhood of Derby,—those of Lord Vernon at Sudbury, of Lord Scarsdale at Kedleston, and of the Earl of Harrington at Elvaston; the old manorial ruin of South Wingfield, near the Wingfield Station, between Ambergate and Chesterfield; Hardwick Hall, a beautiful Elizabethan house, belonging to the Duke of Devonshire,

between Chesterfield and Mansfield, and near to the finely situated castle of Bolsover, belonging to the Duke of Portland. The London and North Western Railway does not reach Buxton through a country of similar character to that opened to it by the Midland Railway; but it is of no small advantage to be able to reach, at little cost of time or money, Chester or Liverpool, Manchester or Stockport, or Whaley Bridge with the Roosdych close to it, or to see from the Disley Station, Lyme with its mansion and park.

By the combined assistance of a carriage and the railways, Leek and Alton Towers—Macclesfield, Trentham Hall, Stoke and the Pottery district,—Chapel-en-le-Frith and Glossop, Castleton, Edale, and Vale of Hope,—Chelmerton, Arbor Low, Monyash, the valley of the Lathkil and Youlgreave,—are so many available objects of interest which may be seen without difficulty during a long day. But, to see the whole of this most interesting district to the best advantage, Worksop, Ashopton, Matlock, Buxton, and Ilam, might be wisely made so many points of departure; any one of which might be made the pleasant place of sojourn during as many days as time and circumstances would justify. Thus, from Worksop might be seen the extensive association of parks and park lands locally known as the Dukeries, containing the finest remains of the Great Sherwood Forest, including, of course, Clumber, and Welbeck, and Thoresby; while from the same point, Nottingham and Mansfield, Hardwick and Newstead Abbey, might be readily seen; from Ashopton, all the High Peak district, more strictly so called, would be easily reached, including Castleton, Hope, Hathersage, Edale, and the Woodlands, containing some of the grandest scenery of the Derbyshire Moorlands; while Matlock and Buxton would supply convenient centres

for seeing different parts of the Scarsdale and High Peak districts; and Ilam is at one end of Dove Dale, from which Dove Dale, Ilam Hall, Ashbourne, Alton Towers, Tissington, Winster, the Rowtor Rocks, and Arbor Low might be conveniently seen.

The details of much that has been indicated are given in the subsequent pages. Few districts are more rich in materials for geological and botanical investigation, in varied scenes of archæological and historical interest, in singular and various beauties of scenery. Whether to the traveller by railway or by road, or to the pedestrian who is at an infinite advantage above the others, there is no part of the High Peak valleys or uplands that has not its strong point of interest, or peculiar claim to consideration. Every mile, every turn of road, every ascent and descent, has its charm, or lends its variety. A pedestrian expedition alone can do justice to such a field; and the practised eye and hand of the geologist and botanist, the quickened senses of the scholar, historian, and antiquarian, and the educated eye of the artist, would be needful to exhaust the opportunities presented by such a tour through the Peak of Derbyshire. The grey rocks, the dark or richly tinted moorlands, the extensive uplands, the stream-channelled gorges, the limestone caverns, the untouched or traceable antiquities, and the historical associations, give the stamp of single or multiplied interest to every place. The valley and river scenery of the Dove, the Derwent, the Wye, the Lathkil, the Goyt, the Dane, and the Manifold,—the hills and valleys of Glossop, Hathersage, Stoney Middleton, Eyam, Peak Forest, Flash, Longnor, and Darley,—the rocks and caverns of Castleton, Matlock, and Ludchurch,—are only some of the indexes to extensive detail.

A HAND-BOOK

TO THE

PEAK OF DERBYSHIRE,

AND TO THE

USE OF THE BUXTON MINERAL WATERS.

CHAPTER I.

ANCIENT HISTORICAL RECORDS OF BUXTON AND ITS BATHS. — POPULATION RETURNS, ETC. — EMINENT NATIVES OF DERBYSHIRE.

"BUXTON is situated on the western side of the north part of the county of Derby, in a tract of elevated, uneven, and hilly *moorland*, called therefore, the *High Peake*, or the *Peake Hundred*.

"The Peake is about fourteen or sixteen miles broad from the south-west to the north-east side; its whole length, from the north-west to the south-east, may be twenty miles; and it is supposed to contain one-fourth part of the whole county, or 170,000 acres.

"This region of high land is the southern extremity of the ridge or chain of mountains and hills, that extends

from the Cheviot Hills, in Scotland, nearly through the middle of the island, and terminates in the north part of Derbyshire. As this range of eminent land runs through the middle of the north of England, as the Apennine does through Italy, it has been called the *English Apennine.*

"The British Apennine may be reckoned, for the sake of forming a general conception of it, from fifteen to twenty miles broad. Near Scotland, it is much broader; and as the island to the north of Derbyshire contracts itself considerably in breadth, this tract of high lands bears no small proportion to the breadth of the north part of England.

"The whole length of this ridge of land appears to be about a hundred and forty miles."

The above is a quotation from a large work, in two octavo volumes, by Dr. Pearson, an eminent physician and chemist of the time, and published in 1784. But the upland country, on which Buxton is situated, must have much larger dimensions assigned to it. From Ashbourne, on the south, at a distance of twenty miles, to beyond Glossop, on the north, at a distance of seventeen miles, (Bnxton being placed almost centrally, in reference to these boundaries,) the hill country rises from the lower districts of Derbyshire and Staffordshire, on the one side, and of Lancashire and Cheshire, on the other. Arising, again, from Staffordshire and Cheshire, on the west, to the east of the towns of Leek, Congleton, and Macclesfield, at a distance of about twelve miles from Buxton, the upland country extends eastward into Yorkshire, stretching at length into Scotland. The upland district, which is virtually the Peak district, and almost in the centre of which Buxton is placed, may be said to have a diameter of between thirty and forty miles, in all directions. Presenting a varying elevation from

a few hundreds to nearly two thousand feet higher than the level of the sea,—and nearly the whole of this great surface of country being divided, and almost in equal proportions, between the formation of millstone grit and that of secondary limestone,—the scenery is characterised by large outlines, massive boldness, and great variety; the mountain masses, sloping hill-sides, broad, basin-like valleys, and moorland summits of the gritstone, contrasting with, and varying, the more abrupt and fantastic grandeur, the summits of bare and rugged rock, and sharp outlines; and the narrow and rocky valleys of the mountain limestone. Overlooking the lower districts around it, in all directions, and offering numberless pictures of more confined character, in its own valleys, shut in by its own hills,—many of these scenes, however, having an extent of many miles,—this great upland region is deservedly considered to be one of the most picturesque and beautiful districts in Great Britain.

According to the statement of Messrs. Lyson, in their History of Derbyshire, the word Buxton was written Bawkestanes, in the time of King Henry the III.; and they add, "It seems probable that it was originally written *Badestanes*, deriving its name from its stone baths."

Dr. Short, in his "History of Mineral Waters," presented and dedicated to the Royal Society, and published in 1734, states that, "without all dispute," the Buxton Baths must have been well known to the Romans. It seems that, in 1709, Sir Thomas Delves, of Cheshire, in memory of having been cured by these waters, caused an arch to be erected over one of the springs, "twelve feet long, and twelve feet broad, set round with stone seats on the inside;" and "in the middle of this dome the water sprung up in a stone basin, two feet square above." In preparing the site for

this erection, which in its turn had to be removed when extensive buildings were erected, in 1780—1784, "an ancient Roman brick wall about St. Ann's Well," had to be removed. "In 1698, when Mr. White, then of Buxton Hall, was driving up a level to the *Bath*, fifty yards east of St. Ann's Well and fourteen yards north of Bingham Spring, the workmen found, buried under the grass and corn-mould, sheets of lead, spread upon great beams of timber about four yards square, with broken ledges round about, which had been a leaden cistern, and not unlikely that of the Romans, or some other ancient bath, which had been supplied with water from Bingham Well. Thirdly, the Roman highway from Burgh (Brough), a small village twelve miles east to Buxton, a great part whereof remains entire to this day, reaches within half a mile of Buxton Hall; and not improbably it took a turn from Brough to Castleton, two miles north-west: for, above this, on the top of Maniton, is remaining a very beautiful and strong camp. All for two miles below, is a fortified station, four square; the town, a garrison; and the castle above it, a fort, armoury, or watch-tower, to answer the camp. Fourthly, that it was of great repute in the darkest distant times is undeniable, from the chapel here dedicated to St. Ann, whose foundation was likewise discovered, and a large piece of its wall dug up, in driving the aforesaid level."



Dr. Leigh, who seems to have died about 1671, and who was one of the numerous writers on the subject of the Buxton waters, says that, in his time, a wall was to be seen near St. Ann's Well, which he believes to have been of Roman erection. He describes it as cemented with plaster, red and hard as brick, but very different from anything at that time in common use, having more the resemblance of some kind of tile than of any other substance. The ruins of an ancient bath, too, he says,

were then visible, composed of matters similar to the wall, and so perfect in every part as to present to an observer every one of its dimensions. Mr. Pilkington, in a work published in 1781, observes, that, "when the foundations of the Crescent were dug, the shape and dimensions of this bath (speaking of one mentioned in Bishop Gibson's edition of 'Camden's Brittannia,' as visible near St. Ann's Well) might be very easily discerned. Its form was that of an oblong square: it measured thirty feet from east to west, and fifteen feet from north to south. The spring was at the west end of the bath; and at the east end there had evidently been a flood-gate for letting out the water. The wall was built of limestone, and appeared to be of rude workmanship. On the outside, it was covered with a strong cement, supposed to have been for the purpose of preventing cold water from mixing with the warm spring supplying the bath. The floor was formed of plaster, and appeared to have been uninjured by time. On the top of the walls were laid strong oak beams, which were firmly connected together at the four corners; and the bath had the appearance of having been exposed to the air."

Dr. Jones, who published a work entitled "The Benefit of the Ancient Baths of Buckstones," in 1572, says:—

"Joyning to the chief spring, between the river and the bath, is a very goodly house, four-square, four stories high, so well compact with houses and offices underneath, and above, and round about, with a great chamber, and other goodly lodgings to the number of thirty, that it is, and will be, a beauty to behold, and very notable for the right honourable and worshipful that shall need to repair thither, as also for others; yea, and the poor shall have lodgings and beds hard by, for their uses only. The baths, also, are bravely beautified with seats round about, and defended from the ambient air, and chimneys, for fire, to air your garments, in the bath side, and other necessaries most decent. And truly, I suppose, that if it were for the sick, a sanctuary, during their abode there, for all

causes,—saving sacrilege, treason, murther, burglary, and robbing by the highway side, with also a license for the sick to eat flesh at all times, and a Friday market, weekly, and two fairs, yearly—it should be, to the posterities, not only commodious, bnt also, to the Prince, great renown and gain."

Such are some, out of many, of the curious and not uninteresting accounts of Buxton, in its more ancient days. There seems to be every probability that, at least, two of the great ancient roads met at Buxton. One of these has already been noticed in the quotation from Dr. Short's important work—between Brough, or Burgh, a Roman station near Hope, and Buxton. This road was traced by Mr. Pegge, in the year 1779. It seems to have extended from Buxton and Brough, to York and Aldborough. The part between Buxton and Brough is still called Batham Gate. Another of these great roads extended from Manchester to Buxton, and thence southward, under the names, in different parts, of High Street, Street Fields, Street Lane, Old Gate, &c. The parts of this road, which are still noticeable, extend from Bollington, about thirteen miles from Buxton; cross the higher grounds, by Pym's Chair, and descend thence to the Valley of the Goyt; being continued as far as Goyt's Bridge, within three miles from Buxton. The road may have been continued up the valley, by the side of the River Goyt, to Goyt's Clough; or, more probably, was carried across the river, and up the opposite hill-side, near to, or on the site of, the existing Goyt's Lane. Immediately to the south of Buxton, this road is again noticeable near to Coteheath, close to the high road to Ashbourne; and again, about five miles from Buxton, near the "Duke of York" public-house, on the same side of the same road.

In the year 1862, an ancient inscribed stone was discovered close to Upper Buxton. It is supposed to be

part of a Roman milestone; and although most of the inscription is so far defaced as to render its decipherment a matter of inference and question, enough remains to mark the distance between Buxton and some place, perhaps the Roman Station Brough, as xi. or xii. miles. Mr. Jewitt, in the *Reliquary*, expresses his belief that no fewer than seven ancient roads diverged from the important and central station of Buxton. These roads were usually made in straight lines, from one station to another, with little regard to natural obstacles. The solidity of the construction was fully equal to the boldness of the design; and many of the roads formed by the Romans have actually borne a traffic of nearly two thousand years, without material injury. The Roman engineers were painstaking and particular in securing a firm foundation for the work; which was done, when necessary, by covering the ground with small stones, fragments of brick, &c.; over this preparation, a pavement of large stones was often firmly set in cement, the stones being fitted to one another more or less carefully. Even when the substratum has been washed away, such a road-surface has been found to be firm and unaffected. The extensive trade with the mining district of Derbyshire, no doubt gave early importance to means of communication with it; and it would seem that the Britons had made a road called the Rykneld, which traversed the county of Derby from its Staffordshire to its Yorkshire boundary. This road seems to have been repaired by the Romans. It enters Derbyshire near to Willington, over Monk's Bridge, between Burton-on-Trent and Tutbury, on the Southern border of the county, and pursuing a north-easterly route, passes near Little Over, and to the west of Derby, Breadsall, Morley, Horley, Ripley, South Wingfield, Clay Cross, North Wingfield, Chesterfield, and Staveley. The great North

Derbyshire Roman road already referred to, as having traversed the Peak district from Manchester and Bollington, by Pym's Chair and Errwood, to Buxton, and thence by Foxlow, Brierlow, and the Duke of York Inn, Newhaven, Brassington, Mugginton, and Duffield, probably joined the great Rykneld road near Breadsall. This road would be the main channel of traffic for North Derbyshire, as the Rykneld was for the southern and eastern parts of the county, and would be supplemented by the important road from Buxton to Brough, by Fairfield and Bradwell, which was probably extended from Buxton on the south-west to Congleton and Middlewich. The difference in degree of relative importance of different parts of Derbyshire in the ancient and modern times, is curiously indicated by the position of the ancient Rykneld and of the Roman road through North Derbyshire. The whole of the districts, now so important, which lie between these main roads, may be supposed to have been in those days wild forest, little traversed, and almost unpeopled; the drier uplands, with their woods and their mines, being then the more important and more populous districts. There would seem to have been, moreover, an ancient road from Melandra Castle, near Glossop, to Chapel-en-le-Frith and Buxton; and there may have been also an ancient road from Buxton to Macclesfield, and thence to Deva (Chester); and also an ancient road from Buxton to Leek, and thence to Mediolanum (Chesterton, near Newcastle, in Staffordshire).

Whether these roads were originally constructed exclusively for military purposes, for effecting the conquest, or more complete subjugation, of the people of the country—or whether they may have only been the means of communication between important places—it seems to be evident that they would bring into notice, if they

were not constructed for the convenience of, the places through which they might pass; and the Buxton waters, with their elevated temperature, large flow, and medicinal value, would acquire repute, at very remote periods of time. That, at periods so remote from our own, large baths should have been constructed of such a durable and costly character as a framework of wooden beams, lined with lead, in one instance; and, in another, of masonry, floored with concrete, and most carefully protected outside with thick and strong cement (even although these structures may have been uncovered and exposed to the open air), cannot fail to astonish us. Now that modern roads and modern railways have served to bring distant places so much more within reach of one another, the Peak of Derbyshire is still sometimes thought to be too remote from the southern parts of England; and it may well be thought wonderful that sufficient numbers of people should have made the pilgrimage to Buxton, in those early times, in search of health from the use of its waters, to have led to the formation of such baths as these. Even now, in the baths which have been reconstructed, and so much extended, the largest of them is twenty-six feet long and eighteen feet wide; and we find the measurement of one of these old baths, probably the work of the Romans, to have been thirty feet long, by fifteen feet wide. The bath of lead and oak seems to have been of older date than this, and, at least, twelve feet square; and either will tell a tale full of import as to the enterprising spirit of a time so distant from our own, as to the estimation in which the Buxton waters were then held, and as to the still more ancient period at which they must have begun to be famous for their medicinal qualities.

BUXTON TEMP. QUEEN ELIZABETH.

In the midst of all this activity of hand, and skilled labour, there was no printing press, and there were few scribes; the affairs of remote provinces had no historians; traditions and public report were the histories and newspapers of the age; and, but for accidental discoveries of such magnitude, the ancient use of the Buxton waters and their ancient fame would have been unknown to us. And, even down to the age of Queen Elizabeth, there is no history of Buxton, nor account of its waters, although the reputation of their curative efficacy had become so considerable, that the accommodations of the place were no longer equal to the wants and demands of the people resorting to it; and a large building was, in consequence, erected by the Earl of Shrewsbury—at that time the principal proprietor of Buxton and the estates adjoining. This building, so quaintly described by Dr. Jones, in the quotation already given, must have been regarded as a fine and imposing edifice, even in that less ancient time. It supplied accommodation to some of the principal personages of that age, who visited Buxton for the use of its waters.

Mary, Queen of Scotland, visited Buxton at least four different times, while in the custody of the Earl of Shrewsbury. These visits must have occurred between the years 1570 and 1583, inclusive. There is a curious account of the circumstances leading to, and connected with, these visits, in Lodge's "Illustrations of British History." From this authority we likewise learn, that the Buxton waters were used for the relief of their ailments, by two of the greatest men of those times,—viz., the Earl of Leicester and Lord Burleigh. Miss

Strickland's edition of the "Letters of Mary Queen of Scots, and Documents connected with her Personal History," may also be referred to. One of the visits of the great Lord Burleigh is noticed in one of these letters. This visit took place at the time when Queen Elizabeth was sojourning at Kenilworth. In a letter dated Buxton, August 10th, 1579, Queen Mary mentions the benefit which she had derived from the use of the baths, in relieving a severe pain in the side. The Queen's last visit to Buxton seems to have been in the year 1583. When the statements contained in these letters are considered, as to the condition of the places in which the poor Queen was confined—the extremely damp state of the grounds and buildings, and even the apartments, at Tutbury, which this royal lady was made to occupy, affording even an inadequate shelter from the weather—it seems to be probable that her ailments were of rheumatic character; and, for the relief of such, the use of the baths and waters at Buxton would be of no mean value.

The Queen is said to have scratched on a pane of glass, in a window of the room she occupied, the following classical and kindly farewell:—

"Buxtona, quæ calidæ celebrabere nomine lymphæ,
Forte mihi posthac non adeunda, vale!"

It is stated, in "Camden's Britannia," that this distich is an adaptation to Buxton of Cæsar's verses upon Feltria. The relief afforded to Queen Mary's case appears to have induced both Lord Burleigh and the Duke of Sussex to resort to Buxton for the cure of their ailments. As Lord Burleigh visited Buxton, at least twice,—viz., in the years 1577 and 1580, it seems to be a justifiable inference that the baths were of use to him. The visit of the Duke of Sussex is mentioned as having occurred in July, 1580.

EARLY RESORT OF IMPOTENT POOR.

It is difficult to realise the various circumstances and position of times so remote as even those of Queen Elizabeth, and to picture the condition of Buxton, and of the inhabitants of the town and the adjoining hamlets, in those days. There is, in the Chapel of the Rolls, the original record of "A Grant to Thomas Dakyn and the Inhabitants of the Chapelry of Fairfield," dated the thirty-seventh of Queen Elizabeth, A.D. 1595, which illustrates, curiously, the state of Buxton at that time, and contrasts very much with what obtains at present. Fairfield is a pretty village and chapelry adjoining to Buxton; and it is in the present day much indebted to its close proximity to Buxton for an enhanced value of its land, and as affording a ready sale for its agricultural produce—the village, moreover, being advantaged by affording lodgings to some of the visitors of Buxton. In those days, however, the people of Fairfield appear to have suffered more from the poor frequenters of Buxton than they gained, either directly or indirectly, from being so near a place of such resort; and, accordingly, the inhabitants humbly supplicated the Queen for a grant to support a "minister or chaplain," pleading, in the supplication, among other weighty reasons justifying the royal bounty, that "the inhabitants aforesaid had fallen into extreme poverty," stating that the said poverty was in part:—

"By reason of the frequent access of divers poor, sick, and impotent persons repairing to the Fountain of Buxton, in the county aforesaid, within the neighbourhood of the Chapel aforesaid for whose maintenance and relief the Inhabitants aforesaid are daily charitably moved to apply their own goods, by which the

aforesaid inhabitants of the Chapelry aforesaid are not rendered only unable to sustain and maintain the Minister or Chaplain aforesaid, but also, by reason of their poverty, the aforesaid Chapel has fallen into great ruin and decay, and thus the inhabitants aforesaid will be altogether deprived of all Divine Service and Spiritual Instruction, unless a speedy remedy, in this behalf, shall be provided by us, wherefore they have humbly supplicated us, that we, being piously inclined, should be pleased to found and establish, within the town of Fairfield aforesaid, one perpetual Chapel, for our Minister or Chaplain to celebrate divine service there, for all the Inhabitants, within the Chapelry of Fairfield aforesaid, for ever to remain."

I am indebted for this interesting reference to the kindness of the late Mr. Goodwin, of Pigtor; and it furnishes a curious picture of the times; illustrating the difficulties with which poverty and disease must have had to contend in so much greater a degree, when the means of travelling from remote distances must have been most tedious and expensive, and when the journey of a poor sick person to Buxton must indeed have been a difficult and severe undertaking. It shows, however, how much the use of these waters must have been valued even at that remote period, when such difficulties and severe privations had not so checked the visits or kept down the numbers of these poor seekers after health, but that they should have proved to be so great a tax and burthen to the inhabitants of surrounding hamlets. The poorest can now find means of transport; and the visit to Buxton is never, in these days, the weary and trying pilgrimage which it must have been to poor sufferers in the days of Queen Elizabeth. Two years after the grant above mentioned, in the thirty-ninth year of the Queen's reign, perhaps in consequence of the supplication from the people of Fairfield, perhaps from increasing resort to Buxton, and further supplications, it was enacted, "that none resorting to Bath or Buxton Wells should beg, but should have relief from their parishes, and a pass under

the hands of two justices of the peace, fixing the time of their return, nor were they to beg there under pain of incurring the penalties of that Act."

BUXTON AT THE REFORMATION.

Previous to the period of the Reformation, the medicinal effects of the Buxton waters had been ascribed to the saintly influence of their great patroness, St. Ann; and the walls of a chapel, that was dedicated to her, had been decorated, from time immemorial, with the crutches of those cripples who had been cured by the use of these baths, and who no longer required them. In the earlier years of the reformed religion, Buxton was made to suffer on account of the superstitious errors of its earlier patrons. Conceived to aid in keeping up a belief in the Romish doctrine of saintly interference in human affairs, these interesting memorials of gratitude for restored health were destroyed; and, indeed, so bigoted had the national feeling, or rather, perhaps, the feeling of the dominant party, become, against everything connected with the unpopular faith, that the waters were for a short time prevented from being used by public authority. The following document, in regard to this, is too curious to be omitted. It is addressed to Lord Cromwell by one of the agents employed by him, for the suppression of all establishments connected with the Romish faith:—

"RIGHT HONOURABLE AND MY INESPECIAL GOOD LORD,—

"According to my bounden duty, and the tenor of your Lordship's letters lately to me directed, I have sent your Lordship, by this

bearer (my brother), Francis Bassett, the images of St. Ann, of Buckston; and Saint Andrew, of Burton-upon-Trent; which images I did take from their places where they did stand, and brought them to my house within forty-eight hours after the contemplation of your said lordship's letter, in as sober a manner as my little and rude will would serve me. And, for that there should be no more idolatry and superstition there used, I did not only deface the tabernacles and places where they did stand, but also did take away crutches, shirts, and shifts, with wax offered: being things that allure and entice the ignorant to the said offering; also giving the keepers of both places orders that no more offerings should be made in those places till the King's pleasure and your Lordship's be further known in that behalf.

"My Lord, I have locked up and sealed the baths and wells of Buckston, that none shall enter to wash there till your Lordship's pleasure be further known. Whereof I beseech your good Lordship that I may be ascertained again at your pleasure, and I shall not fail to execute your Lordship's commandments to the utmost of my little wit and power. And, my Lord, as touching the opinion of the people, and the fond trust they did put in those images, and the vanity of the things, this bearer can tell your Lordship better at large than I can write; for he was with me at the doing of all this, and in all places, as knoweth good Jesus, whom ever have your Lordship in his precious keeping.

"Written at Langley, with the rude and simple hand of your assured and faithful orator, and as one and ever at your commandment, next unto the King's, to the uttermost of his little power.

"WILLIAM BASSETT, KNIGHT.

"*To* LORD CROMWELL."

BUXTON IN THE SEVENTEENTH CENTURY.

The shutting up of the baths and wells would not appear to have been long enforced, nor the reputation of the waters to have been much influenced by these

arbitrary and prejudiced proceedings. In truth, the cures which had been effected, during so many ages, could not be set aside and ignored; and, as they were no longer to be considered as attributable to saintly influence, they began to be ascribed to the properties of the waters themselves.

The Hall, "at that time (1572 and previously) reckoned a fine mansion,"—a "very goodly house, four-square, four stories high,"—appears to have been well frequented, and has been extensively added to from time to time. The more important of these additions, and certainly the oldest of them, were erected about the year 1670, by William, the third Earl of Devonshire. There is extant an engraving of the old building, "four square," with two rows of four windows each on the opposite sides, at different heights, so as to constitute "the four stories high." It was surrounded by a high wall, evidently strong enough to resist a common attack of robbers, or the like; the wall of the house near the ground being pierced by loop-holes, which might have been used for observation, or the discharge of missiles. There was also an observatory on the top of the house, no doubt intended for the same purposes of defence and protection. Some staples on which gates or doors were hung still remain in the centre of the building; and there are parts of the ancient windows; but the present west front of the building was no doubt added in the year 1670; the eastern front of the hall has been added much more recently, and the centre of the south front has been covered within the memory of the present generation. This mansion, with many alterations and very considerable additions, is still a principal hotel in Buxton, and is still called the Hall. Speaking of this building, and its surroundings, Dr. Short, writing sixty years after the time of its alteration, says:—

"Buxton Hall is situated on the south brink of the rivulet *Wye* or *We*, from the union of three springs, a short mile west of the house, called *I*, *Thou*, *He*, which, being united, obtained the plural *We*. On the north side of the river is a steep mountain, covered chiefly with heath, under which is a black moss, or peat heath; below that, a shale; then clay and coal; and lead in some places. The surface here is very barren; and, therefore, return we to the south side, which, for about two miles, is a mountain of an easy ascent. The ground, all about the warm springs, on the south side of the river is very dry, fruitful, and pleasant; being a thin, warm, fertile mound, lying upon limestone; the grass, though short, is very sweet and fattening: hence they have the most delicious beef and mutton. Snow lies a much shorter time here than in the lower country.* Here is good store of hares and foxes, several wild rabbits of the rocks, partridges, moor game, of two sorts: one, a large black cock, weighing five pounds a-piece; the other, a brown, and much less, tho' more plentiful. The small river, which runs from west to east abounds with fine trout, grellin (grayling), crayfish, and silver eels. A little east of St. Ann's Well, over the ditch or level which carries the warm water from the bath, is made a curious natural hotbed; and, upon the rest of this canal, might be made the finest greenhouse in the northern kingdoms. Mr. Taylor, of the Hall, has also taken in several new gardens, with planting, and several curious walks. The garden stuff has a peculiar grateful flavour. Up one pair of stairs, in the Hall, is a beautiful dining room, seventeen yards long, and nineteen feet wide; seven other entertaining rooms, eleven lodging rooms, with single beds and closets; twenty-nine other lodging rooms. This one house affords sixty beds for gentlemen and ladies, besides suitable accommodations for their servants, and all other proper or useful offices."

In the front of the Hall was "a pleasant warm bowling green, planted about with large sycamore trees," and, on the north side of the green, was a grove of trees, which extended on the north side of the Hall, and on the south bank of the river: sheltering the bowling green, the

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* This evidently applied to the small closes of land in which the warm springs arose, the ground in the neighbourhood of the outflows being warmed by the water. The land is now covered by the Crescent, and the buildings and walks around it.

Hall itself, and the wells and baths, from the northerly winds. St. Ann's Well was situated on the east of the great bath, and very near to it; as nearly as might be, on the spot where the St. Ann's Drinking Well was erected, in 1852; and therefore, some yards to the west of the well removed at that time, which was situated at the foot of the Terrace Walks of St. Ann's Cliff, opposite the Crescent. Close to the river, and the grove of stately trees, at the back of the Hall (probably near to the site of the western end of the Crescent), were the gardens, which appear to have been, at one time, so well managed and productive; and, beyond, to the south and south-east of these gardens, the valley was divided into closes, or small fields, in which the different wells were situated. In a work, published in the year 1646, entitled, "A Prospect of the Most Famous Parts of the World," under the head "Darbyshire," is the following:—

"Things of strange note are the hot water springs bursting forth of the ground at Buxton, where, out of the rocke, within the compasse of eight yards, nine springs arise: eight of them warm, but the ninth very cold."

The street, called the Spring Gardens, evidently obtains its name from the gardens of the Hall, which were so famous in the time of Dr. Short.

Lord Macaulay, in the first volume of his "History of England," page 345, says:—

"England, however, was not, in the seventeenth century, destitute of watering places. The gentry of Derbyshire, and of the neighbouring counties repaired to Buxton, where they were crowded into low wooden sheds, and regaled with oatcake, and with a viand which the hosts called mutton, but which the guests strongly suspected to be dog."

Lord Macaulay gives, as his authority for this statement, a "Tour in Derbyshire, by Thomas Browne, son of Sir Thomas." It has been seen, however, that, from a much

earlier time than that mentioned by Lord Macaulay, Buxton was not only a watering place of much importance and resort, but that its principal hotel was a large and commodious house, supplied with all the comforts and requirements that were then to be obtained anywhere; and, indeed, that during, at least, three centuries before the period at which Buxton is thus stigmatised, the wants and expectations of the public had been provided for in the fullest manner, by an amount and excellence of house accommodation, and bathing accommodation, that must have been considerably in advance of most other places of the same kind. The excellence of the mutton, so vaunted by Dr. Short, and so well known in our own times, gives to the stigma a still more marked ironical character.

BUXTON IN THE EIGHTEENTH CENTURY.

The resort of large numbers of invalids to Buxton must have rendered the place unequal to supply adequate house accommodation to its visitors long before the Crescent was finished in 1784. The Duchess of Portland derived benefit from the Buxton Baths in 1766, and resorted to the place during many successive years. Mrs. Delaney, in a letter, dated 4th September, 1766, thus writes:—

"I rejoice that our amiable friend the Duchess of Portland has found so much benefit from Buxton, and hope no perplexities will undo what she has gained so dearly; for, by all accounts, Buxton, is a *shocking place:* but the blessing of health is worth a state of trial."

A similar account of the limited capabilities of the place is given much more at large, in a letter which was written from Buxton to the Honourable Mrs. Grenville, by Mrs. Stapylton, who was born in the year 1728, and died in the year 1815. The letter was found, among other papers, after Mrs. Stapylton's decease, and was kindly given for publication in this work, by her nephew, the late Viscount Combermere. It seems, from the internal evidence of the persons mentioned in it, to have been written between the years 1750 and 1761, when the writer would have been from twenty-two to thirty-three years of age. The MS. seems to be a copy of the original that was kept by the writer; and it is without a date as to the year in which it was written.

MRS. STAPYLTON'S LETTER.

"My dear Mrs. Grenville. You are now to Receive an Account of us from a more Intolerable Prison than We Left in Town. We were prepar'd by what we had heard from Several People to meet with every thing as Bad as it was Possible to Expect, but the Place and Accommodation exceeds Imagination or description very Much Indeed. It is a fuller Season than usual, which is not an advantage in any Respect, as we have not been fortunate enough to meet with any Body we know Little more than by Sight. The Bishop of St. Asaph & Mrs. Drummond went away the morning after we came, much regret'd by all They Left as well as ourselves. But our Seeing them a few hours the Night we Came was the Greatest Comfort in the World. For they Inform'd us Perfectly of the Manners and Customs of this delightful Place, Recommend'd Docr. Harding as the Doctor Fanny shou'd Consult as to the necessary Preparatives to Drinking the Waters, &c., &c., who is a Darbyshire Man. But all

this gives no idea, unless you have heard a fuller description. If Lady Egremont ever saw it you must, & has no other Place but the worst of Bed Rooms to spend her time in when she wou'd be by herself. Writing for Lodgings makes Little difference, for here are some people who have wait'd Six Weeks & are not better off than we are, which is being bless'd with one Garret (it deserves No other Name) with Three extreme Dirty Beds in it, a Broken Table, One Glass, & Four Chairs, besides not having any Place, except the Public Room, but this I have described to be in. The Weather, I am told, as we have found ever since Saturday, is always so bad you must spend more time in the House than anywhere. Without being too Hot we Breakfast in a very Low and not a Large Room, with a Fire, by wh. the Maids who attend us are toasting and buttering what we are to Eat, from which, you will judge, it must be Rather Cool for Augt. & it Rains every Day. At Twelve o'clock we have Prayers in the Room we dine in, which is at Two, then we drink Tea, Play at Cards, Sup at Eight, & dance till Eleven if you can, but it is with difficulty a set is to be made up, for it is not approv'd of for those who Come for their health, and there are not many here upon any other acc. The windows of the Room, where so much is done, are hardly ever open'd because of the Damps and Cold, &c. It's impossible to Let you know half the joys till I have the Pleasure of telling 'em to you; but, if it answers the Purpose of our coming, we can desire no more. Docr. Harding gives us Great hopes. He Order'd her to Repeat her Fifteen Grains on Sunday, and she began to drink the Water yesterday in the most cautious way. He does not propose to Let her Bathe these Ten Days at Least. The Water is not Purgative—I thought it had, and it cannot, I think, be call'd Warm Bathing—it is only not cold. 'Tho I said I wou'd not, I went into the Bath ys morning, but I do not propose to make a Practice of it. We are more in the midst of mountains than in any part of Wales I have been in, tho' to speak fairly and honestly, less Rocky: but then you may go here from mountain to mountain without having anything Like a Prospect—not a Tree, hardly a Bush; and, instead of Hedges, Toad Walls as we call 'em: for here and there we have the same, but it is Twenty miles from Ashburnham (qy. Ashbourne) to ys Place, and there is nothing to be seen the whole way besides. Compts. as usual.

"Augt. ye 19. I am, &c., &c."

ERECTION OF THE CRESCENT, ETC.

Additional accommodation was much required, and in the year 1780, according to Mr. Bray, the foundations of the great pile of building were laid, called, from its form, the Crescent: the architect having been the celebrated Mr. Carr, of York. This beautiful structure, which was finished in 1784, is still the finest crescent-shaped elevation in England, and, probably, in Europe.

By the erection of this building, all the immediate localities of the river, baths, wells, roads, &c., were much altered. The high road from Manchester, which seems to have passed near to the Hall previously, was turned, and made to pass at the back of the large new pile of buildings. The greater part of the grove or avenue of trees was cut down: those only being left which surrounded the bowling green of the Hall, and protected this piece of ground on the north, some of which probably still remain. The river was enarched the whole way from the Hall to some distance beyond the eastern end of the Crescent; and the space occupied by this arch, by the large part of the avenue of trees that had been cut down, and by some of the springs which had emerged near to the south bank of the river, and by the closes of land on the river side, between the river and a rocky mound called St. Ann's Cliff, was occupied by new buildings, forming the Crescent and the Square. And, in course of time, the rocky bank, or rounded and considerable eminence, fronting the Crescent, and said to have been a most unsightly-looking foreground to so

palatial a structure, was forced into form and usefulness by the taste and skill of Sir Jeffery Wyatville, and formed into ranges of terrace walks, with intervening grass banks, adorned with vases of form, and style, and size, to correspond with the Crescent: the whole being made into a foreground of pleasing and ornamental character.

BUXTON SEVENTY-FIVE YEARS SINCE.

The following account, containing, it may be noticed, no complaint of the quality of house or hotel accommodation,—such cause of complaint having been removed by the completion of the Crescent,—is taken from a History of Derbyshire, by the Rev. D. P. Davis, published in the year 1811:—

"Buxton lies in a hollow, surrounded by dreary hills and extensive barren heaths; and so uninviting and cheerless is the scenery around it, that were it not for the deserved reputation of its mineral waters, it would never have attracted any notice, and, perhaps, never have become the residence of human beings. On approaching this celebrated watering-place, the country appears naked and forlorn; and nothing but extensive tracts of bleak, elevated moorlands present themselves to the eye. Long before Buxton is approached, its site may be discovered by the singular appearance of the hill a little beyond, whose declivity is scarred by innumerable limestone quarries—the rubbish from which contrasts strikingly with the black heath around, and produces a very remarkable effect. Owing to the hills, which rise to a considerable height all around, the town is not discovered till it is almost reached; and its appearance, when the public walks and rides are thronged with carriages, persons on horseback, and parties of gay pedestrians, must produce a striking

effect upon a stranger, who, after travelling several hours over moors and sterile heights, suddenly advances within view of this sequestered spot, rendered gay and lively in its appearance by its stately buildings, and its showy, dashing, temporary inhabitants."

Gradually, in addition to the pile of building formed by the Crescent, the Hall, and the Square, a row of houses on the west side of St. Ann's Cliff, called the Hall Bank, an inn—the George, and another inn—the Grove, in addition to a church, built at much cost by the Duke of Devonshire, the noble owner of the baths and adjacent property—in addition to a large range of building, erected on the rising ground on the north, and at the back of the Crescent, for stables and coach-houses, &c., now the Devonshire Hospital—a street came to be formed on the south bank of the river, beyond the enarchment of the stream which is covered by the Crescent. All these buildings, however, with no exception of any importance but the Hall, are comparatively modern. Buxton, more strictly so called, distinguished now-a-days from the part of the town above mentioned, which is called Lower Buxton, by being called Upper Buxton—this, the old town of Buxton, is on a level with the summit of St. Ann's Cliff, and has an elevation of upwards of seventy feet above the lower and more modern part of the town. Higher Buxton or Upper Buxton, contains a much older and smaller church, also a new church and dissenting chapels, a spacious market place, a market house, a cattle market, police station, the Eagle Hotel, (a large house which has been long in repute,) and many inns, and a great number of lodging-houses.

But for a long time after the Crescent had been built, and after many other additions and improvements had been made, to meet the wants of those resorting to it, chiefly for the use of the baths, Buxton had to contend with many local disadvantages. The town had been

situated in the midst of a bare and barren tract of country; there was hardly a tree within miles of it, unless at the bottoms of the more important valleys; the land was, for most part, unenclosed, uncultivated, and unsheltered from the winds; and the whole district must have looked wild, dreary, and inhospitable. Even within the memory of old inhabitants, there was neither cultivation nor enclosure within twelve miles, in the direction towards Ashbourne, unless in rare and isolated patches; and nearly the whole of the valley of Buxton, on the south-west and west of the town, and within a stone's throw of the old bowling green and new church, was untouched moorland. And yet, induced by the great and well deserved reputation of its healing waters, the invalided from all parts have been content to visit and sojourn in this region of wild and barren, if picturesque and mountainous beauty; and so great were the benefits derived, that, without most of the usual supplementary watering place attractions, the Buxton waters supported and added to their celebrity.

At length it was found, about seventy years ago, that, in this mountainous and large featured district, which, in the ancient times, had been well timbered, and formed part of the great midland forest of England, trees would grow if they were planted. It had been thought, notwithstanding the fine old hawthorn trees to be seen here and there, in all sorts of situations, elevations, and exposures, in different parts of the district, that the hawthorn would not thrive in the locality; and, therefore, that hedgerows could not be substituted for stone walls, as fences for the fields. Many hundreds of acres have been planted from that time to this; and, accordingly, although such a country as this ought always to be characterised by the bold and massive grandeur of its scenery, it no longer conveys a sense of bleak desolation,

which it must have done even half a century ago; and the country around Buxton is now universally allowed to be beautiful. That Buxton should have been yearly resorted to by thousands of invalids, under such disadvantageous circumstances, may be accepted in confirmation of the power of its waters, in relieving and curing disease.

The descriptions convey an all-sufficient idea of the efforts which have been made from the beginning of the century to the present time, to render the town and district of Buxton worthy to be the site of the mineral waters. Mr. Heacock was the resident agent of the Duke of Devonshire, during nearly fifty years; and to him Buxton and its district owe much. During Mr. Heacock's agency, the extensive plantations were made throughout the district, which have done so much to clothe, embellish, and shelter the town and valley of Buxton. During this agency, St. John's Church was finished; the pile of houses called the Square, was erected; the older terrace and plantation walks were formed; the pure water of gritstone springs was brought from a mile to the north-west of the town for the domestic supply of some of the principal buildings—a supply eventually extended, during the same agency, to a large part of the town; hot baths, for the use of the mineral waters at a higher temperature than the natural degree of warmth, were made; the Old Church, in Upper Buxton, was restored; a new church was built at Fairfield; the greater part of the street called Spring Gardens was built; Gas Works were established; and the means and position of the Buxton Bath Charity were greatly extended.

But much had still been left undone. A larger amount of house accommodation had been afforded from time to time, but below the wants of the public; additional

baths had been made at distant intervals of time, but even this essential requirement was not adequately provided; public walks and pleasure grounds had been laid out, and planted, and maintained in order, with a princely liberality, for the use of the inhabitants and visitors; but embellishment, drainage, and extensions were still required. It was under these circumstances that the late Mr. Smithers succeeded to the ducal agency in the year 1851. Under the energetic advice and superintendence of Mr. Smithers, many extensions, additions, and improvements were made or planned: and with a success which has been subsequently shown to have been entire. During the five years (1851-6) the supply of the tepid waters to the baths was considerably increased; both the Natural and Hot Baths were reconstructed and greatly extended, and provided with many accessories for comfort and advantage; new baths were erected for the use of the patients of the Buxton Bath Charity; the analyses of the waters by Sir Lyon Playfair were obtained; a park of more than a hundred acres was laid out and planted for ornamental and building ground, from plans by Sir Joseph Paxton; a wooded upland with southern aspect (Corbar Hill) the site of old gritstone quarries, was intersected by picturesque walks of remarkable character; and a large public subscription was obtained towards the cost of a Hospital for the patients of the Buxton Bath Charity.

On the decease of Mr. Smithers, in the year 1856, the late Mr. E. Woollett Wilmot succeeded to the Buxton agency. In the eight years of this agency a Market Hall was erected by a public company; Gas Works were extended to supply the out-lying districts of Fairfield, Burbage, and Cote Heath; a new Church was erected in Burbage, and two new Chapels in Buxton; a new Cattle Market was made by which much occasional inconvenience

to the town was got rid of; and, much more than all besides, Buxton was placed within the provisions of the "Act for the Local Government of Towns;" its main drainage and sewerage were accomplished under the plans and supervision of Sir Robert Rawlinson; and a local executive authority was obtained, by which new houses and streets, roads, footpaths, &c., are planned or supervised. Mr. Wilmot died in the year 1864; since which time Mr. Drewry has held the agency for the Buxton district. Miss Hawkins also died in the year 1864; to whom this work owes so much for the botanical commentary and the classified list of the plants which grow in the neighbourhood of Buxton.

Within the last twenty years there has been a rapid increase in the number of lodging-houses — connecting Buxton with Fairfield, in one direction; with Nithen End, in another direction; with Cote Heath, in a third; and with Burbage, in the fourth direction. An important Terrace Walk has been made, which is 581 yards long. A most suitable and valuable building, by the munificent kindness of the late Duke of Devonshire, has been granted to the use of the patients of the Buxton Bath Charity, under the name of the Devonshire Hospital. The railway extensions of both the Midland and the London and North Western Railways were opened to Buxton, in June, 1863. In the year 1867, not only were these railway extensions to Buxton completed, but a new line to Manchester was opened by the Midland Railway Company; and a large Hotel was finished, on a commanding and excellent site, very near to the railway stations, by a public company, from the able plans of Mr. Henry Currey. This, which is called the Palace Hotel, from its size, character, capabilities and position, is well supported, and of much public value. Many detached and semi-detached villas, and rows of houses,

in convenient and picturesque positions, on the terraces, slopes, and various approaches to the town, in all directions (either recently built or in course of erection) have added very much to the attractiveness and capability of the place.

During the year 1871, the present and future prosperity of Buxton were promoted in a very important degree by the Buxton Improvements Company. This Company was primarily instituted in order to obtain money for the payment of the band of musicians, which had always been important to the interests of the place, and had been during a very long time supported at the sole cost of his Grace the Duke of Devonshire. As the number of the smaller freeholders of Buxton increased, and the proportion of property belonging to the Duke of Devonshire became relatively smaller and smaller, it became less and less justifiable that the whole of this considerable outlay should be made by the principal owner; and during more recent years a subscription of £100 yearly on the part of the Duke of Devonshire had been supplemented by donations and subscriptions from residents and visitors. The sum required, amounting to about £500, was obtained, but with an increasing difficulty. To obviate this, it was kindly proposed on the part of the Duke of Devonshire to convey to a Public Company twelve acres of land, chiefly garden-grounds and plantations, from about forty acres still left free to the use of the public as pleasure-grounds and plantation-walks; the conveyance being made without charge, on the conditions that the twelve acres should be enclosed, that the enclosure should be embellished by landscape gardening, that a suitable building should be provided in which the band might play in unpropitious weather, and that the Company should pay the members of the band from the receipts for admission to the

grounds. These conditions have been fulfilled under the able advice and supervision of Mr. Edward Milner, in the most satisfactory manner. A large Pavilion has been erected, in glass, iron, and wood, with central hall, corridors, and terminal conservatories, 120 yards in length, and of proportionate width and height, with a terrace-promenade in front of it having the same length and width, the whole facing the south, with grassy slopes and gravel walks down to the river Wye, which intersects the grounds. The river is crossed by a handsome iron and stone bridge, ornamented with flower vases and gas-lamps. The bridge leads to a central band-stand, from which another bridge crosses ornamental waters, and leads to broad walks, artistic rock-works, an extensive croquet ground, gardens, lawns, &c. The river and ornamental waters are crossed by three other bridges, and by two culverts of tasteful rock-work. The ornamental waters are varied with two very small islands, disposed and arranged with considerable judgment and effect; and raised and undulating banks and borders, with flower beds, rosaries, and an American garden, give much effective variety, and add to the apparent acreage. The building when needful is warmed by hot water pipes, and is brilliantly lighted with gas. The walks throughout these grounds, which are not less than two miles in length, have been carefully constructed and drained in the best manner; and a succession of floral beauty at different seasons of the year has been secured by extensive forcing pits. All these works were executed within less than a year; and the Company has obtained a financial success, notwithstanding the outlay of a considerable capital, the cost of the band, the cost of labour, and very low charges for admission. The financial success under such circumstances supplies conclusive proof of the prosperity of

Buxton as a place of public resort; and these buildings and gardens supply a valuable addition to the advantages of the town. The sheltered and warmed promenade in ungenial weather is of evident value; the multiplication and improved condition of the walks is an important feature of the undertaking; and, last and by no means least, the character of the music has been improved to a degree at least on a par with the pecuniary prosperity of the Company.

During the years 1876, 1877, the gardens and buildings of the Company were much extended and added to, under the architectural plans of Mr. R. R. Duke, and the curatorship of Mr. Adam Hogg. A commodious concert-hall, large enough to seat one thousand persons, was added to the Pavilion. This hall is of octagonal shape, with domed and lanterned roof, admirably ventilated, well lighted on all its sides in the day time, and by gas-sunlights and gasaliers at night, and it is of such acoustic power that any musical sound can be heard distinctly and perfectly in every part. The interior of this hall is too resonant for other than musical purposes. Opening as the music-hall does from the end of the Pavilion buildings, it forms part of and crowns the large internal area of the structure. A finer interior could hardly be produced, whether by day or by gas-light, and the whole is admitted to be an unqualified success. In connection with these buildings, and opening from them, is an admirable and well-supplied reading room, with retiring rooms, smoking room, &c. An excellent skating rink has also been completed within the grounds. The rink and the terrace, &c., are lighted with gas in the evening. The terrace and the promenades have, moreover, been considerably added to.

