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A GUIDE

TO THE USE OF

THE BUXTON WATERS,

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

FIFTEENTH EDITION, REVISED.

COMPRISING

A DESCRIPTION OF THE BATHS, ETC.,

AND

THE RESULTS OF THE ANALYSES

OF

THE THERMAL, THE CHALYBEATE, AND THE GRITSTONE WATERS OF BUXTON,

BY DR. LYON PLAYFAIR, C.B., F.R.S.,

PROFESSOR OF CHEMISTRY IN THE UNIVERSITY OF EDINBURGH,

DR. MUSPRATT, AND OTHERS;

AND ALSO A NOTICE OF THE EXTENSIONS, TO BUXTON, OF THE MIDLAND AND LONDON AND NORTH WESTERN RAILWAYS.

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A GUIDE

TO THE USE OF

THE BUXTON WATERS.

Two of the most important and increasingly felt wants from which Buxton had suffered were at length supplied in June, 1863. Situated on the old main line of road, between the west of Scotland, Manchester, and London, it was, before the time when railways were first established in this country, passed through daily by mail and stage coaches, carriers' wagons, &c., and enjoyed the advantage of being on one of the greatest thoroughfares in the kingdom. Rival railway companies, and local prejudices, had succeeded in rendering Buxton, year by year, more and more difficult of access than most other places similarly situated. The town and its healing waters had continued to grow in importance, notwithstanding this injurious treatment; but its effect could not have been otherwise than disadvantageous. The grand mountain district of Buxton, and the High Peak of Derbyshire,—its picturesque scenery of hills, and dales, and rocks,

and trout streams; its vast geological formations of mountain limestone and millstone grit; its pure, and dry, and bracing atmosphere; its never varying and great outflow of tepid waters, highly charged with nitrogen gas, and proverbially famous for relieving cases of gout, rheumatism, &c., among the most obstinate and painful of human ailments;—are now connected with the London and North-Western and the Midland Railways. Two stations, belonging to these railway companies respectively, are only separated from one another by a roadway, and contain waiting-rooms, offices, spacious glass covered platforms, &c., and are situated very near to the Baths, the Crescent, the hotels, and other principal buildings; and Buxton is now placed, by the Midland Railway, within from five to six hours from London, by five trains per day; within seven hours from Bristol; within five and a half hours from Cheltenham; within eight and a half hours from Norwich; within five hours from Peterborough; within four and a half hours from Birmingham; within four hours from Leeds; within three hours from Sheffield; and, seven times per day, within one and a half to two hours from Derby:—and, by the London and North-Western Railway, within little more than six hours from London; within four hours from Birmingham; within three hours from Liverpool; within three and a half hours from Shrewsbury; within three and a quarter hours from Huddersfield; and, six times per day, within one and a quarter to one and a half hour from Manchester. The Midland line, from Buxton, traversing at a high level many of the most beautiful of the dales of Derbyshire, exhibiting valley scenery of the character that is peculiar to the mountain limestone formation, and precipitous crags of much boldness and

grandeur, offers scene after scene of unique and wonderful beauty and interest; and the London and North-Western line skirts picturesquely the south side of the valley of Chapel-en-le-Frith to Whaley Bridge, and thence through Disley to Stockport and Manchester. During the present year, 1867, an extension of the Midland Railway to Chapel-en-le-Frith, New Mills, Manchester, &c., has opened a second means of communication with these towns, and the districts around and beyond them, by no fewer than eight trains from Buxton, and eight trains to Buxton, every day. Since the autumn of the year 1858, the Buxton Bath Charity, (by means of which institution the fame and value of the medicinal waters have been in a considerable degree maintained and extended, restoring, as it has done, year by year, hundreds of disabled labourers and artisans to health and usefulness,) has had provided for it a home commensurate to its importance and its needs—with the provision for the comfortable accommodation of one hundred and twenty patients, and the capability of extending this to two hundred patients, should it be required, every patient having a separate bed,—with large dayrooms, diningroom, &c.,—the building being detached, and placed on an excellent elevation, close to the town, and very near to the Baths, commanding views of the Park, the town, and the open valley in which Buxton is placed, and having a large and lofty internal covered colonnade, with a parterre in the centre, and having in the front of the building an extensive sloping pleasure-ground, with walks and shrubberies, the kind gift to the institution of the present Duke of Devonshire. By extending the means of using the Baths and waters, under the very best conditions, to the most needy classes of the people, such a home for this

ancient Charity cannot have failed to add to the importance and increase the public estimation of Buxton and its waters.

The increase in the size and population of Buxton supplies a remarkable instance of prosperous advancement. The population of Buxton, Fairfield, Hartington Upper Quarter, &c., all now virtually contiguous to one another, and to be designated, for practical purposes, under the general name of Buxton, increased upwards of 53 per cent. in the ten years from 1851 to 1861. The number of houses has been increased in at least a corresponding proportion, while the size and character of the houses have been generally improved. And, when it is added, that, notwithstanding the large resort of extremely invalided visitors—notwithstanding the Devonshire Hospital, with its hundred invalided inmates, during a great part of the year, the annual death rate of the population is a fraction under 17 in 1,000, the sanatory character of the town and district is conclusively shown to be unexceptionable. According to a summary, kindly supplied by Mr. Henry B. Bates, founded upon the Returns of the Registrar-General, the population of the Buxton district had increased, in the ten years, (1851-61,) from 2,702 to 4,139: the annual death rate of the eight years, (1851-8,) having averaged 57·375—equal to 16·77, or, $16\frac{3}{4}$ per 1,000, on 3,420, which was the mean population of the inter-census period, (1851-61.) But, whatever the sanatory character which may have been applicable to Buxton previously to the year 1860, this will have been raised to a higher point by the drainage works, which were executed during that year, under the able superintendence of Mr. Rawlinson, in connection with the provisions of the "Local Government Act," within the jurisdiction of which the townships and districts of Buxton and

Fairfield have the good fortune to be placed. And, accordingly, although in the year 1863 the deaths in the Buxton district amounted to 101, so extraordinary are the circumstances of the population, in regard to the immigration of residents and the sojourn of temporary visitors, that 43 of the deaths have to be deducted as not representing the actual data derivable from the population: leaving 58 deaths only to represent the mortality from nearly 5,000 people—or the whole 101 deaths from a population varying from a minimum of 4,000 to a probable maximum of from 6,000 to 8,000 or more. The complete drainage, the entire removal of every source of disorder from sewage and the like, with all the contingencies of typhoid fever and intestinal poisonings, may well be expected to have lowered the death rate, and to have raised the healthy character, even of a district so favoured by nature, as Buxton is, with its limestone and gritstone subsoils, its mountain elevation, and its undulatory and easily drainable surface. The "Local Government Act" has, moreover, created for the town and district of Buxton an executive system, by which nuisances may be abated, improvements regulated and carried out, and new streets, roads, and houses, planned or supervised.

The greater part of the Buxton district, and of the country which surrounds it, belongs to His Grace the Duke of Devonshire; and to the successive Dukes of Devonshire Buxton is indebted for most of the larger improvements it has undergone:—for the development of its resources; the planting of its hills and dales; the building and endowment of churches, schools, &c.; the rebuilding and extension of its Baths; the early supply of adequate hotel and lodging accommodation; and the laying out and maintenance of

park, walks, gardens, and terraces, for purposes of ornament, recreation, and building extension. The resident agent of the Duke of Devonshire has been always of much importance to the interests of the place, in carrying out the intentions of the owner of the property. Buxton owes much to the late Mr. Heacock, who, during nearly fifty years, occupied this important position—who planted the district so extensively, giving shelter to its mountain position, and enriching the barer features of its upland scenery; to the late Mr. Smithers, who, during the five years (from 1851 to 1856), not only supervised the re-erection and extension of the Baths, but under whose care the Park was created, the Corbar Walks were made, and the important analyses of the waters, by Dr. Lyon Playfair, were obtained; and Buxton owes to the late Mr. Wilmot, who was agent for the Buxton Estate from 1856 to 1864, that it is placed under the provisions of the "Local Government Act," that it is in so great a satisfactory state as to its drainage, that it has a Market House, a Cattle Market detached from the town, new Terrace Walks, new streets, new roads, several miles of new footpaths, the secure establishment of the Devonshire Hospital on a broad basis of extensive usefulness, increased provision for the spiritual and educational wants of the people, much improved and extended provision of cottage accommodation for the labouring poor, and that its internal resources, generally, and its railway accessibilities, have been so rapidly and so fully developed.

