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Food Inspector's Handbook

FRANCIS VACHER

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THE

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BY

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PREFACE.

—:o:—

A PAPER entitled "The Physical Appearances of Sound and Unsound Food," which appeared in the *Sanitary Record* in two parts, published respectively on October 15 and November 16, 1885, was so favourably received at the time by Medical Officers of Health and Sanitary Inspectors that it was reprinted as a handbook for the pocket. In 1890, as there was still a demand for it, it was carefully revised and re-issued, and in 1891 it was again reprinted. As the little book was still being called for, and the Author received many applications for further information upon the same subject, "The Food Inspector's Handbook" was written and appeared in the *Sanitary Record*, chapter by chapter, during the present year. This is now revised and presented to the public in a complete form. It is designed to take the place of the previous little book, and includes all therein stated which the Author thinks desirable to retain. How much has been added, those familiar with "The Physical Appearances of Sound and Unsound Food" will not need to be told. The introductory chapter as well as the chapter on Statutory Powers are new, the chapters on foods not mentioned in the Public Health Act have been added, while the important foods coming within the description of poultry, game, fish, fruit, and vegetables, to which were devoted three pages only, now occupy as many chapters.

The one wish of the Author is that the work in its present form may prove thoroughly useful. His long experience as a Medical Officer of Health and Food Analyst has made him well acquainted with the topics treated of, and he is assured that only those who have had practical experience can write effectively on food inspection.

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CONTENTS.

—:o:—

CHAPTER I.

THE FOOD INSPECTOR—HIS QUALIFICATIONS AND OBLIGATIONS.

PAGE

Inadequate attention given to food inspection—Where practicable a special officer should be appointed—Veterinary-surgeon or butcher?—Honesty, truthfulness, and fairness—Patience, even-temper, and courtesy—Health and strength—The training of the five senses—Tact, judgment, common-sense, and fondness for work—Duties of food inspector 1

CHAPTER II.

STATUTORY POWERS.

Markets and Fairs Clauses Act, 1847—Sections 116 to 119 of the Public Health Act, 1875—Section 28 of the Public Health Acts Amendment Act, 1890—Section 47 of the Public Health (London) Act, 1891—Sale of Horseflesh, &c., Regulation Act, 1889 7

CHAPTER III.

ANIMALS, CARCASES AND BUTCHERS' MEAT.

Preliminary division of subject—Live animals—Carcases—Good meat—Meat not of the description represented—Sale of Horseflesh as Beef—Difference between skeleton of Horse and Ox—between Horseflesh and fat and Beef flesh and fat—Difference between Heart, Liver and Tongue of Horse and Ox—Meat partially decomposed through having been kept too long or ill-kept—Meat from animals which have not been killed by man or only killed when moribund—Meat from animals much injured

PAGE

by accidents—Meat from animals newly landed from shipboard, off a railway journey, over-driven or frightened —Meat from animals recently physicked—Meat from aged animals—Immature veal and lamb—Frozen meat ... 20

CHAPTER IV.

The Diseases of Animals which render Meat Unfit for Human Food.

Cattle-plague or Rinderpest—Epizootic pleuro-pneumonia—Anthrax and Anthracoid diseases—Black-quarter —Splenic-fever—Braxy in Sheep—Texan-fever—Sheep-pox—Consumption (tuberculosis)—Actinomycosis—Joint-ill or Joint-felon—Typhoid-fever of Swine—Quinsy in Swine—Worms affecting Swine—Cysticerci and Trichinæ —Glanders and Farcy 30

CHAPTER V.

The Diseases of Animals which depreciate the quality of the Meat, render portions of the Carcase unfit for Human Food, or in the later stages unfit the whole Carcase for Human Food.

Foot-and-mouth Disease—Hoof-rot—Dropsy—Liver-fluke—Filaria—Sheep-scab—"Diamonds"—Carcases of Parturient Animals—Milk fever—Parturient fever—Carcases of Poisoned Animals 40

CHAPTER VI.

Poultry and Game.

White-fleshed and dark-fleshed fowl—Capon and poularde—Good poultry—Diseases—Roup (tuberculosis) —Pip—Chip—Turn—The Scour—Gapes—Parasites—Chicken-cholera—Pigeons—Game—Venison—Hares and rabbits—Feathered game—When in season?—Grouse—Blackcock—Capercailzie—Ptarmigan—Pheasant—Partridge—Quail—Corn-crake—Plover—Snipe—Wild-duck—Teal and Widgeon—Woodcock—Game for invalids—Diseases of game 45

CHAPTER VII.

Fish.

PAGE

White flesh, red flesh and greasy flesh—Fish should be in season, fairly fresh, unbruised, and free from disease—Brill, cod, eels, conger eels, flounder, hake, haddock, halibut, herring, mackerel, scad, or horse mackerel, plaice, salmon, smolts, grilse, kelts—How to distinguish between the "clean-run" salmon and the "unclean"—Trout, skate, smelt, or sparling, sand smelt, sprats, soles, turbot, whitebait, whiting, "buckhorn"—Dried, salted, or smoked fish—Haddock-curing in London—Oysters, lobsters, prawns and shrimps, whelks, mussels, cockles, and periwinkles 53

CHAPTER VIII.

Fruit and Vegetables.

No proper dividing line between them—Fruit ordinarily exposed for sale—When in season?—Apples, pears, and oranges—Barrelled grapes—Cherries, apricots, nectarines, and peaches—Damsons—Greengages, Orleans plums, magnum bonums—Currants, raspberries, strawberries, gooseberries, and rhubarb—Disease, decay, and immaturity—Nuts—walnuts, hazel nuts, &c., Brazil nuts, pea nuts, almonds, sweet chestnuts, cocoanut—Dried fruit, crystallised fruit, bottled fruit and jams—Vegetables ordinarily exposed for sale—When in season?—Potatoes—Artichokes—Asparagus—Beans—Brocoli and cauliflower—Cabbage—Sourkraut—Carrots, parsnips, and beetroot—Celery—Cucumber—Endive—Lettuce—Horse-radish—Mushrooms—Onions—Green peas, dried peas—Sea-kale—Spinach—Tomatoes—Truffles—Turnips—Vegetable marrow—Disease, decay, &c.—Tinned fruit and vegetables 68

CHAPTER IX.

Corn, Bread and Flour.

Corn, different kinds—How distinguished when ground—Diseases of corn: Bunt, smut and ergot—Flour—

PAGE

Wheat flour—Varieties of wheat—Yield of a quarter of wheat—Good flour—Diseased, mouldy, damp, fermented and decomposing flour—Adulteration with other flours or starch—Mineral adulterants—Readily applied test for presence of alum—Bread defined—Wholemeal bread—Good bread described—Sodden, sour, bitter or mouldy bread—Adulteration of bread 81

CHAPTER X.

MILK.

Importance of its being pure—Good milk—Unwholesome milk—Epizootic disease, anthrax, cattle-plague, pleuro-pneumonia, foot-and-mouth disease—Tuberculosis—Garget—Primarily good milk infected with animal disease germs—Primarily good milk infected with human disease germs, diphtheria, scarlatina, and typhoid fever—The Hendon cow disease—Dishonesty or uncleanliness of milk-sellers—Sour milk—"Blue" and "red" milk—Tainted milk—Adulterated milk—Skimmed milk—Separated milk—Cream—Clotted Cream—Preserved milk—Butter milk—Koumiss—Kefyr—Galazyme ... 86

CHAPTER XI.

ARROWROOT AND SIMILAR PREPARATIONS.—BUTTER AND ITS SUBSTITUTES.—CHEESE, LARD AND EGGS.

Purified Starches—Arrowroot—Sago—Pearl sago—Tapioca, tapioca flour—Corn-flour—Farina—Tous les mois—Semolina—Revalenta-arabica—Macaroni and vermicelli—Butter—Rancid butter—Adulterated butter—Margarine—Le Dansk—Cheese—Adulterated cheese—Cheesine—Skim-cheese—Soft cheeses—Parasites—Damaged cheese—Lard—Adulterated lard—Eggs—How to tell fresh eggs—Preserved eggs 96

CHAPTER XII.

TEA, COFFEE, COCOA AND SUGAR.

Tea—Compressed tea—Adulterated tea—Coffee—Adulterated coffee—Chicory—Cocoa—Adulterated cocoa

PAGE

—Chocolate—Sugars—Cane sugar—Beetroot sugar—Maple sugar—Jaggery—Treacle—Glucose—The sugar-mite—Sweetmeats—Honey 107

CHAPTER XIII.

Condiments, Spices, &c.

Mustard—Adulterated mustard—Pepper—Adulterated pepper—Cayenne pepper—Ginger—Adulterated ginger—Cinnamon—Adulterated cinnamon—Nutmegs—Adulterated nutmegs—Mace—Cloves—Allspice—Mixed spice—Olive oil—Vinegar—The vinegar plant—Lemon-juice and Lime-juice—Certain foods sold cooked 120

LIST OF ILLUSTRATIONS.

—:o:—

FIG.		PAGE
1.	Skeleton of the horse	23
2.	,, ,, ox	23
3.	Tongue of the horse	24
4.	,, ,, ox	24
5.	Front teeth of the ox at 2 years of age	27
6.	,, ,, 3 ,, ...	28
7.	,, ,, 4 ,, ...	28
8.	,, ,, 5 ,, ...	28
9.	Head of *cysticercus*, and hook from same drawn to larger scale	37
10.	*Trichina* coiled up and cyst of same	38
11.	Liver-fluke from sheep	42
12.	Milt and pyloric appendages of "clean run" salmon	60
13.	,, ,, spawning salmon ...	61
14.	The anchovy	63
15.	Ear of ergoted rye	82
16.	Leaf of tea	109
17.	,, sloe	109
18.	,, elder	110
19.	,, willow	110
20.	The sugar insect	118

THE

FOOD INSPECTOR'S HANDBOOK.

CHAPTER I.

The Food Inspector—His Qualifications and Obligations.

Inadequate attention given to food inspection—Where practicable a special officer should be appointed—Veterinary-surgeon or butcher?—Honesty, truthfulness, and fairness—Patience, even-temper, and courtesy—Health and strength—The training of the five senses—Tact, judgment, common-sense, and fondness for work—Duties of food inspector.

"Food inspector" is a term which it is difficult to avoid using, though it does not occur in Acts of Parliament. In theory every medical officer of health and inspector of nuisances is a food inspector in his own district, while in markets and fairs the duties of the officer are usually discharged by market constables. In practice, there is good reason to believe that very inadequate attention is given to food inspection, and that much food which is allowed to be exposed for sale is diseased, unsound or unwholesome, and unfit for human food. This could hardly be otherwise considering that many medical officers of health have their time fully occupied as general practitioners, and that not unusually inspectors of nuisances are inspectors of weights and measures, school attendance officers, etc. And even in districts where the medical officer of health and inspector of nuisances devote their whole time to their public

health duties, opportunities may never have been afforded them of qualifying as competent judges of food.

If, then, the most important work of food inspection is to be efficiently performed (which all will admit to be a desideratum), it appears to be necessary that in every district there should be at hand an officer appointed solely for this duty. To meet the requirements of the Public Health Act, he should be formally made an inspector of nuisances, but he should be occupied as food inspector only. The appointment of such officers in large towns is a perfectly simple matter, and not uncommon, but in small towns and rural districts it is not usual, and is beset with difficulties. Wherever there is not food inspection enough to occupy a man's whole time, I would suggest that the authorities of two or more districts should combine and jointly secure the services of a food inspector, in the same way as districts now combine and jointly employ a medical officer of health. Whether, in selecting such an inspector, preference should be given to a veterinary-surgeon or a butcher, has been much debated.

As the only really difficult part of food inspection is meat inspection, it is well that the man chosen should have a good practical knowledge of meat, but that it is necessary or even desirable that he should be a veterinary surgeon is open to question. The veterinary surgeons who have discussed the subject naturally think there are no judges of meat equal to the members of "the profession," but there is evidence that neither medical officers of health nor the public endorse this opinion. Certainly a large proportion of the meat inspectors already in the service of urban sanitary authorities were selected for the appointment they hold because they were experienced butchers, and results, after many years trial, have shown that such men make excellent inspectors. It is not as if the man appointed stood alone. He is acting together with the medical officer of health, and in all cases of doubt or difficulty consults him. And when a prosecution is instituted for dealing in diseased meat, and additional evidence required as to the nature of the disease infecting the meat, an expert can be called in. Besides, a butcher is much more likely to know something of the tricks of

his own trade, and be able to detect them, than an outsider. It may also be noted that the salary ordinarily offered, though sufficient for an experienced butcher, would not command the services of a veterinary surgeon of any experience. I therefore incline to the belief that a good intelligent butcher will probably make the best food inspector.

I pass on now to the consideration of the food inspector's qualifications and obligations.

First—He must be honest.—This, it is needless to say, is most essential—his absolute trustworthiness. In view of the importance of the trust committed to the food inspector, the fact that the health (it may be the lives) of many depend on the conscientious discharge of his duty, and the certainty that he will be tempted by the offer of bribes, his honesty must be altogether above suspicion.

Second—He must be strictly truthful, fair and unbiassed.—This, it might be thought, is implied in being honest, and it should be. While, however, most inspectors are honest, it is rare to find one absolutely impartial and unprejudiced. Anyone who has been present at the hearing of prosecutions in respect of unsound meat, must have heard statements so exaggerated or coloured that it is simply impossible that they could be true. The inspector, it may be, is quite unconscious of the exaggeration, because exaggeration has become a habit; but the result is his evidence cannot be received without some abatement owing to this defect. He is sworn to speak "the truth, the whole truth, and nothing but the truth," and he should simply state the bare facts, omitting nothing essential, even though it may tell distinctly in favour of the defendant. Under cross-examination he should give direct answers in as few words as possible, and never fence with a question.

Third—He must be patient, even-tempered, and uniformly courteous.—The food inspector will necessarily in the course of his duties be a cause of impatience and displays of temper in others; it is, therefore, necessary that he should train himself to bear hard words and bad names with perfect equanimity. So long as he keeps cool and collected he can do his work well, but if ever he allows himself to lose his temper he is almost certain

to be guilty of some indiscretion. Courtesy is what everyone has a right to expect from a public official, and its absence is a very grave defect.

Fourth—He must be healthy and strong.—The duties of a food inspector are so arduous that they cannot be properly performed unless the inspector is in full health and vigour. He must be able to work out of doors in all weathers, and must not object to turning out occasionally when other people are asleep. He must not be subject to any weakness or illness disabling him from time to time, for it is often not possible to fill his place temporarily, and when he is laid up it may be little or no food inspection is attempted. It is necessary that he should have a fair amount of physical strength, for he is liable to be obstructed in the discharge of his duties, and should at least be able to hold his own.

Fifth—His organs of special senses must be in good order and well trained.—As regards *sight* the inspector's sense of colour should be good, and he should be accustomed to the use of the lens or some simple form of microscope. His sense of *hearing* should be acute, for some disease signs are appreciable by the ear only, and in visiting slaughter-house lairs a very slight change in the breathing-sounds may be sufficient to draw attention to an infected animal. The food inspector, no less than the nuisance inspector, should have a perfect sense of *smell*. An indication of the presence of several diseases is a special smell. Again, when animals have been physicked the smell of the stomach will witness to the fact, and may indicate the medicine administered. Then it is scarcely necessary to point out that the first signs of decomposition in animal and vegetable matter may be the presence of effluvia. The sense of *taste* has been quaintly described as an automatic premonitory adviser upon the kinds of food we ought or ought not to indulge in. The tip of the tongue, which is supplied only with nerves of touch, serves to distinguish things acid, alkaline, saline or pungent. The middle portion of the tongue, supplied with nerves of taste proper, is sensitive mainly to sweets and bitters. The back part of the tongue is the seat of the taste of meat, butter, oil, and all rich substances. Aromatic flavours, such as that of cinnamon, for instance, are not really

tasted, but discerned by the sense of smell. With respect to the fifth sense, it is surely not necessary to insist on anything so obvious as that the food inspector should possess a keen sense of *touch*. His natural capacity, training and experience are, perhaps, more shown in the delicacy of his sense of touch than in any other way. Touch will accomplish so much that a really skilful inspector might almost be trusted to examine a room-full of carcases blindfold, and pick out the diseased ones.

Sixth—He must have tact, judgment and common sense.—Touch naturally suggests tact, which is a mental characteristic that cannot be dispensed with. The word is not easily defined, but it may be said to indicate the nice feeling, delicate perception and discernment, which keeps a man from blundering, and enables him to perform disagreeable duties in the least disagreeable way. Judgment is the faculty which enables a man to look at a matter from all sides, and to consider a question in all its bearings. Common sense is allied to tact and judgment, but unlike them cannot be acquired; common sense is inborn, like mother-wit, and there is no accounting for the stupid things the man who is without it may do.

Seventh—He must be thoroughly fond of his work.—This fondness implies a taste for reading on matters connected with his vocation, a desire to increase his knowledge, a readiness to receive new ideas, and powers of close observation. Indeed, the really good meat inspector must be something of an enthusiast, as far as his work is concerned.

The duties and position of the food inspector, as I understand them, are formally set forth in the annexed copy of the duties of that officer in the borough I have so long served:—

"Borough of Birkenhead.

"*Duties of the Inspector of Meat, Fish, &c. &c.*

"The inspector will be required to act generally under the instructions of and be responsible to the medical officer of health, and will submit his books and reports to him every Tuesday morning, or at such other times as he may be instructed.

"He will be required to carry out, so far as he may be able, the provisions of Sections 116, 118, and 119 of the Public Health Act, 1875; Section 74 of the Birkenhead Corporation Act, 1881; the Sale of Horseflesh Regulation Act, 1889; and any bye-laws and regulations, relating to the inspection of meat, &c., in force in the borough.

"He will be required to keep a book, or books, in which he shall enter particulars of every complaint made to him of any breach of the general law, or of the bye-laws and regulations of the board relating to the preparation and sale of meat, fish, &c. On receiving any complaint so made, he shall forthwith enquire into the matter and report to the medical officer of health.

"He shall also keep a petty cash book and enter all official disbursements therein, and shall keep any other books that may be necessary.

"He shall report in writing on all nuisances from the keeping or depositing or preparation of offal, &c., which in his opinion are nuisances or injurious to health, with a view to the inspector of nuisances taking steps for the abatement of the same.

"He shall inspect from time to time the corporation slaughter-houses and lairages, and all the private slaughter-houses, as well as all other premises where meat, fish, &c., is exposed for sale or deposited for the purpose of sale, or of preparation for sale.

"He shall inspect, at his discretion, any meat, poultry, game, fish, fruit, vegetables, corn, bread, flour, milk, or any other food whatsoever deposited for sale; and, in case any articles appear to be intended for the food of man, and are unfit for such purpose, he shall seize the same, and submit them to a justice.

"He shall serve all notices issued on behalf of the board relating to his duties.

"When any notices may be lawfully sent by post, it shall be his duty to post such notices, keeping a sufficient record of all notices so dispatched."

This draft is submitted simply as a general guide, for what it is worth. Of course, the duties and conditions of service will vary with the circumstances of each district.

CHAPTER II.

Statutory Powers.

Markets and Fairs Clauses Act, 1847—Sections 116 to 119 of the Public Health Act, 1875—Section 28 of the Public Health Acts Amendment Act, 1890—Section 47 of the Public Health (London) Act, 1891—Sale of Horseflesh, &c., Regulation Act, 1889.

To expose for sale as human food, or even to have possession of, with intent to sell, anything unfit for human food, is a nuisance at common law, and punishable as such. Again knowingly to expose for sale meat which is unfit for human food is an indictable offence.

Thus the dealer in unsound food might be proceeded against independently of Public Health Acts and local bye-laws. Note also that under the Markets and Fairs Clauses Act, 1847, still in force in some urban districts, every person who shall sell or expose for sale any unwholesome meat or provisions in the market or fair shall be liable to a penalty not exceeding £5 for every such offence, and any inspector of provisions appointed by the Local Board may seize such unwholesome meat or provisions, and carry the same before a justice to be dealt with. Every person obstructing or hindering the inspector from seizing or carrying away such unwholesome meat or provisions is liable to a penalty not exceeding £5. However for all practical purposes the statutory powers under which unwholesome food is now seized and dealt with are contained in Sections 116 to 119 of the Public Health Act, 1875, and (for the metropolis) Section 47 of the Public Health (London) Act, 1891. The four sections of the Public Health Act referred to (it is convenient to study them together) are as follows :—

"Unsound Meat, &c.

"116.—Any medical officer of health or inspector of nuisances may at all reasonable times inspect and examine any

animal, carcase, meat, poultry, game, flesh, fish, fruit, vegetables, corn, bread, flour, or milk exposed for sale or deposited in any place for the purpose of sale, or of preparation for sale, and intended for the food of man, the proof that the same was not exposed or deposited for any such purpose, or was not intended for the food of man, resting with the party charged; and if any such animal, carcase, meat, poultry, game, flesh, fish, fruit, vegetables, corn, bread, flour, or milk appears to such medical officer or inspector to be diseased or unsound, or unwholesome or unfit for the food of man, he may seize and carry away the same himself or by an assistant, in order to have the same dealt with by a justice.

"117.—If it appears to the justice that any animal, carcase, meat, poultry, game, flesh, fish, fruit, vegetables, corn, bread, flour, or milk so seized is diseased or unsound, or unwholesome or unfit for the food of man, he shall condemn the same, and order it to be destroyed or so disposed of as to prevent it from being exposed for sale or used for the food of man; and the person to whom the same belongs or did belong at the time of exposure for sale, or in whose possession or on whose premises the same was found, shall be liable to a penalty not exceeding twenty pounds for every animal, carcase, or fish, or piece of meat, flesh, or fish, or any poultry or game, or for the parcel of fruit, vegetables, corn, bread or flour, or for the milk so condemned, or, at the discretion of the justice, without the infliction of a fine, to imprisonment for a term of not more than three months.

"The justice who under this section is empowered to convict the offender may be either the justice who may have ordered the article to be disposed of and destroyed, or any other justice having jurisdiction in the place.

"118.—Any person who in any manner prevents any medical officer of health or inspector of nuisances from entering any premises and inspecting any animal, carcase, meat, poultry, game, flesh, fish, fruit, vegetables, corn, bread, flour, or milk exposed or deposited for the purpose of sale or of preparation for sale, and intended for the food of man, or who obstructs or impedes any such medical officer or inspector or his assistant,

when carrying into execution the provisions of this Act, shall be liable to a penalty not exceeding five pounds.

"119.—On complaint made on oath by a medical officer of health or by an inspector of nuisances, or other officer of a local authority, any justice may grant a warrant to any such officer to enter any building or part of a building in which such officer has reason for believing that there is kept or concealed any animal, carcase, meat, poultry, game, flesh, fish, fruit, vegetables, corn, bread, flour, or milk, which is intended for sale for the food of man, and is diseased, unsound or unwholesome, or unfit for the food of man; and to search for, seize, and carry away any such animal or other article in order to have the same dealt with by a justice under the provisions of this Act.

"Any person who obstructs any such officer in the performance of his duty under such warrant shall, in addition to any other punishment to which he may be subject, be liable to a penalty not exceeding twenty pounds."

