Better Homes

by

Needham, Mabel A

Publisher : Oxford University Press

Edition : 1958

warm us almost as much as the rays of the sun itself. One way of keeping the house cool is to catch the right moment when the air outside is no warmer than that inside, and close all doors and windows. The air inside will keep considerably cooler than that outside. But remember that the inside air is never so good as the outside air and, if not renewed from outside, will soon become exhausted by people breathing it. That is why you often see ventilators in the walls of a room. If you have no ventilators in your house, the rooms should be opened two or three times during the closed-up period; otherwise, through want of fresh oxygen, weariness and headache will result. In a closed room, a fan does not renew the air; it only circulates what is there. Split bamboo or cane blinds or 'tatties' hung round the veranda keep the house cool.

2. By admitting cooler air. Perhaps you have learnt that evaporation produces coolness because, as liquid passes into vapour, work is done and heat is lost. This principle is made use of when we water the ground round our houses or hang khus-khus tatties or similar blinds in front of our windows and doors and keep them wet. Heat being lost by evaporation, the air which percolates through to our rooms is cool. This is a better method of making rooms cool than shutting up stale air inside them. Moreover, unless the climate is damp, the little moisture that comes in is always good; a very dry state of the air is not good for us. The objection to this method of keeping our rooms cool is the labour it involves. The water thrown on the tatties rapidly dries and has constantly to be renewed. But if labour and water are plentiful, it is a very good wa of keeping the room cool. The principle of the khus-kh tatti may be utilized in the following way, no labour bei

involved. Place inside the room at the top of a window a tin vessel (it can be made cheaply by the local tinsmith) the width of the window. It may be supported on bamboo legs or on small brackets, and painted the colour of the window frame. In the bottom of the tin make half-a-dozen pin-prick holes at even distances. Hang a curtain of thick absorbent cotton cloth, the size of the window, beneath the tin, so that the top lies just under the holes. Fill the vessel with water. Drops will fall on to the curtain fast enough to keep it wet. Constant evaporation will take place and coolness will result. If one or two windows or doors are treated in this way the rest may be closed, and the room will be found considerably cooler than if entirely closed. A fan placed near the wet curtain will drive the cool air into the room and, at the same time, fresh air will be constantly admitted.

3. By circulating the air. The body is a producer of heat at a constant temperature of 98.6°F. Usually, the highest temperature of the closed room or an ordinary house on a hot summer afternoon is less than this. Therefore, when the air is kept in motion, air cooler than the body is brought into constant contact with it, causing a feeling of coolness. The body also perspires and the moving air absorbs the moisture thus produced and carries it away. Thus in two ways coolness and comfort are produced.

The motion of the air may be caused: (i) by hand-pulled punkahs—this is the primitive method; (ii) by punkahs or circular fans, worked usually by electricity, though sometimes by power produced from a kerosene lamp.

The use of the electric fan is less expensive than that of he hand-pulled punkah, when we compare the cost of ctricity with a punkah-coolie's wages.

The heat generated by the electric power in working the fan actually raises the temperature of the room slightly, but not enough to do away with the advantages derived. People who can afford it sometimes keep blocks of ice in their living rooms, or have electrical 'air-conditioning' plants, to keep down the temperature; others have underground rooms, but these are not considered healthy.

WARMING THE HOUSE. In cold climates the living rooms should not be kept at a temperature higher than 60° to 65°F., and that of bedrooms should be less. The commonest way in which to obtain heat is by combustion. Combustion is a form of energy and always generates heat, whether the substance burnt is solid, liquid, or gaseous. Another way of warming a room is by causing to be heated, originally by combustion or electricity, some substance that will radiate heat. We will consider the different methods used.

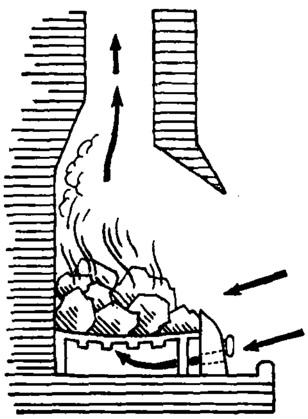


FIG. 2 Fireplace

1. *Open fires.* This is the commonest method of warming our houses. A fireplace is built of some incombustible substance, such as iron, stone, or brick, and placed against a wall, up and through which runs a chimney (Fig. 2). Originally, the fireplace was built in the middle of the room and a hole made in the roof above through which the smoke might make its way out. Wind or rain, however, might enter the hole, to the great discomfort of the occupants below. When later the fireplace

was moved and a chimney added, a great step forward was made in house comfort.

A chimney is essential, with either an open fire or closed stove, for the cleanliness of the house and the comfort and health of its occupants. Even where a chimney is provided, smoke in the room may be caused (i) by an insufficient outlet, (ii) by insufficient upward draught, and (iii) by an adverse wind driving it back into the room.

In the first case, the chimney must be widened. In the second and third, some addition or alteration is needed. Often the chimney is not high enough. Sometimes it is overshadowed by some higher buildings or trees.

An open fire is the most cheerful of all fires, but generally means dust and dirt and labour. The fuel for open fireplaces is (i) coal, (ii) coke (coal partially burnt with the gas driven out), (iii) peat (partially compressed decayed vegetable matter), (iv) wood. Which of these is used generally depends upon what the neighbourhood has to offer. Wood is the fuel most commonly used in Indian houses. Wood gives a cheerful fire, is clean in storage, generally not very dear, and quickly gives out a good heat. But wood burns quickly, and much labour lies in chopping and feeding.

Coal has good heat value and is cheap near its source of supply, but when soft, as is generally the case with house coal, it is the source of much dust and ash. Coke has good heat value, is clean, but needs rather frequent attention. Peat has generally the qualities of wood and is cheap.

The grate should always be kept clean, and the ashes cleared away. In a wood fire, however, part of the wood ashes left are usually swept to the back of the grate where, when the fire is lighted and they become heated, they act as a radiator and throw out more heat into the room.

2. *Closed stoves for burning solid substances.* A stove is a closed receptacle for the burning of substances for the production of heat. It may burn any of the substances mentioned above, and charcoal (wood partially burnt) as

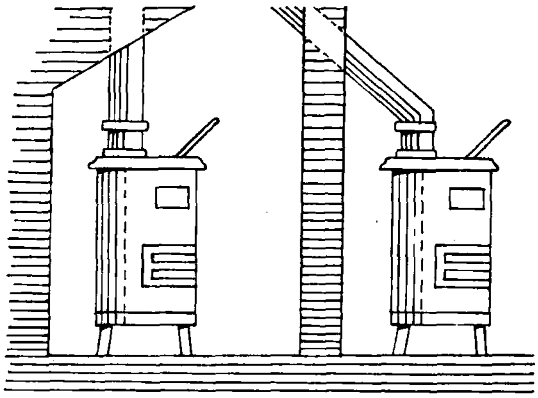


Fig. 3 Stoves and stove-pipes

well. Stoves, if at all large, must be fixed and have a stove-pipe entering a chimney (Fig. 3) or leading out of doors, to carry off the poisonous fumes that are a product of combustion. If small, as charcoal stoves usually are (Fig. 4), they may be moved wherever they are needed, and are not provided with a chimney. Remember, however, in such cases always to have a window open where they are burning. Men sleeping in a closed room heated by a charcoal stove, or even remaining in such a room for a short time, have been known to die of suffocation.

3. *Kerosene oil stoves* also have good heat-producing value but care is needed to keep them clean. Otherwise, smoke and oil fumes will result and contaminate the air.

4. *Gas stoves* give a good heat and can be easily

regulated. There is, however, the danger of turning the burners too low, when a puff of wind may blow out the flame; the gas will then escape and a little gas mixed with air is highly explosive. Gas quickly consumes and dries the air, so water should always be exposed in a shallow vessel above the stove which should be connected with a chimney so that the gas fumes may escape.

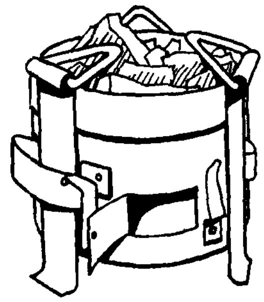


FIG. 4 Charcoal stove

5. *Electric radiators* are very convenient, safe, clean and give good heat, but the amount of electric current consumed is very great and they are therefore expensive.

6. *Central heating.* In cold countries a large stove is kept burning in the central part of the building, generally in the cellar. From this, pipes carry heated air, water or steam to every room in the house.

Things to Do

Practical work

1. Make a study of your own house, considering its site and aspect, its plinth, its dryness, and the number, size and arrangement of its rooms.
2. Measure, and draw to a scale of 4 feet to an inch, one of the quadrangles of your school or home, or of a small garden.
3. Plan, allowing 3 feet to an inch, and arrange the rooms as you think most convenient: (i) an eight-roomed house, in which a father and a mother, two married sons with their wives and five (3 plus 2) children could live comfortably; (ii) a six-roomed house for a family of eight; (iii) a four-roomed house for a family of seven; (iv) a two-roomed house for a family of five.
4. Observe houses under construction.
5. Test the temperature of identical rooms (i) left open, (ii) closed, (iii) partially closed with wet tatties or curtains.

Oral and written work

1. Which aspect do you think the best for houses in your locality?
2. Which do you think the best location for a house in your town?
3. Is the building-ground available in your neighbourhood composed of rock, gravel, clay or sand?
4. Describe the plinth and ceiling of your schoolhouse.
5. Say to what uses a veranda can be put.
6. Discuss the use of a damp-proof course.
7. Are the mills and factories, if any, in your town placed where they will do least harm to the inhabitants?
8. Give examples from the home of cooling taking place through evaporation.
9. Why are ventilators placed high up in walls?
10. Describe methods of transmitting heat exhibited in an ordinary house.

CHAPTER II

THE KITCHEN

WHATEVER its size or type every house ought to have a separate kitchen, where the cleaning, preparing, cooking and serving of food is done. In India, the kitchen is often the most neglected part of the house because servants are generally indifferent to cleanliness and the housewife does not bother. In Western countries, however, the kitchen has become one of the most interesting parts of the house. There all the members of the family assist in the housework and a great deal of scientific research has therefore gone into the planning of kitchens in the West. Every housewife in India would welcome such a change in her kitchen too. It is her workshop for between 16 and 18 hours of the day. This can only be brought about by wise construction and the careful planning of work. In the first place the kitchen should be made as attractive as possible. This alone would help to make the everyday drudgery of housework pleasant and easy so that in a comparatively short time the women of the house would have leisure for other things, and be proud of their spotlessly clean kitchens.

The common practice in India has been for all the women members of the joint-family to work together in the kitchen over the cooking operations, while the cleaning is left to the family servants. Times are changing, however, and the joint-family kitchen is giving place to small kitchens for small families where the housewife works without the assistance of servants. So care has to be taken to bring in efficiency and neatness without having to battle with smoke and dirt.

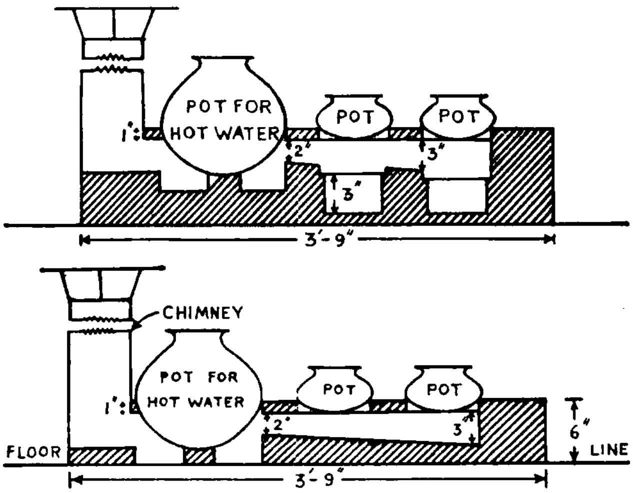
There are two chief processes to be performed in the kitchen: (i) the cleaning, preparing, cooking and serving of food and (ii) the removing, washing and putting away of utensils.

To perform the first—that is the cleaning and preparation of food—let us arrange the equipment in the right sequence to save labour. Where shall we find the materials needed for cooking? The store-cupboard and safe should be on the cool side of the room and easily accessible. What will be required next? Probably water for washing and vessels for cooking the food in. Therefore we shall arrange these things close together. The place for grinding must be nearby also. Next in line should be the sigri for cooking and the fuel must be within easy reach. Utensils, such as the *thoa,* frying-pans and oven, should be arranged conveniently near.

For the second process, that of clearing away the meal, the dishes to be washed must be carried to the sink, after being scraped as clean as possible, and then washed. The place for storing the dishes and utensils used in eating should be conveniently near the sink and the place of eating also. Very often, though, the kitchen is a small dark room which it is both inconvenient and difficult to keep clean. We should select a light, dry room with good ventilation as the place in which the family's food is prepared. Two windows are necessary for this, especially when there is no chimney to carry away the smoke and fumes.

Heat for Cooking. Cooking may be carried on with either an open fire or a stove. In open fires in India, the fuel burnt is usually wood, or cakes made of cowdung and straw. Of these, the former makes the better and hotter fire, and is cleaner and pleasanter in use and gives out no smell.

THE SMOKELESS CHULA. Dr Raju of the Engineering Research Laboratories, Hyderabad, has by experiment evolved a cheap kind of chula whose consumption of firewood or coal is very small. Every calorie of heat is used up in cooking or heating water, so that there can be a constant supply of hot water without incurring extra cost for fuel.



From Dr P. S. Raju's *Smokeless Kitchens for the Millions* (Christian Literature Society for India)

FIG. 5 Two types of smokeless chula

The hearth is raised about 2ft. from the ground and the chula is built on top of this platform. The arrangement is in the shape of the letter L. The fire is lighted at one end and the smoke and heat is drawn through to the chimney at the other end. The chula provides for three holes, each 8 inches in diameter, on which cooking-pots may be placed. If those not in use are covered all the smoke is carried through the chimney and none escapes into the room. The result is a spotlessly clean kitchen; and as there is no wastage of heat, running costs are cut to the minimum.

There are different designs of 'smokeless chulas' ranging in cost to suit the means and needs of different classes of people.

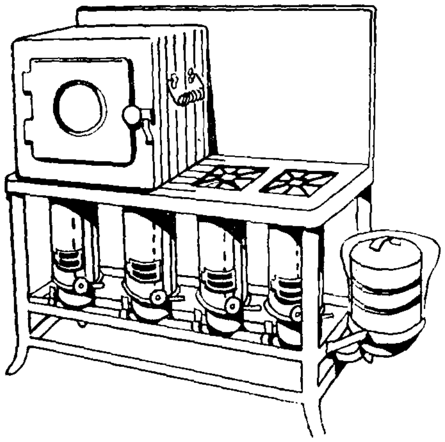
The charcoal sigri, oil and gas stoves etc., are all excellent for those who can afford them. The majority cannot; and so, if we want smokeless kitchens, it is to Dr Raju's inexpensive and efficient design that we must turn.

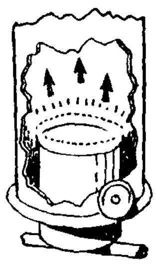
The charcoal sigri has the advantage of producing no smoke. On the other hand, the fumes of unconsumed carbon monoxide are dangerous unless the room is well ventilated. The scarcity of fuel is doubtless responsible for our not having stoves with ovens. This results in our frying food more often than would otherwise be necessary. A metal pan, with deep sides and close-fitting cover, may be used like an oven for baking. Hot ashes are used to line the bottom of the pan, on which the material to be cooked is placed in another tin. Hot ashes are also placed on top of the cover.

STOVES. There are on the market several good oil stoves for cooking. Those burning kerosene need the same care as kerosene lamps, and as stoves already described. The Primus stove does not burn the liquid kerosene, but the vapour produced from it by heat, and no wick is needed. A blue flame is produced.

The blue-flame cooking stoves, burning ordinary kerosene with a wick, are excellent. They give out intense heat (Fig. 6), but special care is needed to keep them clean and in good order or the odour of kerosene oil becomes objectionable.

Methylated spirit is useful in small stoves for emergency purposes, but would be very costly for general use. Some patent solid compressed combustible materials are sold for travelling or emergency. They are useful and effectual, but expensive.





Cut-away of burner

FIG. 6 Blue-flame kerosene stove

Cooking stoves burning coal gas are extremely efficient, easily regulated, and clean to use. If care is taken not to waste gas, they are not extravagant. The usual precautions where gas is used are needed.

FIG. 7 Electric heater, toaster, kettle and iron

Electric cooking stoves. These are heated by coils through which the electric current passes. For convenience, safety and efficiency, electricity surpasses all other forms of heat for cooking, but the consumption of current is very great, thus making the cost too high for ordinary families. Small electric heaters, however, such as hot plates, kettles and toasters are coming into common use (Fig. 7).

Another excellent investment for those who can afford it, is a small electric oven, the G.E.C. 'Junior' Electric Cooker (Fig. 8), with a griller and point. It is attractive, easy to work with, easy to keep clean and, where electricity is plentifully available, cheap to run.

OTHER EQUIPMENT. A *table,* of from 27 inches to 30 inches high, is essential. For persons over five feet tall the working surfaces must be correspondingly raised. Low tables can be raised on blocks of wood or brick. The important point is to avoid stooping.

The *sink* has to be somewhat higher, since we work on the bottom of the sink. The same is true of *washtubs.* If we sit on the floor to work, or work at tables which are too low, we bend our backs and injure our health. The places of bending, designed by nature, are the hips and knees.

Water should be brought into the kitchen in pipes, if possible, and a sink with a sanitary drain is best.

Utensils. It is best to have several sizes of chatties or saucepans, one fitting inside the other like a nest, and ranging in size from 1ft or more in diameter and 1ft deep to the smallest which you may require. These must be supplied with close-fitting covers. Copper and brass do very well for this, but they frequently require tinning. Have you ever thought what becomes of the tin? Aluminium saucepans are much lighter, more serviceable, and more easily cleaned than those made of other metals; moreover they do not require tinning.

One or two frying-pans are required and these are best made of iron, like the *thoa*. The latter has a curved bottom, while the bottom of a frying-pan is usually flat. The thicker the metal the better for these utensils as this makes roasting more even and the food is not so apt to get burnt.

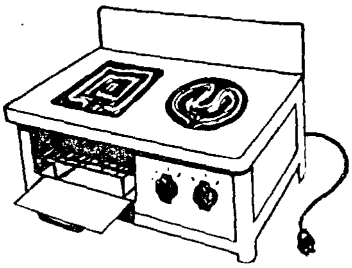


FIG. 8 'Junior' electric cooker

Two or three large earthenware jars for clean water are needed. It is wise to have three, so that one can always be washed and sunned while the others are in use. Petrol tins, fitted with covers, are suitable for waste water.

Large dippers made of half a coconut shell are cheap.

You will require a smooth, hard, black stone, 1ft by ½ft in size, and a round stone roller. These require to be roughened from time to time by a stone-mason. An iron or brass mortar and pestle are suitable for pounding spices and coffee.

A smooth board for rolling bread and pastry, which should not be too small for convenience, and a rolling pin, will be needed. Another small board is needed for mincing herbs, etc., and in the kitchen where meat is cooked a meat block, cut from a crossgrain of hard wood, for cutting the meat, and a large knife are necessary.

We also need a scraper (for coconut, etc.): a circular piece of metal, edged with teeth and fixed to a piece of wood, is the kind generally used.

Weights and scales are also necessary in the kitchen for many reasons. Measuring cups and spoons are useful, if obtainable, and will save much time. Cups and plates for holding liquids and spices while we are cooking are needed too. These are the chief tools required, but may be added to as one's purse permits; e.g. a large mincing machine and a coffee-grinding machine save much labour and time.

Keep your tools as close as possible to the place where they are needed. Articles useful for washing up should be near the sink. Tools needed when preparing food should be hung above, or put in a drawer of, the preparation table. Frying-pans, *thoa,* etc. should be kept near the stove. In this way we can always find the right tool ready to hand when it is required.

WASHING UP. The utensils in which our food is prepared, cooked and served, require the greatest cleanliness and care to prevent infection. This is how it should be done: (1) Scrape off all the waste material on the eating utensils and cooking vessels. A bit of leaf or paper which can be burnt is a good thing to use for this purpose. (2) Sort them according to the material of which they are made—brass with brass, silver with silver, glass with glass, etc.—and place them on the left-hand side of the sink or wash up table. (3) Prepare two chatties of hot water. Place a little soap or soda solution in the one nearest the soiled dishes, on the left-hand side. Keep the other water clear for rinsing the dishes after they are washed. (4) Wash things in order of their cleanliness, taking glass first, china next, brass and silver last. As soon as an article is washed, dip it in the clear water to wash off the soap, and set it to drain on the right-hand side of the sink or table. (5) Dry them with a clean dry cloth, or set them in a clean place to drain. Metal must be made perfectly dry or it will tarnish or rust.

Can you explain the chemical action which causes th. happen? (6) Cloths should be washed out at once, rin clean, and hung to dry, in the sun if possible.

CLEANING THE KITCHEN. Sunshine is the most important factor in the cleanliness of the household. We are blessed with an abundance of this in India, but because of the heat we are inclined to exclude this beneficent gift from our homes. Naturally we must close up the house during the middle of the day, but the morning light should be allowed to penetrate every part of our rooms. Sunlight will destroy bacteria, yeasts and moulds, and prevent rust and mildew.

The second important factor is clean fresh air. To flood our rooms at least twice daily with a strong draught of air is wise, and our kitchen should be well ventilated to keep away the fumes of fuel and food. For efficient work we need to be able to see what we are doing so we must arrange

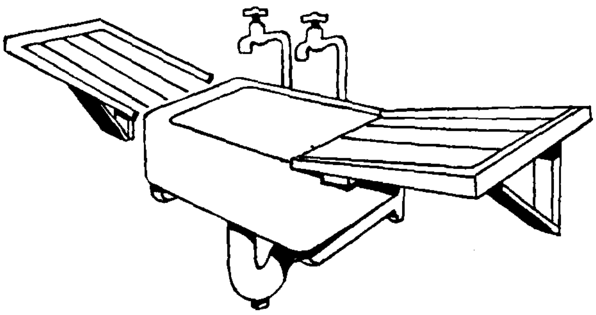


FIG. 9 Sink

the place where food is prepared, and our stove, so that the light falls on them. If the kitchen is not well ventilated, we shall feel fatigued by our work much more quickly.

Water, of course, is the great solvent with which we clean our cooking utensils. If this is brought in pipes to the kitchen we are indeed fortunate. Whether this is so or not, water must be stored for use. If we have a sink (Fig. 9), waste water can be carried away in the drain, and this drain must be kept very clean. If any greasy water is poured down the drain, it should be followed by boiling water to prevent the grease from collecting and sticking on the sides. The sink should be carefully scrubbed and wiped after clearing up a meal and, if any part is of iron, it should be wiped dry to prevent rusting. If rusty, use kerosene oil upon it, sprinkle it with chunam or lime, and leave overnight. Polish your brass taps with rotten-stone and oil, and rub with a dry cloth. If greasy, wash with water and washing-soda. Nickel taps should merely be washed and wiped.

Garbage tin. Solid waste material should be collected in a petrol tin, to which has been fitted a wire handle and close-fitting cover. It is wise to have two, if possible, so that one can be washed and sunned on alternate days. Rinse with washing-soda dissolved in boiling water and dry in the sunshine. To keep the tin in a condition which makes it easier to clean, line it with plantain leaves or old newspapers. When carried to the place where garbage is collected, show your good citizenship by emptying it carefully into the box, and do not let any garbage fall upon the ground. Exposed waste is a breeder of flies, and flies carry disease. Always keep the garbage tin well covered.

STORING FOOD. How shall we store and keep our food? Since it is much more economical to buy dry foods in large quantities, storing them where they will keep dry and where vermin cannot attack them is a big problem. The storeroom should be in a convenient place from which the foods can be taken when needed. It is, therefore, unwise to store cereal grains in a dark, damp room on the ground floor.

We must remember, also, that if we attract rats to our home by storing corn in an easily accessible place we shall be running the risk of bringing plague into the home. Large, circular metal bins are the best things in which to store grains. If earthen jars are used, they must have no cracks and should be provided with well-fitting covers. It is wise to lift the jars on to wooden racks so that air can circulate underneath and keep them dry.

No other stores should be kept in the store food-room. It should have a window which is easily opened to give air as well as light. In this room, as in the kitchen, everything should have an easily cleanable surface. Stone, tile or concrete is best, but all three are expensive. There should be shelves, placed at a convenient height, neither too wide nor too narrow for the containers in which the materials are to be stored. Do not waste space by having the shelves too far apart. If you are making shelves, it is wise to decide what is to go on each, and then make the shelves to fit the jars or tins. Boxes for pulses, etc. should be tin-lined. A series of boxes, made to the right size, lined with petrol tins, would make good and sanitary containers. Label your containers. A little paint makes them look neat, and the name of the contents can be painted on in another colour.

How should fruit and vegetables be kept? The best plan is to have a wire cage through which air can freely circulate, but which keeps out insects and rats. The exposed side of the store-room, away from the rays of the sun, will be the best place to keep it.

A special place which is cool, clean and draughty should be assigned for keeping milk.

Things to Do

I. *Discussion*

1. Which do you think is the best direction for houses in your locality to face? Make a study of your own house considering its site and aspect and the number, size and arrangement of its rooms. What improvements would you suggest and why?
2. Describe a healthy and unhealthy house that you have known or visited. What can you do to improve the health conditions in your own house now that you have learnt something about health in homes?
3. Tell your parents about Dr Raju's new kind of 'smokeless kitchen' and how it works.

II. *Action*

1. Collect pictures of different kinds of houses and gardens and paste them into your album.
2. Collect the different kinds of soils found in your locality. Test the porosity of each and write down your observations. (This should be followed by a lesson on soils with practical tests in the class.)
3. Make a wire vegetable cage for the family.

III. *Writing*

1. If you were selecting a site for a house for your family, what points would you think of?
2. Observe houses under construction and write down the names of all materials used.
3. Explain why ventilators are placed high up in walls.
4. After experimenting with smokeless kitchens write down their advantages and disadvantages. If you consider it economical, why not build one for your mother?

CHAPTER III

THE HOUSE IN RELATION TO THE COMPOUND

MOST of us have very little choice in selecting a house to live in. Thousands of families in big cities, such as Bombay and Calcutta, live in flats in crowded localities without any extra space at all for a garden. Others are forced to live in ancestral homes which may or may not be designed according to their own taste. The majority of people in India live in country villages and are therefore lucky enough to have open space round their houses.

In talking of surroundings of houses we will consider

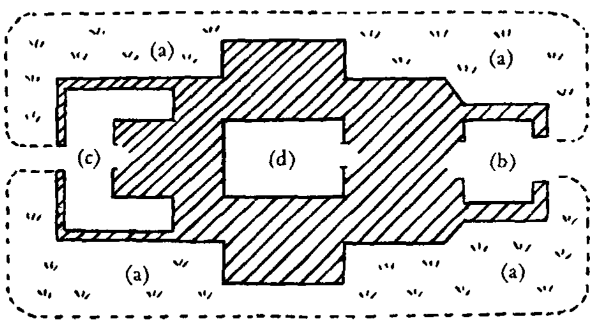


FIG. 10 Floor plan of house (a) Garden; (b) Court; (c) Yard; (d) Quadrangle

gardens, courts, yards, quadrangles, together with any buildings there may be on, or attached to, them. By a garden we mean the cultivated ground surrounding a part or the whole of the house; by a court, the paved enclosed space at the side or front of the house; by a yard, the enclosed space found at the back of the house; by a quadrangle, a space enclosed within the house itself (Fig. 10).

We will now consider how our surroundings may be made to serve for beauty, use and healthfulness.

1. *Beauty.* Much may be done even in the business and crowded poorer residential parts of a town, where space does not permit of gardens, to create beauty in the surroundings; to do this is the work of the municipality. Something can be done, however, by the inhabitants petitioning the municipality and by voting for officers who will work for such things as the planting of trees, the making of gardens or playgrounds, or who will let out to private individuals as gardens the small areas of waste land so frequently seen in our cities. And the people themselves can help by clearing away disfiguring heaps of rubbish or broken walls or tumbled-down houses. As you go home today, look out for all the roads and corners that could be made more beautiful by a little attention in these three ways.

There are few pleasures more delightful than that of making a garden. Gardens vary very much according to climate, the nature of the soil, the water supply, and the time that can be spent on keeping them in order. Think of some gardens that you know. Perhaps you are able to think of one beautiful with green lawns, wide-spreading shady trees, and beds stocked with varied flowers for the greater part of the year; and of another in which a few coconut or other palms give the only shade, a wide stone fountain forms the centre, and bright flaming creepers climb over old stone walls. Ideas of beauty in gardens vary as much as ideas of beauty in house furnishing or clothes. Look at some pictures and discuss your ideas of beautiful gardens.

Whatever your ideas may be, beauty in a garden must be ordered beauty. In large gardens we may like one part to be kept wild, but its very wildness must submit to some sort of order. And everywhere in the garden, undergrowth must be cut away, paths and beds kept free from weeds, hedges cut trim and neat, and no disfiguring heaps of stones or rubbish permitted to accumulate. A trim hedge may hide from view such things as necessary manure pits (covered), gravel heaps and toolsheds.

Courts, yards and quadrangles, if well kept, add very much to the beauty of a house. But too often quadrangles are the dumping ground for unsightly masses of rubbish, worn-out cooking utensils, dirty rags, piles of broken furniture, or what not. Courts and yards often shelter badly-kept cowsheds and carelessly piled supplies of fuel, or broken parts of carriages or wagons. Weeds spring up everywhere while pools of water, and perhaps an open drain, add to the unpleasantness of the general appearance.

Unused materials, materials needed for repairs and also fuel supplies may be stored in cupboards. The useful need never be banished for the merely beautiful. Whatever is *in use*, if cleanly kept and serving a definite purpose—whether it be a cowshed or a carpenter's bench or a spinning wheel—has an attraction of its own; but as soon as it falls out of use or is neglected it becomes an eyesore. Small palms or other rather formal plants in tubs or pots, and a small fountain or pool, add to the beauty and delight of a quadrangle. Remember that the beauty of a court or quadrangle is a formal, not a natural beauty, and attempts at enhancing that beauty must be of the same character.

2. *Use.* A garden ensures fresh air and privacy and provides us with space in which to take exercise and play

games, specially beneficial where there are children. It produces for us flowers for decoration, and fruit and vegetables for food. Generally, people do not make sufficient use of their gardens in the latter respect. If you do, say what you grow and how you grow it.

Even a small garden can grow, in addition to its flowering shrubs and plants, a row of papayas, a clump of plantains, a lime tree, and some beds for whatever vegetables may be in season; while in a large compound almost everything needed for the family may be produced. Fruit trees and vegetables are beautiful in growth, and their produce will taste better and often be fresher and purer than that bought in the bazaar.

The value of a quadrangle we have already discussed. It gives a useful air space and often serves as an extra room, the verandas round it being useful for domestic or social purpose. Yards and courts serve for storing fuel, for home laundering, carpentering, and various other household activities; also, they often shelter poultry-runs, cattle-sheds, stables and coach houses.

3. *Healthfulness.* Having read so far in this book, you will know the answer to the question: How can we make our surroundings serve for healthfulness? You will be quite right if you answer: 'By keeping them clean.' We come back to cleanliness. Without cleanliness in your compound you would be better off (provided you had clean neighbours) without a compound, for, as we shall see in chapter VII, two of our deadliest enemies, the mosquito and the housefly, do not breed in the house but outside it. Have you flies in your house? Then there is dirt on the ground quite near. Have you mosquitoes? Then there is stagnant water or moist undrained ground quite near,

because neither flies nor mosquitoes travel for food far from their breeding grounds. How, then, shall we keep our surroundings healthy?

If you have open drains in your public street, you must not hesitate to approach the authorities if they are not kept scrupulously clean. The same applies to any lack of public cleanliness. But to look after the healthy condition of your private garden is your own concern.

We must not allow water to accumulate in hollows. If you have open water treat it as described in chapter VI. If you are unfortunate enough to live in a house built on damp, marshy ground, open-jointed drain pipes, as described in chapter I, should be used throughout the garden. So will you combat mosquitoes. Do not allow thick undergrowth—it serves only as a hiding-place for snakes—nor heaps of stones, for they encourage scorpions. Allow no rubbish to be thrown on the ground; for, as you know, flies, though they prefer body wastes in which to lay their eggs, can make use of any damp decaying animal or vegetable matter for the purpose. Do you yourself ever throw rubbish on the ground? Are there in any corners of your compound any accumulations of dead cabbage leaves and skins of any kind? If there are, and if they are left even for a day for the sweeper to take away, they spoil the beauty of your garden. If left for a week, the result will be swarms of flies.

We have already mentioned accumulations of rubbish and broken furniture in quadrangles, courts and yards. They are unsightly, and unhealthy too, for they are seldom if ever cleaned; they collect dirt and may be places where disease germs lurk, such as those of tuberculosis; or where insects, such as bugs, or rats and scorpions collect.

Animals in the Compound

Some of you possibly keep a cow or a buffalo or a goat, or even a horse or some poultry. Where do you keep them? And in what condition are their sheds or stables or runs?

The careful housewife will never leave the care of animals and their dwellings entirely to servants, for she knows that on their condition and on that of their sheds and on the disposal of their body wastes depends largely the health of her household.

The dangers arising from ill-kept stables or cowsheds are two: (i) the presence of body wastes which, though they may not give rise to immediate disease, have a very depressing effect on those who have to live near them; (ii) the opportunity they give to flies to deposit their eggs.

What do you do with the body wastes of the animals kept in your sheds? There are three uses to which they may be put.

1. Part may be used mixed with mud in preparing the surface of earth floors.

2. Part may be made, with chopped straw, into fuel cakes. The heat value of such fuel is low, and the smoke produced in burning is unpleasant and bad for the eyes.

3. Part may be used as manure for fertilizing the ground, enabling it to bear finer produce. This is the best use to which it can be put.

If you decide to use these wastes as manure great care must be taken.

If you want to sell the manure, as some people do, covered barrels must be kept for the purpose, into which the sweepers must throw the sweepings every day and cover tightly. When full they can be removed. If you want to use the manure in your own garden, the mali must dig a trench, into which the sweepings must be thrown every day, and covered with a light covering of earth.

Stables and sheds should have a dry floor, thorough ventilation, and be protected from rain. They should be washed out daily with clean water, which should run into a drain or into a trench outside the shed, to be distributed over the garden soil which, in that part, will be highly productive.

Poultry sheds and runs should be swept out once a week. Their wastes, too, should be buried and stored ready for use. All places used by animals should be washed with freshly-slaked lime at least twice a year, and a disinfectant should be poured down their drains once a week.

It is not usually desirable to keep big animals, such as buffaloes and cows, in towns; in some towns doing so is strictly forbidden by law. But where, as in many towns in India, a family has to depend on its own animals for its milk supply, it is a necessity. If the precautions mentioned above are observed one or two animals may safely be kept in the courts of private houses.

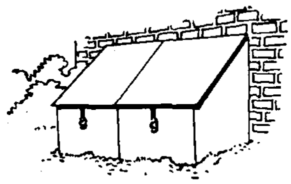


FIG. 11 Covered bins

A different kind of danger sometimes arises from keeping animals. If their food supplies are carelessly stored and grain is scattered about where they are fed, rats are attracted. The use of covered metal bins (Fig. 11) and careful sweeping can overcome this danger.

Things to Do

I. *Discussion*

1. Examine the surroundings, garden and quadrangles of your school and home with reference to (i) their beauty, (ii) their usefulness, (iii) their healthfulness. Set right what is unhealthy and ugly. Report on your efforts.
2. Describe a beautiful garden and house you have seen.
3. Why do mosquitoes abound where animals are stabled? State what you have done to eradicate mosquitoes.

II. *Action*

1. If your compound has very few trees, plant a flowering tree, a vegetable tree and a fruit tree in suitable places.
2. If your house has no compound wall, grow a suitable hedge and keep it trimmed to the proper height.
3. If your house is a small one and has no space for a proper garden, find out how to grow plants in pots and window-boxes.
4. If your house has a compound, make a list of (i) the vegetables, (ii) the flowers, (iii) the fruits that you can grow during every season of the year.
5. Make drawings of sanitary poultry-houses and cow-sheds. What materials should the floors be made of? Why?

CHAPTER IV

VENTILATING THE HOUSE

WE have discussed the location, the site and the aspect, the parts, cooling and heating of our house, and now come to the very important question of its ventilation. Is your house well ventilated? In other words, does plenty of air pass freely through it?

What is air? Air is matter in the form of gas. Can we see air? By which of the senses can we perceive it? Hold up your hand and blow on it. Air is a mechanical mixture of gases, oxygen (nearly one-fifth of the whole), nitrogen (nearly four-fifths of the whole), a tiny amount of carbonic acid gas, a little argon (about 1 per cent), a varying quantity of water vapour (generally from 1 to 1½ per cent), traces of different gases according to locality and various tiny particles of solid matter. Nitrogen seems to have no particular active property necessary for human beings; it serves to dilute (i.e. to render weaker) the oxygen which, undiluted, would be too strong for us. Of all the ingredients of air, oxygen is the most important. It is necessary for the life of all breathing creatures, and without it fire cannot burn or produce light. A very strong pure form of oxygen is called ozone. There is plenty of ozone near the sea.

Carbonic acid gas and most of the other gases sometimes found in the air are impurities. How do such impurities get into the air? From factories, household fires and lamps, the breath of human beings and animals, gases from drains and other waste matter.

Carbonic acid gas (also called *carbon dioxide*) is a product of breathing and of burning, i.e. when animals breathe, and fire burns, this gas is produced.

EXPERIMENT 1. *To show that carbon dioxide is breathed out from the lungs.*

Breathe through a tube into a glass vessel fitted with clean lime water. It will turn whitish due to the carbon dioxide you have breathed out.

EXPERIMENT 2. *To show that a greater quantity is produced with rapid exercise.*

Skip vigorously for five minutes and breathe again into the lime water. What do you observe? Try to explain the reasons for the change.

EXPERIMENT 3. *To show that carbon dioxide is a product of burning.*

Light a candle. Hold over it for a minute an inverted glass jar. Quickly remove the jar and pour in lime water. It will turn whitish through the presence of carbon dioxide produced in the air by burning the candle.

A heavy intake of carbon dioxide causes the spleen (an important body organ) to become enlarged.

Though harmful to men, this gas is useful to plants. Animals breathe in much oxygen and give out carbon dioxide. Plants absorb carbon dioxide, and under the influence of sunlight give out oxygen.

Is it a good thing to plant trees in a city?

Far more dangerous a gas than carbon dioxide is carbon monoxide, a product of burning charcoal. It is also given off from the surface of heated cast-iron stoves. Always keep the windows open when burning charcoal.

Have you ever seen particles of solid matter floating about in the air? You must often have been in a room into which the sun was shining through only one tiny hole or crack. In such a case, what do you see? You could not count the number of particles thus made visible. How do such particles get into the air? When cloth gets thin or any solid matter wears out, worn-out particles pass into the air. You can imagine what the solid particles or impurities in the air in a cotton mill or in a coal mine are like.

There is always water vapour in the air. The amount of water vapour actually in the air compared with the amount it can hold is called its relative humidity (humidity means dampness). How does water vapour get into the air? You know that evaporation (i.e. a turning into vapour) is constantly going on from the surface of water. Say what you can about this.

Does hot air or cold air hold the more moisture? Does moving air or still air? On which day, a hot or a cold one, do clothes dry more quickly? Why? Again, do they dry more quickly in wind or in still air? Why?

How can we detect the presence of moisture in the air?

EXPERIMENT 4. *Show that moisture is present in the air.*

Let us put a lump of ice into a tumbler. What do you see outside the tumbler? Are drops from the melted ice making their way through the glass? No. You know that air being made colder through the presence of the ice cannot hold all the water vapour contained in it, and so deposits some of it on the glass. When water vapour turns into liquid it is said to be condensed.

Cold air cannot hold so much moisture as hot air. When air can no longer hold moisture it is said to be saturated. (Note that air does not soak up moisture. Particles of vapour mingle with air particles.) The temperature at which air begins to deposit moisture is called the dew point.

A certain amount of water vapour in the air is good for human beings. Islands generally have a damp climate. Why? Yet Great Britain has quite a healthy population, and New Zealand, made up of islands, is said to be the healthiest country in the whole world. But when either very cold or very hot air is nearly saturated it makes us very uncomfortable and is bad for our health. We feel depressed and our breathing is often affected.

Very dry air is also bad. The moist lining of our nose and throat becomes too dry for health, as does our skin.

Is the air in your part of the country inclined to be too dry or too humid?

Fresh, clean air to breathe is of the greatest importance to health. We have seen that the air in cities and factories becomes filled with impurities. Owing to the diffusibility of gases, these impurities become scattered and are borne off to the country. We have also seen that the air in every inhabited house becomes impure through being breathed, and as a result of burning fuel in fires or in lamps. If such impurities are to be removed, air must have free entrance and exit; it must also be able to circulate freely in the house. Bad air must be allowed to pass out and good air to pass in. In every room and every quadrangle and passage you need a through draught, i.e. a direct passage through which air can pass in and out. Look at the plans for houses you have made and criticize them from this point of view. How is it in your house?

You will probably say that in some rooms there is a direct passage and in others there is not. If possible, every wall in a room should have at least one opening in it, preferably a door, if you have a veranda all round; if not a door, then a window or in cold climates, a chimney.

Do you know how much air each person needs? It is a good thing if each person can have 3,000 cubic feet of fresh air every hour, though people can get on with less, especially if the air is not too humid. Measure in feet the three dimensions of the room you are sitting in. Multiply them together and that will give you the cubic contents in cubic feet. Divide the number obtained by 3,000 and the answer will show the number of people who could comfortably stay in this room for one hour if all the doors and windows and openings of every kind were closed.

How many could sit in this room? How many are there in it?

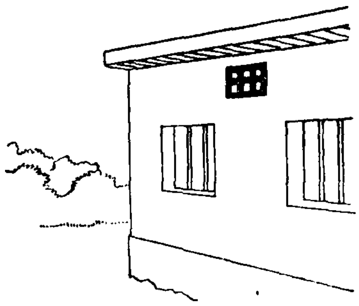


FIG. 12 Ventilator

Fortunately, in the tropics we can keep our doors and windows open all day and all night, except perhaps during the afternoon in hot weather. If we do close them we should allow an open space high up in the wall for the escape of bad air, and one door or window should be kept partly open for the admission of fresh air.

In cold countries, where people cannot sit all day in draughts, one window at least should always be kept open, both top and bottom, or special openings, called ventilators, should be supplied (Fig. 12). Air heated by having been breathed or by burning, rises and passes out through the top ventilators, and fresh cool air from outside passes through the lower opening.

V E Heated air rise? The effect of heat on .nces is to expand them, i.e. to make them Why d' Cold contracts them, i.e. makes them a little ..Now if we take two equal volumes of the same nee, one of which is hot and the other cold, which .e the lighter? The heated one. Therefore it will .d to rise. The lighter heated air rises and the heavier ool air comes in to take its place. It is better if the cool air can come in from a lower level; but if it cannot, cooler particles of air push downward past the warmer ones as these rise. Thus we have what we call a circulation (a going round in a circle) of air (Fig. 13). But the movement of the air in this case is slower than when there is a lower means of entrance for the fresh air.

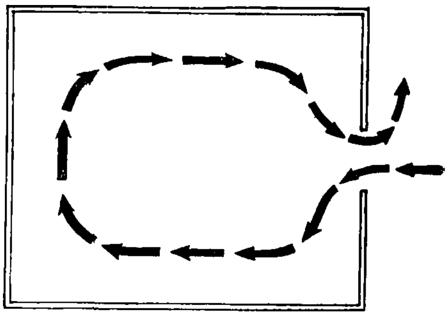


FIG. 13 Air circulation

Indian houses are often built on a good plan as far as ventilation is concerned. The living rooms are built round a central open quadrangle, with one veranda round the quadrangle and another right round the outside of the house. The rooms, of course, should have doors and windows opening on to both verandas. If these are kept wide open, especially in the direction of the prevailing wind, the ventilation will be excellent. But if the doors and windows are not kept open there is no through draught and the air in the quadrangle gets stale.

This bad, heated, stale air rises, but i. air can get in from outside; only more stale air, mixe. smoke from the kitchen, seeps through cracks in alls and windows.

Dwellers in such houses are often pale and through want of fresh air which costs nothing. in such a house, you must see that the doors an opposite one another are opened frequently. If t. no such doors and windows, do your best to have made. The higher the house, the greater the necessit plenty of ventilation on the ground level.

It may happen that the air outside is not very good, owing to over-crowded buildings, or to factories pouring out smoke, or to heaps of decomposing vegetable matter, or to open drains passing along your street. Even this air, however, will be fresher than what is inside because it is changed when the wind blows, and when the heated air rises fresh air from the surrounding area takes its place.

Do you do what some people do? They live in houses supplied with plenty of good air, but cover up their heads when they sleep, through fear of mosquitoes. They shut all windows through fear of thieves, and thus breathe bad air for about eight hours in every twenty-four. Don't do that. Netting keeps out mosquitoes, and iron bars thieves.

What kind of air do you breathe when you cover your head with the bed-clothes?

KITCHEN VENTILATION. One of the pressing needs of India at the present day is to have well-lighted and well-ventilated kitchens where smoke and dirt are reduced to the minimum. How many housewives in India spend at least half their day in dark smokey kitchens cooking the meals for the day with tear-stained faces? The kitchen is one of the most neglected of rooms in Indian houses, but in Western countries it has become a thing of beauty because the absence of smoke keeps its walls and roof free of soot. Its floor is kept so clean that one hates to dirty it, and its walls, painted in pretty colours and hung about with spotlessly clean and gleaming utensils, make the housewife proud and happy. Dr Raju's smokeless chula will mean salvation for many in India.

Carbon dioxide is produced when wood is burnt and naturally a lot of Co_2 accumulates in the kitchen if it is badly ventilated. This is harmful to both animals and man. A still more poisonous gas, called carbon monoxide, is given off where coal or charcoal is burnt. The results of living in a foul and stuffy atmosphere are tiredness of body and mind, drowsiness, yawning, headache, nausea and faintness. If anyone has to live in such an atmosphere for long, general lack of vitality, poor appetite and digestion, poor blood, skin troubles, a bad complexion and susceptibility to infectious diseases, especially those affecting the respiratory tract, will result. Even if the kitchen has no windows it must at least have a chimney which can act as a ventilator. The wind blows across the top of the chimney and sucks up the bad, warm air from inside.

THINGS TO DO

Practical work

Observe, in all the buildings you enter, what provision is made for ventilation.

Oral and written work

1. Say what you can about carbonic acid gas.
2. Discuss the ventilation in your school and in your home.
3. Say what you can about the composition of air. Name the chief common impurities found in air.
4. Observe how people sleep in cool places like Mysore, Coorg, Hyderabad, etc.

CHAPTER V

THE WATER SUPPLY

You already know much about water and its uses. Three-fourths of the surface of the globe is covered with water, and from this water moisture is constantly rising in the form of vapour and descending in the form of rain, hail or snow. What is water? Water is a liquid substance made up of two gases, oxygen and hydrogen, two parts of hydrogen being united with one of oxygen. These gases are not simply mixed, as oxygen and nitrogen are mixed in air. They unite together to form a new substance of a different nature. Water is an example of a chemical compound.

A certain quantity of clean water is necessary for everyone for drinking and bathing and household purposes.

For washing our clothes the water used must be clean and soft. For house cleaning it must be clean, and for drinking and bathing it must be as pure as possible.

Germs are tiny living creatures, varieties of which cause most of the diseases we suffer from. They are sometimes called *microbes* and sometimes *bacteria*. All germs are not harmful. Some disease germs occur in impure air and on unclean solids as well as in impure water. The germs of cholera, enteric, dysentery and diarrhoea are to be found in impure water, as are also some of the worms that sometimes enter and live in the human body.

Where does our water come from, and how is it brought to our houses? We may get it direct as rain water from the clouds, when it may be collected in a pool or stored in a cistern; or from a spring, a well, a tank, or a river. It may be brought to our houses by means of a pipe, or in a water cart, or a waterman may carry it in a goatskin or on his head in a brass or copper pot.

Whence is the water supplied and how is it brought into the building we are in and into your own houses?

Water as it comes direct from the clouds is the purest of all water. How, then, does it become impure?

1. In passing through the air in cities it may pick up germs and other impurities.

2. It may gather germs, etc. from the surface of the land on which it falls.

3. It may sink into the ground and pass near human and animal habitations and be polluted by body waste.

4. In tanks and pools it may be polluted by people bathing and spitting or washing their clothes in it. Sometimes people with skin and other contagious diseases bathe in tanks and rivers.

5. Sometimes the drainage of a town empties itself into a river.

6. Fish and crocodiles often make their homes in tanks and rivers, and live and die in the water. Fish, however, and smaller creatures, and also many water plants, devour decaying organic matter and help to purify water.

7. Birds and monkeys often foul the water of uncovered wells.

8. Those who bring water to our houses in vessels may be unclean or infected with disease.

9. In its passage through the ground, water may dissolve and carry away with it certain harmful chemicals.

Impurities in water may be held in solution or suspension.

EXPERIMENT 5. *To illustrate the difference between solution and suspension.*

Take two glasses of clear water. Add to one a small quantity of sugar, to the other powdered chalk. Which of the two is suspended? Which dissolved? Examine after some time. Discuss what you see.

When certain chemical salts, those of lime and magnesia, occur in water, the water is said to be *hard.* This hardness is shown when it is difficult to make a 'lather' (a soft foaminess) with soap. It is difficult in hard water to wash clothes or to boil vegetables, or make tea satisfactorily.

Rain water is *soft.* Therefore, if your usual water supply is hard, you will do well to store rain water.

Let us discuss the different sources of water and see whether they are pure or impure.

Rain water that has simply collected in shallow pools on the surface of the ground in highland districts, if far from the habitations of men and the haunts of animals, may be safe, but in ordinary districts it is always contaminated by surface drainage, and should be guarded and purified even in the mountains. If in the plains such pools are the only source of water, one pool should be fenced in and reserved for drinking, and the water from the pool should be dispensed only by special watermen.

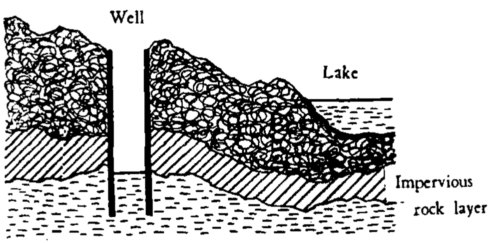


FIG. 14 Deep and surface water

Water from springs. Springs, formed by water gushing up from the ground owing to internal pressure, may be either surface or main springs. The water from the latter gushes up from a hole in a deep stratum of rock and may generally be considered safe (Fig. 14). The former is liable to surface pollution.

What do we mean by surface pollution of the ground? We mean the rendering impure of the surface of the ground by the body wastes of human beings or animals. It is now well known that the germs of many diseases pass out of the body along with the ordinary body wastes, and when these are deposited on the ground some of the germs sink into the ground and are carried by the next rainfall into the nearest well or river or tank at a lower level (Fig. 15) thus rendering the water therein unsafe for drinking, and even for bathing in. Therefore, a well should, if possible, be sunk in higher ground than the house it is intended to supply (Fig. 16).

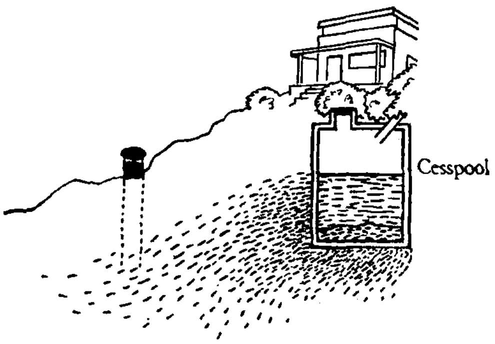


FIG. 15 Bad site for well

Is this usually the case with all the wells you know?

Water from wells. If, in any part of the earth's surface, we dig deep enough we shall come to water. Wells are the deep holes we dig. Being artificially made for human use, they are naturally placed near dwellings. Therefore, unless they are protected there is danger of surface pollution.

Wells are usually divided into three classes :

(i) Shallow wells, by which we mean wells in which water is reached before we come to a layer of rock. Because of surface drainage near the house, this class may be considered dangerous.

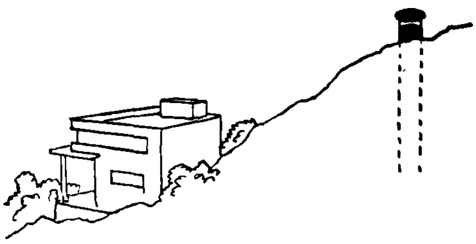


Fig. 16 Good site for well

(ii) Deep wells are wells in which the water is not reached until, by hewing or blasting, solid rock has been penetrated. The water below may generally be considered safe, but the lining of the well to a depth below the level where the impervious stratum is penetrated, or else to a depth of twenty-five feet should, for the reason given above, be of cement or other non-porous material. The surface of the ground round the well should slope away from the mouth of the well, and all wells should be protected by a roof or a cover (Fig. 17).

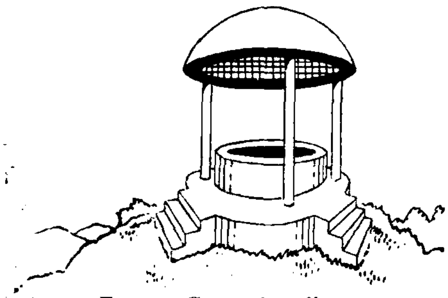


Fig. 17 Covered well

Explain why these three precautions should be taken.

(iii) Artesian or tube wells (first sunk at Artois, in France) are those made in a position where, because the source of supply is high, the water will rise by itself to the level of the opening through iron tubes hammered deep into the ground by means of machinery till deep water below rock is reached (Fig. 18). The tube remains in the ground and the water rises through it to the surface. Like that from deep wells, the water is pure and, as the opening is small and easily protected, the water from these wells is considered the safest of all. Are there any places in your neighbourhood where such wells could be made? Water from main springs and deep wells is pleasant in taste.

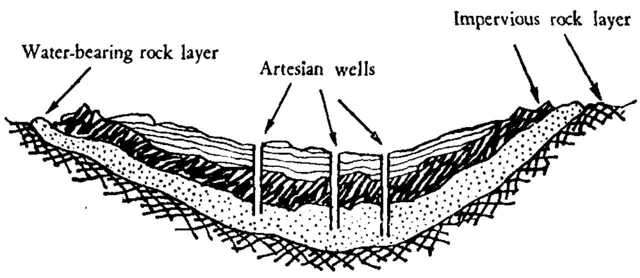


FIG. 18 Artesian wells

Water from tanks is open to the same objection as that from surface pools, and may also be fouled by animals. If used as the source of supply for a town or village, it must be protected and the water must be carefully purified before being brought in.

River water may be polluted in the same way as pool and tank water, with the additional risk of contamination from city drains. But the effect on constantly flowing water of the oxygen in the air under the influence of sunlight, (and especially if the river is rapid and has many eddies and falls), is remarkable. Water plants, too, constantly give out active oxygen, which helps in the work of purification. Nevertheless, river water, even at a distance from human habitations, must be purified for drinking.

Distilled water is procured by heating water and catching the steam in coiled tubes (Fig. 19). The vapour passes through the metal tubing immersed in a vessel through which cold water is allowed to run continuously. The vapour in the tube is condensed and passes out as distilled water. It is as pure as rain water. It is frequently prepared from sea or brackish water, where no other is available. The town of Aden is largely supplied in this way.

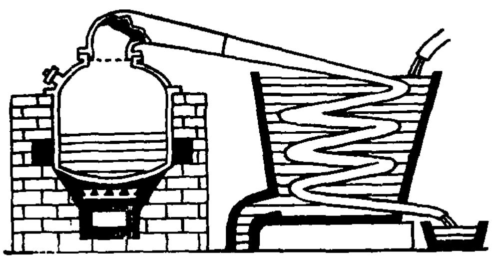


FIG. 19 Distillation of water

Having seen where our water comes from, and the many ways in which it may be polluted, we must now see how to detect impurities and how to purify it and make it fit to drink.

1. HOW WATER CAN BE TESTED

To some extent we detect impurities in water by the senses—sight, taste, smell. If it is turbid (i.e. not clean) or tinged with colour, or if it tastes or smells unpleasant, it is certainly not pure and is most probably harmful. The smell, if any, can be best perceived if the water be heated in a narrow-necked flask and smelt therefrom at a temperature of 80° Fahrenheit. But the most dangerous impurities are imperceptible to the senses. To detect them the chemist and the biologist must be called in. You can, however, perform one or two simple experiments yourself.

EXPERIMENT 6. *To test water for organic impurities.*

Put permanganate of potash into some water. If it turns brown instead of pink, impurities (probably organic) exist.

EXPERIMENT 7. *To test water for hardness.*

Rub soap into the water. If a lather is not formed, salts of lime, magnesia or other mineral matter are present.

EXPERIMENT 8. *To test water for sedimentary impurities.*

Boil water in a glass flask till all is evaporated. If perfectly clean, there will be no sediment.

EXPERIMENT 9. *To examine water through a microscope.*

Put a drop or two of water on a glass slide and examine through a microscope.