Since the death of Mr. Wilmot, in 1864, the ducal agency has been held by Mr. Drewry; and extensions and improvements continue to be projected. Additions have been made to the Hospital, and it has become surrounded by its own

pleasure-grounds,—the principal church has been re-seated, rendered more commodious, and thrown open to the public, —the building of a new church has been promoted,—a large hotel has been aided towards its completion,—the operations under the act for the "local government" in regard to drainage, &c., have been extended,—many new houses have been erected, and many additional acres of land have been set out for building purposes,—and the increase and prosperity of Buxton have been materially promoted during the three years.

May, 1867.

THERE are some points in reference to the use and effects of the Buxton waters, which seem to require an especial degree of notice or explanation; and, perhaps, these may be considered to most advantage, or be more likely to arrest attention, if separately mentioned, preliminary to the work of which the greater part has been so long before the public, than if embodied in its substance.

Greater caution ought to be enjoined and practised in the use of these very powerful medicinal agents. Notwithstanding the directions and cautions which have now been so often repeated, even medical men residing at a distance from Buxton are not sufficiently impressed with the need of a very careful and discriminating use of them, or do not appear to state this to their patients with sufficient explicitness. Some invalids cannot bathe in these waters with any chance of benefit, or even with safety, who drink them with

much benefit. Some may use the warmer baths of these mineral waters with advantage, who cannot bathe without risk, or with a reasonable probability of benefit, in the waters at the natural temperature of eighty-two degrees, Farenheit. Some are unduly stimulated by the internal use of the waters, and are unduly relaxed by the use of the warmer baths, who use the baths at the natural temperature with perfectly satisfactory results. Some either cannot drink the waters, or use the baths, without disadvantage, or even without injury, who derive benefit from sojourning for a time in this mountain district, breathing the thin and bracing air of one thousand feet above the level of the sea, upon the contiguous and extensive formations of millstone grit and mountain limestone, with the dry soil and many secondary advantages referable thereto. The character of these mineral waters, their peculiar and great effect on the system, when used either externally or internally, the modification of their effects according to the quantity that is drunk, the temperature at which the baths are used, the frequency with which the baths are used, and the period of the immersion, should be carefully studied, in order to the judicious and prudent use of so valuable a medicinal agent. It is only by such discriminating attention that these waters can be made to act beneficially upon different ailments, in different stages of these ailments, and in the infinitely modified states of system induced by the hereditary or acquired circumstances and conditions of life. The use of these waters disadvantageously is a direct reflected injury to the medical man who may have suggested their employment, and to the reputation of the waters, as well as a manifest (however unintentional) wrong to the patient. The essentially stimulating, and the

no less essentially alterative character of the waters, must be known, and ever borne in mind, if they are to be prescribed otherwise than empirically; and the necessity of using them with discretion and care must be enforced accordingly, if they are to be made as useful as may be possible. This presupposes, of course, that the case under consideration is suited for the use of the waters in some way or other.

The second of the subjects which seem to demand more prominent mention is the unquestionable and great efficacy of the hotter baths of these mineral waters. The waters at the natural temperature of eighty-two degrees may be too cold or too stimulating for unmodified use. The addition of a very small proportion of the same waters artificially heated is sufficient to raise the by so much greater quantity of the waters in the bath to any required higher degree of temperature—even to that of ninety-five degrees; and at this heat there is no doubt that the waters retain a sufficient amount of their medicinal character to prove curative in such cases as are adapted to their ordinary effects, and which may not be suited to the use of the baths at the lower degree of heat. I have seen cases of rheumatism, and gout, and neuralgia, and such impaired use of different joints as results from these ailments, or from fractures, dislocations, sprains, or other local lesions, as effectually relieved by the use of these hotter baths as by that of the natural baths—the difference being that the number of baths necessary to be taken is generally greater in the case of the warmer baths, and likewise that the time of immersion in the water must be longer in most instances. When the small quantity of the same water artificially heated, which has to be added to the water of the naturally tepid degree of heat, in order to raise

the water of the bath to any required degree of temperature, comes to be considered, the wonder is, not that the medicinal efficacy of the waters is so sufficiently retained, but that the degree of this efficacy should be even so far lessened as it is considered to be.

The third of these subjects for especial notice is one which must be mentioned, although this is not done without reluctance. The important analysis of the waters, by Dr. Lyon Playfair, and especially the discovery that they contain 206 cubic inches of free nitrogen gas in every gallon, has had the effect of increasing the degree of confidence in their medicinal efficacy on the part of medical men generally, and has led to the inference that their medicinal value may be largely, if not exclusively, referred to this considerable and extraordinary amount of gaseous impregnation. It has been generally and fairly inferred, that, even when used as baths, the waters thus charged with free nitrogen gas, if absorbed largely through the pores of the skin, which must be the case if either exercise or friction is freely made use of during the time of bathing, must carry with them a large amount of the gaseous constituent, and that this may well be expected to exert an important degree of medicinal influence upon certain disordered states of the system, and more especially upon those which affect the subcutaneous and the muscular tissues. All this is matter for fair and reasonable inference. It is impossible to conceive that so large a proportion of free nitrogen can be presented to the whole surface of the body, the skin being at the same time softened, and effectually deterged, and thus rendered remarkably absorbent, by the watery medium in which the gas is presented, and by the genial temperature of eighty-two degrees or upward, without

the absorption of much of this gas into the body, and a proportionally great amount of effect. Any additional opinion as to the way in which nitrogen can thus influence the system, whether by acting singly, as a foreign body, and consequently as a stimulus and eventual alterative, or by entering into combination with one or more of the elements of the blood itself, or of the living or the effete tissues or secretions, and thus forming new compounds having medicinal effects, can only be matter for theory and speculation, and could hardly lead to any conclusions of practical value. It has, however, been advanced that the nitrogen when absorbed is immediately rendered capable of decomposing a portion of water, combining with the hydrogen in the due proportion necessary to form ammonia, and that this ammonia is the essential curative principle of the Buxton tepid waters. This is assumed without any foundation whatever; and it may be necessary to add that, even if it were otherwise, the action of ammonia would be quite unequal to explain that of the Buxton waters. These waters are more stimulating and more alterative in their effects than could be thus accounted for. Moreover, this ammoniacal hypothesis is further based upon a statement that the diseases in which the action of the Buxton waters is known to be remedial are marked by a deficiency of ammonia in the secretions. Animal chemistry demonstrates the incorrectness of this. Even the urine of healthy persons does not contain so much ammonia as serves to neutralise the acids which it contains; and in almost all the diseases of excitement or inflammation the urine is likewise free from the ammoniacal character. The ammonia which characterises urine is for the most part formed from the putrescence of the urea and other animal matters con-

tained in it, after it has been discharged from the system. Medical men need not be told that ammonia is equally inadequate for the relief of gout or the cure of rheumatism, however it may be made use of—complaints in which the efficacy of the Buxton tepid waters is signally evidenced. Any attempt to theorise as to the way in which a medicinal agent influences the system, if carried beyond the boundaries of facts, must be disadvantageous; and I have noticed this subject accordingly. It is surely enough to satisfy the mind that these waters must have an important amount of medicinal value, to find that they contain so large an impregnation of free nitrogen gas, in addition to the peculiar saline constituents which characterise the class of mineral waters generally; confirmed and borne out, as this is, by the immemorially ancient, wide, and increasing reputation earned by these waters, in relieving some of the most painful, disabling, and obstinate diseases to which mankind is liable.

Buxton, so long celebrated for its tepid waters, is situated at the western side of the north part of the county of Derby, and on the margin of an extensive mountain limestone formation.

