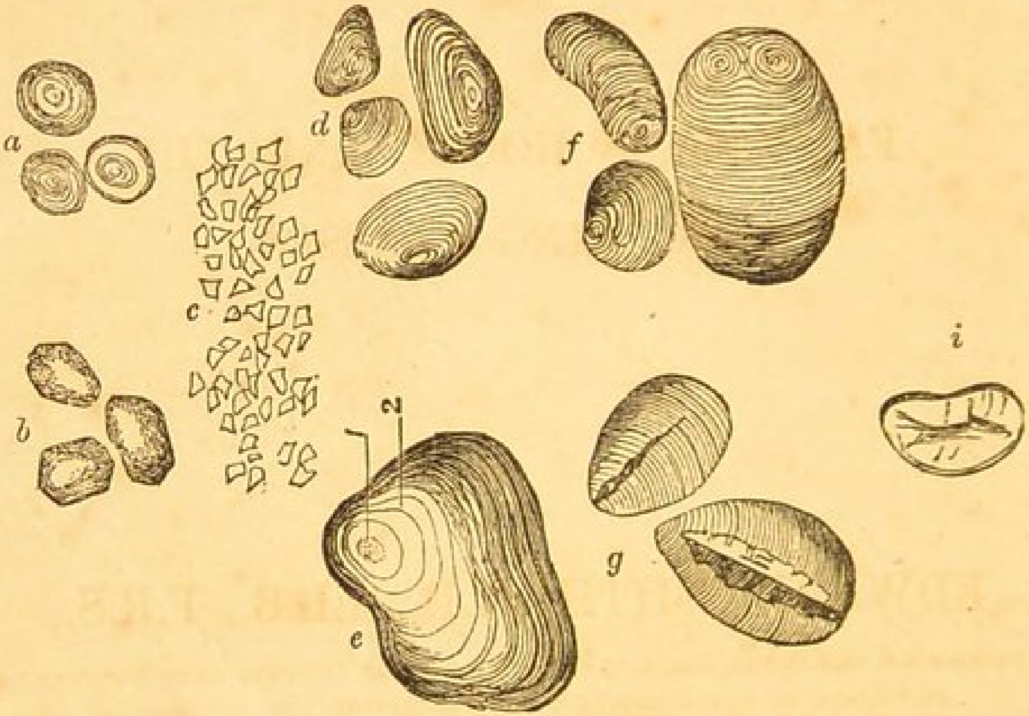
PRACTICAL DIETARY

DR. E. SMITH

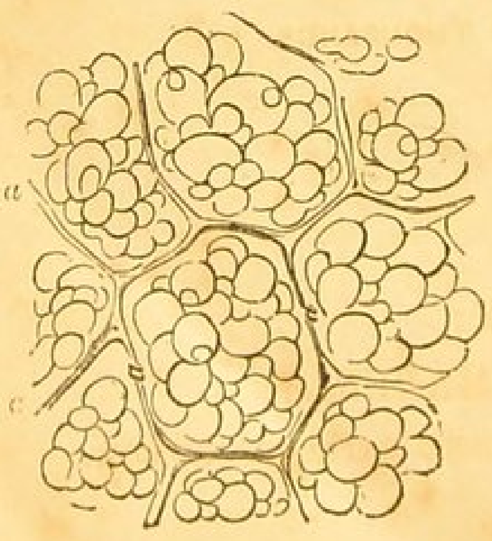
PLATE I.

Fig. 1.



STARCH CELLS.

Fig. 2.



MATURE POTATO.

Fig. 3.

SPROUTED POTATO.

See page 274.

PRACTICAL DIETARY

FOR

FAMILIES, SCHOOLS, AND THE LABOURING CLASSES.

BY

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INSPECTOR OF POOR LAW.

THIRD AND FOURTH THOUSANDS.

LONDON:

WALTON AND MABERLY,

UPPER GOWER STREET, AND IVY LANE, PATERNOSTER ROW.

1865.

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Dedication.

—♦—

To MRS. WILLIAM E. GLADSTONE.

MADAM,

Although the following work is written for all classes, my chief aim has been to afford information which may be of service to our labouring population; and in honouring me by accepting the Dedication, you have afforded another proof of the deep and practical interest which you have long taken in the dietary of the poor.

To no lady are the poor under greater obligations than to yourself; and you would, I am sure, be gratified if all classes of the community should acquire more correct views on the important subject of diet.

I have the honour to be, Madam,

With sincere respect,

Your most obedient and faithful servant,

EDWARD SMITH.

LONDON, 16, QUEEN ANNE STREET, W.
December, 1864.

ADVERTISEMENT TO THE THIRD AND FOURTH THOUSANDS.

The short period which has elapsed since the first issue of this work, and the general approval with which it has been honoured by the Press and the Public, have rendered it unnecessary to make any considerable alterations. Hence, whilst every portion has been carefully reconsidered, and numerous verbal changes made, the work remains substantially as heretofore; but three subjects which have much attracted public attention within the last three months—viz.: Liebig's Soup for Children, Essences of Meat, and South American Beef—have been noticed in the Appendix.

The forms of hand-bills which were placed in the Appendix, and intended to teach the poor how to select the best and cheapest kinds of food, have been issued separately on a single sheet, with a view to its being pasted in a conspicuous place on the walls of cottages, and made the subject of conversation by those who visit, and would instruct, the poor. The price (8*s.* per 100), has been designedly placed low so as to enable landlords, clergymen, district visitors, and philanthropists generally, to distribute them to every house within the circuit of their influence.

The Author gratefully acknowledges that the circulation of the work has been much aided by the Press, and by the interest which ladies, clergymen, and medical men have taken in the subject ; and although the work was not addressed to invalids he is pleased to learn that it has been useful to that large section of the middle and upper classes, who with feeble constitutions are ever ready to fall into disease.

16, Queen Anne Street,
Cavendish Square, W.
June, 1865.

PREFACE.

The following work is intended to be a guide to heads of families and schools in their efforts to properly nourish themselves and those committed to their care; and also to clergymen and other philanthropists who take an interest in the welfare of our labouring population. It is essentially practical and popular in its aim, and therefore contains directions rather than arguments; but at the same time it is based upon the most advanced state of the science, and, except in the exclusion of many technical terms, is scientific as well as popular.

It seemed unsuited to the character of the work to cite authorities, since the responsibility of the whole must rest upon the Author, but an exception has been made in reference to chemists; and it is proper to state here that the analyses of food in the third chapter are for the most part those of Messrs. Lawes and Gilbert, whilst others were made by Professor Playfair and M. Payen. The measure of the quantities of food contained in the second and other chapters is simply that which is considered needful to maintain full ordinary health in the persons referred to. Conditions of disease have not been included, since the consideration of these is more fitted for a separate work; but as insufficient nourishment during the period of growth is perhaps the most effective cause of disease, special directions are given respecting it.

It is desirable that the price of the book should place it within the reach of all classes, and consequently a limitation has been placed upon its size; but, whilst it was neither possible nor fitting that questions which are purely scientific should be largely discussed, it is believed that nothing of general importance, coming within the scope of the work, has been omitted.

As it is probable that its pages will be consulted by various classes of readers, it may facilitate reference to state that the last four chapters consist entirely of practical directions for the dietary of families, schools, and the labouring classes (including under the last head the management of cheap dining-rooms and soup-kitchens); whilst the first two chapters show the substances which the body requires for its nourishment, and those which food can supply; and the third chapter states in detail the most important nutritive qualities of each food. It is desirable that this chapter should be read with the succeeding chapters, since it contains many of the grounds on which the directions have been based; but with that exception, each chapter is complete in itself, and may be consulted separately.

The unusual interest with which the subject of dietary is now regarded both in a personal and philanthropic point of view, leads to the hope that the publication of this work is not inopportune, and the more so that the Government has lent the most effective aid in the collection of facts, on which it is in part founded, as shown by the Reports of the Medical Officer of the Privy Council for the years 1862 and 1863; and the Press has warmly advocated the importance of the subject. But to clergymen and medical men, more than to others, do the labouring classes look for advice; and much of the usefulness of this and similar works must depend upon their efforts. Ladies also may exert the most beneficial influence, and with a view to aid such efforts, I have added, in an Appendix, certain forms of handbills suited for distribution to the poor.

It cannot be doubted that as dietary is a most necessary and powerful agent in the treatment of disease, so is the due supply of proper food a chief means of preventing disease and diminishing the burdens of the community. Hence the subject has as much interest to the Statesman as to the Physician.

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PART II.—DIETARY.

PRACTICAL DIETARY.

PART I.

FOODS.

CHAPTER I.*

THE ELEMENTS OF FOOD WHICH THE BODY REQUIRES.

In any system of dietary it is essential that provision be made for the different conditions in which the body is found; and these may be arranged under the four heads of—maintenance of the fabric, supply of the daily waste, growth, and, lastly, storage of food within the body. These have no doubt a certain distinctiveness each from the other, and must be discussed separately, but practically they are closely connected, and in some instances all act in the same person at the same moment.

In proceeding to state the elements of food which the body requires for these several purposes, I will premise a few words on the introduction and uses of food within, and its exit from, the body; and then indi-

* Some readers may prefer to commence with Chapter 3, on page 31, and reserve the reading of the first two Chapters for a later period.

cate the substances of which the tissues are composed, and the quantity of the several elements of nutrition which the body requires in the twenty-four hours.

SECTION I.—THE ENTRANCE OF FOOD, AND ITS USES WITHIN THE BODY.

Nature has provided in the appetite and the faculty of taste the power of selecting food, whereby the appropriateness of the food to the wants of the body, if it be attainable, is in great part assured. Simultaneously with the satisfaction of the appetite, changes are effected in the food as it is mixed with saliva in the mouth during the act of mastication, or with the juices in the stomach and the upper part of the bowel, by which it is rendered of a proper consistence, and its elements are re-arranged to suit the requirements of the body. At this stage the food is prepared for admission into the blood, and then a further selection is made both in quantity and quality, according to the necessity for nutriment which the body experiences, by which a check is offered to any excess of the appetite; and whatever portions may remain, together with such parts of the food as were not digested, are passed from the body by the bowels.

The food thus prepared having entered the blood, is applied to the satisfaction of the four classes of wants above mentioned; but first to the supply of those which flow from the action of the body at the period in question, then to the growth of the body, if that process be still going on, and finally, to the storage of food material if any portion remain unused. Hence, with abundance of food, and with the necessity existing, all these processes are inseparably combined ; yet, speaking generally, they proceed in the order in which they stand in their importance to life, it being of the first consequence to live, then to grow, and last of all, to provide for the future wants of the body.

For the maintenance of the fabric of the body it is needful that the supply of food in the blood be both in kind and quantity quite equal to the amount of waste which is proceeding, so that, the gain and loss being equal, the composition of the body shall remain the same at all periods. This is pre-eminently the condition required during adult life, when the body, having been fully matured, retains the same composition and characteristics for many succeeding years ; but as old age advances, the waste is apt to exceed the supply, and the fabric tends to ruin. The idea which I desire to convey in the maintenance of the fabric, necessarily implies that there are vital changes going on which tend to change the composition of the body ; but it does not necessarily follow that these proceed in such a manner that the whole of every part of the body is changed within a given time, as for example, seven years—a definiteness of period for which there is no sufficient warrant. The body is essentially made up of two classes of substances, which must differ much in the rapidity with which they are changed, viz. : the framework of each structure or tissue, and the fluid or semi-fluid substance which the tissues enclose, and which is more directly in communication with the circulating blood. There can be no doubt that the particles of the tissues themselves change, but more slowly with advancing age; for it is of every day observation in reference to the lower animals, that the meat of an old animal is much tougher than that of a young one, and this we must assume to be due to less frequent change in the tissues of the former than of the latter. The contents of the tissues, part of which constitute the juices, from their semi-fluidity and connection with the circulation, will change their particles much more frequently, and it is to them that I especially refer when I speak of the maintenance of the fabric of the body. Whatever portion of them is lost must be restored, or the fabric must fall.

The daily requirements of the body include the maintenance of its heat and of its tissues, under the varying conditions of labour and exposure. These requirements are in a degree quite distinct, and yet there is in fact the closest connection between them. The body demands a certain degree of heat, in order that its vital actions may be properly conducted, but at the same time, it is almost always placed in an atmosphere of a temperature lower than its own, and thus loses its heat more or less rapidly; and one of the great problems of life is to supply this loss. It is a wise arrangement, that every vital action occurring in the body is attended with the production of heat, and as these vital actions proceed without intermission, they afford a certainly recurring supply. They are associated with the changes which the food undergoes in its own transformation within the body, and with the juices and tissues as they are wasted, and ultimately leave the body. The former are the most abundant sources of heat; and as there are certain foods which cannot form the tissues of the body, but which in their changes supply heat largely, they have been called "heat-generating" foods. They consist largely of carbon, and are hence called *carbonaceous*, and their changes chiefly engage the functions of respiration.

The other daily requirement is the supply of the waste of the juices and tissues of the body, which proceeds without intermission by night and day. This waste includes all the substances of which the body is composed, and as nearly all the soft structures contain nitrogen, the waste is known as that of *nitrogenous* matters; and in proportion to the waste must be the supply of food of precisely the same nature, and therefore largely abounding in nitrogen, or "flesh-formers."

Both of these classes of operations vary with every known condition of life, and particularly with exertion, and hence the supply of food both in quantity and kind must vary also.

The process of growth has its defined limits, both in extent and time, so that whilst the amount of it often falls short, it rarely exceeds that which is common to the race; and whilst in respect of certain portions of the body, the period of full development approaches middle life, nearly the whole of the process is effected in infancy and youth. The importance of the latter fact can only be duly estimated when it is further stated that as each step of growth has its appointed period, if it be not then taken it is for ever lost; and as the whole period of growth is in like manner limited, any deficiency in the whole can never afterwards be supplied. Hence infancy and youth are the most important periods in reference to the due nourishment of the body, since, whilst they embrace all the questions which affect adult life, they have in addition, their own special responsibilities, which can never be delegated to other periods. The growth of the whole body implies the growth of its several parts, and the food must furnish the material out of which each part is to be formed.

The process of storing material, with any approach to sufficiency of food, takes place in every individual to a very limited degree, but only in certain persons to a marked extent. The process for supplying waste occurs in the blood and juices, for the food which is taken at a meal requires a longer period for its final transformations and ultimate uses than is allowed between the meals, and therefore it accumulates through the day, and the body is heavier at night than in the morning. This is, however, most limited in extent, for, except in extreme cases, no part of any excess of food which has been taken in one day, is found in the body on the next day. The wants of the body must be supplied as they occur, (at least with the moderate extension of the time of the intervals between the recurring desire for new supplies of food,) and the wants of each day must be supplied from the food of that day. But in reference to the storing up of nourishment for future use, the faculty for it varies much more with the individual than with the amount of food which is taken ; for there are some who eat largely, and yet store up little, and there are others who eat moderately, and yet accumulate. But in both directions the same person may vary at different periods of life, and in reference to the latter, even in the extreme cases there is a limit which no feeding can exceed. The store of food which is thus laid up is almost entirely fat, and it may be produced directly from fat which was taken as food, or from starch and sugar in the foods, whenever, in a person having this tendency to store up food, the amount of these three substances is greater than the daily requirements of the body can consume. The fat is found separate in certain parts of the body, but probably a yet larger portion of it is mixed up with the other structures, and exists as an oily fluid, visible only on careful inspection, or with the aid of a microscope, and separable only by the process of cooking. This is strongly illustrated by the fact, that fully fed animals have been shown by Messrs. Lawes and Gilbert to have been composed of fat to the extent of one half of their weight.

The importance of this process rests chiefly upon the fact that the body can thus meet a part of its wants in the absence of the daily supply of food, whether that fail from the absence of food, or from the absence of the appetite to take it; and it may not be doubted that a moderate store of fat prevents disease, and when disease occurs enables the body to be sustained through it. On the other hand, as the body is essentially prepared for exertion, any mere storage of food within it must impede its action, and in place of aiding motion, will demand the exercise of power for its own movement. Hence it may be a burden to the acting powers of the body. Moreover, with storage of fat there is an increase in the quantity of blood in the body—an increase which is attended by its own dangers to life. The mind also suffers as well as the body, for the very conditions which we now discuss imply the existence of an excess of food in the body (with an accompanying sense of fulness, which is perceptibly increased after meals), and which, with the fulness of the blood vessels, tends greatly to oppress the mind and to impede thought. Hence any large storage of material is a burden to the body, and an almost insuperable impediment to the full activity of the mind. The foods which can thus be stored up are carbonaceous, and must be either fat, or starch and sugar to be converted into fat.

SECTION II.—THE EMISSION OF WASTE FROM THE BODY.

So far in reference to the admission and uses of food within the body: I will now offer a few observations upon its emission.

If the weight and composition of the body remain unchanged from day to day, the emission of the products of the food should accurately correspond with the quantity admitted. I have already referred to the emission of that part of the food which was undigested or which was in excess of that which the body selected, so that I have only to refer to that part of the food which had entered the blood. No one assumes that all the food which is taken into the body remains in and passes out of it in the same form as it had when it was admitted; but all are prepared to believe that, as some of it, at least, must have been used to repair the structures of the body, it must have been so transformed as to have become like those structures. Hence the body demands such substances as may be so changed, for it cannot create anything of itself; or such substances as when introduced into the body are like some portions of itself.

Water, which enters largely into all food, enters also largely into all the soft structures of the body, and is not changed after it has been introduced; but whatever quantity of it is in excess of the requirements of the body passes out by every outlet, namely, the skin, the kidneys, the lungs, and the bowels, and chiefly by the three former. Carbon, which is found most abundantly in starchy foods, as bread, in sugar and in fat, passes out chiefly by the lungs; and nitrogen, which is almost invariably found with the starch, yet chiefly in the animal foods, passes out by the kidneys; but a small portion of nitrogen passes out by the skin and lungs, and a somewhat larger portion of carbon by the kidneys. There are also various salts, as those of lime, soda, magnesia and iron, which are only changed when in the body so far as the acid with which they are combined, and leave the body almost exclusively by the kidneys.

As above stated, when the body retains its bulk and composition, the substances which leave it must exactly correspond with those which entered it as food; for whatever changes may have taken place in the structures, the place of any substance which has been removed by waste must have been filled by the same kind of substance in the supply. If, therefore, we could be assured that the composition of the body had not in any degree changed within a given period, we could infer either of these classes from the other.

But there are conditions in which the body does not retain an uniform weight and composition. Thus during the period of growth it must add portions of the food to its own substance, whether bone or soft structures, and this is not merely storing food, but it is the formation of living organized structures out of the food. Under these circumstances, the quantity of material which leaves the body daily, will be less than that which was taken as food, whilst the body itself will gain in weight. Again, when a sufficient quantity of food has not been supplied, the body must partly or wholly live upon itself if it have the requisite materials within itself, and must fall into disease if it have not such a supply. The substance which is first used is the fat which has been stored up in excess, or, if there have not been any in excess, that which has been a necessary ingredient in other structures. At the same time the other soft structures which, unlike fat, contain nitrogen, are also given up as food, and from that source a much larger amount of nitrogenous compounds is emitted from the body than was admitted in the form of food. This waste continues so long as the necessity continues, and the functions of life are maintained.

These are opposed to each other, and it must be added that growth may continue when there is a deficiency of food, as is often seen in the children of the poor, but it proceeds either to a less extent than occurs with sufficient food (and this is the most frequent result); or the body rapidly falls into disease from the large proportion of food which this process consumes, and the insufficient quantity which can be devoted to the satisfaction of the daily demands. Hence the occurrence of rapid consumption in fast-growing and ill-fed youths.

SECTION III.—THE COMPOSITION OF THE STRUCTURES OF THE BODY.

Having thus given a very short account of the introduction of food within the body, its uses when there, and its final emission, I proceed to show what are the elements which remain in the body and constitute its different structures, and which, as has been already stated, must be renewed from time to time by the food.

The whole structures of the body are divisible into two classes. First, those which primarily enable it to perform the object of its creation—exertion; and second, those which keep these in working condition. The former are the muscles and bones, the latter, the vital organs; and, to take an illustration from the lower animals, the former constitute the carcase of the dead animal when prepared for sale, and the latter the offal, part of which is used as food, and other part cast away.

The flesh is the muscular system, and the several parts of it are the muscles, which, fastened to the bones by tendons, move the whole body or any part of it as may be desired by the will. It is the most important part of the body regarded as a machine, and it is the most highly perfected structure in the body.

The composition of muscles varies only within very narrow limits in different animals, and I will take that of the ox as a sufficiently near example of human flesh. It is as follows, in 100 parts (Schlossberger). Water, 77·5; fibrin, cells, vessels and nerves, 17·5; albumen and hæmato-globulin, 2·2; alcoholic and watery extracts and salts, 2·8, with traces of phosphate of lime. Hence, even this important structure is composed of water to the extent of more than three parts in four. The following ultimate elements are found in 100 parts of burnt flesh (Playfair). Carbon, 51·83; hydrogen, 7·57; nitrogen, 15·01, and oxygen, 21·37; besides 4·23 parts of salts. The salts are tribasic phosphate of soda, 2·0; chloride of sodium and potassium, 2·0; phosphates of lime, magnesia and peroxide of iron, 0·23 (Enderlin).

The bones are necessarily far more solid structures than the muscles, since they give form to the whole frame, and are the means by which the muscular power is brought to bear upon the body and upon external objects. They consist essentially of two parts, one a gelatinous framework, which may be well shown by immersing a bone for many days in weak hydrochloric acid; the other, various salts which are deposited in the gelatinous framework, and which can be separated by burning a bone and destroying this tissue. In addition to these is a quantity of fat and the elements of the blood existing in the blood-vessels and juices of the bones. The relative quantity of the gelatinous framework and of the contained salts differs with age, so that the former preponderates and renders the bones elastic in youth, whilst the latter preponderate and render the bones brittle in old age.

The following is the composition in 100 parts of one and the same bone, the tibia, at several periods of life:—

	9 Months.	5 Years.	Woman. 25 Years.	(Von Bibra.) Man. 25 to 30 Years.	(Lehmann.) 44 Years.	(Von Bibra.) The femur. 78 Years.
Phosphate of lime, with a trace of fluoride of calcium	48·55	59·74	57·18	58·95	52·23	57·36
Carbonate of lime .	5·79	6·00	8·93	7·08	9·88	7·48
Phosphate of magnesia . .	1·00	1·34	1·70	1·30	0·91	1·10
Salts (soda, &c.) .	1·29	0·63	0·61	0·70	1·04	0·97
Cartilage . .	41·65	31·34	29·54	30·42	33·94	32·16
Fat	1·83	0·95	2·00	1·55	—	0·93

The cartilage which enters so largely into the structure of bone, is composed almost entirely of chondrin, a substance closely resembling gelatin. But in every 100 parts of it there are about 3½ parts of salts. 100 parts of these salts are found to consist of carbonate of soda, 35·1; sulphate of soda, 24·2; chloride of sodium, 8·2; phosphate of soda, 0·9; sulphate of potash, 1·2; carbonate of lime, 18·3; phosphate of lime, 4·1; phosphate of magnesia, 6·9; peroxide of iron and loss, 0·9.

The composition of gelatin (chondrin, gluten, &c.), which enters into the construction of cartilages, tendons, skin, &c., is in 100 parts: carbon, 50·40; hydrogen, 6·64; oxygen and sulphur, 28·58; and nitrogen, 18·34.

Hair has a similar composition, and contains sulphur and peroxide of iron.

The composition of the vital organs varies much in the relative proportions of their various parts, but does not add much to the list of substances found in the structures already mentioned.

Albumen (white of egg) enters largely into the composition of all soft tissues and of all organs. Its composition is very like that of gelatin, and is as follows in 100 parts: carbon, 53·5; hydrogen, 7·0; oxygen, sulphur, and phosphorus, 24; and nitrogen, 15·5.

The brain varies somewhat in composition with age, losing water and gaining certain salts as life advances. The following is the composition in 100 parts at different ages (L'Hérétier):—

	Infants.	Youth.	Adults.	Aged.
Water	82·79	74·26	72·51	73·85
Albumen	7·00	10·20	9·40	8·65
Fat	3·45	5·30	6·10	4·32
Osmazome and salts . .	5·96	8·59	10·19	12·18
Phosphorus . . .	0·80	1·65	1·80	1·00

The liver consists of 61·79 per cent. of water and 38·21 of solid matter. There are 2·63 per cent. of salts, consisting of chloride of sodium, phosphate and carbonate of lime, phosphate of potash, and peroxide of iron.

Bile, although in part excreted, is in fact an essential constituent of the body, since it is used in the process of digestion, and therefore must be referred to here. When in the liver, and before reaching the gall-bladder, it consists of water, pure bilin, with biliverdin and fats. That from the gall-bladder has the following composition in 100 parts (Thénard) :—water, 90·9 ; yellow resin, 3·73 ; brown colouring matter and mucus, 0·18 to 0·9 ; albumen, 3·82 ; soda holding the resin in solution ; salts of potash and soda and peroxide of iron. Gmelin found in bile :—biliary sugar, brown colouring matter, resin, cholesterin, ptyalin, mucus, oleic acid, and salts.

The lungs consist of a substance resembling gelatin, albumen, hæmatin, a substance analogous to casein, fibrin, oleic and margaric acids, oleate and margarate of soda, cerebric acid, lactic acid, cholesterin, and 82 per cent. of water.

Lactates have also been found in the normal lens of the eye, and peroxide of manganese in an opaque lens.

Such is the composition of the chief structures in the body in their organized form. I will now add the composition of the blood, out of which they are formed and supplied with food.

The blood must vary much in composition, according as digestion is proceeding, and a large quantity of imperfectly transformed food is thrown into it; or as a long interval has elapsed since the last meal (as in the morning), when the elements of food will have been more completely changed and appropriated to the nutrition of the body. The effect of exertion is also very influential over the composition of the blood, for with much perspiration it must lose water, and with much waste of the muscles (occurring during their action), the refuse matter of tissues must abound largely in the blood. In connection with the introduction of food, it must be remarked that the composition of that part of the blood into which the products of digestion are first carried, will differ somewhat from that of other parts of the circulation. There are also differences with age and sex, and it is said that they also exist with race, but if so they are solely due to the habits of the race in reference to food and exertion.

The following is the composition of the blood of the horse in three parts of the circulation.

	Arteries.	Veins.	Vena portæ.
Water in 100 parts	76·08	75·73	72·49
Solid matters ,, ...	23·95	24·26	25·70
In the solid matters—			
Fibrin in 100 parts of the blood. .	1·12	1·13	0·83
Fat ,, ,, . .	0·18	0·22	0·31
Albumen ,, ,, . .	7·88	8·58	9·24
Globulin ,, ,, . .	13·61	12·86	15·25
Hæmatin ,, ,, . .	0·48	0·51	0·66
Extractive matter and salts . . .	0·69	0·91	1·18

From the foregoing it appears that the body possesses the following elements, all of which must be obtained directly or indirectly from the food :—Albumen, fibrin, gelatin, chondrin, and other similar substances, all of which have a somewhat similar chemical composition ; fat and water ; also iron, manganese, soda, potash, lime, sulphur, and magnesia, with various acids in combination with them, as phosphoric, sulphuric, fluoric, carbonic, and lactic acids, besides numerous organic acids. Of these the body can produce from other but similar substances which it receives in food, organic acids, fats, probably water, and some of the substances similar in composition to albumen. But nearly all the water must be supplied to it, as well as much of the fat, the albumen, and some allied substances, and all the salts of the metals.

SECTION IV.—THE QUANTITY OF THE ELEMENTS OF THE BODY REQUIRED DAILY.

If there were only one form of the human body, and it were subjected to the same influences from day to day without variation, there would be no difficulty in stating the quantity of food which would be required for its nourishment, but as, amongst other causes of variation, there are differences of sex, age, height, bulk, and capability for exertion, with extreme diversity in the exertion made, and in the degree of protection against cold, heat, and other external influences, it becomes necessary to arrange mankind into classes, or to form an average which shall only in general terms represent the actual necessities of mankind.

The most satisfactory method of estimating the requirements of the adult is to ascertain what substances in amount and kind leave the body, since for the most part they are the result of the waste of the different parts of the body, and indicate how much must be supplied to renew and repair the parts thus wasted. The only source of error in this calculation is that if any of the elements in food have been in excess of the requirements of the body, the excess and the necessary parts are thrown out together, and the excretion thus becomes a measure of the quantity of food taken, and not simply of the requirements of the body. This is readily illustrated by the use of common salt, for if after a quantity has been given which for a long period has appeared to be exactly adapted to the wants of the body, the quantity be increased, the amount thus given in excess is exactly found as an additional quantity in the excretions. But whilst there is this liability to error, it is rendered quite harmless by taking, as an example, the case of a fairly fed and well formed man; for if the excess above mentioned should exist in any element, we shall err only in indicating a somewhat larger requirement than really exists.

Nearly all recorded estimations have however been made by ascertaining the amount of food which is actually taken by different persons and classes, and this method offers the solid advantage of showing the capability for maintaining health and vigour which such a diet affords; but as the appetite and the means of acquiring food do not accurately measure the wants of the body, the quantity of food thus taken may be either more or less than the system really requires. This is well illustrated by the information that I have recently collected for the Government, which showed that some persons ate ten times more food, in point of nutriment, than others, and that in whole classes of the community a difference of one-half in the amount obtained by the lowest fed was common.

In proceeding to state the quantity of nutritive elements which the body requires daily, I shall use both of these methods in reference to the two largest constituents, viz., the carbon and the nitrogen.

Carbon.—There are not any means at our disposal which enable us to state how much the body requires of each of the different substances which yield carbon, but we know that some amount of oleaginous or fatty substances is necessary in addition to every other form in which carbon can be supplied. In like manner, we do not know how much of the free hydrogen which is found in carbonaceous foods, and most abundantly in fats, and which is usually reckoned as carbon when estimating chemically the value of foods, is required by the system. We know, however, the amount of carbon from mixed sources which the body requires, and if the amount of carbon only which is required be estimated, the free hydrogen will simply be a further gain in the food.

My own experiments on the amount of carbon which is thrown out of the body are by far the most extended on record, and I have used them in the various Government Reports on the foods of the labouring classes. They showed that a man in middle life, in good health, and of full average size and activity, emitted from the body in perfect quietude 7·9 ounces daily; with the estimated exertion of the middle and light labouring classes, 9·5 ounces; and with the estimated exertion of the hard labouring classes, 12·5 ounces.

My inquiries into the composition of the food actually eaten by the labouring classes showed: for in-door labourers, viz., cotton and silk operatives, stocking weavers, needle women, glovers, and shoemakers, 10·5 ounces; for out-door labourers (agricultural only), England, 13·2 ounces, Great Britain and Ireland, 14·1 ounces.

The average of these two classes yielded 12·85 ounces, whilst the average of the estimations just given was 11 ounces. Hence it may be stated that the adult body requires an average minimum daily amount of carbon of 9½ to 10½ ounces in the middle and light labouring classes, and of 12½ to 14 ounces in the ordinarily hard labouring classes.

The observations which have been made as to the relation of weight of body to the daily requirements of carbon, show that about 25 grains per lb. weight is the quantity consumed by the middle classes; and if to this we add the amount which is, and must be, found in the waste matter of the bowel, the total will be about 28 grains for each lb. of body weight daily. There is no satisfactory statement as to the average weight of the in-door and out-door operatives above mentioned; but if we take the usual estimate of 150 lbs., the actual quantity yielded in food was 30 grains and 38 grains per lb. of body weight, in the two classes of English labourers.

The estimate of the nutriment obtained by an infant, which I have recorded in a former work,* showed that 136 grains of carbon for each lb. of body weight was given in food daily—a proportion three to four times greater than that actually obtained by the poor in adult life.

Nitrogen.—We do not know with absolute certainty that the nitrogen which is offered by all "flesh-forming" foods, is equally well digested and appropriated by the system, and hence it is assumed that a mixed diet will be furnished, consisting of animal and vegetable foods.

As in reference to carbon, so to nitrogen, my own in-

* "Health and Disease, as influenced by the Hourly, Daily, and other Cyclical Changes of the Human System." Walton & Maberley.

quiries have extended throughout the year, and are by far the most extensive on record; but there have been a greater number of explorers of this latter part of the field of science than of the former, and the average of the whole very closely corresponds with my own. The results show that about 200 grains of nitrogen are consumed daily in the working of the body by the light-labouring classes, whilst in the middle and well-fed classes the total evacuation by all the excretions was 260 grains.

The actual amount obtained in food by the in-door classes above mentioned was 183 grains, and by the out-door labourers in England, 242 grains; and hence we may place the requirements of the adult body daily at 200 grains with light occupation, and 250 grains for ordinarily hard-working labourers.

When reckoned in proportion to body weight, the quantity which was actually taken into the blood was 0·934 grain to 1·4 grain per lb., and when to this is added the quantity which passes off in refuse food by the bowel, the total amount required in food will vary from 1 to 1½ grain per lb. of body weight. From the estimation of the food taken by an infant, already referred to, the proportion at that period of life is about six times greater than that required by an adult. As infancy passes into youth, the proportion required diminishes, but it is even then higher than is necessary in adult life.

Salts.—The only measure of the requirements of the body in reference to saline substances, is the quantity which leaves the body after it has passed through the circulation, and this measure is likely to be in excess of the requirement in well-fed persons, since it depends upon the food which is taken, as well as upon the waste of the tissues. Phosphoric acid is combined with soda, lime, magnesia, &c., and is required by an adult of middle age in quantities varying from 32 grains to 79 grains daily, or an average of about 50 grains daily. Chlorine is chiefly combined with soda in the form of common salt, and is required in quantities varying from 51 to 175 grains daily. When reckoned as common salt, the daily requirement is about 200 grains, or somewhat less than $\frac{1}{2}$ an ounce. Sulphuric acid is required in daily quantities of from 17 grains to 41 grains. Potash is used in quantities varying from about 27 grains to 107 grains daily; soda from 80 to 171 grains; lime from $2\frac{1}{3}$ to $6\frac{1}{3}$ grains; and magnesia from $2\frac{1}{2}$ to 3 grains. (Parkes.)

The daily requirement of iron, manganese, and fluoric acid is not known, but it is very small.

Water.—Water is required largely in excess of the quantity which enters into the composition of the body, since it is the vehicle by which food is conveyed into and refuse matter removed from the body. It is retained by the body in larger quantity when at rest than during exertion, so that during any system of training as large a portion of it as possible is expelled with a view to reduce the weight and bulk of the body. The amount also varies with temperature and pressure of the atmosphere, in such a manner that it is increased with a falling barometer and a rising temperature, until the equilibrium is established by profuse perspiration or urination. Hence it is impossible to give more than a general idea of the amount of water which the body requires daily; but when a calculation is made of the quantity which is emitted by the kidneys, skin, and lungs in an average adult, it becomes evident that not less than 6 lbs., or nearly five pints, per day are necessary with moderate exertion and medium temperature.

There is no certain estimation of the amount of food which females require who are simply engaged in domestic duties, and hence the allowance varies according to each authority. When determining the amount required by the Lancashire operatives, I ventured to deduct only $\frac{1}{10}$ from that allowed to men, and this estimation was founded upon their relative weights and the similarity of their employment. The same relation will hold for the families of indoor operatives in general; but for outdoor labourers the disparity is much greater, and a reduction of $\frac{1}{4}$ to $\frac{1}{3}$ will more nearly represent the actual quantities when the labourer obtains a suitable amount of food.

I have already stated the requirements of an infant in relation to its weight. There can be no doubt that a youth of 14, 16, or 18 years of age, according to his size and rapidity of growth, demands fully as much food as an adult at middle life. There are not equally certain data as to the requirements of children after the period of infancy; but when, as in families, the children follow each other at intervals of about two years, I have considered two under ten years and one over that age as equal to an adult in the food which they require. This estimation will be erroneous when there are only very young children in the family, as for example, *æt.* 1 month, 2 years, and 4 years, or when several children are near to 10 years of age, as for example, 7, 9, and 11 years; for in the first case one child would live on the mother, and the other two, except in reference to milk, would not eat so much as an adult; and in the latter, two children at 7 and 9 years of age would eat more food than one at 11 years; but when all the variations existing in families throughout the country and the great requirements of growth are considered, I do not think that it would be safe to compute an adult from children of the same family upon any other basis.

It is also necessary to add a word in reference to the season of the year. Outdoor labourers exposed to cold must require more food in winter than in summer, and the most at the change of the seasons into winter and spring. My experiments recorded in the work on Cyclical changes, already referred to, have also shown that such is the case in one who is well protected from the cold; but the difference would be less in such an one than in the ill-clad agricultural labourer.

CHAPTER II.

SUMMARY STATEMENT OF THE ELEMENTS OF THE BODY WHICH CAN BE SUPPLIED BY FOOD.

In discussing the question at the head of this chapter it will be convenient to state in a few lines the various sources whence the required substances may be obtained, and then to discuss the qualities of foods in detail.

Water is supplied to the body both in its separated form and when combined with both fluid and solid substances. In reference to the two latter, it may be remarked that there is no kind of food, however solid, which does not contain it. Thus turnips, carrots, parsnips, onions, and other succulent vegetables contain before cooking from 85 to 92 per cent. of water; potatoes, 76 per cent.; beer, porter, buttermilk, and skim milk, 90 per cent.; new milk, 88 per cent.; eggs, 75 per cent.; liver and fresh herrings, 70 per cent.; dried herrings and fresh beef, about 50 per cent.; mutton, 42 per cent.; bread, 36 per cent.; cheese, 37 per cent.; dried bacon, sago, wheaten flour, pearl barley, and oatmeal, 15 per cent.; rice, maize, and biscuit, 13 per cent.; and even such fats as lard and dripping when pure contain 1 or 2 per cent. of water. Hence a large portion of our daily supply of water is taken in its combined form, and to this must also be added the additional quantity which is usually added when solid foods are cooked and prepared for the table.

Fat is also supplied largely in foods. Thus of fat when dried at the temperature of boiling water, dripping and lard contain 98 and 99 per cent.; suet and fresh butter, 87½ per cent.; dried bacon, 74½ per cent.; green bacon, 71½ per cent.; fresh mutton, 45 per cent.; cocoa and chocolate, 42 per cent.; fresh beef, 33½ per cent.; cheese, 28 per cent.; salted herrings, 12¾ per cent.; eggs, 11 per cent.; fresh herrings, 7 per cent.; maize, 5½ per cent.; oatmeal, 5 per cent.; new milk, 3½ per cent.; skim milk, peas, and lentils, 2 per cent.; buttermilk, 1½ per cent.; wheaten flour, 1 per cent.; and even bread and rice, ¾ per cent. These quantities would have been larger had the fat been stated in its ordinary and not dried state; but the difference is simply in the water which the fat ordinarily contains.

Sugar is found almost exclusively in vegetable foods, and in the following quantities :—Rice, about 0·1 to 0·2 per cent.; maize, 1½ per cent.; peas, 2 per cent.; rye meal and wheaten bread, 3¼ to 3½ per cent. ; cows' milk, 4¾ per cent.; ewes' milk, 5 per cent.; goat's milk and barley meal, 5¼ per cent.; asses' milk, ripe gooseberries, and ripe pears, about 6 per cent. ; oatmeal, about 8 per cent. ; wheaten flour, from 4 to 8 per cent. ; beet-root, 5 to 10 per cent. ; greengages, apricots, and kept pears, about 11½ per cent.; ripe peaches, 16½ per cent. ; ripe cherries, 18 per cent.; dried figs, 62½ per cent.; also in asparagus, potatoes, and other vegetables.

Starch, or a substance having some of its properties, has been found in the brain and other animal tissues, but for our purpose it may be regarded as exclusively a vegetable food. It is yielded by vegetables as follows:—Various kinds of potatoes, from 12 to 24 per cent.; peas, 32½ per cent.; beans, 34 to 36 per cent.; wheaten bread, 53½ per cent.; wheaten flour, 56½ to 72 per cent.; oatmeal, 59 per cent.; rye meal, 61 per cent.; barley meal, 67 per cent.; maize, 81 per cent.; rice, 83 to 85 per cent.; and in a yet larger proportion by arrowroot, sago, and tapioca.

Fibrin, albumen, casein, gelatin, and gluten are the chief nitrogenous foods, and have a similar composition. They are found in both animal and vegetable foods, but the four first chiefly in animals, and the last in vegetables, in the following proportions:

Fibrin: in blood, 0·3 to 0·46 per cent.; in sweetbread, 8 per cent.; in fish, 13 to 15 per cent.; in butchers' meat and poultry, 19 to 22 per cent.

Albumen: in butchers' meat and poultry, 2 to 3 per cent.; in fish, 4 to 5 per cent.; in eggs, 15½ to 17½ per cent.; in blood, about 19 per cent.; in ox liver, 20 per cent.

Casein: in the milk of women, 1½ per cent., of goats, 4 per cent., and of ewes and cows, 4½ per cent.

Gelatin: in sweetbread, 6 per cent.; in fish and butchers' meat, 6 to 7 per cent.; in bones, 39 to 49 per cent.; in isinglass 70 to 93 per cent.

Gluten: in common turnips, 0·1 per cent.; in cabbage, 8·0 per cent.; in red beetroot, $1\frac{1}{3}$ per cent.; in potatoes, 3 to 4 per cent.; in dry peas, maize, and rice, about $3\frac{1}{2}$ per cent.; in barley, 6 per cent.; in oats, southern, 4 per cent., in Scotch, $8\frac{3}{4}$ per cent.; in wheat, 9 to 24 per cent. (usual range from 11 to 15 per cent.); in rye, 8 to 10 per cent.; in beans, $10\frac{1}{3}$ per cent.

Salts. Common salt consists almost wholly of chloride of sodium, yet it usually contains small quantities of lime and magnesia, combined with sulphuric acid.

Phosphorus, in combination with lime, magnesia, soda, potash, &c., is found in most animal and vegetable foods. Thus, in 1000 parts: blood, 0·14; barley, rice, and oats, 0·22 to 1·32; milk, 0·56; wheat, 0·8 to 2; potatoes, 2·5; casein, 13·2; and bones, 27 to 72. It is also found, with lime and magnesia, in fibrin, albumen, the brain, and other animal substances.

Sulphur is contained in fibrin, albumen (white of egg), casein, &c., in the proportion of $3\frac{1}{2}$ to 7 parts in 1000.

Potash is supplied to the body by grapes, lemons, apples, pine-apples, strawberries, mulberries, tamarinds, and nearly all fruits; also by potatoes, cauliflowers, cabbages, cucumbers, asparagus, rhubarb, and all garden vegetables. It is found in animal foods, as albumen, fish, milk, flesh, and bone.

Soda is chiefly given with food in the form of common salt, but it is also found, with potash, in many vegetables.

Iron is met with in most vegetable foods, as cucumber, carrots, potatoes, peas, cabbage, mustard, &c. ; also in milk and flesh.

Alumina has been discovered in carrots, and silica, or flint, in potatoes and other vegetable foods.