Year by year extensions and additional advantages are obtained by these grounds. Seven acres have been

added within recent years. A large sheet of water has been included, sufficient in extent for the use of boats, which add to the interest of the public in a place which previously enjoyed no such privilege within many miles. This sheet of water, which is, happily, too shallow to be dangerous, has been cleverly provided with a sluice, by which it may be lowered at pleasure to within from two feet to a few inches in depth, so as to be rapidly frozen in the colder seasons. for the purpose of skating, and lessening so far the discomfort of casualty. Additional grass and gravel courts have been created for the popular games and tournaments of Tennis; and these are admitted to be unsurpassed in character. The open Tennis tournaments have obtained a national fame and popularity, and are evidently of great interest to the general public. An important quarry of limestone was opened in the more recently enclosed grounds to obtain stone for the construction of the Tennis courts, &c.; and fortunate advantage has been taken of the opportunity, under the good judgment of Mr. Adam Hogg, the curator of the Gardens, to produce a rockery and fernery of considerable extent and most interesting character. The rocks exposed, and left in situ, are full of fossil shells, containing many or most of the fossils of the secondary limestone formation, and the crevices and shelvings of the rocks are planted with ferns and mosses, and the wild flowering plants of the district, forming a most interesting contribution to the flora and primæval history of great part of the Peak of Derbyshire. Two old Buxton gateways: the one, the more ancient, originally leading from the Spring Gardens to the Crescent; the other, somewhat less ancient, dividing the highway opposite the Square from the old plantation walks, have been preserved, and used as entrances to the Rockery. Two ancient stones have been placed within the grounds, to the north-west

of the smaller tennis lawn. They have been removed from a neighbouring field, with the consent of the Duke of Devonshire, under an opinion that they may have been of Druidical antiquity and interest.

POPULATION STATISTICS, 1851 TO 1878.

In addition to the details as to the more recent history of Buxton, which have been given, the reports of the Registrar-General furnish conclusive data as to the progress of the place, and as to the steadily lessening death-rate of its population. The conditions of health and life probability are exceptionally great in Buxton and its vicinity. The two great geological formations which comprise the district in and around Buxton; on the north and west, gritstone; and on the east and south, mountain limestone; are eminently porous, and free from stagnant waters, miasmatous or injurious emanations; even the peat, on the small area of moorland, has comparatively little depth, and retains proportionally little moisture; and the remainder of the gritstone uplands have the characteristically absorbent subsoil. The great range of mountain limestone is not only thus absorbent, but is covered with only a few inches of soil; and the whole area is singularly wanting in springs, and the rain-water has to be collected and stored in what are locally called meres, or round shallow basins of clay lined with rough stone, for agricultural needs. The absence of terrestrial emanations has always been held to be a very important feature in the character of the district, and unquestionably ministers largely to the healthiness of the population.

The census returns fully support these opinions. Buxton Proper had a resident population in 1851 of 1233: in 1861 the number had risen to 1875; and in 1871 had further increased to 2531. The population of Fairfield, for all practical purposes a part of Buxton, had been only 574 in 1851, had increased to 1074 in 1861, and to 2003 in 1871, or had nearly quadrupled in the twenty years. The population of Hartington-Upper-Quarter, also practically a part of Buxton, had been 892 in 1851, was 1190 in 1861, and 1695 in 1871. The total population of Buxton and its outskirts, which had been 2699 in 1851, was 4139 in 1861, and 6229 in 1871, or had more than doubled in the twenty years. The population of the surrounding parishes or hamlets, as Chapel-en-le-Frith, Chinley, Bugsworth, and Brownside, and Peak Forest, had either remained nearly stationary, or had decreased during the ten or twenty years. To the numbers which represent the resident population of the Buxton district, as the census returns are obtained so early in the year as to include very few other people, must be added the correspondingly progressive increase in the numbers of the visitors, who reside in the district during a few days or a few weeks only: a number of which may vary from some very small proportion during the middle of the winter, to nearly the number of the whole resident population during some parts of the months of summer and autumn.

The death-rate returned in the census year, 1881, was little more than 10 per thousand, from a population of 6025.

But, since 1875, the urban district of Buxton has been under the supervision of Mr. Frederick Turner, as the Medical Officer of Health, and the sanitary condition and the death-rate have been ascertained carefully, the needs pointed out, and the results determined. From the

interesting tables furnished to the Buxton Local Board by Mr. Turner, it may be learned that the death-rate of the Buxton population was little more than nine per thousand during 1885, and that there is a gradual decline from 17 per thousand during the last seven years; and the average mortality of the last seven years has been scarcely more than 11 per thousand, and of the last 10 years scarcely more than 12 per thousand.

These reports tabulate the estimated and census population during the last ten years, a summary of births and deaths, and a calculation of the per centage of mortality per thousand, for the same period, and show the death-rate to have been gradually declining, and that of 1883 to have been less than 10 per thousand, that of 1884 to have been between 11 and 12 per thousand – an increase ascribed to the small rainfall of that year, and that of 1885 to have been even a little lower than 10 per thousand.

If this lessening death-rate, and all that it implies as to increasing sanitary advantages, had been fortuitous or inexplicable, it might have attracted little notice, and had no immediate practical bearing; but it has been earned by securing all the sanitary conditions, from the original sewage disposal plans of Sir Robert Rawlinson, to the recent action, under Dr. Thresh, of defecation by a mixture of the sewage with lime and iron, technically carried out with much engineering skill, by Mr. Joseph Hague, C.E., the surveyor to the Buxton Local Board. It should be understood, that, for some years, the sewage of Buxton has not been allowed to pass into the river Wye as it runs through the town, but has been conveyed beyond the town, and not passed into the river until nearly a mile from the town, by the side of the road to Bakewell, in Ashwood Dale. And more recently, before it is allowed to reach the river, it is strained, and the effluent

is mixed with a red stream, from an old coal-working, near Ladmanlow; conveyed thence by conduit and separate pipes; and lime is added; and it is conveyed to a succession of deposition tanks, where all that is sedimentary falls to the bottom, either by its own gravity or by chemical precipitation; the turbid and offensive liquid becoming almost immediately clear and bright, and freed from perceptible or chemical impurity; passing from tank to tank in free exposure to the air; and eventually streaming down a steep incline into an open tortuous water-course, until it is finally poured into the river without any apparent or ascertainable contamination. Gradually the precipitate collects in the tanks; a double series of tanks enables them to be alternately emptied and cleared; the precipitate is conveyed and forced by atmospheric pressure into compression vats; whence a clear liquid is returned to the tanks; and a solidified residuum is obtained, in a portable form, free from salient offensive character, and suitable for agricultural purposes; the sludge having been reduced by the loss of water to one-tenth of its weight and volume. There is still the remainder of less soluble or insoluble sewage, which had been arrested by the grating; this is mixed with the contents of the ashpits removed from the houses in the town, containing cinders and other combustible refuse, and conveyed to a powerful furnace, well called a destructor: thus ending the series of health-services to the Buxton population. Buxton owes much to the medical, chemical, and engineering and surveying advisers of its Local Board, for sanitary services that can hardly be over-estimated.

RAINFALL AT BUXTON.

The rainfall of the district is of much interest, not only as to its climatorial character, but in a sanitary point of view. During sixteen years, the meteorological observations were kept by Dr. Sykes, at the Devonshire Hospital, which is furnished with all the necessary instruments; and, more recently, this important and gratuitous duty has been kindly undertaken by Dr. Thresh. The average yearly rainfall during the last twenty years has been a fraction more than 57 inches. The number of days on which rain fell in 1885 was 203. As might be expected from the one thousand feet elevation of Buxton above the level of the sea, and from the still more elevated ranges of hills on all sides of it, as well as from its considerable distance of not less than fifty miles from the sea both on the east and on the west, and very much further than this on the north and south, the rainfall of the Buxton district is comparatively large. This may be said to be nearly or more than twice the amount of rain which fell in the neighbouring districts of Derby, Nottingham, Sheffield, Chesterfield, or Macclesfield, and considerably more than the rainfall of Manchester; while, on the other hand, it is not more than from two-thirds to one-third of the rainfall of some parts of Cumberland. The comparison of the number of days on which rain falls seems to be rather more favourable to the Buxton district than the aggregate rainfall would have rendered probable; and the number of days throughout the year in which there are many hours without rain seems to be still more favourable to the

district. But the amount of rain which may fall yearly does not seem to be disadvantageous to the sanitary character of any district; and indeed may probably have a favourable influence. The wettest seasons have been often known to have been the most healthy, both as to amount of disease and the lowering of the death-rate throughout the kingdom. Rain carries away impurities both from the atmosphere and from the surface of the earth; and in a district like Buxton, where there are no stagnant waters to become sources of impurity, nor amount of vegetation, nor depth nor character of soil to produce noxious emanations, the rainfall can produce no after-results to be of any importance in a sanitary point of view. Unless during frosty weather, and therefore unless during the winter months, the grounds and roads are dry almost immediately after the cessation of the heaviest rain.

MEAN TEMPERATURE AT BUXTON.

The mean temperature of Buxton is 44 degrees, Farenheit; or 3 to 4 degrees lower than the mean temperature of England; and from 4 to 5 degrees below the mean temperature of London and its environs. The effect of temperature upon climate and upon health must be much modified by the intensity and direction of the prevailing winds, and also by the rainfall. The climatorial character of Buxton cannot, however, from the results of these observations, be held to be so very different as to temperature from that of the metropolis as it has been heretofore supposed to be, and must be largely modified by the absorbent subsoils of the extensive upland country on all sides.

EMINENT NATIVES OF DERBYSHIRE.

Derbyshire has given birth to several distinguished men. John Flamstead, the great astronomer, was born at Denby, near Belper, and died in 1797. Samuel Richardson, the novelist, was born at Derby in 1689, and died in 1761. Joseph Wright, the eminent painter, was born at Derby, and died in 1797; and also William Hutton, well called the English Franklin, successively stocking-maker, bookbinder, and bookseller, and eventually historian and poet, was born at Derby in 1723, and died in 1815. Anna Seward was born at Eyam, in 1747; and Dr. Thomas Denman, the eminent physician, and father of the late Lord Denman, was born at Bakewell, and died in London, in 1815; and James Brindley, the illustrious engineer—the virtual creator of the system of inland navigation, "was born in a humble cottage standing about midway between the hamlet of Great Rocks and that of Tunstead, in the liberty of Thornsett, some three miles to the north-east of Buxton. The house in which he was born in the year 1716, has long since fallen to ruins; the Brindley family having been its last occupants. The walls stood long after the roof had fallen in, and at length the materials were removed to build cowhouses; but, in the middle of the ruins there grew up a young ash tree, forcing up one of the flags of the cottage floor. It looked so healthy and thriving a plant that the labourer employed to remove the stones for the purpose of forming a pathway to the neighbouring farmhouse spared the seedling, and it grew up into the large and flourishing tree, six feet nine inches in girth, standing in the middle of the croft, and now known as 'Brindley's Tree.' This

ash tree is Nature's own memorial of the birthplace of the engineer, and it is the only one as yet raised to the genius of Brindley."—*Lives of the Engineers, by Samuel Smiles.* Sir Francis Chantrey, the eminent sculptor, and perhaps the most distinguished sculptor of portrait busts in any age or country, was born in Derbyshire, at Norton, near Sheffield, in 1782.

Of persons connected with Derbyshire by eminent or successful lives, may be mentioned Sir Richard Arkwright, the great inventor of "the Spinning Jenny," and founder of the cotton manufacture of Great Britain; Mr. Strutt, also eminent as a great inventor of industrial machinery, and also founder of a wealthy and distinguished family, one of whom gave the great Arboretum to the town of Derby; Dr. Darwin, the author of "The Zoonomia," also an eminent physician; and Sir Joseph Paxton, the creator of crystal palaces, and renowned landscape gardener and horticulturist. On the banks of the Derbyshire river Dove, talked and wrote and angled Izaak Walton and his friend Charles Cotton; and some of the greatest of the poems of Thomas Moore were written at Sloperton Cottage, near Ashbourne.

CHAPTER II.

PHYSICAL CHARACTER, ITINERARY, AND ARCHÆOLOGY OF BUXTON AND THE PEAK OF DERBYSHIRE.

THE lowest part of the town of Buxton is at an elevation of one thousand feet above the level of the sea. It is, however, surrounded on all its sides by hills of greater elevation; and it occupies the north-eastern extremity of an oblong basin, the bottom of which is between two and three miles long, and about half a mile in breadth. The surrounding hills rise from the bottom of the valley by shelving sides, which give to the upper margin of the basin a diameter of from four to eight miles, in different directions. The hills which bound the valley of Buxton, rise from it with different degrees of abruptness. On the north and north-west, within little more than a mile from the town, to the north-east of the road to Manchester, Black Edge, the highest part of Comb's Moss, has an elevation of 1670 feet. On the west, at the distance of between two and three miles, and to the right of the Leek road, and to the left of the roads which branch from this road to Congleton and Macclesfield, the highest part of the chain of hills has an elevation of nearly 2000 feet. This is a well known and commanding ridge, called Axe Edge. On the south, the highest part of a chain of hilly grounds has an elevation of 1435 feet. These are covered with what are known as the Grin Plantations, and were formerly, and at their more distant extremity are still, the site of extensive lime kilns. The nearest part of this range of high grounds is within less than a mile from the town. On the south-east, Chelmerton Low forms

the highest part of the range of hills. This Low, probably one of the many stations for signal fires in ancient times in these upland districts, has an elevation of 1474 feet. Chelmerton Low is at a distance of five miles from the town, to the left of the road to Ashbourne, and to the right of the road to Bakewell. But between Chelmerton Low and Buxton, there is a considerable elevation of high land called Stadon. Almost due east from Buxton, at a distance of six miles, is the village of Taddington, with an elevation of 1122 feet. The high grounds of the village of Fairfield, flank and rise above the town of Buxton on the north-east; beyond which, at greater and greater distances, rise the higher and higher grounds of Peak Forest, Mam Tor, and Kinderscout. These surrounding ranges of more elevated ground, not only protect Buxton in a considerable degree from the more severe effects of prevalent winds, but the more or less steep ascents and declivities of the sides of the oblong basin represented by the valley of Buxton, offer a great variety of scenic beauties. Several hundreds of acres of the valley, to the west and south-west of the town, present swells and undulations of great capability, much of the land sloping gently towards the south. These grounds have been partially turned to much account, more particularly within the last few years. The Buxton park occupies 120 acres of this part of the valley; and contiguous to the park, the principal public terraces, pleasure grounds, gardens, and plantation walks have been made. The higher grounds which surround the valley on all its sides, are for the most part crowned with plantations, which not only serve to enrich the landscape, but must assist greatly in tempering the severity of the mountain winds.'

The whole of the town of Buxton, as has been said, lies in a valley, and is surrounded by hills of greater

elevation than its own level. This applies more particularly to the lower part of Buxton, which is immediately protected on the south by St. Ann's cliff—now more commonly called the Crescent Terrace Walks, and on the north by the rising grounds on which St. John's Church, the Devonshire Hospital, and the house and grounds of the Buxton Palace Hotel Company are placed. This part of the town is well sheltered in all directions. It is more immediately protected by plantations on the west; and on the east by the higher grounds of Fairfield, and the rocks which bound the valley through which the road to Bakewell passes, close to the town. The upper part of Buxton is much less sheltered; the higher grounds are situated at greater distances, and its position is by so much one of greater exposure. There is a difference of elevation between the carriage road in front of the Crescent and the centre of the Market-place, amounting to 76 feet 9 inches; and the elevation of Upper Buxton may therefore be said to be 1080 feet, the elevation of St. John's Church being 1029½ feet. In regard to the degree of shelter afforded to Upper Buxton, there is, however, within less than a mile, on the south, a range of ground which is 350 feet higher; and at nearly the same distance on the east and on the north, are grounds of as great or greater elevation. On the west, the two miles in length of the Buxton valley intervene between the upper part of Buxton and the higher grounds in that direction.

These several elevations, and the various elevations of the different more important positions throughout this district, have been obtained either from the excellent surveys published under the authority of her Majesty's Board of Ordnance, or from private surveys which have been kindly made in reference to this work, and the accuracy of which may be relied upon. But an approach

to relative accuracy may be obtained in a most interesting and ready manner, in regard to any locality, whether upland or valley, by the use of the very ingenious instrument—the Aneroid barometer. Barometers are used to indicate the pressure of the air; and therefore they may be had recourse to not only as weather glasses, but inasmuch as they fall with the higher ground, and rise with the lower ground—the weight of the superincumbent atmosphere, by so much diminishing in the one case, and increasing in the other—they act usefully in obtaining the relative elevations of different places above the level of the sea. The Aneroid barometer is sufficiently portable to be conveniently made use of for this purpose. In using this instrument, it is only necessary to have obtained the elevation of any given object in a district; as, for instance, that of St. John's Church, at Buxton. This is to be taken as a standard of the comparative observations, and the index of the Aneroid barometer is to be accurately read and noted on any given day, when the relative elevation of any other part of the district is wished to be ascertained. Every inch on the index of the instrument is divided into forty spaces, and every one of these spaces may be considered, with a sufficient approach to accuracy to satisfy most observers, to signify twenty-one feet. If any of the neighbouring eminences be then ascended, the index of the barometer will be found to fall more and more, as the higher and higher ground is attained; and by multiplying the number of spaces thus indicated by twenty-one, a sufficiently near approximation may be made to the relative elevation of any part of the district. Thus, for instance, it may be learned that there is a range of the index of nine and a half points between the level of the New Church and that part of the road to Manchester which is about three quarters of a mile distant from the church, a little beyond

Northern, or, so called *Nithen* End. Multiplied by twenty-one, a higher elevation is shown of 199½ feet; or, if added to 1029½ feet, the elevation of the church above the level of the sea, the elevation of this part of the road is shown to be 1229 feet. Again, between the level of the church and that of the highest part of the same road, called the top of Long Hill, the index shows a fall of eighteen points, which, when multiplied by twenty-one, gives a higher elevation of 378 feet, or a total elevation above the sea level of 1408½ feet. In a district which presents so many different elevations of country, this instrument supplies an interesting and valuable resource to the tourist and the inquirer. It should be remembered, however, that such an estimate, although sufficiently near for most purposes, is only an approximation to the truth: the attainment of absolute accuracy by means of barometrical observation, requires some deductions for variations of temperature, and other influencing circumstances, and necessitates a somewhat intricate process of mathematical calculation.

Buxton is situated on the south-western edge of an extensive formation of mountain limestone. The formation presents the usual characteristics of the secondary limestone. The surface of the country is remarkably undulating; broken in the course of the streams into bold ravines, which are bounded by lofty and precipitous crags, having deep, time-worn, perpendicular fissures, with frequent horizontal cracks, often of great length, and as straight as if formed by art. These cracks often extend deeply beyond the mere surface of the rocks; and in many places, time or art has removed in part the upper layer or layers, and left broad shelvings of rock, which illustrate very well this character of the formation. In the instance of a well-known rock in this formation, Chee Tor, the appearance is as if the upper part of the vast

mass had been carefully cut off the subjacent layers and accurately replaced in the same position. The long and winding valleys of this formation, with bright trout streams rippling and tumbling over their rocky bottoms, —with beetling, precipitous, cleft, and time-worn crags, of pale-grey colour, bounding their sides,—and the mountain-ash, yew, pine, hazel, and thorn, partially clothing, without concealing, their romantic and various ruggedness,—while the anemone, orchis, saxifrage, forget-me-not, &c., embellish them with minuter features of beauty; contrasting, as these valleys do so very remarkably, with the large-featured upland scenery of this district, on which the eye wanders for miles, until in one or two instances it almost distrusts the evidence of its impressions, and on which the lights and shadows of the clouds are often mapped with a curious and exquisite distinctness, and where the distant storm or distant sunshine may be traced at different points in a single view,—cannot but be admitted to give a variety and character to this locality, which can be met with in few places in this country.

One remarkable characteristic of the mountain limestone formation is well exemplified in the Peak of Derbyshire. It contains many large natural caverns. These caverns, the most important of which are at Castleton, Matlock, and Buxton, are entered by natural arches or fissures, at different elevations of the sides of the hills in which they are situated, and lead to alternate passages and chambers, which differ much as to height, windings, and length; the chambers being in one or two instances of palatial size, and of noble height and proportions; in some cases roofed with a flat surface of rock, in others with arches of different forms and sizes. In the great Peak cavern, at Castleton, these arches, from their height, span, proportions, and harmony as to

character and extent with the chambers which they canopy, fill the mind with a sense of grandeur and beauty, scarcely inferior to that produced by the interiors of some of the cathedrals. In some instances, the constant dripping of water from the roofs of these caverns, charged with calcareous matter,—in others, the constant oozing and welling of such water over large faces of the rocky sides of the caverns, have, in process of time, formed stalactites of great size and curious variety, or produced surfaces of crystalline character. In the Blue-John cavern, at Castleton, the crystalline surface resembles a great cascade, and presents, when well lighted up, a remarkably intricate and beautiful variety of surfaces and reflections. It is remarkable and adds much to the effect of these caverns, that a stream of water passes through the larger number of them. Some geologists have expressed an opinion that such streams may, during the lapse of years, have produced these great excavations. It is difficult to infer such an amount of effect from a flow of water, that is in general small and unimportant; while the alternation of vast chambers and narrow passages renders the hypothesis still less tenable. And, moreover, there are chasms, and arches, and caverns, in this formation, which show no evidence of having been water-channelled at any time; and, therefore, it may be that the whole of these have been equally the effect of disruptions, probably the immediate consequences of volcanic action.

IGNEOUS ROCKS.

That volcanic action has been in extensive operation in this district, at some remote period of time, is not only

shown in this way; and not only, in having probably formed the fissures, through which the tepid mineral waters of the district find their way to the surface; and not only in the displacements, and shatterings, and extensive disruptions of the limestone strata, but evidence is given that molten rocks have, in some places, overflowed the ordinary strata,—thus covering, or underlying, or mixing with the limestone which had not been acted upon by fire. Sir Henry T. de la Beche, in his great work, "The Geological Observer," says:—"In Derbyshire the observer will again see igneous rocks associated with ordinary deposits; in this case with limestone, known as the carboniferous or mountain limestone, in such a manner that their relative geological antiquity can be ascertained. Careful investigation shows that in that area, at least, and probably much beyond it (beneath a covering of the sands, shales, and coals, known as the millstone grit and coal measures), and after a certain amount of these limestones had been accumulated, there had been an outburst and overflow of molten rock, irregularly covering over portions of them. And further, that after this partial overflow, the limestone deposit still proceeded; probably spreading from other localities, where the conditions for its accumulation had continued uninterruptedly. Occasionally water action upon the igneous products may be inferred prior to the deposit of the calcareous beds upon them, if not also a certain amount of decomposition of the former, the limestones immediately covering them containing fragments (some apparently water-worn), and a mingling of the subjacent rock, such as might be expected if calcareous matter had been thrown down upon the exposed and decomposed surfaces of the igneous rock. In some parts of the district another overflow of the same kind of igneous rock again took place, and was again covered

by limestone beds, so that in such portions of the area two irregularly-disposed sheets of once molten rock are included among the mass of limestone beds." The same excellent authority adds, that, of these igneous rocks locally known as toadstones, "natural sections (many of which are excellent) and mining operations show that as regards thickness these overflows vary considerably, so much so as to aid the observer in forming some estimate of the localities whence the molten matter, when ejected, may have been distributed around." . . . . .

"In the case of Derbyshire, though there may have been a removal of a portion of the igneous beds by the action of water upon their exposed surfaces (and an attentive examination of the upper overflow shows a quiet adjustment of the limestone beds formed upon it), no deposits resembling the ash and lapilli beds above mentioned as found in Devon and Cornwall, Wales and Ireland, have yet been detected. There is no evidence showing an accumulation of ash and cinders in the manner of subaërial volcanoes. It may readily have happened, therefore, that the igneous matter was thrown out in a molten state, without any accompaniment of ash and cinders; and this might have taken place as well beneath the level of the sea as above it." These are some of the wonderful phenomena of primeval nature; and they furnish an interesting illustration of the simple way in which they may often be studied and explained. They show the gradual and perhaps slow formation of the limestone rocks at the bottom of the sea, and the occasional disturbances produced by volcanic outbreaks, modified in their degree and effects by the superincumbent ocean, which would probably not only moderate the violence of such action, but circumscribe its effects; the deposition and accumulation of the calcareous strata being only interrupted during the time that the volcanic

outbreak might be going on, and possibly to no very great distance beyond the immediate locality of such outbreak. "Upon examining the structure of the igneous rock, it is found to be partly solid, and confusedly well crystallised, a compound of felspar and hornblende, with sometimes, sulphuret of iron. It is partly vesicular, in some localities highly so: the vesicles, as usual, filled with mineral matter of various kinds (carbonate of lime, as might be expected, being very commonly present), where the rock has remained unaffected by atmospheric influences, but exhibiting the original and vesicular state of the molten rock where these have removed the foreign substances in them. In some localities the scoriaceous character of the rock is as striking as amid many volcanic regions of the present day. Like more modern igneous products, also, it will often be found decomposed in a spheroidal form. There is an example of this decomposition at Diamond Hill, on the south side of Millers' Dale, where the concretionary structure has been developed somewhat on the minor scale, and the size of the spheroidal bodies is about that of bomb-shells and cannon-balls."—*Sir Henry T. de la Beche.*

The outflow of these igneous products in the district more immediately around Buxton, may be compared to the tortuous meandering of a mountain stream. These meanderings of toadstone extend from Fairfield to the Water Swallows, where there is a much broader and more considerable outflow; the narrower meanderings of the toadstone continuing thence to Peak Forest, and thence to Tideswell, Wormhill, Millers' Dale, Litton, Ashford, Chelmerton and Buxton. The toadstone varies much in its density and general physical character; but it always presents the distinctive difference from the limestone, which likewise varies much in its density, that the action of fire has deprived it more or less entirely

of the stratified character of rocks formed by deposition. In different places and specimens, the toadstone shows varying evidence of igneous action, from a friable, light, and porous, lava-like tufa, to a dense, and much more fully vitrified, and compact rock. There are sections of toadstone on both sides of the Ashbourne road, to the south of Upper Buxton, beyond Sherbrook; and on the Bakewell road, rather more than two miles from Buxton; and on the sides of the valley from Millers' Dale station to Chee Dale; and at Green Fairfield, on the Footroad to Wormhill, about two miles from Buxton; and of course in many other places.

LIMESTONE FOSSILS.

The mountain-limestone contains a great variety of fossil shells; and such may be said to constitute a large proportion of the rock and marble of which it is composed. The common grey marble of this district, is evidently altogether composed of dense masses of shells; and a dark-coloured marble, known as the bird's eye marble, is in a great degree composed of shells. It needs no taste for geological pursuits and but little acquaintance with the wonders, as to the formation and early history of our globe, which geology teaches, to make this a matter of curious interest to every one.

The limestone rocks, in all directions in the neighbourhood, show, on their abrupt and craggy surfaces, dense masses of these primeval shells; indicating a time when this high range of country was submerged in ocean; and when, as it should seem, by the agency of

myriads of these marine creatures, such masses of rock were altogether or in large degree produced. These fossil shells differ essentially from those of the existing species; and differ from one another. As to size, some of the fossil shells are several inches in diameter, and others so small as to be altogether invisible to the naked eye. Lamarck well says "in producing living bodies, what nature seems to lose in size she fully regains in the number of individuals, which she multiplies to infinity, and with a readiness almost miraculous. The bodies of these minute animals exert more influence on the condition of the masses composing the earth's surface, than those of the largest animals, such as elephants, hippopotami, whales, &c., which, although constituting much larger individual masses, are infinitely less multiplied in nature." As the coral reef, rising in the midst of the ocean, in our times, comes at length to emerge above the level of the waters, and to form a new land, on which birds may alight, and alluvial soil be formed, and to which seeds may be wafted, and plants may grow and flourish; and all this marvellous sequence, involving the formation and completion of a new and habitable country, be referable to the labours of myriads of coral insects; so, by means of myriads of marine creatures, requiring and producing these coverings of shells, was this formation of secondary limestone in great degree produced,—to be at length upheaved, probably by volcanic influence, from the bed of the ocean,—to be partially vitrified by the heat, its organic structure being so far destroyed, and a crystalline or an amorphous character substituted for it,—to become partially mixed with products of volcanic action, —in part to form rugged and broken masses of precipitous rock, to be worn by the storms of ages,—in part to show marks of disrupted stratifications, the shakes and

displacements which tell, even now, in the strongest language, of the convulsions by which such masses were upheaved,—in part to become extensive surfaces of undulating country,—in part to form the rocky sides of valleys, between which the streams from the mountains may find their way to the sea. Such are the rocks, the uplands, and the valleys of the Derbyshire limestone.

Upwards of one hundred classified and named species of fossil shells are obtained from the limestone formation. It forms a very interesting series. The fossils are principally found in the upper beds of the limestone, as might perhaps have been expected: time, or pressure, or possibly elevated temperature, having more completely obliterated all traces of organisation in the lower beds. Different species of crinoidea are abundant in most parts of the formation; the brachiopoda offer the largest number of species, and abound in the rocks around Buxton; and cephalopoda and gasteropoda, although more rare, are by no means uncommon. To complete the series of the fossils of the district, those in the coal measures and in the millstone grit should of course be obtained; the whole forming what might be called a carboniferous series. There ought to be a public collection of the entire series in every town of the district, where residents and tourists might study these remains of primeval creation. The rockery in the grounds of the Buxton Public Gardens shows a large number of these fossils in situ.

MILLSTONE-GRIT FORMATION.

The sojourner who can gather such food for thought in his walks about the neighbourhood of Buxton, has before him in this locality abundant additional materials

for his inquiries. Leaving the mountain-limestone formation, on the very edge of which he finds himself when he passes to the north and north-west of the town,—and crossing the narrow bed of shale which he does on commencing the ascent of the Manchester road,—he immediately steps to the adjoining formation of millstone-grit, which tells of a less remote period in the world's history. In a quarry of valuable stone for building purposes, about half a mile from the town, on the right-hand side of the road, are occasionally found the fossil remains of fruits and monocotyledonous stems, which show that, at some remote period, the climate of these now colder regions of the world, must have been at least as warm as that of the intertropical countries of modern times. These fruits and stems show, that plants which only grow and flourish within the torrid zone, must at one time have attained a large size in this locality. How strange, and yet with what a strong probability of truth, to think that possibly this gritstone formation was, at some remote period, part of a land of much lower level than that which it now occupies, the temperature of which was that at which palms and the like can grow and flourish; while the adjoining formation of secondary limestone was at the bottom of the sea, or perhaps in process of being produced by myriads of shell-fish!

The contiguity of the limestone and gritstone formations affords much matter of curious observation, as to the difference of vegetative power and character of these different soils.

The moorland character of the uncultured higher grounds of the gritstone formation,—the peat soil,—the existence in a few places of such considerable thickness of bog-earth over-laying the gritstone, as to have contained large trunks of trees completely buried,

and preserved for periods probably beyond recorded time,—illustrate remarkably the very different early history of the limestone and gritstone formation. At those remote periods, these parts of the gritstone formation must have been covered with a dense vegetation; layer upon layer of which, buried by new growths, to be in turn buried by successive growths, at length formed the depths of impervious bog-earth, which retain the rains in a chill and unproductive excess of moisture, and form a surface only capable of supporting heaths and kindred plants, until subjected to such dressing and drainage as alter its character and condition. At those remote periods of time, the limestone may have been at the bottom of the sea, or in the last stages of its formation; and at all events must have been so far differently circumstanced, that it had no vegetative growth of similar character to that of the gritstone formation.

VALE OF GOYT.

The vegetation of the pasture lands differs much on these formations; there are marked differences in the broader features of the landscape; and some trees, and plants, and wild flowers, which thrive on the one, do not thrive on the other. These differences in the characters and productions of the two formations, are especially remarkable in their respective valleys. There is a valley on the gritstone formation, which begins at a short distance from Axe Edge, and extends several miles. This valley called the vale of Goyt, from the mountain stream—the Goyt—which runs through it, exhibits

throughout its course a remarkable richness and variety in its vegetable growths. This is in part due to the gritstone detritus, which constitutes necessarily much of its soil, and in part to coverings, or admixtures, or detritus, of peat or bog earth, of varying thickness and proportion. Trees grow with great rapidity on the sides of this valley. There is scarcely a wild fruit which grows in any part of these kingdoms that is not to be found growing in this valley, or on the adjoining uplands and moors,—from the cloudberry, clusterberry, cranberry, and bilberry of the moorland, to the blackberry, strawberry, and raspberry of the valley and its sides. Errwood valley, leading from the vale of Goyt to Errwood Hall, with the hill sides, almost from their summits to the banks of a mountain streamlet, clothed with a close undergrowth of rhododendrons, forms a feature in this district of much too great beauty, and of too unique a character, to justify omission from this catalogue of the main features of the scenery of these hills and dales. In the month of June, when the sides of the valley of Errwood are covered with the many shades of colour that so many varieties and thousands of rhododendrons produce, the beauty of the scene surpasses description. But, to return: there is a great and readily observable difference in the character and general appearance and form of the surface, in the shape of the hills, in the appearance of their sides, curves, and eminences, and in the whole character of the vegetation of the gritstone and limestone formations.

There is a magnificent and much broader valley, within the same distance from Buxton, on the north; being divided from the valley of Buxton by Comb's Moss. The town of Chapel-en-le-Frith, which is six miles from Buxton, is situated in a part of this wide

and undulating valley, or extensive basin, which consists almost entirely of the gritstone formation. There are few finer scenes than the view of this valley from the north-western edge of Comb's Moss, at the distance of somewhat less than three miles from Buxton. The explorer may turn off the Manchester road to the right, at the first milestone from the town, follow the bridle-road for about half a mile, and then ascend the higher grounds on the right. A vigorous pedestrian, however, should explore the whole of this valley, as well as that of the Goyt.

At a distance of about half a mile from Buxton, on the north-east, is the hamlet of Fairfield, with its fine commanding upland position, its church, and its extensive common—the old Buxton racecourse. The road from Buxton to Fairfield is a steep ascent, presenting on the left, a view of the valley of Buxton, backed and begirt by Axe Edge, Grin Edge, and Comb's Edge; with Lower Buxton, and its Crescent, and church, and hospital, and the adjacent park, occupying the centre of the scene. The village of Fairfield is prettily situated on this upland; and beyond it lies the common, which affords admirable ground for horse-exercise. The road which leads to Chapel-en-le-Frith passes at right angles, less than a mile beyond the common, part of the old Roman road called Batham gate. The undoubted antiquity of this road, together with the name it has immemorially borne, help to prove the ancient use and importance of the Buxton baths.

If this old road, with its less evidently ancient continuations, be followed for about two miles, the so-called Marvel-stones will be seen on the right. This is a curious and somewhat extensive cropping out of limestone rocks, which are raised two or three feet from the surface. The less zealous explorer will however hardly

think himself repaid by their appearance, for the trouble of his journey to the spot.

Immediately beyond the Marvel-stones, lies the mountain village of Peak-Forest, with its chapel, which enjoyed, so recently as in the course of the last century, the celebrity and supposed privileges of an English Gretna-Green. Very near to Peak-Forest village, there is an extraordinary natural opening or fissure in the limestone called Eildon-Hole. The depth of this fissure, and its irregularity, must be great; inasmuch as, on throwing stones into it, they often fall and rebound from side to side, until the reverberation comes to be heard more and more faintly, the sound seeming to be at length lost in the greater and greater distance. There may be some degree of deception in this matter, owing to the echoing effect of the reverberation in the contracted and rocky channel; but it is probable that the depth of the chasm is really very considerable.

WATER SWALLOWS.

About a mile beyond the junction of Batham Gate with the Chapel-en-le-Frith road, at Dove Holes, is one of the remarkable water-swallows, of which several are met with in this district. A larger or smaller stream of water descends by a fissure into an underground natural channel, and emerges from the surface at a greater or less distance,—in some cases amounting to several miles. The most important of the Derbyshire water-swallows are those which occur in the course of the rivers Hamps and Manifold, at the Water-houses, and Wetton Mill, respectively. Large volumes of the waters of these

streams are engulfed; the Hamps pursuing an underground course of some six miles, and the Manifold more than four miles; the two streams emerging in the grounds of Ilam Hall, within a few yards of one another, and presently uniting to form a tributary to the river Dove. There is also an important illustration of these water-swallows at Sparrow Pit, in the Peak-Forest district, where the surface-stream dashes into fissures and caverns, and thence traverses an underground channel, until it re-appears in the Speedwell Mine, at Castleton, whence it again reaches the open air. There is a minor illustration of this curiosity of nature at Sherbrook, near Buxton, and also at Water Swallows, near Fairfield. In many instances, when the streams are full, the swallow is unable to receive the whole of the water, and the diminished flow continues its course along the surface: whereas, in dry weather, the swallow receives the whole of the water, and the farther water-course is left dry.

One mile beyond Dove-Holes, the road joins the main road, which leads from Chapel-en-le-Frith to Castleton. The main road descends rapidly towards Chapel-en-le-Frith, which is about a mile and a half from the junction of these roads, and six miles from Buxton. The town of Chapel-en-le-Frith is prettily situated and sheltered. Immediately beyond the town, the valley in which it is situated opens out to a considerable width, presenting bold and fine elevations towards the north and south, and enclosing beautiful and productive lands on both sides of the road. This road joins the high road from Buxton to Manchester, about three miles from Chapel-en-le-Frith, and six miles from Buxton, at Horridge End, and close to the Hamlet of Whaley.

To the north of Chapel-en-le-Frith are the districts and towns of Hayfield and Glossop; and to the east of

Hayfield is the great range of elevated country, which is dignified more especially by the name of *the Peak*; having Kinder-Scout on its western, and Ashop Moor and Edale on its eastern extremity,—the higher grounds having an elevation of nearly 2000 feet about the level of the sea. These mountain slopes and summits, with their covering of heath, and bold irregularities of surface, with rocky eminences of time-worn gritstone, and a more or less considerable waterfall after recent rains, and with extensive views on the north and south over a beautifully undulating upland country, constitute a very remarkable feature in this picturesque district. The massive denuded and storm-roughened boulder stones on the ridges of the highest elevations give to the scene a look of antiquity that is very impressive. These uplands, and the beautiful valleys which surround them, are approached by the interesting line of railway from New Mills to Hayfield. A free access to these moorlands by the tourist is said to have been forbidden of late by the owner of the property. Such exclusive action must be widely regretted, and deserves re-consideration. The beautiful valley of Edale, than which even this district has few finer scenes to offer, separates this extensive range of high lands from Mam Tor, which, although only 1709 feet above the sea-level, from overlooking Edale on the north, and the more extensive valley of Hope on the south-east, is often considered to be, as would be implied from its name, the greatest of these eminences. Immediately at the foot of Mam Tor lies the old village of Castleton, crowned on the southern side by the smaller, but steep and commanding eminence, on which are the ruins of the castle of the lords of the Peak in the olden times. The view from these ruins is extensive, and very fine and varied; and indeed the whole district supplies such a number and variety of scenes, that every half mile of a journey furnishes a new and extensive picture.

CASTLETON CAVERNS.

Close to the village of Castleton is the Great Peak Cavern,—the most remarkable of all the Derbyshire caverns,—which is entered by a natural arch, forty-two feet high, and one hundred and twenty feet wide; this imposing hall of entrance being three hundred feet in depth. Beyond this hall, a narrow low passage, almost separated from the farther interior by water, which is either crossed by an artificial footpath, or by means of a boat, conducts the explorer into a spacious cavernous chamber, some parts of which are estimated to be two hundred and ten feet in width, and one hundred and twenty feet in height; the whole being enarched, with a magnificence of general effect, and a beauty and variety of detail, which baffle all description.

A lead mine, no longer worked, called the Speedwell Mine, is another of the wonders usually explored by the visitor to Castleton.

The Blue-John Mine, whence the curiously beautiful spar called Blue-John is obtained, is well worthy of a visit. Vast spaces of the sides of this cavern are covered with sparry incrustations of great variety, reflecting most beautifully the lights of the candles and crimson and blue fires, by which the cavern is illuminated by the guides.

The following is taken from an interesting paper on the geology of Castleton, by Mr. John Taylor, F.G.S. in the *Geologist*, Vol. V., No. 5 :—

"The flora of the locality is particularly interesting, especially that of the lower class. Maidenhair, spleenwort, and rue-leaved spleenwort, grow upon almost every wall; and the cystopteris in several species is also common, whilst the adder's-tongue and the little moonwort are exceedingly plentiful in the richer pastures.

The number of mosses is exceedingly great. The beautiful *Eryum dendroides* and others abound in the moister spots of the Cave Dale. In fact, the botanical character of the vegetation hereabouts is so peculiar to the three formations which are found, as to form a geological map to the underlying rocks, coloured by nature herself! The limestone clothed with its short and beautiful carpet of green; the black shales of the Yoredale rocks covered by their stunted and brown vegetation; and the millstone-grit, in the glowing summer time, quite purple with the flowers of the heather, present well-defined surface outlines. And for land shells no other locality can compete with it. From the robust *Helix aspersa* to the diminutive *Pupa*, numerous species intervene; some of them, such as *Clausilia* and *Pupa*, being more numerous in individuals than any other place that I have visited.

"But to the geologist, the rocks present treasures of fossils most beautifully preserved. I have found the *Terebratula hastata* retaining its purple-coloured bands as beautifully, as when alive in the carboniferous seas; and in some places every slab that is turned up is matted with Retepora and Fenestrella. Coming here from Manchester, along the new road from Chapel-en-le-Frith, the first place where we meet with the limestone is about a mile and a half distant from the town. This hill, Trecliff, is about six hundred feet in height, and the dip of the beds is about 25 degrees in a direction N.N.E. It is in this hill that the 'Blue-John' mines are situated; and this is the only locality in the country where this peculiar mineral is met with. It lies in 'pipe-veins,' having the same inclination as the rocks which the veins traverse. One of these veins lies in a sort of clayey stratum, and another seems to be embedded in the nodule state in a mass of indurated *débris*. Besides these, the whole of the limestone masses are fractured and cracked, and, in addition to the pipes, the sides of the cavities are lined with the most perfect and beautiful sky-blue cubes of fluor, and the rhombic crystals of calcite. I remember scarcely anything with greater pleasure than an adventure in search of minerals a year or two ago, in one of these caverns, which was richly rewarded. Witherite, fluor-spar, varying in colour from transparency to rose, blue, violet, and other colours, selenite, and occasionally phosphate of lead, are all found in the lead mines of the neighbourhood. Some varieties of calc-spar have the property of double refraction, like Iceland spar.

"Nearly all the characteristic fossils of the carboniferous limestone abound, as may be seen by glancing at the names of the localities given in Professor Phillip's 'Geology of Yorkshire.' The richest localities for obtaining them is just below the 'Blue-John Cavern,' and in the gorge at the back of the town, which goes by the name of Cave Dale. In geologizing along the side of Trecliff Hill, one cannot but be struck with the various groups of fossils which the different beds present. The *lower* beds contain great quantities of *Phillipsia*—heads, carapaces, &c., being very frequently met with, and occasionally found whole. Just as we should have expected from knowing that the family of Trilobite died out with the mountain limestone, as we continue our researches higher up in the beds we find their remains becoming more scanty, until at the top they are exceedingly rare. One bed is rich in zoophytes, another in goniatites, whilst another is composed of the broken fragments of *Sanguinolaria*, and the whole of the beds contain numbers of *Spirifer imbricatus*, which connects them like a huge bracket from top to bottom. Some rare geologizing may be had along the lower beds; almost every stroke of the hammer lays open something novel.

"The remarkable fissures which occur in the limestone of Derbyshire have afforded matter of speculation to the curious for centuries; the most remarkable one is called the Winnats, and is about a mile distant from Castleton. It gives rise to the most sublime scenery, for the fissure is caused by the splitting of a hill in twain, and the deep precipices on either hand for the distance of a mile and a half, resemble the ruins of old towers and buttresses, in some places clad with ivy, and tenanted by bats and owls. Another such fissure is at the back of the town, and has been already referred to. In some places the passage at the bottom of this is not above three yards in width, and is much of a character, in other respects, with the Winnats. Much speculation has arisen as to the origin of these rents; they occur at nearly right angles to the line of strike, and have doubtless been formed in the first instance by the upheaval and desiccation of the rocks. Subsequent to this they have been worn and channelled by atmospheric and aqueous action. They have been attributed to plutonic agency, but it needs little geological knowledge to see that the above theory is the true one. Along the lower beds in the Cave Dale there is another good spot or two for the geologist. Here are found numbers of trilobites, some quite entire; groups of Entomostracan *Cytheræa*, and that rare fossil the

Cyclas radialis. One bed seems quite a nest of *Pleurorhyncus armatus*, although they are very fragile and require great care to extract them with the cone entire. Plutonic action has not been absent in the neighbourhood, for at the top of this fissure are beds of greenstone, and an imperfectly columnar basalt, whilst the limestone around seems to be somewhat crystallized by the heat to which it has been subjected by the intrusion.

"Old Mam Tor, the 'Shivering Mountain,' in geological position lies just above the limestone. The shales which compose it are speedily decomposed by atmospheric agency, and hence have given rise to the popular name which the mountain bears. The inclination of its beds is E.N.E., and the intensity of their dip about 40 degrees. These beds can be traced through Hope on to Hathersage; and along the brook side, below Mam Tor, a good section is displayed, where they are seen abutting against the lower limestones."

Such are some of the readings of the district of the High Peak obtainable by the geologist; it is no less interesting to the botanist, as may be inferred from Mr. Taylor's observations; while the influence of elevation, and of soil and subsoil, on vegetation, rainfall, temperature, &c., would justify and reward even more general and special inquiry.

The whole of the valley to Hope and Hathersage, and the great extent of hills and moorlands to the north, east, and south, are well worthy of being explored.

Hathersage is said to have been the birth-place of Robin Hood's celebrated henchman, Little John.

"In the churchyard is a grave said to be that of Little John; and the cottage in which that worthy is said to have been born is not far away." "The grave of Little John is on the south side of the church. It is marked by two small stones, one at the head and the other at the foot. In 1728 it was opened, and bones of an enormous size found in it. Some years ago it was again opened, and a thigh bone measuring 32 inches taken out."—"Black's Guide to Derbyshire," edited by Llewellynn Jewitt, F.S.A., &c.

Sir Gardner Wilkinson writes, in the "Reliquary," a most interesting quarterly periodical, specially devoted to

local antiquities, and to which this work is much indebted, that—

"Of antiquities, Hathersage possesses its full share—in the camp called 'The Carl's Work,' and the less important one near the church; in the rocking stones, and numerous rock-basins; in the circles near Longshaw and Eyam; and in the rocks above Derwent, known as 'The Cakes of Bread,' and 'The Salt Cellar,' with others named from their peculiar forms. The drive from Hathersage to Derwent is highly picturesque, and derives an additional charm from the contrast of its wood and water with the moorland heights above the valley; aptly illustrating the name Derwent (Der Gwent), 'fair water,' and fulfilling the expectations raised by an appellation of such high promise. The hope, however, of finding Druidical remains, which some might entertain from the name of the so-called 'Cakes of Bread,' and other objects indicated in the ordnance survey of the hill above Derwent, is not so well repaid; these being simply natural rocks of fantastic shape, the first of which, consisting of layers of gritstone, lying one upon the other, have the same character as the masses of granite that compose the cheesewring in Cornwall, and similar irregular pillars of rock on Mistor, and other heights of Dartmoor. Neither these 'Cakes of Bread,' nor the other works of whimsical shape upon the Derwent hills, in Cornwall, or on Dartmoor, are attributable to the Druids; and it must be admitted, that, if from being in the neighbourhood of old British remains, any superstitious feeling was attached to them, this could only have arisen from the strangeness of their shape, as they are evidently not formed by human agency. The small earthwork called 'Cam Green,' near the church of Hathersage, once surrounded by a ditch, is said to be Danish; but its position and *entourage* argue in favour of its being British, connected as it is, in strategical point of view, with 'Carl's Work,' and the command of the approaches from the eastward. For the one would be ineffectual without the other; and the earthwork was necessary to watch the southern approach on that side, at the same time that it guarded the western valley, and communicated with the heights of Eyam Moor, all of which were masked from 'The Carl's Work.' The church, with the vallum of earth enclosing the camp, the churchyard, famed as the burial place of Little John, the companion of Robin Hood, and the surrounding scenery, present many pleasing views; but as little remains of the camp itself, I proceed to notice the more striking peculiarities of 'The Carl's Work.' This bears the marked characteristics of an

ancient British fort. It occupies one end of an isolated hill, rising above the plain below, and is a site admirably chosen, from its position and the nature of the ground. The vallum is here about 17 or 18 feet in thickness; its outer face, or scarp, fronted with a well-built wall of masonry, of which some of the stones are 50 inches in length; and it extends nearly in a straight line across the gorge of the hill, which is here about 150 feet in breadth. One of the most remarkable features in this part is the gateway on the south side. It is 7 feet 2 inches in breadth; and as the road ascending from the valley below passed between the two curvilinear faces of the wall, which formed the entrance passage, an enemy advancing to force the gate was exposed to the missiles of the besieged on both sides; while the portion of it to the west, projecting like a round tower, raked the face of the wall to the right and left, and formed an advance work over the ascent."

