

already mentioned is one of them. Two small chambers which adjoin each other, one containing a tank of hot water, the other containing a trough, over which are two taps, one of hot and one of cold water, occupy the two other angles; while the fourth angle of the square is occupied by the chamber which contains the fire, over which is the boiler.

"The bather having entered this apartment soon perspires profusely from the humid heat which is produced by the hot water of tanks and fountains, and by the steam of the boiler. The bather sits on one of the marble seats, or lies on the lewan, or near one of the tanks, and the operator then commences his work. The operator first cracks aloud every joint in the body. He makes the vertebrae of the back and even of the neck crack. The limbs are twisted with apparent violence, but so skilfully, that no harm is ever done. The operator next kneads the patient's flesh. After this he rubs the soles of the feet with a kind of rasp of baked clay. There are two kinds of rasps, one porous and rough, one of fine smooth clay. Those used by ladies are usually encased in thin embossed silver. The next operation is rubbing the bather's flesh with a small coarse woollen bag, after which the bather dips himself in one of the tanks. He is next taken to one of the chambers in the corner, and the operator lathers the bather with fibres of the palm tree, soap and water. The soap is then washed off with water, when the bather having finished washing, and enveloped himself in dry towels, returns to the beytowwal and reclines. Here he generally remains an hour to an hour and a half, sipping coffee and smoking, while an attendant rubs the soles of the feet and kneads the body and limbs. The bather then dresses and goes out."

The following description of a Russian bath is from Kohl's *Russia*:—"The passage from the door is divided into two behind the check-taker's post, one for the male, one for the female guests. We first enter an open space, in which a set of men are sitting in a state of nudity on benches, those who have already bathed dressing, while those who are going to undergo the process take off their clothes. Round this space or apartment are the doors leading to the vapour-rooms. The bather is ushered into them, and finds himself in a room full of vapour, which is surrounded by a wooden platform rising in steps to near the roof of the room. The bather is made to lie down on one of the lower benches, and gradually to ascend to the higher and hotter ones. The first sensation on entering the room amounts almost to a feeling of suffocation. After you have been subjected for some time to a temperature which may rise to 145°, the transpiration reaches its full activity, and the sensation is very pleasant. The bath attendants come and flog you with birchen twigs, cover you with the lather of soap, afterwards rub it off, and then hold you over a jet of ice cold water. The shock is great, but is followed by a pleasant feeling of great comfort and of alleviation of any rheumatic pains you may have had. In regular establishments you go after this and lie down on a bed for a time before issuing forth. But the Russians often dress in the open air, and instead of using the jet of cold water, go and roll themselves at once in the snow."

Turkish baths have, with various modifications, become popular in Europe. The Russian baths were introduced into most German towns about half a century ago. They had a certain limited amount of popularity, but did not take firm root. Another class practically owes its origin to Dr Barter and Mr Urquhart. It professed to be founded on the Turkish bath, but in reality it was much more of a hot air bath, i.e., more devoid of vapour than either Roman or Turkish baths ever were, for it is doubtful whether in any case the air of the laconicum was free from vapour.

These baths, with their various modifications, have become extremely popular in Great Britain, in Germany, and in Northern Europe, but have, curiously enough, never been used extensively in France, notwithstanding the familiarity of the French with Turkish baths in Algiers.

In England hot air baths are now employed very extensively. They are often associated with Turkish and electric baths, and with the usual processes of hydropathic treatment.

Bathing among the ancients was practised in various forms. It was sometimes a simple bath in cold or in tepid water; but at least, in the case of the higher orders, it usually included a hot air or vapour bath, and was followed by affusion of cold or warm water, and generally by a plunge into the piscina. In like manner the order varies in which the different processes are gone through in Turkish baths in modern Europe. Thus in the new baths in Vienna, the process begins by immersion in a large basin of warm water. Sudation is repeatedly interrupted by cold douches at the will of the bathers, and after the bath they are satisfied with a short stay in the cooling-room, where they have only a simple sheet rolled round them. In Copenhagen and in Stockholm the Oriental baths have been considerably modified by their association with hydropathic practices.

