The house and its surroundings.

Health Primers

THE HOUSE

AND ITS SURROUNDINGS

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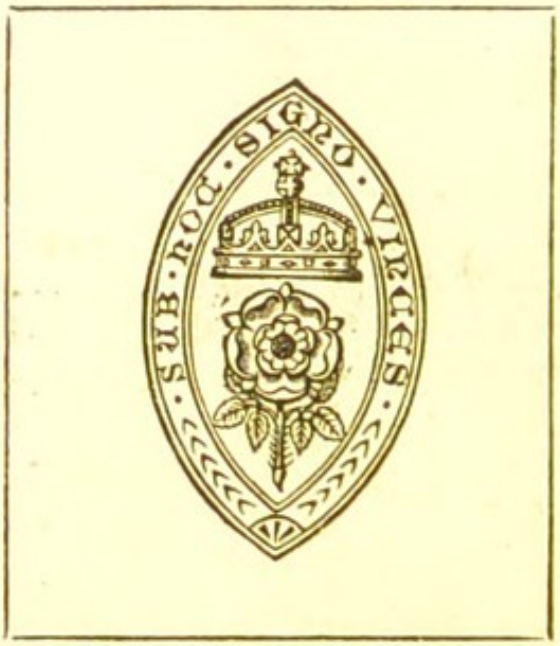

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THE HOUSE AND ITS SURROUNDINGS.

INTRODUCTION.

THE prevention of disease and the maintenance of health are now subjects with which most of us are becoming more or less familiar. During the past ten or fifteen years, a great many facts have been discovered and demonstrated, all of which go to prove that what the late Dr. Parkes fitly terms "personal care of health" will result in the exclusion from our houses of many diseases that now cause a large amount of mortality, and a still larger amount of misery, among the teeming population of the towns, as well as among the more scattered inhabitants in the rural districts of the kingdom. Diarrhœa, cholera, typhoid fever, dysentery, diphtheria, and, in a great degree, consumption, are all diseases of the preventable class. Small-pox, scarlet-fever, erysipelas, and typhus-fever belong to the contagious or infectious groups of diseases, and their disastrous effects may be much modified, even if the spread of the malady

cannot be altogether arrested, by intelligent administration in our own homes. Coughs, colds, bronchitis, inflammation of the lungs and their membranes, and rheumatism may be classed for the purposes of these notes under one head, for they are mostly due to the action of draughts, damp air, wet clothes, and damp dwelling-places. We have these three groups of diseases, the eminently preventable, the contagious or infectious, and the catarrhal group. We may safely say that *all* these diseases are avoidable, though not in the same degree. But there can be no doubt of the fact that all are directly and distinctly influenced by the house and its surroundings, whether the house be a palace, a mansion, a cottage, or a hut, and whether it be built in South Kensington or in Whitechapel, on Blackheath or the Essex marshes, on the breezy highlands of Dartmoor or by the waterside of the Thames, the Clyde or the Mersey. The conditions of existence may be dissimilar in many respects, and the extreme conditions very wide apart indeed. But it will be our endeavour to show that the principles which govern health are the same whether the house be a mansion or a hovel, and we believe that the application of these principles is, comparatively speaking, as simple in the one case as in the other.

But there is great variety in houses and their surroundings, and in the hygienic conditions of existence. Air,

water, light, heat, soil, and situation are all concerned in the matter, not to speak of personal care of health (which in this book will not be specially referred to). Let us begin at the beginning. It may be said with some show of reason that it is absurd to talk to, or to write for, a man as to his house and its surroundings who lives in a tumbledown cottage at the outskirts of a low-lying village, or occupies a tenement among the foul courts and alleys that still exist in parts of London and many of our populous provincial towns. Dirt and disease usually accompany each other, and under some circumstances the extinction of the one, and the diminution of the other, is said to be a physical impossibility. If, however, a man's house be his castle in any sort of way, he may and can accomplish something within, though he may have, in cities and towns, little or no control over the surroundings. The remarks that immediately follow, therefore, concern those only who are compelled to live in crowded streets or in rural cottages, and they are succeeded by notes on houses and their surroundings applicable to other classes of buildings and their inhabitants.

The air of the living and sleeping rooms can be kept comparatively, if not positively, pure by leaving a window sash partially open, or adopting the simple recommendations recorded on pages 44–48, and by keeping the chimney shaft constantly clear, whether there be a fire in

the grate or not. Water is tolerably plentiful in populous neighbourhoods, and there need be no practical difficulty in keeping floors clean. They should be washed on a dry day, and all the windows, as well as the door, freely opened during and after the operation. The expenditure of a very few halfpence will buy sufficient limewash to coat walls and ceilings at frequent intervals, say, as often as every three months. Whether the closet or privy is shared with others or not, it will be an advantage to see that it is not blocked, that it is flushed regularly, that floor and seat are kept clean, that its walls are limewashed at least as often as those of the house within, and that, if any window exist, it is kept open as constantly as possible. With this, as indeed with all other windows, it is a good plan to nail a piece of wood along the top edge of the window slanting inwards, so that, when the top sash is open, the air from without is directed upwards, and so a draught is prevented. The dust-bin is a source of nuisance in all thickly populated neighbourhoods. Foul smells may, however, be in great measure avoided if nothing but ashes are thrown into dust-bins in a town. Potato parings, cabbage stalks, and other vegetable refuse should be dried under the grate and afterwards burnt.

It is frequently difficult to secure water fit for cooking and drinking purposes, even if the supply be fairly abundant, because the cisterns, casks, &c., in which the day's

supply is collected are very badly built, or very badly kept. Whether the supply be stored in cistern or butt, or any other receptacle, see that it is emptied and thoroughly scrubbed at least once a quarter. If it can be limewashed at the same time, so much the better. Remember the necessity of keeping these water receptacles covered, so as to prevent, as far as possible, the thousand and one impurities that exist in the air of towns from finding their way into and polluting the water after it has reached the receptacle from the main. If the necessity for this suggestion be doubted, take a train from, say, Charing Cross to Greenwich, or from Fenchurch Street to Blackwall and back, and count on the way up and down the number of uncovered, dilapidated, and ruinous cisterns and water-butts on either side of the line. Read also, and adopt, if practicable, any of the suggestions on this subject found in pages 34–37. If the drinking-water has any taste or smell, or is at all thick in appearance, boil it always before drinking. If a filter be needed, buy two pounds of animal charcoal, and clean it by pouring on to it some boiling water. Dr. Parkes' cottage filters may then be thus prepared. He says:—"Get a common earthenware flower-pot, and cover the hole with a bit of zinc gauze or of clean-washed flannel, which requires changing from time to time; then put into the pot about three inches of gravel, and above that the same amount of

white sand washed very clean. Four inches of charcoal constitute the last layer, and the water should be poured in at the top, and be received from the hole at the bottom into a large glass bottle. The charcoal will from time to time become clogged, and must then be cleaned by heating over the fire in a shovel. The sand and gravel should also be cleaned or renewed from time to time." This very simple and cheap filter, kept in constant use, and the boiling of all suspicious water, will render us tolerably safe from water-propagated diseases, among which typhoid fever, cholera, and dysentery are pre-eminent.

If the washing *must* be done at home, great efforts should be made to accomplish it when the head of the house is away at his business, and the children are at school. The work is at all times specially disagreeable to those not immediately engaged in it, and the damp air resulting from the hanging up of clothes to dry in an inhabited room is bad and unhealthy for the occupants in every way. London and most other large towns are provided with public laundries, and health will best be consulted as well as the comfort of the family by making use of these establishments, and so keeping the air of your rooms dry as well as clean.

In proportion as rooms are limited in size, so must the importance of keeping that space as clear as possible be carefully considered. All bed-hangings, curtains,

carpets, and clothes occupy spaces that had better be filled with air, make the room itself "fusty," and help to collect and store up dust and dirt, as well as fleas and other still more objectionable insects. Hence, if one is compelled to live in a crowded locality, with little room-space, health will be best maintained by doing with as few hanging things as possible. Iron bedsteads and coir or even straw mattresses, with no bed-curtains and very little carpet, should be used. In fact, the bedroom should contain nothing that is not absolutely necessary. It should be remembered that, in the matter of space, if there are but two rooms, it is better as a rule to make a bedroom of the larger, though the reverse is generally done. Burn as little gas as possible, and if practicable fix a metal tube above the burner to carry off the heat, as described on page 48. If instead of gas, a paraffin or other kind of oil lamp be used, it should be borne in mind that the commoner kinds of oil, i.e. those that smell disagreeably, are not only extravagant but unhealthy. On the score of health, as well as of comfort, lamps of all kinds should be kept very clean.

In rural districts, the surroundings of the habitation, however humble it may be, have to be considered, as well as the house itself. And here it is astonishing how much is often done by the occupier (unintentionally, or rather carelessly,) to render the immediate vicinity of his dwelling-

place unwholesome and favourable to the development of preventable disease. In how many cases in villages and around detached houses is it the prevailing custom to throw all slops and refuse immediately outside the back door, so that a heap of decomposing organic matter and a pool of dirty water collects and remains from one year's end to the other? The children play about, and inhale the unwholesome vapours; the pigs, fowls, ducks, and geese take their pickings at leisure, and the doorstep, is a disagreeable, and often a dangerous spot, although, by the way, few of those interested appear to be aware of the fact. To avoid this evil, a fair-sized tub should be provided into which all slop-water should be thrown, and when the tub is full, its contents should be scattered over the garden, where it will assist fertilisation. Privies (see pp. 56–63) should be placed as far from the house as possible, to avoid nuisance, and should not, on any account, discharge their contents into either stagnant or running water. For if the water is stagnant, a nuisance is very soon created, and foul smells arise; and if the discharge takes place into a running stream, the current of which is strong enough to keep the channel clear, the water is fouled both at the place of discharge and in its course below, and is rendered unfit for drinking purposes either by men or animals. Provision should be made for the exclusion of wet, and for the entrance of fresh air

into the privy-pit during all seasons of the year, also for the prevention of soakage from it into the ground; and the contents should be regularly removed at frequent intervals, and used as suggested. Comfort as well as health is promoted by insisting upon habits of cleanliness and decency in the use of such places, for their condition in many hamlets and about solitary farmhouses is often excessively disgusting. Earth closets have been successfully adopted in many districts, and if they are carefully superintended and only fine dry earth is chosen, they may be confidently recommended.

The want of water in country districts is still a crying evil, and health officers could, if required, furnish information on this point that would appear scarcely credible to those who live in towns, and consider an unlimited and constant supply of water a matter of course. Many in rural districts are dependent solely on small streams in the neighbourhood, which dry up in the summer, and are in numerous cases fouled by privies, slop-water, or other varieties of sewage. The water of ponds is sometimes used, and many cottages have a shallow well near the house, and often at a lower level, so that sewage, slop-water, and other refuse soak into it. But, notwithstanding this need, little care is taken anywhere to collect rain-water systematically, and store it for seasons of drought. The roofs of cottages, farm buildings, &c., all

have some, and frequently a considerable extent of, rain-catching area, and, as is well known, rain-water, even if somewhat polluted by dirt from the roof, quickly cleans, so to speak, by keeping. Two or three large casks, well hooped, tarred, and protected from the sun, or, better still, an iron or cemented tank, with pipes laid into it from roofs in the neighbourhood, would be found an immense advantage as well as a saving in districts where the poorer inhabitants have in dry summers to depend upon the generosity of the squire or the parson, or (as we have often seen in the eastern counties) have to buy water for washing as well as drinking purposes at the rate of a penny a pail! If it is absolutely necessary to keep water for any number of hours in the house, do not let it remain in the bucket, but keep for the purpose a large glazed earthenware jar with a cover, or a covered stone jar, and clean it out thoroughly at frequent intervals. It is better not to use any sort of metallic pails for drawing the water, but to keep to the old wooden bucket, and great care should be taken that this bucket is not used for any other purpose than that of drawing water from the well.