The whole of the district from Hathersage, on the east, to Ludchurch and the Roches, on the west, including of course Peak Forest, Buxton, and Flash, and extending thence southward, across what is now called the Sheffield and East Moors, to Worksop, Retford, Mansfield, and Nottingham, was wild forest land in the mediæval periods of history, the haunt of Robin Hood and all the outlaws and plunderers of whom Robin Hood is the quasi-historical representative.

The traveller, in going from Buxton to Castleton and back, will act wisely to go on the one occasion by the road which passes the foot of Mam Tor, and on the other to pass through the Winnats or Wind-gates. The view through these great rocky portals presents a dioramic scene of magnificent extent and beauty.

About five miles from Buxton, by the side of the road to Castleton, at the upper part of the valley of Bar-Moor Clough, through which the road passes, is the most remarkable of the intermitting springs of this district. It is called the Ebbing and Flowing Well. The frequency with which the intermittent flow occurs, depends upon the amount of rain which may have fallen recently.

After much rain, the flow may be as frequent as every ten or fifteen minutes. The quantity of water poured out at a time must be considerable. The ebb and flow may be due to a curved conduit, through which the supply of water has to pass. One limb of such conduit might become gradually filled with water as it drains from the surface; at the same time the water would rise to the same level in the other limb of this natural syphon; and when the second limb had become filled to its farther extremity, the flow would take place, and continue until both limbs of the conduit were emptied, when the flow would cease, and the curved conduit have to be again filled.

Seven miles to the north-east of Buxton is the town of Tideswell,—at one time a place of considerable importance,—the market town of the lead-mining district of Derbyshire. These lead mines have been comparatively little productive for many years. The church of Tideswell is a large and interesting building,—erected in the 14th century,—of somewhat mixed style,—but on the whole, of handsome and imposing ecclesiastical character, with a lofty tower, and containing the monument of Robert Pursglove, Prior of Gisburne Abbey, in the reign of Queen Mary, and that of John Foljame, also a benefactor to the church, of the date 1358. The "Brasses" are excellent specimens of mediæval work.

The present energetic vicar has done much to restore this interesting and valuable structure. It deserves a visit of inspection from all lovers of ancient ecclesiastical architecture; and the results of a worthy restoration must commend themselves to every one.

Four miles to the north-east of Tideswell is the village of Eyam,—famous on account of its desolation by plague, in the year 1666, and from the devoted heroism and affecting history of the pastor and his wife.

"Among the verdant mountains of the Peak
There lies a quiet hamlet, where the slope
Of pleasant uplands wards the north winds bleak;
Below, wild dells romantic pathways ope;
Around, above it, spreads a shadowy cope
Of forest trees: flower, foliage, and clear rill
Wave from the cliffs, and down ravines elope;
It seems a place charmed from the power of *ill;*
And many are the pilgrim feet which tread
Its rocky steps, which thither yearly go;
Yet, less by love of Nature's wonders led,
Than by the memory of a mighty woe,
Which smote, like blasting thunder, long ago,
The peopled hills. There stands a sacred tomb
Where tears have rained, nor yet shall cease to flow;
Recording days of death's sublimest gloom;
Mompesson's power and fame,—his beauteous Catherine's
doom."—*The Desolation of Eyam, by W. & M. Howitt.*

At the time of the plague-visitation, the Rector of Eyam was but a young man,—his wife, Catherine, a young and lovely woman; and they had two children, a boy and a girl, respectively three and four years of age. Until the spring of 1666, Eyam had escaped the plague-visitation; which had, during the preceding year, attacked the inhabitants of London and other places so severely; and, indeed, at this time, had in a great degree declined in those places. It had been in the month of May, 1665, that the plague had begun to occasion serious apprehension in the city of London; but London does not seem to have been free from it during many previous years. Even in 1647, or eighteen years previously, 3597 persons are recorded to have died from it; the plague mortality having fallen to 611, in 1648,—to 67, in 1649,—to 15, in 1650, and having fallen to 6, in 1664. But in May, 1665, a single occasional death from plague rose to 14 and 17 deaths weekly; in June, to 267; in July, to 1843; in August, to 6102; in September, to 7165; gradually declining to 281, in the last week of the year. In the spring of the year 1666, according to Dr. Mead, a box

of clothes was sent to a tailor in Eyam, who resided near to the church. Within this box the pestilence seems to have been imprisoned. The person who opened this box is reported to have been its first victim. In the course of a few months, five-sixths of the inhabitants of the village had died from the disease. The church and church-yard were closed. The dead were buried hastily in the fields and gardens, and in a grassy upland near to the village. The public services of the church were performed by the devoted pastor from a perforated mass of rock, since called Cucklet Church. At the commencement of the epidemic, Mrs. Mompesson besought her husband to leave the place with her and their children; but he could not be induced to desert his flock, and she could not be induced to leave her husband. They resolved to abide together the consequences of the pestilence; and they sent away their children. Believing that to assemble the people together in the church, would but help to spread the disease, he caused them to meet on the grass before the rock pulpit; and there, twice during the week, and twice every Sunday, the rector performed his public duties. When the plague first broke out, Mr. Mompesson wrote to the then Earl of Devonshire, residing at Chatsworth, some five miles from Eyam, stating that he thought he could prevail upon his parishioners to confine themselves within the limits of the village, if the surrounding neighbours would supply them with necessaries, leaving such provisions as should be required, at appointed times, on specified parts of the hills around. The proposal was punctually complied with; the self-imposed condition was never broken; not a single inhabitant passed the boundary line; although, in that rocky and open country, it is said that a regiment of soldiers could not have kept them within it against their wills. The plague was

stayed within the limits of the self-devoted place; not one of the neighbouring hamlets, no single house beyond the limits of Eyam village, became infected, although the frightful disease raged within it nearly seven months, destroying as has been said five-sixths of the entire population. Three of Mr. Mompesson's letters are extant. In one of them he writes:—"My ears never heard such doleful lamentations, and my eyes never beheld such ghastly spectacles. There have been 76 families visited in my parish, out of which 259 persons died." It was in August, he had to write to his poor children, that his dear wife had been one of the victims of the pestilence. The harrowing date, 1666, is said to have been often met with, some few years ago, on many detached stones that had been used in and about Eyam for ordinary building purposes; but the tomb of Mrs. Mompesson, with its inscription — *Cave Nescitis Horam* — exists in Eyam churchyard, near to an ancient cross; and an elevated piece of ground, near the village, is still marked by the gentle swellings of the turf which covers the graves of many of the victims of the epidemic; and some stones, on the upland, still tell the tale, that a whole family of seven persons, bearing the name of Hancock, died within one week, from the 3rd to the 10th of August, 1666. The graves above referred to are on the hill side, near to the north-eastern end of the village, surrounded by a wall; and they should be visited not only on account of the memorial they present of this most affecting history, but on account of the commanding view of Chatsworth, with its surrounding hills and valleys, which is obtained from the site. Near to the opposite or south-western side of the village is the valley or ravine, containing and commanding the very curious and interesting enarched and covered rocks, called Cucklet Church. The valley and the rocks and the high grounds on the south should

be visited. The key of the entrance to these grounds is kindly lent to applicants at the Hall, which is in the centre of the village. It would be difficult to exaggerate the interest which attaches to Eyam with its history, and position, and the scenery which surrounds it.

Beyond Tideswell, at a distance of some five miles, on the east, and near to the village of Eyam, is the small town, Stoney Middleton; chiefly remarkable from having a spring of tepid water, with a temperature of some 65 degrees of Farenheit, for the use of which baths were erected by the late Lord Denman. As their temperature is so much cooler than that of the warm springs of Buxton, the waters are believed to have by so much less medicinal influence. Their use should be beneficial, in some degree, to the same classes of ailments as the waters of Buxton. It should be said, however, that there is no evidence as to any impregnation of the water with nitrogen gas; and therefore there is no inference as to medicinal influence, beyond the degree of the temperature, and the probably calcareous saline constituents.

The whole course of the Derbyshire river Wye, from Buxton to its junction with the Derwent, at the village of Rowsley, beyond the town of Bakewell, presents a great variety of valley scenery of remarkable beauty. The road from Buxton to Bakewell passes through Ashwood Dale,—the nearest of these valleys to Buxton. This valley is rather more than four miles in length; and the road passes close to the right bank of the river about three-fourths of this distance. Near to Buxton, the valley is bounded by abrupt limestone rocks of considerable height, and much bold and rugged character. Several smaller valleys open from Ashwood Dale; and one of these, from its remarkable and picturesque beauty, deserves to be particularly mentioned. This is Sherbrook Dell, opposite to the first milestone from Buxton. The

sides of this dell are extremely abrupt and lofty rocks, which hem in the narrow gorge completely; and as the ravine bends suddenly within a few yards from the road, the explorer finds himself at once surrounded by much untouched and majestic natural beauty; the rapid and bubbling streamlet, by which its bottom is chanelled in the winter time, and after heavy rains,—the little cascade which tumbles into the dell at its upper end,—and the wild plants and shrubs, by which every cranny and crevice are taken possession of,—all serve to embellish this dell very much.

The greater part of Ashwood Dale is planted on both sides, almost to the summits of the rocks. This has been so far interrupted, and in some large degree defaced, as to afford room for the embankment of the Manchester, Buxton, and Midland Railway. With its straight line, its bulky embankment, its great width in proportion to that of the once natural and rock-walled and river-bottomed valley, the railway is for the most part a cruel despoiling of some of the finest scenery of this picturesque district. Here and there, indeed, the rocky bases have been lowered, perpendicular chasms and rock faces have been rendered more bold and more deep, and bridges or rather viaducts of great span and height have helped to justify the tampering with such grand scenery as this. But the relief to the eye, when, here and there, at intervals and for periods only too few and far between, the railway line is lost in a cutting, or in a short tunnel, will still convey to those who were not happy enough to have traversed these valleys in earlier times, how great has been the malignant influence of the railway, to which the inhabitants of these districts must otherwise owe so much. The embankment is commonly in a great degree or exclusively composed of broken limestone rock, and uncovered by any vegetation. It would be an act of

kindly consideration on the part of the railway authorities, and indeed only a conscientious attempt to amend the injury done to the scenery of these valleys, if judicious efforts were made to cover the stony embankment with grass, or ferns, or ivy, or gorse, or whatever else would thrive and flourish on an exposed and soilless surface.

A little beyond the third milestone from Buxton, the highroad ascends rapidly the steep hill side, leaving the valley and its river and scenery, and gaining after a climb of two miles in length, the elevated grounds near Taddington and Chelmerton. Maintaining the route by the river side along a rough cart road, at Blackwell mill, four miles from Buxton, we come to the junction of the railway with the main line of the Midland route to Manchester; from this the scenery becomes more rugged, the rocky masses in some parts overhanging the pathway, and oozing and dripping from the uplands, form the mass or masses locally known as the Dropping Loach. Beyond this the walls of the valley rapidly rise into a grander beauty; the wooded sides, broken with rocky masses, the gradually enlarging river,—and even the frequent railway bridges, as the railway crosses and recrosses the valley, now lost in tunnels, now following its rock-channelled path,—these bridges often presenting much boldness and beauty, or lightness, and adding to the general effect, from the loftiness, or the form, or the simplicity of their construction in stone and in iron,—combine to give the charm of variety, and add to the general effect, of the successive valley scenes. At a distance of a little more than a mile from Blackwell mill, the scenery of Chee Dale is approached. The pathway crosses the river, ascends the hill side, follows the curve of the valley, and divides into a path which leads to the summit of these uplands, from which the general effect

of upland, valley, railway route, and river may be seen; and over which the track leads to a point of the valley about a mile lower down, and so much nearer to the Miller's Dale station; or a downward path conducts to the river, and to the farther valley scenery of Chee Dale, with its magnificent mass of almost circular and abrupt and lofty cragg, called Chee Tor, abutting upon it, on the right bank of the river. This vast mass of rock is of considerable height, but necessarily seems to be of greater height than it is, from its perpendicular sides, which are as straight as if cleft with care by the hand of man. The curious horizontal fissure near the summit of this rock has been already noticed. The perpendicular cliff towers above the dale on one side; the bright stream occupies the bottom of the valley; on the left, the hill side is embellished with scattered and over-hanging trees and bushes; and an appearance of isolation is given to the scene, by a bending of the valley to the left and then to the right, in order to skirt the rounded projection of the Tor,—the valley being thus shut in on all its sides.

The path that leads to the summit of the higher ground, and over the uplands, descends thence on the opposite side of the hill to the farther valley, where the river is crossed by a foot-bridge, and the river is followed at the bottom of the valley, to Miller's Dale. There is the option of a railway ticket to Miller's Dale station, and returning to Buxton by the river's side, a distance of some seven miles; or going to Blackwell mill, a distance of four miles, in a carriage, and walking thence through the valleys to Miller's Dale, and returning to Buxton by railway; or, of going and returning from Miller's Dale station by railway, walking from the station through Chee Dale by the river side, and returning to the station over the summit of the hill.

Passing from Chee Dale and its great Tor, there is a

steep but practicable footpath up to the village of Wormhill; and from the upper part of this path, a fine view across the valley is obtained. The river now passes below Priest-cliff, a gently sloping rounded hill, which is for the most part planted, as are the sides of the farther valley, which here takes the name of Miln-house or Miller's Dale. At this point is one of the greatest of the railway viaducts; and it is probable, that many might judge the effect of the bold engineering work to have been an improvement on the tamer character of the scenery, at this reach of the river and the valley. But, even if it were so, which is by no means granted, the long and straight railway, on the right side of the river's course, through what was once the open and quiet and lovely valley of Miller's Dale, could hardly gain forgiveness from one who knew and loved the scenes in other days; even if the greatest engineering triumphs had been produced, and the finest viaduct that the art and power of man could raise. There is also, more recently, the much greater grievance of extensive lime works which have seriously impaired the beauty of one side of the valley. Miller's Dale is an open valley, with sloping sides; patches of plantation and juttings of limestone rocks varying the surface. The river is here of a considerably wider and more imposing character; and the scenery is less like that which commonly characterises the limestone valleys, and is more like the valley scenery of other parts of England.

At the end of about two miles, however, the valley again contracts; the river becomes again confined within narrower bounds; the sides of the dale, although clothed with trees, are again more precipitous, and the characteristics of the limestone formation are again strongly exemplified. This part of the valley is called Cressbrook. If the growth of water-cresses might

justify the name, it is deserved at least equally by the reach of the river below Chee Tor. The bold, abrupt, and rocky banks are crowned at Cressbrook with the most picturesque and varied uplands, on which are the house and grounds of the late Mrs. Mc.Connell, and the mills and cottages of an extensive factory, presenting perhaps the prettiest known location of an industrial community, and giving attractive views from road and from railway. It may not be without interest to mention that Mrs. Mc.Connell's house contains a very large number of pictures by the most eminent British artists. Emerging from the narrowed valley of Cressbrook, the river enters the broader and more slopingly-sided valley of Monsal Dale, with natural plantings of hazel, &c., and a great degree of richness and beauty. The Monsal Dale Railway Station will be found to give very convenient access to the valleys of Cressbrook and Monsal Dale. After a course through Monsal Dale of two or three miles, the river again meets the high road opposite to the eighth milestone from Buxton to Bakewell. On the side of this valley are two natural sections of toadstone, one above the other. Whenever met with, much interest always attaches to these ancient lava-formations; and the two layers, with the great shell depositions of mountain limestone above and below them both, cannot but offer interesting suggestions as to successive submarine volcanic outbreaks. It may also be noticed, that, in some places, the toadstone, instead of presenting the appearance of shapeless, unstratified rock, that had at one time been subjected to intense heat, and probably liquefied, is found in the form of rounded masses of larger or smaller size. The size of these irregular spheroids varies from that of bomb-shells and cannon-balls, as found on the side of Miller's Dale, to that of the larger, rounded, and somewhat twisted forms seen in

a railway cutting in Ashwood Dale close to Buxton. This is not only interesting from the resemblance to some of the masses thrown out by modern volcanoes, serving to confirm the opinion that they also are lavas; but as illustrating, in common with them, the violence with which the melted rock was ejected through the spaces left by the disruption of the strata nearer to the surface, as shot becomes twisted and of irregular shape from the friction and force with which it is driven from the barrel of the gun.

Mention has been made of the facilities afforded by the Miller's Dale and Monsal Dale Railway Stations, as points of departure to the explorers of these valleys. The facilities afforded by the station at Longstone are even more considerable. Within an easy walk from Monsal Dale, and with an upper and lower footpath on the eastern side of the valley, to the lofty eminence Fin Cop at its southern extremity, and with a pathway or pathways on the western side of the valley, either of which may be used on going or returning, additional means are offered of exploring thoroughly the valleys of Monsal Dale and Cressbrook. The railway viaduct and embankment are also worthy of notice, not only on account of their magnitude and proportion, but as being mainly composed of broken masses of the black marble of the district. Again, from the Longstone Station, an easy walk leads to the pretty villages of Great and Little Longstone; and a rapid ascent from the former village leads to the commanding range of high land, Longstone Edge, with several existing or exhausted lead workings, and offering a surrounding panorama of hills and valleys which contains the towns of Taddington, Ashford, Bakewell, Rowsley, Edensor, Baslow, Stoney-Middleton, Eyam, Tideswell, &c., and embracing altogether most extensive and various scenery. From the

distant or eastern extremity of Longstone Edge, the descent to Hassop is easy, giving the opportunity of seeing the park and grounds of Hassop Hall, with their stately trees, bold undulations, and sheltered beauty. The return journey is readily made from the Hassop Railway Station; and the distance from the Longstone Station, through the village of Great Longstone, over Longstone Edge, through the grounds of Hassop, and to the Hassop Station, may be probably estimated at six or seven miles.

The Hassop Railway Station is commonly the point of departure for Edensor and Chatsworth, by travellers from Buxton. It is 2½ miles from Edensor, and 3 miles from Chatsworth.

The Bakewell and Rowsley Railway Stations are not only used as being conveniently near to Edensor and Chatsworth, but as affording easy access to Youlgreave, Upper-Haddon, and Winster, with all the varied scenery of the valley of the Lathkil, Rooter Rocks, Bradford Valley, &c., with the Church of Youlgreave, as the ultimate objects. A walk of seven or eight miles would embrace the most of these points of great and varied interest, over and along roads and footpaths traversing some of the most beautiful scenery in North Derbyshire;—from Bakewell over Upper-Haddon, through the Lathkil Valley to Youlgreave, and thence along the high road commanding the valley of the river Bradford to the pretty village of Middleton, and the adjoining gorge or chine with its rocks and water; returning thence to Youlgreave, with its ancient church, its imposing tower, ancient font, Norman arches, and curious monuments; ranking as a whole second only to the church of Tideswell; and thence proceeding to the Rowsley Station by the road skirting Pickering Wood, or by a wider circuit over

Stanton, and by Stanton House, with its fine commanding uplands. The circuit by the carriage roads would be considerably longer.

At the third milestone from Buxton the road to Bakewell, unfortunately made to quit the level of the river Wye, ascends rapidly to the high grounds of these elevated lines of country. Some little compensation, however, is given for the scenery left behind, and for all that is commonly thus left unseen, by a wide and varied range of scenery on the left; the districts of Blackwell, Wormhill, and Tideswell, being overlooked from the road; and, on nearing Taddington, which is six miles from Buxton, the higher grounds of Chelmerton Low are on the immediate right; and the road to Monyash is so much higher than the village of Taddington, that a view may be commanded from it of the high grounds of the East Moor, &c., at a distance of ten or twelve miles. From the village, the road rapidly descends, and enters the valley of Taddington, which is bounded on both sides by lofty elevations of much beauty, and some occasional grandeur. The sides of the dale are clothed by natural plantations, of hazel, hawthorn, &c. After a descent of two miles, the road again joins the course of the river; and passing the end of Monsal Dale, and crossing and re-crossing the stream, it leads through the pretty village of Ashford, to the neat and pleasant town of Bakewell.

Bakewell is an important market town, at the distance of twelve miles east from Buxton. It is situated at the foot of a hill, on the western bank of the river Wye. The town is undoubtedly of much antiquity; and the ramparts of earthwork of an ancient fort, said to have belonged to Edward, surnamed the Elder, king of the West Saxons, and eldest son of King Alfred the Great (A.D. 901—912), are still traceable on the hill close to the town. Its tepid waters, having a temperature of 60

degrees, Farenheit, seem to have had a very ancient reputation; and from bath and well or spring, its name was obviously obtained. In the Domesday Book A.D. 1086, it was called Badaquelle, or Bauquelle. A bathing house was erected over the spring in the year 1697. The waters are probably of similar character and efficacy to those of Stoney Middleton. The church, much of which has unhappily had to be re-built since the year 1840, has been well and fully described by the late Rev. Dr. Plumptre, the master of University College, Oxford. As given in "Black's Guide to Derbyshire,"—"In the angle between the south transept and the chancel stands what has been termed a Runic cross, somewhat resembling that at Eyam. On the west side are sculptures in relief; and, on the three others, are the ornamental scrolls, so prevalent on Saxon crosses. The sculptures, though now almost obliterated, have been ascertained to illustrate the life, death, burial, resurrection, and ascension of Christ. On the bend of the Cross is a representation of the entry into Jerusalem. The existence of this cross, and the remains of several others of like make, seem to prove that a burial-place existed here long before the Conquest; and if a burial-place, it is most certain that a church existed also. In the Domesday Book it is stated that two priests officiated in the church at Bakewell. It is very difficult, notwithstanding these facts, to trace the history of the church. Of its original foundation we know absolutely nothing; though, by local tradition, the building of the nave, which, with the exception of the west end and tower, is the oldest part remaining, is ascribed to King John, while Earl of Morton. In 1192, he gave it, with its prebends, to the cathedral of Lichfield; the dean and chapter of which have still the patronage of the living. It is recorded that in 1365, a charity was endowed by Sir Godfrey Foljame and Avena his wife.

In the south side of the nave is their monument, with two half-length upright figures. The present nave was probably erected about the year 1110. To the east of the transept is the Vernon chapel, in the later decorated style, founded, in 1360, 'upon the walls of the former chapel.' In this chapel were buried the families of Vernon and Manners, the occupiers of Haddon Hall. The most interesting monument is a representation, in alabaster, of Sir Thomas Wendesley, in plate armour, who was mortally wounded at the battle of Shrewsbury, in 1403. In 1841, the restoration of this fine old church was found to be necessary; and on excavating the foundations of the ancient buildings, a considerable number of Saxon remains were discovered, including a coped tomb, and several rudely sculptured coffin lids. They consist, in part, of several fragments of stone, carved with interlacing bands, and other devices, so closely resembling those on the cross in the churchyard, and more especially those on the cross at Eyam, that there can be no doubt they may all be referred to the same period, whatever that period may be determined to be." In Glover's interesting History and Gazetteer of Derbyshire, it is collated that—"in the reign of King John, the church was granted to the canons of Lichfield; and in return for this grant, one of the prebendaries of that cathedral was to say mass for the soul of the King and his ancestors. In a decree of the Archbishop of Canterbury, for repairing and ornamenting chapels belonging to parish churches, which was dated in the year 1280, complaint was made that the deacon and subdeacon of Bakewell were obliged to beg for their bread. The archbishop therefore ordered that they should eat at the table of the vicar. To provide for such an increase of expense, the vicar, who before had twenty marks, was ordered an additional allowance of ten marks

for the support of two priests, with a deacon, subdeacon, and clerk, at his table; and, besides, one mark annually for the deacon, and ten shillings for the subdeacon, were allowed for the purchase of clothes. The archbishop also ordered, that ten scholastic clerks, whose occupation consisted chiefly in carrying about the holy water on the Sundays and festivals, in the church and chapels of the parish, should be chosen and maintained out of the donations of the parishioners. He also insisted that the chapels of Taddington, Longstone, and Baslow, should be supplied, by the chapter, with fit priests, and that the chapter and the parishioners should contribute in equal proportions for their maintenance, each paying at least ten marks and a half."

Bakewell has been much frequented on account of the trout-fishing in the river Wye. It has the advantage of being in the immediate neighbourhood of Haddon Hall and Chatsworth House, the Vale of Haddon, Darley Dale, Matlock Bath, and Monsal Dale, and of having a first-class station on the Manchester, Buxton, and Midland Railway.

Beyond Bakewell, the road still maintains its position by the banks of the Wye, through the Vale of Haddon; passing the fine old mansion of Haddon Hall, on the left, about two miles from Bakewell. In this broader valley, the railway stretches its direct way through a short tunnel behind Haddon Hall, and the scenery seems to be little if at all spoiled by the embankment; and the growth of grass and shrubs may hereafter cause it to be well nigh lost sight of altogether.

Haddon Hall has been again and again described, and has been delineated by ablest artists. It deserves a volume of description. It is almost unique, as an untouched specimen of the houses that were occupied by the aristocracy of England in the olden times. Situated

finely on the side of the broad valley—with its bridge of three arches,—its time-worn gateway and court-yard,—its massive construction and irregular walls,—its ancient chapel,—its kitchens, buttery, and hall, its recessed withdrawing room, its long and well lighted gallery, its varied yet congruous mediæval elevations,—its garden-terraces and yew trees' shade, Haddon Hall richly deserves all the notice which it receives. Erected at various remote periods, the greater part of the structure may probably be referred to the eleventh century.

Beyond Haddon Hall, road and railway soon lead to the cheerful village of Rowsley; during some years the terminus of the railway, and having still a first-class station. The village has been long and much resorted to by anglers. At this place the river Wye loses its identity, and becomes involved in the larger stream of the Derwent. There is here an interesting small Norman church and mortuary chapel, of recent erection; the latter containing an altar tomb to the memory of the late Lady John Manners and her infant child. There is on the tomb a very beautiful recumbent figure of Lady John Manners, exquisitely graceful, and expressive of extreme sweetness and repose. On one side lies the figure of an infant; on the other is sculptured a broken lily, in bold relief. This great work of art is by Mr. Calder Marshall, R.A. The tomb is of the hard and fine gritstone of Darley Dale, and is enriched with well executed carvings. The flooring of the chapel is inlaid with Derbyshire marbles, spars, &c., and probably contains the whole of them. This floor is the work of Mr. Tomlinson, of Ashford. Leaving the railway route, crossing the river, and proceeding northward, towards the village of Edensor, Chatsworth Park is soon reached: the princely domain of the Duke of Devonshire.

Edensor is situated within Chatsworth Park. In the

chancel of Edensor church there was a monument to the first Earl of Devonshire; also, a curious monument, with two recumbent figures, one representing a person in the costume of the period, the other representing a skeleton: a strange way of pointing the great moral lesson!—and also a monument of the celebrated Elizabeth of Hardwick, daughter and co-heiress of John Hardwick, one of the richest women of the time of Queen Elizabeth. She was married four times; obtaining a large accession of wealth by every marriage; leaving children only by her second husband, Sir William Cavendish; their second son being eventually created first Earl of Devonshire. The monuments were necessarily disturbed for the time by the restoration, or rather rebuilding, of the church, at the expense of the Duke of Devonshire, under the able direction of Sir Gilbert Scott. It is a worthy restoration, painstakingly carried out, full of elaborate, beautiful, judicious, and faithful details, worthy alike of architect and of patron. In the churchyard, on its southern and sloping grassy side, is a plain altar-tomb, surrounded by a plain iron railing, surmounted by a massive cross, in full relief, of the length of the tomb, the ends bearing also crosses in relief. It covers the mortal remains of William Spencer Cavendish, the late and sixth Duke of Devonshire, to whose liberality and enlarged charity Buxton and its Hospital are so much indebted. There is, near to this tomb, the grave and monument of the lamented Lord Frederick Cavendish, wantonly if mistakenly assassinated in the Phœnix Park, Dublin, to the great grief of his widow and all the members of his family, and with the sympathising regret of the Queen and all classes of the people.

"The history of Chatsworth does not date farther back than the conquest, when William Peveril held it for the crown. In the Domesday Book it is written Chetesuorde,

and 'no doubt took its name from Chetel, one of its Saxon owners mentioned in that survey.' The property was purchased, in the 16th century, by Sir William Cavendish, husband of the celebrated Countess of Shrewsbury. By Sir William a mansion was begun, which, after his death, was completed by his widow. This was one of the prisons of the unhappy Mary of Scotland, who, out of seventeen years she lived a captive in England, spent portions of the years 1570, '73, '77, '78, and '81 at Chatsworth. The mansion in which she was confined, which has entirely disappeared, was a quadrangular building, defended by towers. 'Her second letter to Pope Pius is dated from Chatsworth House, Oct. 31, 1570, nearly seventeen years before the sanguinary mandate of Elizabeth sent her to the block. Near the river, and not far from the house, is 'Queen Mary's Bower,' which is an object of attraction to visitors. It is a raised 'bower' or garden, strongly built of stone, and surrounded by a moat, and here, it is said, the Queen passed most of her time."—*Black's Guide to Derbyshire.* The north wing has been added to Chatsworth House since 1826.

It is impossible to mention, however cursorily, the Peak Palace and its wonders, without alluding to the man who, acting under a magnificent prince, full of artistic tastes, contributed so much to the high character of the whole, serving eventually what may be well called national interests. Sir Joseph Paxton spent the greater part of his active life in the employment of the late Duke of Devonshire, designed and planned the magnificent arboretum, the vast rock-works, some of the greatest of the waterworks, and, last not least, the orchid houses and great conservatory, which originated the Crystal Palace, and the Royal Conservatory at Kew, with all the attendant and consequent changes, as to the

successful cultivation of tropical plants in this country, and as to architectural innovations, which may end in a new style of art-construction, if it have not already done so. There is scarcely a railway structure, however large or costly, scarcely a horticultural construction however unpretending, in which the genius and Chatsworth experiences of Sir Joseph Paxton may not be said to be more or less traceable, from the ridge-and-furrow roof to the mixture of glass and iron, which are their special characteristics, together with the extensive clear span of the roofs, and the general breadth and boldness of the designs.

Chatsworth House is remarkable from its great size,—its adaptation to the scenery which surrounds it,—its upland background of dark woods, which shelter an arboretum of much botanical value,—its gigantic fountains and waterworks,—its great rock-works,—its conservatories, orchid-houses, gardens, and pleasure-grounds, its Italian façades,—its princely suites of rooms,—its choicely filled sculpture gallery,—its paintings and drawings of great masters, ancient and modern,—and its extensive and valuable library, collected by successive generations of patrons and lovers of letters, and in part by the eminent philosopher, Henry Cavendish, to whom science owes so much.

Mr. Henry Cavendish was born on October 10th, 1731. He was the grandson of the second Duke of Devonshire. He lived retired, and never married, and devoted himself to scientific pursuits, and more especially to mathematics, and their application to chemistry. He discovered that water is composed of oxygen and hydrogen; he discovered that nitrogen is an essential constituent of both atmospheric air and nitric acid; he investigated, with mathematical precision, the properties and combinations of these important gases; demonstrating his results both

analytically and synthetically. "A French writer admits (we should say affirms) that he furnished Lavoisier with the materials of his system; and Sir Humphry Davy, in a lecture delivered shortly after the death of Cavendish, speaks as follows:—'His processes were all of a finished nature, perfected by the hand of a master; they required no correction; and though many of them were performed in the very infancy of chemical science, yet their accuracy and their beauty have remained unimpaired amidst the progress of discovery.' The discoveries of Cavendish were finished; he proved his conclusions both by analysis and synthesis; he ascertained that the weight of the product was the sum of that of its components, and determined its specific gravity. He was the first who carried the mind and methods of a mathematician into the field from which the alchemist had not long retired, and in which the speculator still remained. And when we say the mind and method of a mathematician, we do not deny that the inductive philosopher had been already there; but it was to remark phenomena, and not to measure quantities."—*Penny Cyclopœdia.* He has been well called the Newton of Chemistry: advancing the practical chemistry of the age in which he lived, as much as Newton advanced the science of light and of optics, and the knowledge obtainable from the study of the stars.

A mere catalogue of the contents of Chatsworth House would form a bulky volume, and would be by no means without interest to any educated person. In addition to the extensive and unrivalled library, containing the most valuable and rare works and editions of works, there is a sculpture gallery, which, as to size, and proportions, and contents, can have few equals. It contains many of the greatest of the works of Canova, as well as some of the most celebrated works of Thorwalsden, Wyatt, Westmacott,

Gibson, and others of no less eminence; and it contains moreover, some gigantic art-creations in foreign and Derbyshire marbles, granites, spars, and alabasters. Leading from an orangery more than a hundred feet in length, and of adequate other proportions, and to suites of rooms of palatial size, and eminently artistic decorations, containing many of those wonderful carvings in wood, ascribed to Grinling Gibbons, and, whether executed by him or not, exceeding all imaginable wonders of the carver's art; holding, moreover, some of the greatest pictures that have ever been painted, more particularly Sir Edwin Landseer's well-known and priceless picture of Bolton Abbey in the Olden Time; and furthermore containing probably two-thirds of the drawings made by the great Claude de Loraine for or from his pictures, and called by him his 'Liber Veritatis'; surrounded by grounds and gardens on a scale of princely size, and for which even the genius of Paxton could do no more as to taste and design, with waterworks on so grand a scale as to have anticipated not unworthily those at the Crystal Palace, the Palace of the Peak defies description, and must be seen to be done justice to. The rock-works are so large as to justify wonder that even wealth and perseverance could accomplish such results. The great conservatory is still admitted to be a stupendous creation of glass, iron, and wood; and, thanks to the lightness of the material, and the ridge-and-furrow surface, by no means without a character of beauty; covering nearly an acre of ground; heated by six miles of hot-water pipes; roofed by upwards of 70,000 square feet of glass; and containing the gigantic vegetations of the tropics in most luxuriant health and beauty. The fountains in the grounds are supplied by tubes 6,200 feet in length, and fed by a reservoir on the high ground of the East Moor, at an elevation above them of 380 feet;

the jet of water from the principal fountain rising to the height of 260 feet. A special order should, if possible, be obtained to see the kitchen gardens, containing the house in which the Victoria Regia was first made to flower in this country, containing one of the largest and finest collections of orchidaceous plants, and in every way interesting to lovers of horticulture. The kitchen gardens are at a distance of three-quarters of a mile from the house.

Chatsworth is two miles from Rowsley, ten miles from Matlock, and fifteen miles from Buxton. Immediately beyond the north-eastern boundary of Chatsworth Park, is the prettily-situated village of Baslow, with its turreted church, and ancient bridge over the river Derwent. Baslow is four miles from Bakewell, twelve miles from Sheffield, and eight miles from Chesterfield.

From Rowsley to Matlock the road and the railway follow the farther course of the river Derwent, through the beautiful gritstone valley of Darley Dale. The breadth of the dale is sufficient to prevent the railway from marring the beauty of the scenery. About midway between Rowsley and Matlock, on the right of the road, is Darley Dale church, by the side of which stands one of the oldest yew trees in England, said to be the growth of many centuries, and to measure 33 feet round its stem. In the church is a fine altar-tomb, and there are also some interesting monuments. Not far from the church is the Stancliffe Hall estate, now the property of Sir Joseph Whitworth, the celebrated inventor of the Whitworth rifle, and long distinguished as a mechanician. On this estate is one of the most remarkable freestone quarries in the kingdom, which is now, however, reduced to a decorative position in Sir Joseph Whitworth's extensive and tasteful walks and pleasure-grounds; forming stupendous rock features and foregrounds to the valley

scenery, of most picturesque and romantic character.

Matlock village is eight miles from Bakewell, and nearly five miles from Rowsley; and between the village and Matlock Bath, which has usurped the name of Matlock, there is a distance of nearly two miles by the road. The road passes near to the river, with a now broader and deeper stream; and the valley rapidly becomes walled in by loftier and more precipitous limestone rocks, until Matlock Bath is reached; the rocks surrounding the town, and extending a short distance beyond its principal buildings; separating Matlock Bath from the adjacent village of Cromford.

Matlock Bath is the fourth of the localities in Derbyshire in which there are springs of tepid water. The temperature of these warm springs is 68 degrees of Farenheit. They are similar in their medicinal influence to those of Bakewell and Stoney Middleton; being probably by so much more efficacious as they are eight degrees warmer; and being inferior to the tepid springs of Buxton in temperature, and as to gaseous impregnation. The Matlock Bath waters are known to have been in use and repute for medicinal purposes, since the year 1698. There are three important springs, which have the same temperature and character.

Matlock Bath is, however, more remarkable from its picturesque and sheltered position, than on account of its tepid waters. Three great natural caverns are found here, which deserve to be seen. The Cumberland Cavern contains a gallery 300 feet long, and 18 feet high; the Royal Rutland Cavern contains great chambers, arches, and lofty dome-like roof; and the Devonshire Cavern has an extensive chamber, with a remarkable flat roof. The High Tor is a mass of limestone rock, which rises perpendicularly from the side of the river to the height of 400 feet. The Heights of Abraham, another of the

mountain masses which surmount the sides of the valley, crown the summit of Masson Hill, and are said to be 1000 feet in height. The abrupt and gigantic rockiness of Matlock Bath gives to it a picturesque character that is quite unequalled by any other town in the district. These rocks and eminences on both sides of the valley are easily reached by well kept paths, every step offering an infinite variety of view, and adding to the general attractiveness of the place. The river Derwent, near to the town, is sufficient for the use of boats; and pursuing its devious way through the bottom of the valley, through a broader or a more contracted channel,—and placidly and turbulently as may be,—the river, the plantations, the limestone rocks, the position of the houses at various heights on the sides of the valley, combine to render Matlock Bath one of the prettiest places in the kingdom. The railway, fortunately, owing to its high elevation, the frequent tunnelling, and the breadth of the valley, interferes very little with the natural beauties of the place.

In the year 1884, 15 acres of ground, of which a large part covers a portion of the west side of the valley of Matlock Bath, extending beyond its summit, were purchased by a public Company, enclosed, and laid out as ornamental walks and terraces; handsome pavilion buildings were erected, including central or concert hall and other public rooms; and the site commands much of the beautiful scenery, with the magnificent rocks and varied grandeur. Near to the summit of the grounds is a grand natural rockery, with a range of precipitous rocks, which have the old name of "Romantic Rocks," and deserve to be so designated. A good band of musicians performs in the Pavilion; and the undertaking is a very valuable addition to the local attractions.

Near to Matlock Bath, on the road to Hopton,

traversing a valley with well wooded and steeply sloping sides, called the Via Gellia from the name of the owner of the estate, is probably the best known and most extensive natural habitat of the most beautiful of our spring flowers—the Lily of the Valley. It grows on the sides of this valley in the wildest profusion. It is met with in some other parts of the kingdom, and even sometimes in the upper parts of the valley of the Goyt, near Buxton, when fenced from sheep pasturage; and it grows in the valley of the Lathkil and in Monsal Dale; but the Via Gellia, towards the end of the month of May, claims an easy pre-eminence, as to profuse production of this interesting plant.

Having passed Matlock Bath, the road emerges from this extraordinary portion of its course, through two great rocky sides, to the village of Cromford; and thence still occupying one or other bank of the river, passes on to the town of Belper, an important seat of the cotton manufacture,—goes through the pleasant village of Duffield,—and reaches Derby, with its fertile surroundings, at the distance of 38 miles from Buxton. The railway, having passed Matlock Bath, and presenting an interesting peep of the grounds of Mr. Arkwright, at Willersley, traverses the woods and valley of Alderwasley, and, after a course of six miles from Matlock Bath, joins the main trunk of the Midland Railway at Ambergate.

Derby is a very ancient town; although but few signs of its great antiquity are left for observation. It was probably in existence before the invasion of the Romans; the Roman station, Derventio, was in its immediate neighbourhood; it was inhabited by the Danes, and the theatre of contests between the Danes and the Saxons; A.D. 917, 942. It is called "Villa Regalis" in the writings of the Venerable Bede, in the early part of the

eighth century. Derby was a royal borough in the time of Edward, the Confessor, in the tenth century. The Roman station, Derventio, was on the site of Little Chester, a hamlet immediately beyond the boundary of the borough, on the other side of the river; and Dr. Stukeley, in the early part of the last century, was able to trace its wall quite round, and to ascertain that the inclosure had been oblong, and contained five or six acres. Coins of brass, silver, and gold, have been found from time to time; other ancient remains are occasionally met with; foundations of buildings are occasionally laid bare; and there are the foundations of a Roman bridge over the Derwent at this point, which may be seen when the water is clear.

In the time of the Saxons, Derby was called Northwige; and the name of Deoraby was given to it by the Danes. It is probable that the names of the town, of the neighbouring village Darley, of the Roman station Derventio, and of the river Derwent, are all derived from the same ancient word, *dwr*, water;—with the addition of the adjective, *gwen*, bright, when applied to the river; and of *bye*, habitation, when applied to the town.

Before the time of the Norman Conquest, there was a castle of some considerable size and importance at Derby; at this time, or soon after, it seems to have fallen into decay; the town itself becoming less important; and its annals offering few matters of historical interest. It was held by the Parliamentary troops during the Protectorate; the garrison having been removed in 1645, probably in consequence of the town becoming infected with the plague. In 1665, Derby was again visited with the plague, while London was being scourged by this fearful epidemic. According to the account

given by Hutton, the town was forsaken, the farmers ceased to frequent the market, and the market-place became grass-grown. "To prevent famine, the inhabitants erected, at the top of Nun's Green, one or two hundred yards from what is now the Friargate, four quadrangular steps, covered in the centre with one large stone; the whole being nearly five feet high. It was called Headless Cross. I knew it in perfection. Hither the market people, having their mouths primed with tobacco, as a preservative, brought their provisions, stood at a distance from their property, and at a greater distance from the townspeople, with whom they were to traffic. The buyer was not suffered to touch any of the articles before purchase; but when the agreement was finished, he took the goods, and deposited the money in a vessel filled with vinegar, set for that purpose." On December 4th, 1745, the town was entered by the Young Pretender, with his army, and occupied until the following day; and thence began the disastrous retreat, on the approach of the royal forces under the Duke of Cumberland.

The manufactures of Derby have been chiefly of silk and cotton, marble, porcelain, and iron. The silk and china manufactures were at one time of pre-eminent excellence and importance; and the iron manufacture is now of high character and value. A promising effort is now made to recover the prestige and character of the china manufacture.

The tower of All Saints' Church, built in the reign of Queen Mary, is a very beautiful architectural feature of Derby. It is 180 feet in height, and admirably proportioned. All Saints' Church contains monuments to William, Earl of Devonshire, and to the celebrated Countess of Shrewsbury.

The Arboretum, a magnificent gift to the town, from

the late Mr. Joseph Strutt, containing several acres of ground, laid out in walks, and planted, with a view to the recreation and instruction of the people, is deservedly one of the principal features of Derby.

The Derby railway station is a great central point of the Midland Railway system.

Beyond Upper Buxton, on the south side of the town, is the old road to London, viâ Ashbourne and Derby. This is the most exposed and least interesting of the roads near Buxton. Passing the beautiful rising grounds of Staden Low, near to the town,—and the upper end of Deep Dale, at the distance of nearly three miles,—a road to the left, immediately beyond Brier Low, leads to the village of Chelmerton. Chelmerton is five miles from Buxton. The village is situated at the foot of Chelmerton Low, in an open valley. Chelmerton church possesses some degree of ecclesiological interest. There appears to have been a chapel here as early as the year 1111. This date at all events is said to have been on a beam in the chancel, now removed. The church is probably of considerably antiquity. The different levels of the floor are particularly note-worthy, as also the east window. There is an ancient carved stone font; and there are three carved tomb-stones in the churchyard, of interesting character, bearing the date 1541. According to the survey of the Board of Ordnance, this church seems to stand at an higher elevation than any other in the country.

The chancel of this interesting church was restored recently, with much care, at the cost of the Duke of Devonshire, and many interesting features of the structure were discovered and renewed. Portions of the remaining structure have also been carefully restored, but the whole structure deserves the consideration and help of wealthy ecclesiologists.

From Brier Low, the road to Ashbourne passes over uplands of bare and tame character to Newhaven, the scenery of the adjoining county of Stafford being shut out from the view by the rising grounds on the right; and beyond Newhaven there is little improvement in the scenery until some fourteen miles from Buxton, when the village of Tissington lies on the left, with its old trees, and wells, and enriched Old-English character of scenery; the road to Dove Dale is on the right; and the fertile lower grounds of the Ashbourne district are overlooked and travelled through from this point to Derby.

The wells of Tissington are celebrated as perennial springs; resembling so far, although cold, the tepid springs of Buxton, Bakewell, Matlock, and Stoney Middleton; and, like them, issuing from the limestone close to the edge of the formation.

The perpetual flow of the springs at Tissington is said to have originated the time-honoured annual festival of decorating the wells of the village with flowers on Ascension day. According to the tradition, the flow of the springs was unaffected at a time when all the springs of the surrounding district were dried up; and they are said to have been dressed with flowers ever since, on Ascension day, in grateful commemoration of so signal a blessing. There are several wells situated in different parts of the very pretty village; and these are more or less surrounded or covered with wooden boards, of various shapes, plastered with a somewhat thick coating of moistened clay; buttercups and daisies, with any other flowers obtainable,—and also pine-cones or any other material available for colour, or contrast, being stuck into clay, so as to form a Mosaic work, which is vivid in its colouring, and often tasteful in its design. Texts from Holy Scripture, and devices of various pattern, are

thus produced; and when the artist's ambition does not lead him to attempt too much, the effect is extremely good and pleasing. The service for the day in the quaint country church, and a procession of villagers and strangers, headed by the clergyman, from well to well, after the service of the church, the appointed psalms being read at the several wells, render this a very interesting country festival. The custom of well-flowering has been borrowed by other places in Derbyshire, as by Buxton, Youlgreave, &c., but the well-flowering at Tissington maintains an easy pre-eminence.

The scarcity of springs is one of the characteristic conditions of the limestone formation. In some parts of this tract of country, the inhabitants are entirely dependent on the rainfall for their supply of water, which they collect in tanks, &c., for their domestic purposes, and for their cattle and farm purposes, in round surface ponds, locally called meres, with conduits leading to them from the rocks and uplands. The springs which exist are usually found to be near the margin of the formation, or where there are fissures or dislocations in the strata, with or without toadstone. On the adjoining formations of gritstone and new red sandstone, the springs are much more numerous. This is the more remarkable in regard to the gritstone formation, as it is for the most part of a higher level than the limestone. Moreover, all the Derbyshire rivers,—the Derwent, the Wye, the Dove, the Dane, the Manifold, and the Goyt,—take their rise from the gritstone; and the five last-mentioned from different parts of Axe Edge, near Buxton. The Derwent arises at the extreme north-eastern border of Derbyshire, to the north of Ashopton. The Goyt and the Dane eventually terminate in the Mersey; all the other rivers fall into the Trent.

If, instead of following the high road just noticed,—

the merits of which, for excellence of condition, deserve a passing word of praise,—the traveller diverges from it to the right, when between two and three miles from Buxton, he ascends at once the invidious range of higher ground, which separates him from the scenery of Staffordshire. He passes, on his right and left, many oddly shaped, and bold, and picturesque hills; especially Tor Rock, Swallow Tor, and Chrome Hill, on the right. He may go through the village of Earl Sterndale, ascend the conical hill called High-Wheeldon, and see all these hills before and below him, and an extensive and picturesque reach of the county of Stafford, lying on the other side of the river Dove, which divides Derbyshire and Staffordshire. The more distant of the Staffordshire scenery is divided from that which is nearer, by successive ridges of hills, over which the eye travels, and upon which the lights and shades of the clouds produce the most picturesque and rapid changes. A descent and ascent through interesting and ever varying valley scenery, with a crossing and re-crossing of the river Dove, here a stream of no pretension, leads to the little market town of Longnor, at a distance of six miles from Buxton. Passing thence to the left, through a picturesque valley, which winds around the base of High-Wheeldon, the traveller regains a road which leads to the village of Hartington. Hartington, by the more direct road, is about nine miles from Buxton. There is little scenery worthy of remark on the road from Earl Sterndale to Hartington, until within half a mile from Hartington, whence a higher level of road commands a view of the river Dove, with a much improved description of scenery bordering its course. Hartington is an unpretending and quiet village; and, within about half a mile, the river Dove passes through the first part of the remarkable scenery which has rendered it so famous. Beresford Dale

is a little gem of beautiful scenery. The more matured beauties of that part of the river's course which is more strictly called Dove Dale, if here somewhat less bold in character, are crowded together into a small space, giving the sense of finished beauty which an exquisite miniature conveys, and which may compensate in some degree for any deficiency in the boldness and character, which might distinguish a painting of more pretension, and on a larger scale. Here, too, is the fishing lodge, which was erected for the accommodation of the venerable Izaak Walton; here is the domain that belonged to his disciple, and friend, and expounder, Charles Cotton; here is the stream from which those lessons in angling were obtained, and by the banks of which those thoughts and maxims and gossip were formed, and embodied in simple and quaint phrase, which still serve to edify and please all the lovers of nature, as well as those who practice the "gentle art;" and every one may well feel that this is indeed a fitting place for such thoughts and musings.