Let me briefly consider these sections. Note first that there is no mention of an inspector of provisions, as in the Markets and Fairs Clauses Act; the person empowered to inspect, seize, &c., is "any medical officer or inspector of nuisances"; when, therefore, an urban or rural authority specially appoints a food inspector, it is necessary to have him formally made "inspector of nuisances," even though his duties be those of food inspector only.

The power to inspect and examine food may be exercised "at all reasonable times," that is, whenever business is in progress. Unsound food is freely offered for sale late on Saturday nights, and in wholesale markets during the early morning hours, and often before sunrise. Even Sunday is not necessarily an unreasonable time.

The food which may be inspected and examined is expressly limited in kind. It is "any animal, carcase, meat, poultry, game, flesh, fish, fruit, vegetables, corn, bread, flour, or milk." Thus cheese, eggs, butter, lard, oil, biscuits, sugar, tea, black-puddings, &c., cannot be seized and dealt with under this Act. The word poultry does not include eggs; cheese and butter, though derived from milk, are not milk; and biscuits (except

water biscuits) do not come under the term bread or flour. The limitation is unfortunate, as any of the articles named or excluded may be exposed for sale in an unsound state.

The food which may be inspected and examined must be "exposed for sale, or deposited in any place for the purpose of sale, and intended for the food of man, the proof that the same was not exposed or deposited for any such purpose, or was not intended for the food of man, resting with the party charged." It sometimes happens that persons, having purchased unsound meat, fish or fruit, bring the article to the inspector, believing that he is empowered to seize it as an article illegally sold to them. As, however, the article is no longer for sale, the medical officer of health and inspector are powerless to deal with it under the Public Health Act.

The inability to examine and seize certain kinds of unsound food, and to examine and seize any food when sold, are defects which have been remedied in some towns under local Acts. The amendment required is very simple; thus Section 74 of the Birkenhead Corporation Act, 1881, is as follows:—

"The provisions contained in Sections 116 to 119, inclusive, of the Public Health Act, 1875, shall extend and apply to all articles sold or exposed for sale, or deposited in any place for the purpose of sale, or of preparation for sale within the borough and intended for the food of man."

At present, any sanitary authority, urban or rural, by adopting Section 28 of the Public Health Acts Amendment Act, 1890, may effect the required change, so far as relates to the authority's district. Section 28 of the Public Health Acts Amendment Act, 1890, is as follows:—

"(1.) Sections 116 to 119 of the Public Health Act, 1875 (relating to unsound meat), shall extend and apply to all articles intended for the food of man, sold or exposed for sale, or deposited in any place for the purpose of sale, or of preparation for sale within the district of any local authority.

"(2.) A justice may condemn any such article, and order it to be destroyed or disposed of, as mentioned in Section 117 of the Public Health Act, 1875, if satisfied on complaint being

made to him that such article is diseased, unsound, unwholesome, or unfit for the food of man, although the same has not been seized as mentioned in Section 116 of the said Act."

The word "place" in Section 116 may be taken in its widest sense. A place does not mean merely a slaughter-house, shop or market. Diseased meat placed upon a cart when passing along the streets of Dublin from a slaughter-house to a place for the manufacture of preserved meats was held to have been properly seized under a similar section in the 26 and 27 Vic., c. 117. Still, seizing unsound meat in transit is to be avoided if possible, as the owner or person in charge may allege the meat was not intended for human food, but was being taken to an artificial manure manufactory or a fat rendering works. When practicable, it is better to follow the cart and seize the contents when deposited.

If any of the articles named appear, on inspection, to the medical officer or inspector to be (1) diseased, or (2) unsound, or (3) unwholesome, or (4) unfit for the food of man, he may seize and carry away the same himself or by his assistant, in order to have it dealt with by a justice. Thus in most cases it is only necessary to prove that one of these four terms can fairly be applied to the inspected article. For instance, a liver in which there is an abscess may be seized simply because it is diseased, without reference to the question whether a part of the liver remote from the abscess might not be wholesome. In the same way a fowl, perfectly good when killed, may have been kept too long and seized merely because unsound. Doubtless also immature fruit (*e.g.*, very unripe windfall apples) may be seized as unwholesome, though neither diseased or unsound.

It is not required that food seized and carried away be submitted to a justice on the same day the seizure is made, as this is not always possible; but there should be no unreasonable delay. Neither is it necessary for the officer seizing goods to give notice to the owner, nor is the justice to whom the goods are taken bound to summon the owner before the condemnation thereof. Still, when goods are seized it is courteous to notify the owner or person in charge of the goods that, at such and such a time and place, an order to destroy the same will be

applied for. An officer has no power to destroy articles seized without an order. Although in practice this is occasionally done by consent of the owner, even written consent does not justify the act.

The justice to whom the application to condemn the article of food is made may order it to be destroyed, or so disposed of as to prevent it from being exposed for sale or used for the food of man. The best way of destroying condemned food is by burning it in a refuse destructor or gas retort. Where the justice merely orders the article to be disposed of so as to prevent its being made use of for human food, it may, if a carcase or large seizure of meat, be rendered at a tallow-melter's, under the supervision of the inspector. In no case is it sufficient merely to bury the article condemned. If the article be milk it may be poured into the nearest sewer.

Section 117 not only gives a justice power to condemn an article of food by ordering it to be destroyed, &c., but also power to punish the owner of the same by fine or imprisonment. The application in respect of the article seized should be made as early as possible, in fairness to the owner, that the justice may see the article in nearly the same state in which it was when seized. And if it is desired to prosecute the owner, this may be done subsequently, allowing sufficient time to get up the case, for the justice empowered to convict may be either the justice who condemned the article or any other justice having jurisdiction in the place. In prosecuting, though it is not necessary to prove knowledge on the part of the owner of the state of the article, it is well to be provided with evidence in support of a guilty knowledge, such as inadequate price paid for the article, its removal to defendant's premises in the night-time, &c. In cases where the owner is obviously ignorant of the state of the article, it is inexpedient to take further proceedings after obtaining an order to destroy, &c. A penalty is incurred in respect of each piece of meat seized and condemned.

Any person who prevents the medical officer of health or inspector from entering any premises for the purposes of food inspection, or obstructs or impedes any such officer or his assistant, is liable to a penalty of £5 under Section 118. There

must, however, be some active step in the way of prevention or obstruction to secure a fine. Refusing to go some distance to open premises on demand of an officer has been held a prevention of the officer. Concealing an article of unsound food is not itself an offence, and unless there has been an exposure for sale or deposit for the purpose of sale, &c., and the article has been intended for the food of man, no penalty can be inflicted under Section 119 for concealing, and no order can be made in respect of the concealed article.

Under Section 119, on complaint on oath by an officer of a local authority (not necessarily a medical officer of health or inspector of nuisances), a justice may grant a warrant to such officer to enter and search any building in which such officer has reason to believe there is concealed any of the named articles of food intended for and unfit for the food of man, and to seize any such concealed article in order to have the same dealt with by a justice. Any person obstructing such officer, in addition to any other punishment he may be subjected to, is made liable to a penalty not exceeding £20. The search warrant may be granted for "any building or part of a building," words including cellars and any kind of erection or out-building. Note also the expression "kept or concealed," showing that no proof of concealment is necessary. "Oath" includes affirmation or declaration of a person allowed by law to affirm or declare. This section appears to apply to cases where articles intended for human food are not actually exposed for sale, and where it would be difficult to allege that they are deposited for the purpose of sale in the terms of Section 116.

The statutory powers as regards unsound food, for the metropolis, are contained in Section 47 of the Public Health (London) Act, 1891, giving the medical officer of health or sanitary inspector power to seize, and the justice power to order the destruction of unsound food. The powers are similar to those in Sections 116 and 117 of the Public Health Act, except that all articles of food, solid or liquid, and articles sold may be dealt with, and that the penalties are increased, and under certain circumstances the wholesale dealer is liable. The section reads as follows:

"47. (1.)—Any medical officer of health or sanitary inspector

may, at all reasonable times, enter any premises, and inspect and examine—

"(*a*) Any animal, intended for the food of man, which is exposed for sale, or deposited in any place for the purpose of sale, or of preparation for sale, and

"(*b*) Any article, whether solid or liquid, intended for the food of man, and sold or exposed for sale, or deposited in any place for the purpose of sale, or of preparation for sale,

the proof that the same was not exposed or deposited for any such purpose, or was not intended for the food of man, resting with the person charged; and if any such animal or article appears to such medical officer or inspector to be diseased, or unsound, or unwholesome, or unfit for the food of man, he may seize and carry away the same himself, or by an assistant, in order to have the same dealt with by a justice.

"(2.)—If it appears to a justice that any animal or article which has been seized, or is liable to be seized, under this section, is diseased, or unsound, or unwholesome, or unfit for the food of man, he shall condemn the same, and order it to be destroyed or so disposed of as to prevent it from being exposed for sale or used for the food of man; and the person to whom the same belongs, or did belong, at the time of sale, or exposure for sale, or deposit for the purpose of sale, or of preparation for sale, or in whose possession, or on whose premises the same was found, shall be liable, on summary conviction, to a fine not exceeding fifty pounds for every animal or article; or, if the article consists of fruit, vegetables, corn, bread, or flour, for every parcel thereof so condemned, or, at the discretion of the court, without the infliction of a fine, to imprisonment for a term of not more than six months, with or without hard labour.

"(3.)—Where it is shown that any article liable to be seized under this section, and found in the possession of any person, was purchased by him from another person for the food of man, and when so purchased was in such a condition as to be liable to be seized and condemned under this section, the person who so sold the same shall be liable to the fine and imprisonment above mentioned, unless he proves that at the time he sold the said

article he did not know, and had no reason to believe, that it was in such condition.

"(4.) Where a person convicted of an offence under this section has been within twelve months previously convicted of an offence under this section, the court may, if it thinks fit, and finds that he knowingly and wilfully committed both such offences, order that a notice of the facts be affixed, in such form and manner, and for such period not exceeding twenty-one days, as the court may order, to any premises occupied by that person, and that the person do pay the costs of such affixing; and if any person obstructs the affixing of such notice, or removes, defaces, or conceals the notice while affixed during the said period, he shall for each offence be liable to a fine not exceeding five pounds.

"(5.) If the occupier of a licensed slaughter-house is convicted of an offence under this section, the court convicting him may cancel the license for such slaughter-house.

"(6.) If any person obstructs an officer in the performance of his duty under any warrant for entry into any premises granted by a justice in pursuance of this Act for the purposes of this section, he shall, if the court is satisfied that he obstructed with intent to prevent the discovery of an offence against this section, or has, within twelve months previously, been convicted of such obstruction, be liable to imprisonment for any term not exceeding one month in lieu of any fine authorised by this Act for such obstruction.

"(7.) A justice may act in adjudicating on an offender under this section, whether he has or has not acted in ordering the animal or article to be destroyed or disposed of.

"(8.) Where a person has in his possession any article which is unsound or unwholesome and unfit for the food of man, he may, by written notice to the sanitary authority, specifying such article and containing a sufficient identification of it, request its removal, and the sanitary authority shall cause it to be removed as if it were trade refuse."

The Sale of Horseflesh, &c., Regulation Act, 1889, is not intended to prohibit the sale of what is a wholesome and cheap food, but to prevent the fraud of its being sold under a false

name. The two first sections, requiring signs on horseflesh shops, and prohibiting the sale of horseflesh as other meat, are very complete. They are as follows :—

"1.—No person shall sell, offer, expose, or keep for sale any horseflesh for human food elsewhere than in a shop, stall, or place over or upon which there shall be at all times painted, posted, or placed in legible characters of not less than four inches in length, and in a conspicuous position, and so as to be visible throughout the whole time, whether by night or day, during which such horseflesh is being offered or exposed for sale, words indicating that horseflesh is sold there.

"2.—No person shall supply horseflesh for human food to any purchaser who has asked to be supplied with some meat other than horseflesh, or with some compound article of food which is not ordinarily made of horseflesh."

The expression "compound article" doubtless has reference to sausages, collops, brawn, cooked pies, into which it is alleged horseflesh is introduced.

Section 3, giving power to inspect meat, is as follows :—

"3.—Any medical officer of health or inspector of nuisances, or other officer of a local authority, acting on the instructions of such authority, or appointed by such authority for the purposes of this Act, may at all reasonable times inspect and examine any meat which he has reason to believe to be horseflesh, exposed for sale or deposited for the purpose of sale, or of preparation for sale, and intended for human food, in any place other than such shop, stall, or place as aforesaid, and if such meat appears to him to be horseflesh, he may seize and carry away, or cause to be seized and carried away the same, in order to have the same dealt with by a justice as hereinafter provided."

Note that under this Act the meat inspector is not necessarily the medical officer of health or inspector of nuisances. In other respects the power to inspect, examine, and seize are similar to those in Section 116 of the Public Health Act.

Section 4, giving power to grant search warrants, is as follows :—

"4.—On complaint made on oath by a medical officer of health or inspector of nuisances, or other officer of a local

authority, any justice may grant a warrant to any such officer to enter any building, or part of a building, other than such shop, stall, or place as aforesaid, in which such officer has reason for believing that there is kept or concealed any horseflesh which is intended for sale, or for preparation for sale for human food contrary to the provisions of this Act; and to search for, seize and carry away, or cause to be seized and carried away, any meat that appears to such officer to be such horseflesh, in order to have the same dealt with by a justice as hereinafter provided.

"Any person who shall obstruct any such officer in the performance of his duty under this Act shall be deemed to have committed an offence under this Act."

This, it will be seen, is similar to Section 119 of the Public Health Act.

Section 5, giving power to justices with reference to the disposal of horseflesh, does not suggest that the seized meat should be destroyed or disposed of to prevent its being used as human food. It is as follows :—

"5.—If it appears to any justice that any meat seized under the foregoing provisions of this Act is such horseflesh as aforesaid, he may make such order with regard to the disposal thereof as he may think desirable; and the person in whose possession or on whose premises the meat was found shall be deemed to have committed an offence under this Act, unless he prove that such meat was not intended for human food contrary to the provisions of this Act."

Section 6, stating the penalty, is as follows :—

"6.—Any person offending against any of the provisions of this Act, for every such offence shall be liable to a penalty not exceeding £20, to be recovered in a summary manner; and if any horseflesh is proved to have been exposed for sale to the public in any shop, stall, or eating-house other than in such shop, stall, or place as in the first section mentioned, without anything to show that it was not intended for sale for human food, the onus of proving that it was not so intended shall rest upon the person exposing for sale."

Section 7, giving a definition of horseflesh, is wonderfully inclusive. It is as follows:—

"7.—For the purposes of this Act 'horseflesh' shall include the flesh of asses and mules, and shall mean horseflesh cooked or uncooked, alone or accompanied by or mixed with any other substance."

The insertion of the words "or eating house," in Section 6, and "cooked or uncooked," in Section 7, suggest that cheap restaurants furnish a convenient market for the fraudulent disposal of horseflesh.

Section 8 specifies the local authorities for the purposes of this Act; and Section 9 deals with its application to Scotland. They are as follows:—

"8.—For the purposes of this Act the local authorities shall be in the City of London, and the liberties thereof, the Commissioners of Sewers, and in the other parts of the county of London, the vestries and district boards acting in the execution of the Metropolis Local Management Acts, and in other parts of England, the urban and rural sanitary authorities, and in Ireland the urban and rural sanitary authorities under the Public Health (Ireland) Act, 1878.

"9.—In the application of this Act to Scotland, the expression 'justice' shall include sheriff and sheriff substitute, and the expression 'local authority' shall mean any local authority authcrised to appoint a public analyst, under the Sale of Food and Drugs Act, 1875, and the procedure for the enforcement of this Act, shall be in the manner provided in the 33rd Section of the said Sale of Food and Drugs Act, 1875."

The Sale of Horseflesh, &c., Regulation Act, 1889, came into operation on September 29, 1889.

The Sale of Food and Drugs Acts, 1875 and 1879, are not quoted from or commented on, as it forms no part of the duty of a medical officer of health to analyse food or drugs for the detection of adulteration, and no part of the duty of an inspector of nuisances to gather samples for the purpose of having them submitted for analysis. A local authority may appoint the medical officer of health as analyst of articles of food and drugs sold within the authority's district, or may appoint the inspector

of nuisances an inspector under the Sale of Food and Drugs Acts; but food inspection does not ordinarily include analysis for the detection of adulteration, and any intelligent clerk or police constable, without any special knowledge or qualification, may be charged with the execution of the Sale of Food and Drugs Acts.

For the same reason the Margarine Act, 1887, is not quoted from or commented on. The person authorised to take samples is any officer authorised to take samples under the Sale of Food and Drugs Acts, and requires no special knowledge. All the food inspector will require to remember is that substances, whether compound or otherwise, prepared in imitation of butter, and whether mixed with butter or not, are included in the term "margarine," and no such substance can be lawfully sold except under this name.

CHAPTER III.

Animals, Carcases and Butchers' Meat.

Preliminary division of subject—Live animals—Carcases—Good Meat—Meat not of the description represented—Sale of Horseflesh as Beef—Difference between skeleton of Horse and Ox—between Horseflesh and fat and Beef flesh and fat—Difference between Heart, Liver and Tongue of Horse and Ox—Meat partially decomposed through having been kept too long or ill-kept—Meat from animals which have not been killed by man or only killed when moribund—Meat from animals much injured by accidents—Meat from animals newly landed from shipboard, off a railway journey, over-driven or frightened—Meat from animals recently physicked—Meat from aged animals—Immature veal and lamb—Frozen meat.

In describing the physical signs by which unwholesome food intended for human consumption may be detected, it is convenient to consider the examination of the articles the Public Health Act empowers sanitary officers to examine and seize under six headings, as follows :—

(*a*) Animals, carcases and butchers' meat.
(*b*) Poultry and game.
(*c*) Fish.
(*d*) Fruit and vegetables.
(*e*) Corn, bread and flour.
(*f*) Milk.

This arrangement includes all the foods named in the statute except "flesh," which appears to be a superfluous word.

It is proposed to deal with group (*a*) in the present chapter, and the diseases which render meat unfit for food of man, or depreciate the quality of the meat, in the two following chapters. The remaining five groups will form the subject of the five succeeding chapters. I purpose then to devote three chapters to

the foods not mentioned in the Public Health Act, and certain foods sold cooked.

The simplest language will be used throughout, medical and scientific terms being avoided as far as possible.

Live Animals.—It does not often happen that a sanitary official is called upon to examine live animals. However, he may sometimes have to do so a short time before their slaughter. It is scarcely necessary to say that the powers given to examine and seize live animals should be used only exceptionally, and then with great caution. A healthy animal intended for human food should be well nourished, able to rise without difficulty, and to walk without lameness. Its coat should be in good condition, its skin supple, and without sores, scabs, or boils. Its eyes should be bright, its mouth and nostrils moist, but free from discharge. It should breathe easily, almost noiselessly, and its breath should be without odour. It should not shiver or give any indication of being in pain.

Carcases.—A sound, healthy carcase should be well set as soon as it is thoroughly cool; it should also be well bled, no part of it being purple, brown, or speckled. One side or quarter should not be darker than the rest. It should not be bruised nor bile-stained, and not markedly attenuated. The muscle on being pressed with the fingers should not "pit," as this would indicate the presence of water, and should not "crackle," as this would indicate the presence of air.

In places where carcases are inspected, the offal also (that is the head, feet, hide, and all the internal parts except the kidneys*) should be submitted for inspection. The mouth and tongue should be free from blisters and blotches, the hoofs should be firmly attached to the feet, the hide should be free from sores and pimples. The lungs should be of a bright pink colour and spongy, free from cavities, pus (matter) or worms. A portion cut off should float in water. The heart should be free from bile-staining and blotches. The liver should be of a rich brown colour, should not break down easily under pressure, should be free from abscesses (collections of matter) and from

* The head, feet, and skin of a pig form part of the carcase, the offal being only the internal parts, less the kidneys.

flukes. The spleen or melt should be of a dark colour inside, grey on the outside, thin and long, and sharp at the edges. The stomachs should not be inflamed, the lining should not readily rub off, and should not smell of drugs. The bowels should have a smooth, uninflamed lining, and should be free from blotches or ulcers (surface sores).

Butchers' meat.—Good meat is firm and elastic to the touch, moist but not wet, and except in the case of pork, veal and lamb, bright red in colour. It has also, if well-fed, a somewhat marbled appearance from small layers of fat in the muscles. It has a fresh, not disagreeable smell. (To test this, an iron or wooden skewer should be thrust into the centre and rapidly withdrawn and smelt.) The meat-juice should slightly redden litmus paper, showing that it is faintly acid. The fat should contain no watery juice or jelly, and should be free from blood stains; the suet fat should be hard and ivory white. In salt meat the brine should not be sour.

Meat not of the description represented.—Meat should be what the butcher calls it. In other words, beef must not be the flesh of horse, mule or ass, mutton must not be goat flesh, and lamb must not be derived from kid or dog. That goats and kids are occasionally dressed and offered for sale under another name, is a well-known fact, but it is probably an exceedingly rare offence for a dog to be prepared for human food or fraudulently offered for human food. If in any case the carcase of goat or dog were exposed for sale *whole*, the detection would be comparatively easy, as the general shape of the carcase would suggest something wrong. When merely pieces are exposed for sale the fraud is not always easy to discern. A goat is usually thinner and has darker flesh than a sheep, and smells goaty. As for dog flesh, the characteristic odour may be sufficient to betray it. The only fraud of this description which there is reason to believe has been extensively practised is—

The Sale of Horseflesh as Beef.—As a special Act of Parliament was lately passed to regulate the sale of horseflesh, and prevent its being sold as beef, it is important to point out how it may be recognised.

The very marked difference between many of the bones of

the horse and the corresponding bones of the ox will often be sufficient to distinguish between a joint of horseflesh and a joint of beef, as may be seen by comparing the skeletons of the horse and ox in Figs. 1 and 2.

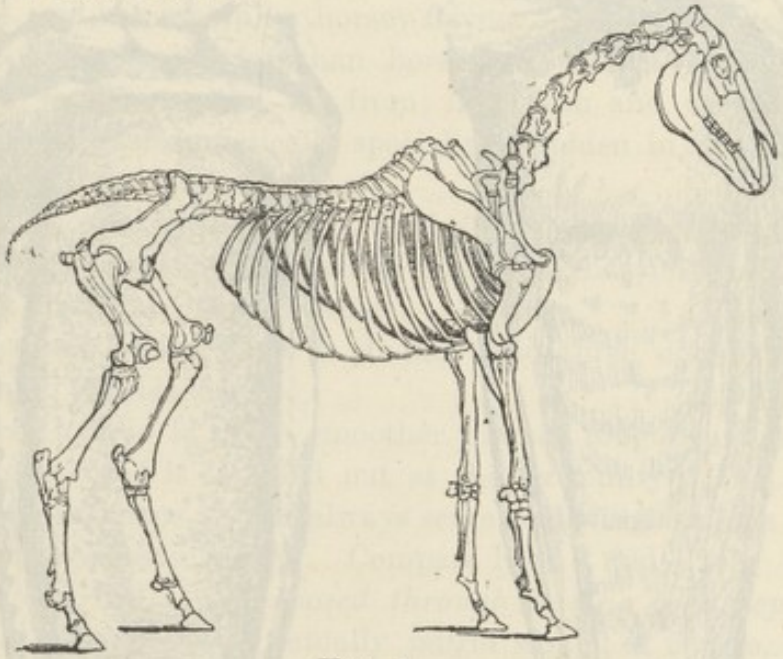

FIG. 1.