A large proportion of cottages still exist in this country that have no proper basement, but are built simply on the ground. As a natural consequence, when damp exists, the floorings rot, the walls are often more or less wet and

sometimes dripping with water, and ague and diarrhœa, rheumatism, &c., are the results. If, therefore, the cottage has no proper foundation, use all possible means to obtain a clear space between the earth beneath and the flooring of the rooms above. If the earth cannot be scooped out from below, raise the floor a few inches, and leave openings in the walls here and there, so that this space under the floor may have free communication with the outer air. By adopting this simple plan, the woodwork will be preserved, the house kept dry from beneath, and much sickness saved. The openings should be protected by some sort of grating, and had better be opposite each other. But any apertures, however rough, are better than none at all, care being exercised to provide against blocking.

The foregoing remarks are intended only for the use of those compelled to live in tenements in towns, or in cottages in country districts. And, in such cases, it cannot be expected that the tenant will have much power or control over the construction of, or arrangements around, his dwelling-place. But even under these circumstances, individual energy and forethought may accomplish a great deal. And if, unfortunately, a case of contagious or infectious disease occur, no time must be lost in communicating with the nearest doctor, who will doubtless advise isolation or the removal of the patient to an hospital. When this has been done, the assistance

of the medical officer of health can be claimed, and will be readily afforded, in the way of adopting all possible means to prevent the spread of the disease among the rest of the family. It is better to be guided by this officer entirely, to make him responsible for the necessary arrangements, and to accept his advice as that of a man who is officially deputed to restrict the spread of preventable diseases, and who is therefore as much interested as the master of the house in the successful issue of events.

In the following pages it is proposed to consider severally the influences of soil and situation, particulars in connexion with construction, drainage, water supply, ventilation, closets and urinals, slop-water and dust-bins, scullery and sinks, warming and lighting, paint and paper, the general arrangements in bedrooms, nursery, laundry, kitchen and larder, the use of disinfectants, and the means to be adopted with the view of preventing the spread of contagious and infectious diseases.

CHAPTER I.

SOIL, SITUATION, AND CONSTRUCTION.

Soil.—Soil is both an air carrier and a water carrier, and it contains a great variety of solid matters. As regards air, carbonic acid gas is found in all porous soils, arising chiefly from the oxidation of organic matter. Gases of all kinds will find their way through the soil. Houses act as suckers to the ground on which they are built, because the air inside is warmer than the external atmosphere, and so sewer-gas, coal-gas, and indeed any other gaseous matter, may be drawn from the earth below into our habitations, and take the place of pure air. Foul air from cesspools has been sucked into houses from a great distance. The late Dr. Parkes attributed to emanations from the soil attacks of cholera, dysentery, paroxysmal fevers, typhoid, and various forms of remittent fever.

The amount of surface as well as of so-called ground water in the soil is of importance. Nearly all land has a current of water flowing under it, at a varying depth, and it may be stated broadly that the greater the depth

of this ground water, the more healthy is the site. But as a matter of health, it is of greater consequence to attend to the surface water. Surface water collects chiefly on clay soils, or is stopped by a clay stratum, and rises, causing a moist surface. Enquiries instituted by the medical officer of the Privy Council, and conducted by Dr. Buchanan, went to prove that the prevalence of pulmonary consumption in England is in inverse proportion to the dryness of the soil. Who shall say after this result that consumption is not a preventable disease?

In the neighbourhood of towns and cities we have to guard against a growing and very serious evil, viz. the building of houses on certain kinds of so-called "made ground." A great part of London, and a still larger proportion of Liverpool, are built on a made soil consisting of house sweepings, street sweepings, cinders, the débris of graveyards, decomposing vegetables, any and all varieties of dust and dirt, most of which contain organic matter in large and of course dangerous proportions. This is probably the worst kind of soil upon which to build a house.

The sum of the matter as to soils, then, is this. Avoid "made ground" always if possible, but if this cannot be done, take care that the ground has been "made" at least two years, and the longer the better. When it is not a question of made ground, endeavour to choose a

site with as little tendency to retain surface water as possible, with a deep run of ground-water. These conditions, of course, indicate an avoidance of all clay soils, which are invariably damp and unwholesome, and of alluvial soils also, which, though porous, are mostly wet, and as a consequence more or less malarious. Gravel, the looser limestone formations, chalk, and, in some cases, loose sand with permeable sub-soil, are, in a sanitary sense, the best soils, and sufficient information on these points can be always readily obtainable from the health officer of the district. If, as will frequently happen, particularly near London, clay cannot be avoided, it is specially necessary to insist upon good trenching round the house, an impervious drainage system with steep gradients, and foundations built up with cement or concrete.

It must not be forgotten, however, that the best soils may be speedily fouled by imperfect drainage. A loose brick, careless laying of pipe sewers, insufficient cementing, and, in fact, any sort of bad workmanship under the house, will, in much less time than is generally imagined, so foul the surface soil round the house that the ground may be aptly compared to a big sponge saturated with sewage. It may be remarked as regards the power of retaining heat that (according to Schübler) sand with some lime (speaking comparatively) retains the most, and fine chalk the least heat.

Situation.—Few of our readers may be in a position to choose the situation of their dwelling-place, but some hints may be useful, even if all cannot be acted upon. In a rural or suburban district it is frequently possible to secure a detached house. The slope of a hill is, perhaps, the very best situation, with trees in the immediate vicinity, but not close up to the house walls. The principal rooms should face south and west, or, as the next alternative south-east, care being taken that all privies and cesspools are placed well away from the house, and on a lower level, and that any neighbouring houses built above the level of your own do not drain into your domain. In semi-detached houses, it is necessary to keep an eye on the sanitary arrangements of your neighbour, and it will be well if, in such matters, you can arrange to work together. As, however, sloping ground cannot be always secured, it is advisable that a house built on level or comparatively level ground should not, especially if low-lying, be situated close to a watercourse of any sort, for moist air is, as a matter of course, to be avoided. For purposes of health, flat grounds can hardly, under any circumstances, be overdrained. It is well to shun the close neighbourhood of factories or mills, which even in rural districts often, and in many cases unavoidably, assist the pollution of the atmosphere as well as of the water in their vicinity. Above all things, in choosing a

site, ascertain, first of all, that the supply of water is both good and abundant, and if you have any doubt on this point, apply for information to the health officer of the district. In urban districts, particularly those that are densely populated, sanitary arrangements with neighbours are difficult, if not impracticable. Avoid, under all circumstances, houses that are built back to back, and avoid unfinished suburbs, because the lighting, paving, drainage, and other matters are usually incomplete, and often dangerous. In some towns, the local sanitary authority prescribes the width of the street, and in such cases the width is usually ordered to be that of the height of the houses. This is, however, too little, and there is no doubt that it should not be less than nearly double the height of the houses in it. Open spaces should, under any circumstances, always exist at the back, and it is hardly necessary to remark that the shorter continuous rows of houses are the better. A garden, whether in town or country, is of course always advantageous. We may sum up the question of situation by saying: get as much air and light as possible, with an abundant supply of good water.

Construction.—The external walls of houses are comparatively seldom built with requisite care, and an old enemy, damp, speedily attacks us. If there be an opportunity of looking after the building of the house,

see that the foundations, and some feet beyond them, are laid in concrete. The basement story should be isolated from the surrounding ground by an open space, and, in order to prevent the admission of underground damp, a thin outer wall should be built, reaching the ground level, and leaving a space between it and the main wall. The majority of houses are, as we all know, constructed in this country of brick. The porous nature of bricks is very great, and Pettenkofer, one of the most distinguished German hygienists, has demonstrated the possibility of blowing out a candle through a nine-inch brick wall.

Walls should be built double, with an interspace, strengthened occasionally by cross-ties of bricks. This will prevent to a great extent the bad results that follow from a driving rain, but it is always well to cover the outer walls with plaster or slate. It is very important to put ventilating bricks at frequent intervals just below the level of every floor, so that the joists and other woodwork of both floor and ceiling shall be preserved from damp rot by continuous ventilation from without.

Proceeding from below upwards, the drains are of course the first consideration, and to these we shall presently refer. The style of architecture need not be discussed here, but it is necessary to remind the reader of the following points: (1) that light (and therefore plenty of window space) is essential to health (2) that

windows should, for purposes of ventilation as well as cheerfulness, reach almost to the top of the room, should face the south, south-west, or south-east, and open top and bottom; (3) that no sleeping room should exist in the basement; (4) that closets should be built one above another, against an outer wall, or, better still, in a separate wing or tower, connected with the house by a vestibule with double doors. These are all important points in house construction. But to plan and build in a sanitary sense successfully, drainage, water supply, and ventilation must be all considered separately and collectively. The chief error of housebuilding (as of shipbuilding), even in the present day, consists in the fact, that the house is built first, and rendered fit for habitation afterwards; that is to say, drains are put in here, ventilating shafts there, and outlet or inlet pipes anywhere, the result being, as a rule, by no means satisfactory. The size of bedrooms must of course be governed by circumstances. Make them as large as practicable, but remember that each person should have, for purposes of health, at least 500 cubic feet of air, and as much more as can be given. A bath-room is a most valuable adjunct, especially if it has both hot and cold water supply. Hall space is valuable, as assisting ventilation, and the hall should have an entrance both at front and back. The plan of making the hall, so to speak, the base of a central

shaft, with a skylight opening on the roof, is not always advisable, as, although acting as an efficient up-cast as far as the ground-floor rooms are concerned, it is apt to convey the foul atmosphere from these into the bedrooms above, and if the movement of air upwards be very rapid, the arrangement is likely to promote draughty ventilation. It is a good rule to arrange, as far as practicable, that the chimney stacks shall be built in the inner walls, as near the centre of the house as possible. And when land is not specially valuable, so that kitchens can be placed on the ground floor, it is a very good plan to make the kitchen, with the adjoining scullery, a distinct offshoot from the main building, but communicating directly with the dining-room through the housemaid's pantry or china closet. The servants' bedrooms may be built over this kitchen, and be approached by a distinct staircase. Kitchen wings of this sort are frequently found in Jersey houses, and are worthy of attention on account of great convenience in administration, and the fact that the heat of the kitchen and the smell of the food do not affect the inmates. The system of placing the kitchen near the roof has many recommendations, and its advantages in large establishments are undoubtedly great; but the adoption of this plan entails a comparatively large staff of domestics, and assumes the existence of a servants' hall, &c. In the present stage of house architecture and

house administration, we are not prepared to recommend the removal of kitchens from the basement to the attic story.

CHAPTER II.

DRAINAGE.

In choosing a house, it should never be forgotten that, as regards much that relates to health, the arrangements of the substructure are of far greater importance than those of the superstructure, and in the former are included the drains. In selecting one for occupation, begin the inspection of it literally from below upwards, and remember that, if the basement is foul from bad drainage arrangements, you may as well for all practical purposes be living over a cesspool. Many houses, in fact, exist at the present day built over cesspools, that are discovered only after typhoid fever, diphtheria, or some other variety of preventable disease has infested the building, and thus frightened the inhabitants into a thorough investigation as to the causes of the outbreak.

In building, take care, as a first principle, that no chief drain is allowed to run under the house at all. All outlets from sinks, closets, wash-basins, &c., should be led to one or more junctions close to and outside the main wall,

whether at the front, back, or side of the house. It is usually practicable to economise labour and simplify work by leading all the pipes outside at one or, at all events, two points; but if this cannot be done, a pipe-drain should be constructed round two, three, or even four sides of the building, so arranged as to have a good fall into the main drain, the house drain-pipes being, of course, led into it. This arrangement entirely obviates the many risks attending the passage of pipes *under* the house. In towns and places that are sewered systematically, the main sewer, which is in the hands of the local authorities, usually runs under the road in *front* of the house, and, as a natural, but by no means necessary, consequence, the main drain of the house generally runs *under* the house from back to front, joining the town sewer at right angles in the road. A far better plan is to carry the main sewer along the *backs* of the houses, as, with this arrangement, the communications with the houses can be easily made, closets, scullery, and other sources from which foul water is discharged being, as a rule, in the rear. But inasmuch as at present this arrangement is the exception rather than the rule, the importance of taking the main house pipe *round* instead of *under* the house is at once apparent.