Some few miles of bare scenery border the course of the Dove from thence to Dove Dale. Dove Dale is separated into several almost distinct portions, every one of which is distinguished by its own peculiar and characteristic beauties. The first of these is a somewhat open valley, with a rippling and shallow stream, and grassy banks and bottom, and shelving sides,—with but little of rocky and limestone character. This is the less adorned entrance to the more enriched scenes beyond. Passing over some higher ground, which serves to shut out this first compartment from that immediately beyond, the eye is arrested by a mass of rock, which rises abruptly, standing in relief, and with much grandeur, on the right side of the valley. On the left, a little beyond this mass of limestone, is an expanded arch, of fine form and proportion, leading to a shallow cavern. Beyond

this, on the left side of the valley, is a marvellous specimen of the peculiarities and capabilities of the mountain limestone. A rock, standing out boldly from the mountain side, at an estimated elevation of between two and three hundred feet from the bottom of the valley, is completely perforated by an arch of some yards in depth, and said to be about forty feet in height, and eighteen feet wide. Through this archway is a space, open to the sky, which might be likened to the small court-yard of a mountain stronghold, and which leads to a narrow cavern in the higher hill-side. This curious archway, which has become detached from the farther cavern, situated as it is at so considerable a height, admitting the light of day freely through it, and presenting the view of the space and cavern beyond it, is one of the most picturesque of the rocky wonders of the limestone formation. The view of the valley from above, as seen through the archway from the upper cavern, is sufficiently beautiful to repay fully the toilsome ascent by which it has to be attained.

The dale immediately beyond becomes much narrower; the sides become precipitous and rocky; the river becomes narrowed, and less quiet in its character, and enters a narrower and darker gorge between two great rocky portals. On one side is a column of insulated rock, which rises abruptly, and in massive grandeur; on the other side is a bold mass, projecting from the side of the valley. What a scene of "hurly burly," and what gigantic action, must have produced and attended the dislocation and upheaving of these mighty masses; and what a tale this scene tells, in the midst of the beauty which is now so solemn and so still, of the agency by which the earth's strata were made to produce the diversified surfaces, so needful for the wants, and so

conducive to the uses, the health, and the happiness of the human race!

The valley below has again a more open and more enriched character; with a more quiet and broader stream, bounded by more sloping hill-sides; broken at intervals by masses of rock, scattered in vast fragments, or projecting, as though they had only just escaped from being hurled into the valley which they overhang.

The town of Leek, a principal seat of the silk manufacture, is at the distance of twelve miles from Buxton, on the south-west. The road rises rapidly from the valley of Buxton, passing over the ridge of elevated ground, of which Axe Edge is the highest point. The first part of the road is wild and bold in its scenery; the pointed and oddly-shaped hills, near Longnor, lying at some distance from the road, on the left; the right being bounded by the higher ground of the ridge of Axe Edge. When the summit of the high ground is at length attained, an extensive view is presented; and from thence to the town of Leek, the scenery is of commanding and varied character.

Macclesfield is at the distance of twelve miles from Buxton, on the west. The highest part of the road, close to a small road-side inn (the "Cat and Fiddle,") offers a view which is circumscribed in breadth, but which extends in length to a distance of forty or fifty miles. The river Mersey, near Liverpool, may be seen from this point, when the air is free from haziness, as after rain; the looking at objects so distant being even painfully fatiguing to the eye. From this point to Macclesfield, the road descends; offering an extensive view over this part of Cheshire, and leading to an idea of the town of Macclesfield which must be admitted to be beyond its deservings. Macclesfield is a well-known and very important seat of the silk manufacture.

Branching from the Macclesfield road, on the left, about three miles from Buxton, is the road to Congleton, —a small town, at the distance of fifteen miles. The road is wild, and less interesting than the road to Leek, or than that to Macclesfield.

On the north-west of Buxton is the city of Manchester, at the distance of twenty-four miles. The road from Buxton, after ascending for a distance of two miles, has the valley of Chapel-en-le-Frith on the right hand, and that of the river Goyt on the left; no part of the one, however, and but little of the other, being visible from the road. The village of Taxal, and, almost contiguous to it, that of Whaley, are six miles, and that of Disley is eleven miles from Buxton. Close to the left of the village of Disley is the extensive park of the Lyme Hall estate, the property of Mr. Legh's family during several centuries. The Hall, to which the public are kindly permitted to have access, forms one of the attractions of the district. The house is interesting from its associations, and contains much that is of historical, and much that is of intrinsic importance.

Lyme Hall contains many very fine specimens of the beautiful wood carving attributed to Grinling Gibbons. The ancient entrance hall is very striking and handsome, and contains the arms worn by Sir Perkin Legh at the battle of Crecy, when he was knighted for his valour by Edward the Third. The great drawing-room is extremely handsome and interesting; it is wainscoted, and the roof is richly ornamented. The whole character and effect of this room, and the staircase, the long gallery, the Stag Parlour, and the chapel, are very impressive, and suggestive as to the architectural conditions and wants of what are called the mediæval times. There is some very interesting ancient furniture in this house; more particularly a very handsome old oak bedstead, said to

have been slept in by Edward the Black Prince. Much of the extensive park around the house is left in the untouched wildness of nature; and the celebrated breed of wild cattle has been preserved in the park from time immemorial, and is said to have been indigenous in the district.

Six miles beyond Disley, or seventeen miles from Buxton, is the town of Stockport,—which, only seven miles from Manchester, strictly so called, is becoming little less than an extension of the great metropolis of the manufacturing districts of Lancashire and Cheshire.

The London and North-Western extension line of railway from Manchester and Stockport to Buxton, passing through Disley and Whaley Bridge, and by Horwich End, and near to Chapel-en-le-Frith, Dove Holes, and Fairfield, does not interfere with, nor bring into view, much of the more remarkable scenery of the High Peak district. It shows, however, as has been said, from commanding elevations, considerable portions of the fine valley of Chapel-en-le-Frith, the south side of which it skirts.

As will have been inferred from the account which has been given of the Buxton district, the walks and drives in the more immediate neighbourhood of the town are interesting.

The walks opposite the Crescent, already mentioned as having been formed on the site of an originally unsightly cliff, by Sir Jeffery Wyatville, offer a valuable resource to those who are more especially invalided, from their proximity to the principal hotels and lodging-houses. These walks are cut out of the limestone rock, and are accordingly remarkably dry. Arranged in a succession of terraces, a series of level walks is obtained, with the advantage of giving occasion for climbing at pleasure, or as lameness may diminish, or strength increase, to a

higher and higher terrace walk; and thus these successive terraces have long been popularly recognised, as supplying indications of restored power and capability, in regard to the crippled limbs and enfeebled state of those resorting to Buxton for the use of its waters. These terraces are adorned with very handsome stone vases, originally brought from Londesborough, when the great ducal residence was pulled down.

Almost contiguous to these walks, at the west end of the Crescent, opposite to the Hall and the Square, are the grounds and gardens already described in the first chapter of this work, which now belong to the Buxton Improvements Company; and beyond these are walks and plantations, which are free to the public. These walks are carried through a belt of plantation, on both sides of the river Wye; the stream being crossed and re-crossed by rustic bridges, diversified by waterfalls, and in other ways subjected to the requirements of ornamental grounds. These walks are sheltered and pleasant, and are still more or less resorted to. They are sometimes called the Serpentine Walks, and sometimes the Winding Walks; and they furnish a circuit of dry, gravelled footpaths, of nearly a mile in extent.

A terrace walk, called Cavendish Terrace, of considerable breadth, and with the advantage of being almost level, extends from the bottom of the Hall Bank to what is called the Tonic Bath, in the direction of Poole's Cavern. This walk is one-third of a mile in length, is dry and well made, offers views of the gardens, plantations, Park, Corbar Wood, and Burbage and Burbage Edge, and has proved to be a most valuable addition to the many similar advantages of Buxton.

Only separated from the Serpentine Walks by the high road to Macclesfield, is the Park, which occupies more than a hundred and twenty acres of greensward,

and slopes towards the south, having walks and drives carried through it. And, again, only separated from the Park by the high road to Manchester, there is a considerable extent of walks, of much beauty and variety, through a plantation which occupies the site of old gritstone quarries, and covers the greater part of Corbar Hill side. Occupying the south side of this commanding eminence, winding through plantations of adequate growth, and traversing the picturesque inequalities of old quarries,—all their rude handiwork covered over long ago with wood, and undergrowth, and ferns, and foxglove, and more recently with rhododendrons, and the like,—and presenting vistas of Buxton, and its valley, and of the hills which surround it,—these walks are a much valued and most picturesque addition to the attractive features of the locality. The more energetic pedestrians should ascend beyond the highest limits of the Corbar Wood walks, pass through an upper plantation, and reach the summit of Corbar Hill, which commands an extensive view of Buxton and Fairfield.

The Terrace Walks, opposite the Crescent, Cavendish Terrace or the Broad Walk, the Serpentine Walks and pleasure grounds, the roads through the Park, and the walks through Corbar Wood, may be moderately computed to supply an extent that must amount to several miles. To this it should be added that, gradually, all the roads, within reasonable distance from the town, have been provided with broad, well gravelled, and dry footpaths; by which the extent of the walks in the immediate neighbourhood of the town may be fairly said to have been doubled within the last few years. And not only throughout the Terrace Walks, the plantation walks, and Corbar Wood Walks, but, at longer or shorter distances, on the footpaths by the sides of the roads, seats are occasionally placed. This consideration for the comfort

of weak or disabled sojourners might be wisely commended to those in authority, as capable of being increased and maintained with great advantage to the general interests of the place.

The road to Bakewell, winding, as it does, through Ashwood Dale, and near to the south side of the river Wye, and leading to much that is interesting, affords a very favourite walk. The road is continued near to the south bank of the stream, for a distance of three miles; but beyond this, as has been mentioned, there is the footpath, or rather bridle-road, beyond Blackwell Mill, as far as the Dropping Loach, and thence to Chee Dale and Millers' Dale.

On the south side of the commencement of the Bakewell road, close to the eastern extremity of Lower Buxton, footpaths lead through the plantation which covers the southern side of Ashwood Dale at this point. The paths are carried back again to the road, at the distance of somewhat less than half a mile. The road may be left at this point by a narrow footpath on the south; and this leads, by a continued footpath through fields, to Upper Buxton. If the Bakewell road is followed a few yards farther than the footpath now indicated, a road, that is somewhat narrower than the high road, leads to Upper Buxton by Sherbrook and Cote Heath, and gives a circuit of rather more than two miles. This, which is commonly called the Duke's Drive, is found to be a favourite walk, and likewise a favourite short drive, in much request by those who make use of pony carriages and bath chairs.

A little distance nearer to Buxton than the first milestone on the Bakewell road, a stile and footpath lead to a wooden bridge across the river, whence a pathway or sheep-track, under a railway bridge, leads up the opposite side of the valley, by the northern end of a plantation.

On reaching the north-eastern corner of the belt of plantation, the sheep-track may be left, and the eastern edge of the plantation may be followed for about a quarter of a mile or less, when the top of the lofty and abrupt rocks which bound the northern side of Ashwood Dale will be found to have been reached, and a bird's-eye view obtained of the road, and the river, and the railway, and all their very picturesque and beautiful surroundings. If the sheep-track shall have been followed, or be now returned to, it will be found to lead to a green and broad way on the west, called Tongue-lane, which leads pleasantly over the uplands to Fairfield; whence Buxton may be returned to, by the high road or otherwise.

Sherbrook Dell, or Lovers' Leap, opposite the first milestone on the Bakewell road, has been already mentioned, and should of course be explored.

By proceeding along the Bakewell road to the bridge beyond the roadside inn, called the Devonshire Arms, crossing the bridge, and returning through Fairfield to Buxton by a valley to the left, called Cunning Dale, a pleasant walk of about five miles circuit is obtained; or, having crossed the bridge referred to, the pedestrian may climb the upland road before him, called Ashe's Bank, cross a field at the top, and reach an old bridle road, along which he may return through Fairfield to Buxton, over the high and open country called Bailey Flat.

If the Bakewell road be followed beyond the second milestone, and the steeply inclined valley immediately on the right be followed along its bridle road, a high range of country is reached by Cowdale and Rock Head; and a footpath from thence across the fields will be readily found, leading over Stadon, and by Sherbrook and Cote Heath, to Buxton, after a circuit of about five miles.

If the Bakewell road be followed a few yards farther, and the lodge gate on the right be passed through, and

the road followed to the opposite uplands, the old road to King Sterndale is soon reached, close to a small church which has been recently erected; and thence, by turning to the right, after a walk of about half a mile, where the road is crossed by the road from Cowdale to the Ashbourne high road, the return to Buxton may be by turning to the left and gaining the Ashbourne road,—or to the right and regaining the Bakewell road, passing by Rock Head,—or by walking across the fields over Stadon to Sherbrook,—or the excursion may be extended by following the foot road across Deep Dale to Chelmorton.

There are an upper and lower road from Upper Buxton to the first mile on the road to Macclesfield, the one passing by Poole's Hole and Burbage, the other by Wye Head; and returning thence to Lower Buxton by the Macclesfield road, gives a circuit of about two miles. This distance may be shortened by following a footpath across the fields,—leading, in the instance of the upper road, from Poole's Hole to Cavendish Terrace, and as to the lower road, from Wye Head to the Plantation Walks and Gardens.

There is a pleasant ramble by Cavendish Terrace from Lower Buxton to the Grin Plantations above Poole's Hole, and through these plantations, by a cart road, to the summit of Grin Low, marked by a mass of loose stones, originally put together to resemble at a distance some ancient ruin. There is a good view of the valley of Buxton from this point.

At the back of Grin Low are the extensive works of the Buxton Lime Company. The extent of these works, the machinery for crushing unburned limestone, and the mode of blasting the limestone rock, by which masses of 2,000 or 3,000 tons in weight are detached, and the contrast in colour of the newly-exposed surfaces of rock

to that of the long-exposed crags, are all worthy of notice.

The second milestone on the Leek road is close to the base of the somewhat steep eminence of high ground, called Axe Edge, from its lofty and commanding position. From the summit of Axe Edge a good view is afforded of the Buxton valley and its surrounding elevations.

The road to Fairfield, with its upland position and extensive common, its fine and bracing air, and the view of Buxton and its valley obtained from it, is one of the pleasant short walks near to the town; and there is a footpath across the fields on the left by which the return to Buxton may be diversified, as well as the routes on the right already spoken of, by which the Bakewell road may be reached opposite to the first or the second milestone, as a shorter or longer walk may be wished for.

A satisfactory long walk is gained by skirting Fairfield Common on the right, pursuing a footpath over the uplands, which leads to an old road or lane, in the same north-easterly direction, over the district called Green Fairfield,—skirts the western side of Great Rocks Dale,—and leads to the Bakewell road over a bridge, at the distance of nearly three miles from Buxton. This comprises a journey of seven or eight miles.

There is a long walk of about seven miles, which offers a great variety of beauty and scenery,—from Goyt's Clough, about two miles from Buxton, on the old Macclesfield road, by the banks of the river Goyt, along the moorland bridle-road, into the valley of the Goyt, and as far as Goyt's Bridge,—and thence across the bridge, and up the steep old road called Goyt's Lane, to the Manchester road, about two miles from Buxton;—or the course of the river may be followed by the road as far as the Powder Mills, where the road crosses the stream, and leads to the Manchester road near the fifth milestone

from Buxton;—or, what is much more noteworthy, the farther course of the river, beyond the Powder Mills, may be followed by a footpath, and the woods and valley of Taxal with very interesting woodland and upland scenery brought to view, the high road being reached about six miles from Buxton, whence the return to Buxton may be from the little distant Whaley Bridge railway station.

Another long walk of much interest is obtained by leaving the Manchester road at the first milestone, traversing the neglected bridle-road as far as White Hall, descending thence by an old road to the bottom of the valley on the north; thence bearing to the right, and reaching Dove Holes, and thence Fairfield and Buxton, after a journey of about eight miles.

Poole's Hole, within about a mile from the town, well deserves a visit from those who are fond of exploring natural wonders. Close to the left-hand side of the entrance to Poole's Cavern, on the 24th of November, 1854, a number of human and other bones were discovered, in the course of widening and levelling the sides and bottom of the opening. They are described by Mr. Bateman to have comprised the bones of "three individuals, accompanied by stags' horns and numerous pieces of corroded iron, consisting of buckles, staples, clench bolts (an inch and three-quarters long), nails, (one with a globular head, three inches long), and a slender sheath or ferule (four inches long)." Fragments of stags' horn, seeming to have belonged to animals of large size, and some human and other teeth, one of the latter being of large size, are now shown at the cavern. In addition to the above, ancient coins and a bronze brooch, in very perfect preservation, have more recently been discovered within the cavern, imbedded in a sparry incrustation, and no doubt thus preserved from the action

of the air; and bones similarly imbedded are frequently discovered, in the course of the operations for rendering the different parts of the cavern more easily accessible. This is one of the more considerable of the caverns in the mountain-limestone formation. The entrance on the side of Grin Low, below the plantations, is extremely contracted; but, after a few yards, it becomes more lofty, and leads to extensive chambers, through the bottom of which a narrow streamlet channels its way, and over which are roofings and arches of imposing extent and character; stalactites hanging from the roof in some places, and large crystalline masses having accumulated on the flooring of the chambers in many places, from the dropping and welling of the water charged with calcareous matter. Much has been done to make the entrance to the cavern more accessible, and to improve the pathways through its interior. It is, moreover, lighted throughout with gas. No fewer than 250 gas-lights are now placed at convenient distances, so as to display its most curious arches and roofings, and irregularities, and great size, and incrusted surfaces. As it may be emphatically said that this remarkable cavern was never seen before, either as to its extent, or its curious characteristics, it may be regretted that it is the only one of the great natural caverns of the Derbyshire limestone formation that is so lighted.

It is a strange history, that these caverns should have been used as human habitations, in remote periods of time, and at distant intervals; the dwellings apparently, from the remains that are dug up from time to time, of considerable numbers of people; the remains being buried at successive depths, with intervening deposits of calcareous crystalline or earthy character; and consisting of human bones of different ages, from childhood upward, and the bones of goats, or sheep, or oxen, or

stags, and also coins, ornaments, stone implements, &c., illustrating the precarious and hunted lives of the outcast or hostile population, driven to drag out wretched lives in the darkness of such caverns, in many instances dripping and welling with water at all times, and rendering the barest comforts, conveniences, or necessities of life an evident impossibility. There is a collection of the remains that have been dug out of Poole's Cavern within recent years, which will amply repay intelligent examination.

The drives in the neighbourhood of Buxton are likewise very interesting.

There is a pleasant drive over Fairfield, and by Dove Holes and Barmoor Clough, to Chapel-en-le-Frith, and thence to Horwich End, on the Manchester road, and thence to Buxton. This is a distance of about fourteen miles. If furnished with a steady horse and strong carriage, to make a steep and rough road safe, the high road may be left about half a mile from Chapel-en-le-Frith, and the road taken to Lydgate, with Bradshaw Hall on the left; and thence, gaining the high ground close to Eccles Pike, leaving the carriage, and climbing the ridge, a view of two extensive and beautiful valleys is obtained; and returning to the carriage, the journey is pursued by Ollerenshaw to Horwich End.

The village of Wormhill is reached by a road across the Fairfield Common, somewhat to the right of the road just mentioned. The carriage may be left on the road near to Wormhill Hall, while the great rock, Chee Tor, and the valley which it abuts upon, are being explored. Returning to the carriage, the road may be followed thence to the end of Millers' Dale, opposite to Priest Cliff, whence the return to Buxton may be by the road which joins the Bakewell road at the fifth milestone. This presents a very interesting circuit of about fourteen miles.

An interesting long drive, about twenty-eight miles in circuit, full of variety as to the objects and scenery, is obtained by following the Ashbourne road from Buxton, until near to Brier Low, between two and three miles from Buxton; following the road to the right, leading by Hind Low, with the higher upland of Brier Low on the left, the elevation of which is 1,481 feet; the road passing thence under an archway of the High Peak Railway, and thence, at a higher point, presenting views, on the right hand, of the extraordinary, twisted-looking, pointed, jagged, and irregularly-shaped hills, Tor Rock, Swallow Tor, and Chrome Hill; and, as the road descends rapidly to the hamlet of Glutton, leaving Earl Sterndale and High Wheeldon on the left. Near to Glutton, the road passes through a bold rocky gorge; and immediately beyond Glutton, the river Dove, here a stream of inconsiderable size, is crossed by a bridge. The river, at this place, passes near to the edge of the gritstone formation, and separates Derbyshire from Staffordshire. The road continues on the gritstone to Longnor, and thence to Warslow. The road ascends rapidly from Glutton to Longnor, and affords a fine view, on the left hand, of the valley of Aldery, Glutton, or Crowdecote, so called, as to its different parts, with its gritstone bottoms, and its limestone hills on the north and east, and gritstone hills on the south and west. Near to Longnor, the valley of Hollins Clough is seen from the road, backed by the swelling hill sides, and sharply defined hill tops, of this part of Staffordshire. Having passed through Longnor, the road is continued through interesting and various scenery to Warslow, at which place the mountain-limestone formation is again met with. Immediately beyond Warslow is the Ecton mining district, on the limestone formation; the hill sides

showing indications of the extent and importance of the mining operations which were at one time carried on there. The Ecton mines yielded, nearly a century ago, great quantities of copper; and they are still worked on a small scale. Good specimens of the ores of lead, copper, and zinc, are readily found. Immediately beyond Ecton, the river Manifold, an important tributary of the river Dove, which arises near to Longnor, and falls into the Dove at Ilam, becomes a stream of some importance; and the course of the river becomes exceedingly beautiful. From Ecton to Wetton, a distance of about three miles, the road near to the river side, although occasionally somewhat rough, is to be followed; and the clear and bright stream, and the meadowed banks, and bold valley sides, offer, along the winding course of the river, some beautiful scenery. On the right, the entrance to a remarkable cavern, on the side of Wetton Low, is seen from a considerable distance. The effect of the entrance to this cavern, as seen from the road, is marred by the regularity of its arch, which is often supposed to have been either formed or modified by art, and might be mistaken very readily for a much misplaced work of masonry. From the part of the road which is nearly opposite to it, the cavern is readily reached on foot. The arch of the entrance is forty feet in width, and it is probably about sixty feet in height. The entrance is effectively lighted, to a considerable depth, owing to a second entrance on the right, almost as lofty as the principal entrance, but much narrower; and almost opposite to this, there is a column of bold massiveness, supporting arches which extend farther inward; and the effect of the light, and of the size and proportion of the arches, on returning to the entrance, is very beautiful. This cave was carefully examined during the years 1864 and 1865, under the judicious supervision of the late Mr.

Samuel Carrington, in the hope of discovering remains of extinct animals, or anything of antiquarian interest. The flooring of the cave was found to consist of successive layers of dried mud intermixed with ashes, animal bones, and fragments of pottery. In the wide part was found a bed of ashes at the depth of two feet, in which were many animal bones and potsherds. At the pillar, below one foot of the mud or clay, was a bed of charcoal more than one foot in thickness, and under this at a farther depth of one foot was a second bed of charcoal of similar thickness; and beneath this again, and under another intervening foot of the dried mud, was a third bed of charcoal; these beds containing also bones and potsherds, some curious instruments of iron of indeterminate use, besides arrow heads, knife blades, ornamental implements of horn, bronze ring-pins, &c. Near to the pillar, a depth of seven feet seems to have been removed; and near to the end of the cave, no less than twenty-seven feet were cleared out, without evidence of a true or natural floor of the cave having been reached. It appears to have been an interesting exploration, worthily undertaken, and honestly carried out. On leaving the cavern, the Low should be climbed for the sake of the completely panoramic view from the top, which can have few equals. The borders of Wales are believed to be visible on one side, the range of country between Ashbourne and Derby is seen on the other side, and the hills near Longnor on the other, and the country more immediately around is various and beautiful. A walk of about a mile leads thence to the village of Wetton, where the carriage may be conveniently rejoined; and a drive of about four miles, through interesting scenery, leads from Wetton to Beresford and Hartington; and Beresford Dale should be seen, if time permit. The return to Buxton, notwithstanding somewhat rough roads, should be through

Sheen to Longnor, over an upland road, whence there is an extensive view of the scenery that has been passed through, and from which Longnor and the whole of the valley of Crowdecote, with their mountainous surroundings, may be seen to advantage.

Another circuit, of about fourteen miles, is obtained by again following the Ashbourne road nearly as far as the third milestone, thence turning to the right, passing through Earl Sterndale, and over the road which skirts the eastern side of High Wheeldon. The carriage should be left at this point, and High Wheeldon climbed, for the sake of seeing the extensive view from the summit of its great and curious conical elevation; and then, having returned to the carriage, the journey is continued, by Crowdecote, to Longnor, returning to Buxton by Glutton Bridge, regaining the Ashbourne road at the same point at which it had been left.

The first six miles of the road to Leek present a hilly road and wild scenery, and from this point the descent presents views of great extent and much beauty and interest. Leaving the Leek road about five miles from Buxton, the small hamlet of Flash, with its church, is soon reached; and thence a rapid descent, along a tolerably good road, passing near to the bank of the river Dane, here a small stream, although of some beauty in parts of its still early course, leads to Quarnford, with a bridge across the river Dane, and thence to the small hamlet of Gradbach. The explorer's intention must now be determined. The carriage, which may be eight miles from Buxton, may remain at Gradbach until the return from Ludchurch and the Castle Rocks; or the driver may be directed to return to Quarnford, and thence drive to the inn at Bramcott, or the Royal Cottage Inn, both on the road from Buxton to Leek. The tourist walks westward through Gradbach, passes an old mill, crosses

a couple of fields, and finds himself in a charming gritstone valley. There is a wooden bridge across the stream, and the footpath ascends the opposite hill side into Gradbach Plantation, with the Castle Rocks immediately on the west. The footpath presently leads to a forest road, which is to be followed about half a mile, until the Castle rocks are almost reached. These rocks are a curious and commanding landmark, which will have been visible all the way from Flash, and form one of the bold features of this remarkable district of country. From the vicinity of Castle Rocks, the whole of the valley with its wooded steeps, jutting masses of rock, and the view in the direction of Flash, are seen to advantage. Thence a road branches to the south-west, and presently leads to the commencement of the rocky wonders of what has long been locally known under the name of Ludchurch. Placed near to the western extremity of a very extensive district of moorlands, uplands, and ancient forests, and offering the means of shelter and concealment to outlaws and disaffected people, the name may have been given to it as affording a natural sanctuary to criminals and rebels. Tradition assigns to Ludchurch the services of Friar Tuck in the presence of Robin Hood and his merry men; and there is every probability that, throughout the historical periods, these rocks and caverns have been, from time to time, the resort and shelter of those who had become placed in any way beyond the pale of the laws. The entrance is almost enarched by inclining rocks, leading to an almost circular first compartment, surrounded by bold rocky masses of considerable height; the path conducting from this down some rude time-worn steps to a long and narrow way with lofty sides of abrupt and rugged rock, adorned here and there with lichen and moss and tufts of fern and other vegetation. This rocky defile extends in the south-

easterly direction, and is left at the farther end by a flight of rugged steps.* There are fissures of considerable depth at the bases of the cliffs. The whole shows evidence of remote volcanic action. The opposite sides of the defile show in many places that they have been torn from one another by this gigantic power, fracturing their rigid substance, and only no longer allowing a linear re-adjustment if the detached surfaces were brought together again, owing to the wearing effects of ages after ages of time and weather. From the south-eastern extremity of these rocky eminences, and from the summit of the still higher moorland elevation immediately beyond, is obtained a good view of the plantation and valley of Gradbach; and from the west of these uplands there is an extensive view of Cheshire scenery, with the park and woods of Swithamly in the foreground, and Congleton and the hills and valleys of Cheshire in the distance; and, in extremely clear weather, with the neighbourhood of Chester and the Welsh hills on the Western horizon. A track or pathway conducts over the summit of a long ridge of rocks in the same south-easterly direction, commanding views on both sides. At a distance of a mile or less from Ludchurch, these rocky summits begin to assume the strange shapes and characters which have long given to them the distinctive name of the Roches. Extending along a distance of several miles, the rocky summits varying in shape, in surface, and in size; some of them being channelled with the winds and the rains of hundreds of years; others evidently corresponding exactly to masses at a distance of yards apart from them;

* Mr. Sleigh, in his History of Leek, says that Ludchurch is by measure 208 yards long, and from 40 to 50 feet deep, the sides of which so overhang that snow often remains therein during the summer, "whereof was a signal proof on Leek fair-day, July 17th, at which time a Warnford man brought a sack of snow there, and pour'd it down at the mercat cross, saying I could help thee to a hundred loads." —*Dr. Plott's History of Staffordshire, 1686.*

while view after view of the less elevated country is obtained throughout the whole extent; will be admitted to render this one of the most interesting expeditions even in this neighbourhood. A little attention to the map of the district will show the possibility of returning from the whole or from any part of this expedition, either through Gradbach, or by the Royal Cottage Inn, or by Bramcott, at discretion.

Six miles on the road to Macclesfield, near to the roadside inn, the "Cat and Fiddle," is the very remarkable view already mentioned over Lancashire and Cheshire, which probably extends over a distance of fifty miles.

A very beautiful long drive is obtained, by leaving the Bakewell road, near to the fifth milestone,—proceeding thence by the road to Millers' Dale,—keeping on the lower road near to the river, as far as Litton Mill,—passing thence over Cram-side to Cressbrook, and thence into Monsal Dale; and, at the part where Monsal Dale bends suddenly to the west, either remaining with the carriage and leaving the valley scenery, and proceeding in the carriage to Ashford, and thence to Buxton,—or leaving the carriage at the bend of the valley, and crossing the river, to ramble through the remainder of Monsal Dale, and regain the Bakewell road, and rejoin the carriage after it has made the circuit by Ashford, opposite to the eighth milestone from Buxton.

Bakewell, Chatsworth, Haddon Hall, Matlock, Tideswell, Eyam, Middleton Dale, Castleton, Beresford Dale, and Dove Dale, form severally, as will have been already inferred, most interesting objects for excursions from Buxton; and the most distant of them can hardly be said to be beyond the limits of a long day's drive. Middleton Dale, about twelve miles from Buxton, is a limestone valley of considerable beauty.

Sheffield is twenty-six, Chesterfield twenty-three,

Nottingham thirty-five, and Ashbourne twenty miles from Buxton.

The many and various archæological remains in the different parts of the district, also supply interesting objects for excursions. This mountain range of country must have had, in most ancient times, a degree of importance that may be conceived with difficulty, when seen through the vista of the historical periods of time: when life and property were insecure, when the morasses of districts on lower levels were undrained and unhealthy, when the means of subsistence were obtained chiefly from the chase and from the flocks, when the whole land was but thinly peopled, when lead mines and forest lands would add to the employment-finding capabilities of this mountain district, it is probable that it was at least as fully peopled as other parts of the Midland Counties; and it might be expected that, at least, the local landmarks of names, and the vestiges of such of the ruder constructions of the period, as might be large enough to defy the destroying influence of time, would be found scattered here and there. And, accordingly, although the map of the district, so ably and so accurately constructed by the Royal Engineers, under the Board of Ordnance, was by no means primarily intended to afford instruction in such matters, the frequent occurrence of such names as Pike Low, Knight's Low, Bee Low, Arbor Low, High Low, Great Low, Nine Ladies, Andle Stone, Rowtor Rocks, King's Stone, Stone Barrow, and Tumuli, in many districts and positions,—and of such words as goit, clough, tor, gill, slack, &c.,—serve to mark places where those persons who prize such ancient records, may expect to meet with materials for investigation.

Of such remains, probably the most interesting and perfect is Arbor Low, which has been called "The Great Druidical Temple of North Derbyshire," and is the site

and only record of what was, in all likelihood, one of the rude but massive constructions for the barbarous religious purposes of the ancient inhabitants of this country. Similar gigantic ruins are found elsewhere: as the one on Salisbury Plain (Stonehenge), and the one near Avebury, likewise in Wiltshire. The ancient circle of stones at Arbor Low is on the left-hand side of the turnpike road from Buxton to Ashbourne, beyond Parsley Hay, about nine miles from Buxton. It will be found without difficulty by following the road to the left from Parsley Hay, a little beyond the eighth milestone from Buxton, and then following the first road to the right, about half a mile. The remains with the embankment will be noticed on the top of the second upland field on the right, consisting of a circle of large unhewed stones, rough, most of them from six to eight feet long, and three or four feet broad in the widest part, but of variable thickness, and extremely irregular shape. There may probably be said to be, at the present time, about thirty in number; but this may be doubtful, as several of them have evidently been broken. These are blocks of limestone, and they are all now lying upon the ground, many of them in an oblique position. Within the circle are some smaller stones, scattered irregularly; and near the centre are three larger stones, conjectured by some, probably without sufficient reason, to have formed part of a cromlech, or altar. The circle is surrounded by a deep ditch, outside of which is a mound, bank, or vallum. The area encompassed by the ditch is about fifty yards in diameter; the width of the ditch is about five yards; and the height of the vallum, although probably much reduced by time, is still from four to six yards. The whole circumference is computed to be about 270 yards. There are two entrances to the area, of the width of several yards, opening towards the north and south.

Numbers of the stones which originally formed this ancient structure have gradually become buried under the accumulations of hundreds of years. The irregular surface of the whole area, and some stones only partly covered over, prove the truth of this statement. It is confirmed by the well-known circumstance that all ancient constructions become thus buried in the course of ages. Successive cities are found to have been built upon the present site of London; and the ancient city of Uriconium, near Shrewsbury, has been passed over by the plough; and Nineveh, and other cities of bygone histories and people, are discovered at considerable depths below the surface. The wonder may well be, that the ancient circle of Arbor Low should have been left, so far as it is, unburied, after the lapse of more than two thousand years; that its vallum should still be traceable, and its fosse not entirely filled. This may be mainly due to its position on a rocky, grass-grown, and sequestered upland.

A *barrow* of extreme antiquity, on the eastern side of the southern entrance, was opened by the late Mr. Bateman, in the year 1845, and confirmed the ancient character of the whole adjacent structures. The tumulus was cut across, from the south side to the centre, and a shoulder-blade and antler of the large red deer were found in the excavation: and beneath the highest part of the tumulus a flat stone was discovered, about five feet long by three feet wide, lying horizontally; on removing which a small six-sided cavity was exposed, formed by ten stones, and having a flooring of three similar stones, neatly jointed. Within this space was found a quantity of calcined human bones, and also a rude kidney-shaped instrument made of flint, a pin made from the leg-bone of a small deer, and a piece of spherical iron pyrites. At the west end were also found two urns

of coarse clay: the one of rude form, the other of a beautiful, artistic shape. As an illustration of the contents of the tumuli or ancient barrows in this district, the description is interesting; but more particularly as adding to the evidence of the antiquity of the remarkable circle at Arbor Low. In some of these tumuli there have been found one or more human skeletons, more or less entire, together with urns, vases, incense-cups, drinking-cups, spear-heads, necklaces, enamels, &c.: some of them of extremely tasteful character and design, while evidencing the rude means of their manufacture. About a quarter of a mile to the west of this Arbor Low circle is a conical tumulus, known under the name of Gib Hill, which is connected with the vallum of the circle by raised earth, and has been likened to what is called the avenue of the great ancient circle of Avebury.

There is also a small stone circle, probably of similar antiquity and character on Harthill Moor, between Winster and Youlgreave, in a field called Nine Stone Close. The circle is about thirteen yards in diameter, and now consists of only seven rough and irregular stones; the largest being about eight feet in length, and nine feet in circumference. On Stanton Moor also, between Winster and Rowsley, there is a smaller circle, eleven yards in diameter, called the Nine Ladies, consisting of nine stones, from three to four feet in height; near to which are several barrows, most of which have been examined. At the east end of Abney Moor, adjoining High Low Moor, is also a small circle of stones, thirty-three feet in diameter, surrounding four larger upright stones, the whole enclosed within a vallum. On Eyam Moor, on Froggatt Edge, and on Hathersage Moor, are still the remains of smaller circles, with tumuli or barrows evidently connected with them.

Rightly or wrongly, many isolated rocks of fantastic

shape, or noticeable from some peculiarity of character, have been described by writers of different periods as being archæologically interesting, and as possibly having been used in the worship of the aboriginal inhabitants of Britain. Such are the rocks called Rowtor or Rooter rocks, or rocking stones, near Winster. Mr. Bateman describes them as being "a remarkable assemblage of rocks, which extends in length between seventy and eighty yards, and rises to the height of about forty or fifty yards. Near the east end is a large block of an irregular shape, which several writers have noticed as a rocking stone, which could be shaken by the hand; now, however, it requires the whole strength to put it in motion, through having been forced from its equilibrium by the mischievous efforts of fourteen young men, who assembled for that purpose on Whit Sunday, in the year 1799. It has been restored to its former situation, but the exact balance it once possessed is entirely destroyed. Its height is about ten feet, and its circumference in the widest part is about thirty; its base has a somewhat convex form, and the rock on which it stands appears to have been hollowed to receive it. At a little distance northward, is a second rocking stone, not very dissimilar to an egg laid on one side, which may be moved by a single finger, though twelve feet in length, and fourteen in girth. More directly north is another rocking stone, resembling the latter both in figure and facility of motion, and at the west end are seven stones piled one over another, various in size and form, but two or three very large, all of which may be shaken by the pressure of the hand: the effect being produced by the application of the hand to various points. Nearly a quarter of a mile west of Row Tor rocks is another assemblage of large rock, called Bradley Tor; on the upper part of which is a rocking stone thirty-two feet in circumference, of an

orbicular shape, and raised above the ground by two stones, having a passage between them. Near the south-west side of Stanton Moor is an elevated ridge, which rises into three craggy eminences, respectively named Carcliff Rocks, Graned Tor, and Durwood Tor, upon all which are excavations or cavities, imagined to be rock basins, and no doubt produced by natural causes."

Referring the reader for additional information on these ancient remains to the work of the late Mr. Bateman, it may be added that a second work was published by him in the year 1861, entitled "Ten Years' Diggings in Celtic and Saxon Grave Hills:" the barrows opened by him, or found to have been previously opened and emptied, having been met with in all parts of the upland district around Buxton; including Buxton and Fairfield, Ladmanlow, Pig Tor, Stadon, Woolow, Eildon Hill, Longnor, Hollins Clough, Warslow, Ecton, Wetton, Hartington, Sheen, Middleton, Youlgreave, Hopton, Chesterfield, Bakewell, Ashford, Eyam, and Tideswell. Sometimes there were found entire human skeletons; with or without urns, which in some instances contained burned bones, in others were empty. The skeletons were sometimes found in a sitting position, but more usually on one side, and much doubled up, so as to occupy a smaller space. The interiors of the barrows were formed of rough stones, placed side by side, or end to end, so as to form a flooring and sides, with two or three flat stones laid loosely over the top. Such instruments or ornaments as beads, chain-work, spear-heads, daggers, celts, axes, arrow-heads, cups, &c., formed of bronze, iron, gold, glass, flint, and bones, being occasionally met with in these ancient tombs. The number of the localities mentioned will serve to prove the statement that the district around Buxton must have been peopled in remote times; and perhaps more particularly the

district on the south-east of Buxton. The times referred to are antecedent to other trustworthy historical records than can be gathered from the burial places of the people, or from the rude circles of unhewn stones that seem to have been to some degree indestructible by time.

As coeval with the Roman period of our history, the late Mr. Bennett, of Chapel-en-le-frith, describes in "The Reliquary," an ancient and embanked course, which he considers to have been formed during the time when Britain was occupied by Romans, and to have been intended for the chariot races, and similar sports, known to have been so much in use during the later centuries of the great Roman Empire. "At the distance of half-a-mile north-east of Whaley Bridge, in the parish of Chapel-en-le-Frith, upon the estate of Thomay Guy Gisborne, Esq., and near to Horwich House, is one of these Rhedagua. It has always borne the name of Roosdyche, and is now in a perfect state of preservation, and might, at this moment, over a considerable part of it, be used as a race-course. It is an artificially formed valley, averaging in width 40 paces, or 83 Druid cubits, and 1,300 paces, 2,228 Druid cubits, in length. It is in a great measure cut out of the side of the hill, to a depth of from ten to thirty feet, but where it is not so, it is enclosed on both sides with banks of earth. The sides of that part which has been excavated are covered with oak and other trees, which form a noble avenue, and invest it with a majestic and sombre character. At the east end of the course is the goal, and at the west end are the remains of the metœ, and other tumuli, and also several other valleys, of smaller dimensions than the Rhedagua, where it is probable the chariots and horses, not actually occupied in the race, were placed until their turn arrived to

engage in the noble strife. The spectators were doubtless ranged upon the sides or banks, on each side of the course, all along its length; and many thousands might easily have found accommodation."

It is curious that such a cursus should also have been found in connection with the great ancient circle at Stonehenge; and this might occasion a doubt whether the cursus should not be referred to a still earlier date than that of the Roman occupation of the country; and yet it is not difficult to suppose that the site for public games and sports might have been fixed near to that of structures which would have been resorted to by the people, perhaps during many previous centuries. Leaving the road from Buxton to Whaley, at Horwich End, and following the road to Chapel-en-le-Frith for a very short distance, a steep narrow and curved road to the left is to be followed, which soon leads to this ancient cursus. A wall that has been built across the course may be reasonable matter of regret; Mr. Bennett's description will be found to be by no means overdrawn; and the view from the top of the southern embankment is rather pretty and extensive.

With the exception of what may be gathered from the details already given, Buxton and the townships immediately around it may be said to be destitute of either buildings or other remains of archæological interest, or even of mediæval antiquity. The Old Hall Hotel is the only building, any part of which can be said to be more than two hundred years old, unless an older date can be assigned to a small church in the higher part of the town, called the Old Church, which had been long used as a schoolroom until it was restored in the year 1840, by the kindness of the late Duke of Devonshire. The date of this church is unknown; but it can hardly be suffi-

ciently old to give importance to any inquiry. There is the date on the Porch 1625, but this is a more recent erection than the Church. There is in existence a brass plate, bearing the date 1674, containing a list of benefactors towards the salary of the schoolmaster, and towards the repairs of certain highways. The somewhat interesting Old Church, designated as St. Ann's Church, was again disused for some years, except as a mortuary chapel, or as a Sunday School, until the year 1885, when it was again restored to church use. The covering, of slabs of stone, and the walls are as sound as when erected more than three hundred years ago. There was a chapel, dedicated to St. Ann, in connection with the baths and wells, before the time of the Reformation; and there were records and valuable memorials preserved in it; but these were all destroyed, together with so much else throughout the kingdom, the loss of which is irreparable.

It may perhaps be conveniently stated here, that, in addition to this small, old church, there is St. John's Church; a costly building, without either ecclesiastical character, or architectural consistency, with the date 1811: there is the church at Fairfield, re-built in 1839; there is the church of Burbage, a small but very pretty church, of Norman architecture, with a peal of bells, erected in 1861; and there are Wesleyan chapels in Buxton, Fairfield, and Burbage; a very handsome building, with a spire, called the Congregational Church, belonging to the Independents: and a small neat Gothic chapel, belonging to the Roman Catholics. There is, in St. John's Church, a very handsome pulpit of alabaster and marble, erected in 1867, from designs by Mr. Henry Currey, to the memory of Bishop Spencer. There are also, in this church, handsome mural monuments to the memory of Mr. Smithers and Mr. Wilmot, successive

agents to the Duke of Devonshire's estates in the district of Buxton; and to Mr. Samuel Turner, a much respected inhabitant; a font and baptistry and beautiful stained window to the memory of Dr. Dickson; and a beautiful large stained window to the memory of the Rev. R. P. Hull Brown, a former vicar of Buxton. A third church, St. James's Church, has been more recently erected. It supplies accommodation to seven hundred persons, and all the seats are free and unappropriated. It is a pleasing ecclesiastical structure. It was designed by Messrs. Taylor, of Manchester, and does them great credit. Both exterior and interior are full of careful and well-considered detail. It is situated near to the west end of the Cavendish Terrace, or the Broad Walk, and very near to the Old Church.

CHAPTER III.

EXTENT AND BOUNDARIES OF LIMESTONE AND GRITSTONE FORMATIONS.—CLIMATE.—THE BUXTON SEASON.

THE mountain-limestone formation, to which the district of the High Peak of Derbyshire owes so much of its character, is of considerable extent. Its greatest length, from the Blue John Mine, near Castleton, which is on its extreme margin on the north, to Sally Moor (near Wootton, about two miles to the north of Alton Towers), the extreme margin on the south, is nearly twenty-three miles. Its greatest width is from twelve to fourteen miles; the narrowest part, from Middleton-by-Youlgreave to Hartington, is five miles across. These measurements are given geographically, without reference to the windings of roads. The average addition of one-sixth will give a sufficiently near approximation to the distances by the roads.

Buxton is on the north-western margin of the limestone formation; and its boundaries may be readily traced from thence. Fairfield and its common are likewise on the margin of this formation; the higher grounds of Corbar and Black Edge being on the gritstone. The Water Swallows, at Dove Holes, are on the edge of the limestone. The road from thence to Castleton passes very near to the margin of this formation; the Blue John Mine, to the right of the road, at the upper end of Hope Dale, as has been said, being on the limestone formation; and Mam Tor, on the immediate left, and the whole of the districts of Chapel-en-le-Frith, Glossop,

Kinderscout, and Edale, being beyond this formation. The town of Castleton is beyond the edge of the limestone; and consequently, the great cavern of the Peak is on its very margin. Middleton Dale is near to its margin; Eyam, Stony Middleton, Baslow, and Bubnell, are beyond its margin. Bakewell and Ashford are on the limestone, but close to its margin. The Vale of Haddon, Rowsley, Edensor, and Chatsworth, are beyond the limestone margin. Youlgreave and the adjacent hamlets of Middleton, Elton, and Winster, are on the margin of the limestone. The village of Matlock is on the adjoining formation; Matlock Bath and its valley are on the limestone formation, but close to its margin. The villages of Brassington and Tissington are on the edge of the limestone formation. The considerable hill, Thorpe Cloud, at the southern extremity of Dove Dale, is on the edge of the limestone. Ilam Hall is on the margin of this formation.

The limestone formation is surrounded by the great formation of millstone grit, interrupted occasionally by limestone shale; and this formation surrounds the limestone, in almost all directions, with ground of higher elevation than its own high level; the difference sometimes amounting to between eight and nine hundred feet. The gritstone formation is particularly extensive on the north and west sides, but gives a boundary to the limestone formation of several miles in breadth on the east. On the south, there is a very narrow and irregular edging of gritstone, which separates the limestone from the new red sandstone formation.

The climate of the district is necessarily much affected by the physical conditions which have now been shown to obtain throughout this extensive tract of elevated country; and which extends from Buxton to an average distance of from twelve to twenty miles, in all directions.

The elevation of the lowest part of Buxton may be said to be 1,000 feet above the level of the sea, the level of St. John's Church having been ascertained to be 1,029½ feet. The mean density of the air is by so much less than it is in most places. In the words of Mr. Whitehurst, "The column of quicksilver in the barometer tube is always an inch lower at Buxton than at Derby, at the same time and under similar circumstances." This difference in the degree of atmospheric pressure has much effect on the human system; and renders the removal of invalids to this district from places that are situated at a lower level, either eminently advisable or otherwise, according to the nature or the stage of the ailment. The effect of a change to this mountain air, on comparatively healthy people, is exciting and invigorating,—promoting circulation, appetite, and digestion, and increasing the buoyancy of the feelings and the general energies of the system. In the instance of the invalided, the probability of such excitement, the degree of which may be increased by the mobility which so often attends severe or long-continued morbid action, may render inadvisable the removal to such an air as that of Buxton. This observation is more especially likely to be applicable to those who are suffering from more acute morbid states; and especially when attended by much mobility of circulation, and great susceptibility of tissue. On the other hand, the mere debility and relaxation, which are so often consequent upon the removal or mitigation of acute disorders; and the mixture of debility and congestive torpidity, which so often accompanies protracted convalescence, and so often attends protracted indisposition of chronic character, are much relieved by removal to the thinner and less oppressive air of this elevated district.