This leads us to notice the introduction of hydropathy. Although cold baths were in vogue for a time in Rome, warm baths were always more popular. Floyer, as we have seen, did something to revive their use in England; but it was nearly a century and a half afterwards that a Silesian peasant, Priessnitz, introduced, with wonderful success, a variety of operations with cold water, the most important of which was the packing the patient in a wet sheet, a process which after a time is followed by profuse sudation. Large establishments for carrying out this mode of bathing and its modifications have within the last thirty years been erected in many places on the Continent and in Great Britain, and have enjoyed a large share of popularity.

But the greatest and most important development of ordinary baths in modern times has taken place in England, and has been extending gradually to the Continent. The English had long used affusion and swimming baths freely in India. Cold and hot baths and shower baths have been introduced into private houses to an extent never known before; and, from 1842 downwards, public swimming baths, besides separate baths, have been supplied to the public at very moderate rates, in some cases associated with wash-houses for the poorer classes. Their number has increased rapidly in London, and in the principal Continental cities. Floating baths in rivers, always known in some German towns, have become common wherever there are flowing streams. The better supply of most European cities with water has aided in this movement. Ample enclosed swimming baths have of late years been erected at many sea-side places. When required, the water, if not heated in a boiler, is raised to a sufficient temperature by the aid of hot water pipes or of steam; and gas has been utilized for heating small quantities of water for baths in private houses. As to separate baths they used to be of wood, painted; they are now most frequently of metal, painted or lined with porcelain enamel. The swimming baths are lined with cement, tiles, or marble and porcelain slabs; and in some of the newest baths a good deal of ornamentation and painting of the walls and ceiling of the apartments, in imitation of the ancients, has been attempted.

We have thus traced in outline the history of baths through successive ages down to the present time. The medium of the baths spoken of thus far has been water, vapour, or dry hot air. But baths of more complex

nature, and of the greatest variety, have been in use from the earliest ages. The best known media are the various mineral waters and sea-water. These, and baths impregnated with their gases, cannot here be considered in detail; we can do little more than enumerate a few of the artificial baths. Of baths of mineral substances, those of sand are the oldest and best known; the practice of *arenation* or of burying the body in the sand of the seashore, or in heated sand near some hot spring, is very ancient, as also that of applying heated sand to various parts of the body. Within the last few years establishments have been introduced into various European cities where hot dry sand is methodically applied. Baths of peat earth are of comparatively recent origin, and are little used out of Germany. The peat earth is carefully prepared and pulverized, and then worked up with water into a pasty consistence, of which the temperature can be regulated before the patient immerses himself in it.

There are various baths that may be termed *chemical*, in which chlorine or nitromuriatic acid is added to the water of the bath, or where fumes of sulphur are made to rise and envelop the body.

Of *vegetable* baths the number is very large. Leys of wine, in a state of fermentation, have been employed. An immense variety of aromatic herbs have been used to impregnate water with. Of late years fuci or seaweed have been added to baths, under the idea of conveying into the system the iodine which they contain; but by far the most popular of all vegetable baths are those made with an extract got by distilling certain varieties of pine leaves. They are pleasant and stimulating.

The strangeness of the baths of *animal* substances, that have been at various times in use, is such that their employment seems scarcely credible. That baths of milk or of whey might be not unpopular is not surprising, but baths of blood, in some cases even of human blood, have been used; and baths of horse dung were for many ages in high favour, and were even succeeded for a short time by baths of guano.

*Electrical* or *galvanic* baths have been popular of late years, in which galvanic action is communicated to the patient while in baths.

Baths also of *compressa* air, in which the patient is subjected to the pressure of two or three atmospheres, have been in use at certain places for some years.

A *sun* bath (*insolatio* or *heliosis*), exposing the body to the sun, the head being covered, was a favourite practice among the Greeks and Romans. This list of artificial baths might be readily increased.