There can be little doubt that the tepid springs of Buxton were known to the Romans; and it is probable that a warm water, of sufficiently elevated temperature to be remarkable by its steam and heat, and thus tempting the people to bathe in it, would be used, from the earliest ages, as a luxurious bath, and thence have any medicinal properties it might

possess, gradually, and, probably, not very slowly, brought into notice. However this may have been, history tells us very little of Buxton until the age of Queen Elizabeth, farther than the discovery of very old baths, of Roman or even earlier construction, leads us to imply. But history does tell us, that, at that sufficiently remote time, Buxton was much celebrated as a bathing place— that it was visited by Mary Queen of Scots on several occasions, and frequented by some of the highest and mightiest individuals of Elizabeth's court for the cure of their ailments.

The formation of mountain limestone, on the margin of which Buxton is situated, is of very considerable extent; and it contributes much, by its elevation and physical characters, to the salubrity and general features of the climate of the place. The lower part of the town is 1,029ft. above the level of the sea; and this considerable elevation, together with the well-known and characteristically absorbent nature of the mountain limestone, renders the air necessarily light and dry, remarkably free from fogs and exhalations, and bracing and healthful in a proportionate degree.

For the information of the distant inquirer, it may be well to mention here, that the principal building of Buxton, called, from its form, the Crescent, is chiefly devoted to two large hotels, called St. Ann's Hotel and the Crescent Hotel, and two principal boarding houses; and that, besides these, there is one of the oldest buildings, the Hall, which forms a large hotel; and farther, that the Royal Hotel, the Grove, the George, the Lee Wood, the Shakspeare, the Eagle, the King's Head, the Cheshire Cheese, the Queen's Head, and several others, are well supported and well conducted establishments; that, with few exceptions, some part of every

house is devoted to the reception of lodgers; and that considerably more than three thousand visitors are commonly accommodated in the town, at the same time, when the place is said to be full. It deserves to be added that many additions have been recently made to the resources and accommodations of Buxton; and that these are now probably almost equal to public wants or expectations.*

The temperature of the water of the warm springs of Buxton is eighty-two degrees, Fahrenheit. The tepid waters make their final way to the surface through several openings or fissures in the mountain limestone. Some of the water is lost, finding a passage into the River Wye, which runs within a short distance. The quantity of the waters thus wasted is probably still very considerable; but a large amount has lately been regained. The amount of flow of these waters, which is now used for the Natural Baths, is ascertained to

* The reader is referred for a detailed account of the district around Buxton to my newer and larger work, entitled, *A Hand-Book to the Peak of Derbyshire, and to the Use of the Buxton Mineral Waters.* But it may be briefly stated here that Buxton is situated in a remarkable district. The rich and romantic beauties of Cow Dale, Chee Dale, Miller's Dale, Monsal Dale, and Middleton Dale; of Dove Dale and the Dale of Goyt; the cavern wonders and wild scenery of Castleton; the pretty town of Bakewell; the rocky grandeurs and wonderful beauties of Matlock; Chatsworth, the princely seat of the Duke of Devonshire; Haddon Hall, the glorious old residence of the Vernons; Hartington and Beresford, famous for the sports and memory of Izaak Walton; Lyme Hall, the seat of the distinguished family of Legh, during, it would seem, at least fifteen generations: are all within easy reach of Buxton. To this list of things worth seeing in the Buxton neighbourhood should be added: Chelmerton Church, which, although in a state of much dilapidation, is said to have points of interest to the Ecclesiologist; Eyam, with its romantic and most sad plague history and grave stones; Arbor-low, some nine miles on the road to Ashbourne—a large and perfect Druidical circle, which has been called "the great Druidical Temple of North Derbyshire;" a Rhedagua, or chariot course of the ancient Britons, at the distance of half-a-mile north-east from Whaley Bridge, near to Horwich House, said to be in a perfect state of preservation; and last, not least, Poole's Cavern, within half-a-mile of Buxton—an extensive natural limestone cavern, of much natural beauty, and now, strange and satisfactory to say, lighted, and shown throughout its depths, and heights, and roofings, and irregularities, with its many surfaces, and sparry incrustations, by two hundred gas lights. Buxton is a hundred and fifty-nine miles from London, twenty-four miles from Manchester, twenty-six miles from Sheffield, thirty-eight miles from Derby, twelve miles from Macclesfield, and twelve miles from Leek.

be 129½ gallons per minute. They had been estimated, by Dr. Pearson, who wrote most ably on the Buxton waters, in 1784, to be discharged at the rate of 140 ale gallons per minute, which would be 116½ imperial gallons. Much of this flow, however, must have been lost, as, according to a Report, by Mr. Eddy, and Mr. Darlington, the engineers, in November, 1851, the amount of flow made use of at that time was 84¾ gallons per minute. In the process of levelling and excavation for the Baths erected in the year 1852, the amount of the waters which had been previously wasted was recovered; and the flow through the Baths is now greater than it was previous to the erection of the Crescent, in 1784. There is, besides this large flow of waters, which is used for the supply of the Natural Baths, and the amount of flow which is still not recovered, the flow of the tepid waters which supplies the Drinking Well, and the much greater flow of the same waters from a spring called Bingham's Well, which is devoted to the supply of the Hot Baths.

Four important analyses of the Buxton tepid waters have been made at different times. The first of these was made by Dr. Pearson, in 1784. According to this analysis, the imperial gallon of the tepid waters contains 19½ grains of solid matters:—

	Grains.
Carbonate of lime	14·000
Sulphate of lime	3·333
Chloride of sodium	2·333
	19·666

The second of these analyses was made by Sir Charles Scudamore and Mr. Garden, in 1820. According to this, the

imperial gallon was found to contain 20 grains of solid matters :—

	Grains.
Chloride of magnesium	0·773
Chloride of sodium	3·200
Sulphate of lime	0·800
Carbonate of lime	13·866
Extractive matter	0·666
Loss	0·693
	19·998

It will be observed that there is only a difference of half a grain between the amount of the total solid constituents resulting from these two analyses, and that chloride of magnesium is the only additional substance obtained by the more recent of these two analyses.

The third analysis was made by Dr. Lyon Playfair, dated July 24th, 1852. The following table gives the amount and nature of the solid ingredients obtained from an imperial gallon of the waters. The total solid constituents obtained amounted to 20½ grains per imperial gallon :—

	Gallon.
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

According to this very careful analysis, the waters contain only ·913, or one grain per imperial gallon more of solid ingredients than was obtained from them by Dr. Pearson, and ·581, or half a grain more than was obtained from them by Sir Charles Scudamore and Mr. Garden. It will be noticed, however, that a very appreciable proportion of carbonate of magnesia, silica, and oxide of iron and alumina is obtainable from the water, and that traces of fluorine and of phosphoric acid are found in it; the former being present in sufficient quantity to have enabled Dr. Playfair to etch with it upon glass the words—"Buxton Water."

In regard to the gaseous constituents of these waters the results of Dr. Playfair's analysis are fortunately much more interesting and important. The circumstance that these waters contain a very considerable proportion of gaseous matters must have attracted attention at a very early period.

Large bubbles of gas rise through the waters in frequent but intermittent bursts; and when a glass bottle is filled with the waters, and held between the eye and a strong light, it is seen to be charged with small bubbles of the gas, presenting very much the appearance of soda water. Previous to the analysis of Dr. Pearson this gaseous impregnation was supposed to be composed of a mixture of atmospheric air and carbonic acid. Dr. Pearson is entitled to the great credit of having ascertained that this gas is free from any admixture of atmospheric air, and consists of a very small proportion of carbonic acid, by much the larger proportion of it being free nitrogen gas. This very curious and interesting discovery was fully confirmed by Sir Charles Scudamore's analysis; but the amount said to be contained in the waters was believed by most persons to be too small

to explain, in any degree, the important medicinal effects of the water upon the system. The amount of gaseous matters obtained by Sir Charles Scudamore from the imperial gallon of the waters was only 8.18 cubic inches or $8\frac{1}{4}$ cubic inches. The results of the recent analysis are so much more considerable, and so interesting, and lead to such important inferences, that it seems to be expedient to quote the words used by Dr. Playfair in his report:—

"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 as 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 1·64 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, per gallon. 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."

So large a proportion of free nitrogen gas in these waters as 206 cubic inches per imperial gallon justifies a strong inference in favour of their medicinal action on the human system, and removes them from the list of such waters as can be said to act on the economy only by virtue of undetected constituents.