The physical character of this mountain country may

help to explain the comparative immunity, which is enjoyed by its inhabitants, from epidemic and endemic diseases. The dry and absorbent soil, which distinguishes almost the whole of the limestone formation, and the greater part of the gritstone formation,—assisted, as this is, by their elevated position,—must conduce much to this result, by diminishing the amount of stagnant water, and other sources of miasmatous impurity. Even the ordinary exanthematous epidemics—measles, scarlatina, and the like—are usually of singularly mild character in this district; and typhus, and even common continued fever, rarely occurs, unless when brought into the district by persons who have been sojourning in less favoured places; and when thus met with, has very seldom been known to have extended to a second case. It has to be said, moreover, that no case of epidemic cholera has occurred in Buxton during any of the visitations of this fearful disease.

If all this were truly written when the present work was first issued; or so long ago as the year 1838, when the work entitled "Buxton and its Waters" was first published, it may be hoped that more confidence must be felt as to the sanitary condition of Buxton, Fairfield, and Burbage, since they have been placed within the provisions of the Act for the Local Government of Towns, and since, in connection with this important measure, the main sewerage and drainage of the place have been so far secured, under the able direction and superintendence of Sir Robert Rawlinson and others. There is only too good reason for the opinion, that intestinal or typhoid fever, with all its disastrous consequences, depends on the poison of sewage emanations; and the only security against this fearful risk to health and life, must be derived from the complete manner in which such impurities are at once removed from houses, streets, and

drains. It were well, if a security of this important kind could be obtained for every town and village in the kingdom; and if such a measure, in the local and national interest, could be forced upon every tenement, whether in town or in country districts. It were at least well if every watering-place, the resort of the toil-worn, for recreation, or of invalids in search of health, were compelled to present such a diploma for the security of its visitors; and it were at least wise and prudent that no such watering-place should be visited until after such inquiry as to its sanitary character had been made, and been replied to satisfactorily. There is no doubt that one effect of change of air is to increase the sensitiveness of the animal system, to render it more susceptible to all external influences, whether morbific or otherwise; and that it is therefore more important, if such were possible, that there should be no poisonous taint in the air of a place resorted to for change of scene, or the use of a mineral water, than that there should be no such taint in the air to which use may have habituated the individual system. The wretched prisoners who breathed, during weeks or months, the mephitic air of the gaols, in the mediæval times, often escaped an attack of the disease, which they carried with them in their clothes, to spread the seeds of disease and death through the courts where they were tried, or the houses to which they returned on their acquittal; and sailors have often escaped the fever or the dysentery, to the risks of which they had been exposed during a voyage in an impure ship, to carry pestilence to the inhabitants of the town at which they have landed.

The bearing which the high elevation of Buxton above the level of the sea appears to have upon the probability of its exemption from cholera is very interesting and

curious. It was announced by Mr. Farr, in the admirable report on cholera in 1849, and has been since confirmed by farther statistical experience, that the mortality from this dreadful malady increases as the level of places in an affected district is lower; and not only that localities of higher level have a less liability to the disease, but that the degree of immunity may be measured by the degree of the elevation. This law must be liable to contradiction or disturbance under very powerful local exciting and predisposing circumstances, and would not be held to justify in any case the neglect of the common principles and conditions of public hygiene; but it is curious as a great truth, derived from extensive statistical data, and interesting in regard to the climatorial and hygienic character of the Buxton district. And this may help to explain the observation that influenza is believed to have been a much milder ailment in Buxton than in most other places, both as to its immediate severity and its ulterior consequences. The importance of this could hardly be overstated, when it is remembered how much more frequently the visitations of this great catarrhal epidemic have occurred of late years; and that they are believed, either directly or indirectly, to have resulted in a greater amount of fatality than any other epidemic disease. In forming an estimate of the degree of fatality which attends influenza, "It is necessary," as the late Dr. Theophilus Thompson well said, in the able volume compiled by him for the Sydenham Society, entitled "Annals of Influenza," "to extend our consideration to the fact that during the prevalence of catarrhal fever the mortality is usually increased, often to a very remarkable degree. The cause of influenza, independently of its agency in producing characteristic symptoms, appearing to exert a power to modify any pre-existing disease with which it may combine, to impair

extensively the vital energy, so as to increase in the population of an infected district, the liability to contract other diseases, and also to lessen the ability to resist any degree of fatal tendency which such concurrent diseases may possess." Such is, beyond all question, the explanation of much of the indirect fatality, which is referable to all the more severe epidemic diseases. To form a true estimate of their effects, the mortality that can be directly estimated must be considerably added to. And when it is considered that, according to the able and trustworthy reports of the Registrar-General, nearly one-fifth of the total mortality of England is referred to "epidemic, endemic, and contagious diseases," too much importance can hardly be attached to the physical and sanitary character of any locality, in which a considerable degree of exemption may be obtained from these fatally influential classes of disease. If the mortality from all such diseases may be estimated, with much probability, to be in the ratio of one in twenty of those who are attacked, the smaller amount of sickness, protracted indisposition, and resulting debility, which a large degree of exemption secures to the inhabitants of this district, in addition to the lower rate of the probable mortality, deserves to be prominently mentioned in this work. It cannot be disputed that a remarkably high average of health is enjoyed by the inhabitants of this district; the general healthy aspects of the children are the subject of frequent observation; and the large number of people who live to an advanced age has always been noticed. Such popular statistics, however, if unfounded on precise data, are not to be received with implicit trust; but that there is an important degree of exemption from endemic and epidemic diseases, that they are generally of comparatively mild character when they do occur, and that all diseases throughout the district are

commonly of very mild and simple type, is the universal experience of the medical residents.

But positive data exist in regard to the sanitary character of the Buxton district, and these have been already recorded in the earlier part of this work. It is reasonable to expect that these results will become of still more satisfactory character, as the effect of the main drainage and sewerage of the Buxton district, carried out and completed in the years 1860 to 1885. In regard to the sanitary condition of the town and district, in regard to the comparative immunity from epidemic and endemic diseases, in regard to general healthiness and probable longevity, the inhabitants have indeed much for which to be thankful; and in regard to the climatorial and hygienic conditions offered by the district to occasional residents, and more especially in regard to the desirability of the district as a resort for the purpose of health or recreation, by the residents of the less elevated and more populous districts, no stronger testimony can be adduced than is to be derived from the facts and figures of such statistical investigations.

The mountain position of Buxton and the surrounding districts renders the whole locality colder than lower situations in the same latitude. The inland position, moreover, renders the mean annual temperature less equable than in places which are more within the influences of the oceanic temperature. There are two circumstances which deduct considerably from these disadvantages. The one of these is the degree of shelter from prevailing winds, which is afforded by surrounding grounds which have a still higher elevation. There is an appreciable difference of temperature between the upper and lower parts of Buxton in cold weather, and more especially if accompanied by high winds, blowing from

the north or north-east; and there is a much greater difference of temperature between Buxton and the surrounding villages, which are less sheltered. But within these sixty years many hundred acres have been covered with plantations, now of an advanced and important growth; which serve, not only to clothe and embellish the scenery of this large-featured country, but to shelter it from the winds in an important degree. The second modifying circumstance referred to is the relative dryness of the air of the place, which greatly subtracts from the effects of an absolute lowness of temperature. Dr. Kilgour says that "cold moist air, compared with cold dry air, abstracts caloric from the body in the ratio of three hundred and thirty to eighty degrees," or more than four times as rapidly. In other words, the chilling effect of the cold moist air is four times greater than that of cold dry air; and therefore the absolute lowness of temperature at Buxton, compared with the temperature of less elevated places, may be sometimes fully, if not more than compensated, by the dryness of its atmosphere. The dry air of the Buxton district is one of the most interesting of its characteristics: it is in general singularly free from fogs and exhalations, and remarkably clear; enabling the objects of distant scenery to be seen with most defined distinctness. This is partly due to the altitude of the place; partly to the attraction of the clouds and condensed vapours in the higher regions of the air, by the more elevated ground in the neighbourhood; and partly to the comparatively small amount of aqueous exhalation, charged with organic contamination, owing to the absorbent nature of the limestone and gritstone soils. It should likewise be said, that immediately after the heaviest rains, the grounds and walks and roads in the town and neighbourhood are found to be dry, to a degree which excites the surprise of all strangers. And, therefore, although, as in most

mountain districts, more rain falls in the High Peak of Derbyshire than in most places of less elevation, the effect of the rain is less observable or inconvenient. But the Buxton district does not receive the whole of the rain, which its mountains may be the means of collecting. It is sometimes observable that clouds which are collected around Axe Edge are precipitated on the adjacent districts of Cheshire and Lancashire, when there is no rain near Buxton. The enclosure of thousands of acres, which were unenclosed and bare of pasture within the memory of the present generation, and the drainage of extensive districts for agricultural purposes, are progressively influencing the climate and scenic character of these upland districts. It is almost difficult to imagine how recently a large proportion of the country around Buxton, and within many miles of it on all sides, was without an enclosure, and covered with heath, gorse, and rank vegetation, the trees having been as yet unplanted which now so much embellish the landscape in all directions.

The beneficial effects of the air of Buxton upon some of the invalids who resort to it cannot be wholly explained even on the ground of its mountain elevation, or on that of its dryness. It sometimes happens that invalids from the neighbouring gritstone districts, of an elevation at least as considerable as that of Buxton, are more benefited, and more rapidly benefited by removal to the limestone formation, than the mere change of air, or any other concomitant circumstances can serve to explain. There is indeed usually an amount of stimulating effect produced by the limestone atmosphere upon those not accustomed to it, which neither the elevation of the place, nor the dryness of the air, can be held to explain. It frequently happens that invalids, who are strangers to the place and district, and who state that the remark has

not been derived from any second person's suggestion, affirm explicitly that they can *smell* the air of the limestone. On inquiry, it has seemed that they have experienced a tingling sensation in the nostrils from the air, rather than that the air has been really odorous to them. That there may be important atmospheric differences, which are not appreciable by chemical re-agents, is universally admitted; and it is not too much to suppose that the air may be influenced by passing over or resting upon extensive districts, either according to their vegetative surface, or their geological character. There is some such effect produced on the air of this district by the great limestone formation; and the result of this is, more particularly, to add to its stimulating influence on the human system.

The spring in Buxton is unusually late, and proportionably short; the summer is of the average duration; and the autumn is long. The spring can seldom be said to have crept from the arms of winter until the month of April; and, in general, April is near its close before the winter can be said to be fairly got rid of. From the middle of May to the end of October,—and in some seasons until considerably later, and almost to the end of the year,—may be said to constitute the real spring, summer, and autumn of Buxton. July and September are apt to be wet months throughout England. The latter end of May, the whole of June, of August, and of October, are usually the least changeable periods of the year.

The Buxton waters, whether used as baths or internally, are equally efficacious at all periods of the year;* and those who are suffering severely from those

* "The usual season for drinking the waters is from the beginning of May to the latter end of October; but if the patient requires a longer perseverance, he may safely use them all the winter, as they are found, upon repeated trials, to be equally good in all seasons."—Dr. Hunter's "Buxton Manual, or Treatise, on the nature and virtues of the Waters of Buxton," York, 1765.

ailments in the relief of which they act so powerfully, make use of them at any time throughout the year. But people who have a choice generally prefer the summer and autumnal months for migrating to watering-places; for the obvious reasons that the country always looks best when Nature has donned her livery, when the sun is bright, and the weather warm; and that exercise, which is so valuable an auxiliary to all medicinal treatment in chronic cases, can then be taken most pleasantly, and perhaps with most advantage. It is difficult, however, to understand why Buxton should not be as full of its invalided visitors in June and July as it is in August and September. This may have arisen from fashion and secondary circumstances; but time and common sense must one day show its absurdity. The comparatively cold evenings and mornings of autumn, and the greatly shortened days, render the exercise which can be taken at this time of the year, less continuous than that which may be taken in the later spring months and the summer months, and make the disposal of his time irksome to many an invalid, in whom indisposition may have spoiled the taste for reading, and for whom the excitement of much society may be necessarily disadvantageous. When invalids visit Buxton during the months of June or July, the days being then long, and dusk and bedtime but little divided from one another, the cheerfulness is more likely to be maintained, and the spirits and feelings made conducive to the effects of the mineral waters, rather than suffered to interfere with them; for it need not be said that the influence of the mind upon the body, at all times paramount, is more especially important for good or for evil when the latter is affected with disease.

I have used the word "continuous" with reference to exercise; and it may be well to embrace this opportunity

of expressing my opinion, that every one, and invalids especially, should take the quantum of exercise, not only regularly, but in divided doses, at different times of the day, rather than endeavour to do as much as can be done at one time, by which fatigue is induced, the blood is determined almost unduly to the surface of the body, the internal organs are disturbed, and the nervous energies are inconveniently, and it may be injuriously expended. This deserves to be seriously considered in regard to invalids, who may be enfeebled by indisposition, and whose systems may be predisposed to be acted upon by causes apparently the most unimportant. On such persons it cannot be too strongly urged, that they should not attempt to walk far at one time; but rather, that a number of short walks should be alternated by rests. This kind of exercise, which may be taken within an hour or two after breakfast, and continued for longer or shorter times, with longer or shorter intervals, almost until bedtime in the summer months, is that which will be found to be most useful to nearly all invalids, which will employ the mind most fully throughout the day, lessening the chance of the time seeming to be hanging heavily on their hands; while a more constant exposure to the genial and tonic influence of the air will be promoted: a point which, in regard to the value of Buxton as a watering-place, deserves, perhaps, a higher degree of importance than has yet been assigned to it.

But there is even a stronger reason to be advanced, why invalids should resort to Buxton as soon as the return of warmer and more settled weather permits them to leave home with comfort. There is more general activity in the system at this time of the year than at any other season; and a correspondingly greater natural effort made for the relief of the more chronic ailments than at any other period. This will have been noticed

by most persons, as well as by medical men. The return of spring, of warmer weather and brighter days, not only stimulates the dormant vegetation, and arouses the life of plants into a renewal of activity; but acts upon animal life likewise, and includes man in its effects; notwithstanding the artificial condition, and the artificial wants, which civilization has given rise to. The effect of such stimulus on the human system is seen, in a very obvious and painful degree, in the instance of those who are suffering the extreme stages of disease. The warmer air is too stimulating for the irritated and wasted tissues; and it has to be predicted of many such cases, that the more early the return of the season which is the more genial to the healthy, the sooner will the slender thread be divided by which such invalids cling to life. And it is no less observable in other cases, in which the effect of such stimulus is not to destroy life, but to aid in the restoration of strength and the removal of disease. It has often been suggested, in the instance of sufferers from the most chronic and obstinate of the disordered conditions, in the relief of which the Buxton waters are found to be so generally useful, that, in order to obtain the greatest amount of effect from their use, the earlier periods of the year should be taken advantage of, when the efforts of the system, thus stimulated by the season, will be most likely to aid and confirm their effects. This stimulating effect of spring upon the human system may be increased by the periodical type, which all the operations of nature are found to assume. There is a remarkable tendency to periodicity in all vital phenomena. It is not merely in regard to the seasons, the succession of day and night, and the alternation of repose and activity; but this law extends to all natural phenomena. And this great law may be supposed to aid in producing the development of all the vital efforts, which is so observable

in spring, and which is found to be of so much practical importance in regard to disease. The dryness of the air of Buxton is the probable cause of one singularly valuable peculiarity, which is observable in regard to the place. Invalids hardly ever take cold at Buxton. They may have only just quitted the bedroom to which they had been confined by serious and protracted indisposition, have travelled to Buxton closely muffled and packed in wrappings and multifarious envelopments; and, almost immediately on arrival, have ventured into the open air, have sat down on the benches with which the walks are abundantly supplied, and have spent hour after hour in this indulgence, which in most places would prove to be so dangerous; but here it is hardly ever followed by any unpleasant consequences; and, on the contrary, contributes to restore health and vigour to the enfeebled system. When it is considered that this observation has reference to a place which is resorted to for the use of tepid and hot baths, from the effects of which the vessels of the surface would be rendered unusually susceptible, its importance in a medical account of Buxton will be admitted to be great. The statement, however, must not be made use of to justify rashness, and sudden and violent changes in regard to exposure and clothing on the part of invalids; but it shows that to be justifiable which would otherwise be unsafe; and it illustrates strongly a valuable character of the air which superincumbs the mountain limestone.

Change of air is well known to be capable of producing much effect on the health of man. The amount of such effect is usually in proportion to the degree of the change, provided that it is not too great for the powers and susceptibilities of the system to endure without injury, and that the change is from a less pure to a purer air, and from an air that is damp to one that is dry. There are important disordered conditions in which

the removal to a damper air is indicated, and in which a low and well sheltered situation should be preferred. But these cases are the exception to what applies to the majority of disordered states. It cannot be wondered at, that the removal to such a locality as Buxton should be followed by beneficial results, in many of the diseases from which the inhabitants of low and damp localities suffer so severely. It must indeed be admitted, that change of air of any kind often does good. The secondary influence of mind and its associations may often justifiably assign a preference to such a change of air, as might seem to be less suitable to the generality of cases. There is, for instance, a virtue in the air of the native place, which may be inexplicable, unless the indirect effect of memory and association be allowed for, It has been said, that

> "Custom moulds
> To every clime the soft Promethean clay;
> And he who first the fogs of Essex breathed,
> (So kind is native air) may in the fens
> Of Essex from inveterate ills revive,
> At pure Montpelier or Bermuda caught."—*Armstrong.*

If this were so, the "custom" would probably have little to do with the result. The effect would have to be ascribed to the mental stimulus: to the influence of the scenes of the younger days on the mind, and through the mind on the body.

But, waving a consideration of such influence of mind, and of such special or exceptional cases as have been referred to, and of the cases in which disease may have so nearly done its worst, that an exposure to the ordinary breath of heaven could hardly be undergone with impunity, and to which the mildest and blandest air may alone be suitable, it may be affirmed that the locality in which the air is the most dry and pure, and the inhabitants are most free from disease, will be most useful to the generality of invalids, and that Buxton deserves to be ranked among the places which claim so high a character.

CHAPTER IV.

ORIGIN AND CAUSE OF THE HEAT OF THE THERMAL SPRINGS OF BUXTON.

THE temperature of the Buxton tepid waters is the first of their characteristics to be noticed. It is one of the most important of their sensible properties; for, although no one who had been witness to their medicinal effects could ascribe them to the temperature of the waters, yet this temperature must aid and increase such effects, and facilitate the admission of the saline and gaseous constituents into the systems of those who make use of them.

There are few subjects which have given rise to more speculation and inquiry than the cause of the elevated temperature of hot springs. Although there are only two districts in which such springs are found in England, they are by no means rare in most other countries. More than forty such springs are reported to exist in Portugal alone; the temperature of which ranges from 68 degrees to 150 degrees. Between sixty and seventy of these springs are said to exist in France; the temperature ranging from 70 degrees to 212 degrees. Switzerland and Italy are likewise rich in this respect. But the springs of Germany have far out-stripped all the others in medical importance, which may be ascribed, in some degree at least, to the personal efforts of the highly-gifted people of that country. The baths of Aix-la-Chapelle, Wiesbaden, Ems, Baden, and several others, are as well known by reputation in this country as to the Germans themselves.

Before directing attention to the causes which may produce the elevated temperature of hot springs, it may be endeavoured to be shown whence the water is derived with which these springs are supplied.

The water of all springs is derived from the atmosphere, or from large subterranean reservoirs, or from the ocean.

The water of most springs is derived from the atmosphere. The aërial vapours are condensed on the surface of the earth, in the form of rain, hail, or snow. The water percolates through the softer strata, finds its way through fissures or *faults* in the denser strata, until its progress is stopped by an impermeable bed of clay, &c. It is forced over the surface of such a stratum by the pressure of the superincumbent water, until it is carried once again to the surface of the earth, through a breach in the stratification above it, and forms a spring. But miners say, that the lower they descend below the surface the less water they meet with. Indeed, these waters can hardly be supposed, under ordinary circumstances, to penetrate very far without being absorbed by the strata through which they pass, or arrested, and again brought to the surface, by meeting with an impermeable stratum. Whereas boiling water is poured out by volcanic agency, at an elevation of many thousands of feet, on the confines of perpetual snow; and, consequently, the depths at which large collections of water may be supposed to exist may be inferred to be very considerable.

There seem, then, to be reasons for believing that there are reservoirs, or large collections of water, situated at very considerable depths in the bowels of the earth; while it must be added, that such collections of water can hardly be so considerable as to be independent of supplies from other sources, and to be capable of pouring out the immense volumes of water, which are discharged

from depths to which the atmospheric waters cannot be supposed to penetrate, under ordinary circumstances; or such discharges of water, in quantities so considerable, would materially increase the quantity of water contained in the atmosphere and in the ocean. It has been inferred that such subterranean reservoirs cannot be of such extent as to afford this large supply, from calculations by which a specific gravity is assigned to the globe of nearly five times that of water, and a third more than the mean density of its rocky crust. Such inferences, however, are without adequate foundation. The Andes, with their elevation of 25,000 feet above the level of the sea, have been well said to bear no greater proportion to the size of the earth that the roughness on the rind of an orange to the size of the fruit; and yet, compared with this, how little is the greatest depth to which man has penetrated. We can be little justified with such facts before us, in forming conclusions as to the composition of character of the internal structure of the earth.

But when we take into account the amount of volcanic agency, which is still going on in various parts of the earth's surface; when we consider that thermal waters spring, with few exceptions, in the neighbourhood of either recent or extinct volcanoes, or of such disrupted stratifications as are the results of volcanic action; when we couple with this the amount of volcanic power which is manifested in the ocean—the islands that have been upheaved from its depths, within the memory and authenticated traditions of men,—and the shocks that are often experienced far out at sea; when we connect these facts with another singular fact, that thermal springs, and indeed that volcanoes, are very rarely found at any great distance from the sea,—and indeed, when so found, are believed to derive their waters from great

inland lakes, or inland seas; and when to these considerations it is added that columns of watery vapour, and showers of boiling water, are among the principal phenomena of active volcanoes, it is surely not too much to connect intimately the waters of the ocean with thermal springs, and to conceive that the ocean is the probable source from which the waters of these springs may be derived. It does not appear to be too much to conceive that, through disrupted strata, or *faults*, at the bottom of the ocean, through chasms created by volcanic outbreaks, water would be forced by the enormous pressure of the mass of waters above; or that this should, under such pressure, and with the facilities created by the strata having been disrupted by the volcanoes, penetrate much deeper than we can conceive the atmospheric waters to penetrate. It may be conceived that, in this way, water may arrive at a centre of volcanic agency; and that there, urged by the heat that exists in the depths of the earth, this water may be converted into steam; and that, when the steam thus formed can find no vent, it may at length accumulate such power as to upheave the masses of strata above it, and in its turn become the active element of a volcano; or that, when the steam can find a vent for itself, by passing through strata already disrupted, it may be generally condensed and cooled, until it may emerge at length on the surface of the earth, in the condition of a hot or of a tepid spring, according to the length of the channel through which it has had to pass.

This is perhaps little more than theory; but it is theory founded on such an association of facts, as seems to justify a strong opinion of its probability. If it be denied, it is difficult to assign any satisfactory reason why thermal springs are not found as commonly in the interior of vast continents, as in the neighbourhood of

the ocean; why thermal waters are so constantly found to be connected with existing or extinct volcanoes; and why water, in the form of steam, or at a much elevated temperature, is so constantly associated with every volcanic outbreak. But this supplies an explanation of several circumstances, which form singular and interesting matters in the history of thermal waters. It gives a key to the surprising fact, that thermal springs flow in unvarying quantity, and at an unvarying temperature, from age to age;* and that, as far as can be ascertained, their constituents have been unmodified by time. If the waters with which these springs are supplied, were derived from the same source as that of the generality of springs, viz.: the waters condensed on the surface of the earth from the atmosphere, they would necessarily be subjected to the same vicissitudes. In a particularly dry season, the supply would be diminished, or would temporarily cease; and on the other hand, after an unusually large fall of rain, the quantity discharged from them in a given time would be greatly increased. But in regard to thermal springs, these causes have no influence. In winter and in summer, in dry seasons and in wet seasons, a certain number of gallons per minute are poured out with an undeviating regularity. Moreover, if these waters were derived from the atmosphere, the colder the season, the lower would be their temperature;

* "The springs in Greece still flow at the same places as in the Hellenic times: the springs of Erasinos, on the slope of the Chaon, two hours' journey to the south of Argos, was mentioned by Herodotus; the Cassotis at Delphi, now the well of St. Nicholas, still arises on the south of the Lesche, and its waters pass under the temple of Apollo; the Castalian fount still flows at the foot of Parnassus, and the Pirenian near Acro-Corinth; the thermal waters of Ædepsos in Eubœa, in which Sylla bathed during the war of Mithridates, still exist. I take pleasure in citing these details, which show that, in a country subject to frequent and violent earthquakes, the relative condition of the strata, and even of those narrow fissures through which these waters find a passage, has continued unaltered during at least two thousand years."—*Cosmos* (*Lieut.-Col. Sabine's Edition. Vol. I.*

and certainly, likewise, the larger the quantity of water poured forth, the lower would be its temperature. But, through long series of years, not only does the quantity of water poured out by these springs in a given time remain the same as it was at the most remote record, but their temperature remains steadily the same as when first noticed. Supposing the ocean to be the source from which these springs derive their supply of water, the definite quantity may be forced through the fissures, either by its gravity, or by the pressure of the superincumbent waters,—this definite quantity may be converted into steam, by the means presently to be noticed,—the steam may be condensed, and cooled to a definite degree, by passing through a definite space,—and supposing no waste to arise, from leakage or otherwise, 129½ gallons of water per minute, containing the same gaseous and saline constituents as now and heretofore, may continue to supply the natural baths of Buxton throughout ages to come.

The absence of sea-salt in any of the thermal springs might at first be considered to be fatal to the above views. But it has been sufficiently proved by direct experiment, that sea water is deprived of its saline constituents, by passing through a certain thickness of sand, &c.; and, therefore, the passing through we know not how many miles in depth of various strata would necessarily deprive it of all its saline matters, even if the hypothesis of its conversion into steam, and consequent separation from every foreign ingredient, were thrown aside.

Knowing as we do the gigantic extent of the processes of nature, and the uniformity of the means used to effect the same results, in different places and at different times, it may probably be inferred that the same cause, which produces the supply of water in the instance of any one of the thermal springs, might equally serve to account

for it in the others. Some general source, which may equally serve in regard to all thermal springs, is therefore sought for. But in regard to the Buxton thermal springs, the circumstance obtains that, in various situations, at no far removed distances, in the limestone formation, surface springs are swallowed up by fissures or cracks in the strata; some of which are found to re-appear at the surface, at different distances from what is locally called the *swallow*; and the whole of these may or may not so re-appear. It could not be thought to be impossible that such swallowed-up spring or springs should travel through such fissures, and serve to supply some vast subterranean reservoir, from which the supply of water to be vaporised might be obtained.

The cause of the elevated temperature of thermal springs is a question of still more immediate interest.

As has been said, thermal springs are always found in the greatest abundance, in the neighbourhood of active or recently active volcanoes; and volcanoes are hardly ever found to exist, without giving rise to springs of tepid water. In those situations where no traces of volcanic agency can be detected in the neighbourhood of tepid springs, these waters are found to issue from the primary rocks, either directly, or from beds of inconsiderable thickness, which evidently form merely a crust over rocks of the primary class. In some instances, the tepid springs are found in the midst of chains of mountains, or close to their base; in other instances, a succession of such springs is found in the same direction as that in which a mountain chain extends; sometimes, they "gush out at or near to the line of junction between the granite or other igneous products, and the stratified rock resting upon its flanks, which from its highly inclined position would seem to have been upheaved; whilst in a few cases where they occur in the midst of

the granite itself, patches of stratified rock are found contiguous. Thus the same agent which forced up the granite through the axis of the chain, may have given rise to the hot springs which accompany it first along the line of the disruption. * * * * * In many instances where the *general* aspect of this country does not so forcibly impress upon the mind the idea of volcanic forces having been in active operation, there is something in the *particular* circumstances of the locality indicative of the same kind of agency."—*(Professor Daubeny on Volcanoes.)*

Professor Daubeny goes on to cite the tepid spring at Clifton, as gushing out of a narrow fissure of hard rock, bounded by abrupt cliffs, with an enormous *fault* near to the north of the spring "which has thrown down the limestone beds one hundred and twenty feet," serving to justify the opinion that a mighty force has at some period rent these rocks in sunder, and opened the passage for the tepid water from deeply-seated strata; he cites Matlock "from the abruptness of the cliffs which bound the defile on either side, and from the existence of an enormous fault, much of the same description as that of Clifton," and justly adds "that the volcanic rocks which are found in many parts of Derbyshire afford an additional presumption that the tepid waters of that country owe their origin to volcanic heat;"—he cites the warm springs of Carlsbad, as emerging from "a kind of conglomerate, composed of broken masses of granite united together by a silicious cement," leading to the inference of riven rocks and shattered fragments and disrupted strata;—he cites the warm springs of Pfeffers, in the Grisons, bursting forth from the side of an extraordinary chasm in a limestone rock; adding that "the other thermal springs in Switzerland appear under circumstances for the most part similar," and that "the

situation of the thermal waters in the beautiful mountain region of Virginia, west of the Blue Ridge, which I visited in 1838, strongly corroborates the views above enunciated;" "in short, out of fifty-six springs more or less thermal, forty-six are situated on, or adjacent to, anticlinal axes; seven on or near lines of fault or inversion; and three, the only group of this kind yet known in Virginia, close to the point of junction of the Appalachian with the Hypogene rocks."

The position of the different tepid springs in Derbyshire confirms these views strongly. Not only do the broken and shattered strata, and the abrupt cliffs, and frequently occurring patches of toadstone, tell of volcanic action and riven rocks, and account for fissures by which such springs could find egress; but the springs occur near to the edge of the limestone formation in every instance; and in such situation, the continuity would be more likely to be broken through, down to more deeply seated strata.

Connecting these facts together, the conclusion seems to be justifiable, that thermal springs arise from beneath rocks of the primary class, through disruptions which have been caused by volcanic agency; and granting that thermal springs arise from terrestrial depths below all the strata which have been the subject of geological knowledge, it would remain to be shown whether the temperature of the interior of the earth may be adequate to raise large quantities of water, brought into successive contact with it, to the boiling temperature.

It has been observed, in many countries of high latitude, that when the atmospheric temperature falls below a certain point, the temperature of the springs in those countries ceases to fall in the same ratio; and, in fact, that their temperature often exceeds that of the air. Nor have these singular observations been confined to the

springs of the countries referred to. It is well known, that a certain elevation of temperature is essential to the life of plants, and that different plants have different ranges of temperature within which they can live. It is said to have been ascertained that rye requires for its growth a temperature of not less than 46 degrees; and yet, owing to the internal temperature which emanates from the earth, independent of the solar influence, this grain is grown and ripened in Sweden, where the atmospheric temperature is little more than 36 degrees. It would seem indeed that the mean terrestrial temperature exceeds the atmospherical in many northern districts, if not in northern countries generally; and that it is owing to this, that nearly the whole of Siberia, the upper parts of Finland, and some parts of Sweden, afford harvests and sustenance to the inhabitants, under a degree of atmospheric temperature which would be insufficient for these purposes, but for the inherent temperature of the earth. That this cannot be owing to the absorption of the solar heat during the warmer months, appears to have been proved by experiments, showing that six months are required for the absorption of heat to the comparatively trifling depth of thirty feet. But this is proved even still more conclusively by the ascertained fact, that the atmospheric temperature at the equator is higher than that of the perennial springs.

These observations would go far to establish an opinion, that the earth possesses a considerable degree of internal heat, which would almost necessarily become more considerable the greater the distance from the surface. But it is by the results of experiments which have been made in mines, that it has been established as a fact, that the deeper we penetrate beneath the surface of the earth, the higher the temperature is, and that we are enabled to form some idea of the depth at which the earth may be

at so high a temperature, as would suffice for the conversion of water into steam.

In the ancient quarries below the observatory at Paris, at the depth of only ninety-two feet, the temperature is nearly two degrees higher than that of the mean temperature of the country. If the temperature of subterranean springs be taken as a guide to indicate the mean temperature of the earth as we penetrate more deeply below its surface, it has been found, to cite one out of many such observations, that in the copper mine of Dolcoath, in Cornwall, at the depth of 1440 feet, the temperature of the spring is 82 degrees, while the mean temperature of the country is only 50 degrees; or, to mention another instance, that in the silver mine of Guanaxuato, in Mexico, at the depth of 1713 feet, the temperature of the springs is more than 98 degress, and the mean temperature of the country little more than 60 degrees.

But it is chiefly by ascertaining the temperature of the rock itself, at different depths, that a fixed conclusion may be arrived at, as to the rate of increase in the temperature, as we descend more and more deeply into the bowels of the earth. And the result of such observations, many of which have been made with great care, and possible sources of fallacy watchfully guarded against, is that the earth becomes warmer by one degree for every forty-four feet of depth; and, consequently, at a depth of little more than 7000 feet below the surface of the earth, the temperature would be sufficient to raise water to the boiling point, and convert it into steam: a depth which bears no greater proportion to the diameter of the globe than a few inches bear to a mile.*

* "Hot springs," writes Baron Humboldt, "issue from rocks of every kind; the hottest permanent springs yet known are those found by myself, at a distance from any volcano,—the 'Aquas calientes de las Trincheras,' in South America, between Porto Cabello and New

It must be admitted that this would be sufficient to account for the elevated temperature of thermal waters, were their temperature the only particular which distinguishes them from other water. The intimate connection that there is between these waters and volcanoes has, however, led to repeated suggestions, that these may or must have something more to do with the production of these waters than merely the having forced the channel by which they escape to the surface. Snow, to the depth of two feet and a half, remained unmelted on Vesuvius, after the eruption had lasted two days, in 1822; and the observers were able to keep their naked hands on the margin of the lava stream without inconvenience, at the time when the centre of it was still in a fluid state. This proves how slowly heat passes through the volcanic products; and it has been urged that it is possible there may be masses of melted material, thus crusted over, of enormous size, situated at great depths in the bowels of the earth; and that such masses may have retained a highly elevated temperature, during periods long anterior to any of our records; and that currents of water, passing close to, or near, these masses, would be vaporised by them, and might form hot springs, the temperature of which might not necessarily undergo any perceptible diminution during hundreds of years.

Valencia, and the 'Aquas de Comangillas,' in the Mexican territory, near Guanaxuato. The first of these had a temperature of 194·5 degrees Fahrenheit, and issued in granite; the latter in basalt, with a temperature of 205·5 degrees Fahrenheit. According to our present knowledge of the increase of heat at increasing depths, the strata, by contact with which these temperatures were acquired, are probably situated at a depth of about 7,800 English feet, or above two geographical miles . . . The elevation of the new volcano of Jorullo, unknown before my American journey, offers a remarkable example of ordinary rain water sinking to a great depth, where it acquires heat, and afterwards appears at the surface as a thermal spring. When, in September, 1759, Jorullo was suddenly elevated to a height of 1682 English feet above the surrounding plain, the two small streams called Rio de Cutimba and Rio de San Pedro disappeared, and some time afterwards broke forth afresh from the ground during severe earthquake shocks, forming springs, whose temperature in 1803, I found to be 150·4 degrees Fahrenheit."—*Cosmos.*

With satisfactory proof of the astonishing fact, that at a few thousands of feet below the earth's surface, its strata are at a great elevation of temperature, it would seem needless to indulge in speculation as to any other cause for the heat of waters, which are known to proceed from great depths, and probably from greater depths than geology has made us acquainted with, and at which no other cause than the temperature of the globe itself would be needful to convert water into steam.*

But, in truth, the ingredients of mineral waters, both gaseous and saline, being identically the same as the materials discharged from the bowels of the earth in volcanic eruptions, it is impossible to avoid the conclusion that these waters proceed from volcanic centres, and probably derive from volcanism all their characteristics. It should be remembered that we are not driven to this conclusion, on account of any difficulty in explaining the elevated temperature of thermal waters, which might be due to the internal heat of the depths of the earth, but on account of the chemical characters and distinctions of all thermal springs. Chlorine, chiefly in combination with hydrogen, as hydrochloric acid,—sulphur, in combination with oxygen, or with hydrogen,—carbonic acid,—the

* "The relation, indeed, of almost all springs impregnated copiously with mineral matter to the sources of subterranean heat seems placed beyond all doubt by modern research. Mineral waters, as they have been termed, are most abundant in regions of active volcanoes, or where earthquakes are most frequent and violent. Their temperature is often very high, and has been known to be permanently heightened or lowered by the shock of an earthquake. The volume of water also given out has been sometimes affected by the same cause. With the exception of silica, the minerals entering most abundantly into *thermal* waters do not seem to differ from those in cold springs. There is, moreover, a striking analogy between the earthy matters evolved in a gaseous state by volcanoes, and those wherewith the springs in the same region are impregnated; and when we proceed from the site of active to that of extinct volcanoes, we find the latter abounding in precisely the same kind of springs. Where thermal and mineral waters occur far from active or extinct volcanoes, some great internal derangement of the strata almost invariably marks the site to have been, at some period, however remote, the theatre of violent earthquakes."—*Lyell's Geology.*

chlorides of soda and lime,—and oxydes of iron variously combined with carbonic acid, &c,—are all the common products of volcanoes, and the ingredients most commonly found in mineral waters. And indeed all thermal waters may thus be grouped into one great family, probably identical in origin, singularly alike in chemical characters, and entirely independent of local causes, in regard to their temperature, their flow of water, and the amount of their saline and gaseous impregnation. Whereas the other kinds of springs, even although their saline ingredients may be similar to those which are contained in some of the thermal waters, are dependent on local influences, are affected by wet or by drought, and by variations in the local temperature; and their geological and geographical positions are materially different from those of the thermal springs. It seems to be an unavoidable conclusion, that the cause of volcanic action, so uncertain as to time, degree, and duration, must be chemical. The heat, the steam, the evolution of gases, all denote the operation of chemical affinities, new combinations, disturbed forces, produced and operating on a gigantic scale, and with proportionate and vast consequences. It seems to be only necessary to infer that such chemical action should be moderated in degree, by dilution of the re-agents, or by the constraining influence of mechanical difficulties or hindrances, in order to explain a more regular series of similar phenomena of less violent character; or such moderated action might follow, and be continued for long periods of time, after the chemical changes had been accomplished in regard to the substances of more powerful affinities, or presenting greater mechanical facility for their display. It may well be, that such gradations of action are equal to produce columns of boiling water or seas of melted lava, to eject them with enormous force, or fearful violence,

amid the cold desolation of Iceland, or from the summit of Vesuvius,—or to charge any given quantity of water with gaseous and saline constituents, and produce a certain elevation of its temperature, and cause it to be poured forth as a thermal spring.

Theories have been broached, and arguments and facts advanced, to extend the chemical theory of volcanic action, far beyond what has now been stated. The merit of much scientific tact, and of having collected and arranged facts and observations, of great interest and value in regard to this question, is due to Professor Daubeny, whose great work on volcanoes has been already referred to.

CHAPTER V.

GENERAL PROPERTIES OF THE BUXTON TEPID WATERS. RESULTS OF SUCCESSIVE ANALYSES.—COMMENTARY ON THEIR COMPOSITION, IN REFERENCE TO THEIR MEDICINAL EFFECTS.

THE tepid mineral waters of Buxton are bright and clear in a remarkable degree. When seen in a glass vessel, as dispensed to the drinkers of the waters, or when seen in the flows and conduits, their brilliancy is very noticeable. There is, moreover, a perceptible shade of colour in the waters—a faint tinge of blue—which is peculiar to them, and serves to distinguish them from the ordinary waters of the district. It is strange that this tinge of colour should have been denied by Dr. Pearson; but he did not enjoy the same opportunity of observing it which we now possess. In the old and imperfectly-lighted baths, the great transparency of the waters could be noticed, but their brilliancy was wholly unobservable, and this tinge of colour was necessarily not noticeable. In the well-lighted apartments which now contain the baths the mass and depth of the water exhibit the transparency, brilliancy, and colour. in the best manner. The colour has been supposed, at different times, to be due to various mineral ingredients, believed to be contained in the waters, but not in sufficient quantity to be detected. At an early period copper was thought to be the colouring ingredient; in more recent times, iodine was inferred to be a probable cause of the colour. The only purpose served has been

to indicate, that the colour has always been a subject of remark, even in remote times. Attention has been directed to all the different causes to which it might be referable; and unless it could be due to the small proportion of iron, which has now been ascertained to be among its constituents, the cause of the blue tinge is still unknown. The brilliancy is due to the large quantity of gas which it holds in solution, and which is given off from it in the form of minute bubbles. If a bottle of transparent glass is filled with the water, and held between the eye and the light, the water will be seen to be charged with these bubbles; most of them being exceedingly small, but clustered quite close together. In the largest of the natural baths, at the instant of the escape of the waters from the bowels of the earth, and from the great pressure to which it must there be subjected, much larger bubbles of gas are given off, somewhat irregularly; sometimes as large as a billiard ball, and sometimes in considerable numbers. The gas forming these large bubbles, which are so much more noticeable than the minute bubbles, bears a very small proportion to the quantity of gas which is given off more slowly in the form of the small bubbles. The greater proportion of the gas quickly escapes when the water is exposed to the air; but if carefully bottled, corked, and sealed, it would contain much of the gas for an indefinite time. The appearance of the large bubbles of the gas, rising like soap bubbles through the masses of the water in the bath, is curious and beautiful. The quantity of gas with which the water is charged, giving it much the appearance of the artificially aërated waters after the first violence of their effervescence has subsided, adds much to the buoyancy of the water in the baths. Feeble invalids have to be cautioned as to the buoyant character of the water, as it renders care, and having

the handrails or the bath-chains in ready grasp, to be needful in the instance of infirm or feeble bathers. When limbs are more or less paralysed, or even much enfeebled, there is sometimes a difficulty in keeping them under the surface of the water. In extreme cases of diminished command over the limbs, or of great debility, the affected parts, and sometimes even the whole body, have to be held by attendants under the surface of the water. Unless in such extreme conditions of system, the buoyancy of the water in the baths is simply an enjoyable characteristic, and greatly facilitates the use of muscular exercise during the immersion.

The effect of the temperature of the natural water on the bathers is somewhat different from what might have been expected. The degree of shock commonly experienced at the instant of immersion is usually greater than would be looked for from bathing in water of so much higher temperature than that of the air. When the bath is made use of under proper circumstances, the shock and sense of chill are only momentary effects, being immediately followed by efficient reaction. If judiciously used there ought to be no return of chill during the stay of the bather in the water; nor should there be any chilliness, unless for a single moment, on leaving the bath. The reaction should be maintained during the whole of the time that the bather remains in the water, after the primary and momentary shock; and it should be maintained, and indeed it is desirable that it should increase for some hours after leaving the bath. The reaction often continues throughout the whole remainder of the day, sometimes lasts throughout the following night, and is occasionally found to be continued during the whole of the subsequent day. These latter cases are rare; and it may be observed, these extreme effects usually show that the warmer baths would be

more suitable for such cases than the natural baths; and that baths of these waters, of any temperature, should be used with much caution and moderation as to the time of remaining in the water, and as to the frequency of using the bath. Such cases are, although comparatively rare, sufficiently numerous to form an important feature in the history of the effects of these waters upon the human system. And in regard to the cases in which the shock occasioned by the bath is not merely momentary, but continues more or less during the time of immersion, or even afterwards, it may likewise be said that the natural bath is seldom used judiciously, or even without risk, under these circumstances. The use of the warmer baths will commonly be found to be preferable in these cases. The stimulating effect of these baths is not only observable in regard to the degree of reaction, or glow of increased warmth; and, in the exceptional cases, by the feverish heat which follows their use; but also in regard to the system generally. The spirits, the digestion, and the appetite, are all so much stimulated, as to convince those bathers who may have been previously the most sceptical as to the powerful and extraordinary action of the baths of these waters upon the animal economy. In the course of the last thirty-five years a very large number of medical men have been led to make trial of the Buxton bath for the relief of their own ailments; and many of these gentlemen had their trust in the medicinal value of the water much influenced by the older analyses, and expressed their scepticism in sufficiently unqualified terms before using the bath. But this want of belief in the peculiar and remarkable character of the waters has never failed to be removed by the use of the bath, even on the first time of bathing. The gaseous character of the waters, so evident when bathing in them—and the marked degree of excitement which

follows the use of the bath—have invariably produced a complete recantation of all preliminary doubts and disparaging opinions.

The stimulating effect produced by the bath usually lasts during the subsequent twelve or fourteen hours. In cases of disordered action, the use of the bath is sometimes followed by an increase of feverishness, pain, or stiffness, according to the nature of the ailment. This effect may begin to be felt from six to twelve hours after bathing, and may continue in greater or less degree, from a few hours to twenty-four hours, or longer. It is almost always desirable that this effect should be allowed to subside before the bath is made use of again. There is a more lasting effect of this kind, which frequently follows the use of several baths of this water, and which is well described as the *water-fever*. This is often to be regarded as an indication that the baths are acting upon and influencing the system and the morbid condition, and that the use of them will be eventually beneficial; the question for consideration being, perhaps, whether their use should be interrupted, or whether they should be used more sparingly, or whether the use of the warm baths should be substituted for that of the natural baths, either temporarily or otherwise. These more powerful effects of the baths are usually controlled by using them only every second, or every third day, or on two successive days with the interruption of the third day; and by regulating the time of remaining in the bath, according to the strength, excitability, or other peculiarities of individual cases. Such restrictions have, moreover, an additional object. Whether the primary excitement from the use of the baths is considerable in its degree or otherwise, and whether the water-fever is evidenced strongly or otherwise, a course of these baths is almost always followed by some degree of general debility. This

is first noticeable in the circulation: the pulse at the wrist, and the heart's action become more feeble; but it is early marked by langour and feebleness, and indisposition to make any exertion, despondency, diminished appetite, and disturbed or lethargic sleep. The degree of this secondary effect of the baths is usually inconsiderable; and it is generally of short duration, when the baths are made use of with the interruption of certain days, when the course is not unwisely prolonged, and when the several immersions have not been for too long a time. But it is right to say, that when such precautions are not used, these effects are sometimes so great as to be of serious importance. It would not be to give a fair account of the medicinal effect of the Buxton baths, nor to offer a caution which is often needful, as to the use of the baths, if this were not thus stated in unqualified terms. It often happens, that strong and otherwise healthy individuals, suffering only from localised rheumatism of some part of the trunk of the body, or of the limbs, referable to exposure to cold and wet—as in the instance of miners, who frequently have to lie down at their work, with one or both legs, and perhaps one hip, and perhaps even one side of the body, covered with water, and this during days and even weeks in succession —are tempted, from an anxiety to obtain relief, and to return to their homes as soon as possible, to bathe more frequently than is advised, or to remain longer in the bath than is directed, with the consequence of a sudden and great prostration of power, sometimes resulting in important and serious disadvantage. Within a single week, such strong and even athletic patients, without previous appreciable disturbance or deranged function of any internal viscus, with an ascertained healthy condition of the circulation, respiration, membranes, and faculties, have presented themselves in a state of much languor and

exhaustion, evidenced by the condition of the heart's action, and every other least mistakeable indication; and all this extreme effect has been referable only to the use of the bath daily, and the having remained in the bath every time from five to fifteen minutes longer than had been ordered.

Such effects as these are not experienced after the use of baths of ordinary water at any temperature, or repeated or continued to any extent; and the enquiry is naturally and at once suggested, as to the cause to which these effects are to be ascribed. The chemical constitution of these waters has therefore been a subject of speculation and inquiry, from the earliest records. It can be no subject of surprise, that every generation of men, seeing the great and marvellous healing powers of these waters, should have become dissatisfied with the investigations as to the chemical ingredients which had hitherto been made, feeling their utter inadequacy to explain so considerable an amount of medicinal effect. And thus, during the long space of three hundred years, have these waters been the subject of anxious and painstaking investigation, to the successive generations of chemists and medical men; leaving every succeeding race of investigators virtually as unable as before to explain satisfactorily and conclusively the effect of the waters, by reference to their ascertained composition. And yet the confidence expressed by the successive medical observers, has been unvarying; and the kinds of diseases for the relief of which they are found to be so useful, are the same as in the earliest times. The temperature, and the flow, and the clearness and brightness, and the freedom from smell or very marked taste, have been no less unvarying, than the effects on certain morbid conditions of the human system, and than the chemical constituents, whatever these may be.