Thus it will be observed that the elements which the body requires are widely distributed amongst foods, and are found in the proper proportion with the usual mixed food of a dietary. This is particularly noticeable in the salts of lime, soda, potash, magnesia, alumina, iron, &c., which are found in small quantities in nearly all foods, and without them the body could not be nourished. At the same time it may be added that sugar, starch, gluten, and salts are especially met with in vegetable, whilst albumen, fibrin, gelatin, casein, and fat are as generally found in animal food.

CHAPTER III.

QUALITIES OF FOODS.

I PURPOSE now to discuss in detail the several foods which enter into the composition of a dietary, and shall under each head state briefly the origin, nutritive qualities, preparation, and cooking.

SECTION I.—DRY FARINACEOUS FOODS.

Wheaten Flour.

There is a sensible variation in the value of flour, as it is derived from wheat grown in different latitudes, in different years, from different seed, and on different soils. The wheat which has been grown in hot climates is called "stronger" than that in high latitudes—as, for example, the wheats of Southern Europe and some portions of North America—and is used by the millers for mixing with the produce of our own or other northern climes, in order to give "body" to the flour and to enable it to absorb a larger quantity of water in the manufacture of bread. So, other things being equal, the produce of this country in a hot season is more valuable than that of a cold one, and produces better bread than can be made from the soft and immature fruit of a cold year. In wet seasons, moreover, the grain is apt to germinate or sprout, when the seed consumes a part of its nutritive matter, and becomes unfit to make good bread. The quality of the seed and of the soil, and the degree of cultivation of the land, regulate the size of the grain produced, and even under the most favourable circumstances of climate and season, inferior produce will yield an undue proportion of bran to flour, and thus be deficient in economy when compared with the finer grains. A distinction of importance is also drawn between white and red wheat, since only from the former can the whitest flour be produced. The finest white wheat may be obtained from the State of New York, and a very fine quality is produced in our own country.

Wheat is practically divided into two parts, viz., the bran or outer covering and the central grain or fecula—and the object of the miller in the preparation of flour is to mix the qualities as above mentioned so as to suit his market, and to separate the bran wholly or partially from the fecula, or to leave the whole in the flour. By the present system all is effected at the same time, and the produce is taken away from the stones unchanged in the form of brown flour or brown meal, or it is passed over a series of sieves technically called "silks," whereby the bran in its larger and smaller particles is separated from the fecula, and the latter can be obtained quite alone or with any required proportion of the former.

The bran is found to consist of several layers, the outermost of which is in thick scales, whilst the inner ones are thinner and much lighter in colour. The larger scales are from the outer bran, and from their size are divided into bran and coarse pollards, whilst the smaller particles are called fine pollards and sharps. The proportion which these comparatively refuse matters bears to the fecula varies with the size and quality of the wheat and the special characteristics of the season. A fair average is 14lbs. to 17lbs. in the bushel of wheat, but inferior samples will yield from 20lbs. to 30lbs. in the bushel. The importance in a commercial point of view of removing the bran from the flour, may be estimated by quoting the value of the several parts of the flour. Thus,

						s.	*d.*
1 bushel of	seconds flour	weighing	56 lbs.	costs	.	7	9
,,	bran	,,	12	,,	.	0	9
,,	coarse pollards	,,	14	,,	.	0	10
,,	fine pollards	,,	18	,,	.	1	0
,,	sharps	,,	26	,,	.	2	0

Hence it is evident that the intrinsic value of whole-ground meal which contains all the bran, is much less than that of flour which has been partially or wholly freed from it.

The market value of flour varies with the quality of the grain, and the amount of the husk which still remains in it, and it is technically divided into four classes, brown meal, households or "seconds," fine households or "best," and biscuit flour, and the nutritive value must chiefly depend upon the estimate which is formed of the nutritive value of the different parts of the bran.

There can be no doubt that the outer part of the bran is glazed over with a layer of flint, and is quite indigestible, for it may be seen in the dung of all animals which have been fed upon it, and, therefore, is not nutritious. But more than this, it is universally allowed that the bran irritates the bowels, and purges, and, by removing the alimentary matter from the bowel too rapidly, causes the loss of nutritive material, and thereby does not nourish the body, but tends to impoverish it. Hence its presence is an evil if the laxative action which it excites is in excess of the requirements of the body; but, as it does not always purge, it is affirmed that it tends to health by offering a mass of innutritious and refuse matter without which the bowels could not act efficiently. It is not denied that in suitable proportions the action of the bran may be kept within healthful limits; but as there is no food which is altogether absorbed into the blood and leaves no portion to pass off by the bowel, and as during the use of food freed from bran the quantity of unused matter is sufficient to induce the proper action of the bowel, there are not sufficient grounds for the statement that bran is required to be taken with the food. But regarding the subject in a medical point of view, if any one desire to take bran as a laxative, and do not heed the expense of it and the loss of the food which it will occasion (by which it will become an expensive medicine), he may do so; but it should be added that, as bran acts as a laxative by irritating the bowel, so by adhering to the throat, as may often be seen after a meal, it causes irritation there and gives rise to a troublesome form of indigestion. It is, upon the whole, better, when a laxative is required, to take it in the form of a medicine, and limit its use to the occasion.

When the outer bran is ground into very fine portions and mixed with the flour, it still remains innutritious, and as it has lost its irritating quality, it is useless and requires other agencies to remove it from the body.

It is probable that the inner husk of the bran, or sharps, possesses a true nutritive value, for although the proportion of starch which it contains is much less than that contained in the fecula, the proportion of nitrogenous matter is greater; and although we are not able to apply the test of vision to ascertain whether it is digested or not, there seems no reason to doubt its digestion. Hence it is probable that the households flour, which contains a notable proportion of it, is the form most fitted for the nourishment of the body; and in proportion as the price charged is less than that demanded for the whiter flours, it is an economical food. Fine white flours must rather be regarded as luxurious than profitable, since the white wheat from which they are prepared is more expensive than red wheat, and their preparation is so much more costly that the very finest are sold at more than double the price of good "households." I do not consider them superior in nutritive value to households or seconds flour, but it is probable that their value may be enhanced if, in their preparation for food, they are mixed with water in which the bran has been immersed for some time, or in which it has been boiled, since some of the nitrogenous and saline elements of the inner bran will have been extracted by the water and added to the fecula. When the food of the masses is considered, it will be found that their bread is prepared from the households flour, and the puddings from the whiter (but not the very whitest) flour; and this is probably as it ought to be.

The price which is charged is also a prime element in the economic value of the different kinds of flour. The consumption of whole brown meal has been so much lessened of late years that the price charged for it is as great as that of households or even of fine flour (nay, in London it is often greater), and hence it has become a mark of luxury and not of poverty, and is the rich man's, instead of, as formerly, the poor man's food. When the relative value of the bran as compared with that of the flour is considered, it will be seen how much this adds to the profit of the miller and the baker, and how much dearer it is to the consumer. Twenty years ago the price of this kind of flour was the lowest in the scale, and the price of the other qualities above mentioned ascended at the rate of 2*d.* per stone of 14lbs.; and, with the exception of the brown meal, this relation continues. Hence, while the brown meal must be the dearest of all the kinds of wheaten flour, the finest qualities are less economical than the households, provided all the kinds alike are made of sound wheat.

Households flour contains 38 per cent. of carbon, and 1·72 per cent. of nitrogen; and hence in each pound there are 2660 grains of carbon, and 120 grains of nitrogen. When households flour is worth $1\frac{1}{2}d.$ per lb., the quantity of carbon and nitrogen which it will yield for 1*d.* is 1773 grains and 80 grains.

In the preparation of flour as food, by whatever process, it is essential that so much heat should be applied as will break the cells in which the starch is placed. When water is added to the flour the starch cells absorb it rapidly, and if supplied freely the cells will break, but in making paste or bread the quantity of water never suffices for that purpose. Hence the two principal considerations in the preparation of flour for food are the due admixture of water and the proper application of heat, so that the whole mass may be equally moistened and the starch cells equally broken throughout. When fat is added to the flour, care should be taken to mix the two with a light hand and produce the paste in thin layers, for as the action of the saliva is of the greatest importance in the digestion of starch, whilst it exerts no influence upon the fat, the starch must not be so enclosed in the fat that it is inaccessible to the saliva during the act of mastication. It is the neglect of this precaution which renders fatty pastes indigestible. The addition of yeast, or baking powder, or soda, to the dough or paste, has no relation whatever to the cooking of the flour, neither is it *desired* that any of them should induce any chemical change, but the purpose is to mix the paste with some kind of air or gas, and thus by separating the particles of it, to render it more easy of mastication, and to permit the admixture of the saliva with the greater freedom.

Wheaten Bread.

As the preparation of bread is the chief use of wheaten flour, it will be convenient to consider it in this place. Bread may be leavened or unleavened, made into thin cakes or larger loaves, and be made at home or purchased from the baker. I will notice each of these particulars.

Unleavened bread consists simply of flour, water and salt, with the dough made of a proper consistence and spread out into thin cakes. The Jews' Passover cake is scarcely thicker than thick brown paper, and is baked so dry that it may be readily broken with the finger, but in the Western States of America and elsewhere the cake varies from three-quarters to one inch in thickness. When milk and eggs are added, it is not regarded as unleavened, since although no fermentation may have been induced, the cake is lighter and more nearly resembles leavened bread. It cannot be doubted that unleavened bread should be made into very thin cakes, and should be well dried, so that no impediment may be offered to mastication. Biscuits are also made without leaven, and are also highly dried; and when they consist simply of flour and water, they are often very hard, and difficult of mastication, solution, and digestion. There is another evil in the use of biscuits in large quantities when taken without fluid, viz., that they absorb much fluid from the juices of the stomach and thus tend to induce indigestion, and failing to obtain the required quantity of fluid they remain for a long time undigested. They may be a compendious and convenient food under certain conditions, but they are not so healthful in their tendency as leavened bread.

It is necessary now, in speaking of leavened bread, not to restrict the idea to fermented bread only, but to include all kinds of dough which have been rendered lighter by the admixture of gas or air. By far the largest quantity of bread which is made, whether at our homes or at the bakehouse, is fermented, and this is effected in several ways. The oldest perhaps is the addition of a portion of the fermented dough which has been reserved for this purpose from the former baking, but it is not the best, since it can with difficulty be well mixed with the new mass, and thus the process is localized and slow. The more usual plan is to obtain the fluid yeast from new beer, or the dried yeast which is now so largely imported into this country, and add water, but others prefer a yeast prepared without beer, called teetotal yeast. The first is not so generally attainable as formerly, since many publicans do not now brew their own beer; but the use of the second has so greatly increased, and its action is so uniform, that in country villages the publicans can no longer sell all their yeast. The action of all ferments is the same, viz., causing the evolution of carbonic acid gas from the sugar, the bubbles of which force their way into the mass of dough and thus lighten it; and the art of bread-making consists in making the dough so that it shall not be too stiff to resist the entrance of the gas, nor so soft as to permit the gas to pass through it too quickly, and so to knead it that the gas shall be well distributed throughout, without any large portion of it having escaped. Hence, fermentation is effected at the expense of the nutritive materials of the flour, the starch being transformed into sugar and its allies, and these changed into carbonic acid, which is finally lost.

Two other methods are in common use to supply air or gas to the dough, viz., the use of baking powder and the admixture of carbonic acid gas artificially prepared. The former consists of an acid and an alkali mixed together when dry, and kept dry until the period of using it. It is then mixed with the salt, and all well distributed through the flour, so that when the water is added the alkali becomes decomposed and carbonic acid gas is set free to mix with the dough as in the act of fermentation. In this plan there is the expense of the powder to set against the flour which would have been wasted by the process of fermentation; and there are the disadvantages of imperfect admixture of the salts with the flour, and consequent discolouration of the bread, the too rapid disengagement of the gas, whereby parts of the dough are often imperfectly leavened, and a certain flavour given to the bread by the salt resulting from the combination of the acid and alkali. Hence, I think, its use is only to be sustained when it is not possible to procure good yeast.

The forcing of carbonic acid gas into the dough is a most ingenious plan, but as it requires a special apparatus it is not applicable to home baking. The bread which is produced is light throughout the whole mass, and although somewhat insipid to the taste of those who have been accustomed to the use of fermented bread, is good, agreeable and wholesome. In this, as in the former process, there is no waste of the flour; but although this is an important consideration to the baker, who thus makes extra profits over him who uses a ferment, it is not of much moment to the purchaser, since he buys the bread by weight and gives the same for an equal weight of either bread. I do not think the idea of destruction of the food during fermentation has any importance in reference to that which remains, since if any portion of it be changed at all it will be in the direction in which it must subsequently be changed in the process of digestion; it only refers to that which has gone off in the form of carbonic acid and for which the purchaser does not pay when he buys the bread by weight.

It is manifestly very desirable that the air of bakehouses should be pure, and not such as is found where uncleanly men remain day and night, since some of it must be mixed with the dough.

The preference of cakes or large loaves must mainly rest upon the period during which the baked bread is to be kept, as bread dries rapidly when exposed to the air. Small loaves will dry more quickly than large ones, and should be made only for immediate use. Large loaves are rarely baked so thoroughly as small ones, or are baked equally throughout, and hence the bread is not always so easily masticated and digested, and if kept many days is apt to become mouldy. Small loaves and well-baked bread should be kept from the air, whilst moist bread should be freely exposed to dry air.

This also leads me to consider the quantity of water which is found in bread. It varies with the quantity which a given specimen of flour will absorb, the thickness of the dough and the completeness of the baking. Flours differ much in the quantity of water which they will absorb; but as a general expression it may be stated that the stronger flours of hot climates absorb more than others, and the fine well manufactured flour than the households or the whole-ground meal. Absorption takes place far more by the starchy fecula than by the horny bran. Flours in good condition also absorb more than unsound flours. Whether, beyond the quantity which is essential to the proper preparation of the dough and the rupture of the starch cells, water is of value in bread, may be doubted, as a matter of nutrition, and, in point of economy, when the bread is bought it is a manifest disadvantage; yet when home made it affords larger bulk, and enables the poor man's wife to give a larger portion to satisfy the eyes of her children. From very many experiments, it may be stated that with average conditions of flour, water, and baking, 10lbs. of flour will produce 13½ to 14lbs. of bread—the former quantity being the statement made in reference to bakers' bread, and the latter my own observations on home made bread. I have found some flour which yielded 20lbs. and 20½lbs. of bread for 14lbs. of flour; but more commonly the yield is 19lbs. to 19½lbs. The addition of alum has been and probably is now made with a view, as the bakers affirm, to enable the dough to be more easily worked, but really to give strength to the flour, and to enable it to absorb a larger quantity of water. It is, however, a reprehensible practice, since it deteriorates the bread, and injures the person eating it. The bakers try to relieve the dryness of the bread by adding potato starch to the dough; but when the price of flour is low, and that of potatoes high, it does not yield a profit to them. When it is desirable to introduce carbonate of lime as an antacid or otherwise into the system, the bread may be made with lime water, and where skimmed milk is plentiful it may be used instead of water, either with or without lime water.

It is often asked whether it is better to bake at home or to purchase bakers' bread. Assuming that it is convenient to bake at home, it cannot be doubted, I think, that it is better to do so. If the flour be good the bread will be unadulterated, it will keep longer than bakers' bread, and the flavour be generally preferred. On the other hand, it must be stated, that sad or heavy bread is sometimes produced at home, the baking is less uniform than at a bakehouse, and if any portion be underbaked it is indigestible; whilst bakers' bread can be obtained in many districts of uniform quality throughout the year. When, however, home made bread can be always well made, and the flavour is approved, it will generally be more healthful to provide it.

As a matter of economy, the advantage falls somewhat to the home made bread. Thus the same sum is charged per stone for bread as for flour; but only 16 lbs. of bread is obtained from the baker, whilst the 14 lbs. of flour, costing the same money, should produce 19½ lbs. or nearly one-fourth more bread. Hence when bread is 1½*d.* per lb., the loss in buying bakers' bread is 5¼*d.* for each 14 lbs. of flour, and against that must be placed the cost of the yeast, ½*d.* to 1*d.*, and the extra cost of firing, 2*d.* or 3*d.* perhaps. When other cooking is in progress there may not be any extra fire required, and the labour of baking, for which the baker must make a charge, is supplied gratuitously at home. In districts where the cost of firing is considerable, or where a fire would not otherwise be made, the gain is reduced to a *minimum*, and in such cases it is more economical, but not so healthful, to bake large flat cakes over the fire, as in Scotland and Wales, where it is known as plank bread.

It is also desirable to add a word in reference to the age at which bread should be eaten. There is a general objection to the use of new bread, either on the ground of economy or health. As to economy, it cannot be doubted that persons, and particularly children, eat more freely of new than of stale bread, and that its flavour is more tempting to the appetite, and if the quantity which is thus eaten is in excess of the requirements of the body, it can neither be healthful nor economical. The objection on the score of health may, however, be more safely based upon the less digestibility of new than of stale bread, owing, I think, to its greater tenacity leading to less perfect mastication. The indigestibility of the bread is not so much due to any chemical quality, as it may be attributed to its physical condition.

After this period the changes proceed more rapidly in bakers' than in home made bread, so that the former will often taste sour on the third day, and will then have lost much of its agreeable flavour, whilst home made bread will remain sweet and agreeable in flavour for a week, and during that long period have exhibited no change, other than increased dryness and solidity. I think the plan of thrifty housewives in this matter is based upon correct observation, viz., that bakers' bread should not be eaten until the second day and rarely after that period, whilst home made bread may be eaten on the second and third day and extended to the fifth or sixth day.

An average sample of white bread contains 28·5 per cent. of carbon and 1·29 per cent of nitrogen, and hence 1lb. will contain 1994 grains and 89 grains of those elements. The extreme nutritive value of bread, and its present low price, render it a very good standard of economy. When both bread and seconds flour are sold at the same price, viz., $1\frac{1}{2}d.$ per lb., the latter is the more economical; and even when bread is only $1\frac{1}{4}d.$ per lb. the same relation exists. Bread at $1\frac{1}{2}d.$ per lb. yields for $1d.$ 1330 grains of carbon and 60 grains of nitrogen, and at $1\frac{1}{4}d.$ per lb. the quantities to be purchased for $1d.$ are 1600 grains and 71 grains.

Oatmeal.

Oatmeal, when made from Scotch oats, is a somewhat stronger food than when prepared from southern corn, since it contains a larger portion of nitrogen. When it is ground in Scotland, it is left in large grains, which require much cooking, whilst the Derbyshire oatmeal is ground finely, and may be cooked as easily as flour. There is always a larger portion of the husk left in oatmeal than is met with in wheaten flour, and it is as indigestible, flinty, and irritating to the bowels as the bran of wheat. As the husk is rich in nitrogen (and in this respect it resembles bark and saw-dust), it is affirmed that oatmeal is a stronger and better food than wheaten flour, but this is probably fallacious; and it is worthy of remark, that the hardy Scot, who has lived upon oatmeal with milk, and taught his children to eat it also, on removing to the more genial clime of England, and to a position where white wheaten bread is cheap and good, still affirms the superior merits of oatmeal—but ceases to eat it. The flavour is sweet, but at the same time rough to the palate of one not accustomed to its use, and nowhere can it compete with good and cheap wheaten bread for popular favour.

The Scotch use it chiefly in two forms—porridge and brose—in both of which it is stirred into hot water; but in the former the water is kept boiling, whilst the latter is made away from the fire. In both cases it resembles a soft pudding, and is known in Derbyshire as hasty pudding. The oat cake, not exceeding $\frac{1}{4}$ to $\frac{1}{3}$ of an inch in thickness, is prepared both in Scotland and in certain parts of England, and is eaten either when newly made or after it has been hung in the roof for weeks, and has acquired a sour taste and odour. It is not anywhere leavened and made into loaves, but it is sometimes, as in Yorkshire, leavened and made into very thin cakes. A preparation is made from the husks both in Scotland and South Wales, called Sowans in the former, and Sucan, or Llymru, in the latter, by steeping them in water from one to two days, when the mass ferments, and is then skimmed and boiled to the thickness of gruel. Budrum, or Brwchan, is another Welsh food, prepared in this manner, but it differs from the former in being boiled to a greater consistence, and then set aside to cool, when it resembles blanc-mange.

Oatmeal is now frequently mixed with wheaten flour in making cakes in Scotland, and with Indian corn in the daily mess of stirabout in the western part of Ireland. In England, generally, its use is limited to the preparation of gruel, by boiling it well in water; or of milk porridge, by boiling it well in milk; and in both it is a very valuable food. When the husk has been entirely removed, the grain is sold as groats, and is much used by invalids. Oatmeal contains 40 per cent. of carbon, and 2 per cent. of nitrogen, and consequently each lb. offers 2800 grains of carbon and 140 grains of nitrogen. In economy it does not contrast favourably with households flour, since its cost is 2*d.*

per lb., and, therefore, for each 1*d.* only 1400 grains of carbon and 70 grains of nitrogen can be purchased.

Rye.

Rye is grown in various districts of England, and particularly in the northern counties, but nowhere is it eaten alone as a food by our populations. It is commonly grown with wheat, and is then called *maslin*, or if grown alone, it is mixed with wheaten flour, in the proportion of 1 part of rye to 3 parts of wheat, before it is made into bread. It contains much indigestible husk, and is inferior in nutritive qualities to wheaten flour and oatmeal. Rye contains per lb. 2660 grains of carbon, and 88 grains of nitrogen, and at the usual cost of 1¼*d.* per lb., the amount of these elements which may be purchased for 1*d.* is 2128 grains, and 70 grains, but it is not a cheaper food than households flour.

Barley.

Barley is still eaten in a few places in England and in Scotland when ground into meal, and cakes or bannocks of bread are made from it. It is common to mix it with wheaten flour in about equal proportions; and when the consumer can obtain plenty of milk, it is rather an agreeable food, but otherwise it is rough and repulsive to the palate. The use of both barley and rye meal is still very frequent in the northern parts of Europe, and they constitute the black or dark brown and sour bread of the soldiers and the peasantry. There is much indigestible husk in barley meal; and so long as wheaten flour is very cheap, its use cannot be profitably extended. The composition of barley meal shows 2500 grains of carbon, and 93 grains of nitrogen in each lb.

Pearl barley and Scotch barley are preparations from the same grain, but the former is more completely denuded of its husk than the latter. They are both valuable foods, and are employed in the whole grain after the manner of rice, and eaten with milk. 1 lb. of pearl barley contains 2660 grains of carbon and 91 grains of nitrogen, and hence is equal to wheaten flour in the former, and much inferior in the latter. As the consumption of these foods is very limited, the price is so high as 2*d.* per lb., and in economy they are much inferior to wheaten flour.

Maize.

This substance is one of the most universally used grain foods, and is perhaps the most prolific and the cheapest of the class. Its use is, however, almost entirely unknown in England as a food for man; but since the potato famine it is common in the west of Ireland, and has done the inhabitants the highest service. In flavour it is rough and coarse, and scarcely improves on acquaintance; so that even in America, the home of the maize, its use is gradually receding before the increasing production of wheaten flour. In England, where the deepest poverty is scarcely known, and at a period when wheaten bread is very cheap, it would be vain to attempt to increase its consumption, but in Ireland, where the deepest poverty has reigned supreme, the low price and excellent nutritive value of the maize have rendered it a general if not an acceptable food.

When the "cob" or head of maize is yet young, and the grain soft, it is commonly gathered whole and boiled in milk, and is a delicious food; but when ripe, the grain must be ground before it can be cooked. In the western parts of America, the grain is freshly ground in a hand-mill, and mixed with water, and a little salt, and sometimes a little soda is added; and when a paste is made, it is spread into a cake, about one inch in thickness, and baked before or over the fire. When milk and eggs are attainable, they may be added with great advantage to the flavour of the bread. In Ireland it is generally made like the Scotch porridge, by scattering it and stirring it into boiling water until a hasty-pudding is prepared, when it is poured out and eaten with a little sugar or treacle (if obtainable), and with milk. This is called stirabout, and has a rough and not agreeable flavour.

When prepared in a peculiar manner, as in the Oswego corn flour, it offers excellent and agreeable farinaceous material for puddings, but so prepared its cost is much enhanced.

The nutritive qualities of this substance are very considerable, since it offers more carbon and nitrogen than is found in an equal weight of wheaten flour, viz., 2800 grains of carbon, and 121 grains of nitrogen in each pound, besides a considerable quantity of free hydrogen which is found in the fat—a substance in which the grain is somewhat rich. In point of economy it exceeds all other grains, since it is sold at 1*d.* per lb. and offers the above large quantities of nutriment for that sum. It is, however, highly probable that it is not fully digested when taken in large quantities, for the amount which leaves the body of those using it daily, is very considerable—much more than would be found with a bread dietary.

Rice.

Rice is to a large part of the inhabitants of the East as important a portion of their food as wheaten bread is to ourselves, and for the same reason in both cases, viz., that the two are respectively the cheapest and best grains produced in the several localities. Whilst wheaten flour cannot compete with rice in the East, rice cannot compete with wheaten flour where wheat is grown, and where rice must be carried several thousands of miles. There are upwards of thirty varieties of rice grown in India, and several of them are imported into this country. They differ much in flavour, so that some are called coarse in comparison with others. All are liable to cause disease if used before they have been kept two or three years. The husk is carefully removed from the grain, and no part of it is commonly eaten by man, even by the poorest Bengalee.

The grain is used in this country both whole and ground. As whole grain it must be softened before it can be used as food, and that is best effected by covering it and keeping it covered with fluid, whilst exposed to a temperature below the boiling point, until the grain has become "creed," or quite swollen and softened. In this mode no part of the substance of the rice is lost, but when it is boiled in water a portion of the nutritive matter is lost, or a part of the mass of rice is imperfectly softened. When preparing it, in India and Turkey, for curry and pillaff, the rice is cooked with plenty of water, but is removed from the fire and the water poured off before the grain has become too soft. It is then put into a dry saucepan, covered up, and allowed to remain near to the fire until the other ingredients of the food are ready to be added to it. When new rice is used in India, it is usual to boil it in much water, and extract the deleterious substance, but with old rice that course is unnecessary.

When the grain is ground it is sometimes mixed with wheaten flour, to produce the whitest flour, and this is particularly so in some of the French manufactured flours. It however renders the bread dry, and lessens the sweet flavour of the fine flour. At other times it is used in puddings, and forms a very agreeable dish.

Rice is used in this country rather as a luxury than as a necessary article of food, and the quantity which is consumed by a family is comparatively very small. Its nutritive value is higher than that of wheaten flour in carbon, but it is much inferior in nitrogen, the actual quantities of these elements in a pound of rice being

2730 grains of carbon, and 70 grains of nitrogen. If we select the highest priced rice, viz., the Carolina, at 5*d.* per pound, we shall find it an exceedingly dear food, and even the inferior kinds, as the Patna rice, selling at 2*d.* per lb., are much inferior to wheaten flour in economy. The small or broken rice is quite as valuable for food as the large and unbroken grain, and small Ballam and other kinds of rice may be obtained wholesale at a cost of 1*d.* per lb., at which price it is much cheaper than households flour at 1½*d.* per lb.—the above mentioned quantities representing the actual nutriment obtained for one penny. This, however, is the wholesale price, and when it is sold retail at 1½*d.* per lb., there is no longer any economy in its use, and at 2*d.* per lb. rice is relatively dear.

Peas and Beans.

Peas, various kinds of beans, lentils, and various pulses used in Italy, India, and Egypt, may be practically classed together, since in their general value and relation to an English dietary, they are similar foods.

Of all this class of foods peas are the most largely consumed in this country, probably because they grow here abundantly, and all are familiar with their flavour in the fresh state, but in no locality do they enter largely into the dietary. Their flavour is not generally inviting, so that they can be used only with other foods, as in soup, which hide or modify it. They are used in England only in the whole state, or when they have been shelled and split into halves; and after immersion in water for some hours to soften them, are added to meat liquor in the preparation of soup, or are boiled in a bag, and eaten in the place of fresh vegetables. When used in the whole state the shells are indigestible, and reappear in the evacuations, so that not only do they not supply nutriment, but they cause much waste of other food. The ill effect of this mode of preparation was very evident in the early history of the supply of food to the distressed operatives of Lancashire. When, however, split peas are used, there is no husk, and the whole aliment is highly nutritious. In Scotland it is sometimes found that the peasantry add pea meal to wheaten flour, with a view to improve the nutritive qualities of the food, but the deterioration of flavour prevents its general adoption.

Haricot beans, lentils, and pulse, are cooked in a similar manner, and the more delicate flavour of the former renders them a welcome addition to the dinner table, and a valuable substitute for other vegetables. Lentils and pulse are but rarely used in this country, but are fitted to be used in soup, or to be cooked and eaten separately. All these foods should be well cooked. They should never be cooked whole, but only when split, or when ground into meal. They are the common food of the Egyptian peasantry.

The nutritive value of this class of food is very high —the highest of all vegetable foods, since they somewhat exceed that of wheaten flour in carbon, and have more than double the amount of nitrogen. The quantity of carbon and nitrogen in one pound of peas is 2730 grains, and 255 grains, and as peas can be obtained for 1*d.* to 1½*d.* per pound, their economy is higher even than that of the maize. The low price of good bread, and the usual abundance of potatoes, alone prevent a large increase in the consumption of this excellent food. We have no higher testimony to the nutritive qualities of this class of food than that recorded of Daniel, who begged that he and his companions might be fed upon pulse (by which term was meant various kinds of vegetable food) and water, and after a season their aspect was more healthy than that of their fellows, who had been fed on the more usual food.

Sago and Arrowroot.

There is a large variety of dried farinaceous substances imported into this country analogous to sago and arrowroot, and of which these may be regarded as the type. They consist of starch almost alone, and consequently are rich in carbon and very poor in nitrogen. They are somewhat insipid in flavour, but are valuable on that account in sickness as well as in health since they permit the use of condiments whereby an agreeable flavour can be obtained. Their chief property is by the absorption of water or other fluids to make emulsions, which are agreeably taken either in a liquid form as gruel, or in the semi-solid form of pudding; but the absence of the nitrogenous principle renders them far less valuable as food than flour, and requires for their full use in the system the addition of a nitrogenous material, as the milk with which they are generally cooked. When mixed with water only they produce a mucilaginous or jelly-form substance, but when taken in this state alone they are but very partially digested. They are useful foods when milk can be obtained in which to cook them, but otherwise they have not much real value. The defect above mentioned and the price which is charged for them, render them dear foods when compared with flour, and not equal in economy even to the high-priced specimens of rice. Each pound of sago contains 2555 grains of carbon, and 13·4 grains of nitrogen.

SECTION II.—FRESH VEGETABLES.

Potatoes.

Of all our garden vegetables none is on the whole so valuable and economical as the potato. Its flavour is agreeable and constant, its supply abundant, its preparation easy, its action in the body unaccompanied by any inconvenience, and, in reference to country populations, its cost very small. There is probably no other vegetable food except wheaten bread, of which so much could fairly be said in its favour. Its merits, however, vary much with the kind of seed, the period of maturity, and the soil in which they are grown. That kind should be preferred which becomes mealy on boiling, and which, when well cooked, can be thoroughly crushed with the finger. The potato which is known as "waxy," and those which remain somewhat hard when boiled, do not digest so readily as the mealy kind, but for that very reason they are said to be more satisfying. Hence the "York Regents" are much to be preferred to "Shaws." Young potatoes have a very agreeable flavour, but the immature state of the starch cells renders them of less value in nutrition than the mature potato. When potatoes have been long kept, and become dry and shrivelled, they have lost much of their nutriment; and the same remark may be made in reference to sprouted potatoes which has already been recorded in reference to the sprouting of grain. The potato is the most fitted for food in the heat of the summer, in the autumn, and the early part of winter. In reference to soil, it may be remarked that the potato which is grown upon the bog lands of Ireland is far more "watery," and contains less starch than those which are produced from the dry, light soil of Yorkshire.

It is not material in reference to nourishment whether the potato be boiled, steamed or roasted, since in all methods alike it should be well cooked. In point of economy and convenience, however, it has been found better to boil than to roast them, for whilst the loss in boiling upon 1lb. of potatoes scarcely exceeds half an oz., that in the most careful roasting is 2 oz. to 3 oz. It is also more economical to cook them in their skins and to peel them immediately before they are eaten; but this is not very convenient in many families, and the colour of the potato is not quite so agreeable as that of those which have been boiled after peeling. When they are peeled before boiling, and particularly when they are small and the operation is performed carelessly, from one third to one fourth of the whole weight of the potato is lost, and if there be no pig to eat the peelings the whole is wasted ; whilst the weight of the peel which is removed after boiling would not amount to more than 1 oz. in the pound. When potatoes have been roasted the loss in weight from the skin and the drying is more than one fourth of the weight before cooking. An average sample of potato after it has been peeled contains 11 per cent. of carbon, and 0·35 per cent. of nitrogen ; and hence in each pound there are 770 grains of carbon and 24 grains of nitrogen, and it is greatly inferior to bread. The economy of its use depends upon its cost, so that in times when potatoes are sold at $\frac{3}{4}d.$ and $1d.$ per pound, they are a very dear food as compared with households flour, whilst they are a very cheap food when produced by the labourer at the cost of the seed and rent of land. Thus at $\frac{3}{4}d.$ per pound, only 1024 grains of carbon and 32 grains of nitrogen will be obtained for 1d. When the cost is 1d. per pound the quantities will be reduced to 770 grains and 24 grains.

When the labourer, however, can obtain 50 bushels of potatoes from a quarter of an acre of land, at a cost of about 30s. for seed and rent, he will have more than 7lbs. of potatoes for 1d., and the quantity of carbon and nitrogen thus obtained for that sum will be 5770 grains and 200 grains. If, however, he were to sell a large part of his crop at the market price, he could procure with the money thus obtained far more nutriment in the form of flour than would have been derived from that portion of his potatoes. The weight of potatoes which alone would supply the daily nutriment required by a man would be about 6lbs. in reference to the carbon, and 8lbs. in reference to the nitrogen; but when a labourer in the west of Ireland lives upon this food he is allowed 10½lbs. daily, besides a large supply of buttermilk, and as both of these kinds of food are cheap in that locality the proceeding is even then an economical one.

Green Succulent Vegetables.

All other vegetables may be considered under one head, since they have a common value in the juices which they contain, and do not differ very widely in the nutriment which they afford. Cabbage takes rank at the head from the universality of its use in the country and the large quantity which is consumed at a meal; but it is inferior to others in the nutriment which a given weight contains. Parsnips rank next to potatoes in nutriment, and possess 6 pei cent. of carbon and 0·22 per cent. of nitrogen. Carrots take the next place, and offer 5·5 per cent. of carbon and 0·20 per cent. of nitrogen. Swedish turnips are more valuable than common turnips, since they contain 4·5 per cent. of carbon against 3·2 per cent., and 0·22 per cent. of nitrogen against 0·18 per cent. Onions have the same amount of nutriment as that offered by Swedish turnips. It is not necessary to carry these details further, and for practical purposes all succulent vegetables may be classed together, and 1lb. of each computed to contain 420 grains of carbon and 14 grains of nitrogen.

It is very probable that parsnips and carrots have not taken so high a place in human dietary as they deserve, for with an agreeable flavour and easy preparation they possess much sugar in their valuable juices, and a considerable amount of other elements of nutrition. This is doubtless owing to the universality of the potato and the more constant preference for its flavour, and perhaps also to the fact that they are regarded rather as luxuries than necessaries and the price charged accordingly. If 7lbs. of carrots be obtained for 6*d.*, the amount of nutriment which would be bought for 1*d.* would scarcely be half of that obtained from potato when bought at $\frac{3}{4}$*d.* per pound, but at the price charged for a ton of red carrots, there would be 4lbs. obtained for 1*d.* and then the nutriment for that sum would be nearly 1700 grains of carbon and 100 grains of nitrogen, and far exceed in economy potatoes costing $\frac{3}{4}$*d.* per lb. Onions are eaten scarcely less universally than potatoes, but as a relish rather than as a nutrient. Yet the position which they hold in the scale of nutrition would render them very valuable in the absence of potatoes and if cultivated on a larger scale. The cost of them is much higher relatively than that of the potato, and hence they cannot be economical food; and although they are sought for their flavour, the same quality would prevent their general use as a nutrient vegetable, whilst cabbage, carrots, and parsnips were equally obtainable.

Rhubarb and fruits must be regarded as agreeable rather than nutrient foods, since the quantity of them which is consumed is not large, and their use is limited to a small portion of the year. It is however difficult to over-estimate their value to the system, both from the vegetable juices which appear to be so needful to the maintenance of health, and the pleasure which they afford to the palate whilst mixed with other and more nutrient foods. In both of these respects it is to be desired that their use should be extended, but it is not desirable that they should in any degree supplant the use of other foods. Rhubarb and apples are doubtless the most important of this series, since they grow in large quantities and are consequently cheap, and their use extends more largely over the early and late seasons of the year. It is not necessary to discuss the amount of nutriment which they contain.

SECTION III.—SUGARS.

Sugar is found most extensively diffused in combination with other substances in foods, but when separated from such plants as contain it largely, as the sugar-cane and beet-root, it is found in two forms, one a solid and crystallised—sugar ; the other, a fluid containing much sugar which cannot be crystallised—treacle.

Sugar.

Sugar varies much in its aspect, according to the mode of preparation adopted in the different localities where it is grown, and the manipulation to which it has been subjected in this country. The lower-priced kinds are of dark and dingy colour, and with the crystallisation imperfectly noticeable by ordinary observation, whilst the higher priced have been purified and crystallised, so that the colour in the best moist sugars is lighter and clearer, and the crystals large and readily observed. The highest state of refinement is found in loaf sugar, but there are several degrees of refinement even in that distinct class of sugars. The aim in the process of refining is to render the sugar more agreeable to the eye and to the palate, by removing dirt, water, and colouring uncrystallisable matters, but it does not thence follow that the sweetening property, and therefore the economic value, has been increased. A good specimen of raw sugar which has not been manipulated in this country has higher sweetening properties than the refined sugars, and as its price is less than that of the most refined qualities, it is a more economical food. 100 lbs. of raw sugar are used to prepare about 85 lbs. of fine loaf sugar. When the flavour of the raw unrefined sugar is not objectionable, it should be preferred to any other; but when it is desirable to purchase loaf or refined sugar, it is better to obtain the best quality, since it is the most free from the impurities which qualify the flavour, and it is found in a drier and more solid state.

The East Indian raw sugars are of lighter colour, and are moister than other varieties, and at the same time the sweetening property is very considerable, and the flavour good. But whatever may be the kind of sugar selected, it should be of uniform appearance, of a clear colour, and free from other substances than sugar. A medium price of $4\frac{1}{2}d.$ to $5d.$ per lb. is the most economical quality. Sugar when pure is destitute of nitrogenous compounds, and as in its ordinary state the impurities pass unnoticed, it is said to be non-nitrogenous, and contains 2800 grains of carbon in the pound. When it is purchased at $5d.$ per lb. only 560 grains of carbon are obtained for a penny.

Sugar is, amongst the poorest classes universally, and indeed largely amongst all classes, regarded as a luxury. It is the first article to be cut off or diminished in times of pressure, and in districts where milk is very abundant and cheap its ordinary use is almost unknown, except in the case of the infant, whose food always contains a portion of it. It is, however, a very valuable food, since it is most rapidly digested, and supplies heat-forming materials to the body. When, however, it is compared with wheaten flour it is a very dear food, since three to four times more carbon will be obtained for one penny in flour, besides the nitrogen, none of which is found in sugar. It has also been proved by Messrs. Lawes and Gilbert that even in its fattening properties—that is to say, its power to form fat in the system when it is supplied in excess of the quantity which the daily wants of the body require to produce heat, is not greater than that of starch as found in the cheapest grains.

Hence, whilst it is a good food it is not an economical one, and its use is and should be limited to a luxury rather than extended to a necessary. Many persons even object to that which is its general recommendation, viz., its flavour, and do not seem to suffer any evil from omitting its general use. When, however, severe economy is not regarded, sugar should occupy a place in food.

But, besides its direct use as food, it is employed to cure or preserve other foods, as in making preserves of fruit, and in curing meat. In reference to the former, I would add that when sugar is kept at the boiling point for some time it loses a part of its sweetening properties, and is converted into a substance approaching gum in quality. This may be well seen in candy-sugar, in which both facts are appreciable, and applies not only to making preserves, but to any cooking in which sugar is kept at a high temperature, so that whilst a better flavour is given to the food by adding the sugar before it is cooked, it is more economical to add it after cooking.

The employment of it in sweet pickle to preserve beef is frequent in this country, and not only assists the salt in this action, but imparts a very agreeable flavour to the meat. It is less generally used to cure hams, but in Western and Southern America its use is by no means uncommon, for there sugar, whether from the maple-tree or the sugar-cane, is within reach, whilst salt and saltpetre are obtained with difficulty.

Treacle.

Treacle is a thick, very dark, and dull-looking fluid, having oftentimes impurities mixed with it, and a thick sediment at the bottom of the cask in which it is imported; or it has undergone different degrees of refinement until it has the appearance of a semi-transparent bright yellow fluid, and is known as golden syrup. The flavour of the former is stronger and coarser than that of the latter, but the former, if a fair sample, exceeds the latter in sweetening properties. In this, as in sugar, the palate and the eye are the guides, so that the refined kinds are preferred to the unrefined. Treacle is a more economical food than sugar, if we compare the lower-priced kind with the medium-priced sugar. It contains 2200 grains of carbon in the pound, and at the cost of 2*d.* per lb. will supply 1100 grains of carbon for 1*d.* When, however, the golden syrup is preferred, and 5*d.* per lb. paid for it, it is a less economical food than sugar. The unrefined treacle is less commonly sold now than formerly, and when it is kept by the dealer the price is often as high as 3*d.* and 4*d.* per lb., so that there is no longer any economy in its employment.

Amongst the very poor and thrifty it is used to sweeten tea and coffee, instead of using sugar, because it may be purchased at a less price, but in so doing there is but little economy if the price be 3*d.* per lb. or upwards. Its right place is in being spread upon bread for children, or made with paste into a pudding in the absence of fruit or more expensive articles, since, from its semi-fluidity, it is retained upon the food more conveniently than the sugar could be. It is not, however, equal in nutritive value to the butter or other fat which it supplants on the bread, or to fresh fruit in the pudding, but it is less expensive. Treacle has the same curing properties as sugar, and is largely used in America for that purpose.

SECTION IV.—FATS.

Fat, like sugar, is widely distributed amongst foods, but to a far greater extent than sugar, since it is as universally found in animal, as sugar is in vegetable food, and in addition is almost universally found in vegetable productions. In the separated form it is usually met with as oil, butter, lard, dripping, and suet, but as it may be readily separated from almost every kind of meat, it is somewhat pedantic to consider it in these forms alone.

Oil.