If, however, as will generally be the case, it is impracticable for the occupier either to plan or supervise the

drains of the house, he should insist upon having a plan of the drains, and take care to become thoroughly acquainted with its details. The closet, scullery, sink, rain-water, bath, and cistern waste pipes will probably be found all discharging directly into the main drain which passes under the house from back to front, and then opens into the main sewer. Commence a process of disconnexion at once, cut the rain-water pipes about eighteen inches from the ground, and either bend or prolong them so that their contents may fall over a grated and trapped opening connected with the main drain. Find out also the lower channels of the bath waste, cistern waste, scullery and sink pipes, have them led through the wall near the ground (if they are not already exposed to view), and treat them in precisely the same way; the open ends being so arranged that the water, &c. flows out over a grating into the main house drain through what is called a "gulley trap." No foul air can then enter the house through any of these pipes. The soil pipes of the closets, however, cannot be disconnected, except in relation to the main sewer, as described at page 28.

Whether in the basement or the upper stories, soil pipes should be ventilated by a tube, nearly, if not quite, as large in diameter as the soil-pipe itself. This tube must be led out just beyond the outer wall, and be sent up beyond the roof, terminating in an open end. In many

houses the rain-water pipe has been utilised as a drain-ventilator, but this is a bad arrangement: (1) because in most cases the upper ends of these pipes open close to the eaves of the house, and consequently close to the cistern or near one or more of the attic room windows; and (2) they are often engaged in carrying off a large amount of storm water from the roof at the very time when their ventilating services are most required. We have placed ventilation before traps, because, in our own judgment, the former is of far more consequence than are the latter. But traps cannot, and should not, be altogether dispensed with, although they are, in most cases, a delusion and a snare, if not guarded by ventilation. All sink, waste, and closet pipes should be trapped outside, beyond the point of origin of the ventilator. There are many varieties of fairly good traps, the principle of all being to prevent the entrance of foul air into the house by interposing a stratum of water, which, to act efficiently, must always be kept at a certain level. It will be readily understood that the protection afforded by these traps against the introduction of sewer gas into the house depends entirely on the continuous presence of water in the trap. This cannot be always relied upon: for (1) if the closet is not used pretty constantly, the water in the trap evaporates; (2) if improper things are put into the closet, the trap becomes a receptacle for them, and then, as a safe-

guard against sewer-gas, it is worse than useless; (3) the water is sometimes sucked out of the trap; (4) the bend of the trap may become filled with various solid materials which accumulate on account of insufficient or imperfect flushing. It will be well to consult the medical officer of health for the district, or an architect, as to the best form of trap for special situations, as new forms are constantly being manufactured. Under any circumstances, traps should be periodically examined, and therefore should be easily accessible, as in many cases they are broken by the subsidence of walls, undue pressure, or other accidents.

Two other very important points require special notice. The principal house drain should be disconnected from the main sewer at some point well beyond the outer wall of the house. This is managed by an intercepting catchpit and grating, and so the possibility of foul air being forced up into the house from the main sewer is thus reduced to a minimum. And no rain-water pipe, as we have indicated before, should be sent directly into any drain. As we have explained above, all pipes from the roof should be disconnected near the ground, and their contents sent into the sewer over and through a gulley trap. It is assumed here that only one set of pipes exists in the sewerage system, which system carries off storm water, as well as all liquid house refuse. In some

places what is called the "separate system" has been adopted, in which the old drains are employed to carry off the storm water, pipes of a comparatively small calibre being provided for the removal of the sewage. The gulley traps and their catchpits should be removed and thoroughly cleaned every six or eight weeks, as accumulations inevitably occur from time to time that cause obstructions and so impair efficiency.

All the arrangements above mentioned can be made by any householder without material interference with the structure of the building. If, after the alterations suggested are carried out, sewer-gas or other foul smells are detected, a leaky pipe or drain inside the house must inevitably be the cause. And here is seen the importance of being familiar with the topography of your drainage system, below as well as above the basement. As to the pipes below, great carelessness still exists among builders and contractors in laying drains at the proper level, filling in and stopping neatly and precisely the junctions, and providing for possible accidents, as settling of walls, &c., by which pipes are frequently broken, their contents soaking into and fouling the soil months before the accident is detected. As to the pipes above the basement, you should insist upon having them all, within as well as without the house, as accessible as possible. Plumbers, as the late Dr. Parkes remarks, "try to conceal everything,"

and in consequence of this principle, when any accident occurs, the house is pulled about, and the walls and woodwork damaged to a great extent, because no one knows or can get at the exact direction of the offending pipe. Therefore all these pipes, including their inlets and outlets, should be visible, or, if enclosed at all, should be cased in with wooden coverings lightly screwed together, and not, as is usually the case, imbedded in plaster or cement, or otherwise fixed securely into the main or other walls of the building. We have already indicated that in numerous cases, even in towns, cesspools still exist, and may be found under the basements of many old houses. Of course, in the case of isolated houses, and in most villages, the cesspool arrangement for drainage purposes is the rule. In order, therefore, to make it as harmless as possible, the following precautions should be taken. The cesspool should be placed as far from the house, and as far from the water supply, as practicable. It should be securely and solidly built of brick, or concrete, with a thick outer layer of clay puddling. The bottom should slope gradually from one side to the other, and the cesspool should be divided some way down by a wide grating to catch the solid débris. There should be a large manhole in the centre of the top, covered with a stone or iron slab easily removable, and the cesspool should be ventilated by a pipe of wide calibre introduced ver-

tically just above the level of the overflow. All drains that empty into the cesspool should have disconnexions as close to the house as possible, so that the cesspool cannot under any circumstances ventilate into the house. Cesspools, if thus carefully constructed, and examined at tolerably frequent intervals, are not dangerous, and if placed as they should be, at a remote corner of the garden, their contents can with the aid of a pump and hose be advantageously expended in fertilising the soil. But if not so utilised, the cesspool should be emptied at regular intervals of from one to three months, according to its capacity, and the number of persons that use it. It must be remembered, however, that wherever any regular system of drainage exists, the continuance of cesspools is entirely inexcusable.

It is not necessary to remind the reader most emphatically that a depot of sewage in the immediate vicinity of dwelling-houses must result in a certain amount of atmospheric impurity, and may cause a dangerous fouling of the water supply. The best safety-guard against this latter very serious evil is in placing the cesspool as far from the well as possible, and on a lower level, taking care that its walls are thoroughly impervious, and that no overflow occurs. Rain-water pipes, on this as on other accounts, should never discharge into cesspools, and indeed nothing ought to be put or sent into them but liquid house sewage.

Unless this rule is strictly enforced, the cesspool, even if the above hints are adopted, will speedily become a nuisance and dangerous to health.

CHAPTER III.

WATER SUPPLY.

Water, next to air, is the chief necessary of life. We may even place it before food, because all food is largely composed of it, and it is required, too, for personal cleanliness, and for the purification of our houses and their surroundings. It is therefore eminently advisable that we should have not only a bountiful supply of water, but that the water should be pure. Sanitary science has, at a comparatively recent date, shown us several important facts in connexion with this subject. It has been proved that water is, or can be, a carrier of epidemic diseases. The history of cholera, as propagated in this country, in India, and elsewhere, shows that it has undoubtedly been conveyed by streams or by the drinking-water directly supplied to the inhabitants from one place and person to another. And the same kind of propagation has been found to occur as regards typhoid fever. Epidemics of diarrhœa and dysentery have also been traced to the same cause. It is difficult perhaps to

determine, and still more difficult to explain, whether the poison as imbibed was originally solid or gaseous, i.e. whether the water has, so to speak, been poisoned from the surrounding polluted atmosphere, or whether it contains actual and active germs of disease. Be this as it may, we should all know, and are bound to acknowledge as a fact now fully established, that those who secure to themselves a pure as well as an abundant supply of water, not only provide the means for cleanliness of person and of surroundings, as well as for drinking purposes, but adopt at the same time one of the very best means for preventing the rise and progress, in the household, of epidemic diseases.

In discussing the various sources of supply, we naturally commence with those that affect large towns. Here the water, as the phrase goes, is "laid on" from one or more sources, and the householder has practically no control over its quality until it reaches his own house. It is scarcely within our province in this Primer to give in detail the various sources from which water companies obtain their supplies, nor have we space to do so. It is enough for our purpose to know that water is obtained in various parts of the United Kingdom severally from the chalk strata, by deep boring, from rivers, lakes, springs, and shallow wells, and from the clouds in the form of rain. In most cases the water is filtered through sand

and fine gravel by the companies before delivery. This measure, undoubtedly, has considerable effect in removing foreign matters. Let us assume that the reader lives in a town the inhabitants of which are supplied with water by a company. We must assume also that the quantity delivered is sufficient for the wants of the household. It is calculated that thirty-five gallons per head per day is a liberal allowance for each person, this including water for drinking, cooking, and washing purposes, as well as that required for baths and the flushing of closets and drains. The capacity of the cisterns in many houses is now sufficient, if the water be delivered regularly.

The structure and situation of the cisterns are, however, very important. They should be made of slate, concrete, or galvanised iron, and on no account of lead, at all events when the contents are to be used for drinking purposes. They should be built against an outer wall, and be well protected from the external air, to prevent pollution as well as the effects of frost, but should not be in the same room with the closet. And it is very important, too, that cisterns should be easy of access, both for examination and for facility of cleansing. We have seen cisterns in good middle-class houses, built into the bathroom just over the closet, and so close to the ceiling that it was impossible either to look into them, or to manipulate with a brush, or indeed anything else, for cleansing

purposes. Every house should, when practicable, be provided with three cisterns, two being appropriated to general domestic purposes, and one reserved exclusively for cooking purposes and drinking-water. In many houses in London the cistern from which the supply of cooking and drinking water is obtained is in the basement, and supplies also the servants' closet, a most objectionable and dangerous arrangement. Water-closets should always be supplied from a separate cistern serving no other purpose but for their supply, or a flushing or service-box (so-called) should intervene between the cistern, if used for other purposes than the water-closet, and the pan of the closet.

All pipes leading to and from the cistern should be arranged so that they can be readily examined, whether inside or outside the house. Tinned pipes are far better than lead, and it is to be hoped that they will soon be generally used. It is desirable, however, that any leaden pipes outside or near the outer wall of the house should be protected from the heat of the sun, which undoubtedly influences the action of water on the metal. An important practical proof of this occurred some few years ago at Cape Town, when it was proved that the extensive use of exposed leaden pipes not only on the houses but in some of the mains was coincident with a severe epidemic outbreak of lead colic, and in some cases of lead palsy,

among the inhabitants; when iron pipes were substituted in the mains, and the smaller house pipes protected from the heat, the epidemic ceased.

Great care should be taken to see that the overflow pipes of the cisterns do not communicate with the drain. This communication, however, often exists, and is a fruitful source of mischief, because the pipe frequently acts as a ventilator to the drain, and discharges a stream of sewer-gas into the house, immediately over the water in the cistern, poisoning it, of course, with foul exhalations. The overflow pipe should in all cases be sent through the outer wall, and should open at once, without any sort of connexion, into the external air; if over a grating, so much the better. All cisterns in cities and towns should be regularly cleaned, and their sides thoroughly scrubbed, every three months. But if you unfortunately possess a lead cistern, and cannot change it, clean by flushing as well as you are able, but scrub as little as possible.

The above remarks apply, of course, to arrangements where the water comes in only at stated intervals, and temporary storage by cisterns is absolutely necessary. The "constant service" is, however, now adopted in many places, and then the water is, so to speak, always "on," and storage, therefore, to any extent is not required. But the service should be (and, to be successful in a sanitary sense, *must* be) really a constant service. If the

pipes are not always charged with water, air of some kind or other will collect in them, and air as well as water will be delivered, the former often of by no means the purest description. This evil is aided by an awkward tendency that pipes have, to leak in unexpected places; and hence we again urge the importance of having all kinds of pipes, throughout their course, as accessible as possible. But do not allow soil pipes, water pipes, and gas pipes to be laid in close proximity to each other. Numerous instances have occurred in which one has leaked into the other, and sewer or coal gas has impregnated the water, with disastrous results. A case quoted by Dr. Buchanan occurred some time ago where, the drain being laid in juxtaposition with the water pipe, the former leaked into the latter, and the inhabitants of the house were systematically, though, of course, unwittingly, poisoning their drinking-water with their own sewage. If, therefore, under any circumstances (whether the "constant" or the cistern service is in operation) any "fizzing" noise is heard when the tap is turned, look to it. If the water delivered is unsavoury in smell, examine the pipes for leaks, and if, as is probable, you find one or more leaky places, have the evil remedied, and so prevent an outbreak of typhoid fever. Although we cannot, perhaps, even in towns be entirely independent of water storage, it is plain that the constant system, when properly

carried out, ought to be encouraged, and will, we hope, be soon universally adopted in all places supplied systematically with water from a common source.

