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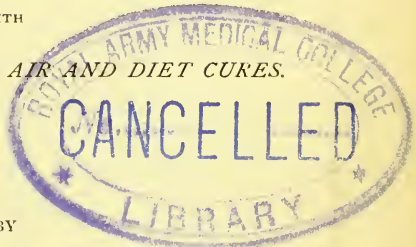
BATHS AND WELLS  
OF EUROPE;

2574

THEIR ACTION AND USES.

WITH

*HINTS ON CHANGE OF AIR AND DIET CURES.*



BY

JOHN MACPHERSON, M.D.

*WITH A MAP.*

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## NOTICE.

To prevent misconception, it may be well to say that this work does not profess to be a guide-book to spas, although it is intended to supply information which will afford aid in the selection of such of them as are suited for particular cases.

To save the reader the trouble of constant reference to larger maps, an outline one has been prepared, on a small scale, which may serve to point out the general position of places.

CURZON STREET, MAYFAIR,

*April 23, 1869.*



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“Every nation has particular opinions respecting the use of baths, and several rules and methods in using them. Drinking them is not at all received in Germany ; for all diseases they bathe only, and will lie dabbling in the water almost from sun to sun. In Italy, where they drink nine days, they bathe at least thirty, and commonly drink the water mixed with some other drugs to make it work the better. We are here ordered to walk to digest it ; there they are kept in bed after taking it till it be wrought off, their stomachs and feet having continually hot cloths applied to them all the while ; and as the Germans have a particular practice generally to use cupping and scarifications in the bath, so the Italians have their *doccie*, which are certain little streams of this hot water brought through pipes, with which they bathe an hour in the morning and as much in the afternoon for a month together, either the head, stomach, or any other part where the malady lies. There are infinite varieties of customs in every country.”—*Montaigne's Essays*, about 1580.





THE  
BATHS AND WELLS OF EUROPE.

INTRODUCTION.

THERE are few people, certainly very few women, who are not more or less doctors. It is not merely that they have some general notions as to what should be done in case of sickness, but that they have distinct medical opinions and theories of their own. Half knowledge and a certain degree of mystery are always captivating to the human mind. It is delightful to take a galvanic bath, and have the mercury and other poisons which have ruined your system, exhibited to you as they are mechanically eliminated by electric action—nay, some years ago a certain nobleman gave it in evidence, and apparently rather to his own satisfaction, that a substance resembling lead had been extracted from his head by metallic tractors. So, a lady who would not dream of wearing an amulet will use a galvanic ring, or a patient is assured by an hydropathist that the odour of the aloes he has been using for years is

plainly perceptible in his perspiration. What can be simpler than the theory of such cases? Or take another instance: a mother is induced to give her child, who is suffering from a paroxysm of fever, a few drops at night of a medicine which she is told is endued with marvellous powers. She watches the operation of the drops, the fever gets less towards morning, and she is a firm convert to globulism. What can be clearer than that the drops cured the fever? that they were not ordinary drops of ordinary practitioners? She has given a practical trial to the system, and doubtless, under the instructions of friends, had previously mastered its plausible theory as completely as most of its professors. A scrap of theory, for instance the announcement that it is a purifier of the blood, wonderfully helps the sale of a quack medicine. Whoever uses such a medicine fancies that he understands exactly how he is cured by it. A patient in the play does not comprehend what the doctor is saying about his case, until he gives this explanation: "Je veux dire qu'il y a quantité d'humeurs corrompues dans votre corps;" on which the patient at once replies, "Ah! je vous entends."

Mystery, or faith, is the next influence in subjection to which the patient places himself. A hundred years ago, a writer on mineral waters observed: "The public is ever captivated with novelty, and ever reveres things seeming secret and mysterious." It is wonderful to what an extent our faith is drawn on by globulism,

and other marvel cures, and it is therefore not very surprising that those who adopt them are often those who evince an extreme readiness of belief on other subjects ; but it is strange that a practice like that of globulism should have arisen amidst the scepticism of Germany, and that many who are most critical in matters of religion and of philosophy accept readily, after little or no examination, the latest novelties in the way of wonderful remedies ; partly because they have never thought much on the subject, partly, no doubt, from their fondness for deviating from everything that is old and established. Curious that the extremes of belief and of unbelief should meet in the ready acceptance of marvels ! A French savant cures an ague by placing a piece of camphor on the pit of the stomach, or an Indian medicine-man, clothed in mystery garb, dances round the patient until he has driven away the fever. In either case faith is the secret of the occasional success of the remedy. And while man's mental constitution remains what it is, and while the problems of medical practice continue to be so complex as they are, a certain amount of this implicit faith will always be required in regular as well as irregular medicine. Although we have not in these days got professed witches, unless we accept mesmeric mediums as their representatives, there is no question that the remark of our greatest philosopher is practically true to this day. "In all times, in the opinion

of the multitude, witches and old women and impostors have had a competition with physicians." To a great many minds, faith in some one else is absolutely necessary; and many patients are much happier when they have erected their doctor into a medical high priest, and they look to him for marvellous cures. Viewing the relation of a large class of patients to their physicians in this light; knowing that the great mass of those, especially of English, who resort to baths are not seriously ill, at least that their ailments are not acute ones, in which imagination can play a comparatively small part; and knowing the craving of the public for novelty and for wonders, it is not surprising, however much it may be subject for regret, that in many instances the bath doctors over-praise their waters, proclaim each to be a panacea, and even invent novelties in treatment in order to keep up the interest of their patients.

Owing to their disapprobation of such practices, and their natural unwillingness to allow that certain effects may be produced more easily abroad than at home (for we have but few wells of much importance), it is not surprising that in England there has been a tendency among many well-informed medical men to underrate the value of mineral waters. But we are not to give up a system on account of the unworthy acts of some of its professors. In fact it would be impossible to put a stop to the resort to bathing places. In German families of any means at all it is



the holiday of the year, which must be kept. And English find it not more expensive to visit a foreign spa, than to go to the seaside at home. Since there is something so pleasing in the annual change from home; since most of the waters drunk or bathed in are either pleasant, or after a time not disagreeable (always used more willingly than physic); and since the imagination is pleased to dwell upon their hidden virtues, visits to spas will always continue to be popular. In short, those who condemn mineral waters unfairly, would do better if they would study their use, and endeavour to explain the *rationale* of their operation. If it were possible, it would not be desirable to destroy faith in mineral waters; they produce real enough cures, but the faith should be rendered intelligent. To arrive, however, at a correct appreciation of all the elements concerned in the influence of mineral waters, is by no means a simple matter. Still, progress is being made in the solution of these questions. The Germans, although they can scarcely write a treatise on mineral waters without beginning *ab ovo*, and explaining the influence of Baco of Verulam (they will call him Baco) on the progress of natural science, have got rid of many old notions. It is no longer a matter of anxious inquiry, as it was some years ago, whether the patient had ever suffered from itch, whether the source of the malady was suppressed foot-sweat; and then abdominal plethora or hæmorrhoidal dyscrasy are less insisted on.

The French, though they still have faith in the mystical powers of waters, which they have termed animated medicines, and believe in a sort of diathesis, which they call the "darts," are getting emancipated; the ordinary bath theory of fever crises and eruptions being essential to cures has been abandoned (not that such effects do not occur, not from the use of waters, but from their abuse). Then we hear less of the chemistry of nature, and of its being necessarily perfect.

The theory of the operation of waters in bathing is better understood. The elementary actions of hot and of cold water have been better studied; purely chemical theories, such as that of alkalization of the system by certain waters containing soda, or of curing scrofula or gout by waters that contain minute quantities of iodine or of lithia, are no longer counted sufficient. The notion that the heat of natural hot waters differs from any other heat is abandoned; even later theories of the operation of such waters, by heat being placed in certain peculiar dynamic states and generating galvanic actions, are seen to be chimerical, at all events to afford no satisfactory explanation, as our commonest acts involve electrical changes.

In short, in this as in other departments of medicine, we are less inclined to take things for granted, especially certain therapeutic actions, and the necessity for an analysis of the causation of the facts that come before us is admitted by all. But many years of accurate

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observation will be required before satisfactory results are attained. These pages pretend to exhibit nothing more than a slight sketch of the present condition of our knowledge on the subject, gathered partly from personal observation, and necessarily much more from every other available source of information. It is hoped that they will supply in a condensed shape an outline of all that is essential to be known on the subject of which they treat. They are meant to furnish a sort of information which may be useful in England at the present moment.

Although few baths that are much out of the track of the English on the Continent are noticed here, and therefore many in Silesia, Hungary, Wallachia, and elsewhere are omitted, yet the number mentioned in this book, it is feared, is quite large enough to be somewhat embarrassing to some. While the stream of English to continental baths is increasing every year, and such wells as we have and our excellent sea-bathing places are not made as much use of as they should be, it seems a pity that the current should run so much in one direction, and that it is not turned into more channels. Undoubtedly, taken as a whole, the German baths are best managed and best suited to the taste of English visitors. But many of the French ones leave nothing to be desired; and if patients once begin to flock to a new place, it is wonderful how soon its arrangements are improved.

Pretty full notice has accordingly been taken of some of the Italian and of the Spanish baths, particularly such of the latter as are not far distant from the English colony of Pau and the fashionable watering-place of Biarritz. While many of the Spanish baths are rising into importance, it is much to be regretted that the analyses and the accounts generally of these waters are very imperfect, and that there appears to be no work of any importance treating of them more recent than that of Rubio in 1853. With reference to the object of this work, which makes no pretension to be a complete treatise on Balneology, it has been deemed unnecessary to include detailed chemical analyses of all the waters. These will be found in the large manuals of Balneology, and the "Dictionnaire des Eaux Minérales," of which a later edition is much wanted. Enough has been said to show the general composition of most of the waters.

While I have to acknowledge the assistance I have derived from Constantine James's popular book, and Weller's little "Taschenbuch," also from a great many guide books and local monographs, I must also thank Drs. Hermann Velten and Robert Velten, of Aix-la-Chapelle, for some valuable hints. Helfft's "Balneotherapie," 1867, and Meyer-Ahren's elaborate work on the Swiss baths, of the same year, have been of much use to me. But the works that I must acknowledge my special obligation to, and of which I have made the

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freest use, are Braun's "Lehrbuch," 1868, written in a critical spirit, and Lersch's "Praktische Lehrbuch," of the same year, like all the other works of that distinguished Balneologist of Aix-la-Chapelle, a perfect mine of information.

I find that the task I have attempted is a less easy one than I anticipated, and the words of Paracelsus, which appeared to me at first to be extravagant, no longer seem so: "The knowledge of such baths is especially worthy of the physician, for in it are comprehended not only the whole of medicine, but also the principles of all the natural sciences with which a physician should be acquainted." While I have felt the difficulty of reaching such a standard, I have often been tempted to contrast it with the unhesitating confidence of many a bath physician, "*qui ne voit rien d'obscur dans la médecine, rien de douteux, rien de difficile.*"

## BOOK I.

### ELEMENTS OF TREATMENT.

#### CHAPTER I.

##### BATH LIFE.

WHEN we come to analyse the benefits obtained from a visit to one of the many places resorted to in the search for health, we find that they are not the result of any one single, but of many co-operating causes.

Take Trousseau and Pidoux's description of a fine Paris lady, written by the way more in the style of a French novelist than of staid practitioners: she is represented "as living in the midst of luxury, not getting up till mid-day, confining herself during most of the afternoon to a perfumed room, which the light scarcely penetrates, taking a drive in a close carriage when the weather is fine enough, living on made dishes, which are made the more piquant as her appetite grows more fantastic; next come her passions, good or bad, her disposition, sad or gay, her social and family duties, the routine of every-day little annoyances, and finally ennui, that pest of idleness and of riches. Her

appetite fails, her digestion is languid, her nervous system is exalted, she gives an endless deal of trouble to her doctor, who can do little for her, and who in despair sends her to some spa. There her habits are changed in every way. To begin with, she has to get up early in the morning for her waters, or her bath; she leads a comparatively simple life in the open air; and without going into further details as to her changed mode of life, can you wonder if she returns to Paris cured?"

A well-known English author, Dr. Beale, expresses himself thus: "If patients could be induced to retire to a pleasant part of the country, where they would take moderate exercise, and be free from mental anxiety, meet with agreeable society, live regularly, take small doses of alkalies, and bathe themselves for an hour or two a day in warm water, in which some carbonate of soda has been dissolved, they would receive as great benefit as by travelling hundreds of miles away, and at much less trouble and expense." Here the whole question is begged. Is it so easy to find, just when you want it, a pleasant spot in a picturesque district, with agreeable society, and all the conveniences for bathing ready to your hand, and would they be less expensive? Even in the case of hydropathy, the appliances of which are so easily procured, who thinks of going through a regular course of it in his own house, or in an establishment in the town where he lives? If he does not go as

far as Malvern, or Yorkshire, or the Rhine, he at least leaves London, or any large city in which he may be, and retires to its neighbourhood; and when he does so, a portion of the benefit he may obtain is to be set down to the amusement he receives from the society he meets in the establishment, and the enforced rules of such institutions.

The first of the advantages of leaving home is that of travelling; on its pleasures I need not expatiate; but those who travel in fine weather, and in comfort, are always in good spirits, and they fall in with others who are, with the exception of a few habitual grumblers, always cheerful. Montaigne said well, "He who does not bring along with him so much cheerfulness as to enjoy the pleasure of the company he will there meet, and the walks and exercise to which the beauties of most baths invite us, will doubtless lose the best and surest part of their effect." This social relaxation is as much required by the hard-worked office man, who goes through his routine work almost mechanically, as by the man of letters, or by the statesman, whose loftier pursuits and objects put a strain on the higher mental powers. It is good for us all to get out of our groove for a time. In travelling alterations of habit are enforced; a certain irregularity of hours of rising and of going to bed takes the place of our fixed ways. There is necessarily a change of diet, and of hours for taking meals.



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When his journey is once over—when a patient is settled at a bath—the routine of home habits is altered ; a special diet is usually enjoined, and sometimes adopted. Patients will often obey implicitly the directions they receive when away from home, who turn a deaf ear to the judicious, but as they think routine, advice of their home attendant. What does not by its novelty arrest the imagination is apt to be treated with indifference. For a long time certain absolute rules of diet were laid down for patients while drinking waters. Butter, and coffee, and tea, and many innocent articles were proscribed. A doctor who allowed the use of butter was set down as an ignoramus, just as an Eastern would have no opinion of one if he ordered him a hot article of diet, when the patient considered that a cold one was suitable for his complaint. Long lists were paraded, and are still used in some places, pointing out what things may be eaten, and what are to be avoided. Many patients like having such positive injunctions. General principles alone can be enunciated at a distance ; those special instructions are welcomed on the spot. The general rule is to confine oneself to eating light digestible food. No one while at home, using laxative medicine, or indeed counting himself ill, would think of eating pork, pickles, salads, fruit, red herrings ; and every prudent man will avoid such things when drinking mineral waters, and also learn from his physician whether there are any special precautions to

be taken while using the waters of a particular spring. At one time bathing and drinking were proscribed to women at certain periods, and in certain conditions, but that rule has been very properly relaxed somewhat.

The routine of bath life, already so familiar to most English readers, scarcely requires to be described. The drinking of the mineral waters is done mainly between half-past six and half-past eight in the morning; a glass of water, on an average perhaps of six to eight oz., is drunk. Many patients drink their water diluted with milk or whey, and ladies often suck it through glass tubes; but in the great majority of instances these practices are unnecessary. The patient then walks up and down shaded alleys or covered ways with his friends—and in many new baths the want of sufficient shade is a great drawback—and repeats his draughts at intervals of about twenty minutes, until he has taken his supply, then goes home to a light breakfast. There are some few people with such an inveterate dislike to early rising that they must be allowed to drink the waters in their homes at first. But an effort should always be made to induce them to get up early. There is no objection to their taking a small cup of coffee, or of tea, before they go out of doors. When baths as well as drinking waters are used, the drinking precedes the bathing; most people who rise early get their bath over before breakfast. But those who do not rise early, or who are not

strong, put the bath off till after breakfast. The bath of course should be over before any heavy meal is taken.

In France you are usually supplied with two abundant meals,—one the *déjeuner* about ten in the morning, the other a dinner about five o'clock. In Germany, on the contrary, the one great meal is taken by the visitors chiefly about one o'clock, and there is a later and more expensive meal about five o'clock, mostly frequented by English and French. I am satisfied, from what I have seen, that patients eat a great deal too much at these *table d'hôte* dinners, unless in some places, such as Carlsbad, where the dinner-supplies (there is no *table d'hôte*) are, to a certain extent, under the control of the medical men. While eating too richly and in too great variety is the danger of the *table d'hôte*, the advantage of it is, that meeting the amazing variety of people seen there is useful to nervous and hypochondriacal, and to many dyspeptic patients. The well doctor should be asked in each particular case whether it is better to go to a *table d'hôte*, or to dine at home. One matter of great importance to many English travellers, with whom the wines of the country often disagree, is that they should find out at once some good sound wine which they can drink without the risk of being incommoded by it. An hour after dinner they go, in some places, and drink any mild acidulous water that the place supplies. The chief

amusements are bands of music during the morning and evening, balls on certain evenings of the week, concerts, and theatres; for in all the principal spas there are handsome public rooms, comprising magnificent ball-rooms and dining-rooms, theatre or concert-room, and reading-rooms. Excursions to places of interest in the neighbourhood both help to fill up the time agreeably, and if judiciously managed, the exercise and the change of air which they involve contribute to the cure.

These are the legitimate amusements, but at a great many spas, and those most frequented by the English, gambling is a great attraction, especially at Spa, Baden Baden, Wiesbaden, and above all at Homburg.\* The gambling tables will ere long be closed, and the English must then manage to amuse themselves without their help. At present nothing is commoner than to hear the English complain of the intolerable dulness of Kissingen, or of Schwalbach, although the scenery is pleasant, and cheerful company is always to be had at these places. It is impossible not to wish for a time when baths will not depend upon such factitious support, and it will be curious to see how a place like Homburg will

\* There are still about eight German and one Swiss and one Belgian spa where gambling tables are kept. The inhabitants of Frankfort enjoy the privilege of being within an hour's railway journey of no fewer than four gambling tables,—Homburg, Wiesbaden, Nauheim, and Wilhelmsbad.

stand the test. Pleasant places though such ones be, they are undoubtedly full of vice of all kinds,\* and it can only be in the hope of working a reformation where it is so much wanted that personages of most special gravity and reverence, with many watering-places of equal salubrioness open to them, are led to resort to the gambling spas.

The selection of the particular bath to send a patient to must be regulated by a variety of circumstances. The first, but by no means the only consideration, is the nature of his malady—whether you are selecting a place for the patient alone, or whether a place is required that may at the same time suit some members of his family, or some friends that may accompany him. Is the patient one who requires repose and quiet, or does he stand in need of pleasant society? Then comes the question of expense and of distance. It is usually more convenient to select a place not very remote or difficult of access, although this is not always the case. Then, are the patients fastidious as to diet, and in other respects?† Do they require, or is it wise,

\* It is amusing to read how in former times such penalties as public whippings at the four corners of the baths were employed at Plombières to deter improper persons.

† My own feeling is that the English, generally speaking, are over-fastidious, and require too much. I believe that in many cases they would be all the better for roughing it a little at some of the smaller spas, if only the appliances in them for meeting the one daily-recurring necessity were improved. The simple truth is that

that they should have the stimulus of excitement? Is the climate of the place very important for the particular case? The climate in reality depends much less on the latitude of the place, and its absolute temperature as shown by the thermometer, than on its being sheltered from the prevailing winds, and having shady alleys near the wells, and paths through the forests with resting-places in the vicinity. Are the arrangements of the particular bath good? If the place is overcrowded, the difficulty of procuring a bath, and the necessity of going at 3 A.M. to take one, may do away with half the benefit expected from it.

Some light is thrown on these subjects by ascertaining how many visitors resort to particular baths; because the larger a place is the greater is the number of those who go there merely for amusement, and *vice versa*. But it is not very easy to arrive at accurate statistics. This statement from Ischl well illustrates the difficulty. In the year 1867 Ischl was visited by 5,795 parties of strangers, while the number of parties that entered themselves for treatment was 1,199, which represented 3,100 individuals. Again, in 1868 the number of strangers visiting Aix-la-Chapelle was over 10,000, while those who underwent treatment were between 3,000 and 4,000.

The following calculations will, however, give some general ideas on the subject of the more crowded ones.

defective arrangements in this respect interfere most materially with the health and comfort of those who are accustomed to better ones.

Homburg is probably much underrated, while I have not been able to obtain any returns for the crowded Schwalbach, or for Vichy, the most crowded spa in France, where the number of guests cannot be under 25,000 or 30,000. Nor have I any returns for the popular bath of St. Moritz. The Spanish bath of Panticosa, of the same elevation, has 1,000 patients, notwithstanding its cramped space.

BELGIUM . . . . .	Spa . . . . .	13,000	
GERMANY . . . . .	{	Baden Baden . . . . .	50,000
		Wiesbaden . . . . .	30,000
		Homburg . . . . .	12,000
		Baden (Vienna) . . . . .	9,000
		Kissingen . . . . .	7,000
BOHEMIA . . . . .	{	Gastein . . . . .	3,000
		Carlsbad . . . . .	10,000
		Marienbad . . . . .	6,000
		Franzensbad . . . . .	3,500
		Elster . . . . .	2,500
SWISS . . . . .	{	Toplitz . . . . .	10,000
		Baden . . . . .	20,000
PYRENEES . . . . .	{	Bagnères de Luchon . . . . .	19,000
		Bagnères de Bigorres . . . . .	18,000
		Eaux-Bonnes . . . . .	9,500
		Cauterets . . . . .	8,000
EASTERN FRANCE . . . . .	{	Ax . . . . .	2,500
		Aix . . . . .	6,000
		Uriage . . . . .	5,000

We thus find that the principal baths alone, some twenty-five out of the three or four hundred considerable baths in Europe, have a resort of at least 300,000 individuals.



A great deal of the success of a visit to a spa depends on the patient going willingly, having friends with him, going to a cheerful place, being fortunate in his weather (although Lersch says he hears of most cures in wet seasons). More depends on such matters than we are perhaps apt to think. If a patient has taken a dislike to a particular spa during one year's experience of it, although this may have been merely the result of accident or caprice, it is far better to select a new place for him, than to force him back to a spa he dislikes. Patients, again, who have extravagant faith in the virtues of a spa they have already tried, should not be rashly dissuaded from returning to it, for confidence is always an important element of cure.

No patient ought to go to a bath without a statement of his case from his usual medical attendant. With the aid of a statement the bath physician is in a much better position for prescribing a suitable course of treatment, than if he has first to make out the whole history of the case, which it may take him some time to do. No one should attempt to enter upon bath treatment without consulting one of the doctors of the place. There may be peculiar usages and practices at the particular bath, the use of which may not at first sight be apparent. But the bath doctors have practical knowledge of the operation of their waters. And all men of practical experience know the use of the weapons they wield better than strangers. There are in fact many waters



of undoubted value, where the good arrangements of the station and the experience of the medical staff make up for what they want in mineral strength. There are differences in the application of particular waters to particular cases, a knowledge of which can only be partially explained on general principles, and which is attained chiefly by empirical practice. One whom it is usual to class among quacks, Paracelsus, wrote more than three centuries ago with so much practical sense on the whole subject, that I must quote the substance of what he says. After explaining that a bath physician should be thoroughly acquainted with his profession, and that the virtues of wells are best tested by the cures they produce, for daily experience is worth more than the counsel of books, he says that the physician should regulate the diet of his patient according to the nature of his malady, and that a physician in sending a patient to a watering-place should judge and discriminate in what condition a patient is more or less fitted for a course of waters, and whether it is a fitting time to send him. For if these things are neglected patients are misled, and the operation of natural thermal waters falls into disrepute.

It is a very general notion that baths and mineral waters, if they do you no good, at least can do you no harm; and this seems to have been the opinion of Montaigne—but he only used the indifferent, or nearly indifferent waters of Plombières, Baden in Switzerland,

and Lucca. Not that even they can be used indiscriminately. It is quite a mistake : many of the waters are very powerful medicinal agents, and may prove most injurious if carelessly employed.

It was formerly the practice that patients should undergo a preparatory course of treatment. Boileau wrote a deplorable account of himself to Racine : " I have been purged and bled, and have not failed to comply with all the formalities required before commencing the use of the waters. The medicine which I have taken to-day has, as they pleasantly say, done me all the good in the world, for it has made me faint four or five times, and rendered me so weak that I can scarcely stand." But though these lengths are not gone to now, the less done in this way, except to improve the health of the patient generally, the better. Then the length of a cure has been usually fixed at about twenty-one days, especially in the use of baths ; any such period is purely arbitrary ; in regular medicine no one defines the period required for cure. Paracelsus, to quote him once more, said that no certain and precise number of baths could be fixed on. Everything depends on the kind of baths or waters used, on the nature of the malady treated, and on the individual peculiarity of the case, whether the patient's constitution or other circumstances, such as the time that he can afford to spend. The great rule is not to hurry the cure ; to spend as much time on it as possible ; to take the waters

first in small quantities. Small quantities taken over a protracted period do not produce the disagreeable effects of over-dosing, and they affect the constitution more favourably and lastingly. Over-bathing, remaining too long in the bath, or bathing more than once a day, are practices to be avoided.

Systematic rules about what are called after-cures have frequently been laid down. It is often useful, particularly in certain classes of disease, to continue at home for some time the use of the waters which have been drunk at a spa, especially if they be of a class that does not suffer much when bottled and carried; or it may be expedient, after a lowering course of treatment at one well, to send a patient to another source with bracing properties; a familiar instance of this is sending patients to iron waters after a course of saline treatment. In many instances where patients have not benefited as much as was expected, they are dismissed to their homes with the assurance that they will feel the benefit of their bath course afterwards. This appears to me to be rather poor comfort. If a favourable change does take place, it is by no means plain that the waters should get the credit of it. It is better to admit that waters, like all other remedies, fail at times to be of use. But it is often difficult to form a dispassionate judgment on those matters. For instance, of two patients who were last year at Aix and Vichy respectively, the one thought himself very little

better while under treatment, but has been better this winter than for a long time. The other benefited much at the time, but shortly after his return home had an attack of disorder of the kidneys, which was attributed to the system being saturated with the alkalies of the Vichy waters. As to the question of expense it is difficult to say much. The most fashionable baths are naturally the most expensive; but even at them there are ways of living economically, though perhaps not found out immediately by English not accustomed to foreign life. Many of the baths are very cheap places of residence; and altogether living, even at the best hotels, is considerably cheaper than in second rate ones in England. The kinds of cases to be sent to particular kinds of baths are mentioned afterwards; here it is not necessary to say more than that it is cases of chronic disease, which are but little influenced by ordinary medical treatment, that profit most by the use of mineral waters.

Some of these are—general anæmia and chlorosis, scrofulous and tropical cachexy, certain urinary, biliary, and skin complaints, dyspepsia and hypochondriasis, chronic rheumatism and gout and thickened joints, many nervous affections, and some forms of paralysis. Bronchitic affections may be frequently benefited; women suffering from various functional derangements often gain much; but ladies must not implicitly believe all the wonderful stories they are told of the dispersion

of ovarian and of other tumours. If they do so, they will assuredly be disappointed.

An objection which has been taken against bath cures may be noticed here. It has been said that the effects are not permanent—that one visit to a bath always leads to a second. But this is no real objection. There are few chronic complaints that can be permanently cured in a month or six weeks, so as to make their recurrence unlikely; and his return to a bath shows that the patient thinks he has benefited by it, or that he likes it. On the same grounds the climate of the Himalayas might be found fault with. In India, all classes, from the Governor-General downwards, prefer spending certain portions of the year away from the plains; and it is notorious that if an officer once sends his family to the hills, he has to do so every year. But the Himalayas or the Neilgherries are not less valuable health-resorts on that account.

## CHAPTER II.

### CHANGE OF AIR.

CHANGE of air is one of the most favourable influences under which a patient places himself in leaving home. There is something in the feeling of change of air that is readily perceived, but not so easily described or explained. The mere change in the physical qualities of the air inhaled is too slight to afford a satisfactory explanation. Perhaps the best illustration of the sensation is the intense feeling of delight and refreshment which a patient derives from his first drive into the country after a severe illness, or the first sniff of sea air to those who delight in it. I have never myself experienced any change of air so wonderfully exhilarating as that from the furnace blasts of the plains of India to the cool air of the mountains, to the odour of pine forests and to the rippling of mountain streamlets. Existence down below and up above were existence in different worlds. In a case like this the main physical and tangible causes of these agreeable sensations, the change in the temperature and in the lightness of the air, are plain enough; but it is by no

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means always easy to explain, not only why change of air is, especially in the tropics, one of our most active curative agencies, why any change of air is agreeable to most people, but how the air of particular places seems to suit the requirements of particular individuals, how so many make up their minds that the air of some places agrees with them and that of others disagrees with them ; and this not merely in the case of such seemingly capricious diseases as asthma. It would be convenient if we could believe with many of our patients, and as they may have been rather heedlessly told by their medical men, that a place suits them owing to the quantity of ozone, or of iodine, or of iron, or of electricity in the air, earth, or water of the place, as it may be ; although there is no question that certain conditions of soil have a very positive influence on health. Patients are very naturally anxious to have a reason assigned for their feeling well or ill ; and if a patient once takes up a notion about his own constitution or the climate of a place, it is wonderful with what pertinacity he adheres to it. Although, however, we cannot entirely explain the cause of the difference in the effects in the air of different places, yet some of the general phenomena of different kinds of air have been tolerably well ascertained.

One of the advantages in point of air gained by going to visit a spa, is that you usually visit it at its best season. If you are in the North of Europe, you go



south to enjoy the milder climate of Central Europe ; if you are in Italy or in the south, you go north to avoid the extreme heat. It is admitted on all hands that fine weather acts beneficially on mankind (of course weather may in Europe sometimes be too hot and dry), and, if in going in quest of health you secure good weather, you have one great element in your favour ; but it should be noted that liver and nervous cases should avoid the heat which suits gout and rheumatism. The bath season usually extends from the beginning of June to the end of September ;\* but some of the Pyrenean or Spanish baths, where they have two bath seasons, also Aix in Savoy, and certain of the Italian ones, may be visited earlier ; and some of these, such as Ischia, may be used the whole year round. There are obvious reasons why spas cannot be so conveniently visited in winter as in summer ; but many baths may be easily used throughout the year with advantage, if patients will live in winter in the houses that contain their baths. The great value of fine weather to a patient consists in his being able to be constantly in the open air, and this ensures both a certain amount of exercise and of exposure to light. In England we scarcely appreciate the advantages of this sufficiently. But be-

\* On one occasion, going to visit a bath on the 15th September, the official date for its closing, I met most of the bath guests and their two doctors coming away in carriages. All the postal arrangements I found ceased on that day.



sides the fine season there are two other important changes of air often met with by going to watering-places—the change to mountain and sea air. These subjects can be only very lightly touched on here—to do more it would be necessary to write a treatise on climate ; but it is necessary to glance at them in their general relations to our subject.

The great characteristic of mountain air, besides its being cooler than the air of the plains, is its lightness, from the great diminution of atmospheric pressure at high altitudes. In the mountains there are greater and more sudden changes of barometric pressure than in the plains, more rain and wind, although in the very highest ranges the quantity of rain is not so great as in the lower ones ; on the whole, more alternation of movement and of repose in the air. There is more absolute moisture of the air above than down below, and the air, from its rarefaction, has more capacity for taking up moisture. Like all country air, it contains fewer organic or other impurities than that of towns. There is increased light and greater sun radiation ; as the soil is more easily heated during the day, so is it more readily cooled at night. On the whole, the daily and yearly range of temperature is more regular and less extensive above than in the plains.

But the qualities of mountain climates do not depend simply on elevation. Montreux is considered to have an alpine climate, though only 1,100 feet

above the sea. They are subject to many local influences ; for instance, valleys of the same elevation as plateaux or spurs of mountains vary much more in temperature than the latter. The position of a hill giving shelter from the north, the opening of one valley into another, or the bendings of a valley, all influence the local climate. Spurs of mountains are colder than valleys when they are exposed to the north, warmer if they face the south, east, or west. Isolated mountains have less variation of temperature than plains. The neighbourhood of glaciers, snowfields, lakes, and even of cultivated land, lowers the temperature of a place. The number of hours a mountain valley is shone on by the sun influences its temperature much. Valleys are in winter colder, in summer warmer, than the mountains. It is a common notion that electrical phenomena are very violent in mountains, but this is mainly owing to the reverberation of sound among them. But enough has been said to show that mere meteorological tests can show but very imperfectly what a mountain climate really is. Its effect on the system must be gathered from observation.

Travellers have often described certain effects of the air at great elevations, such as accelerated action of the heart, and bleeding at the nose or ears ;\* and I am

\* These symptoms have usually occurred in those who have exhausted themselves in the ascent of mountains, and violent headache and sickness sometimes follow a descent from a great height.

aware that giddiness and headache and incapacity for exertion have been said to be met with in Europe at 5,000 and 5,700 feet, and lower. But they need not be discussed here, as no such unpleasant effects (nothing more than a little nervous excitement or sleeplessness at first) are experienced in India up to 8,000 feet, which heights the English fresh from the plains reach without the slightest inconvenience, and at which they have long lived comfortably in the Himalayas. Not even the

It seems scarcely fair to attribute them to the rarefaction of the air, when we find that observers in balloons at the height of 23,000 feet, from whom a half atmosphere's pressure was taken off, experienced only acceleration of pulse and of respiration. When Glaisher rose to about 30,000 feet, and about two-thirds of an atmosphere's pressure was taken off, he suffered mainly from the effects of extreme cold; and going in the opposite direction, if we consider the case of divers, they can bear the most enormous pressure with no disturbance of their functions beyond a little singing in the ears. Divers using the latest French apparatus sustain at the bottom of the sea the pressure of a column of 120 feet, equal to five atmospheres; and they have absolutely worked, although it is not counted safe to do so, at 150 to 180 feet, or under a pressure of seven atmospheres. It is considered prudent to descend, and still more to ascend, gradually; otherwise there may be headache and singing in the ears. (It is strange that increased and diminished pressure in the first instance produce similar effects.) Under these circumstances, and knowing that one can cross the St. Gothard, a height of nearly 8,000 feet, and the Stelvio, over 9,000, without any disagreeable feelings, we cannot expect the assumed effects of rarefied air to be manifested at our most elevated European health-resorts, as St. Moritz, where only about one-sixth of an atmosphere is taken off. Once, however, tell a nervous patient that he is to experience unusual sensations, and he is sure to feel them.

highest places of health-resort in Europe reach that height.

Unfortunately little is known exactly of the operation of mountain air. Professor Pettenkofer has favoured me with these general observations on it: "Rarefaction of the air and decrease of temperature stand in a sort of antagonism to each other in their operation. Rarefaction of the air develops the surface circulation, while the simultaneous diminution of temperature and increased cutaneous transpiration tend to repress it." He states, "that the frequency of the pulse and of respiration cannot be very different, unless the degree of atmospheric pressure is very different. We breathe to take up a certain amount of oxygen, and to give out a certain amount of carbonic acid. The quantity taken in and given out depends much more on the quality of the blood, and on the change of tissue, than on the absolute quantity of air which an inspiration contains. It is proved, experimentally, to be an error to suppose that in an atmosphere containing more than the usual amount of oxygen, more oxygen is also taken up by the lungs."

According to the analogy of experiments made in balloons and with compressed air, it has been thought likely that the pulse beats faster, and that respiration is quickened. But although this may in the beginning of a stay in the mountains have an alterative effect on the processes of respiration and of nutrition, the system

soon gets accustomed to the change. It seems certain that the higher capacity of mountain air for moisture favours the expiration and perspiration of water, also that the air being thinner, less oxygen must be inhaled at each inspiration unless the lungs take on an increased action, that if the supply of oxygen is defective, there must be an expansion of the lung-cells to make up for it. The only practical information that we have on the subject (the question ought to have been settled long ago in our Indian hill-stations) is that of Coindet in Mexico, who found at a height of 7,410 feet that the average number of respirations of 250 Frenchmen was 19·30, and of the same number of Mexicans 20·29 per minute, with relative pulses of 76 and 80. While, therefore, the respiration was slightly more frequent, there was no alteration in the relation between the circulation and respiration. He found the absolute quantity of carbonic acid expired the same as in the plains, and this is supported by the analogy of Professor Frankland's interesting experiment, showing that the amount of combustion of a candle was almost the same on the summit of Mont Blanc as at its base.

The general view of the subject is that change to the mountains retards oxidation, *i.e.* animal waste, and is therefore conservative ; also that changes of barometric pressure and of moisture of the atmosphere are beneficial in giving the system alternate periods of excitement and of rest. But on all these subjects there is

little positively known. Though some sensitive organizations are undoubtedly affected by every change of barometric pressure, or by what it represents, the generality of men either are influenced in no palpable way by it, or immediately accommodate themselves to it.

Alpine climates have been divided somewhat artificially into various zones, and their effects have been characterised as tonic and vivifying, tonic and exciting, &c.; but such divisions are at best dependent on latitude and on local influences. To those who are familiar with a lengthened residence in the Himalayas, or who think of the elevation of Mexico and other inhabited parts of the world, some European directions appear amusing. Thus it has been laid down that patients must not stay more than from six weeks to two months at heights of from 3,700 to 4,600 feet. At 3,000 feet you may stay some months; at 1,500 to 1,850, the greater part of the fine season.

It is by no means easy to get very satisfactory evidence as to the health of residents in hill countries. In the lower parts of the Swiss mountains, dysentery seems to be common, just as it is in the Himalayas, and, as diarrhœa is frequent in the Pyrenees, and low fevers are not absent. Sometimes a wonderful immunity from eruptive fevers is reported; but that is mainly, no doubt, from isolation. But of late years it has been attempted to prove that consumption does not occur above certain elevations. While there is

little doubt that certain elevated spots enjoy a considerable amount of immunity from the disease, it would be easy to show that this is also the case with various places at the level of the sea. Consumption undoubtedly occurs among the natives of the Himalayas, and is not infrequent; and among the children of Europeans in the Indian hills, acute chest and especially laryngeal attacks are common. To look at a few places in Switzerland: tuberculosis is said not to be common at Interlachen, a height of 1,700 feet, and still less frequent among the true hill people. At Gais, 2,875 feet high, there is a good deal of phthisis and rheumatism; in the valley of Château d'Ex, 2,900 feet, consumption is common. At Leukerbad, 4,400 to 4,600 feet high, inflammations of the chest are a very common cause of death. At Davos, 4,700 feet, lung inflammations are common, but mild, and there is no endemic phthisis. At St. Moritz—and the country saying as to the Upper Engadine is, that it has nine months' winter and three months cold—it is said that phthisis is unknown. It does not however follow, because there may or may not be a good deal of consumption in a place, that it is unsuitable, or the reverse, as a change to a consumptive patient. I would only say that mere elevation is no sure test of the healthiness of a place. Munich, some 1,500, and Madrid, some 2,000 feet above the sea, are anything but particularly healthy cities; and for the present



it seems to be a pedantic assumption to talk of living within or above tubercular zones.

As to the therapeutic action of mountain air, very differing opinions have been expressed. While it has been usually believed that it is a valuable remedy in anæmia, some have even thought that it induced that condition. Others consider that it produces congestion, and a tendency to hæmorrhage. Still I think that I am warranted in saying that practically mountain air is of all the most tonic and bracing, and particularly suited for convalescence from acute disease or loss of blood—for much the same cases as are benefited by quinine and iron. The question of how far mountain climates are suitable for consumptive patients is at present exciting much interest, and it is not a little remarkable that abroad (for English consumptive patients are seldom sent to spas) many of the favourite places of resort for such patients have for some years been baths situated at very considerable elevations. Görbersdorf in Silesia, a hydropathic establishment, 1,700 feet high, is not only advertised as being above the tubercular zone, but is a considerable place of resort for this class of patients. Eaux Bonnes in the Pyrenees, 2,100 feet, and Mont d'Or in Central France, 2,900 feet, have long been favourite stations. Consumptive cases have begun to winter at Davos, 4,700 feet, and even at the favourite St. Moritz, 5,700 feet. While Davos, where there is no well, is in high repute, it is curious to observe that at



the neighbouring baths of Tarasp and Fideris, one 500 feet, the other 1,500 feet lower, it is stated that consumptive cases are unsuitable for them. The Spaniards have long sent such cases to Panticosa, of equal altitude with St. Moritz; and I have recently heard of great improvement in some cases of hæmoptysis at that place. On the other hand Rigischeideck, an exposed station at the height of 5,000 feet, is found injurious to phthisis, and authors generally reckon such climates unfavourable in hæmoptysis.

Much further observation is wanted on these subjects, and it may be required to modify the old view that mountain climates are necessarily unfavourable to all forms of consumption. In India, it used to be the established practice never to send phthisical cases to the Himalayas, any more than cases of disease of the heart or large blood vessels. But as to the former class of patients this rule has been somewhat relaxed, and without bad effects, if not with striking benefit.

Cases of pulmonary phthisis are usually divided into two types—a commoner one, the torpid or lymphatic, and the more irritative or erethic form (which, however, supervenes towards the termination of the other form also); and corresponding climates, one favourable and one unfavourable to each state, have been defined rather arbitrarily. The first type would be considered the best suited for mountain climates, which in all probability are more useful in strengthening the con-

stitution in early years, and in warding off phthisis, than in combating the disease when once established.

As to other forms of disease benefited by a mountain climate, dyspepsia is often relieved by it; appetite is frequently almost instantaneously restored, but these effects are not always permanent.

In Europe, on the idea that a more active circulation relieves congestions of the abdominal viscera, mountain air has been talked of as a certain cure in obstruction of the liver and of the spleen. But Indian experience would make one slow to endorse these opinions, or to expect much if those organs have undergone any considerable change. Nor is Indian experience in accordance with the European notion, that a hill climate is useful in dysentery and in diarrhoea. Some of the worst forms of diarrhoea are endemic in some of the Indian hill stations. After all, it is for cases of general debility, of slow recovery from child-bearing, or from protracted lactation, in anæmia and chlorosis, in women and in children, that the beneficial effects of mountain climates are most apparent.

Diseases of the heart and large vessels and bronchitis are admitted by all to be unsuitable for the mountains, and hæmoptysis is by most writers.

When it is intended to send patients to mountain climates, it may sometimes be necessary, but scarcely in the case of English, to ascertain the elevation of a patient's home. Thus a patient sent from Munich or

Innsprück to Ischl or Reichenhall might benefit by the change, and by their sub-Alpine climate, but the benefit would not be derived from any superior altitude of these places.

Although, curiously enough, scarcely a single well of any importance, except one in the extreme south of Europe, is situated close to the sea, yet, as sea-air forms an important element in the effects of sea-bathing, it may be well to say a few words concerning it.

As there is the least barometric pressure at high elevations, so there is the greatest at the sea-level. Its variations are also greatest there. The temperature of sea-air is on the whole lower than that of land-air, and is less variable. If the summer heat is not so great, so also is the winter cold not so intense as in inland situations. Owing to the surface evaporation, the absolute moisture of the sea-air is somewhat greater, and the rainfall is greater on coasts than in interiors. It is freer from organic impurities than land-air, and contains more particles of common salt. It also contains a good deal of ozone, a form of oxygen about which wonderfully little as to its operation on man is known with certainty; any quantity of iodine that may be present in the air is much too small to have an appreciable influence on man, and the smell of it in sea-air, often talked of, is no doubt mainly derived from the seaweed when the tide is out. It has been

thought by some, that with the greater atmospheric pressure more carbonic acid is expired from the lungs at the sea-side, the inhalation of oxygen thereby increased, and the processes of blood-making and of nutrition thus quickened. However, it is not likely that there is much difference in the quantity of carbonic acid expired. Experiments have seemed to show that sea-air produces, almost immediately on arrival at the sea-coast, a great increase both of retrogressive and of progressive change of tissue, as manifested by a striking increase in urea and diminution of uric and phosphatic acids in the renal secretion, in greatly increased desire for food and remarkable augmentation of the weight of the body. To use simpler language, to the great majority of men a change to sea-air is bracing and invigorating. It exercises, very probably owing to its increased moisture, and very possibly owing to the saline particles it contains, a favourable influence on most bronchial affections, and in diseases connected with defective nutrition, especially in early years. Sea-air must be one of the agencies which make sea-voyages so useful in chronic diarrhoea and dysentery.

Places on the sea-coast, whether in England or in France, have long been the favourite resorts of people with delicate chests, or of a strumous habit of body. And although many German writers do not advocate the air of sea-coasts in such cases, I believe that up to the present time nothing better can be recom-

mended in threatened phthisis, in bronchitis, some forms of disease of the kidneys, and of rheumatism, than such places; and, in case of natives of the North of Europe, they are sent with great advantage during winter to some of the many places in the South—most of them near the sea-coast, and chiefly that of the Mediterranean.

There is ample scope for selection among these places, and there is an absurd amount of fashion which often determines the popularity or otherwise of a new place; much petty refinement about shades of climate. A new station is spoken of like a new medicine. Unnaturally sharp lines of demarcation are drawn between the various forms of lung disease, and between the different climates suited to each. Pau and Arcachon, Hyères, Nice, Cannes, Mentone, and Ajaccio, one of the latest found, have each many points to recommend them; so also have Valentia, and especially Malaga—Malaga being not very far from one of the most frequented springs in Spain; Spezzia and Pisa in Italy, and Palermo in Sicily, if a patient cannot visit Egypt or Algiers, or the now rather neglected, because out of the way, island of Madeira. It is far more important than settling minute differences between allied climates, and pronouncing positively on imperfect data this air to be bracing, that relaxing (and patients are taught to expect stimulating or depressing effects), to select a place with such a winter climate that a patient can be

as many hours as possible in the open air, one which is tolerably cheerful, and in which he will not see too many sick faces ; above all, one in which comfortable lodgings and good food are to be found, for without them, and unless he will make up his mind to live as an invalid, a patient, if his case be at all advanced, had better remain at home. I have little doubt that such places with their sea-air, though some are not actually on the coast, are far better adapted for cases of phthisis and of bronchitis than inland places, such as Montreux at the east end of the Lake of Geneva, or Meran in the Tyrol, the last of which is the great winter resort of Germans, and still better than any baths with their inhaling apparatuses and other appliances, unless such places as Amélie les Bains, with a very mild winter climate.