2. HOW WATER CAN BE PURIFIED

Water brought in main pipes from large tanks or rivers is usually first passed into large reservoirs, in which it is left for a few days, or even weeks, until all dirt and decayed

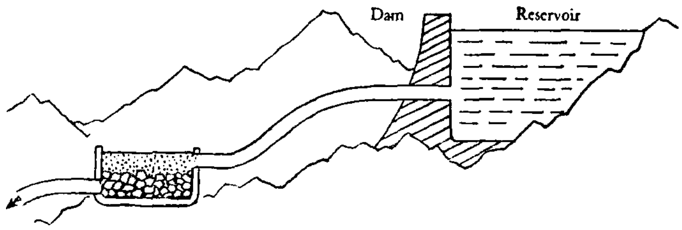


FIG. 20 Filter bed

matter sink to the bottom. The water then is generally clean (free from dirt), but not pure (free from germs). This clean water is then passed slowly through *filtering beds* made of a layer of sand two or three feet deep lying on a layer of coarse gravel three or four feet deep (Fig. 20). Sand has the property of holding back disease germs. The beds must be cleaned periodically, generally every month or less. The water, after passing through the filtering beds should be tested, and if still found impure should be treated with germ-destroying chemicals. The storage, purification, and distribution of water is one of the most important functions of a municipality, whose duty it is to inform the public of the condition of the water at any given time. The public analyst will also analyse and report on any specimens of water you may send him, so that you need no longer doubt the purity of your water.

Impure well water may be purified of decaying organic matter by lowering into it, in a bucket, one and a half to four ounces (according to the size of the well) of permanganate of potash.

How is the water purified in the town in which you live? Study your local Health Officer's reports on your water supply, and also on the prevailing diseases.

Unless water is brought into your house in clean pipes and certified by a careful municipality, or carried in covered vessels by known healthy persons direct from a certified deep well or main spring, it is essential to boil it if you want to be sure that it is safe to drink. If not clean it should be purified with alum before being filtered.

EXPERIMENT 10. *To clean water with alum.*

Put six grains of alum into one gallon of water. Do not use more, or the taste will be very unpleasant. The alum combines with the dirt and causes it to sink to the bottom.

After being boiled, water should be carefully stored, preferably in porous earthenware vessels. Why should you store water in porous earthenware vessels? You will soon learn that when water evaporates heat is given off. As the water continually, though slowly, passes through the porous surface of the vessel, evaporation continually takes place from a large surface. Such vessels must be periodically cleaned with permanganate of potash, and must be renewed as soon as they cease to be porous. What will cause them to loose their porosity?

House filters. Some people trust to filters, i.e. vessels through which water passes to be purified. Such filters undoubtedly clean the water, but cannot be relied upon to rid it of bacteria, if these are present. The candle-filter, in which the water passes through a fine porous porcelain candle-shaped cleaner, is among the best. But it is very necessary to renew the candle from time to time, as the pores get filled up with solid particles which form a good breeding ground for germs. A tap filter, if frequently cleaned, is useful when much clean pure water is needed, as in hospitals and hotels; but, if typhoid or cholera is about, the water to be used for drinking should be boiled as well as filtered. If you buy a filter, be sure you understand the principle on which it works, and do not blindly trust to it.

Simple boiling destroys most disease germs. Five minutes' boiling destroys others. But thirty minutes is needed to destroy the germs of tetanus or lock-jaw.

If the supply of water comes by pipes from a tank or spring on a higher level than that of the house, the water will, of its own accord, always fill the pipes at the top of the house. If the supply is only slightly higher, then when the water falls low (as it does before the monsoon), it will not rise to the higher pipes, and we must carry water upstairs, unless pressure is applied to the water supply.

If the source of supply is lower than the house, as when it comes from a river or a well, then the water must be taken into a cistern above the level needed for all purposes. Sometimes a very large cistern placed on a tower or strong posts, serves a small district (Fig. 21). You may often see such a cistern in the neighbourhood of railway works where several bungalows and houses, offices and workshops are erected. Are there any such cisterns in your town or village? How does the water rise in them? How does it rise in the school in which you are now working, and in your house? If it does not rise naturally, force is required, and this is usually supplied by a *pump*.

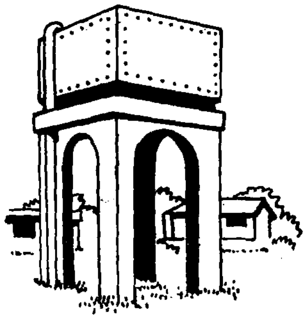


FIG. 21 Water cistern

Water from a cistern, or direct from the natural source, if at the right elevation, is distributed over the house in pipes, and is let out when wanted by means of a tap, which is simply a little brass door opened and shut by a handle. Examine a tap (Fig. 22). The housekeeper should always see that taps are properly turned off and do not drip. She should also know at what point the house pipe enters the house from the main pipe (Fig. 23) called the main, and the means of turning off the water.

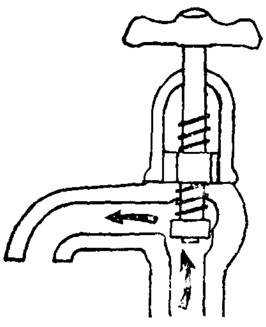


FIG. 22 Water tap

The water should be turned off at this main if a leak should have to be repaired and also if the house is left shut up while the owner is away.

Near the main, before the water enters your house, you will find a water-meter. The word 'meter' means measure, and by a little contrivance the water, pushing its way through the pipe, makes a record of the amount that passes.

Sometimes people pay for the actual amount used, though generally for use in the house itself they pay a definite sum per annum, however much is needed. For watering gardens, however, it is the usual thing for the householder to pay for the actual amount recorded. Find the meter and the main in your building. Examine the pipe system, the taps, and a water bill.

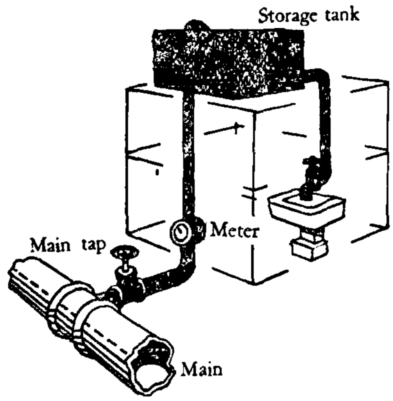


FIG. 23 Water supply to house

THINGS TO DO

Practical work

1. Visit the source of the water supply in your town.
2. Inspect the filtering arrangements, if any.
3. Find out how water is brought into the houses in your town, and examine the condition of the apparatus used.
4. Examine and test specimens of water in every way you can.
5. Observe germs under a microscope.
6. Soften hard water.
7. Visit the 'main' in your school and your home, and see how to cut the water off.

Oral and written work

1. What makes water rise to the level of the cistern on the top of a house?
2. Which would you prefer to drink—water that had passed through sand or through marshy ground? Give reasons. Do you like drinking water from wells near the seashore? If not, why not?
3. Describe fully what you would consider a perfect well. What two conditions are necessary for the making of an artesian well?
4. Write all you can about hardness in water.
5. Discuss fully the nature of the water supplied to you by your municipality.
6. Name three examples of matter in *suspension*, and three of matter in solution.

CHAPTER VI

HOUSEHOLD CLEANING

(REQUIRED: Specimens of brooms and brushes, cleaning cloths, soap, soda, borax, ammonia, acids, litmus paper, a glass rod, vessels, stones, and oil, objects made of different substances and materials, stores' catalogues.)

HAVING built, furnished and equipped our home appropriately let us consider the best methods of cleaning furniture and other household articles. We will begin by making a list of the equipment required.

1. *Cleaning Implements*. Brooms, mops and brushes are used for cleaning floors, walls and ceilings. Brooms are for sweeping off the surface dust, mops for washing, and brushes for scrubbing, rubbing and brushing.

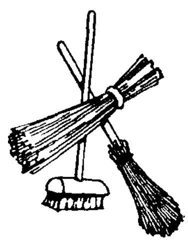


FIG. 24 Types of broom

A broom generally has a long handle attached, and may be made of twigs, bristles, hard or soft fibres or palm-leaves. (A bristle is a stiff hair from the coat of an animal.)

A brush may be hard or soft, and may be made of bristles, hair, twigs, palm-leaves or feathers. It is used when harder rubbing or closer attention is needed than can be given with a broom. It usually has a short, but may have a long, handle.

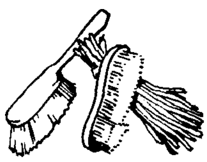


FIG. 25
Types of brush

A carpet-sweeper is a special form of cleaner, in which revolving brushes are enclosed in a box which runs on wheels. The box catches and stores dust as it rises. It is useful for heavy carpets (Fig. 26).

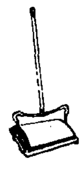


Fig. 26
Carpet-sweeper

A mop saves much stooping when used for washing floors. It has a circular head made of soft yarn or strips of old cloth, fastened to a handle.

A Turk's-head broom is a large mop attached to a long pole, and is used for cleaning ceilings and the upper part of walls.

A carpet-beater is used to beat the dust out of a hanging carpet or rug. It is made of open canework.

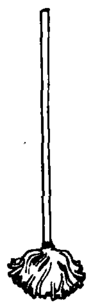


Fig. 27 Mop

A vacuum cleaner is an application to the cleaning of rooms of the principle of the so-called 'abhorrence of nature for a vacuum'. You can imagine what would happen if you were to work a powerful pair of bellows that had either a 'foot' firmly pressed on to a carpet, or a 'nozzle' pushed well into the corner of an upholstered chair. Along with the air that would be sucked up would come anything light enough to rise with it—dust and all kinds of loose dirt. Such a pair of bellows is a vacuum cleaner. The dust is sucked up into the bag attached to it which is emptied when full. No free dust is left to fly in the air.

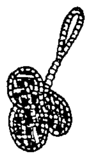


Fig. 28
Carpet-beater

It is not much used in India because we do not generally use thick carpets and heavily upholstered furniture, and we can nearly always clean our rooms with doors and windows open. But in cold countries vacuum cleaners are very useful.

2. *Vessels* (Fig. 30). A dustpan is a little tin shovel into which to sweep the dust on the floor. Generally it has a partial covering to prevent the dust from flying about. It generally has a short handle, but may have a long one to save the sweeper from stooping.

Tubs, pails and basins may be made of wood, zinc, galvanized iron or enamelled ware. *Enamelled* means coated with enamel, a hard, shiny, opaque substance applied to metal at a very high temperature.

Examine specimens of the different implements so far mentioned, and discuss their uses. Use them in different parts of the school or practising house.

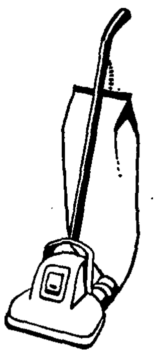


FIG. 29
Vacuum cleaner

3. *Cloths.* Cleaning cloths should be free from scratching material, able to absorb and hold moisture, and such that loose surface fibres (called lint) do not easily rub off. Cloths are of different kinds and qualities according to the purpose for which they are to be used.

Those for washing floors should be thick and of a coarse weave; for washing crockery, cloths loosely knitted out of soft cotton yarn are good. For drying and wiping, they should be soft and absorbent. Linen being much more absorbent than cotton, wiping cloths and towels should be of linen, if possible, though it is more expensive. Dusters should be soft, and finer than cloth for washing.

Many materials of different thickness and weave are specially sold for different cleaning processes. But for dusting and polishing, material from old garments, saris for instance, cut into squares and hemmed round, does equally well. Old silk makes good polishing dusters.

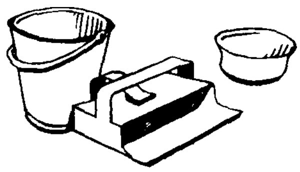


FIG. 30
Pail, dustpan and basin

Chamois leather, a soft leather (originally got from the skin of the chamois goat), is often used for cleaning window-panes. It is very good for this purpose as it does not lint; but it is expensive and is difficult to keep clean. There is also specially prepared short nap (pile) velvet sold for polishing.

For polishing glass, newspaper serves excellently instead of cloth. Chamois leather is also useful for silver and other lustrous metals.

Examine specimens of cloth and, from their thickness, weave and 'feel' classify them for use for different household purposes.

When you have laid in a stock of cloths for cleaning, do you keep them for the purposes for which they are intended? Sometimes one sees wiping cloths (which should be kept clean) used for lifting blackened cooking vessels off the fire. And have you ever seen anyone wipe a cup with a corner of her dress or sari?

Remember that all household cloths should be neatly hemmed or machined, and regularly washed.

4. *Materials.* We now come to cleansing materials, and of these by far the most important is soap. What is soap? You use it every day. How would you describe it? What does it do when mixed (i) with oil, (ii) with water? Pour a little oil on to your hand. Try to get it off with water; then rub on some soap. What happens?

Soap is a substance which when rubbed or dissolved in water produces bubbles and foaminess called lather or suds; it also has the power of combining oil in small quantities with water. These characteristics are shared by some natural vegetable products, hence called soap-nuts, reetanuts and soap bark.

Examine specimens of these. Do you use them in your houses? For what purposes?

Soap is made of oil (vegetable fat) or grease (animal fat) and an 'alkali'. What do you know about the last? An alkali is a natural substance that occurs in many forms, and it has the special properties of loosening dirt and grease and combining with oil to form soap. It can be obtained from the ashes of burnt vegetable matter soaked in water. This is called 'lye'. But alkali is more commonly seen in the form of potash, soda, borax and ammonia. Lime is also an alkaline substance. The presence of an alkali can be detected by testing with 'litmus' paper. Litmus is a blue dye (obtained from lichens) that changes colour when certain substances are applied to it. Paper is coloured with litmus and used for testing. Acids turn it red. Alkalis turn it blue again.)

EXPERIMENT II. *To change the colour of litmus paper.*

Turn blue litmus paper red by applying an acid. Then turn it blue again by applying an alkali.

Acids and alkalis are said to neutralize each other, i.e. each does away with the effects of the other.

Probably the way in which to make soap was discovered accidentally. A woman in olden times would notice that her greasy cooking pots, which water alone would not clean, were cleaned quite easily by rubbing them with wood ashes from her fire and then washing them.

You can make lye for yourself, but it is not easy to calculate its strength. You can also buy it.

EXPERIMENT 12. *To make soap.*

Make an alkaline solution by mixing 1 lb. of caustic soda with 5 pints of water. To every 14 oz. of this solution allow 1 lb. of fat (oil or grease). Warm the fat. Stir the alkaline solution into it until the mixture becomes a smooth, creamy mass. Then put it into a mould. It will gradually dry, when it will be ready for use.

When the amount of alkali is just enough to combine with the fat to make soap, when nothing else is added, then we have what is called a pure or neutral soap. This will be very pale yellow, or white. If you add to the fat more alkali than can be absorbed, the unabsorbed alkali is called free alkali. It is this free alkali in soap which sometimes makes the skin of your hands feel shrivelled and dry after washing. The soap will also have a strong odour. You can test the presence of free alkali with red litmus paper. Cut open the cake of soap and lay it on the paper. If there is free alkali in the soap the paper will turn blue.

Ordinary *washing soda, ammonia* and *borax* are added sometimes to the soap as it is forming. They make the soap more powerful and effective as a cleansing agent, but with such soaps brushes and mops should be used, as alkali is not good for the skin. Also they should not be used for washing good cloth, as they weaken fibre. Soda, ammonia and borax also soften hard water. A small quantity should be added to the water before it is used.

Resin, a substance exuded from the barks of certain trees, is also sometimes added in the manufacture of soaps. It helps the soap to combine readily with the water and form 'suds' but its use is not advantageous. It is sticky and sometimes darkens what is washed.

Naphtha and other petroleum products added to soap considerably increase its cleansing properties.

For toilet purposes scented oil and colouring matter are used. Often the addition of these hides an inferior soap for which a high price is asked. Unless you are sure that scented soap is made by a good firm, it is better to use a good neutral soap for toilet purposes.

Besides soap, other cleansing materials are:

(1) Alkalis. Borax, soda, ammonia, lime.

(2) Acids. Vinegar, lime juice, tamarind juice, oxalic acid, hydrochloric acid and citric acid.

(3) Beeswax.

(4) Oils. Kerosene, lemon, linseed, turpentine, naphtha, petrol.

(5) Powders. Sand, powdered stone, powdered emery (a hard mineral), ashes, French chalk and whiting (preparation of chalk).

(6) Salt. Common salt, salts of lemon.

(7) Spirit. Pure alcohol, methylated spirit.

(8) Stone. Rotten stone, marble, bathbrick, pumice-stone (a volcanic product).

You already know what an alkali is.

An acid is in many ways the opposite of an alkali. It turns blue litmus paper red. It has a very sharp taste, while the taste of an alkali is bitter. An acid combines with an alkali to form a salt which, as you know, is crystalline in form and has its own special 'salt' taste. Many salts are poisonous.

Beeswax is a hard yellow wax, produced by the bee.

An oil is an inflammable liquid, whose natural property is not to combine with water. It is lighter than water.

Stone is a natural material found in the crust of the earth. A powder is finely-ground stone.

A spirit is a fine liquid which will combine with water. It is highly inflammable and easily turns to vapour.

Examine and discuss specimens of each of these.

Note: Oxalic acid, hydrochloric acid, and citric acid and salts of lemon are very poisonous.

Having examined our equipment and materials for cleaning, we will now see how to use them to clean the house.

How to clean stone. Ordinary stone floors must be swept daily and frequently washed with strong soapsuds and soda. Mix them in a pail and apply with a cloth mop. If the floor needs more than this, use a scrubbing brush—preferably a long-handled one to save stooping. Pour on clean water and dry with a drying mop. Stone walls and brick floors or walls can be washed in the same way.

Paint stains may be removed by rubbing with turpentine; or if the paint is old, turpentine mixed with powder or ash or stone.

Marble staircases, bathrooms and tops of washstands should be simply washed with soap and water and wiped thoroughly dry. Polish with a smooth piece of marble and water, and wipe dry. To remove rust and stains on marble rub with soap and water. If they do not disappear then, treat them with an acid, such as lime juice, tamarind, or oxalic or hydrochloric acid (2 parts of water to 1 of acid). Wash off at once with soapy water (as soap, containing an alkali, neutralizes any acid that may be left). Dry and polish. What happens is this. The marble is composed of lime, which is alkaline. As you will remember, alkalis and acids combine together to form a salt. The acid actually combines with the surface of the marble, which it removes and the stain with it. So little is removed with a rapid rub that you cannot see any difference on the surface. But if you were to leave an acid on marble for long, its smooth polished surface would be spoilt.

Tiled floors must be swept and washed every day. Red floor tiles are very difficult to keep clean, as every foot mark shows on them; dust that would be invisible on other floors appears as a thin film on red tiles. This film is not removed by ordinary sweeping brooms; but if you tie a cloth over the head of a hard broom and press down while sweeping, you get better results. If the room is much used, it should be wiped over two or three times a day. Tiled floors may be polished with a small amount of the mixture given below for cleaning wooden furniture. When dirty, they may be washed with strong soapsuds and soda.

Remove paint marks from tiles as from brick; dried cement on tiles should be rubbed with oil and brick.

Wall tiles are easily kept clean with warm, soapy water. They are so highly glazed that, unless they are cracked, stains cannot penetrate them at all.

Painted walls can be washed. Wash with soapy water, doing only a small part at a time, in straight lines up and down. Wipe quickly with clean cloths. If the paint is white, or some delicate shade, moisten a cloth in very hot water and shake over it a little whiting instead of soap, and proceed in the same way. Soda is liable to change the colour of paint.

Distempered and whitewashed walls can be occasionally washed down with cold water in which, if they are dirty, a little soda and lime has been dissolved. Unless, however, a sufficient quantity of glue or adhesive has been mixed in the original wash, it will come off in parts and leave uneven streaky colouring behind.

Papered walls, unless glazed, cannot be washed. They should be swept down with a soft broom and may be cleaned with bread crumbs.

To clean walls and ceilings. Brush daily with a soft long-handled mop, or a broom covered with a bag made of soft cloth. Too many people neglect the walls and ceilings of their rooms, with the result that a layer of dust and germs clings to them, and insects multiply in the corners and crevices. If more than a simple brushing down is needed, a dry cleaning may be given to papered or distempered walls by sprinkling the wall lightly with chalk, lime or fuller's earth; leave for a day and then lightly brush off.

To clean wood. Wood is so important an adjunct to our homes, is so beautiful in itself and responds so well to good treatment, that it is worth while giving it care.

Wood may be left plain or may be stained, polished, oiled, waxed, varnished, lacquered or painted. It is generally left plain only for such purposes as the tops of kitchen tables, pastry boards, etc. when frequent scrubbing is needed. To wash, sprinkle it with a little powder or clean sand and scrub hard with cold water. Wipe as dry as possible immediately. Never let wood remain wet; it absorbs water and quickly swells. Then, if it dries suddenly, it shrinks and cracks.

If the wood has become dark and stained it may be bleached by using a mixture of quicklime, cold water, and a soda or potash solution. Apply, leave on for some time, and then wash off. For an ink stain a small quantity of oxalic acid should be applied *with a brush* and quickly washed off.

To paint wood. Beautiful wood should not be painted, as paint hides the natural beauty of its grain and colour.

Oil paint is generally bought prepared and directions given on the tin. When too thick, thin it with turpentine. Apply in firm, downward, even strokes.

Painted wood, if dirty, is treated in the same way as painted walls. Never scrub and never use soda. But a gentle rub with linseed oil and petroleum, and a dry polish afterwards, will improve the surface.

To stain wood. A good, inexpensive stain may be made by mixing 1 oz. of the crystals of permanganate of potash with 1 quart of water. Let the crystals be thoroughly dissolved. Wash freely and evenly over the surface and let it dry thoroughly. Afterwards, apply varnish, oil, or wax, as desired. Many different ready-made stains, already mixed with varnish, may be bought. Directions will be given on the bottle. Examine some.

To varnish wood. Varnish is prepared from glue (a sticky substance made from the hoofs, etc. of animals), or from various gums or resins. Use varnish thin, and apply with a clean brush in long, straight strokes, lifting your brush from the surface as little as possible.

To oil wood. Using a thick cloth or flannel, rub any oil—lemon oil, kerosene oil, boiled linseed oil, coconut oil—into the wood with a circular motion. Rub in a very little oil at a time. Polish in straight lines.

To wax wood. To prepare the wax, melt ¼ lb. beeswax over hot water, and when the wax is melted remove from the fire and stir in turpentine till the mixture is like thin cream. Bottle it. Use a little of the prepared wax with a great deal of rubbing.

To polish wood. Rub with a mixture of turpentine and linseed oil in equal quantities. The secret of beautiful polished wood lies in the rubbing. Examine several specimens of well-polished plain or stained wood.

To clean varnished and oiled wood. Use linseed oil and petroleum, rubbed on with a soft cloth.

To clean lacquered wood. Wash with a soft cloth soaked in warm soapsuds and wrung almost dry. When dry, wipe over with a little very thin oil.

When using oil as a cleaner, apply in small quantities at a time, rub well (except for lacquered wood) and never leave any on the surface, for free oil rapidly collects dust.

To clean waxed or polished wood. Re-wax and re-polish, using frequent clean cloths.

To clean wooden furniture. Dust it well every day and occasionally rub in well, with a soft cloth, a very little of one of the following mixtures:

(1) 1 lb. beeswax (melted over hot water)
1 pint turpentine
½ pint alcohol

(2) 1 part turpentine
1 part vinegar
1 part linseed oil

These make useful creams, which keep well and help to preserve the polished surface. Shake well before using.

To remove scratches and dents. Rub with oil or No. 1 polish above. If the colour has gone, apply a solution of permanganate of potash with a very fine brush. When dry, polish. For a deep dent, lay on moist blotting paper and press with a moderately hot iron till the wood swells to its former level. Polish as before.

To fill up cracks. Sometimes wood cracks owing to great heat and dryness, and sometimes a 'knot' comes out. If the crack is large, the carpenter had better be consulted. If small, you can make a filler of the following:

1 part boiled linseed
1½ parts turpentine
1 part of whiting or cornflour

If the wood is dark, use artists' colouring till the right shade is obtained.

Fill the crack, smooth the surface, let dry, and polish.

To treat water rings (caused by putting wet glasses on polished wood). Rub with a little methylated spirit or a solution of ammonia.

To clean metals. Aluminium. Wash with hot soap and water, wipe dry. If this is not enough, rub with lime juice or similar natural acid. Rinse in hot water. Wipe dry. Do not use salt, or an alkali such as soda, as they darken and destroy aluminium.

Bell metal. If badly tarnished, wash in a soda solution. Clean with lime juice or vinegar and a fine powder. Wood ash from the kitchen fire is often used. Wash in water, dry, and polish with a soft powder and soft cloth.

Copper and brass. As for bell metal.

Britannia metal. Clean with very fine powder and oil. Wash with hot soapsuds. Dry. Polish with a soft cloth.

German silver. Wash with soap and water. Polish with fine powder moistened with alcohol, ammonia or water. Wipe dry with a soft cloth. Do not use acids on German silver or nickel.

Cast iron (i.e. iron molten and cast into moulds, generally used in saucepans, etc.). Boil in a strong solution of soda and water to remove grease. Rub with powder; wash out with hot water. Dry while still hot. If the iron is rusty, clean it with pumice-stone, or with emery powder and oil.

Galvanized iron, used in sinks and pails. Wash as for cast iron. Rub a few drops of oil over surface to prevent rust where the galvanized coating is worn off.

What do you understand by rust? You know it is a reddish, powder substance, which forms on iron when it is allowed to remain damp. It is caused by the surface of the iron combining with the oxygen of the air and forming a new substance called iron oxide. Oxygen easily combines with other substances and forms oxides. Copper and brass tarnish in the presence of carbon dioxide and form verdigris, which is a poisonous carbonate.

The main part of a cooking stove is composed of iron and steel. Daily, after cooking, wipe off grease or remains of food with a newspaper. Wash over with hot soapsuds and wipe again with clean newspaper. Occasionally rub the stove with a cloth just moistened with kerosene. A special blacking, to be applied with a brush, is sold for cleaning stoves, but it is much more trouble to keep stoves clean by this method. By cleaning with newspaper instead of cloth, much troublesome washing of dirty cloths is saved.

A small hard-bristled brush is best for cleaning out the corners of iron cooking utensils. Small mops are also useful.

Silver and silver plate. In the daily washing of table utensils, keep silver and silver plate separate from other articles. Wash in fresh hot soapy water, rinse in hot water and wipe at once with a dry cloth. Put down gently, as silver soon scratches and dents.

Ornamental silver should be rubbed with a soft cloth when daily dusting is done. A special cleaning should be given to all silver about once a fortnight. Use whiting and water, or whiting and alcohol (methylated spirits will do). Use only enough to moisten the whiting, and rub with a soft cloth, velvet or leather. If the silver is much ornamented, use a soft brush. After cleaning, wash in hot soapy water, with a drop of ammonia, and dry with a towel.

Do not use acids on silver. Silver tarnishes in the presence of sulphur and forms silver sulphide.

Steel. If greasy or rusty, treat as iron, but do not use pumice-stone on steel. Rub with powder—bathbrick is generally used on a knife (a long strip of board with a leather surface). Wash in hot soapsuds, and wipe dry.

For stainless steel, wash in soapy water and rub dry.

For the handles of knives, dip quickly into hot water and dry. Avoid soaking them.

Tin. If greasy, soak (but for a very short time) in hot water with a little soda. Soda tends to dissolve tin. Rub with a fine powder. Wash in hot soapsuds, then rinse in hot water. Wipe dry while hot.

Zinc. Rub with whiting mixed with water or kerosene.

Many metal polishes may be bought in the shops. Some are very good, but all are expensive compared with those that you can make at home with simple ingredients. Whether you prepare your own cleaners or buy them ready-made, do not make the mistake of thinking that one polish will do for all metals, for the latter differ much, as you have seen, in their nature and needs.

For a rough powder use sand; for a medium one, bathbrick or wood ashes from the fire; for a fine one, whiting.

For metals the best effect is generally obtained when the powder is mixed with a little oil.

When a rough powder is needed, many people use simple earth. Never do this unless you are sure that there are no impurities in the soil. Do you ever see people polishing their brass food vessels with soil taken from the ground of a crowded street? Why should such soil not be used?

Polish in class, in the manner described, articles made of the different metals enumerated above.

To clean basketwork and canework. Brush well daily with a long-bristled brush.

When the natural polish of the cane or wickerwork wears off, the object may be varnished or painted with two coats of thin oil paint. They can then be occasionally washed with soap and water as other painted objects.

To clean earthenware. Unglazed earthenware is used generally only as chatties for cooling water. The outside should be kept free from dust by wiping with a damp cloth, and the inside should be periodically rinsed with a solution of permanganate of potash.

To clean china. Glazed earthenware, china and enamel are cleaned with hot water and soapsuds. If greasy, soda should be added to the water. Polish with a dry cloth. In washing cups and jugs, take special care to see that no dirt lurks round the handles.

To clean glass. If dirty or greasy, wash in hot soapy water and rinse in cold. Rub dry and polish with a soft cloth or soft paper (newspaper is good), or smear on a little whiting mixed with water. Let dry, and rub off with a dry cloth.

To clean textiles. The textiles used in the household (as apart from personal use) consist of carpets, rugs, mats, hangings, mattresses, pillow and cushion covers, cloth used on upholstered articles, tablecloths, table napkins, blankets, sheets and coverlets for beds, towels, and cleaning cloths. The methods of washing the greater number of these fabrics are treated in Section II. Heavy textiles, such as carpets, mats and rugs should, where possible, be taken every day out of the room, brushed, shaken and beaten out of doors. Notice which way the wind is blowing, so that the dust will go into neither your own nor your neighbour's house. If it is not possible to take these things out of doors, clean them indoors with a carpet sweeper or a vacuum cleaner, or, failing that, scatter over them damp washed tea leaves from the teapot or bits of damp newspaper or damp sawdust, and brush with a brush into a dustpan. The dust adheres to the damp material and so does not rise into the air. Empty the dustpan into a covered receptacle.

Upholstered furniture should be brushed with a hard brush which can get well into the corners; or a vacuum cleaner may be used.

To clean leather. Leather is liable to become dirty and also to crack. It may be preserved in good condition and kept clean if a *small* amount of the following solution is occasionally rubbed in: To one bar of white soap dissolved in one cup of hot water, add one cup of alcohol and two cups of light oil.

We have seen what we have to clean in our houses, and also what we have to clean with. Let us now see how we should set to work to clean a given room. If we know how to clean one kind of room we can apply the method to all rooms. Before studying this, however, describe the way in which you generally see people cleaning rooms.

One very important point to remember is that when we clean a room we need to take out from that room all the dirt that is in it. In other words, we must remove, not scatter, dust. The floor is swept indeed, and some dust is swept out of the room, or gathered into a dustpan or other receptacle: but how much flies up into the air, and settles again on the floor or furniture as soon as the air is left undisturbed? The furniture is also dusted, but have you ever seen anyone 'flick' the furniture with a duster? This leaves the surface clean for a time, but what happens to the dust?

Dust in the air, besides irritating our throats and getting into our eyes, sometimes has adhering to it harmful germs which we may breathe into our lungs.

The next thing to remember is that every part of the room should be cleaned at least once a week. By every part of the room is meant the ceiling, the walls, the tops of cupboards, and the floor under the carpet. Bearing in mind that we must (i) remove the dust, (ii) clean every part, let us now set to work (in imagination) to 'turn out', i.e. to clean thoroughly, an ordinary sitting-room.

We will begin with the furniture.

Dust carefully, gathering the dust into the duster and shaking it from time to time out of doors, all ornaments and small articles of furniture and take them out of the room.

Dust the larger pieces of furniture, and cover them with a dust sheet. Strong wide khaddar makes good dust sheets.

For a special 'turn out', take down all curtains and hangings and shake and brush them; also remove and clean all pictures. For the ordinary weekly cleaning, the former may be shaken and brushed as they hang, the latter dusted on the wall. (But this will come after the cleaning of the ceiling and the walls. Why?) Take up and shake out of doors all rugs and floor coverings that can be easily removed. Heavier carpets can be taken out occasionally; for the weekly cleaning they should be carefully brushed as described above (the dust being at once removed), and folded over, the corners towards the centre.

We are now ready to clean the room itself. We will begin with the ceiling and proceed downwards. Why? The ceiling will be reached by a Turk's-head broom, or by a long bamboo fixed to a country broom with a cloth tied over it. The tops of cupboards and of doors and window-frames will then be cleaned. Wipe with a mop, or brush with a broom (according to the nature of their surface), the walls, not forgetting curtains, picture rails, the backs of pictures, electric fittings, window and door fittings, and any woodwork that may occur.

Sweep the floor with a slightly dampened broom, taking the dust thus collected out of the room. Then brush it, scrubbing or wiping according to its nature. Methods have already been considered. Clean or wipe everything that has to be washed with water—windows, picture glasses or mirrors. Remove the dust sheets from the room, first folding them over from corner to corner so that no dust escapes. Polish the floor, if polishing is required, and all brass or metal work, door fastenings, etc. Lay down carpets or rugs, and return furniture and ornaments to their original positions.

All houses do not need all the cleaning equipment we have mentioned. Where simple implements and materials are found to do the work well and quickly there is no need to use expensive and elaborate things. Discuss the minimum equipment and cleaning materials an ordinary house should have.)

Things to Do

Practical work

1. Turn out a room in your school in the way described above. If you have a furnished sitting-room as a Domestic Science practising room, choose that; if not, turn out an ordinary classroom.
2. Make some soap.
3. Make drawings of the different kinds of brooms used in different parts of India.
4. Visit a brush factory, if you have one in your neighbourhood.
5. Clean objects made of different metals.
6. Treat specimens of wood in the different ways described in this chapter.
7. Test acids and alkalis with litmus paper.

Oral or written work

1. Describe how you would turn out a bedroom.
2. Describe and explain the use of a vacuum cleaner.
3. Classify household metals into (i) those on which you may, (ii) those on which you may not, use an acid.
4. Why should you save your old newspapers?
5. Why must we not allow dust to rise in the air?

CHAPTER VII

GERMS, INSECTS AND PESTS

REQUIRED: A microscope, germs on microscope slides, small quantities of permanganate of potash, sulphur, carbolic acid, formalin, eucalyptus oil, coconut oil, citronella, camphor, borax, pyrethrum, cedar-wood, tobacco leaves, a syringe, different kinds of sprays, rat-traps, fly-flaps, fly-traps.

IF we keep our houses perfectly clean and their surroundings clean and dry, we have gone a great way towards keeping them free from harmful and annoying creatures, disease germs, insects, spiders, reptiles (such as toads and snakes), or animals (such as rats and mice), all of which are unpleasant and several of which bring illness into our midst. We will not here discuss the symptoms or cures of the different diseases caused by them, but show only how we can keep our houses free from anything that may bring or cause illness. We will first consider germs, then insects, and then other creatures.

GERMS

Disease germs are those minute creatures that get into our bodies and cause so many illnesses. Plague, cholera, influenza, enteric, malaria, pneumonia, tuberculosis, and smallpox are some of the dread diseases common in this country that are caused by germs. Before reading further, discuss what you know about them. Look at some germs through a microscope (Fig. 31).

Germs are sometimes brought into our houses by insects, sometimes in our food, water or milk. Sometimes they are found lurking on the floors or in the corners of our rooms, or clinging to the walls or lingering in our

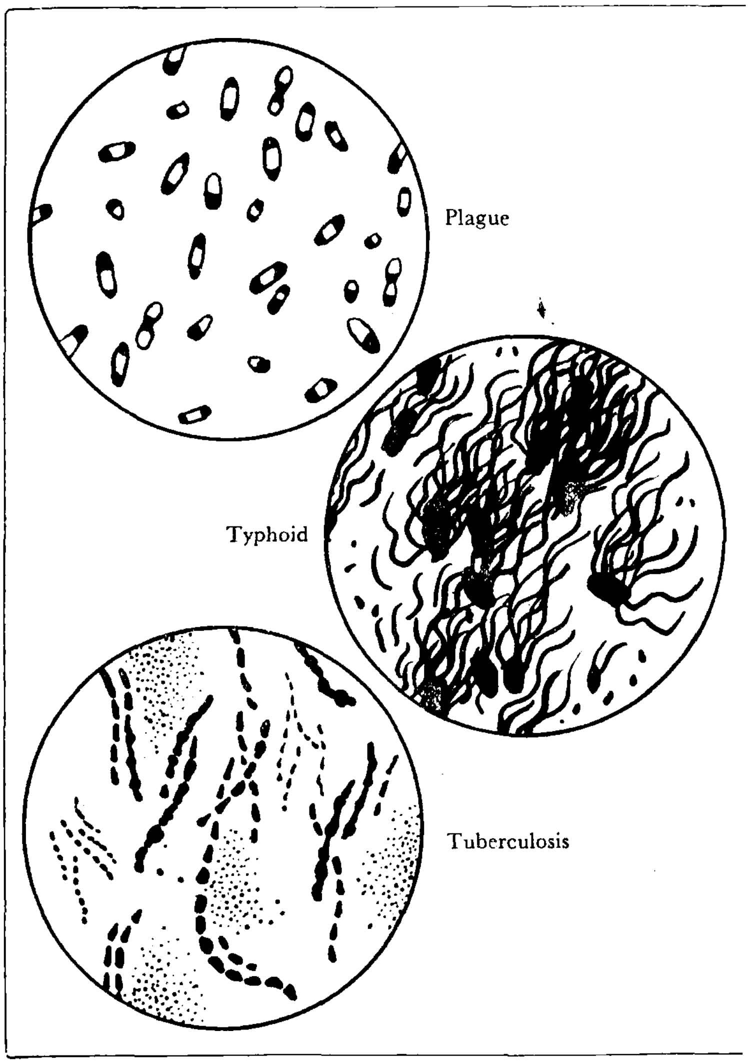


FIG. 31 Germs

compounds. Sometimes they are found floating in the air. They flourish in the living body, whether of an insect, animal or human being, but when removed from the body (either by being coughed out, peeled off the skin, or expelled with body wastes), they tend to dry up and die in a few days, though some, such as those of enteric and tuberculosis, may live for a longer period. As long as they are in a semi-dried state they can revive and cause disease. They quickly perish under the influence of direct sunlight and of oxygen in open dry earth, and in rapidly flowing water. They linger in houses and sheds under cover, in undisturbed rubbish heaps, in damp earth, and in stagnant or slowly-moving water. They can thus linger in our homes, where we must fight them.

Germs can be fought only with the weapon of perfect cleanliness, aided by disinfectants. A disinfectant is anything that will kill germs. It is sometimes called a *germicide* and sometimes a *sterilizer*. Now germs are so small that you cannot be sure that they will be removed by ordinary, even careful, sweeping and dusting. But, fortunately, scientists tell us that the best disinfectants for common use are our everyday friends: sunlight, heat, fresh air, ordinary household soap, and freshly burnt lime. The house that is always kept light and airy, well brushed, dusted and washed, and limewashed once or twice a year, will not harbour germs. The sunlight that ordinarily enters a house only enfeebles germs. For sunlight to kill them they must be exposed to its direct rays out of doors. Heat (boiling point or over) also kills germs, though tetanus germs require half an hour's boiling.

When infectious illness occurs in a house, it is sometimes a good thing to disinfect by special means, though many modern doctors think that the simple disinfectants mentioned above alone are necessary, if constantly used in the right way. Your doctor will advise you when there is need for special disinfection. In the case of epidemics, especially those of plague or cholera, he will sometimes ask the municipality to disinfect your house.

Special disinfectants or ways of disinfecting

1. Exposure to direct sunlight for a few hours.

2. Boiling for half an hour with soap and water. (This applies to textiles only; if they are stained, soak in cold water. Before throwing such water away disinfect it.)

3. Exposure to steam. This is very effective, but requires a special apparatus.

4. Burning sulphur. Close tightly every door, window and ventilator in the room, and fill up all cracks. If the air of the room is dry, boil a pan of water in it till the air is quite steamy. Place a metal tray in the middle of the floor, and put on it a 'sigri' containing a layer of red-hot charcoal. For a room of 200 square feet place 4 lb. of pure sulphur on the charcoal. Or place the sulphur in a pail, pour on a little alcohol and set light to it, and quickly leave the room, closing the door tightly behind you, and leave everything undisturbed for sixteen hours. (Leave the room quickly, or the fumes will hurt your throat.) Sulphur candles bought ready for burning are more convenient. Sulphur stains metals, so disinfect and remove, or cover with oil, metal objects in the room.

5. Exposure to formaldehyde gas. For a room of the same size, close the room and render the air damp as for sulphur. If there are a few tiny cracks or crevices it does not matter so much. Place 10 oz. of crushed crystals of

permanganate of potash in a pail in the middle of the floor and pour on it a pint of formalin, which you can get from a chemist. Immediately a gas is formed which rapidly fills the room. Leave the room quickly, close the door, and keep it closed for six hours. Do not try to use sulphur or formaldehyde gas except with an experienced person.

How much of each would you need for the room we are sitting in? Look at some sulphur and formaldehyde. Such disinfectants are called *fumigants*.

6. Solutions of carbolic acid, saponified cresol, formalin or phenyle are useful disinfectants that may be used with water for washing the floor and walls of rooms, for keeping in sputum bowls or pans, and for putting down drains and privies. You can buy these from a chemist. Directions are given on the bottles. Read some. Remember that they are poisonous and if kept in the house, should be placed on a high shelf, out of the way of children. New disinfectants appear from time to time. Use judgement in buying them, and when in doubt consult your doctor or a sanitary officer. Many people think that permanganate of potash is a disinfectant. It hinders the growth of germs in wounds, but cannot be relied upon to kill them. It purifies organic matter in water.

If the floor of the room to be disinfected is of earth or earth mixed with cow-dung dig it up, take it outside, and burn it. If this is impossible, spread over it lime or quicklime, or soak it with a strong disinfectant solution. Your doctor will advise you as to the best.

What do you use in your house when infection occurs?

During the patient's illness do not allow any germs to leave his room. Keep special dishes, vessels and spoons for the patient, and wash them in his room or on a veranda outside. Wash and disinfect or sterilize sheets, clothes, etc. as soon as taken from him by boiling them. Do not leave them lying about in the house. Body wastes should be disinfected by the use of the solutions mentioned above or by quicklime. Remember to wash your hands in a disinfectant every time after touching the patient or his bed.

Anything of little value, papers or magazines, in the sick-room should be burnt as soon as they are done with.

If you have anyone in your house suffering from tuberculosis, remember that germs from the sputum of the invalid float in the air and deposit themselves on the walls of the house. The patient should spit in a little vessel lined with paper, over which is spread quicklime. The paper, with its contents, can be removed and burnt or buried. The invalid who may or may not be able to move about, needs plenty of fresh air, and if this is given free passage through the room it helps to carry out germs. An open vessel containing a solution of disinfectant, such as izal, helps to purify the air.

Liquid disinfectants, when not poisonous or injurious to human beings, may be sprayed on to the walls, into the corners, and into the air itself, when infectious illness is about. Common colds are very infectious and, when one member of a family has one, generally spread throughout the family. They may often be checked from thus spreading by means of disinfectants. If you get into the habit of using a spray, you will have gone a great way towards keeping your house free from diseases.

We have talked so far only of germs that are to be found lurking in our houses themselves. We have now to consider those brought in with water, milk or food, those found on the ground and those brought in by insects.

We have already studied water in Chapter V and seen how to disinfect it. The germs that are brought in with milk may be those of tuberculosis from a consumptive cow, or those of diseases of the intestines probably deposited in the milk by flies. The remedy is to boil the milk as soon as it comes into the house, and then to keep it covered. Fruit and vegetables to be eaten raw should be thoroughly washed. Cooked food should be bought only from reliable suppliers and brought straight from the cooking place. It should not have been exposed for sale in uncovered vessels.

The germs that may be found in the ground are those of intestinal diseases, diarrhoea, dysentery, enteric and cholera; they are brought in by flies. Other diseases that may be got from the ground are hookworm (which is another intestinal disease, but which is contracted by picking up the minute germs in cracks in the skin of the feet), and tetanus or lockjaw. This group of diseases can only be controlled by proper disposal of body wastes and perfect cleanliness in privies and latrines. Different methods of disposing of body wastes and the destruction of germs lurking in them will be studied in the next two chapters. Now we will think only about the housekeeper's duty of keeping latrines and privies clean. A long-handled brush should be kept specially for the latrines, and with it they should be well washed daily with a strong solution of soap and water, and with a disinfectant once a week or oftener. The ceiling and walls of the latrine should be whitewashed once a month. In case of illness in the house they should be disinfected every day. If latrines are kept thoroughly clean and disinfected they will not attract flies.

Remember you must carefully distinguish disinfectants from (i) deodorants, (ii) antiseptics.

Deodorants simply hide unpleasant smells. They are useful for that purpose only, but do not destroy germs. Generally, weak solutions of the different chemical disinfectants mentioned above serve as deodorants.

Antiseptics hinder the development of microbes in wounds where, perhaps, the stronger disinfectants might harm the patient. The best known are boric powder, permanganate of potash, and iodine.

Insects

Germs that are brought into the house by insects are responsible for very many diseases, of which the best-known in this country are malaria, enteric, plague and cholera. Keep insects away and germs will keep away too.

We can divide insect enemies into (1) those that harm us by sucking our blood or (2) by tainting our food, and (3) those that damage our property.

1. Insects that harm us by sucking our blood.

(i) *The mosquito,* the female of which sucks our blood and gives us malaria and some other diseases, and deposits her eggs in water or in moist ground in our compound.

(ii) *The sand-fly,* which visits certain parts of India, and gives a three- or four-day fever.

(iii) *The bed-bug*
(iv) *The flea*
} These live in our houses, and sometimes spread various blood or skin diseases from man to man.

2. Insects that harm us by tainting our food.

(i) *The house fly,* our greatest enemy, breeds in filth (body wastes of man or beast or damp house refuse) and spreads diseases by depositing germs of intestinal diseases from body wastes by sitting on our food.

(ii) *The ant,* which may leave a germ, but which generally simply spoils our food by crawling over it.

(iii) *The cockroach*, which, like the fly, brings disease germs on his legs and then walks on our food.

3. Insects that damage our property.

(i) *The moth* devours woollen goods.

(ii) *The silver fish* devours artificial silk and starched clothes, paper and paste.

(iii) *The book-louse* spoils our books.

(iv) *The cockroach* spoils books, silk, and leather.

(v) *The cricket*
The wasp
The white ant } These bore holes in and consume wood.

It is against these insects that the housewife must wage constant war, especially if she has neighbours who are not very clean or very particular.

General rules against insects

1. Keep your house and surroundings clean and dry.

2. If there is any open water near the house, keep it clean and its edges trim. If large, stock it with larvae-devouring fish; if small, spray the surface with kerosene once a week.

3. Do away with all broken vessels, old tins, etc., that may collect water.

4. Keep stables, cowsheds, poultry runs and all out-houses clean and sanitary.

5. Fill up all cracks and holes in the walls, floors and ceiling of your houses.

6. Limewash frequently.

7. Frequently inspect bedsteads and other furniture, and any dark corners or cupboards in the house.

8. See that all body waste and house refuse are speedily disposed of. Keep a lid always on your refuse pail.

9. Screen, with wire-netting or mosquito-net, doors and windows during the time of year or hour of day at which insects are likely to enter your house.

10. Leave no food uncovered.

11. Grow healthy-scented trees and shrubs in your garden, such as eucalyptus, neem, tobacco, tulsi plant.

12. Use repellents, i.e. substances of which the odour or fumes are unpleasant to insects. The smoke from burning neem leaves or tobacco leaves or from incense drives away all insects. Bunches of dried tobacco leaves and neem leaves keep away some insects. Strong-smelling woods, such as pine chips, camphor wood or cedar wood, balls of camphor or naphtha, oils such as eucalyptus, or citronella, and powders such as pyrethrum, sulphur, borax, soap powder, pepper or alum, scattered or sprinkled about their haunts, will often keep different insects away for a time. Pyrethrum fumes stupefy all insects.

A good repellent may be made thus:

Oil of citronella	2 parts
Spirit of camphor	2 parts
Oil of cedar	1 part

Mix well. Put a few drops on a cloth near by.

13. Use insecticides, i.e. insect destroyers. The best are pesterine (crude petroleum), petrol, kerosene oil, kerosene oil emulsion, creosote, sulphur gas, formaldehyde gas. Coconut oil is effectual against some insects.

Kerosene oil emulsion	Soap	3 parts
	Hot water	15 parts
	Kerosene	82 parts

Dissolve the soap in the hot water, warm the kerosene (away from the fire) by standing it in a bottle in a vessel of hot water. Add the hot, soapy water gradually to the warmed kerosene. Bottle it, and when wanted use as a spray or a wash, dilute it by mixing one part of emulsion to 20 or less of water. The emulsion is very inexpensive and very effective.

Use a sprayer charged with a good repellent or insecticide once a week in cupboards and daily in dark corners.

What is a sprayer? It is an apparatus for sprinkling liquid or vapour. Examine some sprayers (Fig. 32).

What comes out of the sprayer? Watch, in a narrow ray of sunlight, if convenient. What do you see? Very fine particles of liquid, or oil vapour, mixed with air. Now vapour of kerosene or other inflammable vapour mixed with air is highly explosive. (Distinguish explosive from inflammable. Is a candle inflammable? Is it explosive?) Therefore never spray near an open fire, whether the kitchen fire or a lamp. Electric lights, of course, do not matter.

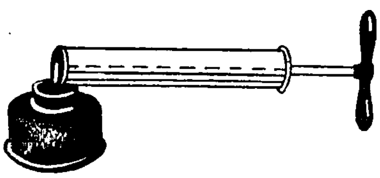


FIG. 32 Sprayer

ALPHABETICAL LIST OF HOUSE INSECTS

Ants. The ant is a busy little scavenger (i.e. a cleaner-up of dirt and dead creatures), and probably does more good than harm in our homes. But we must keep the legs of food-safes, etc. standing in vessels of water with a little oil on top. If ants come in large enough numbers to be a pest, dust borax plentifully round their haunts.

Bed-bugs (Fig. 33). The bug is one of the most disagreeable and repulsive of the insect enemies of man. Bugs live wholly on the blood of human beings and require a meal every five days or so. They can, however, remain in a quiescent state for several months. If one lives in an infected neighbourhood it is difficult to keep them out of one's house. They make their homes in crevices of walls, floors, bedsteads and other furniture. Brushing all possible lurking-places with coconut oil, kerosene oil emulsion, plain kerosene, or creosote (an oily substance extracted from coal tar) is found very effective; or a small *syringe* (like a fountain-pen filler) may be used to squirt the kerosene right into their holes. Very hot water will also destroy bugs and their eggs. If a room is badly infected, sulphur may be burnt in it as for disinfecting (but remember that every crevice by which air can enter should be closed). If they are suspected of coming in from a neighbour's house through the window, wash the framework of the latter daily with kerosene oil. Sun all bedsteads, clothes and hangings at least once a week.

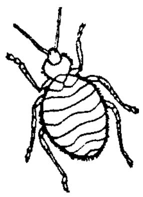


FIG. 33 Bed-bug (x 3)

Bugs, besides being dirty and unpleasant, are thought to pass certain disease germs from one person to another.

Book-lice (Fig. 34). These tiny creatures may sometimes be seen when a book is opened suddenly. They devour the paste used in binding books and framing pictures, and sometimes get into mattresses or upholstered furniture. They appear only when houses or cupboards are left shut up for some time. All rooms should be well aired each day, and book cupboards

FIG. 34 Book-louse (x 2)

frequently turned out and dusted. Should these little pests be found in great numbers, the room should be heated, if possible to 130°F., for several hours, or sulphur should be burnt in it.

Cockroaches (Fig. 35). Several varieties of this insect haunt our houses. They attack food supplies, if given the opportunity, while some of the smaller kinds, attracted by the starch paste used in binding them, damage the cloth or leather bindings of books. Some varieties will devour the surface of the leather itself, whether of shoes, trunks or books.

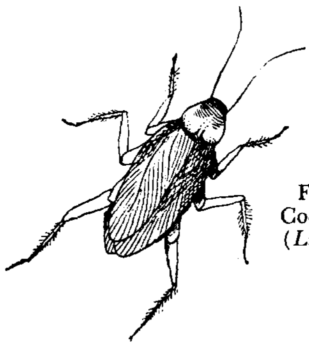


FIG. 35 Cockroach (*Life size*)

The remedy is perfect cleanliness; the removal of the tiniest particles of food and the scattering of some repellent, such as borax, pyrethrum or sulphur, along their run-ways, such as the passages behind rows of books or shelves. Frequently spray their haunts.

If they haunt a particular room, it may be tightly closed up and pyrethrum powder burnt in it. They become stupefied and may then be swept up and destroyed.

Crickets (Fig. 36). These insects do much damage to wood. Treat as for cockroaches.

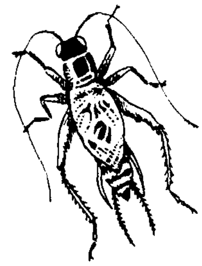


FIG. 36 Cricket (*Life size*)

Fleas (Fig. 37). There are many varieties of these noxious insects. They live on different kinds of animals, but can be transferred from different animals to man. Those we are chiefly concerned with are the human flea, the dog flea, with its close relative, the cat flea, the chicken flea and the rat flea. Probably the first-named transfers diseases from man to man. The second causes much annoyance to pet animals. The third often seriously affects the health of poultry. The fourth, the rat flea, which leaves the body of a rat (or squirrel) that has died of plague, has been proved to be the greatest, and probably the only cause of the spread of bubonic plague.

The breeding place of fleas is generally on the ground among the rubbish or in cracks on the floor. Keep your houses and their surroundings thoroughly clean; and fill up all cracks in floors and walls. A tiled or wooden floor should be washed well with a solution of kerosene oil emulsion and the walls washed with the same. An earthen floor or the surroundings of the house, if affected, may be heavily sprinkled with common salt, and then damped with water, or lime may be scattered around. Repeat on two or three successive days. Chickens may be treated in the same way (but do not let the chickens eat the salt). To get rid of living fleas from animals, wash them in a solution of kerosene oil emulsion; or powder them with patent powders according to directions. Rub chickens, where infected, with kerosene oil mixed with grease.

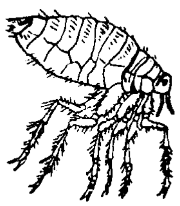


FIG. 37 Flea
(*Greatly enlarged*)

If a grass lawn is infested with fleas, cut the grass very short, and the sun will kill the vermin as they hatch.

Where bedding is infected, or in danger of being infected, spread it out daily on stone or sand under a hot sun. Direct sunlight kills fleas in one hour. But remember that a perfectly clean room will quickly become infected again if stray visitants can find suitable breeding places and if the floor is not kept scrupulously clean. Look for and destroy stray insects wherever there are signs of them.

House flies (Fig. 38). The house fly and the mosquito are of such enormous importance, from the health point of view, that a fuller account of their life and habits will be given than is given of the other pests.

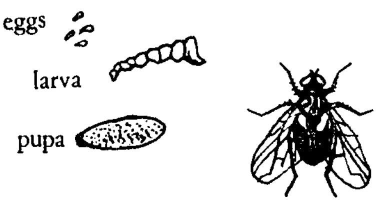


FIG. 38 Life cycle of the fly

The house fly lays its eggs in clumps on the surface of any sort of manure, preferring horse manure to any other; though, in the absence of manure, it will lay them in any organic material, animal or vegetable. At one time a single fly will lay a hundred eggs, each about one-twelfth of an inch in length. These eggs hatch out in 24 hours or less, according to the amount of moisture and the temperature. The maggots (or larvae) feed on the manure on which they come to life, and, under favourable conditions, attain their full size in four or five days. When fully grown they burrow into the ground, when they take on the pupa (chrysalis) form, in which they remain from three to ten days (though in cold countries they may remain in this state throughout the winter), after which time the perfect insect creeps forth. After three or four days the female is ready to lay eggs. Thus, under favourable conditions (and tropical conditions are very favourable), a female house fly lays a hundred or so eggs within a dozen days from the time when the egg from which she sprang was laid. This accounts for the enormous number of house flies that appear during the hot season and monsoon.

As the fly crawls over body wastes, or as the female fly rises from laying eggs there, it carries away filth and, where present, intestinal disease germs on the minute hairs with which its legs are covered. If it then settles on food (sugar and sweets being its favourite dishes) it leaves behind germs which are taken into the mouth and stomach of the person who eats the food. The germs of other diseases, such as tuberculosis, may also be carried by flies.

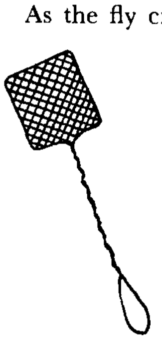


FIG. 39 Fly-flap

Disinfect and destroy all possible breeding places. Cover all refuse pails. Destroy the eggs with kerosene, borax or chloride of lime.

If, in spite of your care, flies abound in your neighbourhood, screen with netting all windows and doors, especially of the store-room, kitchen and dining-room. Maintain cleanliness in the house and keep food under covers.

Use fly-flaps, sticky fly-paper, fly-traps and poisons. A fly-flap usually consists of a handle to which is attached a piece of flexible wire netting (Fig. 39).

A little poison, as recommended by your chemist may be added to water sweetened with scented sugar and exposed in saucers. But poisons are always dangerous if children and pet animals are about.