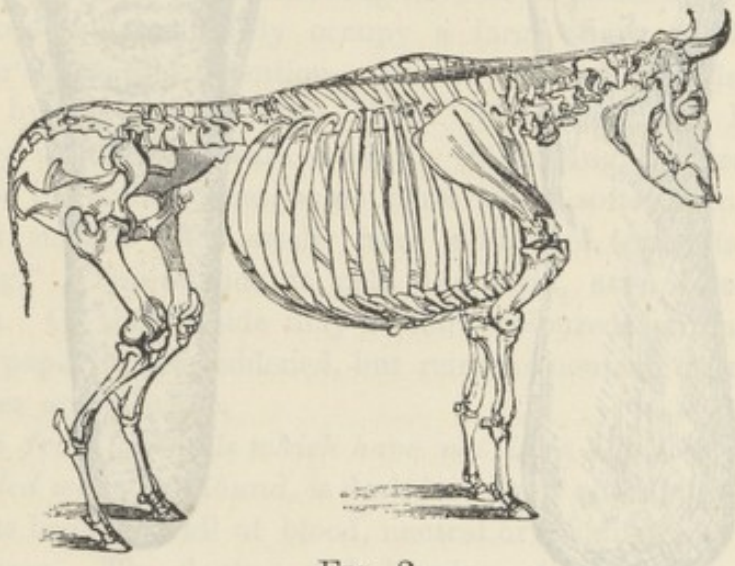

FIG. 2.

The differences are perhaps most noticeable in the bones of the head, breast bone, the ribs, and bones of the feet. The horse has eighteen pair of ribs, the ox only thirteen pair. However,

the skeletons of the two animals differ appreciably throughout. For this reason horseflesh is commonly boned before being

FIG. 3.

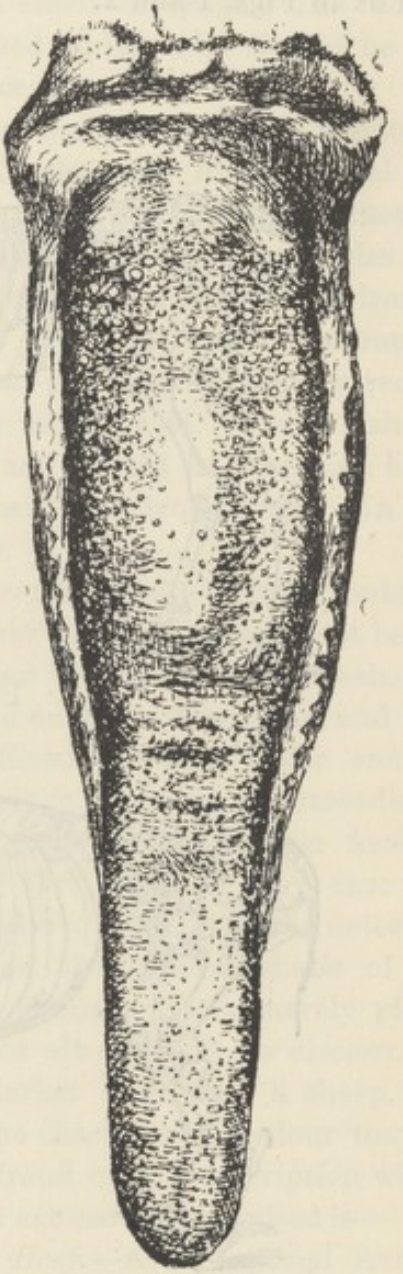

FIG. 4.

offered for sale as beef. It is also well to remember that horse bones are more oily than beef bones.

Horseflesh is coarser in texture and darker in colour than beef, is without small layers of fat in the muscles; besides it has a characteristic odour.

Fat from the carcase of the horse is darker and softer than beef fat, and has a peculiar horsey flavour. So much more easy is it to detect horse fat than horseflesh that it has been a practice to remove the fat from horseflesh and skewer beef fat to it, and this practice is specially forbidden in the Sale of Horseflesh, &c., Regulation Act.

The heart of the horse is at the bottom more rounded off than an ox heart. The heart of the horse has no bone in it, and but little fat on the surface.

The liver of the horse is divided into three distinct lobes, and has no gall-bladder.

Horse tongue is much smoother than ox tongue and instead of being pointed is fattened out at the extremity. The great difference in shape should always serve to distinguish one from the other even after salting. Compare Figs. 3 and 4.

Meat partially decomposed through having been kept too long, or ill-kept.—Meat actually putrid would, of course, never be offered for sale; but checking the sale of meat beginning to decompose will ordinarily occupy a large share of the food inspector's time and attention. Partial decomposition is known mainly by the characteristic odour. The meat, too, loses its elasticity, is soft, and tears readily. On cutting, the resistance offered to the knife varies, some parts being softer than others. The cut surface often swells from a kind of fermentation or "heating." The outside is pale and livid, at a later stage greenish. Or the outside may be dark coloured, hard and dry. Litmus paper is not reddened, but remains neutral, or indicates the juices are alkaline.

Meat from animals which have not been killed by man, or only killed when moribund, is dark in colour, often purple. The meat sets badly, is full of blood, neutral or alkaline, and readily decomposes. The flaying and dressing of such animals are usually done under unfavourable circumstances, and often by no expert hands, so that the carcase looks hacked and blood-stained and untidy.

Meat from animals much injured by accident.—Animals smothered or drowned, or struck by lightning, come under the heading of animals not killed by man, and should certainly be seized as unfit for human food. But there may be submitted for inspection carcases of animals which have been over-lain in a railway truck or ship's hold and yet not smothered, or carcases of animals injured by immersion in water and yet not drowned, or even carcases injured by lightning and yet not struck dead. In such cases it is often a nice point to decide whether the meat should pass. Much depends on the appearance of the carcase after it has had twelve hours to set. The carcase of an animal so nearly suffocated, or so injured by lightning that it bleeds ill, and is full of veinous blood (black blood), should not pass. An animal nearly drowned is injured in the same way as an animal nearly smothered. The meat is sodden and ill-bled and keeps badly.

Carcases of animals which have been nearly choked resemble in many respects carcases of animals nearly smothered. When the animal has struggled long before being killed, and the meat is ill-bled and ill-set, it is not wholesome. Animals hoven or blown, if not given effectual relief, may get into such a state that when killed the appearance of the carcase is similar to that of a smothered or choked animal's.

Another way in which meat may be injured is by being badly bruised. Imported animals suffered much from bruising before the introduction of modern cattle-carrying ships. Now animals are often landed in prime condition after a long, stormy voyage. The bruised portions are not fit for human food, and should be cut away. Sometimes the bruising is so extensive that the only course is to condemn the whole carcase. Sometimes bones are fractured, and the flesh is torn and bruised from within by the sharp ends of the broken bones. If, as sometimes happens when a cow breaks its leg in trying to leap a gate, the animal is at once skilfully killed and dressed, the whole carcase except the part immediately round the fracture may pass, but after a few days' delay swelling and inflammation will spoil a quarter of the carcase, and further delay may render the whole carcase unfit for human food.

Meat from animals newly landed from shipboard, off a railway journey, over-driven, or frightened is almost certainly deteriorated. No animal should be slaughtered when in a tired, nervous, or irritated condition. After a sea voyage or railway journey a day or two for rest should be allowed, after a journey by road not less than a day's rest. When an animal has been over-driven or badly frightened it suffers from a kind of nervous fever, and several days quiet and careful feeding may be required to restore it to a healthy condition. An animal shot or felled in a mad panic is often quite unfit for human food.

Meat from animals recently physicked may be rendered less palatable and wholesome, but should not be condemned merely on this account. The smell of drugs in the stomachs will put the inspector on his guard, and may lead to the discovery of circumstances respecting the animals which have been concealed. Meat highly tainted with the smell of drugs is of course deteriorated in quality.

Meat of aged animals is often of very poor quality, being tough and coarse and stringy. Such meat, however, is not merely on account of age unfit for human food. As cows sometimes go on calving till they are eighteen or twenty years of age, an old cow sent to the meat market may be very old indeed. Such carcases are frequently much emaciated. The carcases of old bulls sent to the meat market are not so old, and generally in better condition. Prime beef should be from oxen

Fig. 5.

not exceeding five or six years of age—the best is usually three or four years old. The following diagrams of the ox's front

teeth at two years of age (Fig. 5), three years (Fig. 6), four years (Fig. 7), and five years (Fig. 8), indicate how to judge of the age of the ox.

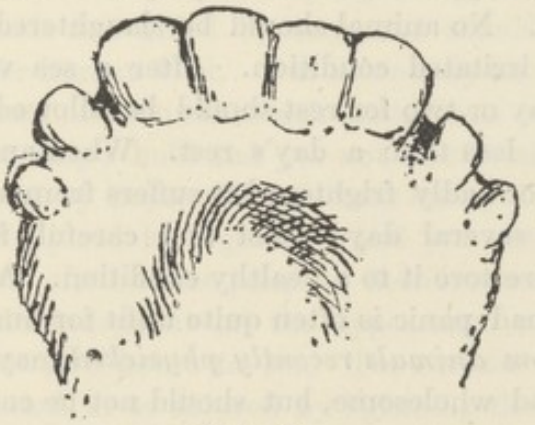

Fig. 6.

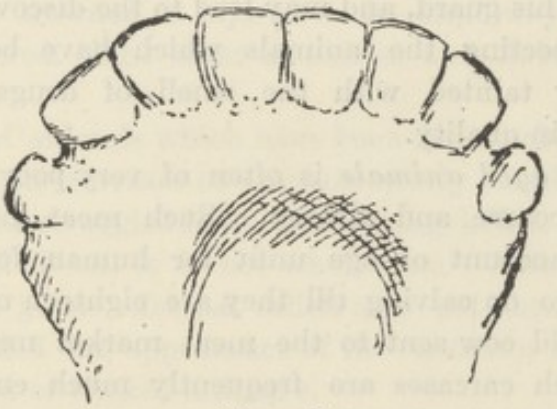

Fig. 7.

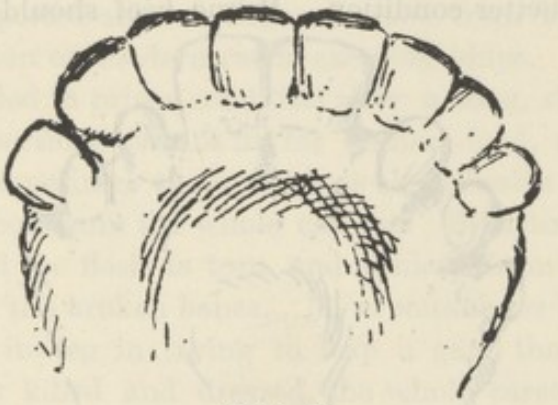

Fig. 8.

At six years old the end teeth are a little larger, and after that all the teeth wear down.

As sheep are not used for milking in this country, aged ewes are not ordinarily seen at the meat market. Rams of good

age are not uncommon, and make poor-quality mutton. A ram is distinguished from a wether by its thick neck, strong shoulders and thighs. Ram mutton is coarse in fibre, and has sometimes an unpleasant odour.

Immature Veal and Lamb.—It is generally held that immature veal and lamb is unwholesome, though it would perhaps be difficult to say on what grounds. Certainly what is called "slink" meat, calves or lambs cast prematurely, or dying during birth, should be seized; but there can be little justification for seizing as unwholesome the carcase of an animal merely because it was killed before completing its third or fourth week, or some age arbitrarily fixed upon. Ordinarily, if the feet have hardened somewhat, and the black slimy contents of the intestines at birth are purged off, as they will be in about forty-eight hours, the carcase may pass.

Frozen Meat.—As live cattle imported from infected areas and landed at a foreign animals' wharf has to be killed within fourteen days, the carcases are often stored in chill rooms for longer or shorter periods. Large consignments of meat from America, Australia, and New Zealand are also imported into this country in a frozen condition. The appearance of frozen meat is therefore quite familiar to the trade, the public, and the inspector. The quality of meat is usually excellent, and much is doubtless thawed and trimmed and sold as prime home-grown meat. This is certainly a fraud, but it is no part of the inspector's duty to attempt the almost impossible task of proving it. American-killed carcases are known through being bruised about the legs, by which they are hoisted previous to slaughter. Note also that the fat of all imported frozen meat is apt to be more or less coloured with red serum.

Through defects in the arrangements for transit, perfectly sound meat may arrive covered with blue mould. Similarly, through being carelessly stored on arrival, the surface may be allowed to grow moist and tainted while the carcase remains sound. It is also true that frozen meat which looks very well on the surface may be a little "gone" near the bone in the centre. Thus no examination of frozen meat is quite satisfactory unless the carcase or piece be cut through.

CHAPTER IV.

The Diseases of Animals which render Meat Unfit for Human Food.

Cattle-plague or Rinderpest—Epizootic pleuro-pneumonia—Anthrax and Anthracoid diseases—Black-quarter—Splenic-fever—Braxy in Sheep—Texan-fever—Sheep-pox—Consumption (tuberculosis)—Actinomycosis—Joint-ill or Joint-felon—Typhoid-fever of Swine—Quinsy in Swine—Worms affecting Swine—Cysticerci and Trichinæ—Glanders and Farcy.

Determining whether meat is sound or decomposing, whether it is well-bled or has the blood in it, or whether it is old and tough or in prime condition, are comparatively simple matters, and not beyond the intelligence of most housewives; but judging whether meat is from a diseased animal, the nature of the disease, and whether it affords warrant for the seizing of the meat will tax the inspector's capacity to the full.

What, then, are the diseases ordinarily met with or likely to occur in home-bred or imported animals which should be regarded as rendering the meat unfit for the food of man?

In *oxen and sheep:* Cattle-plague, epizootic pleuro-pneumonia, anthrax and anthracoid diseases, sheep-pox, consumption (tuberculosis), actinomycosis, and joint-ill or rheumatism.

In *swine:* Typhoid-fever, epizootic pleuro-pneumonia, anthrax, or anthracoid diseases,* quinsy, consumption (tuberculosis); and two diseases known by the presence of parasitic worms, cysticerci and trichinæ.

In *horses:* Glanders and farcy.

Besides these there are other diseases which depreciate the

* Some able authorities deny the existence of true anthrax in swine. Whether they do so rightly or wrongly may depend on what they mean by true anthrax. This is no place for giving a scientific definition or arguing a vexed question in pathology. That swine are subject to a disease closely resembling anthrax no one will dispute.

quality of the meat, render portions of the carcase unfit for food of man, or in their later stages unfit the whole carcase for food of man. These will be dealt with in the next chapter.

Cattle-plague, or rinderpest, is essentially a disease of oxen. The flesh is not changed in appearance except in an advanced stage of the disease, when the meat is dark and has a disagreeable smell, and sometimes crackles on pressure, owing to the presence of air. Quite early in the disease the lining of the intestines and air-passages is reddened. The inside of the intestines is covered with a blood-coloured glairy fluid. Later there is a yellow cheesy deposit in the throat and nostrils, and dark-coloured blood patches on the intestines and heart. There is commonly an eruption on the back, loins, and inside of thighs, which may be seen if the hide is produced. In the cow the eruption may appear on the udder.

The symptoms most likely to attract attention to an animal affected with this disease, during life, are a glairy discharge from the eyes, nose, and mouth, drooping of the ears, shivering, and purging.

Fortunately cattle-plague is of rare occurrence. It is five-and-twenty years since it visited this country.

Epizootic pleuro-pneumonia, otherwise called lung-plague, is of far more importance as a disease of oxen than of sheep or swine. The only thing noticeable about the meat is that it usually looks dark and ill-bled. The lining of the chest will probably be thickened and roughened, and also the covering membrane of the lungs. The principal changes are in the lungs themselves. Early in the disease the colour of the lungs is in great part grey, with red or purple patches or spots, and the lungs are less spongy. Later, the lungs are darker in colour, and growing solid, like liver. At this stage the lungs will sink in water, and the weight is much increased—from 7 or 8 lbs. to 30 lbs. or more.

The most obvious symptoms in the live animal are the laboured breathing and the evidence of pain. There is often a large quantity of water in the chest, quite sufficient to distend it to an extent certain to attract notice.

In the pig, besides the change in colour and density of the

lungs, the intestines are often inflamed and marked with dull patches, and parts of the skin are reddened, especially under the belly.

Anthrax.—There are three forms of anthrax and anthrax-like diseases. In one, probably the least common, large boils are the most obvious symptom, and will be recognised without difficulty. In another form of the disease, called *black-quarter*, or black leg, one of the fore quarters or hind quarters is dark in colour and more or less swelled. This, also, is easily recognised. Although the disease appears to be restricted to one quarter, the whole carcase should be seized. A third form of the disease is *splenic fever*. The meat is darker than it should be, and the whole carcase is bile-stained. The liver is nearly always enlarged and somewhat softened, and the lungs are generally inflamed. But the most characteristic symptom is the enlargement of the spleen—the increase in an ox being from about 3 lbs. to 7 lbs. or 10 lbs. Note, also, the rounded edges of a spleen thus affected. The meat is often dropsical, and water is frequently poured out between the lobes of fat in which the kidneys are imbedded.

An ox or sheep affected with the disease is dull and very thirsty, often sore to the touch, and breathes uneasily. If it has black-quarter it will be lame, and the swelled part may crackle on pressure. Sometimes splenic fever takes the form of apoplexy, and the animal may fall down and die almost without warning. What is called *braxy* in sheep is splenic apoplexy. The meat is remarkably dark and sometimes dropsical, and the spleen is increased in weight from 2 or 3 oz. to 5 or 6 oz., or more. When attacked the sheep staggers, stretches out his head, and breathes rapidly.

The carcase of a pig affected with anthracic disease is livid or red over much of the surface, and the meat is sodden and darker in colour. There may be dark or blood-coloured blotches on the intestines or heart. The spleen is enlarged, as in the case of the ox and sheep. The disease may affect the pig as apoplexy.

Apparently allied to splenic fever is a disease known as *Texan fever*, so called from its having widely affected Texan

cattle. Some years since several oxen landed at Birkenhead from America, which were believed by the Privy Council inspector to be suffering from this disease, were destroyed as unfit for human food. The carcases were ill-bled and bile-stained, and the spleens much enlarged. Ulcers (surface sores) were also found in the fourth stomach. In many cases there was enlargement of the liver, and some inflammation of the lower part of the large gut (the rectum).

Sheep-pox is a disease not often seen in animals submitted for inspection. The eruption, when first it comes out, resembles flea-bites. These become solid pimples, in which a clear fluid soon forms, and then the fluid changes into pus. The postules are larger than in the human disease, and they sometimes run together. The eruption may appear in the mouth. In the lungs may be found little collections of matter. The wool comes off readily. In the early stage the disease might not be recognised, spots like flea bites being the only obvious symptom. Later the flesh becomes soft, pale, and dropsical. After pus has been formed, there can be no mistaking the disease. Except in the early stage of sheep-pox, the meat has a disagreeable odour.

Consumption (*tuberculosis*), called also pearl disease, or, among butchers and dealers, "the grapes," is a common disease of oxen, and less frequently affects sheep and swine. The little rounded tumours, or "pearls," hardly seen when commencing, but growing to the size of a pigeon's egg or larger, occur mainly on or near the surface of the lungs and on the walls of the chest. Butchers, when dressing a carcase, commonly remove the pearls from the chest walls, removing also a large portion of the lining membrane, which the careful inspector will not fail to remark.

Sometimes throughout the substance of the lungs are deposits of the disease, and the glands about the neck, or the glands in connection with the intestines or elsewhere, are enlarged and contain deposits. On cutting open one of the pearls, its contents are found to be a thick cheesy matter, either of the same consistency throughout, or the centre may be softened or gritty. The cheesy matter is cream-coloured or yellowish. The lung tissue may be perfectly normal in appearance, or congested or partly consolidated. Sometimes tubercules, too small to be

called pearls, are scattered through the lungs, and these are occasionally very hard. Sometimes abscesses (collections of matter) are found in the lungs. There may be deposits of tubercle or abscesses in the liver and in almost any part of the body. In life there are often no certain signs to indicate that an animal is suffering from this disease. The animal probably has a cough, but this is not necessarily due to consumption, and there may be no appreciable loss of condition. The disease is very common, especially among the occupants of town cowhouses.

When the disease is of old standing, there are usually distinct cavities in the lungs, and wasting and dropsy.

There has been much discussion as to whether the carcases of all animals infected with tuberculosis should be held as unfit for human food. Indeed many years ago it was generally allowed that if the disease was *apparently* limited to the lungs and not far advanced, and the carcase looked well, the inspector would be justified in passing the meat. However, this is not the approved view now. That tuberculosis is a disease communicable from one of the lower animals to man is an established scientific fact; nor will it be denied that the disease is communicable in various ways, *e.g.*, by breathing infected air, by swallowing infected food, or by having infected matter introduced into the blood. How, then, can the meat of an infected animal be eaten with safety? The disease is now known to be associated with, and believed to be caused by a minute organism, called the bacillus of tubercle, and this is readily carried from one part of the body to another by the blood or by the lymphatic stream.

The disease is, therefore, not to be regarded as localised because it is only apparent in the lungs, for through the lungs circulates the whole blood, and sooner or later the bacillus is carried into the system.

A departmental committee, which was appointed by the Lord President of the Council in April, 1888, "To enquire into the nature and extent of tuberculosis, and the means to be adopted to arrest its progress," and which, reporting on July 16, 1888, expressed it as their opinion that, "although the bacilli may be found but rarely in the flesh, still the chance of their being present either there or in the blood is too probable to ever allow

the flesh of a tubercular animal being used for food under any circumstances, either for man or the lower animals."

Actinomycosis is, like tuberculosis, a disease communicable from animals to man, and occasionally so closely resembles tuberculosis that it may be mistaken for it. The disease manifests its presence in the form of tumours, ulcerations, and abscesses in various parts of the body, especially the head and neck. It is not a new disease, but one which has only recently been understood. The new growths characteristic of the disease, according to their gross appearances, have been called wens, polypi, cancer of tongue, lung tubercle, bone tubercle, lumpy jaw, &c., but the nature of this disease is indicated by the presence of a vegetable micro-parasite—the ray fungus. Inside the mouth the disease appears as nodules, wart-like growths or ulcers, and attacks both upper and lower jaws, especially where there are bad teeth. The disease may appear in the nasal cavities, the gullet and windpipe and lungs. The wens (or tumours in or just under the skin) may grow to a great size or break down early and discharge their contents. The tumour, when cut, has a honeycombed appearance, the bands of tissue forming a spongy structure, in which are the fungus tufts and yellowish pus.

On the whole, actinomycosis is a less serious disease than tuberculosis, but inasmuch as it is a disease common to man and oxen, and like scrofula, affects so many parts of the body, a carcase infected by it should not be regarded as fit for the food of man.

The Board of Live Stock Commissioners for the State of Illinois now enforce the destruction of all animals affected with actinomycosis, and prohibit the use of the carcases for human consumption. In New York also, and in most of the States of America, the utilisation as human food of carcases infected with this disease, even in a slight degree only, is not tolerated.