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

	Grains in the Imperial Gallon.
Carbonate of lime	8·541
Carbonate of magnesia	3·741
Carbonate of protoxyde 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
Fluoride of calcium	trace.
Phosphate of lime	trace.
Total per gallon	18·434
	Cubic Inches.
Free carbonic acid	3·5
Nitrogen	504·0

This analysis so far differs from that published by Dr. Lyon Playfair, in the year 1854, 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 the water, it may be probably held to be the more authoritative analysis, so far as regards the saline constituents. What is much more interesting is, that Dr. Muspratt obtained from the water an appreciable proportion of organic matter. This may have an important degree of influence on the

absorption of the water through the pores of the skin during immersion in the baths, and may contribute to or produce the remarkable emollient effect on the skin produced by the Buxton Baths. It is also satisfactory to find the large proportion of nitrogen first claimed for this water by Dr. Playfair's analysis confirmed by the analysis of Dr. Muspratt, and that no less than 504 cubic inches per gallon are said to have been obtained from it. We may know little of the physiological or the medicinal action of uncombined nitrogen on the human system, when administered in any other form than that of the Buxton thermal waters; and the degree in which this gas contributes to the medicinal action may be matter of opinion; but it must be gratifying both to medical men, and those suffering from rheumatism, or gout, or other disordered conditions, in relieving which this water is so useful, to find successive analysts confirm the statement that an important elementary substance is thus largely and characteristically connected with this mineral water: securing for it a position of much chemical interest, and removing it so very far from the category of ordinary spring, river, or rain water.

At the same time it should be advanced that all the modern researches, discoveries, and deductions of chemistry, have caused more and more importance to be attached to the great elementary principle with which the Buxton tepid waters are now shown to be so largely charged. The very large proportion of nitrogen contained in the essential crystallisable principles of tea, coffee, and cocoa—in taurine, the great azotised constituent of the bile—in the various fibres and tissues, and in the secretions and excretions of the body—the consumption of nitrogen shown by Baron Leibig

to be involved in every movement and process of the animal system—the relative bearings of the proportional amount of nitrogen in the composition of the various articles of food upon the degree of their nutritive qualities—are so many indications of the tendencies and inferences deducible from the great and practical advances of modern chemistry, and so many reasons why the large proportion of nitrogen which is now discovered to be contained in the Buxton tepid waters, and in an eminently available form for internal or external use, may have a significance, and justify an amount of expectation, that may hardly admit of exaggeration.

The waters are singularly clear, and brilliant, and faintly tinged with a blue colour. They are vapid and somewhat calcareous to the taste. They are what is called *soft* to the touch, and are admirably adapted for infusing tea, boiling vegetables, and the uses of the laundress. They have a remarkably detersive and emollient effect on the skin. This is partly due to their calcareous and alkaline character, but may be partly referable to glairine which is said to be present in many mineral waters, of similar composition, and to communicate to them this emollient effect upon the skin. Whatever the cause, or causes, this effect is well known and very agreeable. Their temperature, remarkable buoyancy, softness, and clearness, and freedom from smell, or marked taste, render their use as a bath very pleasant: giving, at the instant of immersion, the slightest possible shock, instantly followed by a perfect and general glow, which usually continues the whole time the person is in the bath, and indeed generally lasts for several hours afterwards.

There are three large baths of the water at the natural temperature. These three baths are of considerable size—

large enough for all purposes of exercise, swimming, &c. There are, besides these, the large Natural Baths which are made use of by the patients of the Buxton Bath Charity. These are all public baths; furnished, of course, with separate accommodation for dressing. They are lined with the patent white or porcelain covered brick, and floored with white marble. The waters enter through perforations in the marble flooring of the baths, and flow out at the top, so that there is a constant current of fresh waters. Besides these large baths there are smaller private baths. All these baths are called in Buxton *the Natural Baths.* The water in these baths is between four and five feet in depth; enabling them to be used in the erect position, and permitting as much exercise to be used by the bather as the circumstances of the case may admit, in order to secure the largest possible amount of absorption of the water through the skin. A considerable amount of exercise and friction during the time of immersion appears to be needful, in order to secure the full amount of medicinal action from the use of the bath. The greater the amount of friction of the surface of the body, and of exercise of the trunk and limbs, while in the bath, the greater is the probable amount of absorption of the water.

These baths are contained within a commodious building at the western end of the Crescent, approached under cover from the Crescent, the Hall, and the Square, and entered by separate corridors.* This building is covered with a roof of glass; and double-action force pumps, with suitable nozzles, are provided for the special application of the water to particularly affected parts of the body or limbs, in the form

* The able architect of the Baths, and of the more important new buildings of Buxton, is Mr. Henry Currey, of London.

of douches. The impulsion of a continuous stream of the water, with a greater or less degree of force, and in larger or smaller volume, against any part of the surface, is often found to be of the greatest value in rheumatic, gouty, spinal, uterine, and other cases.

The baths above described are to be distinguished from the Hot Baths, in which any quantity of the same water, carefully heated, is added to the naturally tepid water, in order to secure baths of any temperature that the circumstances of different cases may indicate. These are called in the place *the Hot Baths*, and are situated at the opposite end of the Crescent to those called *the Natural Baths*. The Hot Baths are contained in a magnificent and extensive structure, composed principally of glass and iron, approached by a covered way from the Colonnade of the Crescent, and entered by separate corridors. These are private baths; and douches of the heated mineral water, and all the appliances for the advantageous and comfortable use of the baths, &c., are provided. The Hot Baths have a somewhat less amount of medicinal efficacy than the Natural Baths, which is estimated, from extended experience, to be usually in the proportion of two-thirds—that is, three Hot Baths are estimated to be equal to two Natural Baths. This infers, however, that the Hot Baths be used at the medium temperature of 93 degrees. If hotter than this the effect would be by so much weakened, and a larger proportion of baths would be necessary; and, if cooler than this, the amount of effect would approach more nearly in degree to that of the Natural Baths. When it is remembered that all the water used for these Hot Baths is the tepid mineral water, it will be perceived that a very small addition of

heated water is needed to raise the temperature to any degree that may be indicated; and it will not seem to be surprising that the medicinal efficacy should be so little impaired.

It should be added that by the care and munificence of the noble proprietor of Buxton, the Duke of Devonshire, the visitors have provided for, and thrown open to them, very extensive, well laid out, and carefully kept walks and grounds. In connection with recent alterations, extensions, and improvements, these have been largely added to. The town and Baths had ceased to be capable of affording an adequate amount of accommodation to the yearly increasing number of invalided visitors; and it was at length determined, on the part of the Duke of Devonshire, that extensive alterations and additions should be made in order to meet the wants and requirements of the public. Dr. Lyon Playfair's valuable analysis; new ranges of Baths; a great and increasing extension and embellishment of the public walks and grounds; a Park, consisting of more than one hundred acres of ground, close to the town, thoroughly drained for building purposes, laid out and planted after designs by the late Sir Joseph Paxton, roads having been carried throughout, and sites provided for the erection of villas; and, last and not least, the provision of Hospital accommodation for the wants of the Buxton Bath Charity; are so many proofs of the interest felt, and the kindly zeal displayed, to make the Buxton waters available under the best circumstances and conditions.

It may be added, most justly, that the scenery of the district is of the most varied and most beautiful character —alternate hill and dale, rock, moor, and enclosure—judi-

ciously and liberally clothed and embellished by extensive plantations.

The Buxton season—which might properly be extended over the whole year as far as the invalid is concerned, as the waters are quite unaffected in quantity and powers by season or weather—is said to begin in April, or May, and to end in October, or November. July, August, and September are the months in which the gregarious and fashionable chiefly resort to it.

It has been mentioned that Buxton is situated on the margin of the mountain limestone formation; to an adjoining narrow bed of shale it is indebted for a valuable chalybeate water; and, immediately beyond the bed of shale, on one side of the place, and at no considerable distance on nearly two sides of the town, begins an extensive gritstone formation, forming the ridges of hills which more or less protect it from the northern and westerly winds. The summit of one of these ridges,—that to the west,—is, at the distance of three miles from the town, somewhere about a thousand feet higher than the elevation of Buxton; and, when the winds are easterly or southerly, the clouds, attracted by these hills, are often and evidently carried away from Buxton, to be emptied on the farther districts; and to this may be referred the fact, that, although Buxton, like all hilly districts, is sufficiently subject to wet weather, it is by no means so much so as many districts having the same elevation, nor probably even so much so as some of the champaign country around it. It is to this gritstone formation that Buxton is indebted for the pure and beautiful water with which it is supplied for domestic and ordinary purposes. This water is remarkably free from foreign or mineral impregna-

tion, and is, of course, destitute of taste, smell, or colour.* This deserves to be especially mentioned in every account of the Buxton waters, inasmuch as it obviates what is found to be a great inconvenience by strangers resorting to limestone districts in general, viz., the necessity of drinking the calcareous water, which is often found to disagree with those who are not accustomed to its use.