Traps (Fig. 40) usually consist of a cone made of wire-netting, set in a cylinder made of the same material, and baited with scented sugar. The flies can enter easily from beneath, but seldom find their way out. When the flies are caught, the trap may be plunged into boiling water, when they die at once.

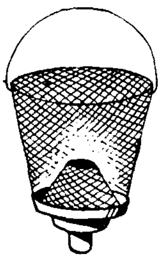
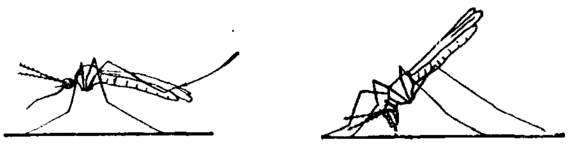


FIG. 40 Fly-trap

It is the duty of the municipality to see that breeding places for flies are not allowed to exist uncovered. Strict by-laws strictly enforced would do much to decrease the number of flies.

Mosquitoes. Two varieties are of importance to us in India: the common *culex* and the *anopheles.* A third common variety is the speckled or striped black and white *stegomyia*, also called the ' tiger mosquito '. The female of the common culex mosquito deposits her eggs on the surface of stagnant water, preferably where she can find a stray leaf or bit of grass on which she can sit. She lays about three hundred at a time in a mass. But the eggs of the anopheles are found separately, arranged in geometrical designs. After twenty hours, in both varieties, little swimming larvae appear, which spend from seven to fourteen days wriggling in the water, coming up frequently to the surface to



Culex Anopheles

FIG. 41 Mosquitoes (x 3)

breathe. At the end of the larval period a change takes place: the head of the larva increasing in size and the whole taking the shape of a comma. It is now a pupa, and spends its time tumbling over and over in the water. In from two to five days the pupa splits its skin and the complete mosquito flies forth. Its natural food seems to be the juice of plants, but the female insect eagerly sucks the blood of animals and of man, whenever she gets the chance. If a man is suffering from certain diseases, germs of the disease are in his blood. Thus the mosquito, sucking his blood, takes into its stomach both the blood and these disease germs. It then passes them into the blood of others when it bites them. Only one variety of mosquito, the anopheles, carries the germs of malaria. The stegomyia spreads yellow fever in the West Indies. The ordinary mosquito of this country, the culex, inflicts an irritable swelling and is thought to spread dengue fever.

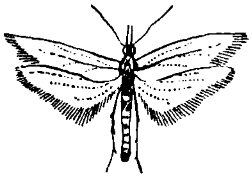


FIG. 42 Clothes moth
(*Life size*)

The culex at rest holds its body parallel to the plane of the object on which it is resting: the anopheles holds its body at an angle (Fig. 41). The wings of the anopheles are spotted. We much more commonly see the culex, the reason being that the anopheles usually waits till after dark before coming out of its hiding place.

To get rid of mosquitoes. 1. First fill up or cover all possible breeding places. Useless pools and puddles and hollows should be filled up. All old tin cans or other receptacles for water should be buried or destroyed. Rain barrels and small cisterns should be covered.

2. Lakes and tanks should be kept clean, and larvae-consuming fish should be introduced into them.

3. Kerosene oil should be sprayed on the surface of unavoidable pools near dwellings every week or ten days.

The oil forms a thin film over the surface, through which the larvae cannot breathe. Consequently they die. Spray a few drops of kerosene on to the surface of a tub of water. Observe how the oil spreads itself and forms a very thin film over the whole surface. Would you say the particles of the kerosene cohere together or not?

FIG. 43 Sand-fly (x 32)

4. Use mosquito nets at night, specially if you suffer from malaria.

5. Remember that the dangerous anopheles mosquito, unlike the fly, loves the dark. It is, therefore, well to close your windows as soon as it begins to be dark. Why? Open them again when the lamps are lit.

But the culex, though it loves the dark, does not strongly dislike the light; some varieties of mosquitoes seem to be attracted by lamplight.

6. Do not sit about in dark places. If you must, spray a repellent or put some on the exposed parts of your body.

7. Spray kerosene oil emulsion or patent mixtures in places where mosquitoes congregate.

8. Sprinkle a few drops of eucalyptus or citronella or turpentine on cloth near where you are sitting, or on your pillow if you are obliged to sleep without a net. If you wish to apply it to your skin, mix it with olive oil.

FIG. 44 Silver fish (*Life size*)

9. Burn incense and neem leaves in rooms where mosquitoes are a nuisance, especially as it begins to get dark. See that the smoke goes under chairs, tables and sofas.

10. If a house is badly infested, attract all the mosquitoes possible into the house (by the simple expedient of leaving all windows and doors open

at dusk, evening and morning). Then in the morning shut them in. By means of smoke or sprayed kerosene oil emulsion or patent insecticide, clear them out of each room and passage in turn till they are all assembled into one small room. In this one room make a very dense smoke or spray heavily. Shut the door. Later sweep up the corpses. Do not burn leaves and spray at the same time.

The male mosquito lives for only two or three weeks; the female, from four to twenty. She lives without food for a long time, hiding for months in dark cupboards. The remedy is to spray all cupboards once a week.

Private individuals can keep their premises free from mosquito haunts. It is the duty of the Health Officer to drain and treat breeding places. What does the Health Officer do in your town?

The clothes moth (Fig. 42). The larva of this insignificant little moth, found in two or three varieties, causes great destruction to woollen clothing that is put away for the hot weather. The moth itself is harmless, but lays its eggs on wool, which is devoured by the larvae as soon as they are developed. The larva of one variety makes for itself a little case, in which it may sometimes be seen climbing up a wall to seek a crevice in which to pass its chrysalis stage. Others spin a little silky case and remain in the cupboard or box in which they have been hatched until the moth is full-grown. The best way in which to keep clothes, furs, woollen rugs and other goods free from moths is to shake them frequently in the open air and sunlight. Where this cannot be done they should be stored, after being well wrapped in old newspapers (the ink of which is disliked by moths), in airtight tin-lined boxes. Putting them away in ordinary drawers and cupboards with camphor and naphtha balls does not always keep away moths for, though they do not like the smell of camphor and naphtha, it will not keep them from laying their eggs on the garments surrounded by them, if no other suitable place can be found, and once the egg is laid the damage is done. If you only have ordinary chests-of-drawers, wrap your clothes in newspapers and then again in heavy tarred brown paper. Spray cupboards and chests with kerosene oil emulsion or patent insecticide.

Sand-flies (Fig. 43). These tiresome little biters have been proved to be the cause of the common three- or four-day fevers prevalent in some parts of India, and known now as sand-fly fever. As in the case of a mosquito, the germs enter the stomach of the insect from the blood of a sufferer. They are then transferred through the sand-fly's mouth to a healthy person.

FIG. 45 Indian wasp (*Life size*)

Unlike the mosquito, the sand-fly is frequently propagated *inside* the house in dirt found in old walls and roofs. It is also frequently found in damp earth. To prevent its propagation it is necessary that houses be kept clean and in good repair, that there shall be no crevices in which dirt may accumulate, and that where there are rafters, etc. they shall be frequently cleaned. Unavoidable damp places round the house should be sprayed with a solution of formalin.

If, with all these precautions, sand-flies abound, sleep under a fine-mesh net, because the sand-fly is able to enter through the mesh of an ordinary mosquito net.

Silver-fish (Fig. 44). This insect, which gets its name both from its appearance and from its smooth, gliding motion, causes great destruction to anything that contains starch, paste or size. It will also greedily devour artificial silk. It, therefore, attacks the surface of sized paper, the paste used in binding books or framing pictures, starched clothes, and silks if stiffened with size.

It usually causes damage only where its food has been left undisturbed for some time in chests or cupboards. The best remedy against it is frequently to turn out and clean all such places. Fresh pyrethrum powder, dusted along its haunts, will keep it away. In places where it has become a pest, it will succumb to sulphur or pyrethrum fumes.

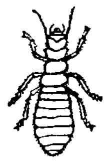


Fig. 46 White ant (termite) (x 3)

Wasps (Fig. 45). Besides the occasional visitant who may give us an unpleasant sting, some kinds of wasps do damage to the woodwork of our houses by boring holes in which to deposit their eggs. They must be watched for during the breeding season, and driven out when seen. Sometimes they come in swarms. Then, make a dense smoke with neem leaves, leaving the windows open, and they will soon go.

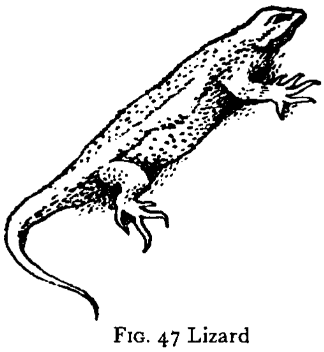


Fig. 47 Lizard

The white ant (Fig. 46) is not a true ant, though it lives in colonies like other ants. You have all seen the little earthen galleries it makes above the surface of the ground, on trees or wooden pillars, and you have no doubt seen the damage it does to the wood. Wood is its food and, in the form of body wastes, is mixed with earth to make the galleries. After emerging from the egg the insect passes through two stages: the immature and the mature form. In the latter form there are three varieties: (i) the soft-bodied wingless workers who do the damage; (ii) those called 'soldiers'; and (iii) the winged sexed variety, which swarms freely at certain seasons of the year, sheds its wings and sets out to found new colonies. The workers cannot live in the light, and they cannot extend their galleries without moisture. They, therefore, need communication with the ground; if this is cut off, by destroying their galleries near the ground, all those above the lines of destruction will dry up and perish. If undisturbed they will travel even to the third storey of a house, or to the top of a high tree. They are very destructive of wood, and will eat out the centres of pillars till only an outer shell remains, and the pillar falls to the ground. They form galleries on stone or concrete surfaces to reach wood.

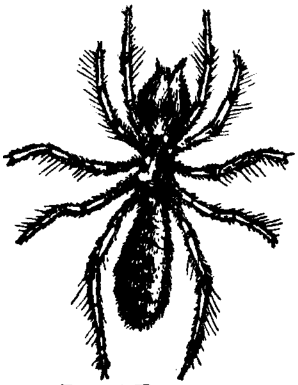


FIG. 48 Tarantula
(*Half life size*)

FIG. 49 Scorpion
(*Half life size*)

Examine specimens of wood eaten into by these creatures. Go round the compound and look for signs of their existence. Constant watchfulness is necessary in order to prevent this pest from destroying our houses. Directly the little galleries appear, they should be attacked. Kerosene should be poured into the hole or crack from which they appeared, and the crack itself should be filled up with cement.

Timber of buildings should be laid on rock or dry cement. If it has to be set in the earth, it should be impregnated with creosote. When plants are attacked they may be sprayed with kerosene oil emulsion.

Examine and become acquainted with the properties of all the remedies mentioned against insects and germs. Use a spray with different insecticides and repellents.

PESTS

The lizard (Fig. 47) is a constant dweller in our homes. It is harmless and on the whole, does good by destroying large numbers of harmful insects. But it helps to make dirt, and if we can manage without its assistance so much the better. Its presence in a house means that it is able to find food there.

FIG. 50 Centipede (*Half natural size*)

The large spider, including the tarantula (Fig. 48) (a large, handsome and very poisonous spider), and the *scorpion* (Fig. 49), *centipedes* (Fig. 50) and *toads* (Fig. 51) also come in search of insect food. The tarantula, the scorpion and the centipede give dangerous bites. The toad, besides being a source of dirt, is a source of danger, inasmuch as it attracts snakes, which desire it as food and follow it into the house.

FIG. 51 Toad

If *snakes* (Fig. 52) are seen to haunt the compound, do away with all grass and shrubs close to the house, and keep at least twelve feet of clean gravel all round it. Also you may keep a mongoose or a cat, and

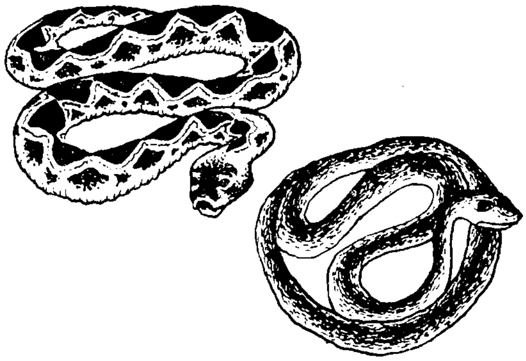


FIG. 52. Russell's viper (LEFT) and rat snake (RIGHT)

sprinkle the surroundings of the house with a strong decoction made of country tobacco leaves and water (one or two annas' worth to a quart of water).

Rats and *mice* (Fig. 53) are to be dreaded, not only because they may give you a dangerous bite, but still more because they may, as we have seen, introduce into

FIG. 53 Rat and mouse

the house the dreaded plague flea. They come after scraps of food and such things as soap and candles, which they devour for the sake of the fat contained in them. If all food, especially grain and such stored household supplies as mentioned above, is kept in closed tins, and if the whole house is kept swept and clean, rats and mice will not trouble us. If they come in from a neighbour's house, a good cat or dog should be kept. Dogs are often good ratters, but rats and mice seem to have more respect for a cat. Traps are sometimes useful, but these little creatures often have the sense to avoid them.

Things to Do

Practical work

1. Burn in the open a small quantity of sulphur and prepare a little formaldehyde as described. (Do not do this by yourself, but with your teacher.)
2. Observe germs through a microscope.
3. Make some kerosene oil emulsion.
4. Prepare tobacco water.
5. Make a fly-trap.
6. Breed some mosquitoes (culex).

Oral and written work

1. What do you understand by the following: Repellent, disinfectant, insecticide, germicide, deodorant, fumigant, sterilizer? Distinguish between those used against germs and those used against insects.
2. How would you prevent the spread of cholera or of tuberculosis if you had a case in your house?
3. Make a list of the household pests you have studied, arranging them according to the danger they cause to human beings.
4. What special advantages come from using a sprayer?
5. Through how many stages does an insect pass?
6. Explain clearly how (i) the house-fly, (ii) the mosquito, cause disease.
7. Enumerate some of the new disinfectants that are in the market now.

CHAPTER VIII

WASTE MATTER AND SANITATION

REQUIRED: A spirit lamp or gas flame, glass piping, models of flush cisterns, traps and sanitary dustbins, small drain pipes.

THE waste matter of the household may be divided into three categories: (i) body wastes, (ii) water waste, (iii) household waste. On the prompt and proper disposal of these wastes largely depends the health of the household.

We have already seen that, besides being unhealthy, unsightly, ill-smelling and depressing, accumulations of waste matter, water and rubbish may contain germs of disease and may invite the breeding of our deadly enemies, the fly and the mosquito.

DISPOSAL OF BODY WASTES

As you know, the body daily loses much waste matter, and a study of hygiene teaches us how important it is that in this matter habits of regularity be formed. A full discussion of the disposal of this waste matter is the province only of the sanitary specialist. But since it is your duty to keep your house and its surroundings sweet and healthful, it is necessary for you to understand enough about sanitation to enable you to do so.

THE WATER-CARRIAGE SYSTEM

The best way of disposing of body wastes is by a system in which the waste matter is carried away by water. This system necessitates a set of water pipes to supply water to the privies and latrines, and a set of drainage pipes (called sewers, to run from each privy or latrine into one house sewer. This empties itself into the street sewer, which in turn empties itself into the main sewer which carries the sewage (i.e. the body wastes) to its destination. It is necessary, if the system is to work well, that the sewers shall lie on a gentle slope. The destination of sewage may be:

1. *The sea,* if the town is near the coast. If this is so, the pipe must be carried out a long way under the water. Sewage passed into the sea is sometimes sterilized.

2. *A river.* In most countries this is strictly forbidden, as the water into which the sewage passes becomes contaminated and dangerous to health.

3. *The land.* Sewage may be passed on to land, either as it is or after being strained or treated with chemicals. It may best be passed into small jointed pipes within a foot of the surface over a wide area of land. Bacteria in the land purify the sewage, and what is left enriches the soil. These bacteria live most freely within one foot of the surface. The whole process, needless to say, requires careful and scientific management.

A water-carriage system, such as described above, is always managed by a public body of men for a whole city or town. But water laid on in the house may also be used, with a simple arrangement of pipes on a smaller scale, to carry sewage into what is called a *septic tank.* This is a large underground non-porous tank or cistern (Fig. 54). It has been found that if sewage is carried into such a tank away from light and air, certain bacteria not requiring air will change the greater part into a clear liquid which may be passed over land, preferably in the way just described. The solid part, which forms very slowly and sinks and accumulates at the bottom of the tank, may be periodically taken away and also used on the land.

The liquid which passes or is pumped out from a properly constructed septic tank is clear and free from smell. But

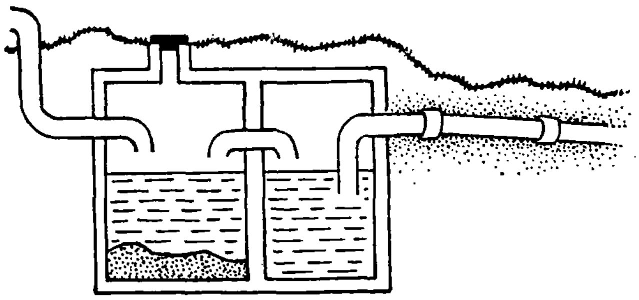


FIG. 54 Septic tank

this does not mean that it is free from harmful germs. If it is to be passed into a stream, it must first be sterilized by the use of some chemical.

Water may also be used to carry sewage into a *cesspool*, which is simply a deep hole dug in the ground (Fig. 55). It was originally lined with stones, through which the liquid portion leached (i.e. soaked) into the ground. Later varieties were made watertight,

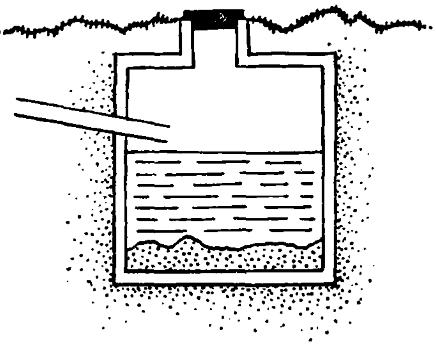


FIG. 55 Cesspool

without outlet pipes and without connexion to a drainage system. They had ventilation, however. Cesspools are dangerous to health and will gradually diminish in number.

A septic tank may be large or small. A large house and estate may have its own, or there may be one for a small group of houses in a town or village. This system may be employed wherever the water supply is sufficient, and its use should be encouraged wherever a public municipal water-carriage system is not possible. It has been found that wherever a scientific water-carriage system is in use, diseases such as cholera and enteric fever tend to disappear.

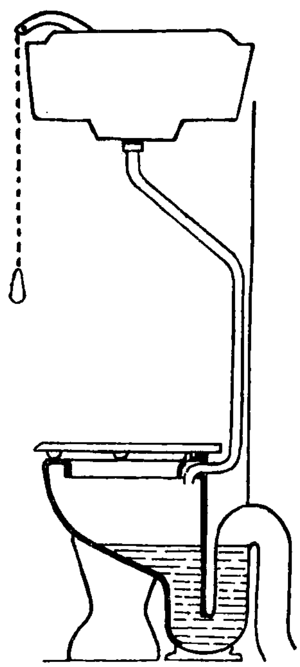


FIG. 56 Water closet

Why should this be? Which insect spreads these diseases? How are they spread?

For the water-carriage system in any form to be effectual, the water in the latrine (usually in this system called a water closet) must descend with a certain amount of force to flush the waste matter. This means that there must be a cistern above the level of the closet. You have seen, in Chapter V, how to secure a supply of water at any required level. Discuss this.

Water closets should, if possible, be situated in a little outer wing of the house, and should be well ventilated. If there are closets on different floors, they should be arranged vertically, i.e. one over the other. The floors should be of marble, tiles, cement, or stone slabs; the walls of the same, or painted with oil-paint. Closets should be furnished with a pan or bowl (set into the ground, or arranged with a seat), a flushing cistern and a drain pipe for carrying away the water and waste matter. Pipes should be visible, easily reached and passed out of doors (Fig. 56). The cistern should be not less than 5 feet above the level of the pan.

Do you notice the shape of the drain? It is known, from its shape, as the S-trap (Fig. 57).

EXPERIMENT 13. *To show the use of the S-trap.*

Take a piece of glass tubing, bend it over a flame into the shape of a horizontal 'S'. Call the upper pipe *a*, and the lower *b*; one bend *c*, and the other *d*. Now pour a little water coloured with ink into *a*, and pour in on top of it some pure water. The latter will replace the coloured water in *c* and drive it into *d* and *b*, while some of the pure water will remain in the bend (Fig. 58). Now if you look again at Fig. 57, you will see that the same thing will happen with sewage.

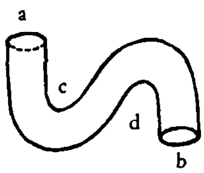


FIG. 57 S-trap

The water remaining in the bend is called a *water seal*, and prevents the rising of any odours or gas through the pipe *b*. What does the name water 'seal' imply?

There are other forms of trap beside the S-trap. But it is only necessary for you to understand the principle of the water seal and the form of trap used in your own house.

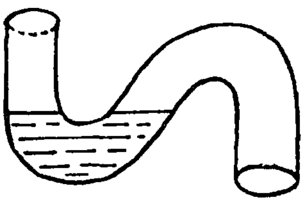


FIG. 58 S-bend with water seal

The flushing cistern is provided with a handle, which is pulled when a flush of water is needed. The drain pipe usually passes through a wall out of the house to enter through the ground itself into the house sewer. The way in which the flushing water enters and leaves the little cistern can easily be seen (Fig. 59). Imagine the cistern to be full. The handle *a* is pulled, lowering the platform *b*, which allows the water to flow down pipe c. This it should

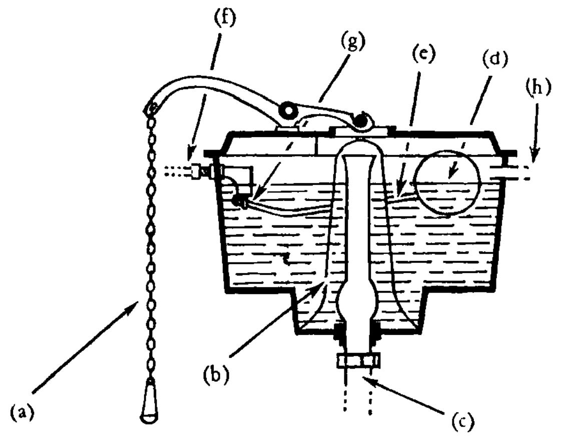


Fig. 59
Cistern

do with a rush. The cistern is then empty and *d*, a hollow iron sphere at the end of arm *e* (which works a little door *g* in feeding pipe *f*), sinks to the bottom. Water then enters from the upper large cistern through pipe *f*. As the water rises so does *d*, because, being filled with air, it is lighter than water. When the arm *e* is level, the little door *g* is closed. Thus the whole thing works automatically. If the ball does not work to open and close *g*, the water will constantly run into the cistern. An overflow pipe *h*, passing through the outer wall of the closet, is therefore provided.

What is the part of the housewife here? She must see:

1. That the windows in the closet are always open.

2. That the pan and walls are washed down every day, and with disinfectant from time to time. She should see that there is no leak in the drain pipe and that the S-trap works well. In case of difficulty she should inform the landlord (whose duty it is to attend to drains), or call in a plumber, i.e. a man trained to understand drainage.

3. That the little cistern is working well, both in its inlet and outlet. If there is a leak in the ball, what will happen? Will it rise? Why not? If it does not rise to cut off the supply when the cistern is full, the overflow pipe will be constantly running, which will waste water and make the ground below always wet.

4. That no household rubbish is ever thrown down the drain to stop it up.

In Fig. 60 you see that, just before the house drain *a* enters the street sewer *c* there should be another water trap *b* to prevent any gas from the street sewer entering the house. Even so, the gas may penetrate the water if it is left standing for long. Therefore an air inlet connected with the drain ventilates it before it is trapped (*d*). A pipe passes up above the roof where it is left open, provided only with a wire-netting to keep birds from building nests in it.

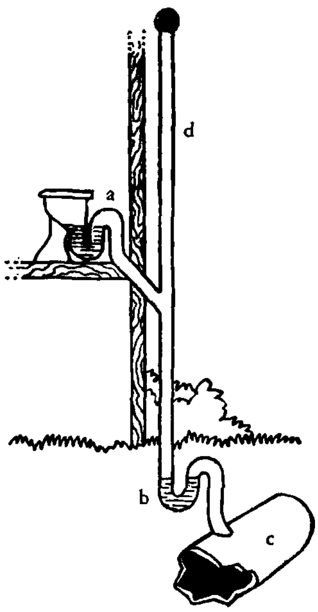


FIG. 60 Drainage system

You now understand the general principles of the water-carriage system. There are many varieties of traps and methods of ventilation, and there are many different ideas as to the best materials to be used, and the best and most economical methods of finally disposing of sewage. To study these is the business of the sanitary engineer. In case of need, you can always consult an expert.

THE DRY CONSERVANCY SYSTEM

1. *The pail system.* In this system each privy, which is either separated from or built on the outside of the house, is provided with a movable pail, placed in a hollow in the plinth. Dry earth or lime must be thrown in after use (though this is generally neglected). A little door in the wall enables the sweeper to remove the pail every day and replace it by a clean one (Fig. 61). The full pail is covered with a tight-fitting lid, and emptied into prepared trenches at some distance from the town or village, and then covered with earth. This pail is cleaned and exchanged for the full pail the next night. In this system two pails are needed for each house. Sometimes only one pail, or even a basket, is used.

FIG. 61 Pail in hollow plinth, with hinged panel

This is not satisfactory, as the pails are often not properly cleaned. In some cases a very large pail is provided, and is taken away only once a week by the sweeper. When this is the case, earth or lime should *always* be thrown in after use. The use of one large pail is not desirable in the tropics.

2. *Well or pit latrines.* In this system there is no movable receptacle but the excreta is received in a hole or well, usually 6 to 20 feet deep, sunk in the ground. It is most insanitary as foul gases are produced and the water supply is likely to be polluted by soakage, especially after a rise in the level of the subsoil water; but it is less dangerous than surface pollution. The site chosen for the pit should be on elevated land and well away from and below the water supply. The soil should be porous and the pit unlined. Clay or soil subject to frequent flooding is unsuitable.

The nitrifying bacteria in the upper layers of the soil purify the excreta.

The seat should be made of tarred wood or sandstone and should rest on a layer of bricks to make it higher than the adjoining ground.

A well-constructed drain should surround the pit latrine to carry away rain water.

3. *The bore-hole latrine* was devised to supply latrines in rural areas and to reduce diseases caused by their lack. They are cheap and require very little space. They resemble pit latrines and consist of a circular hole 14 to 16 inches in diameter and 10 to 20 feet deep. The hole must be bored at least 3 feet below the surface of the ground water. The top of the hole is covered by a concrete squatting plate $30'' \times 36'' \times 2\frac{1}{2}''$ with a slope to a hole $10'' \times 6''$ at the centre. The hole should be bored in hard compact soil and the site should be 50 feet from any well or tank and should not be subject to flooding. When the hole is filled up to about $2\frac{1}{2}$ feet from the ground level, it should be filled in with dry earth and the squatting plate removed and placed over a fresh boring. The excreta is decomposed by the nitrifying bacteria which liquefy it to form gases.

Sometimes the contents are burnt, instead of being used on the land; but this is costly and by no means easy, and sometimes unsatisfactory.

Disposal of Water Waste

Where the water-carriage system is in use the water waste of a household, consisting of bathing water, laundry water, washing-up and house-cleaning water is frequently passed by a separate pipe with its own S-trap, outside the house into the main sewer, and ultimately disposed of in the way just described. Occasionally a separate system of pipe is arranged. If the water-carriage system is not in use, water waste is taken in a pipe outside the house, passing into an open drain, to be eventually carried into some stream or utilized in irrigating the land. This system tends to breed mosquitoes, and often causes unpleasant odours.

Water coming from the kitchen pipe is often very greasy, and if this grease gets cold and hardens, it may stop up the trap if connected with the water-carriage system. If it passes directly into an open drain, it will, after a time, render the ground sour. Never throw grease down a drain, and pour hot water down the drain after washing greasy cooking utensils. The trap belonging to the kitchen drain should be provided with a movable screw (Fig. 62), to enable it to be emptied in case it does become stopped up. The top of the pipe in the kitchen sink should be fitted with a perforated cover to prevent solid matter passing through (Fig. 63). If the water passes on to the ground direct, the kitchen spout should be movable and you should have a set of three trenches (Fig.

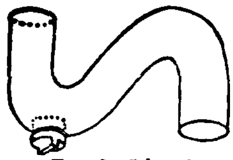


Fig. 62 S-bend with screw

64) going in slightly different directions and set the kitchen spout towards a different trench each day in sequence. Occasionally scrape off the surface layer of these trenches and burn it.

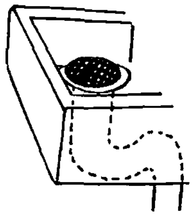


FIG. 63 Perforated cover on pipe

DISPOSAL OF HOUSEHOLD WASTE

The golden rule for household waste is to burn all the rubbish you can. This waste is of two kinds: (i) organic, consisting of vegetable or fruit skins and scraps of discarded dry food, paper and rags; and (ii) inorganic, mainly dust and broken articles. In each house should be kept a covered metal vessel, the lid provided with a handle. Put at the bottom a layer of ashes, and into it organic waste should be thrown immediately it is created. The lid should be replaced each time after use. You know now why you must be so particular about replacing the cover.

But even when you know, do you always do it? Do you always put waste matter into the vessels? Do you sometimes throw it on the ground? Do you sometimes throw it out of the window, careless of where it falls?

If you do, you have not got what is called a 'civic conscience', which means that you have not developed a sense of right conduct towards your fellow-citizens. Every day place the pail outside your house, and the sweeper will empty it into a cart or large receptacle.

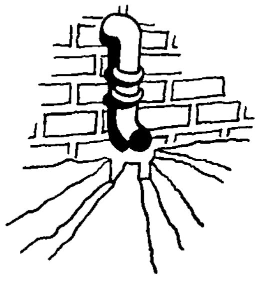


FIG. 64 Trenches from kitchen pipe

Waste-paper baskets should be kept in every room for waste paper and clean rags or rubbish. If small in quantity, their contents may be thrown into the covered pail; but both rags and paper, if you accumulate enough of them, have some value and may be stored in clean sacks and sold from time to time.

Into another basket near the kitchen department may be placed all disused tins and broken glass and china. This may also be carted away by the sweeper.

What happens to the household waste matter that the sweeper carts away?

It is safest and best to burn it. Sometimes it is dumped down on to low ground in order to raise it. This is not considered a good plan if the ground is to be built on, as ground made in this way remains unhealthy for some years. Sometimes, after the removal of broken china and tins, it is spread over fields and used as a fertilizer. Here it is apt to attract flies. Burning is the best and safest way in which to dispose of it.

The way in which wastes of any kind are eventually disposed of is not the immediate business of the home-maker. It is hers only as far as it affects the general health of her home and neighbourhood.

Things to Do

Practical work

1. Study the system employed in your school and home for the disposal of wastes.
2. Walk round your own compound this evening and see whether any waste matter is lying about uncovered.
3. Find out what system of drainage is used generally in your town or village.

Oral and written work

1. What is done in your town with each kind of waste matter described in this chapter?

2. Do cases of cholera, enteric and dysentery occur often in your neighbourhood? If so, what are you going to do to prevent their recurrence?

3. Name all the advantages of the water-carriage system for the disposal of waste.

4. Go on an excursion to different places in the city to see (i) 2 types of water-closets in use, (ii) A bore-hole latrine, (iii) A septic tank. Make drawings of each. Decide which you will have in your home, giving reasons.

CHAPTER IX

THE BUSINESS OF THE HOUSEHOLD

REQUIRED: Bank books and forms, insurance prospectuses and forms of various kinds, account books, forms for making bills, etc., the financial pages of a newspaper, the agenda list for a municipal meeting in a large city as published in the newspaper, will forms.

THE word 'business' suggests to our minds (i) matters connected with money; (ii) matters connected with law and property; (iii) the qualities belonging to the good management of an office, such as orderliness, punctuality, the development of good method—in short, those things that go with what we call a 'tidy mind'. We are not all born with such a mind, but if we are determined to make our homes a success, it is worth while training ourselves to possess one.

Before reading further, name or jot down in your rough notebook all the things you can think of that are concerned with money or law and the household.

Now compare with the following:

1. The income and budget making.

2. Purchasing—ready-money and credit, the keeping of accounts, co-operative stores.

3. Making provision for the future.

4. Surplus income, banks, cheques, investments.

5. Deficiency of income, bankruptcy.

6. Inheritance and property, making wills, death duties.

7. Legal status: the privileges, burdens and responsibilities of a citizen.

THE FAMILY INCOME AND BUDGET MAKING

The family income may be derived from various sources: as rent from landed or house property, as interest from invested money called capital, as wages for one's daily toil, as profits from business. It may be owned or contributed by one person only, usually the father of the family, or by several members of the family—the father, the mother, grown-up relatives or children. The money, however contributed, may be regarded as the exclusive property of the father or as belonging to the one who earns or contributes it. In some parts of the world it is becoming increasingly the custom for the family income derived from the property or earnings of the husband and wife to be regarded as their property in common, so that each may draw upon it at need. Such an arrangement demands equal education and trained common sense, a sense of responsibility and a knowledge of the value of money on the part of both husband and wife, and a subordination of their own desires to the good of the family. In India, too often, owing probably to early marriage and the lack of education on the part of wives, husbands not only keep all the money in their own hands, but even do the daily purchasing—an unnecessary burden on those who have to go out later to do their day's work in office or field. In other cases, the husband pays for every item as need for it arises. In others, he makes a certain allowance to his wife for household expenses, and she renders an account each month. This is the most usual method. Discuss the merits of free partnership, allowance or dole, and consider which is best for this country.

Our income may be large, medium or small, but we all need food, shelter and clothing. The very poor can afford nothing more. Other necessities, such as care in sickness and education, they either go without or accept what is provided by the State. Besides these five primary necessities—food, shelter, clothing, care in sickness and education—those who are better off make provision for household service, conveyance, travelling, change of scene, and intellectual, social and religious requirements (including alms-giving), and old age. The first five belong to the realm of necessity, the others to the realm of choice. The proportion of one's income that should be spent on matters of necessity, taste or choice depends on what that income is and on the size of the family. The poorer one is, or the larger the family, the larger is the proportion that must be spent on food. The richer one is, the more one can spend on intellectual requirements, amusements, travelling and change of scene. When we apportion certain parts of an income for these different items we are said to prepare a budget.

Fill in the chart given below after studying your mother's or somebody else's family budget for last year.

FAMILY INCOME	Rs	
Contributed by father	....	No. of persons, 7;
Mr X	....	Father, mother, grand-
Contributed by Y	....	father, aunt, brother,
Contributed by Z	....	self, small sister
Total Rs		

FAMILY EXPENDITURE	Rs
Food	....
Clothes	....
Rent (or upkeep, if the house is your own) ..	....
Conveyance charges	....

Rates	.. ..	....
Taxes	.. ..	....
Light	.. ..	....
Education for self and little sister	.. ..	....
Doctor's bills	.. ..	....
Carriage	.. ..	....
Insurance	.. ..	....
Household service	.. .. ..	....
Extras	.. ..	....
Total Rs	..	....

When you have done this, you may prepare budgets for the following typical families:

1. A doctor, earning Rs 625 per mensem; family consisting of himself, wife, old mother, five children, ages 5 to 15.
2. A headmaster, earning Rs 250 per mensem; family consisting of himself, wife, two widowed sisters (one earning Rs 30 as a teacher), six children all being educated, one at college.
3. A clerk, earning Rs 125; family consisting of himself, sister who keeps house, grown-up son earning Rs 55, with son's wife and two young children.
4. A peon, earning Rs 55; family consisting of himself, wife, who earns Rs 15 and her food as a cook, old father, who earns Rs 20, and two young children at school.

The Local Purchasing Value of Money

It is important for the housekeeper to understand the purchasing value of money in her own district—not only its general purchasing value, but its variation in her own town for different commodities from day to day. If she lives in a large city, she can see the daily quotations made in the daily papers for different classes of goods; if in a smaller town, she should herself go to the market and learn the current rates. (See today's quotations in any important daily paper.) Thus she will be sure that she is getting good value herself or through her servants.

The good housekeeper must also, in making her purchases, consider four other factors. They are:

1. Whether to buy in bulk or in small quantities.
2. Whether to pay ready-money or to buy on credit.
3. Whether to be tempted by low prices.
4. Whether to buy things locally or from a distance.

Buying in bulk. The wise housekeeper will certainly buy in bulk—generally sufficient to last a month or two—such non-perishable goods as the different varieties of grain and pulse, and also such things as sugar, coffee, beans, tea and certain kinds of nuts and spices; and also fruits and vegetables for preserving, firewood, and cloth for clothes or household purposes. A considerable amount of both money and time may be saved by purchasing in bulk. But the housekeeper must consider whether she has proper means of storage. Without them she will lose instead of gain. The very poor, buying from day to day, cannot afford to buy in bulk and so, though poor, often have to spend more for the value they receive than their richer neighbours.

Paying ready-money. The danger of not paying ready-money for everything is that one may spend more than one realizes and more than one can afford, and then, when the day of reckoning comes, not have enough to pay the bill. Many young housekeepers have got into serious difficulties because of keeping running accounts instead of paying ready-money. It is so easy, if one wants something for oneself or the household, to have it 'put down to one's account', whereas if the cash had to come out of one's pocket and be paid on the spot, one would very likely find that one could not afford it and could do quite well without it. But if one has a good-sized household to run, and knows one's income and what one can afford, and has strength of mind not to exceed it, then weekly or monthly accounts for such things as milk, bread and dry goods, are a great convenience to the housekeeper. Such accounts should be settled at least every month. If one gets into the habit of keeping running accounts greater than one can pay each month, one loses one's freedom of action. If one has a large account with one shop, one does not feel free to deal with another shop, though the goods in the latter may be better and cheaper.

Cheap goods. Generally speaking, it pays to give a good price for an article, if one knows that one is dealing with an honest man. But when special circumstances cause a commodity to be cheap, then we should not hesitate to buy it if we are in need of it. If we want to preserve or pickle vegetables or fruit, we should look out for the time when the dealers are selling their goods cheap for the reason that if kept longer they would perish. Do not buy tinned goods that are being sold off cheap. They have generally been in store some time and may be tainted when opened. In the sales in the big cloth-stores, good bargains may often be picked up in the shape of remnants and ready-made clothes; but do not buy merely because things are cheap. Unless you really need an article, it is waste of money to buy it, especially in a tropical land where insects are on the look-out for food.

Buying locally. Support home industries as far as possible, buying at local shops and markets. But always compare your village prices, especially in the case of goods imported from abroad or outside, with those obtaining elsewhere. Take tea and coffee, for instance. One can often get a better article at a lower rate by sending for ten or more pounds at a time from a distant tea or coffee plantation than by buying from a local shop. If you are travelling in a coconut-bearing district, it will pay you to bring home a sack of nuts. Milk and ghee from a not too distant village will often be much better and no more costly, even when a mazdoor is given something for bringing them, than milk and ghee purchased in the town.

What is your district noted for? What commodities are locally cheap? What articles would it be better to purchase from outside? What large market is near you?

Co-operative Stores

People often feel that they are paying too much for the necessary things of life, especially food and cloth. When this is so, it is generally because the middleman, i.e. the tradesman who acts between the producer (the man who grows, say, grain) and the consumer (the man who eats it), needs a profit for himself. He earns his living by buying from the former and selling to the latter. Such a man must, of course, make a profit on his transactions, as that is his way of earning his living. And he is very useful to both producer and consumer. Would it be convenient for you to send to the farmer or to the weaver every time you wanted a seer of grain or a few yards of cloth? And would it be convenient for the farmer or the mill manager to serve people all day long? Discuss this in the class. But when, in the past, the middleman charged too much to his customers, a number of them determined to set up shops on money contributed by themselves and appoint paid managers and assistants to run them. People who invest their money in this way are called shareholders or members. Current market prices are charged for goods, but a certain percentage, generally 5 per cent, of the profits that accrue are divided among the shareholders, and the rest among the purchasers, member purchasers being given twice as much as non-members. As the managers and buyers are appointed by the consumers themselves, they claim that they can buy goods of the best quality, and, by having the profits returned to them at intervals, whether as cash or as goods, they pay less for them in the end.

It is worth the while of all careful housekeepers to study the co-operative stores in their neighbourhood. Are there co-operative stores in your town? Some schools have a store of their own. Have you? How does it work?

Managing the Family Income

Keeping accounts. By whatever method she purchases, the good housekeeper must keep a strict account of all she spends, so that at the end of each month she may know how much she has given for each item and see whether she has kept within or exceeded her budget. She should keep two books, one into which she should enter in order each item as she pays for it, the other into which everything should be arranged under different heads.

At the end of each month the month's accounts should be made up and compared with those of the month before. It is also interesting to compare with the corresponding month in other years. Keeping accounts is a good check on extravagance, and in time it enables one to be a good judge of what money will buy. Do you keep accounts? Do you compare one year's expenditure with another's?

Start from now and keep an account, with items under various headings, of what you spend on school stationery books, etc. and compare from year to year. Draw up a week's imaginary accounts for any of the families suggested above. Examine different types of account books.

Provision for the future. This belongs not so much to the housekeeper as to the head of the family, who is generally a man. But it sometimes falls to the woman to do it, too. There are several ways of providing for the future of one's family after one's death, or for oneself in old age when one will no longer be able to earn. Some people simply let money accumulate in a bank or elsewhere; some invest it, hoping that the investment may be sound; some buy house or land property, thinking that they will bring in an income for their heirs; while many insure their lives with some insurance society. For a man of limited income, the last is the most satisfactory method. The amount to be paid each year is comparatively small and, if a good society be chosen, the money is safe and sure. Let us take an example.

Mr X, 28 years of age, drawing Rs 150 per mensem, wishes to leave behind him, when he dies, enough to pay the expenses of his burial and to leave a sum for his wife and family. By paying, let us say, Rs 36 per year (i.e. Rs 3 per mensem) into a society, he can be sure of about Rs 1,000 at his death. Or he may want a pension for himself and his wife, or for whichever survives the other. Study actual tables of different insurance societies. They can be obtained from societies in your town.

When you thus pay into a society you are said to buy a premium. The younger you are when you start, the smaller is the yearly amount to be paid. Do not buy a premium from any society until you have assured yourself, on the advice of a sound business man, that it is a trustworthy concern. The managers of the insurance societies invest the money paid by the clients, and generally invest well. Sometimes, however, like banks, these societies fail, and then all or part of your savings may be lost.

The principle of insurance is extended to cover accidents to oneself or to one's property by fire, in travelling, etc. so that the value of what is lost may be recovered. A young father may also insure for his children's higher education or for his daughters' dowries. By buying a premium at his child's birth, he will receive, when the child is old enough to go to college or when he comes of age or marries, a sum large enough to be of substantial use. The great advantage of buying a premium in a good insurance society is that a man pays out of his income a sum which he does not feel much each month, while the benefits secured are greater than can be secured in any other way. He may die after making only one annual payment, yet his heirs will recover the same amount as if he had paid for forty years. How can the society afford to pay?

Surplus income. A man with a moderate or good income does not need to spend it all in maintaining himself and his family. He has a surplus, i.e. something left over. What shall he do with it? In olden times men often used to hide it in secret places through fear of robbers. Sometimes they would trust no one with their secrets, and would die without telling anyone. Even to this day treasure that must have been buried in this way is sometimes accidentally found. Sometimes articles of value—jewels, gold, ornaments, handsome brass or copper vessels, etc.—are bought as a means of storing wealth. In modern times most people keep their surplus money in banks, or invest it in different business concerns. A bank is a business house that takes charge of people's money for them, letting them draw it out at need. The bank directors like the managers of insurance societies, have the right to invest, i.e. to lend out at interest, the money thus entrusted to them. When you thus store your money in a bank you are said to open an account with that bank. When you put money into the bank the amount is written in your deposit book. When you wish to draw out your money, you sign a paper called a cheque, which is simply a request or order to the bank to pay the amount stated therein either to yourself or to the person named. If you are sending a cheque by post or want to make quite sure that only the person named therein shall cash it (i.e. be paid the money), you cross the cheque with two diagonal lines and write the words '& Co.' between them. It can then only be paid through a person with a bank account. Sometimes two people have a joint account, i.e. own in common the money stored in the bank. In that case they may agree that the signatures of both are necessary or that the signature of either will be sufficient.

When a man receives a cheque he must sign his name on the back, in token that he has received the money. He is then said to endorse it. The bank keeps all these endorsed cheques and enters the sums paid in a book, called a pass book, which is generally made up every month and sent to the man who has an account, so that he may see how he stands. Sometimes a man thinks he has more money in the bank than he actually has and pays someone a cheque representing more than the money he has in the bank at the time. He is then said to overdraw his account. The manager of a bank will often allow trusted clients to overdraw, charging interest on the overdrafts. A man may keep two accounts at the bank, one for current expenses, called his current account, on which no interest is usually paid by the bank; the other for money which he does not wish to use at once, and which he cannot draw out without giving notice. This is called a deposit account, and on it he receives interest.

Examine some cheques, pass books and deposit books.

Banks, like insurance societies, sometimes fail, i.e. the directors make speculations with the money entrusted to them and lose so heavily that they cannot go on; or sometimes a dishonest manager will rob the investors of their money. In such cases the investors lose all or part of their money. But banks with a good reputation do not often fail. So, though there is some risk in banking, the system of banking is a much better way of storing one's money than that of burying it in the ground or buying ornaments.

When a bank fails, the shareholders and depositors generally receive some part of their investments or deposits. The proportion the bank is able to pay is expressed as so many annas in the rupee—eight, twelve, or four, etc.

People with an account at a bank usually pay their monthly accounts, servants' wages, rent, etc. by cheque. Thus it is easy to see what payments have been made.

If people have larger sums of surplus money than they wish to keep in a bank, they generally invest it in some business concern in consideration of so much money being paid to them every year on each Rs 100 lent. Such business concerns are railways, tramways, motor bus lines, factories, mills, cement works, etc. You have learnt, in your lessons on arithmetic, all about stocks and shares and the method of buying and selling them. Nearly all the big concerns in a country are carried on on borrowed money, i.e. money invested by those who own surplus wealth. This invested money is called capital, and, as you already know, the money paid yearly on capital is known as interest. If you have money to invest do not be in a hurry. If you have in your family no man with a good knowledge of business, consult a good lawyer or a banker. But remember that some lawyers, for their own advantage, deceive wealthy people with money to invest. Even when you know that your lawyer is trustworthy, be sure that you understand the nature of the concern in which you are investing your money and judge of its chances of success. You can, as the saying is, 'watch the market' in the columns of the larger daily papers.

Study the business columns of the press and watch the daily changes in the buying and selling rates of, and in the interest given by, definite big concerns—mills, cement works, etc. If you can do so, buy a share in some concern as a school or a class, each member contributing so much, and make it the basis of various problems in money matters. Examine some papers now and see in which concern you would like to invest if you had money.

Deficiency of income. While some people have a surplus every year, there are very many people who cannot 'make both ends meet'. Such people spend beyond their income and are consequently in debt at the end of the year. If you ever find yourself in this state see that it does not continue. Rigorously cut down your expenses.

Spend less on everything but food, and even in food, if you find you have been wasteful or extravagant. Examine your accounts and your budgets. Do with less household service, buy less expensive clothes; in short, do anything you can to live within your income. Save something each year, even if it is only a few rupees. But, however careful you may be, unexpected losses or misfortunes may occur and you may find it impossible to get on for a time without help. You then look for someone who can help you. If you have a banking account and are known to the manager of your bank as dependable and businesslike, you will very likely be allowed an overdraft at small interest. You may have to deposit at the bank some valuables, such as jewellery or an insurance policy, as what is called security, until the loan is paid back, or some friend with an account in the same bank may stand surety for you. If you have no dealings with a bank, perhaps you may get an advance on your salary and agree to pay back so much every month. Or perhaps a friend will lend you the money at low interest, or you may sell something of value. If all of these fail you and you have recourse to a professional moneylender, be sure you understand the terms on which the money is lent and see to it that it is paid back as early as possible. All moneylenders charge high interest. Some are honest men and, though they charge you high interest, carry on their business in a straightforward way. But some are not honest; they rely upon the ignorance of their debtors to keep them enslaved for years. Make sure of the following points: (i) The rate of interest charged; (ii) whether it is per annum or per mensem; (iii) the terms on which the debt is to be refunded.

People are often ashamed of going to a moneylender, and in their shame and confusion often sign their names to the documents offered to them without realizing the full meaning of their contents. Do not do that. Write down the terms of agreement, take them home and study them, that you may see exactly how much the loan is going to cost you, and take with you, when you go to sign the agreement, a reliable man, who has your interest at heart. But, if you can, beware of borrowing. Remember: 'He who goes a-borrowing goes a-sorrowing.'

Government has in many districts established co-operative banks, which help their members in times of distress and especially during agricultural depressions.

As you must know, there is in India an enormous amount of indebtedness to moneylenders, and very much of it is due to the custom of spending large sums on caste dinners and marriage dowries. Thousands of people spend very much larger sums than they can possibly afford because they have not the courage to break a custom, which probably had its social uses in olden times, but which is often only a form of slavery now. It is not really being either honest or wise or kind for a man to borrow heavily for his marriage, only perhaps to die long before the debt is paid. Many a child is born in debt, and a larger number inherit only debts at their fathers' deaths.

If a man's affairs are hopeless, i.e if there seems no reasonable prospect of his ever being able to clear himself and pay his debts, he may declare himself, or his creditors (i.e. those to whom he owes money) may declare him, to be bankrupt. When a man is declared a bankrupt all his property, with the exception of his wife's property and certain things by means of which he earns his livelihood, may be seized by his creditors and divided among them.

Sometimes his property, when sold, will pay all his debts; but more often it will not. The portion he is able to pay is expressed (as in a bank that fails) as a part of a rupee. Sometimes, if his creditors wish to spare a man the name of bankrupt, they will make a private agreement with him that he will divide among them all his available assets, and in return they undertake to give him a receipt for the money owed in full. The man who does this is said to make a composition with his creditors. When once a man has been declared bankrupt, or has made a composition with his creditors, he is declared to be free forever from the debts concerned. Even if he again becomes wealthy he is not legally obliged to pay, though an honourable man will always choose to do so. Often a man has to become bankrupt through no fault of his own. War, failure of crops, illness and other causes may ruin his business.

One way of raising money in difficult times is to pawn goods, i.e. to sell them on condition that one may, if one wishes, redeem them for a certain higher price, if this is done within a certain stated time.

Another way is to raise money on land or house property by giving a mortgage on it, which is something like putting it in pawn. The owner keeps the property, but borrows money on it. If he does not pay back the money according to the condition made, he has to give up the land to his creditor.

THINGS TO DO

Practical work

1. Visit the local markets to see (i) what commodities can be purchased there, (ii) the state (hygienic or otherwise) in which they are kept.
2. Visit some institutions in your neighbourhood that are managed entirely by women.

3. .Make an inquiry into the working of any co-operative stores in your town, and see whether you would think it worth while, if you were a housekeeper, to become a member.

Oral and written work

1. If you had Rs 5,000 surplus money, name the concern in which you would invest it, giving reasons for your choice.
2. Which commodities do you think it desirable to buy in bulk in your neighbourhood? How would you store them?
3. How would you propose to diminish and gradually do away with the great indebtedness of India's poor?
4. Do you think it advisable to keep your money in a bank when banks may possibly fail? Explain what happens when a bank fails.
5. Describe all the (i) burdens, (ii) responsibilities, (iii) privileges of being a citizen of your city, town or village.
6. What public matters were discussed at the last meeting of your panchayat, or municipality, and the legislative council of your province and the Legislative Assembly at Delhi?
7. What are the different ways of supplementing the family income?

CHAPTER X

THE WORK OF THE HOUSEHOLD

REQUIRED: A calendar.

THE work of the home has for its object the convenience, health and comfort of those who dwell in it, and it is on the mistress of the home that this work, or the direction of this work, falls. It is no easy matter to run a home in such a way that the object given above is attained. Home-making is generally regarded as unskilled work, but in reality it requires trained intelligence, extensive knowledge and good powers of organization.

THE KINDS OF WORK THAT NEED TO BE DONE

The work of an ordinary household can normally be divided under the headings of Food, Shelter, Clothing, the Care of Children and Health.

Under Food will come the buying, storing, preserving, preparing, cooking and serving of food, with the cleaning of the utensils used.

Under Shelter, the cleaning of the home, and its furniture and ornaments, keeping it free from pests, trimming lamps, gardening, tending animals, and household repairs.

Under Clothing will come mending, making, and laundering.

Under the Care of Children will come (in addition to feeding and clothing them) bathing, training and occupying them, and (when older) getting them ready for school.

Under Health will come a consideration of all four topics from the hygienic point of view, besides a study of the human body, the formation of good habits, the care of invalids, and a knowledge of first-aid to be rendered in times of emergency.

You will see that if all these things are to be done well the mistress of the home must have a good plan of work, or some things will be left undone and others will be badly done. The methods of carrying out these different tasks are considered in other parts of the book. Here we have to arrange the time taken and the order of doing them.

Just how they should be arranged depends on the size of the household, and the amount of help that the mistress can rely upon.

Houses may generally be divided into three types: (i) the small home, in which all the work is done by the mistress herself; (ii) the middle-sized home, in which the mistress is helped by other members of the family, such as daughters-in-law, a widowed sister, aunt or other relative with a visiting servant; and (iii) the large household, in which several servants are kept.

Pause for a minute and consider from which of these three types of home you yourself come, and how the work is arranged in it.

However it may be, the mistress, whether she does the work herself or through others, should understand how each task is done, for then only can she in the one case carry it out effectually, or in the other sympathize with the difficulties of the workers, appreciate their abilities, and gain their respect. Workers in every department of life prefer to work for a skilled rather than an unskilled chief. We will consider in turn:

1. The amount and variety of the work.
2. The division of the work.

3. The place
4. The time } of doing it.
5. The order

THE AMOUNT AND VARIETY OF THE WORK

The amount of work must be regulated not only by the number in the family, but also by the number of workers available. If one woman has to carry out all the tasks, she must confine herself to simple necessities. We sometimes see a woman making herself a slave to unnecessary furniture and ornaments, and overworking herself in consequence; or else we see a house overloaded with badly kept luxuries. Bright-coloured purdahs, clean covers, well-polished brass or copper utensils form the natural ornaments of a simple home. If you have to do the work of your house unaided, yet possess beautiful ornaments, keep out only one or two at a time, and put the rest carefully away until such time as you can have help in your work.

The work of the house may be divided into the following four main headings:

1. *Daily routine work* is that which must be done daily, whatever befalls, such as attending to religious duties, preparing meals, some cleaning of the house furniture and lamps, tending animals, bathing and caring for children.

2. *Regular periodic work* is that which need not be done every day, but occurs once a week or at other stated periods. Such work consists of a variety of things, as:

(i) Washing and ironing clothes.

(ii) Special thorough cleaning of all rooms in turn.

(iii) Putting disinfectant down drains, or kerosene on pools of water.

(iv) Mending clothes.

(v) Special polishing of metal objects or utensils.

(vi) Seeing to household repairs.

3. *Occasional work* is more or less like periodic work but occurs at wider intervals. It covers such things as:

(i) Jam- or pickle-making at the right seasons.

(ii) Dealing with insect pests according to seasons.

(iii) Preparing for religious ceremonies and social festivals.

(iv) Making clothes, whitewashing walls, cleaning wells.

(v) Renovating furniture.

Mark on your calendar the months in which you will do these special tasks.

4. *Extra or unforeseen work.* This would cover work connected with accidents, illnesses, marriages, births and deaths, or the sudden arrival of guests; or repairs needing immediate attention.

Discuss these points and others that you can think of.

The Division of the Work

If the mistress has helpers, she must divide the work, as far as she can, according to her helpers' tastes and abilities. She herself probably excels in one line or more, let us say in cooking and the care of children, and will want to keep these for herself. Then she will allot to others house-cleaning, needlework, laundering and the care of the garden. Or she herself may do best in gardening and needlework, and prefer to hand over the cooking to others. Or, again, she may be the wife of an official or wealthy man who has to entertain in a large way, or she may have to add to the income by helping the business of her husband or by working at her own profession; in these cases she will have no time for anything but the general organization of the work of her household. In whatever way she arranges it, she should manage that each worker has work she enjoys, can be made responsible for, and can take a pride in. As the children grow big enough they can be given certain tasks of their own, and this is better for them than being merely at the beck and call of everyone, though they should help anywhere when needed. If you were the mistress of a house which work would you choose for yourself?

THE PLACE OF WORKING

Every group of tasks should have allotted to it its own place where all the equipment belonging to it may be kept, and where, in some cases, the work may be performed. To begin with, the home-maker needs her own housekeeping corner where she keeps her small housekeeping library. She also needs a desk or writing table in which to keep her records and at which she can sit to plan out her work and make up accounts. The food workroom is the kitchen and veranda attached, and generally food equipment is kept in its proper place. But in how few houses do we find a corner devoted to textiles? And yet it very much lightens our work and also tempts us to sit down to it if we know that our work bag or box, with thread, needles and scissors, and our embroidery frame or sewing machine or spinning wheel with all accessories, and a chest of articles needing completion or repair, are all awaiting us in a pleasant room or veranda. When household articles have been washed they should be sorted out, and all needing repair put into the mending chest.