Most houses have more than one cistern. But the rules above epitomised should apply to all, because the experience of householders must teach them that, with the exception of very small and particularly well conducted establishments, it may be difficult practically to appropriate any one cistern to drinking-water, expecting that thirsty boys, girls, and servants will always avoid drinking from taps connected with any particular cistern. Treat all your cisterns alike as to situation, cleanliness, pipe arrangements, &c., and keep at least one large filter constantly full, out of which all drinking-water is to be taken. It would be invidious to particularise filters, or to name any special variety. There are many kinds, good, bad, and indifferent. But in making a choice the following hints will suffice. Charcoal is infinitely the best filtering and cleansing medium, and animal is much better than vegetable charcoal. Animal charcoal is a somewhat costly article of commerce, but it is practically indestructible. A filter should therefore be chosen the chief, or the sole filtering medium of which is animal charcoal, so arranged (either in loose pieces or in a cake) that it can be removed for cleansing purposes. The cleansing is best performed by subjecting the charcoal to a red heat

on a shovel over an open fire or in a stove, and this operation should be practised on an average at least once every six months, according to the purity of the water when delivered from the mains. If these precautions are taken, and none but filtered water is used for drinking purposes, we may consider ourselves fairly safe from most, if not all, evils that are likely to accrue from drinking unwholesome water. If no kind of efficient filter can be procured, water, before drinking, should be boiled, unless its purity is beyond suspicion.

If, however, you are beyond the reach of water companies, your supplies must necessarily be procured direct from a well, a spring, from a river, or from the clouds. Surface, i.e. shallow, wells are to be avoided if possible, as they are all likely to be contaminated with sewage. No well should be used that is near a cesspool, or, if on the slope of a hill, *below* the level of the cesspool. Shallow well water is often, of course, easily obtainable, in many soils; but it is far better to dig through all surface strata, even at the cost of some labour, and take water from the lower levels, where it is far less liable to contamination. If water be taken from a spring or a river, care should be employed to find out whether the stream is free from sewage pollution. By far the larger proportion of rivers in Great Britain still receive the drainage of towns built on their banks, so that, unless

the distance between the point at which the supply is taken and the town above it is very great, sewage pollution to a considerable extent is of course inevitable And comparatively few wells are safe from some sort of surface pollution, so that filtering or boiling is, under all these circumstances, essential. In some cases rain-water only is procurable, and has to be stored with care, and used sparingly. The Eastern nations give us excellent lessons in the storage of water, and it is astonishing, in rural districts in this country, how much good rain-water is wasted. A large and well-built tank in every village, properly covered and protected, and fed from the roofs of the surrounding houses, would, in the absence of any other regular supply, as well as in the dry season, save a vast amount of suffering, and prevent much disease. Rain-water, if properly stored, is the purest kind obtainable, and most houses and cottages can collect a large amount from their roofs. Whether tanks, casks, or any other receptacles are used, great care, as with cisterns, should be exercised, to ensure that they are kept scrupulously clean, and that arrangements are made for the prevention of pollution from without by properly fitted covers, &c., and for keeping the walls and bottom perfectly clean.

It is hardly necessary to remind you that, if any trouble exist as to the water supply, the nature of which is not

easily and clearly discoverable, you should at once apply to the sanitary officers of the district for advice, so that, if necessary, an analysis of the water may be made. It is useful to know what are the general physical signs of a good water. It should be clear, inodorous, and tasteless. It should also be colourless, and entirely free from sediment of any kind. But it need not always be condemned on this score alone, for the presence of rust from the tanks or pipes will make water of a muddy red hue, and peat will often colour water, although harmlessly. Dr. de Chaumont says: "Although too much importance must not be given to the physical qualities, we may confidently say that a water that is not clear, colourless, tasteless (except as above limited), and inodorous, is not a first-class water." We recommend these remarks as well worthy of close practical application.

CHAPTER IV.

VENTILATION.

Comfort, as well as health, at home is very much influenced by the way in which our houses are ventilated. Even in the present day, the finest mansions are in this respect often the worst arranged, and there are indeed very few houses of any kind the occupants of

which have not at some time or other to complain of draughts or stuffiness, disagreable heat from gas, or foul smells arising from various causes, but all due to the fact that the air of the room is not changed sufficiently often, because the ventilating arrangements are insufficient. The amount of air required for an adult, so that the atmosphere may be kept perfectly free from any odour, is not less than 3000 cubic feet per hour, and this fact alone shows that in crowded localities, or even in good-sized but ill-constructed rooms, the problem of proper and effectual ventilation is one not readily solved. In the absence of all mechanical appliances, the air of a room is changed by means of the windows, the chimney, and any chinks created by imperfectly fitted doors and sashes. When both doors and windows are closed, the only exit for the foul air is by means of the chimney; and, under ordinary circumstances, if the door and sashes fit well and closely, the atmosphere of the room will become proportionately impure. This condition of things, of course, is worse in the evening, when the burning of gas assists to decrease oxygen and increase carbonic acid. But if the houses occupied by all classes of society be examined, hundreds will be found in Belgravia and Kensington, in Mayfair or Bloomsbury and in the City, as well as in the suburbs and at the Eastend, with no sort of mechanical aids to ventilation. So that, as a matter of fact, the occupants

of such rooms are only saved from partial suffocation or many minor maladies by the faulty fittings of the woodwork of their houses.

If it is your misfortune to occupy a house in which aids to ventilation are conspicuous by their absence, much may be done to remedy this serious defect without pulling the rooms to pieces. The window is, of course, the first and simplest aid, and all windows should be made to open top and bottom. If possible, keep the top sash down a few inches constantly. If the weather is cold, and the room small, so that this arrangement cannot be borne, fix a piece of wood the exact width of the window, and ten inches or a foot wide, into the bottom edge, and shut the lower sash down upon it. This will at once cause a continuous current of air to flow into the room between the sashes, the lower one being higher than the upper. A lighted taper held at the upper edge of the lower sash will speedily show you that this current is almost invariably an intake, indeed always an intake unless the air of the room is colder than the external atmosphere, a contingency that comparatively seldom happens in this country. Another very simple plan is to take out a brick, or to make a slanting opening in the wall communicating with the external air. If the brick be taken out, a triangular wooden box should be inserted in the opening, so as to carry the air

from without inwards, in an upward direction. In both cases, whether the slanting opening or the box arrangement be adopted, the air entering upwards will strike the ceiling at an obtuse angle, and be sent in a scattered stream down into the room, thus avoiding a draught. A lid or slide should be provided, so that the opening can be closed if the ingress of air is excessive.

We come next to Arnott's plan of ventilation, which is undoubtedly one of the most simple and useful contrivances in general use. An oblong aperture is cut in the chimney breast near the ceiling, and one of Arnott's ventilators inserted. The ventilator consists of a box with a balanced valve, which valve, when the fire is alight, opens inwards (i.e. towards the flue), and affords a rapid and continuous means of egress for the foul air. When there is no fire in the room, it is usual to keep the valve permanently open by a cord and weight fitted to the apparatus. Many varieties of these valvular ventilators have been contrived, some in which the valves are made of mica, which is exceedingly light, does not easily corrode, and is very sensitive to the action of the wind. Others are made with an india-rubber valve, which arrests the outside air, but opens automatically to act as an exhaust. Rooms may also be ventilated by louvre openings, which are usually placed immediately under the cornice, and connected with the external air by a fire-brick. Glass

louvres are sometimes substituted for the upper panes of the window, and a circular glass ventilator, which can be opened and closed at pleasure, has been in vogue for several years, and is said to answer exceedingly well.

These methods may be either on the exhaust or plenum plans indifferently, i.e. some may remove the foul air, and others introduce a fresh supply. But all are comparatively simple, and can be adopted at little cost. Another substitute for the sash ventilating plan is to introduce into the room one or more so-called Tobin's tubes. These tubes pierce the outer walls horizontally about, say, waist high, and, in reaching the interior, are diverted upwards at a right angle, discharging fresh air into the room some two to three feet from the ceiling. The air ascends, and is distributed gently and without draught over the room. There are many devices for concealing the tubes, or giving them an ornamental aspect.

Perforated bricks of many kinds constitute a simple and very useful mode of ventilation. Even in houses where any attempt to purify the air of the dwelling and sleeping rooms is as yet utterly neglected, these bricks are commonly inserted below the floors, to ventilate the interspaces, and keep the wood from the influences of dry-rot. Perforated iron plates are sometimes used, but the bricks are more sightly, and the effect of rust is avoided. One or more of these bricks can be substituted

in each room for ordinary bricks, always arranging that the openings, wherever made, communicate directly with the external air, i.e. are made in an outer wall. Whether the tube, brick, or any other scheme be adopted, the arrangements should be such as to suit the temperature of the summer months, for in colder weather a certain proportion of the openings can be always closed if necessary. There are many other mechanical modes of ventilation, the details of which are all more or less complicated. A very effectual system may be seen in the new wards of the London Hospital and elsewhere, by which the air is introduced from without by means of a tube laid under the floor to a point below the grate. It is then conducted upwards on both sides of the flue, and, having been warmed in its passage, is passed into the room through one or more openings near the ceiling. Perforated cornices are also occasionally used, fitted with a diaphragm, so that one-half of the tube receives cold air from without, and distributes it into the room by several openings, and the higher section, which has small openings throughout its entire length, receives the foul air, and discharges it into tubes on each side of the flue, whence it is taken to the roof. It should always be remembered that gas exercises a very powerful influence in rendering the air of a room impure and unwholesome. All ordinary gas-burners consume from three to four

cubic feet of gas per hour, and it is found that one cubic foot of gas not only destroys the oxygen of eight cubic feet of air in combustion, but produces about two feet of carbonic acid, besides other impurities (Wilson's 'Handbook of Hygiene'). No gas-burner, therefore, should exist in any room unless a tube of zinc or iron is placed over it to carry off the deleterious products of combustion, and convey them at once in the open air. This rule is disregarded in numberless houses belonging to the middle and upper classes, and an enormous consumption of air, as well as fouling of air by gas-jets, is the inevitable result. The sunlight apparatus now so generally used in most large public buildings is supposed to ventilate as well as to afford light by means of the tube arrangement, and a ventilating globe light was invented some few years ago for use in dwelling-rooms, the main point of which is the creation of an exhaust draught as soon as the jet is lighted. The foul and heated air is carried away by a special tube either up the chimney shaft or into the open air.

We have, of course, assumed in the foregoing remarks the existence of a fireplace and chimney in all inhabited rooms. For although it is asserted, and, as we believe, truly, that from three-fourths to seven-eighths of the heat generated by a fire goes up the chimney, and is of course wasted for all warming purposes, the time is yet far

distant when the Englishman will be content to give up his domestic hearth as it has existed for centuries, and exists at the present day. The pernicious plan of stopping up chimneys in the summer still continues, housekeepers telling us that a down draught causes dirt. But insomuch as chimneys are in most rooms the best and simplest ventilators that we possess, they should never be closed except in case of fire.

It is not necessary in this place to describe many other modes of ventilation involving fans, cowls, and other mechanical contrivances, all of which are as rule applicable only to very large buildings. There are, however, some few cardinal points in connexion with ventilation that must, as first principles, be complied with. All rooms should be lighted from the external air, i.e. not have a borrowed light. No closet should ventilate into an inhabited room, and the tops of the windows should be very near to, if not as high as, the ceiling.

It must not be forgotten, in estimating the immense importance of pure air, that, of the three chief requirements of human existence, air is the one that must of necessity be constantly and continually supplied to us. Dr. de Chaumont reminds us that "we may abstain for a time from food, if we have reason to believe that its condition is objectionable; we may, for a short time, and at the

cost of greater suffering, abstain from drink of any kind, if we have reason to apprehend danger in that direction; but we are bound to breathe the air as we find it, under pain of death itself." It is hardly requisite to remind the reader that consumption, bronchitis, and other diseases of the respiratory organs account for more than one-fourth of the total mortality in the United Kingdom, and that by far the larger proportion of these deaths are due to the habitual respiration of unclean air. The actual and comparative success that attends the treatment of the sick, and the maintenance of health in all large public institutions, whether their inmates be soldiers, sailors, convicts, or paupers, has always depended upon the means adopted to secure a continuous and sufficient supply of pure and wholesome air. Is it not therefore worth while, by the adoption of some of the simple plans recommended above, to endeavour to stop the spread of preventable diseases in our own houses and homes?