The tepid waters of Buxton, whether drunk or used as a bath, or made use of in both ways, are found to be especially useful in cases of rheumatism, gout, neuralgia, spinal irritation, and certain forms of derangement of the digestive, urinary, and uterine functions.

The effect of these waters on the system, whether in health or disease, is essentially stimulating. The stimulating effect is usually produced more immediately, and in a more marked degree, when the waters are drunk, than when they are only used as a bath; but the effect is generally of much shorter duration. When the waters are drunk by a person in perfect health, they frequently produce a slight sense of giddiness, followed by a sufficiently perceptible degree of increased warmth, and the usual marks of increased action that attend the use of any other stimulant. If, however, the waters have not disagreed with the system, these indi-

* "Dear Dr. ROBERTSON, *Buxton, 30th August*, 1852.

"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 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 (4⅜) 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."

cations will be found to pass away very speedily. If not thus rapidly got rid of, or if the internal use of the waters be continued under improper circumstances, the excitement increases, and irritation is set up—marked by thirst, loss of appetite, headache, quickened circulation, and other symptoms of feverishness and derangement. The effect of the bath on a healthy system is, that the momentary shock at the instant of immersion is followed promptly by reaction, with a decided general glow, and increased vigour of mind and body, increase of appetite, and of general secretion and excretion. This is apt to be followed in the course of a few days—the use of the bath being continued every day, or even if used somewhat less frequently—by some degree of sluggishness of the organs, and, these indications being unheeded, by feverishness and general derangement. It need hardly be said that no such effects would succeed the drinking of repeated tumblers of common warm water at the temperature of 82 degrees, nor would such be induced by bathing repeatedly in water of this temperature; and this would be sufficient to show that the tepid waters of Buxton have specific and remarkable effects upon the human system, and be *á priori* evidence that they may be influential in certain cases of disease.

The fact that these waters are so essentially and largely stimulating, renders especial care necessary, that they be not made use of under improper circumstances, and that every means be taken to render the cases to which they are adapted as fit as possible for their beneficial operation.

In regard to the first of these particulars, it should be known that cases of organic change or structural alteration in any of the great internal organs, whether of the brain,

heart, lungs, liver, or kidneys, would be *primâ facie* evidence enough, that these waters should not be made use of. And it should be added, that in cases where disease is of congestive or inflammatory type, they should either not be used at all, or used most cautiously, until the congestion or inflammation has been subdued by appropriate means.

In regard to the second of these particulars, *i.e.*, to adapt the system as far as may be to the use of these waters,—to fit it, as far as possible, to derive the fullest benefit from their use, it is of primary importance to secure a free and active condition of the great excreting organs. For this purpose, two or more doses of efficient aperient medicine are often usefully taken, before the course of these waters is commenced; and, moreover, during the course, it is found by most people that an occasional aperient is quite necessary. The compound rhubarb pill, or the compound extract of colocynth, in pills of five grains each, of which one or two may be taken at bed-time, when required, often subserves this important purpose sufficiently well.

The primary effect of these waters, however used, is essentially stimulating. Their secondary effect is equally and essentially debilitating. After they have been used for a longer or shorter time, according to the nature of the case and the strength of the individual, they begin to impair the powers of the system; and this is to be regarded as the best proof that the course has been persevered in for a sufficient length of time, to enable the waters to influence, as far as possible, the complaint under treatment. This debilitating effect, in most cases, ceases within a very short time of their being discontinued.

It is always well that the fatigue and hurry of a journey

should be recovered from before beginning to make use of these waters; and this interval, of one or more days, is generally well spent in taking one or more doses of some suitable aperient medicine. There is another reason why this little delay should be afforded, and why some cooling medicine should be taken in most cases. It is, that any change of air is apt to occasion some degree of derangement and irregularity of system, and that this is of course more likely to be the case, or to be so to a greater degree, when the change is to a thinner and lighter air, which must, of necessity, in itself, be more or less stimulating and exciting. Although the effect of bathing in these tepid waters is not so suddenly stimulating as when they are drunk, the fullest effects are only to be obtained by bathing in them; and the effect of the waters on the system is not only more decided when they are used as a bath than when used internally, but it is much more lasting.

The best times for using the bath are before breakfast, and about three or four hours after breakfast, Inasmuch as the bath is most efficient when used before breakfast, it is usual in all cases to commence its use about three hours after breakfast; and when two or more baths have been taken, and they have been found to produce no unduly stimulating or deranging effects on the system, to begin to use them before breakfast. It should be said, and borne in mind, that many persons are either constitutionally or from long protracted ailment, of such feeble habit, or are of so excitable a system, as to render it inexpedient that they should ever bathe before breakfast.

The time during which a person should remain in the bath necessarily depends on the nature of the case, the powers of

the constitution, and the excitability of the system. It is, however, almost always advisable, that little more than a momentary immersion should be allowed at the first; and the time during which the individual remains in the water may be increased one or two minutes every time, until it reach that sufficient time which is required by the case in its several relations. It may be stated, however, that there are few cases in which the time for remaining in the bath may not be ultimately extended to four or five minutes, and as few cases in which an immersion of more than ten or twelve minutes will be found to be either necessary or expedient. In many cases it can signifiy very little whether the patient jumps into the bath, or descends into it more slowly down the bath steps. But those persons who are debilitated by disease, or are naturally feeble, the highly sensitive, or those in whom there may be any doubt as to the power, the elasticity, or the *hardiesse* of the system, should descend into the bath gently by the steps. In these cases, and perhaps in cases generally, it may be wise to wet the head with a few handfuls of water before immersing the trunk of the body; or, where the hair is too long to allow of the head being wetted, without some discomfort and risk of taking cold, it is expedient that an oiled silk bathing cap be worn, and that some of the water be poured over the head thus covered. Whether the head be wetted or cooled in this way or not, it is right, with very few exceptions, that the head, whether with or without a bathing cap, be immersed at least once in the water, and as soon as may be after the person has got into the bath.

When the circumstances of the case permit it, walking exercise should always be taken before the bath is used.

The degree of this can hardly be specified. It must vary necessarily with the powers of the system and the nature of the case; but it may be said generally, that it should be sufficient to warm the individual thoroughly, without unduly heating the body, inducing sensible perspiration, or involving any feeling of fatigue.

Exercise should not be taken immediately after the use of the bath—at least this is the general rule, the exceptions being some cases in which the bath agrees in all other respects, but is followed by an insufficient degree of reaction, and a sense of chilliness and depression. In such cases, exercise may be needfully taken immediately after bathing; but the degree of the exercise should be no more than is sufficient to secure the desirable amount of reaction. If exercise be not required immediately after the use of the bath, to secure a due reaction, or if it be taken to a greater degree than is needful to answer this intention, it adds to the risk of undue primary stimulation from the specific effects of the bath. Usually, the bather should remain as much at rest in mind and body for an hour after using the bath, as may be possible. During this time, or in cases of much debility, for a longer period, the individual should confine himself to the lodging, and to the chair or the sofa. It is of much importance, that, during this time, the individual should not allow himself to go to sleep. The propensity to fall asleep after bathing is often very strong, and the indulging it at that time almost always deranges the nervous system, and occasions vascular excitement and irregularity, sometimes leading to headache, feverishness, indigestion, and derangement of bowels. This is a case of by no means rare occurrence, and of sufficiently easy prevention, by having

recourse to an amusing book or easy conversation. It is as well, too, that a period of at least half an hour, and in most cases it is much better that an hour should elapse, between leaving the bath and taking any food.