The same applies to laundry work, carpentering and household repairing, house-cleaning apparatus, gardening, health and child-rearing. A separate room can seldom be given up to each of these things, but one corner of a veranda can be fitted up with a carpenter's bench, and a cupboard with shelves containing a repair outfit, tools and glue, another corner with house-cleaning apparatus, brooms and brushes, clothes and pails, with a shelf for bottles of polishes, lamp-trimming scissors, etc. In or near the mother's bedroom should be a cupboard, out of the reach of little fingers, containing all simple household first-aid remedies and disinfectants, and another cupboard stocked with household linen. Laundry work needs its own corner, with tubs, washers, boilers, drying cords, airers, soaps, soda, stain-removers, irons, ironing boards and starch bowls.

All this applies whether you carry on these operations on a large or a small scale, and whether you have full equipment or very few tools. In running a house efficiently it is essential to have 'a place for everything' and to keep 'everything in its place'.

In considering the place in which to work, the question of lighting arises. Arrange things so that the light falls on your work and not on your eyes.

Convenience in working must also be thought of. Whether standing or sitting on a chair at a table or on a stool, arrange everything within your reach. In planning a morning's work of house-cleaning, for example, arrange things so that you have as little going backwards and forwards as possible. Many workers are constantly going to different cupboards in search of things they need in cleaning, instead of thinking beforehand and taking everything they need at one time. We say of such people that 'their heads will never save their legs'.

THE TIME TAKEN IN DOING WORK

The sense of time is a natural gift, but it can be attained by everyone to a certain degree. Some people, however, go through life without it. If such people are home-makers you will often hear them say at night: 'I have not done half the work I had planned for today.' The reason is that having no sense of time, they planned what was impossible to carry out.

Have you ever timed yourself in carrying out any work? It is very interesting to see just how long it really takes for each different household task. When you once have an idea of the time needed, it is much easier to plan out your work for the day or week. Time yourselves in doing different tasks at home before your next lesson.

We have read about certain labour-saving devices. If you have the opportunity of using them, do so. You all know something about the fireless cooker, patent washing machines, electric cleaners, and so on. They are all very useful, and save time and labour. And if time is saved from house labour, the mother of the family has more time in which to be a companion to her children. She can also take more interest in civic affairs, and help in many ways in the spread of health and knowledge.

Another way in which time can be saved is by doing two or more things at once. If on a given morning you are going to do the ordinary house cleaning, cook the dinner and start the weekly wash, get up early and put the clothes on to soak. They will be soaking while you go round the house and do the necessary daily cleaning. Then, still leaving the clothes soaking, you can prepare food that can be cooked in a fireless cooker, such as rice, dhal and some kinds of vegetables. Put them on the fire, bring them to the boil, and then leave them to finish in the cooker. Now you are free to devote yourself for an hour or two to your clothes—wash them, boil or steam the white garments, hang them out to dry—and still leave yourself three-quarters of an hour for finishing off the dinner. 'One thing at a time and that done well is a very good rule as many can tell', is quite true; but in running a house it is often found that to do two or even three things at a time is a better rule! Your clothes may soak, your fireless cooker may cook, your dough may rise, all while you are doing the household accounts.

The Order in which the Different Tasks are Done

Closely connected with the time taken in doing things is the order in which they are done. In planning the order you are really making a time-table. But the time-table of a home-maker is not like that of a school or factory, for in the home the unexpected is always occurring. So the good house-maker will plan her work, and be prepared at any time to change the order of events.

In making out your daily scheme, do not forget to allow for some periods of rest and recreation, both for the house-keeper, her helpers and the children. And do not forget that the scheme is your servant, not your mistress. At any time something may occur that demands all your care and time—the illness of someone in your house, or some sudden occasion for rejoicing. For such occasions extra help can often be hired, or friends will come in and give a hand. But if they do not, some things must be left. Better cure your child of fever than do the ironing on the allotted day. Compare from the point of view of arrangement of time, the work of a house-maker with that of a clerk in an office. The work schemes of no two families will be alike. Do not try to attain uniformity. Your conditions and tastes and ideals may be quite different from those of your neighbours.

Some women think that matters regarding electricity, drainage and business, are too difficult for them to understand and so leave them to their husbands. This is a mistake. There is nothing in these matters that the ordinary woman of intelligence cannot understand quite well with a little time and attention. It is her duty, and should be her pleasure, to make herself acquainted with everything that affects the welfare of her home, for, as the great poet Milton wrote:

Nothing lovelier can be found
In woman than to study household good.

THINGS TO DO

Practical work

1. Plan out a week's work for the first week of (i) March, (ii) August, and (iii) October for the mistress of a family consisting of seven persons, only one of whom can assist her.
2. Plan out an ordinary day's work for your three helpers if you were the mistress of a large house and obliged to entertain a good deal.
3. Make a time chart for a day.
4. Write down the different ways in which time is wasted in an ordinary household.

Oral or written work

1. What preparations would you make for taking a large family from Madras to Calcutta?
2. If you had two helpers to share the work of your house with you, which work would you keep for yourself? Say why.
3. Give as many examples as you can to show that time may be saved by doing more than one thing at a time.
4. Discuss what you think are the necessary qualifications of a good home-maker.

SECTION TWO: CLOTHING

CHAPTER XI

FIBRES AND THEIR MANUFACTURE INTO CLOTH

REQUIRED: Fibres of cloth, silk, flax, wool, hair, artificial silk, rami, China grass, coconut fibre, hemp, jute specimens of yarn and cloth, implements for ginning, spinning, cleaning and weaving cotton.

WHAT is a fibre? A fibre is a natural thread-like structure. Some fibres can be spun into thread which can be woven into cloth. The fibres used in making clothing for our bodies or cloth for cleaning or decorating our houses or in rendering them comfortable are those of cotton, silk, wool, linen, hair rami, China grass, hemp, jute, the lining of the coconut shell, artificial silk, gold and silver or tinsel thread, and asbestos. Let us examine specimens of each.

Cotton is well known to us all. The fibre (Fig. 66) is a vegetable growth found attached to the seed and closely packed with others inside the boll (Fig. 65) (i.e. the seed vessel), of the cotton plant. There are several kinds of cotton plants, .from the cotton herb (by a herb we understand a smallish plant with a soft stem that dies down every year) to the cotton tree of South America, growing as high as fifteen feet. The chief

FIG. 65 Cotton boll

cotton-growing countries are India, China, the United States, Brazil, Uganda, Egypt and Cyprus.

Now examine some raw Indian cotton as it comes direct from the *boll*. It is made up of a mass of very fine white fibres, the length of which vary from three-quarters to one inch. The fibres of the best American cotton vary in length from one and a half to two and a half inches. The cotton fibre (Fig. 67) is flat like a ribbon, slightly thickened at the edges, and has a natural twist in it, which enables the fibres easily to hold to one another when spun. Were it not for this twist the fibres, being so short, would tend to come out from the cloth.

FIG. 66 Fibre on cotton seed (*Actual size*)

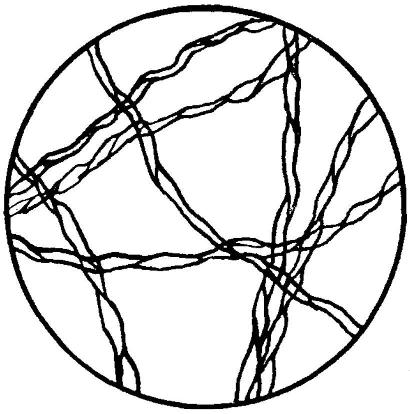


FIG. 67 Cotton fibre (x 100)

Do any other plants produce soft white fibres? *Linen*, another vegetable fibre, is being used more in India. It comes from the bast (i.e. inner layer of the stem) of the flax plant. This plant is grown in India chiefly for the sake of its seed, from which the valuable linseed oil is made. The chief producers of flax are Russia, Ireland, Belgium, Holland, France, Italy and Egypt. The best fibres come from Belgium and Holland, but Irish linen is also much prized. Open the stems of different plants and examine some fibres.

The linen fibre is usually about twenty inches in length, but may be as much as thirty-six. It has no twist in it, but has occasional little cross lines, looking like joints (Fig. 68).

Silk, an insect fibre (Fig. 69), is produced by the caterpillar, called a silkworm, of a whitish-coloured moth. You have probably kept silkworms at home or at school, and know that, like all insects, the silk moth passes through four stages—the eggs, the grub, the pupa and the perfect insect (Fig. 70). When the caterpillar emerges from the egg, it eats the leaves of the mulberry tree (or generally the castor oil plant on the Indian plains) for four or five weeks, during which time it grows a new skin and bursts out of its old one four times. It then stops eating, and seeks some support on to which it can suspend itself while in the chrysalis stage. From two tiny holes in its mouth it produces the fibre we know as silk. As it comes out of the silkworm it is covered with a gummy fluid. The two fibres unite into one thread and soon dry and harden in the air. Having fastened itself to its support, the caterpillar covers itself all over

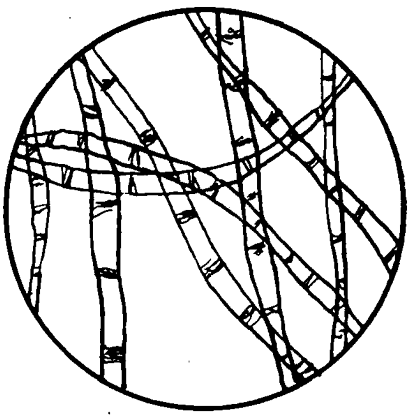


FIG. 68 Linen fibre (x 100)

with silk fibre. To do this it turns its head round in the form of a continuous figure 8, and cleverly jerks the thread just where it wants it to go. You can watch it at work in the early stages until it has covered itself with silk. When this is done, it still goes on inside its silken covering spinning silk from the inside of its body and throwing it round itself. As it cannot eat, it naturally grows smaller and smaller until at last, after about three days, it has spun up all the material it has. Then it goes

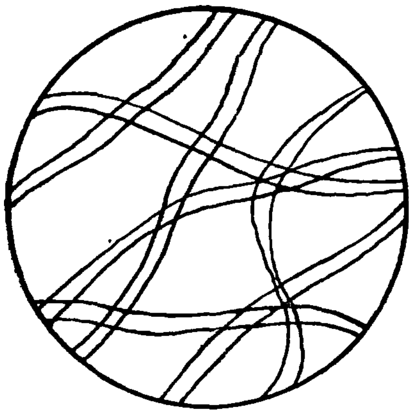


FIG. 69 Silk fibre (x 100)

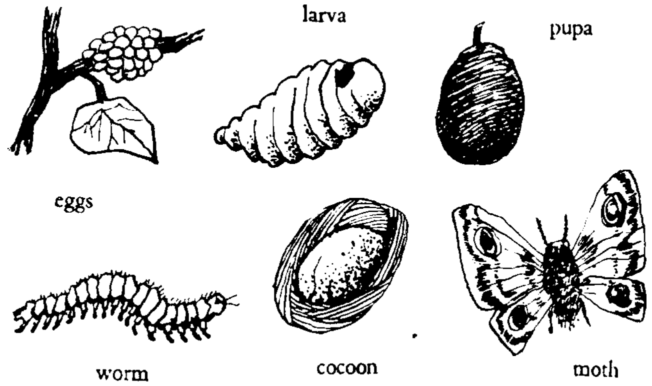


FIG. 70 Life cycle of the silkworm

to sleep for three weeks, at the end of which time it has turned into a perfect moth, which, if allowed, will eat its way out of the silken nest it has made.

The silk fibre spun by the caterpillar is from 300 to 1,400 yards long. In appearance it is smooth, with occasional little leaf-like deposits of gum on its surface.

Wool, a fine fibre from the thickly matted fleece that grows on the back of a sheep, is in many ways like hair. Examine hair and wool and discuss the difference between the two. The wool of sheep and goats is made up of excellent fibres.The fibre varies in length from two to eighteen inches, and also varies greatly in fineness. On the whole, the Saxony and Silesian wools stand first.

The wool fibres (Fig. 71) are covered with minute scales, which cling to each other and enable the short fibres to be spun into thread. They have another use that will be seen later.

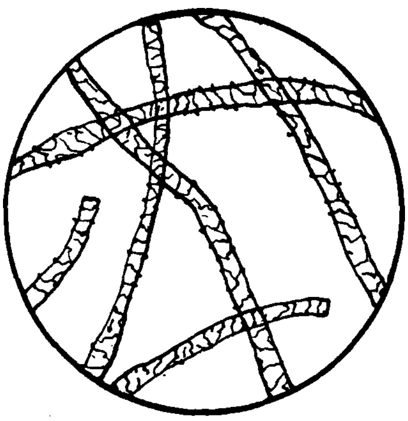


FIG. 71 Wool fibre (x 100)

Hair is the natural covering of many animals. A coarse cloth is woven from the long hair of the horse's tail, and the shorter hairs from some other animals are used, with wool, in the manufacture of cheap blankets and rugs.

Rami, which when prepared is known as *China grass*, is, like linen, a fibre from the bast of the stalk of a plant. It is grown in India, China and Japan, and also in America and France. It somewhat resembles linen. It will probably increase in importance as time goes on. Fine household articles, like tablecloths, are made from this fibre.

Hemp is the name given to a fibre procured from the bast of several plants. Its fibre makes strong ropes and cables, and is used for coarse, heavy cloth, such as sails for ships.

Jute, a fibre coming from a plant belonging to the lime tree family, is very coarse and is used for making sacks and certain parts of rugs and carpets. Much comes from Bengal.

Coconut fibre is, as we have already seen, found lining the outer shell of the coconut. It is used for coarse matting.

Artificial silk is made from wood pulp and other forms of cellulose (the scientific name given to the substance that forms the framework of plants). The pulp is treated with chemicals and then passed through capillary tubes to whatever length is required. The fibre thus formed looks like silk.

Gold and silver thread and tinsel (a name given to any bright metal beaten and cut into threads) are woven, with silk, into cloth. The famous Banaras saris are examples of gold cloth.

Asbestos is a rock found in some parts of Europe and America, which, when crushed, does not crumble into powder but splits into fibres, that can be woven, with cotton fibres, into cloth. The cotton is burnt away, leaving a non-inflammable cloth, which is used as a fireproof material.

Of all these fibres, cotton, linen, silk and wool are the most widely used.

The Qualities and Uses of Different Cloths

We buy cloth for its beauty or its usefulness. The qualities in a fibre determining beauty are smoothness, softness, glossiness, fineness, and an affinity for beautiful and delicate shades of dye. Qualities determining usefulness are strength and durability, warmth (or coolness), washability, the property of resisting dirt, absorptiveness (or the opposite).

Silk is the most beautiful of all the fabrics; it possesses all the qualities for beauty named above. It is also very useful, being strong and durable, warm and able to resist dirt. It is used chiefly for good clothing and house furnishing, but is costly. Silk washes quite well.

Linen possesses in a lesser degree the many beautiful qualities of silk; but it has not the same affinity for colour. It is the strongest of all the fabrics, and has a natural firmness that belongs to no other. It washes very well and is very absorptive, for which reason it makes the best towels for toilet and household purposes. It is very cool to the touch. It is used for table covers, bedsheets, wiping cloths and also for clothing.

Wool has a beauty of its own, but cannot be compared with silk, except in softness. It dyes well. Its chief characteristics is its warmth combined with lightness, which makes it by far the best winter cloth we have. It does not wash well, unless special care is taken.

Cotton is neither so warm as wool or silk, nor so cool and strong or absorptive as linen, nor so beautiful and dirt-resisting as silk. But it makes, considered all round, the most useful of fabrics and is a most excellent washer. It absorbs moisture well, but does not take dye so well as the other fabrics. It can be used for all household purposes and for clothes of all kinds. Cotton is the cheapest fabric we have, and when spun fine and woven and well dyed in colours, it looks attractive. It certainly has a beauty of its own, as we see in fine Dacca muslins and mulmuls.

Adulteration of cloth. All the cloth we buy is not what it claims to be. It is sometimes mixed with inferior material, and is then said to be adulterated. The better fibres—wool, silk and linen—are all liable to be adulterated with cotton, silk with linen, and wool with shredded fibres of old woollen cloth. Cloth from the last-named is called shoddy. The foreign fibres may be combed in with the fibre to be adulterated, or they may be twisted in when spun, or used as either warp or woof in weaving.

It is quite legitimate to mix fibres for the purpose of producing a cheaper or, sometimes, a stouter material, and to sell the products as 'mixed goods' at a lower price. But often a high price is paid for an inferior cloth.

Buying and testing cloth. A considerable part of one's income is spent on cloth, either for personal or household use. Therefore, if the housewife is to spend her money wisely, she must not only understand the actual value of the piece of material she wants to buy, but also the qualities of the different fibres used and the uses of the different cloths made from each. She must know whether (i) it is likely to wear well, (ii) it will shrink in washing, (iii) the colour is fast, (iv) it has been dressed and weighted and calendered to make it appear better than it really is, and (v) it has been adulterated.

When buying she should be able to practise some suitable tests. For this purpose, when in doubt, ask for a sample of the cloth you are considering.

Strength and durability. Much can be learnt by a practised buyer from the look and 'feel' of the cloth.

The cloth may be pulled in all directions to see whether the woven threads move easily from their places. Close, firm, even weaves generally wear better than loose irregular ones. Again, a few strands from both warp and woof should be unravelled, and tested for strength. If they are not easy to break the cloth will probably wear well. Or hold the cloth up to the light and notice the closeness and regularity of the weave.

Shrinking. Measure carefully a small piece of cloth. Wash and iron it in the ordinary way, and measure carefully again. If the two measurements are found to be the same, you may be satisfied.

Fastness of colour. Cut out two pieces of the cloth. Wash one of the pieces in hot soapsuds and iron in the ordinary way. Expose the other to strong sunlight for a week. Compare both with the original.

Sizing and weighting. Tear rapidly a piece of the material to be tested. If much dressing has been used it will fly out in a powder. Or soak in water and look for any sediment.

ADULTERATION OR SUBSTITUTION

Wool or silk with cotton. (i) Use the eye, assisted by a magnifying glass, if possible. Cotton fibres are straight and dull; wool fibres, curly and more lustrous; silk fibres, glossy. (ii) Pick out separate fibres and burn them. Wool and silk burn with difficulty, giving out a disagreeable smell. Cotton is cellulose and, as we have seen, burns very easily. Place a small piece of pure cotton cloth, a small piece of pure woollen cloth, and a small piece of silk cloth, in a flame, and note the difference. Do the same with a mixed cloth. (iii) Make a solution by dissolving one ounce of caustic soda or caustic potash in a pint of hot water. Boil in it small pieces of cloth made of cotton, wool, silk, wool mixed with cotton, and silk mixed with cotton. The wool and silk, containing nitrogen, will be dissolved within fifteen minutes (the nitrogen undergoing a chemical change), the cotton remains practically unaffected. (In these tests, linen is affected in the same way as cotton but linen is not so often used for adulteration.)

New wool and shoddy. Shoddy fibres are generally much shorter than the fibres of the new wool, and are of different lengths and thicknesses. Under the microscope shoddy fibres are seen to be worn and damaged and sometimes of a different colour.

(i) Examine fibres under a microscope or a powerful magnifying glass.

(ii) Tear a small piece of cloth; that cloth made from shoddy is much weaker than that made from new wool.

Linen and cotton. (i) Tear a piece of linen and cotton cloth. Linen cloth is harder to tear, gives out a shriller tone when torn, and is left with fibres more irregular in length than cotton.

(ii) Feel and weigh similar pieces of linen and cotton cloth. Linen is heavier than cotton, and much cooler to the touch.

(iii) Hold up linen and cotton cloth to the light. Linen threads in warp and woof are always more uneven than cotton threads.

(iv) Drop some water on linen and cotton cloth. Linen absorbs water more rapidly.

(v) Do the same with oil or glycerine and hold the cloth up to the light. The linen (if free from dressing) looks much more transparent than the cotton.

If in the last two tests irregularity of spreading or of transparency appears, the cloth is mixed.

Silk and artificial silk. (i) Examine silk by sight and touch. The lustre and feel of pure silk are softer than of artificial silk.

(ii) Burn some fibres. Those of artificial silk, being made of vegetable matter, burn rapidly and smell like burnt paper. Real silk when burnt smells like burnt hair or burnt feathers.

(iii) Wet some silk and some artificial silk. Many varieties of the latter become weak in water, so that any pressing or rubbing produces a hole.

(iv) If pure white silk and artificial white silk are placed in a caustic potash solution, the former remains unchanged in colour, the latter turns yellow.

By using and acting upon these tests at home, you may assure yourself that in the cloth you buy you are getting good value for the money you spend.

Things to Do

Practical work

1. Examine fibres of cotton, wool, linen, pure silk and artificial silk under a microscope and draw them as they appear to you.
2. Test cloth of different kinds for strength and durability, shrinkage, colour and sizing.
3. Test, by boiling (with acids and alkalis) and burning, pure and mixed cloths.
4. Make an album of the different kinds of textiles available.

Oral and written work

1. Describe and name the uses of the principal fibres and the cloth made from them.
2. Name and describe fabrics other than woven ones.
3. Classify fibres in three main classes giving reasons.
4. What qualities in a fibre determine (i) its beauty, (ii) its usefulness?
5. Compare silk, linen, wool and cotton with regard to (i) beauty, (ii) usefulness.
6. What points must be remembered when purchasing cloth?
7. How would you distinguish between (i) pure silk and artificial silk? (ii) Pure wool and wool mixed with cotton? (iii) Linen and cotton?

CHAPTER XII

CLOTH AND CLOTHING

REQUIRED: Specimens of cloth and other materials mentioned in this chapter, stores' catalogues.

MEN clothed themselves first with the natural coverings of other animals, such as skins and feathers, or used the bark or leaves of trees. Their first desire may have been to keep themselves warm or to adorn themselves. Later came the ideas of fashion and decency. We still clothe ourselves for the same reasons: warmth, beauty, fashion and decency.

CHOICE OF CLOTHING

In selecting clothing we have to keep in mind three things: beauty, use and cost. It is not vanity, though it may degenerate into vanity, but a natural and right feeling of self-respect that prompts us to want our clothes to be as charming as they can be. In choosing any garment for its beauty let us consider the following:

1. *Its intrinsic beauty.* A Banaras or Dacca sari, a rich brocade for the hanging of a palace, are beautiful in themselves; a simple white mulmul, if spotless and well draped, is also beautiful.

2. *Its harmony* with the garments with which it is to be worn. Here we must consider *material* and *colour.* A soft, expensive, silk sari does not go well with a coarse cotton blouse, nor a velvet blouse with a cotton skirt. Nor does an unwashable trimming look really well on a garment that has to be washed each time it is worn.

3. *Its suitability.* Large patterns and horizontal stripes and bands do not suit short figures. Soft, clinging drapery, hanging from the shoulders, helps to give an impression of height and slenderness. Unless you are tall, of fine proportions and commanding presence, avoid all startling designs and rich stiff materials.

As in the case of furniture, so it is with dress. That which is inappropriate, i.e. unsuited to the occasion or place, never satisfies our sense of beauty. A dainty pair of embroidered slippers worn while walking along muddy roads, an expensive sari worn while sweeping the floor, rich jewellery worn while attending a course on sick nursing, are all instances of things, beautiful in themselves, that lose their beauty through being in the wrong setting.

To feel that one is well and suitably dressed increases one's sense of self-respect. Is this sense increased if one wears fine garments outside and shabby ragged ones underneath?

4. *Its usefulness.* In choosing a garment our chief considerations will be: (i) The warmth or the coolness of the material chosen; i.e. whether suited to a hot or a cold climate. (ii) Its wearing qualities, i.e. strength and durability, fastness of colour, washing properties. (iii) The cost. Consider how much can be reasonably spent on clothes and keep within that limit.

Care of Clothing

Clothes will not last long, and will never look fresh and pleasing, unless they are taken care of. In order to get the best service from our clothes we should:

1. Mend small holes and tears as soon as they appear.

2. Replace fastenings, buttons, hooks and tapes.

3. Never put away unmended garments.

4. Never let clothes or cloth get very dirty or remain dirty. They should be changed frequently, and washed frequently by the best methods.

5. Keep dresses, coats and waterproofs hanging up on shoulder supports.

6. Fold all clothes smoothly and carefully when not in use, and put them away.

7. Never let clothes lie about.

8. Always remove pins from garments to be put away, or rust marks will appear.

9. Keep heavy garments, such as coats, well brushed.

10. Have a place for every different kind of garment, and keep them always in the right place.

11. Overhaul our wardrobe at the end of every season, and sell or give away such clothes as are no longer of any use. Never store things of no use.

12. Store in a special chest clothes that are not being worn. To keep away noxious insects use a tin-lined box, if possible, and spray with suitable insecticides. Do not put away clothes or linen articles with starch in them; it tends to rot them and attracts insects.

13. Re-dye faded garments that are not worn out.

14. Keep leather footwear well cleaned: when not in use, oil well and put away.

15. Take out and dry and air all clothes, not forgetting shoes, several times during the monsoon. If this is not done, they will be attacked by mildew—a minute plant favoured by damp that eats the surface of leather and cloth.

16. Mark with our names everything that is sent to the dhobi.

Clothing and Health

The value of clothes from the standpoint of health may be summed up in one word—protection. They protect us from (1) extremes of temperature, (2) wet, (3) injury, (4) disease germs.

1. *Extremes of temperature.* (i) Clothes keep us warm by preventing the natural heat of the body (98·6°F.) from escaping. We have already seen which materials serve this purpose best. Linen serves to conduct or take away heat from the body, and therefore feels cool to us. Cotton comes next to linen for coolness. Silk or wool, on the other hand, keep heat in and are called non-conductors.

Air also prevents the rapid loss of heat. Therefore, any cloth that is fluffed or napped (like flannelette) or that is woven with an open *mesh* (with little spaces between fibres), so that air is 'imprisoned' within the substance of the cloth, becomes warmer than it naturally is.

Besides the value of the fibre for conducting away or retaining heat, we have to consider (i) its porosity, (ii) its power of rapidly absorbing moisture, (iii) its capacity for absorption, (iv) its speed of evaporating moisture.

Its *porosity* is of importance in letting heated air and perspiration out, and in letting fresh air in. Non-porous material, such as waterproofs and rubber shoes, soon cause a feeling of discomfort if worn for long at a time. Usually woven wool is the most porous, silk the least porous material. But cloth made from all fibres is porous if woven loosely or with an open mesh. Knitted fabrics are generally more porous than woven ones.

The importance of absorption is easily seen when we realize that even in temperate climates the skin of a healthy grown-up person gives off daily, under healthy conditions, about fifty ounces of water. If perspiration is not absorbed or evaporated as it oozes through the pores of the skin, it clogs them and prevents further perspiration. This causes not only an uncomfortable depressed feeling, but also a slow poisoning of the body. Wool and silk have the greatest capacity for absorbing moisture. Linen absorbs more rapidly, but does not hold so much. It is equally necessary that the moisture absorbed by clothes should be rapidly evaporated, for if the underclothing remains damp we are liable to catch cold. Wool and cotton evaporate moisture slowly, linen and silk rapidly.

Now study the following, and decide which is the best fibre to use for underclothing, especially next to the skin in a hot and in a cold climate.

Wool is (i) porous, (ii) a non-conductor of heat, (iii) absorbs much moisture, (iv) evaporates it slowly.

Silk is (i) non-porous, (ii) a non-conductor of heat, (iii) absorbs much moisture, (iv) evaporates it rapidly.

Linen is (i) fairly porous, (ii) a very good conductor of heat, (iii) absorbs moisture rapidly, and (iv) evaporates it rapidly.

Cotton is (i) porous, (ii) a good conductor of heat, (iii) absorbs moisture rapidly, (iv) evaporates it slowly.

Wool, you see, is excellent, except for the one defect of evaporating moisture slowly. Silk is perfect except for being non-porous, but this defect can be overcome by having it woven with an open mesh. *Linen* is too good a conductor of heat for cold-weather wear, unless it is woven in such a way as to imprison air within its fibres. Otherwise it is very good. *Cotton* shares with linen the defect (for cold weather) of conducting away heat, and with wool that of evaporating moisture slowly.

On the whole, considering only porosity, conduction of heat, absorption and evaporation, we may say that silk is the best fabric for underclothing.

But there are three more points to be considered: (i) power of resisting dirt, (ii) washability, (iii) cost.

Wool collects dirt and bacteria, needs great care in washing, and is rather costly.

Silk collects dirt and bacteria very slowly, needs great care in washing, and is costly.

Linen collects dirt and bacteria slowly, washes well, and is fairly costly.

Cotton collects dirt and bacteria rather quickly, washes excellently, and is cheap.

Silk again comes first in point of cleanliness, but the care needed in washing and its cost prevent its common use for underwear. Cotton easily gets dirty, but can be easily washed and costs little: hence its popularity. In cold weather it is desirable—in hot, perspiring weather it is absolutely necessary—that undergarments be changed every day. For cool weather an open, cellular weave should be chosen. Linen is better than cotton owing to its power of evaporation, but should always be woven with an open mesh. Wool, in spite of its defects, always remains the favourite winter underwear in cold climates, because of its natural power of retaining warmth.

Clothes keep us cool by protecting us from the burning rays of the sun. Even one thin, loose garment makes a great difference in preventing the power of the sun to burn our skin. Linen is the coolest fabric in hot weather.

The texture of cloth makes a difference to its power of keeping us warm or cool, and so also does its colour. Coloured cloth absorbs heat from the sun and passes it on to the body in varying degrees. This power is least in white; then come in order yellow, red, green, blue and black.

A scientist once tried the effect of great heat on rabbits of different colours: white, grey and black. While the white rabbits were unaffected, the grey ones suffered, and the black ones actually died.

2. *Protection from wet.* Waterproofs and rubber boots keep out the wet, and woollen overcoats also often absorb rain, if not very heavy, and keep us dry inside.

3. *Protection from injury.* Our feet are protected from stones and thorns, and often from the bites of poisonous creatures, by the use of shoes; and our bodies, from the bites of insects, by ordinary clothes.

4. *Protection from germs.* Insect bites often leave disease germs behind in our blood, so clothes which protect us from bites at the same time protect us from such germs. But more important is the way in which they protect broken skin, especially on the feet, from the direct attack of germs on the ground. Sandals or shoes should *always* be worn in the streets. The sores so often seen on feet are caused by the itch insect, or the hookworm, getting an entrance into the blood through a crack in the skin.

Dangers from Clothing

Clothes may be a source of danger in four ways.

1. Though clothing is used as a protection, yet it is worse than useless if it is allowed to become dirty and harbour germs. Even perfectly clean clothes can pick up germs if we are in contact with people suffering from infectious or contagious diseases, so that it is very necessary for those nursing the sick to change their clothes before coming among people who are well.

2. It is dangerous to sit in wet clothes, as a chilly breeze playing on wet clothes will cause our skin to become cold and the blood will be driven from the surface to the internal organs of the body, and then set up inflammation. If you are wet and cannot change, keep moving, until the moisture has evaporated.

3. Ready-made clothing is sometimes made under very insanitary conditions, and cheap dyes may poison the skin.

4. Dhobies are sometimes unclean, and a disease called dhobi-itch may come from clothes washed by them, and disease germs from other people's clothes may be transferred to our clothes.

Errors in Clothing

In addition to unsuitability clothes are 'wrong' if they produce *restriction* of any part of the body.

The waist, neck, the leg above the knee, and feet are the parts usually restricted. From time to time in Western countries slenderness has been created by compressing the waist. In India little girls frequently tie their skirt strings too tightly. Until lately in China, high-born families compressed the feet of their little daughters, so that their grown-up women had feet that were almost useless. People often wear shoes that are too tight or too small in some particular. People who wear stockings sometimes keep them up by wearing garters that are too tight.

All these ways of restricting the body are bad. Actual deformity of bones and organs may result, as when waists and feet are deliberately compressed. Even when this does not happen the rubber-like walls of the blood vessels are pressed inwards, so that the blood cannot flow freely. All clothes should allow free play for the blood and the limbs.

Clothes should not be heavier than is actually necessary for warmth, and what weight there is should hang from the shoulders, not the waist. The sari, if not tied too tightly round the waist, is ideal in this respect.

Children's Clothes

All that has been said above applies equally to clothes for children. It must also be remembered that, in growing, children spend much of the energy supplied by the food they eat. They therefore lose heat much more rapidly than grown-up people and need to be warm. Even in a warm country like India, it is well to give them underclothing of fine wool wherever possible during the cold weather. If this cannot be done, a loosely-knitted soft cotton garment may be worn. Why should it be *loosely* knitted? In cold weather arms and legs should be covered. The attempt, sometimes made, to harden children by letting them endure cold is a mistaken one, and is made at the expense of their growth. It is especially necessary to see that they are not allowed to get a chill from want of an extra wrap in the evening or when a cold wind rises.

Things to Do

Practical work

Test specimens of different fabrics for porosity, rapid absorption of moisture, capacity for absorption and evaporation.

Oral and written work

1. Discuss why we wear clothes.
2. What advantages has cotton over silk for everyday wear?
3. Discuss how you would spend Rs 75 a year on clothes for yourself and a sister.
4. For what particular purposes are (i) wool, (ii) silk, (iii) linen, and (iv) cotton, specially suited?
5. What are some of the errors in clothing that you have come across in (1) children, (2) grown-up people?

CHAPTER XIII

LAUNDRY WORK

REQUIRED: Articles of equipment and cleaning agents as given under these heads, with pieces of cloth and garments made out of the different fibres studied.

IT is almost as necessary to wear clean clothes as to have a clean skin. Soiled clothes, besides being unpleasant, may harbour germs; and when the air spaces in its meshes are choked with dust and dirt, cloth no longer absorbs moisture from the skin.

Laundry work is one of the heavy tasks that fall to the lot of the housekeeper, especially when she has a large family and cannot afford a dhobi. The work may be lightened by using suitable equipment and materials.

EQUIPMENT

We have already said that, if possible, a room, or at any rate a part of a veranda, should be kept for the work of washing. To equip this room or corner we need:

A *stove,* for heating water, boiling or steaming clothes and heating irons.

Three *tubs.* These are usually made of galvanized iron. They should be placed on a bench at such a height that the worker need not stoop.

A *rubbing and beating surface,* generally a rather rough stone fixed in a slanting position. A tap should be placed over the stone. Sometimes a wooden board fitted with *slats* (i.e. strips of wood) is used instead of a stone.

A *boiler*. This is generally made of copper, because it transmits heat very quickly. It should be fitted with a tap near the bottom. Why?

A bamboo or other unrustable *frame,* for resting in the water and steaming clothes upon.

Some *clothes sticks,* to stir and lift the clothes out of the water.

One or two *pails, basins* and *jugs.*

Soap dishes.

A *kettle* or *degshi.*

Spoons, for mixing starch and blue.

Little *bags,* for blue and starch.

A '*washer*' of some sort. Several varieties are to be

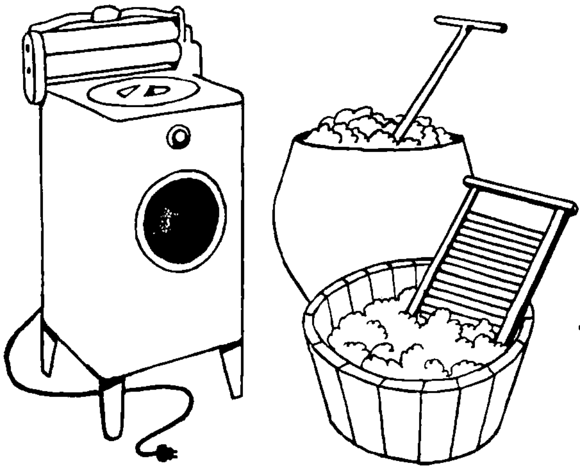


FIG. 72
Types of washer

bought. They all aim at forcing soapy water through the clothes and thus forcing the dirt out (Fig. 72). A washer may be worked by hand or other power. The use of a washer does away with the need for rubbing and beating on stone.

A *brush* for scrubbing obstinate marks.

A *wringer* is useful to wring the water out of the washed clothes.

A *mangle* works like a wringer. It presses cloth flat, and saves ironing in the case of sheets, towels and saris.

A *table,* for ironing on.

A *blanket* and *white cloth,* for the ironing table.

Ironing boards, for skirts and sleeves. These are useful to slip into any circular garment. They should be rested on two trestles or other firm supports, and be covered first with felt or blanket, and then with white unbleached cloth.

A large *bamboo frame,* for drying clothes over a *sigri,* is very useful in the monsoon.

Two or three *baskets.*

A rope, called a *clothes line,* on which to hang out clothes to dry.

Clothes props, for raising the clothes line. They should be forked at one end.

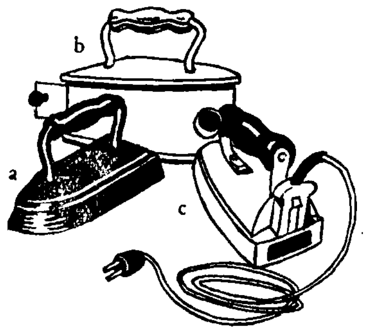


FIG. 73 Types of irons

Pegs, for fastening clothes to the line.

Irons, for smoothing clothes. These may be heated by being placed on the fire (Fig. 73*a*); by being filled with heated charcoal (Fig. 73*b*); by an electric current (Fig. 73*c*).

An *iron stand* and *holder.* A sheet of asbestos makes a good stand.

Cloth for rubbing and cleaning the irons.

Glass-stoppered bottles, in which to keep various cleaning and stain-removing agents.

A dropper.

A glass rod.

A cupboard, for storing equipment.

CARE OF EQUIPMENT

All equipment requires to be kept scrupulously clean. Irons are liable to get damp and rusty in the monsoon, or at any time when there is much moisture in the air. Rust soon eats into the surface of the iron and destroys its smoothness. Keep irons in a warm dry place, and, if not to be used for some time, rub with grease and wrap up in paper. If soiled, rub on common salt, and clean off before greasing. Copper and other boilers, zinc tubs and pails, must always be cleaned after use, wiped and kept dry. Baskets, airers, pegs and sticks must be brushed or wiped before use.

Wringers and mangles must be loosened after use. The machinery should be kept well oiled; the rollers well dried and covered with a cloth.

Washers, if made of wood, need little care if kept dry. Metallic washers get covered with scum. This can be wiped off each time from simple washers, but in the more complicated ones the scum chokes up the inner holes and passages and has to be dissolved out with acids every month or so. But these are not used in small households.

WASHING AND CLEANING AGENTS

Water dissolves some kinds of dirt, and when in motion carries away particles of dirt. It can be used when cold for soaking clothes in and loosening dirt; when hot, for washing clothes and dissolving grease; when boiling, for purifying and disinfecting clothes.

It can also be used in the form of steam, when it has the same effect as boiling water. Steaming involves less labour, and is more economical. Steam also removes some stains.

Boiling water that is 'hard', owing to the presence of lime, causes the lime to deposit itself on the sides of the vessel in which it is boiled.

Washing soda (sodium carbonate) is used to soften permanently hard water. Only enough soda should be put into the water to soften it; and no more when soap easily lathers in the water. Soda has cleansing effects, but damages tender goods and is bad for the hands. It is cheap.

Soap, as we have seen, is made by mixing a fat and an alkali. Its characteristic is that it readily forms an emulsion with soft water. Soap has great cleansing and disinfecting qualities. The alkali in it dissolves the grease, which is generally mixed with dirt.

Borax
Ammonia } These two alkalis have the same softening and cleansing effects as soda, but are harmless. They are, however, more expensive.

Alcohol dissolves grease.

Kerosene dissolves grease and loosens dirt. It is often mixed in laundry soaps, and is sometimes put in small quantities into the water used in the boiling process for clothes.

Benzine and *petrol* dissolve grease rapidly, and are used for taking out greasy stains. Kerosene, benzine and petrol, especially the two latter, should be carefully stored and should never be used near open flames. They are best used out of doors in the daytime.

Potassium permanganate (P. of P.) is used for helping to take out stains from white cloth.

Acetic acid, found in vinegar, is used to set the colour when washing coloured clothes. It also removes weak stains.

Lemon juice, citric acid (prepared from lemon juice), the juice of other *acid* fruit, and *oxalic acid* (prepared from various plants and very *poisonous*) are used for removing many kinds of stains.

(*N.B.*—Acids must be kept in clearly labelled bottles with *glass stoppers,* as acids destroy corks. All acids and alkalis tend to destroy colours.)

Bicarbonate of soda, cream of tartar and *salt* remove some stains. Salt sets colours.

Oils, e.g. olive oil and turpentine, remove certain stains.

Chalk, Fuller's earth, dry starch, and *blotting paper* absorb grease and some stains.

Chloride of lime, a strong alkali, removes stains, but bleaches.

Javelle water removes stains from white goods. To make, dissolve 1 lb. washing soda in 2 pints boiling water. Mix ½ lb. of chloride of lime in 4 pints of cold water. Leave lime to settle. Pour the clear water into the dissolved soda and water. Bottle. Use for white cotton and linen goods only, and always wash out quickly with clean water.

Laundry Accessories

Starch, used to stiffen washed cloth, is found in tiny grains in certain plants. The grains burst in boiling water and combine with the water to form a jelly-like mass, which may be thinned by the addition of more boiling water. For stiff starching, maize or wheat starch is used. For ordinary clear starching, rice is the best. For stiff or medium starch, a small quantity of wax is sometimes added.

Recipe for hot clear or hot water starch:

1 tablespoonful of commercial starch
3 tablespoonsful of cold water
1 teaspoonful of borax (gives a gloss to clothes)
A shaving of white wax (candle wax is good)
Boiling water

Mix the raw starch with the cold water until free from lumps. Then scatter in borax and wax and mix well. Pour on absolutely boiling water, stirring all the time, until starch becomes thick and clear.

Home-made rice-starch, suitable for all ordinary household purposes, is made as follows. Put 5 tablespoons of rice into 4 pints of water. Boil slowly, adding water when necessary, until the rice is a pulp (i.e. a soft formless mass). Add 4 pints of boiling water and strain through a bag. Tapioca may be substituted for rice.

Gum arabic is diluted with water (1 tablespoonful to 1 pint) and used in place of starch, especially for silks.

Blue is used to give a good colour to washed cloth. It was originally, and still is sometimes, obtained from the indigo plant. It is now also manufactured artificially. It is generally sold in the form of a block, which is tied into a little bag and squeezed in the water.

Fabrics to be Washed

We have already studied the four chief fibres. We will now see the effect on each of them of the different cleansing agents and processes. The animal fibres, wool and silk, are more delicate than those of vegetable origin, cotton and linen. *Heat*, whether from hot water or irons, sunshine or fire, damages wool and silk. They are easily scorched.

Heat stiffens silk and causes it to crack. It makes the projecting scales of the wool fibre interlock, thus thickening and shrinking the fabric, causing it to felt. Sudden changes of temperature have the same effect. Cotton and linen are unaffected by boiling, and may be ironed by a much hotter iron than wool and silk. Artificial silk is more easily affected than real silk. Heat also turns white silk yellow.

Rubbing causes wool to felt, and is apt to break the silk fibre. A *reasonable* amount of rubbing does not injure linen and cotton cloth.

Water causes wool to felt. It causes some artificial silks to dissolve. Water often causes colour to 'run'.

Too heavy pressing with an iron causes stiff materials such as stiffened silk and linen, to crack along the folds.

Alkalis have a weakening effect on all fibres. Of all the alkalis usually employed, ammonia and borax do least harm, chloride of lime most. Soda in the washing water turns wool and silk yellow. Alkalis remove colour, and have a worse effect on linen than on cotton.

Acids weaken all fibres, but if well diluted, weaken wool rather less than other fibres. In the case of wool and silk they first roughen them. When used for the removal of stains, acids should be quickly washed out. Long contact will wear a hole in the material. The acids in perspiration weaken cloth. Therefore garments should be washed frequently. Acids remove colour.

Soap, if it contains *free alkali,* will have the same effect as an alkali. Good, pure soaps have no ill effects on fibres, however, though for wool and silk a soap solution should be made in which the clothes may be *soused,* i.e. kept in motion, but not rubbed. Here are two methods of making a soap solution for woollens.

THE LAUNDRY CUPBOARD

Washing	Stains	Drying	Ironing	Mending
Soap Flakes	Alcohol	Ropes	Irons	Cotton
Soap Bars	Benzine	Clothes Pegs	Beeswax	Needles
Soap Nuts	Petrol	Boards for Woollies	Iron Holders	Marking Ink
Washing Soda ..	Kerosene		Iron Stands	
Boric Powder ..	Olive Oil		Sleeve Ironing Boards	
Salt	Turpentine			
Vinegar	Chalk			
Starch	Chloride of Lime			
Blue	Javelle Water			
Gum Arabic	Bowls			
Boards for Scrubbing ..	Droppers			
Sticks for Stirring ..	Small Glass Rods			

(i) Shred and dissolve a cake of good laundry soap in 8 pints of water. Add one or more tablespoonsful of borax if goods are very soiled.

(ii) Shred 4 oz. of good laundry soap to 1 pint boiling water. Small scraps may be economically used up. Put into a pan or jar with the water. Heat slowly, to prevent its boiling over.

This solution can be used for making a permanent lather for all types of cleansing. It is very suitable for washing silk and wool when rubbing must be avoided.

Oils and spirits—e.g. turpentine, alcohol, benzine, kerosene and petrol—have no ill effects on cloth. Clothes treated with them should be exposed to fresh air to remove the smell.

Try the effect of each of these agents or processes on old pieces of cotton, linen, wool and silk cloth. You see now that different methods of washing must be employed for different fabrics. Discuss how you have been accustomed to wash (i) a woollen vest; (ii) a cotton undergarment; (iii) a silk jacket or dress; (iv) a coloured sari.

Preparation for the Wash

Imagine you have a large pile of articles ready to be washed. Proceed as follows:

1. *Sort out all articles needing mending.* Outer garments and slightly soiled household articles, such as curtains, sheets, etc. should be mended before being sent to the wash. Clothes worn next to the skin and soiled household cloths, such as dusters and washing-up cloths, should be mended after being washed.

2. *Sort out all stained garments.* No garment should be thrown into the washtub until stains have been removed.

Many stains are *set,* i.e. made permanent, by the ordinary process of washing. Moreover, it is very troublesome to search for them and give them special attention when in the water with other wet clothes.

Stains, according to their nature, may be (i) simply carried away by the action of water forced through the cloth; (ii) dissolved; (iii) changed chemically, as acids by alkalis and the reverse; (iv) absorbed (by powder or blotting paper) as grease.

The Commonest Stains and their Treatment

Any acid stain. Treat with an alkali. Sponge with diluted ammonia; or cover both sides of stain with sodium bicarbonate, moisten with water and allow to stand awhile. Then wash with clear water.

Any alkaline stain. Wash with warm water, to which lemon juice, vinegar or cream of tartar has been added.

Explain why you treat acids with alkalis and vice versa.

Blood. Soak in cold water. Then soak in warm water with ammonia. Or, if it is only a small stain on heavy goods such as a blanket, spread thick starch paste on the stain, wiping off and renewing until all stain has disappeared.

Coffee. Spread cloth over a bowl; pour on boiling water from a kettle held high. For an old stain, cover the spot with borax or apply javelle water, followed by boiling water.

Commercial dye. Apply potassium permanganate and wash with warm water. Or apply oxalic acid with a glass rod, and wash.

Fruit juice. Rub on salt; wash out. Then treat as for coffee stain or acid stain.

Grease. Wash in warm water and soap or use javelle water (on cotton or linen). Treat old, obstinate stains as for dye. If the material cannot be washed, apply alcohol or benzine with a cloth, rubbing very lightly, or absorb with starch, or iron with a warm (not hot) iron over thick blotting paper, repeating with fresh blotting paper till all grease is absorbed.

Ink. For fountain pen ink apply citric or oxalic acid; wash out, then treat with javelle water; or try javelle water alone.

For ordinary ink moisten with salt and lime juice and lay in the sun; or soak in sour milk for twenty-four hours; or apply diluted citric acid, followed by boiling water.

For red ink moisten with cold water followed by ammonia, or javelle water.

Iron rust. As for ink.

Medicine. Soak in alcohol.

Mildew. Wash in cold water, or treat as for dye or as for ink.

Mucus (as in handkerchiefs). Soak in strong salt and water.

Oil paint. Dissolve the paint in turpentine. If very old, soften first with olive oil or kerosene.

Scorch (slight). Hang cotton and linen in sunlight. On wool and silk gently rub off.

Tea. Wash with cold water and soap, if mixed with cream. Use hot water if clear. As for coffee, if obstinate.

Tar. Soften with olive oil. Wash with soap and water.

Water spots. Shake in jet of steam from spout of boiling kettle, until thoroughly moist. Keep shaking cloth till dry.

Wax. Scrape off. Then treat as for grease.

Wine. Put on layer of salt. Then treat as for fruit stains.

To apply acid use a medicine dropper or a glass rod, and drop one drop at a time on the cloth stretched over a bowl of boiling water. If rubbing is necessary, use a glass rod. Do not keep the acid on long. Dip the cloth into the water and apply acid again, if necessary. Rinse out at least with cold water to which a little ammonia has been added. Why do you do this? Use javelle water in the same way. Use oxalic acid, which is *very poisonous*, only for very obstinate stains.

Remember that even diluted alkalis damage silk and wool, that acids and alkalis both remove colour, and that concentrated acids and alkalis quickly destroy all cloth.

When stains on coloured garments cannot be removed by simple washing or by being dissolved or by being absorbed, you must decide whether it is better to keep the stain or have a white spot. Sometimes a small patch of the same material may be sewn over an obstinate stain.

3. Having mended and removed stains when necessary, sort the wash into separate piles: (i) cotton and linen goods; (ii) silk goods; (iii) woollen goods, dividing each pile again into white and coloured goods. How many piles will you have?

Washing and Ironing (After Removing Stains)

1. *White linen and cotton goods.* (i) Soak in cold water. If the goods are put on to soak overnight, they will require less rubbing in the morning.

(ii) Wash in cold or warm soft water (softened, if necessary, with soda) and soap. Spots must be rubbed with soap, a small brush being useful. The art of washing is to force soapy water through the cloth. As we have seen, this may be done by beating on stone or a wooden board, or by means of a machine. The latter is easier, more effective and less damaging to cloth.

(iii) Rinse in clear water and wring out.

(iv) Place in boiler, cover with clean cold water, flakes or small pieces of soap being added; bring to the boil and boil quickly, stirring with a wooden clothes stick for five minutes. Alternatively, rub over with soap, place on a bamboo or other unrustable framework, place in a boiler half full of boiling water. Put the lid on, and keep the water boiling for five minutes or longer. When in doubt, boil for half an hour. Boiling and steaming destroy germs.

(v) Rinse well in hot water, then again in cooler water. See that no soapiness remains, as some kinds of blue combine with soap and cause iron-rust spotting.

(vi) Shake the clothes out loose, immerse in slightly blued water. Wring out and shake well. A wringer may be used if desired. (The blued water should be well stirred before putting each garment into it, as the blue settles at the bottom and may streak the clothes. The water needs to be re-blued frequently, as the clothes absorb the blue from the water.)

(vii) Separate articles into piles according to the kind of starching required: (*a*) Linen table cloths, table napkins, table centres, doilys, sheets, towels, pillow-cases, handkerchiefs, cotton curtains, clothes worn next the skin, and all articles which require no starching; (*b*) thin muslins, whether for personal or household use which require clear starch; (*c*) garments not worn next the skin, jackets, blouses, cotton table cloths, etc. which need ordinary starch.

(viii) Starch articles requiring ordinary starching by dipping them into hot prepared starch. Rub the starch evenly in, squeeze evenly and shake.

(ix) Shake well and hang out to dry in the open air. See that lines and clothes pegs are perfectly clean, that articles hang straight and in good shape, and that the wind, if any, blows *through* the garments. If the colour of white clothes is not good, spread them out on the grass in the sun and moisten frequently. In the monsoon, garments may be dried on a bamboo frame over a *sigri*.

(x) Take the clothes off the line, sprinkle with water, put into shape, roll (small articles, several together), and press well to distribute the dampness evenly. Pack the rolls close together in a basket. Articles that are to be ironed or mangled at once may be taken off the line before becoming quite dry. Mangling (or even stretching and pulling) is often sufficient for household articles, such as towels, sheets and even saries, though ironing improves the appearance of the latter. In a hot climate clothes should not be sprinkled and rolled more than an hour or two before being ironed, as moist heat is favourable to the growth of mildew. In a cold climate they may be damped overnight. If your cloth gets dry while being ironed, or if a spot appears on it, rub it with a damp cloth.

(xi) Iron such things as need a smooth finish. In very hot, dry weather iron in the early morning or in the cool of the evening; otherwise your clothes will dry too quickly.

FIG. 74 Skirt board

Ironing is an art, and perfection in it can be attained only after much practice. The following directions will help to get good results. (*a*) Always slip a skirt board or a sleeve board (Fig. 74) through circular garments, such as shirts and skirts, or parts of garments, such as sleeves. (*b*) Iron cotton cloth when slightly and evenly damp, and iron each part *quite* dry before going on to another part. Linen requires to be much damper than cotton. (*c*) Let your iron be hot enough to hiss when touched with moisture. If the moisture bubbles on the iron, it is not hot enough. If it evaporates without a hiss, it is too hot. Rub the iron on a piece of old cloth or felt before using it. (*d*) Sleeves should be ironed first in a fitting garment; then the neck, and finally the body. Do the back last. In skirts begin at the bottom. In ironing gathered frills use a pointed iron; begin at the edge and press the point up among the gathers. If pleated, iron the pleats flat, folding them as you go. (*e*) Iron on the wrong side anything in which you do not

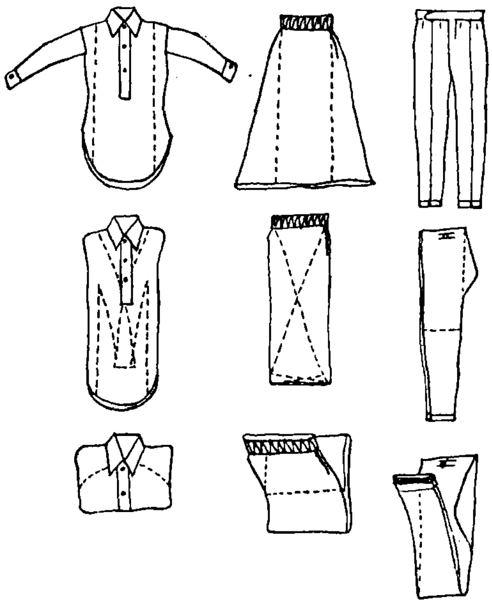


FIG. 75

want a shining surface. (*f*) Place embroidery and lace wrong side up, on a soft pad, that the pattern may not be flattened out. (*g*) Perform all these operations as deftly as possible, so as to keep the article fresh-looking. (*h*) Fold and press folds as you go. In ironing square and rectangular articles, such as handkerchiefs, table napkins, etc. you must pull well into shape and get their corners exactly together. Study the correct folding for different garments. (Fig. 75).

2. *Coloured linen and cotton goods.* Omit soaking, boiling and the use of soda. Wash quickly in warm water in which soap has been dissolved. Hang in the shade, not in sunlight; get dry as quickly as possible.

Set the colour, if it comes out in the water, by adding a tablespoonful (or more) of salt to a gallon of cold water. Substitute vinegar for salt for blue goods. Do not wash different colours together. Iron on the wrong side, with a *warm* iron. For very uncertain colours bran or soap bark (or soap-nut solution) may be used instead of soap. The colours in embroidery silks nearly always need setting.

Recipe for soap-nut (reeta nut) solution. Infuse 2 tablespoonsful of soap-nut shells or bark chips, enclosed in a mull bag, in a quart of boiling water for 5 minutes. Soap-nut shells when boiled with water give a lather which has cleansing properties, due to the presence of a substance called 'saponin'.

The solution of soap-nuts is useful for washing colours sensitive to alkalis, because the solution is not alkaline and has no effect on dyes. It is also useful for other delicate fabrics.

3. *White woollen goods.* Brush and shake out dust before wetting. Treat as for coloured cottons. *In addition,*

keep all water used at about the same temperature. Avoid rubbing and wringing by twisting; *squeeze* water out. Heavy articles need rinsing in several waters. If water needs softening, use borax or ammonia. Do not dry in either a very hot or a cold place. Loose knitted garments, such as jumpers, should not be hung out to dry, but should be spread in their right size and shape on a pad. Iron under cheese-cloth when half dry; never starch.

4. *Coloured woollen goods.* As for white woollen goods, setting colour as for coloured cotton goods.

5. *White and coloured silk goods.* As for woollens except that white silk goods may be soaked for a *short* time, if necessary. If stiffness is required, use gum arabic instead of starch. Iron when damp under thin muslin. But some silks, such as pongee, require to be quite dry or very damp when ironed. Crepe silk and some fancy silks do not require ironing. They should be spread very straight and smooth on a table while still wet.

6. *Artificial silks* should be washed very quickly in lukewarm suds, rinsed quickly, and put on clean cloth to dry.

7. *Velveteen* may be washed in the same manner as silk. Velvet can be freshened by passing it over steam. Hang up while wet; when dry, brush. If it is necessary to iron it, pass it quickly while damp over an inverted iron, i.e. one held upside down.