We have hitherto spoken of general baths, but there are many varieties of local ones, the use of which has become somewhat more definite than it used to be, before the principles of hydropathy were understood. Some of these are affusion, half-baths, full baths, sitz baths, wave baths, local baths, shower and spray baths, douches, fomentations, injections, wrapping up in the wet sheet. Some of these processes, though by no means of novel origin, require a few words of explanation.

*Douches* were used by the ancients, and have always been an important mode of applying water to a circumscribed portion of the body. They are, in fact, sprays of water, varying in size and temperature, applied with more or less force for a longer or shorter time against particular parts. A douche exercises a certain amount of friction, and a continued impulse on the spot to which it is applied, which stimulate the skin and the parts beneath it, quicken the circulation of the capillaries, and thus favour the absorption of abnormal deposits. It wakes up the slumbering activity of the tissues and helps to remove congestions from the deeper seated organs. The

effects of the douche are so powerful that it cannot be applied for a long time continuously. After every two or three minutes there should be an interval in its use. It is obvious that a douche is capable of many local applications, on the description of which it is here impossible to enter. Nor need we say that the douche must be used with great care in the case of nervous and excitable people, and better not at all when any irritation or inflammation is present. Douches are invaluable in old neuralgias, in the sequela of rheumatism, and in thickened joints.

The alternation of hot and cold douches, which for some unknown reason has got the name of *Ecossaise*, is a very powerful remedy from the strong action and reaction which it produces, and is one of very great value. The shower bath may be regarded as a union of an immense number of fine douches projected on the head and shoulders. It has been long in use in England, and produces a strong effect on the nervous system. An ingenious contrivance for giving circular spray baths, by which water is propelled laterally in fine streams against every portion of the surface of the body, is now found in most establishments.

To all these modes of acting on the cutaneous surface and circulation must be added dry rubbing, as practised by the patient with the flesh glove, but much more thoroughly by the bath attendants, if properly instructed.

*Action of Baths on the Human System.*—We shall now inquire shortly into the theory of the operation of the baths and of the bathing processes, of which we have briefly traced the history.

The primary operation of baths is the action of heat and cold on the cutaneous surfaces through the medium of water.

The first purpose of baths is simply that of abstersion and cleanliness, to remove any foreign impurity from the surface, and to prevent the pores from being clogged by their own secretions or by desquamations of cuticle. It need scarcely be said that such objects are greatly promoted by the action of the alkali of soaps and by friction; that the use of warm water, owing to its immediate stimulation of the skin, promotes the separation of sordes; and that the vapour of water is still more efficient than water itself.

It has been supposed that water acts on the system by being absorbed through the skin. The question has been frequently discussed; but the great majority of observers believe that, under ordinary circumstances, no water is absorbed, or if any, so minute a quantity that it is not worth considering. And further, as we have alluded to medicated baths, it is proper to say that, according to the latest authorities, no foreign bodies, under the ordinary circumstances of a bath, are absorbed into the system; although when a portion of skin has been entirely cleared of its sebaceous secretion, it is possible that a strong solution of salts may be partially absorbed. In the case of medicated baths we therefore only look (in addition to the action of heat and cold, or more properly to the abstraction or communication and retention of heat) to any stimulant action on the skin which the ingredients of the bath may possess.

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 on the body of the water of a bath, which has been calculated at nearly one pound on each square inch of the surface, has never been accurately determined. Baths have therefore to be considered according to their temperature; and the effects of cold and of hot baths have to be studied. But we may as well first point out one or two general facts. The human system bears changes of temperature of the air much better than changes of the temperature of water. While the temperature of the

air at 75° is perhaps too warm for the feelings of many people, a continued bath at that temperature is felt to be cold and depressing. Again, a bath of 98° to 102° acts far more excitingly than air of the same temperature, both because, being a better conductor, water brings more heat to the body, and because it suppresses the perspiration, which is greatly augmented by air of that temperature. Further, a temperature a few degrees below blood heat is that of indifferent baths, which can be borne longest without natural disturbance of the system.