CHAPTER V.

CLOSETS—URINALS—SLOP-WATER—DUST-BINS—SCULLERY AND SINKS.

Water-Closets and other Privies.—There are very few sanitary matters about which architects, even in this nine-

teenth century, are more careless than the position and arrangements of the water-closets or privies in and about a house. It appears still to be the rule as to water-closets to put them in any corner more or less out of the way, that cannot be utilised for any other purpose, with no regard whatever as to the ventilating arrangements. Sometimes the situation is disagreeably and inconveniently conspicuous, and in many cases the apartment has no independent window, but borrows its light from the hall, the staircase, or some other room. Servants are proverbially neglectful as to the cleanliness of these places, and the closets in the basement are usually in a chronic state of stuffiness, gloom, and dirt. They are often made a receptacle for slops and other sorts of débris, solid as well as fluid. The consequence is that the pipes are frequently out of order, even if well supplied with water, inasmuch as, contrary to the apparent opinion of some persons, these pipes are elastic in only a very limited degree, and decline to permit the passage of glass bottles, broken china, worn-out wearing-apparel, &c.

The situation of the closets, whether they be supplied with water, earth, or any other material, is very important. Under any circumstances, all closets should be built against an outer wall. They should be arranged, if possible, in a tower, one above another, distinct from the house itself, and communicating with it by a vestibule

guarded with double doors. This vestibule should be open on both sides to the external air, and if it and the closets can be placed at the corner of the house, and jutting out at an angle of forty-five degrees, so much the better. The apartment itself should be well lighted by a window opposite the seat, and carried up to, or within a few inches of, the ceiling. The panes should be either louvred or arranged in such a manner that they can be kept permanently open. All pipes in connexion with the closet should be easily accessible, i.e. boxed in lightly with screw fasteners. As little carpet or thick matting should be put on the floor as possible, and the servants should be positively forbidden to throw any slops, or, in fact, anything, into the pan, as foul smells and clogging of the pipes are the speedy and inevitable results. And, besides, most houses are usually provided with sinks on the upper as well as the lower floors for the reception of slops. But these sinks must be made of slate, or glazed earthenware, and require strict supervision, or they speedily create a nuisance.

The varieties of water-closet pans and machinery are so numerous that it is difficult to describe them, and equally difficult to recommend any particular pattern. In this, as in other sanitary matters, simplicity should be studied, and, according to our experience, the least complicated forms are the cleanest, last the longest, and

comparatively seldom get out of gear. The general principle of all closets supplied with water is pretty much the same. The essential apparatus consists of a pan, a valve set in action by an elevator or a depresser, or both, by which water is introduced into the pan, the water with the contained excreta, &c., finding their way through a trap into the soil pipe below. We must refer the reader, for a detailed description of the many kinds now in use, to the manufacturers. But in choosing such things, it is well to remember that there should be as little metal work of any kind about the apparatus as possible, that the trap is a usual, but not an indispensable, adjunct, and that there is no safety from sewer-gas unless the soil pipe is ventilated immediately beyond the trap. There are two descriptions of water-closets which may be held to fulfil sanitary conditions satisfactorily. They are in certain respects somewhat similar in construction. One is called the patent valve closet and trap. Both parts are made in one piece, but in this form the pan has a side outlet through a conical valve into the syphon, and thence below into the soil pipe. The pan and its adjuncts, including the trap, are all made of white glazed stoneware. In the other, which is also patented, the water supply at the inlet is regulated in a different way. The inventor ignores the trap altogether, claiming as an advantage, on the score of simplicity, that in fixing this closet not only is no trap of any kind

required, but plumbing work, wires, or cranks are unnecessary. In this last-mentioned form of closet, of course, we are compelled to trust to the integrity of a stop valve, technically called the "plunger"; but in many respects this is the best form of apparatus that we have seen, and its efficiency has been tested for many months in a large commercial establishment in the City, where these closets, almost entirely unventilated, are used daily by nearly two hundred persons. With regard to the ventilation of the soil pipe and arrangements for water, see Chapters on drainage and water supply, pp. 25, 33.

The use of so-called disinfectants and deodorisers in water-closets has of late years become a fashion, and has been carried to a very ridiculous extent. You cannot now go into the closet of any house inhabited by the upper or middle class without finding something that is supposed to remove all noxious gases and all evil smells. Carbolic acid in many forms, chloralum, "sanitas," and other substances and liquids, whose name is legion, all have their patrons. The practical but very unwholesome result of all this is, that people are induced to substitute one nasty odour for another, and to think that they have thereby made, in a sanitary sense, all things right. The household finds the atmosphere intensely nasty, takes no heed of, and makes no examination into, any possible

obstruction, or any defect of ventilation, but pours into the pan a quantity of his favourite deodorant, chlorine, carbolic acid, or whatever it may be. But the stink returns, and if the deodoriser is persisted in without search being made for the source of the stink and this source removed, typhoid fever, diphtheria, or other zymotic disease finds its way into the house. It may be taken as a rule, that these powders and liquids, now bought by tons, and often uselessly applied, fail to accomplish their assumed object, and the wisest plan is to call in an architect or medical officer of health, if disease is to be prevented that may cost lives, and will certainly result in much suffering.

Water is by far the most convenient vehicle for the removal of excreta, but, unfortunately, its application for this purpose is limited. There are large centres of population in this kingdom, and extensive areas of country where, from the want of any general water supply, or from an absolute deficiency of the supply, the water-closet is a luxury restricted to the dwellings of the wealthy and well-to-do. Moreover there are important districts and centres of population where the use of the water-closet is objected to mainly on account of the difficulties involved in the ultimate disposal of the sewage. In these districts the disposal of the excreta forms one of the most difficult and troublesome questions of public health; and in a great

proportion this disposal, it must be confessed, is effected in a manner which is simply and actually barbarous. The common privy of our great manufacturing and mining districts, and of our agricultural districts, is, as a rule, a relic of the earlier stages of our civilization, if not, indeed, of actual barbarism. Several methods have been suggested by which, the water-closet not being available, the nuisance of the common privy may be avoided, and the disposal of the excreta accomplished by methods more consistent with modern requirements. These methods are of several sorts, each of which has its peculiar merits, and its special adaptability to particular wants. It is requisite that a brief description of these different methods should be given here, for upon the selection of the best sort of privy to be adopted, when a water-closet cannot be secured, much of the wholesomeness of the house and its precincts will depend.

The different modes of disposal of the excreta other than by the water system have been classified as follows: the Midden System; the Pail System; the Earth System; and the Charcoal System.

The Midden-Privy.—The midden-privy of old construction is the type of all that is bad among privies. It consists, as may still be seen in very many places, of a receptacle of large size open to the air, with which the

closet communicates, built so as not to prevent leakage of its filthy contents into the ground, and often connected by a drain with the common sewer. Such construction is by no means essential to this form of privy. It is possible, indeed, so to construct these privies that nuisance from them shall be diminished very largely, if not wholly avoided. The following are the conditions to be observed where the midden-privy is still had recourse to:—The privy should be detached from the house; no part of the middenstead should be sunk below the ground; and the latter should be made water-tight, covered in so as to exclude rain, but with ample provision for the admission of air, undrained, and of small capacity; arrangements should be made that the ashes and house refuse when thrown into the middenstead may fall upon and cover the excreta. The last-named condition is effected in several ways, of which the plans adopted in Hull and Glasgow are the best. The Hull midden-privy has a middenstead which consists only of the space beneath the privy seat and the floor of the closet. This space is sufficient to contain a week's accumulation of the filth of a household. The seat takes out to admit of the scavenger removing the contents of the middenstead, and being fixed on hinges, it can be raised to facilitate the casting of the ashes and dry house refuse upon the deposited excreta. No slops are thrown into these middensteads,

and their contents, when ordinary care is adopted, are dry, odourless, and inoffensive, the excreta being usually completely hidden under the house-refuse and ashes. In the Glasgow midden-privy the covering up of the excreta is effected in a different way. This form of privy is usually adopted for several families, and the size of its middenstead is calculated to contain a three-days' accumulation of filth. The middenstead projects behind the closet, and ashes and house-refuse are thrown into it through an opening at the side or in the rear. Beneath the opening an inclined plane, usually of slate, is so fixed as to direct the matters thrown in at the opening upon the excreta. This arrangement answers the purpose well of covering up and abating nuisance from the excreta. In some instances the middensteads of these improved privies have been made of a capacity to contain a three-months' accumulation of filth, and it is astonishing how greatly midden nuisance is diminished by the form of construction described, even when the accumulation is so large. But, regard being given to the health of the persons frequenting a midden privy, it is not desirable that the receptacle should contain more than a week's filth, and that if it is necessary to make provision for its storage until it can be used elsewhere, this should be made in a separate receptacle apart from the closet.

Pail-Closets.—The middenstead of the midden closet

described above is a fixed receptacle, but it must be obvious how greatly the question of construction is simplified if for a fixed receptacle a movable one, in the form of a pail or box, is substituted. A simple pail of wood or iron placed beneath the privy seat for the reception of the excreta gives great facilities for dealing with the contents, and for their removal. Pail-closets variously managed are becoming now the most popular mode of dealing with the excreta in parts of England where water-closets cannot be obtained. Nay more, so successful have these pail-closets proved in obviating nuisance from the excreta in many towns, that a general question of pail-closet or water-closet has arisen, and is now being warmly discussed. We have already expressed our preference for the water-closet, but we are prepared to concede that where the water-closet cannot be had the pail-closet may become a very efficient substitute. This latter is worked in several different ways. But, first of the closet. This consists of the ordinary privy, with a flagged floor, and space beneath the seat to receive the pail. The pail may be placed there from the front, the seat being made movable, or from the side or the back by means of a door constructed there. The seat, as a rule, is hinged, and can be raised. In the simplest form the pail is used as a movable middenstead, that is to say, it receives in addition to the excreta the ashes and house-

refuse. This is the case at Nottingham. In another form the pail receives the excreta, only some common deodorant being placed in the pail each time it is emptied, the ashes and house-refuse being received in a separate receptacle, as at Rochdale and other places. The separation of the ashes and house-refuse in the case of Rochdale and similar cases is effected to facilitate the conversion of the excreta into a commercial manure. In other forms of the pail-closet screened ashes are cast into the pail after each use to abate nuisance and to add to the manurial value. The screen may be a loose one with a box for ashes kept in the closet, or it may be fixed so that when used the fine ashes fall from it upon the excreta.

The most elaborate form of pail-closet is now in use in Manchester. In this city the pail-closet is being rapidly adopted throughout in place of the old midden-privy and in preference (with comparatively few exceptions) to the water-closet. Some 50,000 pail-closets have already been constructed there and are now in successful operation. The arrangement for screening ashes here is fixed to the closet and admits of the fine ash falling into the excreta pail, and the coarse ash being removed for re-burning. The house-refuse is collected in a separate pail or box. The pail-closets are for the most part cleaned weekly, and an important part of the procedure,

where the cleansing is carried out by the sanitary authority, is that the pail is washed after each removal of the contents. Where the privy has to be cared for by the occupiers the pail-closet affords the greatest facilities for dealing with the excreta, especially if there be garden ground attached to the house. It is then easy to provide a receptacle for the contents of the pail apart from the closet, and to prevent nuisance from them by a covering of dry earth and the exclusion of wet.