At a conference of the Inter-State Live Stock Sanitary Association, lately held, the following resolution was passed: "That it is the sense of this conference that animals affected with actinomycosis should be destroyed, and that the carcases thereof should not be used for human food."

Joint-ill or Joint-felon.—Animals affected with this disease, which is probably always rheumatism, will commonly attract attention by their lameness or their inability to rise. The joint or joints affected contain a clear fluid; sometimes there is pus in or around diseased joints. Abscesses (collections of pus) may form at some distance from the joints attacked. The meat is often dropsical. If the animal has been unable to get up for some time, the side on which he lay will look red and inflamed.

Typhoid-fever of swine, otherwise called hog-cholera, does not necessarily produce any marked changes in the meat. The skin, however, rarely escapes affording some indication of disease. There is general or patchy redness (red soldier), or there are large livid blotches (blue disease), or there is an eruption resembling small-pox, pus being secreted and crusts forming as in human small-pox. In cases where the pig is "soldiered," the redness is not limited to the skin, but the fat beneath is reddened right down to the flesh. The intestines are often inflamed and marked with red spots, and characteristic ulcers appear in the large gut (chitterlings), and less frequently in the small gut. These vary in size from mere points to three-quarters of an inch across. In the uclers ochre-coloured crusts form, convex and cup-shaped, and these in time fall out. The lungs are commonly congested, and may be in part solidified. These are the main symptoms, but there may be intestinal ulcers without lung disease, and with little discolouration of the skin; and, on the other hand, there may be a very pronounced skin eruption, and scarcely any traces of the disease elsewhere. Butchers sometimes rub salt along the edges of the reddened fat to remove the colour, but an edge so treated can be easily removed with a knife. Of course when the skin eruption is so marked as to resemble bad small-pox, it is not probable that the carcase would be brought into the market.

In life the main symptoms of this disease are the skin eruption, diarrhœa, and the difficult breathing or coughing.

Quinsy in swine, known also as "strangles," is characterised by swelling in the neck and sore throat. The swelling may extend into the fore quarters. The throat is dropsical, and

sometimes part of the inside mortifies. The skin round the throat will be red or livid, and there may be an eruption in the mouth. The main symptoms during life are the swelling, laboured breathing, and the refusing of food.

Worms affecting swine.—Of the two kinds of worms to be looked for in pork, the larger, *cysticerci*, are much more common and easily detected. They look like little bladders of water, and occur in the flesh between the fibres and often on the surface. The bladder is egg-shaped, and generally from $\frac{1}{8}$ to $\frac{3}{8}$ of an inch in length. Specimens from the same animal usually vary in size but slightly. The bladder is semi-transparent, containing a clear fluid, and what looks like a little white ball. Transfer one of the bladders to a slip of glass, prick it with the point of a knife, and press another piece of glass on the top. Examine this with an ordinary pocket lens, and observe the head or sucker of the *cysticercus*, provided with a circlet of hooks. Once seen there is no possibility of mistaking the hooks. Fig. 9 shows the appearance of the head as seen with the help of a lense and one of the hooks drawn to a much larger scale.

Fig. 9.

Pork infested with these worms is called measly, owing to the curious appearance of the flesh on section. Quite young pigs may manifest the disease; indeed, they are probably specially susceptible. When pork is a little dry from exposure to air the bladders may shrink so as to be hardly seen. In such a case a small portion should be soaked in water. The salt in salted pork

tends also to dry up the bladders. The danger of eating measly pork is that any cysticercus reaching the intestines of the human subject is liable to develop into a tape-worm. In examining a live pig to see if it be measled, search should be made beneath the tongue, when often the little bladders can be felt or seen. The bladders may also be found in the loose folds under the tail. Swine affected with this disease are often swelled round the shoulders, but commonly there is no marked external sign indicative of the disease.

The second kind of worms infecting pork, *trichinæ*, can be seen on close inspection. The meat looks speckled. The little white specks soon come out clearer if a very thin shaving of the pork be placed on a glass slip and soaked for a short time in a weak solution of caustic potash. The bladder or shell containing the worm is not placed between the flesh fibres, but actually in a fibre, causing a lemon-shaped swelling. If the glass slip be held up to the light, and examined with a powerful pocket-lens, the coiled-up worm, fine as a hair, will be seen. If the inspecting officer has access to a microscope, of course this (using a $\frac{1}{8}$ objective) will define the parasite better. Sometimes the white specks feel gritty from the presence of carbonate of lime, &c. *Vide* Fig. 10, showing the coiled-up trichina and the cyst (bladder or shell) containing it.

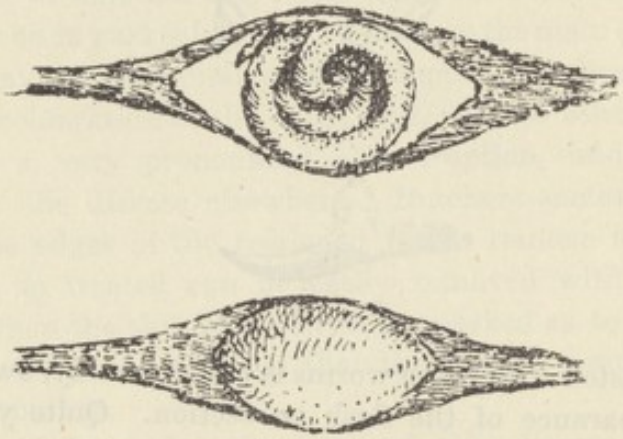

Fig. 10.

The danger of eating pork infested with trichinæ is that the little worms become active and find their way into the flesh of the human subject.

Swine affected with this disease may present no noticeable symptoms during life. To test them a morsel of flesh is sometimes removed from under the tongue, and a section examined with a lens.

Glanders and Farcy.—As horseflesh may be lawfully sold as human food, any meat inspector may have a stall or stalls for the sale of horseflesh in his district. It will then be his duty to see that the meat therein exposed for sale is not infected so as to be unfit for human food. The only diseases ordinarily met with or likely to occur in the horse, which certainly render the carcase unfit for human food, are glanders and farcy. Both diseases (if they be regarded as two, for essentially they are but different forms of the same disease, due to the same bacillus) are certainly communicable from the living horse to man, and the flesh of an infected animal could not be eaten without risk. Glanders is characterised by a profuse mucous discharge from the nostrils, ulceration of the nasal mucous membrane, enlargement of the glands under the jaw, and inflammation of the lungs. In the lungs are often little nodules, and sometimes abscesses. Farcy is characterised by an eruption of what have been called farcy "buds," swellings the size of a marble, which burst, leaving inflamed open sores. Sometimes a limb is swelled, or more than one, apparently from obstruction of the lymphatic vessels. In both glanders and farcy the flesh may be poor, lighter in colour, and watery, but occasionally it looks perfectly healthy.

CHAPTER V.

The Diseases of Animals which depreciate the quality of the Meat, render portions of the Carcase unfit for Human Food, or in their later stages unfit the whole Carcase for Human Food.

Foot-and-mouth Disease—Hoof-rot—Dropsy—Liver-fluke—Filaria—Sheep-scab—"Diamonds"—Carcases of Parturient Animals—Milk fever—Parturient fever—Carcases of Poisoned Animals.

The diseases which do not necessarily render the carcases of the animals affected unfit for human food, but depreciate the quality of the meat, and render portions, and occasionally the whole, unfit for human food, will be briefly dealt with in this chapter. Four diseases, ordinarily met with or likely to occur, come under this description, viz., foot-and-mouth disease, hoof-rot, dropsy, and liver-fluke. Of these, foot-and-mouth disease is the only one which affects swine, almost as extensively as sheep or oxen. Liver-fluke is mainly a sheep disease, and hoof-rot almost entirely so. After a description of these diseases, and a word or two on so-called "diamonds," the parturient state and the diseases incidental thereto will be considered. In the concluding paragraph reference will be made to the carcases of poisoned animals.

Foot-and-mouth Disease.—The eruption in foot-and-mouth disease appears on the tongue and in the mouth, sometimes extending into the throat and nostrils, and round the foot just above the hoof and in the cleft. In cows and ewes and sows it commonly appears on the teats and around them. The eruption consists of blisters, like those produced by scalding water, usually very small at first, but increasing it may be to the size of half an egg. Often the blisters run together. Blisters inside the mouth, as a rule, are soon burst by the tongue, leaving bare red spots, which sometimes become sores, like small ulcers. After the external blisters dry up, crusts form. Round the feet the contents

of the blisters burrow between the soft part and the hoof. The hoof may be loosened or shed. Occasionally (especially in sheep) no regular blisters occur on the feet, but the skin becomes red and swollen, and exudes a thick gummy fluid. The mouth may be badly affected, and little or no disease in the feet, or *vice versâ*, The flesh, even if minutely examined, cannot be distinguished from the flesh of perfectly healthy animals. Ordinarily there is no objection to passing it; but the head, feet, and udder should be seized. When the eruption has extended into the intestines, producing a condition resembling typhoid fever, as is not infrequent with calves suckled from a diseased udder, or when the local symptoms are so severe as to produce much inflammation of the surrounding parts and abscesses, the carcase should, of course, be condemned.

In examining animals before slaughter, note if there is any discharge from the mouth, and examine mouth, feet, and udder. When the feet are affected the animal is lame, or paws the ground, or lies. The state of the mouth makes feeding slow and painful. If the disease has existed some time the falling-off in condition is very marked.

Hoof-rot, which is a not uncommon disease among sheep, may in some cases be mistaken for foot-and-mouth disease. It consists in inflammation of the soft parts of the foot, and may lead to shedding of the hoof or even to disease of the bones of the foot. Usually a thick cheesy matter collects over the affected skin; sometimes blisters or pimples may be seen. The flesh looks wholesome, and is so. Except in rare instances, when the inflammation extends into the carcase, all may be passed except the feet. An animal affected with the disease is lame, and loses condition.

Dropsy is not, properly speaking, a disease, but a symptom of many diseases. It may be due to disease of the heart, liver, or kidneys, and to other causes. Sometimes the water is limited to the chest or abdomen, and in such cases it does not warrant the condemning of the carcase. When, however, the water is poured out into the muscles and between them, making the flesh sodden and wet, the carcase may be seized as unwholesome.

Such meat keeps badly, and has occasionally a faint urinous smell.

Liver-fluke.—The most widespread of sheep diseases due to parasites is that popularly known as "the rot." The cause of the disease is the presence in the bile-ducts of the liver of flukes—little animals in shape like a sole. Figure 11 gives an exact representation of one.

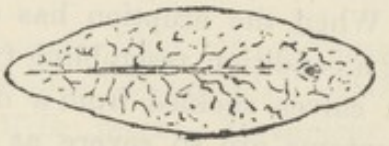

Fig. 11.

Though flukes are not infrequently found in oxen, they do not occur ordinarily in such numbers as to produce serious disease. The fluke is furnished with a sucker by which it attaches itself. This parasite when once seen will always be recognised. It usually measures from an inch to an inch and a half in length, and is about three-eighths of an inch wide. Flukes are often so closely packed in the bile-ducts as to block them up, and the pressure of them causes the ducts to stretch or burst, portions of the liver being broken down or destroyed. The symptoms of the disease presented by the carcase are jaundice (bile staining), dropsy, and emaciation. These three indications that the carcase is really "rotted" undoubtedly warrant its seizure as unsound; but the presence of a few flukes in the liver does not of itself prejudice the carcase, and affords no sufficient reason for seizing it. Even in cases where there is some jaundice and falling off in condition, the carcase may pass. When seen alive, it will be noticed that the animal is sluggish in its movements, yellow in the eyes, is thin or swelled with dropsy, and its wool easily comes out.

It is well here to mention a parasite occasionally found in the lungs of sheep and oxen—the *filaria*. It is a thin worm from half an inch to three inches in length. Inflammation of the lungs, resulting from the presence of these worms, or from cold, is not a serious disease from the meat inspector's point of

view, and does not prejudice the flesh of the carcase. The common and fatal disease, *sheep scab*, a parasitic disease of the skin, allied to the itch in the human subject, usually disfigures the carcase so much that the meat is not offered for sale.

It would, perhaps, not be wise to omit all reference to so-called "diamonds" in swine. From time to time the carcase of a pig is seized, marked with more or less perfect red or dusky squares, measuring an inch or two either way. They are disposed irregularly over the surface, and sometimes one square, as it were, overlaps another. These marks may be few or numerous, and vary much in distinctness in the same carcase. Sometimes the squares are accompanied by rounded patches of dusky red. Such a carcase is said to be affected with "diamonds," and is commonly regarded as unfit for human food on this account. It has been described as "a blood disease" and "worse than tubercle," but no one seems to have a clear idea of the nature of the malady. The writer, many years ago, thinking it might be a skin eruption due to parasites, made sections of the squares and rounded patches, and examined them under the microscope. No parasites were found—the marks appeared to be simply bruise-marks. Probably the best advice that can be given about "diamonds" is to take little account of it, but to judge the carcase affected on its merits. "Diamonds" is not long coming out, for a pig looking well over night may be freely marked in the morning, and a little indigestion or slight cold is said to be sufficient to produce the symptoms. Seeing the marks the inspector will naturally make a more than usually careful examination of the carcase; but if the carcase looks well and has bled well, and the fat is white and firm, neither the "diamonds" nor a little reddening of the stomach lining will justify the seizure of the meat.

Carcases of Parturient Animals.—Carcases of animals which have been slaughtered immediately before, during or after calving or lambing, are frequently submitted for inspection. There is certainly no reason for condemning these indiscriminately. If there are indications of apoplexy (the carcase dark in colour and ill-bled) or bad milk fever (the carcase ill-set, the meat pale or livid, and wet to the touch) it is safe to make the seizure.

When, however, the slaughtering is due to some complication in connection with calving or lambing, the case is different. An animal may be killed on account of uncontrollable bleeding during or after delivery, because the calf has got jammed and cannot be extricated, or even because the calf-bed has come down and cannot be retained in position, &c., &c. In such and similar casualties there is nothing necessarily to prejudice the meat, and usually if the animal has been properly killed and bled it may be passed.

Milk fever, above referred to, does not necessarily render the carcase of the animal affected unfit for food, but often does. Everything depends upon the appearance of the carcase, which will be satisfactory if the animal has been slaughtered early. The practice as regards seizure from this cause varies much. A main objection to the meat when the animal is badly affected before killing is that the meat seems soured, and keeps badly.

Parturient fever.—Whether there be a parturient fever of a non-malignant character seems doubtful. Parturient apoplexy, and the fever due to blood-poisoning, and allied to anthrax, are both sufficient to warrant the condemnation of the carcase. They are rapidly fatal, and the carcase affected will not even look marketable.

Carcases of poisoned animals.—Flesh manifesting no indications of disease may be unwholesome owing to the animal from which it was derived having been poisoned. If the poison actually caused death, or if the animal was killed when in a dying state, the carcase would be ill-bled and ill-set, and attract the attention of the inspector. However, even if this were not the case, there would almost certainly be some inflammation of the stomachs and intestines, indicated by general redness and red spots. The stomachs, especially the first stomach, should be carefully searched for traces of bryony, meadow saffron, yew leaves, &c. Carcases of animals maliciously poisoned may also be brought to the meat market. Here the poison would probably be by a mineral irritant, producing more marked inflammation of the stomachs and intestines.

CHAPTER VI.

Poultry and Game.

White-flesh and dark-fleshed fowl—Capon and poularde—Good Poultry—Diseases—Roup (tuberculosis)—Pip—Chip—Turn—The Scour—Gapes—Parasites—Chicken-cholera—Pigeons—Game—Venison—Hares and Rabbits—Feathered Game—When in Season?—Grouse—Blackcock—Capercailzie—Ptarmigan—Pheasant—Partridge—Quail—Corn-crake—Plover—Snipe—Wild-duck—Teal and Widgeon—Woodcock—Game for Invalids—Diseases of Game.

Poultry, allied to the French word "poulet," a chicken, is a term which includes all domestic fowl propagated and fed for the table and for their eggs. Poultry may be divided into white-fleshed fowl, as chickens, guinea-fowl and turkeys, and dark-fleshed fowl, as ducks and geese. The white-fleshed are tender, delicate flavoured, and contain exceedingly little fat (3 or 4 per cent.). The dark-fleshed are harder, strong flavoured and rich in fat (often upwards of 40 per cent.). It is a common practice to deprive fowls of the sexual organs at an early age, that they may grow larger and improve in flavour and tenderness. Thus treated a cock bird becomes a capon, and a hen a poularde. Young cocks and hens are about equally tender, but unless treated as above the cock bird soon toughens, and after a year old is only fit for soup. The term chicken should properly be restricted to the young female bird under four months old, after which it becomes a pullet, till it begins to lay, when it is called a hen. Small-boned and short-legged poultry are as a rule preferred, and more likely than others to prove delicate and fine-flavoured. As regards feeding, naturally fed birds are better than crammed birds, and ducks fed on grain and

vegetables are more delicate than those allowed to feed on animal offal.

Good poultry should be firm to the touch, pink or yellowish in colour, fairly plump, and should have a strong skin. It has a fresh, not disagreeable smell. Stale poultry loses its firmness, becomes bluish in colour, green over the crop and abdomen, the skin readily breaks, and the bird has a disagreeable odour.

Healthy poultry are bright and active, dry in the eyes and nostrils, their feathers are glossy and elastic, and the combs and wattles are firm and brilliant red. Age is indicated by duskiness of the comb and gills, dulness and fading and brittleness of the feathers, raggedness of feet, and size of claws.

The diseases to which fowls are liable may be briefly enumerated as follows:—

Roup.—This is probably the most common, and often appears to result from cold-catching. It is characterised by an offensive discharge from the nostrils and eyes, swelling round the eyes, and purpling of the wattles. The disease is very contagious, and even the eggs laid by roupy hens are not wholesome. Without doubt this disease is often true tuberculosis. Search for nodules in the liver and intestines.

Pip is indicated by a white horny skin growing on the tip of the bird's tongue. It is not serious, but shows the bird is out of sorts, and may be regarded more as a symptom than a separate disease.

Chip is the name given to a kind of fever common in dairy farms, and seemingly derived from damp and cold. Young chickens are especially liable to it. They sit stationary in corners crying incessantly, "chip, chip."

Turn is apoplexy, affecting birds over-fed and taking little exercise. Without warning, the fowl totters and falls to the ground or drops from his perch. Death takes place unless assistance is promptly rendered.

The Scour is a diarrhœa due to various causes. It often results from improper food or sudden change of food. Without treatment the bird may soon succumb.

Gapes is a distressing malady caused by small worms in the windpipe. It is readily communicated and often fatal.

Poultry also suffer from intestinal worms, large and small, as every cook knows. Skin disease is also not uncommon, and is generally caused by poor feeding and want of cleanliness, and associated with parasites.

A bird killed when suffering from roup is not wholesome food, and should be seized. Most of the other diseases referred to cause falling off in condition; but if a bird has been properly killed, feels firm and looks sound, the inspector is not justified in seizing it.

Poultry suffer from a malady which has been called diphtheria, but no evidence has been adduced to show that this is a specific disease, or that it bears any true resemblance to the human disease of the same name. It is well to bear in mind that so-called diphtheria in poultry may be tuberculosis.

The only serious disease of poultry (besides roup or tuberculosis) which there is reason to believe directly prejudices the flesh so as to absolutely prohibit its being used for food of man, is *chicken-cholera*. When it is prevalent in a district, the inspector is sure to hear of it and be on his guard.

However, there is little evidence of the disease in birds carefully prepared for the market, and even an expert might not find it easy to demonstrate chicken-cholera microbes therein. The flesh is somewhat redder than natural, the liver probably softer, and the heart speckled with red or dark spots often inside and out. The intestines are usually inflamed, with red spots and livid patches. Domestic fowls, ducks, turkeys, geese, and pigeons are all subject to the disease. Poultry affected with this malady, unless in cases when it proves very rapidly fatal, exhibit characteristic signs of suffering. Their feathers are bristling, the wings droop, they sway from side to side, drag their legs, eat nothing and drink much. The comb is flaccid and livid. There is usually (not always) diarrhœa, at first glairy, then foamy, and towards the end often streaked with blood.

Pigeons are not ordinarily included under the term poultry. The wild pigeon is still found in many parts of this country, especially during winter, but the blue house-pigeon is the variety ordinarily served for the table. Nestlings, while fed by their parents, are best for food purposes. These are called in the trade "squabs." At six months old they begin to breed. Pigeons are very liable to tuberculosis, the nodules being abundant in the liver and intestines. Birds thus diseased are unfit for human food.

Game includes all animals and birds, used for human food, pursued or taken in the chase or in the sports of the field. The animals are the red deer and fallow deer, and possibly some other species of acclimatised foreign deer (the flesh of all being called venison), and the hare and rabbit. The birds are very numerous.

Venison.—The fallow deer receives more care than the red deer, feeds closer, takes less exercise, and matures sooner. It is generally reckoned to make the best venison. It is much smaller than the red deer and its horns are palmated. The buck is more esteemed than the doe. The haunch is regarded as a great delicacy, but neck and shoulders are also eaten. Buck venison is in perfection from midsummer to Michaelmas; doe venison is in season in the winter only.

Hares and Rabbits are both clean vegetable feeders. The flesh of the hare is darker in colour, and is much preferred for its superior flavour and digestibility. Young hares, called leverets, are seasonable from May to August, other hares from September to February. Rabbits are seasonable all the year. It is important they should be fresh and fairly young. They seem specially liable to consumption, the deposits of the disease occurring in the liver, glands, &c. Rabbits thus affected should not be passed as fit for food of man.

Feathered Game.—The feathered game ordinarily sold in this country are blackcock or moor-fowl, corn-crake or landrail,

grouse, partridge, pheasant, plover, ptarmigan, quail, snipe, teal, widgeon, wild-duck, and woodcock. The time they are in season is indicated in the following table—

Game.*	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Blackcock or Moor-fowl ..	—	—	—	—	—	—	—	in	in	in	in	in
Corn-crake or Landrail ..	—	—	—	—	—	—	—	12th	in			
Grouse	—	—	—	—	—	—	—	12th	in	in	in	beg
Partridge ..	in	beg	—	—	—	—	—	—	in	in	in	in
Pheasant ..	in	beg	—	—	—	—	—	—	—	in	in	in
Plover	in	—	—	—	—	—	—	—	in	in	in	in
Ptarmigan ..	—	in	in	in	—	—	—	—	—	—	—	—
Quail.... ..	—	—	—	—	—	—	—	—	—	in	in	in
Snipe	in	in	—	—	—	—	—	—	—	—	in	in
Teal	in	in	—	—	—	—	—	—	—	in	in	in
Widgeon ..	in	in	—	—	—	—	—	—	—	in	in	in
Wild-duck ..	in	in	—	—	—	—	—	—	—	—	in	in
Woodcock ..	in	in	—	—	—	—	—	—	—	—	in	in

Grouse, called also red grouse, or moor-cock, is plentiful in the Highlands of Scotland and Wales. It should weigh somewhat over a pound, the male bird being heavier than the female. It is in prime condition on "the 12th."