Cold baths act by refrigeration, and their effects vary according to the degree of temperature. The effects of a cold bath, the temperature not being below 50°, are these:—there is a diminution of the temperature of the skin and of the subjacent tissues; the blood at first rises in temperature nearly 4°, but soon subsides again, this diminution of temperature of the blood usually not taking place in the bath, but shortly after leaving it. There is a certain feeling of shock diffused over the whole surface, and if the cold is intense it induces a slight feeling of numbness in the skin. It becomes pale and its capillaries contract. The further action of a cold bath reaches the central nervous system, the heart and the lungs, as manifested by the tremor of the limbs it produces, along with a certain degree of oppression of the chest and a gasping for air, while the pulse becomes small and sinks. After a time reaction takes place, and brings 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 more active is the reaction. Very cold baths, anything below 50°, cannot be borne long. Lowering of the temperature of the skin may be borne down to 9°, but a further reduction may prove fatal. The diminution of temperature is much more rapid when the water is in motion, or when the bather moves about; because, if the water is still, the layer of it in immediate contact with the body gets warmed to a certain degree.

The effects of *hydropathy* depend on the power of abstracting heat from the body, and of stimulating it by the application of cold water. The action is depressing or exciting, according as the withdrawal of heat or the stimulation predominates.

A great deal depends on the form of the bath; thus one may have—(1.) Its depressing operation,—with a loss of heat, retardation of the circulation, and feeling of weariness, when the same water remains in contact with the skin, and there is continuous withdrawal of heat without fresh stimulation. This occurs with full or sitz baths, with partial or complete wrapping up the body in a wet sheet which remains unchanged, and with frictions practised without removing the wet sheets. (2.) Its exciting operation,—with quickening of the action of the heart and lungs, and feeling of glow and of nervous excitement and of increased muscular power. These sensations are produced when the layer of water next the body and heated by it is removed, and fresh cold water causes fresh stimulus. These effects are produced by full baths with the water in motion used only for a short time, by frictions when the wet sheet is removed from the body, by douches, shower baths, bathing in rivers, &c. The depressing operation comes on 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. The short duration of the bath makes both its depressing and its exciting action less; its longer duration increases them; and if the baths be continued too long, the protracted abstraction of animal heat may prove very depressing.

We shall not attempt to give more than those few hints about hydropathic processes, and shall merely remark that, under them the system is subjected to alternate periods of

excitement and of rest. There is persistent lowering of the temperature of the body, with contraction of the capillaries and local anæmia. This is succeeded by the reverse, or by local hyperæmia. There is powerful excitement of the vascular and nervous systems. The processes of absorption and of excretion are stimulated. There is a great increase of perspiration. The transformation of tissue is materially quickened.

We must next consider the operation of warm baths of different temperatures.

*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 reach the central system. There is no reaction, and the animal temperature remains unchanged. Baths of this kind can be borne for hours with impunity.

*Warm baths from 96° to 104°.*—In these the action of the heat on the peripheral surface is propagated to the central system, and causes reaction, which manifests itself in moderately increased flow of the circulating fluids to the surface, and in an increased frequency of pulse. It appears to supply a slight stimulus to the renewal of tissue.

With a *hot bath* from 102° up to 110° the central nervous and circulating systems are more affected. The frequency of the pulse increases rapidly, the respiration becomes quickened, and is interrupted by deep inspirations. The skin is congested, and the retained animal heat bursts out, causing a profuse perspiration.

*Very hot bath.*—Everything above 110° feels very hot; anything above 120° almost scalding. Baths of from 119° to 126° have caused a rise of 2° to 4½° in the temperature of the blood. Such a bath can only be borne for a few minutes. It causes violent reflex action on the heart and the arterial system, excessive congestion of the skin, and violent perspiration.

In the use of hot baths a certain amount of vapour reaches the parts of the body not covered by the water, and is also inhaled.