8. *Lace* should be shaken and squeezed, never rubbed, in warm soapy water, then rinsed out in water slightly blue. If wanted cream colour, add a little strong coffee to the last water. If wanted slightly stiff, rinse it in a weak gum arabic solution. Lay the lace between two cloths to absorb the moisture. Do not iron delicate lace, but when nearly dry pull gently into shape and pin the edges on to

flannel or firm cloth. Ordinary lace, such as is used on underclothing, may be ironed.

Dry cleaning is sometimes employed with woollen goods. Fuller's earth, or dry starch, is freely sprinkled all over the garment, which is then rolled in a clean cloth. After a time the powder is shaken out, taking the dirt with it. Repeat operation as many times as necessary.

COMMON FAULTS IN WASHING

1. Using soda with soap for washing, instead of only for softening the water. *Result,* weakening of the cloth.

2. Using chloride of lime to whiten clothes. *Result,* rotting of the cloth.

3. Beating too hard on stones. *Result,* tearing of the cloth.

There are other articles of apparel that cannot be cleaned by washing. Such are shoes, sandals, waterproof coats, straw and felt hats, and furs.

Boots and shoes are brushed, smeared with polish according to the directions on the bottle or tin, rubbed and polished with a soft brush or cloth.

White canvas shoes are brushed, covered with a preparation of chalk and dried in the sun. *Sandals* are usually rubbed with oil.

Waterproof coats should be hung up on a hanger, washed with a soft brush dipped in warm suds, soused in water, and left hanging up to dry.

Felt and straw hats should be kept well brushed. If faded or out of shape, they should be sent to a hat-cleaner to be dyed and re-shaped.

Furs and soft leathers may be washed with suds and warm water after removing the lining. They should be rinsed in lukewarm water and spread out to dry. If the skin is too dry and liable to crack, rinse in warm water to which a little olive oil has been added; or rub in a very little olive, linseed or lemon oil at the back of the skin.

Things to Do

Pratical work

1. Put into practice all the methods of washing different kinds of fabrics described in this chapter.
2. Take out as many stains as you can, including fruit juice, rust, ink, grease, oil-paint, coffee.
3. Make soap solution, soap-nut solution, javelle water, starch and blue water as described.
4. Why do clothes tear quicker when given to a dhobi?

Oral and written work

1. Say how silk becomes yellow, and what causes wool to felt.
2. For what purposes can javelle water be used?
3. Why are white clothes starched and blued?
4. Plan out the work for washing day in a small family.
5. Try to do the family washing yourself.

SECTION THREE:
HEALTH IN THE HOME

CHAPTER XIV

HOW HEALTH MAY BE MAINTAINED

THE habits we form with respect to food, clothing, shelter, cleanliness, sleep, exercise and rest, are the factors which determine the growth of our bodies, our power to resist disease and the length of time we shall live. A plough or an engine wears out quickly if it is neglected but it will last many years if given proper care. Similarly human bodies, which are something like engines, may last many years if given care, or may be destroyed in infancy by impure milk, or by fever germs after many years of active life.

Who is it that can rob us of our health? There are many enemies to health lurking about, and we need to know their habits in order to protect ourselves from them. Like other 'robbers' they 'love darkness better than light because their deeds are evil'. They hide in dirt and all uncleanliness. They remain wherever they have fallen, if the place is moist, but if dry they will be wafted about by every breeze, riding upon the dust particles as on airships. If your mouth happens to be open, they may fly in and set up housekeeping in that dark, damp, warm place, where food may be found between the teeth. These tiny creatures are not all evil in their deeds. Some *bacteria* are our friends; but we need to know about them and their habits, if we are to avoid disease, maintain health and increase our length of life.

The causes of disease. A wise Frenchman, named Pasteur, was so deeply concerned about the loss of human life and of efficiency as the result of disease, that he devoted his life to the study of the *causes* of disease. He found these to be largely due to a hitherto unknown world of micro-organisms, unknown because they are so small that they can only be seen under a high-power microscope. These tiny living organisms, or *bacteria,* which are so small that it is almost impossible to determine whether they are plant or animal, are often called *germs* or *microbes.*

Species of Common Moulds

Friendly Micro-organisms. Some of these micro-organisms are our friends. One group of friends is called *yeasts,* and these are important in raising our light bread. Some yeasts are troublesome; but we may consider yeasts for the most part as our useful servants.

Experiment 14. *Growing yeast.*

With a pipette remove a drop of the sediment from growing yeast prepared by fermentation. Place the drop on a slide, cover with a cover glass and study under a microscope. Remove some of the yeast found floating on the surface and study it in the same way. Note that the yeast cells are in groups. Make a sketch of several groups, showing buds of various sizes. Can you see the vacuoles in the cells, as in the first specimen?

Even *moulds* which cause our books, shoes and food to be spoiled in the monsoon, are sometimes friends, as they help to produce appetizing flavours, in cheese, tea, etc.

Experiment 15. *Moulds on different foods.*

Under separate dishes, that will protect them from evaporation, place bits of bread, some pieces of lemon and a bit of banana, etc. Each of those should be moist. Cover and set aside. Moulds will grow in a few days, but probably different species will form upon the different materials. Compare the mould and determine how many kinds can be seen.

EXPERIMENT 16. *Spores.*

After the moulds of the previous experiment have begun to produce spores as shown by the appearance of some colour, remove a little spore material from the surface with a knife blade or a platinum wire and examine under a microscope. For this purpose a compound microscope is necessary since the spores are very small (Fig. 77).

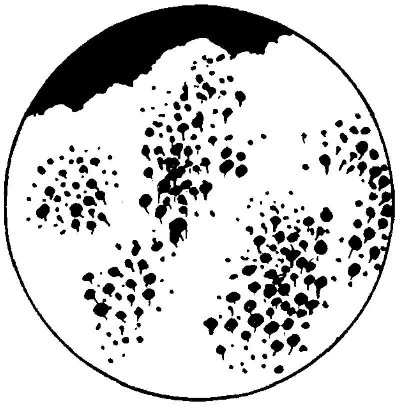


FIG. 76 Mould on bread

EXPERIMENT 17. *Growth of mould from spores.*

Moisten a bit of bread and transfer, with a platinum wire, a little bit of the spore mass from a vigorously growing mould to the surface of the bread. Cover with a glass and set aside for growth. Examine every day and note that moulds start from where the bread was inoculated with the spore.

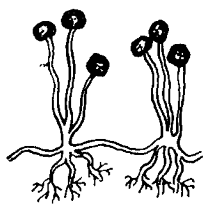


FIG. 77 Spores of bread mould (*Greatly enlarged*)

Bacteria change our milk into curds and are useful in the manufacture of vinegar. They are also the means of fixing nitrogen in the soil, making it more fertile for farming. They break up the waste matter which is thrown upon the earth and purify sewage.

UNFRIENDLY MICRO-ORGANISMS. There are some varieties of bacteria, yeasts and moulds which are unfriendly, and when these get the opportunity they cause disease. It is our business to know how to prevent these ' robbers of our health ' from obtaining access to our bodies and making us ill. One way of preventing disease germs harming us is to learn what things are favourable to their growth; then we can avoid these conditions, or create conditions which they do not like.

Their size. Some bacteria are so small that you would have to put 50,000 in a row to measure even one inch. Even the larger ones are so small it would take 10,000 of them to measure an inch. You might imagine that anything so small could not possibly harm us. The reason we have to fight them so hard is that they multiply more rapidly than anything you can imagine. As they are so small, we do not know they are there until after they are well established and damaging our food or our bodies.

Their types. There are two classes of micro-organisms to be considered. Those that live on dead food are called *saprophytes,* and we will discuss them later in connexion with food preservation. Those that carry on their lives within the living body of plants and animals, including human beings, are known as *parasites.* Many of these parasitic organisms are capable of producing disease: they are therefore called pathogenic organisms. Others, however, have the power of living upon dead as well as upon living matter, so they belong to both classes.

Their shape. Bacteria, or germs, cannot be seen except by the very highest power of the microscope. Some germs are round, others are oblong, some are spiral and others are rodlike in shape. Some are smooth and others have

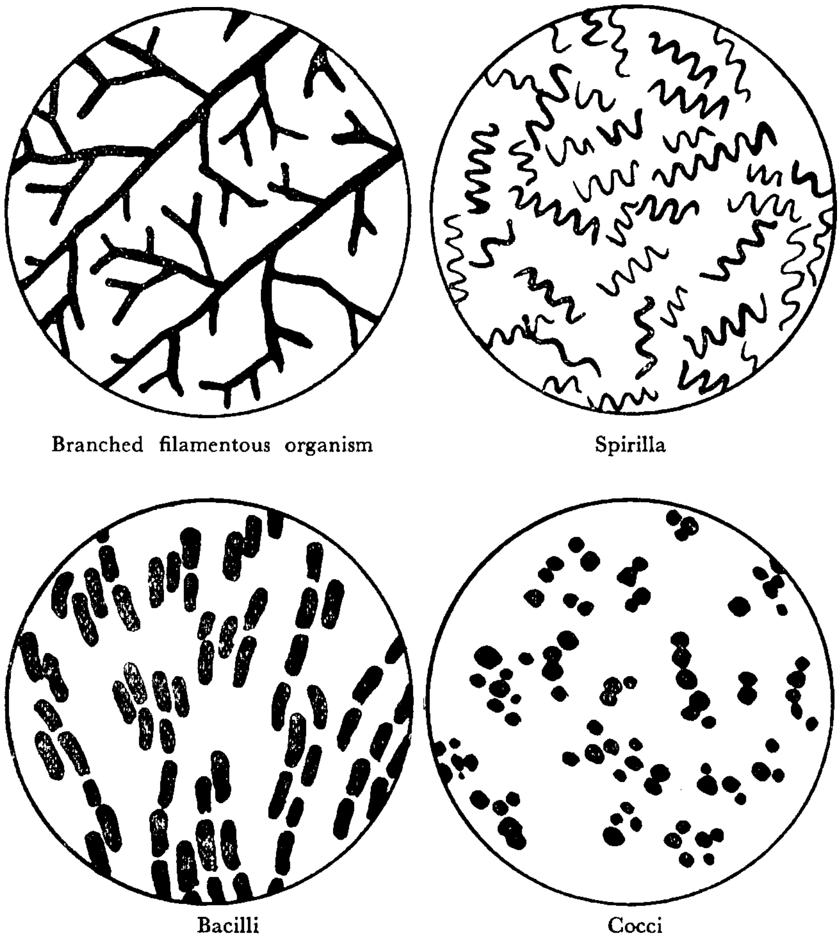


FIG. 78 Types of bacteria

hairlike processes called *flagella* by which they are able to move very rapidly through fluids (Fig. 79).

Their reproduction. Their method of reproduction is extremely simple. The bacteria grow to full size, and then divide in the middle. This method is called *fission*, and you can understand that it does not take long. Suppose you try to calculate with pencil and paper how many progeny one germ would have in twenty-four hours, if it divided by fission every half hour. You will need to use geometrical progression to work this out, and you will find that even in *half* that time the germ would have about 17,000,000 offspring. When you realize that in one day a germ can produce millions, nay crores, of other germs, you will understand what a great danger they may be if they happen to belong to the pathogenic class.

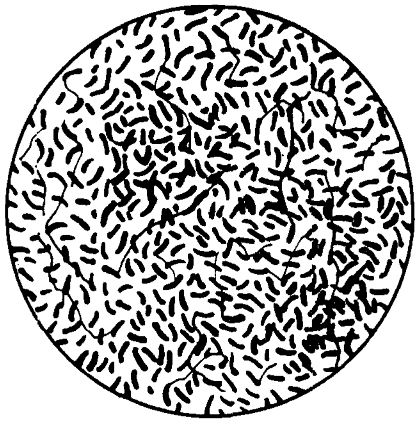


FIG. 79 Cholera vibrio with flagellae

In order to keep this rapid rate of growth, they must have food and other conditions favourable to them. They thrive in dark, damp and dirty places so we can limit their activities by sweeping out all dust and rubbish daily and by admitting fresh air and sunlight into our rooms.

Temperature is another important factor. In the warm climate of India, germs multiply rapidly, spoiling our food and causing epidemics of disease. Cold, though it does not actually kill them, retards their growth. Most pathogenic bacteria grow best at a temperature between 95°F. and 102°F. What is the normal temperature of the human body? Do you think germs would find this a suitable temperature for their growth?

EXPERIMENT 18. *The effect of temperature on bacteria.*

Place bits of cooked rice with a little water in three test tubes. Put the first tube in an ice chest, the second in ordinary room temperature, and the third where the temperature is high. Notice the speed of fermentation.

Micro-organisms do not like it too hot, however, and that is what saves us in India. The hot beneficent rays of the sun destroy many of the germs which are left exposed to them. Most bacteria are readily destroyed by boiling, but here I should mention that a few varieties—of which tetanus is the most important example—are called spore-bearers. A spore is a tiny mass of living matter encased in a tough membrane which protects it from harm within the body of the parent germ. When conditions are favourable to it, the membrane breaks and the tiny mass of living matter is set free to begin its life as a new germ. Spores resist heat and drying to a remarkable extent, and in order to be sure that they are all destroyed we must subject them to continuous boiling for at least 20 minutes, or to intermittent boiling.

EXPERIMENT 19. *The effect of boiling on bacteria.*

Take some milk and warm it slightly without heating it to more than 130°F. Divide it into two parts. Place each in a test tube; set one aside without further treatment, but bring the other to a brisk boil for a moment and then set beside the first. At the end of twenty-four hours see if fermentation has occurred.

EXPERIMENT 20.

Prepare two test tubes of treacle, or gur, and water and inoculate both with a drop of yeast. Plug with cotton. Place one test tube in water and boil for ten minutes, and then leave both test tubes side by side in a warm place for two days, and determine whether the boiling has been sufficient to kill the yeast.

Pasteur, the eminent Frenchman of whom we have spoken, discovered that a temperature of about 155°F. is sufficient to kill most bacteria. That is why heating to this temperature is called 'pasteurizing'. It is best, in India, to heat materials to boiling point if we wish them to be really safe and scientifically clean.

Moisture. We have said that germs must have moisture if they are to grow and multiply. Spores may keep alive for a long time under dry conditions; but the bacteria themselves cannot absorb the food they require for growth unless it is wet.

EXPERIMENT 21. *The effect of moisture on bacteria.*

Place a little of the following foods in separate test tubes: dry beans or grain, Indian corn meal, a piece of dry bread, wheat meal, atta flour, and common biscuit. In another series of test tubes place the same materials *moistened with water.* Set all aside in a warm place and notice the effect of water in bringing about putrefaction.

EXPERIMENT 22. *The effect of drying on bacteria.*

Place under a bell-glass two slices of bread, one of which is damp, either naturally or by being slightly moistened with water, and the other dried. Leave for two or three days and notice the effect of drying in preventing the growth of moulds. If one slice remains dry no moulds will grow upon it, but the other is soon covered.

Air. The majority of bacteria require oxygen, just as we do, to live and grow. That is why decay of food often begins on the surface. This is not true of all bacteria, for some grow quite well without oxygen; but currents of air retard growth.

EXPERIMENT 23. *The effect of air currents on bacteria.* After the bread, in Experiment 22, shows a luxuriant growth of mould, remove the glass and leave the bread exposed to the currents of the air. The mould ceases to grow and flattens down close to the bread.

Distribution. Bacteria, or germs, are to be found nearly everywhere on the surface of the earth, in air, water and food. It will not surprise you, therefore, to know they are present in large numbers in our mouths, stomachs and intestines. You can see some bacteria, taken from the surface of healthy teeth, under a high-power microscope.

Saprophytes use the same kind of food for sustenance as we do: dead animal and vegetable food. In consuming this food they break up the chemical molecules, leaving only fragments quite unlike the original substance. These are called *by-products of decomposition,* some of them being gases, some liquids. So the food in which bacteria have been working is almost sure to become more liquid, and the gases given off produce odours and new tastes. This process is spoken of as *putrefaction* if it takes place where there is little oxygen, and is called *decay* if it takes place where there is plenty of air.

We know that our own bodies secrete perspiration, urea, etc. Germs also secrete substances just as any other living creature does. The secretions of some bacteria are quite harmless, but those of others are very *poisonous.*

DISEASE-PRODUCING GERMS. We shall now consider some of the germs that cause disease, with a view to seeing how we can avoid them. Sometimes they go into all parts of the body, and sometimes they locate themselves in one part; but wherever they find a chance to grow inside us they multiply rapidly and form decomposition by-products and secretions, just as the saprophytes do in lifeless food. Some of these secretions and by-products are poisonous and are called *toxins*. When these toxins are absorbed into our blood, the body is poisoned. Sometimes the bacteria themselves do not enter the blood, but grow in the throat, intestines or other organs, where they form toxins which are absorbed into the blood. This is the case with *cholera,* where the germs grow in the intestines and secrete poisons which are absorbed with the food into the blood, and thus distributed over the body. Something similar is true of practically all disease germs.

A small deep wound which does not bleed much is the very best situation in which such germs as thrive best without air can find a home for themselves. Bleeding is not free enough to wash them out and the wound soon heals over. In such a wound the germs of *tetanus* can multiply rapidly and *secrete* a *poison* which stiffens the person's muscles and causes his jaw to set, so that he cannot move it. This disease is therefore sometimes called *lock-jaw*. Wounds acquired in stables, on roads or other places where horse manure is found are particularly liable to be infected by the tetanus germ; so also are wounds inflicted by splinters and old rusty nails. Consequently, if you do happen to get a deep punctured wound you must be extremely careful to cleanse it thoroughly. Open the wound and put into it some disinfectant, such as carbolic acid or iodine solution, before tying it up in a clean cloth. As a further precaution take an anti-tetanus injection.

Diseases Transmitted by Insects

Malarial fever is produced by microscopic parasites (Fig. 80), which enter the blood corpuscles, where they grow and form a number of spore-like bodies which, when mature, are set free by the rupture of the blood corpuscles. At this stage the victim experiences the ague or chill so

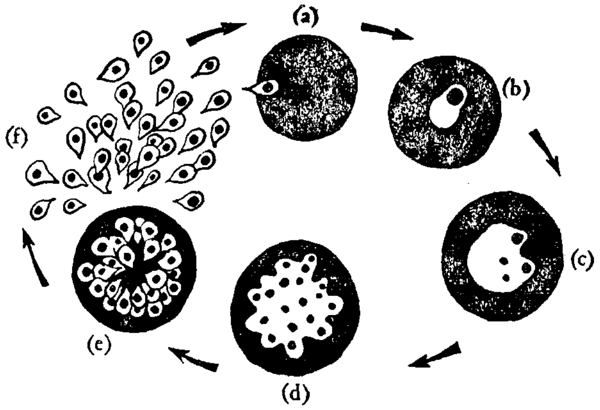


Fig. 80 Life cycle of malaria parasite *a*) Entering the cell; *b*) Within the cell; *c*) Development; *d & e*) Segmentation; *f*) Red cell bursts, setting free young parasites

typical of malaria. The cycle, which takes about 48 hours, is repeated; thus the chill is felt every other day. Another form of the parasite takes three days to repeat its history, and in that case the chills come every third day.

When a mosquito has bitten someone with malaria parasites in his blood, it sucks the blood into its own body. The germs can live in the mosquito's body as well as in the human body, but then their history is different. After passing through several changes the parasites finally reach the salivary glands, near the mouth of the mosquito. When this mosquito, with its salivary glands full of malarial parasites, thrusts its proboscis through the skin of a healthy person, it is sure to leave some of the parasites in that person's blood. There the parasites will start their life history over again, and whoever is bitten by the malaria-infected mosquito will soon feel the chills and fever. So these fevers are spread by the mosquito.

As the parasites never leave the body of the patient suffering from malaria, a way had to be found for destroying them in the body. Fortunately it is possible to kill them by taking quinine or a combination of quinine and atebrin. The best way of avoiding malaria is to sleep at night under a mosquito-net because the type of mosquito which carries the malarial parasite bites only at night. We should also take the precaution of seeing that no old broken pieces of discarded vessels are left lying about the compound, for rain water collects in them and provides a good breeding-place for mosquitoes. If you use ant-tins, empty them and refill them with fresh water often.

Dengue fever and *filaria* (the cause of elephantiasis) are also transmitted by mosquitoes belonging to different groups; whilst sand-fly fever and one or two other short fevers are transmitted by the sand-fly.

Plague is transmitted by the rat-flea. A rat with plague will have crores of germs in a single drop of its blood. When rats die of plague, the fleas leave their dead bodies and seek their food by biting human beings. Fleas contain many plague germs in their bodies, owing to the fact that they have sucked the blood of the plague rats. When they bite human beings, they regurgitate into the wound the germs of plague. Thus people are infected with the disease.

It is encouraging to know that plague germs are easily killed by exposure to direct sunlight. Let us understand, therefore, the importance of airing the rooms and bedding in our homes. Further, if we wish to be free from this disease, we must keep the house so tidy that there are no hiding-places for rats. We must also keep grain and food protected from rats so that they will not be enticed indoors.

Inoculation. If either cholera or plague breaks out in your district, you should get yourself inoculated. Inoculation, like vaccination, is a means of procuring immunity from disease. A limited number of dead germs is injected into us. These, being dead, cannot grow or multiply, but their presence in our system stimulates the blood to produce anti-bodies which protect us, if the living germs of that particular disease attack us.

An injection of serum, on the other hand, is more often used to combat a disease that has already attacked us—such as diphtheria or tetanus. The reason for this is that the serum already contains these anti-bodies because it has been prepared from an animal that had previously been made immune by a series of inoculations. The anti-bodies in the serum hold the disease in check until our bodies have time to manufacture enough anti-bodies of their own to overcome the disease.

Vaccination. It was known, through many years' experience, that if a person had even a light attack of some disease, and recovered, he was not likely to get that disease again, at least for some time. It was a custom, years ago, for people to have smallpox given to them deliberately by a physician and they were then said to be immune if they recovered. An Englishman, named Edward Jenner, whose name we should always remember and honour, learnt that the girls who looked after cattle had a saying that anyone who caught cowpox would not be subject to smallpox. He began experiments upon this, and found that by giving people cowpox he could prevent their catching the deadly disease of smallpox.

Vaccination is a means of giving healthy people a very slight infection of cowpox. The skin is first cleaned thoroughly with soap and water, and then rubbed dry. The clean skin is next scratched with a knife or lancet which has been boiled or passed through a flame. The germs of cowpox are smeared over the scratched surface and their presence there stimulates the production of anti-bodies which protect the vaccinated person from smallpox for about seven years. This protection is called *immunity.*

ELEVEN RULES FOR HEALTH

1. *Rest* the mind and body by keeping calm, overcoming fear and worry. Change of occupation is rest. Rest is just as necessary as work for the development of the muscles. After work a muscle must have time to get rid of the waste matter in its fibres and to take in food and build up the cell fibres. If a muscle works too hard and does not have time for rest, it will become weak.

2. *Exercise.* Spend as much time as possible out of doors, walking and playing games. Hold the body in a correct posture, whether standing, walking or sitting.

3. *Air.* Breathe pure, clean air. Keep windows open.

4. *Sunshine.* Let it shine on the body for a short time daily, but avoid over-exposure.

5. *Water.* Drink at least three pints of clean, boiled water daily.

6. *Baths.* Bathe each morning when you first get up. Wash the hair at least every week. Clean the nails regularly. Wash the hands before eating.

7. *Food.* Eat a variety of good food at regular meal times. Three meals a day are enough. It is better to eat a little at three meals than a great deal at one meal. Chew all food thoroughly.

8. *Teeth.* Brush the teeth twice a day, on rising in the morning and before going to bed at night. A piece of fruit after a meal will help to clean the teeth.

9. *Bowels.* Be sure that the bowels move at least once a day.

10. *Study.* Keep the mind upon good thoughts. Learn to concentrate when you study so as to *make the ideas yours,* and not just to pass an examination.

11. *Sleep* long, quiet hours, with the windows open. Go to bed at a regular hour. Do not cover the head with a cloth. Keep mosquitoes away by screening the windows and doors, or by having a net over the bed. Learn to relax.

Things to Do

Oral and written work

1. What causes the body to be diseased?
2. Do you believe that disease can be prevented? If so, by what means can disease be prevented?
3. Explain how yeasts, moulds and bacteria can be beneficial as well as harmful to man.
4. Under what conditions do micro-organisms flourish?
5. What do you understand by the terms inoculation and vaccination?
6. Explain clearly, with diagrams, the cycle of changes that a malarial parasite undergoes.
7. Why is it so important that we should guard against the tetanus germ?
8. How can you protect yourself from malaria?
9. How would you stamp out plague from India?
10. Go round your village and compound and see what you can do to avoid standing water.

CHAPTER XV

CARE OF INFANTS AND YOUNG CHILDREN

REQUIRED: Basket for cradle, mosquito netting, bedding, large baby dolls, infants' and young children's clothing, safety pins, rubber cloth.

EVERY girl looks forward to the time when she may have children of her own, and most girls help their mothers in caring for little brothers or sisters. It is therefore necessary for you to learn something about the right way in which to bring up little ones who may at some time be entrusted to you.

Every baby needs ample sleep and rest, fresh air, regular bathing, regular feeding, safe water, prompt attention in sickness, muscular exercise, suitable clothing, proper mothering, and training in good ways.

SLEEP AND REST. A baby needs abundance of sleep. A newly born baby normally sleeps nine-tenths of the time. At six months it should sleep two-thirds of the time. If it is sleepless, it is uncomfortable. This may be due to its being fed irregularly or too often; it may be hungry, wet or cold; it may be oppressed by excess of bedclothing and overheating; its nursery may be insufficiently ventilated; it may be suffering from thirst or irritation of the skin.

How to make a bed for a baby. A basket makes an excellent bed for a baby; but a cradle will do, provided it is not rocked. Place a mattress in the bottom and over this a chaff-filled pillow. This latter can easily be washed or changed if it is soiled. Lay a piece of rubber cloth over the chaff pad and cover it with a double fold of clean old chaddar. Chaff makes a good filling for the tiny head pillow also. In the hot weather baby can lie on this, dressed only in a napkin. At night he will require more covering, and the bed can be prepared more or less as follows:

1. Place a clean woollen blanket over the basket or cradle, and on this lay the mattress.
2. Over this place the chaff pillow.
3. Lay a piece of rubber cloth over the chaff pad.
4. Cover this with a piece of old blanket, and lay the tiny chaff pillow in place.
5. Cover baby with a loose, fluffy shawl.
6. Fold the blanket over the sides and turn up the foot and secure it with safety pins. This should not be too tightly fastened, but allow room for baby to kick and move.

The amount of covering required depends upon the season and climate. Hot-water bottles may be put between mattress and chaff pad, if the weather is cold.

The baby should not sleep in the same bed as his mother; this is both unhealthy and risky, as baby may be overlaid.

Where should the cradle or basket be placed for baby? Not at the side of the mother's bed, but at the side of the window. Place a screen to prevent a draught, but permit the window to be open and fresh air to circulate all night. If the baby is well tucked in and his bedding pinned, he can sleep in a cold room and be all the better for it. He should sleep in a sheltered veranda in the daytime, protected from the sun.

As you already know, diarrhoea and similar diseases are spread by flies, and malaria is given by mosquitoes. These insects flying round also prevent baby from sleeping and make him irritable. Therefore, he must be protected from these enemies of his health by a piece of mosquito netting fastened carefully over his cradle or bed. The ideal thing is to screen the room itself but, whether you can do this or not, everyone can have the small piece of netting required for the baby.

BATHING. A warm sponge bath should be given *every day*, either in a small tub or by laying the baby on the mother's legs and pouring warm water over him.

The nose and mouth should be kept clean, but gentleness must mark all such care. If the eyes show a discharge and the lids are swollen, call the doctor at once. Any soreness or redness of skin should be treated with oil, but do *not* use powders. Sunlight and fresh air are the best treatment for a baby's skin, together with perfect cleanliness.

In the excessive heat he can be made more comfortable by giving him a sponge bath two or three times a day. Do not let him get chilled, but keep him in a cool, well-ventilated room. He should have his airing in the early morning and evening.

An even temperature. A baby feels the heat more than we do. Therefore we should try to keep him cool without letting him be in a draught. Keep him quiet, for the heat makes anyone irritable, and a baby needs to lie quietly rather than to be held in the lap and played with. If he has heat rash, in spite of precautions, place him in a bath to which has been added ½ ounce of bi-carbonate of soda.

FEEDING. After the bath the baby may be fed. The feeding may be repeated every four hours but stop feeding at night as soon as possible. Do not give a baby any food between meals, though it may have a little water or fruit juice diluted with water. Be sure that all food given to a baby is clean. Milk and water must be boiled, and baby's fruit juice must be diluted with *boiled* water.

After the baby has finished his feed, hold him up against your shoulder and pat him gently on the back to bring up any air he may have in his stomach.

Too much food, or food given too frequently or too strong, causes baby to be sick, to have diarrhoea and to lose weight.

It is important to teach baby to chew as soon as he has teeth. Give crusts just before meals, when baby is hungry.

In circumstances where fresh clean milk (either cows', goats' or buffaloes') is not obtainable, or does not agree with the baby, condensed or dried whole milk may be used instead. Fresh milk is better than dried or condensed for general use. It is particularly necessary to give the baby orange or other fruit juice every day when giving condensed or dried milk mixtures.

How to prepare food for a baby. First, carefully and thoroughly cleanse all utensils, including the bottles and nipples. Then scald them with boiling water. Do not dry them on a cloth as it may not be clean. They will dry sufficiently after being scalded if the water is boiling.

Measure the sugar into a jug, add the boiling water and stir till the sugar is dissolved. Add the boiled milk and mix well. Bring the mixture just to the boil again and then cool it as quickly and thoroughly as can be. Keep it in a clean place, out of the sun and in a draught, and as cool as possible. The jug must be covered to keep out flies and dirt, but not so as to exclude air. Stir before using.

Never give food either cold or hot to a baby. Warm it to blood heat (about 100° F.). To do this stand the feeding bottle in a vessel of hot water for a few minutes, just before feeding time.

Feeding bottles. It is important that the feeding bottle selected should be of the right kind. A feeder with a long tube is most unhygienic because it is impossible to keep it perfectly clean. Boat-shaped bottles are *not* recommended. They have only one virtue and that is that water can be flushed through both ends. The two openings require rubber-stopper and teat, and rubber deteriorates quickly in a hot climate.

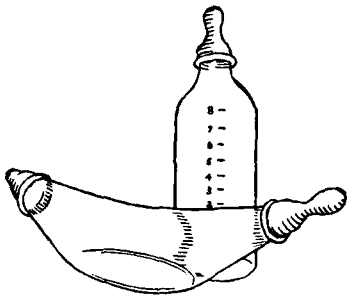


Fig. 81 Feeding bottles

Any bottle, such as a medicine bottle, can be used if it is fitted with a rubber nipple or teat and is kept sterilized. Bottle brushes can be bought which make the cleaning easy. The best type of bottle is that known as the *Hygeia feeder* (Fig. 81). Here, instead of a bottle, an open glass jar is used. This jar is covered by an India-rubber cap. There is no trouble whatever in keeping the vessel perfectly clean without the use of a brush. The hole in the nipple must be of the right size. If it is too large, the milk will run so rapidly that the baby will have indigestion. If the opening is too small, he may grow discouraged and leave off before he has finished: or he may swallow air in his endeavours to satisfy his hunger, thus causing colic.

Care of the feeder. You will understand now the importance of perfect cleanliness in everything which pertains to the baby; but in no case is there greater need for sterilization than in the care of feeding bottles and their rubber nipples. They should be rinsed immediately in cold water, then washed in hot water. Fill the bottles with water and let them stand until it is time to use them again. The nipples, after being similarly washed, should, be dried quickly in the sun and covered with material to keep off flies. As previously directed, everything should be scalded with *boiling* water before use.

Fruit juice. In all cases of artificial feeding, give a little fresh fruit juice daily to infants of three or four months old onwards, to compensate for anything that may be lacking in any prepared food. Orange juice is best, but the juice of lemons or tomatoes may be used. Make sure that no part of the fruit is decomposed. Prepare the juice immediately before use and carefully strain so that none of the solid part is included. It is best given about midway between meals, when the baby is awake, and should be diluted with twice its volume of water which has been boiled and allowed to cool. If very sour, as in the case of lemon juice, a little ordinary sugar may be added. The use of fruit juice may be begun any time after the first month, starting with ten drops daily, increasing this at first by a drop or two daily and later by a teaspoonful a month.

At a year old, a child may have a small tablespoonful twice a day. It would not be wise to use the juice of very sour fruits, such as lemons, in large quantities or continuously. Where the daily use of fruit juice is not convenient it may be given once or twice a week with advantage. Where fruit is not obtainable, the juice of raw carrots or potatoes may be used. They should not be peeled, but should be properly cleaned and kept in boiling water for a few seconds before pressing out the juice, so as to avoid giving the baby any living germs from the soil. They may be grated and squeezed through muslin, or cut up and pressed in a lemon-squeezer. The juice should be strained and diluted as in the case of fruit juice.

Other feeding points. When eight months old, a baby can be given a piece of stale bread or chapati, toasted until hard. Unless it is very hard and dry, it will not serve its purpose of giving the baby something to bite against and develop his teeth.

By the time a baby is nine months old he should begin to take milk from a cup and his vegetables may be sifted through a coarser mesh so as to allow some of the pulp to go through. Other vegetables, plainly boiled (with no spice, ghee, etc.), may be strained and given gradually.

When a baby is ten months old, he should be taking some of his milk from a cup, some he may have with strained cereal porridge, and some he may take with the strained vegetables. Remember on no account to give highly-seasoned vegetables to a small child.

The number of feeds depends upon the amount and quality of milk the mother has and upon the size and strength of the baby. It is a mistake to feed too often, and if the baby can be kept on a four-hour schedule, so much the better. The stomach requires rest.

The following is a good schedule for baby's food:

Age of Baby	Interval Between Feeds	Number of Nursings in 24 Hours	Number of Nursings between 10-30 p.m. and 6 a.m.
1-2 days[1] ..	4 hours	5	1 or 0
3 days to 2 months	3 or 4 hours	5 or 6	1 or 0
2 to 3 months ..	3 or 4 hours	5 or 6	0
After 3 months ..	4 hours	5	0

[1] During these days the child is put to the breast for a few minutes at a time so that he learns to suck and also to stimulate the flow of milk. Plain boiled water is given at regular intervals.

Mother's milk is the baby's natural food, and for this there is no perfect substitute. Babies that are nursed are stronger and develop better health than babies that have to live on artificial milk-substitutes. Babies that feed upon their mother's milk are eight times as unlikely to have diarrhoea as bottle-fed babies. Five times as many babies die when bottle-fed as when nursed on mother's milk.

A practical plan for weaning after nine months

The change from complete natural feeding to complete artificial feeding should never be made in less than two weeks except for urgent reasons—preferably take five or six weeks. Avoid weaning in very hot weather, if possible.

1st week. Give wheat, oat or barley jelly by spoon at 10 a.m. Begin with one tablespoonful of the jelly and give two or three tablespoonfuls of cow's milk on it. Follow this by the usual breast-feed, and give breast-feeds as usual for the remainder of the day.

2nd week. At 10 a.m. give jelly, increased to three or four tablespoonfuls, and follow this by 6 oz. to 8 oz. of humanized milk. Omit breast-feeding at this hour.

3rd week. Give breast-feed at 6 a.m., 2 p.m., and 10 p.m. At 10 a.m. and 6 p.m. give wheat, oat or barley jelly, followed by humanized milk, as above.

4th week. Give breast-feed at 6 a.m. and 6 p.m. At 10 a.m., 2 p.m. and 10 p.m. give humanized milk mixture. Give wheat, barley or oat jelly at 10 a.m. before the bottle-feed, and at 6 p.m., before the breast-feed.

5th week. Give breast-feed at 6 a.m. only—humanized milk at all other feeds—wheat, barley or oat jelly before 10 a.m. and 6 p.m. feeds.

6th week. Discontinue breast-feeds at 6 a.m. Give 8 oz.

humanized milk instead. The baby is now weaned.

If the mother's breasts become uncomfortable or painful during the process of weaning, consult a doctor or nurse immediately—*do not delay.*

Whether a baby is weaned at the ninth month or still suckled, some dry, solid food, such as crusts of bread or dry crisp toast, should be introduced into his dietary about this time so as to train early the powers of munching and chewing and thus induce without delay a proper flow of saliva. This solid food should form part of the meal and should be given about ten minutes before any milk is given, otherwise the baby tends to relax its efforts. These activities lead to an increased flow of blood to the region of the mouth which promotes the growth and development of the jaws, teeth, and the roof of the mouth.

Normally, a baby should be weaned by the time it is nine or ten months old. It is a mistake to continue nursing a big child after a year. To continue nursing for two years or more is very bad for the baby and also for the mother. When weaning, begin feeding the baby with cup or spoon, giving four or five ounces of gruel made from suji or barley or oat flour. Cook the suji with water for an hour and a half, and strain. Add two or three ounces of cow's milk to the cooked suji and a tiny bit of sugar. The baby should also be given orange juice or tomato juice, strained and diluted with water, beginning with two teaspoonfuls and increasing to three tablespoonfuls, once a day between feeds. Water to drink must be given at least four times a day, between the regular feeds.

Artificial feeding. If it becomes necessary, by reason of sickness or the death of the mother, to feed a baby in an artificial way, the nearest substitute for mother's milk is the milk of the goat or cow. The examination of the different kinds of milk has shown that they are not identical and that we must modify the cow's, goat's or buffalo's milk to make it more nearly resemble the mother's milk. (See table on p. 285.)

Our first problem is to get clean whole milk and to know its source and composition. Then we must weigh the baby and calculate the number of calories required on the following basis. A baby under 3 months of age requires 50 calories of food every day for every pound of its own weight. A baby from 3 to 5 months old requires 45 calories per pound of its weight; thereafter, for the rest of the year, 40 calories per pound of body weight are sufficient. He should have from 11 to 13 calories in the form of protein for every 100 total calories. To give an example: a three-months-old baby weighing about 10½ lb., would require approximately 472 calories of food in 24 hours, to be given in the form of 30 oz. of modified or humanized milk.

Regularity of feeding, sleeping, bathing, bowel movement, outing, etc. are all important and should be established during the first week of life. Night-nursing is a bad habit for a baby, and after two months, if not from the first, there should be *no* feeding between the hours of 10 p.m. and 6 a.m. (See table on p. 208.)

Weighing the baby as soon as it is born, and thereafter once or twice a week, is the surest way of knowing whether he is growing as he should. A baby should gain about 6 oz. a week during the first 5 months, and 4 oz. a week during the next 3 or 4 months. If, therefore, a baby weighs 6 lb. at birth, it should double its weight in 5 or 6 months, and would then weigh 12 lb. When 9 months old, it should weigh 16 lb. If a baby does not grow in this way, a doctor's advice should be taken about its diet. Another way of judging whether its food is agreeing with it is by noticing the way it behaves. If a baby sleeps well and seems happy and comfortable, digests its food, has regular bowel movements and passes plenty of urine (water), you may rest assured the nursing is successful.

CHILDISH AILMENTS

1. *Colic* is the term applied to a severe pain in the stomach. The symptoms are crying, a distended abdomen and cold feet which the baby draws up tightly against his body. It is important to get him warm. Fill a bottle with warm water, cover it with a cloth and lay it at his feet. Give him some warm water in which a little bicarbonate of soda has been dissolved (a pinch in a teaspoonful of hot water). Rub his abdomen with oil, and place a flannel cloth, wrung out in hot water, on his abdomen. Be careful not to burn or scald the tender skin. Cover him and keep him warm. Colic is often caused by indigestion or constipation : an enema should then be given, consisting of a cupful of warm water (160°F.) containing half a teaspoonful of purified glycerine. This is introduced into the rectum by means of a small rubber tube. (A rubber ear syringe can be used.) Regular habits in emptying the bowels should be established as soon as possible. Sometimes 15 drops of cod-liver oil, if given two or three times a day, or even sesame oil will correct any tendency to constipation. Massaging the abdomen from the right side to the left side across, and down the left side, in a circular motion, is the best way to stimulate bowel movement.

One thing in particular to be warned against, is the giving of patent medicines, soothing syrups and opium. If a baby is in pain, find the cause and remove it. Is he being fed too often, or being given too much? Reduce the length of time he is nursed, and lengthen the time between feeds.

The nursing mother will not only wish to cure colic, but also to prevent it. Its chief causes are : (i) milk of the wrong composition, which may be due to the mother's health, or to unsuitable artificial food. In the former case colic can sometimes be prevented by giving a few teaspoonfuls of boiled warm water before suckling. The mother should regulate her own diet and take proper exercise to make her milk normal. (ii) Overfeeding which can be determined by the condition of the baby's bowel motions. (iii) Irregular or too frequent feeding. If this is the cause, wait an extra half-hour between feeds. Perhaps the food is taken too rapidly or too slowly; if artificially fed, the hole in the teat may be too large, or if too small the milk may get cold before the baby has finished sucking. (iv) Constipation or diarrhoea in mother or child. (v) Chilling the baby's body due to slowness in bathing, a wrongly prepared bed, wet napkins, cold feet, etc. (vi) Insufficient exercise and activity of limbs and body.

2. *Convulsions*. Convulsions are both dangerous to life and damaging to the nervous system. The chief point is to develop a strong constitution that will prevent convulsions. Regularity of the bowels is a matter of the first importance. The attack may be preceded by indigestion, colic, teething, etc. The symptoms of convulsions are squinting, rolling eyeballs, twitching fingers and thumbs jerking into the palms of the hands, stiffening of the neck, throwing back the head, jerking the limbs and so forth. The mother should act quickly to prevent further fits. First, give a

warm salt enema, and apply cloths wrung out of hot water to the abdomen, being careful not to burn it. Give a teaspoonful of castor oil. This may cut short the attack. Second, give a warm mustard bath by putting one level dessertspoonful of mustard into each gallon of water. Make the water about blood heat. The mother should test the water by putting her elbow into it to see whether it is a comfortable temperature. The baby may remain in the bath from two to ten minutes, and a cloth wrung out of cold water may be applied to the head. The mother should not let the baby become chilled after the warm bath. If she knows that her child has had any indigestible food she should induce vomiting by tickling the back of his throat with her finger or a feather. As each case differs, a doctor should be called without delay.

3. *Croup.* Croup sounds alarming, but may not be dangerous. Sometimes the hoarseness and the barking cough may be symptoms of diphtheria, or other throat trouble; therefore, a doctor should be consulted. If it is only a croup the mother can treat the child herself.

The child usually awakens suddenly at night and is scarcely able to breathe. His cough is loud and brassy.

Treat by applying hot fomentations to the throat. Then, if the patient is old enough to do so without burning himself, get him to breathe the steam from a jug of hot water to which may be added a few drops of Friar's Balsam (tincture of benzoin) to increase the soothing effect. Warm the room, keep him out of a draught, but allow plenty of fresh air. If the child has eaten something indigestible, induce vomiting and give castor oil.

4. *Eczema.* Eczema is the commonest skin disease in babies. It begins with redness and roughness, then the

skin becomes watery and scabs form. It is intensely irritative and the child must be prevented from scratching, as this will make it impossible for the skin to heal.

Eczema is the result of breathing and living in impure air, wrong food and lack of exercise. Overheating, over-feeding, and constipation are frequently the cause. Too much clothing, imperfect drying after baths, soiled napkins, scratching or chafing clothes, all retard recovery.

In order to cure eczema, you must observe all the general rules of hygiene. Stop washing the skin with soap, though clear water may be used. Dab the skin instead with olive or sweet oil, but do not rub it. Tie the child's hands in little bags to prevent him from scratching. Soak off scabs with sweet oil, to stop the irritation. A simple dressing, such as freshly boiled ghee spread on mulmul, can be applied to the sore parts. This should be changed twice a day, using oil to remove the bandage if it tends to stick. A good ointment can be made by using 1 oz. of white vaseline, 1 drachm of zinc ointment, 1 drachm of olive oil and a ½ drachm of lanolin. If, however, the doctor can be seen, it is wise to get his advice, as the cause of eczema may be some microbe which requires special medical treatment.

5. *Teething.* There need be no terrors for the mother of a teething infant if she has observed the rules of health. The secret during this time is to avoid chills and to keep the bowels open. Let the baby have plenty of water, ripe, clean, fresh fruit juice and, if old enough, light food including milk, and there will be little to worry about.

The milk-teeth normally begin to appear between the seventh and the twelfth month, and by the end of the second year a set of twenty should have come through the gums. The teeth come in groups, thus allowing intervals of rest. During these early years of childhood the bones are easily moulded. The practice of using a dummy or pacifier is, therefore, to be condemned. These rubber teats, fastened to a cord, are supposed to provide enjoyment for the child and keep him quiet. Sucking such a dummy, however, is highly injurious, as the bones of mouth and nose are thereby contracted, the arch is deformed and proper teething interfered with. The teeth then come irregularly and out of place; mouth breathing is induced so that adenoids and enlarged tonsils, etc. are likely to follow. More than this, the dummy is wet with saliva from sucking and is frequently dropped on the floor; flies light on it and germs are thus carried to the mouth. It is a filthy, unhealthy and ugly practice, and should *never* be permitted.

Exercise. Exercise is as important for an infant as for older children and adults. A baby's nervous and muscular systems demand it. He should be allowed opportunity for kicking and waving his arms, unhampered by clothing, for five or ten minutes at least twice a day. A pen can be arranged, with a soft quilt on the floor, where with safety he can later crawl and play, rolling and tumbling without harm to himself. In this way, too, he will gradually learn to pull himself up, to stand and to walk. Supply harmless play-things for him, and later give him blocks of wood with which to build. Montessori materials, if they can be afforded, are an excellent means of early education in nervous and muscular control, and for mental growth.

Cleanliness in regard to food is the most important factor in keeping baby well. Germs thrive in the warm weather, and it is necessary to take special precautions against their getting into food. The breast-fed baby is not in so much danger from summer complaints, such as diarrhoea, as the baby which must be fed artificially; nevertheless cleanliness must be our watchword in everything which concerns the baby. Cleanliness of food, clothing, the body and the dwelling, are essential.

CLOTHING. In planning an outfit for an infant, it should be remembered that loose garments are more suitable than tight ones, because of the climate and owing to the rapid growth of children from birth to two years of age. It should also be remembered that our aim is to preserve an even temperature over the entire body, as an essential of health.

The only tight binding permitted is during the first two weeks, when a flannel band, 6 inches wide and 27 inches long, is wrapped tightly about the abdomen, to secure the cord dressings and keep the body warm.

A loose vest may be worn, like a little undershirt, to protect the chest and abdomen from chills. If this has a tab on the lower edge, front and back, the diaper may be pinned to it for support.

Diapers are best made oblong, 36 inches long and 18 inches wide. These can be doubled to form a square, and again folded once or twice to form a triangle. This is wrapped about the hips and between the limbs to form drawers. The several thicknesses are advantageous in keeping the body warm and preventing moisture from penetrating and spoiling the outer clothing. Many babies and little children are permitted to go out without sufficient covering over the vital parts of the body. This exposure is dangerous, as infection from dust and dirt may result in skin diseases.

Care must be taken not to bunch the napkin too much between the legs, or the bones of legs and pelvis will be deformed. Napkins should be changed at once when soiled, and placed in a tin of cold water, washed out and dried in the sun. Do not dry a wet napkin and use it again without washing it. Extra padding may be placed in the napkin to absorb the urine at night (Fig. 82). This should be clean, soft absorbent material and placed as illustrated.

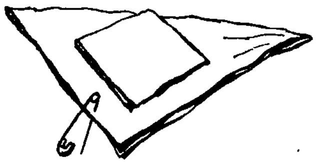


FIG. 82 Child's napkin and pad

When the child has been trained in proper habits, the diaper may be abandoned and drawers may be substituted. Drawers should never be tight in either waist or stride. In cutting drawers, make the curve shallow, in order that the leg length may be short in comparison with its width, and thus avoid any restriction in walking or sitting.

One common defect in the garments of Indian children is that they are too tight about the waist, causing hindrance to free circulation of the blood. Clothing should, therefore, hang from the shoulder.

A slip, or loose frock, should be worn over the vest. This may be cut according to simple pattern, and of a size sufficient to allow for the baby's growth. The neck of the slip may be made to fit by inserting a tiny tape which will draw it up according to the size of the baby's neck. The sleeves also can be tied at first, while the infant is small. Made of good white mulmul or lawn, it is easily constructed, easily cleaned and will last for at least a year.

The gaudy frocks displayed in the bazaar are much too small for comfort, and of such poor material that they will not wear well. The tinsel and lace quickly tarnish and tear, and the colours fade. This fading on the moist skin is a real danger to the health of children, as the cheap dyes used may poison their skins. Simple, white, washable, loose frocks are recommended. Children should be protected from changes of temperature, night and morning, by a light flannel jacket.

Booties or short stockings may be used to keep the baby's feet warm during the cool hours of morning and evening and to protect them from extreme cold and changes of temperature.

A long wrapper of warm cloth may be worn over the slip or loose frock to prevent chills in moist or cool weather. This can easily be removed when the day grows hot.

When the climate is damp and cool, a cap is advisable. The head covering, if any is used, should be cool, light and porous. The heads and eyes of little babies ought to be shaded from strong, direct sunlight; and when the weather is hot and dry a shade should be used to protect their eyes. A bonnet for this purpose may be made with a stiff brim, and a soft comfortable top.

All garments worn by day should be changed before putting a child to sleep at night. A loose slip, or night-gown, is excellent; made with a draw-string through the hem at the bottom, the feet can be tied in like a bag and protected from cold at night.

Things to Do

Oral and written work

1. How would you plan a baby's day so that sleep, food and baths would be given at proper intervals?
2. How would you prepare a baby's bed?
3. Why should he have netting over his cradle?

4. What are the rules for nursing a baby properly?
5. How can you tell whether his food is agreeing with a baby, and that he is growing properly?
6. What is the best way to dress an infant?
7. What should be done in case of colic? How can it be prevented?
8. What causes convulsions? How would you act in such an emergency?
9. What is croup? How would you treat a croupy baby?
10. What causes eczema? How would you cure and prevent it?
11. What care does a baby require when teething?
12. Why is a dummy bad for a baby?
13. When and why should a baby be given hard toast to munch?
14. Why is nursing better for a baby than bottle-feeding?
15. How long should a baby be nursed?
16. Why should orange and tomato juice be given to a baby? When and how would you give it?
17. What bottles would you select? How would you care for them and the nipples?
18. At what age is cereal jelly added to a baby's diet?
19. How may a baby be best weaned?

Practical work

1. With a doll and a small basket-cradle, practise making it ready for a baby in hot and cold weather.
2. If the doll is of celluloid, it can be washed. In any case go through the motions of bathing the baby and putting it to sleep.
3. In the sewing class, make bedding and clothing for the baby doll.
4. Using cow's milk, prepare food for a baby 6 months old, for half the required number of feeds per day. (Why is it best to prepare only half the day's food at a time in India?)
5. Visit the babies' ward of a hospital or a baby welfare clinic.
6. Collect pictures of different kinds of cradles used for babies in India. Write down their advantages and disadvantages.

CHAPTER XVI

GENERAL HOME NURSING

REQUIRED: Bed and fittings, towels, clinical thermometer, graduated medicine glass and spoon, watch with second hand, gauze, cotton wool, oiled silk, flax seed, mustard, small labelled bottles of alcohol, turpentine, eucalyptus oil, camphorated oil, castor oil, tincture of iodine, ammonia, small labelled jars of zinc ointment, vaseline, permanganate of potash, boric acid powder, calomel, Epsom salts, bicarbonate of soda, ipecacuanha, quinine, aspirin.

IN this chapter we shall consider briefly the preparation which must be made in a home to care for invalids generally and what we can do to increase a patient's chances of recovery.

THE ROOM. Choose a room which is cheerful in aspect, but isolated more or less from the rest of the house. This is for two reasons: in order to provide quiet for the patients and also to lessen the danger to others of infection. You can readily understand the importance of both these needs. In time of illness one's nerves are especially sensitive and noise is very irritating. The patient should sleep as much as possible, so quiet is of the utmost importance.

The danger to others from infectious diseases, such as mumps, scarlet fever, diphtheria, smallpox, cholera and consumption, is very great, and the isolation of patients suffering from these complaints is imperative.

Air. The room should be large and have two windows for cross ventilation, but draughts must be avoided. A good supply of fresh air is a great help to recovery.

Light. Sunlight is a great germicide and aids in the cure of disease. It is also active in developing vitamin D which, we shall later learn, is essential to health. Therefore do not shut the sunlight out all of the time, though it is necessary to do so in the middle of the day. The patient's eyes should, of course, be screened from the glare.

Temperature. The room should be kept at as even a temperature as possible. If the floor is of stone, cold water may be poured over it to lower the temperature and khus-khus tatties hung at the openings. In a cold climate it is wise to select a room with a fireplace and chimney. This provides ventilation as well as warmth.

Furnishings. Remove all unnecessary furniture and ornaments from the sick-room. Pictures become tiresome to an invalid and extra furniture requires extra cleaning. A bare floor, with only the patient's bed, a bedside mat and table, is enough, plus a comfortable chair for the nurse. Keep medicines on a shelf and not on the bedside table.

Care of the room. Avoid raising dust when sweeping: better still, wipe the floor with a mop. Dust with a moistened cloth. Remove soiled things from the room immediately.

THE BED. A metal bed is cleanest. The mattress should be firm though soft and should be protected by a covering which can be changed. Place the bed with the head beside the window, not in a corner, nor facing the light from window or door. This provides for good ventilation, prevents eye strain and permits the nurse to reach her patient from both sides of the bed.

Making the bed. Lay a square of rubber cloth about half-way down the bed, and on top of the bottom sheet, and over this draw a sheet that has first been folded lengthwise. This is called a draw sheet, and it should be tucked in well on one side and then drawn very tight and tucked under on the opposite side. This sheet can be changed more easily than the large sheet if the bed requires it; it is also easy to tighten if the sheet becomes wrinkled. Place the top sheet on and first tuck it well in at the foot of the bed, leaving enough of the sheet at the head to turn back over the blankets and counterpane. The sides are not tucked in all the way to the head, for you must leave an opening for the patient. A mosquito net should be hung over the bed, to keep away mosquitoes and flies.

Changing sheets with a patient in bed is fairly easy if she can be turned. Put her on her side with her back towards you. Remove all covers but the top sheet, or leave only enough covering to keep the patient from being chilled. Loosen the soiled bottom sheet from under the mattress on the side from which you are working. Gather it into long folds, and push it well up against the patient's back. Take the fresh sheet, which has been previously gathered into smooth folds, leaving just enough unfolded to tuck in under the edge of the mattress. Lay this on the bed and tuck in the unfolded part the full length of the bed. Push the folds of the clean sheet close against the back of the patient and turn her over towards you, with her face to the side of the bed which has been covered with the clean sheet. Go to the other side of the bed and draw out the soiled sheet, removing it from the bed. Draw the clean sheet over from behind the patient, smooth and stretch it and tuck it under the mattress edge. Change the draw sheet and rubber in the same way.

Lifting and moving a patient in bed can best be done by standing on the *right* side of the bed. Let the patient put her arms around your neck. Then put your *left* arm around and under her shoulder, leaving your right arm free to adjust the pillow or do anything necessary. To move her to the side of the bed, put your arms under her shoulder and hips and so draw her to you.

Changing the night-gown is more easily accomplished if it is split down the back. This is also more comfortable for the patient. If it has not been split, the method of removing the gown is as follows. Draw the gown well up under the arms (working under a sheet). Draw one sleeve off and lift the gown over the patient's head; then slip off the second sleeve. Reverse the order for *putting on* the fresh one. Put one sleeve on, put the gown over the patient's head, put the other sleeve on and pull the gown down under the patient, leaving no wrinkles.

Bed sores are the result of pressure and unclean, damp or wrinkled bedding. Good nursing should prevent them. If the limbs, back, and shoulders are rubbed with alcohol to keep up the circulation and the bed kept in proper condition, there should be no sores to reproach the nurse. Zinc ointment helps to heal sores, if the skin is broken.

Bathing a Patient in Bed. This should be done either before breakfast or an hour or more after. Have everything in readiness before beginning: sheets sunned, night-gown aired, towels, wash-cloths, soap, alcohol, jar for waste water, large basin or brass vessel on a chair or stool, hot and cold water. Put a blanket under the patient in the same way you did the sheet, place another over her and remove the night-gown or sari.

Begin by bathing the face and ears and continue in this order: face, ears, neck, arms, chest and abdomen, legs and then feet. Turn the patient on her side, wash her back and dry it; then rub her back, shoulders and hips with alcohol. Let her lie on her back and wash the pubic region.

In bathing each part place a towel under it so that the blanket will not get wet; dry each part before beginning on another. Change the water after bathing the trunk and again after bathing the legs and feet. Hands and feet may be placed in the basin and washed. Wipe thoroughly, so that no bed sores form. The patient's teeth must be brushed, hair combed and nails cleaned.

KEEPING RECORDS. The temperature should be taken night and morning and recorded on a chart. Also record the pulse, respiration, amount of sleep, amount of food taken, the number and description of excretions.

Time	Temperature	Pulse	Respiration	Sleep	Medicine	Bowels	Urine, amt. passed	Vomits	Food: Quantity and kind

The doctor can determine the nature and progress of the disease by watching the rate of heart-beat or pulse, the respiration and body temperature. Therefore the nurse should be expert in taking and recording this information. The temperature is taken by placing the mercury end of a clinical thermometer under the tongue and closing the lips. One minute is the usual length of time required, but thermometers differ—some requiring longer to record the temperature. A baby's temperature is usually taken under the arm, or in the rectum. The temperature recorded under the arm is one half-degree lower and in the rectum one half-degree higher than in the mouth. Always wash the thermometer in sterile cold water before putting it in the patient's mouth and place it in a glass of antiseptic lotion after use.