After the imperfect investigation which the state of science in that age enabled him to make, Dr. Jones, in his curious book (published in the year 1572), is obliged to content himself with the conclusion, that the qualities of the water are due to the presence of "some excellent ore, rather than either brimstone, alum, bitumen, iron, copper, or any such like, for then it should in drinking be perceived by the taste. Albeit true it is, as affirmeth Galen, all such hot baths of such minerals have force of drying, but in these you have no such sense, but so fair, so pleasant, and so delectable, that it would seem to be a dulce bath, made by art rather than by nature; howbeit the effects declare brimstone to be therein. Sea water often strained through sand, becomes sweet, and so may these waters being strained through the earth, lose their mineral taste, but retain great virtue both manifest and hidden." Here may be remarked, even in those earlier days, when analytical chemistry could do so little, the full admission as to the powerful effect of the waters upon disease, that this effect must be ascribed to some medicinal constituent, and the conjecture that the constituent may be sulphur, or some similar agent, deprived by filtration, or some equally powerful means, of its taste or smell, but being left in other respects in an efficient condition. Of the long catalogue of strangely-named ailments, for which this water was then said to be curative, Dr. Jones places "Rheums" (rheumatism) at the head, as is done at the present time; and in the list, there are female weakness and irregularities, relaxed and irritable states of the mucous membranes, with their many and varied morbid consequences: most clearly indicating, that the large proportion of the invalids at that time resorting to the Buxton Baths, were suffering from the same disordered conditions of system, as the greater number of those who make use of them at this time for the relief of their ailments.

Dr. Lister, the second in date of the ancient investigators of the Buxton water, any traces of whose works have been preserved, describes the medicinal effects of the baths as being stimulating, and states that, if too long continued, they produce wasting, feverishness, and debility; referring the effects to the small proportion of iron, which he affirms that he could taste, but could not otherwise detect; and stating, moreover, that the water contains a small proportion of common salt, and of calcareous earth.

Dr. Leigh, who wrote previously to 1671, testifies to the "surprising effects" which he had observed from the use of the baths in cases of rheumatism. He says: "Persons that could not go before without the help of crutches, came from thence to Manchester on foot without them, viz., sixteen miles." The distance, according to the modern measurement, is twenty-four miles; and it will be noticed, that ancient authors generally, in mentioning the distances from place to place in the district, state them as being two-thirds of the distances as estimated by modern measurement. Dr. Leigh ascribes the medicinal effect of the water to "marine salt, and the sal catharticum amarum, with the nitrum calcarium."

Dr. Short, in 1733, made a much more careful chemical examination of the Buxton tepid water than any which had been made previously. He says, in his preface: "Many of the (mineral) waters in use have been so superficially examined, that it is impossible to draw any certain conclusion concerning their contents, or what they are or are not; and therefore they should be more thoroughly searched and sifted. Buxton, for instance, which though it has justly maintained its character these two thousand years, yet has there no pains been taken to discover its impregnating principles, except by Dr. John Jones (a Welshman, who lived some time at King's

Meadow, near Derby), near two hundred years ago; and a transient visit made to it by Dr. Lister. Matlock, though much frequented of late years, yet the world are strangers to its contents, though some would have us believe that its virtues are exactly the same with those of Bristol (Clifton); but offer neither argument nor experiment to support their opinion." He says: "Since these waters continually bring up so large and numerous bubbles with an impetuous force from the bowels of the earth, then must their interstices be richly stored with this fine air;" and he seems to have been inclined to refer the medical action of the waters, either directly or indirectly, to this air; but would not appear to have endeavoured to estimate the proportion of the air contained in the waters, nor to ascertain its character. He ascribes the principal effects of the water to "its warmth and mineral spirit;" stating that he could not refer the medicinal effects to the solid chemical constituents, which he computed to be only 26 grains in the imperial gallon, of which he estimated 13 grains to be calcareous, and the remainder to consist of marine salt and nitre in equal proportions. Dr. Short testifies to the good effects which he had seen from the use of the baths in cases of gout and rheumatism; and then says, that he would refer the medicinal action of the waters to "a subtle mineral principle or spirit, wrapt up in the air (contained in them)." He mentions the favourable effects from these baths in cases of contraction and stiffness of the limbs, the consequence of "rheumatic and arthritic pains." He concludes that the water is highly impregnated with a mineral steam, vapour, or spirit, containing a most subtle and impalpable sulphur; herein following the idea suggested by Dr. Jones so long before; but not seeming to be conscious that he had borrowed the theory from any preceding writer, although he had quoted largely from

Dr. Jones's work. Dr. Short mentions the effects which he had witnessed from the use of the baths in relieving uterine obstructions, in removing periosteal thickenings, in removing the effects of old sprains, in affording relief to certain disordered conditions of the kidneys and bladder; and he advises that both the baths and the drinking of the waters should be used with discrimination; by no means always or necessarily drinking the waters and using the bath at the same time, or in all cases; but drinking the waters in some cases, bathing in others, and in some cases using the waters in both ways. Dr. Short says also, "let me add once for all, that as this water is of such a nature as I have mentioned, so it is not to be trifled with, for if it be unnecessarily used it will certainly do harm; and he judiciously adds that the use of the waters is not advisable in inflammatory cases, nor "in consumptions attended with a rapid motion of the blood, and weak pulmonary vessels."

Dr. Hunter published a "Treatise on the Nature and Virtues of the Waters of Buxton," in 1765. The results of his analysis are nearly the same as those of Dr. Short. His estimate of the proportion of "calcareous earth" is somewhat larger than that of Dr. Short, and of the proportion of "sea salt" and "native alkali" is somewhat smaller; but his total results, as to the amount of the saline constituents, and their nature, are nearly the same.

Dr. Percival made "Experiments and Observations on the Buxton Waters," which were published in the sixty-second volume of the "Philosophical Transactions." The estimate of the total saline constituents deducible from these experiments is nearly the same as that of Dr. Short; and they are referred to the headings—sea salt, calcareous earth, and alkali.

Dr. Higgins published an analysis of the Buxton waters in 1782, and, so far as the solid constituents of

the water, the analysis is singularly successful. With the needful correction, to make the result correspond with the imperial gallon of water, it would be as follows :—

	Grains.
Sea Salt	4·6
Calcareous earth, combined with acidulous gas	15·1
Sulphate of lime	2·0
Chloride of magnesium	1·6
Iron, combined with acidulous gas	0·6
Saline constituents in an imperial gallon...	23·9

This appears to have been the only instance, previously to Dr. Lyon Playfair's analysis, in which any trace of iron was detected in these waters.

In 1784, Dr. Pearson published his great and excellent work entitled "Observations and Experiments for Investigating the Chymical History of the Tepid Springs of Buxton." It is to this analysis, that the discovery of the nature of the gaseous impregnation of the waters is to be referred. The following paragraph is a summary of the more important of Dr. Pearson's observations and discoveries, which may be supposed to be still of general interest, or to bear upon the character and properties of the water in the present day.

"The water is of crystalline transparency, and is colourless. When a large bulk of it is viewed together, as that contained in the baths, where it is four or five feet deep, it is colourless, and objects may be seen through it. This crystalline fluid exhibits bright bubbles, of the size of the smallest pin's head, adhering to the sides of any vessel containing it, or whatever is immersed in it. The baths contain these bubbles in every part of them, especially upon a little agitation. Moreover, streams or clusters of these bubbles, of various sizes, from the magnitude of the smallest pin's head to the bulk of a cherry, or even sometimes of a billiard ball, every now and then break out from the floorings of the baths, and dart perpendicularly upward through the

whole thickness of the water. In a portion of the water that has ceased to manifest bubbles in a temperate heat, by exposing it to a greater degree of heat, they will again appear. There is no smell from this fluid, nor will it become fetid by standing, as some have asserted. It is perfectly insipid; in particular it has not the slightest acidulous taste. The temperature is $81\frac{3}{4}$ to 82 degrees, according to Fahrenheit's scale. There is every reason to believe that this water has been at precisely the same temperature for many hundred, perhaps many thousand years. It has certainly been of the same heat since this property was first determined by the use of specifically graduated thermometers, more than thirty years ago (1750-53). When the bath is agitated, as by the plunging of the bathers, the transparency of the water is changed to that of turbidness; but as soon as the commotion subsides, it becomes instantly clear as before. This turbid appearance has been ascribed to impurities or to sedimentary matters deposited on the pavement of the bath, and stirred up and mixed with the water; but it certainly is not occasioned by this circumstance, because it may be produced at all times, even immediately after the bath has been thoroughly cleansed and refilled, and when there is no sediment either observable or by any possibility present. Moreover, when glass vessels were filled with this turbid water it appeared perfectly clear, nor did it deposit any sediment on standing. (This muddy appearance is no doubt referable to the large quantity of gas that is mixed with or suspended in the water.) The medicinal qualities of this water chiefly depend upon a permanent vapour. This permanent vapour (gas) is inodorous, is not acidulous, occurs in exceedingly minute bubbles, which are diffused throughout the whole bulk of the water, and are not by any means merely adherent to the sides of the vessel

containing it. This vapour (gas) is elastic, yielding to pressure, and recovering its former volume when the pressure is removed. It continues as a vapour at all temperatures, and is colourless. It cannot support combustion. The gleam of a taper introduced into it was constantly extinguished. Animal life is supported by it, or maintained in it, during a much shorter time than if allowed to respire an equal amount of atmospheric air. Many kinds of water contain more atmospheric air than this water, and many kinds of water contain more carbonic acid gas; but none appear to contain the same amount as this water, of this peculiar, elastic, and aëriform principle. We are instructed, as the results of many experiments, that this water does not contain any inpregnation which is evidenced to the senses, except the permanent vapour, which is not carbonic acid gas, nor any vapour which is odorous,—that the heat of the water much exceeds the temperature of the ordinary springs of the district; the temperature of such springs being usually about 48 or 50 degrees;—and that the water contains acid of vitriol (sulphuric acid) and marine acid (muriatic acid) combined with lime and alkali, and carbonic acid combined with lime, in addition to its impregnation with the permanent vapour."

Dr. Pearson estimated the gaseous impregnation to be only one-fourteenth part of the bulk of the water, at ordinary temperature, and under ordinary pressure; and the following was the result of his analysis of the solid ingredients:—

	In the Imp. Gallon.
Chloride of sodium	2·333
Sulphate of lime	3·333
Carbonate of lime	14·000
Total solid ingredients per imperial gallon	19·666

or 19½ grains.

In the year 1819, or thirty-five years after the date of Dr. Pearson's analysis, Sir Charles Scudamore and Mr. Garden jointly examined the Buxton tepid waters, with the appliances and greater accuracy of the more advanced state of science.

According to the careful and excellent analysis performed by these gentlemen, the imperial gallon of the waters was estimated to contain :—

	Grains.
Chloride of magnesium	·773
Chloride of sodium	3·200
Sulphate of lime	·800
Carbonate of lime	13 866
Extractive matter	·666
Loss	·693
	19·998

or 20 grains of solid or saline matter.

The examination of the gaseous impregnation of the water, served to confirm Dr. Pearson's discovery as to the nature of the gas. In the words of Sir Charles Scudamore, "Dr. Pearson found that the proportion of carbonic acid, in the Buxton water, did not exceed the half of what is found in many common springs. He had the merit of discovering the separate existence of azote in this water, a principle which had never been detected by any preceding chemist in any water. In the imperfect state of chemistry, thirty-six years ago (1783-1819), the nature of azote was unknown, and he described it "as being a permanent vapour, composed probably of air and phlogiston.' The present analysis gave about one-fifth more of azote in a gallon than appears from Dr. Pearson's conclusions."*

According to Sir Charles Scudamore's and Mr. Garden's analysis, the imperial gallon of the waters appeared to contain of gaseous impregnation :—

*A Treatise on Mineral Waters. 2nd Edition. London, 1833.

	Cubic Inches.
Carbonic acid	2·00
Nitrogen	6·18
Total	8·18

The proportion of nitrogen was supposed to be rather more than three times that of the carbonic acid contained in the waters.

In 1852, the water was analysed by Dr. Lyon Playfair, with the subjoined result:—

Analytical Report on the Water of the Thermal Springs of Buxton, by Dr. Lyon Playfair, C.B., F.R.S.

"MUSEUM OF PRACTICAL GEOLOGY AND GOVERNMENT SCHOOL OF MINES.

"*London, July 24th*, 1852.

"TO SIDNEY SMITHERS, ESQ.

"SIR,—In consequence of a request made by you, on behalf of His Grace the Duke of Devonshire, I visited Buxton on the 8th and 9th of April, for the purpose of collecting the water of the thermal spring for analysis.

"The water was collected partly in glass-stoppered bottles, and partly in earthenware jars. The gas, as it issued from the crevices of rock and bubbled through the water, was caught by an inverted funnel, and collected in glass bottles filled with the thermal water itself. These bottles were then sealed on the spot; and the evidence derived from the gas contained in them shows, that the precautions used for preventing the access of air were quite successful.

"It is not necessary for me to describe the physical conditions under which the thermal springs appear at Buxton. It may be sufficient to state, that they issue from fissures in the limestone, and are accompanied by frequent but intermittent bursts of gas, which escape partly as large bubbles, and partly in innumerable small

bubbles, giving to water freshly collected in glass vessels, all the appearance of soda water.

"The water is clear, sparkling, inodorous, and when cool, is almost tasteless. Its temperature is 82 degrees Fahrenheit, and its specific gravity 1·0003.

"Two points had specially to be attended to in the analysis of the waters,—firstly, to ascertain the nature and quantities of the ingredients in solution; and, secondly, the character and composition of the gas accompanying them.

"In order to be sure that every ingredient came under my observation, I caused 100 gallons of the water to be evaporated down to about half a gallon, and examined the deposit and residual solution for bodies which might be present in such small quantity as to escape detection in the unconcentrated water. The precaution was found to have been necessary, for, in addition to the ordinary constituents of the waters, two more rarely occurring bodies—viz., fluorine and phosphoric acid—were found to be present, although only in minute quantity. The amount of fluorine was, however, sufficient to etch glass when applied with proper precautions. Neither iodine nor bromine could be detected.

"The following analysis gives the amount and nature of the solid ingredients in one imperial gallon of the water at 60 degrees :—

	Grains.
Silica	0·666
Oxide of iron and alumina	0·240
Carbonate of lime	7·773
Sulphate of lime	2·323
Carbonate of magnesia	4·543
Chloride of magnesium	0·114
Chloride of sodium	2·420
Chloride of potassium	2·500
Fluorine (as fluoride of calcium)	trace
Phosphoric acid (as phosphate of lime)	trace
	20·579

"On examining the water, there were found present carbonic acid and nitrogen, in addition to the solid ingredients. It was important to estimate the amount of the former in an exact manner. Some of the water was received from the spring into a glass-stoppered bottle, and the stopper was immediately inserted and secured. One gallon of the water was found to contain altogether 13·164 grains of carbonic acid; but of this quantity, 5·762 grains were due to the carbonates of lime and magnesia, and therefore only 7·402 grains could in any sense be considered as free. Again, the carbonates of lime and magnesia are present as bicarbonates, or carbonates dissolved in carbonic acid, and 5·762 grains of carbonic acid would require to be added for this purpose. Hence of the 7·402 grains, or 15·66 cubic inches of gaseous carbonic acid in the water, only 1·640 grains, or 3·47 cubic inches, can be considered as wholly free and uncombined.

"The nitrogen in the water could only be present in solution, and not in combination; and as there is no very accurate method for ascertaining the precise quantity of this gas in the water at any given temperature, it was considered chiefly important to ascertain accurately the composition of the escaping gas, as this would indicate that of the gas held in solution. The following are the analyses of two portions of the gas collected as formerly described, the analyses being given *according to volume.*

	I.	II.	Mean.
Carbonic acid	1·169	1·164	1·167
Nitrogen.....	98·831	98·836	98·833
Oxygen.....	trace	trace	trace
	100·000	100·000	100·000

"The gas, therefore, consists entirely of carbonic acid and nitrogen; for the oxygen, which did not amount to one-tenth per cent, may be viewed as quite accidental,

arising probably from the corks used to close the bottles.

"Judging from the analysis and proportion of the gases, it is assumed that *at the moment of issue*, the water is charged with 206 cubic inches of nitrogen, and 15·66 cubic inches of carbonic acid. This assumption is founded upon the proportional relation of the two gases. The proportion of carbonic acid in the water being determined, and the proportion of carbonic acid to that of nitrogen contained in the water being 1·2 to 98·8, the amount of nitrogen contained in the water at the moment of issue may fairly be assumed to be 206 cubic inches per gallon.

"Before remarking further on the above analysis, it may be useful to refer to that by Scudamore. The analysis given by him was upon the wine gallon, which is one-fourth less than the imperial gallon. Correcting for this difference Scudamore found twenty grains of solid matter in a gallon—a result not materially different from that detailed above. The solid ingredients do indeed differ to some extent in the two analyses; but it must be recollected that analytical chemistry is now in a much more advanced state; and instead of being surprised at the difference, we are rather inclined to admire the precision with which the points had been made out.

"From a consideration of the previous analysis, I am inclined to ascribe the medicinal effects of the water almost entirely to its gaseous constituents. The water, deprived of its gases, has the composition of an ordinary spring water, with the exception of the fluorine and phospheric acid, both of which are present in mere traces; and it is therefore difficult to conceive that they can have any medicinal effect when the water is used for baths. The gases are, however, nearly of the same composition as those of the thermal spring at Bath, and there is no reason to doubt that dissolved carbonic acid

and nitrogen may exert important physiological effects. At all events, the singular chemical character of the Buxton tepid water must be ascribed to its gaseous and not to its solid ingredients.

"Sir,

"I have the honour to be,

"Your obedient and faithful servant,

"LYON PLAYFAIR, F.R.S."

In the year 1860, Dr. Sheridan Muspratt, of Liverpool, published the following analysis of the Buxton tepid waters:—

	Grains in the Imp. gallon.
Carbonate of lime	8·541
Carbonate of magnesia	3·741
Carbonate of protoxide of iron	0·082
Sulphate of lime	0·330
Chloride of calcium	1·227
Chloride of magnesium	0·463
Chloride of sodium	2·405
Chloride of potassium	0·260
Silica	1·044
Nitric acid	trace
Organic matter	0·341
Floride of calcium, Phosphate of lime	trace
Total per gallon	18·434
Free carbonic acid	3·5 cubic inches
Nitrogen	504·0 „ „

In 1876, the well-known chemist M. Otto Hehner, when on a visit to Buxton, became so much interested in the character and medicinal value of this water, as, without solicitation or recompense, to undertake a new analysis of its saline ingredients, especially moved thereto by the wish to ascertain, by the more recently discovered means of Spectrum Analysis, whether any hitherto undetected constituents of medical interest might be obtained from it. The analysis, however, resulted in confirming the accuracy of the previous analyses, with

the discovery of a small but notable quantity of lithia, and a very small quantity of iodine, but in both cases too small to allow of a quantitative determination. M. Hehner did not examine the water as to its gaseous constituents, "aware that the nitrogen is the chief and most remarkable constituent of the water, but I considered its presence is so far beyond all doubt, that, even with better means of collection than were at my command when I obtained the samples for analysis, it appears questionable to me whether I could have added anything to Dr. Playfair's and Dr. Muspratt's results." It cannot but be a satisfaction that the saline ingredients had been so recently examined, more than confirming the accuracy of previous investigations, and leaving the nitrogen contained in the water the ostensible cause of its medicinal value.

M. OTTO HEHNER'S ANALYSIS OF SALINE CONSTITUENTS ONLY, 1876.

	Grains per Imperial Gallon.
Chloride of Sodium	4·51717
Sulphate of Soda	0·20233
Sulphate of Potash	0·66866
Sulphate of Ammonium	0·01564
Sulphate of Lime	0·67364
Nitrate of Lime	0·25660
Carbonate of Lime	9·18584
Carbonate of Magnesia	4·72693
Carbonate of Iron	0·03709
Carbonate of Manganese	0·00847
Silica	0·83769
Total	21 13006
Phosphoric Acid	trace
Iodine	trace
Lithia	trace

The most recent analyses of the thermal water of Buxton are by Dr. Thresh. This important examination required three separate analyses. As in the examination of the water by Sir Lyon Playfair, the words of the analyst are quoted, and the several analyses are detailed.

Dr. Thresh's Analyses of the Residual Deposit from the Buxton Water, of the Gas of the Water, and of its Saline Constituents, 1880, 81, 82.

"The last analysis made of the Buxton thermal water occupied most of the writer's leisure during the winters of 1880-81, and 1881-82. Residing upon the spot, and with a laboratory within a very short distance, unusual facilities were enjoyed for making a prolonged and searching chemical investigation. The complete examination necessitated three series of analyses; the first, of the mud deposited near the mouth of the spring; the second, of the gas issuing from the spring, and of the gas dissolved in the water; and the third, of the saline constituents.

"Every thermal water deposits more or less rapidly upon cooling, or from loss of carbonic acid gas or exposure to the air, a mud or sinter, differing in appearance and in composition according to the character of the strata through which the waters pass in their subterranean journeyings. Very frequently the examination of such deposits reveals the presence of elements which, on account of their excessively slight solubility, are present in the water in such minute quantities, that their presence may be overlooked in an analysis of the water itself.

"When the springs and reservoirs into which the water flows were examined, the slabs, walls, &c., were found to be coated with a very dark brown mud which stained the skin when rubbed between the finger and thumb. It appeared of a peculiar character, and it was felt that its analysis could not but yield interesting results. Such proved to be the case. It was found to consist chiefly of the higher oxides of manganese in a hydrated condition, and capable of combining with

oxygen when exposed to the air, or to water containing oxygen in solution. In composition it corresponds closely with that of many samples of psilomelane and wad, ores of manganese. The importance of the inference to be drawn from this discovery will be discussed later on. Molybdenum has never before been discovered either in a mineral water or in a deposit from such a spring, but probably is derived from a molybdate of lead which may frequently be found in cavities of limestone rocks. The tabulated result of the analysis is appended:—

"Oxide of manganese	80·32
Sulphate of barium, sand, &c.	1·08
Lead oxide	·15
Copper oxide	·07
Molybdic acid	·02
Cobalt oxide	·30
Iron and aluminium oxides	1·36
Zinc oxide	·46
Barium oxide	·79
Calcium oxide	5·31
Strontium oxide	a trace
Magnesium oxide	3·18
Carbon dioxide	3·23
Phosphoric acid	·01
Water	3·93
	100·21

"The results obtained by the analysis of the gas evolved at the spring were in close accordance with those of Dr. Playfair, but it was noted that the composition of this gas varied slightly, according to the length of time during which it was allowed to remain in contact with the water under the reduced pressure to which it is subject when it has risen to the earth's surface. Thus the mean of two analyses of the gas collected at the mouth of the spring, and at once removed from contact with water, gave

Nitrogen	99·12
Carbonic acid	·88

whilst some of the gas which had been allowed to stand over a little water, gave:—

Nitrogen	98·63
Carbonic acid	1·37

"This difference would be inexplicable were Dr. Playfair's assumption correct. Undoubtedly at some little depth the free gas consists of pure nitrogen, whilst at a still greater depth even that will be in solution.

"In determining the amount and composition of the gas held in solution by the water at the moment of issue from the springs, the greatest care was taken to obtain reliable and accurate results, and as an appendix to the original paper an illustrated description will be found of the apparatus used in collecting and measuring the gases. The mean of a number of experiments gave the following results:—

	Cubic Inches per gallon of water.
Nitrogen	6·1
Carbonic acid gas	4·1
Total	10·2

From this the calculated percentage composition is—

Nitrogen	59·78
Carbonic acid gas	40·22
Total	100·

"To dissolve 10·2 cubic inches of such a gaseous mixture at a temperature of 81·5 F. (that of the thermal water) would require a pressure of 1·64 atmospheres, consequently on exposing the freshly drawn water, bubbles of free gas commence to make their appearance, and after a time the excess passes off, but this takes place if the water is not agitated, much more slowly than might be anticipated, considering the insoluble character of the gas. In fact when the water is agitated, as in bathing, the surplus gas is liberated almost instantaneously, and in bubbles so minute that the water becomes opalescent. Doubtless much of the gas is liberated within the very pores of the skin during bathing, and acts in what may be considered its semi-nascent state, producing effects altogether unattainable by use of the same agent in any other condition.

"The analysis of the mineral constituents was conducted after the manner of Baron Bunsen, in his examination of the mineral springs of Baden-Baden. The process, though exceedingly tedious, leaves nothing to be desired as regards the accuracy of the results, and has the advantage over older methods in allowing these results to be so completely checked that there is little danger of overlooking any of the constituents. As was previously stated the whole of the elements present in the deposit were not found in the residue obtained by evaporation of large quantities of the water, but this was doubtless owing to their almost entire insolubility, and to our ignorance of reactions sufficiently delicate to detect such minute quantities. Calculated into grains per gallon the water was estimated to contain—

Bicarbonate of calcium	14·01
„ magnesium	6·02
„ iron	·03
„ manganese	·33
Sulphate of barium	·05
„ calcium	·26
„ potassium	·62
„ sodium	·84
Nitrate of sodium	·03
Chloride of calcium	·02
Chloride of sodium	3·10
„ ammonium	trace
„ magnesium	·95
Silicic acid	·95
Organic matter	·02
Carbon dioxide	·20
Nitrogen	·19
	27·32

Lithium, strontium, lead, and phosphoric acid, traces.

From this analysis, or rather from the manner in which the results are expressed, it would appear as if the quantity of saline matter per gallon was much in excess

of that found by any other observer; but this difference is only apparent, and arises from the fact that the compounds represented by them as carbonates are found here as bicarbonates. The carbonates of calcium, magnesium, iron, and manganese are practically insoluble in water, but in the presence of carbonic acid the bicarbonates are formed and these dissolve. Upon evaporating a water containing such salts, they are decomposed, the carbonic acid being given off and an insoluble carbonate remaining. This decomposition is readily seen when a little of the Buxton thermal water is boiled in a glass flask. Hence, whilst the last analysis represents, as nearly as can be ascertained, the composition of the saline matter as it exists in the water, the former ones merely represent the result of the analysis of the water residue.

"The waters of many mineral springs vary in composition from time to time, certain constituents gradually increasing or diminishing; and to ascertain whether any change is taking place in the Buxton thermal water, it is necessary to compare the results of such analyses as may be applicable for that purpose. Unfortunately, on account of their imperfect character, the results of the examinations made during the last century are not available. The results since obtained are tabulated below to facilitate comparison. In each case the carbonates mentioned in the older analyses are calculated into their equivalents of bicarbonates, as it is in this state that they exist in the water.

	Scudamore and Garden.	Playfair.	Muspratt.	Hehner.	Thresh.
Calcium bicarbonate.....	19·967	11·193	12·299	13·228	14·010
Magnesium „	—	6·919	5·698	7·199	6·011
Iron „	—	·240*	·113	.051	·031
Manganese „	—	—	—	.011	·028
Barium sulphate.....	—	—	—	—	·048
Calcium „	·800	2·323	·330	·674	·260
Plumbic „	—	—	—	—	·004
Potassium „	—	—	—	·669	·621
Sodium „	—	—	—	·202	·843
Ammonium „	—	—	—	·016	—
Sodium nitrate.....	—	—	trace	—	·026
Calcium „	—	—	—	·257	—
Calcium fluoride.....	—	trace	trace	—	·020
Sodium chloride	3·200	2·420	2·405	4 517	3·088
Potassium „	—	2·500	·260	—	—
Ammonium „	—	—	—	—	·002
Calcium „	—	—	1·227	—	—
Magnesium „	·773	·114	·463	—	·953
Silica	—	·666	1·044	·838	·949
Organic matter (and loss)	1·359	—	·341	trace	·201
Strontium	—	—	—	—	trace
Lithium	—	—	—	trace	trace
Phosphates	—	—	trace	—	trace
Iodides.....	—	—	—	trace	—
Total grains per gallon.....	26·099	26·375	24·180	27·662	27·096

"It will be noticed that Muspratt's results differ considerably from the others, and we must conclude either that he did not obtain his water from the same source as the other analysts, or that the saline constituents had varied considerably between the years 1852 and 1860. There is, of course, just the possibility of an error having crept into this analysis, or into the calculation of the results: but, as we have no details of the examination, we cannot judge whether such is the case or not. It will be remembered, however, that the thermal waters supplying the baths, wells, &c., are not derived from a single spring, but from a number of springs arising in close proximity. These are now built over, hence it is difficult to obtain access to them, or to ascertain their number; but in 1646,

* Oxide of iron and aluminia.

before the present buildings were erected, there were said to be nine springs within a radius of eight yards, eight of which were warm and the ninth cold. The two principal springs arise immediately beneath the slabs at the bottom of the gentlemen's natural bath, and have precisely the same temperature; but a more uninterrupted stream of gas-bubbles comes to the surface at one spring than at another. There is therefore a possibility that a slight difference might be detected in the constituents of one or more of these springs; and, if such were the case, the variations in the analysis would be readily accounted for, were the waters not collected at the same source. Unfortunately, previous analysts do not mention where or how their samples were obtained; but so far as can be ascertained, the water examined by Playfair was taken from one of the principal springs, whilst that employed in the two last analyses was derived from the bath over the springs. In this case Playfair's result represents the composition of the waters of one only of the springs, and the others that of the mixed waters of all the springs.

"Scudamore and Garden found only four salts, whereas Playfair enumerates ten. Muspratt twelve, Hehner thirteen, and the writer eighteen. It does not follow that a proportionately large number of elements was detected in each case; but merely that the relative quantities of acids and bases lead to the inference that they are combined in so many different ways. Thus suppose three acids and three bases to be present, these may be united to form not less than three salts or more than nine; and whether these or any intermediate number are assumed to exist in it, depends chiefly upon the proportions of the various radicles; but not unfrequently the result is influenced by the theoretical views of the analyst. A careful consideration of the results will, however, lead anyone capable of

judging to the conclusion that Muspratt had analysed a water from a different source to that from which the others were obtained, and that from the defective method of analysis Scudamore and Garden's result cannot be used for comparison. Taking, therefore, only the analysis of Playfair, Hehner, and the writer, the saline constituents appear to vary slightly from time to time both in character and in quantity. The sulphates and potassium salts have diminished; whilst the carbonates, sodium salts, and silica have increased. The proportions of the calcium and magnesium salts, and the total amount of solid matter, however, vary to so small an extent as not to affect in any way the distinctive character of the water. With regard to the gaseous constituents, no change whatever has taken place, the slight difference in the analysis being doubtless due to the methods of collection. The gas evolved at the spring is nearly pure nitrogen, and the amount of this gas dissolved in the water in 1852, as calculated from Playfair's results, is the same as has recently been found by actual experiment.

"On account of the special organic purity of the water, the comparatively small quantity of the saline constituents, and the large volume of nitrogen contained in it, the Buxton spring is usually classed with those of Gastein and Wildbad. It differs from these, however, in containing in solution a much larger proportion of nitrogen, whilst the gases evolved from the waters of its congeners contain very considerable proportions of oxygen (Gastein), or of oxygen and carbonic acid (Wildbad).

The springs at Gastein, in Austria, are 3,051 feet above the sea level, and the waters have a temperature varying from 95 degs. to 118 degs. Fahr. It is evident, therefore, on account of this higher temperature, that, upon coming to the surface, these waters must

lose their gaseous elements much more rapidly than the Buxton waters, for the solubility of all gases diminishes with increase of temperature. The evolved gas consists of

Nitrogen	69·1 per cent
Oxygen	30·9 "
Carbonic acid	— "

and each gallon of water contains :—

Blearbonate of calcium	5·1 grains
" magnesium	·3 "
" iron	·7 "
" sodium	·6 "
" manganese	·3 "
Sulphate of sodium	15·1 "
" potassium	·1 "
Chloride of sodium	3·6 "
Phosphates of aluminium	·4 "
Silica	2·4 "
Fluorine, Strontium, and Organic matter	traces
Total	28·6

"On account of the difference in the solubility of oxygen and nitrogen, and of the proportion in which they exist in the atmosphere, water when agitated with air, takes up for every 65 volumes of nitrogen, 35 volumes of oxygen, and therefore, is richer in oxygen relatively to nitrogen than the atmosphere. Now the Gastein waters evolve a gas differing from common air only in being somewhat richer in oxygen, and therefore the gas held in solution must contain a still larger proportion of the latter element. By calculation based upon the analytical data just given, the dissolved gas will consist of

Nitrogen	52·5 per cent.
Oxygen	47·5 "

And assuming the water as it issues from the earth to remain as highly surcharged with gas as does that of the Buxton Thermal Spring, it would only contain per gallon—

Nitrogen	4·0 cubic inches.
Oxygen	3.6 "

or less than two-thirds the amount contained in the Buxton Water. Supposing this water to have derived

its nitrogen from the atmosphere, it must have passed in its subterranean course through very different strata to those traversed by the waters of the Buxton Thermal Spring, since instead of losing oxygen, it has actually become more highly charged with this gas.

"The Wildbad (Würtemburg) Springs, about fifty in number, arise at an elevation of 1300 feet, have a temperature of 96 degs· Fahr., and are found very beneficial in cases of chronic rheumatism and gout. They contain more nitrogen than the Gastein Springs, and are in other respects more allied to those of Buxton. Each gallon has been found to contain—

Sodium chloride	8·2(?)	grains.
„ bicarbonate	8·5	„
„ sulphate	4.0	„
Potassium sulphate	2.0	„
Calcium bicarbonate	4·9	„
Magnesium „	10·6	„
Manganese and iron	4·0	„
Silica	3.9	„
Total	46·1	

The gas evolved consists of—

Nitrogen	79·25	per cent.
Oxygen	8·25	„
Carbonic acid	12·5	„

"From which it is evident that, like the Buxton water, it has lost oxygen and taken up carbonic acid; but unlike it, it has not parted with the whole of the former element. The composition of the gas held in solution will be—

Nitrogen	9.4	per cent.
Oxygen	2·0	„
Carbonic acid gas	83·6	„

"And assuming these warmer waters capable of remaining as surcharged with gas, as do the Buxton waters, they would only contain in each gallon 4·7 cubic inches of nitrogen, or a little over two-thirds of the amount found in the Buxton springs. Moreover, this would be

highly diluted with carbonic acid, as one gallon of water would contain—

Nitrogen	4·7	cubic inches.
Oxygen	1·0	„
Carbonic acid gas	44·3	„

"*In its richness in nitrogen, therefore, the Buxton water stands pre-eminent.*"

Much merit is due to Dr. Thresh for this very comprehensive series of analyses. The examination of the deposit from the water gives results of much interest, whether it be held to solve the problem of the origin of the nitrogen in the water or not. By every chemist who has examined the gases with which the Buxton thermal water is charged, it is placed at the head of all mineral waters that are so constituted, and is shewn to be surcharged with nitrogen, whatever medical value may attach to such constitution. Even the well-known mineral waters of Gastein and Wildbad, remarkable as these waters are known to be for their medicinal character, contain less of nitrogen gas than is evolved by the Buxton mineral water, as demonstrated by Dr. Thresh's calculations.

It will have been noticed, as the result of every one of these successive analyses, not only that these waters have been ascertained to be surcharged with nitrogen gas; but that this important element is disengaged on the issue of the water from the limestone, and in such quantity as to be crowded throughout its interstices in the form of minute bubbles of gas; much larger bubbles being disengaged from time to time, and rising to the surface of the waters; and that, when the water thus surcharged is agitated, it loses its singularly beautiful transparency, and becomes thick or opalescent. This renders the actual proportion of gas that may have been held in solution, under the pressure of the depths from which it

may have arisen, or upon its liberation at the moment of issue, of less practical significance, than that the gas is thus brought into immediate contact with the skin of the bather, in a form eminently available for absorption, possibly, as inferred by Dr. Thresh, in a "semi-noscent state," "within the very pores of the skin," securing the absorption into the system, and enabling its degree to be added to, throughout the whole cutaneous surface, or locally, by friction, kneading, or massage, or by any required amount of showers, sprays, or douches.

The different analyses of these waters, which have been made at different and distant periods down to the present time, have thus been set forth, in order to indicate the difficulties which have at all times attended the rationale of their effects in disease; and to show how early the opinion came to be entertained, that these effects might be ascribed, in a principal or important degree, to the character and quality of the gas or permanent vapour, which is contained in the water. It is admitted to be still difficult to determine the precise nature or extent of the effects of uncombined nitrogen, when introduced into the human system, whether by absorption through the skin, or through the mucous membrane of the stomach. It may even be true, that the whole of the medicinal effect of the water is not due to the nitrogen which it contains. It may be in part referable to some constituent, which even the greatly advanced state of modern chemistry has not been able to detect. But it is just to indicate, that the medicinal action of nitrogen may not be unequal to produce great medicinal effects, when so exhibited as to be absorbed into the system with great readiness and in large amount. The effect of nitrogen, throughout the economy of the earth, is now known to be very great and all-important. The agent which, only a few years ago, was considered

to be simply a diluent of the oxygen in the atmosphere, and to have only the effect of lessening the action of this great stimulating and oxydising principle, nitrogen is now ascertained to be an important component of many animal substances, and an indispensible element in the nutriment of animal life. There is no single particular in which the laborious and successful investigations of modern chemists, and the applications of the results to physiology and pathology, have been so influential and important, as in the development and elucidation of the importance of nitrogen, in its multiplied combined relations to the phenomena of life. The high authority of Baron Liebig may be quoted in support of this statement, in reference to its different and important bearings, by adducing a succession of sentences from his works. "All parts of the animal body which have a decided shape, which form parts of organs, contain nitrogen. No part of an organ which possesses motion and life is destitute of nitrogen."—"All kinds of food fit for the production either of blood, or of cellular tissue, membranes, skin, hair, muscular fibre, &c., must contain a certain amount of nitrogen."—"Water and common fat are those ingredients of the body which are destitute of nitrogen. Both are amorphous or unorganised, and only so far take part in the vital process as that their presence is required for the due performance of the vital functions."—"All such parts of vegetables as can afford nutriment to animals contain certain constituents which are rich in nitrogen; and the most ordinary experience proves that animals require for their support and nutrition less of those parts of plants, in proportion as they abound in the nitrogenized constituents."—"The chief ingredients of the blood contain 17 per cent. of nitrogen, and no part of an organ contains less than 17 per cent. of nitrogen."—"All experience proves that

there is, in the organism, only one source of mechanical power; and this source is the conversion of living parts into lifeless, amorphous compounds."—"No part of the body, having an organised or peculiar form, contains, for eight equivalents of carbon, less than one of nitrogen."—"Out of the newly formed blood, those parts of organs which have undergone metamorphoses are reproduced. The carbon and nitrogen of the food thus become constituent parts of organs. Exactly as much sulphur, carbon, hydrogen, and nitrogen, is supplied to the organs by the blood—that is, ultimately, by the food—as they have lost by the transformations attending the exercise of their functions."—"The flesh and blood consumed as food ultimately yield the greater part of their carbon for the support of the respiratory process, while the nitrogen appears as urea or uric acid, the sulphur as sulphuric acid. But previously to these final changes, the dead flesh and blood become living flesh and blood; and it is, strictly speaking, the combustible elements of the compounds formed in the metamorphoses of living tissues, which, with some other substances to be more particularly mentioned hereafter, serve for the production of animal heat."

These quotations may serve to illustrate and justify the degree of importance ascribed to nitrogen, in the phenomena of life—in the nutrition and expenditure of the animal economy. Every movement of the animal machine involves the expenditure of some portion of the existing and living tissues; and every such expenditure involves the consumption of a given proportion of nitrogen, and demands its restoration in the form of aliment, in the composition of which nitrogen is an essential element. The nitrogen, to be thus useful, must be combined with other elementary substances, and combined in certain proportions; but such compounds do

not exist without nitrogen; and this element is essential to organic structure, to animal function and movement, and to nutrition.

Moreover, to return to the words of Baron Liebig:—"Medicinal or remedial agents may be divided into two classes, the nitrogenised and the non-nitrogenised. The nitrogenised vegetable principles, whose composition differs from that of the proper nitrogenised elements of nutrition, also produced by a vegetable organism, are distinguished, beyond all others, for their powerful action on the animal economy. The effects of these substances are singularly varied; from the mildest form of the action of aloes to the most terrible poison, strychnia, we observe an endless variety of different actions. With the exception of three, all these substances produce diseased conditions in the healthy organism, and are poisonous in certain doses. Most of them are, chemically speaking, basic or alkaline. No remedy, devoid of nitrogen, possesses a poisonous action in a similar dose. This consideration, or comparative view, has led to a more accurate investigation of the composition of picrotoxine, the poisonous principle of cocculus indicus; and Mr. Francis has discovered the existence of nitrogen in it, hitherto overlooked, and has likewise determined its amount."

In these instances, likewise, the nitrogen is in combination; and it is in virtue of the proportions of such combination that the resulting compounds are thus powerful in their effects on the animal economy; but the nitrogen is essential to the result, and it is not a mere diluent.

Once again—"*Disease* occurs when the sum of vital force, which tends to neutralise all causes of disturbance (in other words, when the resistance offered by the vital force), is weaker than the acting cause of disturbance."—

"In medicine every abnormal condition of supply or of waste, in all parts or in a single part of the body, is called disease."—*Baron Liebig.*

Such illustrations, cited from such authority, manifest the great importance of nitrogen in the economy of life, and in the production and the cure of disease.

"The Edinburgh Medical and Surgical Journal," No. 193, October, 1852, in an elaborate and able analytical review of my "Letter to Dr. Lyon Playfair," contains the following passage, and also the well-selected quotation from Dr. Sutro's excellent "Lectures on the German Mineral Waters."

"The thermal spring of Wildbad in the Black Forest contains, with a minute amount of saline matters, a large amount of nitrogen, 80 per cent.; and to the presence of this gas, the German physicians and Dr. Sutro ascribe the curative effects which the use of the Wildbad water exerts upon chronic rheumatism, rheumatic gout, and stiffness and nodosity of the joints. So also the waters of Pfeffers in the Canton of St. Gallen in Switzerland, and that of Gastein in the mountains of Salzburg, contain, the former a small proportion of nitrogen, the latter a good deal more (2·02 in 100 parts of water). It seems therefore quite natural to ascribe to the presence of this gas very notable effects upon the human organism; though in what exact manner these effects are produced, it is not easy to understand and explain.

"The opinion of Dr. Sutro is given in the following passage:—'Without oxygen we should suffocate, without nitrogen we should starve. I should not go so far as to attribute a nourishing property to the nitrogen introduced into the absorbent vessels with the highly-diluted water. But when it is admitted, on all hands, that our tissues constantly discharge waste particles in proportion to the regular additions provided by the arterial supplies; and

when we know a great part of this waste to issue from our cutaneous pores in a gaseous form, would it not be reasonable to attribute some restoratory function to the contact and combination of the gas with organic particles? We know that, in old age, earthy or inorganic formations prevail in the reproductive sphere. Limbs become more rigid, the joints less pliable, secretions retarded, excretions diminished, vital elasticity and resisting power impaired. Substances ordinarily carried rapidly along the vascular canals in a dissolved state are now precipitated out of the slowly moving mass, and deposited in spaces where they further impede voluntary movement.'

"If we see the use of a mineral water, causing distinct retrogression of these anti-vital phenomena; if we perceive gouty concretions to proceed towards absorption; if we observe contracted limbs gradually to relax again, and to try feeble efforts of long-forgotten exercise; if we find cutaneous harshness and rigidity to diminish, and to give way to a former softness; if we behold a resuscitated desire for muscular exertion and for mental work in a prostrated individual, and we know the spa, the originator of these changes, to possess a great quantity of nitrogen, is it not legitimate to attribute to this gas part of the efficacy?"

As to the solid constituents of the water, it is only indirectly that the result of the more recent analyses can be said to be of much importance. It is indeed, needful, and only the just due of a mineral water, to which the long-continued and large resort of sufferers from rheumatism, gout, &c., attach much importance, that the more advanced state of chemistry should be brought to bear upon it from time to time, in order to determine whether, or to what extent additional discoveries as to the substances which enter into its composition may bear out, explain, or extend its useful-

ness and applicability in different diseases. The result is that silica, oxide of iron, alumina, fluorine, and phosphoric acid have been for the first time ascertained to be among the substances dissolved in the waters. The proportion of the ingredients is indeed small. But since the presence of these ingredients in the waters had not been detected, even by the analysis which was made with so much care and skill by Sir Charles Scudamore and Mr. Garden at a time comparatively so recent, and with all the means and appliances which chemistry then possessed, it seems to be an unavoidable inference, that as this rapidly advancing science attains greater and greater perfection in its processes and teachings, it may help us to explain more and more satisfactorily the means, by virtue of which these waters act so usefully in the relief of disease. Such explanation may prove to be derivable, exclusively, from the effect that may be referred to the direct introduction of so much free nitrogen into the animal economy, by the use of these waters, whether externally or internally; or it may be assigned, in part, to the introduction, in a peculiarly available state of combination and dilution, of the solid ingredients already ascertained to be contained in the waters; or it may come to be partially referred to a constituent or constituents which have not hitherto been detected in it. Looking at the great advance which has been made in the science of chemistry, in the minute accuracy of its manipulations and results, in the closeness of its reasonings, the breadth of its deductions, the value and bearing of its inferences, and its extensive and much extended influence on all collateral branches of science, both in medicine and the arts, it is impossible to doubt that more certainty may be obtained as to the *modus operandi* of these waters in disease that we now possess. And yet the facts already ascertained are so important and con-

clusive, in regard to the solid and gaseous constituents of the waters, as to warrant a full *à priori* confidence in its medical character. By Dr. Pearson's analysis, carbonic and sulphuric acids, chlorine, lime, and free nitrogen, were ascertained to be contained in them; this analysis was confirmed, and the presence of magnesium detected by Sir Charles Scudamore and Mr. Garden; and by Dr. Lyon Playfair's analysis, the presence of silica, iron, alumina, potassium, fluorine, and phosphorus was ascertained. So large an amount of additional information commands additional confidence and serves to confirm and establish the character and value of the waters, independently of theories, and in aid of the immemorial experience of their medical efficacy.

Dr. Muspratt's analysis so far differs from that by Dr. Playfair as to give a larger proportion of silica, a much smaller proportion of sulphate of lime and of chloride of potassium, and two grains less of total saline constituents in the gallon of water. Inasmuch, however, as Dr. Playfair's analysis was obtained from the residue of 100 gallons of water reduced by boiling to about half a gallon, it may be probably held to be the more authoritative analysis, as far as regards the saline constituents of these waters. What is much more interesting is, that Dr. Muspratt obtained from the waters an appreciable proportion of organic matter. Although only amounting to one-third of a grain per gallon, and therefore not justifying the slightest imputation of impurity, more particularly as found in waters that must arise from vast depths, and must have percolated great beds of strata, this small proportion of organic matter may have an important degree of influence on the absorption of the waters through the pores of the skin during the immersion in the baths, and may contribute to or

produce the remarkable emollient effect on the skin that is produced by the bathing in these waters.

It seems to be sufficient, and to be as much as consists with the present state of information, to have learned that these waters contain these saline and gaseous constituents,—to ascertain what effect the use of the waters, as baths and internally, produces on the human system in health, and in different disordered or diseased conditions—and to assume that the effects must be referable to what has been ascertained as to the constituents of the waters. It would have been impossible to infer *à priori*, that a certain proportional combination of three or four elementary substances would produce an alimentary substance, a certain other combined proportion of the same elementary substances would produce a substance having valuable medicinal properties, a third proportional combination of the same substances produce a virulently poisonous compound, and a fourth compound of the same ingredients produce a substance that would be neither alimentary, nor medicinal, nor poisonous, but a substance insoluble in the gastric secretions, and altogether inert when received into the human stomach. And yet the chemistry of organic substances furnishes many instances of this remarkable character, which the present amount of our information leaves unexplained. The same component elements, in different proportions, form the most powerful of the vegetable tonics (quinine), the most active of the vegetable narcotics (morphia), the most powerful of the vegetable poisons (picrotoxine), and the most valuable of alimentary restoratives (animal and vegetable fibrine). The effects of these compounds are no less certain, and the grounds for their use are no less trustworthy and defined, because the reason of such difference in property cannot be ascertained. The admission, that the degree of effect or the kind of effect

on the system of the Buxton tepid waters, could not be predicted from the nature of their chemical constituents, is no invidious or singular admission of limited knowledge; nor can it affect the trust which science attaches to experience, when the peculiar character of the tepid mineral waters is thus established. An important amount of medicinal value may be claimed for them, on the exclusive ground of their chemical constitution.