Friction of the surface, generally, and more especially of any affected part, should be used assiduously while the person is in the bath; and a thorough rubbing after coming out of the water is extremely useful in securing and maintaining full reaction.

Sufficient notice has perhaps been taken of the period of the day when the bath should be used. It may however be added, that the later in the day, the more excitable the system always becomes, and the more apt the bath is to stimulate unduly. It is only the strong and less excitable who should venture to bathe late in the day; and in their case the beneficial effects would be more likely to be obtained by bathing before breakfast.

It is neither customary or right to use the bath every day. There can be little doubt that the effects are, to a certain degree, cumulative—that, by bathing on several days successively, there is great risk incurred of a sudden manifestation of the stimulating effects of the waters on the system; and in this way it often happens that very serious injury results, and that cases are much aggravated. The risk is avoided, as far as may be, by using the bath either only every second or third day, or using it two successive days, omitting its use on the third day; the frequency of its use being determined by the nature of the case and the powers of the system.

In many cases, especially in cases of rheumatism, of neuralgia, of relaxation of the spinal column, and of internal

derangement, and although much more rarely, in some gout cases, the douche forms a very valuable auxilliary to the bath. It is seldom, however, wise to make trial of the douche until one or more baths have been taken; and the degree to which the system may prove to be susceptible to the influence of the bath, has in this way to some degree been tested. The bather should keep himself as much immersed in the water during the operation of douching, as convenience, and the necessary elevation of the part, render practicable; and it is found that the best time for douching is, when the person has only been in the bath long enough to have experienced a degree of glow or reaction; permitting sufficient time for the use of the bath afterwards, so as to enable him to exercise and reproduce the glow, after the somewhat chilling application of the douche. It is well to regulate the degree to which the douche is used, by counting the number of double strokes of the pump; and in general the patient should begin by having the moderate number of ten or twelve of these double strokes on any affected part to which the douche is ordered; and this number should be increased afterwards according to circumstances, by degrees, to forty or fifty, or, in rare cases to a hundred, or it may be two hundred strokes.

The number of baths which should constitute the course varies necessarily very much in different cases. Of the three varieties of rheumatism, that which affects the periosteum requires a greater number of baths, other things being equal, than that which is seated in the ligaments of the joints; and this, than that which is confined to the muscles. The number of baths required in neuralgic cases likewise varies very much, according to the part that is affected; the deeper seated the tissue affected, the greater the number of baths

usually found to be necessary. Sciatica illustrates this: it usually requires a full course of baths for its satisfactory relief. Generally speaking, gout cases neither require, nor will bear, so great a number of baths as rheumatic cases are found to stand in need of; and, usually, the bath should not be used so frequently in cases of gout, as it may very properly be used in cases of rheumatism. Usually, the less recent the case, and the older the person, the greater the number of baths the course should consist of. It may be said—with the wish to give some idea of the probable number of baths to be required—that a course can seldom be followed by satisfactory or permanent effects, which consists of fewer than fifteen baths, and that more than thirty baths at the natural temperature, or the so much larger proportion of warm baths, can seldom be taken advisedly, without an interruption of some weeks. The average number of baths taken is probably fifteen or sixteen.

By so much as hot water is added to the natural water in the hot baths, are these less stimulating than the natural baths, and produce a less degree of specific effect. This circumstance makes them convenient and useful to a very considerable extent. There are many cases in which the natural bath is unduly stimulating, whether from the excitability of the constitution of the individual, or the nature of the case, or the condition at the time, of the system, or of the part affected. And farther, there are many cases in which the natural bath, if used in the first instance, is found to be unduly stimulating, yet in which the warm bath is found to be borne sufficiently well; and, where the system has been gradually prepared by any requisite number of the warm and less stimulating baths, in which the natural baths are after-

wards used without inconvenience, and advantageously. Hence these warmer baths enable many persons to use the waters, who would otherwise be unable to take advantage of them; and in many cases, they offer a suitable and excellent preparation for the use of the natural baths. It should be borne in mind, that the warmer these baths are taken, the less stimulating they are; and the less of the specific medicinal effects do they retain. It should not, however, be concluded from these observations, that it would be in all cases expedient that the use of the natural bath should be preceded by that of the warm baths. On the contrary, there are many cases in which the system is so far relaxed, that these baths are of doubtful utility, or it may be are positively injurious, and in which the natural baths alone are beneficial. Again, it must be borne in view, that, although these warm baths are by no means so stimulating in their effects as the natural baths, they are largely composed of the natural water, mixed with the heated water, and but little altered, and only so far diluted in its qualities; and that these baths are therefore by no means to be regarded as a medicinal agent of little power, but are in fact, as many cases fully prove, sufficient of themselves for the cure of many cases of disease, in which, from circumstances, it is never deemed expedient to make use of the natural baths at all.

It is customary, in cases where a preparation for the use of the natural bath by means of the warmer bath is indicated, that the first bath is taken at the temperature of 95 degrees; and that it is used at a lower temperature—say 93 degrees—the next time; then at 91 degrees; and then at 89 degrees; below which it is difficult to reduce its temperature, inasmuch as the water is, in the first instance, at the temperature of

82 degrees, and as so very little warmed water is sufficient to raise the temperature 7 degrees, the pipes and apparatus being all heated, and in such proximity to these baths.

The time during which persons remain in these warmer baths is from three to fifteen or twenty minutes. The proper time for bathing is, as in the case of the Natural Baths, either before breakfast, or from two to four or five hours after breakfast. Exercise before using these baths is not so necessary as in the case of the Natural Baths, but it is desirable if circumstances enable it to be taken. The going immediately after bathing to the lodging, and remaining within doors, and at rest, at least an hour afterwards, is as necessary as after using the natural bath; and, during this period, any propensity to sleep should be as positively discouraged. It is, perhaps, not so necessary that the head should be immersed in these baths as in the natural bath; but having the head or the bathing-cap wetted or cooled, by pouring over it half a pint or more of cooler water, is often desirable or necessary. There are attached to these baths douches, by which a current of water is directed to any part, the current being, of course, composed of heated water. This is, therefore, a somewhat milder form of douche than the douching at the natural baths, and answers a very useful purpose in many cases to which the douche of the waters at the natural temperature would not be adapted.

There are shower baths attached to the baths; but they are comparatively little used, for the obvious reason that the water runs too rapidly off the surface of the body, to enable it to exert its specific effects to an extent that may be reckoned upon with any degree of certainty. And yet even the shower baths are sometimes found to be efficacious, when the circum-

stances of individual cases do not render the use of the other baths justifiable.

It is not by any means expedient to confine bathers to the room, after the hour or two has expired which should intervene between the bath and taking exercise. On the contrary, exercise can at no time of the day be taken more advantageously than one or two hours after the bath; and this is commonly the time devoted to drinking the waters, and taking the needful exercise after doing so.

The fact that the drinking of the tepid water produces a more immediate stimulating effect than is occasioned by the use of the natural bath, renders its internal use unfitted for many cases in which the baths are indicated. There are, for instance, comparatively few cases of gout in which it is desirable that these waters should be used internally; and on the other hand, there are many cases, as of irritability, relaxation, and it may be congestion, of the mucous membranes—whether of the bronchiæ, or stomach, or bowels, or bladder, &c.—to which the internal use of these waters is found to be eminently serviceable, and in which the use of the bath may be altogether contra-indicated, or be found, after trial, to be unsuited or injurious.

These waters usually stimulate the appetite and digestion, and act specially on the kidneys and bladder; increasing the quantity of the urine; and, in cases of red or pink sediment, or of the urine passed being charged with mucus, influencing it speedily and decidedly in these particulars—supposing of course that they are merely dependent on functional causes. Occasionally, as it should appear, when they meet with much free acid in the stomach and bowels, the waters act at first as a somewhat powerful purgative; and this is sometimes

the case to such a degree, as to render it necessary that the internal use of the waters should be interrupted for some days; and in some few cases it is found that on account of this effect, the waters cannot on any account be drunk, although apparently otherwise indicated. In general, however, this effect passes away entirely after the first two or three days, and does not return during the course; and on the contrary, is succeeded by a costive condition of bowels, rendering the frequent use of aperients necessary during the remainder of the course. In the large majority of cases in which the waters are drunk, they never exert this laxative power; and indeed it much more usually happens, that although acting decidedly as a diuretic, and otherwise evidently agreeing with the system, their use is attended with such an increase of costiveness as to render aperient medicines more than usually necessary.