The only form of oil which is commonly used as food in Southern Europe is a vegetable product, viz., olive oil, but as it is not produced in England it is not here so economical as other fats, and has scarcely attained the position of a food. It is, however, very valuable, and its use should be encouraged.

Butter.

Butter, from its flavour and abundance, is the most universally used form of fat in this country. It varies chiefly as it is fresh or salted, also as it is made from milk, butter-milk, or whey, and as to the cleanliness of its manufacture, and the period over which it has been kept. Its chief adulterations are inferior priced fats, salt, and water, and probably no kind of food is so universally adulterated.

Fresh butter has a very delicate and agreeable flavour, and should contain only a very small proportion of salt to add to its flavour, and no more water than it will necessarily absorb when manipulated in its manufacture. The quantity of the former should not exceed half an ounce to the pound, whilst that of the latter, when reckoned upon the fat dried at the temperature of boiling water, should be about 12 per cent.; but it is rare to find so small a quantity of either present. It is almost universally made from new milk. An inferior kind is made in Wales from the portions of butter which remain upon the butter-milk after making butter from new milk, and upon whey after making cheese. It is largely mixed with the butter-milk or whey, is deteriorated greatly in flavour, and will not keep long, and hence is almost exclusively used at the farmhouses where it is made.

Salt is added to butter which it is intended to keep, and to nearly all that is imported into this country. The quantity of salt which is added is in no defined proportion, but it varies from one to two oz., or even more, in the pound. With this exception salt butter may be as good as fresh butter, but it more generally occurs that it is badly manipulated, and that the inferior made kinds are mixed largely with mutton fat or lard, or other kinds of fat. Hence no defined idea can be attained of the value of any specimen of butter, simply by the statement that it is salt butter, and each sample must be judged by its own merits, and on the known credit of the source whence it is derived.

From the uncertainty which exists respecting the purity of butter it is very difficult to appreciate its proper economic value; but when fresh butter is sold at 1*s.* 4*d.* per lb., and a really good salt butter at 1*s.*, the latter is probably the most economical food. A fair sample of fresh butter will contain 67·3 per cent. of carbon, and 95·3 per cent. of carbon with the free hydrogen added and reckoned as carbon, whilst in an equally fair sample of salt butter the quantities will be 65·4 per cent., and 92·6 per cent. These quantities more nearly approach each other than do 1*s.* 4*d.* and 1*s.* per lb. The quantity of carbon alone in the fresh butter is 4712 grains, and in the salt butter 4585 grains per lb., so that at the prices above mentioned 294 grains of fresh butter, and 382 grains of salt butter, would be obtained for 1*d.* Hence, upon the whole, in point of economy, good salt butter should be preferred to an equally good sample of fresh butter.

Dripping and Lard.

These two forms of fat may be considered together, as their economic values are almost identical. Dripping is the more agreeable food of the two, since it contains much of the flavour of the meat, whence it is derived;

and on this ground, that produced from meat roasted before the fire is more approved than that from meat roasted in an oven. Lard is understood to be produced only from the "flare" or leaf-fat of the pig; but it is commonly mixed with the dripping of any other fat of the same animal, and also with mutton and other lower priced fats. It is also liable to the same adulterations of salt and water as those pointed out in reference to butter, but the limited amount of it which is consumed renders the adulteration of it perhaps less frequent.

The price of dripping varies from 5*d.* to 7*d.* per lb., and that of lard from 8*d.* to 10*d.*, and as both, when pure, contain nearly the same nutritive elements, the economy of dripping is far greater than that of lard. If we consider 6*d.* per lb. for dripping and 9*d.* per lb. for lard as medium prices, the quantity of carbon alone which would be obtained for 1*d.*, is 886 grains, and 591 grains, showing a great preponderance in favour of dripping when compared with lard, and a far greater preponderance of both when compared with butter. It is more economical to buy the leaf-fat of the pig, and make the lard, since the cost will be less, a more pure article will be obtained, and the remaining solid part—scratchings—will form an agreeable dish.

Suet.

Suet should be distinguished from ordinary fat, and it corresponds very closely with fresh butter in its nutritive value. It is never eaten in an uncooked form, as is the case with the other kinds of fat already mentioned, since its flavour is less agreeable and its hardness prevents its being spread upon bread, but it is a most valuable aid in the cooking of flour. When used for puddings it is important that it should be cut into very small portions, so that the fat may escape from the cells in which it is found either during the process of cooking or of mastication, since otherwise its beneficial effect upon the flour and its capability of digestion are materially lessened. As the use of suet is thus so much restricted it is of less importance to notice its economic value, but with the same nutritive elements as fresh butter, the price is 6*d.* per lb. for mutton, and 8*d.* per lb. for beef suet, and hence, for 1*d.*, the quantities of carbon would be 785 grains and 589 grains.

It thus appears that whilst butter is the most universally prepared separated fat which is accessible to the inhabitants of this country, it is by far the dearest; and that whilst dripping is the least obtainable, it is by far the cheapest.

SECTION V.—MEATS.

Butcher's Meat, &c.

In proceeding to treat of the qualities and economic value of meat, I shall include under that head the flesh of all animals which are usually eaten; but it will be needful to consider each kind of meat separately.

It is needless to dwell on the value of this food in the dietaries of all classes, since it is almost universally acknowledged, and its use is limited far more by deficiency of means wherewith to obtain it than by any doubt as to its utility. Its chief merits, however, rest upon the fact that it is composed of the material which corresponds to the bulk of our own bodies, and it is thus a form of food the most fit for conversion into our own tissues. Hence it is found that, in its digestion, there is less refuse matter left after that process has been completed than occurs with any other food ; and it is worthy of note that the bowels as well as the stomach of flesh-feeding animals are very much less in size than those of vegetable feeders. But when we compare its nutritive elements with those of flour, for example, we are liable to doubt either the correctness of the statements of its nutritive elements or its great superiority as a food, for in their ultimate composition they do not differ very greatly ; but the explanation (at least in great part) is found in the fact that there is much more water in flesh than in flour, and consequently that the really nutritive part of meat occupies only a small part of the whole.

I have elsewhere discussed the question of the necessity for the use of meat in reference to the views of vegetarians,* and have pointed out how far there is a fallacy in the argument, and how far health seems to be sustained in the absence of meat, but with the use of other animal food ; and here I shall take it for granted that a certain portion of meat is held to be a very useful element in a dietary.

* Health and Disease as Influenced by the Cyclical Changes in the Human System. Walton and Maberly. 1861.

There are two main elements of nutrition in all flesh, viz., the lean, or the nitrogenous part, and the fat, whether in separated masses or mixed up with the juices and lean tissues; and these vary much with each other, and both vary with the watery element of the meat.

The watery element is found in the greatest abundance in the flesh of young animals, and in all animals fed almost exclusively upon grass and other green foods; whilst it is the least in the flesh of true mountain cattle and sheep, which are required to make much exertion in order to obtain sufficient food, and which have been subsequently stall-fed. This is readily demonstrated by the shrinking of the meat in the process of cooking, and may be most readily seen in roasting a shoulder of a grass-fed and of a well-fed sheep.

The nitrogenous element, or the lean flesh, is found in the highest degree in mountain sheep and cattle, and when the animal has arrived at its full maturity, as a sheep, for example, of five years old; and consequently such meat is the most profitable, provided the flesh be yet tender so that it can be readily masticated and digested. As however it generally occurs that the flesh of a lean animal is at least comparatively tough, it is the custom to allow some time to elapse between killing and eating it, by which the tissues become more readily separable from each other, and a flavour is obtained which after repeated trials is considered to be agreeable. Hence, when kept within due limits, the hanging of meat tends to promote the digestion of it.

This part of the flesh however consists of two chief portions, the solid matter, and the juices which may be dissolved out by water, and both of these are necessary for nutrition. The juices are recognised by the colour and moderate softness of the meat on pressure, but are less evident in white than in red flesh. The flavour is found chiefly in the juices, so that the market value of the meat is mainly dependent upon them; and at the same time they are the most readily digestible part of the meat.

The quantity of fat varies with the animal and with the mode and extent of the feeding. The flesh of game and poultry possesses but little; pork contains more than mutton, and mutton more than beef; but the latter when fully fed has been shown to contain nearly 50 per cent. of fat. If average fed animals be selected, 33·5 per cent. of dry fat will be found in beef, 45 per cent. in mutton, 71·5 per cent. in fresh bacon, and 74·5 per cent. in dried bacon; so that this element of nutrition is a very important part of those kinds of meat. This statement includes the suet and all the separated fat which is found in the animal.

There is a general belief that the digestibility of meat varies, so that poultry and game are the most easily digested, then mutton, then beef, and lastly veal and pork; and this is to a great extent borne out by the observations which were made in America in the case of a man who had an external opening leading to his stomach, through which various kinds of food were admitted, and the effect of digestion upon them ascertained after certain periods had elapsed. There are, however, two ideas involved in this statement: one the rapidity of digestion, and the other the ease and comfort with which the process is effected; but except in cases of disease the latter need not be discussed. The evil effects which are so generally admitted to follow the use of pork and veal have not, I believe, any connection with the composition of those meats, but depend upon the imperfect way in which they are masticated and prepared for the process of digestion. The flesh of pork is hard, whilst the fibres of the flesh of veal are held loosely together, so that in the former case the teeth separate the fibres with difficulty, and in the latter the fibres are apt to illude the grinding process of mastication; and in both cases the meat is swallowed in masses too large for the ready action of the gastric juice. I do not doubt that the experience of mankind is correct in this matter, and that of all flesh beef and mutton are the most suited for regular food, and poultry and game as adjuncts or as occasional food.

In the cooking of meat the aim is not to change its composition or its nutritive value, but to present it to the palate in a form which is agreeable, and to the stomach in that which is the most fitted for the process of digestion. Hence as small a portion as possible of it should be destroyed by the heat, or removed by the water, and no part should be made much harder than it was before the heat was applied.

It is not possible in roasting meat that the influence of the heat should be equally great throughout a large mass, since the outer surface will necessarily be nearer the source of heat than the inner portions ; and hence it often happens that the juices of the outer part are entirely evaporated, and some of the solid parts are partially destroyed, whilst the inner portions may retain the juices and remain in their moist state. If this be kept within very narrow limits, however, it has the advantage of preventing the ready evaporation of the juices from the inside, and therefore it is quite proper to dry the outside a little as quickly as possible. As the heat is applied and the juices expand they tend to separate the parts of the meat, and thus aid mastication. When meat is boiled the heat may be equally distributed throughout the mass, but as the hot water draws out the juices of the meat, it is well to place the joint at once in boiling water, and thus by hardening the outside, form a thin shell which limits the loss of the juices. The hardening is produced by the action of the heat upon the albumen, as is well shown in the boiling of an egg—a substance composed of albumen. This hardening process should not extend beyond the shell, and therefore after a few minutes the heat should be reduced and kept much below the boiling point until the cooking shall have been finished.*

It is highly probable that boiled or stewed meat, when properly cooked, is more digestible than roasted

* It is advisable that all meat should be well cooked, whilst at the same time the above-mentioned conditions are maintained.

meat, but as the fluid in cooking draws out the salts, it should be eaten at the same meal with the meat. In some experiments I found that 30 per cent. of all the solid matter left in meat liquor was salts of the greatest value in nutrition. Salted meat is not so wholesome as fresh meat, since the salt draws out the juices of the meat and at the same time hardens the fibre and diminishes or takes away its digestibility. Salt also in large quantities is injurious to health. Hence it cannot be an economical food, except so far as it may preserve the meat from decomposition; and when fresh meat may be equally well obtained, should really be regarded as the luxury of the rich. Such meat must be cooked by boiling, since in that mode the excess of salt may be removed; but although the cooking will improve the meat, it may render the liquor unfit for use, and thus the juices of the meat would be lost.

The joints of meat into which an animal is divided vary in value according to their flavour, closeness of texture, coarseness of fibre, and bone. It is remarkable that there should be great diversities of flavour in the different joints when all are from the same tissue in the body and all are fed from the same blood. But so it is; and further, although the joints having the best flavour are sold at the highest price, they satisfy the appetite sooner than others of inferior flavour, and may thence not be the dearest. Looseness of texture is important in an economical point of view, for a joint of that character, as for example the shoulder of mutton, loses much more weight in cooking than a joint of close texture, as the leg of mutton. Coarseness of fibre interferes with mastication, and thereby with digestion, and a larger portion of such meat is liable to pass out of the body undigested than occurs with finer meat. Such a piece is the neck of beef, and in order to aid its digestion it is well to hang it as long as possible and to cook it by boiling.

In selecting meat it is important to bear in mind that flavour, tenderness, and amount of fat vary with the quality of the animal and its feeding. It should have a fine fibre, clear bright-red colour, and plenty of fat and juices. On pressure it should be soft without being flabby, and yet resisting.

The amount of bone which exists in meat varies very much in the different joints. If we take beef as our illustration, the bones in the shins and leg weigh from one-third to one-half of the whole weight; in the neck and brisket about 11 per cent., and in other joints from 7 to 10 per cent. A cow's head offers more than 50 per cent. of bone. Some joints, as the upper side of the round and the thick flank, are without bone; and the best joints, having the smallest proportion of bone, are the middle of the back loin of beef and the leg of mutton. As sheep and pigs have small bones and are fat when killed, the proportion of the bone to the meat is less in them than in oxen.

Bones must not be regarded as altogether loss, since when cooked and broken up they may be sold at ½*d.* per lb., and some of them, as that in the aitch bone, are worth 2*d.* per lb. before cooking. The analysis of the nutriment from bones which I had made for the Government showed that they afford a large quantity of nutritive material. Thus shin bones lost 19 per cent. in weight after nine hours' boiling, and yielded 817 grains of carbon and 28 grains of nitrogen for each lb. weight of bone; and this at a value of 1½*d.* per lb. gave 542 grains of carbon and 18 grains of nitrogen for 1*d.* The flat and cancellated bones lost more in cooking and yielded less nutriment; but an average mixture of all kinds of beef bones gave 783 grains of carbon and 24 grains of nitrogen per lb. weight of bone. Hence 3½ lbs. of bone are equal in nutriment to about 1 lb. of meat in carbon, and 6 lbs. of bone are equal to about 1 lb. of meat in nitrogen. In order to obtain the full nutritive value from bones they should be cut or broken into very small pieces and boiled for not less than nine hours.

The relative monetary value, and consequently the degree of economy in the purchase of joints, varies with the locality. In the West End of London and at a shop where customers are wealthy, the prime joints are the loin and thick ribs, or chine of beef, legs of mutton, fore-quarters of lamb, and breasts of veal, and are sold at a very high price; whilst the inferior joints, not being so saleable to this class of customers, are sold at a price as low or lower than they could be purchased at an inferior shop. On the contrary, in the East End and in very populous districts, the demand for the inferior pieces is so great that their price is higher than at the

West End in relation to that of the prime joints. So also in villages the supply of the inferior parts is unequal to the demand, and the price is consequently higher than in town. On taking equal parts of beef and mutton and a fair sample of the joints, and deducting one-tenth of the weight for bone, we find that there are 2650 grains of carbon alone and 157 grains of nitrogen in each lb.; and hence, if the back loin cost 9*d.* per lb., there will be 295 grains of carbon and 17 grains of nitrogen for 1*d.*, besides the free hydrogen reckoned as carbon, whilst the thick flank at 7*d.* per lb. would yield 414 grains and 24 grains of nitrogen for the same amount. But as the proportion of fat to the lean varies so much in the different joints and in differently fed animals, such estimations can only be approximative to the truth.

The cheapest parts of the animal are the cow's cheek and heart and the liver. The first will yield about 4 lb. of meat, besides bone, for 1*s.* 3*d.* Cow's heart can be bought at 4*d.* to 6*d.* per lb., and liver at 2*d.* to 3*d.* per lb. Liver is rich in nitrogenous products, and that of the pig contains more fat than that of the ox. A fair sample will yield at 3*d.* per lb. 375 grains of carbon and 70 grains of nitrogen for 1*d.* In consequence of the frequent occurrence of disease in the liver, that food should be cut into thin slices and be well cooked before it is eaten.

I think it very doubtful if the South American beef as at present imported will be accepted as food even by our poorest classes. The specimens which have been sent to me have been exceedingly dry, and by no process of cooking could they be rendered agreeable food. It is true that in a given weight they contained far more nitrogen than is found in fresh meat, but that was owing to the juices having been evaporated by the drying process; and as the fibre is hard and can be masticated only with difficulty, it is impossible to admit that nitrogen in that form is at all to be compared with the same element in fresh meat. Hence the statements as to the nitrogen which it contains are no evidence of the nutritive value of the meat. If it can be brought to this country in a comparatively moist state without its having been much salted and with a fair proportion of fat to the lean, it will doubtless be a great boon to the masses of the people.* How far the preserving process, so ingeniously applied by Mr. Morgan, will answer this purpose, yet remains to be fully proved ; but if it should succeed in preserving the meat, the quantity of salt which is introduced, and the comparatively short time in which the meat must remain ere used, will not deteriorate the food to so great an extent as now occurs in our ordinary process of salting. So far as it has yet been tried, I think it a very valuable process.

Bacon.

As bacon constitutes so large a part of the meat which is eaten by country populations, it is necessary that I should give a proper estimate of its value, and particularly as it is the popular habit to consider that a

* See Appendix for further observations.

man does not obtain meat who obtains bacon only. Bacon differs from beef and mutton only in the two facts, that the proportion of fat to lean is much greater, and that it has undergone the process of salting; and, being dry, it possesses a larger amount of nutriment in a given weight than when the flesh was fresh. It therefore supplies more carbon, and thereby diminishes the necessity for bread; but it offers less nitrogen, and thereby renders the demand for milk and other highly nitrogenous food greater. In point of practical economy to the poor man, bacon exceeds fresh meat, but at the same time it may not afford him the full amount of nutriment which he would have if he could obtain fresh meat in an unlimited quantity. The following circumstances must be borne in mind in favour of the use of bacon. 1st. It can be obtained daily and at any hour, whereas in villages meat can usually be bought only once a week. 2nd. It can be bought in very small quantites, as the money will afford. 3rd. It can usually be bought at the grocer's with the weekly supply of goods on credit. 4th. It may be more conveniently cut into small pieces, and cooked with a less amount of fire and with very few utensils. 5th. The fluid fat which runs out in the frying is spread over the children's bread and satisfies them, whilst the solid portion is eaten by the parents; or, when it is boiled, it greases the cabbage and enables it to be the more pleasantly used as food. 6th. It is sapid and highly relishing both when hot and cold. 7th. When cold it is more conveniently carried into the field than could be the case with other fat meat, since it is of firmer consistence. 8th. It enables the housewife to make a more relishing meal when cold cooked potatoes or cabbage have to be warmed up again. Hence there are good grounds for the prevailing practice amongst the country poor.

The economy of bacon depends upon the price which is given for it. Thus, when 9*d.* per lb. is paid as a medium price for English or Irish dried bacon, the amount of nutriment which can be obtained for 1*d.* is only 530 grains of carbon and 11 grains of nitrogen; but American bacon in a somewhat less dried state is sold at 3½*d.* and 4*d.* per lb., and at the latter price would offer 1070 grains of carbon and 20 grains of nitrogen. The flavour of the latter is seldom so good as that of the former, since in the western parts of America the hog is fed chiefly upon acorns, hickory nuts, and other seeds called "mast," in the woods, and the curing is seldom so carefully performed as in this country; but when a fair sample of it is procured, it is an agreeable food, and is far more economical than the English or the Irish bacon. From the imperfect feeding of the American pig, a large proportion of the fat runs out of the bacon when it is boiled, and the piece shrinks in size so that the housewife cannot cut so many slices from a given weight; but if the liquor is made useful as food, this is only an apparent and not a real disadvantage. There is at least 5 per cent. more water in American than in well-cured English bacon.

Tripe, Cow-heel, Sausages, and Black Puddings.

Tripe and cow-heel are so extensively used in towns as to forbid my passing them over in silence. There can be no doubt that when properly prepared they are agreeable food, and, although they are not equal in nutriment to flesh, they are also valuable food. They are rapidly and easily digested,—so rapidly that in the experiments in America, tripe was digested in from one to two hours, whilst beef and mutton required three to four hours, and pork and veal from four to six hours. Their cost varies much according to the thickness, fatness, and flavour of the tripe, and the size of the cow-heel; and although they cannot be regarded as economical food when thus bought, they are very economical when they are prepared and cooked at home.

Sausages differ extremely in the kind and quality of meat which is used in their preparation, and the admixture of other ingredients. The best are prepared from good pork or beef only, with suitable seasoning; but the inferior are made from an admixture of various kinds of meat, such as could not be sold uncooked, with the addition of bread or other farinaceous material, and are highly and coarsely seasoned. The former are agreeable foods, and may usually be eaten with safety; whilst the latter often cause derangement both of the stomach and the whole system. It is not possible to distinguish between the qualities until they have been cooked, and hence they are dangerous foods; but

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when they are home-made or have been obtained from a trustworthy and approved source, their use may be commended.

Black puddings are prepared from the blood of animals, with the addition of groats or pearl barley, fat, herbs, and seasoning. The best kind is prepared from pigs' blood, groats, and pork fat. A strong repugnance exists to the use of blood as food, from the Scriptural prohibition to the Jews, and its immature state as compared with flesh, as well as from the belief that in the so-called diseases of the blood that fluid possesses properties injurious to health; but we must not forget that blood is retained and eaten in the flesh of animals killed in the ordinary way, and as blood possesses iron in a prepared form, some medical men have attributed great virtue to it. I doubt whether any ill effects have ever been traced to its use, but its immaturity renders it in my opinion an undesirable food. If it be desired to avoid the use of blood as food to the utmost possible extent consistent with the eating of meat, it will be necessary to procure the meat which is killed for the Jews, since much care is taken by a clerical functionary to select animals which are free from any evidences of disease, and they are killed by being bled to death.

It cannot be denied that both sausages and black puddings are eagerly eaten in towns, and are regarded as savoury and agreeable foods; but they are dear foods in relation to their nutriment, are more liable than fresh meat to disagree and to induce indigestion, and are frequently prepared from materials and in a manner which excite disgust and mistrust.

In summing up the foregoing remarks, I think that meat must be its own standard of economy, and with it we may compare other animal food; precisely as we accept wheaten flour as a standard, and use it as a measure of the economy of vegetable food. In the present state of our knowledge we must accept both as necessary food, and allow the relative proportions to be such as the appetite and the means of procuring them dictate. When, however, we place side by side the facts that the quantity of nutriment which can be obtained for 1*d.* in meat varies in carbon from 295 grains in beef to 1070 grains in American bacon, and in nitrogen from 70 grains in liver to 17 grains in beef and 20 grains in American bacon, whilst wheaten flour offers 1773 grains of carbon and 83 grains of nitrogen, we see how small should be the proportion of the former to the latter in the dieting of one to whom economy is of the first consequence.

SECTION VI.—FISH.

There is a similarity in the composition of fish and meat; but the experience of districts where fish entirely supplants meat in the dietary, as in certain parts of the southern coast of Spain, proves that in nutritive value it is very inferior to flesh. As it does not anywhere constitute an important part of English dietary, it is not necessary that I should here enter into much detail respecting it, but as a general expression it may be affirmed that it should be an addition to, and not in substitution of, meat. There are considerable differences in the nutritive values of fish of different kinds, and chiefly according to the proportion of eatable and uneatable parts of the fish, and the amount of water which is found in the eatable portions. In these respects the sole and the plaice, being both of them white fish, may be instructively compared—the one having a firm flesh, and offering scarcely any refuse; the other a soft flesh, and having half its weight of refuse. The flavour is a matter which influences the commercial rather than the nutritive values of fish, and in that the sole greatly excels the plaice; but when the flavour is nearly absent, or when if present it is not agreeable, the fish ceases to be of much value in a nutritive point of view, for large portions of it are rejected as food, and of that which is eaten a large part remains undigested. The red-blood fish, as the salmon, takes a higher place in nutrition than the white fish; but even the salmon is not fitted to supply the place of meat, and it was common in indentures when salmon was abundantly found in our rivers to stipulate that the apprentices should not be compelled to eat it oftener than thrice a week. My own experiments have proved that a larger proportion of salmon passes off undigested than occurs with an equal weight of beef, and that during its stay in the body it does not sustain the vital actions in a degree at all equal to the action of meat.

The fish, however, which is the most extensively used by the masses of the people is the herring, and at the price usually paid for it this is an economical food. Fresh herrings contain about 70 per cent. of fluid, and therefore much more water than is found in dried herrings. 1 lb. of fresh herrings offers 840 grains of carbon and 128 grains of nitrogen, whilst the quantities in dried herrings are 1435 grains and 217 grains. 1 lb. of fresh herrings is usually obtained for about 1½*d.*, whilst the cost of the same weight of dried herrings would exceed 2½*d.* A dried herring weighing about 3 ounces costs about ½*d.* to ¾*d.*, and contains about 269 grains of carbon and 41 grains of nitrogen, and hence, if the whole were digested, it would be an economical animal food.

The arrangements in the western parts of Scotland are the most economical, viz., the packing of fine fresh herrings in barrels with salt, and allowing them to remain in a moist state. 260 lb. weight are there obtained for 40s., being somewhat more than 1¾*d.* per lb. The finest herrings are caught in Loch Fyne.

When fish is eaten in considerable quantities, and in the absence of meat, indigestion prevails, the general health is ultimately lowered, and a scorbutic state of the system induced. In the south of Spain it is usual to ascribe the occurrence of leprosy to that cause.

SECTION VII.—GELATIN.

Gelatin is found in its most pure form in isinglass and in dried gelatin: the former derived from the sturgeon, and the latter from various parts of animals.

It exists very largely in the skin, horns, hoofs, tendons, and bones of animals, and in a less amount in the flesh. Hence we obtain it from calves' feet and cow-heel when boiled for that purpose, from the shin and other parts of beef when prepared for soup, and from bones which have been broken and boiled for many hours in water. Whether therefore as jelly or in soup, this substance is largely eaten; and yet it is affirmed even to this day that it is innutritious, and therefore worthless as food. This assertion is avowedly based upon experiments which were long ago made in France and Holland, and proved that an animal could not live on gelatin alone, but not that gelatin, when added to other substances, does not nourish the body. I have pointed out the fallacy involved in the objection on many occasions, and it has been long admitted by Pereira and Carpenter, in their excellent text-books; and yet even in the latest publications on diet, and in reviews of the present year, the objection has been continued. My own experiments have proved that gelatin, like albumen, is transformed within the system, and leaves the body as urea, and hence it must have played its part in nutrition; but whether its nutritive value is quite equal to that of albumen is another question.

I believe gelatin to be a valuable food, and every one knows that, with the addition of wine and other substances, it is a very agreeable one. It is, however, very probable that it is not an economical food as it is ordinarily prepared, but it may be cheaply obtained in soup from bones.

SECTION VIII.—EGGS.

Eggs are very valuable when used as adjuncts to other food, since they consist chiefly of nitrogenous matter, but, being deficient in carbonaceous material, they must be eaten with bread or other carbonaceous food. There is more carbonaceous matter in the yelk than in the white, from the oil which is found there; but for the general purposes of nutrition the whole egg is to be preferred to an equal weight of the yelk only. The shell contains a noticeable quantity of the salts of lime, but as it is not eaten by man, the analysis is made upon the contents of the shell only. This shows that the egg consists of about 11 per cent. of fat, 75 per cent. of water (when the white of egg had been thoroughly dried), 15¼ per cent. of carbon, and 2 per cent. of nitrogen. The economy of this food depends upon the price charged for it, since it is not a food essential for nutrition. If we take an ordinary-sized egg we shall find it weigh from 1¾ ounce to 2 ounces, and when cheap the first size will cost ½*d.*; and thus, for 1*d.*, 240 grains of carbon and 35 grains of nitrogen will be obtained. This contrasts favourably with meat in nitrogen, but it shows it to be a dear food in reference to the carbon. The more suitable comparison is, however, with milk, and it will be shown that when new milk is 2*d.* per pint, eggs are, so far as nutritive elements are concerned, the cheaper food. Practically only the eggs of the common fowl are used as food; for although those of the duck, turkey, and goose are also sold for that purpose, the quantity of them is infinitely small when compared with those of the common fowl. The duck's egg is larger than that of the fowl, and when sold at the highest price of fowls' eggs is somewhat the cheaper food; but in flavour it is not equal to fowls' eggs. In certain districts of the sea-coast seagulls' eggs may be obtained in great numbers for the trouble and risk of robbing the nests; and in certain parts of Yorkshire I found them in the peasants' houses. They are as large as two ordinary fowls' eggs, and yet when sold only realise the price of one egg, and hence are a very cheap food. In some instances they have a fishy flavour, and the whole of the egg is not otherwise so agreeable as that of the common fowl; but I have eaten them, and regard them as a good and agreeable food. Their supply would be limited to a certain part of the year, but wherever they can be obtained without serious risk to life, their use should be encouraged.

SECTION IX.—COW'S MILK.

Milk, next to bread, is as truly a necessary food as any which enters into the dietary of an adult, and should be obtained by every person in the kingdom; whilst in reference to the dietary of very young children it is the essential food on which life and health depend. It is found in four forms, viz., new milk, skim milk, buttermilk, and whey; but, besides these varieties, it varies much according to the cow whence it is derived, the upland or lowland pasture and the other food which is supplied, the season of the year, the period of the day, and the distance from the time of last calving.

There are two main elements in the milk, viz., the casein or cheese, and the fat which is made into butter, besides the subordinate elements of sugar of milk, lactic acid, and various most valuable salts. Some cows yield milk richer in cheese and poorer in fat, and others milk richer in fat and poorer in cheese, whatever may be the food which they usually obtain, and hence at the farm are known as butter cows and cheese cows respectively. The grass of the rich meadows and lowlands produces far richer milk than that of the mountain sides, so that the quantity of butter produced from the milk varies much, and the quality of the cheese made from it varies more. In Wales it is common to add the milk of the ewe, to that of the cow which is fed upon the mountain only, and thus to improve the quality of the cheese. It is said that stall-fed cows, and those which are kept in towns, yield a larger quantity of butter than others ; but if this be so it must be rather from the quality of the cow than from the comparatively unhealthy conditions of stall-feeding. Whatever kind of food and management tends to fatten the cow lessens the supply of milk. Milk is richest in the early spring season, when the fresh herbage is abundant. It contains the greatest amount of nutritive matter in the evening, whilst the morning's milk, after the use of water and the night's partial absence of food, is less valuable. This has been proved by Dr. Hassall, Professor Boedecker, and others, and is shown in the following table :—

NEW MILK.

	Morning.	Noon.	Evening.
Solids	10 per cent.	...	... 13 per cent.
Butter	2·17 ,,	... 2·63 per cent.	... 3·42 ,,
Cheese	2·24 ,,	...	... 2·70 ,,

The milk yielded by the cow soon after calving is particularly rich, apart from the colostrum or beestings, which only then occurs ; and in proportion as she approaches the next period of calving, the quality and quantity of the milk lessen.

With all these sources of variation in the quality of milk, it cannot surprise that there should be diverse statements as to its exact composition ; yet it is probable that no important error will arise from the application of the analysis of average samples.

New Milk.

New milk is the most perfect food which exists, since it is adapted to the wants of the young as well as to those in later life, and contains in due proportion carbonaceous, nitrogenous, and saline ingredients. Each pint contains 546 grains of carbon and 43¾ grains of nitrogen. Its cost is not anywhere in England less than 1*d.* per pint, and in such places the above quantities will be obtained for 1*d.* ; but when 2*d.* per pint is charged for it, it becomes nearly as dear as the best joints of meat, since for 1*d.* only 273 grains of carbon and 22 grains of nitrogen are obtained.

There are numerous persons who believe that they cannot take milk without it disagreeing with them; but in the course of the largest experience amongst the out-patients at the Hospital for Consumption, where milk enters into every dietary, I scarcely recollect a case where this objection has not been overcome on trial. The plan to be pursued is to take the milk hot, and in small quantities at a time, and substitute skim milk for new milk, if necessary. Where buffalo milk is the only kind obtainable, as in Egypt, it is often necessary to skim the milk, since the flavour of the butter is strong and often disagreeable. There is no especial advantage in drinking the milk when it is warm from the cow, except as a proof that the milk is quite fresh, for it will be equally good if it be artificially warmed. As boiling milk coagulates the albumen and causes it to form a skin upon the surface, it will suffice for all purposes to heat the milk to 120° to 130° only.

Skim Milk.

Skim milk differs from new milk only in having lost nearly all the butter, and in having gained some acidity in proportion to its age and the atmospheric conditions. The system pursued in Devonshire of heating the new milk for some time causes all the cream to rise to the surface, and when the milk has been skimmed scarcely a particle of fat remains in it; but usually, when the milk is cold when skimmed, some portion of the butter remains after the first skimming, and if this should be allowed to continue, the milk is more valuable than that obtained in Devonshire. When it has been kept long, or when the atmospheric conditions are unfavourable, the milk becomes sour, and the curd deposits on its being heated. Such milk cannot therefore be cooked, and so far its value is much lessened. An average sample of skim milk contains, per pint, 437 grains of carbon and the same quantity of nitrogen as is in new milk. Its price varies from ¼*d.* to 1*d.* per pint, and therefore its economy varies also.

	Carbon.	Nitrogen.
Thus, at ¼*d.* per pint, there will be obtained for 1*d.*,	1748 grains	175
,, ½*d.* ,, ,,	874	87½
,, 1*d.* ,, ,,	437	43¾

At the first-named price it is an exceedingly cheap food, and even at ½*d.* per pint there is no animal food—except butter-milk, perhaps—which is cheaper. The fat which it has lost in the cream can be readily supplied by adding a little suet when the milk is made into puddings, and so effect a considerable saving. Thus :—

	Carbon.	Nitrogen.
1 pint of new milk, costing 1*d.*, yields for 1*d.* .	546	43¾
1 pint of skim milk costs ½*d.*, and yields for 1*d.* .	874	87½
And when ½ an ounce of suet is added to each pint, costing ¼*d.*, the nutriment in 1*d.* worth of the compound will be	913	58

showing a large balance in its favour. When the skim milk is not at all sour, and is taken when hot, there are scarcely any persons in whom it disagrees. When the suet is added, the milk may not agree so well with some persons.

Butter-Milk.

Butter-milk is that part of the cream which is left after churning, and is very like skim milk in composition. As, however, the cream in small dairies is kept for several days until a sufficient quantity has been collected, the milk which is skimmed with the cream, and which subsequently becomes the butter-milk, is more or less sour, and has lost a portion of its sugar of milk ; and hence in flavour and in its non-submission to boiling is inferior to skim milk. When the acidity has arrived at a certain point the cheesy matter is thrown down from the butter-milk, and the whole substance becomes thick like blancmange, and may be lifted about like an elastic solid. Such is the state in which it is largely eaten in Ireland with the potato dietary. The composition is 419 grains of carbon and 43¾ grains of nitrogen to the pint ; and as it is nearly always sold at half the price of skim milk, it may generally be purchased at ¼*d.* per pint, and then would offer for 1*d.* 1676 grains of carbon and 175 grains of nitrogen, and, with skim milk at ½*d.* per pint, is the cheapest food at our command. There are, however, many places where the value of butter-milk is the same as that of skim milk, and even greater, for it not unfrequently contains lumps of butter, whilst the skim milk may be quite destitute of fat ; and in such cases the nutritive value per pint would be higher than that just recorded, but lower for the sum of 1*d.*

Whey.

Whey is much inferior to the other kinds of milk, since it has lost both its cheesy and its fatty matters, but as it retains all the salts of the milk with the sugar of milk and lactic acid, it possesses nutritive properties.

The quantity of carbon and nitrogen which is found in each pint of whey is 193 grains and $14\frac{1}{2}$ grains, and hence it might well be used as a beverage, instead of water or alcoholic fluids. It is not, however, at all common in England to use it as human food, but whoever keeps a cow, whether the rich or poor man, gives the whey to the pigs. As whey has no marketable value, it is to be regretted that the poor do not consider it a food good enough to be used as a beverage. It has already been stated that an inferior kind of butter is sometimes made in South Wales from the small portions of butter which are left on whey which has been made from unskimmed milk, and so far whey made from unskimmed milk is likely to be more nutritious than that made from old milk.

SECTION X.—CHEESE.

Cheese varies in nutritive value according to the relative amounts of butter and casein which it contains, and to its state of soundness; but it varies in marketable value, also, according to the flavour. When made from new milk alone, or with extra cream, as in Neufchatel, and other cream cheeses, it contains the highest proportion of fat; and when from skimmed milk, the least proportion; but there are between these extremes numerous qualities, according to the habits of the several farmers. Besides these causes of variation are all others to which reference has been made as to the value of new milk, for as is the milk used, so will be, *cœteris pari-*

bus, the cheese produced from it. The mode of manufacture also materially influences the flavour. To this, as well as to the excellent quality of the milk, must be attributed the special value of Stilton and Cheddar cheese; and by adopting it in Ayrshire a quality of cheese is now produced on a farm there which obtains nearly as high a price in the market as those celebrated kinds.

In point of economy, the highest priced cheese is not by any means to be preferred, for the fine flavour is a matter of luxury, rather than of necessity. The cheapest cheese, on the other hand, is not the most economical, except under certain defined conditions, for if it be too new it is tough, and if it be old it is hard, so that in both alike it will be imperfectly masticated. When, however, it is obtained at from six to eight months old, at the price charged in South Wales and Somerstshire, viz., 2½*d.* to 3½*d.* per lb., it is the most economical form of cheese.

When cheese of any kind has undergone deterioration, whether from imperfect preparation, bad keeping, or age, so that it has acquired a keen flavour, it is less valuable as food. Were it not for this cause, the large rich American cheeses would be far more economical than an ordinary English cheese, since a finer quality in reference to the amount of fat is sold at a lower price. Any cheese having undergone these changes is more apt than before to induce derangement of digestion.

Regarding cheese of all kinds as a whole, there are grave doubts whether it is so economical a food as its composition seems to indicate, for it is highly probable that, if a large quantity be eaten, only a portion will be digested. This has been proved in my experiments from the fact that the increase in the emission of nitrogenous products, when cheese had been added to the food, was very much less than the cheese would have yielded had the whole of it been taken into the blood, and hence a large portion of the cheese must have left the body unused. It is wise therefore, as a practical question in a dietary, to limit the quantity of cheese, so that never more than one ounce shall be taken at a meal. If cheese have the indirect action which has always been attributed to it—that of promoting the conversion of other food—a very small quantity will act quite as effectually as a larger one; but, whatever may be its mode of action, it is quite certain that those populations who use the cheap kind very largely, on account of their poverty, and who have been accustomed to its use from their infancy, are the worst fed and least healthy looking of their class.

A fair specimen of an ordinary kind of cheese yields 2660 grains of carbon (besides free hydrogen), and 315 grains of nitrogen in the lb.; and if we select 8½*d.* per lb. as a medium price, the quantity of each for 1*d.* will be only 313 grains and 37 grains. The cheap skim milk cheese of South Wales and the south-western counties yields less carbon, because it possesses less fat, and more nitrogen, because it has a larger proportion of casein; and if 3½*d.*, per lb. be regarded as a medium price for it, the quantity of carbon and nitrogen which will be obtained for 1*d.* is 671 grains and 104 grains. The dearer kinds contrast favourably with meat in economy, so far as nitrogen is concerned; whilst the cheapest kind offers much more nitrogen and less carbon than is found in skim milk, costing ½*d.* per pint.

SECTION XI.—TEA, COFFEE, AND CHICORY.

Tea.

It is to be remarked that these substances, which are now regarded universally as necessities in diet, and to which many ascribe hidden virtues in the nourishment of the poorest classes, are of very recent introduction; and yet, before they were introduced, all classes lived well without them. We need not go back further than the present century to recollect the time when, although in use by the rich, they formed no important part whatever of the dietary of the masses of the people, and hence it might be asked whether the foods which were formerly in use would not, if now used, nourish the body at least as effectually as their modern substitutes. I confess to the belief that they are necessities in food, not from the requirements of the body, but from the acquired habits and tastes of the people, and shall easily show that they are much inferior in nutriment to the milk of former times.

The properties upon which the value of these substances almost exclusively depends are the volatile oil which gives flavour, and a peculiar substance called theine in tea, and caffein in coffee—the former being the test of the tea merchant, the latter of the chemist. In estimating the value of tea, the merchant takes a portion, of the weight of a new sixpence, and infuses it for five minutes in a covered tea-cup filled with fresh-boiled water, and without any other substances added, judges of its merits by the taste; and in doing so follows the practice of the Chinese in their ordinary mode of drinking tea. Hence, both parties take a very weak infusion; and it should be added that only a very small quantity is drunk at one time. In ordinary life a judgment is formed from a strong infusion,—one which has been made much more than five minutes, and contains milk and sugar; the test being chiefly the depth of colour and a certain fulness of body. But few prefer delicacy of flavour to depth of colour and fulness of taste. There are also some who prefer the flavour of flowers, which have been artificially added to the tea, as, for example, the orange-flavoured tea. This is very evanescent, is very quickly removed by hot water, and the tea which is thus flavoured is almost always of inferior quality.

Whenever an infusion is made, there are other substances than those which I have mentioned extracted, as for example, colouring matter, gluten, and tannin. The two latter would be agents of importance, if the quantity of them which the infusion contained were considerable; but as it has been shown that whilst of gluten alone the leaves possess 20 per cent. of their weight, boiling water will only dissolve 16 per cent. of all the principles of the tea combined, so that only one-sixth part of any quantity of tea is used as food. It is true that there are tribes who eat the leaf after the infusion has been made, and others who powder the leaves and eat them with other important articles of food; but such is not the practice here, and it is only to the quantity of material which hot water can extract in a few minutes that we must look for the action of tea.

Tea is a powerful agent when taken into the system, and acts with great rapidity. This was proved by many hundreds of experiments made by me in 1858 and 1859, and published in the "Philosophical Transactions" of 1859, which show that immediately after tea has been taken the quantity of carbonic acid emitted by the lungs, and the quantity of air inspired, have been increased, whilst there has been greater depth and freedom given to the respiration. It is chiefly in its power to increase the respiratory process that it acts so favourably, and promotes the transformation of starchy and fatty food; but in addition to this, it tends to increase the action of the skin, and by inducing perspiration to lessen the heat of the body. Its action upon the respiration takes place whether the infusion be drunk when hot or cold.

The action of both tea and coffee, but particularly the former, upon the brain is well known, preventing sleep, and inducing in many persons extreme excitability and irritability. The importance of this action is not so well appreciated as it ought to be, but I am fully persuaded that it has often a most injurious influence upon health, and even upon sanity. I know of many cases of over-worked brains where it has been found absolutely necessary to prevent its use; and of others who, in order to avoid an irritable state of mind, must intermit its use from time to time.