Blackcock, or moor-fowl, is also grouse, and may be distinguished by its greater size, and the dark plumage of the male. A female may weigh two pounds, and a male about three. It is plentiful in the Highlands of Scotland, and in various counties of England where there is heath to afford it food and shelter. Occasionally it is imported. There is a large grouse, the *capercailzie*, or wood grouse, which resembles blackcock somewhat in appearance, and also in its habits. The male bird is nearly as large as a turkey. It is taken in traps and imported largely from Norway.

* Under the Game Act of 1831 a penalty may be imposed on dealers in game who buy, sell, or have in their possession birds of game after ten days after the expiration of the season for killing them; and on other persons who buy or sell such birds after that time, or who possess them, except for breeding purposes, after 40 days. Some time since the question was raised whether this prohibition applied to birds imported from abroad. The decision of the Courts as to its not so applying "is practically to permit the sale of game at all times, as the origin of the game is difficult of proof."

Ptarmigan, or white grouse, is about the same size as red grouse, and like it, frequents wild heathy tracts. Its plumage is white only in the winter. It is found on most of the high mountains of Europe. Though an object of pursuit with sportsmen in Scotland, the market is largely supplied from Norway and the United States. It is imported into this country in February, and in the two following months, when no other game is in season. The flesh has sometimes a bitter flavour, imparted to it by the bird's food. It is less esteemed than the red or black grouse.

Pheasant, the most beautiful of all feathered game, is abundant in France and many European countries, but British birds are esteemed the best, being more carefully preserved and fed. The hen birds are smaller, and often more delicate flavoured. Pheasants are in best condition in October. Pheasants, like grouse, are considered to be much improved by keeping, and will usually keep six or seven days.

Partridge.—This bird, so carefully preserved in this country, is abundant in many European countries, and largely imported. Partridges live principally on the ground, especially in mountainous districts, the food being mainly seeds, berries, and buds. Partridges are the most esteemed of all game, and are in best condition in September. When young the legs are yellowish and the bills dark-coloured. A species of the bird, known as the Guernsey partridge, has red legs. Unless young, partridges are apt to be very tough.

Quail.—Nearly allied to the partridge is the quail, but it differs from it in performing regular migrations. Some birds, instead of leaving England in the winter, merely go to the coast. It is in condition during the three last months of the year. The supply is chiefly imported.

Corn-crake comes to England about April, living like the quail, in the long grass, and seeks a warmer climate for the winter. It is in best condition when grouse shooting begins in August, and ceases to be in condition when pheasant shooting begins. It is common in Ireland and North Wales, when it arrives, but most of the birds offered for sale probably come from England. The supply is not large.

Plover.—This bird is often very abundant in Scotland and parts of England. It arrives from abroad about April and leaves in autumn. There are two species, green and grey; the former is smaller, and is preferred. Plover is in best condition about September, and is imported in large numbers in the winter. Plovers' eggs are esteemed a delicacy, and largely sold cooked. A considerable proportion of the supply is imported.

Snipe.—This bird, known by its small size, long slender bill, and short legs, inhabits marshy places, and the margins of rivers, where it finds its food—worms and insects. In wet seasons it is found on higher ground. It is "in" during the four winter months, and considered to be in best condition in frosty weather.

Wild-duck, teal, and widgeon.—Wild-duck comes in with snipe; teal and widgeon a month earlier. Wild-duck is smaller and tougher, and less fat than the domestic varieties of duck, of which it is the original. It is known also by its black claws. It is an inhabitant of all European countries, especially toward the north. In Britain it is plentiful at all seasons, but during winter or severe weather quits the more exposed situations for places of shelter. But few of the wild-ducks supplying the market are shot. Nearly all, as well as other water-fowl, are captured by an arrangement of nets and decoy ducks. Both teal and widgeon are ordinarily taken in this manner. Wild-duck and water-fowl should be eaten young, but even then may be strong flavoured or fishy.

Woodcock is held in high estimation, and rarely plentiful. It is somewhat larger than the plover. It breeds in northern latitudes, and comes to this country in October and November. Part of the supply is imported from Europe.

Partridges and pheasants are specially tender, delicate in flavour and easy of digestion, and thus suited for invalids. Grouse also, kept long enough to insure its being tender, is suitable food for invalids. Quail, snipe and woodcock, on the other hand, are usually over rich for invalids.

Game is, with few exceptions, rarely exposed for sale in a fresh condition. The fashion of the time justifies the practice of bringing it to market so "high" that it is really in a state of

active decomposition, and the officer who seized game merely on this account would not have the support of the local bench. When evidence can be produced that game is really putrid an order may be obtained for its destruction, but as there is no defined line between game that is merely "high" and that which is putrid, it is not possible to draw one. Most game are liable to a cholera undistinguishable from that described as affecting poultry, and to many fatal diseases appearing as epizootics among them; but there are no characteristic signs whereby the subjects of any of these diseases may be known should they find their way into the market. Intestinal worms are also often found in the bodies of game, but they do not prejudice the flesh.

CHAPTER VII.

Fish.

White flesh, red flesh, and greasy flesh—Fish should be in season, fairly fresh, unbruised, and free from disease—Brill, cod, eels, conger eels, flounder, hake, haddock, halibut, herring, mackerel, scad, or horse mackerel, plaice, salmon, smolts, grilse, kelts—How to distinguish between the "clean run" salmon and the "unclean"—Trout, skate, smelt or sparling, sand smelt, sprats, soles, turbot, whitebait, whiting, "buckhorn"—Dried, salted, or smoked fish—Haddock-curing in London—Oysters, lobsters, prawns and shrimps, whelks, mussels, cockles, and periwinkles.

Fish, when fresh and good, and properly cooked, is a wholesome food, but varies much in nutritive value. It has been divided into *white fleshed fish*, including brill, cod, flounders, plaice, sole, turbot, whiting, &c.; *red fleshed fish*, of which salmon is the type; and *greasy fleshed fish*, including eels, herring, mackerel, pilchard, sprats, &c. Scaleless fish are generally regarded as unwholesome, but the eel does not come under this description, as it has small soft scales, scarcely visible.

Fish should be in season.—Fish is usually in the greatest perfection just before spawning. During this process it becomes flabby, thin, and wasted, and for some time after it is regarded as unfit for food, and said to be "out of season." Fish which have not reached the spawning age, and a certain proportion which are barren, are always in season. Crabs and lobsters, and prawns and shrimps, and also red mullet are in season all the year round. Oysters, as is well known, are not in season in the four months spelt without an *r*. I have drawn up a list of the fish ordinarily sold in the fishmongers' shops in this country, and indicated the month when each is in season. The

tabular statement has been prepared with some care, and is, I believe, proximately correct, but I am bound to say no two authorities are agreed as to when some fish are in and out of season. It must also be borne in mind that the time of spawning, which regulates "seasonableness," varies a little from year to year. Fish out of season, when boiled, is more transparent, and has a bluish tint.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Brill	—	—	in	in	in	in	in	in	in	in	in	—
Cod	in	in	in	—	—	—	—	—	—	in	in	in
Eels	in	in	in	—	—	in	in	in	in	in	in	in
Flounder	—	—	—	—	—	—	in	in	in	in	in	—
Hake	—	—	—	in	in	in	in	in	in	in	in	in
Haddock	in	in	—	—	—	—	—	in	in	in	in	in
Halibut	—	—	in	in	in	in	—	—	—	—	—	—
Herring	—	—	—	—	—	—	in	in	in	in	—	—
Mackerel	in	in	in	in	in	in	in	—	—	in	in	in
Plaice	—	—	—	—	in	in	in	in	in	in	in	in
Salmon*	—	—	in	in	in	in	in	in	—	—	—	—
Skate	in	in	in	in	—	—	—	in	in	in	in	in
Smelt	in	in	in	in	in	—	—	—	in	in	in	in
Sprats	in	in	in	—	—	—	—	—	—	—	in	in
Sole	in	—	—	in	in	in	in	in	in	in	in	in
Turbot	in	in	—	—	in	in	in	in	in	in	in	in
Whitebait ..	—	—	—	in	in	in	in	in	—	—	—	—
Whiting	in	in	in	—	—	—	—	—	in	in	in	in

Fish should be fairly fresh.—Some fish, such as mackerel and herring, appear to begin to decompose very rapidly, and a very little keeping spoils them. Flat fish, as a rule, bear keeping better. Turbot, for instance, is improved for being kept a day or two. Cod, whiting, and haddock, if kept in a cool place and rinsed with salt water, will keep good for two or three days.

The freshness of fish is indicated by its being firm and stiff. In really prime condition, if held out in a horizontal position by the hand, it will remain rigid. Any drooping of the tail shows that it is not quite fresh, and, indeed, the extent of this drooping may not unfairly be taken as a measure of want of

* Section 19 of the Salmon Fishery Act, 1873, makes it an offence to be in possession, for the purpose of sale, of any salmon between September 3 and February 18, even though the fish be quite clean.

freshness in the fish. The fish usually hawked about the streets is what the shops have failed to sell, and much of it is very limp. However, before an officer is justified in seizing fish, it must be a stage beyond being merely not quite fresh. If the fish besides being limp is actually softened in parts, and the flesh easily separates from the bone; if the gills are a dirty colour, or dry or exude a dirty brown fluid; if the eye is dull and the skin over it not transparent; or if the fish has a distinctly disagreeable odour there is sufficient evidence of commencing decomposition to warrant seizure.

Fish should be unbruised and clean. — Much fish gets jammed and even broken in the nets, and this is sorted out for sale to the poor, or if unsaleable goes to manure the land. There is no objection to this being eaten perfectly fresh, but the effect of bruising is to render the fish unfit for keeping even for a day, so that bruised and broken fish is nearly always unwholesome when offered for sale. If the scales are not bright and in order, it indicates that the fish has been ill-used or is stale. Softening in parts indicates the same. Fish taken from foul waters may be offensive or unclean. Fresh-water fish from a muddy river bottom may require much soaking in salt and water before they part with the smell and taste of the mud. Again, fish from sewage-polluted water is sometimes as unwholesome as the sewage-polluted water itself. Fish may also be damaged or spoiled through the entrails not being removed soon after death.

Fish should be free from disease.—Apparently healthy pilchards and herrings, and many other fishes, and mussels and oysters, even when in season, may occasionally, on being eaten, produce symptoms of poisoning. Attempts to isolate the poison in such cases have failed, and it is thought the fish may themselves have been feeding on unwholesome food. There is certainly nothing to distinguish such fish from others. So little is known about fish disease that it is possible the fish, &c., causing such symptoms may have been diseased. The only fish disease which seems to have been carefully studied in this country is the salmon disease. At times when the salmon disease is prevalent, it is not unlikely that fish affected with the

disease might be sent to the market. The disease is due to parasites, the visible sign of it being a fungus growth, especially about the head, which, so to speak, eats its way into the sound flesh. A sanitary officer would be warranted in seizing a fish thus affected.

I shall now briefly remark upon the fish ordinarily exposed for sale in this country, taking them in alphabetical order.

Brill is a flat fish of oval form. The flesh like that of the turbot should be of a yellowish tint. It is inferior to the turbot and sole, but superior to the plaice and flounder. The flat fish or side-swimmers are called also trawl-fish, as they are taken on the coast or in tidal rivers by trawling over the bottom. The most common in British waters are the brill, two or three sorts of dab, the flounder, the fluke, the halibut, the plaice, several sorts or sole and the turbot. The upper side on which are both the eyes is usually coloured, and the under side white, but some fish are entirely white, and fish coloured both sides are not uncommon.

Cod is one of the best known of white-fleshed fish. Fishermen are able to preserve them alive for a long time. The "sound," or swimming-bladder is pierced with a needle and the air disengaged so that when the fish is put into the well of the boat he sinks to the bottom. When the fishermen come to shore the cod are packed into boxes four or five feet wide and deep and about ten feet long, and the boxes floated or sunk in a tidal river. The cod though alive are packed so close that they cannot bruise themselves with struggling. The water is renewed as the tide goes in and out through holes bored in the sides of the boxes. Cod will live in these boxes eight weeks, and they are frequently kept for that time, all the while without food. They are removed from the boxes as they are needed for the supply of the market, being killed by a stroke on the head with a mallet. This close confinement and starving is certainly cruel, and cod thus treated must be depreciated in quality. In some places a yet more cruel method of keeping cod alive is adopted. After removal from the boat-well they are tied by the tail to a rope, many of them together, and sunk in deep water.

Their tails get sore and lacerated from the string making them fast to the rope.

Cod in good condition should have the sides undulated as if it were ribbed. It should be round and plump near the tail, and the hollow behind the head should be deep. The flesh should be very firm, and when cut raw it should have somewhat the metallic appearance of the silver side of a round of beef.

Eels.—At least three distinct species of fresh water eels are sold in the markets. The sharpnosed eel is the most often seen. The broad-nosed eel is not uncommon. It is relatively larger round the body, and has a wide mouth and thick skin. A third species (occurring chiefly in the Avon) is the snig eel, a small light-coloured eel seldom exceeding half a pound in weight. Eels are caught on the Thames in a basket-work apparatus fixed on a wooden frame, called an "eel buck." On the Severn eel nets are used. A large number of eels are imported from Ireland. They come over packed in boxes alive. Elvers should never be taken, and in good eel fisheries passes should be provided for them over natural obstructions. The eel is most tenacious of life, and can live long out of water owing to its being able to store water to keep its gills moist. These little stores on either side of the head serve as "breathing bags." When once dead the eel keeps no longer than other fish. Perfectly fresh eels may have a faintly disagreeable smell from the foul mud from which they have been taken; and if the mud be sewage-polluted the eels may be unwholesome.

Conger Eels are commonly taken off the Cornwall and Devonshire coasts, and near Dover and Folkestone, but many are imported from Ireland and the Channel Islands, and from France. During the cold weather they are in a torpid state in deep water, but may be caught from March to October. Seven or eight pounds is a full weight for a large fresh-water eel, but congers may weigh ten times as much. They are caught on a line. Whether it be true that a large proportion of the turtle soup sold in London is made from conger seems doubtful, but conger certainly makes a fine thick "stock," and is excellent food.

Flounder.—This is a well-known flat fish, more elongated in form than the plaice, but much smaller. It is common in British seas, and ascends the rivers beyond the reach of the tide. It is abundant and cheap.

Hake belongs to the family of the cod-fish. It has an elongated body and a broad flat head, the mouth being very wide and the lower jaw extending beyond the upper. It is a common, somewhat coarse fish.

Haddock also belongs to the cod family, and much more closely resemble the shape of the common cod than the hake. Like the cod also it is commercially of great importance. Haddocks occur in immense shoals all round the coasts of the British Isles. On each side of the body just above the fin behind the gills is a dark spot called the mark of Peter's thumb. The haddock as brought to market does not weigh more than from two to three or four pounds.

Halibut is the largest of the flat-fish brought to market, measuring from three to six feet long. It is a northern fish, being taken off Greenland, Norway and Scotland. Halibut are sometimes kept alive, packed in large perforated boxes, which are sunk or floated in a dock or shallow water. Like cod they may be thus kept alive for as long as eight weeks. A fine halibut often weighs upwards of a hundredweight.

Herring.—This fish is of great importance commercially, there being large herring fisheries in all the three kingdoms, especially in Scotland and Norfolk. The word herring is derived from the Dutch word "herr," an army. The fish occur in enormous shoals, extending for miles. Fresh herrings should be mature full fish, as there is a large market for inferior qualities as bait. The herring dies as soon as removed from the water, and does not keep well fresh. A herring weighs on an average a little over five ounces. A cran (37½ imperial gallons) contains about 800 mature herrings, or about 1,000 immature herrings. A barrel contains rather less; 132 herrings go to the nominal hundred, a last therefore contains 13,200 fish.

Mackerel, like herring, is a greasy-fleshed fish, and does not keep well. It is fished for from February to November, the chief fisheries of the country being on the south and west coasts.

Different fisheries have different seasons—thus the Cornish fishery is from February till June, and the Rye fishery from April to November. The average weight of a mackerel is a little over one pound, and it rarely exceeds two pounds in weight. Mackerel are reckoned in boxes—50 fish going to a box. The freshness of the mackerel is indicated by the brightness of its appearance. Redness about the head is a sign that it is getting stale.

Scad or Horse Mackerel is smaller and more graceful than mackerel, but the flesh is considered coarser. It frequents many parts of the coast, and is often taken off Devon and Cornwall.

Plaice.—This well-known flat-fish is very abundant, tenacious of life, and keeps well. There are two kinds, with spots and without spots, the former being sometimes called diamond plaice. Probably the finest spotted plaice are taken on the Brown Bank and Well Bank, on the Dutch coast, and between Hastings and Folkestone. The average weight of a plaice is about 1 lb.

Salmon.—This fish should be plump and cleanlooking, the scales bright, the belly firm and thick, and its flesh on section should be rich red. The salmon periodically leaves the sea and ascends rivers and streams to deposit its eggs on gravel, where they hatch out. The young fish, after a certain time, descend to the sea as "smolts," in May and June, some migrating the first year, others not till the second or third. Remaining in the sea for a few months or a year, they return to the river as "grilse." The parent salmon, after spawning, descend to the sea, very much out of condition, and are then called "kelts." In the sea they recover, and when they ascend the river again are in good condition. The kelts (male and female) are weak and poor, and should in no case be taken. Numbers of them die, apparently of exhaustion, before they reach the sea. Indeed, by an Act passed in 1861, it is made illegal wilfully to take any unclean or unseasonable salmon, or to buy, sell, expose for sale, or have in possession the same, or any part thereof. It becomes then important to know how to tell an unclean and unseasonable salmon. On this subject Mr. Frank Buckland

says, "firstly, that the external colouring of the scales of a salmon is by no means invariably a safe guide to its real condition; secondly, that the appearance of the pyloric appendages are most valuable in the diagnosis; and, thirdly, that the actual state of the development of the ova or milt is a point to which the strictest attention should be paid. The salmon feeding in the sea gradually accumulates great quantities of fat. A certain portion of the fat is deposited in the cellular tissue between the skin and the muscular system; but an admirable arrangement for the storing up of the main bulk of this winter food is found in the presence of the pyloric appendages: these are long, worm-like, fleshy offshoots from the intestine, situated immediately below the true stomach. In

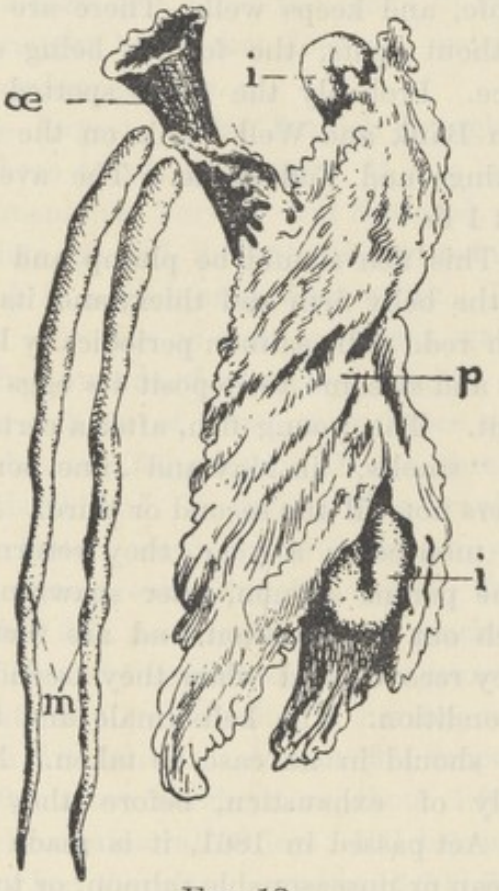

FIG. 12.

the salmon there are 45 to 65 pyloric appendages. The process of developing ova and milt is a great tax upon the system of

the salmon, and the oily matter in the eggs and milt is very great. I believe it therefore sound physiology to say that the use of the fat stored up in the pyloric appendages and under the skin is: first, to supply nutrition to the fish during its sojourn in fresh water; and, second, to afford materials for the development of the milt and ova. The blocks will illustrate what I have endeavoured to explain—*œ* is the œsophagus, *i* the intestines, *p* the pylorics, *m* the milt.

In the case of the "clean run" salmon (Fig. 12), the pylorics can hardly be distinguished on account of the mass of fat which envelopes them, while it will be remarked that the milt is very small. It was, in fact, an "up" fish. The other block (Fig. 13)

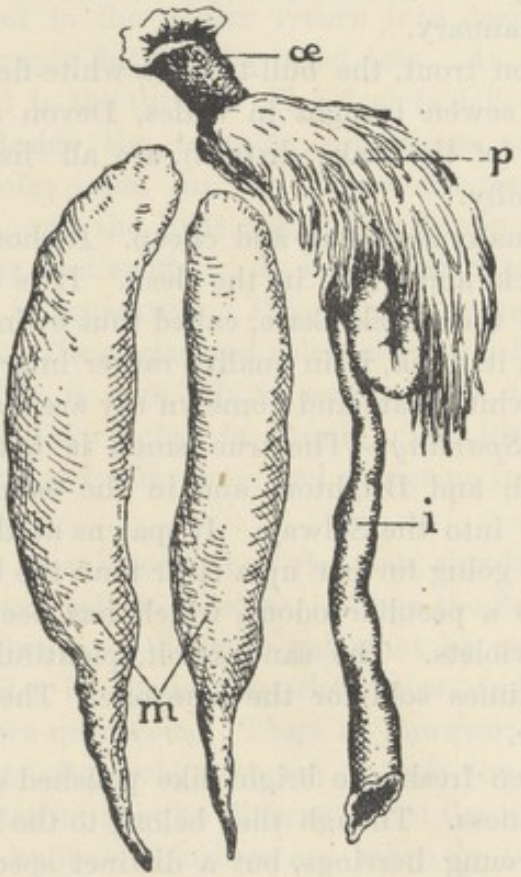

FIG. 13.

represents the same structures from a spawning fish. The fat has entirely been absorbed from the pyloric appendages, while the milt is very large, the fish having been taken on or near

the spawning beds. Spawning operations being over, the fish would at once descend as a kelt or unclean fish to the sea to get on his pylorics a fresh store of fat."

As clean fish are caught going up the river in February and March, just at the time the great majority of salmon are coming down as kelts, there would appear to be a spring migration as well as an autumn migration of salmon into the rivers. However, after what has been said, an "up" fish could not be mistaken for a "down," though a fish coming up the river in the spring could not probably have accumulated as much store fat as if he had remained in the sea till the autumn. These early clean salmon of course fetch a good price. Large Dutch salmon are imported in the winter, from the end of November to the end of January.

The common trout, the bull-trout (a white-fleshed fish), the sea trout, the sewen (caught in Wales, Devon and Cornwall), and the charr (of the Lake district), are all fish belonging to the salmon family.

Skate is usually abundant and cheap. It should be firm and broad and thick, and white in the flesh. It is commonly sold crimped. The thornback skate, called thus owing to its having large spines on its back, is in quality rather inferior to the skate proper. The white skate and homelyn ray are also inferior.

Smelt or Sparling.—The true smelt is taken at Boston, Lynn, Norwich and Brighton, and in the estuaries of many rivers running into the Solway. It spawns at the head of the tideway, never going further up a river than the brackish water. The smelt has a peculiar odour, which has been compared to the smell of violets. The sand smelt, plentiful on the south coast, is sometimes sold for the true one. The quality of the flesh is inferior.