But a sea-voyage presents the most complete opportunity of freely inhaling the sea-air ; and the immunity of sailors from chest complaints is remarkable. There is a considerable variety of opinion as to the amount of advantage to be derived from sea-voyages. I am inclined to believe, from personal observation, that young people from fourteen to twenty have often derived great benefit from long sea-voyages in warmer latitudes ; and that even at more advanced years, when patients have what are called delicate chests, and there is merely a suspicion that phthisis may set in, the disease has been frequently warded off by a voyage. If the disease

is at all advanced, a voyage may still, like most changes of place, help to prolong life. Sea-air is an important element in the sea-side cures of scrofula, but more will be said respecting that condition of system under the head of sea-baths. Almost the only contra-indication to sea-air appears to be in cutaneous, and in some bronchitic and asthmatic affections. It would be interesting to ascertain whether the common impression that sea-air is injurious in skin complaints is really well founded.

After what has been now said of the effects of mountain and of sea climates, no one can fail to remark that they have been recommended in the same classes of disease, in recovery from acute illness, in anæmia, in scrofula, and in consumption. There may be indeed some difference of opinion about the last; most authors have advised for it the level of the sea-side, others the aromatic air of the steppes of Russia; others think it wiser that patients should go to high ground, but not above 2,500 or 3,000 feet in Europe; while the latest view is that they should be at least 2,000 feet higher up. Still, in all these recommendations the same advantages are looked for from such very different conditions of atmospheric pressure and of temperature, that fresh study of the subject and a new analysis of the agencies in force are urgently required.

Before leaving the subject of mountain and sea air, I



may add that, in many cases where the reactive powers of the system are not much impaired, while gout is flying and not yet fixed, when only a short absence from home is possible, the mountain-air of our own islands (a visit to which often involves a sea-voyage also), aided by the active exercise which a sportsman must take, will often prove more efficacious than a hurried visit to a foreign spa—nay, I have heard of ladies suffering from simple debility, profiting more by the air of Braemar than by the iron of Schwalbach, although the elevation of the latter only falls 200 or 300 feet short of that of the former. I have known a German lady, a great traveller, reach Braemar and be so satisfied that she had at last found an air to suit her, that her family had difficulty in getting her to leave it.

I have thus imperfectly sketched the general operation of sea and of mountain air, without pretending to examine minutely the operation of hot and cold, dry or damp air, first on respiration, and second on the skin, and through them on the temperature of the body; but I cannot quit the subject of atmospheric air without alluding to two of its popular applications—hot air, of which we have a natural example at Testaccio in Ischia, and compressed air.

The first of these, *dry hot-air baths*, differ from vapour baths in not impeding the circulation as the latter do, by depositing moisture in the bronchial tubes.



The lungs, instead of having, as they usually have, to heat up the inspired air, are subjected to a temperature above their own. Hot-air baths favour perspiration in the greatest degree; while vapour baths, from the quantity of moisture already present in the air, retard it. In using the hot-air baths now so popular throughout Europe (and of which there are many modifications), the patient goes first into the *tepidarium*, which has a temperature of  $113^{\circ}$  to  $117^{\circ}$ , in which he remains naked, and at rest, until the perspiration, bursting forth, begins to form drops, or 25 to 40 minutes. He next proceeds to the hottest room, or *sudatorium*, of a temperature of, say,  $133^{\circ}$ , and remains there till the perspiration runs down the skin, or 12 to 18 minutes. A servant then, by means of a woollen glove, rubs off the perspiration, and next kneads all the muscles for 4 to 6 minutes. The patient next proceeds to the *lavacrum*, where he has water poured over him of the temperature of  $81^{\circ}$  to  $86^{\circ}$ ; next the whole body is soaped over, the suds rubbed off, and the patient betakes himself to the *frigidarium*, where he lays himself on a couch, still unclothed, and waits till his skin is completely dry; this last measure may last 25 or 30 minutes, when he dresses and leaves the bath greatly refreshed.

Under this head would come the hot-air baths so readily procured by means of a spirit lamp, although in this case, as indeed in the hot-air bath just

described, there is always a certain amount of vapour present. There is no readier way of inducing profuse perspiration when it is desired than by them, and in their use the stimulating effect of dry air on the lungs is avoided, as its operation is usually confined to the skin.

At this moment hot-air baths are in great vogue, and gladly resorted to by patients, when it is explained to them, that their maladies are caused by "Certaines humeurs qu'entre nous autre savants nous appellons humeurs peccantes." But they often cause exhaustion, and are not to be lightly prescribed to those who have reached middle age. Something more will be said afterwards of them.

*Compressed air.*—Many baths, such as Wiesbaden and Reichenhall in Germany, various establishments in France, and, I believe, some hydropathic ones, as at Malvern and Ilkeley in this country, have compressed air apparatuses. They resemble a huge diving-bell, with partitions in which the patients place themselves. The chief palpable feeling to the patient is a certain amount of ringing in the ears, and it seems to be ascertained that the frequency of the respiration and of the pulse is diminished considerably. It is certain that compressed air brings a larger quantity of oxygen to the lungs, but the question is not settled as to what comes of this oxygen; whether the surplus which does not find employment in respiration, combines directly with the tissues. Dr. Liebig of Reichenhall

has now been for some years engaged in investigating this question, and the amount of carbonic acid exhaled which is involved in it, and also the mechanical alterations it produces in the process of respiration : a fresh contribution of his on this subject may be shortly expected. Patients remain from one hour and a half to one hour and forty minutes in the apparatus, during one hour of which they are exposed to the constant pressure of one and a half atmosphere. The remaining time is occupied in raising and in lowering the pressure. In these experiments Dr. Liebig says he has frequently been for a considerable time under increased atmospheric pressure, and it was pleasant to be able to observe in his own person both the suppression of fresh catarrh of the air-tubes, and also the agreeable and quickening effect of the pressure on his general sensations. The pressure was increased to one and three-quarter atmosphere, and he found his sensations still pleasanter than under the usual pressure of one and a half atmosphere, but it is known that labourers can work without any inconvenience, except a noise in their ears, under the pressure of two atmospheres and more. The inhalation of compressed air seems to increase the vital capacity of the lungs by mechanically expanding them, and it will be a very interesting fact, if future observations shall confirm it, that the retardation of respiration is not merely temporary but lasts for some months. Meantime compressed-air baths are said to be useful in loss of

voice, in chronic bronchitis, and the results of pleuritic attacks, especially so in catarrhal deafness, and even in chlorosis and anæmia. What seems to be tolerably ascertained is, that they have been of considerable use in some cases of asthma; but in that affection what remedy has not failed, and what has not seemed to succeed? On the whole I do not think it likely that compressed air will be found to be a therapeutic agent of much importance.

## CHAPTER III.

### EXTERNAL USE OF WATER.

ALTHOUGH most mineral waters are valued more highly for purposes either of bathing or of drinking, yet there are few spas at which both drinking and bathing are not practised. The one is usually made to supplement the other. If the mineral water is not of much efficacy internally, some imported water from a different source is drunk, and, on the other hand, arrangements are made to supply the deficiency, if the waters are not considered efficacious in baths. We shall first consider baths; and as their primary action is exerted by the action of heat and cold, through the medium of water, on the cutaneous surfaces, we must first say a little of common water, and analyse its effects as it is applied either hot or cold.

The first use of bathing water is simply as a detergent to remove any impurities from the surface, keep the skin clean, and prevent the pores from being clogged by their own secretions or other impurities.

But a question of much importance in the solution of the theory of the operation of bathing is, does the

skin absorb water? This is the popular belief; and the story of shipwrecked sailors relieving their thirst by wrapping themselves in cloths dipped in sea-water, has become a standard one. Such a measure might, however, granting the facts, give relief to the feelings in various ways, without any actual imbibition of water; and the result of the most carefully conducted experiments of late years would seem to make it very doubtful, whether any water at all is absorbed by healthy cutaneous surfaces, even after continued immersion. Clemens, perhaps the latest authority on the subject, thinks that he has proved that a full-grown man, after a twenty minutes' bath at a temperature of  $88^{\circ}$  to  $101^{\circ}$ , takes up  $4\frac{1}{2}$  to 6 drachms of water, not much over half an ounce; and he thinks that most water is absorbed, when the temperature of the bath is from  $94^{\circ}$  to  $105^{\circ}$ .

But if no amount of water, that can be considered to have any effect on the current of the circulation, is absorbed, there is no doubt as to the powerful influence of water on the capillaries of the skin, and the mode and extent of that operation depend primarily on the temperature of the fluid; for the influence of the mechanical pressure of the water of a bath, which has been calculated at nearly one pound on every square inch of the surface, has never been determined. Baths must therefore be considered according as they are hot or cold. It would be impossible here to discuss the influence of heat and cold on the system—the ab-

straction of heat from the system, and the means which it employs to make up for its loss ; but it may be well to point out one or two general facts, that the human system bears changes of temperature of air much better than of temperature of water, and can adapt itself therefore to very various climates. But with water it is different ; while the temperature of the air at  $75^{\circ}$  is, perhaps, almost too warm for the feelings of many, a continued bath at that temperature is felt to be cold, and is depressing. On the other hand, a bath of  $98^{\circ}$  to  $102^{\circ}$  acts far more excitingly than air of the same temperature, both because, being a better conductor, it brings more heat to the body, and because it suppresses the cutaneous transpiration, which is greatly increased by air of the same temperature. It may also be mentioned here, that a temperature of  $88^{\circ}$  to  $95^{\circ}$  has been found to be the temperature of indifferent baths, such as can be borne longest by most men. We must now examine the effects of a cold bath on the system.

*Cold Baths.\**—The effects of a cold bath—the temperature not being below  $50^{\circ}$ —are shortly these : a diminution of the temperature of the skin, and of the subjacent tissues and blood ; a certain feeling of shock

\* I may remark in passing that Sir John Floyer contributed much by his writings to the revival of the cold bath in Europe, although he rode his hobby so hard as to attribute what was thought the recent appearance of rickets in England to the abandonment of the practice of total immersion in baptism. This was about the year 1700.

diffused over the whole surface, and, if the cold is intense and prolonged, inducing a certain amount of numbness of the skin. It becomes pale, and its capillaries contract. The action of a cold bath on the central organs is referable to the brain and spinal system, to the lungs and heart, as manifested by the tremor of the limbs it produces, along with a certain degree of oppression of the chest and gasping for air, while the pulse gets small and sinks. After a time reaction takes place, bringing redness to the skin and an increase of temperature.

The colder the water is, and the more powerful and depressing its effects, the quicker and the more active is the reaction. After reaction, the bath may be continued for some time, provided the water is not extremely cold; very cold baths (anything below  $50^{\circ}$ ) cannot be borne long, and must be concluded without waiting for reaction. If the bather remains quiet, and the water is not agitated, the portion of the water in contact with the skin has its temperature to a certain degree raised by the heat of the body, and the stimulus is less; but if it is agitated or changed, so that fresh cold water is applied to the surface, fresh stimulus and reaction follow.

The effects of cold water on the human frame have been studied since the days of Priessnitz with a degree of minute observation never before bestowed on them; and the principles of rational *hydropathy* are now so



well established, that they cannot be passed by without some notice of them, as they are explained by some of the best writers on the subject. They may be said simply to rest on the power of abstracting heat from the body, and of stimulating it by the application of cold water. The effect is depressing or exciting according as the withdrawal of heat or the stimulation predominates.

*First.*—Much depends on the form of the bath.

*a.* There is its depressing operation ; loss of animal heat, retardation of the circulation, and feeling of weariness when the same water remains in contact with the skin, and there is continued withdrawal of heat without fresh stimulation. Under this head come full baths, in which the patient remains quiet, partial and complete covering of the body with wet sheets left unchanged (in which last, owing to an external covering being usually applied, the loss of animal heat is less), frictions without removing the wet sheets, also local baths of a similar nature.

*b.* Its exciting operation ; quickening the action of the heart and lungs ; feeling of glow and of nervous excitement ; feeling of increased muscular power. These sensations occur when the layer of water next the skin and heated up by the body is removed, and fresh cold water causes fresh stimulus. Under this head come full baths with the water in motion, frictions when the wet sheet is removed from the body, douches, shower-

baths, bathing in rivers or in the sea, and local baths, in which the water is changed.

*Secondly.*—Much depends on the temperature of the water. The feeling of depression occurs much earlier in very cold water than in warmer, and, in the same way, the exciting operation comes on faster with the colder than with the warmer water; but water of the same temperature acts differently according to the form of the bath.

*Thirdly.*—The degree and mode of the operation of the bath depends much on its duration. The short duration of the bath makes both its depressing and its exciting action less; its longer duration increases them; but if the bath be continued too long, the continued abstraction of animal heat may prove very depressing.

Further modifications of hydropathic practice are to be found in the local application of cold, local douches, local wrapping up,\* and especially in the sitz baths. These effects are the greater, because the local abstraction of heat is more powerful than the general, and

\* Like many other modern remedies, the wet sheet has less novelty in it than most suppose. Musa, in the reign of Augustus, was one of the first professors of hydropathy. He had immense popularity until the young Marcellus died in his hands. Lucas, writing a hundred years ago, says: "I know a gentleman not far from eighty years of age. He sits or stands naked while his servant wraps him up in a sheet dipped in cold water, and he continues in this from twenty to thirty minutes every morning, winter or summer, and in return has uninterrupted health."

because the action of local can be kept up longer than that of general applications. Another important practice, though it cannot be in any way considered as being peculiar to hydropathy, is the production of copious sweating by packing in sheets surrounded by impervious covers, by hot air or vapour baths. In this way the animal heat becomes so raised that the shock of a cold bath can be borne.

The general effects of hydrotherapy may be thus summed up. The system is subjected to alternate periods of excitement and of rest. There is a powerful and immediate cooling down of the whole body and of its individual parts, especially of the skin, with persistent contraction of the capillary vessels and local anæmia. This is followed by its reverse, or by local hyperæmia. There is powerful excitement of the vascular and nervous systems.

The processes of absorption and of excretion are stimulated. The circulation of the blood, and the transformation of tissue, must be materially affected by the increased amount of perspiration and of water introduced into the system by drinking. In most cases there is a greatly quickened disintegration and renewal of tissue; and in some cases, by the application of the milder form of hydropathic practice, they may even be retarded.

In what has just been said, most has been attributed to the action of water on the surface of the body; in

Germany, at least, water-drinking is but a secondary part of the treatment, and, indeed, is not peculiar to hydropathy; nor has anything been said of the rashes and boils which follow the continued application of all waters to the skin, and which patients are pleased to watch for, under the old notion of their being critical.

We must next consider warm baths in contrast to cold ones. Their general effects may be gathered from the following account of their operation at various temperatures.

Warm baths are usually divided as follows, according to their temperature; different people are more or less easily affected, just as their sensibility to pain is various; but the average operation of baths is well known.

*Tepid*, 85° to 95°. The effects of a bath of this temperature are confined to the peripheral extremities of the nerves, and are so slight that they do not extend to the central nervous system, or to the circulation. Neither the pulse nor the secretions or excretions are affected. As no heat is taken from the system or confined in it, there is no reaction, and the animal temperature remains the same. These are the sort of baths that people can bear for hours with impunity.

*Warm bath*, from 96° to 104°. In this, the action of the heat on the peripheral surface is propagated to the central circulating and nervous systems, and causes a reaction, which manifests itself in a moderately in-

creased flow of the circulating fluids towards the surface, and in an increased frequency of pulse, without affecting the respiration. Its further operations are believed to be a slight excitement of the process of the renewal of tissue, and some operation on the mucous membrane of the respiratory and alimentary tracts without materially affecting the action of the kidneys or of the intestinal canal.

With a *Hot bath*, the temperature of which may be taken in different individuals at from  $102^{\circ}$  up to  $110^{\circ}$  or  $112^{\circ}$ , the central nervous and circulating systems are more affected. The frequency of the pulse increases greatly; \* the respiration becomes anxious, quickened, and interrupted by deep inspirations. The skin is in a hyperæmic condition, and the retained animal heat bursts out in a profuse perspiration.

*Very hot bath*; everything above  $110^{\circ}$  is very hot, and  $120^{\circ}$  is almost scalding. Such a bath can only be borne for a few minutes, and must be used with great care, owing to the violent stimulus which it communicates to the peripheral system. There is violent reflex action on the heart and on the whole arterial system, and the actions mentioned under the last head are all

\* The contrast between the depressing effect of a cold, and the exciting one of a hot bath on the pulse, is strikingly shown by the graphic delineations of the sphygmograph. The pulse produced by a hot bath is very similar to that produced by active exercise, such as rowing.

exaggerated; it is only to be used when a very powerful stimulus is required.

Of the above the tepid and the warm bath have an especially soothing effect on the system.

*Vapour Baths.*—A word or two must be said about a modification of the warm baths, in which water is presented in the form of *vapour*. In volcanic countries, as in Sicily, the Lipari Islands, and Ischia, natural vapour baths have long been in use. It is a familiar fact that a man can bear a much higher temperature of vapour than of water. The following often quoted table is a calculation of the comparative amount of power of communicating heat to the body, of water and of vapour, the last distinguished as breathed or not; a distinction of importance in various respects:—

	Water.	Vapour.	
		Breathed.	Not breathed.
Tepid Bath .	85°—92°	96°—106°	90°—100°
Warm „ .	92°—98°	106°—120°	100°—110°
Hot „ .	98°—106°	120°—160°	110°—130°

Vapour baths produce profuse perspiration and act in cleansing the skin much as hot-water baths. Vapour being a slow conductor of heat does not act so fast as water on the body. Vapour baths can be borne hotter than warm-water ones, but their use cannot be continued so long, as vapour being a bad conductor prevents

radiation from the body. These baths, favourites in ancient Rome, and known to us as Russian and as Turkish baths, have of late years, the latter especially, obtained immense popularity in many European cities.\* In the use of such baths the detergent action on the skin is aided by various mechanical processes, such as the application of lather and scraping. In the Russian bath a slight amount of stimulation of the surface is caused by beating with birchen twigs; but complete revulsion is produced after the beating process, by plunging into a cold bath, or, as in Russia, into the snow, or being subjected to a cold douche, after which the patient is made to lie down, and remain covered up for some time before he quits the bath. The great virtue of such baths is mainly in their sweat-producing properties, which they share in common with various hydropathic processes—than which, however, they are pleasanter to the sensations. In this country there is great risk of catching cold after vapour or hot-air baths. Quite recently I have seen a case of hæmaturia produced by it.

Vapour baths and douches may be used locally.

\* These baths were common in England three centuries ago. Their Eastern name is left behind them in the "Hummums" of Covent Garden. They were originally called hot-houses. The ladies of the day seem especially to have indulged in them; they were first places where they met for gossip; then came assignations; and they grew so disreputable under the name of "bagnios" that they fell into disuse. Hot air is now more used than vapour.



It is to be regretted that of the absolute effect of simple cold or warm baths on the secreting processes very little has been ascertained. Cold baths tend to check cutaneous transpiration, warm ones favour it.

It is supposed that cold baths, by the stimulus they give, increase the secretion of the gastric and other fluids of the stomach and alimentary canal; that warm baths rather serve to retard it. Either hot or cold baths, but especially the latter, serve to favour the secretion of urine; and experiments would seem to show that warm baths increase the secretion of urea. Whether warm or cold baths, like the breathing of hot or cold air, have any effect on the exhalation of carbonic acid, has not been determined by experiment.

This *résumé* of the effects of cold and hot baths ought to have prepared us for the comparison of their operation; in many respects the end obtained by the use of either is the same, although the process is reversed.

The warm bath causes swelling and congestion of the capillaries of the surface; then, when the stimulus of heat is withdrawn, their contraction ensues. A cold bath again first causes a contraction of the capillaries of the surface, which is followed by their expansion when reaction sets in. Both by bringing a supply of heat to the body, and by preventing radiation of heat from it, a warm bath increases its temperature; it can be borne longer than a cold bath, and, instead of favouring



internal congestions, it draws the blood to the surface. There is in either case increased oxidation or waste of tissues; but with the hot bath there is no great call made on the system to produce the oxidation, which is mainly dependent on the increased heat of the blood mechanically produced. A theory of why, if a man is much exhausted, he feels a hot bath refreshing, while he cannot bear a cold one, is this, that the increased heat conveyed to him helps the process of oxidation, and so relieves his system; cold refreshes by exciting the functions—heat by physically relieving them; a hot bath calms by reducing the natural amount of loss of heat, and by supplying an equable temperature.

Very hot baths, it is true, act as stimulants to the heart and nervous centres, but they do it more gradually and with less shock than cold ones; and in the main, as already said, they occasion a flow of blood to the surface, not to the deep-seated organs. Finally, every one is familiar with the fact, that warm water softens and cleans the skin more readily than cold; and sweating may be produced in the patient by rolling him up after a hot bath, just as in the hydropathic practice.

The general result of this comparison would show, that warm baths are a milder remedy than cold ones, and applicable often when there is not sufficient power of reaction in the system to make it expedient to use the latter.

As we shall have no occasion again to mention the effects of simple cold water bathing, this is a convenient place to say a few words about some of the applications of hydropathy. *Hydropathy* has suffered from its professors having too often undertaken to cure every disease by it, by their having practised it in opposition to regular medicine ; whereas, when intelligently used, it is as much ancillary to it, as any other bath treatment. Its importance is greater in England than in most European countries, owing to the almost total absence of thermal waters of any importance.

The cold water cure is more useful in functional nervous derangements than in any other—hence its undoubted value in hysteria, and in many of the complaints of women, when there is no organic disease. It is sometimes useful in hypochondriasis, but less certainly so. It is useful where there is excessive liability to catch cold, the result of increased nervous sensibility of the skin. It has been much lauded in rheumatism and in gout, but thermal waters are usually better suited for such cases, especially for the gouty condition. No doubt mainly by its sweating processes it is useful in lumbago, much less so in sciatica, that *opprobrium medicinæ* ; in paralytic affections, and in all loss of power depending on any organic lesion, it is very disappointing ; but it may be sometimes used with much advantage to remove the effects of sunstroke. It is not well suited for cases of enlargement of any of the

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abdominal viscera and chronic affections of the intestines, although I have known it exceptionally to be successful in chronic diarrhœa ; such cases can be treated better in other ways. In these days when, with Hebra at their head, sceptics have thrown doubts on the value of almost all our remedial agencies in skin diseases, the effect of continued immersion in water, and of simple water applications, is attracting attention. Lastly, there are a vast number of people with whom there is not much the matter, who still want change ; and for them, the change to the diet usually enjoined, to the social intercourse of a large boarding establishment, to plenty of exercise in a pleasant part of the country, procures advantages similar to those of foreign travel, or greater perhaps than those of a hurried visit to a foreign spa.

The contra-indications to this mode of treatment are a very lowered state of system—any general cachexy, organic disease, and especially of the pulmonary organs. If the power of reaction is not considerable, it should not be tried ; it suits better under the age of forty or forty-five than above it. The too prolonged use of this treatment, to which hydropathic professors so often press their patients, is to be avoided. The more intelligent hydropathists themselves admit that they have contributed an unusually large number of patients to lunatic asylums.

A few words must be said respecting modes of using baths. Something has been already said of the

water in a bath being in motion or not, and the effect this has on the temperature of the body, and the layer of water next it. It is a question whether one should remain motionless or not in a bath. On the whole, in a warm bath one feels more inclined to rest than to movement; indeed, it is often necessary to guard against falling asleep. In colder baths one is more inclined to move, although motion increases the action of the cold water. The duration of a bath varies from a quarter of an hour to one hour, or even longer; but the long immersions common formerly, and still practised in many parts of Switzerland, are not desirable. Old people bear protracted immersion in warm baths better than young ones.

When the water is projected with any force against the body, as in a wave of the sea, the mechanical effect of the blow causes a shock, or irritation and stimulation, which is often useful in nervous affections. In many baths, by the introduction of gas and by other contrivances, a sort of imitation wave-baths has been produced: very powerful remedies are cold affusion and dipping in waves, especially when the water is cold. The former is most practised after vapour baths, the latter in sea-bathing.

But *douches* have assumed such an important share in bath treatment, that a few more words must be devoted to them. Thickenings of joints, whether the result of rheumatism or of gout, are constantly treated with advantage by means of douches, which are, in fact, spouts

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of water of various sizes and temperatures, applied with more or less force, for a longer or shorter time, against the particular part. The operation of the douche consists in the stimulation of the skin and parts beneath it, leading to quickened circulation of the capillaries of the part, which favours the absorption of unhealthy deposits, wakes up the slumbering activity of the tissues, and helps to remove congestions from the more deeply-seated parts. The spot consequently to which the douche is applied must not be in a state of irritation or of inflammation. Care must be taken as to the part of the body to which it is applied in nervous and excitable people. The douche is not to be used continuously—it may be employed for two or three minutes, and then used again after a pause of some minutes; but in all this much depends on habit, and on the patient getting accustomed to it. The alternation of hot and cold douches, which has somehow got the name of the *Ecoſsaies*, is much practised in many baths, and is a very powerful remedy, from the strong local action and reaction which it causes; more local douches are used in the forms of injections, and may be often applied with advantage. Ascending douches may be used for the intestinal canal or the vagina; but they should be employed with care: as it is, they are apt to be resorted to much too freely, and they may prove injurious in uterine complaints. A variety of douche is that which is applied to the eye; it requires to be handled carefully.

The slow process of *drop baths* has been followed in some cases, when a single drop of water falls, from a height of about thirty feet, on the particular part every few seconds, while the patient sits in the bath ; the effect of cold or hot water in such a case being pretty much the same. It causes a considerable shock, and cannot be borne for more than a few minutes at a time.

Finally comes the *shower bath*, the one with which we are most familiar in England, the one most generally applicable for constitutional purposes, and one of very great value.

To all these modes, which have been barely enumerated, of acting on the capillary circulation of the cutaneous surfaces with water, must be added *dry rubbing*, which is far best practised by bath attendants, and the various forms of mulling and kneading the muscles, stretching the limbs and cracking the joints, which are borrowed from the East, and of which advantage may be taken at some of the continental or Turkish baths. This local treatment is no mean portion of the successful management of old thickenings of joints and sprains ; but it is only at some baths that they understand the practice of it thoroughly. The two Aixes, Teplitz, and Wildbad are probably among the best in this respect. The pleasant, luxurious mulling and kneading of a Turkish bath are not all that is required for thickened joints.

We have seen that, though we cannot compel healthy

skin to absorb water, unless in very small quantities indeed, we can undoubtedly make it excrete water, and something with it, or perspiration in more than the natural quantity. This process of *sudation*, or of causing increased cutaneous transpiration, is involved in so many bath proceedings that it requires to be alluded to.

Perspiration is commonly described as insensible or sensible, according as the water escapes unseen, or is observed in the form of moisture on the skin. The relation of its two forms to each other has been compared to that of clouds and rain.

There is considerable analogy between the functions of the kidneys and those of the skin, not only in giving off water from the system, but in excreting urea and common salt. The skin and the kidneys sympathise with each other. Increased cutaneous transpiration diminishes the secretions of the kidneys, and *vice versâ*. This is familiarly shown by the effects of change of temperature on the skin. In cold weather the kidneys do more work, in hot weather the skin. When those who have resided in tropical countries return to Europe, extra work is thrown on the kidneys, owing to the great diminution of the cutaneous transpiration in the colder country, and it takes some time, months or even years, before their organs get accustomed to the change.

The quantity of perspiration depends on the amount of water drunk, on the state of the air, on the amount of exercise taken, and also on the constitution of the



individual. Taking 30 ozs. of perspiration as the daily average,  $\frac{1}{3}$  of an ounce would be urea and other peculiar solids, while the amount of them contained in the urine is 2 to  $3\frac{1}{2}$  ozs. daily. In 100 parts of perspiration there are about 97.5 of water, 1 to 2.5 parts of solid matter, consisting of odoriferous matter, and of the secretion of the sebaceous follicles, urea, a little common salt, and some phosphates. About one-fourth of the solid matter is said to be urea; nearly 150 grains of that substance are, it is believed, excreted by the skin daily.

But a certain amount of respiration is also performed by the skin. While the quantity of water usually excreted by the skin is at least double that given off by the lungs,  $\frac{1}{30}$  to  $\frac{1}{66}$ , as much carbonic acid is given off by the skin as by the lungs, and a nearly equal amount of oxygen is absorbed; a minute quantity of nitrogen is also taken in by the skin.

It would thus appear that the skin eliminates water and effete matter, and aids in the respiratory process; and one use of perspiration is believed to be, to regulate the temperature of the body.

While the average loss to the system by perspiration is considered to be 30 or even 40 ozs. in the twenty-four hours, calculations have been made as to the loss in weight from violent sudation. It has been calculated that a man in a Russian bath loses about half an ounce every minute; and it has been found that a man has lost two pounds in



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forty minutes. The average loss by the use of a Russian bath may probably be set down at one-half to three pounds. In this way a considerable effect may be produced on the blood by the abstraction of a large amount of water, but it is made up for almost immediately from the fluids that we drink. Some have calculated the amount of fluid that may be lost by perspiration at a much higher rate.

It has long been a popular notion, both in and out of the profession, that specially noxious as well as effete matter is got rid of by the system through the perspiration; and of late years it has been said that in some diseases large quantities of uric acid are excreted by the skin. The proof of this, however, is very defective. Such exudations have very generally been found, on examination, to consist of desquamation of epidermic cells. Dr. Garrod, a great authority on the subject, has never been able to detect uric acid on healthy skin. It is too generally supposed that all perspirations in disease are necessarily intended to eliminate poisons from the system; but this cannot well be alike the case in the sweating of rheumatic fever, in a fit of ague, or in the hectic of phthisis. Perspiration is often the accompaniment of changes called crises, but not necessarily their cause or their effect. While, however, much on this subject is uncertain, and while no theory of their production is satisfactory, no one can doubt the prejudicial effects

of sudden checks to the cutaneous exhalation, even if the injurious consequences of suppressing the perspiration in animals had not been experimentally proved by applying varnish over their skins; and to restore the natural function of the skin, when it is believed to be suspended, has always been one of the admitted principles of therapeutics.

I believe that we are not generally aware that men who are engaged in mechanical labour, which induces copious perspiration, and thus washes off some of the secretions from the surface, stand less in need of baths than people of sedentary habits.

Before leaving the subject of the external applications of water, a few words may be added on the *injurious effects* of hot and cold baths when used injudiciously, although something has been already said of the indications and the contra-indications for their employment. The soporific effect, both of hot and lukewarm baths, must not be overlooked; this effect is very constant, and has frequently led to death by drowning in the bath. The effects of very hot baths are vomiting, swimming in the head, fainting, congestion of the brain, and, in some rare cases, apoplexy. In such cases, after death there is usually accumulation of blood in the right side of the heart, and the whole symptoms seem to point to paralysis of the heart's action. It is therefore at once evident how cautious people should be in the use of very hot baths who have weak hearts or

any obstruction to their circulation : fat men, and those who are full-blooded, and boys predisposed to epilepsy, as well as pregnant women, should avoid them.

It is interesting to find that the primary morbid appearance after death from extreme cold, is also to be found in accumulation of blood on the right side of the heart.

Though sleepiness is not likely to follow soon the shock of immersion in a very cold bath, still it is among the effects of exposure to great cold. The risk in cold baths is congestion of the internal organs, as is often indicated by the lips getting blue, and even in some cases by bleeding from the nose ; extremely cold baths are therefore very unsafe for all in whom a tendency to any internal congestion is suspected : they are not adapted for the old or for the very young, or for women at certain periods. They are always dangerous when the system is exhausted by fatigue. I have often known them bring back an ague.

## CHAPTER IV.

### INTERNAL USE OF WATER.

As all well cures imply the use of a larger than usual quantity of drinking-water, it is impossible to overlook the share which the water, apart from its mineral constituents, has on the system. The average quantity of fluid taken in by a healthy man, in various shapes, in the twenty-four hours, amounts to about four pints; some take less, some a good deal more.

The *important function of water* in the economy is apparent from such facts as these, that it supplies about three-fourths of the whole constituents of the body, and that nineteen-twentieths of the circulating fluids are water; from twelve to twenty-four pounds of water would seem to be poured out daily with the excretions into the intestinal canal, the greater part of which is re-absorbed from it. The secretion into the alimentary canal takes place from the arterial and from the venous blood; the re-absorption is effected by the lymphatics and the extremities of the vena portæ. The whole amount of water lost in the perspiration and in the urine, and through the lungs, from four

to five pounds, is not to be compared with the daily amount poured into the intestinal canal; none of the excretions contain less than 86 per cent. of water, and some of them more than 98. One part of the water is excreted through the skin and lungs, and is accompanied by various matters, but by no salts. Sweat, urine, and milk, again remove peculiar organic compounds, and especially a considerable quantity of inorganic salts along with water; while the third portion of water in the system forms the foundation of those secretions, the constituents of which are re-absorbed, altered or unaltered, such as saliva, bile, pancreatic and gastric juices.

The rate at which water, which has been just swallowed, is absorbed, varies according to the quantity drunk, and its temperature; for the more nearly it approaches the temperature of the blood, the more easily is it taken up. If the stomach is empty, absorption takes place very quickly; but if too large a quantity is drunk at once, its absorption is retarded. Water is taken up mainly by the stomach. The quantity absorbed by other portions of the intestinal canal is much smaller, and absorption in them takes place more slowly. The greatest portion of the water is taken up by the veins of the stomach, and is immediately conveyed to the vena portæ, the blood of which, under ordinary circumstances, contains more water than other venous blood. If too large a quantity of water is drunk, there

may be a feeling of oppression and of weight. Absorption may then take some time, and reach its maximum two or three hours after the fluid has been taken into the stomach, as its excretion through the kidneys appears to take place after about such a period. The freer the water is of saline constituents, the more readily is it absorbed. The quantity that has occasionally been drunk, not including what has occurred in cases of diabetes, is astonishingly great. For instance, about twenty-four pounds daily has been reached in some hydropathic establishments, and many extraordinary stories are told of the quantity of water that has been drunk at various wells.

The effect of swallowing these large quantities of water is somewhat uncertain; little of the water seems to pass through unabsorbed. These large draughts have occasionally caused constipation, but more often a tendency to diarrhoea.

It appears to be pretty certain, that the quantity of water in the blood varies with the quantity of water taken in or given out by the system, but the variation of this amount is small and imperfectly ascertained. The excretion of water usually begins very soon after it has been taken in, and continues for two to four hours. All water drunk does not pass through the kidneys. The proportion passed by them has been stated at as 10 to 11. The quantity of water excreted depends much on the state of the body, and what its wants

at the time may be. Water drinking makes the urine more abundant and relatively thinner. There is some difference of opinion as to whether it increases the excretion of urea or not. On the whole, however, it seems to be ascertained, that the more the water drunk, the more urea is excreted, and along with this there is a diminution in the quantity of uric acid. As to inorganic constituents of the urine, chloride of sodium, phosphoric and sulphuric acids appear to be increased, for a time, by drinking large quantities of water, and then to be diminished in amount.

The effect of water-drinking on the excretion of carbonic acid by the lungs has not been determined. It usually increases the insensible transpiration, but this depends a good deal on the external temperature. Much water-drinking very markedly increases perspiration, especially when it is aided by high temperature of the water or of the air, by the heat of bed, or by active exercise. According to Mosler's experiments, the excretion of solids through the kidneys was greater after drinking water gradually, than after drinking it rapidly. The interstitial change of tissue was favoured by high external temperature, and by exercise, and the use of equal quantities of warm was more effective than that of cold water.

To conclude this abstract of the physiological action of water, the water which circulates in the blood is the motive power of the nourishment of the secretions

and of the change of tissue in the part. The secretions which are poured into the intestinal canal, and which are destined to be again absorbed, are employed in the transformation, fluidification, and assimilation of articles of food. "The water," says Lehmann, "which is poured out with the bile must not be overlooked as a solvent for the soluble parts of the chyme; the blood of the veins of the liver is much poorer in water than that of the vena portæ. Water has to make a frequent circuit from the stomach into the vena portæ, from it through the liver and biliary passages, and back into the alimentary canal. It thus contributes to the gradual fluidification of the chyme, and the more so as this water, owing to the bile acids becoming insoluble, always loses again in the alimentary canal the substances which have been dissolved by the agency of the liver." The fact of the increased secretion of bile from water-drinking is probably connected with the absorption taking place mainly through the stomach and vena portæ, and we may in this way imagine how it may assist the abdominal circulation.

Again, too small a supply of water must react on the animal heat, on the absorption in the alimentary canal, and on the secretions, and act generally unfavourably on the digestion; while too much water-drinking produces a poorness of the blood in soluble salts, unless plenty of nourishment is taken. A certain degree of water cachexy may thus be induced by an immoderate



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use of water, and one of a more lasting character than the so-called well fever.

Coming now to the *therapeutic* effects of water, its first one is probably, in a great degree, mechanical. It expands the stomach and the intestines, the lymph and blood-vessels, the biliary passages, the bladder, and it may be conjectured that this expansion helps to relieve the congestion of the liver, or other viscera ; also that it may aid materially the passage of gall-stones ; in the same way, after free drinking of water, gravel may be more easily passed from the bladder. Water dilutes the contents of the alimentary canal, and is so far laxative. It dilutes them mechanically ; and it also serves to dilute the contents of the lymphatics and of the veins ; it facilitates the capillary circulation, and may thus be supposed to relieve the heart and congestions generally ; it also dilutes the bile and the urine. Further, by its solvent power, it materially assists digestion. It is quite possible that the solvent power of water may even extend to some unhealthy albuminous deposits. Water, by making the secretions more abundant, makes them bring more matter into circulation, and removes more decayed cells and effete matter : it thus quickens the change of tissue. As the appetite is generally improved, there is an inclination to take more food, and thus there is increased activity and a certain renewal of the system.

On such principles we can suppose that in some diseases,

as gout, and perhaps rheumatism, large quantities of water are useful in washing out lithic acid. Cadet de Vaux's cure of gout, founded on the effects he had seen produced by drinking the waters of Plombières, is well known. He directed forty-eight glasses, of 6 to 8 ozs. of water, of the temperature of  $50^{\circ}$  to  $60^{\circ}$ , to be taken successively, one glass every quarter of an hour. Water drinking has been especially in repute in chronic metallic poisoning; it is easy to see, as the liver is the great seat of most metallic poisoning of the system, how the free use of water may facilitate the elimination of metallic salts, by increasing the amount of the secretions, especially of the liver, and aid also by its action on the kidneys and skin. Its use in the elimination of mercury naturally led to its being also employed in syphilis, but it has not been employed in it with any particular advantage.

The operation of *hot and of cold water* is somewhat different. It seems probable, that the one has to be lowered, and the other to be raised to about blood heat before it is absorbed. Probably cooling down takes place more easily than heating up; but experience shows that overfilling the stomach with water, whether hot or cold, retards its absorption. Cold water acts first as a stimulant, then exhausts the irritability of the stomach, without, however, removing its causes. Warm water is a stimulant, though a less strong one, and also diminishes irritability, and reaction is less likely to ensue after it.

Cold water is extremely useful in atony of the stomach ; in its coldest form it deadens its irritability, as in the shape of ice in obstinate vomiting. In small quantities, it acts as a stimulant to digestion ; while if the quantity is considerable, it impedes that function. The swallowing of cold water to any considerable amount retards the circulation. It has been observed to bring down the pulse from eighty to sixty-two beats. A tumbler of cold water, the first thing in the morning, is an excellent stimulant of regular intestinal action.

Warm water, again, is very useful in painful affections of the stomach and of the lower portion of the abdomen ; it quickens the circulation, when that is wanted, or when perspiration or any bleeding has to be encouraged ; it is preferable to cold, when it is desirable to make the contents or the secretions of the alimentary canal more fluid, and possibly when there is a hope of producing the absorption of unorganized deposits.

Dr. G. Keith, of Edinburgh, has had much practical experience of the use of hot water, and has found it very useful in many gastric and so-called bilious attacks, also in catarrh of the stomach. In chronic cases he has found it most useful in exciting the action of the liver ; a tumbler night and morning he finds certainly more efficacious than most cholagogue medicines.

Griesinger, whose recent death medical science deplores, found small draughts of hot water useful in

bronchial and in laryngeal catarrhs; and it is quite an open question whether the benefit derived in such cases from weak alkaline and sulphur springs, does not result simply from the drinking of warm water.

Cold water is generally indicated when the temperature of the body is unnaturally high, and may be administered freely in most febrile complaints; cold, and for that matter, hot water has been, like almost every other substance of the *Materia Medica*, proclaimed a cure for intermittent fever.

If the powers are too low, and in anæmic conditions generally, it is not wise to administer cold water systematically, and it is a familiar fact that, when the system is exhausted by exercise, a warm drink is more refreshing than a cold one.

Certain constitutional effects produced by the use of water may be here conveniently noticed.

Until very recently, much importance was attached in all bath treatment to the production of a *certain febrile condition* and certain rashes or eruptions, which were looked on as proofs both of the system being saturated, and of the occurrence of a crisis. These effects appear to be produced as readily by common as by mineral waters. For convenience' sake I shall quote the effects of Buxton and of Gastein, both of them purer than ordinary drinking water. It has been said of Buxton, that its waters, though not drunk to a larger amount than  $4\frac{1}{2}$  pints daily, have sometimes affected

the head with a sort of inebriating giddiness and sense of fulness and drowsiness, on first drinking them. The following are some of the symptoms recorded at Gastein:—Painful feeling of drawing in the limbs, excitement of the pulse, sleeplessness, seeing sparks of light before the eyes, alternate shivering and heat, or something like an ague fit—one or two hours' feeling of cold, followed by heat and sweating. This condition is often associated with pretty sharp diarrhoea and rashes, called *Bad friesel* or *la poussée*. But much disturbance of the system is in no way necessary to cure. Braun has written so sensibly on the subject, that I transcribe his remarks :

“From misuse as to quantity and temperature of the water drunk (and he might have added from too long continued and generally from too hot baths), there often arise various shades of discomfort, which vary in different individuals, and have most inconsistently been called well fever. But just as there is no nymph of the well, so is there no fever of it ; and what is understood by that term, are conditions induced by over-doing the process of cure, often connected with diet and change of mode of life, but attended by no certain and constant symptoms. The flooding the stomach with water very easily excites dyspepsia and gastric catarrh ; and the peculiarities of mineral waters, such as their heat or coldness, the presence of various salts and gases, combine to modify this influence. The digestion fails,

nutrition is impeded, the skin is attacked by different eruptions, especially by small boils, and sometimes the symptoms of the original disease become aggravated in sympathy. The violent sweat-producing processes, whether hydropathic or otherwise, are particularly apt to bring out rashes."

These feverish symptoms and eruptions, though often considered by the patient to be highly desirable, are by no means to be wished for. They interrupt the course of cure for a time. The treatment may have to be stopped for a day or two, but it is soon possible to go back again to the well, drinking it in smaller quantities, or to the baths, probably using them of a lower temperature, and staying in them for a shorter time.

It is presumed that water will not be drunk to excess by patients under regular treatment; but there is no doubt, that inordinate drinking of it may *prove positively injurious*. Large quantities of common hot water and of mineral ones have at times caused convulsions, delirium, stupor, and death. But much more frequent and familiar to all, are the dangers of drinking large quantities of cold water, especially when the body is exhausted by previous exercise. Instances of sudden death from this are known to most people. When the death is instant, there is often sudden pain in the head, fainting, and apoplexy. The familiar instance of pain in the forehead experienced by some people, immediately

on swallowing ice, has some points of analogy with these sudden seizures. Or there may be difficulty and spasm of breathing and hæmoptysis preceding the fatal result. When death is not so sudden, there may be violent pain in the stomach, vomiting, or purging; or peritonitis or pleuritis may occur.

With reference to some of the general results of water-drinking, the observation of Bernard Gordon, a professor at Montpellier, made some centuries ago, may be worth quoting: "He who drinks too much cold water will not escape disturbance of the mental functions and premature old age." What will our modern water-drinkers say to this?



## CHAPTER V.

### OF MINERAL WATERS GENERALLY.

HITHERTO we have talked of water as if it were chemically pure, but even the best drinking water contains a certain minute quantity of mineral salts, or of organic impurities. Indeed, water not perfectly pure is pleasanter to the taste than distilled water, and it always tastes mawkish, in the absence of some atmospheric air, and of some slight amount of salts.

There are some wells which supply a water too much impregnated with mineral matters, to make it fit for common use, but which is still found to be useful in the treatment of disease. There are also springs, the heat of which exceeds the average temperature of other wells in the same place. Such waters are called mineral ones; and these definitions, though open to objections, will answer for practical purposes. It is generally considered, that waters with more than five grains in the pint of solid matter, should be counted mineral, but no such proportion can be arbitrarily fixed, for there are good drinking waters that contain nearly as much, and some of the indifferent mineral waters that contain much less.



The number of elementary substances, that have been found either free, or usually in combination in mineral sources, is very large, as appears from the following list. The most minute portions of these substances are now detected by spectral analysis :—

Oxygen and ozone, nitrogen, chlorine, hydrogen, carburetted hydrogen, carbonic acid, ammonia ; hydro-sulphuric, hydrochloric, sulphuric, sulphurous, nitric, nitrous, phosphoric, antimoniac, silicic, and boracic acids ; calcium, sodium, potassium, bromine, iodine, arsenic, sulphur, lithium, rubidium, caesium, barium, strontium, magnesium, aluminium, manganese, fluorine, iron, copper, lead, zinc.