*Vapour* baths produce profuse perspiration, and act in cleansing the skin, as powerful hot water baths do. Vapour, owing to its smaller specific heat, does not act so fast as water on the body. A vapour bath can be borne for a much longer time when the vapour is not inhaled. Vapour baths can be borne hotter than water baths, but cannot be continued so long, as vapour, being a bad conductor, prevents radiation of heat from the body. A higher heat than 122° is not borne comfortably. The vapour bath, though falling considerably short of the temperature of the hot air bath, heats the blood considerably more.

*Hot air* baths differ from vapour baths in not impeding the respiration as the latter do, by depositing moisture in the bronchial tubes. The lungs, instead of having to heat the inspired air, are subjected to a temperature above their own. Hot air baths, say of 135°, produce more profuse perspiration than vapour baths. If very hot, they raise the temperature of the body by several degrees.

Vapour baths, hot air baths, and many hydropathic processes agree in producing violent sudation, and also frequently in subjecting the body, while in a state of perspiration, to the action of water of a comparatively low temperature. Of perspiration we shall only say, that it is sensible and insensible: 30 oz. may be considered to be about its average amount in the twenty-four hours; of this, which is chiefly water, about ⅓ of an oz. consists of urea and of other peculiar substances. A man has been known to lose 3 lb in a Russian bath; some think more may be lost. As perspiration eliminates water and effete matter from the system, and also aids in respiration, it is obvious that its regulation must have an important effect on the economy.

In comparing the general effects of hot and cold baths, it

may be said that while the former tend to check cutaneous transpiration, the latter favour it. It is supposed, but is scarcely proved, that cold baths, by the stimulus they give, increase the reaction of the gastric and other fluids of the stomach, and of the alimentary canal, and that warm baths rather serve to retard it. Either hot or cold baths, but especially the latter, favour the secretion of urine. 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.

The warm bath causes swelling and congestion of the capillaries of the surface in the first instance; 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. A warm bath elevates the temperature of the body, both by bringing a supply of heat to it and by preventing the radiation of heat from it. It can be borne longer than a cold bath. It draws blood to the surface, while a cold bath favours internal congestions. There is in both cases increased oxidation or waste of the tissues; but with the warm bath there is less call made on the system, as oxidation depends chiefly on increased heat, which in the case of the warm baths is artificially supplied. The reason why a man when much exhausted feels a hot bath refreshing, while he cannot bear a cold one, may be that the increased heat conveyed to him by the warm bath helps the process of oxidation, and thus relieves his system. Cold refreshes by exciting the functions, heat by physically relieving their action; a hot bath calms by reducing the loss of heat, and by supplying a certain amount of it. Very hot baths, it is true, act like cold baths, as stimulants to the heart and nervous centres; but they do it more gradually and with less shock to the system than cold baths. The general result of this comparison would show that warm are a milder remedy than cold baths, and are applicable often when the system does not possess power of reaction sufficient to make the use of the latter expedient.

As regards the use of baths simply for the promotion of health, it follows, from what has been stated, that warm baths are best suited for the delicate, for the very young, and for the old; cold baths for the strong and active, in whom the powers of reaction are unimpaired. It would be out of place to say much here about the use of baths in medicine. Warm baths according to their degree of heat are of great value in relaxing spasms, in calming the nervous system, and in neuralgias, chronic rheumatism, and gout. Turkish baths are useful in these last affections, and wherever it is of importance that there should be free action of the skin. Cold baths, again, are more useful when the system requires tonics, and when it can bear the shock of cold affusion; when diseases of the system, especially of the nervous system, are more functional than organic. It is obvious that the cold-water cure, including, as it does, copious sudation, combines in a certain degree the effects of both kinds of baths.

But baths often produce injurious effects when used injudiciously. Long continued warm baths are soporific, and have owing to this action often caused death by drowning. The effects of very hot baths are swimming in the head, vomiting, fainting, congestion of the brain, and, in some instances, apoplexy.