Sprats, when fresh, are bright like polished silver, and soon lose their freshness. Though they belong to the herring family, they are not young herrings, but a distinct species. They are often very abundant off the coast, being taken for the most part in the winter. They specially favour the coasts of Suffolk, Essex and Kent. When the market is glutted large quantities are sold for manure. There is good authority for saying that

sprats are occasionally manufactured into what passes for "anchovy paste." Salt, saltpetre, prunella, and red colouring matter are added, and then the mixture is well pounded and pressed. If bottled as anchovies they would be recognised by the shape. *Vide* figure of anchovy below.

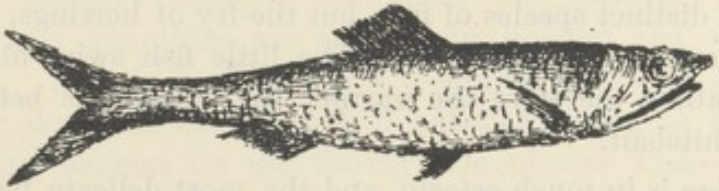

Fig. 14.

Soles come to the banks and coasts of estuaries to spawn and for food, but in the winter return into deep water. They are taken, like most flat fish, by trawl nets. As a table fish the sole ranks next to the turbot. The flesh is delicate, white, and very firm. Beside the common sole there are three other varieties of *solea* sold in the shops—the lemon sole, the variegated sole, and the little sole. The lemon sole is a brown orange in colour, and spotted. It is smaller than the common sole, but wider in proportion. It is inferior in quality, the flesh being less firm. The variegated sole, called thus from the colour of the upper side, is rare. It is smaller than the lemon sole, scarcely attaining six inches in length. The little sole, or red sole, is four or five inches long, and comes up in the trawl nets with the others.

Turbot, the most esteemed of flat fish, should be thick and firm, and the flesh yellowish white. When the fish is purchased whole the purchaser is likely to get what he asks for, as the turbot is rounder in shape than the plaice, and its spots are smaller and more numerous. There is, however, no doubt that cut-up halibut is often sold as turbot, though the smooth upper surface of the turbot is quite different from the tubercle covered surface of the halibut. Turbots are taken in trawl nets with other flat fish off the English coast and Holland coast and Flemish banks. When the weather has driven the fish into deep water, they are fished for with many-hooked lines. Turbots commonly weigh from five to ten pounds.

Whitebait seem to be specially attracted to the Thames, and are netted in large quantities off Gravesend, Queensborough, Leigh, Southend, &c. They are usually sold by the quart. Whitebait appear to have been first used as human food about 1780, their use before being as bait for crabs, &c. Whitebait are not a distinct species of fish, but the fry of herrings, sprats, weevers, sand-eels, smelts, &c. The little fish swim higher in warm weather, therefore the warmer the season the better the take of whitebait.

Whiting is in much esteem, and the most delicate flavoured fish belonging to the cod family. It is caught all round the coast, but especially at Plymouth. It will not keep long, and suffers damage from packing and carriage. Large whiting (from two pounds to three pounds when fresh) taken off the coast at Dartmouth are sun-dried by the fishermen and sold under the name of "buckhorn."

Dried salted or smoked Fish.—The preserved fish ordinarily met with in the markets in this country are barrelled cod, dried salt cod, smoked haddock, cured salmon, red herring, kippered herring, and bloaters, and dried sprats. In examining cured fish it is important for the food inspector to remember that fish curing is not confined to large establishments properly supervised, but is done on the premises of petty vendors all the year round. Fish that is already stale and just beginning to turn is put into the brine-tub for a few hours, and then rapidly smoked or sun-dried or wind-dried. Even when the fish is perfectly good when the curing begins, the process is so quickly gone through it will not insure the keeping of the fish for any long period of time. Thus cured, the fish is often bad and unwholesome, and the superficial curing hides its defects.

Barrelled Cod.—As soon as caught the fish are beheaded, opened, cleansed and salted. They are then stowed in beds, head to tail, in the ship, a layer of salt being placed between each layer of fish. After a few days, when they have well drained, they are again salted and stowed. Finally they are packed in barrels, after being previously cut into large pieces. A barrel contains about 40 fish.

Dried salt Cod.—The cod, after being beheaded, opened, cleaned and salted, is laid out on the shingle of the shore or on low walls and dried by the sun. Dry salt cod weigh about 5 lb. a-piece.

Smoked haddock, commonly called "Finnon" haddock, is so named after the fishing village of Findon, near Aberdeen, where haddock smoking with peat has attained perfection. Enormous quantities are smoked in London and other large towns. Mr. J. K. Lord, in a communication to *Land and Water*, describes the process of haddock curing as carried out by costermongers on the Surrey side of the Thames. In a small railed enclosure, close to the rails he found tubs, pans and vessels of all descriptions, "filled with a fluid of yellow colour and oily consistence," which he was informed was the pickle, a solution of salt and water. "Occupying one corner stands a sort of sentry-box, or curing-house. It is composed of scraps of plank, staves of casks, fragments of oilcloth, and old rags for caulking; numerous ledges are nailed along two of the sides. The haddocks are brought into the enclosure, and boys and girls at once commence removing the heads from the fish, split them open, scrape off all the dirt, and plunge them in the pickling-tubs according to size. The fish soak in pickle for about three hours, and then the skewering up process commences. The larger haddocks are first, one by one, taken from the tubs, and a peeled rod is passed through each fish until there are as many as the rod will contain; the ends are laid upon the lowermost ledges in rows until filled up, and so on until the smallest are on the top ledges. A fire is kindled on the ground, which is kept smouldering by a judicious application of sawdust underneath the haddocks. The curing-house is closely shut up, and when the haddocks are sufficiently tinged of a yellow colour they are considered to be cured. From six to eight hours is quite sufficient time to enable a skilled curer to split, salt and smoke a load of haddocks fit for sale." Sometimes imitation Finnon haddocks are made without the aid of smoke, the fish being washed with diluted pyroligneous acid, and hung up to dry. Finnon haddocks pack about 300 to the barrel.

Cured Salmon.—Salmon curing is very simple, but takes a long time. The fish is split and cleaned and salt well rubbed in.

It is then left in vessels, covered with strong brine pickle for six or seven weeks. Then it is carefully pressed, and finally packed in casks with alternating layers of salt. Smoked salmon, so common in many parts of the Continent, is scarcely seen in this country.

Red Herrings, Bloaters and Kippers.—Red herrings, and so-called Yarmouth bloaters, are prepared very largely by the poor, and not merely in factories. They are soaked for twenty-four hours or a little longer in strong brine, and hung up to smoke over a wood fire. Kippered herrings are first split and flattened out like Finnon haddocks. Red herrings are commonly packed in barrels, 500 to 700 the barrel, according to condition. Bloaters are reckoned in baskets, 150 to the basket. Kippered herrings are sold by the score or dozen in boxes.

Dried Sprats.—Sprats are cured by being soaked in brine and then dried with or without smoke. At Yarmouth and Gravesend they are cured like red herrings. They are commonly made up in bundles of 30.

Shell Fish.—The shell fish ordinarily sold in this country are oysters, lobsters, crabs, prawns and shrimps, whelks, mussels, cockles and periwinkles.

Oysters are found round the coast wherever there is a suitable shore. Off Essex and Suffolk they are plentiful. They are obtained from the oyster beds by dredging, and stored in pits provided with sluices. The shells commonly become green after storage. Oysters from the pits are in better condition than those fresh from the beds. After six or eight weeks captivity and feeding they attain perfection. An oyster is in its prime when about eighteen months old. The small "native" oyster is the most esteemed. The contents of a dozen pairs of shells, fluid included, should not weigh more than four ounces. The soft part of the oyster is the liver, the hard part is the muscle. Oysters should not be sold unless they are alive. Ordinarily on death the muscle binding the shells together is relaxed and the shells open.

Lobsters and Crabs are caught in basket-work "pots" sunk at sea. The position of the pots is marked by a buoy fastened to them. They cast their shells annually and just before doing

so are in poor health, but they are never out of season. They are sometimes sold alive, but generally ready cooked. They remain alive in the basket pots for months, with such food only as they can gather from the sea-water.

Prawns and Shrimps are taken in hand-driven nets in shallow water. They are always sold cooked. Prawns should boil bright red and have no spawn under the tail. The shrimps usually sold boil brown. These are called "buntings." There is another kind of shrimp, carrying a sword in its head, that boils red like a prawn. Prawns are sold by the dozen, and shrimps by the pint—about 320 shrimps go to a pint.

Whelks, Mussels, Cockles and Periwinkles.—All these are sold by measure. Periwinkles count about 2,000 to the peck, whelks (a larger specie of periwinkle) count about 112 to the peck. A peck of cockles contains about 1,000, and a peck of mussels about 500. These shell-fish are sold raw or cooked, and their consumption is chiefly confined to the poor. They are usually cooked in their own liquor or in salt water, and vinegar added. The mussel has a bad reputation for occasionally causing symptoms of poisoning when eaten, especially in the warm weather. This may be due to the mollusca feeding on something poisonous, or to the water from which it was taken being foul or poisonous, but sometimes a special poison appears to be developed in the liver. Certainly mussels, to all appearance fresh and wholesome, may cause poisoning.

CHAPTER VIII.

Fruit and Vegetables.

No proper dividing line between them—Fruit ordinarily exposed for sale—When in season?—Apples, pears, and oranges—Barrelled grapes—Cherries, apricots, nectarines, and peaches—Damsons—Greengages, Orleans plums, magnum bonums—Currants, raspberries, strawberries, gooseberries, and rhubarb—Disease, decay, and immaturity—Nuts—walnuts, hazel nuts, &c., Brazil nuts, pea nuts, almonds, sweet chestnuts, cocoanut—Dried fruit, crystallized fruit, bottled fruit and jams—Vegetables ordinarily exposed for sale—When in season?—Potatoes—Artichokes—Asparagus—Beans—Brocoli and cauliflower—Cabbage—Sourkraut—Carrots, parsnips, and beetroot—Celery—Cucumber—Endive—Lettuce—Horse-radish—Mushrooms—Onions—Green peas, dried peas—Sea-kale—Spinach—Tomatoes—Truffles—Turnips—Vegetable marrow—Disease, decay, &c.—Tinned fruit and vegetables.

There is no dividing line marking off fruit from vegetables. For instance, from custom rhubarb is sold and used as a fruit, which it is not; while, on the other hand, the tomato, obviously a fruit, is conventionally classed among vegetables.

Fruit literally means something which is enjoyed, and may be defined as the produce of a tree or plant containing the seed.

Nearly all kinds of ripe fruit used for food of man are wholesome raw. Many fruits intended for cooking or to be kept some time are purposely gathered in an unripe state.

The kinds of fruit ordinarily exposed for sale in the food markets in this country, and the time of year when they may be considered in season, are given in the following table. Lemons are not included in the list, for they are imported nearly

all the year round, keep well, and are always to be obtained sound. Almost the same may be said of pines, nearly all of which are imported, but they require much greater care in keeping. Bananas, too, are imported nearly all the year round, and keep with care so as to be rarely out of season. Bananas, like plantains, to which they are allied, are excellent food-stuff, and as cultivated are practically seedless.

Fruit.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Apples	in	in	in	—	—	—	—	in	in	in	in	in
Apricots	—	—	—	—	—	—	—	in	in	in	—	—
Cherries	—	—	—	—	—	—	in	in	in	—	—	—
Currants	—	—	—	—	—	in	in	in	—	—	—	—
Damsons	—	—	—	—	—	—	—	—	in	in	—	—
Grapes	—	—	—	—	—	—	in	in	in	in	—	—
Green Figs ..	—	—	—	—	—	—	—	—	in	in	—	—
Greengages ..	—	—	—	—	—	—	in	in	in	—	—	—
Gooseberries ..	—	—	—	—	in	in	in	—	—	—	—	—
Melons	—	—	—	—	—	—	in	in	in	in	—	—
Nectarines ..	—	—	—	—	—	—	—	in	in	—	—	—
Oranges	in	in	in	in	in	—	—	—	—	—	in	in
Peaches	—	—	—	—	—	—	—	in	in	—	—	—
Quinces	—	—	—	—	—	—	—	in	in	in	—	—
Raspberries ..	—	—	—	—	—	in	in	in	—	—	—	—
Rhubarb	—	—	in	in	in	—	—	—	—	—	—	—
Pears	in	in	—	—	—	—	—	in	in	in	in	in
Plums	—	—	—	—	—	—	—	in	in	in	—	—
Strawberries ..	—	—	—	—	—	in	in	in	—	—	—	—

Of the three winter fruits, *apples*, *pears* and *oranges*, the two first are indigenous to this country. Crab apples still grow wild in many parts, and are sold in the markets for flavouring and making jelly. Most apples and pears ripen best after gathering. Apples should be stored on shelves or trays in a room carefully ventilated, but not too dry. The temperature should be equable and rather low. Pears often do better hung up. The storing place should be well shaded, dry, and provided with some arrangement for heating. In an unwarmed room, during severe weather, the fruit is apt to get frost-bitten.

Nearly all the oranges imported are gathered unripe or they would not keep. Pears are imported from many European countries and early apples. A very large supply of apples come

from America* and Canada, and an increasing quantity is arriving yearly from Australia and New Zealand. To the winter fresh fruits may be added *barrelled grapes*, which are imported in enormous quantities and last till spring. They keep well in the sawdust in which they are packed.

Stone-fruit naturally divides into three groups—cherries, high-priced large fruit, and plums. The cherries, of which a large number of species are grown and imported, are of all stone-fruit most liable to be badly bruised. The cheaper kinds, such as "black hearts," are often offered for sale by street vendors in a state of decomposition. The second group—apricots, nectarines and peaches—usually grown as wall-fruit, requires much more care in cultivation, and as it commands a good price is rarely offered for sale in a damaged state. The third group—the plums—includes the damson, or plum of Damascus, the greengage, brought to England by a member of the Gage family from the monastery of Chartreuse, the Orleans plum, coming from France, as its name signifies, the magnum-bonum, so-called because it is the largest English plum, and many others. These are commonly gathered before they are quite ripe, and consequently less liable to be bruised in packing and sorting. All plums are acid and liable to disagree with the eater unless quite ripe, all are wholesome when cooked.

Large quantities of garden summer fruit, *currants*, *raspberries* and *strawberries*, are imported in the spring from the Continent. Early *gooseberries* and *rhubarb* are also imported for two months before the home produce is ready. Though strawberries do not appear more liable to damage than currants or raspberries, a very large proportion are spoiled. They are bruised and crushed and left in the sun till many decompose, and sometimes fermentation is set up.

Though the fruit supply is so extensively augmented from abroad, the finest of all kinds (excepting, perhaps, oranges and lemons) for quality and flavour are English-grown.

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* Lately large quantities of apples were seized by the New York Board of Health and destroyed on the testimony of official analysts that they were poisonous and dangerous to eat as food, owing to the practice of spraying with a liquid containing a preparation of arsenic, to destroy the codlin moth or its *larvæ*.

Fruit may be the subject of disease, or in a state of decay, or it may be so immature (especially in the case of early windfall apples) as to justify seizure. Diseased or decaying fruit is known by softening, change of colour, and external mould. Fruit may be bird-bitten or insect-bitten and none the worse except that it is disfigured. Much damage is done to apples, and sometimes to pears, by the grub of the codlin moth, and to plums by the red grub. The "black spot" seen on the outside of apples and pears is due to the presence of a fungus, and impoverishes the fruit.

Nuts ordinarily exposed for sale in this country are the walnut, several varieties of hazel nut (including the filbert) the Brazil nut, pea nuts, almonds, the sweet chestnut and the cocoanut.

Walnuts are largely grown in England, though they originally came from the East. They are gathered in September and remain "new" till the end of January. For pickling the walnut fruit is used when green, before the shell hardens. The fresh walnut is wholesome, but as it contains much oil and this is apt to become rancid, old walnuts are often unwholesome.

The wild hazel nut and the cultivated filbert, the "black Spanish" nut, the Barcelona nut (said to be kiln-dried) and the cob nut, are closely related. Filberts are grown for the most part in Kent and the neighbourhood. They are more wholesome and free from oil than other nuts of the kind, and are considered to be in season from September to March.

Brazil nuts are not borne singly, but packed to the number of from twelve to twenty in a woody capsule. These long, irregular three-cornered nuts have a hard, close shell, and consequently keep better than walnuts. They also contain a large quantity of oil, which is liable to become rancid and render the nuts unwholesome.

Pea nuts, which in recent years have been very largely imported, appear to keep well, but having thin shells should not be much exposed to the sun. They are sometimes sold roasted.

Chestnuts and almonds are a really useful food, and might be used in place of bread or potatoes. Chestnuts are much improved by being cooked, and often sold thus. Almonds,

though they contain much oil, keep fairly well. The best sweet almonds are Jordan almonds, imported from Malaga. They are longer and narrower and better flavoured than the Valentia almonds. The bitter almond, owing to the prussic acid it contains, is seldom used except as a flavouring. Sweet almonds are often not distinguishable from bitter almonds except by the taste.

Cocoanut is also an excellent food. Indeed, cocoanut and fruit allied thereto is almost the sole food of thousands of human beings. Cocoanut seems little liable to change, and even after the nut is broken the solid part keeps well for any reasonable time.

Preserved fruit includes dried fruit, crystallized fruit, bottled or canned fruit and jams.

The most familiar kinds of dried fruit are Malaga raisins, called muscatels, a dessert-fruit, Valencia raisins, used for puddings, sultana raisins, used for puddings, and made from a small light coloured stoneless grape growing in Smyrna, &c., and grocers' currants, sometimes called Zante currants, prepared from the small black Corinth grape. There are also many qualities of prunes and French plums and figs and dates, and Normandy pippins and dried American apples and pears. All dried fruits keep well, but the raisins and currants if damaged with moisture are liable to ferment.

Crystallized or candied fruit is for the most part imported, but an increasing quantity is being made in this country. Almost every kind of fruit is preserved in this way, and some, like the almond fruit (similar to an unripe peach), is available for eating in this way only. All candied fruit, except candied citron and lemon peel, are used without further cooking. Fruit preserved in this way keeps well.

Gooseberries, currants, raspberries and plums, and all fruit used for pies and puddings are preserved for winter use by the simple process of bottling. Occasionally a little sugar is added, but the approved plan is simply to bottle the fruit, covering it with water, heat it sufficiently, and exclude the air. Bottled fruit keeps well in a cool place if properly sealed. The process of canning is similar.

Fruit preserved as a jam or marmalade, if carefully preserved and sufficiently cooked, should keep well from one fruit season to another. Sometimes, however, the top covers with mould, and sometimes fermentation is set up. Jam is specially liable to get bad if kept for several years and exposed in sunny shop windows.

Vegetables may be conveniently defined as plants cultivated for culinary purposes. The kinds ordinarily exposed for sale in the food markets in this country, and the time of year when they may be considered in season, are given in the following table :—

	Jan.	Feb.	Mar.	Apl.	May	June.	July.	Aug.	Sept.	Oct	Nov.	Dec.
Artichokes	—	—	—	—	—	—	in	in	in	—	—	—
Jerusalem ditto	in	in	in	in	in	in	—	—	in	in	in	in
Asparagus	fd.	fd.	fd.	fd.	in	in	in	—	—	—	—	—
Beans, Broad	—	—	—	—	—	—	in	in	—	—	—	—
„ French	—	fd.	fd.	fd.	fd.	fd.	in	in	in	—	—	—
„ Haricot	in	in	in	—	—	—	—	—	—	in	in	in
Brocoli	in	in	in	—	—	—	—	—	—	in	in	in
Brussels sprouts	in	in	in	—	—	—	—	—	—	—	in	in
Carrots, young	—	—	—	in	in	in	—	—	—	—	—	—
Cauliflower...	—	—	—	—	—	in	in	in	in	—	—	in
Celery	in	in	in	in	—	—	—	—	—	in	in	in
Cucumber	—	—	fd.	fd.	fd.	fd.	in	in	in	in	—	—
Endive	in	in	in	—	—	—	—	—	—	—	in	in
Horse-radish	in	in	in	in	in	in	—	—	—	in	in	in
Lettuce	—	—	in	in	in	in	in	in	in	—	—	—
Mushrooms...	fd.	fd.	fd.	fd.	fd.	fd.	fd.	fd.	in	in	fd	fd.
Spanish Onions	in	—	—	—	—	—	—	—	in	in	in	in
Parsnips	in	in	in	in	in	—	—	—	—	in	in	in
Peas, green	—	—	—	—	—	in	in	in	—	—	—	—
Potatoes, new	—	—	fd.	fd.	in	in	—	—	—	—	—	—
Sea kale	—	in	in	in	in	in	—	—	—	—	—	—
Spinach	—	—	in	in	in	in	in	—	—	—	—	—
„ winter	in	in	—	—	—	—	—	—	—	in	in	in
Tomatoes	—	—	—	fd.	fd.	fd.	fd.	in	in	in	—	—
Truffles	in	in	in	—	—	—	—	—	—	—	in	in
Turnips, young	—	—	—	in	in	in	—	—	—	—	—	—
Turnip greens	—	—	in	in	in	—	—	—	—	—	—	—
Vegetable Marrow ...	—	—	—	—	—	—	in	in	in	—	—	—

"fd." stands for forced.

Potatoes are by far the most important of all vegetables as a food-stuff. When new, as shown in the table, they are in season in the spring and early summer. When mature they keep well all the year round.

Good potatoes should be of dwarf and neat appearance when growing, the haulm (or stalk) being strong and branching. The tubers of the most approved varieties are long, oval, or

kidney-shaped, fairly symmetrical, smooth in the skin, and with few eyes. The flesh should be pale and uniform in colour, fine grained and very firm, and the juice should be acid. The potato should be dry and floury when cooked, and of good flavour. Inferior potatoes are best known by their lightness: thus, a potato, with a specific gravity of less than 1068°, may be regarded as bad.

The presence of the fungus producing the potato disease is shown by the leaves turning blackish and curling up. It spreads to the tubers, causing decomposition. The tubers are also attacked by "smut," which is recognised by dark-brown patches on the skin.

Potatoes green on one side, from exposure to the air and sun when growing, are usually considered unwholesome. Potatoes, stored for the winter, must be put in a cool and dry place, or they will sprout, and must be protected from the cold, or they may get frost-bitten.

The sweet potato, so much in favour in America, is rarely seen in this country.

Artichokes.—Two varieties of this vegetable are ordinarily seen in the markets when in season—the green and the purple, the latter being sometimes known as the French artichoke. The head should be fresh-looking, firm, well rounded, and of good flavour. It is better for being gathered two or three days. The Jerusalem artichoke is quite a different vegetable, not produced from seed, but from roots. The part used is not the flower-head, but the tuber. It comes in as its more esteemed namesake goes out, and continues in season the remainder of the year.

Asparagus.—This vegetable is largely imported from France, especially the "giant" varieties. It is a native of great Britain and easily grown, the best soil being a light sandy loam. It is sown in March, and ready for cutting in 26 months. It should be firm and white in the stalk, and have a deep-green compact crown.

Beans are of great nutritious value, especially haricot beans, which are gathered ripe. The haricot bean should be firm and full, the skin being smooth and white.

Broad beans are gathered when the beans are nearly mature, but unripe. The ordinary varieties are the "long-pod," usually containing seven or eight beans, and the short containing from three to five. The beans should be broad, kidney-shaped, flattened or concave at the sides, and in colour chocolate or greeny-brown.