The *Materia Medica* list of the constituents of mineral waters is thus very long, and it would be no easy task to appreciate the influence of each of these substances, if it were necessary to do so ; but although bath doctors have with pride boasted of the number of substances entering into the composition of their waters, and have held this out as a recommendation, the active principles of mineral waters are comparatively few ; they exist in very varying quantities, sometimes scantily, sometimes abundantly, while the other constituents are commonly found in mere traces ; and it is very doubtful whether such minute quantities modify the action of the waters—if they do, it is in a way quite beyond our ken.

The really important constituents are, carbonate and

sulphate of soda, chloride of sodium, carbonate and sulphate of magnesia, carbonate of lime and carbonate of iron and their sulphates, bromine and iodine, carbonic acid, hydro-sulphuric acid and nitrogen.

It may be borne in mind, that we cannot be said to know very accurately, the real chemical constitution of any but the simpler mineral waters. The chemist finds by his analysis bases and acids, but he cannot tell us with absolute certainty, how they are combined. In fact, the chemical composition assigned by the analyst to a particular water, often depends on his theoretical views on chemistry. Although some slight differences of composition have been detected in springs at different seasons of the year, yet it is extraordinary how long their character has remained unchanged; in many instances, certainly since the commencement of the Christian era.

But besides having mineral constituents, many waters, especially thermal ones, deposit large quantities of a glairy substance, which has received the names of baregine, glairine, and of zoogene. This substance, though of no importance in medicine, unless perhaps when being present in large quantities it gives softness to the water, is essentially organic, and is interesting to us at this time, when protoplasm, to which it bears some analogy, is the subject of so much discussion.

Baregine, to the naked eye, is a jelly-like substance, in which some filaments are apparent. On micro-

scopic examination it has been resolved into two parts, one amorphous and unorganized, usually colourless, and when calcined giving an odour of ammonia, and leaving a little ash of silica. The other is found to be made up of low organic forms, differing in different wells; the diatomaceæ being abundant in some, in others confervaceæ, forms resembling oscillatoriaceæ, nostochineæ, also anabænas, some of these oscillatoriæ forming very beautiful and regular net-like figures on stones which they envelope. Some writers are of opinion that the first or jelly-like substance, out of which these oscillatoriæ grow, may be resolved into agglomerations of hydrocrocis and leptothrix. However this may be, the production of this glairy substance in mineral waters is a very curious phenomenon, not satisfactorily explained. It is believed that it is formed at great depths, and that it is only after it has been exposed to the air, that those low forms of vegetation appear. They seem to bear a certain proportion to the temperature of the springs, and in some cases to the amount of sulphur present. But this interesting subject, as it has no bearing on the curative effects of water, cannot be pursued further here.

The mineral waters that first arrested the attention of men, and which in early times were usually dedicated to various divinities, and in more modern ones to different saints, were those which differed most palpably from ordinary water, and those were warm

or thermal springs, and sulphur ones. The heat in one case, and the smell in the other, attracted notice. Mineral waters occur in almost every portion of the world, but we are mainly concerned with those of Europe.

It is of thermal and other springs in Italy and Greece that we have the earliest accounts. Herodotus, for instance, notices the fountains of the Tearos in Thrace; some were hot and some cold, and they cured skin complaints of men and of animals. Some of the waters of Ischia are probably as hot as those of Kamschatka and of Bishisht in India, probably the hottest in the world, reaching nearly to  $212^{\circ}$ . Thermal springs are almost absent from Great Britain and Ireland, Denmark and Belgium; tolerably abundant in Germany and Switzerland, much more so in France, Spain, Portugal, and in Italy. Thermal springs vary much in the quantity of water they supply; probably of entirely natural sources, the Sprudel at Carlsbad and the well at Dax in the Landes yield the greatest supply. That of the latter was calculated at a ton and a half of water per minute. Thermal springs occur at every height from the level of the sea, or nearly so, in Ischia and Iceland, up to 12,000 feet in the Cordilleras, and 16,000 feet (from beneath a glacier) in the Himalayas.

The number of sulphur wells in all parts of the world is great; the largest group in Europe, by far, is the Pyrenean one, especially if we include those

on the Spanish as well as on the French side of the chain; and if we were to include every spring which gives forth a slight odour of sulphuretted hydrogen, the number might be indefinitely increased.

The other kinds of mineral water which were early noticed for their sparkling bubbles, their yellow deposits,\* their salt or bitter taste, need not be dilated on here.

Springs of mineral water arise under all circumstances, in open plains and in broken country, but undoubtedly they prefer the latter. They, and particularly thermal springs, seem to be most common in volcanic districts,

\* It is not for want of steady efforts to bring such waters into notice that the use of many feeble springs has been abandoned. Dr. Monro, in 1770, enumerates in London and its immediate vicinity, Dulwich, Streatham, "Dog and Duck" in Lambeth, Sydenham, Bagnigge, Acton, Epsom, Kennington, Richmond, Shadwell, Hampstead, Islington, Pancras; and there were also Beulah Spa and Kilburn. Who hears of these wells now? Dr. Ruty also, in the last century, introduced to notice nearly sixty springs in Ireland, now all but forgotten. In Scotland, too, many springs were recommended, but after a time abandoned. I may instance the Gilcomston Spa, in Aberdeen. As long ago as 1580, a broadside was printed on "the Well of Woomanhill, beside Aberdeen." In 1615 appeared "Calirrhöe. The Nymph of Aberdeen resuscitat by William Barclay, Master of Arts and Doctor of Physick; what diseases may be cured by drinking of the well of Aberdene, and what is the true use thereof." Later came professors fresh from Leyden, and knowing something about foreign spas. They made great attempts to bring it into favour, but failed. By the year 1770, a chalybeate in that district, at Peterhead, had become a place of resort.

at points of great displacement of strata, or at the junction of stratified and unstratified, or of sedimentary and crystallized rocks; a great many of them occur in narrow, picturesque valleys, such as Plombières, Ems, and Carlsbad, and this picturesqueness adds materially to the popularity and to the absolute utility of the springs. This in the main, although there are also disadvantages connected with such situations.

Mineral waters may be grouped in a variety of ways, for instance, according to the district in which they occur; and in this way the Pyrenean, the Auvergne, the Nassau, and the Bohemian ones, would each form natural groups.

It has again been attempted to connect them with geological formations, and the waters of the Pyrenees have been subdivided on this principle, and they have been classified as they occur in formations of different ages. Thus springs of one character were supposed to occur in primary rocks, of another in tertiary, and of a third in the neighbourhood of extinct or of active volcanoes. Even if such a classification could be carried out, it would be of no use to us, as theoretical notions regarding the origin of a well can never have any bearing on its practical use.

A much more practical division is into cold, and hot or thermal; and thermal springs may be considered to be those, the temperature of which is higher than the mean temperature of the place where they rise. Of

the conditions influencing thermality little is known. In a general way it is believed to be connected with chemical action going on in the rocks which the springs have to traverse, and on the depth from which the springs arise, as the fact of the central heat of the earth might lead us to suppose. The distinction between hot and cold waters corresponds very closely with that of water used for baths, and of waters used for drinking; but many mineral waters are used for both purposes, so this division would not be always applicable.

It has been most commonly proposed to class waters according to their chemical composition; and on the whole this division is the most valuable one, as affording some clue to their therapeutic action; but nothing like a chemical classification has yet been found, that is not open to many objections. The extremely complicated composition of many springs stands in the way of satisfactory classification.

But as such classifications are an important aid to the knowledge of their properties, and also supply general views of their comparative constitution, I give two of the more popular French ones:—

Sulphur Waters . . .	{	Sulphuret of Soda.
	{	Sulphuret of Lime.
Common Salt Waters	{	Chloride of Soda.
	{	Chloride of Soda bicarbonated.
	{	Chloride of Soda sulphuretted.
Bicarbonated Waters.	{	Carbonate of Soda.
	{	Carbonate of Lime.
	{	Mixed Carbonates.



Sulphated Waters . .	}	Sulphate of Soda.
		Sulphate of Magnesia.
		Sulphate of Lime.
		Mixed Sulphates.
Iron Waters . . . .	}	Bicarbonate of Iron.
		Sulphate of Iron with Manganese.

Or—

Class.	Genus.	Species.	
Carbonated .	}	Soda base.	
		Earthy base . .	{ Ferruginous. Non-ferruginous.
Sulphuretted and Sulphated.	}	Soda base . .	{ True Sulphur. Degenerated Sulphur.
		Lime base . .	{ Simple Sulphates. Mixed Sulphates and Sulphurets.
		Magnesia base .	Sulphated.
		Iron base . .	Sulphated.
Chlorides . .	All a Soda base	{ Simple, with Iodine.	

The next is a German classification :—

- |                             |   |                            |
|-----------------------------|---|----------------------------|
| I. Alkaline . . . . .       | } | 1. Simple Carbonated.      |
|                             |   | 2. Alkaline.               |
|                             |   | 3. Alkali and common Salt. |
| II. Glauber Salt.           |   |                            |
| III. Iron . . . . .         | } | 1. Pure.                   |
|                             |   | 2. Alkaline and Saline.    |
|                             |   | 3. Earthy and Saline.      |
| IV. Common Salt . . . .     | } | 1. Simple.                 |
|                             |   | 2. Concentrated.           |
|                             |   | 3. With Bromine or Iodine. |
| V. Epsom Salt.              |   |                            |
| VI. Sulphur.                |   |                            |
| VII. Earthy and Calcareous. |   |                            |
| VIII. Indifferent.          |   |                            |



There are many points in favour of a mixed physiological and therapeutic classification, although an idea once thrown out, that the constituents of mineral waters might be discovered by watching their effects on the system, carries this notion too far. Thus the digestive and urinary organs are specially affected by alkaline waters ; the liver and the alimentary canal by saline ones. The skin and, according to continental authors, the mucous respiratory membrane are much influenced by sulphur waters, while a special action on the blood has always been attributed to ferruginous sources.

Still more generally they have been divided according as their action is stimulant or depressing. But the same waters may act in either way, according to the mode in which they are employed.

I do not think that the simple empirical use of the waters has produced results that would justify us in classifying waters according to the diseases they cure, or their apparent general effects on the system. Besides, it is found that the same source cures the most different diseases ; and that similar diseases are often cured by very different waters.

The classification here adopted, mainly borrowed from Braun, will be a general practical one, founded, 1st. On whether the water is used chiefly for bathing or drinking ; 2d. On its predominating chemical constituents, with little reference to its less important ones.

In Germany the great majority of the watering-places

are public, while in France the great majority are private property; but in all cases their general control and management are undertaken either by the State or by some governing bodies, which appoint both physicians and bath inspectors, sometimes with and sometimes without a salary. At most baths, if you stay more than a few days, you are called on to pay a small tax for keeping up the establishment or its band. In Spain you cannot drink the waters at all, without making a small payment first to the doctor of the bath.

The arrangements for drinking mineral waters are different at the various wells and mineral stations. In some cases the wells are open and surrounded by light railings; in others they are covered in by pavilions or miniature temples. In some places, where the supply is not very abundant, and the demand is great, the drinkers have to pass in between railings, such as are used at the entrance of theatres.

The pleasantest arrangement is, when the water is served out fresh, as it issues from the open well at Homburg, by active, good-natured girls; another common one is, that a rod, with an arrangement for holding half a dozen glasses at its end, is dipped down into the well; and the least pleasant or natural way is when it is pumped up by a special apparatus. It is now usual, and the most convenient arrangement, not to bring your own glass, but to take one supplied to you; it is often necessary to pour the water backwards and forwards

between two glasses to cool it, and still more to get rid of any great excess of carbonic acid. This is an operation which is very neatly performed by the nymphs of the fountains. The glass usually contains from about 5 to 8 ozs., but there is no uniformity in this respect among the different spas. This is very unfortunate, for in appreciating the therapeutic value of waters, an exact knowledge of the quantity of a water drunk is very important. At many wells the ladies make a point of drinking the waters through a glass tube, to prevent the waters injuring their teeth. There is really no risk of this, but there can be no harm in using the tube, especially if the spring is very cold. In some instances, when patients suffer from laryngeal or bronchial affections, they are directed to drink their water diluted with milk or whey, or gum water.

The bathing arrangements are usually under the superintendence of a local inspector, from whom tickets for baths are procured. You get a set of baths cheaper than single ones. There are first and second, and often third class baths; in various places too, indeed in most, as in Wildbad, there are baths for the poor.

Austria and other German States have baths for their soldiers; France no fewer than ten of them: counting six in France, one in Corsica, two in Algiers, and one in the Island of Bourbon. And here the question naturally suggests itself, whether England might not do something in this way either at home or abroad. There is no

question that Bath is quite as efficacious as most of the foreign calcareous thermal baths. In India, Government has been very active in selecting sanitary stations in the mountains, and it encouraged an investigation of the mineral waters of India, which I had the honour to suggest in 1853. But the inquiry had little result, mainly because Indian, like English practitioners, take slight interest in the subject. It can scarcely be said, in spite of one or two creditable exceptions, that any serious attempt has been made to utilize the waters of India, though they are much employed by the natives.

Some of the buildings set apart for bathing in the older spas are, as at Plombières, of great antiquity; although I believe that at no station, unless at Wiesbaden, are any actual Roman remains now employed. As a general rule, new baths, like new hotels, are pleasanter than old ones. Some of the most modern and complete establishments I have seen, have been at Plombières, Aix-la-Chapelle, Wildbad, Aix, Vichy, and the new bath at Carlsbad; but fresh excellent buildings are springing up everywhere.

Baths may be divided into single and common ones; the first are far the most convenient and most employed: they are ranged in cabinets usually opening off each side of a long corridor or passage; they are commonly metallic tubs, in some instances wooden ones, into which you step, or they are depressions in the floor of the

bath-room, lined with flags, marble, or porcelain, according to the class of the bath, into which you descend.

These single baths are greatly to be preferred to the common baths, or piscinæ of every size, which are to be found at most spas. In them it is necessary to wear a light shirt, and they are often crowded. There is a prejudice against them on the score of possibly catching contagious diseases in them,\* but care is taken to exclude those suffering from such affections; and, as a matter of fact, I believe that there is no case on record of any one having ever been so affected. The convenience of, or rather the necessity for the piscinæ, is in stations, as Barèges, where the supply of water is scanty; but if they are used at all, there should be a sufficient flow of fresh water through them.

Up to a very late period, common baths for men and women were usual; but this most undesirable practice of the two sexes bathing together, has been pretty nearly abandoned. It is still kept up at Leuk, where one of the sights for visitors is, to see men and women sit in water for hours, with drinks and card tables floated to them on trays, and, I believe, the practice is still followed at Baden in Switzerland, and Baden near Vienna, and at Ofen on the Danube. The nearest parallel to this may be found in Japan, where men and women bathe promiscuously without any coverings.

\* In old days, persons coming from infected places to Plombières were liable to capital punishment.

There are many varieties of baths, such as full, half, and sitz baths, foot, and other partial ones; others, in which a kind of attempt at imitating the waves of the sea is made: all ordered according to circumstances by the doctor in charge, who will also give directions, as to whether the patient is to remain quiet in his bath, or splash about, or whether it is desirable that he should exercise himself in swimming, in which case one of the larger baths, such as those in Aix in Savoy, must of course be used, also how long he is to remain in his bath.

Then there are, in different establishments, various forms of drop and of shower baths; the former chiefly used for enlargements of joints. At some places they have a complicated revolving case of perforated tubing, through which a sort of circular shower is projected against every portion of the surface of the body. There are douches which vary according to the force with which the water is propelled, the size of the bore of the muzzle of the pipe, and the temperature of the water.

In many bath establishments there are chambers for the inhalation of the vapour of the waters or their gases; there are also gas baths, and gas douches.

## BOOK II.

### B A T H I N G.

#### CHAPTER I.

##### INDIFFERENT AND EARTHY BATHS.

WE have hitherto considered the effects of bathing in simple water of various degrees of temperature, and from what has been said it will be apparent, that in all bathing cures, the gréatest share in the production of the beneficial result is to be attributed simply to the judicious application of water. And this is the most rational way of accounting for the immense popularity, for centuries, of many of the indifferent springs, in which chemistry has never detected anything, that one could reasonably suppose to act on the system. We have seen, however, that there are also more powerful mineral springs, variously impregnated with a variety of gases and salts. Some of the chief gases are, carbonic acid, hydrosulphuric acid, oxygen, nitrogen ; salts, as chloride of soda, carbonate of soda, carbonate and sulphate of magnesia ;



in smaller quantities, iron, iodine, and bromine ; in still smaller, such substances as barium, cæsium, arsenic, lithium, strontium, and rubidium.

Have any of these substances a distinct action on the system through the process of absorption by the skin? It had long been taken for granted that such substances were absorbed. After immersion in the soda baths of Vichy, the urine was found to be alkaline ; where could you have a clearer proof of the absorption of alkalies? but, unfortunately for this conclusion, it was found that baths with scarcely any mineral constituents, or with salts that were not alkaline, also produced this effect.

The general result of experiments appears to show that the skin readily absorbs the gases of fluids, their mineral constituents very slowly, if at all ; but at the same time there is no doubt, that the stronger mineral waters produce a positively stimulant effect on the skin, beyond the action of the mere water.

Clemens has arrived at the following results :—1. That a few gaseous substances, such as hydrosulphuric acid, readily penetrate the skin. 2. Other substances penetrate slowly, but they take so much time, that their doing so can really be of little importance in balneology ; such as iodine and water. 3. Others can only penetrate the epidermis, and work solely by their stimulant effect on the surface nerves, such as common salt, chloride of lime, salts of lithia, corrosive sublimate, salts of lead.



4. Some substances only penetrate the epidermis in the most minute quantities, such as sulphate of iron, iodide of potash, sulphate of soda.

The first class of baths is that of *indifferent* waters, which contain very small amounts of mineral constituents, and along with these may be counted the *earthy* ones ; for their lime salts, chiefly gypsum, are the least of all likely to be absorbed, or to act much on the surface. This class of waters acts mainly like simple warm baths on the skin. Their first effect, at temperatures of about  $90^{\circ}$  to  $96^{\circ}$ , is to excite gently the peripheral nerves, to make the circulation more active, render the respiration freer, and produce a desire to make water, which effects are followed by increased frequency of the pulse, increased cutaneous transpiration, and augmentation of the urinary secretion. They regulate the action of the skin and that of the kidneys, and seem to have a power of dispersing exudations. They improve the appetite, and they make the ingestion of more nourishment possible. A great many patients find the effects of even the least mineralised waters to be exciting.

The great majority of indifferent wells are thermal. Indeed, where there is no smell of hydrosulphuric acid, they would never have attracted attention but for their higher temperature.

As a great many of the more important indifferent thermal springs, which used to be called wild baths,

*Aquæ Ferinæ*, or *Thermæ Silvestres*, rise at a very considerable altitude above the sea-level, and many of them owe at least an important share of their curative effects to a more or less Alpine climate, the following list of some of them may be interesting. The heights given may not in every case be absolutely accurate; the measurements in feet of different countries have been mixed up together, but the general average result is what is of importance to us. The temperatures given are the natural ones of the springs, not of the baths as they are employed.

## INDIFFERENT THERMAL WATERS.

1. *With scarcely any Mineral Constituents.*

	Height.	Temperature.
Panticosa . . . . .	5,800 . . . . .	85° — 95°
Gastein . . . . .	3,315 . . . . .	95 — 118
Pfeffers . . . . .	2,115 . . . . .	98 — 100
Bagnères de Bigorres . . . . .	1,850 . . . . .	91'4
Badenweiler . . . . .	1,425 . . . . .	69 — 81'5
Wildbad . . . . .	1,323 . . . . .	110
Plombières . . . . .	1,310 . . . . .	86, — 156
Warmbrunn . . . . .	1,100 . . . . .	95 — 105
Liebenzell . . . . .	100 . . . . .	71'5— 77
Schlangenbad . . . . .	900 . . . . .	80 — 87
Buxton . . . . .	900 . . . . .	82
Römerbad . . . . .	750 . . . . .	94 — 98
Teplitz . . . . .	658 . . . . .	95 — 120

2. *Earthy.*

Bormio . . . . .	4,400 . . . . .	86 — 104
Leuk . . . . .	4,400 . . . . .	93 — 123
Courmayeur . . . . .	3,800 . . . . .	62 — 95
Chianciano . . . . .	1,800 . . . . .	100

3. *Sulphur.*

	Height.	Temperature.
Escaldas . . . . .	4,380 . . . . .	108°—114°
Barèges . . . . .	4,100 . . . . .	87—113
Cauterets . . . . .	3,254 . . . . .	71—134
St. Sauveur . . . . .	2,525 . . . . .	70—109
Eaux-Bonnes . . . . .	2,400 . . . . .	55—89
Ax . . . . .	2,300 . . . . .	80—170
Bagnères de Luchon . . . . .	2,000 . . . . .	102—134
La Porretta . . . . .	1,100 . . . . .	100
Baden, S. . . . .	1,100 . . . . .	122
Schintznach . . . . .	1,060 . . . . .	96
Aix, S. . . . .	790 . . . . .	112—114

Indifferent baths, especially the milder ones, are often found useful in calming the nervous system; the continued use of lukewarm baths is found to have a beneficial effect in over-excitability of the nervous system, and in tendency to spasms in hysterical women, also in painful menstruation, and a large class of nervous cases, where there is over-excitability of the spinal system.

They find a further application, when hyperæsthesia manifests itself in the form of neuralgia, especially in those forms which have a gouty or rheumatic foundation, and in those which are the consequence of former injuries, and of exudations consequent on them, or of inflammation of the nervous sheaths. The prognosis is less favourable, when there has been any wasting of the part, or there is incipient paralysis of it. Some of the neuralgias that receive most benefit, are face, brachial,

intercostal ones, local affections of portions of skin, particularly the result of exposure to cold, and sometimes neuralgia of the breasts. True tic again is very seldom cured, and sciatica usually resists all thermal treatment.

Loss of power in its various degrees is treated often with much success, by the use of the warmer baths, which probably operate by reflex action on the motor nerves; but if electro-muscular contractility is found to be quite gone, little can be expected from them. It is therefore always wise to ascertain beforehand, experimentally, by electricity, the real state of the muscular contractility, and it may be remarked, that electricity, used in connexion with baths, assists their efficacy much; practical men seem to think that the use of electricity, before and after a course of bathing, is of more use than when both agents are used simultaneously.

The cases which gain most from thermal treatment, are those in which the exciting cause of the paralysis is removed, while the loss of power continues; such are partial paralysis after diphtheria, and some effects of typhus; also loss of power of the lower extremities, the consequence of bad confinements, and paralysis from lead-poisoning; in such cases, in many of which recovery would, in the natural course of things, ensue in time, recovery is often greatly accelerated by the exciting action of the hot waters. The results of shocks or blows, or of violent impressions on the

nervous system, are often removed; but where any mechanical cause exists for the paralysis, benefit cannot be expected. In all these cases, the judicious application of douches has much to say to the cure. Care must always be taken never to use water hot enough to produce blistering in paralysed limbs.

In certain cases of more serious paralysis—the results of apoplexy, or of the effusion of blood in the brain—thermal treatment may be of considerable advantage, especially if the cases are not treated too soon after the apoplectic attack; but much caution is always required in such cases, and the state of the heart and blood-vessels must be carefully ascertained.

In cases of hemiplegia, in which the brain has undergone structural alterations, and in paralysis agitans, or progressive muscular atrophy, little is to be expected.

In paralysis of spinal origin a good deal may be hoped for, if there be any rheumatism present, especially if the case is not too old, and if the power of the sphincters has not been lost. In true *tabes dorsalis* no benefit is obtained, and it is miserable to see such cases dragged from one spa to another, in the vain hope of cure.

Gout is not cured by any waters, but is often alleviated by them; the earlier gouty patients resort to them, the more likely are they to derive benefit from them. But it is especially in the results of gouty deposits in the joints and synovial membranes, and the skin and

surrounding cellular tissue ending in stiffness, that the steady application of these waters is most useful, and in such cases there often takes place such an amount of absorption of previous exudations, that one or two seasons at a bath may give relief for a series of years. It is the cases of gout in weak and flabby and older patients, that are most suitable for these cures.

Chronic rheumatism profits much by thermal treatment, whether it has all along had a chronic character, or is the result of an acute attack, especially when there is much thickening of the joints or old muscular rheumatism. Of course it is very necessary to be sure that you do not treat by the hotter baths, cases complicated with heart disease. Simple effusion into the joints, pseudo-anchylosis, adhesions of the sinews to joints, exudatory bands in the cellular tissue round joints, often find resolution, if the limb has not been too long kept in one position; but no cases where absolute destruction or absorption of surfaces has taken place, can expect benefit, and scrofulous cases generally derive no advantage.

Thermal waters are useful in cases of old ulcers and wounds, and in metallic poisoning; but these affections will be noticed under the head of sulphurous waters, which have the reputation of being still more efficacious.

In affections of the joints the waters must be used very warm, and the treatment is most materially assisted by local douches and frictions. The bath

treatment of joints very often produces exacerbation of the feelings of discomfort in them, in the first instance.

The following are the chief indifferent baths ; their mineral constituents are so trifling in amount, that they do not deserve separate mention.

*Gastein* is in many respects the chief of indifferent thermal baths, whether we consider its altitude, the magnificent scenery in which it lies, or its ancient repute—for it is one of the oldest baths in Europe. The districts of the Salzkammergut and parts of Styria have of late attained that popularity with the English which they deserve, and Gastein is now more visited by them. It is, however, still twelve or thirteen hours' drive from Salzburg, the nearest railway point, and will always, owing to its remote position, probably continue to be one of the most select watering-places.

It combines the advantages of an Alpine climate, of sufficient elevation, and of excellent bath arrangements. The chief drawback in it, as in most mountain stations, is the heavy fall of rain ; in June and July the rainfall is twenty-one to twenty-two inches. The mean temperature of June, July, and August varies from  $54^{\circ}$  to  $59^{\circ}$ . The season is unfortunately short, owing to the coldness of the climate ; and the best season is from the middle or end of July, up to the first or second week of September. The temperature at which the baths are used varies from  $86^{\circ}$  to  $104^{\circ}$  ; some



patients can only bear them for ten minutes, others remain in them for an hour. As the lodging accommodation is scanty at Gastein, many visitors are accommodated at *Hof Gastein*, 500 or 600 feet lower, whither the water is conducted from Gastein, and is of the temperature of 95°. There are no shady walks here as at Gastein, but the most interesting excursions can be made from both. Besides producing the usual effects of other indifferent thermal waters, Gastein is found to be particularly useful for persons of advanced years, for some forms of hysteria and of hypochondriasis, for calming the nervous system and allaying cerebral irritability, perhaps also in the effects of sunstroke. It has a special repute in cases of *tabes dorsalis* and of impotence. But the basis of the reputation of any waters in such cases is always very doubtful.

*Römerbad* or *Tuffer*, in Lower Styria, deserves to be mentioned, owing to its having a fine climate, and being a place of resort easily reached from Vienna or Trieste. The temperature of the baths varies from 94° to 98°. It lies 750 feet above the sea, and it fulfils the indications of the milder thermal baths; according to analogy, its effects ought to resemble those of *Schlangenbad*. The place is prettily situated, much visited by the Trieste people, and might be convenient for English families settled in Gratz.

*Pfeffers* and *Ragatz*.—Similar in their effects to Gastein, are the baths of *Pfeffers*, 2,130 feet above the sea,

in the valley of the Rhine. They are elevated enough to give something of an Alpine climate, but they are situated in such a gloomy though extraordinary ravine, eroded by water, in limestone rock, that no invalids would from choice reside there, especially as the waters are conveyed to Ragatz, about 500 feet lower, where the comforts of hotels and new baths are to be had in an open smiling valley, with fine Alpine scenery around. The climate is, on the whole, a mild one; the extremes are less than might have been expected. The place is very accessible, being on the railway to Chur, and on the way to St. Moritz; it is also one of the nearest points to Davos, which has of late been brought forward as a climatic resort for chest complaints: in winter a very doubtful experiment. Ragatz is suited for much the same class of cases as Wildbad or Gastein, and is not expensive. They drink the water at Pfeffers, and also bathe in water of an average temperature of 98°.

In former days Pfeffers had an immense name, and Paracelsus wrote full accounts of its virtues in a great variety of diseases.\* It has now no longer any repute in the treatment of skin diseases, nor indeed is any special class of diseases the subject of particular treatment. On the whole, it seems best adapted for nervous

\* Contraction of limbs, paralysis, gout, and rheumatism, old fevers, calculus and gravel, skin diseases, and some complaints of women.

affections of women and some irregularities of their system.

There are vapour baths and douches, and no doubt many cases of gout and rheumatism might be treated here, though the treatment is not energetic enough for thickened joints.

*Wildbad*, in the Black Forest, at a height of 1,333 feet, with a pleasant climate in the summer months, can now be reached the whole way by railroad, and in twenty-four to thirty hours from London by Paris and Strasburg. The temperature of the baths varies from 89° to 97°. Wildbad has new baths, both common and single, which are being extended, and excellent hotels and *pensions*: the living is moderate. The scenery of the Black Forest is sub-Alpine and very pleasing; in short, there is everything here to make a bath liked by those who can exist without the presence of a gambling-house or of other strong excitement.

It is perhaps more destitute than any other place of the kind, of an apology for a drinking well; such as it was, are most vapid. There are baths here for the poor as well as the rich—single baths, and others to be used by more than one. The bottom of the baths is covered with a very fine sand. Although the baths are shallow, the supply of water is ample, and it is in a state of constant renewal; and on the whole there is no place that should suit patients better, in search of such effects as can be looked for from thermal

waters. All the arrangements about the baths are excellent. Though adapted for the milder treatment of gout, Wildbad appears to be chiefly resorted to for various forms of paralysis. I observed more lame and paralysed patients here than anywhere, except at Teplitz. A peculiar breed of dogs of the country, which appears to be "gone" in the forelegs, cuts an amusing figure among the lame human beings.

Wildbad has almost everything that can recommend a place to the English. But of late years the resort to it has been inconveniently great, and it may be well supplemented by two less known places, which are mentioned next.

*Liebenzell*, 995 feet high, a small quiet spot within about eight miles of Wildbad, possesses mild thermal baths, having much the same qualities as those of that place, although it contains a few grains of common salt and a little carbonic acid. As the temperature of none of its wells exceeds  $77^{\circ}$ , it has to be raised for bathing. It is a place for those who want rest and quiet, and who find Wildbad too crowded. They have the advantage of having a muriated iron drinking well, which, if not very powerful, at all events has far more efficacy, than what often pass in this country for chalybeate springs.

*Teinach*, fifteen miles from Wildbad, is a similar place; but its waters, which have rather more mineral constituents, are cold. It also has an iron spring.

*Badenweiler*, in the Upper Breisgau, an hour from the

railway station of Mülheim, 1,450 feet above the sea, is described as lying in a most beautiful part of the Black Forest, with a very mild climate. It has for some time been a favourite German place of resort for diseases of the chest. The baths have only a natural temperature of  $81^{\circ}$ ; so they are heated artificially. It is only comparatively of late that this place has been resorted to for its thermal springs; but it possesses many advantages of climate, scenery, and cheapness. The English have not yet found their way there in any great numbers.

*Warmbrunn*, in the Riesengebirge of Silesia, at a height of 1,100 feet, with waters of a temperature of  $95^{\circ}$  to  $105^{\circ}$ , is an old-established place, with admirable bath arrangements. It is visited in great numbers by northern Germans; but its climate is somewhat severe, and as it lies quite out of the track of the English, it need not be further mentioned.

*Schlangenbad*, 900 feet above the sea, and not far either from Schwalbach or Wiesbaden, is a place for those to fly to, who cannot bear the overcrowding, that is met with at both of those stations during the season. It is as picturesque as a place can be on the small scale, with shady alleys and endless forest paths. The baths, which are used at a temperature of  $88^{\circ}$  to  $93^{\circ}$ , are beautifully arranged, and I can vouch for their pleasant feeling, though I leave it to the fair sex to vouch for their cosmetic qualities. They have a great reputation for quieting and strengthening the nervous

system, and are resorted to very much by hysterical ladies, and ladies suffering from functional derangement of the uterine system. Skin complaints are also treated here. Most English consider it dull.

*Bertrich*.—This quiet little spot, in a volcanic valley off the Moselle, deserves a passing notice for those who like a quiet life and moderate living, and who require nothing more than an indifferent kind of water. The arrangements are comfortable; the water is of the temperature of  $90^{\circ}$ , and contains more salts than most such waters, and it is mentioned here merely for convenience. Sulphate of soda, 7 grains; carbonate of soda, 2 grains; common salt, 3 grains; and  $4\frac{1}{2}$  inches of carbonic gas in 16 ounces. The spring was once hotter.

In a far opener country than that about Wildbad, lies *Teplitz*, the type of waters of this kind; it and the adjoining *Schonau* possess probably more bathing establishments than any other bath in Europe. The waters are abundant, and the temperature high, and they are used of the highest temperature that can be borne. These baths have contributed mainly to establish the reputation of indifferent waters. They have a special name, like those of Barèges, for being useful in the effects of gunshot wounds. Of late years, as in all the Bohemian baths, so here, peat baths have been an essential part of the treatment.

The old town of Teplitz is somewhat dull and old-fashioned, as are its hotels, and the tide of visitors

has of late years flowed to the newer suburb of Schonau. The country around Teplitz is full of objects of interest; among them the most alkaline of the German springs, *Bilin*, rises almost under the shadow of a very striking igneous rock; and in the immediate neighbourhood, in the forest of the Fichtelgebirge, is *Eichwald*, a place of resort in lung affections. That singularly picturesque district, the Saxon Switzerland, is easily visited from Teplitz. Teplitz is reached by a branch railway, from the line running between Dresden and Prague. The English do not appear to have visited it so much of late years. Everything that has been said about the effects of the indifferent thermal waters in disease, may be considered specially to apply to Teplitz, where the practical arrangements are excellent.

*Plombières*, in the Vosges mountains, at an elevation of 1,300 feet, reached easily from Paris and Nancy, is not known as much as it might be to the English. Its waters should be just as efficacious as those of Wildbad or Teplitz, and the establishments are admirable. I do not think I have seen any greater or more commodious baths than those of the Bains Napoléon. The water is so abundant, and its temperature so high, that it can easily be employed at any temperature wanted. There are several sets of baths in the town.

The little town follows the bendings of a very narrow valley. All the old baths and old houses look much as



they must have done in the days of Montaigne, although the curious practice, of grand seigneurs presenting to inns their coats of arms cut in wood, has disappeared. There is much that is lively and pleasant about a French town, and those who go from year to year to German spas might try Plombières as a variety. There appears to be plenty of small gaiety, and amusement for young people, and the neighbourhood is very picturesque. I had occasion to prove the efficacy of the baths and douches in obstinate lumbago. There is an establishment for soldiers. Besides rheumatism and chronic joint affections, the French resort here for stomach complaints, and neuralgia and various diseases of women. It is specially contra-indicated in phthisis.

*Néris*, in an uninteresting country in the department of Allier, has waters of a temperature of  $113^{\circ}$  to  $125^{\circ}$ , feebly alkaline, containing scarcely more than three grains of carbonate of soda and one of lime in the sixteen ounces. But the bath belongs to Government, and the bathing arrangements are very good. The waters, which were known to the Romans, are chiefly used as baths; they have a great reputation for calming neuralgic and hysterical conditions, and are doubtless useful in rheumatism and in such uterine affections as mild thermal waters are applicable to. They are scarcely known to the English.

*Caldas de Oviado*, in the province of that name in the north of Spain, is a village in a cheerful country. The

waters of this place are of the temperature of 108·5, feebly mineralized, but believed to contain a good deal of nitrogen gas. The waters are used in baths and douches, and also drunk. They are said to be diaphoretic and diuretic, and to excite the digestive functions moderately; but the chief virtue of the waters is considered to reside in their nitrogen gas, which, employed in an inhalation-chamber, is used successfully in affections of the respiratory organs. Some years ago the number of visitors used to be 700 or 800 in the season, but I have not been able to see any late accounts of the place, or to learn that English have ever gone to it. There appears to be a fair bathing establishment. The place has good air, and water, and provisions. Season from June to the end of September.

*Panticosa*, which has an immense reputation in Spain in consumption, is situated high up among the Pyrenees, and is almost the highest bath in Europe, as there is but little difference in height between it and St. Moritz. After leaving the village of Panticosa, you pass for one and a half or two hours through a narrow gorge in most savage and broken mountains, called the Staircase. At last the road turns sharply, and you discover a group of houses forming the thermal establishment. Their base is washed by a small, deep blue lake, into which some magnificent cascades fall. The establishment is one of the best in Spain. The place is small and shut in; there is only one short

walk in the vicinity, and just room to turn a boat in the lake.

The principal sources are four in number: that *de la Laguna*, or of the tank; *del Estomago*, of the stomach; *de los Herpes*, of eruptions; and *del Higado*, of the liver. The water most used for baths is the *de los Herpes*, and on its account a notice of Panticosa finds its place here. Considering the weak mineralization of these waters, it seems impossible that their virtues can depend on it; much must be attributed to the altitude of the place. The climate is represented as comparatively mild, the thermometer never rising above 86°. The waters are employed for drinking, for bathing, and for the inhalation of nitrogen. The chief diseases treated here are chronic affections of the chest, loss of voice, phthisis, and stomach affections. The season is from July to the end of September; the place is of course deserted in winter. It is visited by French and English, chiefly as a curiosity, owing to its elevated position, but is in growing repute with Spaniards. The arrangements are said to be very fair, but rather of a primitive description; nevertheless it has about 1,000 visitors annually, chiefly Spaniards, and of the higher ranks. One of the great drawbacks of Panticosa is the tiring journey to it for invalids. It is more accessible from the French than from the Spanish side.

*Buxton*, in Derbyshire, at nearly the same elevation as *Schlangenbad*, while its wells are very similar, enjoys a

more bracing climate, a great advantage at the season when baths are visited, though not so in winter. The arrangements at Buxton are excellent, and it has long deservedly enjoyed a great reputation in chronic rheumatism and gout; the natural heat of the waters is  $81^{\circ}$  to  $82^{\circ}$ , and it is raised when necessary. To those who prefer staying at home, Buxton, with its interesting neighbourhood, presents many attractions; it produces all the good effects of the less stimulating indifferent waters, and its chief recommendation, as compared with continental baths, is, that going to it saves a long journey; but living at it costs more than almost anywhere abroad. *Matlock*, with water of  $68^{\circ}$  and lovely scenery, is analogous to Buxton.

We come next to the *earthy thermals*.

Among them are the springs of *Pisa* and the better known hot wells of *Lucca*. These baths, with a wonderfully temperate climate during the fine season, situated in a beautiful valley, some fifteen miles from Lucca, have been long great places of resort. Montaigne has given us a very full account of his experience of its waters.

The hottest spring is  $116^{\circ}$ . The wells contain about eighteen grains to the pint of solid constituents, some twelve of which are sulphate of lime. They are used much more for baths than for drinking. Their effects are the same as those of Bath or Leuk, and all the benefits to be procured from indifferent waters in the

plains may be obtained here, but they have never been favourites with the English, as they always migrate to the north before the season, when the baths of Lucca become available. June to September is counted the bath season; the baths are on a very extensive scale, and there is ample provision for the poor. Lucca is healthy, and the neighbourhood is picturesque. All Florence goes to it in the season, but they go for coolness and for society rather than to use the baths. Every convenience of life is to be had here as well as in Florence. It is therefore the most comfortable of all the Italian baths, and it is a cheap place.

Baths of *Bormio*.—While the flow of English travellers sets in towards St. Moritz and Eastern Switzerland, and while consumptive patients are sent to Alpine climates, the baths of Bormio, “Il paradiso delle Donne,” with the milder climate of the southern side of the Alps, should not be overlooked, as they are not far distant. They are situated on the Italian side of the Stelvio route, the highest over the Alps, at a height of 4,400 feet, and in the midst of the most grand scenery. The old bath is some 500 feet higher than the new one. The new bath was started by a Swiss company, and every comfort is to be got there during the season, which lasts from 15th June to 15th September. The baths have been used for many centuries by Italians, and by the country people, and have a reputation among them in paralysis, rheumatism, hysteria, and sterility,

also in spleen and other results of malaria poisoning. It is easy to see in what cases baths varying in temperature from  $86^{\circ}$  to  $104^{\circ}$  at such an elevation, are applicable. They contain about eight grains of solid constituents to the pint, six of which are sulphate and carbonate of lime. Probably very few English have yet found their way to these baths. The mildness of the climate may be inferred from the fact, that May used to be the favourite month for cures.

The baths of *Leuk* are accessible enough, not being many hours' drive from the station of Sion. They lie in a valley at the foot of the pass over the Gemmi, at a height of 4,386 feet above the sea. The climate, an Alpine one, is rather subject to extremes. The waters are nearly indifferent, but contain some eleven grains of sulphate of lime in the sixteen ounces; they vary in temperature from  $93^{\circ}$  to  $123^{\circ}$ . They are greatly frequented, but chiefly by Swiss and French. Few English go there, except to see the place as a sight.

It differs from other baths in the old habit of long-continued immersion being kept up. The baths are common, and persons of both sexes, in long bathing gowns, frequent the same bath, and spend hours together, eating, reading, and playing chess on floating boards. Patients are warned to be careful about the bath which they select in the first instance, as it is difficult afterwards to make any change, without giving offence to your neighbours. I fear that the visitors

are apt to be disputatious, as the police regulations order that there are to be no discussions on religious subjects.

The same cures are produced by the Leuk as by similar indifferent waters, but the speciality of the place is the effect on the system of long-continued immersion in water of the temperature of about  $97^{\circ}$ . It is possibly on this account, and according to Hebra's views, that these waters have always had a great repute in skin complaints. They are found very efficacious in eczema, impetigo, lichen agrius, and ecthyma, while they are of less use, like all other remedies, in those obstinate complaints, psoriasis and lepra. The water is also drunk, but there is difference of opinion among the local physicians, as to its efficacy and its use in dyspepsia. The bath season extends from June to September. The months of July and August are counted the best.

Some of the English who pass to or from Italy by Aosta, may be tempted to stay and enjoy the magnificent scenery, and the mountain air of Courmayeur and *Pré St. Didier*, which is close to it. The waters of this place have a temperature of  $96^{\circ}$ . They contain not very much saline matter, and in it carbonate of lime predominates. These waters have a considerable reputation, chiefly local, in rheumatism and contraction of joints, in cutaneous and in nervous affections. They are used mainly in baths. I wonder that English do not linger more on their way north at these Italian



Alpine baths. There is plenty of excellent Italian society at the neighbouring Courmayeur.

*St. Amand*, lying on the Scarpe in the north of France, enjoys a reputation for its mud baths. There is an excellent thermal establishment, one of the best in France. The waters, temperature  $67^{\circ}$ — $77^{\circ}$ , are weak sulphated ones, and give out a slight sulphuretted hydrogen odour. These waters permeate the layers of a peculiar elastic soil, and this, in the shape of mud, is used for baths, for which purpose it is collected in one large glass rotunda. Each patient has a separate division of this fluid mud, and its use is specially reserved for him during the season, as it is not renewed. As the natural temperature of the mud is not high enough for most people, it is usually artificially heated. Patients remain for some hours in these baths, doing their best to amuse themselves, until they can quit them, and purify themselves in a bath of fresh water. These baths have a great name in rheumatism, thickening of the joints, paralysis, and congestion of the liver, in fact in much the same cases as the mud baths of Acqui and Albano and the peat baths of Germany.

*Bagnères de Bigorres*.—This popular bath will be mentioned again under another head. It is noticed here owing to the virtues of its two chief bathing wells: the Foulon, temperature  $91.4$ , and the Salut, temperature  $89.6$ . The supply of the first is rather scanty; the latter is more abundant, and its waters are also drunk.

They both contain a variety of salts, but in very small quantity, and their action must be considered indifferent. They are often found to be efficacious in much the same cases as Schlangenbad, and the waters of the Foulon have something of the pleasant feeling of the water of that place. They are considered to be soothing to the nervous system. It is doubtful whether this bath should not, so far as the remedial effects of bathing go, be classed entirely among earthy bathing places.

*Sacedon*, on the upper part of the Tagus, not very far from Madrid, has of late years become a very popular bath. It seems to be a pleasant place of residence in a pretty country, with walks in the royal gardens, with Roman remains, and a fine gorge in the mountains, to make excursions to. These waters, which are weak sulphate of lime, were known to the Romans and to the Arabs. They are chiefly used for bathing purposes; their temperature is  $85^{\circ}$ , so that for some cases they have to be artificially heated. They are used in rheumatism and in cutaneous affections.

*Bath* possesses the only springs of any considerable temperature in Great Britain; the hottest is  $117^{\circ}$ . According to early records, the ladies and gentlemen used to enter a common bath in a state of nature. After a time they were induced to adopt decent clothing, but they still resorted to common baths, and spent many hours in them, just as they do now at Leuk.

But Bath, once as crowded with visitors as the most fashionable spa, has fallen from its high estate. Its waters are now little employed, not that they are not as efficacious as ever, and quite as powerful as any other waters of their class, for, notwithstanding the presence of a little gypsum, and some other solids, they must be considered indifferent waters. Bath is one of the few places, where a cure can be conveniently carried on during the winter, and it possesses one of the best English winter climates. Altogether, the fact that Bath, presenting so many advantages of climate, and of cheap living, and of pleasant if not "fast" society, should have been abandoned, in spite of its thermal springs, is very remarkable. It must be attributed partly to fashion, and partly to the city having grown too large; few baths continue very popular, after a large city has sprung up around them.\*

To these earthy thermal springs may be added Clifton, with wells of  $74^{\circ}$ , and the only Irish warm one, *Mallow*, where the water has a constant temperature of  $69^{\circ}$ . The last is pleasantly situated, and was at one time in repute for its baths, but is now little known.