The *Earth-closet* and the *Charcoal-closet.* — These methods of dealing with the excreta differ wholly from any of the preceding methods described. The action of dry and suitable earth upon fresh excrement is very remarkable. It presently forms with the excrement an inodorous compost in which all traces of excrement are lost, and which, judged by experience, forms an admirable manure for many garden crops. An earth-closet should be constructed like the pail-closet or the midden-closet as the case may be. It is preferable that the construction should be as the pail-closet, if the contents are to be removed frequently; a construction like that of the midden-closet, as above described, is usually followed if the contents are not to be removed except at longer intervals. Forms of these closets are made in which, by means of a simple mechanism with a hopper, the requisite quantity of dry earth can be distributed upon the excreta

after each use of the closet. This quantity should be about one pound and a half, four pounds being about the allowance required per head per day. The kind of earth to use is important. Chalky and sandy earths do not answer. Clays, loams, especially of a peaty character, and brick-earth answer admirably. The compost may be long in the receptacle without giving rise to offence, and three months may be permitted to elapse before its removal, but as a rule it is unadvisable to allow so large an accumulation in a closet. A simple but sufficient arrangement of this form of closet consists in placing a vessel with dry earth and common handscoop in a convenient position within it, and throwing a scoopful of the earth upon the excreta after each use. Another simple expedient for cottages in rural districts is by having a covered space behind the seat of the closet, easy of access, in which a store of garden soil, collected when dry, is kept. A portion of this soil is thrown from behind upon the excreta by a spade at frequent intervals. Sometimes also the ashes are deposited by the side of the earth, and sifted upon it, the fine ash being used with the dry earth. An arrangement of this sort answers admirably in abating privy nuisance and in forming an excellent compost for garden purposes.

In the *charcoal-closet*, charcoal is substituted for dry earth. The excreta are completely deodorised by this

agent and putrefactive changes held in check for an undetermined time. One fourth quantity of charcoal is required for use in the closet as compared with the quantity of dry earth.

The success of the several closets described is dependent upon the continuous care given to them. Where the sanitary authority undertakes the regulation of these closets and the removal of their contents, no difficulty ought to be experienced in their management. Where the occupier is himself responsible for the management no insuperable difficulty ought to be experienced if due care has been given to the selection of the kind of closet adopted, and its adaptability to the circumstances of the case. (See NOTE for additional details as to the structure of water-closets, earth-closets, privies, &c., at end.)

Urinals.—These are in the majority of cases a great nuisance in a house, and arrangements should be made, if possible, to do without them altogether, as a chamber-utensil in the closet is, under most circumstances, an efficient substitute. If, however, a urinal is considered indispensable, it should be made of slate, or glazed earthenware, as little metal as possible being used in the construction. A tap, with constant water supply, should be fixed above the urinal, and a good stream should be directed into the pan every time it is used. The exit pipe should be trapped and guarded as carefully as that of the

closet, and the pan with its adjuncts must be kept scrupulously clean, or foul smells will be engendered inevitably and speedily. However, as we have already remarked, this sort of apparatus is best conspicuous by its absence, for even if carefully used, drippings will fall to the floor below and speedily cause a nuisance.

Slop-water.—Carelessness in the disposal of slop-water is proverbial in every class of house and in all districts, whether in town or country. In town houses the servants, unless closely watched, will invariably throw slops into the upper floor closets, to save the trouble of bringing them downstairs. The soil pipe is thus often clogged and eventually stopped, and the smell is specially objectionable and unwholesome. A sink should therefore, if wanted upstairs at all, be constructed under a tap, and used exclusively for the conveying away of slop-water. The exit pipe should be of wide calibre, properly guarded and disconnected on the same principle as the rest. There can then be no sort of excuse for getting rid of that liquid refuse in an improper way. Slop-water generated in or near the basement is best disposed of by pouring it down a wide grating at the back of the house, communicating with the main drain; taking especial care that this or any other channel of exit is well flushed pretty often with some fluid deodorant, as a solution of carbolic acid or of sulphate of iron.

In places outside sewered areas one of the greatest difficulties to be dealt with in securing the vicinity of the house from nuisance is the difficulty of dealing with the slop-water. The nuisance liable to occur from this source stands second only in offensiveness to that arising from improperly constructed and ill-kept privies. It is too commonly the case in small towns, villages, hamlets, and even in detached houses, for the slops to be thrown carelessly upon the ground in the vicinity of the house, or for them to be carried into a neighbouring ditch; in the one case keeping the soil near the house saturated with offensive putrefying filth, in the other case, hardly less productive of nuisance, fouling the air. In small towns, villages, and hamlets a common plan of sewerage will alone, as a rule, meet the evil. Under the circumstances of detached houses, or houses with gardens, one or other of the following modes of procedure may be adopted with success.

1. The slops may be carried by a drain to a small water-tight tank in the garden, and thence ladled as occasion may require, on the garden. The cultivation of garden crops has been carried on with great success by the use of the slop-water thus collected for the irrigation by hand of the cultivated plots of ground.

2. Another method of disposal may be practised by laying in the garden a series of sub-irrigation drains—

common agricultural pipe-drains—and distributing the slops through them. The slops, unfortunately, are apt to penetrate but a little way in these drains except when poured into them in quantity from a washing-tub, or by other means, about to be described. Nevertheless, notwithstanding the slight extent of flow of the slop-water along the drains, if the soil be porous, nuisance is by this means avoided, although little benefit to the crops above may be obtained by the sub-irrigation.

3. A third method of disposal of slops includes both the foregoing plans. A writer has given an interesting description of their application at the vicarage of Fordington, in Dorsetshire, the residence of the Rev. Henry Moule, M.A., whose name is so well known as the principal promoter of the dry-earth system of disposal of the excreta. The writer referred to says: "Mr. Moule, whose name is commonly associated solely with the dry-earth system of excrement disposal, has by no means limited his attention to that system alone. The dry-earth system, indeed, is perhaps more correctly described as a part of a more general scheme which Mr. Moule is engaged in maturing for dealing with the whole refuse of a household. As part of this scheme, I witnessed in a small plot of garden, attached to his house, the successful disposal and utilization of the whole of the liquid refuse of the household. This refuse flows to a catch-pit in the garden,

which has an overflow into a sub-irrigation drain. The garden is cultivated by alternate cropping, the only manure applied to it being the fresh slops, which are ladled from the catch-pit and distributed to the garden daily. Luxuriant successive crops of garden vegetables are obtained in this manner, and Mr. Moule is of opinion, as the result of his experiments, that the liquid refuse of a family of from seventeen to twenty persons can be thus profitably used on five or six perches of ground, as many as three or four crops being grown yearly. The following illustration of Mr. Moule's procedure may be given. On two perches of ground, from which potatoes had been removed, drills were run, and after these had been saturated two days with slops, brocoli was successfully transplanted to them in blazing sunshine. Then, between the drills, holes were made to the depth of ten inches, and prepared for subsequent transplantation of cabbages by filling them again and again with slops. Meanwhile, on both sides of each row of holes, a row of autumn carrots was sown."

4. A fourth mode of dealing with slops has been devised, and successfully carried out. In this mode sub-irrigation is followed, but the peculiarity consists in the manner in which the slop-water is delivered into the sub-irrigation channels. We referred, in noting the second method of disposal recorded, to the slight extent to which slop-water penetrated into sub-irrigation drains, as poured into them

in ordinary flow. This difficulty has been overcome by the invention of an automatic flush-tank fixed at the head of the sub-irrigation channels. This tank, which is made of ordinary pottery-ware or of iron, receives the slop-water in the first instance, and it is so constructed that when the slop-water reaches a certain level in it, it is discharged automatically by means of a syphon into the sub-irrigation drain. The rush with which the slop-water is thus discharged carries it to the furthest extremity of the sub-irrigation channels, if these have been properly laid, and so distributes the fluid over a large area of porous soil. These "flush-tanks" have proved eminently successful in operation, and they enable slop-water to be most effectually disposed of without nuisance, where ground is available for the purpose.

The principle of the flush-tank admits of being applied on a larger scale to the disposal of the slop-water of hamlets and villages, as has been shown by Mr. Roger Field and Mr. Bailey Denton in conjunction. These gentlemen have designed a sewage-tank, arranged on the same principles as the "flush-tank," and which is adapted for dealing with the sewage of populations which is not of sufficient quantity to flow by ordinary gravity through channels arranged for its utilization on cultivated land.

Dust-bins.—The dust-bin is one of the objectionable necessities of civilised life. In crowded localities its im-

mediate proximity to the house is inevitable, but much may be done to minimise the dangers that arise in consequence. As things are now, the day's dust in many towns is put outside the door of each house in the morning, and carted away by the dustman. A vast amount of refuse is scattered through the air during the process, and so assists very materially to pollute the atmosphere of our cities and towns, no practical effort by way of deodorisation or disinfection being made to obviate this serious evil.

In most London houses the dust-bin is conveniently enough placed in the exterior of the front basement story, and close to or near the bottom of the area steps. It should be well protected from rain and wet, and should not be large enough to hold more than, at all events, a week's collection of house refuse. The walls should be carefully built of some non-absorbent material, and the bin should be thoroughly cleaned and limewashed at least four times a year. Although no wet or even moist materials should be thrown into it, it is desirable that provision should be made for the speedy escape of any fluid that may collect at the bottom of the bin; and the regular removal of the contents should be strongly insisted upon. Dustmen are sometimes difficult to manage, and in several of the metropolitan districts the work of collecting is not only done carelessly, but very irregularly. As, however, the removal of house refuse from the imme-

diate vicinity of dwelling-houses influences considerably the maintenance of health, we cannot urge this subject upon the attention of our readers too emphatically.

Various places are assigned for the dust-bin in urban and rural districts. Whatever the situation may be, take care that it is not under the kitchen, or indeed any other window, that the conditions above mentioned as to construction are adhered to, and that, in process of collection, the dust has not to be carried through any part of the house. Preferably the dust-bin should be a movable receptacle, and this is insisted upon in the districts where a daily removal of the dust is required and carried out by the sanitary authority.

Scullery and Sinks.—As kitchens are in very many cases situated in the basement, they seldom come under the eye of the master, and their sanitary arrangements are in consequence generally defective, and frequently very bad indeed, simply because administrative carelessness speedily puts any well devised system of slop and refuse disposal out of gear. The master or mistress of a house should pay an unexpected visit to the scullery at least once a week, not only to see that the place is clean, but to prevent the accumulation of all solid refuse, consisting chiefly of spoiled vegetables, bones, fat, tea-leaves, and dripping, most of which articles should find their way at once into the dust-bin if it is not practicable to consume

them in the kitchen fire. The scullery should have no cupboards in it, and ought, of course, to be provided with an abundant supply of water. The sink is often a standing grievance and a fruitful source of mischief. Most sinks are furnished with a circular perforated plate and bell-trap, which is almost invariably removed, and is indeed practically useless for sanitary purposes. No house is safe from the entrance of sewer-gas by the sink pipe, unless this pipe is cut off as it emerges from the outer wall of the house, and is made to discharge over a grated and trapped opening into the sewer below. A tolerably wide meshed grating is probably the best covering for the upper, i.e. the sink, end of the pipe, and this grating should be so fixed that the servants cannot tamper with it. The sink should be made of stone or slate (the latter is preferable), and be placed against an outer wall, with a window immediately above it. If this arrangement exist, any defect in the pipe can be easily detected and quickly remedied, and no soakage or leakage ought to remain undiscovered for a day. The disconnexion referred to above will make the entrance of sewer-gas into the house by this means an impossibility, especially if the pipe be still further protected by a trap considerably below the upper opening. There are at least twenty varieties of these traps, and the choice can safely be left to the architect or engineer ; simplicity being in this, as in other matters, a chief consideration.

CHAPTER VI.

WARMING AND LIGHTING—PAINT AND PAPER.

Warming and Lighting.—The enormous waste of heat and light in most houses is so notorious that it is specially advisable to direct attention to the fact on the score of economy as well as health. Nearly all houses in this country are warmed by open grates, and the plan, though wasteful, will, we believe, continue to be adopted for many years to come. Stoves and chimneys, as at present arranged, conduct more than half the heat up the chimney. This may to some extent be obviated by bringing the grate as forward as possible. Stoves should be chosen on account of their radiating rather than their absorbing qualities, and many such can now be procured. Economy of fuel can best be compassed by some contrivance that will admit the introduction of the fuel into the bottom instead of the top of the grate. Fireplaces should always be placed, if possible, near the centre of the house, and there are one or more plans by which a fire in one room may be arranged to supply heated air to those adjoining. If stoves are used in the hall, or elsewhere, special provision should be made for their ventilation, the air for this purpose being brought in direct from the outer atmosphere, and in a situation

where no pollution from stables, drains, or closets is likely to occur. Stoves not systematically provided with fresh air dry the air of the room to an unwholesome and sometimes dangerous extent.