French beans are gathered quite immature, the pod forming the bulk of the food-stuff. The pods should be long, tender and fleshy, and comparatively free from stringiness.

Beans are attacked when growing, and when stored, by a weevil (the bean beetle), the grub of which may often be seen in the bean.

Brocoli and Cauliflower should have large white compact heads. Any tinge of yellow or green generally indicates an inferior quality. Brocoli sprouts are purple in colour, and not compact in the head. Brocoli are "in" during winter and spring, cauliflowers during summer and autumn.

Cabbage, in one of its varieties, is in season all the year round. The small cabbage known as the "Savoy" is usually in good condition from May to August. Brussels sprouts are in season all through the winter. A good cabbage should be crisp and firm, and "heart" well. Borecole, or kale, and curled greens are excellent for winter use, some being hardy enough to stand the severest frost. There are many varieties of pickling cabbage, deep red and purple, with compact heads, or rosette-shaped, and in various sizes.

Cabbages, brocoli and cauliflowers are much damaged by the *larvæ* of three kinds of white butterfly, and the cabbage moth and turnip moth; and also impoverished by plant lice and many fungus parasites.

Sourkraut, now often sold in grocers' shops, &c., is prepared in Germany from ordinary full-sized heads of cabbage. The heads are cut in the late autumn, stripped of their outer leaves, and packed closely in layers in a hole in the ground, the hole being lined with dried garden leaves. Earth is filled in at the top to shut out the air, and if this be not heavy enough, a flag-stone or weighted board is added. In the course of a few months the cabbages are entirely changed, and are light

brown through to the cores. They are then taken up and packed in barrels with salt, and in a short time are ready for export as *sourkraut*. The change in the cabbages is similar to that which takes place in grass packed in a silo, and is of the nature of acid fermentation.

Carrots, parsnips, and beetroots are distinguished among vegetables for their richness in sugar. Bread has been made from all of them. When in great abundance they are sometimes used in distilleries for making spirits.

Carrots should be light red or yellow, of a regular conical shape, sweet and crisp. Young carrots are more tender and preferred for the table. They are in season from April till June.

Parsnips should be buff in colour, unforked in the roots, sweet and crisp. They are in season winter and spring. They should be stored in dry sand.

Beetroot should be deep red or purple, of a long oval or globular shape, fine-grained, sweet and delicate in flavour. It keeps well in dry sand, and is always seasonable.

The *larvæ* of the carrot-fly burrow into and spoil carrots and parsnips, often causing them to shrivel. A mildew also attacks parsnip roots. Beetroot is liable to be damaged by a nematoid—the male of which is like a worm, the female lemon-shaped.

Celery should be nearly white in colour, large, crisp, solid, and nutty in flavour. It is in season in winter and spring. It is fit for use for some time after being gathered. There is a variety of celery in which the root is large and turnip-shaped. This has been called *celeriac*. All varieties are eaten raw or cooked.

Much damage is done to the plant by the *larvæ* of the "celery-stem fly" and a fungus known as "red rust" and "black mildew."

Cucumber should be regular in shape, smooth in the skin, dark green in colour (some varieties light green), white-fleshed, and delicate in flavour. It is in season in spring, summer, and autumn.

Endive is a sort of winter lettuce, and should be crisp and succulent. When carefully tied up it blanches well. It is

ordinarily used as a salad and garnish. It requires much cleansing, as insects find their way right into the heart.

Lettuce is ordinarily in season from March to September, but some varieties of both cos and cabbage are seasonable in winter. The head should be close and compact, and the leaves should be crisp and sweet. When the lettuce is too young, or running to seed, the flavour is bitter.

Mildew often attacks the leaves. Its presence is indicated by pale patches, and it soon causes putrefaction.

Horse-radish.—This garden root is usually scraped raw, and used as a condiment and garnish. It is in season from October to June. There seems to be some risk of aconite root (a poison) being mistaken for horse-radish. Horse-radish is usually from 7 to 10 inches long, and as thick as a man's thumb, the full thickness being continued till close to the end. It is yellowy-white outside. Aconite root is usually from 1 to 3 inches long, not thicker than the finger at the crown, and tapering. It is blackish-brown in colour outside. A minute portion, cautiously chewed, causes prolonged tingling and numbness.

Mushrooms may be gathered in the fields in September and October, and forced mushrooms can be obtained all the year round. There are many edible British species. They will grow in any cool, shady place (in an outhouse in the winter), but the temperature should be fairly uniform, and not below 45° F. The cap should peel easily, the gills vary in colour from salmon-pink to brown, or nearly black. The stalk should be thick and frilled. No part of the mushroom is bright in colour, or has a hot or acrid taste. The little immature button mushrooms are usually used for garnish and pickling.

Onions are in season all the year, the imported Spanish onion from October to January only. Onions are grown in this country in great variety, the smallest being the silver-skinned ones used for pickling, the largest fully as big as the Spanish. The outside colour may be brown, red, yellow, white, or light green. They are all possessed of an acrid volatile oil, irritating to the eyes, but when boiled, should be mild in flavour. The bulbs should be symmetrical, well filled out, fine fleshed, and

small in the neck. They should keep well. Leek, garlic, and shalot all belong to the same genus.

Onion bulbs are attacked by eel-worms, the *larvæ* of the onion fly, "smut," mildew, and mould. When stored they are subject to putrefactive change, giving rise to a greenish slime on the surface.

Green peas are cultivated in numerous varieties. They are in season in June, July, and August, and much earlier when forced. The plant should not grow high, and should begin podding near the ground. The haulm should be strong. The pod should be nearly straight and well-filled to the end, containing from four to ten or eleven peas. The peas are wrinkled or smooth, grey, blue, or green, according to variety.

Peas are attacked, when growing and stored, by a weevil (the pea beetle), the grub of which feeds on the pea. The *larvæ* of the pea moth also spoil many peas.

Dried peas on keeping, become pale, shrivelled, and hard; but they keep better thus than as meal, which is very liable to become mouldy. Whole or in meal, peas are susceptible to the attacks of insects. The *acarus*, a sort of itch insect, may be well defined with a pocket lens.

Sea kale.—This plant is related to the asparagus, and derives its name from growing on certain sea shores. It is easily cultivated from seed or roots. It is in season from February to June.

Spinach.—There are many varieties of this, the best known, perhaps, being the "round leaved," the "strawberry," and the rapid-growing "New Zealand." It is ordinarily in season from March to July. The "prickly," or winter spinach, is in season from October to February. Spinach should be bright in colour, should last well, and not run to seed early. The leaves should be soft and succulent, and not stringy.

Tomatoes are cultivated in hot-houses and out of doors in this country; but large quantities are imported. They vary in colour from deep crimson to scarlet or yellow; in size, from that of a large apple to that of a cherry. Indeed, there is a currant tomato, producing bunches of fruit looking like fine red currants.

They are in season from August to October, and those grown under glass much earlier. The plant has an unpleasant odour.

Truffles are tubers, possessing an animal rather than a vegetable flavour, in this as in other respects somewhat resembling mushrooms. They are not subjected to regular culture, but grow some inches below the surface of the earth in damp calcareous soils, especially in oak and chestnut forests. They are of irregular form, ordinarily the size of a walnut, but sometimes attaining to the size of a turkey's egg, and have a rough, brown, warty surface. There are at least three species, black, white and red, but only the black, the most common, is ordinarily seen. They grow in clusters without roots. They are found in parts of England (Hampshire, Wiltshire and Kent, &c.), and in France, Italy, Spain and Holland. Large quantities are imported from France, the best coming from Perigueux and about Angoulême. They are seldom found twice in the same place, and they have to be scented out with the help of a pig or a trained dog. Truffles are in season from November to March. They should be light in proportion to their size, elastic when pressed and of fine aroma. They are in use chiefly for seasoning and garnishing. When dried much of their aroma is lost. The best way of preserving them is to partially boil them in tin, and then seal them up in their own diluted juice.

Turnips may be obtained all the year round, but young turnips (best suited for the table) are in season from April to June, and turnip-tops from March to May. The turnip should be regular in shape, firm-fleshed, white or yellow, and sweet. Turnip-tops should be bright green in colour, fresh and tender. The swede, a large buff variety of turnip, is coarse when full grown, but when young often sold for the table. There is a kind of turnip, the "navet," light buff in colour, and shaped like a carrot, especially full-flavoured. It is much esteemed in France, and sometimes imported to this country.

Turnips are much injured by parasites. The *larvæ* of the turnip moth eat roots as well as leaves. "Gall" is caused by the turnip-gall weevil—the female pierces the turnip and deposits an egg, the grub from which lives to maturity in the turnip, forming a swelling on the surface, called a gall. Clubbed

turnips, that is roots disfigured with knobs, are ordinarily infested with the club-root fungus.

Vegetable marrows are grown in this country in many varieties, under glass and in the open garden. They should be young, quite firm, bright coloured, and smooth on the surface, and of good flavour. They are in season July, August and September.

Vegetables, like fruits, are subject to disease, or may be in a state of decay. The chief indications are softening, change of colour and external mould. The insects and parasites attacking them have been already referred to.

Tinned Goods.—There is good reason for believing that nearly all tinned fruit and vegetables are more or less contaminated with tin, the amount present being from one-tenth of a grain to over one grain per pound. Fortunately, the metal is not known to be poisonous, except in large doses. Green peas and French beans, and some other preserved green vegetables and pickles, are frequently deliberately adulterated with copper, and this metal is undoubtedly injurious to the health of the consumer. The presence of copper can be detected by leaving the blade of a penknife in the liquor round the vegetables for a short time. The copper will deposit itself on the blade.

CHAPTER IX.

Corn, Bread and Flour.

Corn, different kinds—How distinguished when ground—Diseases of corn: Bunt, Smut and Ergot—Flour—Wheat flour—Varieties of wheat—Yield of a quarter of wheat—Good flour—Diseased, mouldy, damp, fermented and decomposing flour—Adulteration with other flours or starch—Mineral adulterants—Readily applied test for presence of alum—Bread defined—Wholemeal bread—Good bread described—Sodden, sour, bitter or mouldy bread—Adulteration of bread.

Corn is generally understood to include wheat, barley, oats and rye. Maize and rice also come under the term "corn." It is by far the most important food substance in use in this country, and if stored in a dry place keeps well. Barley will grow even in the Arctic circle, and oats in quite a cold climate. Rye requires more warmth, wheat yet more, and maize more again, while rice is the corn of tropical countries.

In all kinds of corn the bulk consists chiefly of starch contained in a husk. It is easy to tell one kind of corn from another before grinding. The difference in the structure of the husk and the size and shape of the starch particles, as seen under the microscope, serve to distinguish between the different kinds of corn when ground. Rice, as ordinarily sold, has been deprived of its husk.

Diseases of corn.—The most common diseases of corn in this country are bunt, smut, and ergot. *Bunt*, frequently affecting wheat, grows within its seed, producing a fine powder. This powder, rubbed between the fingers, feels greasy, and gives an unpleasant smell. *Smut*, most frequently affecting barley, oats, and rye, developes a fine powder like bunt, but it is finer, and has no smell. *Ergot*, for the most part confined to rye, developes early in the grain by taking the place of the solid

contents. It has a peculiar sour smell. The appearance of an ear of rye, when ergoted, is shown in Fig. 15. All these diseases are due to a low form of plant growing in the grain, and if the

FIG. 15.

powder produced be examined under a microscope, they may all be distinguished with certainty.

Little is known as to the effect of bunt or smut on those who may eat them, but eating ergot is distinctly injurious to health. However, no corn in which parasitic fungi have developed can be considered wholesome. Corn is also attacked by the *weevil* (an insect nearly as big as a grain), and by an *acarus* (too small to be seen by the naked eye).

Flour.—The term "flour" may reasonably be held to include groats, barley meal and oatmeal, ground rye, maize flour, and ground rice and rice flour. In other words, flour is coarse or fine ground corn.

Wheat-flour.—Ordinarily the term "flour," used without qualification, means wheat-flour. The varieties of wheat naturally divide into two classes, white wheat and red wheat. Most of the wheat grown in this country is unbearded, a few varieties are bearded like barley. Among remarkable varieties is a one-sided wheat, the spike yielding but one row of corns, and the so-called Egyptian wheat, the stalk of which is branched and bears several ears.

In the process of thrashing wheat is deprived to some extent of its husks, but when it reaches the mill it is well sifted before grinding. The quality of the flour is to a great extent dependent on the care exercised in grinding and dressing the wheat.

A quarter of wheat, weighing 504 lbs., is estimated to yield 333 lbs. of fine flour, 53 lbs. of "seconds," 34 lbs. of "middlings," 51 lbs. of fine and coarse pollard, 26 lbs. of bran, and 7 lbs. of waste.

Good flour should be of faint yellow colour, smooth to the touch, and not gritty or lumpy. If a handful be compressed it

should adhere, taking the form given it. It should be slightly acid to test paper (reddening litmus), but should not taste acid. When made into dough with water it should stick together well, drawing out easily into strings.

Flour may be made from diseased corn, in which case the presence of the spores of some fungus will probably be detected on examining it under the microscope. Flour may also be mouldy a condition which is at once known by the characteristic smell. It may be exposed to damp, to make it weigh heavier, when it is more liable to mould. It may have undergone a kind of acid fermentation. This gives it a peculiar smell, an acid taste, and makes it somewhat gritty to the touch. Flour may be in a state of active decomposition, when it will be moist, discoloured, and of an offensive smell. Flour is also subject to two forms of adulteration—it may be mixed with a cheaper flour, or meal, or starch, or with some mineral substance to increase its weight or improve its colour. Wheat flour is thus liable to be adulterated with the flour of barley, oats, maize, rice, and less frequently, rye or buckwheat, beans, peas, and linseed. Potato starch is also sometimes used for this purpose. Most of these adulterants can be certainly detected by examining the flour under the microscope. Some will appreciably alter the colour and taste of the flour, and would thus afford sufficient indication to one who is not an expert.

The mineral substances used as adulterants of flour are alum, chalk, gypsum, powdered soapstone, silicate and carbonate of magnesia and sulphate of barytes. All these, except alum, which is only added in very small quantity, can be readily detected by the simple process of burning the flour down to ash. The ash, which in wheat or maize flour would not exceed 2 per cent., and in barley, rye, or oats flour would not exceed 3 per cent., would be immensely increased. The best readily-applied test for the presence of *alum* is that known as the logwood test. It will give distinct indications, even though the proportion of alum in the flour be but a grain in the pound. The method of applying the test is thus given in Sir James Bell's handbook:—

"The re-agents required are recently-prepared tincture of logwood and a solution of carbonate of ammonia. The former

is prepared by digesting 5 grams of logwood chips in 100 cubic centimetres of strong alcohol; and the latter by dissolving 15 grams of carbonate of ammonia in 100 cubic centimetres of distilled water. The test is applied as follows :—A small quantity, say 5 grams, of flour is made into a paste with 5 cubic centimetres of water; 1 cubic centimetre of logwood solution is then mixed with the paste, and this is followed immediately by the addition of 1 cubic centimetre of the solution of carbonate of ammonia. If alum be present, the colour produced will be more or less lavender or blue, according to the quantity of alum in the flour; but if the colour be pink, which soon fades to a dirty brown, then, according to our experience, alum is invariably absent. Should there be any doubt as to the colour, the paste is put aside for several hours, and then, if alum be present, even in very small quantity, there will be a decided tinge of lavender on the sides of the capsule near the edge of the partly-dried paste." Obtaining the lavender tinge is not absolutely conclusive proof of the presence of alum or of any salt of alumina, but it is quite enough to cast some suspicion on the genuineness and wholesomeness of the flour. It is important to note that pure wheat flour has been found to contain a quantity of alumina equivalent to from 2 to upwards of 40 grains of ammonia alum per 4 lb.

Bread may be defined as the flour or meal of any corn mixed with water and dried or baked. The flour or meal may be freed from the husk or may contain part or the whole of it. The so-called "wholemeal bread" is made from the flour of wheat from which only the bran has been removed. The bread may be unleavened or it may be aërated with leaven or yeast, by kneading the flour with water charged with carbonic acid, or by means of a baking powder or a chemical compound. Thus bread includes oat cakes, passover cakes, water biscuits, black or rye bread, &c. The word is, however, in this country usually restricted to wheaten bread leavened, fermented, or aërated.

Good wheaten bread should be well baked (not burnt), light and spongy, the crumb being well permeated with little cavities. It should be thoroughly kneaded, of good colour (white or brown), not acid to the taste, not bitter, not too moist. When

set aside, the lower part should not become sodden. A 4-lb. loaf loses about 1¼ oz. in 24 hours, about 5 oz. in 48 hours, and about 7 oz. in 60 hours. This loss will vary with the temperature, draughts of air, &c.

Bread may have many defects. It may be sodden and heavy owing to bad flour or yeast, the sponge never having risen properly, or owing to imperfect baking. It may be sour owing to bad flour, or to fermentation having been allowed to proceed too far. A slight degree of sourness in leavened bread is not objected to. It may be bitter owing to bitter yeast. Finally, it may be mouldy, which is due to the bread having been too moist originally, having been kept in a damp place, or kept too long, or to bad flour having been used.

Wheaten bread may be adulterated with barley, maize, pea or bean flour, and with boiled rice or potatoes. For the purpose of improving the appearance of bread made from inferior, damaged, or mixed flour, a small quantity of alum is added. Its effect is to make the bread lighter and whiter. The quantity present is generally less than fifty grains to the 4 lb. loaf. The best rough test for alum in bread is the logwood test. The process, as applied to bread, is very simple. The tincture of logwood and solution of carbonate of ammonia, above referred to, are used. A teaspoonful of each is mixed with a wineglassful of water, and in this a piece of the crumb of bread is soaked for about five minutes. The bread is then removed and dried at a gentle heat. If no alum be present, the bread dries of a dirty brown colour; if a little be present the bread dries of a lavender colour; if much alum be present the bread dries of a dark blue colour.

CHAPTER X.

Milk.

Importance of its being pure—Good milk — Unwholesome milk—Epizootic disease, anthrax, cattle-plague, pleuro-pneumonia, foot-and-mouth disease—Tuberculosis—Garget —Primarily good milk infected with animal disease germs— Primarily good milk infected with human disease germs, diphtheria, scarlatina, and typhoid fever—The Hendon cow disease—Dishonesty or uncleanliness of milk-sellers— Sour milk—"Blue" and "red" milk—Tainted milk— Adulterated milk—Skimmed milk—Separated milk—Cream —Clotted Cream—Preserved milk—Butter milk—Koumiss —Kefyr—Galazyme.

Milk, though an animal food, occupies a position between this and vegetable food, and possesses to a considerable extent the nourishing properties of both. As it is largely used in a raw state, it is important it should not be infected with disease, and as it often forms the sole food of young children, it is important that it should be delivered without addition to it or abstraction from it. The milk ordinarily exposed for sale in this country is obtained from cows. There is also some sale for asses' and goats' milk, but it is inconsiderable. The same constituents are present in all, the proportions, however, differing appreciably.

Good milk is a yellowish-white opaque liquid, having a specific gravity of from 1026° to 1036°. It has a fresh smell and a bland sweet taste. After the milk is allowed to stand from four to eight hours the cream rises, and the remainder of the milk is less opaque, and nearly or quite white. The amount of milk a cow gives varies much. About twelve quarts is the average daily yield; just after calving it may be double this. Milk varies in quantity and composition with the breed of the cow, age of the cow, her health, the food given her, with the

number of her pregnancies, with the time since calving, and probably, to a slight extent, with the season of the year. The first milk obtained after calving differs most noticeably from normal milk. It is a rich yellow colour, clots more readily, tastes like beaten eggs, and has a specific gravity of about 1050°. This milk is called "colostrum," popularly the "beestings." At a single milking there is also considerable difference between the "fore milk" and the "strippings," the latter being richer in cream. Goat's milk is, as a rule, rather richer than cow's milk, ass's milk is rather poorer. The peculiar smell of goat's milk always serves to distinguish it. The specific gravity of goat's milk is from 1032° to 1036°, that of ass's milk from 1023° to 1035°. In using a lactometer it is important to remember that they are usually adjusted to 60° F., thus a correction should be made for temperature to the extent of nearly one degree in specific gravity for every ten degrees of temperature above or below 60° F. The whole of the cream never separates from milk, even if it be allowed to stand for twenty-four hours or longer; the percentage by volume which separates varies from 2 to 25 per cent. Usually it is from 6 to 12 per cent.

Unwholesome milk.—Milk may be unwholesome from various causes, viz.:—1. It may be derived from a cow suffering from a specific epizootic disease. 2. It may be derived from a consumptive cow. 3. It may be drawn from an inflamed udder. 4. It may have become infected with the germs of an animal disease. 5. It may have become infected with the germs of a human disease. 6. It may have become sour. 7. It may have become "blue" or "red." 8. It may be tainted from things stored near it. 9. Injurious substances may have been added.

Epizootic disease, fortunately, often arrests the secretion of milk, and in one disease especially liable to be injurious to man—*anthrax*—if there is any milk yielded, it is thick and of bad colour, probably containing traces of blood, and readily decomposes. Still there is a case on record where this disease was communicated to a child who drank milk from an infected cow.

Cattle-plague one has little of in this country. The milk is, as a rule, so diminished in quantity it is difficult to obtain a sample. In appearance it differs from ordinary milk far more

than colostrum. The sugar is scarcely a quarter of the normal amount, and the butter is very largely increased.

Pleuro-pneumonia does not appear to interfere appreciably with the milk secretion, and here, and in foreign countries, when the disease has prevailed, milk has been sold in the open market, and there is no way by which it may be recognised. Though there is no evidence of this disease being communicated to man, milk from a pleuro-pneumonic cow must be less than wholesome.

Foot-and-mouth disease nearly always exercises a marked influence on the milk supplied by the cow infected. The total yield of milk is diminished, it is richer in butter, and has a tendency to get stringy. It may contain traces of blood or pus, or small portions of sore-crusts. It soon sours, and sometimes has a faint cheesy odour. From the fact that sucking calves fed from infected animals get a very severe and fatal form of the disease, drinking the raw milk would appear to be one of the readiest ways of transmitting the disease. Children fed on such milk have developed an eruption in the mouth and throat and between the fingers, the eruption resembling that seen in infected animals. This milk should certainly be seized and destroyed when recognised.

Tuberculosis.—The question whether milk derived from a consumptive cow can be used for human food with impunity has been much debated. The almost unanimous opinion of those best qualified to judge is that such milk cannot be drunk without grave risk. It is proved that it can induce tuberculosis in many animals; and, there are a few isolated cases in which children have developed the disease after having been fed on milk from infected cows. There is therefore warrant for pronouncing tuberculous milk unfit for human food, and endeavouring to prevent its sale. As regards the quality of the milk, it is, probably, always somewhat deteriorated; but there is no means by which its identification is possible, even by an expert. It is quite exceptional to succeed in finding the bacillus of tubercle in such milk.