When the poor make a very weak infusion—as for example, a very small teaspoonful of tea in a teapot full of water—the beneficial action must be chiefly due to the hot water, and the milk and sugar which are added render the beverage more palatable. As water is necessary to the system after solid food has been taken at a recent meal, and heat supplied directly by the water is grateful, it is impossible to doubt the inference, that the great comfort which the poor experience from their cup of tea is due rather to the pleasant fluid, than to any powerful qualities in the tea itself.

In selecting a tea on economical grounds, a moderately priced kind is better than one at either extremes. It should be composed of leaves exclusively—that is, it should be free from stalks. The larger are the older leaves, and have a stronger and rougher flavour than the smaller and younger ones, but they do not differ materially in the chemical elements of which they are composed. Green tea is produced from the same tree that yields the black tea, but it is prepared chiefly from the young shoots, and is rolled very closely together in its manufacture; whilst the black tea is more commonly made of the larger leaves, and undergoes a degree of fermentation which gives it its black colour. Of the two, green tea has usually the more delicate flavour, and as it is rolled closely, a given weight of it scarcely occupies half of the space taken by black tea. Hence if, as is usually the case, the quantity of tea is measured and not weighed, an infusion of green tea will be twice or thrice as strong as an infusion of the same volume of black tea. To this should be attributed, at least in chief part, the greater effect which green tea exerts over the system.

The following figures will establish the above-mentioned facts. They show the weight in grains of an evenly taken moderate-sized caddy-spoonful of tea, and the number of such spoonfuls which are found in a pound.

BLACK TEAS.

Kind of Tea.	Weight of a Spoonful. Grains.	Number of Spoonfuls in a Pound.
Oolong	39	179
Congou, inferior quality	52	138
Flowery Pekoe	62	113
Souchong	70	100
Congou, fine	87	80

GREEN TEAS.

Hyson Skin } Not now imported into this country	58	120
Twankay... } Not now imported into this country	70	100
Hyson	66	106
Fine Imperial	90	77
Scented Caper, an artificial preparation	103	68
Fine Gunpowder	123	57

The commonest kind of black tea, consisting of large leaves and stalks, is called inferior congou; whilst smaller leaves, with a finer flavour and with less admixture of stalks, are found in the finer qualities of congou and in souchong. Oolong is rolled very loosely, and is generally a fine tea, but from its peculiar flavour and almost colourless infusion, it has the qualities of a green tea, and is used to mix with other black teas. The cheaper kinds of green teas are now sent almost exclusively to America, but hyson and gunpowder still hold their place in English estimation. A very agreeable mixture of moderately fine teas consists of kaisow and oolong in the proportion of three parts of the former to one of the latter, or of kaisow or some other fine kind of black tea with flowery pekoe; and if a green tea of good quality should be desired it is better to select the fine gunpowder, and not to add more than one part of it to three parts of black tea.

It should be added, that all the qualities of tea may be derived from the same farm or neighbourhood, and the whole produce together is called a "chop;" but the quality varies with the year, and hence the kinds which should be selected for home use must vary from time to time. The finest qualities are not exported from China, and the best teas which may be met with out of that country have been sent to Russia. The teas which are now produced in India are fine in quality, and strong in flavour, and hence fetch good prices, and are used chiefly for mixing.

The best tea for the poor is congou without stalks.

The place which tea occupies in a dietary is scarcely that of a food, for it is never taken in the place of substantial food, but always with or after a meal consisting of solid food. When it is taken almost alone,—as after excessive fatigue, or to keep the mind active, or to relieve a headache,—it is in the nature of a medicine, rather than of a food. It promotes the transformation of other food, and enables it to be eliminated from the body; and therefore, when food has been taken in excess, or when it is not digested with sufficient rapidity, its action is very beneficial. In the dietaries of the poor, where the meal must consist chiefly of bread—a substance not very savoury, nor digested with great rapidity—the warm tea enables the recipient more readily to masticate and swallow the dry bread, or the bread with very little fat upon it, and, so far as the tea itself has any action, to digest it more quickly. Tea does not supply food, neither does it enable the body to live with less food than it would otherwise require; and it is quite possible to select foods, which on the one hand do not need this kind of aid, and on the other, when eaten hot, supply aid at the same cost as tea, whilst they offer a much larger amount of nourishment. Tea should be essentially the adjunct of the food of those who eat too much food; but it should be, as far as possible, avoided by those who do not obtain sufficient food, with a view of allowing all the money to be spent upon nutritious foods. As far as we may measure the nutriment contained in tea by its chemical constituents, the amount of nitrogen (which is contained in the theine and gluten) in an infusion of tea, does not exceed ten grains from an ounce of tea costing 3*d.*, whilst more than the same amount would be obtained from a quarter of a pint of milk. The amount of carbon is too insignificant to be mentioned.

The lightness and cheerfulness which follow the use of tea, has been noticed in all countries and times since its introduction into general use. Here it is said to be "the cup which cheers and not inebriates." In China it is affirmed that "tea is an exceedingly useful plant," and that "if we drink it, the animal spirits will become lively and clear;" also, that it tends to "clear away impurities, to drive off drowsiness, and to remove or prevent headache." These results may be referred to one or more of three modes of action: 1st, the removal of the sense of oppression at the stomach, which occurs after a full meal, or when the digestive process is not sufficiently active, and which always induces a sense of heaviness and depression of spirits. 2nd, the quickening of the vital processes as seen by the respiration. 3rd, the action upon the brain, for quickness and clearness of thought, and entire absence of drowsiness, are certainly induced when strong tea has been taken at night; and 4th, the removal of the dry and hot state of the skin which follows a full meal, and particularly when much meat and alcohol have been taken, and which is, also, under ordinary circumstances, more frequently present in the evening than in the morning.

Hence, to sum up:—

Tea may be useful to the corpulent, the over-fed, after a full meal; at the end of the day when the food has accumulated in the system; when digestion and other vital changes proceed slowly; for the old, for hot climates, for the sedentary, for those who do not perspire freely, for those who eat much starchy food, for soldiers on the march in hot climates; and as a restorative in cases of drowning, or wherever it is desired to increase the respiratory functions. *Tea may be hurtful* in the absence of food, after a long fast (as at breakfast), to the poor and ill-fed, the spare, and the young. It is not adapted to sustain exertion, to prison dietaries, to low temperatures, nor to hot climates when the appetite is defective and the skin active, nor to those who perspire too freely, neither should it be taken with our principal meal.

In preparing tea for the meal the following directions should be followed :—

1. Make the tea-pot quite warm, and keep it warm, until the tea has been introduced.

2. If strong tea be required do not omit to use sufficient tea.

3. It is not so convenient to weigh the tea, as to measure it, but if different samples of tea be used, an uniform strength can be obtained only by weighing the tea.

4. Use fresh and soft water. The Chinese directions are, "take it from a running stream, that from hill-springs is the best, river-water is the next, and well-water is the worst." The best water in this kingdom is probably that used at Glasgow, and obtained from Loch Katrine, and the next quality is probably that supplied to Manchester. When clear rain water can be obtained, it should be preferred.

5. Add a little carbonate of soda—say, as much as a threepenny bit held in the thumb and finger will take up.

6. Let the water be freshly boiled—that is, do not use water which has been previously boiled—and use it immediately it boils. The Chinese say, "the fire must be lively and clear, but the water must not be boiled too hastily. At first it begins to sparkle like crabs' eyes, then somewhat like fishes' eyes, and lastly it boils up like pearls innumerable, springing and waving about." The tea-tasters in England use that water only which has been newly boiled.

7. Fill up the pot at once, stir the leaves and let the pot stand over a lamp or near the fire for five minutes.

8. When the tea-pot is placed upon the table, cover it, if necessary, with a woollen cover to keep in the heat. It may thus be kept quite hot for more than half an hour.

For fuller details respecting tea, see my paper on tea in the "Journal of the Society of Arts" of Feb. 15, 1861, and Mr. Fortune's celebrated work on the same subject.

Although I have placed both tea and coffee at the head of this article, I have chiefly referred to tea, for in many respects coffee has a similar action, and the description of one may almost suffice for the other; but there are a few circumstances of importance which specially refer to coffee, and those I will now mention.

Coffee.

Coffee tends to lessen the action of the skin, to increase the action of the heart, and, when strong, is apt to act upon the bowels; whilst tea tends to increase the action of the skin, and does not usually increase the action of the heart otherwise than by the hot water with which it is taken. Hence so far they are adapted to different classes of persons, those who usually perspire freely and those who have dry skins; and to different climates, coffee being more adapted to cold and tea to hot climates; modified, however, by the special tendency of the skin in each individual. The action of coffee upon the respiration is somewhat less than that of tea, but like tea it contains an extremely minute quantity of the elements of nutrition, and is valuable almost entirely as forming an agreeable hot beverage, and as promoting the digestion and assimilation of foods. It is more fitted for breakfast, whilst tea is more adapted to the requirements of the body at night. In its action upon the skin it resembles alcohol, whilst that of tea is opposed: hence brandy and coffee is a more frequent compound than brandy and tea; and both coffee and tea are fitted to aid the expulsion of alcohols, and so far are remedies or antidotes.

In preparing coffee, the freshly ground grains should be always selected and mixed with chicory in the proportion of four parts of the former to one part of the latter. The pot should be made hot immediately before the coffee is introduced, and some recommend that the dry coffee should be held over the fire for a short time. The water should be boiled when used, and poured into the pot as rapidly as possible, and the pot should be kept near the fire until the infusion has been made.

If the coffee be boiled, or if, after an infusion has been made, it be boiled again for a few minutes, it causes wakefulness and increases the action of the heart more than when made in the more usual manner. It matters not whether the infusion be made in a jug or a saucepan well covered, or in any other vessel, provided the above-mentioned conditions have been attended to; except so far as the difficulty will arise in separating the clear infusion from the grounds, and for the latter purpose it is usual to employ strainers of cloth or metal. The use of cloth is apt to give a flavour to the coffee, for it is difficult to keep it perfectly clean; and the employment of a metal strainer has the possible inconvenience of allowing the water to run through the coffee too quickly, and then to leave much soluble matter in the coffee grounds. The simplest and cheapest pot is the *cafétière* in universal use in France, by which a clear fluid is obtained, and by far the greater portion of the soluble matter extracted. There are however many other more expensive apparatus now in use which are very efficient.

Chicory.

Chicory is very commonly used with coffee, and is an adulteration only so far as it is of less marketable value than coffee, for my experiments have proved that it, like coffee and tea, increases the respiratory process, and thus has an action similar to that of those substances. Its effect is however less considerable, and therefore it is not equal in value to either tea or coffee, but its flavour is approved, and it is regarded as a valuable addition to coffee. It varies much in quality and purity, and therefore care should be exercised in its purchase. It is also more economical to purchase it separate from the coffee, and to mix the two in such proportions as may best please the consumer.

SECTION XII.—ALCOHOLS.

It would be inconsistent with the plan of this work to enter largely into the discussion of the use of alcohols, both because the subject is one of great extent, and because opinions upon it vary very greatly, and I shall therefore content myself with a few practical observations.

There are three distinct classes of fluids included under the head of alcohols, viz., ardent spirits, wines, and beer.

Ardent Spirits.

Ardent spirits consist almost entirely of spirits, colouring and flavouring matters, and water, of which the first and the third are the active agents. The proportion of spirit varies much, and the maximum is limited by law, but the minimum varies with the honesty of the dealer, and the price charged for the compound. The quality also varies much from the fine clear spirit which is met with in the best specimens of spirits of wine, to the rough fiery spirits containing much fusil oil and free acid, distilled from inferior and damaged grain, and which within a few years was sold on the banks of the

Ohio for 8*d*. per gallon. The finest quality of spirits, as for example, fine Cognac, is prepared from good spirits of wine, whilst the inferior is made from inferior spirits; but within the last few years coarse spirits have been introduced largely into the Cognac districts, and the quality of the brandy has been deteriorated. The flavouring substances are in part introduced artificially, in part obtained from the distillate, and in part produced by time. That of gin and Hollands is owing to the admixture of the essential oil of juniper, that of rum to the distillation from the sugar and molasses, and the admixture of burnt sugar which is used to colour the spirit; whilst that of brandy is in part added artificially as in the manufacture of English brandies, and in part is produced by changes which proceed after its manufacture. The latter, as well as those found in rum, are called ænanthic ethers, the nature of which has not yet been fully investigated; and although the chief action of ardent spirits must be due to the alcohol, the finer and older spirits owe something at least to the ethers which they contain.

There is some popular knowledge as to the different actions of these three principal kinds of spirits. Thus, in the West Indies old rum is drunk largely and with impunity, whilst those who drink brandy soon fall into disease. Gin-drinkers soon assume an emaciated and wretched appearance, which is in chief part due to the increased action of the kidneys, whereby the body becomes drained of its fluids, and incessant thirst is induced; and in other part to the depressing influence of the spirits by which the appetite for food is greatly lessened. It is impossible, from what we know of the actions of rum and gin, to believe that the latter could be drunk by sailors with the degree of impunity with which rum is taken. In my experiments into the influence of these agents over the respiratory process, it was shown that rum differed much from the others, since it largely increased that action, whilst gin as largely decreased it, and brandy exerted but little influence, yet tended to decrease it. Without pretending to explain the cause of this, the presence of sugar in rum may be mentioned, since that substance largely increases respiration; and without estimating too closely the ill-effects which any form of alcohol may induce, I do not doubt that good old rum is the least injurious. The proper place for these compounds is as medicines, and as such their value may be as great as their power; also as luxuries, but not as foods, and they should not find any place in mere dietetic arrangements. As they act as local stimulants to the stomach, and when in the circulation increase the force of the heart's action, and tend to lessen the action of the skin, they may be as useful in certain states akin to disease as they would be hurtful in other conditions.

Wines.

Wines contain other and more important agents than alcohol and aromas, such as sugar, and various salts and acids, all of which may be of service in the nutrition of the body. The broad line of distinction in the various kinds of wines is the amount of alcohol which they contain, and this alone constitutes the two large classes of strong and light wines. Alcohol is found in every kind of wine, and is produced in its preparation; but more is added to the stronger wines for the purposes of increasing their intoxicating qualities, giving special strength to their flavour, and preventing the occurrence of the acetous fermentation under the conditions of movement, climate, and age. The alcohol which is produced in the wine is of fine quality, whilst that which is added is usually a strong and rough spirit, produced from grain, and imported into the wine-exporting countries. The quantity varies from 5 or 6 per cent. in very inferior wines to 10 to 15 per cent. in fair light wines, 15 to 25 per cent. in the stronger light wines, and in ordinary port and sherry, and even to a greater amount in stronger specimens of the two latter wines.

The flavour of the wine chiefly determines its value, and this is dependent upon the quality and quantity of the alcohol, the amount of sugar, tannin, salts, acids, and the ethers which have been produced from the particular grape, or by the influence of time. The volatile ethers which are inhaled on smelling wine, exert a special influence upon the body, for whilst the wine when drunk may somewhat excite the respiratory processes, these, when inhaled in my experiments, lessened them.

All the elements which give value to wine except the alcohol which has been added to it, are found equally in the so-called light wines and the strong wines of Spain and Portugal; and hence ordinary claret is quite as valuable to the system under numerous conditions both of health and disease as port or sherry. This fact is neither so widely known nor so well appreciated as it ought to be; and I feel convinced that, whether as a luxury or a medicine, the so-called light wines should yet further supplant the intoxicating wines with which we are more familiar. I do not think that wine can be regarded as a necessary food; but, on the other hand, I am convinced that its use is quite unnecessary in the ordinary conditions of health. Its proper position is that of a luxury and a medicine.

Beer and Porter.

These substances contain many elements whereby they may be properly ranked as foods, as the sugar, gluten, and numerous salts, whilst the alcohol which they contain entitles them to be regarded as medicines also. In all cases, my experiments showed that they increase the vital changes of respiration, and maintain the increase for a considerable period. They differ as they are new and old, bitter or sweet, weak or strong. New beer may be weak as well as strong, but old beer or ale must have been made strong in alcohol to have prevented the acid fermentation. Some of the latter which have been kept for many years are known to contain 25 per cent. of alcohol, so that one pint affords five ounces of alcohol, nearly equal to seven ounces of brandy, and quite sufficient to produce serious intoxication.

Weak beer seldom contains more than 3 to 5 per cent. of alcohol; but mild ales, having the appearance of weak beer, often contain 10 to 15 per cent. of alcohol; and in proportion as ales advance in age they lose their sugar and gluten, and gain in alcohol and acid.

Bitter beers are thin and clear, and are perhaps more medicinal than any other kind of beer; but the good qualities are not at all deficient in sugar and alcohol; and when such is the case it is not perhaps very important whether the bitter principle has been obtained from hop, quassia, gentian, nux vomica, or any other similar substance in proper quantity.

Bottled ales contain a larger proportion of free carbonic acid than is found in cask ale, and if this do not offer any positive alimentary or medical advantage, it is grateful to the palate.

Whilst we cannot deny to beers the position of foods, it may be doubted whether they are necessary ones, and whether others cannot be found which offer the same advantages at a less cost. It is impossible to regard them as economical foods, whilst as medicinal agents they may have much value, and as luxurious foods they may supply a want in the present state of society.

Cider and Perry.

Cider and perry are drunk largely, much more largely than beer, in certain parts of the South-Western and Midland counties. In general properties they resemble beer, since they contain alcohol, sugar, salts, and acids, but are not equal to beer in nutritive qualities. The quantity of alcohol is nearly the same in medium qualities of both cider and beer, viz., about nine per cent.; but many samples of hard cider contain fifteen per cent., and are intoxicating liquors. Their use is said to lead to the occurrence of rheumatism from the presence of lactic acid, and it is believed that they prevent the formation of stone in the bladder.

SECTION XIII.—CONDIMENTS.

The substances which are the most commonly used as condiments in this country are common salt, various kinds of pepper, and mustard. All act by increasing the relish for food, and stimulating the digestive process; beginning with the mouth, where the flow of saliva is increased by them, and extending to the stomach and the whole of the alimentary canal. Hence their use is very great with defective appetite and repulsive food, and to persons who are advanced in life, as well as to many, whether well or ill, in whom the process of digestion is slowly performed; but they are less required by the young, and by those, of whatever age, who have been accustomed to take only simple food prepared in a plain manner. Common salt has also the advantage of supplying two elements which the body requires for its nourishment, viz., soda and chlorine, and hence is a true food as well as a condiment.

It cannot be doubted, I think, that the habitual employment of these substances should be restricted to the smallest amount which is compatible with health; for whilst common salt in considerable quantity is beneficial not only as a condiment and a food, but as a medicinal agent in the prevention of worms in the bowels, any excess of it in the blood impedes vital changes and leads to ill health; and the use of peppers renders the palate less pleased with the taste of plain food, and the digestive process and the movements in the bowels more dependent upon the presence of this stimulus. The required quantity of common salt for an adult is from $\frac{1}{4}$ to $\frac{1}{2}$ oz. daily.

There are numerous other substances which are taken as condiments, but they contain nutritive elements also: such are preserved ginger and nutmegs, marmalade, preserved olives, watercress, and garden-cress, all of which may be taken at discretion; also various pickles and sauces which are partly composed of pepper and vinegar, and which should be eaten with much moderation. Great care should be taken to avoid the use of these substances when artificially coloured, since the colouring matter has usually a poisonous character. Pickles and preserved green vegetables, as peas, when of a clear green colour, are almost always tinted with salts of copper.

PART II.

DIETARY.

CHAPTER IV.

THE DIETARY OF FAMILIES.

In the statements which I have to make in this chapter I shall address myself exclusively to those who are able to obtain, and do obtain, a suitable quantity and variety of food for their families, and to whom extreme economy in the selection of food is not of any importance. Hence my observations will be especially addressed to the higher and middle classes of society; but there are also many persons in England who, belonging to an inferior class, have the qualifications just mentioned.

The diversities existing in the conditions in which the various members of a family are placed, as well as the manifest variations in the wants of the body at various periods of life, render it necessary that I should consider each of them separately; and I purpose, therefore, to discuss the subject in reference to infancy, childhood, youth, adult age, and old age, in their order.

SECTION I.—DIETARY IN INFANCY.

It cannot be doubted that the proper food for an infant is the milk of the mother, or of a properly chosen substitute, since it is that which Nature has provided, and the propriety of the plan is attested by universal experience. This should, if possible, be the sole food until the infant has attained to at least three months of age. After the age of three months circumstances occur which render it advisable not to depend entirely upon that source. Such are—the drain upon the mother, the convenience of being able to leave the infant for a few hours when necessary, the possibility of failure of the supply from illness or other cause, and the deterioration in the quality of the mother's milk which always occurs after a certain number of months. But, in the absence of any imperative reason to the contrary, the infant may be fed by the mother or nurse entirely until it has attained to nine or ten months of age; or it may be partly fed from other sources after three months of age, at the discretion of the mother.

The most common reasons for feeding an infant are deficient supply of milk on the part of the mother or nurse, and deterioration in the quality of the milk. The former will be evident on careful observation of the insufficient fullness of the breasts, and of the want of satisfaction on the part of the infant; and if prolonged it will be further evidenced by loss of health. The latter is not so readily ascertained; but if the infant do not thrive, or is peevish, and no other cause is evident, it is always wise to assume that the mother's or nurse's milk is at fault; and this will be the more likely if the health or the state of constitution of the mother is not good, and if the infant be over six months of age. This fact is not so well understood by mothers and nurses as it should be, and, in the absence of improvement in the nutrition of the infant, it is advantageous to seek another nurse, or to obtain another supply of food.

When food other than the mother's or the nurse's milk is required, it should be milk only; that is to say, it should consist of milk, without the addition of bread, arrow-root, flour, biscuit, or any other substance whatever, except sugar. The reasons for this are, that the milk still contains all the elements of nutrition required by the child, and that the absence of a nitrogenous principle in the juices of the stomach and bowels of the infant, either entirely prevents the transformation of starchy food, or very greatly lessens it. When infants have been fed with flour, it will be found that the stools are much larger than is proper for an infant, and, in fact, that the starchy matter is passing off unused.* This is a constant source of derangement of the liver, and a frequent cause of fits. But much more to be reprehended is the plan of feeding an infant with sop, consisting of bread, or biscuit, with water and

* See Appendix for remarks on Liebig's food for infants.

sugar, and with only a very small quantity, if any, of milk added; for as the foods other than milk and sugar are not digested, and as the quantity of milk is insufficient alone to support the infant, it follows that starvation, or some approach thereto, must occur. Again, some feed infants on cream and water, in the belief that they are thus offering a food richer than milk, but in so doing they fall into grievous error, and the child rapidly pines away. The explanation is, that the cream is composed entirely of fat, except the small quantity of milk which accompanies cream when skimmed off the milk; and fat by itself is totally inadequate to sustain life. It has been already shown that milk contains casein, or cheese, in large quantity, with sugar, and numerous important salts besides the fat, and all these are necessary to nutrition and growth.

Various attempts have been made to provide a kind of milk which shall nearly resemble the mother's milk, and it does not seem unreasonable to do so. Thus, as cow's milk contains more butter and casein, and less sugar than the mother's milk, it is advised to dilute cow's milk with water, to the extent of one-third, and even of two-thirds, and to add a quantity of sugar, either the cane sugar in common use, or the sugar which is obtained from milk. Others select ass's milk, because it contains very much less butter and casein, and very much more sugar than are found in cow's milk; but ass's milk is also much poorer than the mother's milk in butter and casein, and richer in sugar. Goat's milk is more readily obtainable in a few parts of the country, as South Wales, than cow's milk, and it is common to use it in substitution of, or in addition to, cow's milk. It exceeds cow's milk in butter and casein, but is somewhat inferior in sugar, and hence it may be said to have the supposed defects of cow's milk in an exaggerated degree. Moreover, it has a peculiar and not agreeable odour, arising from a peculiar acid (hircic acid), which is present in the butter. Ewe's milk is a very rich, thick, and agreeable milk, containing more butter and much more casein than are found in cow's milk, and having an equal proportion of sugar. Hence, if dilution of cow's milk be necessary, it is much more important that ewe's milk should be mixed with water.

Generally speaking, however, wherever milk is obtainable it is that of the cow, and if that of asses could also be obtained with facility, it would be wise to use each in equal parts. Ass's milk is insufficient food when taken alone. If the cow's milk be pure and good, it is wise to dilute it to the extent of one-third, and to add fine sugar to it; but if it be not very good, or if it be that which is supplied in towns, it is usually much better to give it without further dilution. This must, however, depend somewhat upon the state of the constitution and health of the infant, for if they are robust, the dilution will be better borne than if they are feeble, and the infant be not fat; also upon the age of the infant, for it will bear stronger food as it advances towards one year of age. Some persons think it very important that the sugar which is used should be the sugar obtained from milk, and thence called sugar of milk; but as the nutritive properties of sugar of milk and ordinary sugar are the same, and as the object of sweetening the milk is more readily effected by the use of ordinary loaf sugar, the latter is perhaps preferable.

The most convenient mode of administering the food is by the bottle, with a syphon tube, with a cow's teat for the nipple, great care being taken to wash the bottle inside and outside, twice or thrice a day, with hot water, and to keep the teat very sweet and clean. When the teat is kept in gin and water, or spirits of wine and water, the greatest pains must be used to wash all the spirit off it on each occasion of its use, since a portion of the spirit becomes incorporated with the teat, and it is a substance injurious to the health of the infant. The India-rubber teats are largely used, but they cannot be kept so clean and so free from disagreeable flavour as the cow's teat; yet, in the absence of the latter, they must be used, and great care exercised, by washing daily, to keep them in a state fit for use. A sour, or foul state of the bottle or teat is a very frequent cause of loss of the appetite and health of the infant.

When the infant is partially fed with cow's milk it is most convenient for it to take it during the day-time, and to have the comfort and advantage of the mother's or nurse's milk during the night; but where the mother's milk is insufficient to supply the wants of the infant during the whole night, it is better to feed it before the mother retires to rest, and again in the early part of the morning.

The milk should always be administered, not merely new-milk warm, but of the temperature of the infant's body, or nearly so, and the temperature maintained so long as the infant is taking the milk. This can be the most conveniently effected by immersing the bottles in water of the temperature of 98° or 100°. It is particularly necessary in cold weather, and rests upon the fact that the temperature of the infant should be maintained; and therefore heat should be given to, rather than taken from it. Great care, however, must be taken that the temperature of the milk does not exceed 98° to 100°.

The food, of whatever kind, should be supplied at regular intervals during the day and night, but the intervals may be somewhat prolonged during the night. Until four to eight months of age, according to the development of the infant, food should be given every two hours during the day, and every three hours during the night, and if it be of the kind already mentioned, no other limit need be placed upon the quantity than the desire of the infant. There is more usually danger of giving the child too little than too much milk, and if the growth be not very satisfactory, and the child be restless and peevish, without other evident cause, it may be assumed that the food is insufficient in either quantity or quality. The quantity which an infant of two or three months old takes, when the supply is good and abundant, is not less than three pints in the twenty-four hours, and during the period of infancy this quantity is generally exceeded. When the child possets, many assume that the milk is given too abundantly, or that it is disagreeing, but in neither respect is the assumption correct. Vomiting is the natural mode of relief when the stomach has received more than it can contain conveniently at the moment, or when the child has been thrown about very much, under the idea of amusing it, and occurs constantly in well-fed and healthy infants ; whilst curdled milk is the natural state after milk has been introduced into a healthy stomach. If the curdled milk be formed into a mass, and be very large in quantity, it may be assumed that the secretions of the stomach require correction; or if in that case the infant be fed on cow's milk, it is probable that the milk should be somewhat more diluted. There are also some conditions attended by sickness, in which it is better to take away a portion of the cream; but this is more particularly the case when infants are fed on the milk of the buffalo, or the goat.

After the period above mentioned, the infant is capable of taking a larger quantity of food at a time, and the intervals between the meals may be prolonged to three hours during the day, and to four hours during the night.

When the child has arrived at nine or ten months of age, and has been nursed by the mother or nurse during the whole period, it will be time for the supply of food from that source to cease. This is in part owing to the supply usually diminishing about that period, and also to some changes which the quality of the milk undergoes, which, although not very constant in a chemical point of view, materially affect the growth of the child. Up to a period of six months the change is chiefly in a diminution of the supply of sugar, but at a later period, the milk becomes poorer in all its solid constituents. It is also rare that the mother or the nurse can supply sufficient food for the infant after that period, without her own health suffering, and the quality of the milk being further deteriorated.

The condition of the child is but an imperfect guide in fixing this period; for if it be strong and in health, it will live well enough on cow's milk, and if it be feeble, it may well be questioned whether the mother's or nurse's milk is not in fault, and a fresh supply needed; and, hence, in the absence of conditions of disease, which can alone be judged of by the medical man in charge, no reason is offered why the change should not be made.

As strong broth and beef-tea are given by many persons at this early period of life, it is necessary to add a remark respecting them. It cannot be doubted that their use is very proper when milk cannot be obtained in sufficient quantity, and that they are much better foods than the sops which are frequently given; but, except under medical advice, they should not be used to supplant milk. Whenever they are allowed as foods, they should not be made very strong, nor be given in large quantities, and they should retain a fair proportion of fat.

Before closing this section I will add a few remarks in reference to the choice of a wet nurse. This is too frequently left to the latest moment, and a selection is made rather from necessity than preference. In addition to the fundamental question of general robustness of constitution, which must be determined by the appearance of the nurse, and the examination by the medical attendant, it is important to bear in mind that the quality of the milk which she can supply varies with her temperament, her peace of mind, and the sufficiency of her food. It has been shown that, taking extremes, the brunette supplies far richer milk in all its constituents than a blonde, both being of the same age, and fed in the same way. Hence a person of sanguine temperament, fleshy and fresh-coloured, is likely to supply the best milk to the infant; but as the infant's capacity for feeding depends upon its own temperament, and as it will closely correspond with that of the mother, the temperament of the nurse should not be widely different from that of the mother. Where, however, the mother is of very fair temperament and delicate frame, it will be quite proper to select a nurse somewhat darker in complexion, and much more robust in constitution; but a nurse of dark complexion and black hair should not be selected as the nurse of a child whose mother had very light complexion and light hair.

It has been proved that the solid constituents of the milk, and thereby its nutritive qualities, are much reduced when the nurse is unhappy. Also, that when the nurse has been insufficiently fed, the quantity of butter in the milk is much lessened, and that of mere water is increased. It may be fairly inferred that if these evils have existed for some time, the nurse is not so suited to supply food, as one who has been happy and well fed ; but if the latter conditions can be speedily corrected after the engagement of the nurse, the evils may not be considerable. Preference should, however, always be given to a nurse who has been sufficiently fed, and moderately happy, and during the continuance of her engagement it is essential that both conditions be maintained. The proper food for the nurse is stated under the section of adult age, at page 162.

SECTION II.—DIETARY IN CHILDHOOD.

Throughout the whole period of childhood milk should constitute by far the chief part of the food which is taken, and so far as may be practicable the milk of Alderney cows should be preferred. During the second year of life no food should be given in which milk does not form a part, and hence the diet must consist of milk and farinaceous materials almost exclusively. Such are bread and milk, arrowroot and milk, milk thickened with wheaten flour, and puddings made of milk with eggs, flour, arrowroot, sago, tapioca, and corn flour. The milk should be new milk and given without water. Arrowroot and sago must not be given with water only, since, as my experiments have shown, they are not digested in the absence of some nitrogenous principle, such as that supplied by milk, but pass off by the bowel unused. A good form of food is that of fine flour which has been well boiled in a cloth, and when cold, grated into a powder and boiled with milk. Care should be taken that the mixture is not too thick or the appetite will be too soon satiated, a large portion of the food will pass off undigested, and habitual constipation be induced; neither should it be too thin, lest the bowels should be excited to act too freely. A small tea-spoonful of the boiled flour with a proper quantity of sugar added is sufficient for half-a-pint of milk. Change of food is also desirable, and nothing will be better than biscuit powder or rusks when well dissolved. No artificial flavours should be added to food, except as a medicine when the child is in pain; and no condiment allowed other than a little common salt and sugar.

The food should be supplied at intervals of about three hours during the day, and once during the night, or at an early hour in the morning. If the child be sent to bed at 6 or 7 p.m., the interval between that and the breakfast hour on the following morning is much too prolonged for proper nutrition, and will lead to defective growth. Hence at the period in question food should be supplied at 6 o'clock or as soon after as possible in the morning, and this may be, if necessary, of milk which was obtained but not cooked on the evening previously. It should be given when warm, and thickened or otherwise as opportunity may offer. If a meal similar to the dinner be provided at this age, it should be given about mid-day; and with the early meal and the last meal to be given very soon before the child is put to sleep, there should be three others during the day.

In the third year of age and during the remaining period of childhood there must be a gradual addition of food given apart from milk, but yet so that milk is supplied at least thrice a day. This will be in the ordinary form of bread and butter, vegetables and gravy, and meat.

It is of the greatest consequence that food be given as early in the morning as the children rise. This may be of bread and butter only, or with milk whether hot or cold as may be convenient, and should precede the breakfast by an hour or more. The breakfast should consist of milk thickened with oatmeal, flour, or bread, and be as large in quantity as will fairly satisfy the appetite. In Scotland the children are early trained to eat oatmeal which has been stirred into boiling water when taken off the fire or when kept boiling on the fire, and called brose in the one case and porridge in the other. This when eaten with plenty of milk is a most nutritious food, except in the cases in which it causes relaxation of the bowels; but it is remarkable that Scotch families when settled in England soon allow this habit, which in Scotland they regarded as essential, to lapse, and feed their children upon bread and milk or the English milk porridge. No food is better, and none other need be sought for a child's breakfast, than milk with such a portion of oatmeal well boiled in it as the appetite and bowels will allow, and then poured over broken bread; but it is essential for the right use of the oatmeal that it be well boiled. In from two to three hours after the breakfast a piece of bread and butter should be given and accompanied by a little water or cold milk. The early dinner should be provided between 12 and 1 o'clock, and for a young child should consist of plenty of pudding in which milk forms a part, and of a potato with meat gravy added.

The age at which meat should be given to a child is a question open to dispute, and is not perhaps of the importance which has been attached to it, or rather, it is a question about quantity.

There can be no doubt that a child which has been well supplied with milk and farinaceous food properly cooked, has no need of meat up to four, six, or eight years of age, since in the milk he has received all the necessary elements of meat and in a form more readily capable of appropriation by the system than in that of meat; but on the other hand, if the milk have not been sufficient in quantity and quality, the defect may be in some part supplied by the use of meat; and if with an abundant supply of milk a small quantity of meat have been given, it is probable that no injury has been inflicted. When a child has been fed on the plan laid down in this work, the use of meat may be regarded quite as a luxury—to be exhibited first as gravy with the vegetables, and afterwards as solid meat cut into very small portions and eaten in a small quantity.

Hence at three or four years of age the dinner should supply a little potato with any reasonable quantity of meat gravy, if the latter have not been too highly seasoned and salted, in addition to the milk pudding. After that period and up to the limit above mentioned, the use of solid meat should be in small quantities, well divided, deliberately masticated, and eaten at first occasionally and then regularly. The meat should be well cooked and eaten hot, and the usual variety of white and red meats may be given.

The points on which I am desirous to lay stress and which must guide the mother, are these :—1st. With an abundant diet of milk, eggs, and farinaceous food, meat is not necessary. 2nd. With a spare diet of milk, meat should be given. 3rd. With milk pudding as a principal part of the dinner, the meat should be eaten after the pudding. 4th. Variations which are slight in degree are often well borne ; and 5th. With abundance of the food named and with the eager appetite of childhood, the use of savoury food is unnecessary, and the kinds of food in use should be few. With a pampered appetite the right kind of food is discarded, and an insufficient amount of nutriment is obtained. With a wisely trained appetite from infancy plain foods are eaten and abundant nourishment received.

A habit is arising of giving very strong broths and beef teas, and also raw meat to children who do not grow well. The latter is much to be condemned, since whatever immediate value it may have in improving nutrition, it will certainly lead to the production of worms within the body, and thereby do much harm ultimately. The former may be given in moderate quantity, but only of moderate strength.

Recurring to the pudding at the dinner, it may be remarked that as the child grows older solid puddings are better borne; but even then the fluid which is used to make them should be milk. Such are flour puddings with or without a few currants, egg puddings, with flour and suet puddings. Light flour and custard puddings are suitable for every period of childhood, and may be baked or boiled; but all flour puddings should be well cooked, and the comparatively insipid puddings made with sago and tapioca should not be too frequently given. Much variety of simple puddings may be provided, and if they are well cooked and be eaten with proper deliberation, the quantity allowed need not be limited. The crust, however, of baked puddings should be thin and not eaten in large quantities.

The meal which corresponds to the tea meal of the adult should consist of bread and butter and a cup of plain warm milk, and should be eaten at 4 to 5 o'clock. The supper meal for the reason mentioned above should usually be given, and at as late a period as possible, and should consist of plain milk porridge, varied sometimes by a milk and farinaceous pudding, or bread and butter, and accompanied by a little milk to drink.

There are three other questions which arise at this period of life, which are perplexing to mothers, and upon which the future health and strength of the child much depend, viz., the instances in which fat or milk are disliked, and those in which sugar is eaten very largely.

There can be no doubt that on the one hand fat is essential in the dietary of a child, and that on the other, there are many children who dislike it ; but the latter fact does not extend so universally as the former. Fat is supplied in the milk to the extent of ½ oz. to ¾ oz. of butter in each pint, also in the butter when separated from the milk, as well as in nearly every kind of meat and in the gravy of meat ; and so far as is known, its value is the same to the system, whatever may have been the source whence it was derived. If with the above-mentioned dietary, the child dislike both milk and the fat of meat or gravy, it is probable that the deficiency in his food will be considerable ; but even then we may turn to butter and to suet, and other fats which are used in puddings. Moreover, it most rarely happens that the fat of every kind of meat is disliked, and very commonly that of bacon can be eaten when beef and mutton fat is disliked, and that of mutton, and particularly when cold, is generally less disliked than that of beef.

In such a case success most rarely follows a determined attempt to compel the child to take that kind of fat which it dislikes ; but much may be done quietly, even with the special dislike, by still supplying a little fat when it would naturally be given, as with the special kind of meat in question, by occasional gentle encouragement and by the influence of the example of others ;

yet more will be effected by more frequently and abundantly supplying that kind of fat which is not disliked, whether it be butter, dripping, or the fat of bacon or meat. There are, however, many families in which the habit exists of cutting off every portion of fat from the meat when placed upon the plate, or of purchasing meat which is almost wholly lean. In such a case the children acquire the habit at least as much by example as by taste, and no improvement will be effected until the whole family is made sensible of the value of a moderate quantity of fat in food, and the impropriety of the habit which they have acquired. On the other hand, an injudicious use in families of fat, as in suet puddings, fat gravy, and fat meat, may have created a disgust for it in the minds of the children.

When good milk is not disliked, and is taken largely, there need be no fear of deficiency of fat in the dietary of the child; for, in addition to the fat of the milk, butter will be eaten with the bread, and some amount of fat will be taken with the meat and gravy; but in such a case the supply may the most readily be given by increasing the quantity of butter. I scarcely know a case in which, by this cautious procedure and with or without medical aid to improve the digestion, sufficient fat may not be taken; and, as the tastes vary with age, the particular dislike may be ultimately lost.

Many of these remarks are also applicable to the case of the dislike of milk. When the child has been brought up from infancy to the use of milk, and has lived on plain and simple food, no such dislike is engendered except as the result of illness or the injudicious example and remarks of others. But even in the case of previous illness, which has rendered the taste abnormal, and much more in every other case, the objection is rather of taste than of health ; and is very frequently due to an erroneous belief in the supposed disagreement of the food as an article of diet ; and whilst no amount of argument will convince them to the contrary, quiet perseverance and example will, in nearly all children, remove the difficulty. There are, however, a few circumstances which, being attended to, will expedite the issue :—1st. Hot milk has a less perceptible flavour of milk than warm or cold milk, and moreover, by quickening the vital actions, is more quickly removed from the stomach than cold milk. 2nd. A small quantity at a time will not only be less objectionable than a larger one, but will be attended by less sense of oppression at the stomach, if any exist. 3rd. There are cases in which the fat of the milk seems to be the true objection to its use and to its proper digestion ; and in these it is well, either temporarily or permanently, to take off a portion of the cream before it is used. 4th. Whatever may be the objection to milk when taken alone, it is most rarely that any dislike exists to it when cooked in puddings, although, if the mind be much impressed with the belief that milk cannot be taken, there may be a degree of prejudice to the use of puddings which are known to contain it. Hence, in such cases, let the milk be given when hot, in small quantities, and in puddings ; and, if necessary, let it be partially or wholly skimmed.

The third circumstance, or the effect of eating large quantities of sugar, may be readily disposed of. So far as the sugar is concerned, it must be regarded as food, and the evil of its excessive use lies in the unnatural taste which the child thus acquires, and the diminution of the appetite for other valuable foods. There is no condition of disease which an excessive use of sugar induces; and hence the injury which is inflicted by it is one quite within the reach of the parent. When it is evident that the appetite for proper food fails, it will be necessary to either limit the quantity of sugar which the child obtains, or to purposely place so much within his reach for a day or two, that by an unusual indulgence in it he may acquire a temporary disgust for it. If the latter plan is adopted it will be well to use a strong brown sugar, full of flavour and very sweet.

The taste which thus acquires a preponderance is often induced by the injudicious habit permitted by the mother or nurse of eating sweet biscuits and other sweet pastry. From the foregoing it will be evident that such should never be given to a child; and a principal aim on the part of the mother should be to induce her child to prefer simple food, to enjoy all proper foods alike, to obtain no inconvenient dislikes of food, and thus to lay the foundation for a strong and evenly balanced appetite for food in after life. This is perhaps the most important acquisition in reference to future health which the child can make, and in acquiring it, it gains present health for itself and gives pleasure to those in whose charge it is.

I have not included tea, coffee or alcohols in the list of foods to be supplied to children, but I must go further, and expressly affirm that their use would be injurious. The two former are nervous stimulants which have a fitting place in later life, but in childhood, when activity is the leading feature of life, they are unnecessary and would be injurious. All children are sensitive ; but there are many with very light hair, very fair complexions, and pale, thin skins, who are unusually so, and to such the use of tea would be very fitted to induce affections of the brain. The last class of substances are so manifestly unfitted for the simplicity of taste, activity, and innocency of children, that it would be unnecessary to refer to them here if it were not that many persons, without consideration, give them to their children as an occasional luxury, and some even give beer daily. The number of such persons is, I believe, proportionately few, but the importance of the subject warrants me in expressing my belief that such a course tends to the present injury of the children, and is likely to lead to a taste for alcohol which may be most prejudicial in after life.

It may be well also to add a remark respecting vegetables and fruit.

I have mentioned the potato as the vegetable which may be usually given, and I have done so on the ground that of all vegetables it is the least likely to cause derangement of the bowels. When, however, other fresh vegetables are in season, there will be no impropriety in their occasional use, so long as the quantity which is given is not large, and the bowels remain unaffected.