The proper times for drinking the waters are half-an-hour before breakfast, and one hour before any other meal. They are supplied to the drinkers in glasses of three different sizes, the smallest holding a quarter of a pint, the second one-third of a pint, and the largest half a pint. It is usual to begin the course by taking one of the smallest glasses of the water one hour before luncheon, or before dinner; to increase the quantity by taking one such glassful before breakfast, and a second glassful before the second or third meal; and if found to agree, to increase the dose, by taking the second-sized glassful, and in the course of a couple of days more by taking the half-pint glassful. It is not often desirable that more than a pint of these waters should be drunk every day. Yet there are, of course, cases in which double or even three times this quantity is eventually found to be needful.

It is not a necessary inference that, because the drinking of these waters may at first occasion a little giddiness, or sickliness, or derangement of stomach, they are therefore not suitable to the case. Such effects often cease after they have been taken two or three times. Yet these cases ought to be regarded watchfully, and perhaps with some suspicion; and any possibility of cooling medicine being required ought to be properly considered. To lessen the chance of such unpleasant effects, it is always well that the first glass or two should be taken slowly, and even perhaps that the glass be held in the hand during some seconds before it is drunk; and the smallest glass only should be taken until such effects cease to be experienced. Exercise, when the individual is not too much crippled to admit of it, should always be taken after drinking the waters. The degree of it must of course depend on the powers of the individual, and other circumstances. This is one reason, and by no means the only one, why the waters should never be drunk immediately after using the bath, inasmuch as it is not well that the system should be excited by exercise, nor needlessly exposed to the open air, immediately after using the bath; whereas it is expedient that exercise should be taken after drinking the waters, in order that they should be absorbed from the stomach, and dispersed through the system, as soon as possible—which purposes exercise unquestionably subserves. But the other reason why these waters should not be drunk immediately after using the bath—and it is even a more important reason—is, that whether bathed in or drunk, these waters have essentially the same stimulating effect on the system: and so far as the primary effect is concerned, it is so apt to be more than is desired, and is so little serviceable

in the end,—and this is so much less likely to be excessive when the baths are taken, and the waters drunk at different times,—that it is always wise to have an interval of an hour or more between the two ways of using these waters.

When it is desirable that the waters should be drunk oftener than twice in the day, either because the stomach is not able to digest them readily when taken in the larger quantities, or because more than a pint a day is required to meet the wants of the case, a third glass may be taken half an hour or an hour after the second glass; and, if need be, a fourth glass about two hours after luncheon, or about the same time after a light dinner.

Persons in health should not either bathe repeatedly in these waters, or drink them. Supposing the stomach and bowels to be in good order, or that care is taken by some fitting medicine to put them into good order in the first instance, and that there is no lurking ailment that would be a just and sufficient prohibition, there can be no reason why an occasional bath should not be taken—say one, or even two baths a week—for the purposes of cleanliness and comfort; but it may be confidently affirmed, that in no case is it right or even prudent, that healthy persons should use these baths oftener; and it may be added, that it might be unwise, under these circumstances, to remain in the water longer than three or four minutes. To prove how careful people ought to be about using the baths: In the year 1839, I was summoned home suddenly, and found a young lady, of some thirty years of age, extended on the sofa, senseless, and evidently labouring under pressure on the brain. The history I received from her distressed relatives, who were with her, was, that they were on a pleasure tour, passing through

Buxton, and staying only a few days exploring the scenery of the mountain district; that the young lady had been apparently in perfect health, had bathed for the first time that morning in the natural bath, for amusement and curiosity, had immediately become comotose, and continued so ever since. There were the usual symptoms of such cases; and there was evidence that there had been a masked disease of the heart, of probably long standing. The case terminated fatally, in defiance of all means, in the course of a few days. Her case is of much interest, inasmuch as the sufferer was young, and had appeared to herself, and to all about her, to be in perfect health up to the time of bathing;* but cases in which invalids use the baths under improper circumstances, are of very common occurrence; and cases in which healthy people use them to their disadvantage are by no means seldom met with; and they point out, often and strongly, the importance of careful diagnosis and direction on the part of the medical attendant, and of caution on the part of the visitors of Buxton. It will be understood, that, under doubtful circumstances, the warm baths can be used with much less risk than the natural baths; and that it is only in rare cases, and never when proper care is taken, that a single bath, or anything but a course of such baths, can be hurtful to the really healthy. As to the drinking of the waters, it may be said emphatically, that this should be avoided except by those invalids whose cases require them.

The considerable elevation of Buxton and the surrounding

* It may be inferred, that bathing in any water whatever, would at the time have been equally fatal to this poor young lady, and that the death is not ascribable to any peculiar effects of the natural bath. The specific effects would not have been manifested until some hours after the bath, and perhaps not until several baths had been taken.

district above the level of the sea, not only renders the atmosphere by so much specifically lighter and drier, and by so much more stimulating and bracing to the system, but, added to the absorbent nature of the mountain limestone, renders the town and district remarkably free from stagnant waters, and other sources of miasmatous impurity. Hence cases of epidemic, endemic, and contagious diseases, are comparatively little known in Buxton. Even the ordinary exanthemata, (measles, scarlatina, and the like,) are comparatively rare, and usually of a remarkably mild character; and typhus, and even common continued fever, rarely obtains, unless brought into the district by persons who have been sojourning in less favoured places; and has, in no single instance that I have met with, extended to a second case, or proved either contagious or infectious. As to typhoid fever, and its probabilities, the only trust-worthy assurance against it must be derived from the efficient drainage and sewerage of the town and district, by Mr. Rawlinson, under the "Local Government Act," by which, it is to be hoped, the local source of such endemic poisoning may have been effectually done away. In the visitations of epidemic cholera which have afflicted these kingdoms, not a single case has been met with in Buxton. Cases of influenza are usually of a mild character, and occur in comparatively scanty numbers; and cases of diptheria have been rare, and of a much modified type. 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 the record of "epidemic, endemic, and contagious diseases," a locality must be admitted to be singularly happy in which people are so remarkably exempted from this extensively

important class of diseases. If the mortality of this class of diseases is estimated at one in twenty of those attacked, the smaller amount of sickness, protracted indisposition, and resulting debility, that the inhabitants of this district suffer, in addition to the proportionally smaller rate of mortality, deserve some mention in a medical account of Buxton and its waters.

It is necessary to mention, that there are many cases in which the thin pure dry air of the mountain district must necessarily prove beneficial, to which the mineral waters of Buxton are in no way suitable. There are many who visit Buxton under these circumstances, who would be much benefited in this way, if they could be satisfied to make no use of the waters, who not only deprive themselves of such benefit, but do themselves harm, by tampering with these stimulating and powerful agents.

General debility, the consequence of febrile attacks, whether rheumatic or not; local weakness of the spinal column, the joints, or the mucous membranes and passages; muscular, synovial, and periosteal rheumatism, if not in an acute stage; gout, especially perhaps chronic gout, or the sequelæ of more active or acute gout, are all cases for the use of the Buxton Baths. Dyspepsia in many of its forms, and especially when dependent on, or largely mixed up with, general feebleness and relaxation—neuralgia, and more especially when partaking most of rheumatic character—some cases of paralysis, especially such as may be ascribed to cold, or to spinal affections, or such as are of long standing—are all cases for a trial of the baths, or the waters internally, or both. Cases of general debility, consequent on the decline of life, or on having lived hard, and expended unwisely the nervous energies, either by intemperance, or debauchery, or

sedentary occupations, and overworking of the mind, are those in which these waters often do much good, and in which they deserve to be tried. In cases of irregularity or relaxation of the female constitution, their effect is very often marked and rapid, and deserves to be better known than it has even of late years become. To this sufficiently long list must be added many of the milder forms of scrofula,—to which indeed some of the above may be often referred,—which are often materially benefitted by the use of these waters. The effect of the baths and douches upon such lameness or crippled conditions as often result from sprains, dislocations, fractures, and other similar surgical injuries, is in most cases so great and immediate, as to render their use eminently advisable under such circumstances.