The symptoms seem to point to paralysis of the action of the heart. It is therefore very evident how cautious those should be, in the use of hot baths, who have weak hearts or any obstruction to the circulation. Fat men, and those who are full-blooded or predisposed to epilepsy, should avoid them. Protracted indulgence in warm baths is relaxing, and has been esteemed a sign of effeminacy in all ages. Sleepiness, though it will not follow the first immersion in

a cold bath, is one of the effects of protracted cold baths; depression of the temperature of the surface that exceeds 9° becomes dangerous. The risk in cold baths is congestion of the internal organs, as often indicated by the lips getting blue. Extremely cold baths are, therefore, very unsafe wherever there is a tendency to internal congestion; and they are always dangerous when the system is exhausted by fatigue.

We shall conclude with a few words of advice about ordinary bathing for hygienic purposes:—Wherever it is practicable, bathing should be over before 1 p.m. It is not to be thought of when the stomach is loaded, or after much wine. The shorter the bath is, especially if the water be cold, and the bather cannot swim, the better,—say five minutes. He should swim if possible, and then a quarter of an hour is long enough. Bathing should not be practised more than once a day. When one is over-heated, but not exhausted, it is advisable to bathe at once, without waiting to cool. After hot air or vapour baths care must be taken that cold be not caught, although the more enthusiastic advocates of such baths declare that there is no risk of this.

For the literature of baths in earlier periods we would refer to the *Architecture of Vitruvius*, and to Lucian's *Hippias*; to A. Baccius, *De Thermis Veterum* (in Grævii *Thesaur. Antiquitat. Roman.*, 1694, vol. xii.); to Cameron's *Roman Baths*, London, 1772; to Gell's *Pompeiana*, London, 1836; to Bechi, *Museo Borbonico*, ii. 49–52; to Becker's *Gallus*, and to the article "Balnea" by Rich, in Dr Smith's *Dictionary of Greek and Roman Antiquities*. Some of the more important works on the use of water externally are those of Floyer, *Enquiry into the Right Use of Water*, London, 1697; F. Hoffman, *De Aqua Medicina Universali*, Halle, 1712; Lucas, *Theory and Use of Baths*, Dublin, 1772; James Currie, *Medical Reports on the Effects of Water*, Liverpool, 1788; Marcard, *Ueber die Natur und die Gebrauch der Bäder*, Hanover, 1793. Some of the best works on Hydropathy are those of E. Johnson and Petri, and the very complete *Manuals* of Fleury and of Beni Barde. There are many separate brochures on Turkish baths by Urquhart, Brereton, Haughton, Barter, Bartholomew, Luther, and a separate work by Sir John Fife. A considerable amount of information regarding bathing may also be found in Dunlop's *Philosophy of the Bath*. (J. M.)

BATHURST, a town of New South Wales, on the Macquarie River, 122 miles W.S.W. of Sydney, with which it is connected by railway. It stands in a fertile plain on the western side of the Blue Mountains, and is the centre of an important gold field. Founded in 1815 by Governor Macquarie, and named in honour of Lord Bathurst (the third earl), it soon became a place of considerable size, and was raised to the rank of a municipality in 1862. It is built in rather a spacious style, with broad and regular streets running at right angles. Many of the buildings are large and handsome; and it possesses numerous churches and schools, a theatre, a hospital, and various societies. Population in 1871, 5030.

BATHURST, ALLEN BATHURST, EARL OF, a distinguished statesman in Queen Anne's reign, was born in the year 1684. After completing his education at Cambridge, he was elected in 1705 to represent the borough of Cirencester. He distinguished himself particularly in the struggles and debates relative to the union of England and Scotland, firmly supporting a measure which he thought calculated to strengthen the Government and add to the prosperity of the country. Though he was content to act a subordinate part in the opposition planned by Harley and St John, his intimate friends, in order to sap the credit of the duke of Marlborough and his adherents, nevertheless he did good service to his party by arraigning, with more eloquence than truth, the conduct of the general and of the earl of Godolphin, whom he accused of lavishing the treasures of the nation on conquests more splendid than serviceable. The loss of the battle of Almanza, which happened about this time, seconded his efforts and those of his associates in dispelling what they called the intoxication of former successes, and disparaging achievements which