Fruit may be given freely in its season when it is ripe or when it is properly cooked, but of uncooked fruit the best is grapes, and the next are apricots and peaches (when skinned) and currants. Apples and pears should rarely be eaten raw, and gooseberries are likely when uncooked to derange the bowels. There is a tendency in childhood to relaxation of the bowels, and when it occurs severely it is one of the most efficient causes of important disease. Hence, whilst free evacuation should be associated with abundant food, the kind and quality of food should be so regulated as not to unduly increase the natural tendency.

SECTION III.—DIETARY IN YOUTH.

As infancy is the period of life when old age is established, so youth is the season which immediately influences manhood, and both demand judicious management in the selection of food. The period of youth embraces that of the greatest development of the body, and demands much food, whilst at the same time the rapid expansion of the passions and the mind often renders the tastes and appetite capricious. It is also the period when, with the increase of knowledge and intelligence, there is a sense of independence and responsibility; and consequently the scheme of dietary must be enforced less by authority than by nature and reason.

The chief points of difference in the dietary from that of childhood is in the freer use of both vegetable and animal food, and the longer intervals which may be allowed to elapse between the meals. Now, as then, the aim must be to supply the largest possible amount of nourishment; but, in addition, appeals must be made, if need be, to the appetite, so as to render the desire for food at least equal to the requirements of the body. The test which must now be employed as to the sufficiency of the dietary is not only the evident health, vigour, and development of the body, but the storing up of a certain proportion of nutriment within the body, both that it may supply food should occasion require, and that it may be evidence that the food supplies somewhat more than the daily requirements of the body. When the process of growth is going on rapidly it is not an easy task to take so much food as will fully satisfy this, and further lay up nutritive material; but whilst at a given period this in a particular case may not be possible, I am convinced that no one is safe who remains very thin, and who has not, in some degree, accumulated fat.

As the youth enters upon the duties of life, the problem which we have in hand becomes one of the greatest complexity, for whilst he requires a certain amount of exertion in the open and pure air to enable him to take and digest much food, he is shut up in school or in an office during many hours in the day, and thereby loses exercise, light, and air; or he is engaged in labour with a degree of activity beyond the present power of his system, and with an amount of waste greater than the daily supply of food will meet. Either too much or too little exertion in the open air will be injurious, and, except for the faculty of adaptation which the body so manifestly possesses, it would be rare for the requirements of the body and the actual condition of things to be accurately adapted to each other.

At the period of rapid development especially, it is of the highest moment that milk, eggs, meat, and bread should enter largely into the dietary: the first being given twice or thrice a day in notable quantity, whilst the third is given at least once a day.

As in the period of childhood, food should be supplied early in the morning, either as a meal before the breakfast or at the breakfast, according to the hour at which the latter is taken. If the youth should rise at 6 to 7 A.M., and the breakfast hour be 8½ A.M, he should take bread and butter with milk as soon as possible after dressing, and prepare himself for breakfast by some amount of exercise in the open air. At the breakfast hour, milk should be largely supplied either as cold milk with bread, or hot milk made into porridge, or hot milk with cocoa or chocolate, or coffee to which hot milk is added in the proportion of three parts of milk to one part of coffee. The quantity of milk then taken should be between half a pint and one pint. Bread or bread and butter should be eaten freely with it, and eggs or bacon or both may be added at and after the period of puberty. At this meal, above all others, food should be eaten in abundance, and a good appetite be fairly satisfied; since it occurs at the period of the day when the system, having had a long interval of fasting, urgently needs food and appropriates it with the greatest rapidity to its own use. The rapid increase and subsidence of the vital actions from the breakfast indicate clearly the necessity for an early dinner, and whether the meal be called a lunch or a dinner it should be made at 12½ to 1 P.M., and be of a thoroughly substantial kind. As it usually occurs that the youth is engaged in duties which require his full attention in the afternoon, it may be inconvenient to him to make a hearty meal in the middle of the day; but as the question of health is paramount over every other, the proper kind and quality of food must be eaten, whilst it is rendered as consistent as possible with the proper discharge of the duties of life.

The dinner should principally consist of meat, which is to be taken before pudding. It should as far as possible be fresh and freshly cooked and hot, since then it contains the largest amount of nutriment, the most freely gratifies the appetite, and digests with the greatest ease. The standard varieties should be beef and mutton; but at this period of life and with a sound appetite any kind of meat is digested with ease, and even pork may be taken with much impunity. A moderate supply of fresh vegetables, and particularly of potatoes and bread, should be added, and the whole should be followed by a pudding of some of the various kinds already described. Whether it will be necessary to add bread and cheese will depend upon the degree of satisfaction of the appetite; but it will be more conducive to health to satisfy the appetite with meat and vegetables. The mode in which this abundant supply of food may be rendered compatible with the discharge of mental duties is by well dividing the meat in the operations of cutting and mastication, so that the juices of the stomach may the more rapidly act upon it; and by eating bread and vegetable food with deliberation, so that it may be well mixed with the saliva in the act of mastication, and thus in both ways facilitate as far as possible the process of digestion; also by limiting the amount of fluid which is taken with food to the simple wants of the stomach for the purpose of solution of the food, and thus, by avoiding too great an increase of the fulness of the blood-vessels, allow the brain to be as little oppressed as possible. Hence it is well to avoid both soup and beer under such circumstances, since the former may unduly increase the amount of fluid which should be taken, whilst it offers but little nutriment in proportion to its bulk; and the latter, in addition to these two disadvantages, excites a direct action over the heart, and increases its force and fills the blood-vessels. The proper fluid is water, and the quantity should not exceed half a pint. Such a regulation of the meal is probably the most conducive to health in youth under all circumstances, but if the restrictions above mentioned do not exist, it may not be inappropriate to take soup at least occasionally, unless by so doing the desire for more substantial food could be lessened.

Fish is known to be more quickly digested than flesh meat, and hence might be considered to be well adapted for dinner in the circumstances now under discussion; but whilst I would not altogether interdict its use, I think that its great inferiority to meat in nutritive qualities should induce all persons to give the preference to meat. Fish may be allowed as an occasional change of food, or as a small portion of the meal; but care should be taken lest in satisfying the appetite by the use of fish, the quantity of meat which can be eaten should be too greatly reduced to fully supply the wants of the system.

The tea meal is seldom one at which much nutriment is eaten, but rather one in which fluid of an agreeable flavour and temperature is drank with a view to refresh the system or to remove the sense of oppression which so frequently follows a good dinner. If the dinner has been a substantial one, the latter is the right view to take of the tea meal, and from half to one pint of fluid may then be taken with advantage. The effect of the warm fluid is to more rapidly terminate the act of digestion of the previous meal, to supply fluid for the due solution of the food, if any lacked, and to remove the products of food and other waste from the body. In one or all of these respects the tea meal is found by most persons to be exceedingly agreeable. It is unnecessary that the tea be strong, but on the contrary it should be weak, and a moderate quantity of milk added to it. In early youth it is better to nearly fill up the cup with warm milk, and to add only a small quantity of tea, since at that period of life a more frequent supply of nutriment is required, and the stimulus of the tea is less necessary than at a later period. If at any period coffee should be preferred, it should, as at breakfast, be mixed with a more than equal share of milk. It is also quite proper to satisfy the appetite with bread and butter, and to allow an egg and even meat, when the dinner was not a very good one, when the subsequent exertion was considerable, or when the appetite seems to require it. The proper period for this meal is three to four hours after the dinner; and if it be much further delayed its character should be changed into that of a substantial meal.

Suppers are better borne in youth than in adult life, since the necessity for a frequent supply of food is more urgent, and they should always be allowed. The kind of food to be supplied depends somewhat upon the age of the youth, the supply of food during the day, and the nearness of the bed hour. As the process of digestion proceeds slowly during the night, and the system is excited and less disposed to sleep under its influence, the food selected should have passed through this stage of its changes before sleep is sought. Hence, if much bread or meat be eaten, about three hours should elapse between the meal and sleep, and the meal must be taken early or sleep be sought late at night.

As early retiring to rest is a prime necessity of youth, it is better to select a kind of food which is more quickly digested; and such is milk. A basin of cold milk with a slice of bread or toast, or a basin of hot milk porridge, or a pudding prepared with milk, eggs, and farinaceous food, and accompanied by a glass of water as a beverage, constitutes the most perfect supper, and may be eaten one hour or one hour and a half before retiring to rest. A supper of one or two eggs lightly boiled, poached, or fried, with a little bread and butter, and accompanied by water or cold milk, will be quite right. In the case of females a cup of plain hot milk, or of chocolate, or cocoa prepared with milk, is a very agreeable and proper supper.

Meat suppers are more suited to those persons who could not take tea until 6 or 7 o'clock in the evening, and who act more wisely by taking supper instead of tea. This case is very similar to that of late dining, and I shall refer to both in the next section.

I have not in this section referred separately to the two sexes, for at the period in question the dietary should be similar for both, and differ chiefly in the quantity which the appetite of each will demand. It is however probable that there are more girls than boys, whose appetites for food are capricious or feeble, and whose dislikes of certain foods are strong; moreover, at the period of puberty these evils are not unfrequently exaggerated in girls. Hence, whether throughout the whole period of youth, or at the special period in question, much watchfulness should be exercised, and the earliest evidences of ill-health checked. In such cases, the use of good soups with dinner or before dinner, and whatever variety in the cooking of food can be obtained, should be allowed; but the essential articles of diet must be those already mentioned.

The subject of the necessity for the use of alcohols in youth is one of great importance, and cannot be passed over in a work of this kind; yet, as their action over nutrition is certainly more indirect than direct, they should be regarded as medicinal rather than as nutritive agents. We may, in a dietetic point of view, exclude ardent spirits altogether from the discussion, and thus limit the inquiry to beer and wines.

When the appetite is good, and the food which is taken is abundant in quality and quantity, the use of alcohols is unnecessary; and since alcohol in every form acts as a disturbing agent in health, its use under these circumstances must tend to injury. When however growth is defective, the appetite not robust, the digestion imperfect, and the general tone whether of body or mind feeble, the use of beer and wines may be proper, and lead to an improvement in the appetite for food, and the general strength; also when growth has been very rapid, and the general nutrition has not proceeded at an equal rate, there is much true debility of system combined with increased liability to the occurrence of disease, and in such a case these substances may be fitly taken.

The most appropriate period for their use is with the mid-day meal, since the system then needs their help, and any increased action of the heart which they may induce can be then well borne. Their employment is much less proper in the evening, since in the cases in question the body needs early repose rather than stimulation, and the effect of alcohols upon the heart will probably render the sleep insufficiently sound and refreshing.

The best kind of alcohols is beer, and, of the various qualities at command, the home-brewed ale of moderate strength, with plenty of honest malt and hops, is the best. If very weak table-beers are taken their influence is so slight that they need not be reckoned as alcohols, but if strong old ales are employed, the large quantity of alcohol which they contain will cause them so to disturb the functions of the body, as to produce injury rather than benefit. The light pale ales of the day are to many agreeable drinks, but as some of them contain much alcohol, it is necessary to point out their misnomer. The quantity to be taken at a time, at the period of life and for the purpose in question, should never exceed half an ordinary or one small-sized tumblerful.

The *necessity* for the use of wines as an article of diet is so purely a medical question, to be determined by the special circumstances of each case, that I am unwilling to enter upon its discussion here. In the cases where the use of them is not urgent, I consider that an ordinary full-bodied claret is the most appropriate, and it may be drank alone or with water. When the appetite is defective and the tone of health low, and particularly in females, a better result is obtained when hot water and sugar are added to the claret, and the negus drunk whilst hot. The proper quantity to be taken at a time is a large wine-glassful of wine, and twice that quantity of water may be added to it. In the cases in which the necessity for its use is more urgent—that is, when the evidences of debility and defective nutrition are stronger, it may be needful to use wines stronger in alcohol, and of these fine sherry and madeira are probably the best.

The effect of season is not unimportant in reference to this subject, for generally speaking the vital powers of the system are much reduced at the end of our summer, or in any climate after long continuance of hot weather; and at such a period a freer and more general employment of suitable alcohols is permissible, and may even be *necessary*. In this climate the conditions referred to extend through July and August, and in a hot season even into September. Moreover, in the winter season, if the state of the general health be feeble and the appetite insufficient to maintain the warmth of the body, the use of ales or wines may be very proper.

Hence, as a general expression, I venture to affirm that with the ordinary evidences of health, growth, and vigour, neither wines nor beer are necessary, but on the contrary, their use is to be deprecated in youth; yet we have conditions bordering on disease in which these agents may do much service; and in all cases the use of them in a very limited degree may be admitted and tolerated as a luxury, if such be desired. The aim of the youth and parent should be to avoid the necessity for their use by the proper supply of food and by the employment of other agencies tending to improve the health; and when a state of system exists which borders upon disease, it is well to call in the aid of the medical adviser and to increase the supply of such other food as will improve the nutrition of the system. The acquisition of a taste for these agents in youth is not unattended by danger both physically and morally.

SECTION IV.—DIETARY IN ADULT AND MIDDLE LIFE.

In order that the observations which I have to make in this section should be of practical value, it will not suffice to rest content with a statement of a model dietary for an adult, nor yet to select a typical person as an example, but since men and women are engaged during the day under circumstances which are very diverse it will be needful to make special reference to the requirements of several classes. Before, however, I enter into the required details, it will be wise to state in a general manner the dietary which would be the most conducive to health.

It is the most in accordance with the wants of the body and the ordinary habits of mankind, to supply the largest portion of the nutriment in the early part, and to give the largest quantity of fluids in the later part of the day. This is based upon the facts of the long interval of fasting during the night, whereby the system is the most free from nutritive materials in the morning, and consequently is then fully prepared for a copious supply; also of the rapidity of the process of digestion in the morning as compared with the afternoon, whereby a speedy renewal of food is required; and of the accumulation of food in the body as the day advances, whereby the renewal of the supply of food is less urgent, and the action of fluids in expediting the removal of waste products from the body at night is more necessary. Hence a good substantial breakfast and a good early dinner, followed by tea and a light supper, are indicated.

The breakfast should be taken at as early an hour as may be convenient, and consist of any substantial food which the appetite will tolerate. Before the universal use of tea and coffee this meal was a far more nutritious one than it is now the practice to take. Meats of various kinds, both hot and cold, with bread, butter, or cheese, cheese cakes and meat pies, were abundantly eaten, and accompanied by deep draughts of milk or ale. But as the last has been banished from the breakfast table of our day, and has been supplanted by the nervous stimulants, tea or coffee, which yield no nourishment, so has the quantity of the solid foods diminished also. In many respects this is to be regretted, and whilst we may not desire the return of the taste for ale at this early meal, it cannot be doubted that the quantity of milk which is now taken should be increased, and that of tea and coffee decreased. It is, however, too late to raise any serious objections to the use of tea and coffee, since they are now regarded almost universally as necessaries; but as there are still some who avoid them and drink water at breakfast, I venture to say that those who do not care much to have tea and coffee, may supply their place well by milk or table-beer, and even by water. The breakfast then should consist of milk, hot or cold, or of coffee taken with much hot milk, or of cocoa or chocolate boiled in milk, with eggs, bacon, or hot or cold flesh meat or fish, as opportunity may offer. Tea is less conducive to nourishment at the breakfast hour than coffee or chocolate, and when it is used it should not be made strong, and a larger quantity of milk may be added than would be allowed in the evening. If the appetite be good and the health robust, there need not be any limit, other than the sense of satisfaction, to the quantity of both solid and liquid food which may be taken, for it may be remarked that a sense of fullness or distension, which not unusually follows the dinner, is almost unknown after breakfast; but if any restriction be laid down, it should be rather of fluids than of solids. When, however, the appetite is not robust, it will be necessary to limit the quantity of fluid to probably half of that which might otherwise be taken with propriety, and the solid food should be selected to please the appetite.

If the dinner be taken about mid-day, whilst the breakfast was eaten at 8 to 9 o'clock, the best hour will be from 1 to 2 o'clock. It should consist always of meat and vegetables, the former hot or cold and fresh or salted, but with a preference at all times for hot and fresh meat. Pork and veal are less easily digested than other kinds of meat, and when they are eaten they should be thoroughly cooked and their digestion aided by seasoning. The quantity of meat may vary from 3 ounces to 6 ounces when cooked, and that of potato should not exceed $\frac{3}{4}$ lb.; but, within the limit that the quantity of dry and fresh vegetables should not be too large, no other restriction than the satisfaction of the appetite need be made. If soup be taken the quantity should not be large, but the quality should be good. Fish should not, except very occasionally, be the sole kind of meat eaten. Puddings may be very varied, and if the quantity of vegetable taken with the dinner be not large, they may be eaten freely. The best are milk, egg, and farinaceous puddings; then boiled fruit puddings with a light suet crust; or a baked pudding with bread, or flour and suet and eggs, with or without fruit. When rolled preserve puddings or tarts are eaten, the paste should be lightly rolled. If cheese be eaten after the other part of the dinner, it should be in very small quantity; and if the use of olive oil be not objected to, the free use of salad and oil will be proper. The best fluid to accompany the dinner is water, or home-brewed or other genuine beer, in quantities not exceeding half-a-pint.

Tea should be taken at from 5 to 6 o'clock, and supper at 8 to 9 o'clock. The former should be really a light meal, and whilst the latter should be more substantial, it should not be a heavy one. Meat is not usually required at the supper.

Such is the mode in which a person may live as nearly as possible in accordance with the requirements of his system; and the following may be taken as the substantial part of a proper and moderate quantity of food for a man in good health, with a good appetite, and making a moderate degree of exertion :—

Breakfast.

$\frac{3}{4}$ pint of milk and $\frac{1}{4}$ pint of water, with coffee or tea; bread, 4 oz. to 6 oz.; butter, $\frac{3}{4}$ oz.; sugar, $\frac{3}{4}$ oz.; bacon, 3 oz., or eggs, 4 oz., or cooked meat, 3 oz.

Dinner.

Cooked meat, 4 oz. to 6 oz.; potatoes, 8 oz.; bread, 3 oz. to 4 oz.; pudding, 8 oz.; cheese, $\frac{1}{2}$ oz.; soup, 6 oz.; water or beer, $\frac{1}{2}$ pint.

Tea.

Water with tea, $\frac{3}{4}$ pint; sugar, $\frac{3}{4}$ oz.; milk or cream, 2 oz.; bread, 3 oz.; butter, $\frac{1}{2}$ oz. to $\frac{3}{4}$ oz.

Supper.

Milk, $\frac{3}{4}$ pint, oatmeal, 1 oz., and bread, 3 oz. to 4 oz.; or eggs, 4 oz., or cooked meat, 3 oz., and bread, 3 oz.; butter or cheese, $\frac{1}{2}$ oz.; water or beer, $\frac{1}{2}$ pint.

I will now add some observations upon the dietary of certain classes of persons who cannot follow the plan now laid down.

1. *Those who dine at a late hour.*—This is due to habit and preference, as in the higher classes, or to necessity, as in many engaged in business.

There are some who, from long habit, do not experience any desire for food until a late hour in the day, and to whom the plan of an early dinner seems inapplicable. Such persons often take breakfast at a late hour, as from 10 to 12 o'clock, and thus effectually prevent the possibility of hunger at 1 to 2 o'clock; but even with an early breakfast the absence of severe exertion and the habit of taking a very small lunch, as a biscuit and perhaps a glass of wine, has rendered late dining the most agreeable to them. The absence of a good midday meal in the case of business men is founded upon the want of facility for obtaining it, or of time in which to eat it, or on the sense of unfitness for clear thought which follows it; but it is contrary to reason that health can be uniformly maintained at its highest pitch when, after an early breakfast, there is continued and close application to business until 4 to 6 p.m., without relaxation and almost without food. We have copied the French habit of late dining, but have omitted its essential accompaniment—the substantial *déjeûner à la fourchette.*

The objection which may be fairly taken against late dinners is very greatly lessened if a sufficiently good lunch be eaten in the middle of the day. All such persons should take at least meat and bread as a lunch, the former to the extent of three ounces in the form of sandwiches or otherwise, accompanied by a glass of wine (if that be usually taken) or simply by water, and that restricted to the smallest quantity which is consistent with a sense of ease during digestion. If the labour which is to follow be rather bodily than mental, it would be better to take a hot chop or a supply of other hot meat, with bread, and perhaps a potato, so as to make the meal somewhat as valuable as a dinner.

With a dinner at 6 o'clock or thereabouts a fair supply of food may be taken, and food in greater variety and with strong flavours seems then to be desired. If the system have not been exhausted by the labour of the day, the digestion of this meal may yet be good, and particularly with the aid of the tea and coffee which follow it; but if the digestion itself be not very active, and the body have been much depressed by labour or anxiety, the food will be only partially digested, and so far an unusual portion will be wasted. When, however, meat has been taken at breakfast and at the early dinner, it is less necessary at the late dinner, and if a portion of it at the latter hour be wasted no serious harm will follow; yet, with an accumulation of only partially digested food, the system is certainly more apt to be deranged in health than would have occurred with an early dinner, and indigestion, with gout and debility, will more frequently follow. At this meal moreover the desire for wine is more urgent than at the early dinner, and after the exertion of the day the vital actions may need such a stimulus.

Hence, whilst to improve health the early dinner should be preferred to the late one, nearly every evil may be averted by taking a good meat lunch in the middle of the day; but a biscuit and a glass of wine, or any similar quantity of food, is quite insufficient to sustain the system during close and severe attention to business.

There are many merchants' and banking-houses where no opportunity is allowed to the clerks or salesmen to take food until 5 or 6 o'clock at night. This seems to me to be a most tyrannical exercise of power, and one which I have known to exert the most prejudical influence over the health of young men. A certain interval, however small, should be allowed for dinner, and facilities for obtaining suitable food should be afforded. If, however, the clerk so circumstanced will provide himself daily with a cold meat pie, or with meat sandwiches, and milk which he may perhaps be able to warm, he may find opportunity to eat them, and thus make a moderately good dinner.

2. *Those who cannot eat much breakfast.*—Many persons, and particularly females, are unable to eat a sufficient breakfast at the usual breakfast hour. This arises even in good health from the influence of late and heavy suppers, from too prolonged sleep, from the impurity of the air of the bed room, and from long continued habit; whilst in a defective state of health or constitution, it may be due, in addition to some of the foregoing, to defective appetite. During the continuance of this state of things it will be well to take a cup of hot milk or hot chocolate and milk immediately on rising, and in addition to the meagre breakfast to take food at about 10 or 11 o'clock. But the better plan is to remedy the evil which leads to the defective breakfast,

and particularly to regulate the supper, and the supply of air to the bed-room, and to rise somewhat earlier.

3. *Those who are of feeble constitution.*—This cause of modification of dietary approaches too closely to a medical question to be discussed here at length, but the chief changes which will be required are to supply food in smaller quantities, and at more frequent intervals, and to render it more agreeable to the palate. A cup of milk or chocolate should be given on rising every morning, and a cup of beef tea or other essence of meat, or an egg with a glass of wine, at 11 to 12 o'clock, in addition to the usual meals. The food at the meals should be well cooked and served hot, and should consist chiefly of animal food in the form of meat, soup, milk, eggs, omelettes, and puddings. It is also of great service to many persons to give a cup of hot milk or a glass of hot claret and water, with a little bread and butter, during the night.

4. *Those who lead a sedentary life.*—Persons of sedentary habits are liable to become thin, feeble, and dyspeptic, or to become stout, as the original state of the constitution and the attendant conditions of life have led. A certain amount of exertion is necessary to enable a person to breathe the pure air in sufficient quantity to carry on the function of digestion and other vital actions in activity and vigour; and when this is not obtained the quantity of food which is supplied must be reduced, or fullness of the system or derangement of digestion and general health will follow. If the reduction of the appetite for, and digestion of food be

greater than the necessary wants of the system can tolerate, the former result occurs; but if they remain good the system will, at least for a time, store up fat within it, and the person will become stout.

When, with a sedentary occupation, the person becomes thin, feeble, and dyspeptic, it is necessary that the same plan should be adopted which has just been laid down for persons of feeble constitution, viz., the frequent supply of small quantities of hot food; and as animal food excites the vital actions more than vegetable food, it should be preferred, and the quantity of it should be gradually increased. There are many in this state who hesitate to take milk and eggs from having felt uncomfortable after their use, but they should be encouraged to take them in the form which is the least disagreeable. Milk in puddings or with chocolate, and eggs fried or made into herb omelettes are the best forms of food. Meat is not objected to, but care in its cooking and flavouring, and variety of meat (excluding pork, and perhaps veal and fish) are necessary. Meat should be eaten twice a day, and at the tea meal potted meats, ham, or eggs should be added. Curries are valuable, and all the meat should be hot, fresh, and seasoned. So long as the sedentary habit is continued, the total quantity of food which is supplied should be less than would be requisite under other conditions, but it should be largely of an animal nature. It will, however, often be necessary to seek the medical adviser, in order to keep the functions of the body in a state as consistent with health as may be possible; and above all things arrangements should be made by which exertion of a somewhat severe kind may be taken at one or more regulated periods daily, and thus obviate the ill effects of the sedentary occupation.

When the health remains good, but the body becomes too bulky, the plan may be pursued which I shall detail in cases of obesity.

5. *Those who suffer much anxiety.*—When the mind is anxious the appetite fails and becomes capricious, and from the pre-occupation of the mind the meal is often disregarded. Such cases require the watchfulness of a near relative to remind them of the necessity for food, and to encourage them to take it; but above all others they require surprises of dishes which were formerly agreeable, and great variety and selection of food according to the taste. The food should be well cooked and savoury, and should consist of the kind referred to when discussing the dietary of feeble persons. It should be largely animal in its nature, and the supply of hot claret and water twice or thrice a day with the food is very desirable as a temporary expedient.

6. *Those who make much exertion.*—As great activity of body leads to great waste of the structures of the body, and the rapid destruction of food, it is necessary that it be followed by a large amount of food; and as it is usually accompanied by a good appetite, an abundant supply may be taken at each meal. The increase should be of all kinds of food alike, both animal and vegetable, particularly of meat, milk, fat, bread, and fresh vegetables, but the amount of fluid

which is taken, should be increased in a less degree. Thus to one who makes much bodily, or bodily and mental exertion during the day, as in hunting, or campaigning, the following quantity of food daily would not be excessive, viz., cooked meat, 8 oz.; bacon, 4 oz.; milk, 2 pints; bread 1 lb. to $1\frac{1}{2}$ lb.; vegetables 1 lb.; butter, 2 oz.; sugar, 2 oz.; cheese, 2 oz., besides one or more eggs, and the less important foods which enter into a daily dietary. Soldiers and sailors in time of active service obtain 1 lb. to $1\frac{1}{2}$ lb. of uncooked meat, and as they do not have the variety of food just enumerated, and cannot thoroughly cook their food, so large a quantity is no doubt necessary.

7. *Wetnurses and Nursing Mothers.*—The large amount of nutriment which the nurse must furnish to the child makes it highly important that she should receive much herself. In addition to the other parts of the dietary already described, she should take not less than from two to three pints of milk daily. Alcohols are largely used by many persons in the belief that they support the system and maintain the supply of milk for the infant; but I am convinced that this is a serious error, and is not an unfrequent cause of fits and emaciation in the child. Whilst I would not affirm that a small glass of beer taken at the dinner would be injurious, I think that it should not be exceeded. The mother's milk must be produced from the food which she eats, and of all these none is so proper as milk itself.

8. *Those who labour in the night and rest during the*

day.—This applies to readers, compositors, and others, engaged in printing offices, and probably to many other classes. I have made during the present year an extended enquiry for the Government into the condition of printers, the results of which are given in the Sixth Report of the Medical Officer of the Privy Council, and to that source I must refer for details of the question now under discussion. There is however much diversity in the plans pursued by different persons of the same class, some of which are I think prejudicial to health. The proper plan is to take a good dinner almost immediately before going to duty, as for example, at 4 to 6 P.M., and a good meat supper at about midnight. A small breakfast should then be taken on leaving the office and before going to bed, and a good breakfast, similar to the French *déjeûner à la fourchette*, on rising at 12 to 2 o'clock. There will thus be three good meals taken during the 24 hours, and the body will be sustained by nourishment at the period when exertion is made, and when the human system is at its lowest point of vigour.

9. *Those who wish to increase in weight.*—There are many persons who have arrived at adult life, and in whom the process of growth has terminated, who yet remain of spare habit, and who with the usual evidences of health have not the bodily strength, or the power to recover from an attack of disease which they observe in others. Such not unnaturally seek a remedy, and desire to be able to accumulate fat and flesh in a greater degree.

The condition is frequently constitutional, and was inherited at birth, for it is of everyday observation that varying degrees of fullness of body belong to certain constitutions, and that such remain, more or less, throughout life. There are, however, probably a majority in whom it is due to the conditions in which they have been placed, as for example, feebleness in childhood, leading to defective appetite and a restricted supply of food during the period of growth; growth in a degree and with a rapidity beyond the alimentary powers of the system to sufficiently sustain with food; earnest attention to the duties of life in youth, whereby the appetite and desire for food were restricted and never fully developed; too great bodily exertion in the later years of youth, and the commencement of adult life; an anxious disposition, or the constant pressure of anxiety; ill regulated habits in adult life, by which improper food was taken, or the appetite and the digestion were enfeebled and impaired, and the vital actions rendered insufficient to maintain robust health; excessive activity of body and mind, leading to neglect of nutrition; and, lastly, the frequent recurrence of conditions of disease in a person of feeble constitution. All these are circumstances, which acting for lengthened periods affect the habits or the constitution of the body, and induce a spare state of system, and are quite apart from temporary causes of emaciation, or recognised disease.

Where the condition is hereditary, the probability of changing it is less than when it has been induced by other, although long-continued, causes. It is often seen, however, that spare persons become stouter after marriage, as do many of those who obtain ease and competency after years of anxiety and labour, and others who have been induced to live in a more generous manner than was their previous habit. The principle to be adopted as a guide, is to so change the habits of anxiety and exertion, that more rest may be attained ; to exchange sedentary for more active pursuits ; abstemious living for a generous table ; neglect of the appetite for a moderate cultivation of the pleasures of the table ; too great rigidity in the rules of life for more freedom of habit ; improper for proper food, and indigestion for good digestion, as the circumstances of each case specially require.

Any dietary which has for its purpose the improvement of nutrition, and the increase of the bulk of the body, must abound in both animal and vegetable food ; and it will be successful in proportion as it is digestible, as the quantity which is taken, and as the body has the faculty to form fat and to retain fluids. Of all foods, new milk is that to be the most relied upon, since it possesses nitrogenous matter, fat, and sugar, in abundance, and in a form which is the most readily admissible into the circulation ; and if it should be disliked, the aim of the physician must be to remove the objection, and render it an agreeable food. It should form a part of every meal, and enter into the composition of chocolate and coffee, of puddings and custards, soup, mashed potatoes, and even bread. By thus adding it to many kinds of food, it will not be difficult to cause three to four pints of it to be eaten daily, since in some of them the watery part of the milk would have been dissipated, whilst the solid and nutritive part would remain. It is also possible to increase the consumption by evaporating it gently over the fire, until a portion of the water has been driven off, and two pints rendered equal to three. When, however, the use of fat is not disliked, cream may be added largely to the food, as in the coffee, chocolate, and puddings, and with preserves, fruits, &c., so that at least half a pint a day may be added to the quantity which is found in the milk. Moreover, for the same purpose, the milk of the Alderney cow should be obtained, or that of the ewe should be added to ordinary cow's milk. The meat need not be large in quantity, but it should be highly fed, and a fair proportion of fat be eaten with the lean. Beef and mutton are preferable to other kinds of meat, and bacon, eaten either when hot or cold, may be largely indulged in. Bread and potatoes prepared as above-mentioned, sugar, butter, and other fats, should be eaten as largely as possible. Tea should be almost always avoided, or it should be weak, and added to the cup nearly full of milk and cream. The meals should not be so large as to cause oppression, and should be repeated, from the cup of chocolate with milk and cream on rising, to the milk, cream, and farinaceous pudding at the supper, at intervals of three to four hours.

The use of alcohols is often of great value in these cases, as for example, the addition of two or three teaspoonsful of brandy or rum to the milk or the chocolate several times a day, and the use of good and new home-brewed ale; but the quantity of fluids, other than milk, which is given daily should not exceed one half to one pint.

With such a dietary, and probably with a sudden change in the dietary, there must be a fair amount of exercise in the open air daily, so as to insure good digestion, and care should be taken to ascertain daily that all the functions of the body are healthily performed. As, however, with every care there may be a temporary derangement of the system, and headache occasionally occur, the plan is still to be followed, with patient perseverance, and due medical attention given to the state of the system.

The measure of the effect will be the increase of weight, and this should be tested at intervals of two or three weeks, and always at the same time of the day, and after the same meal. The clothes should be weighed separately, and the nett weight ascertained.

If the plan be pursued with children of spare habit, success is almost sure to follow; and even in adult life it would be impossible to take the quantity and kind of food now stated, for some weeks or months, without material increase of weight having occurred.

10. *Those who wish to decrease in weight.* 1*st. In obesity.*—Bulk depends as much upon the capability which the body possesses to retain fluids in its tissues, as upon the fat which is laid up, and both may be in excess of the muscles, or lean flesh. Hence it may vary much

as the body is influenced by external circumstances, so far as refers to the fluids; such, for example, as perspiration, exertion, indolence, cold, heat, and the pressure of the atmosphere; whilst in reference to fat, it may remain stationary, and be influenced only from within. There can be no doubt that excessive bulk of body is a serious evil, always causing inconvenience in locomotion, impeding the action of the mind, and tending to increase the risks of life. It is mainly dependent upon original quality of constitution, so that with but a moderate (not a deficient) dietary, the bulk is maintained, whilst in those of spare habit, more food may be taken, and yet the body remain spare. It is, however, much influenced by the condition in which the person is placed, for with ease and happiness, comparative inaction, enjoyment of food, and fondness for fat, sugar, and milk, and indeed for almost any kind of food, good digestion, full flow of spirits, and geniality of disposition, it is much more likely to occur than under the opposite conditions. It is rare to find a fat man otherwise than of a genial although irritable disposition, and as rare to find one who does not enjoy his food and cultivate warmth and repose of both body and mind; and it is only when the bulk becomes an impediment to his enjoyment or his usefulness, that he ought to seriously enter upon a plan of reduction.

There are two directions in which we may seek to lessen bulk; one, by increasing waste, and the other by decreasing supply, or the two may, in varying degrees, proceed together. Increase of waste is very difficult in a very corpulent person, for exertion is the chief cause of waste, and his capability for exertion is very limited. He can lie down, or he can sit in an arm chair, or he can be carried in a comfortably cushioned carriage; but he cannot walk for a long period, he resolutely shuns a hill, and, like Falstaff, he cannot run. Hence, if left to his own inclination, he would do but little to increase the waste of his body; and if he submit himself to the regimen of another, he will far sooner become exhausted than wasted.

Hence a prime object to be attained before much exertion can be made, is that which the exertion was intended to effect, viz., the reduction of the weight of the body; and we are thrown back upon the other expedient, viz., lessening the supply.

To lessen the supply, we may either limit the quantity of food which is taken, or lessen the power which is possessed of digesting it, and of appropriating it to the use of the body. In all fat persons, who gained their fat whilst they were in health, the latter functions are in excellent order, and to disorder them would be equivalent to inducing ill health; and, therefore, it is better to leave the power of digesting and transforming food perfect, and to lessen the quantity of food which is supplied.

It is manifest that fat persons eat too much food, since fat cannot be produced without food, and it is also evident from the example of the thousands about us, that thinness is induced by too little food; and hence the plan of treatment which is indicated is simple enough. The division of foods into fat-forming and flesh-forming, which has been in use for some years, has led persons not well informed on the matter, into error, by assuming that some foods are separately directed to the one end, and others to the other; but all foods, even the leanest flesh, are so far fat-forming that they contain the elements of fat, viz., carbon, hydrogen, and oxygen, and none, therefore, must be omitted from consideration; but certain foods have a larger proportion of the fat-forming materials than others, and to them special attention should be given.

It will be commonly found on inquiry that fat persons eat nutritious and perhaps large suppers, or drink much ale or milk, or are fond of fat, bread, or potatoes, and eat much of one or more of them; and hence each case must be considered apart. But speaking generally, we must reduce the milk, cream, sugar, fat, bread, and potatoes, to a point below that which is required in an ordinary state of the body in health, so that the further quantity which is required may be obtained from the fat of the body; but it must be done slowly, so that the loss of bulk, whether of fluid or fat, may not interfere with the fullness of the blood-vessels, and thus cause failure of the heart's action; and, also, with such moderation that there shall be sufficient nutriment in the food to sustain the flesh of the body, the strength and the animal spirits. During each day in which such a plan is in operation, the body must diminish in bulk and weight, and it may be left to experience to make a further reduction in the food as the duration of the treatment progresses.

The diminution should be effected both by reducing the number of meals and the quantity of food which is taken at each meal, but it will require much resolution to effect it. If the usual quantity of food be allowed at breakfast, dinner, and tea, and the supper be entirely cut off, there will be a material diminution in the quantity of food taken daily. This should be the first step in the reduction, if suppers have usually been taken, and particularly when they have consisted of milk, meat, or beer; and if care be taken that no increase of food is eaten at the other meals, there will be a perceptible effect upon the bulk of the system.

After this has been continued for three or four weeks (or even during that period), the food itself may be diminished in quantity at the other meals (if it have been in excess of the real requirements of the body, and if the medical adviser is of opinion that a more rapid diminution in the supply of food can be borne) on the following principles, viz. :—

1. Milk is the most perfect combination of food, and tends more than any other to increase bulk of body, but there are multitudes who never take it at any time, and in the ordinary habits of society amongst the well-fed classes, its use is not extensive. The quantity may, therefore, be rigidly limited, without materially deranging an ordinary dietary, and it should be restricted to 2 ounces per day—affording sufficient

to colour the tea—and a further $\frac{1}{4}$ pint occasionally in puddings.

2. The quantity of fluid which is taken should be limited, so that, in the whole it will not exceed two to three pints daily. The best kind of fluid is water when cold, and tea when hot. It is better that coffee be avoided.

3. As in fat, sugar; bread, flour, sago, rice and all other farinaceous food, we have fat-forming elements similar in nature but differing in quantity, a diminution of any one of them will, in the proportion which it bears to the nutritive value of the whole, be equally efficacious; but fat may be reckoned as equal to about two and a half times its weight of any of the others. All of them are subject to chemical or physical change when taken into the body, and are in some proportion used at once in supplying the wants of the body which then exist, and are only laid up within the body as they are in excess of the momentary requirements. But of all of these, fat is the least changed when it is eaten, and is the most likely to be the first to be laid up as fat, and hence its use should be the most limited. To this end, the quantity of butter which is spread upon bread, and the quantity of lard, dripping, or suet which is mixed with flour in making pastry, should be reduced to the smallest amount which will render the bread and flour eatable. No oil should be eaten with salads, and no fat remain upon the soup.

Sugar is the next article which is regarded as a luxury, and as there are whole communities, as in

Devonshire and Ireland, who never eat it, and multitudes who in ordinary life eschew its use in tea and coffee, whether from dislike to its flavour, or from an honourable effort of self-denial, it is evident that the quantity may be greatly reduced without deranging the dietary. Its use may be almost altogether withheld in puddings, except during the fruit season, and also in the tea if the palate will allow it; but at any rate, its use in tea is less necessary than in coffee, and it may be reduced to a minimum without difficulty. The allowance of milk having been reduced, there is but little place for several farinaceous foods, as sago, arrowroot, and tapioca. If rice be used, it should generally be boiled in water, but in the absence of sugar, treacle, or fat, it would be insipid and distasteful.

Of the ordinary foods, only fresh vegetables, bread, flour, and meat, remain for consideration. The least nutritive of the fresh vegetables are greens, cabbages, white turnips, and onions, and these may be taken in moderate quantities daily at dinner; but as they contain much water, they should be well pressed after cooking, lest the total quantity of fluid which the body would receive should be unduly increased. On alternate days one potatoe may be taken instead of them, or in addition to a portion of them.

The quantity of bread which is eaten daily by different persons varies very much. In the well-fed, and at or after middle life, it does not amount to more than one-third of a pound in many, and rarely if ever in that class exceeds three-quarters of a pound daily, whilst with the poor, possessing less variety of food, it amounts to from 1 to nearly 2 pounds daily. As we have to do in this place chiefly or exclusively with the well fed classes, we may assume that the first mentioned quantity will be that to which they have been accustomed, and we may limit the allowance to less than one-half pound daily. Many use toasted crusts instead of the usual bread, and since a part of the starch is destroyed when the drying process has been carried too far, they lessen the nutritive value of the bread, and by using it dry, they draw upon the stomach for fluid wherewith to dissolve it, to a greater extent than would be needful with moist bread; but the same object is attained by further limiting the weight of moist bread, and the fluid which is taken with it. It must also be recollected, that as toasted bread and biscuit have been deprived of much of the moisture which is found in moist bread, a given weight of it represents more nutriment than is found in the same weight of ordinary bread.

Flour is necessary in making puddings, and as the use of fat is restricted, it cannot be largely used. The most convenient form is that of yeast dumplings, or of hasty pudding, with which a little sugar or treacle must be eaten, or of suet pudding, or rolley-poley puddings, with very little suet; and as a variety, boiled rice may be employed. It is, however, probable that with many fat persons the quantity of pudding may be reduced to a minimum, and be often entirely omitted without much deranging the dietary.

Gluten bread appears to me to possess special advantages, since it offers bulk with but very little starch, and contains nitrogen, which is useful in the transformation of food. Moreover, when it is toasted and eaten hot, it has a fatty flavour, and may be eaten without any butter.

If the reduction which has been made in bread, flour, and other farinaceous substances be moderate, there will not be any need for increase in the allowance of meat, but if it have been excessive, an increased quantity of food must be given in that form. In point of carbon, lean meat contains only about one-third more than bread; and it is therefore quite inconsistent to reduce the quantity of bread and flour on the one hand, that the quantity of meat may be increased on the other.

The meat should be fresh and lean, and may therefore include game, fowls, rabbits, and the usual butcher's meat; and the quantity may vary from four to eight ounces per day, as it is eaten at one or more meals.

Eggs may be eaten to the extent of two or three per day.

Such being the details of the plan to be pursued, let us sum up the whole in a few words.

1st. For special cases:

If suppers have been largely indulged in, it may suffice if they be entirely cut off, provided no additional food be eaten at the other meals.

If much ale, milk, sugar, fat, bread, or potatoes have been indulged in, the quantity of each must be reduced to that which has been above mentioned, and this, with the omission of supper, may be sufficient, provided no additional food of other kinds is eaten.