We cannot have, in this country, too much natural light, so that an all-sufficient rule is to make windows as large as possible, for there are very few places in England where the occasional glare of the sun cannot be effectually moderated by blinds, shutters, or some such contrivances. As to artificial light, gas, though it generates more heat and absorbes more oxygen than any variety of lamps or candles, is cheapest and most convenient, and hence most general. But if used, the means recommended under the head of ventilation should be adopted with every burner, or the atmosphere within the house will be most seriously fouled. All so-called weak-chested persons are practically cognisant of this fact, and will tell you how much pleasanter to them is a room lighted with candles than one in which gas is burnt. If it can be afforded, we therefore recommend, on the score of health, that at all events the study, drawing-room, and nurseries should not be lighted with gas, and if arrangements can be made to dispense with its use in other rooms, so much the better.

Paint and Paper.—Taste will always regulate these matters, which it is not our province to attempt to

influence, except so far as questions relating to the prevention of disease are concerned. It is therefore only necessary to remind the householder that all paints should be varnished : (1) because the paint work is thus more easily cleaned; (2) because any deleterious ingredients of which the paint may be composed are thus rendered harmless ;—that flock papers should, as a rule, be avoided : (1) because they collect, absorb, and retain particles of dust often containing organic matter; (2) because flock papers frequently contain, in their colouring matter, a dangerously large proportion of arsenic. The attention of the public has lately been directed to this latter point, and well authenticated cases exist in which severe symptoms of poisoning from arsenic are proved to have been caused by the presence of this metal in the loose facing on the surface of the wall paper. In point of fact, with paint and paper, choose, if you have the opportunity, each of a kind that will assist as little as possible in the collection of dirt, and which can be most effectually cleaned, perfectly smooth surfaces being indispensable, and a glazed surface desirable, in all cases. And whenever a room is re-papered, take care that all the old paper is removed before the new one is put up. We have seen three or four layers of old paper removed from the walls, and a considerable number of insects found under or between these layers of decomposing material.

CHAPTER VII.

BEDROOMS--NURSERY—LAUNDRY—KITCHEN—LARDER.

Bedrooms.—We have already remarked that bedroom space should be as liberal as possible in proportion to the number of occupants. In England no hangings are required to beds, and indeed beds are much healthier without them. Mattresses are better than feather beds, and horsehair is the best material for stuffing. There should be no carpet under the bed, as it collects dust, and that compound of nastiness commonly called "fluff," and as little carpet on the floor as is consistent with British ideas of comfort. Squares of carpet, i.e. carpets not fitted to the room, are, in fact, best in all rooms, both on sanitary grounds and on those of general cleanliness and convenience. The tendency of bed-rooms to become "stuffy" during the night (i.e. to become filled with air unduly charged with carbonic acid) is best counteracted by leaving the top sash open at least two or three inches, and there are really very few states of weather in which this cannot be borne by a healthy person. At any rate, sleep with either door or window open, unless you are fortunate enough to occupy an exceptionally well ventilated room, with very ample cubic space. We are the more disposed to lay stress upon

these last items of advice, because our experiences of the foul atmosphere generated and bottled up in the sleeping apartments of the middle and upper classes show how little attention is paid to this matter. It is hardly necessary to say that bedroom windows should be thoroughly opened as early as possible, and should be kept open during the entire day, wind and weather permitting.

Nursery.—It may seem superfluous to address fathers and mothers as to the pre-eminent importance of giving their children all possible space, both in their day rooms and sleeping rooms. In the majority of middle and upper class houses in the metropolis, as well as in our chief provincial towns, the children are usually relegated to small rooms high up, and so not specially accessible, without a good water supply, and almost invariably deficient as to cubic area. Fresh air, an abundant supply of good water close at hand, plenty of light, no curtains, and a paucity of carpets, are all nursery necessities if your children are to grow and thrive well. Always have a sitting-room distinct from the bedroom, so that the latter may not be occupied during the day. The careful application of the hints on ventilation (see pages 44–49) is of more consequence as regards the nurseries than any other rooms in the house, inasmuch as we have to deal with a growing population, whose lungs are specially

sensitive as to the quality of air inspired. Iron bedsteads and horsehair mattresses should be used in the nursery as in the other bedrooms, because they harbour insects less, are cleaned much more readily, and are cooler and healthier in every respect than wool, feathers, or any other material. The immediate removal of soiled linen, and liquid or soiled excreta, from both day and night nurseries is of great importance. Many servants, in other respects clever, are careless on this point, and so the rooms always have a characteristic "baby" smell.

Laundry.—In rural districts washing at home is naturally the rule. In urban districts, and emphatically in crowded localities, it should always be the exception. The fumes arising from a mixture of steam, soap-suds, and dirty linen, are not only disagreeable, but detrimental to health, as engendering moist heat and favouring the aërial distribution of organic matter. Our large metropolitan and suburban laundries are now, it is hoped, in process of reformation and reorganisation, and indeed there is great room for improvement in the conduct of these establishments. Until, however, improvements occur, we must submit; but every one can aid in the prevention of disease by taking care that no linen or clothes of any kind that have been used by persons suffering from contagious and infectious maladies shall be sent to a laundry without being previously disinfected, and due

notice also given to those in charge of the laundry. Where private laundries exist, they should, if possible, be quite apart from the house, and care should be taken that the drying-ground is open, and away from the ordinary sources of air pollution, as stables, piggeries, &c.

Kitchen.—The kitchen and its surroundings should be inspected regularly by the mistress of the house, or by some equally responsible, if not equally interested, person. A floor of wood or good cement is preferable to stone, as the latter is in this climate cold and comfortless. A central square of carpet is sufficient, as it ought to be taken up and shaken every day. No butter, cheese, or any other kind of food should be left in the kitchen longer than necessary, and should on no account be allowed to remain there during the night. The room should not be made a convenient hanging-place for bonnets and shawls, and health as well as economy is consulted by keeping the consumption of coals within reasonable bounds.

Larder.—Unless some care is taken not only to buy wholesome food, but to keep it in good condition, health in the house cannot be fairly secured. The larder should be arranged so as to have at least one outer wall with, if possible, a northern aspect. Choose in fact the coolest part of the basement, and let it be so ventilated that, though as a matter of necessity near the kitchen, no kitchen air is drawn into it, except as an accidental

occurrence. The floor should be laid with tiles or concrete; and the shelves should be of marble, slate or tiles, all of which are cleaner and cooler than wood. A meat safe, if used elsewhere than in the larder, should have perforated zinc sides, and be hung where there is as much cool air and as little dust as possible. Nothing assists the decomposition of animal food so much as damp heat.

CHAPTER VIII.

DISINFECTANTS—ANTISEPTICS—INFECTIOUS AND CONTAGIOUS DISEASES.

Disinfectants.—Those of our readers who desire to know something of so-called disinfectants should obtain and read another of these Primers in which the subject is specially treated. We refer to them here because, in houses of almost every class, it appears to be just now the fashion to keep in stock, and in many cases to use very liberally, one or other of these articles. A powder-box may be found in almost every closet; the cook is exhorted to keep a special supply for the benefit of the scullery and sink, and in fact a general order exists in most middle-class families to the effect that any dubious or nasty smell is to be neutralised, or rather smothered, as speedily as possible, by another variety of odour. As

to actual smell, the remedy is often worse than the evil; and the man or woman has, we take it, still to be found who can derive any enjoyment from the inhalation of chlorine gas or the vapour of carbolic acid. Indeed, there is no exaggeration in asserting that more than one-half of the fluid and liquid deodorants so plentifully scattered within and without our houses are worse than useless, not only as direct preventives of diseases, but because they give to us a sense of false security. The advice given here is briefly to avoid so-called disinfectants as much as possible. If foul smells exist within the house, whether in passages, rooms, closets, or basement, do not content yourself with stifling them by the use of chlorine, carbolic acid, &c., but find out the source of the mischief by a careful inspection of pipes, drains, and basement. In the vast majority of cases, a leakage will be discovered in one or other of the drain pipes, and the repair of this leak is of course the effectual remedy. Close the leak, ventilate well, and the evil ceases, without any resort to artificial disinfection.

In brief, the reader should know that heat and pure air are the best household disinfectants. It is of course necessary to cleanse the atmosphere of a room, as well as to remove its contents, after it has been occupied by any one suffering from contagious or infectious disease. In all such cases, consult the medical adviser of the family,

in conjunction, if necessary, with the medical officer of health. It is not only a duty, but it is eminently an advantage, to do so, for, if sanitary matters are properly organised throughout a district, the infected and suspected rooms will be fumigated and lime-washed, and if necessary, repapered, and all articles of bedding, clothing, &c. removed to the public disinfecting chamber, and properly dealt with under skilled supervision. Unless prepared to adopt this latter course in its entirety, the clothing and bedding should be destroyed by fire with the least possible delay.

Disinfectants are not to be despised, but for household purposes they should be regarded only as secondary aids to the maintenance of health and the prevention of disease.

Infectious and Contagious Diseases.—Although it is not our province in this place to discourse in any sort of way on the treatment of disease, it is our duty to remind the householder that he has grave responsibilities whenever his house is unfortunately occupied by any contagious or infectious disorder. There can, according to our knowledge and belief, be no doubt whatever that it is the duty of the master of the house or of the practitioner in attendance to inform the health officer of the district as to the existence of any such case, and pending his arrival to isolate the patient as far as possible, and permit no one

to go in and out of the room except those immediately responsible for the care of the sick person. It is not necessary to explain in detail the measures that should be adopted for the safety of the household, because all proper directions will or should be given by the medical man in attendance, in conjunction with the medical officer of health. But the advice of the latter must be sought for and obtained as soon as possible, and if removal to a special hospital be recommended, the welfare of the patient and of every one else in the house will be best consulted by the adoption of the suggestion, and by having the sick person sent away under proper supervision as speedily as possible. It is necessary, however, to remark that no person affected with a contagious disease can legally be sent in a public conveyance, and that any departure from this rule subjects the offender to a penalty.

SUMMARY AND GENERAL APPLICATION.

We have endeavoured in the foregoing remarks to convey information of a kind that shall be useful to all classes of society. For, few perhaps, have the opportunity either of building a house or of choosing the site, or in any material respect influencing the surroundings. The business of life, whatever in each case it may be, compels

most of us to live in a particular locality, and to take the soil, air, water, and houses of that locality as we find them. But the object of this Primer is to show that every one, in an individual as well as a corporate capacity, can, in the administration of his own house and its surroundings, do much to influence his own health as well as that of his neighbours. We have called attention to some things apparently so trivial that our readers may exclaim, "Oh! we know all about that, of course." But so-called little things are oftenest forgotten, or thought unworthy of systematic attention, and it is besides very important in matters relating to health to learn how to do little things well and regularly. The best advisers are the medical officer of health, the surveyor of the district, and the family medical attendant. Every ratepayer has a claim upon the services of the two first-named officers, and medical men generally will always be glad to act in conjunction with them. But when repairs or alterations are required, and are in progress, relating to pipes, drains, or anything usually, and often inconveniently, concealed from general observation, see that the workmen do their task properly. Artisans as a rule do not yet understand that a loose joint, a leaky pipe, or an inefficient ventilator may mean to the household an indefinite amount of sickness and possible mortality, so that it is necessary not only thoroughly to understand what has to be done, but to see that

it is done properly. Surveyors, engineers, and medical men all have their favourite varieties of closets, traps, ventilators, stoves, &c., and hence, as a rule, we abstain from recommending specially any particular kind, assuming that the article chosen will fulfil the sanitary requirements indicated in our recommendations. Each person must satisfy himself thoroughly as to whether this or that ventilator is likely to work, or does work, well, as an incast or an outcast, if the particular class of trap chosen is really efficient, and so on—remembering that all these things should be as simple and as accessible as possible.

With the aid of this Primer it should be practicable to know where to look for probable defects. But when these defects are remedied, and all is in good working order, personal supervision alone will maintain this order. Cisterns, closets, sinks, overflows, and drain connexions (or rather drain disconnexions) should be inspected at regular intervals. We are dependent as a rule upon others for our supply of water and gas, and for the emptying of the dust-bin, and reminders are frequently required as to these matters. Intelligent co-operation is the surest road to success, and so-called public improvements will always fail unless backed by individual effort. A well-known and distinguished statesman has very truly told us that we "cannot get healthy brains to grow on unhealthy soil." Nor, we may add, healthy bodies either.