The normal temperature is 98.4°F. If it is lower than this we call it sub-normal and at 96.5°F. it indicates collapse. Temperatures above normal indicate fever, which is usually lower in the morning than it is at night. Moderate fever is indicated at about 100° in the morning and from 102° to 103° at night. High fever will register 102° to 104° in the morning and 104° to 105° at night. This temperature is dangerous if long continued and the doctor must be called immediately. To reduce the temperature cold sponge-baths and cold compresses may be applied, or the back may be rubbed with alcohol.

Fevers end either slowly, as in typhoid fever, or suddenly by crisis, as in pneumonia. When a sudden drop in temperature occurs, apply hot applications and give hot tea or medicine to prevent heart failure. The normal pulse of a man is 60 to 70 beats per minute, of a woman it is from 65 to 80 beats and of a child from 90 to 100 beats. The pulse varies according to age, activity and position. Respiration is normally 18 to 24 breaths per minute. Try to count it when the patient is unaware of your doing so. Sometimes you can continue to feel the pulse and pretend to be counting it, while in reality you are watching the chest rise and fall.

Doctor's orders should always be carried out absolutely. Ask questions and be sure his orders are understood. Regularity is important in giving both food and medicine. Delay may cause serious trouble. Make your preparations in time, so that you will be ready to give the nourishment or medicine at the exact hour.

Food. Meals for the patients should be served punctually and daintily, with clean linen and dishes so as to tempt the appetite. Take care to have hot food really hot and cold food cold. Do not serve large quantities, but give the right amount the patient is permitted to have.

Food for invalids, like food for children, must be easily digestible and must furnish an adequate amount of tissue-building materials, i.e. proteins, mineral salts and vitamins. If the disease is a 'wasting' one, the tissues will need an abundant supply of new material. That is why, in tubercular troubles, milk, eggs, meat, fruits and leafy vegetables are given in large amounts. These foods are good for all sick people, if the method of preparation is simple. We may classify diets into four groups:

1. Liquid diet is usually prescribed by the physician who will list the foods permitted to the invalid. Commonly they are broths, vegetable or meat extract, tea, milk and buttermilk, gruel, egg-milk drink, cream, soups, cocoa.

2. Semi-liquid diet includes jellies made with gelatine or agar-agar (China grass), meat jellies, custards, kanji, cereal jelly, strained vegetable pulp, milk toast.

3. Soft diet is similar to the semi-liquid, but not strained. Additional dishes of chicken, fish, milk puddings, stewed fruit and creamed dishes may be added.

4. Solid diet includes any food simply prepared which is easily digested. This permits of more variety in methods of cooking and serving.

MEDICINES. It is wise to ask the doctor to write down his exact orders, so that no mistake may be made as to time, amount and sequence in which medicines or treatments are to be given. All medicines should be locked up so that no one but the nurse can get them. Poisons and strong medicines should be separated from others, and poisons should be marked unmistakably with a coloured label; put them on the top shelf. Never give or take medicine in the dark. Never use an un-labelled medicine, either liquid or powdered. Look at the label *three* times: first when you take the bottle from the shelf; second, when you pour it out; third, when you return the bottle to the shelf—and in this way avoid giving the wrong medicine by mistake. Measure carefully and exactly the quantity ordered by the doctor; for this a measuring glass is best. Buy only the amount required and keep the bottle corked, for some medicines lose strength. Give medicines at the hour ordered. Never give another person's prescription.

Medicine chest. It is best to keep medicines in a special cupboard with a lock and one that is too high for children to reach. This should contain the simple remedies which might commonly be needed in an emergency. It is not wise to keep medicines from old prescriptions, as they lose strength and are not suitable for any but the case for which they were originally purchased. Everyone should keep a few bandages, some cotton wool, a bottle containing sterile gauze or lint, a hot water bag, an eye-glass, a clinical thermometer, a medicine glass, adhesive plaster, oiled silk, eucalyptus, vaseline, tannafax, camphorated oil, castor oil, permanganate of potash, tincture of iodine, boric acid powder, bicarbonate of soda, Epsom salts, quinine, calomel, ammonia, aspirin, mustard and ipecacuanha.

Some Home Nursing Terms Explained

1. *Counter-irritants* are used to draw the blood to the surface of the body. They may be hot or cold. A rubber bag or a bottle filled with hot water and wrapped in flannel to prevent burning may be used; a hot brick or flat iron, a bag filled with hot sand or hot salt, are all useful means of heating some special part of the body. Ice bags are made

of rubber and can be partially filled with crushed ice and covered with a piece of cloth.

2. *Stupes* are cloths wrung out of boiling water. Sometimes the doctor will order turpentine mixed with a little oil to be added to the water. Use a cloth (preferably white flannel) three times the size of the area to be covered. In order to wring dry a cloth so hot that you cannot do it with your hands, lift the cloth with a wooden stick and lay it in the middle of a towel; then twist the ends of the towel in opposite directions till no more drops can be squeezed out. Unfold the flannel, shake it well, and place on the patient. (If the flannel has been properly wrung and shaken it will not burn the skin.) Cover it with a piece of mackintosh or clean plantain leaf over which a dry towel should be placed to keep the stupe warm. Keep in place with a firm binder. Keep the water hot so that another stupe may be applied in about 20 minutes, and continue for as long as prescribed.

3. *Hot and cold compresses.* Use clean bits of cloth, pieces of gauze or cotton wool and dip in hot or cold water. Apply them to inflamed parts, for fifteen minutes at a time, at intervals throughout the day. Sometimes hot and cold compresses are alternated. If they are applied to an infected part, like the eye, never use the same compress on both eyes and take care not to touch your own eyes. Keep everything very clean.

4. *Poultices* are used much less than in former years, as they keep the tissues moist and warm and therefore encourage germ growth. Usually we make them of flax seed, by adding flax seed meal to boiling hot water until the mixture is thick enough to drop from the spoon. After it is thoroughly heated, remove from the fire and beat

it until light. Spread the mixture on a clean piece of cloth which is sufficiently larger than the poultice to allow of the edges being folded back. Do not make it too thick. Test the heat against your cheek before putting it on the patient, then cover it with oiled silk and a folded towel. When it is cold, replace with a fresh hot one.

5. *Mustard plasters* for adults are made by mixing one part of ground mustard with eight parts of *maida* or white flour. For children there should be twice as much flour used as mustard. Spread on a cloth in the same way as a poultice. Do not leave a plaster on too long or the patient will be blistered, five to ten minutes is long enough. Wash the skin after removing the plaster.

Infectious Diseases

After any infectious illness the patient's sheets, pillow cases and towels should be boiled for half an hour. Woollen and coir fibre articles should be soaked for two hours in izal solution. Other textile fabrics can be sprayed with pure carbolic acid solution and sunned for several days. Leather articles can be wiped with a 1 per cent formalin solution. Boil cooking and eating utensils for at least fifteen minutes or, if they would thus be spoiled, soak in a 1 per cent formalin solution.

Scrape the walls of the sick-room and whitewash them, burning the scrapings. Scurb everything that will stand it, such as the bed frame, furniture, woodwork, windows, etc. with soap and hot water. Earthen floors can be disinfected with kerosene emulsion and cyanide. Scrub the woodwork and floor in the latrine with mercuric chloride solution. By boiling, scrubbing and sunning everything in the house, you can make it safe to live in.

Cholera, enteric or typhoid fever, dysentery and diarrhoea are all caused through swallowing the germs of these diseases, with water or food, and thus letting them reach the intestines where they grow and multiply. About three-fourths of the people who have cholera die of it. The germs are very strong, and it takes but two days to develop the symptoms of the disease. The germs are able to live a long time outside the body, if kept damp, and that is why they live so well in water and on moist food.

But how do the germs get into the water and food? That is the most unpleasant part of the story. They cannot get there except through the careless and unclean habits of people who have the germs in their intestines, or the carelessness of those who look after the sick. That is why it has been said that 'whenever anyone catches one of these diseases, someone else ought to be put in jail'. To be the cause of spreading disease germs is just as truly taking life as to kill with a knife or poison. We are responsible for the health of those about us. Let us learn how we may avoid causing the sickness and death of others.

How these diseases are spread. Some people who have been sick with these diseases and have recovered are germ carriers, while others who have never shown symptoms of the diseases can also carry them in their intestines. It is these people who are probably responsible for starting epidemics of disease. It is therefore important, especially in a hot climate, that everyone, whether sick or well, should take the greatest precautions in disposing of body wastes. Any person having disease germs in his intestines may spread them with the excreta (or faeces) and urine which he voids. This body waste should be disposed of in sanitary closets, and lime (chunam) sprinkled over after each evacuation. If the wastes are allowed to lie on the top of the soil, or drain into open sewers, flies will surely light upon them and carry away disease germs on their legs. Flies are filthy creatures, and every one of them is an active agent in spreading germs. They light upon food, fruit and sweets; they rest upon baby's face and hands, and drop into the milk. We should therefore screen our food and keep flies out of the house.

Another way by which these active germs of cholera, diarrhoea, dysentery and typhoid fever are able to enter our bodies is in the water we drink. This fact has been mentioned in several other connexions, but these diseases in particular are carried by water. Faeces and urine which are carelessly disposed of may seep through the soil into tanks, wells or rivers. Furthermore, people who bathe in tanks, after attending nature's demands, scatter germs of these diseases, which are then taken in by the other bathers, and by those who drink the water or use it for washing out their mouths. Again, if the clothes of those who are sick, or are carriers of these diseases, are washed in the water which others use for drinking and bathing, they, too, spread the infection. To take in germs in drinking water is an especially dangerous way of contracting diseases, for water passes so quickly through the stomach that the acid of the stomach has little chance of destroying the germs. During an epidemic we should avoid eating indigestible food, or taking medicines like salts which hasten the passage of food through the stomach. Do you not think we should be extremely careful not to contaminate water? And ought we not to make sure it is pure before we drink it? When cholera or enteric are about, it is wise to be inoculated against them.

In the event of sickness we must not only look after the patient, but we must see that the disease is not spread to others. What, therefore, should we do? First, a doctor should be called in and, if there is a good hospital near at hand, the sick person should be carried there, where good nursing and medicines can be secured as well as the doctor's care. The sick who are taken to the hospital have a very much greater chance of recovery than if nursed at home. It is also safer for the family.

These diseases should be reported at once to the health officer. It is our duty to notify the authorities, so that precautions may be taken to prevent an epidemic. We should obey the health officer, and not leave the house if he orders us not to do so. Quarantining the family of those who have cholera is one way of stopping the spread of the infection. If we disobey and go out when we are quarantined, we may be the cause of many more deaths.

Precautions to be taken in nursing these cases. If we take proper precautions, there is no reason why we should not nurse the sick. Doctors and nurses do this and are not ill. It is cruel to neglect the sick because we are afraid of getting the disease. What should we do to safeguard ourselves while nursing a person with one of these diseases?

1. All wastes from the body of the patient must be disinfected. Carbolic acid and lime may be used for this purpose. If you cannot get either of these, burn or bury all waste matter at once. Vomit, urine and excreta should be well covered with earth, but it is much safer if lime can be poured over it before the earth is placed there. Do not bury the waste near the water supply.

The wastes from all members of the family should also be treated in a sanitary fashion, for someone may have the germs without knowing it. Use carbolic acid or lime in the closet, or bury the waste as above.

2. Everything used for the sick person must be kept separate from the things used by the family. Their dishes, trays and cups should be washed separately and boiled in water to kill the germs. Their clothing and bedding, too, should be washed separately and boiled.

3. The house itself, as well as the sick-room, should be well sunned and aired. Dryness and sunlight destroy germs.

4. Wash your hands with warm water and soap, and use some disinfectant on your hands after waiting on the patient. Always disinfect the hands before eating.

5. All drinking water should be boiled and then cooled and kept covered. Pour the water out into a cup, instead of dipping a cup into the water.

6. Keep all food covered from dust and flies. Cook all food before eating it. Avoid raw fruits and salads. Do not use food that has been allowed to stand all night. Cholera germs grow in cooked rice that has been allowed to stand.

7. Keep visitors away. They may spread the disease.

8. If anyone is suspected of having the disease, keep him in a separate room for forty-eight hours. Anyone who has been exposed to infection should also be isolated for two days, until it is known whether he is free from germs.

9. When the patient has recovered or has been removed from the room, it should be scoured with washing soda and sprayed with disinfectant.

Whooping cough. Fan the patient in the face with fresh air during spasms. Bathe carefully to avoid chill and keep out of a draught. Pneumonia may follow or accompany this disease. If vomiting is persistent and food eaten is lost, feed the patient again soon after a spasm, otherwise he will grow weak from lack of nourishment. Give water freely. Sometimes a band pinned tight about the abdomen will support the muscles when coughing and prevent rupture.

The matter coughed, or vomited up, should be coughed into rags or pans and burned, as it contains the germs. Sometimes inoculation is used successfully as a cure.

Intestinal Complaints

Children are very apt to suffer from diarrhoea and such intestinal complaints. Their little bodies cannot kill the germs. This is the chief reason why so many babies die in India. It is a terrible waste of human life, and it can largely be avoided by cleanliness and care. Unclean food and water are the causes of infection.

Worms. Various kinds of worms are apt to get into the intestines. They do not cause disease, but like germs they may enter with our food and water and are spread by the body wastes. The most important member of the group is the hookworm, which fastens upon the walls of the intestines and sucks the blood, causing weakness and anaemia.

The eggs of the hookworm pass out through the intestines and, in the soil, soon hatch into tiny worms. When you run barefooted, these tiny worms get between the toes and work their way under the skin, then into the blood, and finally into the intestines. They cause sores when they burrow into the skin, and these sores are sometimes called ground-itch.

In cases of sickness, a doctor must prescribe the treatment. We should know enough, however, to meet emergencies, to co-operate with the doctor and to nurse the patient under his directions. The tables at the end of this chapter may be referred to as a help in recognizing infectious diseases. They should guide you in knowing how long after exposure it will be before a specific disease may develop. Then you can isolate anyone who has been in contact with the disease and determine whether he also is going to have it. In this way, we can protect healthy people and prevent the spread of disease.

INJURIES AND EMERGENCIES

1. *Burns* are caused by the skin coming in contact with fire, heated metal, electrically charged wire, or some chemical; a *scald* is caused by boiling liquid. The treatment is the same for all, except burns caused by chemicals.

If the clothing has stuck to the burn, cut round it—do not tear it off. Clean gently with swabs of cotton wool moistened with boiled water or weak antiseptic lotion; then dry and apply strips of gauze spread with tannafax. If tannafax is not available, soak the gauze in white of egg and apply to the burnt surface. If the burn was caused by an acid it can be neutralized by applying a weak solution of washing or baking soda. If it was caused by an alkali apply a weak acid, such as lemon juice or vinegar. Any trace of the alkali should be gently removed first.

A bad burn, besides causing great pain, gives the patient a nervous shock. Keep him quiet and warm, and give a mild stimulant such as hot coffee or salvolatile.

What would you do if your clothes caught fire, or if you saw someone with her clothes blazing? What does fire need if it is to burn? Deprive it of oxygen and it will go out. Therefore, roll firmly round the blazing person a thick blanket or rug. Do not use thin cotton cloth; it is very inflammable. If nothing is at hand, roll her on the floor. Do not permit her to run, as this causes a draught and will make the clothing burn more briskly.

2. *Bruises* or swellings in the skin, caused by a blow or knock, should be treated with cold water or iced dressings.

3. *Bites and stings.* When bitten or stung by snakes, tarantulas, scorpions, insects, dogs or cats, the preliminary treatment is the same. The poison is more likely to enter a vein than an artery, because the veins, which are pipes taking our blood to the heart, lie near the surface while the arteries are more deeply seated. Our object is to prevent the poison reaching the heart, thus circulating and affecting the nervous system. As blood travels very quickly, the vein through which the poison will pass must be closed immediately by compression (as you might close an empty bicycle tube). The vein closed must be between the bite and the heart, therefore at once tie tightly a piece of tape, string or cloth round the limb—finger, wrist, or arm near the elbow; toe, ankle, or leg near the knee—so as to prevent the blood travelling along it. The vein should be compressed with the finger while the ligature is being prepared. It is best to tie two or three ligatures (as these tight bandages are called) along the limb. If the bite is on a part of the body which cannot be tightly tied, for example the neck, then press with the fingers, or with a small pad, the veins between the bite and the heart, tight on to the bone. Veins are very compressible and if forced against anything hard are immediately closed. Loosen the ligature every twenty minutes for a few seconds.

Having thus prevented the poisonous blood from reaching the heart, attend to the wound itself. If blood-warm water, which encourages the flow of blood, is at hand, bathe the wound freely, squeezing out the blood and with it the poison. Do not use hot or cold water; they tend to clot the blood and prevent its flowing. The further treatment will vary as follows according to the origin of the wound.

(i) *Snake bite.* Two little red spots, where the fangs have entered, can usually be seen. Over these, *after* applying the ligature, cut with a sharp knife a small deep cross, rub in powdered crystals of permanganate of potash. Treat for nervous shock, if necessary. Take to the nearest hospital for injection of anti-venom, or smear your mouth with ghee and suck the wound, spitting out the poison.

(ii) *Tarantula bite.* As for snake bite. (The tarantula is a larger, handsome and very poisonous spider.)

(iii) *Scorpion sting.* This is not generally dangerous, but is extremely painful for several hours. Bathe with dilute ammonia or with methylated spirits. Application of some non-burning alkali, such as a paste of bicarbonate of soda or a solution of washing soda, helps to relieve the pain; or dab with a dhobi's blue bag.

(iv) *Wasp, bee or hornet's sting.* As for scorpion bites.

(v) *Dog or cat bite.* If the animal is known to be healthy, treat with iodine, lest pus-forming bacteria breed, and apply suitable dressing. But if there is any reason for suspecting rabies, burn the wound well, either with a redhot wire or a flame, or with pure carbolic acid applied on cotton wool at the end of a match pressed well down into all parts of the wound. Undiluted tincture of iodine may be used if nothing else is at hand, but cannot be depended on to do the work as well. Then go to a doctor.

If the dog turns out to be mad, you will need anti-rabic injections. Remember that a scratch from the paw of a mad animal or saliva from the mouth, if it gets into a crack in the skin, can carry rabies as easily as a bite.

Skin Infections

Itch. Children cannot rest and grow strong if their lives are tormented by these tiny animals which are too small to be seen. They cause irritation on the surface of the skin and then, when the skin is broken by scratching, they crawl in and lay their eggs. The eggs hatch and more mites spread all over the body, clothes and bedding.

A doctor should be consulted at once. If a doctor is not available, the following treatment should be undertaken. Bathe in hot water, scrubbing well with soap where the itching is; then rub with sulphur ointment and put on clean clothes. Do this on three successive nights; be careful to dilute the ointment for a baby's skin. Do not scratch.

Another variety of itch, known as *dhobi's itch,* is caused by a tiny plant which grows in the skin, forming spores or seeds. This is harder to cure, and you should get a doctor to give you medicine, if possible. In any case, bathe daily and change into clean underclothes that have been boiled. Sprinkle over the sore places a powder made by combining equal parts of starch (cornflour), oxide of zinc, and boracic acid. Or use an ointment of carbolized zinc and cover with a soft clean cloth.

Ringworm. This is a trouble occasioned by a tiny plant or mould. The doctor should be consulted where possible, in order to destroy this growth. The sores spread in all directions from the centre, healing from the middle and spreading at the edges, thus forming a ring.

Lice. These pests, like the itch mite, prevent children from getting proper rest. Lice develop from long white eggs which stick to the hair and are called nits. They multiply so rapidly that two female lice can produce ten thousand in two months.

In order to get rid of these pests, mix equal parts of sesame oil (gingili) and kerosene. Smear the scalp, and wet the hair thoroughly with it. Wrap the head in an old cloth and leave the lotion on overnight. Remember to keep well away from unprotected lights and flames while the lotion is on the head. Wash the head and hair next morning in soap and warm water and comb it with a fine comb dipped in vinegar. The vinegar loosens the nits. Cleanliness is the only way of keeping oneself free from lice.

Body lice are somewhat larger. Remove your clothing and sun it in direct sunlight. Take a bath, in which bicarbonate of soda has been dissolved (use 4 or 5 oz. soda to a tub of water). Mix 2 oz. glycerine with ¼ oz. pure carbolic acid, to a seer or pint of water. Rub the body with this.

To destroy the crab louse, use mercurial ointment, and keep the parts clean by washing several times a day.

Constipation

This is most often the result of nervousness, or failure to form a regular habit of evacuation. Fear, worry and emotional strain may cause indigestion and constipation. If good habits are established in childhood, the adult will not be troubled by either of these difficulties. They should be unconscious processes, and the more one makes them habitual the better. Exercise and drinking plenty of water help to form this habit. Eating green or succulent vegetables is another good way of preventing constipation.

It is very important that the habit of regularity in emptying the bowel should be established early in life, and that it should never be broken. This waste material, the faeces, contains millions of bacteria which cause it to decay and form poisons in it. If this waste is not promptly removed from the body, the poisons will be absorbed into the blood and the whole body will be injured. Headaches, tiredness, weakness and other disorders result.

There are two classes of medicine used for constipation; laxatives, such as cascara, liquorice powder, rhubarb, senna, liquid paraffin; and purgatives, such as salts, calomel and castor oil. The laxatives are mild and can be taken for a long time without harm. Purgatives are violent and should only be taken rarely. But it is much wiser to select the right food and establish regular habits than to take medicines.

Poisons

Substances which when swallowed and absorbed into the blood destroy health or even life are called poisons. Sometimes children suck matches or 'taste' disinfectants or eat unsound food which causes ptomaine poisoning. Sometimes poisons are taken deliberately, or overdoses of medicine may be given accidentally. In all such emergencies it is very necessary that you should know how to act immediately. A first-aid manual should be kept at hand, for it is impossible to remember the symptoms, antidotes and treatment of all poisons.

What would make you suspect poisoning? (i) Sudden illness or unconsciousness in a person in good health; (ii) the onset of symptoms after eating or drinking.

How can you tell what poison to suspect? Glance round quickly and see if any bottle or box shows what has been swallowed. Note whether the mouth and clothes have been burnt, as they would be in the case of corrosive poisons. Smell the breath, for this may tell you whether carbolic acid, opium or alcohol is the cause. Observe whether the pupils of the eyes are contracted as in opium poisoning, or dilated as with belladonna (datura).

What should you do when you suspect poisoning? (i) *Send immediately for a doctor,* letting him know why he is needed and, if possible, what poison you suspect has been taken. (ii) Do not wait for the doctor to arrive, as time means everything. Get your manual of first-aid and look up the treatment for the specific poison if you know it. If you do not know the poison, look for the symptoms and judge accordingly what the poison is likely to be. (iii) Rid the system of the poison. Cause vomiting either by tickling the back of the throat with the finger, or by giving an emetic such as one tablespoonful of mustard in a glass of warm water; or a tablespoonful of salt in a glass of warm water; or even plain warm water, plenty of it, will do, if you have nothing else at hand. *Do not give an emetic if there are burns on mouth and lips.* If the poison has burned the mucous membrane in going down, it will burn it still more in coming up, if we give an emetic. In such cases we give milk, cooked rice, flour and water, or mashed potato, which soothe the stomach and prevent the poison from being absorbed. (iv) Neutralize the poison with an antidote, if you know what the poison is. An antidote is something which will counteract the poison. You have learnt what an acid and an alkali are. *If the poison is an alkali,* give an acid such as lime juice or vinegar.

If the poison is an acid, give chunam, bicarbonate of soda or plaster. After the antidote has been given it is usually safe to give an emetic. (v) Stimulate the patient. In many cases of poisoning there is collapse or drowsiness and the patient will require either warmth to the feet or artificial respiration, or to be kept walking to prevent him going to sleep. Give stimulants, such as hot tea or coffee.

THE CHIEF GROUPS OF POISONS. (i) *Narcotics.* These are poisons which produce sleep, such as opium and its preparations, laudanum, Dover's powders, paregoric, heroin, morphia, and chlorodyne. Their symptoms are drowsiness, unconsciousness, pulse fast and then weak, breathing slow and shallow, face pale or blue, clammy sweatiness, pupils of eyes contracted. The treatment consists of giving an emetic to produce vomiting followed by a stimulant such as hot, strong coffee. Give solution of 10 grains of permanganate of potash to 1 pint of water; walk and slap the patient to keep him awake. Repeat the emetic. Give artificial respiration if there is collapse and insensibility.

(ii) *Irritants.* These include metallic poisons, such as arsenic and mercury; and substances such as kerosene oil.

Arsenic poisoning somewhat resembles cholera. Symptoms are pain in the stomach and abdomen, vomiting, thirst, bloody movements of bowels, rapid weak pulse, clammy skin and sometimes unconsciousness. *Treatment:* (*a*) Give emetic of warm salt water; (*b*) give milk, flax seed tea or brandy and olive oil; (*c*) if bowels have not moved, give castor oil. Give similar treatment in cases of poisoning from kerosene oil, turpentine, and ptomaines.

Mercury preparations are used as disinfectants and are very poisonous, causing great pain. Symptoms are metallic taste in mouth, white swelled mucous membrane, pain in abdomen, nausea with vomiting, and bloody stools; skin clammy, prostration and collapse. *Treatment*: (*a*) Give an emetic; (*b*) give raw white of egg, or, milk or flour and water; (*c*) give lemonade and brandy.

For *phosphorus,* the treatment is that given for arsenic poisoning, except that no oil of any kind may be given.

(iii) *Corrosives* are strong acids and alkalis which destroy tissues. In this group are sulphuric and nitric acids, and alkalis such as ammonia, caustic soda and potash. Symptoms of *acid poisoning* are burnt lips and mouth, often stained white, yellow or black; pain in the alimentary tract; intense thirst; vomiting; difficulty in talking; collapse. *Treatment*: AVOID EMETICS, give whitening, plaster, chalk, mixed with water; follow this with half a pint of oil (olive or sweet) in one pint of water; give milk freely.

Carbolic acid is different in character and is recognized by symptom of white stain on burnt lips and mouth, and by its odour. The muscles become soft and useless; collapse. *Treatment*: AVOID EMETICS, give Epsom salts or sulphate of soda ($\frac{1}{2}$ oz. in $\frac{1}{2}$ pint of warm water or milk); give milk freely, or limewater and milk, flax seed tea, or raw eggs, and also alcohol; warm the feet and give artificial respiration; *do not give oil* or glycerine, as they hasten absorption of poison.

With strong alkalis, such as ammonia, caustic soda and potash, the symptoms are vomiting and purging with pain in straining; collapse. *Treatment*: Give lemon or lime juice, or else vinegar diluted with one part of water. Follow this with soothing drinks of milk or eggs or gruel, and administer stimulants if there is collapse.

(iv) *Nerve poisons.* In this group we place prussic acid and cyanide of potassium, cocaine, mushrooms, strychnine, nux vomica, belladonna, datura, alcohol, hemp or bhang. These substances produce delirium or excitement. Symptoms vary in some particulars (see first-aid manual); but in general, the pupils of the eyes are enlarged or dilated, there is giddiness and staggering, followed by insensibility. *Treatment*: Give emetics, and then stimulants, warmth and artificial respiration. With mushroom poisoning also give a purgative (2 oz. castor oil).

First Aid

Everyone should know how to fold and apply a triangular bandage and how to put on an arm sling (Figs. 83-4). A forty-inch square of strong cotton cloth, cut diagonally across from corner to corner, will form two bandages; or a large handkerchief may be folded and used without cutting. It may be used as an arm sling when any injury to the hand or arm necessitates it being raised to prevent the flow of blood downwards. To put it on, place one end so as to hang a few inches over the front of the shoulder on the injured side. Take the bandage behind the neck, bring it over the other shoulder, spread it out on the chest with its point towards the elbow of the injured arm. Bend the arm on the middle of the bandage. Bring the hanging end outside the injured arm up the other end hanging over the front shoulder, and

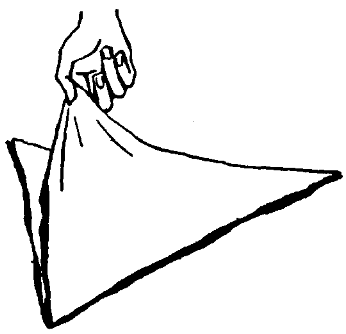


FIG. 83 Triangular bandage

tie the two ends in a reef-knot. With two safety pins, secure the point at the elbow to the bandage on the outside.

By folding the triangular bandage with its point to the base and then folding it in two, we have a broad bandage. If we fold it in three we have a medium bandage. By folding a broad bandage into two, we have a narrow bandage. The broad bandage may be used for a sling, instead of the unfolded triangle.

(i) *Broken bones: Fractures.* If anyone should fall and break a bone, it is well to know what to do. The broken ends must be put together closely and held close, or they cannot knit together again. If the patient has to be moved, care must be taken not to displace the broken ends nor allow them to lacerate the flesh. If the skin is broken, apply an antiseptic to prevent the entrance of pus-forming bacteria.

FIG. 84 Sling

There are many kinds of fractures and special methods of bandaging according to the position of the broken bone. Wrap a bandage around the limb. Then place splints around it, and tie them to the limb to keep it straight and steady

(Fig. 85). Should nothing be available, strap the broken leg to the uninjured leg, or the broken arm to the side of the body. Slip a blanket carefully under the patient; place two poles on either side of him and tie the blanket to, or roll the edges round, the poles. Carry him home on this stretcher. Keep the limb straight until the doctor comes.

(ii) *Dislocation.* When a bone gets out of place it is usually because the ligaments have been broken around the joint. It takes a skilful person like a physician to pull it back into place, and you should call one to do this before the joint becomes too swollen. Then it must be kept in place. Remove the clothing and place the limb on a pillow and apply a cold water dressing. If that does not relieve the pain, apply hot cloths. Keep the patient warm. The limb must be bandaged.

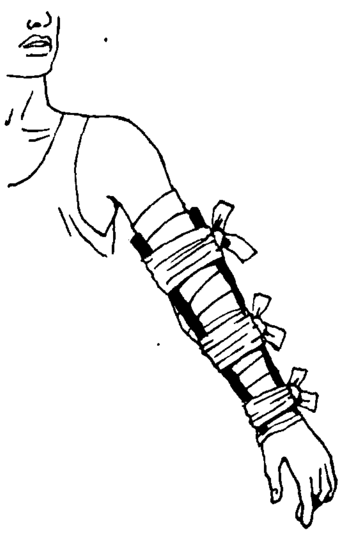


FIG. 85 Broken bone setting

(iii) *Sprains.* The commonest form of sprain occurs when an ankle is turned too far, thus pulling the ligaments away from the bone. It heals by new ligaments forming to take the place of broken or torn ones, but it often takes a long time. Treat as for dislocations. Stroke the injured part, pressing the blood up towards the body. Bandage carefully and exercise as soon as pain stops, or the joint will become stiff.

(iv) *Checking bleeding.* The blood comes away from the heart through the arteries and, therefore, being fresh and with new oxygen in the red corpuscles, the colour is bright red. The blood in the veins has lost its oxygen and it looks dark. The heart pumps the blood into the arteries in jumps; with each beat of the heart the blood jumps into the arteries. But in the veins it flows steadily. If you should cut an artery it would be necessary to stop the flow from the direction of the heart. If a vein is cut, staunch the flow from the direction farthest from the heart. How can this be done? First stop the bleeding by pressing hard with your finger above the cut; if it is an artery, tie a cloth tightly around the limb, between the cut and the heart, if possible where an artery passes over a bone. Place a knot of the cloth so that it will lie on top of the artery. If this is not sufficient, put a pad, or piece of money, under the knot. To make the binding very tight, put a stick through the cloth and twist it; such a bandage twisted tight is called a tourniquet (Fig. 86). Do not let a tourniquet stay more than twenty minutes without loosening it for a moment. Raise the part of the body that is bleeding. Why? When you loosen the tourniquet, press your finger over the artery to keep it from bleeding. Tie it up again, unless the doctor has come. The treatment of a bleeding vein is similar, only remember that the

FIG. 86 Tourniquet

pressure should be on the part *farthest* from the heart, i.e. between the extremities and the wound.

Internal bleeding, called *internal haemorrhage*, needs the immediate attention of a doctor. Till he comes, keep the patient lying flat, undo his collar, give fresh air and fan him. Give ice to suck or cold water to drink, apply an ice bag locally if the seat of the injury is known. If faint, treat as for fainting, but give no stimulant to drink.

The blood, through the blood-vessels in the skin, responds very readily to changes of temperature. Heat or cold tend to coagulate the blood and to check its flow. The application of warmth on the skin brings the blood to the surface; the application of cold drives it to the internal organs. In headaches and sprains, where the pressure of too much blood causes heat and pain, we apply ice; where pain is felt internally, we apply hot fomentations to draw the blood to the surface. When the skin is exposed to sudden chills the blood rushes inward, and sometimes sets up inflammation which brings about a condition favourable to the development of a cold. A hot mustard bath for the feet will draw the blood downwards from the over-heated internal regions, and thus helps to check the cold.

If your nose should bleed, do not lie down but keep your head up. Sit in front of the window with your arms up, and get someone to hold them so. Breathe through your mouth instead of your nose. If there is someone to help you, have him place a cold, wet cloth (ice is better) over your nose and also at the back of your neck. Place your feet in hot water. Sometimes it will stop the bleeding if you put a wad of paper between your upper lip and teeth, and then press on the outside. In small cuts, the bleeding is stopped by the clotting of the blood. Do not wash away the clot nor blow your nose, or the bleeding will begin again. You can stop the nose from bleeding by compressing the nose between the finger and thumb for 10 minutes.

(v) *Choking.* Sometimes, in the act of swallowing food, a person laughs or coughs, thus letting the food slip past the epiglottis and enter the trachea instead of the esophagus. This causes him to choke. Usually a thump on the back, with the head bent forward and arms lifted, will be sufficient to dislodge the obstruction. If he will cough, sometimes that will bring it up. If the choking persists, force your forefinger as far down the throat as you can; but avoid forcing the obstacle further down. Try to pull it out.

If a child swallows an article, such as a button, that sticks in his throat, hold him upside down and slap him on the back. Sometimes you can pull the article out with forceps. If breathing ceases, try artificial respiration and send for the doctor at once.

FIG. 87 Expelling water from the lungs

(vi) *Asphyxia.* We drown because the water cuts off the air from our lungs. Therefore, with any case of drowning our aim must be to get air into the lungs as quickly as we can. First, drain the water from the lungs, by lifting the patient, face down, and jerking the body repeatedly and quickly (Fig. 87). A heavy person may be rolled over a barrel. The next thing is to fill the lungs with air. Make a pillow of anything available and lay the patient's face down, with the pillow under his chest. Loosen his garments at neck and waist. Act quickly.

Then start artificial respiration (see Fig. 88). Stand or kneel astride the patient, and place your hands over his lower ribs on each side. Press down steadily, with the weight of your body on your hands, to drive the air out of the lungs. Then relax the pressure without removing your hands, thus allowing the air to come into the lungs again. Again press the air out, and again remove the

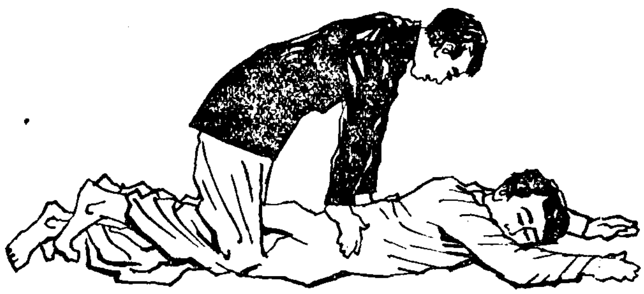


FIG. 88 Artificial respiration

pressure, but not the hands. Repeat this action fifteen times a minute and keep it up until the patient revives. Do not give up hope under two hours at least.

If there is someone to help, let him rub the limbs along the veins, in the direction of the heart, thus forcing the blood to circulate. Keep the body warm in any way you can with blankets, hot water bottles, hot stones wrapped in cloth, or hot sand in a bag. Place one at the head, but avoid having it too hot.

When the patient begins to revive and can swallow, let him drink strong hot coffee. A little alcohol, or sweet spirits of ammonia in water, are good stimulants. Change his clothing and keep him warm.

In *suffocation* the same trouble exists—lack of oxygen in the lungs—and therefore artificial respiration is necessary.

Whenever breathing ceases, by reason of shock, asphyxiation or choking, try restoration by this means. When poisonous gases have been inhaled, remove the patient to fresh air and sprinkle cold water on his face.

(iii) *Electric shock.* If the patient is touching a wire or electrified rail, cut off the source of electricity, *immediately* if possible. If not, remove the patient. The human body is a conductor of electricity so that your body touching the patient's body while touching the source will immediately become electrified. Thus, far from helping the patient, you will fall unconscious and need help yourself. Therefore, stand on wood, or a dry coat, a rubber mat, or some layers of dry newspaper, and push his body away with a dry stick, or pull it away quickly with your hands thickly covered with some dry, non-conducting material—rubber, dry cloth or newspaper. If you want to cut the wire, cut on both sides of him with an axe with a dry wooden handle. When the patient is disconnected from the source of the current, you can handle him without danger. Then give artificial respiration.

A person struck by lightning may be treated at once with artificial respiration. Sometimes pouring buckets of water on the body of lightning-struck animals helps recovery.

In all cases when artificial respiration is tried, smelling salts may be applied to the nose, and the chest may be flicked with a damp cloth.

The Nurse

In deciding which member of a family shall act as nurse in case of sickness, what are the special qualifications we should look for? In the first place she should herself be well and possess a strong constitution. She will then be less likely to contract disease and will have the strength to endure the strain of nursing. She is more likely to be optimistic and cheerful also. Anyone interested in nursing is bound to succeed better than someone who merely acts from a sense of duty. She should be gentle and kind both in word and deed, making the patient feel that the services rendered are done willingly. At the same time, she must be firm. If she is observant she will better understand her patient's needs and thus control them. These qualities, combined with observation and sympathy, are most important. She will be patient even when he is irritable and cheerful in the face of discouragement. Cheerfulness is often worth more than medicine.

A nurse must be accurate in observation and in reporting her observations to the doctor. She must never be careless in the performance of any of her duties. She must possess presence of mind and keep calm and courageous in the face of every emergency. Promptness in thinking and acting is a necessary virtue at all times. Orderliness, too, is most important in the care of rooms, patient, medicines and all details of nursing. A nurse must be quiet in manner, speech and actions. Her work must be thorough in all details. She must obey the doctor's instructions implicitly and prove that she can be relied upon. Her own dress and person must be neat and clean and she should especially see that her hands are kept smooth and clean. A nurse must be unselfish, trying always to 'do unto others as she would be done by'.

THINGS TO DO

Oral and written work

1. What would guide you in choosing the room for an invalid?
2. Why is it necessary for a nurse to be skilled in making a bed?
3. How can bed sores be prevented?
4. What is the normal pulse rate and temperature of a girl of your age?
5. Why are records important in nursing? How should they be kept?
6. What temperature would cause you to send for the doctor?
7. What precautions must we take before giving medicine?
8. How would you disinfect a room?
9. What is your duty towards the doctor?
10. What are the qualifications and characteristics of a good nurse?
11. What would you do if your clothing caught fire?
12. How would you stop nose-bleeding?
13. Differentiate between arterial and venous bleeding.

Practical work

1. Practise making an empty bed. Have everything ready before beginning. Sheets should be well aired and dried. Over the mattress place a piece of blanket. See that it lies smoothly. Put the bottom sheet on, tuck in both ends and one side well; then draw the other side tight and tuck it far under so that there may be no wrinkles.
2. Practise changing sheets with someone lying on a bed.
3. Practise moving and lifting a patient in bed.
4. Practise taking each other's temperature, pulse and respiration.
5. In the cooking class, practise preparing and serving a tray for an invalid.
6. Practise making poultices and stupes and plasters.
7. Practise various bandages and dressings for burns, bites, stings and fractures.
8. Apply tourniquets at different points to arrest haemorrhage.
9. Practise giving artificial respiration to one another.

TABLE OF DISEASES

TABLE OF DISEASES

DISEASE	MODE OF INFECTION	INCUBATION PERIOD	SIGNS AND SYMPTOMS	APPEARANCE AND CHARACTER OF RASH	PATIENT DANGEROUS TO OTHERS	PREVENTIVE MEASURES	SPECIAL TREATMENT
AGUE OR MALARIA	Mosquito bites	10 to 15 days	Three stages:— (i) Cold (ii) Hot (iii) Sweating		Whenever parasites are in the blood	Exterminate mosquito. Sleep under net	Take quinine daily.
CHICKEN-POX	By contact with anyone having disease	10 to 21 days		Red pimples, rapidly changing to small blisters, appear 1st or 2nd day. Scabs come and go from 4th day	About 2 weeks or till last scab has fallen	Isolation and disinfection	
CHOLERA	From excreta through milk, water, food, dust, flies and clothing	A few hours to 5 days	Three stages:— (i) Diarrhoea, (ii) Vomiting, cramps, watery stools, suppressed urine, collapse (iii) Reaction		Until stools are free from cholera bacilli	Inoculation. Boil drinking water and milk. Avoid raw fruit and vegetables.	Phage

DIPHTHERIA	Through breath; carried by cats and fowls	2 to 10 days	Sore throat: greyish-white patches in tonsillar area		2 to 3 weeks	Inoculation, isolation and disinfection	Antitoxin injections.
DYSENTERY (BACILLARY)	As cholera	36 hours to 7 days	(i) Diarrhoea (ii) Cramp (iii) Blood or mucus in stools		As long as the bacilli are in the stools	Isolation and disinfection of excreta	Anti-dysenteric serum, Phage
ENTERIC OR TYPHOID	As cholera	14 to 21 days	Headache, abdominal pain, rash, high fever	Red elevated rash found on abdomen 7th to 15th day	8 weeks from first symptoms	As cholera. Disinfect everything touched by patient. Inoculate contacts	
INFLUENZA	Through breath, clothing, etc.	1 to 4 days	Cold breaks out. Aching		2 to 6 weeks according to type	Strict isolation. Good ventilation	
HYDROPHOBIA	Bites from infected animals—dogs, jackals, cats, etc.	7 days to 2 months or even a year	Terror of water. Restlessness. Difficulty in swallowing. Spasms of throat and respiratory muscles		Animal that bit patient should not be destroyed, but observed for 10 days	Cauterize bites with nitric or carbolic acid	Preventive inoculation.

TABLE OF DISEASES—*contd.*

DISEASE	MODE OF INFECTION	INCUBATION PERIOD	SIGNS AND SYMPTOMS	APPEARANCE AND CHARACTER OF RASH	PATIENT DANGEROUS TO OTHERS	PREVENTIVE MEASURES	SPECIAL TREATMENT
MEASLES	By breath	1-2 weeks	Severe cold. Rash. Eyes congested	Dull red, behind ears, on face	3 weeks	Disinfection and isolation	Care of eyes and kidneys
MUMPS	Direct contact	14-21 days	Painful swelling behind angles of jaws		2 weeks or till swelling subsides	Disinfection and isolation	
PLAGUE	From rats through fleas	3 hours to 15 days. Usually 2 to 8 days	Three types: (i) Bubonic (enlarged painful gland) (ii) Septicaemic (iii) Pneumonic		6 to 8 weeks	Inoculation, isolation, disinfection. Destroy rats	Serum and vaccine
PNEUMONIA	Through air, sputum, food	16 hours to 5 days	Rigors, cough, headache, rusty sputum. Crisis about 15th day	Herpes around nose is common	15 days	Isolation and careful disinfection	M. & B. 693

SMALL-POX	Through air, from skin and clothing	10 to 14 days	High temperature which rises when pus appears in pocks. Scabs from 9th and 10th day and begin falling 14th day	Small red pimples, becoming pocks, appear on 3rd day	As chicken-pox	All persons coming in contact with case must be vaccinated	
SCARLET FEVER	By breath, mucous discharge, clothing, books, scales from skin	2 to 7 days	Cheeks look as if painted. Pale circle around the mouth. Fever, generally high	On 2nd day bright scarlet markings on chest. Fades on 5th day of fever	Until peeling has ceased	Isolation and disinfection	
TUBERCULOSIS OR CONSUMPTION	Through air, from sputum or milk	Uncertain	Indigestion, fever, wasting, debility, cough. Haemorrhage from lungs		Throughout the disease in pulmonary cases	Isolation, disinfection of sputum, clothing, etc. Examine sources of milk supply	Sunshine, fresh air, good diet. Cod-liver oil.
WHOOPING COUGH	Through breath or clothing	4 to 14 days or longer	Coughs until blue in face, then whoops, vomiting after coughing. Attacks occur 4 or 5 times daily		6 to 8 weeks	Isolation, disinfection of sputum, clothing, etc.	Vaccine

CHAPTER XVII

FOOD AND NUTRITION

A FOOD is a substance which, when taken into the body, may be digested and used to give heat and energy, to build body tissues and to regulate body processes. Every living creature must have food to keep it alive. Human beings of different races do not all take their food in the same form, and even people of the same race have very strong individual preferences. It is possible for the body to be nourished by diverse foods and diets because they are more alike in their composition than their appearance and taste indicate.

The eating of food by people depends on many factors—the chief being the sense of hunger. Starved or semi-starved people are guided mostly by a desire to be full, and so are people whose diet consists mainly of rice—such people must get a variety of foods, with many vegetables. When they get a more balanced diet the quantity of rice desired will be automatically reduced. Sorrow, fatigue and worry prevent the digestion of food and therefore limit its intake. Memory and the association of food with certain people or a certain situation may play a part. Neurotic people have more food dislikes and prejudices than normal people. The attractiveness of food in its appearance and preparation also affects the mental attitude towards food. Climate and economic conditions play a part in food acceptance, but the most important factor is race, as racial dietary patterns are difficult to break. Yet these patterns must often be at least partially broken if people are to come to a state of good nutrition.

The main constituents of most foodstuffs are water, protein, fat, carbohydrate, minerals and vitamins in varying amounts. In a well-balanced diet, all these food constituents must be in the right proportion for the body's needs. There is a large quantity of water in the body amounting to about two-thirds of the weight. Proteins form approximately one-sixth of the body weight, while minerals and fat make up most of the remainder. Very little carbohydrate is found in the body, considering what a large amount of starch and sugar we eat.

Materials, similar to those of which the body is composed, are necessary to build up the body tissues and repair them. A constant balance must be maintained between the intake of food and the outgo of waste products. Our study centres mostly around food, because food is the chief material that is capable of being utilized by the body for the growth, repair and maintenance of vital body processes. We study nutrition because we desire a good and full life for ourselves and our country—for ourselves to learn how to maintain our health; to prevent deficiency diseases; and to prevent the disposition to other diseases such as tuberculosis. For our country we want the improvement of the race mentally and physically, so that we cannot only prolong life but make it useful and enjoyable. Thus our country has a chance to gain and maintain a position of respect in the councils of the world.

When food is digested changes take place in the cells of the body. The digested food-products are brought by the blood to the cells, where a constant breaking down and building up of material in the cells take place. These changes are known scientifically as metabolism.

Some foodstuffs are able to do more than one of these things. Carbohydrates, fats and proteins are all used for body fuel, to give heat and energy; but proteins chiefly build body tissues. The mineral salts are used not only to build body tissues, but *also* to assist in regulating body processes. Of course, most foods are not pure protein, fat or carbohydrate, but mixtures of these. (The same food is often found in the various food groups given below.)

THE FOOD GROUPS

I. Body-building Material : Proteins

Animal sources: milk, cheese, eggs, meat, fish, fowl.

Vegetable sources: pulses, gram, dhal, wheat, millet, nuts, leafy vegetables.

II. Body Regulators: Mineral Salts

(i) *Calcium*

Animal sources: milk, buttermilk, curds, egg yolk.

Vegetable sources: dhal, nuts, fruit, gram, leafy vegetables.

(ii) *Phosphorus*

Animal sources: milk, buttermilk, eggs, meat, fish.

Vegetable sources: dhal and other legumes, nuts, wheat, oats, barley, leafy and succulent vegetables, spinach, radish, cucumber, carrot, cauliflower.

(iii) *Iron*

Animal sources: liver, red meat, eggs.

Vegetable sources: dhal, whole cereals, leafy and succulent vegetables and fruit.

(iv) *Iodine*

Animal sources: sea fish and oils.

Vegetable sources: fruit and green leafy vegetables.

III. Vitamins or Body Builders

(i) *Vitamin A*

Animal sources: fats and oils from fish, liver, kidney, egg yolk, butter and ghee, whole milk.

Vegetable sources: green leafy vegetables and vegetable tops, bamboo sprouts, gram, sprouted grain, yellow root vegetables (carrot and sweet potato), tomato, millet (ragi).

(ii) *Vitamin B*

Animal sources: milk, eggs, liver, brain, heart, kidney.

Vegetable sources: yeast, tomato, lettuce, spinach and leafy vegetables, walnuts, atta, ragi, dhal.

(iii) *Vitamin C*

Animal sources: liver, blood, unboiled milk.

Vegetable sources: green leafy fresh vegetables, fresh fruit, sprouted grain and dhal, raw carrot, orange and lemon juice and peel.

(iv) *Vitamin D*

Animal sources: cod-liver oil, milk, butter, ghee, egg yolk, fish.

Vegetable sources: sea plants, vegetables grown in sunlight, oils and grain.

(v) *Vitamin E*

Animal sources: egg yolk, liver.

Vegetable sources: whole wheat, fresh vegetables.

IV. Fuel Foods (Providing Heat and Energy)

(i) *Fats*

Animal sources: butter, ghee, cream, milk, fish oils, suet.

Vegetable sources: vegetable oils, olives, groundnuts, etc.

(ii) *Carbohydrates*

(*a*) *In sugar*: e.g. fruit, jaggery, gul, treacle, white and brown sugar, honey.

(*b*) *In starches*: e.g. cereal grain, dhal, beans, nuts, tuber and root vegetables, bananas.

(*c*) *In cellulose* (or roughage): e.g. the woody fibre found in vegetables and fruits.

Carbohydrates and fats provide our bodies with heat and energy. When building a fire you use different fuels. Some ignite more readily than others, so dried grass or paper are lit first, then wood, then charcoal or coal. The oxygen of the air combines with the carbon of the fuel, giving off carbon dioxide and water and releasing heat. Oil and ghee will burn and so will sugar or dhal.

Scientists have proved by experiment that the foods we eat are oxidized in the body, giving off carbon dioxide and water and releasing heat by which the warmth of the body is maintained and energy for work provided. Scientists have also been able to determine the amount of heat with which each food will furnish the body and they indicate this quantity in terms of *calories.*

A large calorie is the amount of heat required to raise a kilogram of water through 1 °C. In measuring the heat values of foods the large calorie, which is 1,000 times greater than the one used in physics, is used. The gramme is also used as the unit of weight for foods. 1 gramme = 15 grains; 1 ounce = 28.35 grammes.

1 grm. of sugar or starch furnishes 4 calories of heat to the body. 1 grm. of pure protein furnishes 4 calories of heat. 1 grm. of fat furnishes 9 calories of heat.

Protein foods provide flesh-forming materials. Protein is necessary to every muscular cell of our bodies. This is because it contains nitrogen which other foods do not. Nitrogen is the element of prime importance in the upkeep of the cells and for growth.

Proteins are built up from *amino-acids* of which there are many kinds. Just as different combinations of letters make different words, until we have a dictionary full, so the different combinations of amino-acids build up very many proteins, as different from each other as words are. Some of these amino-acids are especially important and unless they are included in the structure of the protein food it is incapable of sustaining growth. Such proteins are called unsuitable.

In like manner, we may eat a protein food, like that contained in wheat, which is lacking in certain amino-acids and which is, therefore, unsuitable, or incomplete, and combine it with milk which contains the very amino-acids lacking in wheat, thus completing it. No living creature can grow without suitable, or complete, proteins and therefore children or animals fed on unsuitable, or incomplete, proteins cannot grow. The protein foods from animal sources furnish 'suitable' or complete proteins, whereas most vegetable sources furnish 'unsuitable' or incomplete proteins.

Proteins are also often divided into two groups:

(i) Complete proteins—generally from animal sources, such as meat, fish, eggs, milk and cheese, etc.

(ii) Incomplete proteins—generally from vegetable sources such as dhals, nuts, cereals, etc.

Some amino-acids are common in all foods; but some are needed by man and some others by animals. If all these very necessary amino-acids appear in one food it is said to be complete, but if one or two or three are lacking it is said to be incomplete. The animal proteins are said to be complete because they contain all these amino-acids. But soya beans, which are not very common in India, though used widely in China, are thought to be the only vegetable food containing complete proteins. On the other hand, gelatin is an animal protein that is incomplete.

Our bodies require 75 to 100 grm. of proteins daily to provide for growth and repair of muscle. Protein should furnish not less than 12% of the calories. Growing children should have 15% of protein in their diet. Lack of sufficient protein in the growing period will lead to stunted growth.

In areas where more than 50% of the food comes from cereals the protein content of cereals becomes important. The protein value of certain cereals in percentages is as follows:

Rice	6·4	Maize	11·1
Wheat	11·8	Cholam	10·4
Ragi	7·1	Bajra	11·6

% COMPOSITION OF SOME PROTEIN FOODS

	% Protein	% Fat	% Carbo-hydrate	Fuel value per lb. calories
Beef (lean)	18·9	12·2	..	842
Bread (whole wheat) ..	9·7	0·9	49·7	1113
Curds	20·9	1·0	4·3	499
Cheese	28·8	35·9	0·3	1990
Chicken	21·5	2·5	..	493
Dhal	22·89	1·35	69·31	1610
Eggs	13·4	10·5	..	672
Fish	18·8	9·5	..	727
Flour	13·8	1·9	71·9	1630
Groundnuts	25·8	38·6	24·4	2490
Liver	20·4	4·5	1·7	583
Lobster	16·4	1·8	0·4	379
Milk (cow's milk) ..	3·6	5·7	4·7	380
Mutton	19·8	12·4	..	863
Oysters	6·2	1·2	3·7	228
Ragi (millet)	11·68	5·5	74·68	1635

From this list you can calculate, e.g. the amount of milk, etc., required to replace dhal.

From the list of food compositions classified as 'body-building materials' (p. 262), you will notice that the protein foods from *animal sources* are milk, cheese, eggs and meats (fish, fowl, and animal). These furnish 'complete' proteins. It is understandable that many people do not want to kill in order to satisfy their need for food. So we must consider how the protein may be otherwise supplied.

Vegetable proteins are found in the great variety of dhals (pulses or legumes). The amount of protein in these vegetables is very high; but they lack the essential amino-acids and are therefore classed as 'unsuitable' or incomplete. Let us plan the diet so as to supply the parts that are lacking by adding some food which contains 'suitable' or complete protein. Instead of relying upon wheat alone, or wheat, rice and dhal, for the protein, we will add milk, curds or eggs. Green leafy vegetables also contain suitable protein, though the quantity is small. These will, therefore, supplement the cereals and pulses.

Mineral Salts or Ash Constituent

Minerals act as body-builders along with proteins; but they do other very important work also. There are many minerals in the body tissue such as copper, iron, zinc, etc. Minerals in rocks get mixed with the soil and from there they are dissolved or carried away by water. These dissolved minerals are absorbed by plants, and may be changed into organic forms. The plants are eaten by animals, and human beings eat both animals and plants. Therefore we find minerals in three food sources—water, plants and animals.

In a laboratory you can burn a food, leaving an ash composed only of minerals, but all this cannot ordinarily be used by the body. In some cases only 40% is utilized.

Poor teeth and crooked legs, hollow chests and poorly developed lungs are largely the result of an insufficient supply of ash constituents, particularly calcium (chunam, or lime) and phosphorus. Sulphur and iron are always combined with protein in our food materials. Phosphorus and calcium are sometimes so combined; but we also get them in other forms. Phosphorus is found combined with fat, in egg yolk. Iron is found in yolks also, as well as in haemoglobin of the blood, in the green leaves of plants and in outer coats of grains. Milk furnishes a rich supply of calcium and phosphorus.

Iron is an essential element of the red corpuscles of the blood, enabling them to carry oxygen. If the body lacks iron, it must work twice as hard to purify the blood and this may injure the heart by overtaxing it. Every cell of the body requires iron as an integral part of its nucleus, so that our very life depends upon our supply of iron. For small children egg yolk is the best source. For non-vegetarians meat, liver and kidney are rich sources. Certain dried fruits, such as raisins and dates, are good sources, but vegetarians are mostly dependent on green leafy vegetables. Some of these are especially rich—notably amaranth (keerai), radish tops, and some of the wild greens. These are so very rich that, even if we cannot utilize all the iron from them, they are still rich sources. There are certain red and yellow vegetables that contain iron. Potatoes are the only white vegetables that contain iron, near the peel.

Calcium or lime is necessary to form the bones and teeth, but our power to deposit the calcium in the bones is dependent upon phosphorus and magnesium, so both of these elements must be supplied in a certain proportion. To be fully utilized in the body it also requires a sufficient supply of Vitamin D and possibly Vitamin C.

If we do not have enough lime, the spine and thorax may become crooked and our lungs will be compressed so that we are unable to breathe properly.