\* The sketches of Bath life given by our old novelists, and by our professional writers, are very amusing. One of the latter, stigmatizing the practice of forcing pills and quack medicines on those frequenting the baths, mentions in the following ludicrously serious terms one of the girls employed in hawking these medicines:—"Molly Lawrence, whose most agreeable, graceful exterior person gives indications of what her conduct proves, a sensible and well-disposed mind."

## CHAPTER II.

### SULPHUR BATHS.

ALL the effects produced by the indifferent thermal springs may also be obtained from the sulphurous ones, which are very weak solutions of sulphur in combination with alkalies, or of hydrosulphuric acid—such very weak solutions, that one wonders whether the sulphur has any operation at all; but certain special actions on the cutaneous and bronchial surfaces are attributed to these waters. While there is much difference of opinion as to the share which sulphur has in their operation, yet it is proper for the present to describe the effects usually attributed to its presence.

Sulphur baths of the temperature of  $90^{\circ}$  to  $95^{\circ}$  excite the nervous system slightly, make the circulation more active, render the respiration lighter and easier, and produce a desire to make water. Sometimes their continued use causes languor and loss of appetite for a few days, and baths, especially of a higher temperature, produce a slight eruption, to which much importance has been attached, called *la poussée*. A very slight degree of

irritation of the conjunctiva is also said to be an occasional effect. Further effects are, increased frequency of the pulse (though the latest observers say it is retarded), increased cutaneous transpiration, while the urinary and bronchial secretions are augmented. The specific gravity of the urine is usually diminished, while the urea and uric acid are increased, and the phosphates and sulphates are lessened. The change of tissue is thus quickened, the sanguification is more rapid, and under these influences chronic indurations often disappear. The appetite and digestion are improved. Such is about the standard account of these things, but exact observations are wanting.

Although it is the tendency of modern dermatologists to throw off all faith in sulphur waters, we cannot wait, if they are really useful, till a satisfactory *rationale* of their use is supplied, especially as dermatologists are far from being at one among themselves, and not even agreed about the classification of many of the commonest forms of cutaneous affections.

The writers on the Pyrenean waters explain the cures which they effect with them, on the theory that they act by modifying various constitutional states, of which the cutaneous affections are merely expressions. And these states they have called the scrofulous, the gouty, the dartrous, or the herpetic, and the syphilitic. The subject generally has attracted much attention in France of late years, and Bazin has attempted to demonstrate, that

sulphur cannot possibly have any operation against those various states or diatheses, although he considers eruptions to be the result of general constitutional conditions.

Durand-Fardel goes further back, and refers all cutaneous affections to alterations of the blood and of nutrition, thus recalling to us old notions of acidity or alkalinity of the system, and the corresponding use of alkalies or of acids. But the subject cannot be pursued further in this place.

The darts condition is one, however, so little recognised in English medicine, yet so constantly referred to by French writers, that some of its main features, as described in a recent work, may be enumerated. It comprises a great majority of cutaneous affections, humid and dry, various affections of the eyelids, of the external ear, and of the aural passages, granular sore throat, darts of the nose, certain asthmas, certain chronic bronchitic affections, some affections of the stomach, a great many disorders of the genito-urinary organs of men and women; in short, a general irritability of skin and of mucous membrane seems to be described, approaching, perhaps, to what we might call, catarrhal.

But passing from such theoretical considerations, I think that it must on the whole be admitted, that cutaneous affections are often benefited by sulphur waters, or by the treatment which they receive at some

of the principal sulphur baths. Many chronic skin diseases—such as eczema, impetigo, prurigo, psoriasis, and lepra—frequently improve.

It appears to be mainly by their action on the skin, that sulphur waters have also been found useful as a sort of test for latent syphilis, their use frequently bringing out eruptions that were dormant. I have known something analogous, in the way in which sulphur waters have brought out patches of *Lichen circumscriptus* of former years. As to the absolute curative effects of these waters, they only appear in syphilis in its secondary forms, and then not very remarkably. Their employment in the form of baths, in such cases, is at most an adjunct to the use of iodide of potass, and of other remedies.

It seems to be admitted on all hands, that sulphur waters are useful in eliminating metals in cases of metallic poisoning ; but as direct absorption of sulphur, and even of any quantity of hydrosulphuric acid, through the skin, is out of the question, this result, so far as it is not common to all other bath treatment, must be attributed to the drinking of sulphur waters.

Many of the Pyrenean waters are counted very efficacious in functional uterine disorders.

Another use to which sulphur waters are constantly put in modern times, is in the form of inhalations consisting of vapour impregnated with hydrosulphuric acid. Judging by their universal employment abroad,



they must be found useful in chronic laryngitis and bronchial affections, if not in incipient phthisis, as has been thought. The *rationale* of this is not yet explained.

The Pyrenean is far the largest group of sulphur waters known. There are 110 mineral water stations with 500 springs on the French side of the Pyrenees, and there are said to be more on the Spanish.

*Barèges*, the most celebrated of the Pyrenean baths, appears to owe nothing to the beauties of nature or to its climate, which is variable. Its inhabitants have to emigrate in winter. The supply of water is so scanty, that the wants of patients are with difficulty supplied. In spite of all these disadvantages, and that its cures are effected chiefly by immersion in crowded piscinæ, no waters are in greater repute for the cure of certain ailments; and at the head of these stand, old wounds and cicatrices, and chronic diseases of bone; in rheumatic and neuralgic affections the action of the waters is also powerful; in fact, very much the same cases are treated here as at Teplitz.

The waters, which are very feebly mineralised, and contain the half-organic substance baregine, are considered the most exciting of the Pyrenean baths: no doubt the height of the place has a good deal to say for this; they are used for drinking, but their chief employment is in baths.

The colder waters are first used, and then you go

on to the hotter ones; the temperature ranges from 87° to 113°. Barèges is reached by carriage from the railway station of Lourdes, but it is only in very special cases that English are likely to resort to it. The arrangements are better than they used to be. It has a military hospital, and the season is July and August.

*Cauterets* lies in a picturesque narrow valley on the banks of the Gave; mountains shelter the place from winds, and render its climate mild and less variable than might have been expected; its wells are very numerous and scattered, but, having been recently leased to a new company, will have the advantage of having their management systematized and amalgamated.

Though its baths are used for all the purposes for which other sulphur waters are employed, the reputation of Cauterets rests chiefly on its beneficial effects in tubercular and bronchitic affections. It has a great reputation in the diseases of women, who employ the waters in baths and in local douches, and also drink them. It is said that mules in Tarbes and Pau, suffering from bronchial catarrh and from diarrhoea, when sent up to Cauterets, mend rapidly.

The baths may be divided into three groups,—the eastern, the western, and the southern. Of all the springs, a western or south-western one, La Raillère, is far the most frequented; and the crowd of patients, in the most different costumes, ascending the hill to it in

every variety of conveyance, is said to be one of the most amusing scenes in the Pyrenean baths. The season commences in May and lasts till October; it is often very crowded; as many as 15,000 guests have visited it in a season: it is reached in 8 hours 30 minutes from Lourdes.

*St. Sauveur*, at a height of 2,525 feet, with not so unsettled a climate as many mountain places, appears to have little sulphuretted hydrogen in its waters, but is a fashionable bath. The water is soft and pleasant to the skin. In many respects it may be considered the French Schlangenbad. It is good for nervous patients, likewise for complaints of females, and is essentially a ladies' bath; it has the advantage of being close to some of the finest scenery in the Pyrenees. The temperature of the water varies from  $81^{\circ}$  to  $135^{\circ}$ , and it is chiefly used in baths, although it is also used internally, often mixed with milk or gum-arabic. The season commences in May and ends in October; it is approached like the other baths from Lourdes.

*Eaux Chaudes*, subject to rather sudden changes of temperature, is situated in a savage, picturesque, and very narrow and gloomy gorge, where the houses can scarcely find room. Notwithstanding its thermal establishment built of marble of the Pyrenees, it is not very much resorted to. Although it is used for chronic rheumatism and for chlorotic complaints, its baths seem mostly to serve as a supplement to the neighbouring

Eaux Bonnes, where the waters are chiefly drunk. The season is from 1st of June to 1st of October; it is reached by diligence from Pau.

*Bagnères de Luchon.*—Climate mild, but, like most Pyrenean ones, changeable. This and the Bagnères de Bigorres are by far the most important of the Pyrenean baths for the English, as they are the only ones which supply all the comforts they look for; and with the exception of not being aided by the Alpine air of some of the higher stations, owing to their being only 2,000 feet above the sea, its various baths produce all the effects that are to be expected from sulphur waters. They are situated in the midst of the most magnificent scenery. The bath establishments and drinking arrangements of Luchon are excellent. The waters of Luchon and of some other sulphur baths have the property of getting white or milky after exposure; this is from the deposit of sulphur, but chemists have not made out very distinctly the cause of this phenomenon.

They profess to cure here all the complaints in which thermal springs are useful; but specially skin affections. Each of the many wells is believed to have peculiar virtues, and to be most useful in particular forms of disease; but such details cannot be entered into here.

Piscinas or common baths are still in use here and objected to by many, but infection through such sources is absolutely unknown. Luchon is reached from Mont-

réjeau in 3 hours 15 minutes. The season is from 15th June to 15th September.

*Amélie les Bains*, about 800 feet above the sea, reached by carriage from Perpignan, lies in a romantic situation, with lofty masses of rocks, and streams flowing from them; deserves notice chiefly, as one of those places in which every possible arrangement has been made, for presenting the fumes of sulphuretted hydrogen to the patient in a variety of ways. The temperature of the springs varies from  $92^{\circ}$  to  $145^{\circ}$ .

There is probably no place on a small scale where the arrangements of this kind are better. The French have retained it for one of their permanent military hospitals.

It is resorted to for rheumatism, but more especially for the early stages of pulmonary consumption; and owing to the mild climate of the place, patients are able to stay there during the winter.

*Amélie les Bains* may be considered as a representative of the sulphur baths of the Eastern Pyrenees. They do not differ in essentials from other baths, except in their mild climate, and therefore in being, some of them, fit for a winter residence for invalids.

Very hot vapour baths and inhalation rooms form an important part of the curative process. The treatment is mainly by bathing, but the waters are also drunk, and are believed to increase the secretion of urine, and even favour the solution of gravel. It is complained, that they

do not understand mulling and kneading the muscles here. Notwithstanding that all writers are agreed in praising the arrangements of this place, it does not appear yet to have received a proportionate number of annual visitors, but of late years over 400 have spent the winter at it. The regular season extends from May to the end of October.

*Le Vernet*, with many points of resemblance to *Amélie*, lies higher, at an elevation of 2,000 feet ; like it, it has of late years become a place of winter resort, but, though sheltered from the east and from the enervating south wind, it is open to the north, and in December and January owing to the neighbourhood of the mountain of *Canigou* and others, it only sees the sun for one hour or two. But to make up for this, there are inhalation chambers of regulated temperature, for winter patients, and the climate is very pleasant in spring and in autumn.

*Ax*, in the Eastern Pyrenees, has, perhaps, the largest supply of thermal sulphur waters in Europe, and the hottest in the Pyrenees. It is as picturesquely situated as *Luchon*, and though the village is a miserable place, very fair accommodation is provided for visitors, who now reach an annual average of 2,500. Although it is declared by chemists that the waters of *Ax* have not quite so much sulphuret of soda as those of *Luchon* (the quantity in the latter not amounting to one grain in the sixteen ounces), I think it is of very little

importance, as there is no doubt about the extrication of an abundant supply of hydrosulphuric acid. There are three bathing establishments, and a military hospital. It is reached from Foix.

*Escaldas*, up among the mountains, is also very picturesquely situated, not very far from Ax. Out of the way though it is, it receives a contingent of 700 visitors every year, chiefly from across the Spanish frontier. In spite of its high position its climate is mild during the season, and it is resorted to for bronchial catarrhs as well as for skin complaints. It is reached from Perpignan.

*Aix les Bains*.—There is probably no sulphur bath where the arrangements are more complete than here. Separate baths, baths in common, baths for men and baths for women, every variety of douche and of vapour baths, not forgetting the local and general application of water and of steam, and inhalation chambers, are all met with. The supply of sulphuretted water of a high temperature is so abundant, that there is no necessity for utilizing it carefully as in places like Barèges. Add to this, that the town is in a beautiful neighbourhood, and very near some of the pleasantest scenery in the Alps, that living is moderate, and that there is agreeable society, and it will be found on the whole to be one of the most convenient places to which the English can resort. It is reached by railway from Lyons or from Geneva, being on the main line to Mont Cenis.



Aix can be visited earlier in the season than some of the more northern baths. It gets hot in July and the first half of August, but after that can then be visited again. Everything that can be effected by skill in application of thermal waters, is to be obtained here.

*Marlioz*, a pretty little village quarter of an hour's drive from Aix, is nicely laid out, and makes a pleasing variety from Aix. It has extensive arrangements for pulverizing its waters and for inhaling rooms, and is trying to establish a name in laryngeal and bronchial affections.

In these days, when the magnificent island of Corsica seems likely to be opened out as a health resort in chest complaints, its mineral resources must soon attract notice. It has various excellent sulphur baths, which have been long in use.

*Pietrapolo*, temperature  $110^{\circ}$  to  $146^{\circ}$ , much frequented with good arrangements; fine thermal establishment, and in picturesque country among the mountains.

*Guagno*, temperature  $105.8^{\circ}$ , although selected for a military hospital, is represented as gloomy, and the arrangements are very imperfect.

*Guitera*, temperature  $104^{\circ}$  to  $131^{\circ}$ , with an immense supply of water, is very promising, but accommodation for visitors has still to be supplied.

*Puzzichello*, cold, has great local reputation and very fair arrangements. Its effects are said to resemble much those of Schinznach, and it is used mostly in

cutaneous affections, but its low situation exposes it to the effects of malaria at certain seasons of the year.

*Baden in Switzerland*, on the railway near Zürich, is one of the oldest and most visited baths in Europe; but rather a resort of French and Swiss than of English. It is in a pleasant country, and the arrangements are very convenient, the waters being abundant, and baths attached to all the hotels. The town is somewhat old-fashioned. There is no great variety of amusements, and it is a place only to be visited by those who really have need of its waters. The quantity of hydrosulphuric acid in its waters is very trifling. Their effects, therefore, are chiefly those of thermal waters; they are also used for drinking, but the thirteen grains of common salt in the sixteen ounces of water, a weak enough dose, is balanced by thirteen grains of sulphate and carbonate of lime; so that it is not surprising that it is not borne well by many stomachs. One cannot but be amused at the praises lavished on the many delights of Baden by Meyer-Ahrens, but he will not convince the world that the place is not dull.

*Schinznach*, only a few miles from Baden, is more picturesquely situated, and has more complete public arrangements. Here there are no private hotels, the whole establishment belonging to the canton; the arrangements are excellent, but this also is a place only to be visited by invalids. The waters contain more sulphuretted hydrogen than most baths on the Continent,

excluding some Hungarian ones ; but their temperature not being high, it is necessary to heat them. At Schinznach they pay much attention, and successfully, to cutaneous disorders. The quantity of lime is much less than in the waters of Baden, and there are in the sixteen ounces of water some seventeen grains of sulphate of soda, and other soluble salts, so that some effect may be produced on the digestive organs by their internal use, especially with the additional employment of the strong chloride of sodium of the neighbouring *Wildeg*, which contains some iodine.

*Baden in Austria* is one of the largest baths in Europe, and all the arrangements are on a magnificent scale. There are enormous swimming baths, and common ones, in which men and women spend many hours.

It is a place of great resort to the people of Vienna ; not much visited by the English. The waters are rather weak, and the place is more one for strangers to go to see, than for those who are seriously in quest of health, to resort to. It contains somewhat more sulphuretted hydrogen than its Swiss namesake, but its temperature of  $95^{\circ}$  does not come up to the high temperature,  $115^{\circ}$ , of the latter.

*Aix-la-Chapelle*, or Aachen, in Rhenish Prussia, on the route between Antwerp and Cologne, and with its neighbouring Burtscheid, almost identical in its waters, except in their heat, rising to  $166^{\circ}$ , has, owing to its abundant supply of waters of high temperature, long

been the chief sulphur bath of Germany, and well known to the English. The arrangements of every kind are excellent, and the douches certainly second to none in Europe. Every effect that sulphur baths, not at a great elevation as some in the Pyrenees, can produce, may be procured here, but rheumatism and cutaneous affections are the complaints probably most successfully treated ; being a bath of established reputation, it has a staff of very experienced officers, whose practice in a large city like Aix is not limited too much to one set of diseases as at most baths.

The season lasts from June to the end of September, but the baths are open all the winter, and owing to their excellent arrangements may be very well used at every season. The new Kaiserbad is in all respects one of the most complete in Europe. The chief disadvantage under which Aachen labours is that, owing to the prosperity of its manufactures, the town has greatly increased in size, and become so large, that those who visit it, have not the advantage of large pleasure-grounds or shaded walks near the wells, which they have in some other baths. But these waters will be mentioned again, as their internal employment co-operates with their external application in a more tangible way than is the case with most sulphur waters, the mineral constituents of which are often almost *nil*.

Italy can boast of many excellent thermal sulphur springs.

*Acqui*, not very far from Alessandria in the north of Italy, has been used at least since the days of the Romans. There are many springs, of which the most abundant emerges at the high temperature of  $169^{\circ}$ . Its main constituents, besides hydrosulphuric acid, are chloride of sodium and a little lime. The water is limpid, and soon parts with its smell of hydrosulphuric acid. These waters produce all the curative effects of other hot thermal waters; and they are remarkable in another respect, as being like the baths of Abano and of St. Amand, the prototypes of the German mud-baths. The favourite mode of bath here, is for the patient to have the affected parts covered with a layer of soft incrustation, brought up by divers from the bottom of the well. An abundant vapour exhales from it, and converts the room into a regular vapour bath. A patient remains with the part enveloped for three-quarters of an hour or an hour, after which he cleanses himself in a bath of the mineral waters.

The baths of *Abano* and *Battaglia*, six miles apart, in the Euganean hills, not far from Vicenza and Padua, contain more common salt than the waters of Aix-la-Chapelle, and quite as much hydrosulphuric acid. There was once a temple here connected with the waters, where oracles derived from the state of the spring were delivered. The baths are deservedly much frequented, though not by English. The temperature of the hottest spring is as high as  $185^{\circ}$ .

In spite of this great heat *confervæ* and *bacterias* live in it. Besides the employment of baths and douches, the mud of the baths is applied topically. There are shady walks about, and the ordinary sources of amusement. The climate is mild and temperate, but at times apt to be very hot. The accommodation at Battaglia is much better than at Abano. It is a pretty place with luxuriant vegetation.

There are many hot sulphur springs in the Padua district.

There are many excellent thermal sulphur springs in Spain, but most of them in out-of-the-way places, as in Galicia, quite out of the beat of the English. One near Santander is most in their way. While the arrangements of most of the Spanish baths remain as they are, it is only very adventurous people, who will venture to any of them far removed from the beaten track. Some of the chief are :

	Temperature. Degrees.
Archena, in Murcia . . . . .	126·5
Cuntis, near Pontevedra . . . . .	68 to 140
Carballo, near Corunna . . . . .	77 to 97
Cortegada, near Orense . . . . .	84 to 90·5
Ontaneda, near Santander . . . . .	77 to 100
Ledesma, near Salamanca . . . . .	86 to 122

The first of these has a special reputation in the cure of syphilis, and the last is one of the most frequented baths in Spain.

## CHAPTER III.

### SALT AND SALINE BATHS.

IN parts of the Continent far removed from the sea, the salt springs are in great repute, and *sool bäder*, as they are called, are extensively used. They are of less importance to the French and English, who have a large supply of sea-coast watering-places, where by proper arrangements every effect produced by the salt springs may be obtained.

The stronger ones are most of them artificially prepared ; that is, a weak spring is strengthened by adding the salt mother liquor, as they call it, and too strong a one is diluted. Their efficacy depends on the stimulation of the skin, and the degree of this depends on the strength of the bath, on the length of the immersion, and much also on the skin of the patient. The sensibility of the skin depends partly on age, and partly on individual constitution : 2 to 3 per cent. is the average for most people, while 10 per cent. of salt in the bath produces over-stimulation of the skin ; an advantage which these waters possess over indifferent ones is, that with a lower temperature they produce as much stimulation of the skin.



It seems probable that no portion of the salt is absorbed, although it is a matter of ordinary experience, that a certain amount of it adheres to the cuticle. Some of these springs owe most of their reputation to the supposed absorption of the iodine or bromine which they contain; but even if the minute quantities they hold in solution were absorbed, their amount is so small, that they could not be reasonably supposed to act on the organism. Salt baths are believed to act primarily on the skin, and to favour the transformation of tissue. During their use the appetite and powers of digestion increase, and experiments would seem to show, that an increased secretion of urea is a result of this quickened oxidation.

Scrofula has long been considered specially under the influence of sea air and of salt water, and of their use in it there is no question, though their action is greatly helped by the internal employment of medicines, to assist in the resolution of swollen glands.

It is probably owing to the favourable influence which they exert on anæmic conditions, that salt baths are in great repute in many of the sexual diseases of women, chiefly in those depending on debility; they are said to disperse indurations of the uterus and of the ovaries; nay, there are not wanting accounts of fibrous tumors of the uterus, and even of cancer of the breasts, being cured at Ischl and at Kreutznach: but such statements must be received with much caution.

The list of diseases to be cured by these baths, if we take the accounts of the local doctors for granted, is enormous, and cannot be accepted; but, among them, there is no doubt that they are useful in chronic rheumatism and in gout. Much in such cases depends on the temperature of the baths used: where the temperature is high, some of the weaker saline baths, such as Wiesbaden and Baden Baden, are among the more efficacious ones for gout. But it must be considered, that their qualities in this respect are mainly the same as those of the indifferent baths, especially in the case of Baden Baden, where the quantity of salt is so small. It is no doubt owing to their temperature, that the baths of Bourbonne, like indifferent springs, have got a reputation in paralysis and old wounds.

Salt waters may be divided, with reference to baths, into—1, weak; 2, carbonic acid ones; 3, strong ones; 4, sea-water.

And first of *weak* ones. In studying their effects, two points, besides the quantity of salt they contain, have always to be borne in mind—the temperature at which they are used, and the quantity of carbonic acid that they contain, as a good deal of that gas is necessarily lost in heating the colder waters to a proper temperature for baths.

*Wiesbaden*, one of the most important thermal baths of Europe, visited by 15,000 to 20,000 guests annually, is the capital of Nassau, and lies in a valley only open

to the south ; it is easily reached from all quarters by railway. The climate is not an extreme one, and in winter is mild for Germany, and many foreign families are beginning to make it their winter residence. Like almost all continental baths, it is for a time in summer intensely hot. The water is very abundant, and almost all the hotels have baths in them, or in their close proximity. There are no fewer than seventeen sources of warm water. Only one of the wells, the Kochbrunnen, is used for drinking. The waters contain from 45 to 58 grains of common salt in 16 oz. The hottest of them has a temperature of 156°.

The general effects of the waters of Wiesbaden are pretty much the same as those of indifferent waters, and many of the cases that are sent to Teplitz might be very well treated here ; but the appliances, in the way of douches and local treatment, do not appear to be as complete as in Teplitz, Wildbad, the two Aixs, and some other places. Wiesbaden has a great reputation for gout, as Aix-la-Chapelle has for rheumatism : there may be an opportunity afterwards of examining how much of this is owing to the internal use of these waters. Wiesbaden is provided with very pleasant gardens, a handsome *Cursaal*, and gambling-rooms, so that it offers inducements to people of all tastes. The town is not striking, nor is its neighbourhood, but it is a very comfortable place of residence, in which one can live cheaply or expensively, according as he

manages; and its convenient situation near Mayence and Frankfort will always make it a great place of resort.

*Baden Baden*, far the most picturesque and pleasant bath in Europe, is easily reached by railway through Strasburg. It is a pleasure and gambling resort, rather than one for health; still most of the advantages of an indifferent bath may be had there. Chronic rheumatism and gouty cases, that would not bear more active treatment, are often sent to it with advantage.

It remains to be determined, whether the unusual amount of lithia in the Murg well here is of any real importance.

The climate of Baden is warm, and the place is sheltered, and there is abundance of amusement to be had, so that persons merely requiring relaxation and change of air, without having anything specially wrong with them, cannot be sent to a better place. Every one likes Baden.

*Bourbonne les Bains*, in the Haute Marne, is one of the chief French salt waters. It is a small town agreeably situated outside the Vosges Mountains. Its waters contain about as much salt as those of Wiesbaden—46 grains of common salt, 14 grains of lime salts, bromide of soda, 0.38, with a good deal of nitrogen and of carbonic gas. Its waters are quite sufficiently warm (temperature 114° to 147°); and as the two places fulfil very much the same indications, it has sometimes been called

the French Wiesbaden. In both places the bathing is generally associated with drinking the waters; but Bourbonne must have improved greatly, if it be nearly as pleasant a place of residence as its German compeer. There is a military hospital here, and it is worth while to remark that the baths have been found efficacious in rebellious malarious fevers, and in the visceral engorgements of the abdomen, which occur in soldiers who have served in Africa.

*Bourbon l'Archambault*, reached *viâ* Moulins, with weaker salt waters, and with a military hospital, was formerly in great repute; but it is a dull place. The curious practice of performing scarification, after exhausting the air by suction through a horn, used to be employed here.

*Balaruc*, situated on the edge of a melancholy salt marsh, the borders of which are, however, now enlivened by neat villages, near Montpellier, has salt waters of nearly double the strength of those of Bourbonne, with a temperature of  $118^{\circ}$ . Its waters have obtained a somewhat doubtful reputation in paralysis by the active application of thermal treatment, including vapour baths, douches, and mud impregnated with salt. The waters are also drunk. The climate of the place is mild, and treatment may very well be carried on in winter.

*Caldas de Montbuy*.—These springs, which are only four leagues from Barcelona, have a temperature of  $153^{\circ}$  to  $158^{\circ}$ , and contain 405 grains of salt in the cubic foot

of water. They are in great repute for rheumatism, sciatica, and old wounds. They have an early season—from 1st of May to 15th of July, and after the extreme heat is over, from 1st of September to 15th of October.

The baths of *Trillo*, not very far from Madrid, and high up the Tagus, are among the most popular spas in Spain. The temperature of the water is only from 73° to 86°, and the amount of common salt or of other solid constituents is very small. However, it is lauded in rheumatism, paralysis, secondary syphilis, and diseased joints. The neighbourhood seems pleasant, and the walks are varied. The water is also drunk.

I can only spare room to name one or two other salt baths, the efficacy of which is much aided by the large quantity they contain of carbonic acid gas :

	Temp.	Carb. acid.	C. Salt in 16 oz.
Canstatt . .	70 to 80	19·27 inch.	16·19 gr.
Soden . .	70 to 80	30 to 48 ,,	106 ,,
Cronthal . .	55 to 62	33 ,,	28 ,,

*Salt Baths* strongly impregnated with *carbonic acid*.—This class of baths has come into great favour in Germany of late years, and if their advocates at the two chief seats of these baths—Nauheim and Rehme—are perhaps a little too confident as to the results they have produced, there is no doubt that the presence of a considerable quantity of carbonic acid in a salt bath, while it is most agreeable to the feelings, adds materially to its efficacy.

It has been already said, that gases are absorbed by the skin with comparative readiness, and it has been found that the amount absorbed is proportionate to the pressure exercised. In determining the action of the carbonic acid present in baths, it is difficult to distinguish that of the gas which has been absorbed through the skin, from that of the gas which is inhaled through the lungs. Braun, while the question remains unsettled, thinks it unlikely that, with the capillaries of the skin probably strongly contracted by the cold water, any considerable amount of carbonic acid can be absorbed.

When a bath of 86°, containing much gas, is taken, the reaction and feeling of warmth come on much earlier than in a common salt bath. The skin becomes red, the action of the muscles appears freer, and there is a slight feeling of pleasant excitement in the head. The effect on the constitution is believed to be a general increase of the activity of the nutrition, and of the more important organic functions.

This form of bath is most applicable as a general stimulant and tonic, when the system is low; for instance in slow recovery from an illness, or retarded development of children, and in anæmic cases generally. It is used for the same forms of diseases as other salt baths. But it has been thought to be specially useful in chronic nervous affections, and even in some cases of that most hopeless, yet often long-



protracted malady, *tabes dorsalis*. The colder temperature at which these baths are given, renders them peculiarly suited to cases of hysterical paralysis and other forms of hysteria. These waters can no more than those of Kreutznach heal important ovarian or uterine diseases; but they may be of a great deal of use in the functional disorders of the uterus.

*Nauheim*, with its salt water springs varying from about  $83^{\circ}$  to  $100^{\circ}$  in temperature, on the railway between Frankfort and Giessen, and distant a pleasant drive from Homburg, has of late years come into great notice owing to the temperature of its salt water and the large quantity of carbonic acid it contains. The great Sprudel is the most remarkable well of its kind, throwing jets of water about nine feet into the air, and in this respect is only second to Carlsbad, which, owing to the quantity of vapour which it emits, is likely always to remain the most striking of thermal springs.

Everything is new at Nauheim, and the arrangements of all kinds are excellent, from the handsome conversation house with its ball-room and gambling-tables, down to the bathing-houses and inhalation chambers. There are several salt mineral springs, which are, however, in taste not at all attractive, after the pleasanter similar ones of Kissingen or Homburg. There is a great manufacture of salt at Nauheim; so that there is no difficulty in making the baths as salt as is desirable; and there is the air of the *gradir häuser*, for

those who are likely to be benefited by it. The country around is fairly interesting.

Nauheim is for the present chiefly visited by English, who go over from Homburg to spend the day there; but it is hoped that, when the gambling-tables are closed at Homburg; a portion of the crowd which now frequents that place may be diverted to Nauheim: and undoubtedly all the best effects of salt baths can be obtained at it.

*Rehme Oeynhausen* is well worth the notice of the English, both on account of its excellent arrangements, and because it is further north than most of the favourite watering-places, and therefore the extreme heat of many of them is not found there. It lies in Westphalia, not far from the Porta Westphalica, in a pretty valley, enriched with tolerably high hills, but open to the west, with a mild climate, and pure moderately damp air. The Cologne and Minden railway passes through Oeynhausen, so that it is easy of access. The thermal baths are said to be among the finest modern ones, and the great cupola inhalation room is the largest of the kind. The temperature of the salt spring, which rises from a depth of 2,219 feet, is 92°. The baths are used in various degrees of concentration. Rehme is rising into some importance as a bath, but is chiefly frequented by northern Germans; and it is difficult, notwithstanding the example of Kreutznach, to expect great popularity for it among the English, as the virtues

of its salt waters reside mainly in the baths, and as its salt springs are too strong to be adapted for drinking.

*Kissingen* will be spoken of for its drinking waters ; but here its salt bath with abundant carbonic acid, which one reaches in a short mile's walk, at the salt works, must be mentioned. It is cooler than most saline baths, but reaction from its first effect takes place very speedily. These baths are very refreshing and strengthening. They are given in the shape of *wellen* baths. The advocates of Rehme and of Nauheim say, however, that baths of this kind should be taken with the water still and without moving the body, as the chance of absorption of carbonic acid is thereby increased.

*Stronger Salt Waters.*—I shall take the first four of these, which have all the advantage of being situated in the most beautiful Alpine scenery : details need not be given of the strength of these baths, which is varied according to the requirements of the case.

*Ischl*, in the Salzburg district, in the valley of the Traun—nearest railway station, Gmunden—is 1,440 feet above the sea, and is situated amidst glorious scenery. Besides strong salt baths, it offers various attractions to the invalid. It has got the character of being soothing in lung affections of the erethic type : it has got mud baths, two weak sulphur wells, and it is a great place for the whey cure. It is often visited by emperors, and is a crowded place in the season. There are no

indications for the use of its baths, in any way special to the place.

*Aussee*, not far off, in the midst of beautiful scenery, presents the same advantages as to salt baths, and is quiet and much less expensive. It has also a whey cure.

*Reichenhall* is very similar. It is in the same district, and is reached by a branch of the Munich and Salzburg railway. It is in the centre of as beautiful scenery as Ischl, and offers the attractions of an inhaling chamber, a compressed air apparatus, and of mountain bitters. It is only rising into notice; is visited much by the northern Germans, little by the English. It is a quiet place, and cheaper than Ischl; close to some of the most beautiful scenery, to the Königsee, the Watzmann, and some of those curious channels worked in the limestone rocks, called *clamms*, of which Pfeffers may be considered a specimen on a vast scale.

*Kreuth* has the advantage of being 3,000 feet above the sea; it is reached by a four hours' drive from Holzkirchen, passing the beautiful Tegernsee. When you arrive there, you find yourself in a meadow of a few acres, surrounded by lofty mountains; and I know no more complete picture of the idyllic life the Germans are so fond of describing. There are no houses here but those connected with the Government baths. Besides the salt bath, supplied with water from Reichenhall, there are two feeble sulphur springs. The

they cure is here in full force. It is a very cheap and quiet place for those who want a moderately Alpine climate, and no very particularly active waters. It is frequented chiefly by Germans, and no doubt would be voted insufferably dull by English, but might be a very pleasant summer residence for quietly disposed people, notwithstanding that its arrangements are somewhat primitive.

*Bex*, in the valley of the Rhone, amidst beautiful scenery, but with only the elevation of 1,400 feet, possesses a powerful salt spring, which is well worth the attention of the numerous English who live here in *pensions* at very moderate rates. It is apt to get very hot in summer. Like other places near that end of the Lake of Geneva, it is recommended for delicate lungs, in the early spring, when it is desirable to leave the stations at the head of the lake.

The old-established chalybeate station of *Pyrmont* has salt springs, used for baths, as well as for drinking.

So also has *Dürkheim*, in Rhenish Bavaria, a cheap place, much resorted to of late years for its whey cures.

And *Rheinfeld*, near Basle, promises to be useful in the same way.

*Kreutznach*, in the valley of the Nahe, less than an hour by railway from Bingen on the Rhine, is a pleasant, picturesque enough place, with a mild climate, and situated very conveniently for those who are not German, on the borders of France. Its strong salt

bath was the first in Europe, which was found efficacious in scrofula and strumous swellings, and all the other salt springs have come into use, more or less in imitation of it.

In this place more scrofulous patients are usually to be seen, than at any other source. Scrofula has been so long systematically treated here, that the physicians have great experience in it. The cures attributed to iodine, here and elsewhere, are not to be taken for granted. The stories one so commonly hears, of fibrous and other tumors of the uterus or of its appendages being removed by Kreutznach waters, even after courses of three or four seasons, must not be too readily believed. The salt spring has a material share in the cures. The baths are taken about an hour after drinking, and commonly of the temperature of  $90^{\circ}$  to  $92^{\circ}$ ; patients usually begin with baths lasting for a quarter of an hour, and the time is gradually increased up to three-quarters of an hour; wet applications and douches are much used. The principal wells and baths and the *Cursaal* are in a wooded island in the Nahe, and pleasant excursions can be made in the neighbourhood. The arrangements of the baths, that I saw, rather disappointed me, considering the high reputation of the place; living is comfortable and not expensive; there is a sufficiency of amusement; there seemed to be many English and French present.

The effects of sea-air have already been shortly

noticed, and those who go to the sea-side to bathe are necessarily brought under its influence. *Bathing in the sea* differs from bathing in any other saline waters, in the body being in sea-bathing far more exposed to the open air and to the presence of waves, the force of which produces a certain amount of what is called shock to the system. The temperature of sea and air, and the effect of the water, must constantly vary, and the presence or absence of wind makes the effect of a bath of this kind much more variable than that of a bath taken in a house.

Sea-water holds in solution on an average in 16 oz. of water—common salt, 190 gr., chloride magnesia, 30 gr., sulphate magnesia, 25 gr., sulphate of lime, 8 gr., sulphate of potash, 7 gr.; but the quantity varies, being most in the Mediterranean, and least in the Baltic. I shall say something afterwards of the internal use of sea-water; many attempts have been made, especially in England, to have it used in this way, but it is nauseous to most people, and is unpopular. The sea-water of the Mediterranean may be said to have  $2\frac{1}{2}$  to  $3\frac{1}{2}$  per cent., that of the Atlantic  $2\frac{1}{4}$  to 3 per cent. of salts. The summer temperature of the Mediterranean is stated at  $72\cdot5^{\circ}$  to  $80\cdot6^{\circ}$ ; that of the Bay of Biscay at  $73\cdot4^{\circ}$ ; from it to the British Channel  $68^{\circ}$  to  $73\cdot4^{\circ}$ ; of the German Ocean  $60\cdot8^{\circ}$  to  $68^{\circ}$ .

The salter waters are on the whole preferable, but the climate of a place is important, and the nearer



the temperature of the sea and air correspond, the more suitable is a place for sea-bathing. The Baltic is so late in getting heated up, that it is not warm enough for bathing till August and September. On the English coasts July and August are the great bathing months, though many are able to bathe in June.

As few details can be given here about sea-bathing, suffice it to say that, in the case of delicate women and of children, it is often well to prepare them for open sea-bathing by salt-water baths in the house, perhaps beginning with them slightly warmed. Of course old people and young children are least able to bear cold water or the shock of the waves, and many nervous people are afraid of the waves, and have to be educated before they can bear their shock. It should be so managed, that those who bathe for the first time, may not get frightened. It is best not to bathe on very wet or stormy days, although some make a bravado of never missing their bath. It is best to bathe entirely naked, but this can seldom be done by men, and is never done by women. The English ought to adopt the *schwimm hosen* of the Germans, or the short drawers of Easterns. Women very generally use glazed silk caps to protect the hair, but this is a great pity, as the immersion and wetting of the head is one of the most refreshing parts of the process. True, the feeling left in the hair after salt water is not pleasant, and sea-bathing causes a good

deal of the hair to fall out: but the first inconvenience can be remedied by washing the hair with lukewarm water, and not putting it up till it is dry; and as to the last, the hair will soon come in stronger again of itself. The best hour for bathing is between seven and nine in the morning; in any case it should be got over by twelve o'clock. The bath may vary in duration from five to twenty minutes, but long-protracted baths are injurious; one bath a day is quite sufficient. In a great number of people sea-bathing causes a feeling of sleepiness, and in some rare cases an eruption. The latter is a contra-indication to its use. The general theory of the operation of sea-bathing is that of cold bathing with the water in motion, and with enough of salt present in it, to stimulate the skin slightly.

Sea-bathing is well adapted for delicate women and girls, for men who are over-worked by any kind of business and need setting up. It improves the general health. It has a very material effect on congestion of the uterus, relaxations of its ligaments, and on leucorrhœa. It acts as a powerful tonic in irritation of the spinal system, but with limitations to be mentioned. It is useful in bracing the system of those who are always catching cold; on the whole, no cases benefit so much as those of scrofula, particularly in children; now and then children suffering from incontinence of urine profit by sea-bathing.

A separate mention must be made of scrofula, the disease *par excellence* benefited by the sea-side. The following were found to be the results at the hospital for children at *Berck-sur-Mer*. The mean period of residence was nine months, and the cases that gained most were found to be, chronic enlargement in all degrees of the cervical and submaxillary glands, from the most recent swelling without induration, to large masses of scrofulous infiltration. These disappeared much faster than under ordinary treatment. In scrofulous affections of the joints there has often been amelioration, but in not so striking a degree. Sea-bathing at that place appeared to be contra-indicated in chronic inflammations of the eyes or eyelids, in eruptions of simple or of impetiginous eczema, which seemed often to be aggravated, while strumous and extensive caries of the bones remained stationary.

Much of this is applicable to *Margate*, the great English place for the treatment of scrofula; as its climate is more bracing than that of *Berck*, the constitutional improvement there is probably greater. Diseases of joints appear to recover in a surprising way, and cases can be operated on in that place with success, which would scarcely have been ventured on in London hospitals. The treatment in the *Margate Hospital*, according to information kindly communicated to me by Mr. Thornton, consists mainly in giving good food, plenty of good air and sea-bathing, with iron medicinally.

It is to be regretted that with our vast extent of coasts more places have not been utilized for the cure of scrofula, like Margate, and that sea-bathing in England is rarely carried out on systematic principles.

Sea-bathing is usually to be avoided where there is a tendency to any cutaneous affection; and if there be any eruption present, it should be smeared with pomatum or oil before bathing. Except in the form of warm baths, sea-bathing is to be avoided in gout and rheumatism. It is a doubtful measure, and must be used with much care, in convulsive diseases, chorea, and epilepsy; in hysteria it is by no means always successful. It is to be avoided, when there is disease of the heart or blood-vessels or lungs, or any tendency to cerebral congestion.

But a short space can be spared for glancing at a few of the sea-bathing places of Europe.

The small amount of salt in the waters of the Baltic makes its sea-bathing places inferior to those on the German Ocean. Much need not be said of the few along the latter, as they are seldom visited, except as a matter of curiosity, by the English.

The chief of these are the interesting little sandstone island of *Heligoland*, the resort of the Hamburgers, and the small flat island of *Norderney*, off the Hanoverian coast, where simple quiet living may be had at a very moderate rate. Going south, we have the gay and crowded *Scheveningen* at the Hague, fashionable and dear, the chief Dutch watering-place. Next comes *Blanken-*

*berg*; like the last, situated among the dunes, and offering no advantage in the way of natural beauty; it has in a few years grown out of a fishing village into a much frequented bath. It supplements *Ostend*, and indeed is in new hotels and other arrangements superior to that place, which is perhaps the most crowded sea-bathing place in Europe.

The list of sea-baths as we go along the coast is large, and many are resorted to by English. Some of them are *Dunkirk, Boulogne, Dieppe, Fécamp, Trouville, Biarritz*. Many of these places are admirably supplied with public rooms, baths of hot and cold salt water, swimming-baths, &c. A good example of this is the establishment at Boulogne; it would be better if we had more such establishments in England. With their aid bathing may be carried on at all times; without their aid, it is necessarily interrupted by bad weather. While Biarritz, with a bare country behind it, and no great beauty of its own, is crowded to overflowing, it is a pity that no English go on to the neighbouring wonderfully picturesque sea-bathing places of Spain—*Deva, Motrico, Soutoraran*, and *San Sebastian*. Comfortable lodgings are to be had in all, and San Sebastian, which rivals Palermo in beauty, has bathing machines; the whole district is beautiful, and close to an important group of mineral waters.\*

\* San Sebastian has greatly advanced of late, and its capabilities may be inferred from the fact that a French and an American company are both at this moment anxious to establish gaming-tables there.

We do not hear much of the English making use of Italian sea-bathing places; but the water of the Mediterranean is the saltest of all. *Nice, Leghorn, Spezzia, Naples, Venice,* and *Palermo* are all bathing-places.

It would be a long task even to enumerate the English sea-side places, which present every variety, from the immense scale of *Brighton* and *Scarborough* down to secluded Welsh villages like *Llanstephan* and *Fishguard*. As regards health, the main question in selecting one of these places is, do you want a bracing climate? Then the east and south-east coast must be chosen. If you want a milder, damper climate, go to the west, to Devonshire and to Wales. Patients must judge for themselves whether they want a quiet, retired, or a bustling place; at least they are pretty sure to follow their own bent in this respect.

Scotland cannot be considered rich in sea-side resorts, as there are few of them where the arrangements are good and convenient. On the east coast *Portobello* is best in this respect. I have heard of a German family from Hamburg paying it a visit. They found it comfortable, and they thought the expense of it much the same as that of a German watering-place would have been; but there was a great lack of amusement, and as for a Scottish Sunday, "What did they find it?" *Nairn*, in the north of Scotland, is a flourishing watering-place with good arrangements; and some of the places down the *Clyde* are very good, and the scenery beautiful; but the climate is too damp.

Ireland, which is even poorer than Scotland in mineral waters, is particularly rich in sea-bathing places. Almost all of these are in the neighbourhood of fine cliff scenery, and many have excellent hotels. For instance, one of the most comfortable of all is *Portrush*, near the Giant's Causeway. Going along the coast towards the south, you come to the secluded *Cushindall*, and to *Glenarm*. Next comes one of the newest and most popular, *Newcastle*; then *Ross Trevor* and *Warrenpoint*, as lovely as can be. Passing Dublin, you reach *Bray*, more in the style of a new English watering-place, with its sea views, reminding you on a fine day of the coast of Italy; in the west, *Kilkee* and *Bundoran*, both open to the full sweep of the Atlantic, the one half-embayed, with lofty rocky scenery in its neighbourhood, the other commanding gloriously wide sea views: but the field for the choice of such places in Ireland is ample.

In the present state of our knowledge, the efficacy of most of our *alkaline* and *saline baths*, those containing carbonate of soda, sulphate of soda or of potash, or iron salts, must be considered to depend mainly on the general properties of water, and in some instances on the quantity of carbonic acid they contain. It has been already seen that many of the weaker salt waters, such as *Soden*, *Cronthal*, *Homburg*, *Canstatt*, contain considerable quantities of carbonic acid, so also do various thermal alkalo-saline springs, such as *Vichy*,



*Ems, Neuenahr, Carlsbad*; or cold ones, as *Franzensbad, Marienbad, Elster, Tarasp*; or iron baths, as *Schwalbach, Rippoldsau, Petersthal, Pyrmont, St. Moritz*.

It has been pointed out very fully by Dr. Braun, that the quantity of carbonic acid likely to be present in a bath, depends upon a variety of circumstances; such as whether the temperature of the water has to be raised for the bath, or again, whether the water of the spring has to be allowed to cool down first. In either case a great deal of carbonic acid is lost; much will, however, depend on the arrangements used in preparing the bath.

As none of the mineral contents are absorbed in the case of alkaline and alkaline saline waters, the effect is that of very soft water, which mollifies the epidermis, and makes it particularly easy to clean the surface of the skin. No such waters are rich enough in salts to act as stimulants, and the stimulating action of such baths depends on their temperature and on the carbonic acid they contain, unless the bath is made strong artificially, which is expensive.

Much the same is the case with *steel* baths, in which ladies have so much faith, not entertaining a doubt that the iron is absolutely absorbed through the pores of the skin. This is entirely imaginary; not so, however, the benefit which they actually derive.