NOTE.

THE Local Government Board has recently issued a series of "Model Byelaws" on the construction of New Buildings for the guidance of Sanitary Authorities. These byelaws should be carefully studied for the authoritative information they give on the structural requirements of houses. We reproduce here, in preference to including them in the text, the byelaws relating to the construction of water-closets, earth-closets, privies, &c., for their peculiar importance with reference to the subject of this Primer. Those relating to drainage of buildings are also worthy of perusal.

MODEL BYELAWS.

With respect to water-closets, earth-closets, privies, ash-pits, and cesspools in connection with buildings.

67. Every person who shall construct a water-closet or earth-closet in a building shall construct such water-closet or earth-closet in such a position that one of its sides at the least shall be an external wall.

68. Every person who shall construct a water-closet or earth-closet in connection with a building, whether the situation of such water-closet or earth-closet be or be not within such building, shall construct in one of the walls

of such water-closet or earth-closet a window of not less dimensions than *two feet* by *one foot*, exclusive of the frame, and opening directly into the external air.

He shall, in addition to such window, cause such water-closet or earth-closet to be provided with adequate means of constant ventilation by at least one air-brick built in an external wall of such water-closet or earth-closet, or by an air shaft, or by some other effectual method or appliance.

69. Every person who shall construct a water-closet in connection with a building shall furnish such water-closet with a separate cistern, service box, or flushing box of adequate capacity, which shall be so constructed, fitted, and placed as to admit of the supply of water for use in such water-closet without any direct connection between any service pipe upon the premises and any part of the apparatus of such water-closet, other than such cistern, service box, or flushing box.

He shall furnish such water-closet with a suitable apparatus for the effectual application of water to any pan, basin, or other receptacle with which such apparatus may be connected and used, and for the effectual flushing and cleansing of such pan, basin, or other receptacle, and for the prompt and effectual removal therefrom of any solid or liquid filth which may from time to time be deposited therein.

He shall furnish such water-closet with a pan, basin, or other suitable receptacle of non-absorbent material, and

of such shape, of such capacity, and of such mode of construction as to receive and contain a sufficient quantity of water, and to allow all filth which may from time to time be deposited in such pan, basin, or receptacle to fall free of the sides thereof, and directly into the water received and contained in such pan, basin, or receptacle.

He shall not construct or fix under such pan, basin, or receptacle any "container" or other similar fitting.

He shall not construct or fix in or in connection with the water-closet apparatus any trap of the kind known as a "D trap."

70. Every person who shall construct an earth-closet in connection with a building shall furnish such earth-closet with a reservoir or receptacle, of suitable construction and of adequate capacity, for dry earth or other deodorizing substance, and he shall construct and fix such reservoir or receptacle in such a manner and in such a position as to admit of ready access to such reservoir or receptacle for the purpose of depositing therein the necessary supply of dry earth or other deodorizing substance.

He shall construct or fix in connection with such reservoir or receptacle suitable means or apparatus for the frequent and effectual application of a sufficient quantity of dry earth or other deodorizing substance to any filth which may from time to time be deposited in

any pan, pit, or other receptacle for filth constructed, fitted, or used in or in connection with such earth-closet.

71. Every person who shall construct an earth-closet in connection with a building, and shall provide in or in connection with such earth-closet a fixed receptacle for filth, shall construct or fix such receptacle in such a manner and in such a position as to admit of the frequent and effectual application of a sufficient quantity of dry earth or other deodorizing substance to any filth which may from time to time be deposited in such receptacle, and in such a manner and in such a position as to admit of ready access to such receptable for the purpose of removing the contents thereof.

He shall not construct such receptacle of a capacity greater than may be sufficient to contain such filth and dry earth or other deodorizing substance as may be deposited therein during a period not exceeding * , or in any case of a capacity exceeding † *cubic feet.*

He shall construct such receptacle of such material or materials, and in such a manner, as to prevent any absorption by any part of such receptacle of any filth de-

* The spaces left vacant are so left for sanitary authorities to fill up according to the circumstances or needs of their particular localities.

† Forty cubic feet = three months' accumulations, may be taken as a maximum.

posited therein, or any escape, by leakage or otherwise, of any part of the contents of such receptacle.

He shall construct or fix such receptacle so that the bottom or floor thereof shall be at least *inches* above the level of the surface of the ground immediately adjoining the earth-closet, and so that the contents or such receptacle may not at any time be exposed to any rainfall or to the drainage of any waste water or liquid refuse from any adjoining premises.

72. Every person who shall construct an earth-closet in connection with a building, and shall provide in or in connection with such earth-closet a movable receptacle for filth, shall construct such earth-closet so that the position and mode of fitting of such receptacle may admit of the frequent and effectual application of a sufficient quantity of dry earth or other deodorizing substance to any filth which may from time to time be deposited in such receptacle, and may also admit of ready access to that part of the earth-closet in which such receptacle may be placed or fitted, and of the convenient removal of such receptacle or of the contents thereof.

He shall also construct such earth-closet so that the contents of such receptacle may not at any time be exposed to any rainfall or to the drainage of any waste water or liquid refuse from any adjoining premises.

73. Every person who shall construct a privy in con-

nection with a building shall construct such privy at a distance of *six feet* at the least from a dwelling house or public building, or any building in which any person may be or may be intended to be employed in any manufacture, trade, or business.

74. A person who shall construct a privy in connection with a building shall not construct such privy within the distance of * *feet* from any water supplied for use, or used or likely to be used by man for drinking or domestic purposes, or for manufacturing drinks for the use of man, or otherwise in such a position as to endanger the pollution of any such water.

75. Every person who shall construct a privy in connection with a building shall construct such privy in such a manner and in such a position as to afford ready means of access to such privy, for the purpose of cleansing such privy and of removing filth therefrom, and in such a manner and in such a position as to admit of all filth being removed from such privy, and from the premises to which such privy may belong, without being carried through any dwelling-house or public building, or any building in which any person may be, or may be intended to be, employed in any manufacture, trade, or business.

76. Every person who shall construct a privy in connection with a building shall provide such privy with a suffi-

* Thirty feet should, if practicable, be the minimum.

cient opening for ventilation, as near to the top as practicable, and communicating directly with the external air.

He shall cause the floor of such privy to be flagged or paved with hard tiles or other non-absorbent material, and he shall construct such floor so that it shall be in every part thereof at a height of not less than *six inches* above the level of the surface of the ground adjoining such privy, and so that such floor shall have a fall or inclination towards the door of such privy of *half an inch* to the *foot*.

77. Every person who shall construct a privy in connection with a building, and shall construct such privy for use in combination with a movable receptacle for filth, shall construct over the whole area of the space immediately beneath the seat of such privy a flagged or asphalted floor, at a height of not less than *three inches* above the level of the surface of the ground adjoining such privy; and he shall cause the whole extent of each side of such space between the floor and the seat to be constructed of flagging, slate, or good brickwork, at least *nine inches* thick, and rendered in good cement or asphalted.

He shall construct the seat of such privy, the aperture in such seat, and the space beneath such seat, of such dimensions as to admit of a movable receptacle for filth of a capacity not exceeding *two cubic feet* being placed

and fitted beneath such seat in such a manner and in such a position as may effectually prevent the deposit, upon the floor or sides of the space beneath such seat or elsewhere than in such receptacle, of any filth which may from time to time fall or be cast through the aperture in such seat.

He shall construct the seat of such privy so that the whole of such seat, or a sufficient part thereof, may be readily removed or adjusted in such a manner as to afford adequate access to the space beneath such seat for the purpose of cleansing such space, or of removing therefrom or placing and fitting therein the appropriate receptacle for filth.

78. Every person who shall construct a privy in connection with a building, and shall construct such privy for use in combination with a fixed receptacle for filth, shall construct or fix in or in connection with such privy suitable means or apparatus for the frequent and effectual application of ashes, dust, or dry refuse to any filth which may from time to time be deposited in such receptacle.

He shall construct such receptacle so that the contents thereof may not at any time be exposed to any rainfall or the drainage of any waste water or liquid refuse from any adjoining premises.

He shall construct such receptacle of such material or materials and in such a manner as to prevent any absorp-

tion by any part of such receptacle of any filth deposited therein or any escape, by leakage or otherwise, of any part of the contents of such receptacle.

He shall construct such privy so that the bottom or floor thereof shall be in every part at least *three inches* above the level of the surface of the ground adjoining such privy.

He shall not in any case construct such receptacle of a capacity exceeding *eight cubic feet.**

He shall construct the seat of such privy so that the whole of such seat, or a sufficient part thereof, may be readily removed or adjusted in such a manner as to afford adequate access to such receptacle for the purpose of removing the contents thereof, and of cleansing such receptacle, or shall otherwise provide in or in connection with such privy adequate means of access to such receptacle for the purpose aforesaid.

79. A person who shall construct a privy in connection with a building shall not cause or suffer any part of the space under the seat of such privy, or any part of any receptacle for filth in or in connection with such privy to communicate with any drain.

80. Every person who shall construct an ash-pit in connection with a building shall construct such ash-pit at a distance of *six feet* at the least from a dwelling-house

* This is the space between the seat and the floor of the privy, and is sufficient for a week's accumulation of filth and dry house refuse.

or public building, or any building in which any person may be, or may be intended to be employed in any manufacture, trade, or business.

81. A person who shall construct an ash-pit in connection with a building shall not construct such ash-pit within the distance of * *feet* from any water supplied for use, or used or likely to be used by man for drinking or domestic purposes, or for manufacturing drinks for the use of man, or otherwise in such a position as to endanger the pollution of any such water.

82. Every person who shall construct an ash-pit in connection with a building shall construct such ash-pit in such a manner and in such a position as to afford ready means of access to such ash-pit for the purpose of cleansing such ash-pit, and of removing the contents thereof, and, so far as may be practicable, in such a manner and in such a position as to admit of the contents of such ash-pit being removed therefrom, and from the premises to which such ash-pit may belong, without being carried through any dwelling-house or public building, or any building in which any person may be, or may be intended to be employed in any manufacture, trade, or business.

83. Every person who shall construct an ash-pit in connection with a building shall construct such ash-pit of a capacity not exceeding in any case *six cubic feet*, or of

* Thirty feet should, if practicable, be the minimum.

such less capacity as may be sufficient to contain all dust, ashes, rubbish, and dry refuse which may accumulate during a period not exceeding *one week* upon the premises to which such ash-pit may belong.

84. Every person who shall construct an ash-pit in connection with a building shall construct such ash-pit of flagging, or of slate, or of good brickwork, at least *nine inches* thick, and rendered inside with good cement or properly asphalted.

85. A person who shall construct an ash-pit in connection with a building shall not cause or suffer any part of such ash-pit to communicate with any drain.

86. Every person who shall construct a cesspool in connection with a building shall construct such cesspool at a distance of * *feet* at the least from a dwelling-house or public building, or any building in which any person may be, or may be intended to be employed in any manufacture, trade, or business.

87. A person who shall construct a cesspool in connection with a building shall not construct such cesspool within the distance of * *feet* from any water supplied for use, or used or likely to be used by man for drinking or domestic purposes, or for manufacturing drinks for the use of man, or otherwise in such a position as to endanger the pollution of any such water.

* Thirty feet should, if practicable, be the minimum.

88. Every person who shall construct a cesspool in connection with a building shall construct such cesspool in such a manner and in such a position as to afford ready means of access to such cesspool for the purpose of cleansing such cesspool, and of removing the contents thereof, and in such a manner and in such a position as to admit of the contents of such cesspool being removed therefrom, and from the premises to which such cesspool may belong, without being carried through any dwelling-house or public building, or any building in which any person may be, or may be intended to be employed in any manufacture, trade, or business.

He shall not in any case construct such cesspool so that it shall have, by drain or otherwise, any outlet into or means of communication with any sewer.

89. Every person who shall construct a cesspool in connection with a building shall construct such cesspool of good brickwork in cement properly rendered inside with cement, and with a backing of at least *nine inches* of well puddled clay around and beneath such brickwork.

He shall also cause such cesspool to be arched or otherwise properly covered over, and to be provided with adequate means of ventilation.

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