It has been advanced, as a mode of explaining the action of the Buxton tepid waters upon the animal economy, that the absorption of the nitrogen with which they are so largely charged, leads to the formation of so much ammonia, by involving the decomposition of a due proportion of water to furnish the required amount of hydrogen; and that the ammonia thus formed, and brought to bear immediately upon the blood and tissues, is the essentially curative principle of these mineral waters. There is no foundation for this hypothesis; the supposed conversion of the nitrogen into ammonia is entirely conjectural, and extremely unlikely; and even if it were otherwise, the action of ammonia would be inadequate to explain that of the Buxton waters. These waters are more stimulating and more alterative in their effects, than could be accounted for in this way. This ammoniacal hypothesis is attempted to be supported by a statement, that the diseases for which the action of the Buxton waters is known to be remedial, are marked by a deficiency of ammonia in the secretions. Animal chemistry, however, demonstrates the incorrectness of this assertion. Even the urine of healthy persons does not contain so much ammonia as serves to neutralise the acids which it contains, and urine ought always to show a slight excess of acidity; and in almost all the diseases of excitement, or of inflammatory character, the urine is likewise, in at least an equal degree, characterised by

predominant acidity. But the ammonia which characterises urine is, for the most part, formed by the putrescence of the urea, and other highly animalised matters contained in it, long after it has been discharged from the system. If the remarkable similarity in composition of carbonate of ammonia and urea be considered; and the fact, that a considerable proportion of the excess of uric acid in gouty and rheumatic conditions, would seem to be obtained at the expense of the urea, and to be the consequence of an imperfect decarbonisation of the blood during the process of respiration, as ably urged by Dr. Gairdner in his excellent treatise on Gout; the utter fallacy of this ammoniacal view, as to the action of the Buxton waters, either as regards the effects of ammonia or the condition of disease is fully demonstrated. Medical men need not be told that ammonia is equally inadequate for the relief of gout or the cure of rheumatism, in whatever form it may be used.

CHAPTER VI.

THE CRESCENT, AND THE RANGES OF BATH-BUILDINGS. ESTIMATED FLOW OF THE TEPID WATERS. THE NATURAL AND HOT BATHS, DOUCHES, WELLS, ETC.

THE mineral waters are situated in the lower part of Buxton, emerging from several natural openings in the limestone rock, very near to the edge of the mountain limestone formation. The baths, wells, &c., are necessarily placed as near as may be to the fissures from which the waters issue, and had to be constructed at the somewhat low level to which the waters rise. The baths are contained in two wings, at the east and west ends of the Crescent.

The range of bath buildings at the east end of the Crescent contains the hot-bath establishment, &c. The range at the west end of the Crescent contains the St. Ann's Well, the Chalybeate Well, and the ranges of baths in which the waters are used at the natural temperature of 82 degrees.

"The diameter of the inner circle on which the Crescent is built is about two hundred feet, and of the outer one three hundred; and the breadth of each wing is about fifty-seven feet, making the length of the whole building nearly three hundred and sixty feet. The upper storeys in the front are supported by an arcade, within which is a paved walk, about seven feet wide, where the company may take air and exercise without being incommoded by bad weather. The area in front is a small gravel plot, some feet below the level of the arcade, well supplied with garden chairs for the accommodation of the walkers.

"The building has three storeys. The arcade is of the rusticated character. Above the arches, an elegant

balustrade extends along the whole front and the ends of the fabric. Over the piers of the arcade arise fluted Doric pilasters, that support the Architrave and cornice. The trygliphs of the former and the rich underpart of the latter have a beautiful appearance. The termination above the cornice is formed by another balustrade, that extends along the whole building. The front contains forty-two pilasters, and two tiers of windows above the arches, thirty-nine windows in each tier; to these add the lower windows, those in the ends, and in the back of the building, and there arises a total of three hundred and seventy-eight windows."—*Jewitt's History of Buxton*, 1811.

The Square is connected with the Crescent by a colonnade; the colonnade extends along three sides of the Square; and the colonnade which skirts the internal area of the Crescent and the external area of the Square, forms a covered walk of a hundred and seventy-five yards in length.

Both the great ranges of bath buildings are covered, and their interiors are well lighted. Due ventilation is secured by shafts and other appliances of the best modern construction. When the amount of watery vapour necessarily discharged from the warm waters, as they are poured into the reservoirs, and thence into the baths, in such vast quantities, is considered, and the amount of heat which is given out from the waters, and the quantity of nitrogen and carbonic acid gases constantly disengaged from them, are taken into account,—the importance of a free ventilation at all times, and a command over the means of adding to its degree at pleasure, will be appreciated, and felt to be peculiarly needful.

The western or natural bath department, occupies a space of ground between the Crescent and the Hall, and has a comparatively small extent of frontage. This

limited space is occupied by an elevation of dressed stone, surmounted by a balustrade, and presenting five compartments. Of these, the three in the centre are occupied by domed, semi-circular, recessed, and fluted spaces, of windowed size and shape; the base of every recessed space being formed of a vase, from the centre of which a jet of water may be made to play. This architectural front has been adapted in its style to the Crescent, with which it is connected, and to the uses of the building it appertains to; and it serves to illustrate the suitableness of the stone of the adjoining gritstone formation for ornamental building—its fine and beautiful grain, and the smooth surface and bold and sharp edges with which it may be finished and carved, either in relief or otherwise.

The elevation of the eastern, or hot-bath department, is not interfered with by any other building, and forms a decorated and substantial example of what must be called the Crystal-Palace style of architecture,—a style which is one of the great creations of our times, and which is calculated to produce, directly or indirectly, a most important change in the character and details of modern architecture. Presenting frontages of glass and iron, on the south and the east; every enarched compartment having a breadth of four feet six inches; the building is nearly 30 yards in width, and more than 60 yards in depth. It is placed substantially on a base of wrought and smoothed stone.

Both these departments of baths are approached from the colonnades of the Crescent and the Square by contiguous arcades; and there is a roofed passage of communication from the Hall. The extension of this colonnade is occupied by shops.

At the south-west corner of the Crescent, entered from the Crescent colonnade, is the St. Ann's Well for the

use of the drinkers of the water. This more recent well is on the site of the oldest St. Ann's Well that is on record, and close to the spot at which the spring emerges by which the well is supplied. The apartment containing the well is entered from the colonnade, without exposure to the weather. The well room is lofty, and lighted from above; the well in the centre being surrounded by a ledge of marble, on which to place the glasses,—supported by a partition, from within which the water is dispensed to the drinkers.

On the north side of the entrance to the St. Ann's Well, and close to it, is the entrance to the gentlemen's department of the natural baths; next to this is the entrance to the ladies' department of the natural baths; and next to this, and opening from the Crescent Colonnade in the same way is the well for the supply of the chalybeate waters to the drinkers.

The size of the room containing the chalybeate well is twenty-two feet by sixteen feet, and lighted from above. The chalybeate water is poured from three orifices into an ornamental basin, in the centre of this apartment.

The well-rooms, especially the one used by the drinkers at St. Ann's Well, are inferior in size to the requirements of the public, and should be replaced by adequate and handsome reception rooms.

Every one of the baths in the natural-bath and the hot-bath departments is separately supplied with the mineral waters, from closed reservoirs, in which the tepid waters are collected, as they are poured from the fissures in the limestone rock. The separate supply thus afforded to every one of the baths is so large, that the temperature of from 80 degrees to 82 degrees is maintained, and the gaseous and chemical properties of the waters are preserved. In regard to the natural baths, there is not only this separate supply of the mineral waters, but the

waters are constantly running into and out of them; the supply for every bath being received directly from the reservoir which feeds it, and carried away at once through the waste pipes into the river. As in the instance of the other baths, the baths which are devoted to the use of the patients of the Hospital have likewise this independent, untouched, and abundant supply of the tepid waters, derived from the unused overflow during the hours when the other baths are not in requisition.

The flow of the tepid waters is amply sufficient for every purpose; and the amount which is discharged altogether is even considerably greater than the very large quantity which is now made use of. Were the whole of the flow to be determinable—thus constantly discharged—in unvarying quantity—of the unvarying temperature, at the moment of issue, of a fraction of a degree more than 82 degrees Fahrenheit—and of unchanging chemical character—the whole quantity poured forth would probably be found to be not less than 250 or 300 gallons per minute.

Dr. Short, writing in the year 1734, says, "all these four springs together," viz., those of the inner bath, the outer bath, St. Ann's Well, and Bingham's Well, "throw forth in a year 97,681,860 gallons of water, besides the waste water that gets out of the bath, and the strong spring rising up in the middle of the bath level beyond St. Ann's Well, and the warm water which rises up in the hot and cold spring, and lastly the two small warm springs which rise up in the low ground between the hot and cold spring in the sough, with several other oozings of warm water in sundry other places, the whole added together will be nearly double this computation." But even this estimate, which Dr. Short states to have been the earliest which had ever been made, gives 185 wine gallons, viz., 139 imperial

gallons per minute as the flow of the four springs; which he was induced to estimate as only half that of the amount of tepid water actually discharged, if the whole had been collected, and none permitted to run to waste. The flow of Bingham's Well and of St. Ann's Well, according to Dr. Short's estimate, being deducted from the above, amounting to 26½ gallons per minute, would leave a flow of 112½ gallons per minute for the supply of the natural baths in the year 1734, *i.e.*, forty-six years before the foundations of the Crescent were laid. Fifty years after this estimate had been made by Dr. Short, an estimate of the flow supplying the natural baths, exclusive of that of the other wells and springs, was made by Dr. Pearson. This estimate was made in the year when the Crescent was completed, viz., 1784; and the flow is stated as having been "nearly 140 ale gallons per minute," which would be 116½ imperial gallons. These estimates confirm one another very remarkably, and justify our great confidence in the statements of these observers.

Much of the flow of the tepid waters supplying the natural baths would seem to have been lost between the years 1784 and 1851; as according to a report which was made to Mr. Smithers, by Mr. Eddy and Mr. Darlington, the engineers, in November, 1851, the amount of flow which supplied the natural baths at that time was only 84¾ imperial gallons per minute. In the process of levelling and excavation for the formation of the new natural baths, a larger amount of flow was regained than that which had thus gradually come to be wasted; and 129½ imperial gallons per minute are now poured forth for the supply of the natural baths exclusively, in addition to the flow by which the hot baths, and that by which the drinking wells are supplied. It will be observed that this flow is greater to the extent of 17

gallons per minute than the quantity of water supplying these baths in 1734; and greater by 13 gallons per minute than the supply in 1784.

The depth of water in all the gentlemen's natural baths is 4 feet 8 inches; and the depth of water in the ladies' natural baths is 4 feet 2 inches. These baths are therefore used in the erect position, in order to admit of free exercise and movement during the period of immersion. This is essential in baths of water, at the natural temperature of the Buxton tepid springs, viz., 82 degrees Fahrenheit. Although the temperature of 82 degrees constitutes a bath of tepid character, and may be said to be about 20 degrees higher than the temperature of river water in the summer season in these high latitudes, it is nevertheless 16 degrees below the temperature of the internal organs of the human body, and 13 degrees to 14 degrees below that of the surface of the body. A bath of 82 degrees would therefore be unwisely made use of in the recumbent position. The degree of muscular action which is involved in the maintenance of the body in the erect position, lessens the risk of chill attending or resulting from the use of the baths, even when the limbs are not kept in more or less active movement during the time of bathing. Crippled and paralysed conditions sometimes preclude any such movement of the limbs, or any very important amount of muscular exercise during the use of the bath. But, in most cases, active exercise is not thus precluded or interfered with during immersion in the water; and the erect position in which the baths are used leaves the trunk of the body and the limbs under full command, and renders every desired degree of exercise usually obtainable. The baths are of sufficient size, as well as sufficient depth, for this important purpose; and they are, moreover, surrounded with

handrails, and supplied with swinging chains, in order that the bather may obtain any desired amount of exercise during the use of the bath.

It is by no means exclusively on account of the temperature of the water, that as much muscular exercise as is otherwise expedient and practicable should be taken during the use of these mineral baths. The absorption of the water through the skin into the system seems to be indispensable to the effect of bathing in any mineral water. This absorption is secured and promoted by bodily exercise, and friction, or pressure, of the surface of the body, during the use of the bath. Very little absorption of the water is believed to take place through the skin, if the bather remains quiescent while immersed in the bath; and the greater the amount of friction of the skin, and the more active and general the degree of the muscular exertion which is made, the greater the amount of absorption under the same circumstances. This is applicable to baths of any temperature; but it is more particularly important in using baths of mineral waters, and more especially of those mineral waters which may be chiefly dependent for their medicinal action upon the amount of the gaseous impregnation which they contain.

The degree to which the skin is absorbent has been the frequent subject of experiment and discussion. Some substances are more readily absorbed than others; and many substances, as mercury, show, from their medicinal action, that they are absorbed, although not amenable to chemical tests. An increase in the amount of the secretion from the kidneys is almost always experienced after the use of the Buxton baths; and the secretion is usually lowered in its specific gravity, and rendered less acid in its character. If not absorbed, the action of these waters when used as baths is inexplicable:—a character and amount of effect upon rheumatic and other

local and general conditions, that may be held to be one of the strongest arguments in favour of the absorbent powers of the skin, as to these and certain other medicinal agents, if assisted by friction, or by exercise, during immersion. The alkaline character of the waters, and their emollient and detergent effects, must aid the degree to which they are absorbable through the skin; and the gaseous constituents of the waters may be considered to add to this effect. The relaxed and moist state of the skin, generally and locally, of many persons afflicted with rheumatism, gout, &c., may aid the degree of the absorption, and help to explain the medicinal results.

All the baths are supplied with douches, or continuous jets of water, made to issue with a considerable amount of force, and which may be directed against, and played upon, any part of the body, limbs, or joints, which may be more particularly affected. The douche is an exceedingly valuable remedy in many chronic localised ailments. Sprains and similar injuries of the textures near to the surface—the seats of re-united fractures and reduced dislocations, which are often left for a long time after such injuries in a very imperfect and painful condition—cases of spinal weakness, and localised chronic infirmities of rheumatic or gouty character—and local forms of paralysis, sometimes traceable to exposure to cold and wet, sometimes to the effect of lead and other mineral poisons—are found to derive much greater or more rapid effects from the use of the bath when combined with the douche than when used without it.

The medicinal value of the douche is due to the greater degree of absorption of the mineral waters, through the skin, by the parts submitted to its action; the effect of the impulse and percussion of the jet of water being tantamount to active friction with pressure. The readi-

ness with which the degree of this friction may be controlled, by regulating the force of the jet and the time of the application; the much greater amount of this kind of friction that may usually be borne, without inconvenience at the time, or discomfort afterwards, than of rubbing with anything of harder character than the water itself; the amount of pressure with which the jet acts on the part submitted to it, answering the full purpose of most efficient shampooing; the perfect adaptation and equalisation of the pressure and friction over the whole surface douched, notwithstanding any curves or inequalities of the body or limbs, while the medicinal properties of the water are absorbed and brought to bear immediately upon the part or parts which may be more particularly affected—are the evident reasons why the douches of the mineral waters prove to be of such great value in the treatment of many localised and disabling ailments. And it is not too much to say, that some of the most wonderful and gratifying instances of relief obtained from the use of the Buxton waters have been referable to their use in the form of douches. A noble duke had his foot trodden upon by a horse. The foot was not apparently injured after the primary irritation had subsided. There was no perceptible swelling of the foot, nor thickening of the bones or ligaments of the arch of the foot, which had been injured. But there was much crippling, and some occasional pain. To walk was difficult; and to take an amount of walking exercise adequate to the wants and duties of life was impossible. Months passed away; the most skilful surgical opinions and appliances were found to be useless. In three weeks, under the use of the baths and douches of the Buxton water, the patient was enabled to walk three miles continuously, without lameness at the time, or inconvenience afterwards.

Such cases might be multiplied to any extent. This case is cited, because, from the high position of the sufferer, considerable attention was attracted to it at the time; and because it is one of many such cases of local injury, in which a cure by the use of the baths and douches of these mineral waters may be looked for with much confidence.

But the effect of the baths alone, without the use of the douche, upon local lesions, even of remote date, is most curious and conclusive; evidencing their great influence on the deeply seated and dense fibrous tissues, which are so rarely remediable by ordinary means of treatment. The sites of fractures or other serious injuries, that have happened in the earlier years of life, become sensitive when these baths are used in mature and even advanced life; and stiffness and imperfect use are often removed, that have been of many years' duration. An elderly lady made use of the baths on account of rheumatism of both knees, not only with satisfactory relief to the rheumatism, but with the effect of restoring use to one of the hands which had been injured by a fall thirty years before, and which had been so contracted that she had been unable to open it from the time of the accident. There was the evidence of her son and her niece, both of mature age, as to the contracted state of the hand from the time of the injury; and the restored power was seen by numbers of people. Minor instances of this kind are so common, that cases of injury, and consequent diminished power of movement, should resort to the baths without reference to the lapse of time, as affording a reasonable chance of recovery, if there have been no destruction or extreme displacement of the injured textures. While such cases supply the most gratifying proofs of the action of the waters, the question is often asked why they do not act

as promptly and as conclusively upon the cases of constitutional ailment attended by local lesions of similar character, and involving a similar disability of movement? The reply is, that the removal of local lesion without any constitutional bias or complication, must be a smaller result than the cure of a morbid condition which may be traceable to hereditary influences, and may have impaired the restorative powers of the system. It is not too much to infer, and experience supports the inference, that the same means, which, in a shorter time, can remove such lesions when not complicated with constitutional conditions, may, in a longer time, afford a probability of removing them, when by so much less amenable to the action of remedies.

The gentlemen's department of the natural baths is entered by a corridor, which is sixty feet in length, and of an ample width and height; and which gives access to two large public baths, to the private baths, and shower baths, of the water at the natural temperature.

The "Gentlemen's Public Bath No. 1," or "Two Shilling Bath," is contained in an apartment which is nearly fifty-one feet long, more than thirty-three feet wide, and upwards of twenty feet high, from the top of the water in the bath to the ceiling of the room. The bath itself is twenty-six feet in length, and eighteen feet in width. This large apartment contains suitable dressing closets, and all other desirable comforts and conveniences; and is lighted by means of a double tier of windows. This bath is on the site of the oldest of the baths; but the new bath is two feet longer, and two feet and a half wider than the former one; the apartment is nearly double the height; it is well lighted (instead of being somewhat dingily dark), and dry, and well warmed and ventilated (instead of being more or less close and damp at all times).

The "Gentlemen's Public Bath, No. 2," or "One Shilling Bath," likewise furnished with dressing closets and all other comforts and conveniences, is twenty-seven feet long and fifteen feet wide. The apartment is not so lofty, nor so well lighted as the No. 1 bath; but it is larger, and better lighted than this bath used to be; and the area is well warmed and ventilated.

The gentlemen's private baths are eleven feet long, and five feet wide, with private dressing rooms, and shower baths, and every comfort and accommodation.

The ladies' department of the natural baths is likewise entered by a separate corridor.

The "Ladies' Public Bath" is contained in an apartment which is thirty-nine feet long, and thirty-nine and a half feet wide. The bath itself is twenty-three feet long, and eighteen feet wide. There are dressing closets, and all desirable and comfortable appurtenances.

The "Ladies' Private Baths" are eleven feet long, and five feet wide, and supplied with douche apparatus; there are also shower baths connected with these baths; and they are furnished with separate dressing rooms, and every accessory to comfort.

The bath of the waters at the natural temperature, provided for the use of the patients of the hospital, is equal in every essential particular to those already mentioned. There are dressing boxes, douche apparatus, &c.

It is mentioned by the late Dr. Joseph Denman, in a work entitled "Observations on the Buxton Water," published in 1801, in strong terms, as a great disadvantage to the usefulness of the Buxton Waters, that no provision had been made for supplying baths of the mineral water at any higher degree of temperature than the natural heat. It was not until the year 1818, or seventeen years after the publication of this decided opinion in favour of warmer baths of the mineral waters,

that this deficiency was in any degree supplied. But Dr. Denman could not have foreseen, nor could any adequate anticipation have been formed, as to the amount of benefit which would accrue from the use of artificially heated baths of the Buxton tepid waters, and the consequently greater and greater demand for these baths on the part of the public.

Much apprehension has been always entertained lest the raising of the temperature of these waters, in ever so small a degree, might have the effect of impairing the medicinal qualities. Such an apprehension might seem to be the more justifiable, inasmuch as the opinion has come to be more and more generally held that the medicinal effects of the waters depends to an important extent upon the gases which they hold in solution, and which might be likely to be more and more driven off, as the temperature of the water is more and more raised. It has to be remembered, however, that the whole of the waters poured forth from these springs, and supplied to the baths, have naturally the elevated temperature of 80 degrees or upwards; and that the very large proportion of the water in a bath is unmeddled with, until the moment of introducing the relatively small quantity of the same water heated, which is necessary to raise the water of the bath to such higher temperature as may be required. Supposing the temperature of common spring or river water to be about 50 degrees, a bath of 95 degrees would require the addition of so much hot water as would elevate the temperature of the water 45 degrees; whereas, in the instance of the tepid waters of Buxton, the difference of temperature would be only 15 degrees, and the addition of one-third only of the proportion of heated water to the bath would be necessary. So small a proportion of heated water has to be added to the natural water, to raise its temperature to that of any

ordinary hot bath, that it has often been impossible when these baths have been in a very great demand from morning till night, to prepare a bath in the hot-bath department at a lower temperature than 88 degrees, or even sometimes than 90 degrees; the heat of the marble sides and floorings of the baths, and of the pipes conveying the hot water, &c., being sufficient to raise by so much the temperature of the natural water without the addition of any heated water at all. It may be justifiably advanced, that the temperature of these mineral waters affords the greatest facility for their use in the form of baths, at any required degree of temperature, with the least possible risk of impairing their effects. In a very large proportion of the cases in which these baths are required, the natural temperature is precisely that which would be desired. The degree of heat is that at which the slightest degree of shock would be given on immersion, and a due amount of reaction be rendered the most certain to follow the use of the bath,—at which the good, without the evil results of cold bathing, would be experienced. At any higher temperature, the regular use of the baths would be more likely to be attended by debilitating effects. Whereas, as has been stated, any such higher degree of heat for a bath may be obtained most readily by the addition of a very small proportion of heated water, and with so much less risk of diminishing the amount of the medicinal properties of the waters. It may be advanced, that, if the Buxton waters had been of so much higher a degree of natural heat, the water would have had to be lowered in its temperature by the addition of cold or cooler water to it, in order to adapt its heat, for the purpose of bathing, to the requirements of a large number of invalids; more of the medicinal properties must have been diminished by such addition, or such exposure, than takes place under present

circumstances; and if this water had been at such a natural degree of heat that it could not have been used in any case without having been previously cooled by addition or exposure, the disadvantage and loss of properties must have been very important. But the proportion of invalids who use the natural baths is very large; and those who use the heated baths have, as nearly as may be, the full advantage of the medicinal properties of the waters, to the extent to which the water used in the baths is in its untouched and natural state; the bath being only affected in that proportion in which hot water is added, and in which the whole of the water in the bath may be supposed to be influenced by being mixed with so small a proportion of heated water, and by the temperature of all the water in the bath being raised any given number of degrees above the natural heat. The principal difference in effect between the heated and the natural water is, in all probability, due to the difference of temperature; and this difference cannot be so important as might have been supposed to be probable, for the reason that so little of the water has to be made hot, in order to raise the temperature of a bath of 82 degrees to any required degree of heat up to 95 degrees; beyond which temperature it is rarely found to be either needful or expedient in any case, to raise the temperature of the water in these baths. It follows, that the greater the extent to which the mineral waters have to be heated, the greater the degree to which the medicinal efficacy is diminished. But when the above statements are carefully considered, it must be admitted to be wonderful, that so small an addition of heated water to the natural water as is required, should influence the medicinal effects in any appreciable degree; and the usual estimate, that three baths of the water at the temperature of 95 degrees are only equal to two natural

baths, is at all events as high an estimate of the difference between the amount of relative effect as is justifiable. And, accordingly, numbers of cases, in which the use of these heated baths has to be trusted to exclusively, the use of the colder natural bath being contra-indicated by any individual circumstance of such cases, are found to be relieved or cured as completely as if the natural baths had been made use of. Many periosteal, neuralgic, spinal, paralytic, and atonic cases,—many cases of rheumatism and gout, attended with much debility,—many cases in which acute or active morbid action has been recent, or perhaps may have imperfectly subsided, many cases, in which disturbance or irritation of the heart's action, or of the mucous or the fibrous tissues, or of any of the great viscera, may render the shock of a bath of 82 degrees inexpedient or hazardous, and a less active agent than the unmodified baths of the Buxton tepid waters to be preferable, whether in the first instance, or throughout the course of the baths—such cases, and they are very numerous, find in these hot baths, adapted in temperature, &c., to the individual indications, the means of using these waters without risk, and with every probability of benefit.

The hot-bath department, placed, as has been said, at the east end of the Crescent, occupying a frontage to the south of 90 feet, and to the east of 180 feet, is connected with the Crescent, the Square, the Hall, and the natural baths, by a colonnade; and is divided into two separate parts, one of which is devoted to ladies, and the other to gentlemen. None of the baths in this department have had to be placed beneath existing structures, as had to be done in regard to two of the public baths in the other department; a sufficiently extensive and unoccupied space of ground has been covered throughout by a ridge-and-furrow roof, and

arranged internally in the best and most efficient manner.

The gentlemen's hot-bath department, to which a colonnade in the south front of the building; eighty feet in length, gives access, is entered by a corridor which is likewise eighty feet long. The several baths are entered from this corridor.

The range of private baths is extensive and complete, with separate dressing rooms, with shower baths, and with every other appliance which may conduce to comfort or advantage. These baths are prepared of any heat that may be desired.

The hot baths are lined throughout with marble, or with the patent white porcelain-covered bricks. The douches in the hot baths are served at any required temperature. The hot baths are shallow, and used in the recumbent position.

The ladies' hot bath department corresponds exactly with that appropriated to gentlemen. It is entered by its separate corridor, eighty feet long, from the arcade on the south front of the building; the baths being likewise extensive and complete, with separate dressing-rooms, and every accessory arrangement for convenience or comfort.

Near the great building are the hot baths for the use of the patients of the hospital. These baths are approached by an entrance on the south of the building. There are separate bath-rooms for men and for women, each containing four baths, with dressing-closets, douche closet, &c., and entered from comfortable waiting-rooms.

Within recent years, the external use of mineral waters otherwise than by immersion, or in addition to immersion, has been in request at some of the Continental health-resorts, and has been advised, or regarded more or less favourably, by members of the medical profession in

this country. Seeing that the object in view must be the medicinal action of the mineral water that may be absorbed through the skin, the practical issue must be the degree to which absorption is obtainable, and its results. It may well be, that, if the local or general absorption of the water through the skin can be increased, the remedial effect may be increased; and that in cases for which general immersion may not be advisable, on account of local or general weakness or lesion, a local external use of the water, without immersion, might be justifiable and of value. Douches of various force and volume,—showers or sprays of definite degree, kneading or massage of affected parts,—while soaking or partly steeping in shallow water,—manipulated by more or less skilled attendants, might secure local effects from the absorption of the water, that might be remedial. In cases for which general or partial immersion might not be contra-indicated, these local or general means might obviously increase the degree of absorption, and add to the probable or possible results. It is advanced, that these means have given valuable results in cases of great weakness, or great susceptibility, or extremely chronic character, or complicated with organic lesion, which had contra-indicated immersion, and that such accessory arrangements may increase or modify the results in special cases of localised rheumatism, deposition, contraction, or loss of power, whether of anœmic, congestive, neuralgic, or cachectic character, in all their infinitely multiplied varieties and degrees, suggesting degrees and modifications in the treatment. The value of such accessory means of using mineral water externally will probably be mainly confined to exceptional cases, and may not equal the curative results of general or partial immersion in the water; but it may be of value in states of system which may not justify immersion, and may be a valuable subsidiary

treatment in the more severe local conditions. In the use of all such means, the known medicinal power of the mineral water must be borne in mind, and the time and degree of the application should be regulated accordingly. It is an axiom that excessive treatment is commonly injudicious, and more likely to weaken than to cure the patient. Shallow pans or baths, through which the mineral water at regulated and desired temperature may run in a gentle stream, and in or on which the whole or any part of the body may rest, and which may be readily accessible for the needed manipulation, shampooing, or massaging, from all sides, give the required conditions for this application. It is curious that the shallow streams, with their beds of fine sand, so long in use at one or more of the Continental warm mineral water resorts, anticipated, if they may not have suggested, these modified baths. The shower, needle, wave, and sitz baths, now added to the various douches, and other means of using the Buxton mineral waters, may add to their value, by adapting them to a larger number of cases. These various baths are regulated to any temperature that may be required.

CHAPTER VII.

PRIMARY, SECONDARY, AND ALTERATIVE EFFECTS OF THE BUXTON TEPID WATERS. MORBID CONDITIONS FOR THE RELIEF OF WHICH THEY ARE USEFUL. CIRCUMSTANCES WHICH CONTRA-INDICATE THEIR USE. RULES FOR THE USE OF THE BATHS AND FOR DRINKING THE TEPID WATERS.

THE effects of the baths of the Buxton tepid waters upon the human system may be classed as primary, secondary, and alterative.

The primary effects include the shock immediately experienced on immersion in the water at the natural temperature, and the reaction which should immediately follow the shock; whether the degree of the reaction be no greater than is necessary to restore the general balance of the circulation, or continue during many hours afterwards; such an amount being included in the primary effects, although it may produce a very important degree of stimulation on the nervous and muscular systems. The secondary effects, which are seldom experienced until several baths have been taken—or in any very important degree unless they have been taken during several successive days, or unless the immersion has been continued during an unusual length of time, or unless the bath has been made use of by those suffering from special morbid conditions—do not show themselves until some hours after the bath has been used; and are then characterised by excitement, at times amounting to a feverish state. The alterative and ultimate effects are

not usually produced until several baths have been taken; and are then characterised by more or less of general depression and languor, and their accompanying indications.

Under the head of the primary effects of these baths, is the degree of the shock which attends their use at the natural temperature; and this is believed to be so far peculiar, that it is greater than would be occasioned by a bath of common water at this tepid degree of heat. This greater degree of shock is probably due to the contained gases. Usually, if the bath has been used under proper circumstances, the shock is of very short duration; and is followed, after a few seconds, and during the immersion, by a vigorous reaction. The degree of reaction is commonly greater than the degree of the shock which had preceded it, and much greater than would attend the use of a bath of ordinary water at the same temperature. The reaction, involving a general glow of heat over the whole body and limbs, a somewhat accelerated circulation, and a remarkable buoyancy of the feelings, usually continues during several hours after the bath, and is attended by an increase of appetite, and a marked degree of excitement of the spirits. The special effect of the baths, in regard to the primary shock, and the reaction which immediately follows it, is however chiefly one of degree; the same effect, but less in its amount, being commonly experienced after bathing in common water. The warm baths of the mineral waters produce necessarily less shock in proportion, as the water of the bath is more nearly of the same temperature as that of the human body; and the degree of the reaction is usually less, other things being equal, than that which follows the use of the natural baths; but it is usually greater, to a very marked extent, than commonly follows the use of a warm bath of ordinary water.

The secondary effects of the baths are of a still more peculiar character; differing much more from that which follows the use of a bath of ordinary water, at any temperature. Seldom manifested until from eight to sixteen or eighteen hours after the use of the bath; and seldom, unless under specially excitable and morbid conditions, until after several baths have been made use of; the degree of the secondary effects is added to, by the longer time that the bather has remained in the bath, by the more frequent repetition of the bath, and by the morbid or the constitutional susceptibility of the system to become unduly stimulated. The secondary effects include the increase of gouty and rheumatic pains, so commonly experienced at the commencement of a course of these baths, in such conditions of system; and likewise the thirst, restlessness, loss of sleep, feverish symptoms, and less active state of the secreting organs, during the course, and especially during the earlier part of the course of the baths; for, as the course is continued longer and longer, the secondary effects gradually subside, and are succeeded after a longer or shorter interval, which varies much in different cases, by the alterative effects: the feverish condition sometimes subsiding altogether; but in most cases in the first instance, alternating with the indications of the alterative action—with the depression, languor, and eventual debility, which mark the full alterative action of these mineral waters.

The alterative action of the baths is then essentially characterised by symptoms of debility; and such symptoms—apart, of course, from the relief of pain, the partially or entirely restored use of crippled limbs, or the generally improved state of the several organic functions—constitute the great and conclusive proof of their full medicinal action. And it may be strongly said,

that the full effects can seldom be considered to have been obtained, until some indications of diminished general power have been shown. It is often of some importance, in cases where much morbid condition has to be removed, to determine how far the alterative action of the baths should be continued; and in most such cases, the course has to be interrupted and resumed many times. Sometimes two courses, and more rarely three courses may be advisedly used in the course of the same year; interrupted by a sufficient interval of time, to enable the powers and general balance of the system to be so far restored, as to justify the resumed use of so powerful an alterative as these waters are. It is often a great mistake to infer, that the full benefit derived from their use is certain to be obtained from one or two or even more courses of the baths. I have seen—in the course of the years during which the effects of these waters have been under my observation—very many cases, in which a large and even unlooked for degree of benefit has been obtained; but in which, after a persevering use of the baths through two or three courses, they have been abandoned; because they had not proved to be completely curative, although they had been so largely remedial. I have seen the bed-ridden sufferers from gout and from rheumatism enabled to walk about again, with the aid of a crutch, or stick, or both; and enabled, contrary to any reasonable expectation that could have been entertained, to resume the horse exercise, which had been impracticable for months or years: and yet the hopeful continued use of these waters has been abandoned, because a more rapid and entire relief has not been afforded. It cannot be too early, or too anxiously impressed on the minds of such sufferers from the most severe forms of gout or rheumatism, that a strong constitutional bias, the gradual result of hereditary

predisposition, or of the misdoings of years, and unchecked morbid action, may not be entirely curable, even by the use of such a great agent as these waters; or, if curable, may only prove to be so after a long, persevering, and patient use; and that a certain amount of relief, the degree of which may be even beyond reasonable hope, ought to afford an amply sufficient motive for their continued use.

The diseases for the relief of which the Buxton baths are found to be the most eminently useful are rheumatism, gout, neuralgia, and certain forms of spinal, uterine, and dyspeptic affections. Many of the disordered conditions which are incidental to old age—much of the deranged health incidental to middle age in females—much of the irregularity and disturbed condition incidental to females at various periods of life—much of the nervous weakness, that is indicated by tic-douloureux in its various forms, sciatica, &c.—much of the functional derangement which is consequent upon exposure, intemperance, or advanced life—much of the disordered and painful conditions, dependent on old age, gout, &c.—much of the local loss of nervous, and thence of muscular power, dependent upon the poisonous effects of lead, mercury, &c.—are usually remediable, and in an important degree, by the use of these mineral baths. And, as has been previously urged, the painful or crippling consequences, which often follow such injuries as fractures, dislocations, sprains, bruises of tendons and ligaments, and the like, are commonly influenced and relieved by the use of these baths, in the most satisfactory degree.

The presence of acute inflammation, and the existence of organic disease in any of the great organs essential to life, usually contra-indicate altogether the use of these baths. The intimate connection between paralysis

and disease of the brain, or spinal cord, or their immediate envelopments—the equally intimate connection between rheumatism and affections of the heart—the frequent occurrence of pains of rheumatic character, in connection with the general derangement of health, consequent upon affection of the liver or the kidneys—the connection between gout and visceral congestion, and all the important bearings and consequences of such congestion—the degree of liability there is, in acute or subacute gouty and rheumatic states, to metastasis—are, severally, cogent reasons for the exercise of care and judgment in the use of the baths. It cannot be said too strongly, that no invalid should leave his home, in order to make use of these baths, without the express advice and sanction of his usual medical attendant; and medical men cannot be made too fully cognizant of the stimulating and alterative character of these mineral waters. And, moreover, as no medical man who has not personally been concerned in the use and effects of the waters can know so much about them as those who have their effects under their continual observation, it may be said, with equal truth and emphasis, that no person ought to use these waters without the sanction and direction of a medical man resident in Buxton. It is my duty to state this in so many words, and to urge it upon public attention; and the seniority of my position enables me to do this with a less chance of misconstruction, and justifies me in doing so.

The warmer baths of the Buxton waters are weaker, less stimulating, and less alterative in their effect, in the same proportion as they are raised in their temperature above that of 82 degrees; and inasmuch as, when not heated beyond the temperature of 95 degrees—that is, when no more of the same water heated is added to a much larger bulk of the water at the natural temperature

than is required to raise the whole water in a bath to 95 degrees, or less—not only a sufficiently large, but a definable proportion of the medicinal effect is retained; inasmuch as the shock, with its risks, in the cases of feeble and excitable invalids, is thus got rid of; inasmuch as the primary stimulation, and the secondary febrile state, and the ultimate alterative effects are thus modified; the use of these warmer baths frequently serves as a valuable introduction to the after use of the natural baths, and as a very useful substitute for them, in cases where debility, or excitability, would render the use of the natural baths unwise or unsafe.

Neither the natural nor the warmer baths ought to be used every day. When so used, the alterative effects are very liable to be manifested suddenly, and in excess. Strong men who have ventured to bathe in these waters every day, have often become suddenly and very unnecessarily debilitated; and in the case of rheumatism and other ailments having been the occasion for using these baths, the disadvantage has arisen that the bathing has had to be discontinued for a time, and sometimes for months; the full, and otherwise realisable degree of relief, not having been obtained. The impatience to secure the benefit from the use of the baths in as short a time as possible, and the anxiety to return to their homes and occupations, lead many to make such excessive use of them, and supply ample and conclusive experience as to their powerful character. Generally the baths are to be used every other day; or on two successive days, their use being omitted on the third day.

The time of the day for bathing is a question of much importance. The baths have usually most effect when used before breakfast, and are commonly the best borne about three hours after breakfast, or three hours after luncheon. The system is found to be more susceptible

to the action of medicinal agents, before breakfast; probably because the nervous and vascular powers are more vigorous at that time, and the tissues are then in a more absorbent condition. It is well known that stimulants produce greater effect when taken before breakfast, and tonics are seldom wisely directed to be taken at that time; and, on the same principle, the baths of these mineral and stimulating waters are not by any means always wisely ordered to be used before breakfast; and, on the contrary, many invalids are unable to bathe with comfort or even safety before breakfast, who do so without discomfort between breakfast and luncheon, or dinner. The time for using the baths after breakfast, depends much upon the kind and amount of the breakfast, and the rapidity of the digestion. The larger and heavier the meal, and the more slow the digestion, the longer should the bath be deferred. And, on the other hand, in the cases of much enfeebled persons, and of those who from habit, or want of appetite, or general debility, eat but sparingly at breakfast, and of the most easily assimilated kinds of food, the use of the baths may not be wisely deferred beyond the end of the second hour after breakfast, as the complete digestion of the food in the stomach is apt to be followed by an unmistakable degree of languor, and the bath is not so well borne under such circumstances. It is generally advisable to use the baths between breakfast and luncheon or dinner, at the commencement of the course; and in some cases to use them before breakfast afterwards, when the effects shall have been proved to be moderate, and the extra effect obtained by bathing before breakfast may even be thought to be desirable. Usually, more baths have to be taken during a course, if the baths are used after breakfast, than if used before breakfast. The more feeble the

person, the more excitable the individual constitution, and the more febrile or inflammatory the nature of the ailment, the less desirable it is to bathe before breakfast; and the less susceptible the individual system, the stronger the system, and the more obstinate and unimpressible the nature of the ailment, the more desirable it is that the baths should be used before breakfast. The time during which persons should remain in the baths varies very much; but should seldom if ever equal the long periods which are said to be expedient in using many of the continental mineral baths. From one minute, or less, to ten minutes, and very rarely to fifteen or twenty minutes, is usually found to be a sufficient time for the immersion in the natural baths; and from three minutes to twenty minutes, and very rarely longer than the latter time, in the warmer baths. Generally, the time of immersion should be longer in the warmer than in the natural baths; and longer, the higher the temperature of the warmer baths may be. Usually, if the temperature of the warmer baths is not gradually reduced, in order to bring the case more and more within the influence of the medicinal effects, or in order to prepare the patient to commence the use of the natural baths, the time for remaining in the baths should be increased. It is seldom wise to begin the course of either the warmer or the natural baths, by remaining in the water for the same time which may properly be allowed after several baths have been taken, and the system has become somewhat accustomed to the stimulating effects of the waters.

When the warmer baths are not indicated—either as preparatory, or as being exclusively adapted to the individual case—and the use of the natural bath might be justifiably begun at once, the use of the warmer baths may be deprecated as involving exactly as much loss of

time, as these baths are less powerful in their effects than the natural baths, besides being in some instances less suited, or even occasionally altogether unsuitable. This often applies to dyspeptic conditions—to cases of gout, rheumatism, &c., attended by cutaneous irritation, with or without the scorbutic character—to relaxed states of the female constitution, without visceral congestion or obstruction—and to such cases of spinal derangement as are not marked by irritation, but by general or local relaxation, and consequent diminution of power and defective function. There are many cases of hysteria, chorea, facial tic, &c., in which the warmer baths are either used without advantage, or even disadvantageously; and in which the use of the natural bath is attended with the best effects.

But there is a much larger number of morbid conditions, in which the use of the natural baths is unsafe or unjustifiable, and in which the use of the warmer baths is beneficial. Such are cases of gout, rheumatism, or neuralgia, accompanied by marked irritability of the general system, or by an evident tendency to assume an inflammatory character. Such are cases in which there is irritation or disturbance of the heart's action; cases in which there is a congestive or irritative condition of the mucous membranes; cases of hepatic congestion, irritation, sluggishness, or disturbance of function; and, generally, cases of congestion or irritation of any of the great internal organs; such congestion or irritation not being sufficient in degree, or in the importance of its bearings or connections, to justify the withholding the baths, when otherwise strongly indicated, for the relief of the special conditions in which these baths are useful.

The effect of the warmer baths is modified satisfactorily in some of the more severe morbid conditions, by varying the degree to which the body is immersed. When the

body is only covered to the height of the armpits, it is called a three-quarter bath; when only to the waist, a half bath; and when to the hips, a quarter bath. In this way, any degree of pressure from the water on the trunk of the body may be avoided; and, which is sometimes of importance, the gaseous emanations from the water are kept at so much greater a distance from the mouth and nostrils. By this modified use of the baths, the range of cases for which they are otherwise indicated, and to which they are thus rendered applicable without risk or disadvantage, is much increased. When the variety of visceral conditions with which gout, rheumatism, &c., may be complicated, is considered, the value of such a means of modification may be inferred to be important. The longer or shorter interval of one or more days between the baths; the longer or shorter time of the immersion, from one minute to twenty minutes, or longer; the use of the warmer baths, or of the baths at the natural temperature; and the degree of heat of the warmer baths, from 95 degrees, or higher, to 88 degrees; and the use of the quarter bath, or half bath, or three-quarter bath, or whole bath, according to circumstances, supply an extensive power of adaptation to different cases.

The baths should not be made use of after dinner, and not later than three or four hours after any meal, if the system is very excitable, or there is any reason to infer a probability that the baths may disagree. The most convenient times for bathing, when not thus contra-indicated at those hours, are before breakfast, and an hour before dinner. It is necessary, in almost all cases, to return to the lodging as soon as possible after leaving the bath, and to remain within doors during two or more hours afterwards, according to the season and the weather. In dry and warm weather, one hour will

generally be sufficient for this purpose; but in cold and damp weather, it may be advisable to remain in the house three or four hours, or even during the whole remainder of the day. Remaining thus quiet during so long a time after bathing, not only diminishes the risk of taking cold afterwards—for the degree of excitement produced by the baths renders this unlikely, and of rare occurrence—but it lessens the chance of undue excitement of the system after the bath, and is therefore to be generally and strongly advised in proportion to the relative excitability. On the other hand, in exceptional cases, the primary effect of the bath is depressing, and followed or accompanied by more or less chilliness. This, if not sufficient to forbid the use of the bath, would justify increased caution in its use, and probably indicate that exercise should be taken immediately after. The tendency to go to sleep after using the bath, which is often great, should be resisted in all cases. Sleeping, until some hours after using the baths, almost always deranges, and excites, and adds to the risk of congestion, and should be watchfully avoided.

Drinking these waters produces much the same effect on the system, as is produced by the baths; they are, however, more immediately stimulating, and less eventually alterative in their effects. They act occasionally as an aperient; but this is uncertain and unsatisfactory, and rather indicates irritation than relief, suggesting their discontinuance until some corrective medicine has been made use of, such as may relieve the congestion or morbid condition of the abdominal organs and secretions, upon which this effect from the internal use of the waters almost always depends. They ought to act upon the kidneys; and their value as a diuretic, and corrective of some morbid conditions of the urine is very great. They ought not to occasion headache, or thirst, or loss of

appetite, or broken or disturbed sleep, or feverishness; but they ought, on the contrary, to promote appetite and digestion. Their use is often of great value in such cases as the baths would be prescribed for, but from circumstances contra-indicating their use. The internal use of the waters is eminently auxiliary to the effect of the baths; and they should always be taken in connection with the use of the baths, when not contra-indicated. The degree of excitement immediately occasioned, however, makes it needful to forbid their use in many cases, in which the baths may be used without any disadvantage. This remark applies to a large number of cases of gout. The waters should not be drunk either immediately before, or immediately after the use of the bath. It is desirable that the possibility of the twofold excitement, caused by using the waters in both ways, without some interval of time, should be avoided. If the bath is not used before breakfast, the first glass of the waters, and in some cases two glasses of the waters, may be taken before breakfast; and the second or third glass may be taken, when not interfering with the time of the bath, three hours after breakfast. Or the second, or third, or fourth glass of the waters, may be taken two or three hours after the bath, or an hour before dinner, or three hours after an early dinner. It is seldom necessary to take more than two half pints of the water every day. There are three differently sized glasses at the St. Ann's Well; the one containing a quarter of a pint, the second one-third of a pint, and the largest half a pint. It is generally advisable that the smallest glass should be used at the beginning of the course; increasing the dose again and again, at the interval of a day or two, if no contra-indication should occur. The waters are so fully charged with gas, and until the system has become accustomed to its use, the gas is so apt to occasion some degree of

giddiness or even headache, that it is prudent at first to drink the water by sips, and even to hold the glass in the hand a few seconds before beginning to drink it; but this seldom applies to more than the few first times of drinking the waters; and afterwards it is desirable, in order to secure the whole of the gas, or as much of it as may be, to drink the water as rapidly and immediately as possible, after receiving it from the attendant at the well. It is desirable, if possible, to walk after drinking the water, in order to expedite its absorption from the stomach. The amount of walking found to be desirable on this account, varies from ten minutes to an hour, or more. The expediency of remaining within doors, during one or more hours after using the baths, and of walking for some little time immediately after drinking the waters, is an additional reason why the use of the baths and the drinking of the waters should, if possible, be at different times of the day. The water should seldom be drunk later than four or five o'clock in the afternoon. When more than two glasses of the waters during the day are indicated, the additional quantities may be taken from half an hour to an hour or more after the previous glass, according to the readiness with which the waters are found to be absorbed from the stomach. The internal use of these waters is often extremely useful, in cases of bronchial irritation and relaxation, urinary affections, and irritation of the bladder, in which the use of the baths may or may not be advisable.

CHAPTER VIII.

ANALYSIS, CHARACTER, AND USES OF THE CHALYBEATE WATER.