The diet, during the course of the waters, should be regulated, and in some degree restricted. But usually this ought not to be carried to such an extent, as to interfere greatly with the individual's habits, or to weaken his system. It should be borne in mind, that after the first few baths have been taken, and the risk of undue stimulation, which has chiefly to be dreaded at the beginning of the course, has been avoided, the secondary effect of the waters should be looked forward to, and, as far as may be, prepared for; and, therefore, that although a little extra care in the diet, and perhaps even some diminution of the usual quantity, or some lowering of the usual quality of the food, may be necessary during the first week or ten days, this may be very far from right or necessary afterwards; and that even a more generous diet than the system may have been accustomed to, is sometimes required. The same observations apply to the use of stimulants. A man used to take three

or four glasses of wine a day, might perhaps advisedly take a glass or even two glasses less during the first week of the course of the Buxton waters, but would seldom be justified in discontinuing the use of wine altogether; and, during the latter periods of the course, should probably return to the maximum allowance per day, or even in some cases might do well to take more towards the end of the course, to bolster up the system, and help it to sustain the debilitating effects of the waters.

To prevent, however, as far as may be, any crudity of stomach or bowels, is most important; and with this view, it is well to avoid the use of cheese altogether during the course of these waters, and to eat little of either turnips, carrots, greens or cabbage, peas, new potatoes, stone-fruits, hot butter, or rich and greasy articles of food.

Regularity of hours is important at all times, and especially so during the course of the waters. Early hours of going to bed at night and rising in the morning,—the latter being indeed quite necessary when either the bath is to be used, or the waters to be drunk, or when both have to be accomplished, at least half an hour before the breakfast,—and regular hours for the meals, are of much importance; late hours of dinner being avoided as far as is consistent with the habits of the individual; and suppers being, if possible, abjured altogether.

Exercise in the open air, and especially walking exercise, should be carried as far as the strength and other circumstances will permit; and the spending a large part of every day in the open air, weather permitting, is justly to be regarded as important to almost every invalid, and as ministering largely to the chances of restoration to health and strength.

To leave the mind as far as possible free from the cares and anxieties of life, to give it as full and complete a holiday from its labours, and to be surrounded wherever it is possible by members of the family circle, are matters that are apt to be lost sight of, but which are really of primary importance, in enabling the system to realise all the good derivable from the use of these, or any other mineral waters.

THE waters of the chalybeate spring act on the system as a mild but efficacious tonic, producing the general effects of iron upon the constitution. They are a weak chalybeate; containing, according to an analysis by Dr. Lyon Playfair, made in the year 1852, little more than one grain of proto-carbonate of iron in an imperial gallon; and even this comparatively small proportion is twice the amount previously supposed to be contained in them. They have a distinctly chalybeate taste, are colourless and inodorous, and are of the ordinary temperature of the atmosphere. Their composition, per imperial gallon, is as follows, according to Dr. Lyon Playfair's analysis:—

	Grains.
Proto-carbonate 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 potassium	0·460
	7·082

These waters are, however, much used and valued as a mild and excellent tonic. The usual dose is from a quarter to half a pint, taken once or twice a day. Like other tonics, this should not be taken before breakfast, but rather as soon as may be after breakfast, or after luncheon, or after a light dinner. When the waters are taken oftener than twice in the day, the interval between the doses need not be longer than from half an hour to an hour. It is right to take exercise after drinking these waters.

These waters are not only used internally. They prove to be a useful eye-water. They are likewise valuable as a local application in many cases of gouty and rheumatic swellings of indolent character; and appear to aid, when poured over the parts affected once or twice a day, in promoting the absorption of articular deposits and ligamentous thickenings.

It is not uncommon to drink the tepid waters before breakfast, and the chalybeate between breakfast and dinner; occasionally the waters are mixed and immediately drunk, and in some cases with apparently good results. It is not uncommon to find that the mixed waters have an aperient effect. It need hardly be added, that the action of the chalybeate waters when they agree, will be to promote appetite and digestion, without exciting thirst, pain at the stomach, headache, derangement of bowels, or feverishness. They strengthen the general system, and improve the action of the various organs of secretion. They have not, however, the specific and marked action on the kidneys and bladder, that is exerted by the tepid waters when taken internally.

It may be useful to conclude these observations on the waters of Buxton with some account of "The Buxton Bath Charity," which was established many years ago, to afford to the poor the gratuitous use of the baths, to supply them with needful medicines and proper medical advice, and, if in want of pecuniary assistance, to furnish them with a weekly allowance of money.* It was stated in the fuller account of these waters already published, that, of 14,906 patients admitted to the full benefit of the Charity, in the eighteen years preceding 1838, 12,608 were dismissed "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 had been 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 persons having been dismissed only relieved in some degree, the small number of 885 having been dismissed as no better. To appreciate fully this result, it should be understood that a large majority of these cases had been of some standing, and essentially chronic in their character; for which the ordinary appliances of medicine, whether by hospitals or dispensaries, or the efforts of the private practitioner, had been tried, and tried in vain; and that usually in

* I have before me a printed document, bearing the date of 1785, which states that the pecuniary fund for the relief of the poorer patients of the Buxton Bath Charity, originated in the year 1779; and it is added that the Charity Baths had been devoted to the gratuitous use of the poor by "the munificence of the noble proprietor and his ancestors." This shows that the Charity Baths must have been devoted to the poor from a much more remote time: and, if this be considered as synonymous, as it well may, with the Buxton Bath Charity, the Institution may be regarded as being of considerable antiquity. It is curious, and interesting, to find that, whereas at its origin as a pecuniary fund for the relief of the poor bathers, the number receiving such relief was limited to "sixteen objects at one time," and it was only given during the six summer months, the number of persons who receive relief at the present time is quite unlimited, and the period of the year is no longer restricted.

three weeks, and seldom in a longer period than four weeks, these most satisfactory results had been obtained. If it be added to these considerations that the cases, for the most part cases of chronic rheumatism, by no means in general yield readily to remedial agents, but, on the contrary, are cases that, of curable diseases, are perhaps the most intractable and unyielding of all complaints,—the Buxton waters will have advanced for them the strongest proof that could be afforded of their effect on disease,—and the Buxton Bath Charity will need no further argument in its favour to be laid before the public. To this may be added that the expense of medicines, &c., is comparatively inconsiderable,—that the medical officers give their services gratuitously,—and that the Charity Baths are devoted to the purposes of this Institution by the liberality of the Duke of Devonshire.

There are two Charity Baths of the waters at the natural temperature, one for men and the other for women. These are large baths, between four and five feet deep. They are respectively eighteen feet long by fourteen feet wide, roofed with glass, lined with porcelain-covered bricks, and furnished with douches, and every desirable comfort and appliance as to dressing-boxes, &c. At the sole cost of the Duke of Devonshire, and with characteristic munificence of liberality, new hot baths have been constructed for the uses of the Charity. These baths are likewise provided with all the details of comfortable and useful accommodation.

During the last seven years the patients of this Charity have been most comfortably lodged and provided for in the Devonshire Hospital, with spacious, well-warmed, and well-ventilated dining hall, day-rooms, and dormitories, a liberal

diet, well-ordered household care, regular hours, and kindly supervision.

When it is added, that, in the seven years, the Buxton Devonshire Hospital had 8,199 patients under treatment; that its 120 beds were occupied, and many of the patients were obliged to have beds out of the Hospital, during many weeks of these years; that the cases of 7,264 of the patients were relieved, only 935 of the patients having derived no benefit during their stay; although 1,145 of the patients, or about one-seventh of the whole, were not suffering from any of the forms of rheumatism, but were such cases as are ordinarily met with in hospitals; the value of the Buxton mineral water as a medicinal agent, and the character of this important charitable institution, will need no commentary. On the average of the seven years, the patients remained under treatment 24 days; and 6,830 cases of rheumatism, embracing every conceivable variety of this distressing malady, and for the most part cases of severe and obstinate character, for the relief of which ordinary medicinal means had been used in vain, before these poor people had been sent to Buxton, were, in a time comparatively so short, and with so little aid from other means than the Buxton water, discharged with results so satisfactory. Patients are recommended by casual, annual, and life subscribers.

THE END.

JOHN C. BATES, PRINTER BY STEAM POWER, BUXTON.