Flechsigt, after a careful analysis of the comparative effects of lukewarm water, of plain water, and of water containing iron and carbonic acid, has arrived at the

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following general conclusion, that iron baths act on the system mainly by producing stimulation of the peripheral nervous system, and thus altering the functions of the skin and lungs. The altered activity of the skin seems to be the prime mover of the further changes which take place in the interstitial change of tissue.

Along with increased appetite, which they have the power of giving in common with plain water baths, they seem really to support the powers of assimilation in a greater degree.

## CHAPTER IV.

### ARTIFICIAL BATHS AND INHALATIONS.

THERE is no occasion to discuss here the infinite variety of these, general and local, that have been popular at various times; for instance, those of horse dung, or those of malt, in which cases there is generation of carbonic gas, or such things even as baths of blood and baths of tripe; but I have to notice some of the forms of such baths, which form a part of bath or other popular methods of cure.

*Arenation*, or covering the body with the sand of the sea-shore, is a very old practice,\* and has been recommended of late years by various French and German writers, and at various sea-bathing stations, such as Blankenberg and the island of Norderney. The patient lies in a hollow excavated in the sand, and has a layer

\* The buccaneers used to bury themselves in the sand for the cure of fevers. "Dr. Graham," as is well known, "exhibited himself towards the close of the last century buried in earth, with only his head, duly powdered, and pigtail above the ground, and beside him also buried his goddess of health, the future Lady Hamilton."—See a well-written article in the *British and Foreign Medical Review* for April 1857.

of damp sand thrown over him. He is exposed to the full rays of the sun. The process is said to cause free sudation, and to stimulate the skin. The exposure to the sun, however, appears to be a very doubtful measure.

This process is a very favourite one on the shores of the Mediterranean, and the following is an account of it as practised in Ischia, and best at St. Restituta in that island. The sand there is heated by the percolation of mineral waters and hot air from below. Fresh grave-like holes are dug in the sand, in which the patient lies down at full length, and is covered up to the neck with a depth of eight to ten inches of sand, the heat of which is about  $108^{\circ}$  to  $109^{\circ}$ . Weaker patients remain in this about a quarter of an hour, stronger ones half, or at most three-quarters of an hour. The deeper the hole is dug, the greater is the heat; besides profuse sweating, stimulation of the skin, amounting even to blistering, may be produced, if the process is kept up too long. This process, usually carried on in the open air, is not a favourite with any but the natives of the country. After the arenation is over, the patients sometimes bathe and wash themselves in the mineral water; others again roll themselves up in sheets till they are dry, thinking that rubbing off the sand will interfere with the efficacy of the bath.

From very early times the *scum* or the deposit of baths has been collected, and used under the very natural idea, that it contains in a concentrated form the principles on which the efficacy of the bath depends.

In this way, the mother water, as it is called, of brine springs has been used; ochry deposits from chalybeates, and sulphur from sulphur waters, as well as the half animal, half vegetable substances which grow in waters, such as those of Barèges and Gastein, and many other thermal springs, have all been employed.

We have seen how the mud has been made use of at Acqui, Abano, St. Amand, and other places.

The operation of all these baths is evidently the result of the action of thermal waters intensified, and accordingly their chief application has been to old rheumatic and gouty affections, contraction and enlargement of joints, chronic glandular enlargements and tumours.

But of all baths of this description, one, which it would be easy to introduce into this country, is by far the most popular; it is one the virtues of which are freely admitted alike by bath physicians, who are sceptical about the powers of mineral waters, and by those who have most confidence in them; I mean *peat* baths.

Moor, turf, or peat baths are now supplied in most German spas. They consist of peat earth, which has been exposed to the action of the weather during winter, and has been thoroughly impregnated with the particular mineral water of the place. It is finely powdered and prepared to a consistency of thick soup or broth. The average temperature of these baths may be considered 95°. Uninviting though the mess looks, and though at

first one is unwilling to be immersed in this oozy, dirty-looking bath, when you have once got in and allowed the slimy broth lazily to cover you, a very pleasant velvety sensation is imparted to the whole surface. On taking one of these baths, one is able to appreciate in some degree the practical philosophy of the pig, who wallows in the mire in a hot sun. He has shown himself a good judge of what is pleasant to the feelings.

As to their physiological effect on the system, peat baths are more exciting than might be expected from their temperature, and even a local one will often cover the whole person of the patient with perspiration. These baths bring out eruptions more readily than mineral waters, and indeed if carelessly used they cause a good deal of irritation of the skin. They are considered to increase the activity of all the functions of the skin, to quicken the circulation and the renewal of tissue, and to stimulate the secretory organs and the nervous system.

How all these effects are produced, that is, through what power besides their thermality, is quite undetermined. We have already seen that similar effects are produced by the mud of various baths; the peat earth and mineral impregnation of each bath varies somewhat, and the richness of the compost of each bath is praised up by its advocates; yet they all seem to produce the same effect.

Although we know, that salts are less likely to be

absorbed from such a mess than from water, still the chemical composition of these baths has often been examined with a view to explaining their effects. A hundred parts of the peat earth of Teplitz dried, yielded 55·16 parts of inorganic matter, 44·84 of organic substances and water chemically united with them. Among insoluble matters are found humic acid, vegetable remains, minute quantities of lime and silex, and in some baths a considerable quantity of oxide of iron. The soluble matters are comparatively few and in small quantities, as sulphate of potass, magnesia, soda, iron, silicic acid. Peat baths generally have an acid reaction. A chemist has recently extracted from the peat bath of Franzensbad, what he considers to be a compound salt, of sulphate and oxide of iron; sulphates of soda, magnesia, and lime; silicic, humic, and phosphoric acids, besides free sulphuric acid.

The one of these substances to which most has been attributed is iron, and we hear gravely of the styptic effects of some of these baths; but there is not the slightest reason to suppose that the baths containing most iron are more efficacious than the others. Inquirers into the subject of their efficacy have thought of the possible action of carbonic or other gases which are developed, of special organic matters, such as formic acid, which has sometimes been detected; but there is no satisfactory explanation, if turf baths are superior to other thermal applications, why they are so.



Peat baths are either taken before or after ordinary baths, or they are used alternately with mineral baths, so that one day a common bath, next day a peat bath is taken. Local peat baths and poultices are in great favour, and are often used for thirty minutes and longer; half peat baths, in which the body is covered up to the stomach, are seldom borne more than twenty minutes.

A mass of clinical observation seems to make it certain, that this general poultice applied to the whole surface, is of much use in the same cases as thermal baths. While less exciting than thermal waters of the same temperature, they seem to have more of a resolvent power in exudations and thickenings of the joints; but indeed the variety of affections in which they are considered especially applicable is very great. I shall only mention anæmic conditions, congestion of liver and spleen, spinal irritation, especially of an hysterical nature.

These baths, which are growing daily in popularity, are contra-indicated in patients inclined to congestions of the head, with disease of the heart, or tendency to phthisis, or where eruptions are present.

*Peat water.*—Baths of the common dark coloured water impregnated with peat, so common in all our moors, have of late been used; but what their special virtues are, I have not heard.

Baths of *Pine Balsam.*—At many baths where pine woods are abundant, there has been got by distillation from the fresh green leaflets of the pines, a pretty clear

greenish-brown fluid, of strong, pleasant aromatic odour, which, along with various resinous substances, contains an ethereal oil and a little formic acid. This balsam is added in various proportions to baths, to make them stimulating to the skin. For children and excitable people one to three quarts are added. The quantity is gradually increased every day up to fifteen or ten quarts, and full-grown people may use double these quantities. The temperature of these baths varies from  $80^{\circ}$  to  $100^{\circ}$ . Their operation produces itching and pricking of the skin, and its general stimulation. They are found useful in chronic rheumatism, and in some neuralgias, and when a general stimulus to the surface is wanted. The balsam is also used still more effectively in the shape of vapour baths. This remedy, though greatly over-praised some years ago, is a useful one, and ought always to be popular.

Baths of the fermenting *dregs of the wine tub* have also been used in districts where grapes are abundant; there is a great extrication of carbonic acid, and they act powerfully on the skin, but are not often employed.

Baths of *Whey*.—At certain whey cures, and other places where milk is abundant, baths of this fluid, of which, as a drink, something will be said afterwards, have been employed in great irritability of the nervous system, in neuralgias and over-irritability of the skin, and they are as efficient as baths of other bland fluids.

Baths of milk, an expensive remedy, have been used chiefly as a cosmetic by voluptuous women, and sometimes, in cases of great debility, in the hopes of a portion of it being absorbed where food could not be swallowed, but such uses do not come within the scope of this book.

The operation of vapour baths has been already discussed; it remains to notice the applications of various gases to the surface of the body, at least of such as are employed at bathing-places.

Advantage was very early taken of escapes of gas from rocks in volcanic countries, and they were employed for the production of natural gas baths. Baths of this kind are to be found at *San Germano*, *Castiglione*, the *Solfatara*, and other places in Italy, and at *Cransac* in France. The gases are carbonic acid, hydrosulphuric acid, and exceptionally, at the *Solfatara*, ammoniacal gas.

Of late years, wherever carbonic acid or hydrosulphuric acid are abundant in mineral waters, arrangements have been made for their use in baths, and *carbonic acid* baths have been much lauded. In some instances a stream of this gas is let into the bottom of an ordinary bath. But besides its employment in this way, the gas is collected from the mineral waters by a simple process, and by means of tubes is easily distributed for use as wanted. A patient going to take a bath of this gas, seats himself with most of his clothes on

in a sort of box, in which his whole person is enclosed, except his head and neck. The gas is let in from below, and gradually rises and displaces the atmospheric air. The gas produces, after a time, a pleasant tingling sensation, and a certain feeling of heat accompanied with perspiration: it is said to quicken the pulse and act on the generative organs. A bath usually lasts for ten or twenty minutes, but it must be discontinued the moment sleepiness, swimming of the head, or any other unpleasant symptom comes on. These baths have been used in paralysis and loss of power, also in some rheumatic affections; but their virtue, if any, is very trifling.

This gas is also used locally in douches; it has been applied to the eyelids closed, when it produces a certain amount of tingling and burning; it has also been applied to the external ear-passages, but practitioners seldom place any real faith in such applications, which at first have a stimulating, but afterwards a deadening effect on the function of these organs.

Carbonic acid is also sometimes applied to relieve painful affections of the uterus, and as a local stimulus to it, but the gas is very readily absorbed from mucous surfaces, and the practice is not unattended with danger. The baths of this gas appeared to me to be little used in most establishments.

*Hydrosulphuric acid* is also at some baths collected from the waters impregnated with it, and is occasionally

used in douches ; even if not inhaled, the gas, if applied pure to the surface of the whole body, would have almost poisonous effects, and the gas has to be much diluted, before it is applied to it. Of the effects of its application in this way in baths very little is known, but they are supposed to be analogous to those of carbonic gas.

*Sulphurous acid* occurs as an emanation from volcanoes, but as such has not been locally applied. Sulphur fumigations locally applied cause heat, slight tingling and redness of the skin, and free perspiration, to which no doubt the heat necessary for the vaporisation of the sulphur contributes. They are a very old remedy in rheumatism, fever, and itch, and in epidemics to this day they are counted the best gaseous disinfectant. There has been quite a *furor* of late in Scotland about their use, but I believe it has nearly died out.

*Chlorine*.—Minute quantities of muriatic acid occur in volcanic and in sea air, and also in the air about the *gradir häuser* ; but in the only local application of chlorine gas which is used, it is combined with the vapour of water. It is a strong stimulant to the skin, and after a time produces constitutional effects, including a certain amount of salivation ; it is believed to act powerfully on the biliary organs, and it is no doubt to the presence of this gas that the nitromuriatic acid bath owes its efficacy, for as an acid solution can only act as a stimulant to the skin, the nitromuriatic acid does not enter the system, and its efficacy, which

has never been thought highly of abroad, must depend on the action of the chlorine which it contains.

To this list may be added vapour baths impregnated with the odour of certain *aromatic herbs*, an addition popular at some places.

In judging of the effects of gases used as baths, it must be remembered that, with the exception of carbonic acid, all the other gases are applied associated with the vapour of water. In many of these cases, unless special precautions are taken, and indeed in the uses of all mineral waters containing much gas, the inhalation of a certain amount of the gases is necessarily associated with their external employment.

*Electrical Baths.*—It has already been said, that electricity is an extremely useful aid in the thermal treatment of paralysis; nay, some are confident that it helps in the resolution of tumours. It was also observed that one explanation of the action of mineral waters was based on their electrical action. For instance, Schönbein considered that he had demonstrated that positive electricity is developed in some maladies, as the acute exanthemata, and *negative* in rheumatism. Rheumatism is cured by Baden waters; they have been shown to be *positively* electrical. It is thence inferred, that the cure is caused by electrical action, although, granting the facts, the theory of the cure is not very obvious. But all the common actions of life, the very friction of clothes on our persons, the passing a comb

through the hair, the pouring water from one vessel into another, develop electricity, not to mention its generation by the vapourisation or pulverisation of water.

It is impossible to accept many statements respecting the electrical effects of mineral waters ; we are told that after using the Carlsbad waters for some time, ladies find their hair, when let down, stand apart. This lady feels an electric shock, when she gets into a mud bath ; that gentleman feels one, when he plunges into the sea. But this subject is alluded to here at all, because electro-galvanic baths are often connected with sea and other bathing establishments, and the galvanizing a patient in water baths between the poles of a battery has become a very popular practice. The negative electrode is put in connexion with the metallic side of the bath, and the positive is put into the hands of the bather. The water is acidulated sufficiently with nitric or hydrochloric acid to make it stimulating to the skin. While the legitimate application of electricity in medicine is being studied and gradually developed, such applications as galvanic baths are chiefly meant to tickle the fancy of the public, and have fallen very much into the hands of charlatans.

A portion of treatment, to which much importance is attached at many baths, is the *inhalation* of the vapours and gases of the waters, a subject which may be conveniently noticed here ; and first of the *vapours of common salt*.



They are inhaled cold, by patients who are made to walk along and in the neighbourhood of the giant fences of fagots, through which the water of the salt springs is made to trickle for purposes of concentration; patients are directed to choose the side of the hedges (*gradir häuser*) protected from the wind, as there the air is richest in saline matter; they are also directed in fine weather to rest on seats in their neighbourhood. It is calculated that 7 or 8 grs. of salt are inhaled per hour. It seems very problematical whether, in the inhalation of such air, there is any gain beyond what results from a comparatively cool, moist atmosphere in hot weather. Such unsightly fences are to be found at Kreutznach, Kissingen, Nauheim, Reichenhall, and elsewhere.

Saline air is also presented by a process of pulverisation in inhaling-chambers at many of the salt springs; it has been calculated that 10 grs. of salt are inhaled per hour by this process; and the warm vapour may be inhaled by various arrangements, as it rises from the heated salt-pans. These inhalations are found to be useful in chronic catarrhs of the mucous membrane of the air-passages, and in bronchitis.

*Chlorine.*—As infinitesimal quantities of this gas, probably in the form of hydrochloric acid, are present in sea-air and in the vapour of salt-pans, it has been supposed that its vapours might be found useful, and at many baths the inhalation of chlorine gas, mixed

with atmospheric air, has been tried, but the results have not been satisfactory.

*Sulphur.*—The vapours of this substance have been a favourite remedy from the earliest times. Galen sent patients to Sicily to inhale the sulphur fumes of Mount *Ætna*, and lately, in Scotland, not only serious chest affections, but rheumatism and neuralgias have been cured by it, could one accord full credit to the statements. However, it is in the form of hydrosulphuric acid that it chiefly occurs in mineral waters, and there is not now one of the numerous sulphur baths, hot or cold, in which inhalation does not form a portion of the cure; a popular handbook says, “Hydrosulphuric acid tones down the action of the nerves, retards the circulation, favours excretion, and by its continued action produces a general perspiration.” It must be used with care, and where there is irritation of the lungs or cough, it must be slowly and quietly inhaled, as otherwise it is apt to cause congestion of the lungs; for purposes of inhalation the atmosphere of large rooms is impregnated with it, and usually along with some nitrogen and carburetted hydrogen gas, the first of which predominates in the Pyrenean, the latter in the German baths. Such inhalations are considered in Germany, and still more in France, to be very useful in pulmonary cases. Of the absolute effect of the inhalation of hydrosulphuric acid in any but large and poisonous doses, very little is known; as nitrogen to a certain

degree takes the place of oxygen in these waters, the air inhaled may be thus less exciting, and therefore more soothing.

But, after all, the effect of these inhalations is perhaps more negative than positive, and the importance of the inhalation of aqueous vapour along with the gas must not be forgotten.

*Carbonic acid* is exciting when present in the blood in small quantity, paralysing when in large: at some baths it is necessary to take precautions against its excessive accumulation in the bottom of chambers. The gas cannot be inhaled pure, and is used only in the proportion of two to four per cent. of atmospheric air; it is inhaled in cabinets, into which the gas is made to flow from below. To make the gas less exciting some moisture is added to the air. The effects are said to be, quickening of the respiration; the expiration is more complete; there is acceleration of the pulse, and a feeling of warmth in the chest; lessening of secretion into the bronchiæ, and dryness of the throat; then perspiration breaks out, and there is swimming in the head, and the process must be stopped. The gas is said to improve the secretions of the air-passages and to quicken the activity of the lungs, but all this is, to say the very least, problematical, and in most places, as already observed, the carbonic acid cabinets seem to me to be deservedly falling into neglect.

*Oxygen*.—Although more or less of this gas is present

in drinking and in many mineral waters, little is known of the effects of any inhalation of the gas derived from natural sources, and nothing need be said here of its artificial preparation and exhibition.

*Nitrogen.*—This gas is present in considerable quantities in the waters of Lippspringe, Teplitz, and many of the Pyrenean and Spanish baths, and its inhalation is supposed to be useful in pulmonary complaints. If it be really of any use, it is probably by diluting the air, and thus letting a smaller quantity of oxygen, which is somewhat of an irritative, enter the lungs.

*Carburetted Hydrogen.*—Of the effects of the inhalation of the small quantities of this gas which are sometimes associated with other more abundant gases of mineral waters, nothing positive is known. This gas, which has much analogy with naphtha, a favourite remedy in the East in cutaneous disorders, appears to be more abundant in the waters of La Porretta than of any other place.

*Vapours of balsam of fir.*—Even in ancient times patients were recommended to inhale the air of pine forests, and at the present day the neighbourhood of fir woods is considered to be one of the great advantages of places for consumptive patients; for instance, Bournemouth and Arcachon. The use of a bath with fir balsam led very naturally to the inhalation of that substance, as it is practised at Ischl, Reichenhall, and other places; and there is no reason to doubt, as balsams have always been employed for such purposes,

that moist air impregnated with fir balsam may prove useful in bronchitic affections, and tend to allay irritation in them; indeed, in close analogy with this are the medicinal inhalations of air impregnated with turpentine, creasote, or carbolic acid.

The great argument against the special value of any one of the inhalations we have alluded to, is that their fashion changes constantly—for a few years or months this substance is the favourite, in a few another takes its place. An enthusiastic practitioner, probably a young man, convinces himself that he has hit on a new remedy of extraordinary efficacy; or a less scrupulous one, or a quack, satisfies himself that he has discovered what will at least take the fancy of the public for a time, and that is all he cares about. In all these varied inhalations, the only element which remains constant is a certain amount of warm aqueous vapour, which never fails to be soothing in bronchitic and laryngeal affections.\*

\* Since this was written, I have seen an amusing *brochure* attributed to Dr. De Hartsen of Cannes, giving an account of the delights of the winter station of Doux-Repos. He tells us how successful Dr. Anglicide has been in utilizing for the benefit of the *poitrinaires*, by means of pulverising and inhaling apparatuses, one of the natural products of the place, its fine calcareous dust. He explains how the very disadvantages of a place may be converted into its recommendations; how in his winter station the *bise* is adapted for the lymphatic form of phthisis, the southern wind for dry coughs, and how the patient is to remain at home or go out, according as the wind suited to his condition blows or not. He tells many unpleasant truths, for instance of the doctors often playing into the hands of the lodging-house keepers.

## BOOK III.

### WELLS.

#### CHAPTER I.

##### INDIFFERENT AND EARTHY WELLS.

WHAT has already been said about drinking water will have prepared us for considering that fluid to be a therapeutic agent of importance ; however, it is apt to be used in far too large quantities, and when the stomach is overloaded, its curative effect is lost or greatly diminished. People have drunk enormous quantities of both cold and thermal waters. At Contrexeville there are patients who steadily drink from thirteen to twenty-two pints. At Pougues, a man has been seen to drink ten pints at once. A peasant, aged eighty-two, used to come for many years to Euzet for three days, and drink the first day 50, the second 100, and the third 150 glasses of the sulphur water, the maximum being at least sixteen or eighteen quarts. The following are examples of the way in which the *warm indifferent* waters are sometimes used.

*Panticosa.*—The water here is without taste or smell, with only slight traces of sulphate and carbonate of lime. The ease with which the stomach bears it is quite marvellous. C. James says, “I have drunk eight glasses of it in an hour without having the least feeling of heaviness or of satiety.” The patients usually drink from twenty-five to thirty glasses a day. It is sedative, and produces no febrile reaction. It is prescribed with success in bronchial catarrhs and in incipient phthisis.

*Eaux Bonnes.*—Its waters contain a minute quantity of sulphuret of sodium, a very little silex, and rather more sulphate of lime. The extreme activity of these waters makes it necessary to commence their use with great care. One begins with half a glass, gradually increasing to four or five daily. But there are some patients so impressionable that they can only bear them in spoonfuls. Scarcely has the water reached their lips, before they already feel the most of its effects. Therefore no one now will follow the advice of Bordeu, who made his patients drink five or six pints of the water every day, and even advised its use at the dinner-table. At the present day, says James, patients who can use the waters in such a way, are rare. Generally they excite so much reaction that they have to be discontinued.

The waters both of *Panticosa* and of *Eaux Bonnes* contain but a very small amount of sulphuretted hydrogen.

Something has already been said of the situation of *Panticosa*. *Eaux Bonnes*, like its neighbour, *Eaux*



Chaudes, is reached from Pau. It lies in a narrow gorge, and has been greatly improved of late years. The climate is mild, but the alternations of temperature make it necessary for patients to be warmly clad here as in all the Pyrenean baths. It has become a great place of resort in consumption, mainly for cases of atonic phthisis, also in clergyman's sore throat, and laryngeal affections.

*Plombières.*—Its waters are, perhaps, less mineralized than any others. Patients begin with one or two glasses, and increase them to five or six; in former times they used to take from fifteen to twenty. The water is easily borne by the stomach, and never produces crises or disagreeable effects. It is greatly valued in chronic catarrhs of the stomach, and I have little doubt is really useful. These waters, and the feebly mineralized ones of Teplitz, are not, however, found to be of any use in phthisis, like the others just mentioned.

The preceding examples are instances of the internal use of indifferent waters, and most of them have been drunk warm. How much are we to attribute to imagination, and how much to the simple effect of warm water? Something to both, but most to the latter.

Similar instances of the use of *indifferent cold* waters might easily be multiplied. The vast majority of sulphur or of chalybeate springs for example in England are so slightly impregnated with any mineral contents, that the cures effected by them must be regarded simply as cold water drinking cures. In former days far more

faith was placed in those feeble wells; now most of them have been forgotten. They, however, continue to supply the same water as formerly. The secret of their usefulness was, no doubt, contained in the early morning walk and the copious draughts of fresh water, which were forced on those who resorted to them. The following list of waters, which at one time or other have been drunk, shows how little they can have owed to their few grains of mineral constituents in the pint:—Gastein, 2·6; Pfeffers, 2·29; Wildbad, 4·3; Plombières, 1·72; Schlangenbad, 2·5; Teplitz, 8·4; Buxton, 2·2.

The *earthy salts* are sulphate and carbonate of lime, carbonate of magnesia, and sulphate of alumina. Of these the two first play far the most important part in mineral waters. An immense quantity of lime is required by the system, and is supplied to it in food chiefly in the form of phosphates. Lime taken into the stomach, and that is made use of, deposits itself in the system mainly in that form, in which also it is chiefly excreted through the alimentary canal. Of the physiological effects of carbonate or of sulphate of lime, little is known directly. They act to a certain degree in neutralizing the acids of the intestinal canal; but in large quantities, especially in the form of the sulphate, they retard digestion, and in very large quantities may be injurious, although the old notion that gypsum (the sulphate) was a poison, is untenable. We may probably expect from their use some diminution of excessive

secretions and of over-action of the kidneys. A still larger quantity of magnesia than of lime reaches the stomach in the food, but of its use in the economy our knowledge is imperfect. The greater part of the magnesia leaves the system unaltered, not being required by it. The carbonate, besides neutralizing the acid of the stomach, acts slightly as an aperient.

With the effects of alumina we are but partially acquainted. It acts chemically on surfaces to which it is applied, and which are not protected by mucus, and it undoubtedly is astringent, and is inclined to produce constipation.

Of earthy waters by far the largest constituent is lime. The amount of carbonate of magnesia present in them is small, and alumina is generally presented in some shape, which makes it very disagreeable to swallow it.

Earthy salt waters are much more used as baths than for drinking. But springs with lime in them have often been in repute in the treatment of diseases, such as osteomalacia, in which it was supposed that the system suffered from a defective supply of lime ; but abundance of lime is always offered in food ; the defective action is with the system. You cannot make it take up lime by simply presenting to it that substance, even in the state of phosphate, however theoretically correct such practice may appear to be. The root of the disease lies either in the stomach not being able to take up lime, or in the organs excreting too much of that substance, and it is to

correct such state of the system that we must address ourselves. Phosphate of lime, I believe, like many other medicines, owes its reputation mainly to the fact of its being innocuous.

For somewhat similar reasons the lime waters have gained some credit in scrofula and in tuberculosis; probably on equally insufficient grounds.

They have often been used in dyspepsia, a complaint in which, when used with moderation, they may be of benefit as antacids, and, indeed, it is only in this last way that we can imagine their being of use in the constitutional affections just enumerated.

The *rationale* of some of these weak lime waters being esteemed as efficacious as the distinctly alkaline waters in bladder affections is not quite clear; but some of these waters have a reputation in gravel and affections of the bladder, which is founded on experience of their real utility, which cannot be easily gainsaid.

Many of the earthy springs that have been already described as being chiefly used for bathing, are also used for drinking, such as Leuk, Lucca, Sacedon, Bath. The following table gives a notion of the amount of lime which some of them contain:—

	Total Mineral Constituents.	Carbonate of Lime.	Sulphate of Lime.
Leuk . . .	14·3° . . .	10·6° . . .	—
Bormio . . .	7·8 . . .	1·3 . . .	3·7°
Lucca . . .	15 . . .	— . . .	6·9 to 13·8
Bath . . .	15·5 . . .	— . . .	8·4

Many of the earthy wells contain iron, and are described as chalybeates, while others, such as Baden in Switzerland, have been mentioned already as sulphur baths, so that the list of earthy wells employed for drinking, to be run over, will not be large.

*Lippsprunge*, in Westphalia, has of late years risen into great reputation in affections of the chest, notwithstanding its northern position, and that its climate is rather damp and not particularly mild, though tolerably equable.

The chief well contains about 10 grs. in the 16 ozs. of lime and insoluble salts, and a very large quantity of carbonic and of nitrogen gases. One to three glasses of the water are drunk in the morning, and if necessary one or two in the afternoon. Baths are used as an auxiliary, and also inhalations of nitrogen. There are comfortable arrangements for visitors, and walks in the park. A few miles off are the baths of *Paderborn*, which are still richer in nitrogen, and also used for inhalation. Cases of consumption in their early stage are said to benefit much by the use of tepid baths, inhalations, and the drinking of these weak lime waters.

*Wildungen*, in the little state of Waldeck, in a fruitful valley, is one of the baths that can still boast of a gaming-table. It has several wells, the two chief of which contain about 10 and 20 grs. respectively of carbonates of lime and of magnesia in the 16 ozs., besides other salts in smaller quantity, also a large quantity of

carbonic acid gas. These wells have a special reputation in affections of the bladder. The water must be drunk for five or six weeks, and its internal employment is supported by the use of baths.

The arrangements for visitors are good.

*Füred*, a most popular Hungarian bath, much visited from Vienna, is situated beautifully on the slightly saline lake of the Platten See; its waters contain about 7.5 grains of carbonate of lime and other carbonates, and about 6 of sulphate of soda, with as much as 38 inches of carbonic gas; it is, therefore, difficult to say whether it should be classed among earthy, saline, or acidulous waters. Two wells are used for drinking and one for bathing. Small doses only are drunk. The baths are said to be very pleasant from the quantity of gas they contain. There is also bathing in the lake, and abundance of amusement of every kind.

These waters may be considered useful in cases where stimulation of the skin by carbonic acid is desired, and where acidulous waters with slight purgative effect are indicated, as in many cases of dyspepsia with torpor of the bowels. The season begins in May and ends in September.

*Weissenburg*, in a ravine off the Simmenthal, not very far from Thun, has a well which contains about 20 grs. of lime in the 16 ozs. and which has a great reputation in cases of chronic bronchial catarrh, and some eminent Swiss physicians have much confidence in its efficacy in

such cases. The temperature of the spring is from  $75^{\circ}$  to  $80^{\circ}$ . Meyer-Ahrens tells us that new arrangements have made a perfect little paradise of this place, but it is gloomy and cut off from the world, and is therefore only suited for those of very quiet tastes, and there is nothing in the composition of the waters to inspire us with confidence in them. The waters are chiefly drunk. There is little bathing. The height is 2,759 feet.

*Courmayeur* is little visited by the English, but much resorted to by Italians during the season. It has a great deal in its elevated situation and in the beauty of its scenery to attract visitors. Its waters contain 8 or 10 grs. of carbonate of lime and of magnesia, with small quantities of sulphate of soda and of magnesia. They are slightly purgative. They enjoy a reputation in bronchial affections, in struma, in some affections of the bladder and of the skin.

*Chianciano*, to which the nearest town of importance is Sienna, lies in the valley of Chiana, at a height of over 1,800 feet, not far from Monte Pulciano, famed for its wine; it has springs of the temperature of  $100^{\circ}$ , strongly impregnated with lime, one of these having about twenty-five grains, in the sixteen ounces, of insoluble salts.

These wells have a great local name, and as much as twelve pounds of one of the springs used to be drunk daily by the patients. Like other lime waters, they have reputation in irritation of the bladder and in



gravel, also in indigestion ; used in the form of baths and of douches (and the Italians have always been particularly fond of douching), they have been found useful in enlargements of the liver and spleen, and as injections in vaginal catarrhs. They are chiefly resorted to by Italians, the accommodation seeming to be rather poor ; but the charges are not high, and there are many interesting Etruscan remains near.

*Contrexville*, in the Vosges, situated in a narrow valley about 1,000 feet above the sea, used to be rather a dull place of resort, but has considerably improved of late years. It owes its reputation to its cold lime waters, which contain about sixteen grains in the pint of salts of lime and magnesia, and minute quantities of carbonate of soda and other salts.

These waters are used chiefly in affections of the bladder, in gravel, and in gout, and enjoy a great reputation as solvents of calculi. It is not very easy to explain the action of these waters, as some patients are purged by seven or eight glasses of them, while others can bear even twenty or thirty of them without being affected. We are gravely assured that there never has been a relapse among the many patients who have been cured of gravel at this place. Granting the complete cure, perhaps this need not be disputed.

Since 1864 a company has managed the place and improved it greatly. These waters are largely exported.

*Pougues*.—Much has been done of late years to revive

the fame of this once popular bath, and to make it agreeable to visitors. It lies in the valley of the Loire, in a pleasant country not far from Nevers. It contains about twenty-two grains of ingredients in the sixteen ounces, with something like nine grains of carbonate of lime, six of magnesia, and four of soda, and some carbonic acid. But as the quantity of the last is not great, these waters, when bottled for exportation, have a supply of that gas added to them. They are popular in dyspepsia, gravel, and catarrh of the bladder.

*Alzola*, in the province of Guipuzcoa, in a picturesque gorge, easily got at, by rail to San Sebastian, and thence in a few hours by carriage, is called the Spanish Vichy, and has of late years rapidly sprung into repute. Its waters, of a temperature of about  $87^{\circ}$ , appear to be only weakly impregnated with a little carbonate of lime and some common salt ; but there is no recent or complete analysis of them.

These wells, like some other weak waters, enjoy a very great name in affections of the kidneys and bladder, especially spasmodic ones of the latter and of the urethra ; also in affections of the spine, where there is loss of nervous power. The peasants come in and drink these waters in winter for their coughs. The waters are drunk, two or three glasses before breakfast, and they are also used in baths. Seventeen days is the time in which they are expected to produce a cure.

I know of more than one English family that

derived great benefit from this place. One family visited it for five years successively; but the patients are almost all Spanish. The hotels have greatly increased in number of late years; there are good *tables d'hôte*, at which sixty or seventy people sit down; the food is abundant, and the wine excellent; still there are many things that a fastidious Englishman has to put up with. The environs are beautiful, with great variety of landscape. The season is from the 1st of June to the end of November.

*Fitero*, Old and New, on the borders of Castile, Navarre, and Arragon, with waters of a temperature of  $117.5^{\circ}$ , containing chiefly lime, and of which a fresh analysis is much wanted, is in much repute in the north of Spain. A correspondent writes: "They go there chiefly for rheumatism and paralysis. My wife and I could not regain our strength after an attack of cholera—we both were yellow and looked like ghosts; we were sent there in November, and found the place covered with snow; we had to get food as best we could, but all the same we got well. I have been three times to *Fitero*. At half an hour's walk are the sulphur and cold waters of *Cerdela*, used to strengthen the stomach, and for skin complaints. There is excellent accommodation, and it is altogether a fine place. In *Fitero* and *Cerdela* even the dust along the roads is balsamic!" Though these waters are drunk also, their use in baths is probably most efficacious. The season is from the 1st of June to the end of September.

*Cransac* deserves special notice among earthy waters, as being the only well in use which contains considerable quantities of *alumina*, and also very distinct traces of *manganese*; it is situated in a pretty valley in Auvergne, near an old volcanic hill, from which sulphurous fumes still exhale, and in which dark caverns have been excavated, in which patients can inhale hot air charged with the fumes.

There is uncertainty about the analysis of these waters; but they undoubtedly contain large quantities of sulphates of lime, magnesia, and still more of alumina. The well in which the alumina predominates (at least 16 grs. of sulphate of alumina in the pint) seems to cause constipation, while the one containing a considerable amount of sulphate of magnesia purges, when used in the quantity of five or six glasses. These waters have a special reputation in enlargements of the liver and of the spleen, and in obstinate intermittents, for which the small quantity of manganese present has got the credit, and of late years they have been largely resorted to by the French, as being eminently tonic. There is very poor accommodation for visitors, who usually lodge in the neighbouring town of Aubin.

## CHAPTER II.

### SULPHUR WELLS.

A LITTLE has been already said on the action of sulphur water in baths, and something more must be said on the difficult question of the effect of sulphur when taken into the system by drinking. The subject is made the more difficult by the discordance of opinion among authors.

Thus Lambron and others look on their effect as lowering and reducing the force and frequency of the heart and of the pulse, while at Barèges their effects are considered directly exciting. Then it is affirmed that different waters affect different parts of the system. Eaux Bonnes, for instance, the respiratory organs; Eaux Chaudes, the digestive; Luchon, the skin; while Barèges has a specific effect on old wounds and ulcers. Then there is a considerable amount of jealousy between French and Germans as to the value of their sulphur waters; and in some cases we are forced to believe that when the quantity of sulphur present is so minute, the virtue of the water may depend partly on the other salts it may contain, or on the temperature at which it is drunk.

French writers have also laid much stress on a somewhat artificial distinction of sulphur waters into natural and accidental, according as they spring from primary and metamorphic, or from secondary and tertiary strata, according as the sulphur is united with soda, or with lime, and special virtues have been attributed to the presence of silicates in the Pyrenean waters.

Among all these conflicting views it seems scarcely possible at present to arrive at the truth.

The human system contains a good deal of sulphur, which is derived from the food in various combinations. Of the absolute physiological action of sulphur very little is ascertained; its most palpable properties are, that it is slightly laxative, and that if it is long used, traces of it appear in the cutaneous transpiration. Its action is supposed to be analogous to that of hydrosulphuric acid. That acid is always generated in the system in certain quantities, especially in the intestinal canal. When inhaled in anything like a pure state, it is instantly poisonous; when much diluted, its inspiration for a time is not deleterious: nay, as we have seen, it is beneficial in certain conditions. In its poisonous effects it appears to act directly on muscular contractility, and thus on the heart, the respiration, and the capillary circulation.

The action of the sulphurets of potass, soda, and calcium seems to have much analogy with that of hydrosulphuric acid. It has been proved that the sulphur of sulphuret of potass is absorbed. It passes partly into the

blood, where it soon gets oxidized. If too much is taken into the blood, the surplus seems to be deposited in the muscles and bones: it is eliminated partly through the urine, and partly through the breath and the perspiration, in the shape of hydrosulphuric acid. It has further been supposed, but this is purely hypothetical, that the alkaline sulphurets of the waters may render albuminates of mercury and of other metals retained in the system, soluble, and even that the sulphur combines directly with them, and so aids their elimination, which does not seem likely, as most such sulphurets are insoluble; possibly, if they cause increased activity of the liver tissue, a quickened metamorphosis of liver cells and increased secretion of bile may afford a simpler explanation of their action. Sulphurets act more powerfully than sulphur itself.

A few facts of a practical bearing respecting the operation of sulphur waters have been ascertained. That they are on the whole rather constipating, their aperient action being the exception. They all increase the amount of the secretion of the kidneys, some say of the quantity of urea. They do not improve the appetite, though they do not exactly impair it. The alvine excretions after a time get black and offensive, iron sulphurets are found in them, procured either from the food in the intestinal canal, or from the blood. It seems further to be pretty well ascertained that, under the continued use of sulphur waters, enlarged livers diminish in size, and



the system is apt to get anæmic. The theory of the anæmia has been supposed to be, that the blood-corpuscles may be diminished, owing to sulphur robbing them of their oxygen, in order to form hydro-sulphuric acid. When their use is long continued, symptoms come on of what is called saturation, an inability to drink more without loathing, and among other affections even a certain catarrhal affection of the throat, which the French have called Grippe.

Sulphur waters are used internally at most spas, to aid the operation of the baths in the diseases already enumerated in the chapter on Sulphur Baths. In Germany they are considered to act favourably on the hæmorrhoidal diathesis, making the circulation of the liver more active, diminishing abdominal plethora and local hæmorrhoidal congestion: whether this opinion is derived from the use of sulphur in some popular remedies for piles it is difficult to say, but it is widely spread in Germany, though not shared in by the English. On this account, and because the liver appears to be the great receptacle of metals, the sulphur waters are much drunk in metallic poisoning, and they have been considered useful in malarial cachexy and in enlarged spleen and liver.

In early tuberculosis, and in some bronchial affections, the drinking of these waters, particularly when warm, is used in aid of the inhalations of hydrosulphuric acid. The inhalation of that gas, which must always accompany

more or less the use of the waters, either in drinking or in baths, has been alluded to already.

The majority of the sulphur waters employed mainly for bathing are also used in drinking. Those that have been described above need not be mentioned again, and I shall only make an exception in favour of Aix-la-Chapelle.

Five cold springs that are much used in Germany, agree in the main as to the mode in which they are employed. They are little known to the English. They are much cheaper and quieter places than they like to frequent. Two glasses, gradually increased to six or eight, are drunk before breakfast. In all, I believe, there are inhaling rooms, where the hydrosulphuric acid has been separated from the waters, and is used mixed with a certain amount of atmospheric air. In other places aqueous vapour is impregnated with gas. These are :

*Weilbach*, in Nassau, where the operation of sulphur waters used internally has been chiefly studied. The water is exported. Though easy of access, it is not a very tempting place of residence.

*Nenndorf*, in Hesse, with sulphur mud baths, inhaling apparatus, and whey cures, and also salt-baths, in a pleasant country, with good arrangements.

*Eilsen*, in Lippe-Schomburg, offering much the same things to its guests, lies in a pretty open valley, but not much frequented.

*Langenbrücken*, in Baden, in a pretty valley between

Brucksal and Heidelberg, the same, and with a pleasant country and climate. It has, however, a much larger concourse of visitors, although the accommodation for them appears to be limited to what the *Kurhaus* supplies.

*Meimberg*, in Lippe-Detmold, offering in addition a pneumatic apparatus, and situated on a pleasant spur of some wooded hills, on a larger scale than the others, and holding out more inducements to visitors, and, with its drinking well, containing so much salt, that it might be counted among salt waters.

*Aix-la-Chapelle*, and the neighbouring waters of *Burtscheid*, are believed to owe a good deal of their virtues to the chloride of sodium, 20 to 21 grs. in the 16 ozs., which they contain. The source "Elisen" is the one most used for drinking; it is disagreeable at first, but people get accustomed to it, and even to like it. They begin with 6 or 8 ozs. and increase it gradually to three or four times that quantity. As its temperature is about  $110^{\circ}$ , patients walk up and down, tumbler in hand, till it cools.

Besides having the general operation of sulphur sources, the water of Aix-la-Chapelle contains enough of salt to make it produce many of the same effects as Wiesbaden and other thermal salt waters, so that the operation of its springs, when drunk, is believed to combine the effects of salt and of sulphur waters. While Weilbach has got a special name for the treatment of phthisis, associated with fatty liver, and of cases of

enlarged liver, it is difficult to see why the same cases might not be treated with advantage at Aix-la-Chapelle. The former certainly has somewhat the advantage in point of climate. Aix water has of late years been exported a good deal.

Some Swiss springs of ordinary temperature will next engage our attention. Their establishments are on a small scale, and chiefly resorted to by the natives ; but they are in the midst of such beautiful scenery, and some of them, such as Gurnigel and La Prese, are so elevated, that it is surprising the English do not oftener turn aside to them. The arrangements in all have rapidly improved of late years. But they are all on quite a small scale after the baths of Germany and of France.

*Stachelberg* lies at the height of about 2,000 feet, at the end of the Lin Valley, in Glarus, in some of the finest and grandest scenery in Switzerland. Its waters only contain about 4 grs. of mineral constituents in the 16 ozs. They contain, however, abundance of carbonic acid gas. The place is immensely crowded in the season. Drinking the water and bathing in it are both practised, and the diseases, especially the cutaneous ones usually treated with sulphur waters, are the subject of treatment here. But affections of the chest are specially benefited by the waters, mixed with milk or whey ; there is a whey cure.

*Lenk*, near Weissenburg, is a promising new bath.

*Gurnigel*, which has of late risen into importance, lies among the mountains to the right as you go from Berne

to Thun. It is 3,850 feet above the sea. The waters contain sulphate of lime. They drink the water in large quantities; but when they exceed ten glasses per diem, symptoms of saturation occur. These waters are used much in dyspepsia and hypochondriasis, in congestion of the liver, and in bronchial catarrh. There is a handsome bathing establishment, and also provision for the poorer class of patients.

*Heustrich* is in a valley not far from Thun and the lake of that name. It is distinguished from the other sulphur springs by containing a little carbonate of soda, but only somewhat over 6 grs. in 16 ozs. To this, however, its efficacy in chronic bronchial catarrhs is attributed. In these it has a very great reputation. The arrangements are most comfortable.

*La Prese*, a little off the high road from the Engadine into Italy, with romantic scenery and a beautiful little lake, 3,000 feet above the sea, is completely sheltered from the north and north-east, and enjoys a wonderfully mild climate. The waters contain sulphate of lime; but the source of this and of the four preceding stations are feebly mineralized. Now that the current has set in so much towards the east of Switzerland, this place may meet with the attention it deserves. Good whey is supplied, and baths of whey, and also the fresh *kraüter säfte* are to be found. A sheltered place like this, at so considerable an altitude, may be found useful in many pulmonary affections.

Switzerland is wonderfully rich in sulphur waters ; many others might be mentioned, such as *Alveneu*, not very far from St. Moritz, and I may be excused for mentioning the Moffettas, or gas springs, not far from Tarasp, issuing from certain clefts with such strong vapours of sulphuretted hydrogen, that dead beetles and frogs, and even mice and birds, are to be found around them.

France, so rich in thermal sulphur springs in the Pyrenees, is not so well supplied with cold ones. Almost all the Pyrenean springs already enumerated are used for drinking as well as bathing. I shall only mention two more.

*La Preste*, high up in the mountains, along the river Tech from Amélie. It can only be reached by mules, and, though within French territory, is quite Spanish. It is situated in a savage gorge. The well is of the temperature of 118°. The supply of water is ample. It is chiefly used internally for lithiasis and catarrh of the bladder. Its season is from June to the end of August. There are interesting grottoes with stalactites.

*Visos*, a cold sulphur and bituminous spring, near St. Sauveur, is a good deal drunk by people frequenting that bath. It has no establishment ; and has a great reputation in ulcers and old wounds, also in chlorosis, because it is supposed to contain iron. It is exported.

*Allevard*, in a beautiful Alpine valley, between 1,400 and 1,500 feet above the sea, with very charming

scenery, one hour's drive from the Grenoble railway, has risen into importance within the last forty years, as a cold sulphurous spring.

There is some difference of opinion respecting the constitution of its waters. The mineral contents are very small; while they contain quite as much hydro-sulphuric acid gas as Eaux Bonnes, these springs have a great deal more carbonic acid. It is said that the presence of this large quantity of carbonic acid makes the waters sit more lightly on the stomach than most other sulphurous ones; while the quantity of nitrogen also present, is of use in the cold inhalations of the hydrosulphuric acid, which are practised here, as well as warm ones, with great success in affections of the chest. These waters are employed in all cases in which sulphur waters are used, but specially in the diseases of the respiratory organs. The arrangements here are excellent, and the place is well worthy of being better known to the English. There is a whey cure.