2nd. Generally:

When none of the above foods have been specially indulged in, and when the above mentioned limitations have not been so efficacious as was desired, the following dietary may be followed:

For breakfast at 8 to 9 A.M., and tea at 7 to 8 P.M., three-quarters to one pint of tea, with one ounce of milk, and one-third ounce of sugar, 2 ounces of bread, eaten fresh or toasted, or 2 ounces of biscuit, one-third ounce of butter, and 2 to 4 ounces of gluten bread, toasted, and eaten when quite hot. Also one or two eggs, taken boiled or poached, or 2 ounces of any kind of lean cooked meat, eaten hot or cold.

For dinner, 6 oz. of soup made from the shin of beef and vegetables, but with all the fat skimmed off; bread moist or toasted, 1 oz.; cooked meat, hot or cold, 4 oz.; green vegetables, 6 oz., or potatoes, 4 oz. On alternate days an omelette of one or two eggs, when not eaten at both the other meals, or 4 oz. of any of the puddings already mentioned, or 2 to 3 oz. of cooked macaroni. Half a pint of water or *very* weak table beer, or 4 oz. of light wines may be drunk. When the dinner is eaten at 5 o'clock, or at a later hour, this plan must be modified. The tea will then consist only of half a pint of tea prepared as above mentioned, and without the other foods; and there will be a lunch at

1 to 2 o'clock, of 2 oz. of cooked meat, or 1 oz. of cheese, with 2 oz. of bread eaten when moist or toasted, with a small glass of water or *very* weak table beer; or it may consist of a glass of light wine with a biscuit.

It is evident that with persons differing extremely in the amount of food which they eat daily, in the exertion which they make, in the age at which they have arrived, and in their views and desires upon the question of food, no fixed dietary can be adapted to all; and whilst many combinations of food could be made of equal value, no scheme can be otherwise than general in the quantity of any particular food which it may afford. In the foregoing it is assumed that there will be suitable interchanges of the food, so that, for example, eggs will not be taken at all the meals, and that within the limits prescribed the palate will be consulted. If the craving for food should in any person be considerable with this dietary, the quantity of gluten bread, green vegetables, and meat, may be increased.

If we assume that in this dietary there will be consumed daily 3 oz. of milk, 5 oz. of bread, 4 to 6 oz. of gluten bread, 6 oz. of cooked meat, two medium sized eggs, the materials of the soup, 1 oz. of butter and suet, 1 oz. of sugar in puddings and tea, 6 oz. of green vegetables, or 4 oz. of potatoes, and 1½ oz. of flour or some equivalent farinaceous food, 7 to 8 oz. of carbon will be eaten daily. This will not be a deficient dietary for an idle man, or for an old man, or for one who has been habitually a small eater; but it will be deficient in the contrary conditions, and therefore it should never be reduced except under proper medical advice.

With this regimen there should be regulated walking in the open air, during two to four hours daily, as the degree of obesity will admit of. An occasional Turkish bath should be taken, and the skin should be well wiped with cold salt and water twice daily. The clothing, both by day and night, and the temperature of the rooms, should be only moderate.

2nd. *In Training.*—In writing the foregoing directions, I have had in view only those persons in whom the bulk of the body has become a hindrance to their usefulness and comfort; but there are others who are not fat, and yet seek to reduce their weight to gain a special object: such are jockeys, prize-fighters, and competitors in running and rowing matches. It does not come within the scope of this work to discuss the latter objects at length; but, as the plan to be pursued is very similar to that required in obesity, it will be well to add a few remarks upon it.

The training of these classes involves the following sound principles:—

1. That bulk and weight depend largely upon the fluids contained in the body, and that in order to lessen them it is necessary to limit the supply of fluids and to increase the discharge of them from the body. Also that there are certain fluids which, when taken, tend more than others to increase weight and bulk, and that the excretion of water by the skin is more directly within the control of the trainer than by any other outlet.

2. That it is possible to lessen the amount of fat already existing, and to greatly restrict the further formation of it, whilst the muscles are increasing in tone and vigour. This may be effected by limiting the supply of fat-forming and increasing the quantity of flesh-forming foods, at the same time that much exertion is made with the whole and with certain parts of the body.

3. That this may be rapidly effected, so that an average reduction in weight may amount to from 1 lb. to 2 lb. daily, according to the bulk of the person so trained.

In applying these principles to practice the trainers limit the supply of separated fluid to about 1½ pint daily. Tea and water are universally allowed; but whilst some allow coffee, wine, and hard old ale, others forbid them. In the training of King half-a-pint of sherry and one or two half-pints of hard ale were allowed; whilst in the case of jockeys (it having been affirmed that a single wine-glassful of wine increased the weight 3 lb. to 4 lb.) wine has been rigorously withheld. The removal of fluid from the body is effected by causing the person to walk briskly when well clad in flannels for some hours daily, and thus induce profuse perspiration; but the duration and severity of this process are less with spare than with bulky men.

The solid food consists of meat in large quantity; whilst bread and vegetables are eaten very sparingly, and sugar and butter are usually forbidden. Eggs are allowed, but fish is considered watery, and is disallowed.

Thus King ate for breakfast two chops, with dry toast or stale bread, and one cup of tea, without butter and sugar ; for dinner, 1 lb. to $1\frac{1}{4}$ lb. of fresh beef or mutton, toast or stale bread, a little potato or greens, and half-a-pint of old dry ale ; for tea, one cup of tea, an egg, and dry toast ; and for supper, gruel or half-a-pint of dry old ale. The exercise consists in gentle and fast walking to the extent of at least twenty miles per day, and of such special exertion in boxing or rowing as may call into action the sets of muscles upon which the result of the strife will chiefly depend.

The result of the whole training is that the muscular system gains in development, so that the muscles are more apparent and feel hard and resisting to the touch ; but some of this is more apparent than real, since, the fat having been taken away and the quantity of fluid greatly reduced, the spaces between the muscles are enlarged and the muscles appear more prominently than before. It is not a process which even one who had before been trained would undergo again for pleasure only, since it demands much self-denial in all, and in some is effected with much difficulty, and felt most severely.

It is, moreover, not conducive to improvement in health, but, on the contrary, when too prolonged, exhausts the system ; and in ordinary cases, when the struggle is over, the person finds it imperatively necessary to return to the ordinary quantity and admixture of food. It is believed that, when judiciously effected, it gives freedom of motion and endurance ; but it is doubted whether it affords greater strength during the fight, and afterwards the prostration of strength (as in the case of Heenan), is oftentimes deplorable.

The case of jockeys is much worse than that of prize-fighters, since the object in the training is to reduce the weight of those who are already below the average weight; and equal pains are not taken to sustain the general health and vigour of the system. The restriction of fluids and the production of perspiration are carried out severely; whilst alcohols are often interdicted, vegetable foods reduced, and animal foods insufficiently increased. Hence we have in the training itself an explanation of the feebleness and early mortality of this class of persons.

I doubt if much improvement can be made in the present system of training. The whole tendency is to induce an abnormal state of system, and the rapidity with which the change must be effected will always render it dangerous to health. I will, however, offer one or two remarks of a general tendency.

1. The small allowance of fluid as food, conjoined with the daily diminution of fluid within the body, is fitted to lessen the digestion of bread and other farinaceous food; for the fluid will be absorbed into the blood almost instantly, instead of being appropriated to the solution of food in the stomach. The same fact, conjoined with the excessive elimination of fluid by the skin and the consequent diminution of the secretion of the kidneys, renders it almost impossible for the waste of animal food and of the tissues to be removed from the

body; for this proceeds almost exclusively by the latter channel. Hence a state bordering upon disease must always be present, and a gouty condition of system will follow; and it is only the limited period of the training which prevents the occurrence of serious mischief. I found in my experiments that three half-pints of cold water, *taken alone* in the early morning at intervals of half-an-hour, caused an evacuation of thrice the amount by the kidneys before mid-day (no food having been eaten) and thereby materially lessened the weight of the body; and I suggest to trainers the adoption of this plan every fourth day.

2. Alcohols in every form tend to lessen the elimination of fluid from the body, and should only be given in training when support of the digestion and the action of the heart is called for—that is, when the training is carried on too severely. The statement that a glass of wine increased the weight of the body by several pounds within an hour or two was evidently an error. No food can increase the weight of the body immediately beyond its own weight, but it may lessen the rapidity of decrease of weight, as by lessening the perspiration. The fact, however, seemed to have been proved, and an explanation was offered, to the effect that vapour from the air might have been absorbed by the skin and lungs; but as the air which is expired contains (in ordinary weather) more vapour than that which is inspired, and as the power of the skin to absorb fluids is exceedingly limited, the only fact of importance is that which my experiments have proved, viz., that the wine would

lessen in a small degree the quantity of vapour which the expired air contained, and increase the weight of the body by one to two grains per minute.

3. Coffee lessens whilst tea promotes perspiration, and hence the latter is to be preferred.

4. The application of cold salt and water after the sweating is of the highest value, since it limits the sweating action and restores the tone of the skin.

5. It is highly probable that the large quantity of meat which is given at dinner is only partially digested; and it would be much better to limit it to half-a-pound at that meal, and, if needs be, to supply more in the evening. The value of eggs is far inferior to that of meat.

In conclusion, we cannot fail to see that the experience of training offers but little encouragement to those who, led by the whim of the day, would enter upon a similar course merely to reduce a degree of bulk of body which is not really excessive.

SECTION V.—DIETARY IN OLD AGE.

The requirements of the dietary in old age are that it should be smaller in quantity than at middle life, be highly nutritive and well cooked, be given when hot and at short intervals, and even in the night at a very advanced period of life.

In old age the faculty of taste is less sensitive, and the power of mastication is much limited, whilst at the same time the appetite for and the relish of food have diminished. The old therefore need the watchful care of others to encourage them to take sufficient food and to provide savoury and agreeable dishes. Besides the warm fluids which are then so grateful, as tea and well-seasoned soups, the dietary should chiefly consist of animal food in the form of eggs, milk, and meat: the first boiled, poached, or fried, or made into savoury omelettes and eaten at any of the meals; the second made with cream and farinaceous foods into puddings, and the last eaten always when hot and fresh, and with all the variety which can be obtained, and prepared in a savoury manner. Generally, roasted or fried meat is preferred to boiled meat, since it is more savoury; but whatever may be the mode of cooking, the meat should be made tender by good feeding, keeping, and good cooking, and if it be boiled it should be accompanied by proper sauces. Curries of fresh meat are very proper, but those of fish, as indeed fish in any form, are less valuable. A moderate quantity of fat of an agreeable flavour is generally liked, and is very suitable; and hence a certain richness may be given to the food, whilst the quantity of food which is supplied at a time should be limited. Bread should be given in very moderate quantity.

When however there is a hale and vigorous old age, and the appetite retains its force, it is well that the food which is supplied should be as plain as it was in earlier years. If possible it should still contain much milk, as with the tea or coffee for breakfast, the farinaceous pudding for dinner, and the milk porridge or hot milk pudding for supper. There may however be an increase of meat to whatever extent the appetite will allow, provided there be the capability of masticating it well, or it be well cooked in stews or soups. All the food may be rendered somewhat more savoury.

It very commonly occurs that in old age the breakfast is deferred until a later hour than formerly. Moreover the depression of the vital powers which occurs at every period of life in the middle of the night, say from 1 to 4 A.M., is exaggerated at this, and hence there are two reasons why food of a nutritious and easily digested kind should be given at supper, and why, with watchfulness in the middle of the night, a little hot milk or chocolate should be given to those who are very feeble. Nothing is better for the supper than milk porridge, or a hot milk, egg, and farinaceous pudding, or a plate of good soup, or a small omelette with a glass of hot claret negus. The habit of taking hot spirits and water soon before retiring to rest is not without danger at this period of life, except it have been a habit indulged in for many years, and then it should still be allowed, or its discontinuance be effected with caution. As by far the larger proportion of deaths occur in the night when the vital powers are at their lowest point, there is especial danger at that period in old age, and it should be borne in mind by those having charge of such persons. If the dinner hour is 6 o'clock or later, the midday lunch should be equal to a dinner, and consist of good soup and hot meat.

Wines are well borne, and are probably more fitted for old age than for any other period of life. They should be old and generous, and not given more largely than two or three glassfuls daily in health; but if the health and appetite are good without them they should not be regularly given.

A supply of artificial teeth, if necessary, and plenty of clothing, with a considerable amount of carriage and other kinds of exercise, should be added to the system of dietary.

CHAPTER V.

DIETARY IN SCHOOLS.

As I have already indicated the dietary for young persons in Chapter III., I purpose here to refer only to the special conditions which are met with in schools.

There are many boys' schools where from routine, or a desire to increase the attainments of the pupils, the following is the course pursued:—Rise at 6 o'clock; enter school at 7; breakfast at $8\frac{1}{2}$, either with or without a short interval since leaving the school; school at $9\frac{1}{2}$ to $12\frac{1}{2}$; dinner at 1; school at 2 to 5; supper at 6; and school again, or preparing lessons until nearly bed-time. There is generally a short interval before and after each of the meals, but the mind is engrossed from early morning to late at night without much relaxation. There are only three meals a day, and they consist of bread and cold milk for breakfast and supper, meat frequently hard, and salted, cold and hot alternately, with vegetables and bread, and a flour or other pudding on alternate days for dinner.

In many girls' schools there is a variation of the above plan as follows:—The forenoon lessons are arrested at 12 o'clock, and a walk of two hours is taken. A lunch of a little dry bread or bread and butter and water is then allowed, and after the afternoon lessons dinner occurs at 5 or 6 o'clock, and tea with a morsel of bread and butter is given in the evening; or the morning lessons are continued with a slight interval until 3 P.M., when the dinner is taken without any lunch. An interval of two hours then follows, after which tea is taken with a little bread and butter, and the lessons are prepared for the morrow. In both of these plans for girls there is very great deficiency in the quantity of milk which is eaten, and the meat being allowed only once a day is quite insufficient to remedy it. The lunch referred to is quite inadequate to sustain the strength during the working hours of the day, and in feeble persons the appetite at 6 o'clock could not repair the defect.

There is also practically a limitation in the supply of meat even when it is theoretically unlimited; for it is understood that the first supply is about the right quantity, and although they may be invited to take more, each pupil has some diffidence in asking for more, and goes without. There are however many schools in which there is a further limitation than this implies, for the pupils are invited only in a general manner to take more, and that only when any of the supply of meat is left. In a school of moderate size the attention which is paid to the amount which each pupil eats is but small, and in a large school it is almost neglected; so that diffidence, the remarks of comrades and defective appetite for fat, or for the food in general, are almost uncontrolled.

There are many of the higher class of schools in which the dietary arrangements and supervision much more nearly approach to those of a well-regulated private family; but such is not the rule, and the above illustrate the evils which I wish to point out.

I will now offer some observations on the best arrangement of the dietary in schools.

There should be four meals daily, taken at 8 A.M. in summer and 8½ A.M. in winter; 12 to 1 P.M., 5 to 6 P.M., and 7½ to 8½ P.M. The breakfast should consist of three-quarters of a pint of hot milk porridge in the cold weather, and hot or cold milk in warm weather, with as much bread as the appetite will take. The milk should be new and without water, and the bread should be of good households flour lightly and uniformly baked. If in girls' schools it is thought necessary to give tea or coffee, coffee only should be given, and that in the form of *café au lait*, viz., three parts of hot new milk with one part of coffee, so that about half-a-pint of milk may be taken at the meal. Butter should be added in fair proportion to the bread, and the bread and butter be supplied in an unlimited quantity.

It is very advantageous to cultivate the use of oatmeal amongst boys, and this may be partly effected in the milk porridge, but for such as have no distinct objection to its use it would be well to give them the opportunity of eating the Scotch porridge, or oatmeal hasty pudding, with treacle or with cold milk as an occasional breakfast. It is made by simply sprinkling oatmeal into water whilst it is boiling until the food is thick enough and has been well boiled. I do not, however, advise that any boy should be compelled to eat this food, since there are many to whom it is very repulsive.

The dinner should consist of joints of meat of good quality, almost always hot and almost always fresh. Salt meat should not be eaten more frequently than once a week, and it should be very lightly salted, so that the liquor shall be fit for making broth. Whenever the meat is boiled the liquor should be given in the form of soup or broth, so that the valuable salts which have been boiled out of the meat may thus be given to the system on the day on which the boiled meat is eaten. The quantity of these salts may be ascertained by reference to my report on the dietary of the Lancashire operatives in the fifth report of the Medical Officer of the Privy Council. Bones well broken and stewed in the meat liquor for eight hours should be added, and the broth or soup should be properly flavoured with herbs and vegetables and thickened *occasionally* with rice or split peas. The quantity of meat should be unlimited, and in order that the pupils may be encouraged to ask again it is better in large schools that separate joints be distributed over the table so that one shall be near each knot of pupils, and each pupil be specially invited to ask for a second supply. Fresh vegetables, well cooked and served hot in an almost unlimited quantity, should be provided daily, varied in character, but always consisting in part of mealy potatoes, and in other part of greens, cabbage, turnips, and carrots, in their season. In cold weather split peas, French beans, and rice, boiled in meat liquor and properly flavoured, may be advantageously eaten as a vegetable with meat, and particularly with bacon or ham. There is generally a dislike to fat in schools, and as this seldom extends to bacon, it is very advantageous to have a bacon dinner occasionally. Pudding should be given daily after the meat, and be varied from day to day. Rice and other farinaceous puddings made with milk are the best, and after them come suet puddings, boiled or baked, made also with milk, or roley-poley preserve and similar puddings made with a suet crust. It is possible that on the days when soup is given to boys the pudding might be supplanted by bread and cheese.

I cannot here refer to the mode of cooking further than to observe that the meat should be well cooked and tender; the potatoes mealy evenly throughout; the peas, beans, and rice made soft and yet not mashed; the pea-soup not too salt or too thick, and flavoured differently on different occasions with dried herbs; the bread well baked and the flour puddings well boiled. I would also add the remark that as it is almost impossible to serve the food quite hot to all the boys in a *large* school, it is better to use hot-water plates, at least in the cold weather. Boys in a large school need to have their food hot as much as those in a small school, and may fairly demand that it shall be so.

The beverage with the dinner should be water or *weak* home-brewed beer according to the wishes of the pupil.

The tea meal should consist of half-a-pint of warm or cold milk, with bread and butter in an unlimited quantity, and if tea be desired for girls a small portion should be added to a larger quantity of milk.

The best food for supper is bread and butter or bread and cheese when milk was taken at the tea meal, and bread and milk when otherwise. When the former are taken they should be accompanied by water or weak beer.

To dine at a late hour is not consistent with the best mode of supplying food to the pupils ; but as this is the practice in the higher class of schools, it is necessary that I should add a few remarks upon it.

With late dining, it is far better to defer the dinner until 5 o'clock than to have it at 3 o'clock, since it leaves a proper period at which a good lunch may be taken. The lunch should be taken at the proper hour for dining, and consist of cold or hot meat, with bread, butter, or cheese, and water or weak beer. When the dinner hour is fixed for 3 o'clock the lunch should be given at 12 o'clock, and consist of bread and butter or cheese, with water or weak beer. With the dinner at 5 o'clock, the supper will not be necessary, but the tea will be taken in its place, and there should be a full allowance of bread and butter. When the pupils dine at 3 o'clock the tea meal must be deferred until 7 o'clock or a supper must be allowed.

Hence, whilst it is necessary to place a limit upon the quantity of milk which is supplied, and it is desirable also to limit the quantity of soup, tea, coffee, and weak beer, it is essential that all other foods be given in an unlimited quantity. It is also right, regardless of habit, to supply every pupil with hot food, and whilst always selecting plain food, to afford much variety. The milk should always be new and good, except, perhaps, that which is made into puddings, if suet form an element in the composition of the pudding. Milk from which the cream has been skimmed for the use of the officers should not be given as new milk.

In the management of large quasi-public schools there should not be a preconcerted sum allowed for the maintenance of the pupils, within which the govenor or other head authority should make it his first concern to keep his expenses. The food supplied should be simple and given as abundantly as the pupils desire, quite irrespective of precise cost. It is also very important that at table the pupils should be divided into small bodies, over each of which a teacher is placed, whose duty is at the meal times to make himself acquainted with the peculiarities of each pupil so as to know whether he is eating any kind of food in excess, or in an insufficient quantity, and particularly if he take less than a fair share of meat and fat; and in cases in which either tendency exists the evil should be corrected privately. Pupils must be fed as they should be taught, viz., as individuals and not as classes. When the dislike of fat of meat is marked, it is important to induce the pupil to eat more fat in other forms. This may be effected by butter, by bacon dinners, and by the use of dripping with the potatoes, or (for supper) with toasted bread, or with mashed potatoes instead of the other food above mentioned. Many, if allowed to spread it themselves, will eat it cold with toast, and if it were possible to serve the toast hot, many more would occasionally prefer it to any other food. It is far more rational that the dripping should be thus consumed by the pupils than sold from motives of economy.

I would express my conviction that whilst over-feeding may render the boy sluggish and inapt at learning, a full and generous dietary is calculated to give energy both to the body and the mind, with independence and force of character, and to fit him both for the battle of precedence in the school and for the struggle in which he will be called upon to enter at a later period of life. Feeble persons may be apt to learn, and may pre-eminently excel in mental accomplishments, but strength of body is now as necessary for success in life as activity and acuteness of mind. Both should go hand in hand.

CHAPTER VI.

DIETARY OF THE LABOURING CLASSES.—FAMILY ARRANGEMENTS.

I PURPOSE in this chapter to discuss the question of the dietary of the labouring classes, and although that term will include persons who are very differently circumstanced in their means of acquiring food, it will almost universally indicate those to whom economy in the selection of food is of great or even of prime importance, and it is in that sense chiefly that the remarks I have to offer will differ from those to be found in Chapter III.

There is also a considerable difference between country and town populations in the kind of food which they can obtain in the most ready and economical manner, and probably also in the kind and quantity of food which they require, and consequently both must be included in the observations now to be made.

The medical department of the Privy Council has given much attention to these questions during the last two years, and acting under the direction of the Government, I have ascertained in the most careful manner, and on a very wide scale, the ordinary dietary of low-fed populations in both town and country, and at the same time have noticed many of the most evident defects.

The details of these inquiries have been published in the Reports of the Medical Officer of the Privy Council for 1862 and 1863, and I shall make use of them so far as they may be applicable to my present purpose.

I will first give a very short statement of the mode of living, and the quantity of food obtained by some large divisions of this class, and then point out the best and most economical food which they could obtain.

SECTION I.—THE PRESENT MODE OF LIVING.

There are in nearly all families four classes of cases, each of which has its own special requirements, viz., the infant, the young children, the wife and the husband; and I purpose to consider them in their order.

The Infant.—The infant, until a certain period, lives chiefly or entirely upon its mother's milk, but after that it is wholly dependent upon other food. Many mothers are ignorant of the fact that milk is still as necessary for the nutrition of the child after it has been weaned as it was before, and they feed it with whatever food they or the elder children take. Others, however desirous they may be, are unable to obtain milk; and others still, being obliged to work away from home, leave the babe to the care of a young child or to the want of care of a neighbour; or if the mother be generally absent from home, she pays a fixed sum for the maintenance and care of the child to some one who has an interest in feeding it on the least expensive food. Hence, speaking generally, the infant is fed both before and after it has been weaned upon a sop made with crumbs of bread, warm water, and sugar, and in some cases a little milk is added. Bits of bread and butter, or of meat, or any other kind of food which the mother may have in her hand are added; and not unfrequently drops of gin or Godfrey's cordial, or some other narcotic, are administered to allay the fretfulness which the want of proper food causes. It should be distinctly understood that milk is essential to the health and well-being of the infant, and should be obtained at any amount of trouble. The proper quantity of milk required per day varies from 2 to 3 pints, but if that cannot be purchased it is of the greatest moment to obtain at least 1 pint daily. When the required quantity of milk can be had no other food is required, except perhaps a little bread or biscuit in the second year of life; but when all of it cannot be obtained, the quantity of milk should be mixed with water and boiled with a little fine flour which had been previously boiled for six hours, and the whole sweetened with sugar; or the milk should be boiled with oatmeal for at least half an hour, and the liquor strained through muslin, or the sweetened and hot milk and water should be poured over bread crumbs.* A very small quantity of butter should be added in each case, and small portions of boiled eggs given separately three or four times a day. The places are comparatively few where a little milk cannot be obtained for the infant, however it may be denied to the

* See Appendix for Liebig's food for infants.

other members of the family; but where it is wholly unattainable, the best food in addition to the sop is small portions of boiled egg, so that a small egg may be eaten daily; yet with every care the dietary will be defective. When fed with this kind of food it must be with the spoon, and the food should be given every two or three hours.

The Young Children.—In very poor families the children are fed at breakfast and supper chiefly upon bread, bread and treacle, or bread and butter, with so-called tea; whilst at dinner they have the same food, or boiled potato or cabbage smeared over with a little fat from the bacon with which it was boiled, or in which it was fried, or have a little bacon fat or other dripping spread upon the bread, and drink water or join the mother at her tea. On Sundays they usually have a better dinner, and on week days, when a hot supper is provided instead of the dinner, they join in eating it. They rarely have more than three meals daily, and often have only two, or the third meal is a small one. In some ill-managed families they obtain small portions of beer from the father at the public-house, or from the mother, with her half-pints at home.

At this period of life also nothing is equal to milk for food, and when new milk cannot be obtained skim milk should be used. If plenty of milk and bread is eaten there need not be serious fears as to the health. When skim milk can be obtained cheaply, as at $\frac{1}{4}$*d.* per pint in Devonshire, and $\frac{1}{2}$*d.* per pint in most country places, no food is so economical and useful as milk-porridge made of it, and thickened with flour or oatmeal; and also milk-pudding made with milk, rice, sago, corn-flour, &c., and vegetables, for dinner. A little fat, as suet or butter, say $\frac{1}{4}$ oz. to a pint, should be added, so as to supply the amount of fat which had been taken off the milk when it was skimmed. It is very desirable that meat should be given at least occasionally, and particularly if the quantity of milk is deficient; and, in the absence of both milk and meat, the best alternative is bread, with whatever fat may be obtained to spread upon it, and hot vegetables as frequently as possible. The use of both tea and beer should be deprecated, but as the strength of the tea which they obtain is very slight, the warm water and sugar with which it is accompanied render it not undesirable.

The Wife.—The wife, in very poor families, is probably the worst-fed of the household. On Sundays she generally obtains a moderately good dinner, but on other days her food consists mainly of bread with a little butter or dripping, a plain pudding and vegetables for dinner or supper, and weak tea. She may obtain a little bacon at dinner once, twice, or thrice a week; but more commonly she does not obtain it. In counties where milk is abundant she adds it more freely to her tea, but when otherwise she drinks tea without milk, and during a part or the whole of the week without sugar also. In towns the wife fares relatively somewhat better, for as meat in some form is obtained more frequently than by the poorest families in the country, and the members of the family take their food together at home, she obtains her share. This often consists of sheep's trotters, sausages, herrings, black puddings, fried fish or similar savoury but not very nutritious food. In families where the pressure of poverty is less felt the wife is better fed, but so long as much effort is required to obtain food for the children and the husband she remains generally the least fed.

The Husband, in the poorest agricultural families, is certainly better fed than any other member of the family, for his labour being of the deepest importance to the family, the wife feels that he must be sufficiently fed if possible, and because of the impossibility of dividing equally between himself and the other members of the family such food as he must take with him to the field. Hence he obtains nearly all the meat or bacon, when there is but little, and the week's supply, after the moderately good Sunday's dinner for all, is reserved so that he may take it cold with him to his work, or have a rasher cut off, and fried with vegetables, for his supper. With less pressure some can be spared for the wife, and the gravy and dripping become the portion of the children. He must also have a larger share of the bread, and, in Dorsetshire, where cheap cheese in great part supplants bacon, of the cheese also. The beer and cider, moreover, have some nutritive value, and they belong exclusively to him. His meals consist of bread and butter, or bread and cheese, or bread and bacon with coffee in the morning, and with tea at dinner, if he takes some with him, but more commonly with beer or cider. There is—except in districts where fuel is very scarce—a hot meal daily, either a dinner or a supper, according as the husband can return home to the former or not. This consists, except in the very poorest cases, of herring or bacon, or some similar food, with potatoes or cabbage, and in certain districts, as Somersetshire, of a boiled pudding, and sometimes with bread and butter, or bread and cheese added. If it be a dinner the evening meal is accompanied by tea or coffee. Even in counties where milk is abundant it is rare to find the husband having his basin of milk-porridge morning and night.

In towns the food of the husband more nearly resembles that of the family, but he is entitled, from his bodily wants, to have a larger share than the others. Neither he nor his wife ever indulge in the luxury of a basin of milk, and probably the whole supply of milk for the family does not exceed $\frac{1}{4}$ to $\frac{1}{2}$ pint daily; but they, more commonly than in the country, indulge in beer at night.

Single Young Men and Women, and Youths, who support themselves, have usually a larger absolute income than falls to the share of the different members of a family; but from the absence of knowledge or opportunity, they spend their money to less advantage and take their food with less comfort than occurs in a family. Some in towns take at least one meal daily from the cook-shop, and in the cotton districts they have the opportunity of having their meals partly or wholly supplied to them from a cook-shop at a small cost daily, except on Sundays.

Such is a short sketch of the mode of living of the low-fed labouring population, and the following is the amount of food which on inquiry I found to be consumed by each adult (reckoning, for the reasons given in my Report to the Government, one person above ten years of age and two persons below that age as an adult) weekly.

Agricultural labourers living at their own homes, on the average derived from every county in England, obtained of bread, flour, oatmeal, peas, rice, and similar farinaceous dry food, reckoned as if all were bread, $12\frac{1}{3}$ lbs.; of sugar or treacle, $7\frac{1}{3}$ oz.; of butter, dripping, or suet, $5\frac{1}{2}$ oz.; of bacon or meat, 1 lb.; of milk, 32 oz., or a little more than $1\frac{1}{2}$ pint; of cheese, $5\frac{1}{2}$ oz.; and of tea, $\frac{1}{2}$ oz. The quantities differed from each other in the other parts of the kingdom, viz., Wales, Scotland, and Ireland, so that the labourers in all three obtained more breadstuffs; in Scotland and Ireland much less sugar, fat, and cheese; in all three much less meat; in South Wales much more cheese; in Ireland much less tea; and in all three much more milk, than those in England. The particulars of each dietary may be found at page 209 of the Sixth Report of the Medical Officer of the Privy Council.

Indoor labourers of the low-fed classes, viz., silk-weavers, needlewomen, kid-glovers, stocking-weavers, and shoemakers, obtained of bread, &c., $9\frac{1}{2}$ lbs.; of sugar, 8 oz.; of butter and other fats, 5 oz.; of meat and bacon, $13\frac{1}{2}$ oz.; of milk, 18 oz., or somewhat less than a pint; and $\frac{3}{4}$ oz. of tea. They thus obtained much less food than outdoor labourers, the nutriment in the former being 28,876 grains of carbon, and 1192 grains of nitrogen, whilst that of the latter was 40,673 grains of carbon, and 1594 grains of nitrogen; but the difference was chiefly in the breadstuffs and milk.

There was much difference in the amount of food eaten by these several classes of operatives. Needle-women were the worst fed, and lived on the average, weekly, upon $7\frac{3}{4}$ lb. of bread, $7\frac{1}{4}$ oz. of sugar, $4\frac{1}{2}$ oz. of fat, 15 oz. meat, 7 oz. of milk, and $\frac{3}{4}$ oz. of tea. They spent their money upon food which was not nutritious in proportion to its cost; so that whilst they obtained only 22,900 grains of carbon and 950 grains of nitrogen weekly, stocking-weavers with the same income living in the country obtained 33,537 grains of carbon and 1316 grains of nitrogen.

SECTION II.—THE MOST SUITABLE DIETARY.

In proceeding to point out the most proper and economical food for the labouring classes, I shall not deem it necessary to again discuss the economic values of different foods, but must beg of the reader to refer to the remarks in Chapter III. I would also, with the knowledge which I have obtained by so extensive and unique an inquiry, deal very tenderly with the apparent defects in the plans pursued by the poor; for it is almost impossible for any one who has never felt the necessity of rigid economy in the selection of food, to be so practically acquainted with the subject, as those who by years of want and care have gained their experience with all its deficiencies; and I would venture to commend the same spirit to those who take upon themselves to advise the poor.

Certain general considerations must be noticed before the details of the plans to be proposed can be given.

1. The poor have great deficiency in cooking utensils, and thereby their modes of preparing food are very limited, and the possibility of good cooking greatly restricted. In this respect the advisers of the poor may do them real service. Let them give such *necessary* utensils from those in their own kitchens which have been already used, as on inspection are found really to be required, and teach them how to use them and keep them clean. A gift of this kind would be valuable for years.

2. They have, except under very special circumstances, a deficiency of fuel, and particularly in the South-Western counties, where they use furze, roots, and hedge clippings almost exclusively. Without fuel they cannot cook, and hence it often occurs that a hot meal cannot be obtained more than twice or thrice a week. This evil is greater everywhere in the winter season, when hot food is the more necessary. A man who can obtain hot meals at home would not need to seek the fireside of a public-house; and the health of the wife and children demands the use of hot food. Let the farmers aid their men more effectively to get abundance of firing, whether of wood, turf, or coal; and let the rich

aid and encourage the establishment of clubs for the obtainment of this indispensable part of a dietary.

3. The wife has but a very limited knowledge of cookery, and this, added to the fewness of the utensils, limits the variety of foods which she prepares, and consequently which she purchases. Efforts have been made without much success to teach them to cook, as for example, by inviting them to learn cookery at the parsonage; but how great the difference between the kitchen of the parsonage, with its good coal fire always at command, its variety of clean and proper utensils, its abundance of crockery, and the knowledge of the value and the taste which has been acquired for the most proper kinds of food,—and her own furze fire, cupboard, and information! What wonder that she should go back to her own ways when the training is over! The better mode is, with the greatest modesty and caution, to instruct in the cooking of one food at a time at their own homes, selecting that food which they have habitually in the house. When another kind of food is recommended, take care that it is such as they have the means of obtaining and cooking; then take it ready cooked to the house, so that it may be seen whether the wife and family approve the flavour, and inform them as to its economy and nutritive value, and when their confidence has been gained, show the wife how to prepare it herself. Another and yet more practical mode of helping the poor is to prepare a good nutritious soup for them twice or thrice a week, to be sold at the cost of the materials. A good soup made

with meat may be sold at 1*d.* per pint or even less. Similarly, skim milk might be given away, or rice, or Scotch barley and milk prepared, and sold to the poor.

4. The small sum of money at the wife's disposal, and the great necessity which she feels for obtaining sufficient bread as the staple article of food, greatly restricts her capability of buying variety of food. If she had all the requirements for cooking, and were better informed as to the real value of some other foods, she might gain greater variety; but with good and low-priced bread universally obtainable, it may be shown that she does not now go far wrong. It is also very common for her to have to provide two sets of meals, one for those at home and another for those at work from home, which is a further tax upon her resources.

5. Very many families are in debt for food, and are therefore restricted to buy their food at certain shops and to take such kinds of food as are offered to them. This in villages is often a serious evil, since the price of food is generally high, whilst the quality is not good, and those foods which are not the most commonly consumed are charged at a yet dearer rate. Here the rich may help the poor by promoting the establishment of clubs, at which certain foods may be purchased and retailed to the members at the wholesale price; or in their absence, by buying and selling to the poor at cost price such foods as oatmeal, Scotch barley, rice, peas, and American bacon.

6. Limitation of food for the purchase of clothing and shoes is often necessary. This might be lessened

by the aid of the clubs just mentioned, by the rich giving their partly worn clothing to the poor, and begging the left-off clothing of their friends living at a distance for the same purpose. By encouraging and aiding both men and women to wear woollen clothes of a rough and cheap kind, as is the case with the women in Wales, rather than calicoes and cotton cloths, for when properly selected they are the cheapest in the end. The rich might readily buy the fabric at cost price, and sell it to their labourers and others.

7. The wife herself must work at home, as for example, in straw plaiting, or she goes out to work in the fields or the factory. In the former case she has but little time for preparing food, and in the latter she has none at all until she has left work in the evening. Hence the food of some members of the family must be obtained away from home, whilst that of others must be eaten when cold during the day, or be cooked by a child, and the chief meal will be the supper.

8. Milk, which is so essential an article of diet cannot, except in a few localities, be obtained in abundance and cheaply, and in many places it cannot be obtained at all. Here again the rich can help the poor. Some, as the Marquis of Bath, keep cows that they may supply the labouring classes with new milk at 1*d*. per pint, supplying at least enough for the young children and for the sick. Others, as my friend Mr. Merry of Highlands, give new or skim milk, again preferring the children, women, and sick persons. Others, as the Welsh farmers, give butter-milk once or twice a week.

There are many farmers who have these but will not sell them, preferring to make all their new milk into butter and cheese, and to feed pigs on skim milk and butter-milk. The influence of the clerical and medical professions, as well as that of public opinion in general, should be brought to bear upon such persons, so that they may appreciate the responsibility which rests upon them in the monopoly which they have of a food so essential to the welfare of man.

How desirable it is that the poor should be aided to purchase a goat or a small cow where a common is near to their dwellings, or where the animals may feed in the lanes.

9. The progressive enclosure of commons is an immediate injury to the poor man. He can no longer cut furze for his fire, or keep a few geese or a pig upon the waste land. A housewife with a gander and three geese could, with an open common, rear young geese in sufficient numbers to pay the rent of her house; and the labourer's pig could supply a large portion of its wants before it is shut up for fattening without any cost to its owner; and thus a provision would be made fitted largely to improve the dietary of the labourer's family.

10. It is much to be regretted that clear and good water is often quite unattainable in country places, and that the poor must supply their wants from a pool or a rivulet, or from a spring which pours out its water upon the ground, and which is rendered muddy by the feet of cattle or the carelessness of men. Hence the water which

is used is often thick and repulsive or derived from unwholesome sources.

Such are a few of the difficulties which stand in the way of introducing a good system of dietary into the homes of our labouring classes. I will now proceed to point out the best system which the poor can adopt.

When the pressure of poverty is extreme, the poor man's family should be fed almost entirely on bread, since at its present price bread is the cheapest food of any in ordinary use, in relation to the nourishment which it affords. The first duty is to provide sufficient food to maintain health, and after that it will be right to please the palate.

The cheapest fat to eat with the bread is dripping, if it can be obtained, and next to that American bacon, costing 4*d.* or 4½*d.* per lb. The fat of mutton which is cut off the meat is often sold at 4*d.* to 5*d.* per lb., and if it be not disliked when boiled and eaten cold, is a cheap fat. Butter is the dearest fat, but there are very low-priced admixtures of fats sold under that name which, if the flavour be not objected to, would occupy the next place in point of economy. Butter has, however, the advantage over other fats of being always attainable, of being ready for use, of having an agreeable flavour, and of being of a proper consistence to spread upon bread, and will therefore be more generally used than the other fats.

Indian corn meal or maize is the cheapest food of a character similar to bread, but it has a rough and coarse flavour, and would not therefore be eaten except in extreme poverty, or after the palate had become accustomed to it. It is fully one-half cheaper than household wheaten flour, but it is not as yet, usually kept for sale, either in town or in country places. It is prepared for the table by being boiled in water like hasty pudding, and is eaten with a little sugar or treacle ; or it is made into cakes by being mixed with water and a little soda and baked before the fire, or in the frying-pan, or in the oven ; or it may be made into baked puddings with milk, and with or without eggs. It is generally eaten when hot. There are many sensible housewives who would induce their families to eat it at least occasionally if they were informed of its low price and nutritious qualities, and instructed in the modes of cooking it.

Oatmeal is not now so cheap a food as wheaten flour, and, therefore, cannot be recommended to the very poor, except in the small quantity required to make gruel or porridge. Where it is used largely, as in the north of England and Scotland, the shells should not be thrown away, but be soaked in water for twenty-four or forty-eight hours, until the mass ferments, after which it should be skimmed and boiled to the consistence of gruel, or until it becomes, when cold, a jelly-like food. Both forms are of value and cost very little. They are called sowans in Scotland, and budram and sucan in Wales. Oatmeal is best prepared by boiling it well in water and eating the hasty pudding thus prepared with treacle, or sugar and butter, or milk.

Households flour should be, as it is universally, preferred to both brown flour and finer flours, since it is cheaper in relation to its cost and nutriment, can be eaten with very little butter or treacle, and does not act unduly upon the bowels. Brown bread should not form part of a poor man's dietary.

Barley bread and rye bread should both give place to households wheaten bread, unless they are obtained at a low cost, and as a part of the wages; since, although the cost of barley meal and rye meal is less than that of wheaten flour, the nutriment which they afford is less also; and as from their flavour they cannot be eaten pleasantly without butter or treacle (which cannot always be obtained), their use is practically not economical. Rice and Scotch barley are valuable as affording variety, and particularly in making puddings, or rice milk, but their cost should not exceed $1\frac{1}{2}$*d.* per lb., for if more, wheaten flour is cheaper.

Peas, when split, or with the shells strained out of the liquor, are a very valuable food, and their use should be largely extended. Their flavour, and the action of the shells upon the bowels, have hitherto limited their use, but the latter may be removed, and the former either modified or tolerated. The best modes of using them are in making soup, or as pease-pudding, and hence they may be used whenever bacon has been boiled, or when there is fat with which to boil them. The peas for pudding should be boiled with the bacon, or with some fat liquor, and when eaten should have a fat flavour. In soup it is important that the flavour be changed by the addition of herbs of different kinds, so that the children may not be disgusted with it, and peas should not be added to broth at all times. Moreover, as the flavour is harsh, and the food a very strong one, it is not well that large quantities be eaten at a time. The pea-soup should not be made too thick, and the pease-pudding should not be eaten too freely. They might be used with advantage once or perhaps twice a week, if properly cooked, and are better used as a part than as a whole meal.

Lentils prepared in a similar way, with fat and spice, are a most economical food, but they are not known as such in this country.

Potatoes and green vegetables are of the utmost economy to the poor living in the country, since they are produced at very little cost. They also supply much nutriment, are agreeable foods, and constitute a large part of a dinner, or supper, with the addition of a little fat, when meat or bacon cannot be obtained. Potatoes are by far the best of this class of foods, and it should be the care of the labourer to provide a large supply from his garden and potato-ground, and to so use them that when they are sound, and will keep, they may supply the wants of his family through the whole winter. It is too frequently the case that they are eaten in an extravagant manner when they are new, and the crop newly gathered, and the whole stock is consumed before Christmas. It is also very desirable that the labourer should grow a further quantity, with which he may feed a pig, since in the crop for his own use there will be refuse potatoes which could only be eaten by a pig; and these, with potato-peels, and other refuse food from the family, would almost keep a young pig. Half an acre of potato-ground will yield 160 bushels of potatoes, and of these 50 bushels will keep the pig for 40 weeks, and with 16 stones of meal, will produce a pig weighing 16 stones, and worth *5l.* to *6l.* Half of this pig would supply 2 lb. of meat, or bacon, to his family weekly, and do much towards supplying all his wants in meat.