Calcium maintains the contractile power of muscle, it strengthens the nervous system and also increases the coagulability of the blood.

Expectant and nursing mothers require a generous amount of calcium for they must supply calcium for the development of the baby's skeleton and teeth (because teeth are framed in the gums before the baby is born). She will need 1 grm. of calcium per day and this can be supplied by 1½ pints of milk. When calcium is lacking in the diet or when its balance with the other minerals and vitamins is upset, we get stunting of growth and rickets in children, which in extreme cases will show in knock-knees or bow-legs, pigeon-chests and other bone deformities. In older people you may get osteoporosis, which is a disease with brittle bones, and, especially in women, a disease called osteomalacia which causes bone deformities, especially of the pelvic girdle. Young children lacking calcium sometimes start eating earth.

Sources of calcium. We find that milk is one of the best foods for the body's needs and this is the best form in which children can take calcium. Green leafy vegetables (including their stems) are also rich in calcium and adults secure most of their supply in this form, but they also would be the better for adding milk to their diet. Ragi is the one cereal that is rich in calcium. Cluster beans, beetroot and dhal contain a certain amount. Where people chew betel leaves with lime, it is considered that the calcium content of six leaves with lime is equal to that of ten ounces of milk.

Phosphorus. This mineral plays a very important role in our body and is associated with calcium. Phosphorus helps to keep the blood neutral and helps in the oxidization of the carbohydrates. It also plays a part in the multiplication and movement of the cells. It is estimated that we require 1·32 grm. of phosphorus per day and children should have not less than 1 grm. per day.

Without phosphorus, as we have already noted, the calcium cannot be deposited in the bones and the result is a disease named rickets. We must have these two minerals in proper proportion in our diet to prevent rickets. Sunshine is a very important factor in preventing rickets and we in India have a generous supply of this. Little children who run freely in the sunshine unclothed are safeguarded from this disease. Girls and women who maintain *purdah* and do not enjoy the sunshine are in danger of developing this disease which affects the bone structure of the body, deforming the pelvis, and thus making child-bearing dangerous. Have you ever seen anyone with rickets? Children with it usually have protuberant abdomens, narrow chests, bow-legs or knock-knees, and are apt to suffer from bronchitis, pneumonia and tuberculosis. (Later we will learn that there is another factor—vitamins—concerned with the prevention and cure of rickets.)

The foods which are rich in phosphorus are spinach and similar green vegetables, wheat, milk, buttermilk, fish, curds, legumes or dhal, and egg yolk. It is found in the seeds of plants rather than in their roots and stems.

Sulphur. If we have sufficient protein in our diet, we will be getting the necessary amount of sulphur.

Chlorine and *sodium* are provided by table salt and there is no danger of our not having sufficient of these minerals. Why do we add common salt to our vegetables? Because they do not contain enough sodium in their composition to balance their potassium. Meat contains a plentiful amount of sodium and, therefore, animals that live on meat do not need to eat any salt. People who use a mixed diet require a little salt; but they must be careful not to take too much or they will injure their arteries and kidneys. Salt is an important factor in keeping the blood of the right composition and the organs acting as they should. Sodium helps to retain water in the tissues, and chlorine assists in forming the hydrochloric acid secreted by the stomach.

Iodine is another mineral essential to normal nutrition, though we require only a small quantity of it. Some people in India suffer from a disease known as goitre and it has been generally accepted that this is the result of a lack of iodine in the body. Iodine is found in crude salt, such as we ordinarily use in India, before it is purified. It will be a great pity if the time comes when salt is not used in this natural condition, for then we shall suffer from another deficiency disease which modern civilization has brought upon us. Iodine is found in sea water and the crude salt retains some of this element. Sea foods, such as fish and fish oils, also provide iodine; leafy vegetables and fruits, grown in the soil which contains iodine, will also furnish iodine in the diet. Without this ash constituent, tiny though the quantity needed may be, goitre will become more extensive. This disease is characterized by enlargement of the thyroid gland and various other symptoms.

The necessity for an adequate diet of green vegetables, fruit and milk is increased by our wish to prevent goitre.

Water

A large proportion of our bodies is made up of water and this proportion must be maintained. If there is insufficient water, the metabolism of our bodies is interfered with and its various functions are upset. We lose our appetites, become nervous, have indigestion and are unable to work. Water is necessary to carry off the body wastes and to regulate the body temperature. As we have previously learnt, we should make the drinking of water one of our health habits. We not only take it as a beverage, but also as a part of our food. Some foods are nearly all water. Lettuce, tomatoes, green vegetables and fresh fruits have over 90 per cent water in their composition. We realize that oranges are watery, because the juice is easily released, but you may be surprised to know that potatoes, carrots and other such seemingly solid foods have about as much water in them as oranges, that is, over 80 per cent. Even such hard foods as groundnuts contain 10 per cent water. When we cook legumes, pulses and seed grains, we add water to them and in this way cause them to be more easily digested. We also take water in such beverages as sherbet, tea and milk. Pure water is as essential to health as food. Many waters have minerals held in solution, but the point of greatest importance is that it be clean and safe.

Vitamins, or Body Builders

Food substances, such as carbohydrates, fats, proteins, ash and water, can all be seen and examined. For many years it was thought that these were all that the body required to maintain health and growth. But, by experiments in feeding rats it was found that if these foodstuffs were purified so that nothing but *pure* carbohydrate, fat, protein, ash and water were consumed by the rats, they were unable to grow and their health steadily declined. Something was lacking. When some cow's milk was added to the diet, the rats immediately began to grow. Thus scientists became convinced that there was something else in the milk besides protein, fat, carbohydrate, ash and water, that was previously unknown. The name 'Vitamin' was given to this substance or substances. The first part of the word, *vita,* means 'life'. Vitamins are called by the letters of the English alphabet, A, B, C, D, etc., but now most of them have a chemical name also. Just as oil is necessary for the smooth running of a motor car, so vitamins are necessary for the proper functioning of the body.

Scientific men and women are continually conducting experiments on the feeding of animals, and many important discoveries have been made as to the nature of vitamins, the effect upon animals and people when vitamins are lacking from their diet and where they may be found.

Experiments showed that the substance required for growth was to be found in the fat of milk or butter. Doctors proved that there is something in butter and egg yolk, which is essential for growth and health but which is not found in lard and vegetable fats. (We now know that substance as Vitamin A. This was among the first of the vitamins to be discovered.)

Rats are generally used for such experiments because a rat's life is not so long as that of larger animals and man: in fact, one day to a rat is equal to one month in the life of man; and one year to a man is the same as thirty years to a rat. Rats like all the foods men eat and do not mind living in a small space. Thus it is easy to note the effect of different diets upon rats and so determine whether it is

FIG. 89 Underfed rat and properly fed rat

a good diet or a poor one. It is possible also to see the effects of each diet on the children and grandchildren of the rats. In this way, many important discoveries have been made, proving that vitamins are essential to health, to growth and to the prevention of disease. Several vitamins have been discovered and all of them are essential for growth. A diet may contain everything else, but if it lacks any one of the vitamins the animal cannot grow. As soon as food containing the vitamin is added, the animal at once begins to grow. We can judge from this the effect upon children of not having vitamins in their food.

Vitamin A. In addition to being necessary for growth, it has been found that, when this vitamin is absent from the diet of animals and children, a disease of the eyes is produced. The disease is known as zerophthalmia. It is very painful and causes the eyes to swell and close. If Vitamin

A is not given at once, the eyes become permanently blind and death may also occur. A Japanese, named Mori, observed many human cases of this disease and found they were curable by feeding the patients on chicken livers, fish livers, eel fat and cod-liver oil.

If people sell the cream and butter from milk and feed children on skimmed milk, this disease will result, as proved in Denmark. India should learn from this example.

The lack of Vitamin A makes people much more susceptible to certain diseases, such as broncho-pneumonia and other lung troubles.

It has been found that rats with a liberal supply of Vitamin A live more than twice as long as those which had exactly the same diet, but with less Vitamin A. It has been shown also that rats with sufficient Vitamin A for health and growth are successful in rearing their young to several generations, while the young of those with too little Vitamin A do not live. It is one that is generally lacking in South Indian diets. Where are we to get Vitamin A from, to keep us well and make us grow?

As you have read, butter, fat, ghee, egg yolk, cod-liver oil and Indian-made shark-liver oil are rich in Vitamin A. Cod-liver oil can be purchased from the chemist and given to little children who are too young to eat green leafy vegetables. It contains three times as much Vitamin A as egg yolk and ten times as much as butter or ghee; therefore only little need be given. Prolonged heating of food in an open vessel destroys much of the vitamin and that explains why when ghee is used in frying, the Vitamin A is destroyed.

What are the uses of Vitamin A?

1) It is essential for normal growth.
2) It is essential for good eyesight.

3) It is essential for healthy skin and all epithelial tissues.
4) It is essential for sound teeth.
5) It is essential for healthy nerves.
6) It is essential for reproduction and possibly protection against disease.

Vitamin B or vitamins of the B complex. They are so called as there are at least thirteen members of this complex, and they appear to be all interrelated, so that it is often dangerous to add just one to the diet without being sure that all others are there also. We do not know the part they all play in the maintenance of health; but we are fairly certain of the part three of them play, namely: Thiamin or Vitamin B_1; Riboflavin or Vitamin B_2; and nicotinic acid or niacin, called the antipellagra vitamin.

The first discoveries relating to Vitamin B were made in the course of the search for the cause of the disease called beriberi, a disease prevalent among rice-eaters, by experimenting with fowls, feeding them on polished rice. The vitamin is found in the polishings, which we throw away to cows and poultry. The Northern Circars is one of the worst parts of South India for this disease.

Children cannot grow when Vitamin B is lacking in their food. If they had every other food substance but lacked this vitamin, they would lose appetite, sicken and die.

Beriberi is a disease which affects the nerves of motion and sensation; it is caused by lack of Vitamin B_1 or Thiamin. Seeing what dreadful conditions result from the lack of this vitamin you will want to know where it is found. It is found in unpolished rice, as already mentioned, in bran and also in the outer coatings and embryos of other grains. If you use unrefined food grains, you will not lack

Vitamin B. Remember that refined white flour has lost its vitamins and also its mineral salts in the milling. (See the section on 'The milling of cereals' on page 278.) Therefore use *atta*. Dried peas, beans and dhal contain this vitamin. Vitamins B_1 and B_2 resist high temperatures, but too much washing and long soaking of cereals and the use of soda in cooking vegetables destroy them.

Thiamin sources	*Riboflavin sources*
Pumpkin	Amaranth (keerai)
Bengal gram	Red gram
Red gram	Milk
Groundnut	Yeast
Liver	Liver
Yeast	

Vitamin C. Scurvy is a disease that has been known for many centuries. Practical experience in many countries proved that people who only ate dried foods were liable to contract scurvy, and that fresh oranges, lemons, tomatoes, sprouted seeds and pulses, raw green leafy vegetables and tubers would cure scurvy. Now we know this is due to the presence of Vitamin C.

Sailors on long voyages, and soldiers, often died in large numbers from this dreadful disease which causes loss of weight, tender swollen joints and paralysis. The teeth loosen and the gums get soft and bleed. The body aches as with rheumatism.

But it is not only soldiers and sailors who suffer from the ill effects of a lack of Vitamin C in the diet. Infants who are fed on heated milk lose their appetites, become anaemic, irritable and weak, and fail to grow. Their teeth fail to develop properly and decay early. Vitamin C is destroyed when food is exposed to the air too long, or is salted, and when vegetables are dried or soaked or cooked with soda.

Vitamin D, which is found chiefly in cod-liver oil and halibut-liver oil, is known as the anti-rachitic vitamin because it prevents rickets in young children. Rickets is a disease in which the bones soften and bend, causing deformities such as bow-legs and pigeon-chest. The muscular system loses its tone so the abdomen distends and constipation is apt to follow. Rickety children become fretful, weak and anaemic. Vitamin D is also called the calcifying vitamin because it helps the body to assimilate the calcium in the diet and build it into bones and teeth.

THE MILLING OF CEREALS. The flour from which we make our bread comes from the core (endosperm) of the wheat grains. This core and the outer husk (bran layer) are bound together by a thin layer known as the aleurone layer. At one end of the grain is a small area which becomes active and sprouts when the seed is planted; this area is called the germ.

As we have already pointed out, Vitamin B is found in the outer coating of cereals like wheat. In the patent processes of milling, the aleurone layer and the germ are often removed with the husk; with them, the vitamins and minerals are lost. When we grind wheat between two stones at home, we retain the aleurone layer and the germ which are rich in protein and phosphorus compounds. White flour contains only the endosperm which is chiefly composed of starch cells. Can you explain why the flour ground at home (*atta*) is more nutritious than the white milled flour?

Is white flour wholly starch? There is a network of protein in the flour cells and the starch granules are closely interspersed with this. When the protein is moistened and kneaded for bread, the protein becomes fibrous and gummy. Whole kernels of wheat (*atta*) and ragi are superior, both in taste and food value, to the white, devitalized patent flour.

In India, we have the great advantage of having our rice husked but not polished. The polishing of rice deprives it of both minerals and vitamins. In China and Japan the custom of using polished rice has shown results in deficiency diseases. When people form the habit of using polished rice, unpolished rice becomes distasteful to them and they do not realize what a serious effect it can have upon their health. Unpolished rice contains not only the starch, but also some of the mineral matter and vitamins that are essential to growth and health.

Parboiled rice is paddy which is first steamed and then sent to be milled. The heat toughens the inner bran layer and makes shelling more difficult. Thus the inner bran, the embryo and the aleurone layer are preserved. The inner bran is rich in vitamins and minerals; the embryo also contains valuable vitamins and salts and the aleurone layer is rich in suitable protein.

Raw rice. If paddy is not heated first, the inner bran, embryo and aleurone layer are removed when it is highly polished and only the endosperm (rich in starch) is left. Thus 'parboiled or boiled' rice is more nutritious than 'raw' or 'table' rice.

Cereals do not contain sufficient protein and must therefore be supplemented with other foods rich in protein. The proteins of cereals are not 'suitable' because some of the essential acids are missing. They must be supplied, from other sources, such as milk and its products, curds, buttermilk and cheese, or from green leafy vegetable. There is little fat in the cereal grains which we make up by using cream, milk, butter, ghee, oil from oil-seeds, nuts.

The 'whole grain' of cereals contains some Vitamin A as well as Vitamin B, but Vitamin C is wanting. This can be supplied from green leafy vegetables, sprouted gram and from milk. Cereals contain very little calcium and this lack must be made good with milk and green leafy vegetables which are rich in calcium.

Pulse grains (dhals), which are rich in protein, are commonly taken with the cereal grains—wheat, rice, ragi, etc.—in most Indian diets. We are not able to assimilate an unlimited amount of dhal and it is wise to combine the dhal with wheat or rice in no larger proportion than four parts of dhal to twenty parts of the cereal grains. It is a still better plan to take only a little dhal and to use milk, curds or green leafy vegetable as well. Wheat-, rice- and ragi-eaters can secure enough carbohydrate food from these sources; but suitable protein, fat, calcium, Vitamins A, C and D must be supplied by dhal, milk, curds, green vegetables and fruits.

Nuts are rich in fat and contain some carbohydrates. The protein of nuts is suitable, being very similar to that in meat, and will sustain growth. Almonds or groundnuts eaten with chapati made from whole wheat (*atta*) or ragi will provide an adequate diet of protein, fat and carbohydrate. These nuts are also rich in phosphorus, and almonds are especially rich in iron. They also contain Vitamin B, but very little Vitamin A, and no Vitamin C.

Tests for Protein and Cellulose in Foods

Experiment 24. Take 4 teaspoonfuls of white flour or *atta* and moisten it with water, as if you were going to make a chapati or scone. Knead it to make it smooth and let it stand for half an hour. Put it in a piece of mulmul or butter-muslin and tie it in the form of a bag. Place it in a bowl of cold water and work it with your fingers. Note the white substance which comes out into the water. Test this for starch (see Exp. 28). Set the bowl aside for a time to let the starch settle. Continue to wash the material in the bag until the water is no longer milky and then open the bag.

EXPERIMENT 25. Weigh what is left in the bag when the starch is removed. This substance is called gluten. Divide into two parts. Heat one part in an oven and note what happens to it. Does it remain soft? What is the effect of heat upon gluten? Gluten is a protein and, to prove this, we must know the test for proteins.

EXPERIMENT 26. Take a small amount of water in a test tube. Add a little of the gluten and a few drops of nitric acid (handle with care as it is a corrosive acid) and boil. A yellow colour appears. Add a few drops of ammonium hydroxide and re-heat. The orange colour shows that a protein is present.

EXPERIMENT 27. Test the following foodstuffs for protein : bread, eggs, potatoes, corn meal, etc. Make a table showing the results.

Let us examine the milky mixture left in the bowl. Pour off supernatant fluid carefully and examine the white sediment which remains. This is the starch of wheat.

Sometimes it is difficult to detect starch with the naked eye; so a means has been found of identifying it under a microscope. Starch may also be tested chemically.

EXPERIMENT 28. Take a little tincture of iodine in a test tube and dilute it with water. What colour is it? Add a few drops of iodine solution to the starch mixture found in the bottom of the bowl and note the change in colour which takes place. This is the characteristic colour when starch is present. Now try the iodine test on other foods and make a list of those that have starch in them.

EXPERIMENT 29. Gently heat the starch mixture which you have tested with iodine and allow it to cool. What happens? Can you explain why? Take a small portion of dry starch in a clean, dry test tube and heat it gently. Explain the moisture which condenses on the cooler part of the tube. Increase the heat and note the odour of the vapour and the colour of the starch. Discuss. Now heat it until only a black residue remains. What is it?

EXPERIMENT 30. Mix a small quantity of starch with water and cook it. What does it look like? Dip a small piece of muslin in it; squeeze it and let it dry. What happens to the cloth?

EXPERIMENT 31. Grate a potato, place it in butter-muslin or mulmul and let it soak in water. Is the sediment left in the water like that from the flour? Test it for starch.

Examine the material left in the cloth. Is it the same as we had in Experiment 25? Test and see. If it is not protein, what can it be? Test it with iodine. Yes, both are carbohydrates. The starch soaks out into the water and the material left is cellulose or woody fibre.

The woody fibre, or cellulose, which holds vegetables and fruit upright and in form, is not digested by human beings, though herbivorous animals are so constructed that they can utilize the bulky cellulose. Cellulose is of real use to us in another way: acting as 'roughage' it distends the walls of the intestines and stimulates peristalsis. You might almost liken it to a broom which sweeps the waste matter along, so that it can be expelled. Some vegetables and fruits contain acids which stimulate the intestines. Many vegetables also contain magnesium, which is a laxative. These facts explain why vegetarians are less apt to suffer from constipation than other people. Plenty of fresh green vegetables should be taken daily, therefore, to supplement the diet of wheat-, ragi- and rice-eaters, as well as that of non-vegetarians.

PERCENTAGE COMPOSITION OF INDIAN FOOD GRAINS

	% Water	% Protein	% Fat	% Carbohydrates	% Fibre	% Ash	Total calories per lb.
Wheat ..	...	10·99	2·08	70·9	1·92	1·45	1571
Polished rice ..	7·7	6·75	1·05	83·72	0·05	0·73	1685
Cleaned rice ..	12·66	6·43	1·77	78·63	0·25	0·86	1427
Ragi (small) ..	11·3	10·4	3·3	71·5	1·5	2·0	1621
Maize ..	12·5	9·5	3·6	72·7	...	1·7	1639

PERCENTAGE COMPOSITION OF INDIAN PULSE GRAINS

	% Water	% Protein	% Fat	% Carbohydrates	% Fibre	% Ash	Total calories per lb.
Peas ..	12·5	23·6	1·3	54·5	5·7	2·4	1470
Gram ..	11·5	21·7	4·2	59·0	1·0	2·6	1636
Masur (Mysore dhal) ..	11·80	25·1	1·3	59·6	...	2·2	1590

Meat and fish furnish protein in about the same proportion as seed grains or cereals. Scientists today state that vegetables combined with seed grains form a better diet than meat combined with seed grains can do.

The proteins of meat and fish are suitable, containing all the essential amino-acids. The amount of protein depends upon the amount of *lean* muscle the meat contains.

Two and a half ounces of curds or dhal, or $\frac{3}{4}$ pint of milk, have as much protein as a mutton chop or small fish.

Meat and fish contain about as much phosphorus as the seed grains and, like them, are low in calcium content. Iron is one of the chief elements of meat, but this is equalled by an egg yolk, two chapatis or slices of whole-wheat bread, or two ounces of cooked spinach. Mutton contains a small amount of Vitamin B, but is lacking in Vitamins A and C. Beef contains some A as well as B vitamin. Liver contains all the vitamins. If meat is eaten, it should be taken in a mixed diet with whole seed grains, *atta* bread, vegetables, fruit and milk, and not allowed to replace them. Meat protein is complete, but no better than that of milk and eggs. Too much meat in the diet is bad for us. Protein cannot be completely oxidized and the uric acid thus formed causes ill-health.

Eggs. Eggs, like milk, contain suitable proteins, equal to those of meat and can be substituted for meat in the vegetarian's diet. Like milk, the protein of eggs supplements the vegetable proteins of the pulses and grains. They are more concentrated than in milk and, therefore, after a child begins to eat other foods, its milk may be lessened in quantity and eggs added. The yolk of egg is rich in fat and ash constituents. Calcium, phosphorus and iron are all abundant in the yolk.

Milk requires special care in a tropical climate. Why? What makes milk sour? Look back to the chapter on micro-organisms. Not only must the surroundings of the cow, the shed and pen be clean, but the cow's udder must be washed with clean water before she is milked. The milker, too, should prepare for this work as carefully as he would prepare to enter a kitchen to cook the food. A bath, clean clothing and clean vessels are all important in keeping the milk clean. The vessel, in which the milk is caught, should be thoroughly washed and rinsed, first in boiling water and then in cool water. The milk-vessel should be covered with clean mulmul as shown in Fig. 90 and stood in a pan of cold water to cool quickly. It is nothing short of criminal for a milkman to dilute milk with water (probably polluted).

Fig. 90 Covered milk jug

Infection is readily carried by milk, as it furnishes a dilute food for micro-organisms. Bacteria like warm milk, so we can prevent their growth by keeping it cool. Boil milk quickly, stir while boiling to prevent scum forming, and cool quickly.

Goats' milk is often used for children and is better than cows' milk in some respects. Its iron content is higher. Its fat droplets are smaller, give a more thorough emulsification, are more easily digested, and it is richer in Vitamins A and D than cows' milk. The curd, too, is finer and children are often able to tolerate goats' milk when they cannot digest cows' milk. As goats are not susceptible to tuberculosis, their milk may be used with greater safety.

Percentage Composition of Milk

Type of milk	% Water	% Fat	% Protein	% Sugar	% Ash	Calories per lb.
Mothers' breast-milk ..	88·3	3·5	1·3	7·0	0·3	288
Goats' milk ..	85·7	4·7	4·5	4·5	0·8	350
Indian cows' milk ..	85·28	5·7	3·6	4·7	0·77	380
Water buffaloes' milk ..	81·73	8·0	4·5	5·0	0·8	500
Whole milk powder ..	4·0	29·0	25·5	36·0	5·5	2530
Skimmed milk powder	3·0	2·0	35·5	51·5	8·0	1830

Curds and cheese. Ancient peoples found that it was possible to preserve the curds of milk if they drained off most of the moisture (whey) and kept the curds in a cool place. Sometimes they buried it or put it away in caves. Moulds and bacteria attacked it, changing its flavour without destroying it. Necessity caused them to eat it and custom taught them to like it. Cheese is, therefore, a recognized food in the West, while we in the East prefer to eat the fresh curds. It is possible now to secure cheese made in India without the use of rennet and, where milk and curds are scarce, cheese can be used without offence to custom. A pound of cheese contains the protein from four quarts of milk. It is rich in fat, ash constituents, calcium and phosphorus and can well be substituted for meat in the diet.

Curds or cheese, taken with whole-wheat bread or chapatis and fruit, makes an adequate diet for a man if a sufficient quantity is eaten to make up the calories.

Milk fat. The fat of milk is in the form of tiny globules which rise to the top when milk is allowed to stand. We call it cream. We churn the cream to make butter. The fat of milk not only yields heat and energy, but supplies Vitamin A and a little Vitamin D which, we have learnt, is necessary for growth and health. The custom of clarifying butter to make ghee arose from the same necessity as that for making cheese. In a hot climate, butter quickly becomes rancid by the action of micro-organisms. It was found that boiling out the water which butter contains also hardened the protein present, and it could then be strained out. It should be boiled in a closed vessel otherwise the Vitamin A will be destroyed. Such a condensed form of fat is not attacked by ferments and will keep much longer than butter. It is an excellent source of heat and energy but is often adulterated.

Its mineral ash. The minerals of milk are found in the whey or fluid of the milk. There is more calcium in a quart of milk than in a quart of limewater. Similarly milk contains a good supply of phosphorus. Therefore it is a food well suited to growing children who need material for their bones and teeth. The iron in milk is in a form which is readily absorbed and used by the body, but there is not enough of it to supply all that is needed. What could you take with milk that would add iron to the diet?

Its vitamins. Milk contains Vitamins A, B and some D, and if the cow is fed on green food her milk also contains Vitamin C. We must not forget that Vitamin C is destroyed when milk is heated. Do you know what else to give a baby if she has to have boiled milk? Half a tola (a tablespoonful) of orange, tomato, or carrot juice will supply the need.

Sugar of milk is found in the fluid 'whey' and may be evaporated out. Sometimes we buy it from the chemist to use in modifying milk for babies, as it does not ferment easily, and is less sweet than cane sugar.

Its water content. The protein, fat, sugar, minerals and vitamins of milk are held in an emulsion with water. Food in this liquid condition is easily attacked by bacteria and yeasts, and we therefore have to keep it clean and cold and covered to prevent it from souring.

Things to Do

Oral and practical work

1. What is food?
2. How may foods be classified?
3. What is the composition of milk?
4. What foods are used for body fuel, to provide it with heat and energy?
5. What foods are used for repair and growth of body tissue?
6. What foods are necessary for regulating the body processes?
7. What is the effect of too little calcium in the diet? What is the best way to supply it?
8. Why do we require phosphorus for health and growth?
9. Of what use is iron in the system?
10. What proof have we of the effect of having insufficient vitamins in our food?
11. Why is *atta* a better food than white flour?
12. What is the protein of cereal grains called? How would you recognize it?
13. What is the test for starch?
14. What minerals are most prominent in cereal grains?
15. What vitamin do cereal grains contain? What value is this vitamin to us?
16. Compare the composition of the cereal grains which you use at home.
17. Are nuts good food value?
18. What mineral salts are found in vegetables? What good purpose does the cellulose perform?
19. Can a suitable diet, adequate in all respects, be provided without meat or fish?
20. What foods may be used to provide a complete protein supply?
21. Why is milk called a 'protective food'? Name all its good qualities.
22. How can milk be kept cool, clean and safe from infection?
23. In what respects does the milk of animals differ?
24. What is the best substitute for mothers' milk?
25. What is cheese? How is it made? What value has it? How does it differ from curds?
26. Make a list of the green leafy vegetables you have eaten in your diet for a week. Find out their food value.
27. How can rice be cooked to prevent the loss of Vitamin B_1? Find out the different ways of cooking rice.

CHAPTER XVIII

FOOD FOR THE FAMILY

At birth, the average baby born in India weighs five and three-quarter pounds. From this tiny beginning the baby must develop to twenty or twenty-five times his weight, if he grows to be a man. The most rapid growth of a child is in the first year. A baby doubles his weight in six months and trebles it in a year; thereafter his growth becomes slower. Between ten and sixteen years of age, boys and girls increase rapidly in weight if they are provided with adequate food. Thus age is one of the factors which determines the amount of food needed.

There is some difference between the time when greatest growth takes place in boys and in girls. Boys, too, are usually larger than girls. For these and some other reasons, we say that size is a factor governing food requirements. If we know a person's height and weight, we can determine how much food he requires for health and growth. A tall, thin girl needs more fuel (food) to keep her warm than a short, broad girl of the same weight, because she has more body surface for the radiation of body heat. Her heart has to pump the blood a greater distance and, therefore, more energy is required.

Food Required for Heat and Energy

Another important factor in determining how much food is required is activity. The more active we are, the greater the amount of fuel we need to provide energy. How much fuel in the form of food does an average person need?

Our bodies need fuel at all times, even while we are sleeping. Although lying quietly in bed, a man burns 168 calories in 24 hours, or 7 calories an hour, for every stone he weighs. If he weighs 10 stone, he will require 70 calories an hour, or 1,680 calories of heat in twenty-four hours, just to keep his body warm and alive, though he himself is lying still. The fuel requirements of men, women and children have been determined by scientists, so that now we are able to tell, according to our age, height, weight and activity, how much food each one of us needs.

The following table[1] gives approximate averages of the hourly energy-expenditure under differing conditions of

Activity	Hourly expenditure of Calories
Sleeping	50-55
Awake, lying still	55-70
Sitting at rest	80
Standing at rest	90
Tailoring	105
Typewriting rapidly	110
Bookbinding	135
Light exercise	135
Shoe-making	140
Walking slowly (at about $2\frac{3}{4}$ m.p.h.) ..	160
Carpentering	190
Active exercise	230
Walking rapidly (at about $3\frac{3}{4}$ m.p.h.) ..	235
Stone-working	315
Severe exercise	355
Sawing wood	380
Running (at $5\frac{3}{4}$ m.p.h.)	395
Very severe exercise	470

[1] See *footnote on p.* 291

activity, of an average-sized man in Baroda, weighing 121 lb. Of course, all men do not weigh the same but you can take proportionately less or more, according to weight, for a smaller or larger man doing the same work.

From this table you can plan how many calories a man uses in one day, according to his work. For example, a teacher requires food to provide energy as follows:

ACTIVITY	DURATION IN HOURS	CALORIES PER HOUR	TOTALS
Sleeping	8	55	440
Sitting at meals ..	2	80	160
Sitting in the classroom ..	4	90	360
Walking in classroom ..	3	160	480
Walking to and from school	1	235	235
Working in the garden ..	2	230	460
Reading at night ..	3	90	270
Dressing, bathing, etc. ..	1	135	135
			=2,540

FOOD REQUIRED FOR GROWTH AND REPAIR OF BODY TISSUES

We shall now consider the body's requirements of food for growth and repair of tissues. The foods for this purpose we have called 'building materials'. It has been proved that an adult needs to have from 90 to 100 grammes (3-3⅓ oz.) of protein every day. Sometimes we measure

[1] Based upon figures given by Dr H. C. Sherman in his *Chemistry of Food Nutrition*, p. 186. Dr Sherman has given the averages for a man weighing 11 stone (154 lb.), and we have arbitrarily assumed that a smaller man will require less in exact proportion. This is the nearest we can arrive at our requirements in the absence of exact calorimeter experiments in India.

this in terms of the percentage of total calories in the diet. If you select 12 per cent to 15 per cent of the calories from protein, the body will have a sufficient supply. The other building materials needed are mineral salts to the extent of 1 oz. daily. From what source will you secure these materials? We cannot measure in grammes the amount of vitamins needed, but we can see to it that our diet contains all the essential vitamins. What are they called? Where are they most plentifully found?

If food is in the right proportion it should provide:

Protein	..	75·000—100·000	grammes
Fats	..	52·000— 90·000	"
Carbohydrates	..	353·000—480·000	"
Calcium	..	0·680— 1·000	"
Phosphorus	..	1·000— 1·320	"
Iron	..	0·015— 0·020	"
Vitamins	..	A, B, C, D	

We must now consider from what sources we should select our daily diet in order to meet these requirements.

Determine the amount of energy you require, according to the hours you spend in sleeping, sitting, walking, standing, doing housework, and so forth. Calculate the amount your father and mother, sisters and brothers require and record it in your notebook. Compare your results with those found by other girls in your class. Discuss.

Let us consider a family consisting of a father, a mother, a girl of fourteen, a boy of eight and a baby of one. How many calories will they require?

This is the amount of food the family will need for one day. To determine their requirements of calories for a week, multiply the amount for one day by seven. This gives us a maximum total of 76,090 calories. Study the

Persons composing family		Minimum calories required	Maximum calories required
Adult man	..	2,500	3,000
Adult woman	..	1,730	2,380
Girl of 14	..	1,840	2,390
Boy of 8	..	1,700	2,100
Baby of 1	..	900	1,000
		8,670	10,870

following groups of foods and see what proportion from each we should select for this family. We might provide the necessary weekly calories for our family as follows:

24,000 calories, from 14¼ lb. seed grains; 16,000 calories from 29 lb. milk and 10⅓ lb. dhal, meat and eggs; 16,000 calories from 5 lb. fats, oils and fat foods; 8,000 calories from 4½ lb. sugar and sweet foods; 16,000 calories from 70 lb. fruits and vegetables. Total = 80,000 calories.

Groups of Foods

1. *Seed grains, or cereals (corn)*. From these our bread is made. The more economical our diet must be, the larger the return in calories we shall secure for our money if we buy this group of foods. If we use the 'whole' grains we shall get more calcium, phosphorus and iron than if we use polished rice and patent white flour. Even so, we cannot get all the mineral salts we require. These foods are also low in vitamins A and C. The incomplete proteins need to be supplemented.

2. *Milk and its products (curds or cheese)*. From milk we secure calories for heat and energy, complete

protein for tissue building, mineral salts and vitamins. Taken with pulses and grains, it supplements their deficiencies.

3. *Pulses, or legumes (dhal)*, like the cereal grains, furnish energy as well as protein. Some of their proteins are incomplete. They contain minerals and some vitamins. Sprouted pulses are richer in vitamins.

4. *Eggs.* The yolk of the egg especially is rich in minerals and vitamins. The whole egg is rich in complete protein, and is a good source of energy because of its fat. So eggs supplement the protein of the grains and pulses.

5. *Meat, poultry and fish* are rich in complete proteins and fat. They yield energy, but are deficient in minerals and vitamins. They can be used in place of grains, but must be supplemented. Are they as cheap as the grains?

6. *Fats and sugar* provide heat and energy, and are chiefly added to the diet to increase the calories. Butter and ghee also provide Vitamin A, but no protein.

7. *Fruits and fresh vegetables* provide some calories. They are important sources of mineral salts and vitamins. This is a good group of foods, therefore, with which to supplement the grains and pulses.

Marketing

Begin by making a price list of the foods you require. Make a list of the ghee, oil, sugar, etc. according to the cost per seer or pound, or the amount you can buy for one rupee. Do not forget milk, nuts, spices, vegetables and fruit. From the food composition lists (pp. 266 and 283) you can easily calculate how much the calories are going to cost and which are the most economical sources of heat and energy. For example, you might find that

1,000 calories in the form of rice cost as little as one anna, in the form of ghee five annas and three pies, while in the form of milk they might cost five annas and nine pies, and in vegetables six annas and four pies.

Can we let cost control our choice entirely? Supposing you bought only rice, would the food be sufficient to keep you well and make you grow? No; we have to remember all the time that we need not only calories of heat and energy, but protein, mineral salts and vitamins.

See if you can plan a good way of spending the money you have for food. Begin by determining how much cereal grains are needed for the whole family. Write this down in seers and calories also, and call this Group 1.

Next calculate how much milk should be bought. Babies and little children must have two seers each. The older children, too, should really have as much, but if we cannot afford it, we shall allow them one and a half pints each. Everyone else in the family should have a pint of milk a day. Now add this up and calculate how many calories the milk will furnish. Call this Group 2.

Group 3 will consist of all the food we must buy for the special purpose of providing proteins. These are pulses (dhal), eggs, cheese, fish, flesh or fowl. Estimate how many calories you will secure from this group of foods.

How much ghee, butter and oil will you need for the whole family? This will be low in quantity, but high in calories. Write down the amount and mark it Group 4.

Group 5 will include all the sweets required, in various forms—sugar, etc.—for everyone in the family for the day. Calculate the weight and the number of calories.

The sixth and last group will contain fruits and fresh vegetables of all sorts and kinds. This ought to be a much larger amount per head than is usually allotted.

Count up the calories from each group separately, and consider whether your choice has been wise and good. Do you know how to work out percentages? We want to know what percentage of the total calories each group will furnish in the family diet.

First we must know what the grand total of calories amounts to, so add all the calories of the six groups together. Compare this with the total requirements of the imaginary family mentioned on page 293. Suppose you have 8,000 calories in all for the daily diet of the whole family. Divide the total into the number of calories from each group. Next you should determine its cost.

The following points should help us to make some general rules for those people who eat a *mixed diet*:

Divide up your food money into five parts. Spend one-fifth or less on vegetables and fruits; one-fifth or more on milk and cheese (curds, etc.); one-fifth or less on meat, fish and eggs; one fifth or more on bread and cereals; one-fifth or less on fats, sugar and spices, etc.

See if you can make a good rule for the division of your money for buying a vegetarian diet.

The vegetarian spends about three-tenths of his money on cereals; one-fifth on milk; one-tenth on pulses; one-fifth on fats; one-tenth on sweets and spices; one-tenth on vegetables and fruit.

The man who eats a mixed diet has to pay more for his proteins, so he spends less on milk and cereals and buys more vegetables. Don't you think vegetarians would do better to buy more vegetables and fewer sweets? The less we have to spend the larger the proportion of our money must be spent on cereals; but we should be careful not to try to save on the milk and vegetables. We could more easily do without the fats and sweets.

One-third of the protein and half the fat should come from animal sources, and vegetables used in the diet should weigh four times more than meat and dhal.

The cereals, fruit and vegetable should be varied and not all of one kind. Leafy vegetables and citrous fruit should be eaten at least three times weekly. Fresh fruit and raw vegetable salads should be eaten frequently. Milk must be used generously. Avoid eating tinned and preserved food if fresh food is available.

Things to Do

Oral, written and practical work

1. At what ages does the greatest growth take place?
2. What are the factors which determine the amount of food you need?
3. What are the chief characteristics of each group of foodstuffs from which we select our diet?
4. How much of the money set aside to buy food should we spend on each group of foodstuffs?
5. What are the chief faults in your diet? How can they be corrected?
6. Plan the meals for a child under twelve years of age. If possible prepare and serve them.
7. Plan an adequate diet for yourself.
8. How many hours do you spend sleeping, working, playing, etc.? Work out your daily requirements of calories according to your activities.
9. Determine the quantity of food required to supply all the needs of your family for a week. Work out its cost.

CHAPTER XIX

COOKERY

The Flavour of Food

'The science of cookery may be said to be in retaining all the nutrients and rendering the food more digestible. The art of cookery lies in producing flavours, textures and forms which please the eye and the taste. The appetizing odour and pleasant flavour have a stimulating effect upon the digestive juices also. Indeed, there is more science in the production of flavours which " make the mouth water " than is realized. Delicate chemical changes are responsible for the development of the aroma and flavour which take place during the processes of cooking. And it is the need for developing good judgement and skill in this art which makes training in cookery so important.'

When spices and condiments are added in too great amount, they deaden the sense of taste and weaken the digestion as well. Then the taste has to be whipped up by adding more and more, causing the digestive secretions to flow from the glands until they tire and refuse to respond.

But if we are to be artists in cooking, we shall not add seasonings to everything and make them all taste alike. Neither shall we add so much of these strong condiments and spices that the natural flavour of the food is entirely lost. Little children should not be given any chillies or spices at all, and adults would have better digestions if they used less.

The art of cookery is one which is interesting to most girls and very necessary for all home-makers. Even if we do not do the cooking ourselves we need to know how to if we expect a cook to carry out our instructions. A cook very soon discovers whether or not the mistress of the house understands the art.

You have learnt the value of all the various food materials; now we shall observe the changes which take place when they are cooked.

METHODS OF COOKING

GRILLING	Cooking over a glowing fire	Direct application of heat
ROASTING	Cooking before a glowing fire (toasting)	
BAKING	Cooking in an oven	Application by means of heated air
BOILING	Cooking in boiling water	Heat applied by means of water
STEWING	Cooking for a long time in water below the boiling point	
STEAMING	(*a*) Moist: cooking in a steamer	By contact with steam
	(*b*) Dry: cooking in a double boiler, or in a pan set inside another pan containing water	By the heat of steam surrounding vessel

<table>
<tr><td>FRYING</td><td>Cooking in hot fat, deep enough to cover the article to be cooked</td><td rowspan="2">Heat applied by means of heated fat</td></tr>
<tr><td>SHALLOW FRYING</td><td>Cooking in a small quantity of hot fat</td></tr>
<tr><td>PAN-BROILING</td><td rowspan="2">Cooking in a frying pan or on a griddle, with little or no fat</td><td rowspan="2">Heat applied by means of heated metal</td></tr>
<tr><td>PAN-BAKING</td></tr>
<tr><td>BRAISING</td><td>A combination of stewing and baking</td><td></td></tr>
</table>

Before beginning to cook, see that you have everything required—the right tools and utensils, and your materials weighed or measured or ground, as the case may be. Have your fire lighted, or ready to light so that once having begun the process of cooking you will not have to stop to search for anything needed.

Temperatures for Cooking

For baking: *paper test.* The temperature is right for placing food into an oven when a piece of white paper placed in the centre of the oven browns in the time specified for each food in the following table.

Food	Time for cooking per lb (in minutes)	Oven Temperature	Paper Test (in minutes)
White bread (yeast) ..	60	hot[1]	2
White bread (baking powder) ..	60	moderate	3
Scones ..	10-15	very hot	1½
Cup cakes ..	20-25	very hot	1½
Layer cakes ..	15-20	hot	2
Loaf cakes ..	45-50	moderate	2½
Biscuits ..	10-15	hot	2
Sponge cake ..	40-50	very mod.	3½
Custards ..	60	slow	4
Pastry shells ..	10-15	very hot	1½
Pies ..	30-40	very hot[1]	1½
Meat and poultry ..	20-25	very hot[1]	1½

For deep fat frying: bread test. The temperature of the fat is correct for frying when a small piece of white bread dropped into fat browns in the time specified below.

Food	Bread Test
Croquettes ..	40 seconds
Fritters ..	30 seconds
Fish ..	60 seconds
Doughnuts ..	60 seconds
French fried potatoes ..	20 seconds

Cooking with fats. Fats are made of the same elements as carbohydrates, but they differ from starch and sugar in the proportion of oxygen to carbon and hydrogen. As there is much less oxygen in the fats, they take more from the air for their oxidization. Therefore fats will yield more than twice as much heat as the carbohydrates yield.

[1] Reduce the temperature for the last half of cooking.

People in cold climates, therefore, should eat more fat than people in hot climates. Fats are chiefly digested by a process of emulsion, and when we heat them, we make them less digestible than when they are uncooked. Fats may be heated above the boiling point of water without showing any change; but if raised to too high a point slight decomposition takes place, and products are formed which irritate the mucous membranes and interfere with digestion. Your eyes and throat are irritated by foods frying in fat, and it is these substances, produced by the high temperature, which make such foods indigestible.

Furthermore, by heating butter and ghee in open vessels for frying, we destroy much of the Vitamin A.

For sugar syrup: cold water test. Cook syrup until it reaches one of the stages indicated below. Test by dropping a small amount of the syrup into cold water.

Candy	In cold water test syrup will make a
Fudge and sweet palas ..	Soft ball
Fondant ..	Soft ball
Caramels and toffee ..	Hard ball
Peanut brittle ..	Caramel or crack

PRINCIPLES OF COOKERY

I. Carbohydrates

1. *Sugars*: cane sugar, fruit sugars, honey, treacle, etc. (i) *Reasons for cooking.* To improve the flavour of other foods, and to change cane sugar to simpler form. (ii) *Effect of cooking.* Cane sugar is a double sugar, and when heated with water it is hydrolized and changed to dextrose and levulose, simple sugars more readily absorbed.

(iii) *Method of cooking.* With water at a high temperature, sometimes with acid, or may be made into a syrup by heat.

2. *Starches and cellulose.* These are found in vegetables and cereals. (i) *Reasons for cooking.* To soften the cellulose and make the starch more digestible and appetizing. (ii) *Effect of cooking.* When the cellulose of starchy foods is heated in the presence of moisture, the cellulose is softened and the grains swell and burst the cellulose envelope, making it easier for the digestive juices to penetrate the food. This requires a high temperature, and if much cellulose is present a long time should be given to the process of cooking. The starch is then hydrolized and changed into a form simpler and more easily digested. (iii) *Method of cooking.* Some vegetables contain sufficient water in their composition to make it possible for them to be cooked in the oven by dry heat. This method ensures the retention of all their nutrients. Vegetables and cereals are often cooked with water at a high temperature, for a longer or shorter time, according to the fineness of the cereal and the size of the vegetable. A fireless cooker is best for long-process cookery.

II. PROTEINS

1. *Of animal origin*: meat, fish, eggs, milk, cheese. (i) *Reasons for cooking.* The digestibility of these foods is not increased by cooking. Heat is applied to render them more appetizing in appearance and taste. (ii) *Effect of cooking.* Heat has the effect upon protein of making it solid at a low temperature. If heat is applied at a high temperature and for a long time, it will render the protein hard and indigestible. (iii) *Method of cooking.* Apply heat at the low temperature for a short time for

the development of flavour, colour and texture.

2. *Of vegetable origin*: beans, peas, dhals, cereals. (i) *Reasons for cooking.* Some vegetable proteins require cooking to develop them. They are combined with starch and cellulose, both of which require long cooking at a high temperature. (ii) *Effect of cooking.* Heat develops vegetable proteins, softens cellulose and swells starch grains, rendering them all more digestible. (iii) *Method of cooking.* Moist heat, a high temperature and long cooking make these foods palatable and digestible.

III. Minerals, Ash Constituents and Vitamins

Fruits and vegetables of juicy and succulent varieties are the type of food in which these constituents predominate. *Milk* is also a good source of vitamins and minerals. (i) *Reasons for cooking.* To sterilize; for variety; to soften cellulose; from habit. (ii) *Effect of cooking.* If long continued, cooking will largely destroy the vitamins. Heat does not affect the minerals; soaking or cooking in water dissolves much of these constituents which pass into the water and may be wasted. Soda, too, destroys vitamins. (iii) *Method of cooking.* Eat uncooked as far as possible. Wash vegetables in running water, and keep in damp butter muslin. Never soak. Cook quickly in a little water at a high temperature. Never add soda.

IV. Fats and Oils

These are more easily digested uncooked; but if it is necessary to heat them, they should not be brought to a high temperature, as the heat disintegrates the fat. Frying food in fat of any kind is the worst possible method of cooking. By cooking food like this we make it difficult for the digestive juices to penetrate, and we thus delay digestion. We often overheat proteins by frying. This is the habit of the thoughtless housewife. Fats are better used to season cooked foods, and oils to dress salads.

STARCH

Is starch soluble in water? You will remember that in boiling water it formed a transparent jelly. The starch grains are enclosed in an envelope of woody fibre, called cellulose. This is softened by boiling water, and the swelling starch is able to burst the cell walls.

We know that food materials must be changed to a soluble form before they can pass through the walls of the digestive tract. Therefore, starch must be changed to a soluble form before we can assimilate it. The simple sugars found in fruits can, however, be absorbed without change, and therefore require no cooking. Thus raisins, dates, figs, and such dried fruits, are easily digested.

Starch, however, must be chemically changed. By thorough mastication it is possible partially to bring about this change; and some foods we eat, such as plantains, contain raw starch. Raw starch requires a much longer time to digest than cooked starch, and that is why civilized people use heat, water, acid, or ferments to hydrolize the starch partially before eating it.

Starch first takes up water, and if acid or a ferment is present the change to simple sugar is hastened. In breadmaking, the yeast breaks up the sugar into CO_2 and alcohol. If the alcohol is burned, then the carbohydrate is changed to CO_2 and H_2O again, so that the starch and sugar are returned to the air in the form from which the plants originally made it.

If starch is heated dry it will change to dextrin, which is soluble in cold water. If you continue to heat it, it will be further changed to caramel, which causes its brown colour. Test with iodine. When heated still more it turns black. What is this?

The simple cooking of starch, as we find it in rice, rolong and potatoes, consists in softening the cellulose with moisture and heat. The starch grains are capable of swelling to twenty-five times their bulk. When so distended it is much easier for the digestive juices to penetrate the mass, and change it to its simpler form for use in the body.

The accompanying diagrams show the effect of cooking potatoes. A similar change takes place when we cook rice.

The potato contains so much water that it may be cooked without adding any more. A pound of potato contains nearly a cupful of water. Rice and rolong, on the other hand, require a great deal of water in cooking, but we must not use more water than they can absorb.

If rice is washed before cooking there is a great loss of mineral salts and vitamins. So do not throw away any water in which rice is cooked, but use it in sauces or soup.

Sufficient water must be used in cooking cereals to swell the grains to their full extent, but avoid having the product too soft, as it is then liable to be swallowed without mastication. For young children, cereals should be strained to remove all cellulose.

Recipes for Starchy Foods

Cereal porridge

1 cup cereal (oats, rolong, etc.)
4 cups water
½ teaspoon salt

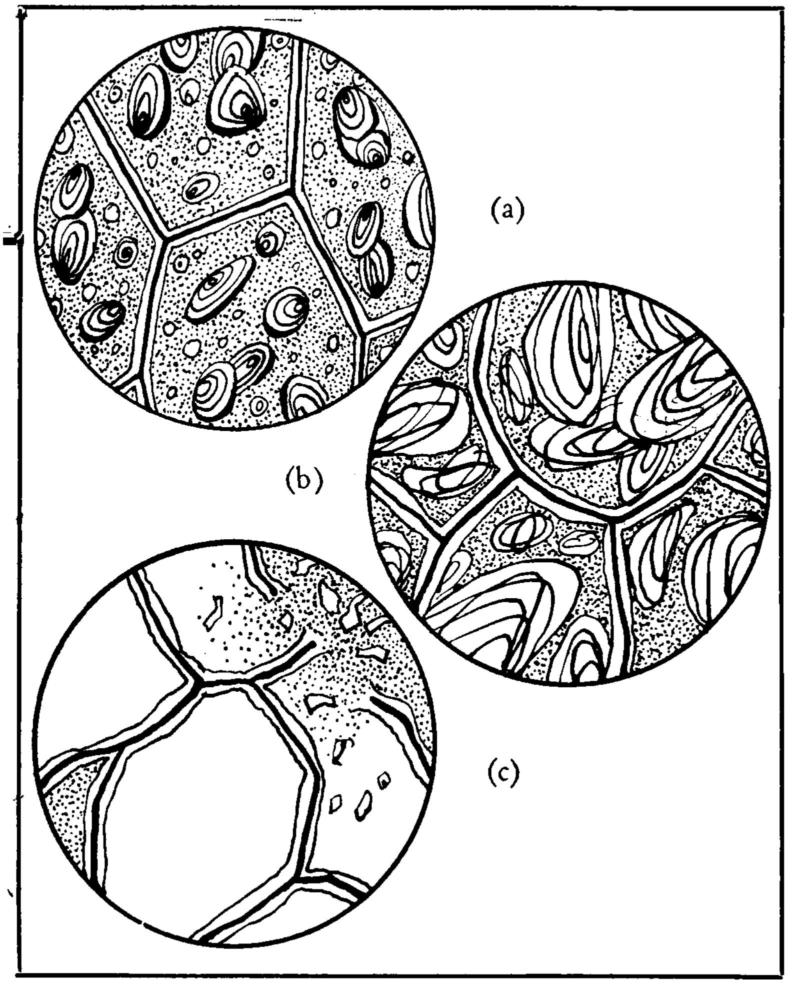


FIG. 91 Potato

(a) Raw, showing starch grains and cellulose structure; (b) Parboiled, starch grain rupturing; (c) Boiled, cell structure broken down

Boil the water, add salt and cereal gradually, keeping the water boiling briskly. Lift with a fork to prevent sticking, and cook directly over the flame for at least 10 minutes, cover, and place either over boiling water, or on a slow fire. Cook from 1 to 3 hours, according to the coarseness of the grain. When cooled, this gives a jelly.

Baked potatoes. Do you know how to cook a potato without adding any water? Place hot ashes inside an oven pan and lay potatoes or sweet potatoes, which have been washed, on top of the ashes. Place the cover over the oven and heap hot ashes or charcoal on top. It will require nearly an hour to cook the potatoes, depending upon their size. They can be baked in a thoa, closely covered, over a slow fire in the sigri. If you have a stove or range with an oven, bake the potatoes in this. They require a hot oven. When done, squeeze them gently and with a fork break open the skin to let out the steam. They may be eaten, skins and all, with salt, butter or ghee.

Potatoes cooked in this way are good for little children and invalids as well as for the rest of the family.

Boiled potatoes. The usual way of cooking potatoes is in water. Have a vessel of water boiling before placing the potatoes in it. It is a good plan to add half a teaspoon of salt to the water. The potatoes may be boiled in their skins, or, if preferred, they may first be peeled carefully so as to waste as little as possible. The former method is more economical, as the mineral salts lie close to the skin. Let the water cover the potatoes and boil them gently so that they may keep their shape.

To test whether they are ready, prick with a fork. Then pour off the water and keep it for soup. The potatoes should be dry and mealy when done.

Mashed potatoes. If the potatoes have been cooked in their skin, these must first be removed. Boiled potatoes may be mashed while hot, until free from lumps. Then add butter or ghee and hot milk to moisten, but not enough to make them too soft. Whip them vigorously with a fork until they are light. Add more salt if required, and whip until creamy. Then pile in a dish without smoothing the top.

Batters and doughs. Bread and cakes are made with a foundation dough or batter, whose essential ingredients are flour, liquid of some kind, shortening, and salt. To lighten or aerate the mixtures use one of the following means.

Air is used to lighten bread dough, such as chapatis, and some batters, such as Yorkshire pudding. In the latter, however, as the batter is thin, and consequently insufficient in gluten to hold the air, it is customary to add eggs. The protein of the eggs quickly hardens and holds the mixture up, after the steam has expanded the mixture.

Bicarbonate of soda, in combination with sour milk or molasses (treacle) or lemon juice, may be used to lighten bread or cake, the amount of soda depending somewhat upon the acidity of the milk or molasses. The use of an excess of soda makes cakes bitter to taste and more likely to fall and be soggy than to rise. Half a teaspoon of bicarbonate of soda to one cup of sour milk is sufficient.

Baking powder is a dry mixture of cream of tartar or tartaric acid and bicarbonate of soda, mixed with dry cornflour to prevent them from acting upon each other. Some baking powders use other acid constituents, such as acid phosphate. When using baking powder it is wise to add it just before baking the mixture, or the carbon dioxide will escape too soon. When the mixture is placed in the oven or other hot medium, the gas expands, stretching the gluten of the flour. Further heating hardens the gluten and the mixture is made light and porous.

Recipe for baking powder

2 oz. cream of tartar
2 oz. tartaric acid
4 oz. bicarbonate of soda
8 to 12 oz. cornflour or rice flour

Sift well, mix together and keep in a closed bottle.

Yeast is another leavening agent. You have already learnt (p. 188) that yeast is a micro-organism, a tiny plant which reproduces itself by budding and by forming spores, which in turn become new plants. Under favourable conditions yeast cells multiply very rapidly, producing as they grow a gas, carbon dioxide. This process is called the fermentation process; the sugar is acted on by the yeast and changed into alcohol and carbon dioxide. It is the gas which, forming all through the dough, stretches the cell walls and causes the bread to rise. During baking the gas expands, thus increasing the size of the loaf, before the dough is hardened by the heat and the gas driven off.

Three things are necessary for proper growth and development of the yeast plants: warmth, moisture and food. Yeast is killed by high temperatures and rendered inactive by low ones. The moisture present in the air is usually sufficient in quantity to favour the growth of the yeast cells.

Quick breads

There is a standard method of combining ingredients for each type of quick bread. Almost any kind of dough or batter can be mixed according to one of these patterns: (i) the batter way, (ii) the scone or pastry way, or (iii) the cake way. First measure all ingredients accurately.

1. The *batter method* is used mostly for batters, and consists of the following steps: (i) Sift together all dry ingredients. This includes salt, sugar, flour, baking powder or soda and spices. (ii) Add liquid gradually, stirring until mixture is smooth. Liquid means milk, water, egg, molasses. The egg, if used, is beaten lightly into the other liquids. (iii) Stir in melted fat.

2. The *scone* or *pastry method* for doughs, both soft and stiff, is as follows: (i) Sift all dry material together. (ii) Cut shortening (i.e. the fat) into flour with knives, or mix it in coarsely with the finger-tips. (iii) Stir the liquid in gradually to give the dough the proper consistency.

3. The *cake method* of mixing is suggested for some particular quick bread recipes. (i) Cream the shortening and sugar. (ii) Add the liquid ingredients. (iii) Sift in the dry ingredients.

Baking quick breads. Quick breads are baked immediately after mixing, either in a hot oven or a hot griddle. Scones, small cakes, etc. need a hot-oven temperature. The time for baking cannot be stated definitely, because of the varying sizes of loaves, scones, or cakes, but in general baking is continued until the surface is golden brown.

Chapatis

1 lb. atta
¾ to 1 oz. ghee or oil
Salt to taste
Water

Sift flour and salt to make it light. Rub in oil or ghee and convert mixture into a soft dough with cold water. Cover and stand aside for one hour or more.

Knead well, divide into about 10 balls, roll each out to about 5 inches in diameter. Bake in a hot thoa and cook until it browns; then turn and bake on the reverse side and throw on to hot charcoal to make it puff.