*Enghien*, with its pretty lake, is not far from Paris, and has indeed become almost an *annexe* to it. It has mild sulphur waters, used both for drinking and for bathing. They have the usual effects of sulphur wells; but as English in search of health are not likely to stop short at Enghien, it seems unnecessary to enter into details.

*Caratraca*, some leagues from Malaga, is probably the most visited watering-place in Spain. The country about is beautiful, the climate delicious, and there is plenty of



amusement to be had. The water, of a temperature of about 66°, is but feebly mineralized, but it enjoys a great reputation in skin complaints, in scrofula, and in bronchial catarrhs. It is used for drinking, bathing, vapour baths, and injections. Season from 15th June to 30th September.

There are also *Ormeztaguay*, cold sulphur, near Tolosa, and *Santa Agueda*, to be mentioned again for its iron waters, belonging to the group of wells near San Sebastian, so worthy of further investigation. They are much resorted to by the Spaniards.

Great Britain, poor in thermal springs, is also poor in sulphur ones; and the well which used to be considered the type of English sulphur fountains, the old sulphur one at Harrogate, contains so very large a quantity of common salt, 108,272 grs. in the 16 ozs., that it must take its place among the salt springs.

*Gilsland Spa*, near the borders, on the railway between Carlisle and Newcastle, is prettily situated in a broken country, in the neighbourhood of the old Roman wall, and of one of its most remarkable stations. According to old analyses, the well, while very free from mineral constituents, would seem to contain about two inches of hydrosulphuric acid in the sixteen ounces, (?) a very considerable proportion. *Gilsland* has also an iron spring. The waters are believed to be useful in dyspepsia, chronic rheumatism, and skin complaints.

The place is much frequented in autumn, chiefly by

people from Liverpool and the West of England. If the waters be not very powerful, yet I know no place in England, where people of moderate means can get more in the way of pleasant relaxation, often as useful as medicine, than here. That the cases of illness treated are not very acute, seems plain from the fact of there being no resident doctor.

*Moffatt*, in the south of Scotland, in an interesting country, with a somewhat damp climate, has long been a favourite watering-place. It, like Harrogate, only in a minor degree, contains a good deal of chloride of sodium, about as much as Aix-la-Chapelle. Its chief constituents are, in twenty ounces: hydrosulphuric acid, 2·65 inches; sulphate of lime, 1·19 grains; sulphate of soda, 2·07; chloride of sodium, 22·07. It therefore is by no means very unlike Aix-la-Chapelle, having the same quantity of common salt, and perhaps more hydrosulphuric acid, but its waters are cold. *Moffatt* has maintained its position very well. An old author's account of the action of its waters is as follows:—"It proves mostly an alterant and a diuretic; it generally opens the belly, and it purges some people." Like other sulphurous waters, it has been much used in cutaneous affections and in chronic obstructions. *Moffatt* has much to recommend it.

*Strathpeffer*, in a narrow valley in a very picturesque country, at the foot of Ben Wyvis in Ross-shire, our most northern spa, has four (two principal) sulphur

wells. The pump-room, or new well, according to Dr. M. Thomson's analysis, would seem to contain in the pint about 12·5 grains of sulphate of lime ; 3·5 carbonate of lime ; 7·5 sulphate of magnesia ; 7·5 sulphate of soda ; sulphuretted hydrogen, nearly three inches (?). The upper well contains only half the amount of lime, and about one quarter more of magnesia. They are undoubtedly strong sulphuretted waters.

The usual dose of these waters is three tumblers before breakfast, and three more in the afternoon. Baths can be had, but they are little used in the treatment.

These waters, which appear to be strongly diuretic and usually slightly constipating, are believed to be very efficacious in rheumatism and in dyspepsia, and in cutaneous affections. They are greatly frequented by the people of the country, who come from long distances and drink the water in enormous quantities, but the arrangements are very imperfect, and living is by no means cheap. However, there is a large resort, the clerical element predominating, to these wells, which are very celebrated in the north of Scotland, and it would no doubt be increased if a higher style of accommodation were given, and this will certainly follow the formation of the new railway to the Isle of Skye.

Ireland is very poor in wells of all kinds. The wells of *Swanlinbar* and of *Lisduvarna* scarcely deserve mention, so far as their mineralization is concerned,

nor do they offer such accommodation as can attract strangers.

Before leaving the subject of sulphuretted waters, I shall give the following table, which shows how difficult it is to connect the action of such waters with their containing any considerable quantity of sulphur. The Pyrenean waters, though smelling strongly of it, contain only traces that can be detected by chemists, and their virtues are believed to reside in sulphuret of sodium. It is very doubtful whether the analyses giving large quantities of hydrosulphuric acid set down to Groswardein, and perhaps to some of the others, are really trustworthy. The table gives the cubic inches of the gas in 16 ozs. The sulphuret of soda is in grains to the 16 ozs.

	Hydrosulphuric Acid.	Sulphuret of Soda.
Aix-la-Chapelle . . . . .	0'5 . . . . .	—
Burtscheid . . . . .	0'12 . . . . .	4'834
Weilbach . . . . .	0'16 . . . . .	—
Eilsen . . . . .	1'51 . . . . .	—
Schinznach . . . . .	1'72 . . . . .	—
Barèges . . . . .	trace . . . . .	0'360
Eaux Chaudes . . . . .	do. . . . .	0'893
Luchon . . . . .	do. . . . .	0'476
Amélie . . . . .	do. . . . .	0'24
Groswardein . . . . .	5'34 . . . . .	—
Strathpeffer . . . . .	1'7 . . . . .	—
Harrogate . . . . .	0'66 . . . . .	—

## CHAPTER III.

### SALT SPRINGS.

THE common salt, or chloride of sodium waters, form a tolerably natural group, and one might have supposed that by this time the precise action of so ordinary a substance as culinary salt on the human system might have been accurately ascertained; but our knowledge of the subject still remains very general.

It is not surprising that chloride of sodium is abundant in the human body, as it is a constituent of almost all our food and drink. It has been calculated that a full-grown man may have from 800 to 1,800 grains of salt in his system, and the daily supply taken in has been calculated at from 90 to 300 grains. Salt forms from 40 to 45 in 10,000 parts of blood; it is a constituent of most of the secretions, of watery transudations in disease, as in cholera, and accompanies the secretion of urea.

Its physiological effects have been thus described: first, introduced into the stomach and added to the

food, it, as a solvent, extracts from them their albumen and starch; next, it helps to pass on to the bowels a soft mass well supplied with these substances; thirdly, it furnishes a sufficient supply of itself to the blood for the purposes of absorption, secretion, and change of tissue, without permanently overloading the blood, as its excess is quickly excreted again.

An increased use of salt may be considered to augment temporarily the amount of salt in the blood and in the secretions. The secretions become more abundant, change of tissue is accelerated, the action of the alimentary canal and of the generative organs is slightly stimulated; no direct action on the nervous system has been observed.

When taken in too large doses, it may cause congestion and inflammation of the alimentary canal and kidneys (possibly of the brain), of the conjunctiva, and the nasal passages. On the whole salt may, in a general way, be said to have the power of rousing the vital functions.

Therapeutically, salt acts through the capillaries on the stomach, increasing the secretion of the mucous follicles; it also exerts a similar influence on the bronchial surfaces and on the skin. It stimulates the liver as a cholagogue, and promotes a healthier activity of its functions; as an aperient, which it always is when taken in considerable doses, it is useful in obstructions of the circulation of the portal system. It also favours absorp-

tion, undoubtedly often removing fat when it is excessive, and glandular infiltrations.\*

Salt waters require to be carefully employed, as their protracted use is debilitating. When used too long and in too great quantity, they may produce loss of appetite, giddiness, drowsiness, biliary derangement, diarrhoea, and irritative fever. Those waters which contain most carbonic acid are pleasantest, and most easily borne by the stomach; but especial care is needed in their employment in the case of those who are full-blooded.

Salt waters are probably more useful in improving certain states of system, than in acting specifically on structural changes of particular organs. First in the list of these states comes scrofula; but a good deal has already been said of it in connexion with salt-bathing.

There are two forms of anæmia which benefit much by salt waters, that of women, and tropical anæmia. In such cases the question has always to be decided, whether the case is to be treated at once with iron—whether it is better to present iron directly to the system, or to endeavour to get the system into such a state, that it may be able to assimilate the iron presented to it in the various articles of food. It may often be best to begin with salt

\* I am only aware of a few applications of common salt in ordinary medicine: as a vermifuge, in which it has often seemed to me to be a very useful adjunct to the bark of the pomegranate root; as a febrifuge it has been used a good deal by the French and the Americans. Salt as a domestic remedy is useful as an emetic, and as an addition to enemas.



waters, in small doses, especially when there is irritability of the alimentary canal, or congested state of liver. Practically I have often been disappointed in the use of iron in such cases. Some recent researches point towards the settlement of these questions. It has been found that chloride of sodium does not, like chloride of potass, cause a copious elimination of iron in the urine; on the contrary, it appears greatly to favour the assimilation of that metal. It had been shown formerly that iron, when given internally, is not absorbed of itself, without the favouring agency of chloride of sodium. The great desideratum, therefore, would be a well containing iron and salt in such proportions as to make them readily absorbed, and without that predominance of salt which makes the use of any considerable quantity of such waters cause purgation; but no well exactly of this character has been yet discovered. The *Luisen* well at Homburg is an approach towards it. Chlorotic anæmia will be afterwards alluded to. Here a few words about the tropical form may not be out of place.

By Indian cachexy, and the French have described a similar state in Algiers, is meant the result of longer or shorter exposure to heat, moisture, and malaria; I mean the general condition induced, whether by general atmospheric influences and long residence, or by repeated attacks of fever, liver, or dysentery. Even after the chronic diarrhœa, so often an obstinate adjunct of this state, has been got over, there remains very generally with torpor of

the liver, perhaps along with that odd symptom burning of the feet and hands, a general relaxation of the system, manifested in a great liability to catarrhal attacks, with frequent elongation of the uvula, and often in women with leucorrhœa. There is a general want of red blood, and deficiency of fibrin manifested, as I have known, by troublesome hæmorrhage after trifling operations, such as snipping off the uvula or the extraction of teeth. From this latter cause I have more than once seen very serious effects follow. In such conditions, where it must always be a matter of time, recovery may be materially assisted by a visit to many of the salt springs; in short, when the symptoms of general cachexy predominate over local affections.

Dyspepsia is very often benefited by the use of salt waters. Here the choice lies very much between salt and alkaline waters, unless a very free action of the bowels is required, when some of the more purging waters are indicated. In chronic diarrhœa there is some evidence that these waters are of use when given in small doses. Liver and spleen are said both to diminish under the use of these waters. I have no doubt that they do; but for the former, alkaline or purgative waters are more adapted, and for the latter, purgative or steel ones. Cases are reported of spleen cures with salt water, and, considering the analogy of the action of chlorides with that of iodides and bromides, there is nothing improbable in this; salt are undoubtedly more effi-

acious than alkaline waters in such cases, but there seems to be no sufficient evidence of any direct action on the spleen, and in spleen I should have more confidence in the usual medical treatment than in mineral waters.

Salt waters are extremely useful in a great variety of female complaints depending on general relaxation of the system in older, and on imperfect development in younger patients. A great deal of unnecessary local treatment is often saved by a visit to a salt spring, especially when the patients are once got to believe that the local treatment is unnecessary, and I venture to say that one half of it might be omitted with advantage. No doubt chronic congestions and hypertrophy of the uterus are frequently removed, and its functions restored; no fibroid or other tumours are ever really dispersed.

Some congestive states of the eyes, such as choroiditis or inflammation of the ciliary body, occurring chiefly in women, and connected with feeble circulation, and not amenable to ordinary treatment, are often greatly benefited by alterative waters like those of Kissingen and Homburg, or steel ones like Schwalbach. Many baths have wells that have got the name of eye wells. I need hardly say that there can be no specific action in such cases, any more than in cases of deafness which may benefit by the favourable operation of such waters on the general health.

Patients going to the most popular baths in Europe, such as Homburg and Kissingen, or to Harrogate in

this country, are seldom aware that the chief constituent of the waters they drink, is common salt.

The following table shows the quantity of common salt in grains, and of carbonic acid in inches, in 16 oz. of some of the principal springs; also the presence or absence of iron, and of the carbonate and sulphate of lime. I have included muriates under the same head as carbonates.

	Temp.	Common Salt.	Carbonic Gas.	Iron.	Carbonate of Lime.	Sulphate of Lime.
Nauheim .	80° to 103°	124	20	0·19	12	—
Homburg .	—	76	48	0·46	17	—
Kreutznach .	—	72·8	—	0·199	13	—
Soden . .	—	94	42	—	8·3	—
Wiesbaden .	156°	57	6	—	6·8	—
Bourbonne .	149	51	18	—	8	6
Kissingen .	—	45	41	0·24	8	2·5
Pyrmont . .	—	54	23	—	—	6
Cronthal . .	—	28	33	0·25	5	—
Canstatt . .	75	19	23	—	7·3	7·5
Baden Baden	155	17	1	—	1·2	1·5
Harrogate K.W.	—	82	3	0·373	20	—
do. M.W.	—	26	3·2	3·23	17	—
Dürkheim .	—	49·2	—	—	18	—
Bridge of Allan	—	47·5	—	(muriate)	38·4	—

*Sea water*\* has frequently been used internally. The

\* An average analysis of its constituents has been already given; another one is added of the water of the German Ocean.

Chloride of sodium . . . . .	195'
Chloride of magnesia . . . . .	34'
Sulphate do. . . . .	5'4
Bromide do. . . . .	2'5
Sulphate of potass . . . . .	11'7

ancients often used it in that way, and indeed they used to mix it with some of their wines, thinking that a small quantity, about a thirtieth part of it, improved their quality.

Of late years French writers have been enthusiastic in its praises. They have said that sea water is a true mineral water, extremely rich in saline principles, containing in itself almost all the most valuable medicines. It has lime to harden our softened bones, iodine to purify our blood; it has heat concentrated in it with a "Je ne sais quoi" of something unknown, a gelatine or mucus, which bestows form and life. More of this sort of thing in Michelet.

Salt water was, however, about a hundred years ago, used extensively in this country, and it may be well to see how its action was then described.

"Taken internally in small quantities, it proves a stimulating, healthy remedy, dissipates the finer fluids, and increases thirst. Taken in larger quantity, it proves purgative, often at the same time causing thirst. What is remarkable of the use of it is, that patients often drink it daily for a considerable time in such quantity as to purge, and that instead of losing they gain strength by it, which is certainly owing to, besides its purgative action, its giving a stimulus to the stomach and the intestines, increasing the appetite, and improving digestion, whereas most of the common purgative medicines pall the appetite and dissolve the

blood at the same time that they cause large evacuations, which weaken the system.

“From our being able to keep up a purgation for a considerable time without hurting the constitution, we frequently by salt water remove disorders which have resisted other remedies. Dr. Russell wrote that he found few glandular swellings, which had not already suppurated, which he had not been able to remove by the use of sea water. This is perhaps too general an assertion, though it has been found most serviceable in removing recent scrofulous swellings in the neck and lips, and scrofulous ophthalmias, especially when joined to the use of bark. Sea water has likewise been found to be extremely serviceable in purging off gross humours which have been the consequences of indulging the appetite too freely, and leading too indolent and lazy a life, and in clearing the intestines of viscid mucus and of worms.”

These remarks of Dr. Munro have appeared to me worth preserving, as they illustrate what has been already said about the use of salt. I have no doubt that the action of salt water is truly enough described by him; but though we hear occasionally of patients drinking salt waters, it is a disagreeable and unpleasant remedy, never likely to come into fashion again.

*Kissingen*, in the pleasant valley of the Saal in North Bavaria, has not yet been reached by a railway; but it is only about two hours' drive from Schweinfurth, and

nearly three from Gmunden. It has long been one of the most favourite of modern watering-places, and a great resort of English; the writings of that patriarch of English Balneology, Dr. Granville, having contributed greatly to this. It has much to recommend it.

The Rakotzky is one of the milder salt springs, with a plentiful supply of carbonic acid, and a quite appreciable quantity of iron. The Pandur agrees closely with it. A milder spring, the *Maxbrunnen*, is a delicious table drink; the *Sool-bad*, about a mile off, with its *wellenbad* (supplied from that magnificent well, the great Sprudel, with its intermittent flow), is invigorating; and only four miles off is Bocklet with its strong chalybeate spring. The arrangements of all kinds are excellent. There is a handsome *Kursaal*; there are good hotels and lodgings, and pleasant excursions to be made in the neighbourhood. There is not so much dress or folly here as at Homburg, nor are the *tables d'hôte* so good.

The English often complain unreasonably of its being dull.

The waters were to me more palatable than those of Homburg, being less salt. The general indications for the use of waters of this sort have been already given. They are the waters about which the English public has heard most, so need not be described at large. The action of the water is milder than that of the Homburg ones. The water is drawn up on sticks



from the well, but the arrangement of open wells with girls to hand up the water is pleasanter.

*Homburg* is reached by railway, and being near Frankfort, is very centrally situated. Everything has been done to make it attractive to strangers; the magnificent reading and ball and gambling rooms are open to all; the grounds are extensive and beautifully laid out; the wells are abundant and various; so that it is not surprising that the place has attained a wonderful degree of popularity. Its wells may, on the whole, be described as a more powerful Kissingen; and the place being more open, and standing higher, on the slope of a hill, makes the heat not feel so oppressive as in Kissingen. At this moment Homburg is the most popular bath in Europe.

French, English, and Americans quite outnumber the Germans. Here comes the fine lady to recruit from the dissipation of the last season; the *bon-vivant* to repair his digestion after the good things he has been indulging in; the clergyman, or the man of business, for relaxation. You have leading statesmen and capitalists meeting all the black-legs of Europe. Still there is an immense deal of benefit to be got from the waters; but for the reason which led me to say little about Kissingen, I shall not say much about Homburg.

An analysis of the Elizabethbrunnen is given in the table; the Kaiser has only 55 grains of salt, and as much iron; the Ludwig, 40 grains, and no iron; the Luisen, 23 grains of salt, and 33 of iron. The waters are mainly

drunk, and three glasses of the Elizabethbrunnen have generally a very distinct aperient effect. Baths of all kinds are supplied here; but Homburg is not a place to go to for bathing. The carbonic gas inhalation-rooms are not much used.

Only a very few words are required about some places whose waters are mainly used for bathing and have been already mentioned, but are also employed internally.

*Kreutznach.*—The Elisenbrunnen is chiefly used for drinking, and notwithstanding the absence of carbonic acid gas is less disagreeable than might have been expected. It is considered an important adjunct to the cures.

*Nauheim.*—The chief drinking spring is somewhat salt and unpalatable; the milder one is mawkish, but the pleasant acidulous waters of *Schwalheim* are only a mile off. They are drunk a good deal at Nauheim, and exported.

*Wiesbaden* is more of a bathing than of a drinking source; still its waters, with their chicken-broth smell, are well suited for cases where a moderate action of chloride of sodium is desired. They are applicable in some forms of indigestion, and in atonic gout, in enlarged liver, and even spleen.

*Baden Baden.*—The waters of this place are still milder, and much the same may be said of them as of the last, only that their action is slighter.

The *Bourbonne* and *Balaruc* waters are both used

almost entirely for bathing in these days, but are also occasionally used internally.

*Pyrmont*, known better for its iron springs, which will be mentioned afterwards, has a pleasant salt spring with a moderate amount of salt and plenty of carbonic acid gas.

*Soden*, at the foot of the southern slope of the Taunus mountains, has a number of salt springs of lukewarm temperature. The place is cheerful, and nicely laid out. It makes a convenient change from Homburg, but has many saline rivals in its neighbourhood, as Nauheim, Homburg, and Cronthal. The climate, like that of Wiesbaden, is counted mild, at least for an inland one, and in consequence Germans recommend the place in threatened phthisis. Some of its wells contain from  $\cdot 2$  to  $\cdot 3$  grains of iron.

*Cronthal*, half an hour's walk from Soden, and prettily situated a little higher, makes another pleasant change from Homburg. Its waters are very mild, the strongest well having only twenty-seven grains of common salt in the sixteen ounces.

*Canstatt*, adjoining Stuttgard, has its warm wells and baths at the foot of a low hill laid out in gardens, and having beautiful views up the valley of Stuttgard. The climate is mild. The waters offer a moderately strong supply of salt, with a small one of iron. They have considerable repute in dyspepsia and other affections not requiring more active waters. There are many English

resident in Stuttgart for educational and other purposes, and they might make more use of these waters than they do.

*Ischia*, an hour and a half by steam from Naples, at the northern corner of the bay ; whether this island be an epitome of the universe, as it was called by Bishop Berkeley, or not, it is probably the most interesting bath in the world. The variety and the abundance of its sources both in caloric and in mineral constituents, the beauty of its scenery, its delicious climate, and its historical associations, distinguish it from all others. It combines the advantages of sea-air and sea-bathing with those that are special to its wells, and almost its only drawback is its insular position. Plenty of accommodation can be had. There are excellent lodgings on the hills above the village of Casa Micciola, where the air is much cooler than down below, and bracing as compared with the air of other Italian places in summer. A good many English resort to *Ischia*.

There are fourteen sources in the island, varying from  $72^{\circ}$  to  $170^{\circ}$  in temperature ; one is believed to come up to  $212^{\circ}$ , and one rises in the sea. They are essentially salt springs, with an unusual quantity of carbonate of soda, and with a greater or smaller amount of the purging sulphate of soda, with a considerable quantity of carbonic acid. I have not seen the latest analysis of these waters, but some of them have been stated thus :—Capponi, common salt, 25·7 ; carbonate

of soda, 10.55; sulphate of soda, 2.3 grains; carbonic acid, 2.3 inches. Gurgitello has been stated at: common salt, 32; carbonate of soda, 30 grains; carbonic acid, 9 cubic inches; but the quantities of solids are probably too high.

The Bagno Fresco is believed to have the virtues of Schlangenbad, for the skin.

Gurgitello is used almost entirely in baths. This is the water most employed and best known to strangers.

Capponi, having the chicken-broth smell of some waters, is more drunk, is slightly aperient, and used chiefly for the digestion.

Citara, beautifully situated, has long had the same virtues attributed to it as the *Buben Quelle* at Ems. It contains much salt, and is used chiefly in baths; taken internally, it is very purgative.

Acqua di St. Restituta is the strongest.

Olmitello has a reputation in calculous disorders.

There are natural vapour baths at Castiglione and at Cacciuto, at San Lorenzo, and elsewhere, and the process of arenation is carried on here.

It is evident that a great range of diseases may be appropriately treated at Ischia. In rheumatism, and in all diseases requiring active thermal treatment, these baths, with proper precautions, may be used with great advantage. The baths of Ischia are capable of much further development.

*Castellamare*, near Naples, formerly *Stabiæ*, contains a

number of salt springs known to the ancients. They vary in strength, but their main constituent is common salt, with small quantities of carbonate of soda and somewhat larger of sulphates of soda and magnesia. There are also chalybeates of various strength, one with a good deal of carbonic acid, another sulphated with hydrosulphuric acid; it is therefore easy to see how these waters may be of much use in affections of the digestive organs. On the spot the different wells are considered to vary very considerably in their effects, and different wells are prescribed according to the nature of the malady; rheumatism, gout, obesity, cutaneous affections, being of the number.

*Pozzuoli*.—The use of the old thermal waters at the temple of Serapis has been revived of late years, and they are in considerable repute at Naples. The temperature of the hot spring is about  $106^{\circ}$ . These waters are weak salt ones, but they contain a good deal of soda, and one of them should be valuable in dyspepsia according to its analysis, which gives it carbonate of soda, 8 grains; ditto magnesia, 1.20; ditto lime, 1.50; ditto iron, .53.

*La Porretta*, lying between Pistoja and Bologna, is three hours by rail from Florence, in the valley of the Reno, at the foot of the Appennines, but at a height of 1,100 feet; it has thermal springs of temperature from  $85^{\circ}$  to  $100^{\circ}$ , the main constituent of which is common salt—in the stronger wells reaching to 60 grains in

the pint — containing a little sulphuretted hydrogen, and so much carburetted hydrogen, that it is collected for the purpose of lighting the little town.

There is much variety in the strength of the waters, and they may be applied in consequence to the treatment of a great variety of affections. But their special reputation is in the treatment of cutaneous diseases, no doubt owing to the small quantity of hydrosulphuric acid they contain. Besides being drunk, the waters are also employed in baths and douches, and they may be used at their natural temperature.

The arrangements of the place are fair, but it is scarcely visited by English, though with management they may do very well. There is a casino close to the spring where people may lodge, but in the village on the hill it is better and healthier.

*Monte Catini*, between Lucca and Pistoja, in the valley of the Nievole, is a pretty enough place, and the most important salt bath in Italy. The arrangements are on a handsome scale, and in former times the Dukes of Tuscany visited it annually, and were its great patrons. There are hotels and lodging-houses. The strongest spring, the *Terma Leopoldina*, of about the temperature of  $93^{\circ}$ , contains 140 grains of common salt in the 16 ounces; a milder one is employed for drinking—it contains a little carbonic acid gas, and is of the temperature of  $80^{\circ}$  to  $81^{\circ}$ . Like other salt springs, these have been lauded for containing iodine.



The stronger spring is used for bathing; the Tettuccio, a weaker one, for drinking.

The Italian doctors consider these waters sovereign remedies against dysentery and ague, and enlargement of the liver and spleen. Constantine James even classes them with Carlsbad in hypertrophies of the liver; but there appears to be nothing in the chemical constitution of the waters, to make us expect any other results than those obtained at Homburg and Kissingen, and the absence of carbonic acid makes them much less pleasant to drink. However, it is very remarkable, how for centuries these waters have been praised in dysentery and in the consequences of inflammation of the bowels.

The neighbouring grotto of Mosumanno is much used as a *stufa* or hot air bath. The grotto is dark, and as you pass on, you get gradually hotter and hotter till you reach the *inferno*, by which time you are bathed in the most copious perspiration; it is very useful in rheumatism, but much care is required to avoid chills after the process. The arrangements are somewhat rough; people go in bathing clothes, which get saturated with moisture, after which the patients are packed in blankets and sent home. A good many English go to Monte Catini.

*Cestona*.—The thermal salt waters of this place have obtained considerable popularity. Of a temperature of 88° to 94°, they seem to contain chiefly common salt, forty-six grains, with one-third as much sulphate of lime,

and about one-ninth of sulphate of soda in the pint. They are very distinctly purgative. The waters are used for drinking, for baths, and douches. They are used in rheumatism, disorders of the digestion, and in bronchitic affections.

There are good hotels, and the neighbouring country in the north of Spain is beautiful. It is one of the group of Spanish baths within easy reach of San Sebastian, which comprise sulphurous, iron, carbonated, earthy, and chloride of sodium waters.

*Harrogate*, with the most important drinking waters in England, and therefore mentioned here at somewhat disproportionate length, has kept up its reputation ever since it was discovered. The place itself is ugly and not attractive, but agreeable excursions can be made from it. The air is bracing, and those who find the upper part of the town too much so, can reside in the lower and more sheltered part.

There are three wells, all very fairly pure salt ones. The old sulphur well, with 108 grains of salt, has barely 12 of lime and 2.75 inches of carbonic gas; the Kissingen well, 82 of salt and 25 of lime with a little iron, and 3.02 inches of carbonic gas; while the mild sulphur well has 29 grains of salt and 4 grains of lime, 1.78 inches of carbonic gas. There is therefore considerable choice among these waters.

A recent practical writer, who has had ample experience of Harrogate, Dr. Myrtle, represents the action of

these waters, taking the strongest as his type, as stimulant; increasing the secretions from the stomach and the intestinal canal, acting also on the liver not only as a cholagogue, but promoting a healthier activity of its functions; as an aperient, acting comfortably, and often removing habitual constipation; as a resolvent, causing rapid absorption of the fatty tissue in cases of obesity; nay, even reducing chronic hypertrophy of the uterus, and gradually reducing glandular indurations and gouty and rheumatic swellings. He finds the purgative action of the water not so lowering as that of sulphates, citrates, and tartrates of magnesia, potash, and soda. Many patients take it in medium doses with comfort for weeks together. Usually it is not given for more than eight days to three weeks, but in some cases patients have expressed a liking for it, after it has been daily taken in full doses for weeks and even months, while the patient shows no sign of being weakened by its use. If taken injudiciously, however, it produces, as the French would say, symptoms of saturation, constitutional disturbance, characterised by loss of appetite, thirst, giddiness, drowsiness, headache, biliary derangement, and fever.

A pint to a pint and a half taken in half-pint doses at intervals of fifteen or twenty minutes, beginning an hour or hour and a half before breakfast, is generally sufficient to produce its aperient action. To secure its alterative action, from two to eight ounces are taken

cold three or four times a day. When the digestion is weak the water is prescribed warm, as when taken cold it lies heavy on the stomach. The class of patients that improve most at Harrogate are cases of faulty digestion and assimilation, arising from purely functional or organic causes, or from a mixture of both, also men suffering from failure of nervous force consequent upon over-work.

Who can fail to observe that these are exactly the same class of cases that benefit so much at Homburg and Kissingen?

The best time for taking the Harrogate waters is from May till the end of September. But patients may drink and also bathe at any season with advantage; Harrogate, however, is not a place for delicate people to go to in inclement weather. The great resort of visitors to Harrogate is, I believe, from the west of Scotland and north of Ireland.

*Bridge of Allan*, near Stirling.—The sheltered situation of this place makes it a favourite resort for the people of Edinburgh and for others, who are glad to escape for a time the cold wind of the eastern coast. It has a salt spring, which contains in the pint 47·5 grs. of common salt, 38·4 of muriate, and 4·15 of sulphate of lime; unfortunately the presence of nearly as much lime as of salt impedes the favourable action of the former. Nevertheless these waters are a good deal resorted to for affections of the digestive organs—certain forms of which

are commonly supposed to be induced by whisky drinking and the use of oatmeal. The waters are aperient, and they are heated before they are drunk. Three tumblers before breakfast is the usual quantity.

Bridge of Allan is a very pleasant health-resort, as are also the smaller places of *Bridge of Earn* and *Innerleithen*, both having waters of the same nature with it, containing a good deal of common salt, along with muriate of lime.

## CHAPTER IV.

### ALKALINE WATERS.

It is pretty certain that the fibrine and albumen of the blood are kept in a state of solution by the presence of alkalies. Soda is the alkali the presence of which is most important in the human system—far more important than that of potash. It is found in the blood combined with chlorine, with phosphoric and carbonic acids. Most of the fluids of the body are indeed alkaline. The saliva is commonly so; bile has a weak alkaline reaction; the mucus of the whole intestinal canal is alkaline; the urine in man is usually slightly acid, and it is one of the functions of the kidneys to remove excess of alkalies from the system. The physiological operation of the alkalies is very imperfectly known. It is probable, although it is not proved, that alkalies accelerate, while acids retard oxidation. Two modes of the operation of alkalies are undoubted; their chemical action on acids with which they come in contact in the system, and the fact that their presence is essential to the formation of bile.

Large doses of alkalis readily make the urine alkaline, and it is believed render other fluids of the body so also. The salts of soda are diuretic; the carbonates more so than the chlorides. The carbonates and bicarbonates act most directly on the system; but all the combinations with vegetable acids are rapidly decomposed in the stomach. It is only in small doses that alkalis assist digestion, and thereby the nutrition of the system; in large doses they have been proved by experiments on animals to obstruct assimilation. There is no question that the continued use of large quantities of alkalis is very lowering to the system, mainly through altering the consistence of the blood, and making it more fluid.

The theory of the use of alkaline waters has hitherto rested mainly on their chemical action on the fluids, their saturating acids, and their producing alkalisation; granting that there may be such a condition, will alkaline waters in the quantity that is usually drunk, induce it, and how long does it last, after their use has been given up? This notion of counteracting acidity at once leads us to the digestive processes, and affections of the stomach.

*Dyspepsia*.—There are no cases more likely to profit by a resort to a suitable spring than dyspeptic ones. The symptoms of this complaint (the disease indeed is in one sense only a symptom) need not be described here.

But a state of things which often occurs in those who have resided long in the tropics, and have no organic disease, is this. There is a feeling of nausea on getting



up in the morning, leading either to hawking up a little mucus, or sometimes to vomiting up the contents of the stomach. In such cases elongated uvula is very frequent, and by its irritation it keeps up a short cough. There is often also a relaxed state of the throat, and a granular state of the pharynx. The condition comes close to that of laryngo-pharyngitis, only the voice and larynx are not commonly affected. After regulation of the diet, which is a very important point, the use of an alkaline water will often aid to remove these symptoms of disturbed digestion.

In functional diseases of the stomach generally, alkaline waters may be useful, first, in relieving acidity, and secondly, in influencing favourably the innervation and peristaltic action of the bowels. True mucous catarrh of the stomach—and writers are by no means agreed as to what constitutes this—generally requires some more powerful waters; when diarrhoea is mild enough to come under the designation of intestinal catarrh, small doses of the warm alkaline waters may be of use.

*Liver.*—Whatever the specific action of soda in the secretion of bile may be, it is certain that enlargement of the liver often disappears under the employment of alkaline waters, though probably not so fast as under that of more purgative ones.

However the desirable effect is produced,—and the emulgent effect of large quantities of water must help the

passage of all stones,—I have known patients suffering fearfully from gall-stones recover their health completely by periodical visits to alkaline waters. No doubt assisting causes may be found in the facts, that the increased consumption of water favours the secretion of bile, and quickened action of the intestinal canal stimulates the liver.

There is no evidence that alkaline waters are of use in enlargements of the spleen.

*Diabetes.*—On the idea that want of soda is the reason why sugar does not convert itself in the blood, soda was for a long time used in this complaint. The general conclusion arrived at concerning it seems to be this, that while continued long and given in large doses it is distinctly injurious, in smaller doses, again, it has often proved of positive, at least temporary benefit. This may arise either from a favourable action on the liver, disorder of which is at the root of diabetes, or from moderating the excessive secretion of acid common in diabetic patients. But whatever the theory of its operation may be, most practical writers have recognised the usefulness of small doses of alkalies in diabetes. Vichy and Carlsbad waters have their rival advocates, and the effect of both depends mainly on the carbonate of soda which they contain. Various sagacious physicians have satisfied themselves that these waters, whether from their thermality or other cause, are more efficacious than the simple exhibition of carbonate of soda. It is, of course,

only in the early stage and in the milder forms of the disease that a certain amount of benefit is to be expected.

In *lithiasis*, or the tendency to form stone in the bladder, much was for a long time expected from the chemical action of waters ; but hopes have been disappointed. Münch's experiments show, that although the use of carbonate of soda at first diminishes the quantity of lithic acid in the urine, this effect after a time disappears. When actual concretions have been formed in the bladder, it has never been known that they have been diminished in size or dissolved by alkaline waters ; nay, there is even some suspicion that the latter have sometimes led to the formation of them.

Ample dilution with hot water is probably the secret of success in some cases of gravel, as also in vesical catarrh, and in affections of the kidneys, in which alkaline waters have been employed, in most of which cases the simultaneous action of baths on the skin is not to be overlooked. In such cases no doubt the actual alkalescence of the mineral waters helps, and the presence of a little common salt does not interfere with the alkaline action.

In *gout* alkaline waters are often found very useful. They were given on the theory that they were to saturate lithic acid, which in cases of gout was supposed to be in excess in the system ; but the modern view is that there is a deficiency of lithic acid. The undoubted efficacy of such waters probably depends on their favouring retrogressive changes and the absorption of fat ; as treatment

by alkaline waters is essentially lowering, it is only in the more active forms of gout in the robust that these waters are indicated.

*Mucous Membranes.*—It has long been known empirically that the use of alkalies tended to diminish catarrhal discharges. This effect was produced, probably not, as was commonly thought, by the alkalies softening them, and making them thinner; but rather, while they diminished their quantity, by making them more consistent: and a recent theory has been propounded that alkaline solutions excite ciliary movements on mucous surfaces, and thus lead to altered action of them.

*Respiratory Organs.*—Alkaline waters are accordingly often found useful in chronic bronchial catarrhs, and, as they are generally thermal ones, their warmth no doubt greatly facilitates expectoration. In the same way, in some forms of consumption connected with acidity of the stomach and impaired digestion, alkalies are often used with advantage, and we can understand how some of the alkaline waters abroad have obtained a reputation in incipient phthisis. They are also much used in all laryngeal affections, and in vesical catarrhs, as already mentioned.

*Diseases of Women.*—Slight vaginal catarrh is often treated with alkaline waters, but more by their local use than by drinking. Such cases usually require treatment of a more tonic character. If an anæmic condition is present, they are contra-indicated.

The number of powerful alkaline waters is not great. In fact they are only drunk at a few sources, while there is an immense export of such waters. In examining the following table, it is to be recollected that they almost all contain more or less of common salt, and that the quantity of carbonic acid is stated variously by different observers.

TABLE OF THE CHIEF CONSTITUENTS OF THE CHIEF ALKALINE WATERS.

	Temp.	Carbonate of Soda.	Carbonate of Magnesia.	Chloride of Sodium.	Carbonic Acid, in inches.
Vichy . . .	105°	37·5	2·3	4	13
Vals (about)	—	49	—	11	2·6
Neuenahr . .	92° to 97°	8·2	2·5	0·7	16
Heilbrunnen	—	13·4	8	12·8	43
Ems . . .	85° to 115°	15	1·7	7	19
Geilnau . . .	—	8·1	2·7	0·2	47
Fachingen . .	—	28	2·3	4·5	33
Giesshübel . .	—	6·8	1·3	0·3	55
Bilin . . .	—	33	1·6	2·4	33
Luhatschowitz	—	61	—	27	16
Gleichenberg	—	27	4	14	35
Ischia, C. . .	95°	10·5	—	25·7	2·5
Fideris . . .	—	6	—	—	—
Bourboule, F.	89°	15	4	30	abundant.
Royat . . .	95°	12	9	13·5	some.

*Vichy*.—This is by far the first alkaline bath in Europe, and the greatest thermal establishment in France, overcrowded every season. It lies on the Allier, in a country not remarkable for beauty. There is a handsome casino,

and abundance of hotels to suit all tastes. There are shady walks in front of the baths, and a pleasant piece of garden laid out on the banks of the river. The chief objection to the climate of the place is, that in the height of summer it is intensely hot—unbearable in July. I have not space to describe the baths in detail, or the manufactory of Vichy lozenges, or the arrangements for bottling and exporting the waters. There is a military hospital here.

The wells are the Grande Grille, Puits Carré, Hôpital, Celestins, de Mesdames, and some others. The general constitution of all the waters is alike, and they owe their virtues to the carbonic acid and carbonate of soda present, as appears from the analysis of two of them.

	The Grande Grille.	The Hospital Well.
Bicarbonate of Soda . . .	37'501	38'622
"    "    Potass . . .	2'703	3'37
"    "    Magnesia . . .	2'327	1'536
"    "    Lime . . .	3'33	4'37
Sulphate of Soda . . . .	2'23	2'23
Chloride of Soda . . . .	4'11	3'98

And the first contains 6'973, the second 8'194 inches of carbonic acid gas in the pint. There are also minute quantities of phosphate of soda, arseniate of soda, of carbonates of strontium and of iron, to which it is impossible to attach much significance, although the practitioners on the spot explain the varied operation of the waters according to their presence or absence. The quantity of water drunk is two to four and six glasses.

The use of the baths is also commonly associated with drinking. Their average temperature is  $90^{\circ}$  to  $91^{\circ}$ , and patients stay in them twenty to forty minutes.

The great majority of patients who resort hither, come for some urinary affection—gravel, catarrh of the bladder, diabetes; many with stone already formed look for its solution, or at least for the prevention of further formation of concretions. Cases of gout come in great numbers, but it is only those whose constitution is not much weakened who are fit subjects for these waters; also cases of dyspepsia, of engorgement of the liver and spleen. Cases of the first kind benefit here, but spleen rarely or never; in some cases of biliary calculi these waters work wonders. The Vichy waters diminish obesity, as doses of potass and other alkalies do, the theory being that the alkali combines with the fat and removes it as a sort of soap. Ladies also come here for many uterine affections, and the careful employment of the waters in drinking and in baths and douches is often of use.

*Vals*, in Ardeche, west of the Lyons and Marseilles railway, has stronger carbonate of soda waters than Vichy; they are cold, and for the present they are chiefly used for exportation.

There is another spring in Vals called the Dominique, which is vaunted as infallible in paludal cachexias, spleen, and obstinate intermittent fevers; how far there is ground for this, or whether those virtues necessarily result from the presence of a little arsenic, I cannot say. There



seems to be accommodation for strangers, but no bath establishment.

*Vic sur Cère*, in Cantal, in a strikingly picturesque country, comes next of French wells in the quantity of carbonate of soda; it contains about 15 grains in the pint, but with this are associated about 11 grains of common salt, and 7 or 8 of sulphate of soda, with minute quantities of iron and of arseniates, with quite as much carbonic acid as Vichy. These waters have risen into considerable importance of late years, owing to the varied nature of their constituents, the sulphate of soda giving them a slight resemblance to some of the Bohemian wells. They are lauded in urinary affections, congestion of the liver, and even in rebellious intermittents.

*Chaudes Aigues* has weak alkaline springs, of a temperature from 143° to 178°. It lies in Cantal, in a savage gorge which separates Auvergne from Gevaudan. Living is cheap enough, and the neighbourhood not without attractions, but the number of visitors is small. Like other very warm waters, these are used chiefly for rheumatism and enlargement of the joints.

*Mont Doré*, one of the chief and best-managed establishments in France, in the valley of the Dordogne, lies high up (3,300 feet) among the volcanic mountains of Auvergne, in a very interesting country. It has one cold and six thermal springs. They are feeble alkaline ones, the strongest not containing quite 5 grains of carbonate of soda in the 16 ounces; temperature 90°

to 104°. The waters are used for drinking, for baths, and for douches, and there are inhalation-rooms. July is the chief season, although the season extends from 15th June to 15th September.

It is especially in the treatment of chronic bronchitic attacks and in threatening of consumption that Mont Doré has its great reputation. Baths of a considerable temperature form the chief element of treatment; and if they are really useful, the question suggests itself, whether in our management of phthisis we usually pay sufficient attention to the condition of the skin? whether the use of baths in the treatment of that disease is not too much overlooked? and this the more particularly, when phthisis is no longer regarded as the result of unavoidable hereditary inheritance, but often as the consequence of catarrhal pneumonia.

*Royat*, near Clermont, and on the road to Mont Doré, has alkaline waters of a temperature from 82° to 95°, rising abundantly in a gorge. It is about 1,400 feet above the sea, and its waters have been compared to those of Ems. The buildings are new, and the place has attractions.

*St. Nectaire*, an older bath in the same district, with thermal waters purer and more alkaline than those of Royat, has several establishments.

*Soultzmatt*, in an agreeable valley in the eastern part of the Vosges, has the advantage in mineral constituents over Vic and Mont Doré, containing about 9 grains of carbonate of soda, 3 of carbonate of magnesia, and 4

of carbonate of lime, besides some 9 inches of carbonic acid gas, and an infinitesimal amount of boracic acid. The waters for the present are chiefly exported; they are indicated where weak alkaline waters are desired.

*Heilbrunnen*, in the interesting volcanic valley of Brohl on the Rhine, deserves a notice here, owing to the unusual amount of magnesia which its waters contain. Their composition is: carbonate of soda 13·4, of magnesia 8·4, of lime 2·5, common salt 12·6, sulphate of soda 2·3, carbonate of iron ·68, and no less than 43 inches of carbonic acid; for the present it is only exported, but taken in connexion with the pleasant acidulous Tönnistein spring close to it, and a strong chalybeate not far off, a future of some importance seems possible. There is a small bathing establishment, and grounds have been laid out for visitors.\*

*Ems* has been termed by a very critical German the pearl of baths, and an enthusiastic Frenchman has called it the violet; we cannot therefore be very far wrong in considering it a desirable place—and a very pretty, picturesque spot it is; its social attractions are thus described: “Il y règne un esprit de bon ton, de distinction parfaite, sans roideur, sans morgue aristocra-

\* The Brunnen and Bade Verwaltung of Brohl should learn to write less comical English. While telling us that “lovely nature far and near will make a stay at our place very pleasing,” they mention that their waters are useful “in chronic blenorrhœa of the bronchial artery, and that they cause a general laxativeness without colics.”

tique." Ems is so well known, that much need not be said of it. Its gambling is comparatively quiet.

The waters are mild alkaline, and may be said to contain in the 16 ozs. 15 grs. of carbonate of soda, 7 grs. of common salt, 1.5 and 1.7 of carbonate of lime and of magnesia, with an abundant supply of carbonic acid—19 cubic inches.

Two of the springs are used chiefly in drinking,—the Kraenchen, temp. 85°, and the Kesselbrunnen, 115°; the others, and especially the Fürstenbrunnen, 95°, and the new well, 117.5°, are employed for baths, while the Bubenquelle, 104°, is used only for uterine douches, at a temperature of 90°.

This is the most popular women's bath in Europe. It need scarcely be said that no waters cure sterility, while the careful use of douches of these mild alkaline waters may be useful in improving certain local conditions.

On the whole, Ems is perhaps best suited for cases of bronchial and laryngeal catarrh, in whose favour is the mild and moderately moist climate of the place, which lies sheltered between high hills on the banks of the Lahn.

All the public rooms are on a large scale, and there is abundant variety of amusements.

There are carbonic gas inhalation-rooms here. Their success was once much puffed up, but they are falling into neglect.

*Neuenahr*, in the valley of the Ahr, not far from the

Rhine between Bonn and Coblenz, has of late years come into notice. It has new showy buildings. It is near the very interesting scenery of Altenahr, but for the present it wants shade; it possesses feeble alkaline sources—the springs commonly used barely containing 6 grs. of carbonate of soda, with perhaps 2 grs. of carbonate of magnesia, and  $1\frac{1}{2}$  of carbonate of lime; the most favourable analysis of some of the springs gives as much as 8·2, and even 10·8, of carbonate of soda. The temperature of the waters varies from  $90\cdot5^{\circ}$  to about  $105^{\circ}$ ; and there is an abundant supply of carbonic acid, from 17 to 32 inches.