Green vegetables are often eaten in great excess when they are abundant, and the supply is soon exhausted. It is better to eat them moderately over a longer period. When bacon is boiled with the cabbage, the water should not be thrown away until the fat has been skimmed from it. The labourer should seek to provide winter greens and early cabbages, and besides a good supply of cabbage there should be onions, carrots, parsnips, and rhubarb.

Sugar is not an economical food for the poorest persons, and should, therefore, be used in limited quantity, and the price should not exceed 4½*d.* or *5d.* per lb. Treacle when thick, and sold at *2d.* to *3d.* per lb., is cheaper than sugar, and is more fitted for use with puddings, bread, oatmeal, Indian corn, &c. It is not equal to fat for the children, but it is a cheaper food, and will please them better.

Cow's cheek and sheep's head are the cheapest joints of meat, and they should be boiled and the liquor used as broth. The meat of the former will supply a small portion of meat on every day, or nearly so, for a small family; and the broth and the fat (which may be properly skimmed off) will nourish the children, and save the purchasing of butter. The next in point of cheapness is liver, and pig's liver more than any other, and it is well assorted with pease-pudding for dinner. In towns, the pork butchers prepare the liver into a food called *faggots*, which is cheap, savoury, and nutritious. The heart comes next in order of economy, since it is sold usually at 4*d.* to 5*d.* per lb.

In buying meat, the small pieces which are without bone and are cut off the joints, should be selected. Next follow the joints of meat which are without bone, as the thick flank, and part of the round; next the thick and solid parts of the animal, in which the flesh is considerable in proportion to the bone, as the legs of pork and mutton, and the loin and chine of beef, except in fashionable neighbourhoods, where they are sold at a high price; and, lastly, such joints as the neck of mutton and lamb, and the breasts of veal. The wife should purchase such portions as contain the least bone, and may be cut up and fried in slices daily. If she can buy a larger portion, which when cooked on the Sunday will serve the wants of the family during the greater part of the week, it saves cooking, and less of it will be eaten when cold than hot; but it does not render the meal so agreeable, is apt to be unevenly distributed over the week, and does not cost less.*

* See Appendix for remarks on South American Beef.

American bacon if it can be procured in good condition should be preferred to any other, since it is equal to any other in nutriment, and its cost is one half that of English bacon. Those interested in the poor should make suitable efforts to procure a proper supply of this food in villages, either in the club or in the shops. The most economical part, if the price be properly arranged, is that above, below, and on the back of the shoulder piece, since it contains a fair proportion of lean, has a good flavour, costs less than other parts, and may be cut into rashers. The high priced parts should be avoided, as they are not more nutritious, and are charged a higher price only from the quantity which the rich consume of them.

As bacon is so much more convenient in the arrangement of the dietary of the very poor than butcher's meat, I must compare the values of each with the other. English bacon does not shrink when boiled, offers the largest number of slices both when hot and cold in a given weight, affords fat in which the cabbage and peas may be cooked, forms a hot meal for the parents, whilst the dripping delights the children, enables the wife to make the cold vegetables into a savoury meal; and moreover, really good American bacon may be bought at a much less cost per lb. than butcher's meat. Hence it offers many tangible advantages to the housewife. With less pressure of poverty it cannot be doubted that butcher's meat should be preferred to bacon, and in towns the cheaper bits of the former can be readily obtained; but it is probable that the best possible course at present is to use them, as is often the case in practice, alternately, or a portion of each every week.

Pickled pork, which is used almost to the exclusion of bacon and butcher's meat in many counties, is there a cheap food, and is highly savoury, and in no instance did I hear of any ill effects attributed either to the salting or to the pork.

The cheap cheese which is used in Dorsetshire and South Wales is a very economical food if eaten when it is six months old, and in small quantities; but cheese at more than 6*d.* per lb. is not economical. It is, however, a convenient food, and helps to make a meal when meat is not accessible and when cooking is not possible.

Tea and coffee should be drank weak, as indeed they are almost universally by the poor, but not in too great quantities; and when milk can be obtained it should always be preferred. It should be understood that in the strength which the poor prepare them they have very little, if any, action other than that due to the warm water, and the chief use of them is to provide a supply of an agreeable and warm fluid; and hence at the price paid for them they are really very dear foods. They should never be given to the children if warm milk can be obtained. Beer and cider should never be purchased by the poor man, and if he can induce his employer to give him the value of these allowances in money he will do well to do so—at least for half the quantity which is allowed him. When they are received as a part of the wages, the husband should always take a portion home to his wife; and since two pints of cider is the least quantity which is allowed daily, he may do so without injury to himself.

A most desirable event in connection with the dietary of the poor man, is that he should take all his earnings home to his wife, learn the utter valuelessness of strong drinks, and not spend any portion of his money at the public-house; and another not less so is that the wife should have the means, the disposition, and the ability to make her home happy and cheerful, and by a supply of good, warm, and well-served food to keep her husband at home.

SECTION III.—THE BEST ARRANGEMENT OF MEALS.

I will now offer some observations upon the meals of the labouring classes.

When the husband or any member of the family leaves home for work before the breakfast hour he should eat a piece of bread with half-pint of milk, or bread and butter or bread and cheese. Hot food is then desirable, but it is not convenient when fuel is scarce.

The best breakfast for every member of the family is milk boiled with oatmeal and eaten with bread, or Indian meal hasty pudding, or oatmeal hasty pudding eaten with milk. If skim milk can be bought at $\frac{1}{4}$*d.* or $\frac{1}{2}$*d.* per pint, and three pints be used for the breakfast of the family, it will be the most economical and nutritious meal which can be procured. It would be needful to add a little water and a little fat of some kind (as butter or suet), and it should be moderately thickened with oatmeal or flour. The husband should, if possible, take with him or obtain one pint of milk which he should make hot in his can over a kitchen fire or a few burning sticks, and eat it with plenty of bread. But very few employers would refuse to sell him milk for his own use on their land. Next to this food is bread and bacon with butter-milk or hot coffee, or tea, if a little milk can be obtained to add to it; or the weak beer which is sold in certain parts of the country at $\frac{1}{4}d.$ to $\frac{1}{2}d.$ per pint if otherwise. The husband would eat his share of the bacon cold in the field, and the wife and children fry a little for their separate use at home. Next to this is bread and cheese, or bread and butter, or dripping, then bread and treacle, and lastly dry bread with butter-milk or whey. With each of the latter it is well to prepare a sop or broth, such as is in use in many parts of the kingdom, bearing the name of tea-kettle broth, and consisting of meat-liquor, if possible, or of water with a little fat added, and bread, a little flour and seasoning. If the poor could be taught to like broth, and induced to make it with meat or bacon liquor and vegetables, it would be an advantageous substitute for tea and coffee when bacon and milk are not attainable—that is to say, when bread must constitute nearly the whole breakfast.

When the husband is engaged in out-of-door and heavy labour, he should take a little bread and cheese at 10 o'clock.

It is most desirable that all the members of the family should take their dinner together, since their domestic comfort is increased, the father who leaves his home very early, and, but for the dinner, would not return until late, sees something of his children, the whole meal is better cooked and made more comfortable, and the food is more suitably divided amongst the members of the family. Hence the husband should, if possible, return home to dinner if he work within one mile of his house. If, however, he must dine away from home, he should be induced to cook, or at least to warm, his food at the farm-house fire, or to make a little fire for that purpose rather than have another cold meal; and if the food be only bread and cheese, he should warm the beer or cider which he would drink with it. A supply of broth either sent from his home or given by his employer, as on the Yorkshire farms, or taken by him from home, and warmed in the field, would be a most advantageous addition to his meal, and it might readily be warmed in the can in which he would carry it. A little dry turf or a few sticks would be quite sufficient for the purpose.

The dinner should always consist of some kind of animal food with hot vegetables and bread, and, if possible, a pudding should be added; but if broth were provided, it might take the place of pudding. Small portions of bacon, liver, or heart, or bits of butcher's meat, or herrings, should be fried with or without vegetables, and the quantity should not be less than two ounces for each adult, with a less portion, and the vegetables and gravy, for the children (but for the husband it should amount to $\frac{1}{4}$ lb.) ; or the liquor from the boiled cow's or sheep's head should be made into properly seasoned soup, with dry vegetables and fresh vegetables on alternate days, eaten hot, with a portion of the meat so long as it lasts, and failing that, to be followed by a pudding or bread and cheese, and bread and fat for the children. Whilst a good dinner on the Sunday is to be desired, it is yet more important that no indulgence on the Saturday night and the Sunday should be allowed, which will cause the consumption of more food than can be provided for the other days of the week. It should be the aim to distribute the food, so that there shall be a comfortable dinner on every day.

When the stock of potatoes has been exhausted, and the supply of green vegetable is insufficient, the labourer should seek to purchase turnips or turnip tops from his employers, and to use peas once or twice a week, and boiled rice once a week, and thus supply both vegetable juices and nutriment. A savoury and pleasant meal may be made with rice and fat in the absence of meat, as was well pointed out by Mr. I. N. Radcliffe in his remarks on "The Hygiène of the Turkish Army." The rice should be boiled, and afterwards placed in a dry saucepan on the fire, so as to well distend the grains, and then placed upon a dish, and melted fat poured over it. This is the Turkish "Pillaff."

The best pudding is that which is made of milk with flour, bread, Indian corn, rice, and Scotch barley, and a little fat and spice added. When boiled flour pudding is made there should be some fat or milk added to it—those made in Somersetshire with only flour and water are hard and digested with great difficulty, and are quite unfit for the food of the children. With a good milk pudding and bread, the children would make a sufficient dinner, if needs be, occasionally; and if it were possible they should have a milk pudding daily. Suet puddings, treacle roley-poley puddings, and fruit or rhubarb puddings and pies in their season are very good, but fruit pies alone should not constitute a dinner unless accompanied by plenty of milk.

When the husband is unable to return home to dinner, it is still very important that the wife and children should have a comfortable meal; but the absence of fuel will often prevent it.

The tea meal is usually taken by the wife and children alone when the husband works from home, and as it is the last meal which the young children usually have, it also should contain milk and bread, bread and fat, or treacle.

The supper, when all have eaten a hot dinner, should consist of milk porridge, or oatmeal or Indian meal pudding, and in the absence of this, of bread and bacon, or bread and cheese, or bread and butter, with butter-milk if possible.

When the husband has not returned home to dinner, and neither he nor the family had a hot meal, and a hot supper is provided for them, it should have the characteristics of a dinner. It is much enjoyed as being often the only hot meal in the day, and the only meal at which all the members of the family meet. Hence it is difficult to find fault with it; but there can be no doubt that it is better for the husband, if away from home at dinner, to make his meal hot, and for the family to have an ordinary dinner, so that the evening meal may consist of milk.

Hence the model dietary for a poor labouring man and his family is milk with plenty of bread or hasty pudding for breakfast and supper, and meat or bacon with plenty of vegetables, to be accompanied by broth or a milk pudding, or bread and cheese for dinner. The milk may be new or skimmed; and skimmed milk is made nearly equal to new milk, if it be not sour, by adding about half-an-ounce of suet to each pint when it is made into puddings, and a little more than a quarter of an ounce of butter or suet when made into porridge. In the absence of both of these butter-milk should be obtained largely, and whey should be drunk instead of water whenever it can be obtained. The allowance to a Scotch labourer at a farm is three and one-fifth English pints of milk, and in Ireland three pints of skimmed milk or butter-milk daily. An English labourer should have two pints per day, and his wife and children somewhat less in proportion if it were attainable. The poor in this country do not properly estimate the value of skim milk, butter-milk, and whey. Tea should be reserved for the wife at the afternoon meal, and for the family on Sundays or on very special occasions. Eggs should be added to the dietary as far as possible.

In towns where milk is dear, it may be substituted in part by cheap eggs. The model dietary there will be coffee with as much milk as can be obtained, egg or bacon with plenty of bread or bread and butter, or hasty pudding with treacle or butter. Dinner as above. Tea, weak tea with milk and bread and butter. Supper, bread and butter or bread and cheese, with an egg or a milk and farinaceous pudding, or hasty pudding with treacle or fat.

If for a labourer in the country we should consider the following as a sufficient daily dietary, viz., $2\frac{1}{2}$ pints of skim milk at $\frac{1}{2}d.$ per pint, $1\frac{1}{2}$ lb. of bread, 1 lb. of vegetables, $\frac{1}{4}$ lb. of bits of meat, or 2 oz. of meat and 2 oz. of bacon, 2 oz. of cheese, 2 oz. of oatmeal, $\frac{1}{4}$ lb. of flour or some equivalent in rice or peas, and $\frac{1}{2}$ oz. of fat; the cost will be $6\frac{1}{4}d.$ per day, or 3*s.* 8*d.* per week, excluding that of the vegetables, which being grown by him may be here omitted. This dietary would yield no less than 48,500 grains of carbon and 2500 grains of nitrogen weekly, a quantity doubtless beyond his necessities.

I do not think it necessary to consider in detail the differences in the dietary of other classes of labourers, since they are mainly in the quantity of food, and will be regulated by the appetite; but I would add a remark in reference to the dietary of cotton or silk hands and others labouring in warm air. There can be no doubt that the relish for plain food, and particularly for dry vegetable food, as bread, is greatly diminished, and that they seek savoury food and warm drinks. This is not due to inactivity, for I found that a person attending to a spinning-mule walks or runs $1\frac{1}{3}$ mile per hour, but to the warmth and peculiar smell of the air of the factory. Hence the women live much on tea, with bread and as much butter and sugar as they can obtain; and the men seek beer, meat, and other stimulating foods. The warm tea is called for by the rapid evaporation of fluid from the body and by the sense of comfort which increased evaporation gives. The evils are that the skin becomes too sensitive of cold, the functions of the body are too much excited, and the food obtained is often too little to support them; and hence liability to take cold, feebleness of body, and consumption follow.

It is very desirable that milk and meat should enter more largely into the dietary—the former with or without coffee, with an egg and bread and butter for breakfast, and milk porridge at supper; the latter, hot meat with vegetables at dinner. A large portion of the women thus employed are single, and when at full work obtain a sufficient income, and the others are married women who then neglect their home duties; but both alike are usually bad managers, and require the aid of others in cooking their food.

SECTION IV.—SPECIMEN AND PROPOSED DIETARIES.

I thought it might have been useful in concluding this chapter to select as examples some of the 500 cases which I inquired into for the Government, and which are published in the sixth report of the Medical Officer of the Privy Council; but on careful inspection of them

I have arrived at the conclusion that the diversities which exist in the number of children in a family and their ages, the income of the family, and the obtainment of certain articles of food, as milk, in different parts of the country, would not enable me to select any examples as universally applicable. The best guide to a poor family will be the directions already given, viz., to obtain plenty of skimmed milk, bread and potatoes; to add thereto as much meat, bacon, or herrings, and fat, as they may be able to afford; to take cheap cheese when meat cannot be obtained, and to buy but little tea. I will, however, cite three cases, two of which are admirable arrangements, and then add a number of dietaries which I have arranged for adults, of different nutritive and monetary values.

Example of a family living at Okehampton in Devonshire, and consisting of husband, wife, and three children under ten years of age. The weekly income was 10*s.* besides the value of the potatoes. When they had no potatoes, they got into debt temporarily, but when potatoes were plentiful (and they had much potato land cultivated by the wife), they required less bread, and saved money.

Flour, 35 lb.; peas, 4 lb.; rice, 2 lb.; treacle, 1 lb.; very cheap butter, 1 lb.; bacon, 3 lb.; cheap pieces of meat, 4 lb.; skimmed milk, $10\frac{1}{2}$ pints; eggs 3 (from their own fowls); tea, 1 oz.; total cost weekly, 10*s.* 7*d.*

The following was the best arranged dietary which I found amongst single women in the Lancashire distress.

Bread, 8 lb.; oatmeal, $1\frac{1}{4}$ lb.; treacle, 1 lb.; bacon, $\frac{1}{2}$ lb.;

meat, ½ lb.; skimmed milk, 2 pints; and coffee, 1 oz. She obtained meat or bacon daily, oatmeal porridge and treacle or hasty pudding and treacle, and bread and coffee sweetened with treacle. Carbon, 3777 grains, and nitrogen, 100 grains, daily; total cost weekly, 2*s.* 0¾*d.*

The following case had 2*s.* allowed for food weekly, and out of it saved 3*d.* per week wherewith to redeem her clothes:

Bread, 12 lb.; treacle, ½ lb.; bacon, ¼ lb.; 3 herrings, and 1 oz. of coffee. Carbon, 3801 grains, and nitrogen 164 grains, daily. She obtained bacon or herring for dinner five times a week.

In drawing up model dietaries I have endeavoured to meet the requirements of the system:—

1. By providing sufficient nourishment.

2. By selecting well-known foods.

3. By giving such variety as would permit the meals to be varied, and to correspond with those of the community, and particularly, whilst not permitting a deficiency of nourishment, to introduce almost daily some kind of meat for dinner.

4. By introducing fresh vegetables at a cost of 2*d.* per week.

The following are selected from those which cost from less than 3½*d.* to less than 4½*d.* per day, at the prices in the North of England:—

No. 1. Bread, 9 lb.; oatmeal, 1 lb.; meat, ½ lb.; bacon, ¼ lb.; skimmed milk, 3½ pints; butter-milk, 3 pints; and vegetables, 4 lb. This would give milk-porridge twice a day, with bread and vegetables daily, and meat five times a week. Carbon, 4004 grains, nitrogen, 201 grains daily; cost, 1*s.* 11¾*d.* weekly.

No. 2. Bread, 8 lb.; oatmeal, 1¼ lb.; treacle, ½ lb.; bacon, ½ lb.; 3 herrings; skimmed milk, 7 pints; and vegetables, 4 lb. This would give animal food and vegetables daily, with milk-porridge and oatmeal, pudding, and bread and treacle. Carbon, 4122 grains; nitrogen, 207 grains daily; cost, 2*s.* weekly.

No. 3. Bread, 8 lb.; oatmeal, 2 lb.; sugar, ½ lb.; treacle, 1 lb.; meat, ½ lb.; skimmed milk, 7 pints; coffee, 2 oz.; vegetables, 2 lb. This gives bread and treacle, oatmeal pudding and treacle, milk porridge, meat four times a week, and coffee daily; but by introducing the coffee and more sugar the proportionate amount of nitrogen is lessened. Carbon, 4249 grains; nitrogen, 184 grains daily; cost, 2*s.* 0½*d.* weekly.

No. 4. Bread, 8 lb.; flour, ½ lb.; sugar, ¼ lb.; dripping, 2 oz.; meat, ½ lb.; bacon, ½ lb.; skimmed milk, 3½ pints; coffee, 2 oz.; and vegetables, 4 lb. This will give meat and vegetables daily, with one or two plain puddings, bread and dripping, bread and milk, and coffee. Carbon, 3701 grains; nitrogen, 165 grains daily; cost, 2*s.* 1*d.* weekly.

No. 5. Bread, 8 lb.; flour, 1 lb.; oatmeal, 1 lb.; sugar, ¼ lb.; dripping, 2 oz.; suet, 2 oz.; 3 herrings; liver, ¼ lb.; skimmed milk, 3½ pints; cheese, ¼ lb.; coffee, 2 oz.; and vegetables, 2 lb. This would give three or four plain puddings with fat and milk, animal food four days, and cheese two days weekly, with vegetables daily, milk porridge, bread, and coffee. Carbon, 3937 grains; nitrogen, 208 grains daily; cost, 2*s.* 2*d.* weekly.

No. 6. Bread, 10 lb.; oatmeal, 1 lb.; rice, 1 lb.; sugar, ¼ lb.; treacle, ½ lb.; dripping, ¼ lb.; skimmed milk, 3 pints; butter-milk, 4 pints, coffee, 2 oz.; and vegetables, 4 lb. This excludes meat, but supplies much bread, with dripping or treacle, boiled rice or rice-pudding, with milk, vegetables, and dripping, milk-porridge, and coffee. It is deficient in the comfort of the dinner, but the whole nourishment is ample. Carbon, 4793 grains; nitrogen, 200 grains daily; cost, 2*s.* 3½*d.* weekly.

No. 7. Bread, 10 lb.; oatmeal, 1 lb.; treacle, ½ lb.; butter, ¼ lb.; meat, ½ lb.; bacon, ¼ lb.; skimmed milk, 3½ pints; and vegetables, 3½ lb. This gives no coffee, much bread, with butter or treacle, oatmeal pudding with treacle, milk porridge, and meat five days weekly, with vegetables daily. Carbon, 4433 grains; nitrogen, 198 grains daily; cost, 2*s.* 4*d.* weekly.

No. 8. Bread, 10 lb.; oatmeal, 2 lb.; treacle, ½ lb.; meat, ½ lb.; bacon, ½ lb.; skimmed milk, 3½ pints; and vegetables, 4 lb. This is an excessive dietary, and differs from the last only in supplying meat daily, and offering more oatmeal pudding. Carbon, 4991 grains; nitrogen, 221 grains daily; cost, 2*s.* 4¼*d.* weekly.

No. 9. Bread, 8 lb.; oatmeal, 2 lb.; sugar, ¼ lb.; treacle, 1 lb.; skimmed milk, 3½ pints; butter-milk, 3 pints; coffee, 2 oz.; bacon, 1 lb.; and vegetables, 4 lb. This would give bacon, vegetables, and bread daily, with oatmeal pudding and treacle, milk-porridge, and coffee.

Carbon, 4434 grains; nitrogen, 210 grains daily; cost, 2*s.* 4½*d.* weekly.

No. 10. Bread, 8 lb.; oatmeal, 2 lb.; peas, 1 pint; sugar, ¼ lb.; treacle, ½ lb.; butter, 2 oz.; 4 herrings; bacon, ¼ lb.; liver, ½ lb.; skimmed milk, 6 pints; coffee, 1 oz.; and vegetables, 2 lb. This is an excessive dietary, and particularly in nitrogen. It supplies animal food six or seven days in the form of liver and bacon, with boiled peas pudding, or herring, and vegetables, oatmeal pudding with treacle, milk porridge, coffee, bread and butter, and treacle. Carbon, 4714 grains; nitrogen, 265 grains daily; cost, 2*s.* 6*d.* weekly.

Such are examples of how much nutriment may be obtained from food to which the people are accustomed, and offering three meals a day with the usual variety, and usually including 2 oz. of some kind of meat, at a cost up to 4¼*d.* per day. The articles selected are the cheapest farinaceous foods, American bacon, which is the cheapest fat, and skimmed milk; whilst sparing use has been made of butchers' meat, sugars, and the dearer fats.

Let us now look at the subject in another, and to my mind more satisfactory light, and ascertain how much nutriment can be afforded at a meal for sums not exceeding 1½*d.* for breakfast, 2*d.* for dinner, and 1*d.* for tea or supper, or a total cost not exceeding 4½*d.* per day. For this purpose I will again turn to the dietaries which I have prepared for the Government, and in order to apportion the daily nutriment to the wants of an adult at the period of the three meals, I will state that the amount of carbon required is 1500 grains at breakfast, 1800 grains at dinner, and 1000 grains at supper, whilst that of nitrogen required at those meals is 70 grains, 90 grains, and 40 grains, respectively.

Breakfast.

No. 1.—Oatmeal brose and treacle. Oatmeal 6 oz., skimmed milk $\frac{1}{2}$ pint, water $\frac{1}{4}$ pint; treacle 1 oz. Carbon, 1397 grains; nitrogen, 74 grains; cost, 1*d.*

No. 2.—Milk porridge and bread. Skimmed milk 1 pint, oatmeal 2 oz., fat $\frac{1}{2}$ oz.; bread, 3 oz. Carbon, 1300 grains; nitrogen, 77 grains; cost, $1\frac{1}{8}$*d.*

No. 3.—Milk porridge and bread. Skimmed milk $\frac{3}{4}$ pint, oatmeal 2 oz., fat $\frac{1}{2}$ oz., water $\frac{1}{4}$ pint; bread, $5\frac{1}{3}$ oz. Carbon, 1478 grains; nitrogen, 80 grains; cost, $1\frac{1}{4}$*d.*

No. 4.—Milk porridge, bread and bacon. Skimmed milk $\frac{1}{2}$ pint, oatmeal $1\frac{1}{2}$ oz., water $\frac{1}{2}$ pint; bread 4 oz., bacon 2 oz. Carbon, 1564 grains; nitrogen, 69 grains; cost, $1\frac{1}{4}$*d.*

No. 5.—Rice milk, treacle and bread. Rice 2 oz., skimmed milk 1 pint, spice, fat $\frac{1}{2}$ oz.; treacle 1 oz., bread 4 oz. Carbon, 1551 grains; nitrogen, 75 grains; cost, $1\frac{1}{4}$*d.*

No. 6.—Coffee, bread and butter. Coffee and chicory $\frac{1}{8}$ oz., skimmed milk $\frac{1}{2}$ pint, sugar $\frac{1}{2}$ oz., water $\frac{1}{2}$ pint; bread 6 oz., butter $\frac{1}{2}$ oz. Carbon, 1190 grains; nitrogen, 56 grains; cost, $1\frac{1}{4}$*d.*

No. 7.—Coffee, bread and bacon. Coffee $\frac{1}{8}$ oz., skimmed milk $\frac{1}{4}$ pint, sugar $\frac{1}{2}$ oz., water $\frac{1}{2}$ pint; bread 6 oz., bacon 2 oz. Carbon, 1528 grains; nitrogen, 58 grains; cost, $1\frac{3}{8}$*d.*

No. 8.—Oatmeal brose, treacle, bread and bacon. Oatmeal 5 oz., skimmed milk ½ pint, water ¼ pint; treacle 1 oz., bread 3 oz., bacon 1 oz. Carbon, 1990 grains; nitrogen, 88 grains; cost, 1½*d.*

No. 9.—Rice milk, treacle, bread and bacon. Rice 2 oz., skimmed milk ¾ pint, water ⅛ pint; treacle 1 oz., bread 4 oz., bacon 2 oz. Carbon, 1889 grains; nitrogen, 76 grains; cost, 1½*d.*

No. 10.—Tea, bread and butter. Tea ⅛ oz., sugar ½ oz., skimmed milk ¼ pint, water ½ pint; bread 6 oz., butter ½ oz. Carbon, 1081 grains; nitrogen, 46 grains; cost, 1½*d.*

Nos. 8 and 9 show, in a striking manner, the amount of nutriment which can be obtained from the cheaper farinaceous foods, cheap milk and cheap fat; whilst the contrast between them and Nos. 6 and 10 show how wasteful is the expenditure upon the dietary when tea and coffee are introduced. With the two last-mentioned exceptions the quantity of nitrogen is universally sufficient for the meal.

Dinner.

[Water is to be added when necessary in cooking the food.]

No. 1.—Bread and cheese. Bread 8 oz., cheese 1 oz. Carbon, 1150 grains; nitrogen, 66 grains; cost, 1⅛*d.*

No. 2.—Suet pudding, bread and cheese. Flour 6 oz., suet ¾ oz., skimmed milk ½ pint; bread 4 oz., cheese ½ oz. Carbon, 2010 grains; nitrogen, 99 grains; cost, 2*d.*

No. 3.—Rice pudding, bread and cheese. Rice 3 oz., skimmed milk 1 pint, suet $\frac{1}{2}$ oz., sugar $\frac{3}{4}$ oz., spice and salt; bread 3 oz., cheese $\frac{1}{2}$ oz. Carbon, 1673 grains; nitrogen, 83 grains; cost, $1\frac{3}{4}d.$

No. 4.—Fish. Fresh herrings, 9 oz. (2), dripping, $\frac{1}{2}$ oz.; potatoes 8 oz., bread 3 oz. Carbon, 1387 grains; nitrogen, 101 grains; cost, $1\frac{3}{4}d.$

No. 5.—Bacon, vegetables, and cheese. Bacon 4 oz., potatoes 8 oz., bread 4 oz., cheese $\frac{1}{2}$ oz. Carbon, 1843 grains; nitrogen, 69 grains; cost, $1\frac{7}{8}d.$

No. 6.—Meat pudding, potatoes, and bread. Flour 4 oz., suet $\frac{3}{4}$ oz., meat 3 oz.; bread 2 oz., potatoes 5 oz. Carbon, 1616 grains; nitrogen, 71 grains; cost, 2*d.*

No. 7.—Liver pudding and bread. Flour 4 oz., suet $\frac{3}{4}$ oz., liver 4 oz., bacon 1 oz.; bread 2 oz., or potatoes 5 oz. Carbon, 1734 grains; nitrogen, 100 grains; cost, 2*d.*

No. 8.—Potato pie and bread. Flour 3 oz., dripping $\frac{3}{4}$ oz., meat $2\frac{1}{2}$ oz., or potatoes 8 oz.; bread 2 oz. Carbon, 1778 grains; nitrogen, 71 grains; cost, 2*d.*

No. 9.—Faggots, peas pudding, bread and cheese. Liver 3 oz., bacon 1 oz., herbs; peas 3 oz.; bread 2 oz., cheese $\frac{1}{2}$ oz. Carbon, 1513 grains; nitrogen, 140 grains; cost, 2*d.*

No. 10.—Meat, vegetables, bread and cheese. Meat, 3 oz., potatoes 8 oz., bread 4 oz., cheese $\frac{1}{2}$ oz. Carbon, 1441 grains; nitrogen, 75 grains; cost, 2*d.*

No. 11.—Irish stew and bread. Meat 3 oz., potatoes 12 oz., onions 1 oz.; bread, 4 oz. Carbon, 1568 grains; nitrogen, 72 grains; cost, 2*d.*

No. 12.—Hasty pudding, treacle, herring and potatoes.

Flour 6 oz., skimmed milk $\frac{1}{2}$ pint, water; treacle, 2 oz.; 1 herring; potatoes, $\frac{1}{2}$ lb. Carbon, 2144 grains; nitrogen, 119 grains; cost, 2*d.*

Two of these largely exceed the standard quantity in carbon, viz., Nos. 2 and 12; whilst four, viz., Nos. 2, 4, 9, and 12, exceed it in nitrogen. No. 1 is quite insufficient for a man, whilst No. 12 is much more than enough.

Supper.

No. 1.—Oatmeal brose, as at breakfast.

No. 2.—Milk porridge and bread. Skimmed milk $\frac{3}{4}$ pint, oatmeal 2 oz., fat $\frac{3}{8}$ oz.; bread, 2 oz. Carbon, 1034 grains; nitrogen, 61 grains; cost, 1*d.*

No. 3.—Bacon and bread. Bacon 2 oz., bread $5\frac{1}{3}$ oz. Carbon, 1250 grains; nitrogen, 43 grains; cost, 1*d.*

No. 4.—Tea, bread and butter. Tea $\frac{1}{8}$ oz., sugar $\frac{1}{2}$ oz., skimmed milk $\frac{1}{8}$ pint, water $\frac{5}{8}$ pint, bread 4 oz., butter $\frac{1}{4}$ oz. Carbon, 670 grains; nitrogen, 29 grains; cost, 1*d.*

No. 5.—Coffee, bread and butter. Coffee $\frac{1}{8}$ oz., sugar $\frac{1}{2}$ oz., skimmed milk $\frac{1}{4}$ pint, water $\frac{5}{8}$ pint; bread $5\frac{1}{3}$ oz., butter $\frac{1}{4}$ oz. Carbon, 925 grains; nitrogen, 42 grains; cost, 1*d.*

In each of the first three there is an excess of the standard requirement, whilst the fourth corroborates the fact already mentioned,—the impossibility of providing the most economical dietary where tea and butter are introduced.

Such, then, are abundant and cheap dietaries for our working classes, at a cost within the reach of all in

England who obtain regular employment, or who are not oppressed with a large family wholly dependent upon the head. There are, however, multitudes of persons both in England, in our Sister Island, and on the Continent, who from these and other causes do not obtain so much income as would enable them continually to purchase this quantity of food, and to such it is of the greatest moment that they should restrict themselves to the cheapest food, viz., Indian corn, peas, bread, butter-milk, and skimmed milk. I need not refer at length to the nutriment to be obtained from these foods, as that has already been stated in Chapter III., but a reference to the following table will show that two pounds of Indian meal made into stirabout will afford more than the required nutriment at a cost of 2*d.* per day; and it cannot be doubted that this, with 1 pint of butter-milk, costing $\frac{1}{3}$*d.*, or of skimmed milk, costing $\frac{1}{4}$*d.* to $\frac{1}{2}$*d.*, would, if the appetite for it did not fail, sufficiently nourish the system. Again, in the case of those who grow a large quantity of potatoes at a merely nominal cost, there can be no doubt that they may make them a principal article of food, and, taken in sufficient quantity with butter-milk or skimmed milk, would maintain health at a cost much below that of the dietaries which I have devised.

It may be of use to those who advise the poor if by way of summary I insert a table which I have prepared, and which will show the relative economy of almost all ordinary kinds of food when compared with bread, as a basis.

TABLE, showing the quantity of carbon, free hydrogen reckoned as carbon, and nitrogen, contained in one pennyworth of various foods at the prices annexed; and also the variation from the pennyworth of various foods to supply as much carbon and nitrogen as are contained in one pennyworth of bread (the standard quantity).

FOOD.	Costing.	Carbon for 1*d*.	Free hydrogen reckoned as carbon.	Nitrogen for 1*d*.	Variation from cost of 1*d*. to supply the standard quantity of 1450 grains of carbon and 66 grains of nitrogen. Carbon.	Nitrogen.
	d.	Grains.	Grs.	Grains.	*d*.	*d*.
Bread	1⅜ per lb.	1,450	11	66	...	...
Fine flour... ...	2 ,,	1,330	11	60	1·09	1·1
Barley	1 ,,	2,500	...	93	·58	·7
Rice	2 ,,	1,380	8	35	1·05	1·88
Oatmeal	1⅘ ,,	1,513	88	75	·957	·88
Maize	1 ,,	2,800	126	121	·51	·545
Peas	1½ ,,	1,820	30	170	·796	·388
Potatoes	½ ,,	1,540	...	49	·94	1·34
Potatoes	1 ,,	770	...	24½	1·88	2·69
Green vegetables...	¼ ,,	1,640	...	56	·88	1·18
Green vegetables...	½ ,,	820	...	28	1·76	2·36
Butter	14 ,,	327	136	...	4·43	...
Lard	9 ,,	591	373	...	2·45	...
Dripping	6 ,,	886	365	...	1·63	...
Suet	7 ,,	651	280	...	2·22	...
Sugar	4½ ,,	622	...	...	2·34	...
Treacle	3 ,,	746	...	...	1·94	...
Beef	7½ ,,	320	109	23	4·53	2·87
Mutton	7 ,,	415	172	20	3·49	3·3
Pork	7 ,,	483	...	18	3·0	3·66
Liver	3 ,,	410	71	70	3·53	·94
Bones	½ ,,	1,566	...	48	·92	1·46
Dried English bacon	8½ ,,	510	200	12	2·84	5·5
Green American ,,	4½ ,,	918	356	17	1·58	3·88
Dried herrings ...	¾ each.	352	...	54	4·1	1·22
Fresh herrings ...	½ ,,	480	...	72	3·0	·91
New milk... ...	1 per pint	546	98	44	2·66	1·5
New milk... ...	2 ,,	273	49	22	5·32	3·0
Skimmed milk ...	¼ ,,	1,748	224	174	·82	·38
Skimmed milk ...	½ ,,	873	112	87	1·64	·76
Skimmed milk ...	1 ,,	437	56	44	3·28	1·52
Butter-milk ...	⅙ ,,	2,514	...	262	·576	·25
Butter-milk ...	½ ,,	838	84	88	1·15	·75
Whey	... ...	...	...	...	...	...
Skimmed milk cheese	3 ,,	782	...	122	1·98	·54
New milk cheese...	8 ,,	333	...	40	4·33	1·65
Tea...	3 per oz.	...	...	3·3	...	20·0

The items of the calculation in the above Table are simply the cost of the different foods and their nutritive values, and taking bread at $5\frac{1}{2}d.$ the 4 lb. loaf, the quantity of nourishment which will be obtained for $1d.$ is 1450 grains of carbon and 66 grains of nitrogen besides the free hydrogen. There is some difference in the digestibility of the different foods, which in nice calculations must be taken into account. The table may be summarised as follows :—

As to the Carbon.

Maize will yield the standard quantity at a cost of $\frac{1}{2}d.$ Butter-milk (bought at six pints for a $1d.$) and barley-meal, at a little more than $\frac{1}{2}d.$; peas, green vegetables (costing $\frac{1}{4}d.$ per lb.), potatoes (costing $\frac{1}{2}d.$ per lb.), and oatmeal and bones, at from $\frac{1}{2}d.$ to $1d.$ Fine flour, rice, butter-milk (costing $\frac{1}{2}d.$ per pint), at from $1d.$ to $1\frac{1}{2}d.$; green bacon, skimmed milk (costing $\frac{1}{2}d.$ per pint), dripping, green vegetables (costing $\frac{1}{2}d.$ per lb.), treacle and skimmed milk cheese, at from $1\frac{1}{2}d.$ to $2d.$; suet, sugar and lard, at from $2d.$ to $2\frac{1}{2}d.$; new milk (costing $1d.$ per pint), fresh herrings and pork, at from $2\frac{1}{2}d.$ to $3d.$; mutton and skimmed milk (costing $1d.$ per pint), at from $3d.$ to $3\frac{1}{2}d.$; dried herrings, butter, new milk, cheese and beef, at from $4d.$ to $4\frac{1}{2}d.$

As to the Nitrogen.

As the relative quantity of nitrogen to carbon is not high in bread, we shall find that numerous articles of food offer the nitrogen at less cost than bread, whilst at the same time the extreme variation from bread is in reference to the nitrogen. Thus, butter-milk (costing $\frac{1}{6}$*d.* per pint), will give the standard quantity of nitrogen for $\frac{1}{4}$*d.*; skimmed milk (costing $\frac{1}{4}$*d.* per pint), peas and South American beef, at from $\frac{1}{4}$*d.* to $\frac{1}{2}$*d.*; skimmed milk, cheese and maize, at about $\frac{1}{2}$*d.*; butter-milk and skimmed milk, each costing $\frac{1}{2}$*d.* per pint, and barley meal, at $\frac{3}{4}$*d.*; oatmeal, fresh herrings, and liver, at from $\frac{3}{4}$*d.* to 1*d.*; fine flour, green vegetables (costing $\frac{1}{4}$*d.* per lb.), dried herrings, new milk, and skimmed milk (each costing 1*d.* per pint), and bones at from 1*d.* to 1$\frac{1}{2}$*d.*; new milk cheese, at a little more than 1$\frac{1}{2}$*d.*; green vegetables (costing $\frac{1}{2}$*d.* per lb.), potatoes (costing 1*d.* per lb.), beef and new milk (costing 2*d.* per pint), at from 2*d.* to 3*d.*; mutton, pork, and green bacon, at from 3*d.* to 4*d.*, dried bacon, 5$\frac{1}{2}$*d.*, and tea, at 20*d.*

CHAPTER VII.

DIETARY OF THE LABOURING CLASSES. COOKING DEPOTS AND SOUP KITCHENS.

We owe to the philanthropic efforts which were made in 1862 to alleviate the distress of the cotton operatives, either the origination, or the more complete development of cooking dépôts and soup kitchens; and whilst the latter have been in great part discontinued, the former have been retained, and their number and utility largely increased.

There is an essential difference in the principle on which these two classes of institutions have been founded, although both had, no doubt, the object of doing good as their prime basis, viz., that the cooking dépôts charge for the food a sum sufficient to cover all expenses, whilst the soup kitchens regard the principle of charity as their characteristic, and distribute the food gratuitously, or at a charge below prime cost. Hence it will be needful to refer to them separately.

SECTION I.—COOKING DEPOTS.

An establishment has recently been founded as a Joint-Stock Company, which having grown out of a cooking dépôt is expected to distribute very large profits amongst its shareholders. Such are trade institutions, and will, doubtless, be carried on as other trade organisations are, viz., in antagonism with the interest of the consumers; the aim being to gain the largest profits upon the materials which they sell. I do not purpose to offer any observations in aid of these establishments, but I shall restrict myself to those whose aim is to supply the largest possible amount of nourishment to the consumer at the least possible cost. Such an institution was that of John Pender & Co., in Manchester, where the details were worked out with great intelligence and success by Mr. David Machaffie and subordinate officers. With this fundamental principle as a guide, it follows that all the working expenses, viz., rent, furnishing, service, and supervision, shall be reduced to the lowest possible amount consistent with efficiency, cleanliness, and comfort. As the class of persons who most urgently need such an institution are really the lower divisions of the working classes, the dépôts should be situated in poor and populous neighbourhoods, and be clean and plain. They should be without such ostentation as would tend to repel the attendance of the poorest person, and which, having cost much money, must increase the working expenses for interest on capital, and sustenance, and thus limit the nourishment to be sold in the food. The attractions should be excellence, cheapness, fitness of food, and convenience of locality for the poor, and not handsome buildings, pier glasses, and decorations.

Such institutions can alone be founded in very large towns and cities, and in order to obviate the possible ill-results which many fear, viz., the separation of the husband from his family at the meals, the acquisition by him of a taste for food and cooking which will render him unfairly dissatisfied with the possible arrangements at home, the inducement to spend an undue share of his earnings upon his own food, to the disadvantage of his wife and children, and the absence of the stimulus of his presence, and the gratification of his wants at home, leading to the yet more careless and inefficient cooking of food. To obviate such, it is desirable that food be sold, to be taken home, at the price which is charged when it is eaten at the rooms.

In the selection of the foods to be offered, and the price to be charged, it is necessary that a profit be made upon each dish; or, as is the case with the meat, the profit be made upon a dish, as soup, arising out of it. The per-centage of profits thus made are really large, but the separate transactions are very small in amount, and it is only when great numbers of consumers are obtained, that the necessary working expenses can be met.

I will now cite a few examples :—

Bread. A 4 lb. loaf costs, say, 5*d.*, when bought in large quantities, and if cut into eight slices, each containing ½ lb., and sold at 1*d.*, there will be 3*d.* gained upon the loaf, or about 40 per cent. profit. There are, however, some institutions giving only one-twelfth, and others only one-sixteenth of the loaf for 1*d.*, and thus making unfair profits.

Potatoes cost 2*s*. 6*d*. per bushel of 56 lb., as a medium price, when bought wholesale, or a little more than ½*d*. per lb. They do not lose more than ½ oz. in the lb., when cooked in their skins, and two medium sized, or three small potatoes, weighing about ¾ lb. are sold for 1*d*., and hence the profit made upon each lb. is more than ½*d*., or about 60 per cent.

Meat is bought at 5*d*. to 6*d*. per lb. (such as the briskets, thin ribs, and thick flanks), and with 40 per cent. loss from bone and cooking, will produce 9½ oz. of cooked, for each lb. of raw meat. The cost of the cooked meat will thus be (at 5½*d*. per lb. raw), about 9¼*d*., and when 3 oz. are sold for 2*d*., there will be a gain of 1¼*d*., or about 8 per cent. to be added to the value of the bones and meat liquor. Many, however, only give 2 oz. for 2*d*., and thus gain nearly 60 per cent. on the meat alone.