BETWEEN the limestone and gritstone formations at Buxton, there is a narrow bed of shale, containing a considerable proportion of iron; and from this arises a very useful chalybeate spring. This water has been long and extensively used and valued. It is an excellent chalybeate; fortunately, as nearly as may be, free from alum. It is therefore as little astringent in its effects as possible, and acts as a mild and efficacious tonic, producing the usual effects of iron upon the constitution; and in the perfectly satisfactory way that only chalybeate waters attain: being more certain in the effect, more secure of absorption, and less apt to heat the system, or engorge the membranes or viscera, than any artificial way of exhibiting iron medicinally. This water has a distinct chalybeate taste, is colourless and inodorous, and is of the ordinary temperature of the atmosphere. It was analysed by Sir Lyon Playfair, in the year 1852, with the following results. The imperial gallon was found to contain:—

Protocarbonate of iron	1·044
Silica	1·160
Alumina	trace
Sulphate of lime	2·483
Sulphate of magnesia	0·431
Carbonate of magnesia	0·303
Sulphate of potash	0·147
Chloride of sodium	1·054
Chloride of potasium	0·460
	7·082

The value of such an excellent and simple chalybeate water is necessarily very great, in a place which is resorted to by such large numbers of invalids, for the use of the baths of the tepid waters, or for the benefit of the great and useful change of air, which the mountain elevation, and the limestone and gritstone soils of the Buxton district, afford to important classes of invalided conditions. There are great numbers of invalids who use the Buxton baths advantageously, in whose cases the internal use of the tepid waters is not advantageous, and in whom the internal use of the chalybeate water proves to be eminently serviceable. There are many cases in which the use of the tepid waters is not indicated, either as baths or internally, that take the chalybeate water with advantage; and there are some cases, of not unfrequent occurrence, in which the chalybeate and tepid waters are mixed together, and so taken with much benefit. It is curious that, when so mixed, they are often found to have a laxative effect; whereas the tendency of the chalybeate water alone, and in some degree the tendency of the tepid water, is to produce a constipated rather than a laxative effect.

The chalybeate water should not be taken before breakfast. When so taken, it is liable to induce headache, and feverishness, and gastric disturbance, in cases where it suits well when taken at other times. The best times for drinking the chalybeate water are as soon as may be after breakfast, after luncheon, and after dinner, when two or more glasses, of larger or smaller size, may be taken at intervals of one or two hours. The quantity taken at a time may be from a quarter of a pint to half a pint. It should not occasion headache or feverishness; it should promote appetite and digestion, and not interfere disadvantageously with either. If it should occasion thirst,

or uneasiness, or sense of distension of stomach, it should probably be discontinued. It is advisable, if possible, to walk after drinking the water.

The chalybeate water is of much value as a collyrium, in many cases of weakness and chronic irritation of the eyes. It is of more use as an eye-water, than might have been expected from a reference to its composition. It should be applied by means of the usual eye-glass adapted to this purpose, and it should be used freely.

The chalybeate water is extremely valuable as an application, auxiliary to the baths and douches of the tepid waters, for the relief of indolent swellings of the joints, &c., so often left after the subsidence of rheumatic conditions. When poured over the joints affected, in directed and regulated quantities, once, or twice, or three times a day, it has appeared to stimulate the absorbents to a much greater degree, than has been found to attend the similar application of common water at the same temperature. This success has led to its use by means of sponging and friction, in similar cases, and with good effect; and this, to the use of the affusion of this water down the spine, and to sponging and friction of the back with it, in some forms of spinal weakness and irritation, with good effect. In some paralytic conditions, likewise, whether dependent on cerebral or spinal affection, the use of the affusion of this water, or of sponging and friction with it, over the head or down the back, according to the nature of the case, has often been attended with good effect.

CHAPTER IX.

THE SUPPLY OF GRITSTONE WATER FOR DOMESTIC AND ORDINARY PURPOSES.

THERE are not many questions which are of greater importance in regard to the health of people in different localities, or which have met with less full and practical consideration, than the extent and the character of the water supplied for domestic and ordinary purposes. Use has been made of the advantageous position of Buxton, in regard to this important particular. There is an abundant supply of remarkably pure water. The water of calcareous districts generally is more or less objectionable for domestic uses, inasmuch as, according to its degree of hardness, the solvent power of the water is lessened; and all cleansing and washing purposes so far interfered with, and the infusion of tea, the boiling of vegetables, &c., so much less readily completed. And, moreover, even persons who reside habitually in calcareous districts are occasionally found to suffer from the calcareous matters contained in the water, and more especially from their astringent effect; and strangers, not accustomed to the use of such waters, suffer much more frequently, and to a greater degree. It is one of the valuable circumstances referable to the gritstone formation which adjoins Buxton, that the water supply for domestic purposes is derived from it. The water is brought from three sources: two, of higher level, locally known as the cold springs, arising near to Comb's Moss, on the right of the Manchester road, about

a mile from Buxton; the third, from a stream in the lower grounds, nearly a mile to the west of this place. The waters from these places were examined by Dr. Lyon Playfair, with the following results:—

Buxton, 30th August, 1852.

"Dear Dr. Robertson,

"I have examined the water with which Buxton is now supplied (for domestic and ordinary purposes), and find it to be pure and soft, such as is indeed to be expected from a water flowing from the millstone grit. Its hardness is of two degrees; that is to say, it is of the same hardness as would be given to one gallon of distilled water, by dissolving in it two grains of chalk (carbonate of lime).

"The water from the brook, which is intended to be used for the further supply of Buxton, is 4·35° (4⅓ degrees) of hardness. This is also a soft water, though twice as hard as the previous sample.

"Perhaps you may judge better of the relative qualities of these waters by contrasting them with the water of the river Thames, which is about 13 degrees of hardness.

"I am, very sincerely yours,

"LYON PLAYFAIR."

A curious circumstance connected with the use of this water by strangers is, that it is occasionally supposed to be too pure. The taste of the water is considered to be vapid by some, who have been accustomed to use waters impregnated strongly with earthy or saline matters; and the change to the use of this water, from that of less pure water has been known to produce some degree of discomfort in very delicate and highly sensitive systems. In such cases the water of the cold calcareous springs has been desirably substituted for the gritstone water; and Buxton is variously and sufficiently supplied with water of this kind from pumps and otherwise. The brook which runs across the field from Wye Head, forming the succession of ornamental ponds, is chiefly of this kind of water. There are two pumps connected together

by an arch, opposite the west end of the Crescent. One of these pumps is supplied with the tepid water, the other with the cold calcareous water.

Occasionally, after heavy rain, the gritstone water becomes more or less discoloured, from mixture with surface water that has passed over the summits of Comb's Edge and Comb's Moss. This might be rectified by deposition tanks of sufficient depth, or by filtering beds. The brightness of the water is readily restored by filtration.

CHAPTER X.

HISTORY, PROGRESS, POSITION, AND USEFULNESS OF THE DEVONSHIRE HOSPITAL AND BUXTON BATH CHARITY.

THE Buxton Bath Charity and Devonshire Hospital is, under the former of these names, an institution of considerable antiquity. It arose by degrees from very small beginnings, to its present position of extensive usefulness. It is recorded by Dr. Jones, in his work so often cited, that Buxton was much resorted to by poor afflicted persons, in the middle of the sixteenth century; and indeed the petition which has been previously mentioned, from the inhabitants of the adjoining village of Fairfield, which was addressed to Queen Elizabeth, in the year 1595, for a grant from the Royal bounty for the maintenance of a chaplain, on the ground that they were too much impoverished to do this for themselves, by reason of the urgent and continual claims for relief on the part of the many poor sufferers, resorting to the Buxton baths, confirms the opinion that the numbers of poor persons who then made use of the waters must have been very considerable. It may be fairly gathered from the various ancient writers on these waters that these poor persons had been so far aided, from time immemorial, as to have had the use of the baths allowed to them gratuitously. Dr. Jones indeed speaks of "the treasury of the bath" as being partly devoted "to the use of the poor that only for help do come hither;" but whether this is said in reference to a fund that had been

already in existence, or only by way of suggestion for the formation of such a fund, does not clearly appear. Dr. Jones adds, however, an appeal that deserves to be quoted in all works that may be written concerning the waters of Buxton :—"If any think this magisterial imposing on people's pockets, let them consider their abilities, and the sick poor's necessities, and think whether they do not in idle pastimes throw away in vain twice as much yearly; it may entail the blessing of them that are ready to perish upon you, and will afford a pleasant after reflection. God has given you physic for nothing; let the poor and afflicted (it may be members of Christ) have a little of your money; it may be the better for your own health. Heaven might have put them in your room, and you in theirs; then a supply would have been acceptable to you."

It would seem, then, that the invalided poor, resorting to Buxton for the use of its baths and waters, had thus early met with aid as to their gratuitous use, and also with a kindly solicitude and attention from medical men in attendance at the baths; for it would appear to have been the custom in earlier times, as it is said to be even now in some of the continental watering-places, that the medical attendants were wont to afford their instructions in the bath apartments, and personally superintend the fulfilment of their directions. So much is left in obscurity, as to periods of time less remote from our own than that now referred to, that it is little wonder the early history of Buxton should have left no more traces than these of the origin of the Buxton Bath Charity; and it cannot but be regretted that the ancient records, which appear to have been kept at the baths by the medical attendant when he was present, and by the bath-keeper in the absence of the physician, of the "name, place of abode, coming thither and departure, condition, calling,

disease, and symptoms, and the benefit received," should have been destroyed. A more curious and interesting record than such an ancient register would now be, cannot well be imagined, It is not, however, known at what distant period of time baths were first provided at Buxton for the gratuitous use of the poor; nor is it even known when baths were first provided for the separate and exclusive use of the poor bathers.

There is in the Hospital a printed document, which bears the date of 1785, in which it is stated that a pecuniary fund for the assistance of poor bathers had originated in the year 1779; and this paper is evidently a copy of an annual report of this charity, which has probably been issued regularly from that time to the present; although I have not been able to meet with any copies of these reports between the years 1785 and 1818. It is not known when "the poor treasury," if such really had existed, ceased to be supplied with funds; but enough has been said to show that the Buxton Bath Charity may claim to be one of the most ancient charitable institutions in the kingdom. The fund which has, at all events since the year 1779, been regularly provided by charitable persons, for the assistance of poor bathers, must have been at first of a very moderate amount, as the number who were to receive pecuniary relief from it was limited to "sixteen objects at one time," and it was only given during the six summer months. It was stated in my work on "Buxton and its Waters," published in the year 1838, that of 14,906 patients admitted to the benefits of the institution in the eighteen years previously, 12,608 were dismissed as cured or much relieved; the remainder having been either little relieved or no better at the time of dismissal. From that time to the beginning of September, 1858, 23,319 patients were on the books of the institution; and of these it may be gathered from the

reports that 16,575 were cured or much relieved, 5,859 were only relieved in some degree, and 885 only were no better when dismissed.

During the twenty years, 1859 to 1878, the patients were most comfortably lodged and provided for in the Devonshire Hospital. This building presents a remarkable instance of the successful conversion of a range of magnificent stables to the purposes of hospital accommodation and requirement; offering spacious, well-warmed, and thoroughly ventilated dining hall, day rooms, and dormitories, ample kitchen, &c., &c.—an excellent master's house, consulting rooms, dispensary, house surgeon's and dispenser's rooms, &c.—accommodation for the servants of the establishment, and 150 beds for patients—in addition to a ward for cases of accidental injury. The central position of the building on a commanding eminence, close to the church, the Crescent, the baths, and the wells—with a southern and western exposure, presenting views from all the windows of the park and walks, surrounded by its own grounds, and with a costly colonnade and parterre in its centre—furnishes an affecting evidence, as is recorded on a stone over the door of the hospital, written, not long before his death, by the late Sir Francis Darwin, formerly one of the physicians, of "the last munificent charity of William Spencer, 6th Duke of Devonshire, K.G., who allowed these buildings to be converted to the use of the sick poor, January, A.D. 1858."

In the 20 years the hospital had 26,106 patients under treatment; all the beds were occupied and the admission of many applicants had to be refused or deferred, during many weeks of those years; the cases of 22,690 were treated beneficially, only 3,416 of the patients having derived no benefit during their stay; and 2,971 of the patients, or about one eighth of the whole

number, were not suffering from any of the forms of rheumatism, but were such as are ordinarily met with in hospitals, and required medical treatment accordingly. On the average of the 20 years, the patients remained under treatment 24·16 days; and 23,135 cases of rheumatism—embracing every conceivable variety of this distressing malady, and for the most part cases of severe and obstinate character, were, in so short a time, and with little aid from other means than the Buxton waters, treated with such satisfactory results.

From the winter of 1862-3, the memorable winter of the deplorable Cotton Famine, when 100 young women, who most needed change of air, and food, and restorative care, were received by the Hospital, and eventually returned to their homes with renovated health and strength, a kindly feeling had been entertained in regard to the Hospital; and this culminated in an arrangement, by which a grant of £24,000 was made from the surplus fund, collected for the relief of the sufferers, to obtain the extension of the Hospital to the whole of the great building of which it had occupied a part, and to obtain its enlargement to the provision of a total number of 300 beds for patients, and an ample area of grounds and buildings for all the accessories of a great medical institution. This involved the entire re-construction of the whole interior of the vast octagonal building; and necessitated the roofing of the unoccupied area in the centre, by what has proved to be the largest dome that has ever been erected. This dome covers half an acre of ground, and canopies a single apartment, warmed by hot water pipes as required, and renders the patients practically almost independent of season or weather. The whole of this re-construction has involved the expenditure of between £30,000 and £40,000, and has reduced very seriously the investments of the funds of the Hospital, which should be repaid by public benefaction. When

the re-construction was completed, the architectural effect was unexpectedly great; and it was scarcely a surprise to find that the building had been copied from a mediæval palace, "The Palace of Christian Kings, at Granada," in Spain, of which, with the exception of the dome, it is an almost exact replica. The merit of the thoughtful and kindly grant, from the Cotton District's Convalescent Fund, is mainly due to the late Mr. E. Ashworth, of Bolton, in Lancashire; and the skilful re-construction to Mr. R. R. Duke, Architect, of Buxton.

The patients are supplied with a liberal dietary, medical advice, and medicines, and have the use of the baths and waters. Annual subscribers are entitled to recommend a patient, for three weeks, to the full benefit of the institution, for every guinea subscribed. Casual subscribers have the same privilege, on the payment of forty shillings. Life-subscribers have the same annual privilege for every twenty guineas. Four out-patients may be recommended, instead of one in-patient. Out-patients receive medical advice, medicines, and the use of the baths and waters. In addition to the subscriber's recommendation, the fitness of every patient, as an object of charity, is expected to be satisfactorily certified by the officiating minister, or by the churchwardens or other parochial officers. Letters respecting the admission of patients are to be sent to the secretary, Mr. Joseph Taylor, Devonshire Hospital, Buxton, Derbyshire. It is advisable to obtain notice of the day on which there will be a vacancy in the hospital, before a patient is sent from home. Donations, subscriptions, &c., should be made payable to the treasurers, the Sheffield and Rotherham Bank, Buxton, Derbyshire. It need only be added, in support of the claims of the institution to a universal sympathy, in addition to the statistical statement of the curative results, that every patient costs the institution from £2 5s. to £2 10s., notwithstanding the gratuitous

services of the medical officers, and the most painstaking and constant supervision.

Extending over so many years as from 1820 to 1886, and embracing such large numbers of cases, the records are ample enough to satisfy the most sceptical inquirer. And as to the nature of the ailments, in regard to which so great a degree of success has been obtained by the skilled use of the Buxton waters, it should be stated that a very large proportion of the cases have been those of rheumatism—and of rheumatism, for the relief of which hospital and dispensary appliances, and the efforts of the private practitioner, have been tried in vain; and, moreover, that the results have been obtained, for the most part, by the use of the Buxton baths and waters for average periods of only from three to four weeks. The chronic and obstinate character of the generality of these cases is sufficiently explained, by the difficulty with which poor people are enabled to leave their homes, and by the fact that, notwithstanding the assistance afforded by the institution, and the provision of medical advice, medicines and baths, few poor persons are enabled to defray the cost of a journey to Buxton and back, at a less outlay from their own resources, than from ten shillings to three pounds sterling. This circumstance, moreover, causes attempts to impose upon public liberality, on the part of healthy persons, or of persons suffering from less severe or less obstinate forms of ailment, to be too unprofitable to be of frequent occurrence. That many much-afflicted poor persons should, notwithstanding this expenditure, from scanty funds, contrive to visit Buxton every year, or almost every year, as the only means which they find to be effectual, in warding off such a degree of crippling of the limbs, as would prevent them from pursuing the occupation by which they earn their livelihood, may be regarded as supplying evidence of the medicinal value of the baths and waters.

APPENDIX.

CATALOGUE OF PLANTS WHICH GROW IN THE NEIGHBOURHOOD OF BUXTON, WITH A BOTANICAL COMMENTARY.

BY THE LATE MISS HAWKINS.

THE following list was prepared previously to the year 1854; and many of the plants have been disturbed by the cuttings and embankments of the railway. It is hoped, however, that most of them will be found to be in or near their old localities:—

Proceeding along the road from Buxton to Bakewell, the first plant worthy of particular notice is the Golden Saxifrage (Chrysoplenium oppositifolium). It grows very near the river, and flowers in May. Near the same place may be found the Red and Black Currant (Ribes rubrum and R. nigrum, and also the Gooseberry (Ribes grossularia). But though it is natural for these shrubs to grow in damp soil, near a river, it is possible that the spot where these are found may be the remains of a former garden.

A little farther, on the opposite side of the river, is a Willow, not very common—the Sweet Bay-leaved Willow (Salix pentandra), producing its blossoms in June or July. Still farther, on the other side of the river, and nearly opposite to the Lover's Leap, is a beautiful shrub, the Bird Cherry (Prunus padus), putting out its elegant spray of white blossoms in May. The ground beneath is covered with bright blue patches of the Great Water

Scorpion-grass (Myosotis palustris), flowering from June till August, and the White Wood Anemone (Anemone nemorosa), which flowers in April and May.

At the Lover's Leap, following the bed of the little stream which runs between high rocks, there will be found, in May and June, a great quantity of Broad-leaved Garlick (Allium ursinum); and at the upper end of the rocky bed of the rivulet, it is overhung by a beautiful deep pink Rose (Rosa villosa). This rose grows also in many places on the opposite bank of the river Wye, together with the Common Dog Rose (Rosa canina), and the White Trailing Dog Rose (Rosa arvensis).

In all the plantations on each side of the road, may be found the wild Raspberry (Rubus idæus).

Passing the Lover's Leap, on the rocks on the right hand, is a plant not found in any other place in England except near Malham Cove, in Yorkshire, the Blue Jacob's Ladder, or Greek Valerian (Polemonium cæruleum), flowering in June. Other plants on the side of the road are common everywhere. Smooth Speedwell (Veronica serpyllifolia), Germander Speedwell (Veronica chamædrys), Procumbent Speedwell (Veronica agrestis), Wall Speedwell (Veronica arvensis), Ivy-leaved Speedwell (Veronica hederifolia), all flowering from April till June, or even later; the Round-leaved Bell-flower (Campanula rotundifolia), flowering in July and August; the Field Scabious (Scabiosa arvensis), flowering in July; Small Scabious (Scabiosa columbaria), which is much more rare than the former, and flowers from June till August. Cuckoo-flower (Cardamine pratensis), flowers in April and May. Herb Robert, or Stinging Cranesbill (Geranium Robertianum), Shining Cranesbill (Geranium lucidum), Dovesfoot Cranesbill (Geranium molle), all flowering from May

to August. Near the river, the Butterbur (Tussilago petasites) grows in profusion, producing larger leaves than any indigenous plant in great Britain.

Beyond the mill, on the left hand of the road, the bridge leads to a bushy bank of small extent, skirting a footpath leading to Fairfield; on which bank, besides the Prunus spinosa (Blackthorn or Sloe), flowering in April or May, the Raspberry (Rubus idœus), Common Blackberry (Rubus fruticosus), also flowering in April or May; the Dog's Violet (Viola canina), and Common Cowslip (Primula veris), and some rarer plants are to be found. Here are the Green Hellebore (Helleborus viridis), flowering in April or May; Clustered Bell-flower (Campanula glomerata), Bloody Cranesbill (Geranium sanguineum), flowering from July to September; Hairy Violet (Viola hirta), flowering in April; Common Dwarf Cistus (Cistus helianthemum), and Hairy St. John's Wort (Hypericum hirsutum), both flowering in July and August. Bushes of a very beautiful deep pink or red Rose (Rosa tomentosa), also grow on this bank. Close to the river, a little farther on the opposite side, is the Common Dame's Violet (Hesperis matronalis) flowering in May and June.

Between the bridge and the turnpike, are found on the rocks, on the right hand—as also in many of the pastures—the Grass of Parnassus (Parnassia palustris), flowering in September and October; Ivy-leaved Wall Lettuce (Prenanthes muralis), flowering in July; Common Wall Cress (Arabis Thaliana), flowering in April; Hairy Wall Cress (Arabis hirsuta), flowering in May; the Nottingham Catchfly (Silene nutans) used to grow on this bank; but in taking materials for repairing the road, it seems to have been destroyed. It grows in the end of Miller's Dale, and in Dove Dale.

Beyond the turnpike, in the wet ground on the left hand, are the Common Marsh Marigold (Caltha palustris) flowering in March and April; Common Water Cress (Nasturtium officinale), flowering in June and July; and by the road side, chiefly on the inner side of the wall, is the Blue Meadow Cranesbill (Geranium pratense), flowering in June and July. Still farther, past the bend of the road, are Small Marsh Valerian (Valeriana dioica), flowering in June; Wild Angelica (Angelica sylvestris), flowering in July; Great Hairy Willow-herb (Epilobium hirsutum), flowering in July. This last plant grows on the bank dividing the fishpond from a small branch of the river, mixed with large patches of Blue Scorpion-grass, the Common Cow Parsnip (Heracleum sphondylium), flowering in July. On the right hand of the road, before reaching this bend of the road, are the Small-flowered Hoary Willow-herb (Epilobium parviflorum), flowering in July; Brooklime (Veronica Beccabunga), Mouse-ear Chickweed (Cerastium vulgatum), and Silverweed, or Wild Tansy (Potentilla anserina), all flowering from May to July.

On approaching the third milestone from Buxton, the limestone is interrupted by toadstone, and as far as this extends, a beautiful little plant grows in the crevices of the stones, the Common Butterwort (Pinguicula vulgaris), flowering in May and June. In many parts of the river grows the White Floating Crowfoot (Ranunculus aquatilis), showing its white flowers in May. On the rocks on the right hand, going up the hill called Topley Pike, grows a sweet-scented plant, the Common Kidney Vetch, or Ladies' Finger (Anthyllis vulneraria), flowering in June and July; and higher up on those rocks, the Stone Bramble (Rubus saxatile), flowering in June. In the valley below the road, on rocks close to the river, there are a few plants of the White Beam Tree (Pyrus

Aria), flowering in May. The Giant Bellflower (Campanula latifolia) grows near the road, going on to Ashford.

The plants to be found near Buxton, farther from the public road, are the Common Privet (Ligustrum vulgare), growing on rocks in a dale near the bottom of Topley Pike, flowering in May and June; where may also be found the Common Buckthorn (Rhamnus catharticus), flowering in May and June. And in a dale leading to Chelmorton, the Burnet-leaved Rose (Rosa spinosissima) grows amongst the loose stones on the side of a hill.

Amongst the rocks and shrubs in other places are two plants which used to be considered doubtful natives of Britain—the Cinnamon Rose (Rosa Cinnamomea) and the Mountain Globeflower (Trollius Europæus)—both flowering in May and June. Other more common plants are to be found in almost every meadow and road side. Such are the Common Corn Salad, or Lamb's Lettuce (Fedia olitoria), flowering from April to June; Devil's-bit Scabious (Scabiosa succisa), flowering from August to October; Cross Wort Bedstraw (Galium cruciatum), flowering in May; Smooth Head Bedstraw (Galium saxatile), flowering from June to August; Yellow Bedstraw (Galium verum), flowering in July and August; Cleavers, or Goosegrass (Galium Aparine), flowering all the summer; Greater Plantain (Plantago major), Hoary Plantain (Plantago media), having a very pleasant scent, and flowering from June to August; Great Burnet (Sanguisorba officinalis), flowering in June and July; Common Wall Pellitory (Parietaria officinalis), flowering from June till September; Common Ladies' Mantle (Alchemilla vulgaris), flowering from June to August; Field Ladies' Mantle, or Parsley Piert (Alchemilla arvensis), flowering from May to October; Procumbent Pearlwort (Sagina procumbens), flowering from May to

October; Annual Small-flowered Pearlwort (Sagina apetala), flowering in May or June.

Common Primrose (Primula vulgaris), flowering in April; Autumnal Gentian (Gentiana amarella), flowering in August; Perennial Blue Flax (Linum perenne), flowering in June and July; Mill mountain (Linum catharticum), flowering from June to August; Smooth Cow Parsley (Chærophyllum sylvestre), flowering in May; Sweet Cicely (Myrrhis odorata), flowering in May, not very common; Common Earth, or Pignut (Bunium flexuosum), flowering in May or June; Common Goutweed (Ægopodium podagraria), flowering in June; Sheep's Sorrel (Rumex acetosella), flowering in June and July; Broad Smooth-leaved Willow-herb (Epilobium montanum), flowering in July; Bilberry, or Black Whortleberry (Vaccinium myrtillus), flowering in May; Common Ling (Calluna vulgaris), flowering in June and July; Cross-leaved Heath (Erica tetralix), flowering in July and August; Fine-leaved Heath (Erica cinerea), flowering from July to October; White Meadow Saxifrage (Saxifraga granulata), flowering in June; Rue-leaved Saxifrage (Saxifraga tridactylites), flowering in May; Mossy Saxifrage, or Ladies' Cushion (Saxifraga hypnoides), flowering in June; Common Chickweed, or Stitchwort (Stellaria media), flowering all the year; Vernal Sandwort (Arenaria verna), flowering from May to August: Orpine, or Livelong (Sedum telephium), flowering in August; Biting Stonecrop, or Wall Pepper (Sedum acre), flowering in June; Common Wood Sorrel (Oxalis acetosella), flowering in April and May; Corn Cockle (Agrostemma githago), flowering in June and July; Meadow Lychnis, or Ragged Robin (Lychnis flos cuculi), flowering in June; Red Campion (Lychnis dioica), flowering in May and June; Common Houseleek (Sempervivum tectorum), flowering in July; Meadow Sweet

(Spiræa ulmaria), flowering in June and July; Spring Cinquefoil (Potentilla verna), flowering in April and May; Strawberry-leaved Cinquefoil (Potentilla fragariastrum), flowering in April; Water Avens (Geum rivale), flowering in June and July; Dwarf Cistus (Cistus helianthemum), flowering in July and August; Lesser Celandine (Ranunculus ficaria), flowering in April; Bulbous Crowfoot (Ranunculus bulbosus), flowering in May; Creeping Crowfoot (Ranunculus repens), flowering from June to August; Common Bugle (Ajuga reptans), flowering in May; Common Ground Ivy (Glechoma hederacea), flowering in April and May; Red Dead Nettle, or Archangel (Lamium purpureum), flowering in May; Common Marjoram (Origanum vulgare), flowering in July and August; Wild Thyme (Thymus serpyllum), flowering in July and August; Common Self-heal (Prunella vulgaris), flowering July and August; Common Yellow Rattle (Rhinanthus cristagalli), flowering in June; Common Eyebright (Euphrasia officinalis), flowering from June to September; Knotty-rooted Figwort (Scrophularia nodosa), flowering in July; Purple Foxglove (Digitalis purpurea,) flowering in June and July; Common Whitlow-grass (Draba verna), flowering in March and April; Speedwell-leaved Whitlow-grass (Draba muralis), flowering in April and May; this is considered rather a rare plant; Rock Hutchinsia (Hutchinsia petræa), flowering in April; Common Shepherd's Purse (Thlaspi bursa pastoris), flowering all the summer; Common Milkwort (Polygala vulgaris), flowering in June and July, in a variety of colours—blue, white, and lilac; Common Furse, or Gorse (Ulex Europæus), flowering in May; Common Bitter Vetch (Orobus tuberosus), flowering in May and June; Tufted Vetch (Vicia cracca), flowering in July and August; Lesser Yellow Trefoil (Trifolium minus), flowering in

June and July; Common Bird's-foot Trefoil (Lotus corniculatus), flowering from June to September; Greater Bird's-foot Trefoil (Lotus major) flowering in July; Common Perforated St. John's Wort (Hypericum perforatum), and Imperforate St. John's Wort (Hypericum dubium), both flowering in July and August; Hairy St. John's Wort (Hypericum hirsutum), flowering in June and July; Yellow Goat's Beard (Tragopogon pratensis), flowering in June; Corn Sow thistle (Sonchus arvensis), flowering in August; Rough Hawkbit (Apargia hispida), flowering in July; Common Mouse-ear Hawk Weed (Hieracium pilosella), flowering in June; Musk Thistle (Carduus nutans), flowering in July and August; Spear Plume Thistle (Cnicus lanceolatus), flowering from June to September; Marsh Plume Thistle (Cnicus palustris), flowering in July and August; Meadow Plume Thistle (Cnicus pratensis), flowering in June; Woolly-headed Plume Thistle (Cnicus eriophorus), flowering in August; Coltsfoot (Tussilago farfara), flowering in March and April; Common Rag Wort (Senecio Jacobæa), flowering in July and August; Moon Daisy (Chrysanthemum leucanthemum), flowering in July; Common Yarrow, or Milfoil (Achillea millefolium), flowering in July; Black Knapweed (Centaurea nigra), flowering from June to August; Greater Knapweed (Centaurea scabiosa), flowering in July and August; Common Salad Burnet (Poterium sanguisorba), flowering in July; Perennial Mercury (Mercurialis perennis), flowering in April and May; Rough Hawksbeard (Crepis biennis), flowering in July; Spotted Cat's-ear (Hypochæris maculata), flowering in July.

On Axe Edge are found, besides the three common heaths (Calluna vulgaris, Erica tetralix, and Erica cinerea), the Black Crowberry, or Crakeberry (Empetrum nigrum), a plant in appearance very like a heath, but of

a very different class, as it bears the blossoms and the fruit on separate plants; the former appearing in May, and the latter, which is a black berry, like a small black currant, ripe about August. It is said, that in former times a sort of wine was made from this fruit in Iceland and Norway. The Bilberry (Vaccinium myrtillus) grows there in abundance, and also the Cowberry, or Whortleberry (Vaccinium vitis idæa), flowering in June, bearing a red berry. Cranberry, or Marsh Whortleberry (Vaccinium oxycoccus), flowering in June; the fruit of which is, in an early state, pale coloured with red spots; but when fully ripe of a deep red. The Mountain Bramble, or Cloudberry (Rubus chamæmorus), which in June bears one very elegant white flower, on a slender stalk; the fruit resembles a small white raspberry. The Wild Rosemary, or Marsh Andromeda (Andromeda polifolia) flowering in June.

The plants of the Orchis tribe, near Buxton, are the Early purple Orchis (Orchis mascula), flowering in April and May; Spotted Palmate Orchis (Orchis maculata , flowering in June and July; Aromatic Palmate Orchis (Orchis conopsea), flowering in June; Frog Orchis (Orchis viridis), on the high ground above the hospital at Buxton, and flowering in June and July; Green Man Orchis (Aceras anthropophera), flowering in June; Common Twayblade (Listera ovata), flowering in June.

Plants of the Fern tribe, immediately near Buxton, are the Common Polypody (Polypodium vulgare), Rigid Three-branched Polypody (Polypodium calcareum); Male Shield Fern (Aspidium filix mas), Broad Sharp-toothed Shield Fern (Aspidium dilatatum); Female Shield Fern (Aspidium filix fœmina); Brittle Bladder Fern (Cyathea fragilis); Common Maidenhair Spleenwort (Asplenium trichomanes); Green Maidenhair Spleenwort (Asplenium viride), much more rare than the Common Spleenwort;

Wall Rue Spleenwort (Asplenium ruta muraria); Common Hart's Tongue (Scolopendrium vulgare); Northern Hard Fern (Blechnum boreale); Common Ovate Adder's Tongue (Ophioglossum vulgatum). Common Moon Wort is said to grow near Corbar Wood.

The Common Brake (Pteris aquilina) grows in abundance near Ashford, and the grounds at Chatsworth.

CLASSIFIED LIST OF PLANTS.

CLASSIFICATION of Plants, which grow in the neighbourhood of Buxton; and most of which grow within the district immediately around the Town:—

Diandria.—Monogynia.

Ligustrum vulgare	Common Privet
Fraxinus excelsior	Common Ash
Veronica serpyllifolia	Smooth Speedwell
,, beccabunga	Brooklime
,, anagallis	Water Speedwell
,, officinalis	Common Speedwell
,, chamædrys	Germander Speedwell
,, agrestis	Procumbent Field Speedwell
,, arvensis	Wall Speedwell
,, hederifolia	Ivy-leaved Speedwell
Pinguicula vulgaris	Common Butterwort

Triandria.—Monogynia.

Valeriana dioica	Marsh Valerian
Fedia vulgaris	Common Lamb's Lettuce

Tetrandria.—Monogynia.

Scabiosa succisa	Devil's-bit Scabious
,, arvensis	Field Scabious
,, columbaria	Small Scabious
Galium cruciatum	Cross Wort Bedstraw
,, saxatile	Smooth Heath Bedstraw
,, pusillum	Least Mountain Bedstraw
,, verum	Yellow Bedstraw
,, aparine	Goosegrass
Plantago major	Greater Plantain
,, media	Hoary Plantain
Sanguisorba officinalis	Great Burnet
Cornus sanguinea	Wild Cornet Tree
Parietaria officinalis	Wall Pellitory
Alchemilla vulgaris	Common Ladies' Mantle
,, arvensis	Field Ladies' mantle

Tetrandria.—Tetragynia.

Sagina procumbens . .	Procumbent Pearlwort
,, apetala . . .	Small-flowered Pearl Wort

Pentandria.—Monogynia.

Myosotis palustris . .	Water Scorpiongrass
,, sylvatica . .	Upright Wood Scorpiongrass
Cynoglossum officinale . .	Common Hound's Tongue
Symphytum officinale . .	Common Comfrey
Primula veris . . .	Common Cowslip
,, vulgaris . . .	Common Primrose
Polemonium cærulum . .	Greek Valerian
Campanula rotundifolia. .	Round-leaved Bellflower
,, latifolia . .	Giant Bellflower
,, trachelium . .	Nettle-leaved Bellflower
,, glomerata . .	Clustered Bellflower
Viola hirta	Hairy Violet
,, canina	Dog's Violet
,, lutea	Yellow Mountain Violet
Rhamnus catharticus . .	Common Buckthorn
Ribes rubrum . . .	Common Currant
,, alpinum . . .	Tasteless Mountain Currant
,, nigrum . . .	Black Currant
,, grossularia . . .	Common Gooseberry
Hedera helix . . .	Common Ivy

Pentandria.—Digynia.

Chenopodium Bonus Henricus	Mercury Goosefoot
Gentiana amarella . .	Autumnal Gentian
,, campestris . .	Field Gentian
Chærophyllum sylvestre .	Wild Chervil
Myrrhis odorata . . .	Sweet Cicely
Bunium flexuosum . .	Common Earthnut
Ægopodium podagraria .	Common Goutweed
Angelica sylvestris . .	Wild Angelica
Heracleum sphondylium .	Common Cow Parsnep
Pimpinella magna . .	Greater Burnet Saxifrage

Pentandria.—Tetragynia.

Parnassia palustris . .	Common Grass of Parnassus
Linum perenne . . .	Perennial Blue Flax
,, catharticum . .	Mill Mountain

Hexandria.—Monogynia.

Allium ursinum . . . Broad-leaved Garlick
„ vineale . . . Crow Garlick
Juncus lampocarpus . . Shining Jointed Rush

Hexandria.—Trigynia.

Rumex sanguineus . . Bloody-veined Dock
„ acetosa . . . Common Sorrell
„ acetosella . . . Sheep's Sorrell

Octandria.—Monogynia.

Epilobium hirsutum . . Hairy Willowherb
„ augustifolium . Rose-bay Willowherb
„ parviflorum. . Small Willowherb
„ montanum . . Broad Smooth Willowherb
Vaccinium myrtillus . . Bilberry
„ vitis idæa . . Red Wortleberry
„ oxycoccus . . Cranberry
Calluna vulgaris . . . Common Ling
Erica tetralix . . . Cross-leaved Heath
„ cinerea . . . Fine-leaved Heath

Octandria.—Tetragynia.

Paris quadrifolia . . . Common Herb Paris

Decandria.—Monogynia.

Andromeda polifolia . . Marsh Andromeda

Decandria.—Digynia.

Chrysoplenium alternifolium Alternate-leaved Golden Saxifrage
„ oppositifolium Opposite-leaved Golden Saxifrage
Saxifraga granulata . . Meadow Saxifrage
„ tridactylites . . Rue-leaved Saxifrage
„ hypnoides . . Mossy Saxifrage

Decandria.—Trigynia.

Silene nutans . . . Nottingham Catchfly
Stellaria media . . . Common Chickweed
Arenaria verna , . . Vernal Sandwort

Decandria.—Pentagynia.

Sedum telephium . .	Orpine Livelong
,, acre . . .	Biting Stonecrop
Oxalis acetosella . . .	Common Wood Sorrel
Lychnis flos cuculi . .	Meadow Lychnis
,, dioica . . .	Red or White Campion
Cerastium vulgatum . .	Mouse-ear Chickweed
Spergula nodosa . . .	Knotted Spurrey

Dodecandria.—Dodecagynia.

Sempervivum tectorum .	Houseleek

Icosandria.—Monogynia

Prunus padus . . .	Bird Cherry
,, spinosa . . .	Sloe Blackthorn

Icosandria.—Di-Pentagynia.

Mespilus oxyacantha . .	Hawthorn
Pyrus aucuparia . . .	Mountain Ash
,, aria	White Beam Tree
Spiræa filipendula . .	Common Dropwort
,, ulmaria . . .	Meadow Sweet

Icosandria.—Polygynia.

Rosa cinnamomea . .	Cinnamon Rose
,, spinosissima . .	Burnet Rose
,, villosa . . .	Soft-leaved Rose
,, canina . . .	Common Dog Rose
,, arvensis . . .	White-trailing Rose
Rubus fruticosus . . .	Blackberry
,, idæus . . .	Raspberry
,, corylifolius . .	Hazel-leafed Bramble
,, saxatilis . . .	Stone Bramble
,, chamæmorus . .	Cloudberry
Pontentilla anserina . .	Silverweed
,, verna . .	Spring Cinquefoil
,, fragariastrum .	Strawberry-leaved Cinquefoil
Geum urbanum . . .	Common Avens
,, rivale . . .	Water Avens

Polyandria.—Monogynia.

Cistus helianthemum . .	Common Cistus

Polyandria.—Pentagynia.

Aquilegia vulgaris . . Columbine

Polyandria.—Polygynia.

Anemone nemorosa . . Wood Anemone
Ranunculus ficaria . . Crowfoot
,, bulbosus . . Bulbous Crowfoot
,, repens . . Creeping Crowfoot
Trollius Europæus . . Mountain Globe Company
Helleborus viridis . . . Green Hellebore
,, fœtidus . . Stinking Hellebore
Caltha palustris . . . Marsh Marigold

Didynamia.—Gymnospermia.

Ajuga reptans . . . Common Bugle
Glechoma hederacea . . Ground Ivy
Lamium purpureum . . Red Dead Nettle
Origanum vulgare . . Common Marjoram
Thymus serpyllum . . Common Thyme
,, acinos . . . Basil Thyme
Prunella vulgaris . . . Self-heal

Didynamia.—Angiospermia

Rhidanthus cristagalli . . Yellow Rattle
Euphrasia officinalis . . Eyebright
Scrophularia nodosa . . Knotty Figwort
Digitalis purpurea . . Purple Foxglove

Tetradynamia.—Siliculosa.

Draba verna . . . . Common Whitlowgrass
,, incana . . . Twisted-podded Whitlowgrass
,, muralis . . . Speedwell-leaved Whitlowgrass
Hutchinsia petræa . . Rock Hutchinsia
Thlaspi bursa pastoris . . Shepherd's Purse

Tetradynamia.—Siliquosa.

Cardamine impatiens . . Ladies' Smock
Cardamine pratensis . . Cuckoo Flower
Nasturtium officinale . . Watercress
Hesperis matronalis . . Dame's Violet
Arabis thaliana . . . Wall Cress
,, hirsuta . . . Hairy Wall Cress

Monodelphia.—Decandria.

Geranium pratense	Blue Cranesbill
Geranium Robertianum	Herb Robert
,, lucidum	Shining Cranesbill
,, molle	Dovesfoot Cranesbill
,, sanguineum	Bloody Cranesbill

Diadelphia.—Octandria.

Polygala vulgaris	Common Milkwort

Diadelphia.—Decandria.

Ulex Europæus	Common Furze
Anthyllis vulneraria	Kidney Vetch
Orobus tuberosus	Common Bitter Vetch
Vicia sylvatica	Wood Vetch
Vicia cracca	Tufted Vetch
Hippocrepis comosa	Horseshoe Vetch
Trifolium minus	Lesser Yellow Trefoil
Lotus corniculatus	Birdsfoot Trefoil
,, major	Greater Birdsfoot Trefoil

Polydelphia.—Polyandria.

Hypericum perforatum	Perforated St. John's Wort
,, dubium	Imperforated St. John's Wort
,, montanum	Mountain St. John's Wort
,, hirsutum	Hairy St. John's Wort

Syngenesia.—Polygamia æqualis.

Tragopogon pratense	Yellow Goatsbeard
Picris hieracioides	Hawkweed Ox Tongue
Sonchus arvensis	Corn Sow Thistle
Prenanthes muralis	Ivy-leaved Wall Lettuce
Leontodon taraxacum	Dandelion
Apargia hispida	Rough Hawkbit
Hieracium pilosella	Mouse-ear Hawkweed
,, murorum	Broad-leaved Wall Hawkweed
,, umbellatum	Narrow-leaved Hawkweed
Serratula tinctoria	Common Saw Wort
Carduus nutans	Musk Thistle
,, acanthoides	Welted Thistle
Cnicus lanceolatus	Spear Plume Thistle
,, palustris	Marsh Plume Thistle

Syngenesia.—Polygamia æqualis.

Cnicus eriophorus. . . Woolly-headed Plume Thistle
„ heterophyllus . . Melancholy Plume Thistle
Carlina vulgaris . . . Carline Thistle
Eupatorium cannabinum . Hemp Agrimony

Syngenesia.—Polygamia superflua.

Tussilago farfara . . . Coltsfoot
„ petasites . . Butterbur
Senecio vulgaris . . . Common Groundsel
„ Jacobæa . . . Common Rag Wort
„ tenuifolius . . Hoary Rag Wort
Solidago virgaurea . . Common Golden Rod
Bellis perennis . . . Common Daisy
Chrysanthemum leucanthemum . . . . } Ox-eye Daisy
Achillea millifolium . . Milfoil

Syngenesia.—Polygamia frustranea.

Centaurea nigra . . . Black Knapweed
„ scabiosa . . Greater Knapweed

Gynandria.—Monandria.

Orchis bifolia . . . Butterfly Orchis
„ pyramidalis . . Pyramidal Orchis
„ mascula . . . Early Purple Orchis
„ viridis . . . Frog Orchis
„ maculata . . . Spotted Palmate Orchis
„ conopsea . . . Aromatic Palmate Orchis
Aceras anthropophera . . Green Man Orchis
Listera ovata . . . Common Twayblade

Monæcia.—Tetandria.

Urtica dioica . . . Great Nettle

Monæcia.—Pentandria.

Bryonia dioica . . . Red-berried Bryony

Monæcia.—Polyandria.

Arum maculatum . . . Cuckoo Pint
Poterium sanguisorba . . Salad Burnet
Corylus Avellana . . . Common Hazel Nut

Diæcia.—Diandria.

Salix pentandra . . . Bay-leaved Willow
„ caprea . . . Round-leaved Willow
„ alba . . . . Common White Willow

Diæcia.—Triandria.

Empetrum nigrum . . Black Crowberry

Diæcia.—Enneandria.

Mercurialis perennis . . Perennial Mercury

Diæcia.—Monadelphia.

Taxus baccata . . . Common Yew

FERNS.

Crypotogamia.—Filices.

Polypodium vulgare . . Common Polybody
„ calcareum . . Rigid Three-branched Polybody
Aspidium Filix mas . . Male Shield Fern
„ aculeatum . . Prickly Shield Fern
„ lobatum . . Close-leaved Prickly Shield Fern
„ dilatatum . . Sharp-toothed Shield Fern
„ Filix fœmina . Female Shield Fern
Cystea fragilis . . . Brittle Bladder Fern
„ dentata . . . Toothed Bladder Fern
Asplenium Trichomanes . Spleenwort
„ viride . . Green Maiden-hair Spleenwort
„ ruta muraria . Wall-tree Spleenwort
„ Adiantum nigrum Black Maiden-hair Spleenwort
Scolopendrium vulgare . Common Hartstongue
Blechnum boreale . . Northern Hard Ferns
Pteris aquilina . . . Common Brakes
Botrychium lunaria . . Moonwort
Ophioglossum vulgatum . Adder's Tongue
Equisetum limosum . . Smooth Naked Horsetail

APPENDIX.

Letter from SIR ROBERT RAWLINSON, C.B., *Chief Engineer-Inspector of the Local Government Board, to the* CHAIRMAN OF THE BUXTON LOCAL BOARD.

The important letter, which has been kindly and opportunely granted for publication, by the Chairman of the Buxton Local Board, with the permission of Sir Robert Rawlinson, C.B., Chief Engineer-Inspector of the Local Government Board, is thankfully published, as an appendix to this work, at the moment of its issue from the press, in fullest corroboration of all that has been advanced, in the preface and body of the work, as to the sewerage of Buxton. It must be highly gratifying to Dr. Thresh, and Mr. Hague, and to the Chairman and Members of the Buxton Local Board, to have received such signal approval, from the highest Public Authority, of the great work, which they have, in so spirited and satisfactory a manner, devised and achieved. It must, moreover, be a singular gratification to Sir Robert Rawlinson, to find that the sewage works, which he instituted a quarter of a century ago, by the wish of the late Mr. E. Woollett Wilmot, at that time Chairman of the Buxton Local Board, and the local Agent for His Grace the Duke of Devonshire, has been carried to such a successful issue, by the present Local Board of Buxton, with the advice and plans of Dr. Thresh and Mr. Hague, and that the works are visited by the Authorities of other Urban Populations, with the expectation that sanitary works, on the same or similar lines to those of Buxton,

may be carried out, with the same happy results elsewhere, for the health and life-expectation of the people.

It should be added, that, during many intervening years, Captain E. L. Darwin filled the position of Chairman of the Buxton Local Board, and gave much time, and great engineering ability, to the works in question.

The reader is specially referred to the Preface, and to pages 34, 35, and 36, in the body of the work, as to the detailed particulars of the sewerage works of Buxton.

THE CRESCENT HOTEL, BUXTON,
20th July, 1886.

TO E. C. MILLIGAN, Esquire,
Chairman of the Local Board.

DEAR SIR,

I have for short time to-day, with your Surveyor, Mr. Joseph Hague, visited and inspected your sewage works, and have been very pleased with their arrangement, appearance, and efficiency. They are the cleanest-looking works I have seen, and send out a well-clarified effluent. I naturally take some interest in Buxton, as I designed and executed the main sewers, as Engineer for their Commissioners; but it is so long since that I forget the name of the Duke's agent, and of the members of the Commission. Buxton was, however, one of the first towns sewered on the new lines I at that time had laid down—namely, manholes, and right lines with true gradients. The site of the town is for the most part limestone, gunpowder having to be used in forming the main sewer trenches. This involved great care and extra cost. Then I was under the strictest injunctions not to risk any injury to the hot and other springs; and from what I have learned as to the action of the sewers, and have seen of the sewage works, I can say that no town is more perfect in its sanitary arrangements, and this is

certified by your low death-rate. Mr. Hague informs me that the sewer ventilators do not cause nuisance, and that the delivery of sewage from 9 o'clock p.m. to 6 o'clock a.m. is almost pure water, indicating that there is no deposit in the sewers, as also that the outflow from the drains and sewers is continuous. I don't suppose any human excreta remain within the area of the town one hour, but all is delivered in a fresh state at the sewage works. Herein consists the efficacy of the system and works, which are alike efficient for the ordinary resident population, and also for your season population, up to, say, 20,000. This is an important feature in your works.

I must compliment you on your gas-works, which, under your continued good management, ought, and no doubt soon will, free you from any rate in aid.

I have the honour to be,
Dear Sir,
Yours very truly,
ROBERT RAWLINSON.

P.S.—Will you please to kindly make my respects to your clerk and to the several members of your Local Board?

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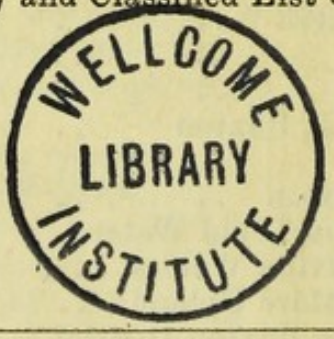
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