These waters have become very popular, and are much frequented for the same complaints as Ems. Thus they profess to be useful in pulmonary affections, even in phthisis and emphysema of the lungs, catarrh of the stomach and bladder, hypertrophy of the liver, uric acid diathesis, hysterical affections. No doubt these waters can effect anything to be fairly expected from warm carbonic acid waters with a little alkali, but it is difficult to assign them a place very different from the waters which have enjoyed the longest and most constant popularity, *i.e.* the indifferent thermal ones. There are baths, douches, and inhalation-rooms.

*Fachingen*, in the valley of the Lahn, and *Bilin*, near Teplitz, contain as much as 28 and 33 of carbonate of soda, and plenty of carbonic acid; the waters are almost exclusively used for exportation, which is increasing.

*Gleichenberg*, not many miles from Gratz in Styria, has a considerably more alkaline spring than Ems. The amount of carbonate of soda is variously stated at from 20 to 27 grs., of common salt 14, with about 4 grs. of carbonate of magnesia, and also of lime. There is an abundant supply of carbonic acid. The climate is excellent and the whole district attractive.

*Fideris*, weakest though it be of alkaline waters, deserves notice because it was described 300 years ago by Conrad Gessner, and as it is in a district of Switzerland to which the attention of the English has been drawn of late. It has a small establishment, but is always overcrowded with Swiss; it is recommended for children and anæmic persons, in threatened tuberculosis, and especially in dyspepsia.

*Luhatschowitz*, about ten miles from Hradisch, on the northern line of railway from Vienna, is the only alkaline bath at a considerable height, for Fideris can hardly be counted an alkaline well. It is about 1,700 feet above the sea, in a pleasant valley among the Carpathian mountains. The climate is mild, and inclined to be damp. The analysis of this water given above, shows that it is the strongest alkaline in Europe, while the quantity of common salt present is not sufficient to act as an aperient. The springs are used chiefly for drinking; there is a ewe whey establishment here, but the place is too new to judge yet of its future. There are sixteen lodging-houses, and only one hotel.

## CHAPTER V.

### PURGATIVE WATERS.

SOME notion has already been given of the action of soda, magnesia, and of lime on the system, and waters containing those substances have, with the exception of chloride of sodium, been treated of as alkaline waters; but many of these salts, especially soda and magnesia, often exist in combination with sulphuric acid, which imparts a new character, and so well marked a one, that they may be termed purging waters. They are a very important division of mineral waters, but of the nature of their operation,—as Liebig's views on the subject, that they act by producing increased exosmosis, are not generally accepted,—very little is known beyond their mere aperient effects. Sulphates of soda and of magnesia in small doses cause diarrhœa; in large ones (although when injected into the veins they do not appear to act in this way), catharsis.

The sulphuric acid of the sulphates taken up by the stomach, is chiefly excreted again through the kidneys, and is found partially in other secretions. The greater part of the magnesia and soda probably leave the system



unused. In the excretions produced by these salts, are found, besides water and the remains of food, bilious matters, some of the acids of digestion, and some remains of the salts themselves. These salts were not known to operate specially in any way on the nervous system. Recent experiments, however, seem to show, that sulphate of magnesia in large doses, though in a much less degree than sulphate of potass, acts on the muscular tissue as a poison, and through it on the respiration and the heart. Sulphate of soda can be given with safety in much larger doses than sulphate of magnesia. In small doses neither of them act as poisons; but a continued use of large quantities of earthy and of alkaline sulphates is injurious to the digestive organs. Indeed, there is evidence that sulphate of soda diminishes the coagulability of blood, and thus favours hæmorrhage.

Sulphated waters exist in a stronger form, when they are chiefly exported and used as a substitute for ordinary aperient medicine, and also in a weaker form, when considerable quantities of common salt and of carbonate of soda are usually present.

The latter class of waters occurs at many of the more important spas, and their therapeutic actions are valuable. The quantity of purging salts present is, comparatively speaking, so small in most of them, that we must look to something more than their mere purging action to explain their beneficial effects. Their general operation

has been thus described. They always produce a certain loss of substance to the system, chiefly at the expense of its fat, without the muscles bearing any share in it, and without impairing the appetite, the digestion, the general powers of assimilation, and the feeling of health. A lowering of the powers only results from the use of an excessive quantity of such waters. These waters are used most in abdominal disorders: 1. To improve digestion and the action of the bowels; 2. in affections of the liver and spleen; 3. the mild use of them is indicated in the same cases as that of the alkaline waters.

German practitioners of the old school should find themselves in a paradise among wells of this description, the favourite cures for their ever-present idea, abdominal plethora, or venous dyscrasy. This term includes hypochondriasis and hæmorrhoids, and many of the affections of middle age, supposed to be caused by indulgence in over-nutritious food and by sedentary habits, and which results in a disproportion between the power of the heart and the amount of blood to be propelled, leading to retarded circulation, especially of the portal system. By their purgative action, the stronger of these waters derive from the head, and the deep-seated organs. Quickening the abdominal circulation, and regulating the peristaltic action of the bowels, they 'as it were lighten the system, and remove congestions.

They are considered particularly useful in cases of hæmorrhoidal congestion, bringing on crises in piles

and restoring what many Germans seem to regard as a natural function. They are more useful in full-blooded, big-bellied, sanguine men, who are the better for getting rid of a portion of their superfluous fat—for that class of hæmorrhoidal patients—than for the thinner, sallow-faced, yellow-conjunctivaed class, with low spirits and hypochondriasis, who of all things do not require further lowering treatment.

There can be no question that these waters are powerful agents in simple congestion and enlargement of the liver; that large livers diminish rapidly in bulk under their use. Such beneficial effects cannot, of course, be expected in cases of structural change, as in cirrhosis; and in suspicion of the presence of hepatic abscess, the use of such waters, owing to their lowering quality, must be worse than useless.

It seems to be quite proved, that enlarged spleen is often reduced in size by the employment of these waters, aided by what is generally considered a very powerful adjuvant in such cases, the peat-baths; but although change of air, such as is got in travelling, is of much use in spleen disease, it is questionable, whether any bath treatment is nearly so effective as the ordinary treatment by steel medicines. It is worth observing, that a combination of the neutral salts and of iron has long been a popular remedy for spleen in India, and that some of those waters, which in addition contain steel, have a considerable analogy to such a preparation.

These waters are generally useful in the same catarrhal states in which the alkaline waters are found beneficial ; but their greater activity of operation must be borne in mind, and they are not in these cases so useful as the alkaline waters, while it seems probable that they are more active in gout and in lithiasis ; they also have sometimes given encouragement in diabetes, and Carlsbad waters have been used nearly as much as Vichy ones in that condition of system in which there may be an excessive production of glyucose, an imperfect oxidation of it, or a combination of both conditions. Such waters are naturally most useful in cases in which the affection is the result of a sedentary life, and when more activity of the abdominal circulation is desired.

We shall first consider the *purging waters*, which contain little or no carbonate of soda.

The general composition of these purging waters will be best understood from the following rough table of their chief constituents. The last four differ from the others in containing a larger quantity of common salt, but they all are without carbonate of soda.

	Sulphate of Soda.	Sulphate of Magnesia.	Chloride of Soda.	Chloride of Magnesia.	Carbonic Acid.
Püllna . . . . .	123·8	93	116	16·6	6·9
Seidlitz . . . . .	17	104	3	—	—
Saidschütz . . . . .	46	84	2	25 (nitrate)	—
Birmersdorf . . . . .	54	169	—	—	—
Epsom . . . . .	—	240	—	—	—

	Sulphate of Soda.	Sulphate of Magnesia.	Chloride of Soda.	Chloride of Magnesia.	Carbonic Acid.
Aranjuez . . . . .	396	—	—	—	—
Vacia, Madrid . . . .	1296?	—	—	—	—
Friederichshall . . . .	41	39	67	30	9
Leamington . . . . .	40'3	—	40'7	—	2'1
Cheltenham, Sulphur S.	29	—	28'5	6'5	—
Cheltenham, Strong S.	11'7	—	74'5	—	—
St. Gervais . . . . .	20	—	14	—	—
Uriage . . . . .	18	19	59	—	—

Only the last four of these waters are drunk at their sources. The first are only exported—and they are simply to be regarded as convenient purgative waters. The two most popular, and which are most, used all over Europe, are the *Püllna* and *Friederichshall*. Patients will take them more readily than similar preparations made at a chemist's, and I have known them used with great comfort in habitual constipation for considerable periods, apparently not losing their power, or acting injuriously in any way on the system. It may be observed that the common Seidlitz powder of potassio-tartrate and carbonate of soda, with tartaric acid, is not in the slightest degree analogous in composition to that of the waters, from which they derive their name. There is, however, no necessity for discussing here the operation of purgative waters not drunk on the spot; and the original *Epsom* well, from which the salts have got their name, and which the people of London used to resort to, is now enclosed within a garden, and only a stray

application is now and then made for permission to drink them.

The four wells to be now noticed, have many analogies with the common salt ones, but they contain so much more of purging salts than salt springs usually do, that it has seemed convenient to notice them shortly by themselves.

The baths of *St. Gervais* lie in a valley about 2,000 feet above the sea, not far from Chamounix, and therefore in the centre of the most magnificent scenery in Europe.

There are four principal springs, varying in temperature from  $77^{\circ}$  to  $126^{\circ}$ . One well contains about 20 grs. of common salt and 14 grs. of sulphate of soda, while another contains about 15 grs. of each of them, with the addition of 7 grs. of sulphate of lime. They also contain small amounts of hydrosulphuric acid and of iron. The baths can be used at the natural temperature of their waters.

The waters, which when drunk are slightly aperient, are found to be useful in some eczemas, and eruptions depending on disorders of the digestion, in chronic bronchial catarrhs, and are reckoned especially efficacious in neuralgias, and in cases of head affection the result of over-work, in the production of which effects, doubtless the Alpine climate co-operates with the slight derivative action of the waters. There has been for a long time a large bathing establishment here, to which a hydro-

pathic establishment has been lately added. Season, from 1st June to 15th September.

*Uriage*, in a pretty valley about 1,500 feet above the sea, not far from Grenoble, has its waters of the temperature of 79°, and, if the analysis of it can be trusted, one of the strongest salt waters in France, but it contains so much of purgative salts as to justify its being placed here. Its main constituents are common salt 59 grs., sulphate of magnesia 19 grs., of soda 18 grs., carbonate of lime 15 grs., also some hydrosulphuric acid.

These waters are celebrated for the treatment of chronic affections of the skin, in which the use of the bath is the most important part of the treatment. They are also much used in scrofula and in glandular enlargements. If they had been in Germany, they would undoubtedly have been employed in congestion of the liver and sluggish states of the abdominal canal, for which they are particularly fitted.

The arrangements here are excellent; it is a very picturesque part of France little known to English, but has many attractions, and there is a very considerable resort to these waters.

*Cheltenham*, in the west of England, has quite fallen from its high estate; from being a crowded bath with 12,000 or 15,000 visitors annually, it has dropped into comparative neglect. An analysis of two of the nine principal sources has been already given. The strong



saline, owing to the quantity of common salt that it contains, has many points of analogy with Uriage, while the sulphur saline is more akin to St. Gervais.

It is evident that the effects of the waters must vary a good deal according as the large quantity of common salt is taken or not. The waters are used chiefly in drinking. They were much used for the livers of old Indians in dyspepsia, and also in chlorosis and anæmia, and there is no reason why these waters, if used judiciously, should not be found efficient. What used to be sold as Cheltenham salts contained a good deal more of sulphate of soda than the natural waters.

*Leamington*, in Warwickshire.—This well-known agreeable place of residence, according to the analysis of its waters already given, has points of analogy with one of the Cheltenham and with one of the St. Gervais wells, particularly the one of the latter which contains a good deal of lime, but it is more distinctly purgative than either. Here, as at Cheltenham, the public arrangements are excellent, and the waters are found useful in dyspepsia and affections of the liver.

*Scarborough*.—The strong sulphate of magnesia wells of this place have that salt so nearly equally balanced with sulphate and carbonate of lime, that they must lie heavy on the stomach; owing to their containing a small quantity of iron, they have been considered to be tonic.

The next group of *purging waters*, though a small, is

a very important one. Their action is a good deal modified by even the small quantity of carbonate of soda which they contain; one of them only is thermal—Carlsbad. The four, although one is in Saxony, are in the same district, and may be grouped as the Bohemian baths. Tarasp in the Lower Engadine is distinguished from them by the larger quantity both of carbonate of soda and of common salt which it contains. Possibly the late analysis of the waters of Ischia, or of some others in the Bay of Naples, may show that some of them are analogous to Tarasp.

	Tempera- ture.	Carbonate of Soda.	Carbonate of Magnesia.	Common Salt.	Sulphate of Soda.	Carbonic Acid.
Carlsbad . .	124°	9·7	1·3	7	17	17
Marienbad .	—	10	2·7	15	38	22
Franzensbad .	—	8	—	9	25	31
Elster . . .	—	4	—	14	22	28
Tarasp . . .	—	27	7·6	29	16	33
Rohitsch . .	—	8	10	—	15	25
Bourboule, G. S.	—	10	—	21	14	abundant

*Carlsbad* is in many respects the most striking bath in Europe, as it is one of the most frequented.

The mass of steaming water of the Sprudel, and the strange site among overhanging rocks selected for the place, at once arrest attention; and on closer investigation the waters are found to be among the most powerful in use, not waters with which you may trifle with impunity. Although in the height of summer the place

becomes intensely hot, there are sudden alternations of temperature.

The walks in all directions among the woods are beautiful, and the views varied, but the hills are steep, and many invalids are unable to ascend them on foot.

The hotels are comfortable, but not of the latest fashion, and there are no *tables d'hôte* here, so that although there is an immense concourse of visitors at the baths, they are not particular favourites with the English. There is a look of dampness and want of repair about many of the buildings over the wells, though a magnificent new bathing establishment has lately been completed at the expense of the municipalities.

The three chief of the eight wells—the Sprudel, Mühlbrunnen, and Schlossbrunnen—agree with each other in chemical composition in all essentials. They contain about 18 grs. of sulphate of soda, 10 grs. of carbonate of soda, 8 grs. of common salt, 2 or 3 grs. of carbonate of lime, and some unimportant salts. They are in temperature 165°, 126°, 125°. The water of the Mühlbrunnen is commonly best borne by the stomach. The dose is two to six glasses daily, sometimes increased to eight and ten, and even more. The amount of water drunk should be diminished, whenever there is a tendency to watery dejections; and that this is the first palpable operation of the waters, is very plain from the number of cabinets

scattered among the woods, and which diffuse an odour that calls loudly for hygienic measures.

In former times these waters were used chiefly for bathing ; but now baths are the least important part of the cure. Stories of these waters producing peculiar electrical states of the system must be received with caution. Practitioners on the spot detect different operations of the different wells, although their chemical constitution is nearly uniform.

These waters are the great remedy for enlarged and fatty livers. They seem also, like the waters of Vichy, to have certain virtues in gall-stones, the *rationale* of which it is not easy to explain. They are also used in many of the other complaints for which Vichy is employed. When active effects on the abdominal viscera are wanted, Carlsbad is best. Where there are urinary complications Vichy is to be preferred.

The peat baths are here, as in all the Bohemian baths, used very much, so that a portion of the good effects produced must be attributed to thermal action.

The waters of Otto's Cave at *Giesshübel* are acidulous and pleasant to the taste. A public conveyance plies to them. They have been long known, and are chiefly used for exportation, and that to a large extent. Carlsbad lies about 1,000 feet above the sea. Eger is for the present the nearest railway station, and it is about six hours' drive from that place ; but a railway will soon reach Carlsbad.

*Marienbad*, if not so striking as Carlsbad, is much opener and less shut in, and it is beautifully situated in an amphitheatre of wooded hills. It is in all its arrangements the pleasantest of the quiet baths of Germany; but owing, I suppose, to the more powerful action of its waters, the remark made respecting the sanitary improvement required at Carlsbad, is still more applicable here.

The wells of *Marienbad* differ from those of Carlsbad in being cold, and containing about double the quantity of purgative salts. Their composition is: sulphate of soda, 38 grs.; common salt, 13 or 14 grs.; carbonate of soda, 9 grs.; carbonates of lime and magnesia, each about 4 grs., with the important addition of from 0·27 to 0·47 of oxide of iron, and 15 to 22 inches of carbonic gas. There is little to be said specially of these waters, except that they contain more iron than those of Carlsbad, and that if not used too actively, so as to cause violent purgation, it is probable that a portion of the iron is absorbed. There is also a very pleasant mild spring, the *Wildbrunn*. The presence of iron wells without purging salts is a great convenience; and one of these, an earthy one, the *Wiesenquelle*, has of late been found useful in urinary affections.

Peat baths form a still more essential part of treatment here than in Carlsbad, as the waters are cold.

At *Marienbad* all the springs are conveniently situated in one line, and a patient may walk either down below,

or take moderate walks on the hills, without requiring to be able to climb, which is almost necessary at Carlsbad. On the whole I know no bath that ought to present more attractions to the English. Marienbad lies nearly 2,000 feet above the sea, and is reached in five hours by coach from Eger.

*Franzensbad* lies in an ugly, uninteresting moor near the gloomy town of Eger, but everything has been done in the way of planting parks, in public institutions, and in good hotels to make up for its natural wants. It is greatly resorted to, and the patients, many of them chlorotic girls and pale-faced women, have a great look of business about them. They have come for cure, not for amusement. The number of English must be very small.

The waters are cold, and in strength are between those of Marienbad and Carlsbad. The constituents of the Wiesenquelle and of the Sprudel are pretty nearly the same: about 26 grs. sulphate of soda; 9 of common salt; bicarbonate of soda, 6 or 7 grs.; carbonate of iron, 0.37 and 0.2, with an immense supply, 30 to 40 inches, of carbonic gas. Their operation is the same as that of other waters of this group.

Peat baths here, too, are in constant use. *Franzensbad* is now reached very easily, as it is a station on the Eger railway.

*Elster*, though comparatively a small bath, has great advantages over *Franzensbad* in lying in a pleasant

valley, 1,460 feet above the sea. It has scarcely been found out by the English yet. The Government of Saxony, or rather its king, has done a great deal for the place ; and as Saxony is not rich in mineral waters, good subjects of King John are expected to make the most of Elster. The bath establishment is good.

Although it contains one very strong sulphate of soda well, the amount of salts present on an average resembles that of Carlsbad, Franzensbad, or Marienbad. The constituents are : sulphate of soda, 22 grs. ; common salt, 14 grs. ; carbonate of soda, 4 grs. ; with 16 to 28 inches of carbonic acid gas ; but it is distinguished from the other group by having much stronger chalybeates.

The same effects can be produced at Marienbad, Franzensbad, and Elster, but of the three the most attractive are the first and last. There are a good many points of resemblance between Elster and Schwalbach, and it deserves to be more visited. The living is very moderate, and there are plenty of good lodging-houses. It is about a couple of miles from the nearest railway station. It has peat baths, and a whey cure also.

*Bourboule*, a short way from Mont Doré, in a picturesque country at the foot of an enormous granite rock, and at a height of 2,748 feet, contains two springs, having such constituents that it is surprising that the accommodation suited for visitors, except country people, has not yet been provided.



These springs have many points of analogy with those of Tarasp, especially the second one, which contains as much as 13·5 grs. of sulphate of soda. The springs range in temperature from 87° to 118°. These waters have been called analogous to those of Mont Doré, but they are much more powerful. They are strongly alterative, and ought to be useful in congestion of liver, and in such cases as the waters of Kissingen and of some of the Bohemian spas.

*Rohitsch*, not far from Cilli, in that pleasant corner of the world, Styria, deserves a passing notice, though its arrangements are still on a small scale. Its waters, well suited for dyspepsia, are drunk by some thousands on the spot, and are exported largely. The place is little known to the English, but the neighbourhood is pleasant and the climatè excellent.

*Tarasp*, in the Lower Engadine, which may be reached either by coming down from St. Moritz, or by going up from Finstermüntz, about 4,000 feet above the sea, has of late years, along with the neighbouring *Schuls* and *Vulpera*, been growing much in importance. Its wells had indeed been known for centuries, but had not attracted sufficient attention.

Its water differs materially from the wells just mentioned, in containing nearly twice as much carbonate of soda and common salt as it does of the purging sulphate of soda; it has also an appreciable quantity of iron, and abundance, some 33 inches, of carbonic

acid. In the neighbourhood also are a group of distinct chalybeates, and of sulphur wells.

The waters are mainly employed for drinking, but there are also bathing arrangements. Patients begin with three glasses of 3 ozs. each, and go on gradually to six or eight glasses; usually within half an hour of taking the last glass the bowels are freely moved two or three times, and their operation on them is over, but there is increased secretion of urine in the afternoon and evening. Tarasp has only of late years come into notice, so that its effects have not been sufficiently studied; meantime its chief applications are considered to be in enlarged liver and spleen, catarrh of the stomach, general obesity, besides a great many other affections, among which chronic bronchial catarrhs and laryngitis hold the first place. They consider the waters contra-indicated in tuberculosis.

Great efforts have been made to afford accommodation for visitors, and there is a handsome bath establishment. The climate of the Lower Engadine is much milder than that of the Upper, and the whole surrounding country is on a grand scale, and in many ways interesting to naturalists. Tarasp has a great future before it, when it becomes more accessible.

## CHAPTER VI.

### IRON WATERS.

OF late years the prevailing medical treatment in Europe has been what the French call *reconstituent*, the principles of which were foreshadowed by Toinette in the "Malade Imaginaire:" "Il faut boire votre vin pur et pour épaissir votre sang qui est trop subtile, il faut manger de bon gros bœuf." In such treatment iron takes a very prominent place.

Iron has long been popular as a tonic medicine. What could be more bracing than the martial preparations of steel and iron? When modern chemistry came to show that iron was actually present in the hæmatine of the blood, its use became still more extended; poor blood is caused by want of iron, and therefore can be remedied by a supply of it. Those are the obvious ideas that suggest themselves, and if such could always be carried out, there would be more of precision in medicine, than we have yet arrived at. But it is not so easy always to make the system take up the substance which may seem chemically to be wanting, and iron is no exception to the rule; only small doses of iron are taken

up by the blood—it declines to have large ones forced on it.

Iron exists in blood united with its colouring matter. It has been calculated that the blood of a healthy man contains from about 37 to 47 grs. of it; iron is also found in other parts of the body, as in the muscles, and especially in the hair and in the spleen. It occurs in minute quantities in some of the secretions, including those of the alimentary canal. Iron is introduced into the system in articles of diet, and the proportion taken up depends mainly on the activity of the nutritive process; hence arises one of the questions regarding its administration, already hinted at, when noticing salt springs, whether in a particular case it is better to present iron directly to the stomach, or to endeavour to place the system in a condition favourable to its taking up iron from the food.

The exact use of iron in the system is only partially known, although its presence appears to be essential to the formation of blood-globules. We know indeed that poverty of iron in the blood may be induced by excessive loss of the circulating fluid, or by continued suppuration or other discharges, and that there is a want of iron in the blood of girls suffering under that disease of imperfect development, chlorosis.

A great deal of the iron which is exhibited medicinally is not absorbed, but passes off chiefly in the form of sulphates. Strong doses, especially of the sulphates, are

difficult of digestion, and thus some of the strongest chalybeate springs, for instance some English and Scotch ones—as Sandrock in the Isle of Wight, and Hartfell,—are practically useless. The oxides appear to be dissolved by the gastric juice, and the presence of albumen and of phosphated alkalies favours solution; but even when introduced in a soluble state, iron is taken up very slowly. It seems to be taken up chiefly by the blood, not by the lymphatics. Part goes to the blood-corpuscles, part to the secretions and other parts of the system, especially the hair. Iron passes readily into the water, when more has been absorbed than is wanted by the system; it has also been found in the perspiration and in bile.

But a small quantity of iron appears ever to be absorbed; it has been calculated that chlorotic patients have taken up 4 to 5 grs. of the lactate daily, or scarcely 1 gr. of metallic iron.

As to the physiological effects of iron when it is absorbed, it seems to make the pulse somewhat slower, and to have a contractile effect on the capillaries, and undoubtedly to cause a great increase of the blood-corpuscles; it is probable that it favours oxidation and the production of heat. Its continued use is said to lead to congestions, at the same time that its external and local application is strongly styptic, and its internal use often stops hæmorrhages and other discharges. If presented in an unsuitable way to the stomach, it often

interferes with healthy digestion ; on the whole it is constipating to people in health ; but some of its salts may cause diarrhœa in irritable states of the alimentary canal.

The medical uses of iron may be classified—first, according to its contractile action ; secondly, its general constitutional effects. In the first case it may be useful in chronic diarrhœas and in atonic bronchial secretions ; it is much used in excessive secretion of the genito-urinary organs. It is also, by its contractile power on the blood-vessels, that its undoubted efficacy in spleen is supposed by many to be exercised. But its far more important effects, and those having most analogy with the effect of mineral waters, are its general and constitutional ones.

Iron is of great service in cases of what may be called atrophy of the blood, want of red corpuscles and relative wateriness, whether the result of great losses by bleeding, suppuration, acute illnesses, or of a more gradual deterioration of system. The first class of cases improves very rapidly under iron ; the other general cachexy cannot be so speedily removed. One of the most marked forms is the malarious one with enlarged spleen, not uncommon in Europe, but commoner in tropical countries ; such general conditions, where the liver and alimentary canal are in fair working order, may profit much by iron. Iron is the great remedy for spleen—it has also been said to cure intermittent fever ;

and Pyrmont and some other spas are reported to have extinguished obstinate agues.

But the disease of all others in which iron is considered the remedy, is chlorosis; and in it, especially when combined with the stimulating effects of carbonic acid, it is most efficacious. It is scarcely necessary to define chlorosis; the pale, sallow, bloodless look of some growing girls is familiar to all, and is to be cured by a combination of nourishment, exercise, and iron, with in some cases, when the bowels are sluggish, the addition of aperients; it is in these last cases that the waters of Homburg and Franzensbad or Elster are preferable to simple chalybeates, when it is desirable to act a little on the bowels. There is a somewhat similar condition in young men, accompanied with want of power, and in it also iron is one of our best remedies. It has been ingeniously calculated that for the cure of a case of chlorosis about twenty-two to forty-four grains of metallic iron are required, and a cure by mineral waters may be expected to extend over from four to six weeks.

There are very few iron waters, indeed, in which the patient is able to take one grain of iron daily.

Other classes of disease, such as neuralgias, hyperæsthesias, impotence and sterility, have often come under treatment by iron; but it is only in the two last, that some benefit may be expected from iron waters, and then not from any specific action, but from their general effect on the system.



Every water that deposits a yellowish rust has been set down as a chalybeate, and the number of such springs in almost every country is infinite, not so the number of really powerful waters. They are very abundant in Northern Germany, scarce in England and in France. Italy has a few, and Spain appears to have some that enjoy considerable repute.

Iron occurs in waters mainly in the shape of carbonates, the most convenient form for its assimilation. Sulphates, and still more chlorides, are uncommon, and iron rarely occurs in a water except with other salts. In all the popular spas there is an abundant supply of carbonic acid, which makes these wells palatable; but besides carbonic acid other substances are often present, and waters have been classified, according as various substances predominate. For practical purposes they have been divided into tolerably pure, common salt, and complicated ones; the last, besides some carbonate of soda, may contain Glauber salts, carbonate of magnesia or of lime, sulphate of magnesia or gypsum.

There are few waters of which it is possible for a patient to take more than sixteen ounces, which may contain half a grain of iron. But if their analyses be correct, it might be possible to give more iron, by using such wells as Arapatak and the strong Harrogate. Many chalybeate waters are, as appears from the following table, at least 900 feet above the sea, which

adds very materially to their effect. They vary in temperature from about 39° to 62° or 63°.

St. Moritz . . . .	5,464	Alexisbad . . . .	1,350
St. Bernardhine . .	5,005	Franzensbad . . .	1,293
Wyh, Schuls . . . .	4,000	Petersthal . . . .	1,100
Rippoldsau . . . .	1,886	Spa . . . . .	1,000
Bagnères de Bigorres	1,850	Schwalbach . . . .	900
Reinerz . . . . .	1,668	Driberg . . . . .	633
Elster . . . . .	1,465	Bocklet . . . . .	620
Recoaro . . . . .	1,463		

#### TABLE OF AMOUNT OF IRON IN SOME SPRINGS.

##### ALKALINE.

	Carbonate of Iron.	Mineral Constituents.	Carbonic Acid.
Fachingen . . . .	0·11 . . . .	38·3 . . . .	32·4
Giesshübel . . . .	0·33 . . . .	12·2 . . . .	39
Geilnau . . . . .	0·29 . . . .	16·6 . . . .	21
Gleichenberg . . .	0·18 . . . .	27·5 . . . .	22
Heilbrunnen, B. . .	0·68 . . . .	41·2 . . . .	43

##### ALKALINE SALINE.

Marienbad . . . .	0·65 . . . .	81·5 . . . .	14·8
Franzensbad . . . .	0·37 . . . .	45·1 . . . .	31
Elster . . . . .	0·48 . . . .	16 . . . . .	33

##### COMMON SALT.

Kissingen . . . .	0·24 . . . .	65·7 . . . .	41
Soden . . . . .	0·21 . . . .	89·4 . . . .	18
Canstatt . . . . .	0·25 . . . .	40 . . . . .	19·5
Kreutznach . . . .	0·21 . . . .	79·3 . . . .	—
Homburg . . . . .	0·179 . . . .	72·6 . . . .	47
Do. Lu. . . . .	0·33 . . . .	23·8 . . . .	—
Harrogate, K. . . .	0·373 . . . .	113·4 . . . .	3

## EARTHY SALINE.

	Carbonate of Iron.	Mineral Constituents.	Carbonic Acid.
Orezza (about) . . .	0·8 . . .	14 . . .	abundant
Pyrmont . . . . .	0·42 . . .	17·9 . . .	18
Driberg . . . . .	0·78 . . .	38·5 . . .	28
Petersthal . . . . .	0·35 . . .	23·7 . . .	33
Rippoldsau . . . . .	0·38 . . .	23·1 . . .	15
Bocklet . . . . .	0·67 . . .	28·6 . . .	39
Bagnères de Bigorres	0·675 . . .	22·3 . . .	—
St. Moritz . . . . .	0·18 . . .	11 . . .	31
Do. . . . .	0·25 . . .	13·4 . . .	57
Tarasp, B. . . . .	0·25 . . .	28·3 . . .	62
Do. W. . . . .	0·20 . . .	10·7 . . .	48
Wildungen . . . . .	0·16 . . .	11 . . .	19

## COMPARATIVELY PURE.

Recoaro . . . . .	0·29 . . .	6·8 . . .	21
Schwalbach . . . . .	0·44 . . .	11·9 . . .	45
Do. . . . .	0·64 . . .	4·6 . . .	50
Spa . . . . .	0·37 . . .	4·3 . . .	8
Liebenstein . . . . .	0·54 . . .	10·7 . . .	32
Brückenau . . . . .	0·092 . . .	3·4 . . .	28
Marienbad . . . . .	0·33 . . .	6·0 . . .	15
Tunbridge . . . . .	0·39 . . .	1·0 . . .	—
Harrogate, T. . . . .	0·169 . . .	1·3 . . .	1·4
Alexisbad (sulph.) . . .	0·403 . . .	3·6 . . .	8

## STRONG CHALYBEATES.

Wassenach . . . . .	3·08 . . .	12·9 . . .	—
Arapatak . . . . .	2·35 . . .	24·5 . . .	24
Harrogate . . . . .	3·38(1·8 chloride)	58·1 . . .	3·2
St. Bernardhine . . . . .	1·45 . . .	24 . . .	—

Perhaps no bath in Europe has kept up its reputation more steadily than *Spa*, and it has everything to justify

this : good waters, agreeable country, excellent arrangements, and plenty of amusement, including the gambling rooms, which might be dispensed with. It is also of all baths the one most easily reached from England.

Only one of the four or five abundant springs is in Spa itself, the others are at considerable distances in the woods. The water is very easily borne by most stomachs, and the quantity is from two to four glasses. It has been more used for baths of late years, and there is a magnificent bath-house. When baths are used, the higher temperatures are not recommended. Peat baths are to be had here, and chemical analysis has of course discovered that the peat soil of Spa contains particularly valuable principles.

The waters of Spa are adapted most for anæmia and cachectic conditions of the system. The waters are not quite so strong as those of Schwalbach, but the general indications for the use of both are the same. Schwalbach has the advantage of stimulating the cutaneous functions more by its baths.

The country around Spa is pretty, and there is no station where riding on horseback is so much practised. To the older arrangements of this long-established spa a very complete *kur-haus* has of late years been added.

*Pyrmont*, though with much to render it attractive, has rather gone down in the world of late ; but it lies in a beautiful valley, has excellent arrangements of all kinds, and can still boast of a gambling-table, a source of

income to the Prince of Waldeck, in whose territory it is.

There is an immense supply of carbonic acid in these springs, and some of them are said to have the stimulating effects of champagne. Patients begin with small quantities, two or three half or full glasses, and then go on gradually to six or eight.

Poverty of blood, hysteria, slow convalescence, hypochondriasis, are among the maladies likely to profit by Pyrmont, and the strong brine spring and salt drinking well vary the resources of the place. It is only 400 feet above the sea, and therefore cannot boast of Alpine climate, one of the most important adjuncts of some of the chalybeates now enjoying the greatest popularity. It requires four hours' driving to reach it from the nearest railway station.

*Alexisbad* lies in the romantic Selke valley in Anhalt, about 1,400 feet above the sea. It has two iron wells: one the Selkebrunnen, used almost entirely for bathing; the other the Alexisbrunnen, for drinking. Its artificially-heated baths have gained a considerable reputation, especially in some of the affections of women connected with a relaxed state of system, but it has no special virtues in this way; though popular in the north of Germany, this bath is little known to the English. It is two to three hours' drive from the railway station of Quedlinburg.

*Driberg*, in a pretty valley in Westphalia, has long

been popular among Germans, though not much visited by English. It is nearly 700 feet above the sea, and the air is counted pure and invigorating; three to eight glasses are the quantity usually drunk. Baths are also much used. An omnibus goes from the railway station to it.

*Liebenstein* is a very quiet little place in Saxe Meiningen, but with a powerful spring; it is more than 900 feet above the sea. It has got a whey cure, a hydropathic establishment, and salt baths, and is in favour with the Northern Germans as a healthy place, where living is cheap. A pretty spot like this in the Thuringian Forest ought to suit many English people. It is less than an hour from the railway.

*Brückenau*.—It is a great pity that this secluded village, lying among hills covered with luxuriant forests of beech, and with admirable bath arrangements, cannot boast of a stronger well—its own not containing quite  $\frac{1}{10}$ th of a grain of iron in the pint. There are, however, some very pleasant acidulous springs useful in dyspepsia, and the turf baths are in full force. It is some hours' drive from Kissingen, and from the nearest railway station. This pretty spot was the favourite bath of the late King Louis of Bavaria, who built a handsome *kur-haus*, but without his patronage it must soon cease to be visited by those who are in need of vigorous treatment. The living is simple, but comfortable, and very cheap.

*Bocklet*.—In strong contrast to Brückenau stands this place, not with the same natural and acquired advantages, although a pleasant enough place, but with a far more powerful, though not so pure a well. It is a disadvantage to Bocklet that it is so close to Kissingen. Its waters come very well after a course of Kissingen, and there are carbonic acid douches for such as want them; but visitors usually prefer a greater change than the mere move of some four or five miles up the same valley. However, Kissingen is often so overcrowded, that many patients are obliged to resort to Bocklet.

*Schwalbach* is at this moment the most popular chalybeate in Europe, and with very good reason. It has a good supply of iron, and an abundant one of carbonic acid; and the presence of carbonic acid in considerable quantities has been secured for baths. By good arrangements only a small portion of the carbonic acid is lost in the process of heating, so that, although they are not to be compared with the stronger baths of this kind, the Schwalbach baths decidedly stimulate the skin, and are much liked by patients. Everything that has been said of the effects of iron applies to Schwalbach, and there are few wells which answer in their effects to one's expectations better than these.

Schwalbach lies in a pretty valley surrounded by wooded hills, in which there are pleasant walks. But there is a want of public gardens sufficiently large for the recreation of the immense crowd of visitors, and the



place gives a cramped feeling. The living too is on the whole not equal to what it is in many other places. The place is at times intensely hot. The drive to Schlangenbad is pleasant, and that place might be made more use of as a change than it is. English and Americans and other foreigners here greatly predominate in numbers over the Germans. It is reached by carriage in three hours from Wiesbaden, or from Eltville on the Rhine railway.

*Rippoldsau*, in the Black Forest, is growing into a favourite station, and so is *Petersthal*. The amount of iron and of saline constituents that they contain, is nearly identical. For those who are satisfied with a plain way of living at a moderate cost, these, especially Rippoldsau, and other places in the Black Forest, offer many attractions. The scenery is always pleasing, though sometimes a little monotonous, and the people are friendly. Rippoldsau, at an elevation of about 1,900 feet, has the advantage of being 700 feet higher than Petersthal. They are easily reached by the Baden railways.

*St. Moritz*, the most popular bath in Europe with the English at this moment, owes more to its elevation and to the quantity of carbonic acid it contains, than to its very moderate amount of iron. It has grown into notice with great rapidity. A few years ago the author of "Voyages des Zig-Zag" mentioned it in these disparaging terms. He talks of its woods which grow up the hills to the height of 700 feet above it, as contrasting

“tristement presque avec les gracieuses scènes” which he had just left. Nor does he give a flattering account of the neighbouring village: “C’est une petite bourgade composée d’étables et de cafés billards, où des baigneurs barbus tuent le temps: un de ces endroits qui doivent au séjour momentané des malingres un peu de fausse vie, beaucoup d’odeur des cigarres et ce grotesque mélange de pâtres occupés et de messieurs fainéants de liquoristes et de faiseurs de fromage, de laitage, de carambolle. On nous reçoit dans une salle de billard: on nous y loge dans un café.” Times have changed in these few years, and the crowd of visitors is so great that there is difficulty in getting accommodation.

The mineral wells rise in a low meadow, somewhat marshy, where the baths are. They are used chiefly for drinking, but they are also heated for baths, and the carbonic acid gas is used for inhalations and local douches. As might be expected, waters slightly chalybeate, and with abundance of carbonic acid gas, and therefore pleasant to drink, and having none of the after-effects of most medicines, are universally popular, and, in conjunction with the influence of the Alpine climate, are applicable to a variety of general conditions of debility and relaxation, among which chlorosis and anæmia are pre-eminent.

Besides its other attractions, St. Moritz is not far removed from many important wells of a variety of kinds: the alkalo-saline wells of *Taras* and *Wyh*, in

the Lower Engadine, both containing as much iron as St. Moritz; the steel waters of *St. Bernhardine*, which must be very powerful, if the analysis of them is at all trustworthy, where baths have been built of late years in a very grand country; the sulphur waters of *Le Prese*, on the way to Italy; the indifferent baths of Pfeffers, and the earthy ones of Bormio, not to mention many less important ones springing into use, as those of *Alveneru* and *Fideris*.

Excursions of the most varied kinds can be taken, and in fine weather the place is delightful, and the climate is quite exhilarating; but it must be recollected that the season is not a long one, and that although people, in spite of scanty supplies, are now wintering there for consumption, the saying of the country is, "Engadina terra fina, si non fosse la pruina." When there is difficulty in getting rooms at St. Moritz, it is best to push on to *Silva Plana*, *Samaden*, or other villages with very fair inns, and particularly to *Pontresina*, and wait till you get rooms; you have all the advantage of the mountain climate there, and at some of them have much finer scenery than at St. Moritz, especially at *Pontresina*. The living at St. Moritz is indifferent.

Before leaving St. Moritz, on which I have dwelt perhaps too long, owing to its present great popularity, I may observe that *Paracelsus* is commonly quoted as saying that St. Moritz in the Grisons has the best well in Europe, and that its virtues are most powerful in the

month of August. I have only been able to discover in his works the vague statement, that there is an acidulous spring in the Grisons nobler than that of Göppingen (now forgotten), which it well may be, and that it owes a part of its virtues to the waters having passed through many cataracts. The excellence of the whisky produced at a celebrated distillery in Scotland has been attributed to a similar cause!

It still takes about eleven hours to reach St. Moritz by diligence from Chur on the railway.

*Recoaro* is reached by diligence from Vicenza in about four hours. It is situated on the Prekeli, in a fine valley shut in by magnificent dolomite mountains. It is about 1,500 feet above the sea. The arrangements of the place are excellent, and living is moderate. The place is high enough to escape to a considerable extent the heat of an Italian summer. Altogether, there is scarcely any other steel spring with a moderate amount of iron,—and it contains more than St. Moritz, that offers so many attractions.

I shall only mention one Spanish chalybeate.

*Sta Agueda*, about twelve miles from Alzola, and one of the group of northern Spanish baths near San Sebastian, besides its sulphur springs has a ferruginous spring, of which Rubio says, that it has a considerable quantity of iron and a very small quantity of earthy constituents in it; it is much resorted to by the Spaniards as a strong tonic.

This is a fashionable bathing-place, and in a beautiful country ; a correspondent writes that "English might be fastidious about the accommodation, but the climate is so fine that one is always out of doors ; indeed, rooms more furnished would be stuffy ; at that season food is always abundant, and to my taste good." Some years ago a Frenchman wrote : "If you take vapour-baths here, you will get ones at least as good as any to be had in Paris. Only they will cost you much less, and possibly do you more good, thanks to the cleanliness which reigns in the comfortable establishment." The whole neighbourhood offers much of interest to the botanist and the geologist.

France is not rich in desirable chalybeates.

*Bagnères de Bigorres*, in the valley of the Adour, is perhaps the most popular bath in France. There is beauty of situation, with good accommodation for visitors and a great supply of mineral waters.

Their main character is derived from sulphate of lime. The baths of two of the weaker sources have already been mentioned. There is a cold sulphur spring at Labassère, containing sulphuret of sodium, the waters of which have been brought into Bigorres. There are three springs which contain carbonate of iron, and they differ from all other springs of the kind in their high temperature. The Théas well, with a temperature of  $124.2^{\circ}$ , contains 0.675 of iron with 22 grs. of mixed constituents, chiefly lime ; the Reine,  $115^{\circ}$ , practically

the same ; while the La Serre, 102°, has only one-third as much iron and some chloride of magnesia, which makes it somewhat purgative. Unfortunately these wells contain scarcely any gas to balance the heaviness of the sulphate of lime, but this does not prevent their being found very useful in chlorosis and the cases for which iron is usually prescribed. Every arrangement has been made for providing amusement to the guests. The country is beautiful and the place easily reached, as it lies on the railway.

*Orezza*, in the island of Corsica, is by far the best French chalybeate. It is comparatively pure, has a large quantity of carbonate of iron, and an abundant supply of carbonic acid. It is in a beautiful country, and amidst forests. It is in great repute locally in cases in which iron is indicated, especially in chlorosis and some of the complaints of women, and is said to be a specific in malarious poisoning, which is common in many parts of Corsica, but only when it has not gone the length of producing engorgement of the liver or spleen. Its waters are largely exported. The season is short—from the middle of June to the 30th of August.

*Forges les Eaux*, department of the Lower Seine, has a very fair chalybeate, enjoying a reputation in chlorosis, the effects of hæmorrhage, in dyspepsia, and in some diarrhœas ; but, as a French guide-book says, it only suits those who like quiet and tranquillity. The only distraction is the promenade. The bathing establish-

ment is surrounded by a well-wooded but rather damp park.

*Bussang*, in a pretty situation in the Vosges country, close to the source of the Moselle, is a pleasant weak acidulous chalybeate. Its waters are largely exported, but not drunk on the spot; it is chiefly used as a table-drink. There is no drinking establishment, and a visit to Bussang merely makes a pleasant excursion for visitors at Plombières Bains, or other baths in the Vosges country.

Nor has England much to boast of in the way of chalybeates.

*Tunbridge Wells* is almost the only source of the kind it possesses, and the quantity of iron is small, and there is little gas. Still it is a fairly pure chalybeate. At one time the waters were in great repute; now they have fallen very much into neglect; but the place will always be popular owing to its bracing climate and the very pretty country in its vicinity. Those who go to Tunbridge Wells, and are likely to benefit by chalybeates, ought certainly to give the wells a trial.

*Harrogate*.—The Tewitt well is a singularly pure weak chalybeate.

To the list might be added two of the stronger wells, those of *Arapatak*, scarcely yet known, but containing in its two fountains, 1.60 and 2.35 grains of the carbonate of iron, respectively. Also the newly-described iron spring at *Wassenach* near Tönnistein in the Brohl valley



off the Rhine, which invites further observation. Better known is Dr. Muspratt's chalybeate at Harrogate, said to contain as much as 1·45 of carbonate, and 1·8 of chloride of iron, but along with 55 grs. of other salts. The value of this water, it is said, cannot be overestimated. It is given in doses from 2 to 6 ozs. three times daily; but it is worth while to observe the qualification, "that the water must be given with much circumspection, as it frequently proves not only most difficult of digestion, but is apt to cause several of the most painful physiological effects common to pharmaceutical preparations of iron;" while the same writer finds the greatest improvement traceable to the action of steel for the use of the weak Tewitt chalybeate. This affords strong confirmation of what has already been said, that the system only takes up a certain amount of iron.

Waters with the sulphate of iron, if they are at all strong, are too disagreeable for the stomach to bear, and therefore of very little use, especially when alum also is present. To the milder wells of this kind belong *Alexisbad*, and *Mitterbad* and *Ratzes* in the Tyrol, both greatly frequented by natives of the country and by Italians; *Auteuil* and *Passy*, now included in Paris. The Passy waters are not much drunk, and the Auteuil ones are chiefly exported. They contain sulphates of iron and of lime, and some hydrosulphuric acid, and are counted a powerful tonic.