Soup is usually made of two qualities, one called Scotch broth, and the other soup. Scotch broth, of a formula to be given below, costs, for vegetables and condiments, besides the meat liquor and bones, just one-sixth of a penny per pint, whilst it is sold at 1*d*. per pint, or a profit of 600 per cent., the value of the meat liquor and bones having been reckoned in that of the meat. Soup, properly so called, yet made from the same amount of beef liquor and bones, as in the formula given below, will cost ¼*d*. per pint, besides the value of the meat liquor and bones, and then leave a profit of 400 per cent.

Potato Pie served hot, and prepared as below, costs

$1\frac{1}{6}d.$ per ration, and when sold at $2d.$ yields a profit of about 60 per cent.

Tea, when prepared from the formula given below, will cost nine-tenths of $1d.$ per ration, and if sold for $1d.$ gives only 10 per cent. profit, but the bread and butter which are eaten with it, also yield a profit, and that in a higher degree.

Coffee prepared as below will cost less than $\frac{1}{2}d.$ ($0·4d.$) per ration, and the profit will be 60 per cent.

Butter, of the quality known as best tub butter, or Dorset or Ostend butter, will admit of a pat weighing 1 oz. being sold for $1d.$, and yet leave a profit of 15 to 25 per cent.

Cheese costing $7d.$ to $8d.$ per lb. would leave but little or no profit if 2 oz. were sold for $1d.$, but if ten rations were made from 1 lb. there would be a profit of 25 per cent. or upwards.

Hence without going into further detail it cannot be doubted that profits amounting to about 50 per cent. upon the sum actually expended in the purchase of food may be obtained when the food is sold at the prices above-named; and it should, in my opinion, be the aim of all managers of such institutions to sell the food at those prices, viz., Bread (good household), 8 oz. for $1d.$; potatoes, $\frac{3}{4}$ lb. for $1d.$; boiled meat, 3 oz. for $2d.$; soup, which should also retain a little meat, $1d.$ per pint; cheese, $1\frac{1}{2}$ oz. for $1d.$; butter, 1 oz. for $1d.$; and any other foods at a profit of 50 per cent. on their actual cost.

The following are the formulæ above referred to:—

Broth, to make 100 *rations.*—Meat liquor from 7 lb. of beef, and 1 lb. of well-broken bones; split peas ($1\frac{1}{3}$*d.* per lb.), $2\frac{3}{4}$ lb.; Scotch barley ($1\frac{1}{3}$*d.* per lb.), $3\frac{1}{5}$ lb.; carrots ($\frac{1}{4}$*d.* per lb.), $3\frac{1}{2}$ lb.; turnips ($\frac{1}{8}$*d.* per lb.), $3\frac{1}{2}$ lb.; cabbage, and other green vegetables, $7\frac{1}{4}$ lb.; salt, pepper, and dried herbs. Carbon, 300 grains; nitrogen, 12 grains per ration.

Soup, to make 100 *rations.*—Meat liquor from 7 lb. of beef, and 1 lb. of bones; split peas, 13 lb.; carrots and swede turnips, each $6\frac{2}{3}$ lb.; onions, $5\frac{1}{2}$ lb.; leeks, $\frac{1}{2}$ lb.; salt, pepper, and dried herbs. Carbon, 490 grains; nitrogen, 36 grains per ration.

Potato pie, to make 100 *rations.*—Potatoes, $43\frac{3}{4}$ lb.; meat (mutton usually), $10\frac{3}{4}$ lb.; bones, $1\frac{3}{4}$ lb.; dripping, $1\frac{1}{4}$ lb.; flour, $5\frac{1}{3}$ lb.; onions, 3 lb.; seasoning. Carbon, 878 grains; nitrogen, 33 grains per ration.

Tea, to make 100 *rations.*—Tea, 13 oz. (3*s.* 3*d.* per lb.); sugar, $3\frac{1}{4}$ lb.; new milk, $3\frac{1}{4}$ pints. Carbon, 107 grains; nitrogen, 2 grains per ration.

Coffee, to make 100 *rations.*—Coffee, $19\frac{1}{3}$ oz.; sugar, $3\frac{1}{4}$ lb.; new milk, $3\frac{1}{4}$ pints. Carbon, 107 grains; nitrogen, 2 grains per ration.

Other formulæ may be selected from those cited below.

SECTION II.—SOUP KITCHENS.

I design under this head to refer not only to the large organisations which I found in operation in Lancashire and Cheshire, when I was requested to advise the Government as to the minimum amount to be allowed for food ; but to such efforts as ladies and gentlemen may make at their own homes, or in their own neighbourhoods.

The following circumstances should be duly considered :—

1. If only one kind of food is provided, it should be varied in composition on alternate days, as for example, pea soup and other kinds of soup alternátely; and moreover the flavour of the same kind of food should never be the same in two consecutive supplies. The flavour is easily varied by the kind of dry herbs which are mixed together for the purpose.

2. The seasoning should be only just sufficient to render the food palatable, since if the food be made too salt its nutritive value will be lessened, and if much pepper be used, the children will not eat it.

3. It is better to make such foods as soup a little too thick to be eaten, so that they may be the more safely carried, and the poor may make them thinner according to their taste and wishes.

4. If possible the tin vessel should be washed out with boiling water in the place where the soup is served, and particularly if the supply is intended to be kept in the houses of the poor for two or more days; since hot water, and the knowledge of the absolute necessity for using it, are not universally found in the houses of the poor, and without it the soup would soon become sour.

5. It is much better to supply smaller quantities of

food daily or thrice a week, than larger quantities at longer intervals.

6. If it be possible to give food prepared with milk for the children, either instead of or in addition to soup or other food for the senior members of the family, it would be most valuable. Such are Scotch barley or rice and milk, or the same made into puddings.

7. When it is possible that the food can be carried home within a few minutes, it should be served as hot as possible, and thus save the necessity for warming it again.

8. It would add much to the value of such aid if the food could be eaten comfortably where it is served by such of the members as could attend, and particularly by the children, and be carried to the house for the others.

9. Those kinds of food which supply meat mixed up with other substances, scarcely permit an equal distribution of the meat. Such are potato hash, potato pie, and soups. Care should be taken to cut the meat into portions the size of a filbert, to constantly stir up the mass of soup and hash from the bottom of the vessel, and to divide the mass fairly for each ration.

10. All the food should be well cooked, but yet so that the pieces of meat may be seen and tasted; and remains of food from the previous day should not be added to the present day's cookery, but be served separately.

A great variety of formulæ suited to this purpose may be found in my Report on the Food of the Lancashire

Operatives, published in the fifth report of the Medical Officer of the Privy Council, and I will insert a few of them here.

Soups.

Ox-head soup for one ration (carbon 1117 grains, nitrogen 49 grains; cost 0·92*d.*). Meat off ox-heads 2 oz., bones 2½ oz., pearl barley 2 oz., rice 1 oz., oatmeal 1 oz., seasoning and dried herbs.

Pea soup for one ration (carbon 1201 grains, nitrogen 58 grains; cost 1·28*d.*). Neck of beef without bone 1½ oz., pig's-head without bone 1 oz., bones 1 oz., barley 2 oz., split peas 1 oz., pea meal ½ oz., onions, carrots, and turnips, of each 1 oz.; seasoning and dried herbs.

Pea soup for one ration (carbon 1099 grains, nitrogen 61 grains; cost 1·16*d.*). Meat off leg of beef 2 oz., bones 4 oz., barley, split peas, oatmeal, and onions, of each 1 oz., crushed carrots 2 oz.; seasoning and dried herbs.

The above are arranged by myself: the following is a nutritious soup supplied at Mrs. Gladstone's soup kitchen in Blackburn.

Pea soup for 100 rations (carbon 1048 grains, nitrogen 75 grains; cost 0·94*d.* per ration). Beef, meat only, 4⅓ lb., bones ⅔ lb., ham 5 lb., salted pig's cheek 4⅙ lb., white peas 20 lb., pea meal 2 lb., swede turnips 6⅔ lb., onions ½ lb.; seasoning with pepper, curry, and salt.

The next formula supplies a larger amount of meat. It is that in use at Messrs. Wood and Sons' factory, Wigan.

Pea soup for 100 rations (carbon 975 grains, nitrogen 53 grains; cost 1·57*d.* per ration). Beef 16½ lb., bones 7½ lb., blue peas, Scotch barley, and rice, of each 5 lb., oatmeal 2 lb., turnips, carrots, and onions, of each 2½ lb., pepper 2 oz. This may be coloured by adding ½ oz. of sugar burnt in a little fat.

Potato Hash.

Miss Hilton's (Ardwick Cooking) Kitchen.

For 100 rations (carbon 1269 grains, nitrogen 50 grains; cost 1⅓*d.* per ration). Potatoes 116½ lb., meat 13⅓ lb., onions and carrots, of each 5 lb., pepper and salt 1⅔ oz.

Portwood Soup Kitchen, Stockport.

For 100 rations (carbon 2038 grains, nitrogen 80 grains; cost 2⅓*d.* per ration). Potatoes 192½ lb., beef 20¾ lb., bones 4 lb., onions 2 lb., and pepper and salt.

Potato Pie.

The formula of J. Pender and Co.'s Gaythorn Cooking Dépôt has been given on page 243.

Mothers' Kitchen, Blackburn.

For 100 rations (carbon 2884 grains, nitrogen 109 grains; cost 3⅓*d.* per ration). Potatoes 150 lb., meat 30 lb., bacon 2½ lb., lard 5 lb., flour 20 lb., pepper and salt.

Rice Pudding.

Miss Hilton's.

For 100 rations (carbon 1445 grains, nitrogen 44 grains; cost 1¾*d.* per ration). Rice 40 lb., new milk 40 pints, sugar 3⅓ lb., dripping 3⅓ lb., water.

Rice Milk.

Edgeley District, Stockport.

For 100 rations (carbon 878 grains, nitrogen 30 grains; cost 1·07*d.* per ration). Rice 12½ lb., new milk 50 pints, butter 3⅓ oz., sugar 4¼ lb., nutmeg ⅓ oz., water.

Porridge, or Oatmeal Hasty Pudding.

Messrs. Thorneley and Co., Stockport.

For 100 rations (carbon 855 grains, nitrogen 29 grains; cost ½*d.* per ration). Oatmeal 21 lb., treacle 12½ lb.

APPENDIX.

I.

HANDBILLS FOR DISTRIBUTION AMONGST THE POOR.

ALTHOUGH so large a portion of the foregoing work has been written with a view to aid the poor, I cannot hope that it will effect its object, except through the intervention of others; and of all intermediate agencies that of cottage lectures by the clergyman and the medical practitioner of each parish, and the distribution of short and cheaply printed handbills, would probably be the most efficacious. The former may be assisted, if ladies will read to the poor the remarks on pages 209 to 224, and also some of the subsequent directions. The latter only is within my reach, and I will append a few specimens; but, as the poor read little, it will be the most useful to them to print the following in separate handbills, rather than as a whole, and distribute them separately. The source whence they have been taken should also be acknowledged, so that reference may be made to the grounds of the recommendations by any one desiring to do so. The bills should have as a common heading the words, "The cheapest and best Kinds of Food."*

I would also most urgently advise the establishment of well-regulated co-operative stores in towns, and clubs in the country, where, in addition to other advantages,

* These are now published, on one sheet, and sold at 8s. per 100, for distribution to the poor.

the poor might purchase the most suitable foods at the nearest approach to the cost price. The latter class of institutions, or perhaps both classes, should be aided by the clergy and gentry, with a view to insure efficiency and economy, and to help those who seek to help themselves. To enable the poor to buy at cost price, and to pay ready money, for flour, bread, American bacon, dripping, butter, peas, rice, oatmeal, Scotch barley, treacle, tea, pickled pigs' heads and pork, herrings, potatoes, carrots, and turnips; besides woollen clothing for both males and females, food for the pig, and various domestic requisites, is a most practical mode of doing good.

THE CHEAPEST AND BEST KINDS OF FOOD.

BREAD AND FLOUR.

Select households or seconds bread or flour.

Do not eat bread when it is new, but keep baker's bread one day, and home-made bread three days, before it is eaten.

Do not keep it too dry, but cover it up in an earthenware pan. When it has become dry, make it into puddings, or add it to broth.

Bake at home if you have an oven and firing.

A labourer should eat daily nearly 2 lb., the wife and growing boys above ten years of age, $1\frac{1}{4}$ lb. to $1\frac{1}{2}$ lb., and every child as much as it desires. Eat it slowly.

If you are very poor, spend nearly all your money on bread.

MILK.

New milk is better food than skim milk.

Skim milk is a cheaper food than new milk, and when used for a pudding you may make it as good as new milk by adding a little suet (say $\frac{1}{4}$ oz. or $\frac{1}{2}$ oz. to each pint).

Make it into hot porridge, with flour, or oatmeal, or creed rice and bread, and add a little salt; and, by way of change, use a little allspice.

Make puddings with it and rice, &c.; and when you make a baked or boiled flour pudding, use skim milk instead of water, if you can get it.

When it is a little sour, do not boil it, but warm it, and add some kind of spice and bread. If you add a little lime-water to it, it will become less sour.

Bread and milk-porridge make the best breakfast and supper for husband, wife, and children.

Butter milk is a very good and cheap food.

Buy or beg as much of it as you can eat.

Warm and spice it in cold weather.

Whey is food, and is a much better drink than water or beer.

Get as much of it as you can, and particularly if you cannot obtain milk.

Every member of the family should, if possible, have two pints of new milk, skim milk, or butter milk daily.

With plenty of bread and milk, there will probably be health and strength, and no doctors' bills.

PEAS.

Use split peas, or, if you buy whole peas, sieve out the skins (when you cook them) before you give the food to the children.

Cook them well.

Make them into soup with meat, or bacon, or with the liquor from meat, bacon, or broken bones, or with a little dripping or other fat, and add a little flour and fresh vegetables, if you have them. Flavour the soup with salt, pepper, and such dried herbs as thyme, mint, marjoram, and rosemary. Do not make it too thick. Eat it when quite hot.

Make them into pudding by boiling them well in meat or bacon liquor, seasoned with pepper and salt; or in water, with fat and seasoning. With plenty of fat and bread they will make a good dinner.

If you bake your bread at home, add sometimes 1 lb. of peameal to the stone of flour, and it will make a more nutritious bread.

They are very strong food for both grown people and children, and should be eaten once or twice a week all the year round.

INDIAN CORN MEAL.

When you can buy it, you will find it a stronger and cheaper food than flour. Make it into—

1st. Hasty pudding, by sprinkling it into boiling water and boiling it for a short time. Eat it with milk, treacle, sugar, or butter.

2nd. Cakes, by stirring it well in hot water or skim milk, and then baking it in the frying-pan, or Dutch oven, or upon the hot hearth; or spread upon a board and lay near to the fire. Eat them hot with milk, butter, or treacle.

3rd. Puddings, with milk, fat, and spice.

GARDEN VEGETABLES.

Potatoes are the best of all garden vegetables.

When they are grown by the labourer they cost only the rent of the land, manure, and seed, and are therefore very cheap food; but when they are bought they are a very dear food—much dearer than flour.

Get half an acre of potato ground, if you can, in the garden or field, and plant it chiefly with potatoes, so as to have enough to supply your family through the winter and to feed a pig.

You will thus save bread and gain bacon.

Obtain good seed, and have both early and late potatoes.

Do not eat potatoes extravagantly when they are new and plentiful, and when, with the warm weather and harvest, you are pretty well off; but keep a proper quantity for the winter (if they are not diseased), when you will have less money to buy bread, and will want more fuel and clothing.

Do not peel them before boiling, unless you have a pig to eat the peel, but boil them first and peel them as you eat them.

Carrots and parsnips are very good vegetables, and should be grown plentifully, or bought from your employer at the wholesale price.

They are not cheap when bought retail.

Besides making a dish of vegetables, they are very useful in making soup, and to eat with boiled meat or bacon.

Do not cover your garden ground with much cabbage, as it is not equal to potato as food; but there should be some to eat in the spring before potatoes come in.

It gives but little nourishment, and bread is almost as much required with as without it, but it makes a relishing dish when boiled or fried with bacon or fat.

Do not grow many peas and beans unless you have plenty of both ground and potatoes.

Have a little celery, parsley, and other pot herbs, with mint, thyme, and rosemary for dried herbs, and grow as much fruit as you require.

Above all things, grow enough potatoes.

THE PIG.

Keep a pig if it be at all possible to get food for it. If it should cost you nearly its value you will have saved the money and have it then for use; but if you manage it well you will gain money by it.

Buy it at ten to twelve weeks old, and feed it on the small potatoes, potato peels, and other waste from the house, and on the spare cabbage and cabbage-stalks and roots from the garden.

If you can let it run on a common it will eat the acorns and roots, and find nearly all its food. Gather all the acorns you can for it.

Half an acre of potato land will grow enough potatoes for yourselves, and also for your pig until you put it up for feeding.

Whilst growing, give it a little mill stuff at a cost of

6*d*. to 1*s*. weekly, and also a few crushed beans sometimes. The manure will pay for this food.

When you have put it up for feeding, give it about two stones of meal weekly, besides the other food. A mixture of two stones of barley-meal and one stone of pea-meal is the best food; but it costs more than sharps and barley-meal.

When you have your potato crop and have bought a young pig, the extra expense will be 6*d*. to 1*s*. per week for about twenty weeks, and 3*s*. a week for eight or ten weeks, and you will have a pig weighing fourteen to sixteen stones, and worth from 5*l*. to 6*l*. Its share of the potatoes will cost you in rent and seed 20*s*. to 30*s*., and the meal 40*s*. to 50*s*., and you will gain 30*s*. to 2*l*.

MEAT.

The cheapest butcher's meat is cow's cheek, sheep's head, liver, ox heart, and sometimes pig's head.

Boil the head and cheek, and with the liquor make broth, with garden vegetables and a little oatmeal at one time, and barley, rice, or peas at another. Flavour it with dried herbs.

Do not make the broth too salt, and do not give the children too much of it at once.

Keep the liquor, without adding anything to it but salt, in a well-scalded pan in a cool place, to prevent its becoming sour, and do not make more at one time than can be eaten in about three days.

Eat a little meat every day, and do not eat nearly all of it on Saturday night and Sunday.

Liver should be cut into thin slices and boiled or fried with bacon. Cook it well, but not with a hot fire, and do not make it dry and hard. See that it looks healthy.

Make the liquor into broth, or fry potatoes or cabbage with the gravy.

Heart should be roasted whole, and on the following days cut it into thin slices and warm it up in a little warm water and seasoning in the oven or frying-pan; or cut it at first into slices and fry it.

Buy bits of meat at 6*d.* per lb., and fry them.

The low-priced fat pieces, as the brisket and thin flank, are not really cheap, but when bought they should be boiled and the liquor made into broth. Do not buy them when salted, except very rarely.

The cheapest cuts of meat are from the thick flank and round at 7*d.* and 7½*d.* per lb.

The neck part of beef is tough, and must be gently boiled or stewed.

If you like fat meat, buy breasts of mutton at 5½*d.* per lb.

If you can buy a joint at once, the cheapest are legs of pork at 5½*d.* and 6*d.*, the aitch-bone of beef (if it is well cut) at 5½*d.* or 6*d.* Make broth from the bone of the latter, a stew or pudding from the thin side, and roast the remainder, or roast the whole at once.

Do not usually buy young pickled pork, sausages, or black puddings.

If you can clean tripe and cow-heel, buy them occasionally. Clean and cook them, and make broth.

Buy or beg uncooked bones for broth.

The cheapest bacon is American bacon.

Buy the part about the shoulder at 3½*d.* to 4½*d.* per lb., and boil it. Make pea soup from the liquor.

Do not buy the expensive parts of English and Irish bacon unless you can afford it. If you can buy a large quantity at a time, the cheapest piece is the top end of the flitch including two ribs, called the "fore end." You can buy it of the best quality at 6½*d.* per lb.

FATS.

Obtain as much dripping as possible from your richer neighbours, or buy it at the shop when its price does not exceed 7*d.* per lb.

If you can buy the fat which butchers cut off the loin and neck of mutton at 4*d.* or 5*d.* per lb., do so, and render it down, or cut it into bits and add it to puddings, or fry the vegetables with it.

Use the fat of American bacon at 4*d.* per lb. for the same purposes.

Do not buy much butter or lard.

Fresh butter is a very dear food.

There are very cheap kinds of butter sold at 7*d.* to 10*d.* per lb., and, if the flavour is not very keen, they are more economical than fresh butter at 1*s.* 4*d.* and 1*s.* 6*d.* per lb., and, if you are poor, should be preferred. Buy only a little at a time, as it may not keep well.

Fats of some kind are most necessary to health, and particularly for growing children and youths who cannot obtain sufficient new milk.

TEA.

Tea is a very dear food.

When made very weak it is only useful from the warm water, sugar, and milk which it contains; yet 1 oz. of tea costs as much as twelve pints of skim milk in Devonshire.

If you are very poor, do not buy any tea, but spend your money in bread and skim milk.

If you are less poor, drink tea only rarely, as on Sundays or special occasions.

The husband, wife, and children, all need better food than tea.

Never take tea without real food, as bread; and never regard tea as food.

When you cannot obtain sufficient milk, and must drink tea, let it be weak, and add as much milk as you can to it; but it is then better to make broth for breakfast and dinner.

COOKING.

The objects in cooking food are:—

1*st. To make it softer, so that it may be more easily masticated and digested.*

All food, including meat, should be well cooked, but as little of it wasted in the cooking as possible.

In boiling rice and peas, potatoes, greens, and other garden vegetables, do not boil them too long, or they will be mashed and disagreeable, and much of the nourishment will be wasted in the water. Boil them enough or they will be less digestible. Potatoes are less wasted when steamed than boiled.

Unless you cook flour, oatmeal, or such foods in milk, you need not boil the milk, but you should only make it hot. If you add oatmeal, &c., you must boil it gently until the oatmeal has become quite soft.

In boiling or stewing meat, put it into cold water; do not use too hot a fire, but keep the water only simmering, and allow a little more time for cooking. When boiled fast it becomes hard and cannot be easily masticated or digested.

Do not boil eggs hard.

In roasting meat, do not have the fire too hot or the meat too near to it, but roast it gently so that it may be sufficiently done throughout, whilst the outside is not too much dried.

Meat which has been too much roasted or boiled has lost much of its nourishment.

Boil bones, after they have been well broken, in plenty of water for nine or twelve hours in a covered pot, and add water as it may be required.

When you make broth, you should simmer the vegetables slowly.

There is less waste in boiling than in roasting food, and less in gently stewing than in boiling or roasting it, since the fluid in which it is stewed contains the nourishment which has been drawn out of the food, and is eaten.

Do not purchase salted meat.

In baking bread, make it light and bake it equally throughout the whole loaf. It is more difficult to thoroughly bake a large than a small loaf. Do not have the oven too hot, or it will dry the outside of the loaf too much, and destroy the nourishment. If the loaf is underbaked, it will be disagreeable and indigestible, and it should be made into puddings, so as to be cooked again without waste.

2nd. To make it hot, and more agreeable to the palate.

Hot food is both more agreeable and digestible than cold food. Eat hot food generally, and particularly in cold weather, except in the instances, as bread, where it would be wasteful to do so.

Children, and old and feeble people, need hot food more than strong adults.

When you are very poor, and have not enough to eat, do not drink cold fluids.

Roast and fried food is generally more savoury than boiled food.

Take pains to season your food agreeably with salt, pepper, &c., as you cook it.

When you fry eggs and meat, place the seasoning and fat which you use in the frying-pan first, and then add the food, and frequently turn it, or sprinkle the seasoning upon it.

Do not use too hot a fire, and take care that the eggs or meat do not become too much dried.

APPENDIX.

II.

SINCE the issue of this work, public attention has been particularly called to three kinds of food, and it seems desirable that I should now refer to them.

Liebig's Soup for Children.

This is prepared as follows. Take 1 oz. (1 large table-spoonful) of seconds flour, and mix it very slowly and carefully with 10 oz. of cold skimmed milk, until the whole is smooth. Add $7\frac{1}{2}$ grains of bicarbonate of potash, dissolved in a tea-spoonful of water (if 60 grains of the potash be dissolved in 1 oz. of water, 1 tea-spoonful must be used at a time), and then heat it gently to the boiling point, and keep it boiling for five minutes. Stir it well while it is being heated. Add to the hot fluid 1 oz. (1 large dessert-spoonful) of malt flour (malt ground in a coffee-mill and sieved), mixed with 2 oz. of water, and stir it well. Cover the pan, and let it stand for half an hour in water which is nearly boiling, so as to keep the fluid warm, then strain through a fine sieve and bottle it.

The great authority attaching to the name of Baron Liebig, will doubtless induce the public to give trial to this preparation; and it may aid them to arrive at a sound conclusion, if I offer a few observations upon it.

1. It is not a substitute for milk, since milk itself is an essential element in its preparation; but it is really an improved mode of doing that which is almost universal in this country—giving milk with flour, or milk with rusks and other farinaceous material.

2. Its real merit consists in adding a material to the flour which will aid the stomach of the infant and child to digest it; and that which remains for investigation is the proof to be derived from the evacuations, whether such aid has been effectual. This may be ascertained roughly, in any case, by noticing the size of the stools. The quantity of flour which is here added to the milk is greater than that which is commonly used, but let a trial be made with the milk and flour alone, and then with the food thus prepared, and if the stools are as large in the latter as in the former, it may be safely inferred that the food has no special advantage over the use of boiled milk and flour.

At page 121, I have stated that flour is incapable, or only very partially capable, of digestion in the stomach of infants, whilst elsewhere I have shown that at a later period the power to transform the starch into sugar, and thus to digest it, is increased. It is found that this deficiency in infancy is owing to the absence of a ferment in the stomach, and this defect is presumed to be supplied by the presence of *diastase* in the malt, which, acting as a ferment, causes the desired change in the flour to be effected. That this action will take place, to a certain extent, with the properly prepared malt flour is certain; but it remains to be proved whether it enables the whole of the flour to be thus transformed.

3. As the stomach of a child of three years, and probably of one between one and two years of age, can digest flour, and transform it into sugar, this preparation offers scarcely any appreciable advantage to them over the long-established one of well-boiled milk, flour, and sugar, or milk-pudding.

4. When milk can be obtained for infants, it is beyond all comparison the best food for them, and no addition of any kind should be made to it; and hence for the children of the rich and the middle classes, Liebig's food is scarcely necessary. When the poor cannot obtain sufficient milk for their infants, this preparation is probably the best substitute, for that part of the milk which is absent, which has been hitherto devised.

5. The quantity above indicated is enough for a day's supply of a child under two years of age, and a quart of milk should be added to it.

6. It may be well to point out that the word *Soup*, as ordinarily understood in this country, is here a misnomer, and that the proper expression is milk and farinaceous food.

Essence or Extract of Beef.

Preparations of meat called *essences*, or *extracts*, are now largely introduced into England, and are attracting an unusual share of public attention. They are prepared from fresh meat in such a manner that the fibre and fat are left behind, and only osmazome, or the flavouring property of meat, certain salts, and a very small quantity of albumen, remain. The quality of this food is determined by the first-mentioned substance, and with a teaspoonful of the essence about a pint of soup may be made, which although *thin* to the palate, is as full of the flavour of meat as when beef-tea is prepared at home. The salts are not perceptible to the senses, but they consist, in part, of phosphates, and are very valuable. The albumen is necessarily in very small quantity, from the small amount of the extract of meat which is used.

Hence, what is the dietetic value of this preparation? No *combination* of nutritive elements can be offered to the body in a form more concentrated than its own flesh, and, as has been shown in this work, the flesh of animals is almost identical in composition with our own flesh. It is true that flesh consists of water to the extent of 77 per cent., and that only 23 per cent. of the whole is nutritive material; but the solid elements cannot be obtained in a nutritive form without water, neither could they be digested in a solid state. Hence, whilst for the sake of argument it may be allowed that the bulk of flesh may be reduced without lessening its nutritive value as a food, this reduction can be carried only so far as to leave one-fourth of the whole, or 4 oz. in 16 oz. But it is affirmed that 1 oz. of the essence of beef is derived from 30 oz. of beef, and yet it contains the nutritive parts of the larger quantity.

Can this be so? A large amount of fibre with fibrin, gelatin, and fat, and some albumen, is left behind;

and it is affirmed that the former is not nutritious, because dogs fed exclusively upon it do not live. There is a serious and obvious fallacy in this. That fibre is digestible is proved by the fact, that in fresh meat nearly all of it is digested — only a small quantity passing off by the bowel—and that it is highly nutritive is proved by its chemical composition. Hence it is a folly of the grossest kind to throw away this material. That it will not alone support life is quite certain, from the fact that salts necessary to life, and fat highly important to life, have been removed; but this does not in the least prove that it is not of great value as a part of a dietary.

As fibre and fat constitute by far the greater proportion of the solid parts of flesh, it follows that the so-called *essences* contain but a very small proportion of the nutritive parts of flesh, and that they can scarcely be regarded as nutrient foods.

When one teaspoonful of the essence, or extract, has been dissolved in about a pint of hot water, and seasoned with salt and pepper, it forms an agreeable and stimulating food, and in this respect, as also in the small quantity of nutriment which it offers, it must be ranked with tea, coffee, and chocolate. It may be advantageously thickened by adding a little sago; and vermicelli, maccaroni, and various Italian *pâtes*, are agreeable and proper additions.

Its proper place is that of a luxury, and in some states of disease it is also a valuable food; but in health the quantity of nutriment contained is too small to be computed, and its action upon nutrition is rather indirect, by stimulating the vital actions, than direct, by supplying food. It is manifestly better for the housewife to make beef-tea from shins of beef, so as to obtain much gelatin, or from gravy beef, and to serve up the solid part as food at the same meal. Our continental neighbours eat their *bouilli* and *potage* at the same meal, and so should we.

Liebig's essence of meat is, however, a very valuable addition to the stores of the traveller, since it occupies a very small space, and with hot water he may at any time prepare a basin of soup in two minutes, which would be more useful to him than any other fluid. It is particularly suited to those who abstain from intoxicating drinks.

South American Beef.

The sympathies of every one must attend every effort to obtain meat for our labouring classes at a price within their means, and no one would offer a remark which might hinder this result, except from a sense of duty. When the columns of the *Times* were opened to the discussion of this question, I refrained from offering an opinion upon it until the best specimens of South American beef had been shown, and time had been afforded to form a just judgment respecting it.

I have very shortly referred to this subject on page 79, and now I must express my opinion that the dried meat, as at present preserved and imported, is not an economical or agreeable food, and that the effort to force its sale is not to the advantage of the genera community. I will add a few observations in order upon it.

1. It is a mistake to speak and write of it as "Beef at 3*d*. per lb." It cannot be bought retail at that price, and it is in fact sold retail at 4*d*. per lb. This approximates its cost very closely to that of the cheapest parts of fresh meat.

2. It is not correct to intimate, that because it contains more nitrogen in a given weight than fresh meat, that it is therefore more nutritious. It is exceedingly dry and hard, and is sold in slices, or in the form of thin sheets, resembling very much in appearance a thick dried skin. The fluids have been evaporated, and with them the aromas and flavours of the meat. The solids in the juices—salts and albumen—have been in large part extracted from the cut surfaces by the process of salting, and whatever may remain is in the centre of the thin sheet or slice. The dried beef is chiefly hard fibre, and as in fresh meat the fibre is not wholly digested, what must be the result with a hard mass which, by no process or duration of cooking, can be reduced to a state at all approaching to that of fresh meat? The fibre of wood is composed of very similar materials, but is much less digestible; yet would it be fair to inform those who are ignorant of chemistry and physiology, that woody fibre—rich in nitrogen—is good food? I have soaked thick slices of the meat for twenty-four hours, and simmered them for six hours,

and then they were dry, and split up into fibres much more resembling board than flesh. It cannot be doubted that the fibre is in great part indigestible—infinitely less digestible than the fibre of fresh meat—and consequently that it is so far useless as a food.

3. It has lost nearly all the natural flavour of meat, so that it can only be regarded as meat because it is unlike any other known food.

4. Even in this dried form it is highly salted, and by no process can all the salt be extracted. Hence all the objections lie against it which attach to salted meats. Excess of salt in the system is injurious to health, and at the same time induces thirst, which may encourage the use of improper drinks. Drinking too much fluid of any kind is opposed to the nourishment of the body.

5. In all publications respecting it great attention is directed to the process of cooking. Some of these directions are vague on the point of the greatest importance, and others state results which are not strictly correct. Thus the directions of the "Commisson" (improperly so termed), are:

(1). "Cut in small pieces, about an inch square; simmer it by the fire for one and a-half hours; add potatoes, pepper, and onions; and again cook slowly *until ready*. It will then be found a very good Irish Stew."

(2). "Mince in the form of mince collops; cook it slowly, and *when ready*, mix it up with mashed potatoes. It may then be put in a dish, and browned in the oven."

In these directions I have underlined the words *when ready.* The general impression to be produced is, that the food may be prepared in a short time; and the words *when ready* leave the matter really undetermined. If by the words *when ready* is meant, when the food becomes soft and fit for digestion, the poor man and his family will wait long for their dinner.

Again, the South American Beef Company have issued the following :—" Wash the beef to free it from any accidental impurity. Put it on the fire, and before it boils, change the water, and allow it to simmer gently for one and a-half to two hours : it will then be *perfectly tender,*" &c. I state most explicitly that in reference to any specimen which I have seen in the market, the statement that " it will be perfectly tender " is beyond the fact.

6. For whose use is the beef introduced?

(*a*). *For the poor?* There are no better judges of flavour than the poor, and none so little disposed to buy or eat dry and tasteless food. Firing is very generally deficient, and so much so is this the case in many of the South-Western and Eastern districts of England, that food cannot be cooked more than twice a week, and no hot food, other than fluid, is obtained by the labourers more frequently. These are really *the poor,* and how could they maintain a fire for twelve hours at a time—the least time required to cook dried beef? This, above all other classes, should be invited to spend their money upon the most digestible and most nutritious food, in order that it may be employed in the most economical manner, but dried South American beef at 4*d.* per lb. is in these respects a *dear food.* Hence this is not a food for the poor.

(*b*). *For the rich?* The rich may find fire, cooks, pot-herbs, condiments, and "pieces of fat salted pork to boil with it," in order to render the food masticable, and to give it the flavour which it would otherwise lack; but they have money wherewith to buy fresh, digestible, and full-flavoured meat, and are not in the habit of subjecting themselves to culinary experiments for commercial purposes. It is said that stock or gravy may be made from it, but stock and gravy are also obtained from fresh meat, and it is not pretended that the former is superior to the latter in this respect. Hence it is not a food for the rich.

7. The most inferior qualities have been imported, and in addition to the disgust which they have produced, they are exceedingly likely to induce dangerous diseases. The poor are tempted by the low price to obtain, and then to eat it. The most rigid inspection of this material should be made, as it enters the ports of the country, and by the Officers of Health in every town where it is used, or otherwise it may become a public nuisance.

8. When the quality is good, and the meat is given to the poor, they should prepare it as follows. Cut it into thin slices, soak it in different quantities of water for one to two days, rubbing the surface well to remove

the salt and dirt. Take it out of the water, and beat it well with the rolling-pin, and then simmer it gently in other water from twelve to twenty-four hours. Boil fat bacon in the same liquor, either towards the end of the cooking of the beef, or afterwards, and with the broth make soup with garden vegetables and herbs,—sometimes adding split peas, and at others barley and rice, and thicken it with a little flour. Do not add salt, but use as much pepper as will make it palatable. Cayenne pepper is better than black pepper for this purpose. Eat the bacon and beef together. It is in vain to fry it, or even to make it into Irish stew with the means at the command of the poor.

9. As it is impossible to keep the water at the same temperature for a long period either with a coal or furze fire, the process advised can be properly carried out only when the small charcoal grates of France and Germany have been introduced into our cottages, and when charcoal is used instead of coal.

10. The poor must never be taught to rely upon this meat to the extent to which good fresh meat may be trusted to sustain nutrition. It is possible that advance in knowledge may permit it to be imported in a moist, and yet not in a very salted state, and thus remove some of the objections to its use ; but then the price would rise above 4*d.* per lb., and it might not be a cheap food.

Clergymen and ladies who are so deeply interested in the welfare of the poor, will do well to eat this food before they recommend it, and to satisfy themselves by actual experiment as to the mode in which the poor, with the means at their command, can most effectually cook it. It is the most needed, and probably it may be the most readily introduced, in Somerset, Wilts, Dorset, Cornwall, and Norfolk; and true philanthropy, if exercised in this direction, would purchase the meat at the wholesale price, cook it in the kitchen of the rich, and give it or sell it with the soup to the poor.

11. It would be a cruelty to introduce it into workhouses, since it would be extremely unpalatable. It would also be an injustice to the country to feed prisoners with it, since it cannot afford equal nutriment with the same value in money spent upon fresh meat. It is neither an agreeable nor a cheap food.

Mr. Jones's process of preserving meat in nitrogen and sulphurous acid gas, by which it may be brought to England in a fresh state, is worthy of attention and deserves success. It is also to be hoped that Professor Morgan will endeavour to ascertain if he cannot preserve meat by his salting process for a period sufficiently long to enable it to be consumed in this country, with a much smaller quantity of salt and saltpetre than is at present used. It is not needful that meat should be preserved for many months when it is intended for use in private families.

EXPLANATION OF PLATES.

EXPLANATION OF PLATES.

As starch is frequently referred to as a constituent of flour, oatmeal, potatoes, &c., on pages 31 to 61, and is an important article of food, I have introduced drawings of the cells (starch cells) in which it is contained, in their natural condition, and also when expanded and ruptured in the process of cooking. The former, together with drawings of mature and sprouted potato, are represented in Plate I., constituting the Frontispiece; whilst the latter will be found in Plate II.

The following is a description of the several drawings :—

PLATE I.

Fig. 1. Shows the forms of the starch cells in different plants when magnified about 200 diameters.

a Wheaten starch, showing faint concentric rings.
b Sago starch, Rice starch, very small and angular.
d Potato starch of medium size, flattened, and with well-marked lines.
e The same more highly magnified, to show the markings, 2; and particularly the nucleus, 1.
f *Tous les mois* starch, very large and of oval shape, with beautifully regular markings.
g The same, when the cell has been ruptured by heat.
i Pea starch, showing the central folding or cavity.

Fig. 2. A slice of healthy and mature potato, showing the cells *a* filled with starch cells. *Magnified.*

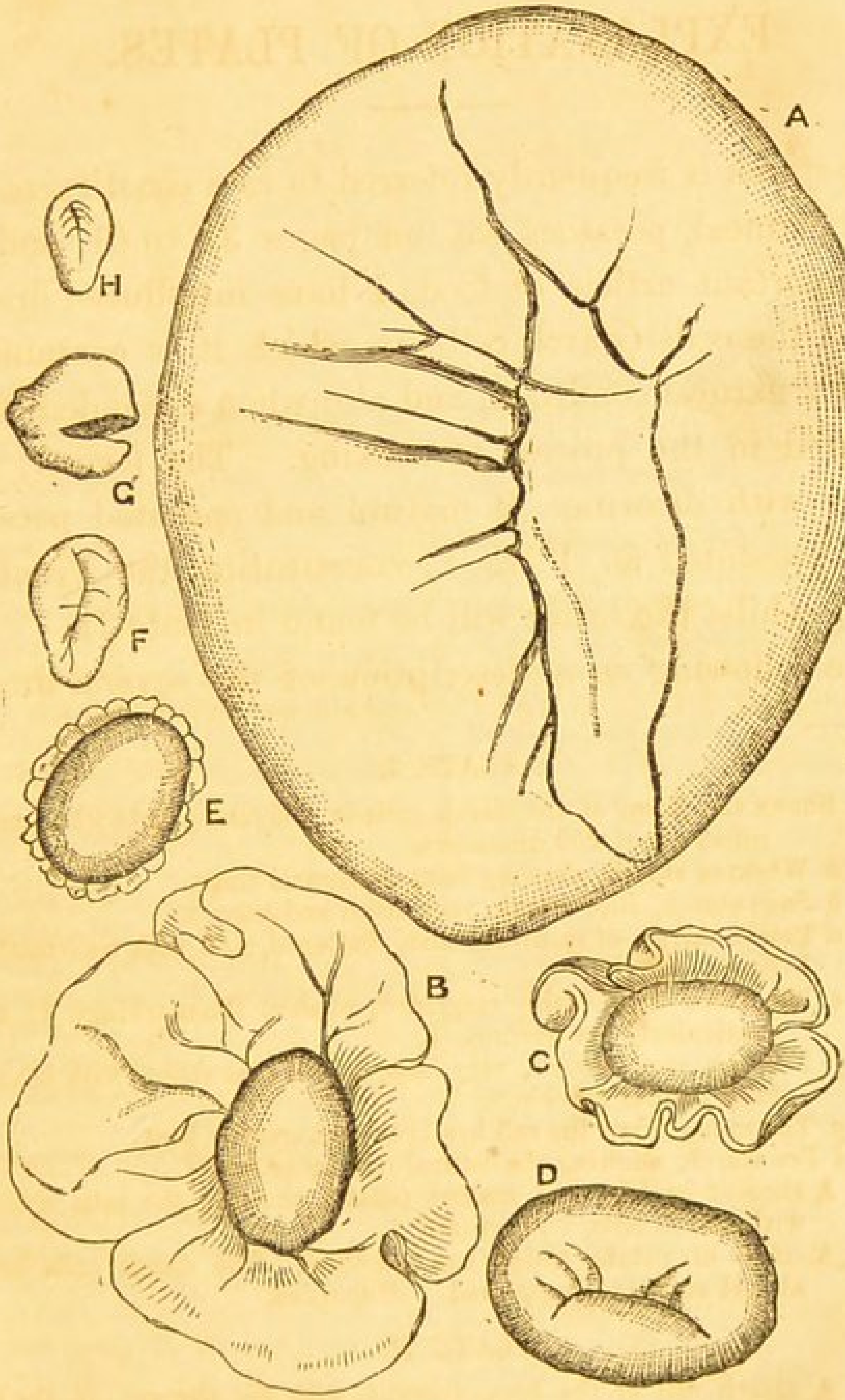
Fig. 3. A slice of potato which has sprouted. The starch cells have almost entirely disappeared. *Magnified.*

PLATE II.

H. A starch cell of the horse-chesnut, with the changes, in the inverted order of the letters, which it undergoes when sulphuric acid has been applied to it, or when it is cooked by boiling or roasting.

The fringe shown in E, C, and B, are plaits of the cell wall, which become further unfolded and expanded until the wall bursts, as shown in the large figure A.

PLATE II.



STARCH CELLS, ENLARGED IN THE PROCESS OF COOKING.

INDEX.

THE END.

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