Chapatis should be cooked until crisp for small children, and allowed to cool before adding ghee.

Puri

½ lb. coarse maida
¼ teaspoon salt
Ghee for shortening
Water or milk

The maida and salt are sifted together twice. The water or milk is then added and mixed with the other ingredients to form a stiff dough. Allow the dough to stand for 10 minutes and then divide it into 25 equal balls. Roll them, one at a time, on a floured board into circles 2½″ in diameter. By folding and refolding during the process, the dough is aerated into thin layers.

Melt 1 to 2 oz. ghee and fry the small cakes until brown. They should puff up like balloons, and be hollow inside.

Baking powder scones

2 cups white flour
4 teaspoons baking powder
1 teaspoon salt
4 tablespoons ghee
¾ to 1 cup milk or water

Sift dry ingredients, rub in shortening with finger-tips or cut in with two knives. Add liquid and mix to a soft dough. Toss on slightly floured board, pat into shape and cut with biscuit cutter. Bake for 15 minutes in hot oven.

Soda scones

2 cups flour
½ teaspoon soda
1 teaspoon salt

¾ cup thick sour milk or buttermilk
4 tablespoons ghee

Sift together salt, soda and flour. Work in ghee. Add milk gradually, mixing to a dough. It may not be necessary to use all the milk. Place dough on a floured board. Knead well. Roll to half-inch thickness. Cut with a round cutter and bake in a hot oven for 12 to 15 minutes.

Variations: (i) *Bran scones.* Substitute 1½ cups bran for 1 cup wheat flour. Add ¼ to ½ cup jaggery or molasses if desired. (ii) *Whole wheat.* Substitute 1 cup whole wheat for 1 cup flour. (iii) *Corn.* Substitute ¾ cup yellow cornmeal for 1 cup flour. (iv) *Cereal.* Substitute cooked rice, oatmeal or other cereal for part (⅓ or ¼) of the flour.

Bran brown bread

1 cup bran	½ cup sugar (moist brown)
1 cup sour milk	1 cup flour
½ cup raisins	1 teaspoon soda
2 tablespoons melted ghee	¼ teaspoon salt

Mix together the bran, sour milk and raisins, then add the sugar and flour which has been sifted with the soda and salt. Stir in the melted ghee. Put the mixture into a greased can, cover tightly, and steam for 3 hours.

Cakes, biscuits and frostings

Mixing. Cream the fat and sugar well together. Sift the baking powder, salt and flour very thoroughly. A thoroughly incorporated baking powder means a more even-textured cake. If the beaten white of the egg is to be folded in last, be sure that it is well mixed through the batter. When left in lumps it destroys the even texture of the cake. When adding raisins, nuts, or dried fruit, have them dry on the surface and well dredged with flour to prevent bunching and sinking. Add melted chocolate directly to the fat and sugar; it helps in the creaming process, and is evenly distributed through the batter.

Baking. Grease the cake pans and sprinkle flour over the grease. This helps to make it possible to remove the cake from the pan easily. Most failures in baking are due to the heat being too great. See that you have steady but slow heat. It takes longer, but your success is assured.

Tests. To know when a cake is done, watch the sides, and note when the cake begins to shrink from the pan; when that happens the cake is well baked.

Another test is to press lightly, with the finger-tips, the surface of the cake. If it springs back it is surely done.

A third method is to test by piercing the cake with a fine straw or stiff stem of grass; if it comes out clean, with no cake-mixture adhering to it, the cake is baked.

Scotch shortbread

1 lb. maida flour
¼ lb. sugar
½ lb. butter

Rub the butter and sugar to a cream, gradually add the flour, and knead well, the longer the better. Lay it on a board and press it with your hands into sheets half an inch thick, cut into pieces, and bake in a moderate oven.

Date cake

¾ lb. maida or atta	1 teaspoon bicarbonate of soda
3 oz. shortening	
6 oz. brown sugar	1 ,, vinegar
4 oz. dates	1 ,, salt
1 cup milk	1 ,, mixed spices

Mix spice with the flour, rub in the shortening, chop dates and roll in flour. Dissolve soda in portion of the milk and combine with the dry ingredients, adding remainder of the milk (more if atta is used). Add the vinegar last. Put into a greased tin and bake in a moderate oven for 2 hours. This will keep well for several weeks.

Pastry

$\frac{5}{8}$ to $\frac{3}{4}$ cup water	$\frac{1}{2}$ teaspoon salt
3 cups flour	$\frac{1}{4}$ cup shortening (butter or ghee)

Sift dry ingredients into chopping bowl. Cut in shortening. Add enough water gradually to make a paste which is not crumbly, but holds together without adhering to knife or bowl. Turn on to a board lightly dredged with flour, and roll out to thickness required. Do not allow paste to stick to roller.

Mixing. The fat is worked into the flour (which has been well sifted with the salt), either with the finger-tips or with some convenient utensil. It is possible to use a fork for this purpose, or two knives cutting against each other. The important thing is to incorporate the fat into the flour without getting too dense a mixture. The fat should be allowed to remain in small lumps (one-eighth inch or less) throughout the flour. Perhaps knives accomplish this result better, because the heat from the finger-tips warms the fat; but the latter method is quicker, and almost equally satisfactory if a light touch is used.

A cool, dry atmosphere is an essential condition for successful pastry-making. Use maida, well dried. The shortening is largely a matter of taste. Better results are secured with a fairly hard fat; therefore, if a softer fat is used, it should be quite cold. Cold water is necessary in mixing the paste, and no more should be used than is necessary, as water detracts from the shortness of the crust. Cool hands and deftness are important factors.

Cooking vegetables

Spinach. Some of the leafy vegetables, such as spinach, may be cooked without the addition of any water. Containing so much water themselves, we have only to put them into a pot and cover them. Let them cook slowly, and stir occasionally to prevent them sticking to the vessel. It takes a very short time for them to be done. Another practice to be avoided is that of squeezing out the juice of these vegetables, as is sometimes done. The juice contains the mineral constituents and vitamins, and should not be thrown away. Our reason for cooking these vegetables is chiefly to sterilize them, but we also soften the cellulose; and we increase the variety of our diet by different methods of serving them. We must not forget that heat will largely destroy the vitamins, especially Vitamin C, and, as these vegetables are our chief sources of Vitamins A and C, cook them in as little water as possible for a short time, and without any soda.

Some of our fresh vegetables cannot be cooked without the addition of moist heat. Steaming is the best method to employ for all such vegetables. There are patent steamers, easily procurable, like the one shown in Fig. 92, in which several foods can be cooked at the same time. This means great economy of fuel, as only one sigri is required to cook a whole dinner. You can see from the diagram, in which a portion of the vessel has been removed, that the steam from the bottom saucepan can rise through the upper saucepan, and thus cook the foods that are placed above. You might improvise a steamer by perforating holes in the bottom of a pan and placing it in a slightly larger vessel, into the top of which it will tightly fit, and make a cover.

Another great advantage of this method is that much less water is employed, and the vegetables do not have to stand in it. When vegetables are cooked in water their

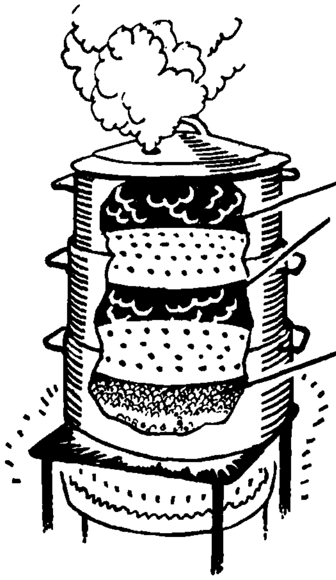


FIG. 92 Steam cooker

valuable nutrients soak out into it. The only way of securing them, therefore, is by using this water—which we call vegetable broth or stock—to make sauces. Or it may be thickened with cooked rice or barley and taken as soup. This is very good for everyone, especially children.

We often fry our vegetables. When we do this the starch is coated with fat and becomes less easily dissolved by the digestive juices. We also add massala to stimulate the digestive organs for their difficult task. This is very bad and accounts for indigestion and languor after eating.

CHAPTER XX

PROTEIN FOODS AND BEVERAGES

WE should always remember that digestibility means the solubility of the material. Our experiment (p.281) with wheat gluten showed that protein is hardened by heat. You must be familiar with this fact if you have ever heated curds; the casein of the milk, when heated at a high temperature, becomes so hard that it is rendered insoluble. White of egg will coagulate at 160° F. If eggs are cooked in boiling water, they become hard and difficult to digest. The same thing is true of fish, and the flesh of fowl and animals. If we fry animal protein foods, such as eggs and meat, the temperature of the fat is so high that the proteins are toughened and hardened. This causes us to have indigestion after eating fried foods. If proteins are to be cooked in fat they will need to be protected by some carbohydrate coating.

Proteins of pulses, such as dhal, unlike animal proteins, require cooking to develop them, to soften the cellulose and swell the grains of starch, which are combined with the vegetable protein in the pulses.

MILK AND ITS PRODUCTS

To make curds

1½ lb. milk
2 oz. curds

Boil the quantity to 1 lb. and keep the milk lukewarm. Add curds, and mix it. Cover, and keep in a warm place in winter and a cold place in summer.

Curds may also be made by squeezing the juice of half a sour lime into a pint of warm milk, and leaving it for 24 hours.

To make butter

Take a quantity of cream from boiled milk that has been standing for some hours. Let the cream stand for 12 hours. Then put it with a small quantity of water into a churn, and keep it rapidly moving until the butter is formed. Add more water until the butter floats easily; then form it into a compact mass with wooden hands.

Or butter may be made in the country fashion, from whole milk that has been standing, by rapidly twisting a ravai until the butter forms in little globules of fat on the sides of the vessel and in the ravai. This method is slower and makes less butter.

Buttermilk. Buttermilk is the remains of the milk or cream mixed with water left when the butter is taken out, or it may be formed by adding water to curds and beating it well. It makes a very wholesome drink.

To make ghee. Simmer the butter on a moderate fire. Strain through coarse muslin in a clean dry jar, and, if it is to be kept, throw in some peppercorns. Cork when perfectly cold.

Meat and Poultry

Knowledge of the structure of meat is of importance to non-vegetarians when it comes to cooking it. Muscle tissue is composed of very minute fibres bound together in bundles. They might be likened to tiny tubes filled with water, in which is held the mineral constituents, extractives and protein of the meat. In cutting meat, the cut is made across the muscle fibres instead of with them. The meat would be tough unless cut in this way. In cooking meat we must decide whether our object is to draw out the juices, as in the making of soups and stews or whether we wish the meat to retain the juices as in grilling and roasting.

Muscle fibres are held together by connective tissue (Fig. 93). This connective tissue is composed of collegen. When meat is heated, the collegen softens, and changes to a substance known as gelatine, which upon cooling thickens into a jelly. People who like a mixed diet make

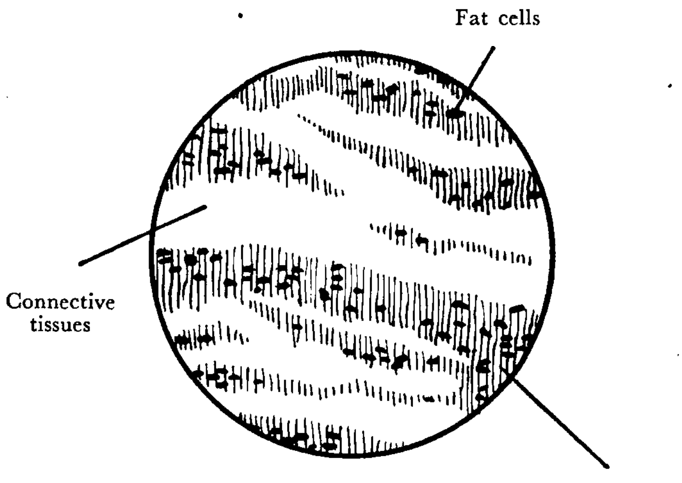


FIG 93 Structure of meat

gelatine the foundation of many attractive dishes. It can be bought in sheets or in granulated form. It is especially nice for the preparation of cold puddings. Gelatine is not a complete protein food, as it lacks some of the essential amino-acids, but it is usually served in combination with eggs and milk, which make it complete.

Vegetarians, who object to taking gelatine because of its animal source, can use Irish moss, which is a seaweed and is sold in a dry state by chemists. When combined with milk it makes a very attractive pudding, and is an excellent dish for children and invalids.

If our object is to make soup or stew, beef tea, mutton or chicken broth, we place the meat in cold water to draw out the nutriment of the meat. The temperature is then gradually raised, but the meat should never be boiled.

If we wish to grill, bake, roast or boil meat, to retain the juices, we first apply a high temperature to the surface of the meat, and in this way, by coagulating the protein at the ends of the muscle tubes, we prevent the juices from escaping. When this is done, the temperature should be lowered to below the boiling point, and the meat cooked slowly at this moderate temperature until done.

Beverages

(i) *Tea.* Use fresh water; if the water is stale, the tea will taste flat. Use a perfectly clean vessel to boil the water in. Water dissolves any material that may be in a vessel, and will consequently taste of it. Scald out the teapot with hot water before putting in the tea. Unless the pot is hot, the water will be cooled when poured over the tea. Water must be actually *boiling* before being used, or the infusion will be poor. Crush the tea-leaves before placing them in the pot. The finer they are the more complete will be the infusion. Use a level teaspoon of tea-leaves for each person to be served, if strong tea is desired. Never let the infusion remain standing on the tea-leaves for more than 5 minutes. *Never boil tea*: such treatment develops tannic acid and is harmful to the stomach. For those who prefer weak tea the infusion can be diluted with hot water. Do not use an old enamelled or tin teapot where the coating is worn off. The tannin of tea combines with the iron thus exposed to form ink; and people do not like to drink ink!

Tea may be served hot, with milk or milk and sugar. Some people perfer it with a slice of sour lime or lemon instead of milk. Also serve on crushed ice, with lemon.

(ii) *Drip coffee.* Put fresh clean water on the stove to boil. Take a level tablespoon of powdered coffee for every person, and one more for the coffee-pot. Put it in the dripper, or upper sieve-like part of the pot. A clean piece of mulmul may be hung in the top of the pot to allow the coffee to drip through. As soon as the water begins to boil pour it little by little over the coffee. Let the water drip slowly over the coffee powder. Care should be taken to keep both the water and coffee-pot hot. The coffee-pot must be quite clean if the coffee is to taste good. It can be washed with hot water and a little soda. A little strong coffee, with an equal or a greater part of milk, is better than much weak coffee and little milk.

After meals coffee is usually served in small cups, with or without sugar according to taste. Some people prefer black coffee, without milk or cream. When hot coffee is served with milk, the milk should be hot. Iced coffee can be prepared by cooling it over crushed ice, with milk.

(iii) *Cocoa.* One teaspoon of cocoa is required for every ½ pint of liquid; the liquid can be either milk or water, or a mixture of the two. Place the cocoa in a pan, add a little liquid, and mix; add the remainder of the liquid, stir till boiling, and boil for 3 minutes.

If a large quantity is required, heat the liquid, pour it over the blended cocoa, return it to the pan, and boil.

CHAPTER XXI

PRESERVING FOOD

Causes of Decay

The decomposition of food is due to the presence of micro-organisms classified as yeasts, moulds and bacteria.

Yeasts act directly on sugar by changing it into alcohol and carbon dioxide, and upon starch by converting it, by means of an enzyme they secrete, first into sugar, and then into alcohol and carbon dioxide. Yeast can do much damage by fermenting jams, jellies, preserves and fruit syrups.

Moulds are fungi and feed on most food if moisture is present; some even feed upon cotton, wool and leather. Moulds will occasionally grow on pickles, although acid prevents the growth of the other putrefying organisms. Moulds make food unsightly, injure its taste, and finally decompose it. If mould is checked quickly, the food can be utilized. To prevent mould forming, food should be kept air-tight, exposed to light, and kept cool and dry.

Bacteria are organisms which enter or are present in food, set up putrefactive changes, occasionally generating poisons which may prove fatal if the food is eaten. They are more difficult to kill than yeast or moulds. They reproduce rapidly and some produce spores which can lie dormant for a long time.

Preventive Measures

These three types of micro-organisms can be checked in their development by withholding food, moisture and warmth. The following methods of doing so are adopted.

1. *By removal of warmth.* This is effected by means of freezing and cold storage. To be properly conducted, specially constructed cold chambers kept continuously at one temperature are needed. The degree of frost depends on the food concerned. Cold storage is used in India's large cities for preserving perishable food which comes from other parts of India or from abroad, and for storing food for export.

Ice-boxes and refrigerators are used in homes and shops for preserving perishable foods, but, unlike cold storage, will not keep them for an indefinite period.

2. *By removal of moisture.* Foods are either dried in the sun's rays or gentle heat or dried and smoked over a fire. These methods are used in India for home-preserved meat, fish, fruit and vegetables. Micro-organisms cannot grow without moisture; so no decomposition is possible.

3. *By removal of air.* This is the method used in canning and bottling food. Heat is used to destroy the micro-organisms present and then all air is driven out and a vacuum formed. The containers are then sealed so that their contents will keep indefinitely.

When purchasing tinned food always examine it carefully and avoid any tin which has a bulge outwards. This shows the presence of gas in the tin and indicates that putrefaction is going on inside due to faulty canning.

4. *Preservation by means of antiseptics.* Sugar, salt, vinegar, mustard or other sweet oils, and spices have a preservative action because they make food unsuitable for use by micro-organisms without destroying it as food for man.

Some Preserving Methods

I. Jams, Jellies and Marmalades

Many fruits in India, both on the hills and in the plains, make excellent jams and jellies. As most of them are rather watery, they are often boiled first without sugar. This makes the juice better flavoured and thicker.

The setting of jams and jellies. Jams or jellies 'set' due to the presence of pectin and acids and added sugar. Pectin is a carbohydrate found chiefly in the cell walls of fruit. Some fruits, like oranges, lemons, apples, wood-apples, plums, guavas, cape gooseberries, etc. are rich in pectin. Other fruits like strawberries, raspberries, vegetable marrows, melons, peaches, and pineapples, contain very little pectin. During the wet season the proportion of pectin in fruit is less than during dry weather.

Choice of fruit. In unripe fruit, pectin is present in larger amounts than in over-ripe fruit. A mixture of ripe and unripe fruit is best. This ensures a good flavour and sufficient pectin and acid for preserves to set well.

Acid. The acid in a jam or jelly is also important. It assists the solution of the pectin in the juice and combines with it and the sugar to form a 'gel'. Some fruits, such as citrus fruits, apples, plums, mangoes, and grapes, are rich in acid; but some, like strawberries, melons, bananas, peaches, pears and guavas, are often deficient in acid. The addition of acid in the form of lemon or lime-juice, or tartaric acid is in some instances highly beneficial.

Sugar. The preservation of fruits in a concentrated solution of sugar—in the form of jams, jellies, marmalades, morabbas or preserves, fruit cheese or hulvas—has been practised in the East from very ancient times. The amount of sugar used is important. If too little is used, jam does not set well and may ferment and become mouldy on keeping. If too much is used, the jam will be too sweet and sticky and apt to go sugary on keeping. The amount of sugar necessary for preserving depends on the acidity of the fruit and on the amount of pectin present. When the amount of pectin is low, less sugar is necessary. When the amount of pectin is high, more sugar will be required. Fruit rich in pectin will require approximately 1 lb. sugar to 1 lb. fruit. Fruit low in pectin will require ¾ lb. sugar to 1 lb. fruit.

Testing for pectin. When using recipes which are known to give satisfactory results, it is not necessary to test for pectin; but if in any doubt, it is advisable to test as it is a guide to the amount of sugar to be used, especially in jelly-making. Before adding sugar to a jam, the pectin test can be made after the fruit has been cooked for 30 to 40 minutes. Put a teaspoon of the strained juice into a glass and *let it cool*; then add three teaspoons of methylated spirit. Any pectin in the juice is thrown out of solution by the spirit. Shake the glass and pour off the spirit; the pectin will form a jelly-like clot in the bottom of the glass. Then pour the clot gently from one glass into another two or three times. If firm and in one lump, the fruit is rich in pectin and will form a good jelly, and 1 lb. sugar to 1 lb. fruit will be required. If the clot breaks up, there is a little less pectin and only ¾ lb. sugar will be required. If the clot is poor or not firm, it will be necessary to add apple or citrus pectin, or to mix in some other fruit rich in pectin; otherwise the jam or jelly will not set.

Home-made stock pectin. Pectin can be made by boiling citrus fruits with water. For citrus pectin, wash the fruit and remove the yellow layer of peel as it gives an undesirable flavour. It should be pared off with a silver or a stainless steel knife and put through a mincing machine. Put ½ lb. white peel to 2 pints of water and keep for several hours; then cook slowly for two or three hours. Strain liquid and use for fruits that lack pectin.

By using home-made pectin, or bought commercial pectin, it is possible to make attractive well-setting jams or jellies of such fruits as strawberries, rhubarb, raspberries, peaches, pears, pineapples, and others which otherwise do not make good jams or jellies. To each pound of fruit allow about half a cupful of citrus pectin.

Potting jams. Cool the jam slightly and stir; this is done to prevent the fruit from rising to the top of the jars. Fill into warm, dry, sterile jars. Place wax circles on top immediately to exclude the air, and tie down the jars when they are cool. Store in a cool, dry place.

Mango marmalade

Peel and cut into pieces several unripe green mangoes. Remove their stones and put the pulp into a brass or aluminium pan. Cover with hot water and boil slowly until soft. Weigh and put back into the pan with 1 lb. sugar for each pound of pulp. Stir constantly and boil rapidly, removing scum as it rises. When ready the jam will, when placed on a cold plate, set into a jelly which will wrinkle when the plate is tilted.

Cape gooseberry jam (tipparee or Brazil cherries)

3 lb. gooseberries
3 lb. white sugar
A little water

Reject any bruised or spoilt berries, remove stalks, weigh, wash, and put into a preserving-pan with a little water. Boil gently for about an hour. Take pan off the fire, stir in the sugar gradually, and continue stirring until it is dissolved. Boil rapidly till the jam sets, stirring all the time. When jam is nearly ready remove all scum. Pack in sterile jars, seal and label.

Tomato jam

1 lb. tomatoes (not fully ripe)
1 lemon or 2 limes
1 orange
Sugar

Wash the tomatoes. Cut them into pieces and allow them to simmer with a quarter cup of water. Strain the pulp and juice through a strainer. Cut the lemon or limes and orange into thin slices, removing the pips. Measure the pulp and juice and add an equal quantity of sugar. Put in the pieces of lime and orange and boil. Stir constantly, removing scum as it rises. When the jam sets into a jelly, pack in jars and label. (The juice of 1 lime may be added just before taking off from the fire.)

Orange marmalade (thick)

2 lb. bitter oranges — 9 lb. sugar
2 sweet oranges — 6 pints water
2 lemons or 4 limes

Wipe the fruit with a damp cloth, and remove the skins. Remove as much of the white pith as is possible. Shred the skin finely. Quarter and cut the fruit, removing pips. Put pips into a basin and add one pint of water, and soak for 24 hours. Put the shredded skins and pulp into a bowl with the water, and soak for 24 hours. Boil soaked pulp, adding strained liquid from pips. Boil slowly for 45 minutes. Remove from fire, add the sugar, bring to boil, remove scum and boil fast till it sets.

Vegetable marrow jam

6 lb. vegetable marrow	2½ oz. whole dried ginger
3 lemons or 6 limes	3 inches cinnamon bark
4½ lb. white sugar	

Peel and cut up the marrow; cover with sugar. Add grated rind and juice of lemons, bruise the ginger and tie in mull cloth with the cinnamon stick, and put with the marrow. Cover and leave overnight. Next day bring to the boil and simmer for 45 to 60 minutes or more until the marrow is clear and unbroken. Remove ginger bag. Bottle and cover.

Note. Marrow contains very little pectin and to obtain it the marrow would have to be boiled for a long time without sugar. This would cause the marrow to break. Marrow jam does not set in a jelly, but remains in syrup, unless extra pectin is added.

Apple jam

6 lb. apples 6 lb. sugar

Wash, peel, and core fruit; cut into slices. Put peel and cores into a pan, cover with water and simmer till skins are tender. Put prepared apples into a preserving-pan, strain in liquid from cores and skins, bring to a boil and boil slowly for five minutes. Add sugar and boil gently until it sets—in about 45 to 60 minutes.

Guava, plum, mango or tipparee jelly

Choose suitable fruit, wash, cut up if necessary, put into a preserving-pan with enough water to cover. Boil slowly until the fruit is quite tender. To get the jelly it is necessary to break down the fruit so that the acid and pectin are dissolved in the water.

Straining the pulp. Scald a clean jelly bag or towel with boiling water and put the cooked pulp gently into the bag and allow it to drain until the residue is fairly dry, and until no more liquid will drip from it. The bag must not be pressed or the jelly will not be clear. Place the juice in a clean preserving-pan, boil it down to about half the initial quantity and skim.

Addition of sugar. To each pint of liquid add one pound of white sugar; in the case of guava jelly, add lime- or lemon-juice.

Finishing point. The sugar must be dissolved in the juice by gentle heat and then boiled *rapidly* without stirring until it sets. It must then be poured whilst hot into sterile glass jars. Place wax covers on the surface whilst the jelly is hot. When it is cold they can be tied down.

Lemon cheese curd

1 lb. white sugar — Rind of 3 lemons or 6 limes
4 oz. butter — Juice of 2 lemons or 4 limes
6 large or 8 small eggs

Put the butter, sugar, juice and grated rind into a jug, and stand it in a pan of boiling water. When the sugar has dissolved, add the well-beaten eggs. Cook gently until it becomes thick and coats the back of a wooden spoon. Cool slightly and pour into sterile jars.

Strawberry jam

Strawberries do not contain much pectin, and any they do contain could only be got by breaking down the berries. The most popular strawberry jam, however, is one in which the fruit is whole. It is therefore necessary to add pectin in order to obtain the required set. Strawberries are also low in acid so lemon or lime-juice or tartaric acid should be added.

A jam with a light set and in which fruit is whole can be made from the following recipe:

6 lb. strawberries	Juice of 2 lemons or 4 limes
$4\frac{1}{2}$ lb. sugar	or $\frac{1}{4}$ oz. tartaric acid

Prepare the fruit, cover it with the sugar and leave it standing overnight. Next day put fruit, sugar and acid into a pan and simmer gently until all sugar is dissolved. To avoid too much scum and waste, put a small piece of butter into the jam, as it boils. Boil the jam until it sets lightly. Allow jam to cool slightly before filling the jars; this enables it to thicken. Stir before potting to prevent the fruit rising to the surface.

II. Fruit Preserves or Morabbas

These are whole fruits or large pieces of fruit preserved in a syrup. Sugar has a hardening effect on fruit, so in making morabbas the hard fruits must be cooked until soft before putting them in syrup to harden and preserve.

Some fruits which are bitter before cooking in syrup are treated with lime, curdled milk, or whey. In order that hard fruits may be soft enough for syrup to enter easily, they are pricked all over with a fork. While cooking, care must be taken to keep the fruit well covered with the syrup or the exposed pieces will dry up and spoil the quality of the preserve. Heating must be gentle to avoid burning, and to allow the syrup to permeate the fruit. The finished product will then be plump and crisp rather than soft and tough. Rapid cooling is essential to preserve the colour of the fruit and to improve its flavour.

Mango morabbas

1 lb. green mangoes	2 lb. sugar

Wash the mangoes, peel, stone and cut into required size and shape. Prick all over and drop into limewater, and allow to soak for two hours. Wash in clean water and sprinkle over with salt and leave for one hour. Wash again, put into hot water and boil until soft; then drain off all water. Make a syrup with 2 lb. sugar and 1 pint water, boil until it is like honey or will draw a thread. Put the slices of mango into the syrup and cook very gently until the fruit looks clear and the syrup is thick. Cool quickly, and pack the fruit tightly in wide-mouthed bottles or jars which must be dry and sterile. Pour over the syrup. All tops of bottles must be sterile, and be sure the bottles are sealed so as to be air-tight.

Pineapple preserve or morabbas

1 lb. pineapple 1 lb. sugar ½ pint water

Pare the pineapple core and remove all eyes and hard centre. Cut into slices half an inch thick. Put into a pan and cover with water and cook gently until soft. Remove slices of fruit and add sugar to juice from pan reduced by boiling down to 1 pint. Dissolve sugar in juice over gentle heat: boil until it is a syrup. Place pineapple chunks in this and boil gently until transparent. Finish off the preserve as described in previous recipes.

Plantain morabbas. Take equal weight of ripe, peeled plantains and sugar. Cut fruit into suitable pieces. Prick all over. Drop into a syrup made of sugar and water (1 lb. sugar to ½ pint water) and cook over gentle heat. When the syrup is thick and the fruit is clear, cool and bottle.

III. Chutneys

Chutneys are usually made from acid fruits such as apples, plums, tomatoes, mangoes, green papaw, or from suitable vegetables. Onions, garlic, raisins, sugar, spices and tamarind are added to taste, and the whole mixed with vinegar. Vinegar and spices are preserving agents.

A good chutney must be smooth to the palate and have a mellow flavour. This can only be obtained by cutting up all ingredients finely, and cooking them very slowly for 2 to 3 hours. No raw material must be added after the cooking has been done or the flavour and texture will be spoilt. Metal sieves and spoons should never be used for they impart an unpleasant metallic taste. Brass and copper pans must also be avoided; only enamel or aluminium pans should be used.

Chutneys (and pickles; see below) are best put into wide-mouthed glass bottles or jars. Glazed earthenware jars should never be used, because the acid eats into the glaze and makes the chutney unwholesome. Chutney must be bottled hot in dry sterile bottles and sealed at once.

Sweet mango chutney

3 lb. green mangoes	2 lb. jaggery or brown sugar
1 lb. stoneless raisins	6 oz. nuts
3 oz. dry chillies	3 oz. salt
3 oz. garlic	3 oz. green ginger
2 bottles vinegar	

Peel the mangoes with a stainless knife; cut into slices, boil in one of the bottles of vinegar until tender. Dissolve the sugar in the other bottle of vinegar, strain, and then make into a thick syrup by boiling. Grind the chillies, garlic and ginger on curry stone with vinegar. Chop nuts and raisins. Mix the cooked mangoes with the syrup and mix in ground massala, nuts, raisins, and salt. Boil the chutney *slowly* on a very low fire, stirring all the time for an hour or more. Bottle and seal.

Date chutney

1 lb. stoned dates	4 oz. stoned raisins
4 oz. onions	4 oz. sugar

½ oz. garlic	¼ oz. salt
6 dry chillies	1 pint vinegar

Chop dates, onions and raisins; put them into a pan with the sugar and salt. The garlic and chillies should first be ground with vinegar on a curry stone and then added to the other ingredients in the pan; then pour over the vinegar. Cook slowly, stirring until tender. Bottle and seal.

Green tomato or apple chutney

2 lb. green tomatoes or apples	1 lb. onions
	1 lb. seedless raisins
4 to 6 plantains	½ oz. green ginger
½ oz. red chillies	2 oz. salt
1½ oz. brown sugar	1½ pints vinegar

The tomatoes and plantains should be sliced, the onions, raisins and ginger chopped fine, the chillies ground with vinegar on a curry stone. Mix all ingredients and put them in a pan; bring to the boil and then simmer slowly until of a thick consistency.

IV. Pickles

Green or slightly under-ripe fruit and vegetables are most suitable for making into pickles. The preservatives used are salt, vinegar, or mustard or any sweet oil; the other ingredients are added to give flavour.

General method for home-pickling. After the vegetable or fruit has been prepared, it should either be soaked in a brine made from 8 oz. salt in 2 quarts water or sprinkled with salt and left for some hours. The salt withdraws some of the water, makes the fruit or vegetable more crisp, and checks the growth of micro-organisms. The vegetable or fruit is next rinsed to remove all salt, and drained as free from water as possible. It is then packed in dry sterile wide-necked glass jars.

The bottle should be filled to within one inch of the top of the jar; this leaves room for vinegar or oil to cover the pickle and thus prevents the fruit or vegetable from becoming discoloured. Sufficient cold spiced vinegar or oil is poured over to cover the pickle completely. Jars are then sealed as tightly as possible. Bottles or jars may be covered with screw tops or tightly fitting corks or clip tops. The object is to exclude air. As corks are porous, cover top of pickle with a round of paper; or seal cork. If metal caps are used, they must not come in contact with vinegar.

Spiced vinegar for pickles. Choose good malt vinegar as it gives the best flavour. With each quart of vinegar use the following ingredients:

¼ oz. cinnamon bark	A few peppercorns
¼ oz. cloves	2 or more chillies
¼ oz. mace	¼ oz. whole allspice

Tie the spices in a bag, put them into the vinegar and bring to boil keeping the lid on the pan (otherwise much of the flavour is lost). Remove from fire and allow to cool. Then remove spice bag. Cold spiced vinegar is best for pickles, such as onions and cabbage, which should be crisp when eaten; hot vinegar is best for pickles like walnuts and plums, which are wanted soft.

Pickled onions. Choose small, even-sized onions; peel and cover them with salt and allow them to stand overnight. Rinse well and drain free from water. Pack into dry sterile jars. Pour over cold spiced vinegar and cover and keep for two or three months before using.

Mixed pickle. Take small pieces of cauliflower, small onions, very young cucumbers, young French beans, and a few strips of red chillies. Cut vegetables into suitably sized pieces, sprinkle with salt and leave for 48 hours.

Wash, drain thoroughly, bottle and decorate with the red chillies. Cover with cold spiced vinegar and seal.

Lime pickle (in oil)

20 limes	1 oz. black pepper
2 oz. chillies (dried)	2 oz. mustard seeds
½ oz. powdered saffron	1 lb. salt
1 oz. green ginger	Mustard or gingili oil
1 oz. cloves	

Quarter the limes and sprinkle with ½ lb. salt and expose to the sun for 6 hours, turning them every half hour. Place them in a large bowl and mix in the minced green ginger, the mustard seeds and chillies which should be ground into powder, the pepper, cloves, and remainder of salt. Mix all well together until thoroughly blended. Mix the saffron with a little oil, pour hot mustard or gingili oil to cover the whole. Mix again and when cool, bottle and seal.

Expose jars to the sunshine for three or four weeks and give a good shake. This exposure prevents the formation of moulds and helps to mature the pickle.

Things to Do

Oral and written work

1. What causes fruit, vegetables and meat to spoil?
2. How can food be preserved?
3. What foods can be dried? Make a list of such foods.
4. What materials are used to preserve food?
5. What two substances must fruit contain before good jelly can be made from it?
6. Why must sterilized jars be used while they are still hot and without being wiped out with a towel?
7. When and why must the scum be removed in making jams and jellies?
8. What are characteristics of a good jelly and chutney?
9. Make a list of fruits available in India which are (i) rich in pectin; (ii) poor in pectin.
10. Why should extra acid be added in making certain jams?

APPENDIX

ADDITIONAL RECIPES

I. Soups and Fish

Dhal soup

4 tablespoons dhal	1 teacup milk
½ carrot	½ turnip
1 dessertspoon ghee or fat	1 pint water or stock
	1 or 2 onions
1 potato	2 teaspoons flour or rice flour
Salt and pepper	

Clean and wash the dhal and soak for a few hours. Prepare vegetables and cut into small pieces. Melt the fat and fry the drained dhal and vegetables without browning. Add water and seasoning and bring slowly to boiling point. Simmer until all the vegetables are cooked (2 to 2½ hours). Rub through a wire sieve and return all to the pan and boil up. Mix the flour with the milk, stir into the soup and boil for five minutes. Serve very hot with fried slice of bread.

Green papaw soup

1 green papaw	1 teacup milk
Parsley	A little mace or nutmeg
2 teaspoons flour or cornflour	1 pint stock or water
	Salt and pepper
1 onion	1 dessertspoon ghee, butter or oil

As for dhal soup.

Tomato soup

$\frac{3}{4}$ lb. tomatoes	1 small onion
$\frac{1}{2}$ turnip & $\frac{1}{2}$ carrot	$\frac{1}{2}$ teacup milk
$\frac{1}{2}$ oz. butter	$\frac{1}{2}$ oz. flour or cornflour
1 pint water or stock	$\frac{1}{2}$ teaspoon sugar

As for dhal soup but add milk at the end; heat soup, but do not boil or milk may curdle.

Mulligatawny

1 lb. mutton	3 to 4 chillies
2 onions finely minced	4 peppercorns
1 clove garlic	1 tablespoon coriander and leaves
small piece green ginger	
Coconut	1 teaspoon cumin seeds
Salt	$\frac{1}{2}$ inch turmeric
2 tablespoons ghee	$\frac{1}{2}$ teaspoon mustard seed

2 limes or some tamarind

Wash and cut up the mutton and stew gently with one quart water and peppercorns. Grind all the curry stuffs, each separately on the curry stone with a little vinegar. Put the ghee into a pan with the green leaves, minced onion and garlic; cook but do not brown. Then add the curry paste, cover, and cook slowly for 4 or 5 minutes until raw smell of turmeric has disappeared. Then turn the contents of the first pan into the second. Simmer gently until meat is tender. Add salt to taste, lime juice, coconut milk; reheat. Serve with a few pieces of meat.

Fried fish

After cleaning, cut the fish into equal portions, season, and rub over ground saffron made into a paste with salt and pepper. The fish must be protected from the heat by some coating, for which one of the following may be used:

(i) Milk and flour (maida, atta, etc.)
(ii) Milk and fine breadcrumbs
(iii) Well-beaten egg and fine dry breadcrumbs
(iv) Batter made from flour and water

The fat must be hot or fish will be sodden with fat and of a poor colour. Fry first on one side and then on the other till the fish is cooked (7 to 12 minutes according to the thickness of the fish). Drain well and serve hot, garnished with slices of lime and coriander leaves or parsley.

Fish molee

4 or 5 fillets or slices of fish
1 tablespoon chopped onion
5 to 6 fresh green chillies cut into pieces lengthwise
½ teaspoon ground turmeric
Coconut milk
2 inches cinnamon stick
2 oz. ghee or butter
½ teaspoon minced garlic
Salt
A little green ginger
3 cardamoms
4 cloves

Fry in ghee the chopped onion, garlic, spices and ginger. Cook but do not brown. Add the pounded turmeric and sliced green chillies and cook for a few minutes. Add the coconut milk, made from a grated coconut, and salt to taste. Bring to the boil, add the fish; simmer but do not boil, cooking until the fish is tender.

II. Curries, etc.

The essentials for success in making curries are abundance of the frying medium, the proper proportion of ingredients, and time. If curry powder is used, 1 or 2 tablespoons to 1 lb. of meat or fish, etc. is sufficient, according to taste. If fresh curry stuffs are used, the following will be suitable for 1 lb. of meat, fish or vegetable.

Curry paste

½ to 1 oz. coriander	¼ oz. cumin seeds
¼ oz. turmeric or saffron	3 to 4 red chillies

¼ teaspoon mustard seeds

Broil the chillies, coriander, mustard and cumin seeds over a fire in a dry pan until coriander seeds burst. Remove husk and, with a little water, grind each massala separately on a curry stone to a smooth paste.

Mutton curry

1 lb. mutton	Coconut
A few curry leaves	Curry paste
A little green ginger	Green coriander leaves
2 oz. ghee or oil	Salt to taste
3 to 4 cloves of garlic	2 or 3 minced onions

½ lime or little tamarind

Cut up the meat into suitable pieces. Fry minced onions, the garlic and curry leaves lightly in the ghee or other fat for 2 or 3 minutes. Cook until the onions change colour, but do not brown or it will spoil the flavour of the curry. Add saffron and fry; then add the other massala and cook for 3 or 4 minutes, sprinkling with water to prevent burning, until ghee rises. Add meat, salt, green ginger, etc.; cover the pan and cook slowly for 10 minutes. Gradually add a little water or coconut milk to form a gravy. Simmer until meat is tender. Before serving mix in the lime juice and half a cup of thick coconut milk.

Pot roast

Joint of meat or a chicken	Ghee or fat
Salt and pepper	Water

This is a useful method of cooking meat when an oven is not available for baking hot. Put the ghee into a strong pan and get it smoking hot. Put in the meat and brown it all over to form a coating to keep in the juices; cover with a lid and cook slowly until tender. Allow 20 minutes for each pound and 20 minutes over. Potatoes may be cooked with the meat if desired. Turn the meat and baste from time to time. Lift cooked meat onto a hot dish, pour off some of the fat leaving the sediment. Add water, salt and pepper and boil; strain, serve with meat.

Curry puffs

8 oz. flour	4 oz. butter, ghee or fat
¼ teaspoon salt	2 teaspoons lime juice

Cold water

Sift the flour and salt into a basin. Divide the fat into 3 parts. Rub ⅓ of fat into the flour, add lime juice to a little cold water, and use this for binding the paste; knead lightly and roll out into a strip. Divide remainder of fat into 3 parts and put ⅓ of fat over ⅔ of the paste. Fold in three taking care to keep unbuttered part in middle. Turn the closed side to the left-hand side. Roll out and put another portion of fat onto paste; repeat until all fat is used up. Leave in the ice-box to harden after each fold. Roll out the pastry to required size and thickness. Put the curried filling onto the pastry, wet edges, fold over twice. Mark ends with back of a knife. Brush with egg and bake in a hot oven to a golden brown or, without egging, fry in hot fat.

For the filling make a curry of minced mutton, beef or vegetables, using little liquid, and cook gently until moisture has evaporated and the mixture is of the right consistency for filling puffs.

Sausage rolls

Remove skins from sausages, season and cut each sausage into 2 or 4 according to size of sausage roll desired.

Roll sausage meat with flour into a miniature sausage. Make up as for curry puffs and cook in a hot oven.

Groundnut cutlets

3 tablespoons nuts	1 egg
1 teaspoon lime juice	1 oz. flour
1 oz. butter or ghee	¼ pint milk
2 tablespoons bread-crumbs	Salt, pepper, nutmeg, and any sauce to flavour

Shell the nuts, remove all skin and put through a mincing machine; add the breadcrumbs, seasoning, and lime juice. Put the fat into a pan and melt it; add the flour and cook over little heat. Add the milk and stir until the mixture is in a thick paste. Beat up, add the egg and all other ingredients. Turn into a plate to cool. Form into cutlets; egg and crumb. Fry in hot fat until golden brown. Serve with tomato or curry sauce, mashed potatoes and green vegetables.

Dhal vadai or fritters

Soak 2 cups dhal overnight. Next day drain off all water. Grind on a curry stone until soft; also grind 6 green chillies, 3 onions, a little green ginger. Mix together well; add salt to taste and a little minced fresh coriander leaves. Shape into flat round cakes and fry in hot fat or oil.

Fried brinjal

Cut brinjals lengthwise into fairly thick slices; sprinkle with salt and allow to stand for 10 minutes. Wash off all salt and dry the slices. Make a paste of a few ground chillies and of saffron ground with vinegar. Rub the paste well all over the slices, add salt and fry in hot fat.

Brinjal cutlets

Boil or bake brinjals until tender. Cut them lengthwise in halves, and scoop out as much pulp as possible without breaking the skins. Blend the pulp with breadcrumbs or soaked bread, chopped onions, green chopped chillies, garlic, green ginger, pepper and salt, and minced meat. Fill the brinjal skins with mixture, brush over with fat or ghee, and crumb. Either fry or bake.

Boiled Ladies Fingers

Dip in boiling salt water for 2 or 3 minutes, then scrape to remove stickiness and stringiness. Cook in boiling salted water until soft. Drain and serve with a squeeze of lime juice and a little pepper.

III. Sauces

White sauce

1 dessertspoon butter or ghee	½ pint milk
1 dessertspoon flour	Seasoning

Melt the butter in a pan and stir in the flour, cook gently until all fat is absorbed. Remove pan from heat and add liquid *slowly*. To save milk, use half water; for fish sauce, use half fish stock; for vegetables, use half water in which vegetables were boiled. Boil sauce for 5 minutes stirring all the time. Season and serve. For a *flowing* sauce use 1 dessertspoon flour to ½ pint liquid; for a *coating* sauce use 1 tablespoon flour to ½ pint liquid.

Parsley sauce:	Add 1 teaspoon chopped parsley.
Egg sauce:	Add 1 hard-boiled egg chopped.
Cheese sauce:	Add 2 tablespoons grated dry cheese.
Onion sauce:	Add 2 small boiled onions chopped.
Sweet sauce:	Add 1 teaspoon sugar.

IV. Puddings and Sweets

Milk puddings

In making milk puddings the correct proportions can be taken as 2 oz. grain, 1 pint milk; or 2½ oz. grain to 1 pint milk for a cold shape. If eggs are used, rather less grain will be required.

Rolong

2 oz. rolong	½ oz. butter
1 pint milk	1 oz. sugar
Flavouring	Salt

Grease a pie-dish; heat milk in a pan. Sprinkle in the rolong; cook until grain is soft, stirring all the time. Add sugar, salt, flavouring of grated lime peel or nutmeg, and butter, pour into pie-dish. Brown in the oven.

Rice

2 oz. rice	Salt
1 pint milk	1 oz. sugar
½ oz. butter	Grated nutmeg

Grease a pie-dish; wash the rice and put into dish with milk, butter, sugar and salt. Grate nutmeg over the top. Bake in a moderate oven 1½ to 2 hours.

Arrowroot cream

3 teaspoons arrowroot	1 egg
2 teaspoons sugar	½ oz. butter
½ pint milk	Flavouring

Mix the arrowroot with a little of the milk. Boil the rest of milk and pour over arrowroot. Boil the mixture for 5 minutes stirring all the time, then add sugar. Cool, and add the beaten yolk of egg; whisk the white until stiff and fold into mixture. Pour into a greased pie-dish and bake in a moderate oven for about 15 minutes.

The same recipe can be used with cornflour, ground rice or rolong.

Plantain fritters

4 or 5 ripe plantains	¼ lb. flour
¼ teaspoon baking powder	1 egg

½ cup milk or coconut milk Lime or lemon
½ oz. sugar Salt

Mash the plantains, add beaten egg and milk. Mix well. Sift flour, add salt, pour in the liquid, beating well. Add baking powder. Drop in spoonsful in hot fat, fry to a golden brown. Scatter over sugar and serve with cut lime.

Mango fool

Pare, slice and boil the unripe fruit in sufficient cold water to cover it. Boil gently until quite soft. Put the mixture through a fine hair sieve, sweeten to taste. To each cup of pulp add a cup of boiled milk or custard. Mix well, chill and serve.

The same recipe can be used with other suitable fruits.

Kul-kuls or Indian doughnuts

1 lb. wheat or rice flour, or rolong ½ coconut
2 tablespoons ghee or butter 2 eggs
A pinch of salt 1 oz. sugar

Sift flour and salt into a bowl; rub in the fat. Grate the coconut and extract the milk from it as thickly as possible. Beat up the eggs and add to them the strained coconut milk. Mix into the flour and make into a soft dough. Turn onto a floured board and knead well.

Take pieces of dough about the size of walnuts, press them against the prongs of a greased fork and roll into a scroll. Drop the kul-kuls into a deep vessel of hot fat, and fry to a light golden brown. Drain and sprinkle liberally with sugar.

Groundnut toffee

1 lb. sugar
1 cup nuts, broiled, shelled, skinned and chopped.

Put sugar into a pan, stir constantly until melted, and the syrup is a light brown colour. Add nuts and pour immediately into a buttered tin. Mark into squares when the toffee is slightly cooled.

Coconut ice

2 lb. white sugar	½ teaspoon vanilla essence
½ pint water or coconut milk	Colouring
	1 coconut or more

Dissolve the sugar and liquid slowly. Boil without stirring till it forms a soft ball in cold water. Add the grated coconut. Reboil again to a soft ball. Remove pan from fire, add vanilla, stir until toffee is creamy and thickens. Pour half into a buttered tin. Colour remainder and pour on top. When firm cut into pieces.

Fudge

3 cups white sugar	¾ teacup milk
1 tablespoon butter	Vanilla essence

Place the sugar and milk over low heat and allow the sugar to dissolve. Then boil without stirring until it forms a soft ball in cold water. Allow candy to cool without stirring. When lukewarm, add butter and vanilla. Beat until creamy and opaque. Quickly turn it into a buttered tin. When firm cut into squares.

Chocolate nut fudge

2 oz. chocolate or cocoa
½ cup chopped nuts

Almond and raisin fudge

3 tablespoons stoneless raisins
3 tablespoons blanched, chopped almonds

Plantain hulva

8 ripe plantains 1 lb. sugar 1 teaspoon ghee

Steam and peel fruit; remove seeds and mash. Make a syrup of sugar with ½ pint water and boil until it will draw a thread; add mashed fruit, cook gently until hulva forms into a mass. Add ghee, a little at a time, and stir well. Spread on greased tin or plate.

Rolong hulva

1 lb. rolong	2 teaspoons poppy seeds
2 lb. sugar	12 cardamoms
½ lb. ghee	1 coconut
3 pints water	

Broil the rolong and poppy seeds until a light brown. Mix with the scraped coconut pulp, sugar and inner seeds of cardamoms. Pour over 2 pints of water; stir well and boil over a slow fire stirring all the time until it is cooked and thick. Add ghee gradually, and allow to become thoroughly mixed into other ingredients. Turn into a greased flat tin and cool. Cut into shapes desired.

V. Scones and Cakes

Wheat scones

¼ lb. white flour	½ teaspoon bicarbonate of soda
1 oz. ghee or butter	1 teaspoon cream of tartar
¼ lb. atta flour	½ oz. sugar
Salt	¼ pint milk

Sift the flours and rub in ghee. Sift in the salt, rising agents and sugar. Add sufficient liquid to make a soft but easily handled dough. Shape quickly into rounds and cut each into four. Bake in a quick oven for 15 to 20 minutes.

Drop scones

½ lb. flour	A pinch of salt
½ teaspoon bicarbonate of soda	2 teaspoons sugar
	¼ pint of milk
1 teaspoon cream of tartar	1 egg

Mix the flour, sugar and salt. Add beaten egg and sufficient milk to form a stiff batter. Beat well for 5 minutes and then add remainder of milk to batter. Then add cream of tartar and bicarbonate of soda. Drop 1 tablespoon of batter into a greased thoa or frying pan. Cook till bubbles appear, turn, and cook on other side. Cool in a towel.

Rock cakes

The foundation recipe is:

6 oz. flour	2 small eggs
2 oz. rice flour	1 teaspoon baking powder
3 oz. ghee or butter	Milk

Other ingredients are:

1½ oz. chopped peel
1½ oz. currants
Grated nutmeg

Sieve the flours and salt into a bowl. Rub in the fat; then add sugar, cleaned fruit, finely-chopped peel, nutmeg, and baking powder. Mix milk with the beaten eggs. Add to dry ingredients to make stiff dough. Pile mixture in rocky heaps onto greased baking tin. Bake in a hot oven for 20 minutes.

The foundation of this recipe can also be used for the following cakes with the additions mentioned:

Chocolate rocks

1½ oz. cocoa and vanilla essence.

Nut rocks

1½ oz. chopped nuts.

Coconut rocks

2 oz. or more freshly grated coconut.

Lemon rocks

1 oz. chopped candied lemon peel, grated rind of half a lemon or one lime.

Jam buns

Make Rock cake foundation recipe into buns, insert jam in middle, and then pull dough over.

Orange buns

Rock cake foundation recipe and grated rind of 1 orange, juice of ½ orange, and 1 tablespoon chopped candied peel.

Rich Madeira cake

4 oz. butter or ghee	4 oz. sugar
3 eggs	2 slices candied peel
6 oz. flour	½ teaspoon baking powder
Milk if necessary	

Beat butter to a cream with pounded sugar until it becomes soft and creamy. Beat eggs and add a few spoonsful at a time, beating well between each addition. Mix in sifted flour; then add any dry ingredients and lastly the baking powder. Milk will only be necessary if the mixture is too stiff.

For a fruit cake, have the mixture fairly stiff to keep the fruit from sinking. Do not beat the mixture after the flour is added. Put mixture into a buttered tin, lined with buttered paper. Lay the strips of candied peel on top of the mixture, and bake in a moderate oven for an hour.

This foundation recipe may be used in many ways by varying the flavourings.

Sponge cake

3 small eggs	Pinch of salt
3 oz. pounded sugar	Flavouring
3 oz. flour	

Whisk eggs and sugar for about 10 minutes or until they are light and stiff. Sieve in slowly the flour and salt and fold in carefully; add flavouring. Handle mixture very lightly, taking care not to expel air enfolded by beating. Pour into greased tins which have been dusted with a mixture made of an equal quantity of flour and sugar. Bake in a moderate oven until browned and firm and slightly shrunken from sides of tin (10 to 20 minutes).

Jam sandwich

Make a sponge-cake mixture, and cook it in round shallow tins. When cold, split open and spread with jam or other filling. Sift over pounded sugar.

Swiss roll

Cook mixture in oblong shallow tin. When cooked turn onto sugared paper. Spread with warm jam, trim off sides, and roll up carefully. Sift over sugar and cool on a sieve.

VI. Dishes for Invalids and Convalescent Patients

Albumen water

1 white of egg ¼ pint water
½ teaspoon sugar cr a pinch of salt

Separate the white of egg from the yolk and whisk it without making it forthy. Now add the water which must have been boiled but be cold. Add seasoning and strain through mull. This is administered a few teaspoons at a time in cases where no other food can be taken.

Egg flip

1 fresh egg 1 teaspoon sugar and flavouring
¼ pint milk 1 teaspocn brandy (if allowed)

Beat up egg thoroughly, strain to remove speck, pour over warm milk, and add sugar, etc.

Beef tea

1 lb. steak 1 pint cold water
Seasoning

Wash or wipe meat, remove all fat and skin, and shred finely or put through a mincing machine. Put meat, water and seasoning into a jar or jug. Allow to stand for an hour, frequently pressing beef against sides of jar with a fork to get out as much juice as possible. Cover jar and put into a slow oven or stand in a pan of cold water—the water to come halfway up the sides of jar. Simmer for 3 hours, occasionally stirring. Stir well, strain through a coarse strainer, remove grease and serve hot. These quantities make enough beef tea for 4 cups.

Gruel or congi

1 oz. fine oatmeal
1 pint water, or milk and water mixed
A little salt
Sugar to taste

Mix the meal with a little of the cold liquid until well-blended. Boil the milk or water and pour into the mixed paste. Return to the pan and boil well for 10 to 15 minutes, stirring all the time. Add sugar and any flavouring desired, and serve. Arrowroot, cornflour or rolong may be used instead of oatmeal, if preferred.

Rice water

Wash 2 oz. rice well; boil gently for an hour in about 1 quart cold water. If desired, add a little cinnamon stick. Stir occasionally, strain, and sweeten to taste.

Barley water

2 tablespoons pearl barley — Sugar to taste
2 strips lemon or lime rind — 1 quart water
Juice of 1 lime

Wash barley; simmer for 2 hours in the water with lemon rind. Strain through mull, add sugar and fruit juice. Serve hot or cold.

Lemonade

When lemons cannot be obtained, this can be made with limes. Wash 2 lemons or 4 limes. Remove rind very thinly taking care that none of the white part is used or this will give a bitter taste. Squeeze the juice, remove all pips. Put rind and juice into a jug and pour over 1 pint of boiling water; stir in 1 oz. sugar, cover and leave until cold. Strain and use.

Orangeade

3 oranges	Juice of 1 lime
¾ oz. sugar	1 pint boiling water

Make as for lemonade.

Banana milk shake

1 fully ripe banana
1 cup cold boiled milk

Peel banana, mash it up and beat until it is smooth like cream. Add the milk and mix well. Serve cold. This makes a nourishing and easily digested drink for liquid diet patients.

Baked custard

1 small egg	¼ pint milk
2 teaspoons sugar	Grated nutmeg

Beat the egg and sugar together; pour on milk. Strain into a greased pie-dish, add grated nutmeg. Cook in a moderate oven.

Steamed custard

As above, using a little less milk. Put in a buttered cup, cover with buttered paper, and steam gently without allowing custard to boil. Serve hot or cold.

Savoury fish custard

1 slice fish	Seasoning
1 egg	1 teacup milk

Wash and trim fish and cut into 3 or 4 pieces and place in a buttered pie-dish. Beat up egg, add seasoning and milk. Pour over fish and bake in a moderate oven.

Junket

1 teaspoon sugar	Calcium lactate
1 pint milk	Grated nutmeg

1 teaspoon rennet

Warm the already boiled milk to blood heat. Stir in sugar and rennet. Add pinch of calcium lactate. This is added because the boiling of milk, which is essential, causes some of the calcium in milk to be thrown out of solution and junket cannot set without calcium. Pour mixture into a glass dish, add grated nutmeg, and allow to set.

Invalid chop

1 mutton chop
Little butter or ghee
Salt and pepper

Wipe the meat, remove bone, and tie into shape, and season. Place on a buttered soup plate and cover with another plate or basin. Put over a pan of boiling water. Steam for 40 minutes. Serve on a hot plate, with any liquid from it poured over it.

Canary Pudding

4 oz. flour	Salt
½ teaspoon baking powder	1 egg
2 oz. butter	Milk
2 oz. sugar	Lime

Beat butter and sugar to a cream; then beat in an egg. Sift in flour, salt and baking powder. Add a little lime rind and juice. Mix to a fairly soft consistency using milk as needed. Put into a greased basin, filling to two-thirds full. Cover with greased paper. Steam for 1½ hours. Turn out on a hot dish. Serve with lemon or white sauce.