Under this head come the strong waters of *Sandrock*, Isle of Wight; *Vicars Bridge*, near Dollar; and *Hartfell* near Moffatt, besides many in Italy. At times the use of these waters has been recommended, but it has always been difficult to get patients to drink them, and they are very little used now.

## CHAPTER VII.

ON THE PRESENCE OF MINUTE QUANTITIES OF SALTS  
AND OF CARBONIC ACID IN SPRINGS, AND ON ARTI-  
FICIAL WATERS.

FOR convenience' sake I have thrown together into one chapter the few remarks which I have to make on some other varieties of waters.

Many of the salt waters that have been above enumerated, contain traces of *iodine* and *bromine*, some very considerable ones, and special effects of a very important kind have been attributed to them. It is hardly necessary to say that they are both very powerful medicines, both very active in promoting absorption (although much is not practically known of bromine in this respect), both, particularly the bromine, producing very marked effects on the central nervous system, and one certainly, when given in large doses, often producing the disagreeable symptoms of iodism, in many respects analogous to those of mercury ; suffice it to say, that those powerful effects are produced by large doses, that iodide of potassium is administered in doses of from 8 to 60 grs. daily, and that it is only since bromide of potass

has been used in still larger doses, that its remarkable properties, making it for the moment almost a panacea, have been discovered.

Some of the salt waters that have been believed to produce all the effects of iodine, are those of *Kreuznach*, *Dürkheim*, *Wildegge*, *Krankenheil*, *Adelheids Quelle*, *Hall*, *Challes* in Savoy, and *Castro Caro* in Italy; and if the analysis of it is to be trusted, *Woodhall Spa* in England, our sole salt well for medicinal purposes, is as powerful as any of them, containing in the pint about 0.35 gr. of iodide of potass, and 0.64 of bromide of sodium. Children at the last place are ordered 1 to 2 ozs. of the water; adults 4 ozs. three times daily. It is evident that in this case the children cannot receive more than a quarter of a grain of the two salts combined, and an adult not more than three-quarters. But in practical medicine we have no knowledge of the operation of such small quantities. We therefore are thrown back on the chloride of sodium, which is the chief constituent of these waters, and we find that at *Krankenheil*, where there is not much salt in the spring, salt is added to the iodine water to increase its efficacy.

Notwithstanding stories, to which it is impossible to attach credit, of iodism being induced by the use of such waters, it has been found at the *Adelheids Quelle*, that 54 to 72 ozs. may be drunk daily for six weeks without any perceptible effect being produced, and a child between

five and nine years may take a quart daily for any length of time. As to the Wildegg water, which is of about the same strength in iodides as Woodhall spa, for a long time they did not venture to go beyond tea-spoonful doses to children ; even now they say that young people should not take more than two or three glasses daily, but practically it is at present considered valuable, merely as being a good vehicle for administering iodide of potass in !

As for the iodine waters of Saxon in Switzerland, which have of late years attracted attention, owing to the varying amount of iodine they contain, and the curious fact, which is apparently ascertained, that the rocks near the springs emit a distinct smell of iodine, one is sorry to think, that they have often been tampered with, and that artificially impregnated waters have been palmed off on the public for real ones.

On the whole therefore, and as in every instance those small quantities of iodides or bromides are associated in mineral waters with large quantities of common salt, we are not warranted in assuming, that any effects are produced by them, which may not be ascribed to the employment of the latter substance.

This may be a convenient place for noticing shortly some of the other infinitesimal constituents of mineral waters.

Much importance was attributed some years ago to the discovery of *arsenic* in many of the mineral waters, and special effects were attributed to its presence.

Arsenic is, however, now known to be a constituent of so many waters, of many excellent drinking waters, and it has always been found in such small quantities, that people have ceased to think much of it. It cannot seriously be considered as a therapeutic agent in mineral water cures.

The discovery of *lithium* again in some waters exceptionally (of 0.5 of a gr. in the 16 ozs. in a well at Elster, and in the Murgquelle of as much as 2.36) seemed to promise something in the treatment of certain classes of disease. But although Bence Jones' experiments have shown the immense rapidity of the passage of lithium into the circulation, and of its reaching the joints, the hair, and even the lens of the eye, very little is really known of its use in medicine. The dose for an adult is set down as 3 to 6 grs. of carbonate of lithium thrice daily, certainly not less than 12 grs. a day, so that the minimum dose of the Murgquelle would be over five pints, which would contain more than half an ounce of other salts, and that of the next strongest well would be twenty-four pints daily. Much therefore can scarcely be expected from the *Sources à Lithion* at Baden Baden.

Of the operation of minute quantities of *copper*, of *strontium*, of *barium*, or of *rubidium*, absolutely nothing is known. *Boracic acid* is believed to be a solvent of calculi, but it has never been detected in wells, except in very minute quantities.

As to the effects of *manganese*, which occurs in the fluids of the body, and in very trifling quantities in some mineral waters, this metal, when used medicinally, has been considered a tonic, and analogous in its effects to iron. But the only mineral waters containing any considerable amount of manganese, are those of Cransac.

Some writers attach importance to the presence of *silicic acid* in waters, and French writers in particular to the presence of silicates in some of the Pyrenean sources, but nothing in reality is known of its operation on the system. It is so difficult to tell, why the weakly mineralized waters of the Pyrenees exert on the system an influence beyond the ordinary thermal action of water, that extravagant importance has been attached to the presence of small quantities of sulphurets and of silicates in them.

*Carbonic acid* forms so important an element in many mineral waters, their degree of palatability depending on its presence more than on anything else, that it requires a separate notice.

Wonderfully little is known of its effects when taken into the stomach, beyond its immediate effect of pleasant stimulation, when taken in small quantities. Taken in large amounts, a portion of it is immediately got rid of by eructation, but enough may remain to cause a certain amount of lightness of the head analogous to that caused by champagne, and sometimes a feeling



of distress about the heart, where the action of that organ or of the lungs is not free. This gas appears to act not only as a stimulant to the stomach, but also to the intestinal canal: in this way it is useful, particularly associated as it usually is in mineral waters with small amounts of alkalies or of earthy salts, in indigestion and torpidity of the bowels. Sometimes these waters are of no small use in quieting irritability of the stomach. Carbonated water is at all times refreshing, and the use of such waters at the table is an adjuvant to other stronger waters, especially where alkalies are indicated.

The waters in which carbonic acid is combined with salts in considerable quantities, have been already noticed under their several heads; and as the weaker ones are chiefly used for the table and for exportation, it may be sufficient merely to enumerate some of them. As a general rule it may be said, that 6 to 10 inches of carbonic acid in the 16 ozs. of water is quite sufficient to make it agreeable; quantities over 25 inches are in excess of what is wanted.

These table waters may perhaps be divided, into those in which carbonate of soda and chloride of sodium predominate, and into those which contain lime or magnesia; there are often minute quantities of iron and of other salts also present.

The first are chiefly German; they are very abundant in the Rhine country or near it, as *Seltzers*, *Heppingen*,

*Roisdorf, Tönnistein, Schwalheim*, also at many other places, such as *Kissingen, Brückenau, Giesshübel, Soultzmatt* (which by the way is French).

The second are chiefly French, as *St. Alban, St. Galmier, Chateldon, Condillac, Renaison, Pougues*.

Carbonic acid helps also to make some of the aperient waters already mentioned more palatable, such as those of *Püllna* and *Friedrichshall*.

*Artificial Waters.*—When Bacon expressed surprise that “no man hath sought to make an imitation by art of natural baths and medicinable fountains,” he was not aware that such imitations had been already made. Herodotus, indeed, a successor of Galen, had declared long ago, that the copies were not equal to the originals.

We have already seen that, as regards baths, everything has been done that Bacon could have wished; and it is the same with medicinable fountains, of which imitations have now for a long time past been prepared. They are truly called imitations, for they are seldom exact enough to rank even as accurate copies.

And this is not surprising, while the exact chemical constitution of mineral waters is by no means positively determined. Whether the presence of minute quantities of a great many salts is of any real importance, whether nature's polypharmacy is more valuable than man's or not, it is very difficult to add these fractional quantities accurately to artificial waters, and the organic

matters, such as baregine, present in some, cannot be imitated at all.

As these artificial waters are but imperfect copies, perhaps it would be better if the actual contents of the bottles were specified on the outside, instead of the name of the spring they imitate; indeed, the affixing names of places to artificial waters is forbidden in Austria. In most Continental countries a licence is required from the State for the manufacture of such waters. In any case, however, it is an objection against them, that we can only have the guarantee of the maker's name for their being what they profess to be. There is no certainty that they are of one uniform standard.

Strongly mineralized waters are the most easily imitated, and their imitations the most useful: weaker waters, in which there is great faith when they are drunk on the spot, as for instance those of Eaux Bonnes, can positively not be imitated with the slightest advantage. On the whole, therefore, now that the art of bottling waters securely is understood, and that it is known that most natural waters may be made to keep quite well, by the exclusion of all atmospheric air, it seems probable that the original bottled waters will be greater favourites with the public than their imitations. The only exception will probably be in favour of some of those used chiefly as articles of diet, such as soda and Seltzer waters, which owe their qualities mainly to the quantity of carbonic gas

they contain, and which, without following very strictly any natural sources in their manufacture, are made very palatable—indeed often more so than the bottled waters in imitation of which they are made.

We have at all events learnt something from nature's chemistry, and know that by the aid of carbonic gas we can present many medicines to the stomach in a palatable shape, and one likely to favour their absorption. The exhibition of medicines in a state of effervescence is a great step in practical therapeutics.

Alkaline and saline waters—such as those of Vichy, Bilin, Fachingen, or Carlsbad, Marienbad, and Eger—are among the best of these exported waters. Iron waters do not, even when the greatest care has been taken, keep well; the iron constantly gets precipitated, and it may be much doubted whether Schwalbach or the weak Bussang waters, away from their sources, are so good as their imitations, or indeed so good as the ordinary milder pharmaceutical preparations of iron.

Well-bottled waters from the original sources are however, generally speaking, better than their imitations, and there can be little doubt that the mere medicinal action of the waters on the system, if they have not undergone decomposition, must be essentially the same, whether the patient drinks them fresh at the source or at home. But we have endeavoured to show, that the whole *rationale* of the use of mineral waters is different from that of taking ordinary medicine; that their value is immensely increased by

the various aids, of entire change of air and of habits of life, of the baths and other appliances of watering-places. The influence of the imagination, too, is lost—one by no means to be overlooked.

Although, therefore, there are various conditions in which the use of exported waters may be convenient, drinking them at home can never take the place of drinking them at their source, and this is the general feeling of patients; they usually declare that mineral waters drunk at home, with the exception of some simple aperient ones, have not the same effect as when drunk at their fountain.

The larger the amount of mineral constituents in a water, as a rule, the less does it suffer by transport.

The exportation of their waters is a considerable source of profit at many wells; the sale of exported waters has now become very extensive indeed, and is becoming greater every day. Waters even cross the Atlantic, and certain American ones are drunk with faith by many poor ladies, who hope to be cured of cancer, and of every conceivable malady, by their use.

In concluding this division of my subject, I am happy to be able to give the last results obtained by my friend Dr. von Liebig with the compressed air apparatus, at Reichenhall. The amount of air expired under ordinary and under increased atmospheric pressure is found to be practically the same. The mean quantity of carbonic acid expired under high pressure is only a trifle less than under normal. If a man under ordinary pressure expires 755 grammes in the twenty-four hours, he would expire 727 under increased pressure.

While the slowness of the pulse induced by compressed air does not last on removal from it, it is said that there is no doubt as to the retardation of the respirations continuing for some time.

Some of the remarks in the Introduction might have been illustrated by a reference to Boll Bad, a weak sulphur source, not far from Ulm. Here a bathing establishment, formerly the property of a company, is now used as a place for the cure of disease by prayer, under the superintendence of a pastor. There is a similar institution on the Lake of Zürich.

Perhaps I might have said more of some points of hydropathic practice, of Dr. Chapman's ice-bags, and of various artificial baths and inhalations, but I have been obliged to limit myself to such remedies as are used in connexion with bathing establishments, and for chronic disease.

It is hardly necessary to say, that the terms hydrosulphuric acid and sulphuretted hydrogen, and chloride of sodium and common salt, have been used by me indifferently.

## BOOK IV.

# DIET CURES.

## CHAPTER I.

### POPULAR CURES FROM THE VEGETABLE WORLD.

IN the enumeration of appliances connected with baths already given, one might suppose that the list of modes of treatment supplementary to regular medicine, had been exhausted. But this is far from being the case, as will appear most readily by looking at a few German bath advertisements, which contain many odd things, besides inquiries for a little English boy to come and play with another one for so many hours daily.

At one place we hear of the wonderfully successful results, not only of pine-leave vapour-baths, but of steel, malt, bran, salt leys, salt spring, and vegetable baths. Another place, we are told, lies 1,700 feet high, "above the consumption zone." We read of Irish-Romish baths, with all kinds of medicinal, carbonic acid, and electric baths; the English part of the advertisement describing



them as “Turkish—tub—steam, and overthrowing baths.” We also meet with this beautiful collection of remedies : goat whey and mineral water establishment ; also baths of Kreutznach salt ley, of sea-salt, of sulphur, of malt, of bog, of calmus (I suppose *Calamus aromaticus*), and of fir leaves ; also drinking cures of all sorts of herbs, as well as of natural and of artificial waters ; and we may wind up with a dietetic Schrothisch institution, where every disease under the sun is treated.

Although the French very naturally praise the beauty and other attractions of their baths, I have not lighted on any of their advertisements which quite come up to the German ones. The following is a tolerably characteristic one :—“ Perfected apparatuses, vast gymnasium, baths of condensed air, a piscina for swimming, vapour baths and douches, medicinal and electrical baths, &c. ; everything has been united to form a complete *ensemble*.” I am quite aware that we have no want of more or less quackish advertisements in England, but their style is different from that of foreign ones, and certainly not superior.

But of these numerous remedies, we can only glance at some having a bearing on *diet*, and diet mainly meant to cure in a season, like mineral waters. The popularity of some of these cures is unbounded ; and that patients have often benefited by them, is certain. It has been justly remarked, that it is not unworthy of the attention of the regular practitioner, to inquire what are the elements

of success in such cases :\* and these seem to be, first, that the patient, owing to the amount of faith which he places in a new mode of treatment, gives up injurious articles of diet, which he would not otherwise have done ; in the second place, a certain amount of simplicity of food and of regularity in the hours of taking it is enforced, which is advantageous in many cases ; and thirdly, these modes of treatment are believed in some instances to supply to the system certain substances of which it is in want.

The *dry method* consists essentially in reducing the quantity of water drunk to a minimum, and making the diet consist chiefly of bread and biscuits ; while wine is allowed, and the smallest quantity of meat. A diet of this kind is continued for six or seven weeks. The essential of this mode of cure rests in the diminished supply of water, and the effect of this on the blood.

This system has been for some years carried out at Marseilles, Montpellier, and other towns in the south of France, and in a variety of it, which has been called Schroth's cure, portions of the hydropathic treatment have been adopted. Every variety of disease is to be cured by this method. It enforces abstinence, and the

\* Although it is quite ascertained that people can reduce their weight much by strict rules of diet, that which was called Banting's system is already out of fashion in England, while it is comparatively in favour in Germany. Its main principle is, to select a diet consisting chiefly of albuminates, and especially of the lean of meat, with as few hydrates of carbon as possible, and one which is also somewhat stimulant, so as to favour the conversion of tissue.

hunger cure has no doubt always been a valuable agent in medicine, although patients will rarely practise it in their own houses, especially in these days when the feeding up system is the fashionable one.

*Extract of Malt.*—Hoff's extract is a sort of beer, which is moderately purgative, from the bark of the black cherry said to be used in its preparation. Its popularity has led to the preparation of purer extracts, such as Lincke's, and malt is an element of Liebig's food for infants. Malt is at present wonderfully popular abroad, and even soaps of it are advertised. In former days in England the use of malt was recommended in scrofula and phthisis; and some of the highest modern German authorities, such as Niemeyer, bear testimony to the value of Lincke's preparation. He says that it is free from the deleterious properties occasionally manifested by Hoff's beer. He has, in cases where a nourishing diet is required, and when the digestion is too weak for animal fats or cod-liver oil, administered it with the most satisfactory results. But extract of malt has been mentioned here chiefly owing to its richness in sugar, in which respect it excels ripe fruits and grapes, which we have to examine presently.

In England *herbalist* cures are almost forgotten; not so in Germany, where the cures of the shoemaker Lampe, at Goslar, were a few years ago counted marvellous; but they would scarcely have come under our notice, were not such medicines used frequently in association with

salt baths or some of the whey cures, and that in Germany they are often used as a preparation for bath cures.

The fresh expressed juice of water-cress, dandelions, couch-grass, willows, &c., is recommended to be used in spring, but in moderate doses of two or three teaspoonfuls daily on an empty stomach. Larger doses are not usually borne well. Where it does not agree with the stomach, we are directed after each spoonful to drink a wine-glassful of Seltzer water, and this to be followed by a cup of pure black coffee. Improved digestion, increased appetite, and slight movement of the bowels are the results of this treatment, which is usually continued eight to fourteen days. I should not myself recommend any such preparatory course.

But another kind of *bitters* is prepared in two or three Alpine stations, which has at present a great reputation in Germany, and is doubtless of some use at both Reichenhall and Kreuth, where the drinking sources are of no great importance; or at Heiden, where they have only whey.

Apparently, *bitters* are favourites in all mountain climates. Just as *bitters* are at the present day made of the elegant common centaury (*Erythræa centaureum*), in the West Highlands of Scotland, and as old Burton recommended, "centry sodden in whey," so in Switzerland they manufacture various compounds, rejoicing in such names as "Alpen kraüter, magen bitter," all varying

according to the fancy of the local compounder, all intended to stimulate the appetite. The Reichenhall bitters are prepared of the fresh juice of *Taraxacum*, *Veronica beccabunga*, *Trifolium fibrinum*, and *Sisymbrium nasturtium*, and are now largely despatched to all parts of Germany. I have no doubt that the preparation may be efficacious, for it resembles many of our remedies for liver, and that it may be useful in cases where *taraxacum* is indicated—a medicine, by the way, to which a sort of specific action on the biliary secretions has been attributed. There is a considerable quantity of potass in the ash of the *taraxacum* bitter, to which a portion of its alterative qualities is ascribed, and no doubt potass acts more powerfully on the system than soda. Many patients become quite fond of this mixture ; I cannot pretend to have found it palatable. The dose is from one to two ounces daily, about ten o'clock in the morning.

Two other vegetable juices may just be mentioned. The sap of the *birch* tree, from which a pleasant effervescing drink is made in Scotland, and which in former days, taken in the quantity of eight ounces in the morning, was thought to be anti-scorbutic, diuretic, and useful in stone.

The sap of the *pine*, which has of late years been used in the Landes, in quantities of half to a whole tumbler, morning and evening. It has been found useful in chronic bronchial affections, where digestion and assimi-

lation are imperfect, and even in early stages of tuberculosis.

We might thus in many parts of Great Britain, particularly in Scotland, supply several of the popular continental remedies—bitters, sap of birch and of pine, pine balsam, in addition to peat and peat-water baths. But we pass on from these, most of them, curiosities of medicine.

Fruit, and *grapes* in particular, have in all times been used both by physicians and by the laity as grateful and useful to patients in sickness, but it is only of late years that their systematic employment as a means of cure has become common. The juice of grapes consists of, in 1,000 parts,

Water . . . . .	830—860
Grape sugar . . . . .	150—300
Other constituents . . . . .	20— 30

These last consist of silicates and phosphates, and of soda, potass, lime, &c. ; of tartrates of lime and of potass, of some mucose and pectine. The skins contain aromatic ethereal oils, and the stones a good deal of tannic acid, and some fat. But the composition of the juice varies immensely according to the weather of the particular year, the nature of the soil, the species of vine, its mode of cultivation, the degree of ripeness, &c. On dry soil grapes yield much more sugar than on moist, more in warm than in cold climates ; and the geological nature of the soil has much effect on the nature of their inorganic constituents.

In Switzerland the division of grapes into *Fendants* and *non-Fendants* is of some importance for the grape cure, as the first contain less sugar and less acid than the second, but more gum and albumen. The following analysis of 1,000 parts of the Clairette (*non-fendant*) will give an idea of its chief constituents:—

Water . . . . .	824
Sugar . . . . .	140
Gum and dextrine . . . . .	5
Albumen and nitrogenous matters . . . . .	15
Iron . . . . .	0·63
Potass . . . . .	1
Soda . . . . .	2·5
Lime . . . . .	1·8
Magnesia . . . . .	0·9
Tartaric acid . . . . .	4·3
Malic do. . . . .	2·9

Grape juice has been compared with the waters of the Grande Grille at Vichy; in 10,000 parts the inorganic constituents are:—

	Grape Juice.		Grande Grille.
Chlorine . . . . .	0·26		3·24
Sulphuric acid . . . . .	1·09		1·64
Phosphoric acid . . . . .	4·71		0·70
Silicic acid . . . . .	3·44		0·70
Potass . . . . .	17·94	} 23·8	1·82
Soda . . . . .	5·82		22·3
Magnesia . . . . .	2·76		0·97
Lime . . . . .	5·09		1·69
Iron and Magnesia . . . . .	1·50		0·12
	<hr/>		<hr/>
	42·7		33·11



On the whole, therefore, the grape cure supplies us with a somewhat complicated solution of salts, along with a great deal of sugar and small quantities of albumen and gum ; the salts combined with inorganic acids may amount in the 16 ozs. to 24 grs., with organic acids to nearly 40 grs., while the sugar may vary from  $2\frac{1}{2}$  to 5 ozs.

The following are the physiological effects of eating fresh grapes. Little is known of the digestion of grape juice, but it is probable that the grape sugar is partly absorbed in the stomach unchanged, and is partly converted into lactic acid. Grapes usually, during the first few days, cause frequent and fluid motions ; after a few days, if the cure is borne, the purgative action becomes more regular, and varies from five to six motions a day ; sometimes, however, there is no laxative action. Usually the appetite is increased, the digestion improved, the secretion of bile increased, the circulation of the portal system and the peristaltic action of the bowels accelerated. Sometimes in the first few days there is a certain amount of excitement, with quickened and fuller pulse, and tendency to congestion of the head occurs ; but this usually passes off, although this stimulation seems occasionally to have gone the length even of producing hæmoptysis and bleeding at the nose. The grapes act with the greatest certainty on the kidneys, always augmenting their secretion, and, like all fruits, rendering the urine alkaline, diminishing perhaps the amount of urea.

The general effect on the system is sometimes that of resolution and absorption, at other times it is nourishing and strengthening, and even produces fattening. But these effects vary much in different places and in different seasons, showing how much depends on the varying quality of the grapes. In the alleged fattening, the animal diet allowed and mountain air have their share.

From what has been said of the physiological action of grapes, some of their uses may be inferred :—

1st. General resolving action on the abdominal organs, exercised in everything depending on abdominal plethora. Good effects have been observed in dyspepsia, jaundice, congestion of liver, of spleen, and hæmorrhoids ; in short, in most cases to which purgation is applicable.

2d. In chronic catarrhs, whether of the respiratory or of the digestive mucous tracts. Combined with mountain air grapes seem undoubtedly to be of some use in the former ; in the latter they should be used with much care. They have frequently brought on irritation bordering on that of dysentery. Curchod's statement that he has cured with grapes many cases of diarrhœa among Indian officers is important, if such favourable results could be usually counted on. I am aware that lime juice is a favourite Italian remedy for diarrhœa ; still I believe that unripe grapes would be injurious, and that the trial must be made with perfectly ripe ones. When they are efficacious, I take it to be much in the same way as the Indian Bel fruit is useful, which contains

little acid, but much mucose and pectine, the quantity of tannin present being so small, that much cannot be attributed to it.

3d. In the early stages of tuberculosis it is considered by many competent medical men to be of advantage, but this can probably only be the case when there is a tendency to inflammatory action. Probably they act by soothing the mucous surfaces; and the large quantity of sugar, which has always been a favourite remedy in phthisis, present in grapes, may also help.

These are some of the chief applications of the grape cure. I confess that, apart from the season of the year, and from other favourable influences co-operating, the effects do not appear to me to be very striking. Very discordant results have been obtained by those who prescribe the cure in different districts. Grapes often act as a rather irritating, unpleasant purgative.

The doctor must determine the quantity of grapes to be eaten in the particular case. It depends on the age and constitution of the patient and the nature of his malady. On the whole it may be counted at three to six pounds a day, and may reach eight and even twelve pounds. A man has been known to eat 300 pounds of grapes in four weeks. The grapes should be quite ripe, have thin skins, and the fewer stones the better.

One begins with small quantities and goes on gradually to large ones, and the quantum is divided thus: about

a quarter before breakfast, a half between breakfast and dinner, and the other fourth in the course of the evening. The meals are directed to be as simple as possible; but there is no particular article among the simpler ones of diet to be avoided unless milk, which does not agree with the grape cure. Of course the skins are not swallowed, and it is an objection to the cure for children, that they are apt to swallow them. To save trouble in mastication, the fresh squeezed-out juice has been recommended. Small presses have been made to squeeze the grapes, and the juice will keep when well bottled; but drinking it is not so efficacious as eating the grapes, in which process their juice is swallowed slowly, and properly mixed with the saliva. The average length of the course is three to four weeks.

The grape cure occasionally produces very obstinate dyspeptic symptoms, with aphthæ in the mouth, and jaundice, the latter chiefly in children, also a very disagreeable inflammation of the mouth. It is sometimes injurious to the teeth, especially if caries exists. On the whole a grape cure is a powerful agent, and not to be too lightly undergone by patients. It suits men better than women, and is not at all adapted for children. The season for it is from the middle of September to October.

*Bingen* and *Dürkheim*, *Vevay*, *Montreux*, and *Meran*, are some of the favourite grape-cure stations.

There are other fruit cures, such as *cherries, apricots, pears, apples, lemons, oranges* (ten to fifty in the day of these last), &c., but strawberries alone can be mentioned here.

A rough analysis of *wild strawberries* gives in a thousand parts : water, 872 ; soluble substances, 64 ; insoluble, 63. In the first, sugar, 32 ; free acids, 16 ; albuminous substances, 6 ; pectine, 1·5 ; ashes, 7·3. In the second, seeds, skin, and cellulose, 60 ; pectine, 3. Wild strawberries, of which we speak, contain much less sugar, but more salts than garden ones, and a little more acid. Strawberries contain twice as much acid as grapes, but only one-fifth of the same quantity of sugar, while they have about one-half more of salts. Their action appears to be aperient and diuretic.

Strawberries used to be employed formerly by physicians of repute in hypochondriasis, gout, and stone, and even in consumption, but little is known on the subject. Of late their use has been revived, and *Interlachen* is counted a convenient spot for their use, as they are abundant there the whole summer through : but we must recollect that, however refreshing strawberries are, they supply very little nutritious matter ; they contain less sugar than any other fruit, but a great deal of acid, and more iron. They are of course contra-indicated when there is a tendency to diarrhoea. Wild strawberries do not grow in such abundance in Great Britain as in many continental places.

## CHAPTER II.

### MILK AND ITS PREPARATIONS.

*Milk* supplies a complete specimen of an article of nutrition supplied by nature. It contains along with water, an albuminate in its casein, a fat in its butter, a compound of carbon in its milk-sugar, and besides this a small quantity of inorganic salts, and all these mixed in such a way as exactly to meet the wants of the suckling. But perfectly adapted though it is for them, it was never meant to be the sole food of children, much less of adults, as it does not possess the stimulating properties of other articles of diet, especially of meat. But though not sufficient by itself, it is most useful in conjunction with other food in modifying the nutrition of the system at all ages.

Milk varies very considerably in its composition in different districts and countries. The way in which the cattle are fed has most effect on the quantity of the water, casein, butter, and sugar which it contains. Heavy rains produce a very marked effect. Various aromatic plants may in certain pasturages impart an

aromatic flavour, just as turnips do theirs. Even during the course of the day there are considerable changes in milk. Although there is little difference in their specific gravity, yet the solid constituents of the evening milk are considerably greater than those of the morning, and very remarkably so in the amount of butter.

Of the three kinds of milk chiefly used for invalids, cows' milk has the largest, asses' milk the smallest, amount of solid constituents. Goats' milk is between the two. Protein substances are also considerably more abundant in cows' than in goats' milk, while asses' milk does not contain one half so much of them as goats'. In amount of butter and of sugar, cows' and goats' milk are pretty much on a par. Asses' milk is very poor in butter, but richer in sugar and in salts, than either cows' or goats' milk. The accounts of ewes' milk vary, but on the whole it is rich in constituents. Mares' milk seems to be poor in butter and casein, but to be rich in sugar. Buffaloes' milk, according to Vernois' analysis, is very rich.

In round numbers cows' milk may be said to consist\* of, water, 857 parts ; casein, 48 ; albumine, 6 ; butter, 43 ; milk-sugar, 40 ; salts, 6. These salts consist chiefly of

\* Good milk should contain 130 to 140 parts of solids in the 1,000 parts. A comparative table of milk from Becquerel and Vernois gives as much as 196 for Angus, 182 for Tyrol, 162 for Bretagne, 160 for Holland, 142 for Belgium. Muspratt gives 135 as the average for England ; but London milk falls short of that average.



phosphates of lime and magnesia, iron, chloride of potass and of soda, and phosphates of the same.

*Skimmed milk* is the milk with the cream removed, after it has risen to the surface; *butter-milk* is what remains of the cream after it has been deprived of its butter; *whey* is the serum of the milk which remains after the butter and curds have been removed, but a considerable portion of its salts are lost, most of its phosphates being precipitated in combination with the casein. Ten parts of milk yield about six of whey. In a general way a pound of whey may be said to contain from 36 to 40 grs. of salts, consisting of 10 to 14 grs. of chloride of potass, 2 to 3 grs. of chloride of sodium, and some 20 grs. of phosphates, besides about 350 grs. of milk-sugar.

With respect to the physiological action of milk and of whey when drunk,—in the case of milk, the casein is first coagulated by the gastric fluids, and is afterwards partly dissolved in the process of digestion, by the approach of alkaline fluids and of bile, and, perhaps, partly converted into an albuminous solution. The whole of the casein appears never to be absorbed by the stomach; a small portion passes into the duodenum. The butter, which oxidizes slowly, appears to be re-absorbed in the small intestines unaltered, and reaches the lacteals in the form of an emulsion; while the greater portion of the milk sugar is converted into lactic acid, and reaches the blood, where it is readily oxidized.

As to the general effect on the system, there is no food that is so quickly digested by a healthy stomach, none that excites so little. Indeed some have attributed a soporific action to it; it does not increase the production of heat or quicken the circulation; and if it increases any secretion, it is that of the urine. As so much of the milk is absorbed into the system, only small masses of fæces are formed. Its tendency, therefore, besides being generally sheathing to the intestines, is to cause constipation. Milk is unusually nourishing, and promotes the deposition of fat, especially when it contains much cream.

The action of the whey, which is a weak solution of salts and of milk-sugar, and is a fluid with a mawkish taste, which is agreeable to very few persons, is not very marked; in large quantities it readily produces dyspepsia and an uncomfortable state of the mouth and gums. It is generally laxative, often producing diarrhœa. It acts very distinctly as a diuretic, but it also occasionally causes constipation, and even a slight amount of jaundice. It is believed to increase the secretion of mucous surfaces, of the liver and of the skin. If not taken in too great quantity, whey is absorbed rapidly. The clearer it is, that is, the less butter or casein it contains, the less likely is it to cause dyspepsia.

*Milk* has long been used in sickness and in cases of debility. Hippocrates used to order milk and wine. At the present day milk and brandy are often used in recon-

stituent medicine ; and what more popular remedy is there than old man's milk ? Who has not had occasion to witness the good effects of milk and lime water in irritation of the stomach, and in some forms of dyspepsia ? But it is rather with the systematic use of milk as an article of diet that we have here to do, and more particularly with its nutritive effect in combination with country and mountain air ; as, however, I think it is not sufficiently valued in medicine, I shall say a few words as to its use in some forms of chronic disease.

In various advanced stages of disease, and of perverted nutrition, of which it is difficult to define the exact nature, but in which drugs appear to have no effect, the steady use of milk appears to produce a complete change of the nutrition. Dr. Karell of St. Petersburg, and others, have advocated its use in somewhat of the following manner : the patient begins with 2 to 6 ozs. of milk three times daily ; it must be taken at fixed hours, for if specific directions are not given, as for medicine, the patient will not adhere to the use of it. The quantity, when the milk agrees, is to be gradually increased, and patients often get to take as much as 10 or 12 glasses daily ; the good effects are then apt to cease, and it is necessary to revert to the small doses again. The milk is generally best borne tepid, and should be taken in slowly, just as grapes should not be eaten when very cold, and should be swallowed gradually. If the milk causes much thirst, a little seltzer water may be taken. Patients are to

be kept as much as possible to this diet, but a little stale bread one day and milk soup the next may be allowed.

Dr. Karell says that from this treatment he has met with quite unexpected success in various cases of hypochondriasis and dyspepsia, neuralgic affections of the intestines, in congested liver, and even in dropsy connected with enlarged liver. Dr. G. Keith of Edinburgh tells me he has used the treatment with extraordinary success in some of these last cases, and also (what from my own experience I should quite be inclined to expect) in old diarrhœas ; but he finds it difficult to get patients to stick rigorously to the milk, and to small quantities of it. The complete *rationale* of the good effects of milk given in this way is not very plain.

But the good effects of milk diet in general conditions of the system, and where there is a tendency to tuberculosis, are much more generally admitted. It is accordingly often found extremely useful in combination with country air in anæmic states, the result of acute illness, or of loss of blood in scrofulous and rachitic children, but, above all, in threatened tuberculosis, in which its use has been popular, with some interruptions, since Galen used to send patients suffering from it to the milk cure at Stabiæ.

The general indications for its use are so well laid down by Niemeyer, that I shall quote what he says : "In the selection of suitable diet for consumptive patients the old rules, derived partly from common expe-

rience, agree completely with the views now received in physiology respecting nourishment and renewal of tissue. All the articles of food especially recommended to consumptive patients contain large quantities of fat, or of substances which form it, and proportionately little of protein substances. This selection corresponds with the empirically ascertained fact, that the production of urea or the conversion of nitrogenous elements is increased by a large supply of protein substances, while on the other hand the conversion and expenditure of the organs and tissues most important to the organism is reduced by an abundant supply of fat and fat-forming articles. Therefore the freest possible use of milk cannot be too strongly recommended to phthisical patients. But it is entirely superfluous, and indeed erroneous, to remove the casein from the milk, and make it be drunk in the shape of whey; this can only be necessary in the rare cases, when the stomach bears whey well and milk badly. When I frequently order my patients to drink three times daily a pint of milk warm from the cow, my only object is that the milk should not be robbed of any of its constituents or skimmed before it is drunk."

Warm milk is, like other warm fluids, useful in chronic bronchitis. Milk is also an agent of very great value in affections of the stomach and of the intestines. It is easy to see how it is useful when we do not wish to give these organs much work to do; in chronic

catarrhs of the stomach, and in perforating ulcer, milk is constantly used with great advantage. In infants, when amylaceous food is given too early, a return to milk is often the appropriate remedy. It is also useful in chronic diarrhœa and dysentery; in the chronic diarrhœa of children its use is familiar; and it is an old and rather neglected remedy in dysentery. If used with care, it is a valuable adjunct in many stages of the disease, and I believe that if more freely and systematically used, it would be found to be one of the best cures for the obstinate diarrhœas and other sequelæ of tropical dysentery; of course the milk must be taken with care, and it must be ascertained whether it is digested or not. If given in too large quantities, it may overload the stomach and increase the diarrhœa.

To improve general constitutional states there is no necessity, as in Dr. Karell's employment of it, for the milk being drunk at precise hours and in precise quantities. The chief object is to drink the milk in such quantities as are digestible. There is no virtue in drinking milk warm from the cow if you do not like it; many drink cold milk more readily. It is better to have it previously boiled. The following is the regimen usually recommended. Let the breakfast be of milk, and let three or four cups be taken of warmed milk with some bread or biscuit. It is best to begin with skimmed milk, as the milk is often rich in Alpine pasturages. There is no objection to a little cocoa or tea with it. Some hours

later, or about ten or eleven o'clock, the patient should take two more cups of milk. At one or two o'clock the patient should have a simple but nourishing diet of roast meat and vegetables, with a glass of good wine or of sound beer. At five or six in the afternoon two more cups and some bread should be taken, and thus patients may gradually come up to sixteen or twenty cups daily. At any time when the patient begins to get tired of the quantity of milk, or there are symptoms of its disagreeing, the quantity is to be reduced, or even for a time discontinued; there are few patients who, if they begin with small doses, cannot take milk, although a patient will often assure you that milk always disagrees with him.

The main virtue of a milk diet is, that it supplies nutriment which can be easily assimilated, and does not make any great call on the powers of the system.

*Whey.*—Although it is only within the last few years that the use of this drink has reached its full development, it is by no means a new remedy. Old Burton, while he thought milk increased melancholy, said that whey was most wholesome. About a hundred years ago we read of people going to the head of the Solway Firth for three weeks “to the whey,” or to the Highlands for goats’ whey, and Tabitha Bramble was very near sending her dog Jowler to the whey cure at Abergavenny; and Bath posset, or whey, used to be made by boiling two parts of the mineral water with one of milk.



There is a great deal of fancy about the selection of particular kinds of whey. Cows', goats', and ewe milk whey all have their advocates ; but goats' milk whey has a strong smell which is distasteful to many ; the cows' milk has no unpleasant odour or flavour, while ewe-milk has no disagreeable smell, and its taste is very pleasant ; it is decidedly the nicest to take of the wheys. We are often told of the aromatic flavour imparted by the herbs that the animals have grazed on, but such flavour is always lost in the preparation of whey. Then it is asserted that the rennet, or prepared piece of stomach employed in making the whey, must be got from that of an animal of the same species ; for instance, that you cannot get good goats' whey if you use the rennet of calf. Then in various places different herbs are employed in imparting flavour to the whey. There is a general feeling in favour of Swiss whey ; and if they are not in Switzerland, patients are gratified to learn that the whey is made by a native of Appenzell, and still better pleased, if the said native shows himself in his national costume.

The general composition of whey has been given above, but particular kinds are thought to be most useful in different complaints ; thus, goat milk whey is considered best in chest affections, cows' milk for abdominal ailments, and ewe-milk as most generally nourishing : but these rules are often as arbitrary as the distinction between the mineral waters of the

same place, when they scarcely vary at all in composition.

Whey (the main therapeutic value of which is probably as a nutritive drink) is recommended theoretically, as supplying to the blood only non-nitrogenous elements, the nitrogenous casein and the fat being excluded; the notion is, that the constitution of the fluids and tissues of the body is altered and improved by the salts and milk-sugar which it contains, while the nitrogenous elements are withheld. But these theoretical ideas are of no real importance, as long as all patients drinking whey at the same time use a diet in which there is an abundance of nitrogenous or protein substances; some have attributed special virtues to the small quantity of the salts of potass present in whey.

The whey cure is recommended in chronic bronchial and laryngeal catarrhs, in tuberculosis and hæmoptysis, in chronic catarrh of the stomach, in congestion of the liver, and in hæmorrhoids.

In the first of these affections we have already seen, that warm water is a useful remedy, and it is probably to the whey being drunk warm, that its good effects are to be attributed.

In pulmonary phthisis it is for its more erethic, excitable form, in which inflammation occurs from time to time, and active hæmorrhage, that the whey cure is recommended. In most cases the operation of whey may be considered mildly anticatarrhal and antiphlogistic.

But for the more torpid forms of consumption it is not adapted; and where there is much acidity present, as in some forms of incipient phthisis, and still more when there is diarrhœa, the whey is contra-indicated.

In abdominal affections, whey acts chiefly as giving hardly any work to the digestive organs to do, and as a mild aperient; but it is apt to cause dyspepsia and diarrhœa. While it has many advocates for its use in hæmorrhoids and abdominal obstructions, the general voice is against its employment in catarrhs of the stomach or in perforating ulcer.

Whey, on the whole, is by no means the mild remedy that it is usually supposed to be; its continued use is often very lowering; at the same time there is no question, that many people thrive on it and on mountain air.

If milk, a natural product, easily causes indigestion, and is not suited to be singly the food of adult man, much less is the artificial product whey fitted to be so. Adults going through a milk cure, use ordinary articles of diet; in a whey cure they must do it, or would suffer excessively in their nutrition. Useful, therefore, though milk may be under many circumstances, and whey occasionally, most of the success claimed for systematic milk and whey cures may be very fairly set down to change of mode of living, to great simplicity of diet, to exercise in the open air at the best season of the year, and to the pure air of Alpine elevations.

Milk and whey cures are to be obtained almost every-

where : but for the English, *Ems*, *Schlangenbad* and *Badenweiler* may be recommended in the low country ; *Ischl*, *Reichenhall*, and *Kreuth* in the Eastern Alps ; *Gais*, *Weissbad*, *Heiden*, or *Interlachen*, in Switzerland.

The supply of whey at most baths is abundant, and there are few places where a great many of the patients, particularly ladies, are not directed to drink the waters mixed with whey. Whey by itself is mawkish, and these mixtures appear to me to be singularly disagreeable to take, and therefore not particularly suitable for delicate stomachs.

I do not see why we should not have ewe-milk whey cures in Great Britain, especially in some parts of Scotland, although I believe regular systematic whey cures are less popular in Germany and in Switzerland at present, than they used to be.

The mode of life at Gais, the oldest of the Swiss whey cures, is thus described :—“At six o'clock in the morning the bell rings to let people know that the whey has arrived. A tub of whey is set down before each hotel, from which the kellner fills up the glasses of the guests, which contain one to three choppins. Whoever comes too late, has to wait for the next supply, as the whey must be drunk warm ; however, he can never have to wait long, as the bell sounds every quarter of an hour up to half-past seven or eight o'clock, announcing the arrival of fresh relays. In the intervals of drinking, the patient walks about. When a patient has drunk the quantity

directed, he takes a longer walk. In bad weather the whey is drunk in the *curisal*. The bell calls to breakfast at nine o'clock, which consists of soup, coffee, or tea and bread. From half-past six to half-past twelve the guests amuse themselves with walking, with conversation, music, or billiards. About half-past twelve dinner commences, when patients must eat according to the directions they receive, but the table is ample and varied. After dinner come longer walks, and at eight o'clock the bell rings for supper."

Patients begin with one glass, and go up to three or four glasses. If the whey is taken in larger quantities, the stomach is oppressed, and sometimes headache and giddiness are occasioned. On this account, patients with delicate stomachs should commence with very small quantities, less than half a glass. The drinking successive glasses rapidly after each other is to be avoided. If diarrhoea is the result, the quantity drunk is to be reduced; if constipation occurs, any of the bitter waters may be used, in small quantity, at bed-time. Loss of appetite, weariness, and other effects somewhat resembling the saturation by mineral waters sometimes occur, and for this the doctor must be consulted.

Cows' milk, goats' milk, and ewe milk whey are given in different places; many do not like goats' milk whey; on the whole, the cow milk is best borne. Ewe milk whey contains about two per cent. of albuminates, cows' and goats' about one per cent.

The most favourable season for the whey cure is spring; but the season varies much according to the elevation of the station.

The duration of a whey cure is very various. If the digestion does not suffer, it may be prolonged; and if it really be effective in tuberculosis, it is evidently only from long-continued courses of it, that much beneficial alteration in the nutrition of the system can be expected. It is not uncommon to drink the whey in spring, then stop during summer, and have a second course in autumn.

*Butter-milk* has been much used in diseases of the stomach, and in perforating ulcer, and is applicable where milk can be better supported by the stomach without its cream. For such cases it is suited; but even practical men have at times become enthusiastic about its virtues, and recommended it in hysteric catalepsy and spinal irritation!

*Cream* may in a certain number of cases be found useful in producing improved nutrition in the same way as cod-liver oil; but many stomachs cannot bear it. I have known an attack of extreme violence, and resembling Asiatic cholera, follow the swallowing of too large a quantity of it.

*Sour Milk*.—It is well known that milk, if left exposed to the air, soon turns sour and coagulates. This is believed to depend partly on the formation of minute fungi, of bacterias and of vibrios, and partly on the conversion of milk-sugar into lactic acid. The souring is readily

caused by changes of temperature and atmospherical influences; nay, even the vessel in which the milk is kept, seems to have a wonderful influence on the process.

When milk has soured, its casein and lactic acid do not appear to interfere with digestion; indeed many writers, particularly some Vienna ones, have of late thought it more easily digested than fresh milk. Sweet milk, when it enters the stomach, has its casein coagulated and then redissolved, and it is the opinion of many, that the casein which has coagulated exposed to atmospherical influences, is more easily dissolved again than the other.

It is chiefly in disorders of the digestive organs that the superiority of sour milk is maintained. There seems to be no doubt that casein is easily digested by most stomachs. One of its forms is known in Scotland as Corstorphine Cream. Sour or curdled milk, under the name of Dahi, is a popular article of diet, indeed of medicinal regimen, among the natives of India. They also preserve it dry and powdered, and in the East generally it is often prepared mixed with flour.

*Koumis*.—Another result of the decomposition of milk, is a sort of spirit procured by the Tartars from the fermentation of mares' milk, no doubt mainly from the transmutation of the milk-sugar.

It is much used by them as a strengthening article of diet, and of late years it has attracted some notice in Europe as a tonic remedy. It is considered a great



restorative in depressed states of the system, and, combined with the fresh air of the steppes, is believed to be just as efficacious as whey supported by an Alpine climate.

I should not have thought it necessary to allude to the koumis here, had not some attempts been made to introduce it into Europe. Besides being used in various Russian towns, it has been employed at Bremerhaven, at Salzbrunn, at Görbersdorf in Germany, and at Eaux Bonnes in the Pyrenees.



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