Garget is a very common term among cattle salesmen and farmers. For instance, when a pig suffers from repletion, it is

said to have garget of the maw; and in some parts of the country garget is used to signify a disease of the throat. Ordinarily the word means inflammation of the udder, and when milk is drawn from such an udder it is usually said to be gargety. Cows allowed to get into high condition, through being turned into a very rich pasturage, or otherwise, are predisposed to this. The most common causes of the malady are cold and exposure, over-distention of the udder from being long unmilked, bruising from unskilled milking, and pressure on the udder from an awkward way of lying. When from one or more of these causes inflammation of the udder is set up, great care is needed, or permanent injury may result. Taken in an early stage of the disease the most important indication is to milk the udder quite empty twice a day; but owing to the painfulness of the operation and the difficulty of getting the milk to flow, this can seldom be done.* It is, however, always attempted, so that a cow with garget is regularly milked. Being ropy and often quite curdled, and not infrequently containing traces of pus and blood it would not meet with a ready sale by itself; but mixed with the rest of the produce of a dairy (perhaps twenty times its volume of sound milk) it may pass muster. It should be borne in mind that this kind of unwholesome milk is especially liable to be mixed with good milk. Epizootic disease, being for the most part readily communicated, may affect the whole stock of a farm at the same time; similarly, ill-ventilated town cowsheds, in which animals are fed and stalled under the usually insanitary conditions, commonly have several inmates suffering from consumption at one and the same time; but cases of inflamed udder occur singly, and have no tendency to spread beyond the case first affected. There is, therefore, usually plenty of good milk to mix with the tainted, and it is ordinarily mixed. Again, inflamed udders being due to causes always obtaining, milk is probably very frequently tainted from this cause. Indeed, the admixture of gargety milk with good milk may be done inadvertently, the fact that one cow in a large dairy has garget being occasionally not noticed till after two or three milkings. That gargety milk is unwholesome is beyond doubt. Beside

being always changed in appearance, it will ordinarily contain some traces of blood or pus or broken-down tissue. It is not likely that gargety milk is ever sold unmixed. Even mixed there is evidence of its producing indigestion and diarrhœa. Of course such milk, when drunk, has no power to produce any disease at all allied to garget.

Primarily good milk infected with animal disease germs.— Milk from healthy cows may become infected with the contagium of an animal disease, in many ways. It will suffice to give three examples. In small dairies, where only a few cows are kept, and the horse for the delivery cart is stabled in the cowhouse (not an uncommon arrangement), milk may become contaminated with the contagium of *glanders*, a disease which is undoubtedly communicable to man, and by means of the nasal discharges which are given off so abundantly by affected animals. In the second place, where the dairyman and his employés are not as scrupulously clean and careful as they ought to be, milk may be fouled by portions of the bowel discharge, and if the cow should chance to have some disease, the specific contagium of which is contained in the discharge, the milk would assuredly be specifically tainted. Again, healthy milk may be infected with the contagium of foot-and-mouth disease. The contagium liquid is in the vesicles on the udder and teats, and these vesicles get broken in milking, part of the contents being mixed with the affected animal's own milk. If the milker, without washing his hands, proceed to milk an unaffected cow, the contagium will be mixed with her milk also.

Primarily good milk infected with human disease germs.— That good milk may become infected with the contagium of human disease is but too well known. Again and again outbreaks of diphtheria and scarlatina have occurred, the germs of the disease having been delivered in the morning's milk-can. Again and again have milk-pails, rinsed out in the polluted water, so contaminated the milk that customers drinking it have sickened with typhoid-fever. The dairyman's family is suffering from an infectious disease, or one of his employés, or the farmer from whom he buys; a few contagium particles get mixed with the milk, and the disease is soon spread over a

wide district. How many other diseases beside the three named may be carried by milk is as yet uncertain. It is at least probable that measles may be sometimes thus conveyed.

It is stated on evidence not quite sufficient to amount to proof positive that a certain cow disease, which has been conveniently called the Hendon disease, so affects the milk of the infected animal that it is capable of producing scarlet-fever in those consuming it. If further investigation should support this view one more will be added to the many dangers menacing those who drink raw milk.

The sum of the matter is, that wherever disease is communicated by milk, it is, with few exceptions, owing to the dishonesty or uncleanliness of milk sellers, wholesale or retail. Inspection to be effective must be not only of the milk shops and dairies, but of the cow byres and farms. The food inspector will ordinarily be able to ascertain where there is epizootic disease, and where there is human infectious disease, while inflammation of the udder is easily recognised. Indeed, with the help of the medical officer of health, he should be able to prevent the sale of milk specifically infected, tuberculous milk alone excepted. Unfortunately the prevention of the sale of tuberculous milk is rarely possible.

There is an objectionable form of delivery which must occasionally result in milk becoming infected with the germs of human disease:—the practice of milk-sellers leaving their own cans at houses and calling for them a little later. Such cans are commonly given back without being washed, and may be used again on the same round. This practice should be checked.

Sour milk.—Under the influence of an organism (called the bacillus of lactic acid) introduced from without, the sugar of milk is converted into lactic acid, and it is this which causes milk to turn sour. Milk only slightly soured, exposed or offered for sale as "milk," may be seized as unsound, and an application for an order to destroy it applied for. However, butter-milk is ordinarily sold somewhat "turned"; sour butter-milk may therefore be held to be the normal condition of butter-milk. When milk sours the part that forms the cheese, the casein, coagulates. In fresh milk the casein is combined

with phosphate of lime which keeps it fluid. The acid converts the neutral alkaline phosphate into an acid phosphate and the casein coagulates. Warmth, as is well known, assists the change—thus milk in which only a very little lactic acid has been formed, may appear perfectly fresh when cool and yet curdle on boiling.

The curd produced by the action of rennet on milk is different from that produced when milk turns sour or where acid is added.

"*Blue*" *or* "*red*" *milk.*—Neither of these milks are common. In each a special organism has been discovered, and the development of the organism in the milk occasions the change of colour. The change is quite marked enough to attract the attention of the food inspector. "Blue" milk looks dirty, "red" a light pink, as if slightly stained with blood. Neither of them would sell readily. It may be well to note here that the colour of milk is affected when the cow yielding the milk has been browsing on certain plants. Thus the polygonum and some other plants would give the milk a blue tinge, and the rhubarb and other plants would give the milk a red tinge. However, an expert would not mistake milk thus coloured for "blue" or "red" milk.

Tainted milk.—Milk readily becomes tainted by noxious vapours, liquids or solids. Thus coal-gas will taint it, paraffin, turpentine, urine, and the exhalations from contiguous middens. Tainted milk has the smell of the absorbed impurity, and is certainly unfit for human food. Milk may also be tainted by purgative or poisonous herbs, as meadow saffron and colchicum, which have been eaten by the cow. It is alleged that milk may be tainted when the cows yielding it have fed on sewage farms, or drunk from polluted ponds, but there is no reliable evidence in support of the theory.

Adulterated milk.—Of the many adulterants added to milk, water is the most common, and this water may be dirty or (as already stated) infected with the germs of disease. The specific gravity, taken in conjunction with the amount of cream, will enable the inspector to judge if the milk has been watered to any considerable extent. Taking the specific gravity alone gives

no useful information whatever, and indeed would probably lead the inspector to suspect an unusually rich sample of milk of being watered. The amount of cream varies so much that the inspector will not be able to detect the abstraction of cream. The method of analysis adopted by chemists consists in ascertaining the percentage of fats and non-fatty solids and the incombustible matter (ash) in a sample, and from the results obtained they form an opinion as to whether the milk is watered or skimmed, and the amount of water added or cream removed. In an individual cow, Sir J. Bell finds the fats vary from 1·92 to 6·87 per cent., and the non-fatty solids from 8·00 to 11·27 per cent. The other adulterants of milk, cane sugar, glycerine, carbonate of soda, salt, starch, borax, salicylic acid, &c., are many of them innocent. Some are added simply to make the milk keep, others to cover the addition of water. Annatto, or other colouring matter, is often added to make the milk look rich. Whether chalk is ever added may be doubted; as milk should have no sediment on standing, chalk would be easily detected. The presence of any of the adulterants named would be indicated if a sample of suspected milk were submitted to analysis.

Skimmed milk is simply milk from which the cream has been removed by skimming after it has stood some hours. It is perfectly lawful to sell skimmed milk, provided it be sold for what it is. Milk with a specific gravity of 1026 would ordinarily, after skimming, have a specific gravity of 1030.

Separated milk is milk from which the cream has been removed in a machine called a "cream separator." The milk is placed in a horizontal rotating vessel, driven at the rate of 6,000 revolutions per minute, which sends the milk to the circumference, the cream coming to the centre of the upper part of the vessel. Arrangement is made for the gradual removal of both cream and separated milk. There is also a vertical rotating cream separator, which at a reduced rate of speed is said to be as effective. Almost the whole of the cream is separated from the milk, and in this respect separated milk differs from skimmed milk, in which only the cream which rises is removed.

Cream varies in composition according to the quality of the milk from which it is obtained, and the method used in obtaining it. In skimming it from cold milk a varying proportion of milk is removed along with it. The proportion of fat in cream ranges from 25 to 40 per cent.

Clotted cream, sometimes called Devonshire cream, is solid, not fluid like ordinary cream. The milk from which it is collected is allowed to remain for about twelve hours, and then heated over hot plates, to cause slight coagulation of the albuminous matter, and a more complete separation of cream. It keeps much better than the ordinary cream. The proportion of fat it contains is usually from 56 to 60 per cent.

Preserved milk is now largely sold in airtight tins. It is condensed by the simple process of removing water by evaporation. Two kinds are ordinarily sold, that sweetened by cane sugar, and the "unsweetened." The milk is reduced to about one quarter of its original volume. The sugar added is stated to be from 1 lb. to 1¼ lbs. for every quart of condensed milk. Sweetened condensed milk keeps well, but "unsweetened" does not remain good for any length of time after exposure to the air.

When milk, deprived of part of its cream, is condensed, the product looks better, and is more pleasant in flavour than when a rich milk is used. However, there is no reason to believe that cream is ordinarily abstracted from condensed milk.

Unsweetened condensed milk, imported from abroad, is occasionally mixed with four times its weight of water and sold as pure new milk. The boiled flavour of such a mixture would ordinarily serve to distinguish it from new milk.

Butter-milk is the milk left after the manufacture of butter. It is thicker than new milk, slightly sour, and the casein, though coagulated, is in a finely-divided state. The proportion of fat is usually less than one per cent.

Koumiss is an alcoholic drink made by the fermentation of milk. It is prepared in Asia from mare's milk and camel's milk and in this country from cow's milk. Koumiss is made by the Tartars as follows:—One part of sour milk is mixed with ten parts of warm fresh milk, and a small quantity of sugar, and

stirred from time to time. In three or four hours part of the sugar of the fresh milk is changed into lactic acid and part undergoes alcoholic fermentation—that is, is changed into carbonic acid, alcohol and water. There is, doubtless, also some change in the casein making it more digestible. Koumiss contains from 1 to nearly 3 per cent. of alcohol, and a little over or a little under 1 per cent. of fat. The name *kefyr* is given to fermented cow's milk made in the Caucasus. The koumiss manufactured from cow's milk in England is of three qualities, the one being neutral, one slightly acid and one very acid. Even after bottling it is not constant in quality, the acid fermentation, and to some extent the alcoholic fermentation, continuing. A drink somewhat similar to koumiss is *galazyme*. A solution of sugar and a special ferment are added to a bottle of milk, which is then corked and tied down. The result is an effervescing beverage containing about 1 per cent. of alcohol.

CHAPTER XI.

ARROWROOT AND SIMILAR PREPARATIONS.—BUTTER AND ITS SUBSTITUTES.—CHEESE, LARD AND EGGS.

Purified Starches—Arrowroot—Sago—Pearl sago—Tapioca, tapioca flour—Corn-flour—Farina—Tous les mois—Semolina—Revalenta-arabica—Macaroni and vermicelli—Butter—Rancid butter—Adulterated butter—Margarine—Le Dansk—Cheese—Adulterated cheese—Cheesine—Skim-cheese—Soft cheeses—Parasites—Damaged cheese—Lard—Adulterated lard—Eggs—How to tell fresh eggs—Preserved eggs.

IN this and the following chapters it is proposed to treat of foods not mentioned in the Public Health Act. This chapter will deal with arrowroot, sago, tapioca, corn-flour, farina, &c., as well as butter, margarine, cheese, lard, and eggs, leaving for the two next chapters, tea, coffee, cocoa and chocolate, sugar, honey, treacle, mustard, pepper, Cayenne pepper, spices, salad oil, vinegar, and certain foods sold cooked.

Though, as has been already stated, the term "flour" may he held to include the flour or meal of any corn (wheat, barley, oats, rye, maize and rice), it does not include preparations of purified starches, the best known of which are arrowroot, sago, tapioca and so-called "corn-flour." It is well to remember that all these, being nearly pure starches, are incomplete foods by themselves, and cannot take the place of flour. Combined with flesh-forming and bone-forming material prepared starches are excellent food. Chemically all the starches are alike, but under the microscope each description of starch is readily distinguished by the form, size and marking of the granules. The envelope of the granules being tough, starch is indigestible in a raw state. To make starch digestible it must be heated sufficiently to rupture the granules. The descriptions of starch

having large granules rupture at a comparatively low temperature (113° F.), the descriptions with small granules require to be heated to nearly 194° F. to insure rupture. The proportion in which one starch is mixed with another is estimated by means of the microscope.

Each kind of starch has its own peculiar flavour.

Arrowroot is derived from the rhizomes (underground stems) of a plant which is a native of the West India Islands, India, and the tropical parts of America. Several species of this plant, *Maranta*, are cultivated for the manufacture of arrowroot. The plant is from 4 to 6 feet high, with broad pointed leaves, and the rhizomes are long and pointed and as thick as a finger.

The preparation of arrowroot is as follows:—the rhizomes when mature are dug up, washed, peeled, and reduced to pulp. The fibrous matter is then separated from the starch by washing the pulp in a sieve. The starch which passes through the sieve with the water is again repeatedly washed till pure, when it is dried. The rhizome yields at most about 25 per cent. of starch. The value of arrowroot depends largely on its purity, and this is generally fairly indicated by its brilliancy and whiteness. Arrowroot consists simply of starch, about 16 per cent. of water and a trace of mineral matter.

Arrowroot is adulterated with cheaper purified starches, or these may be even substituted for it and sold under the name of arrowroot. It is not possible to distinguish arrowroot from any pure starch by simple inspection or chemical analysis, but this is done with certainty by means of the microscope. Even a small admixture of another starch can be detected. Curcuma starch, a preparation manufactured in the East Indies, is an adulterant which, however, very closely resembles arrowroot.

Sago is manufactured from the pith of the stems of several species of palm. The sago palm grows in the islands of the Indian Ocean and in the south-east of Asia. It attains a height of 20 to 30 feet, and measures 5 or 6 feet round the trunk. The tree is cut down at maturity, and the trunk cut into lengths of 6 feet or more, and split lengthwise. The pith is then scooped out and powdered and washed with water till the starch has been separated from the fibre. A sieve or similar

apparatus is used as in preparing arrowroot. After repeated washings the starch is dried. The produce of the trunk of a single tree may exceed 500 lbs. of sago, and after the trunk is cut down a new trunk grows from the root.

Pearl Sago, large and small, is prepared from sago flour by mixing it with water into a paste and granulating it with a sieve. Pearl sago is dried in shallow pans over a slow fire, a large proportion of the starch granules being ruptured and much of the starch gelatinized. Pearl sago consists of starch, about 15 per cent. of water, and a trace of mineral matter.

Sago is rarely adulterated, but sago flour, which is largely used in making household starch, may be adulterated with potato starch, or the latter may be substituted for it.

Tapioca is derived from the tuberous roots of several species of the cassava plant, cultivated in Africa and tropical America. The plants grow to a height of 5 or 6 feet, and are propagated by cuttings. The tuberous roots are about 14 inches long and from 4 to 5 inches thick. The tubers, which occur in clusters, are washed and peeled and reduced to pulp. The pulp is pressed and the juice therefrom allowed to settle. The deposit is repeatedly washed and then sun-dried, and the outcome is *tapioca flour*. The remainder of the pulped tubers (what is left after the expulsion of the juice) is used for making cassava meal and bread. Tapioca, as known to commerce, is made by heating the deposit from the cassava juice when moist on hot plates, and stirring it. A large portion of the starch granules rupture, and much of the starch is gelatinized. Tapioca, therefore, except in derivation and external appearance, closely resembles pearl sago. Tapioca consists of starch, about 15 per cent. of water, and a very minute trace of mineral matter.

Tapioca is rarely adulterated, but it might be with a cheaper prepared starch.

Corn-flour is not the flour of maize or rice, but a preparation therefrom. Much of the flesh-forming and bone-forming parts of the flour are extracted by soda or lime. About 2 per cent. of flesh-forming and bone-forming matter is left. There is rather less water than in arrowroot, pearl sago, and tapioca, and more mineral matter.

Farina literally means simply flour, but the article ordinarily sold under this name is a purified starch made from potatoes. The potatoes are washed and peeled and reduced to a pulp, and the fibrous matter separated from the starch by washing, as in the preparation of arrowroot. Farina, being cheaper than other starches, is not adulterated.

Tous les mois is the French name given to another purified starch, made from the rhizome of the *Canna edulis*, a plant grown in the West Indies. It is prepared like arrowroot.

There are many preparations of farinaceous food which do not come within the description "purified starches." Thus, there are (1) certain granular preparations of wheat, &c., such as *semolina*, made from the inside of the grain of wheat; (2) certain proprietary foods, of which *Revalenta-arabica* will serve as an example, largely composed of the highly nutritious flour of lentils; and (3) *macaroni* and *vermicelli*, made from hard Italian wheat, with or without the addition of eggs. The meal or flour used in the manufacture of macaroni and vermicelli is derived from the inside of the grain (*semoule*) which must be of good quality, soft or tender wheat being useless for the purpose. In macaroni made with eggs, the proportion is four or five to the pound of flour. These being worked up together, the paste is damped with hot water, and kneaded and rolled out into very thin sheets, which are left till dry on the surface, and then rolled up tightly and cut. Water macaroni and vermicelli is manufactured from dough of semoule and hot water. The dough is rolled out and cut into ribbons, or forced through moulds, which give it its familiar forms.

Butter consists of the fatty portion of milk—chiefly cow's milk. It is suspended in the milk-liquid in the form of minute fat globules. When milk is left at rest some time, most of the fat globules (being lighter than the rest of the milk) rise to the top, forming a layer of cream. The cream, which contains casein and milk-liquid as well as fat, is ordinarily removed by skimming, and violently shaken or beaten up in a churn or other suitable vessel, till the fat globules unite and form a mass. This mass, carefully washed and squeezed, with or without the addition of salt, is the butter of commerce.

Butter varies much in colour, flavour and quality. The colour ranges, according to the season and the food and breed of the cow, from deep yellow to almost white. The flavour is influenced by the food of the cow, and the quality by the state of the cream, the method of churning and making up the butter, &c.

Carefully prepared butter has a pleasant odour and agreeable taste, and is of the same consistency and colour throughout. It is easily cut and moulded into shapes, and melts to a light coloured oil. It always contains water and curd and a trace of mineral matter, and nearly always a minute portion of sugar of milk. The curd is especially liable to decompose, and the change in the curd is soon followed by decomposition of the fat; hence the addition of salt as a preservative. Butter fat, freed from curd and water, and fairly excluded from the air, will keep a long time without change.

It seems superfluous to say that butter of fine flavour cannot be made from sour cream. Yet much butter is made from sour cream, particularly in small farms and dairies. The best method of collecting cream for churning and securing its sweetness is by setting the milk to cream in iced coolers. Where there is a large quantity of milk to be dealt with, it is convenient to use the cream separator, an apparatus already described. The temperature of the milk at the time of churning should be raised to from 55° to 65° F. In some places the entire milk is churned instead of the cream only, this practice prevailing where there is a ready market for butter-milk.

The amount of fat in butter ranges from about 80 to 90 per cent. The amount of water generally ranges from 7 or 8 to 16 per cent., and any amount exceeding this is injurious to the keeping qualities of the butter. The amount of curd should not exceed 1 or 2 per cent.; when the butter is badly made there may be as much as 5 per cent. present. The amount of salt in butter varies much, from less than 1 per cent. to 15 per cent. There is no clear distinction between salt and fresh butter, so much depends on custom. A degree of saltness which would be allowed in fresh butter in one county might constitute salt butter in another.

Rancid butter.—The fat of butter consists of many fatty acids in union with glycerine. On the decomposition of the fat, butyric and other acids are liberated and the butter is said to be rancid. At first it has a cheesy, and afterwards, as the rancidness increases, an acrid taste.

Adulterated butter.—There is no doubt that occasionally the practice is resorted to of working up a quantity of water with butter (in addition to the water incorporated in the process of manufacture) for the purpose of increasing the weight. Butter thus treated must be regarded as adulterated. There is an instance on record in which upwards of 42 per cent. of water was found in a sample of butter. An undue proportion of salt may also be regarded as an adulteration. Sometimes this appears to be added to enable the butter to take up more water. An instance is on record in which upwards of 28 per cent. of salt was found in a sample of butter. The amount of water allowable in butter should not exceed 16 per cent., and the amount of salt should not exceed 8 per cent. It is stated that butter is adulterated with flour or mineral matter, but such frauds must be very uncommon and could be easily detected. Ordinarily adulterated butter is butter mixed with other animal fats or vegetable fats; or such fats coloured and salted and churned up with a little milk to give them the appearance and flavour of butter. Such admixture or substitution can be readily and certainly detected owing to the difference in the specific gravity of butter fat and foreign fat, and the difference in their melting-points. Chemists are also guided by the difference in the proportion of soluble and insoluble acids yielded by butter fat and foreign fat. Admixtures of quite small quantities of margarine can also be detected by examining the sample through a microscope under a polarized light.

Margarine was up to the time of the passing of the Margarine Act called butterine. It cannot of course adequately take the place of butter, but is a wholesome low-priced substitute. It should be made from perfectly fresh ox fat, the fat ordinarily being derived from the omentum (the "kells") and the mesentery. These are hung up to cool, soaked in warm and cold water to cleanse them, and then mixed in an apparatus resembling a

sausage machine. The minced fat is then put in a pan heated to a temperature of 120° F. by a steam coil or otherwise. After melting the clear fat is drawn off and cooled slowly at a temperature of 70° F. Then the granulated fat is packed in small canvas bags and subjected to hydraulic pressure. The connective tissue, if any, and stearine remain in the bags—nearly all the oleomargarine (about 50 per cent.) is pressed out. The latter is churned up, at a temperature of about 70° F., with milk, colouring matter (annatto) and sometimes a little carbonate of soda. The product is suddenly cooled and then churned again. Finally, about five per cent. of salt is mixed in, and the butterine (now called margarine) is ready for the market. This process is varied more or less in different factories, and in some a certain proportion of olive oil or nut oil is mixed with the sweet fat. Margarine resembles butter in appearance and keeps well.

Le Dansk is the name given to a butter substitute lately introduced into this country from France. Clean fat is cut up and melted at a temperature of about 120° F., and cooled slowly, and the oleomargarine separated from the stearine, &c., by hydraulic pressure. The product is then churned up with new milk and oil and pure butter, cooled in iced water, salted and packed.

Cheese is made from whole milk, or skimmed milk, or milk enriched with cream. Its colour, flavour and quality vary according to the breed and food of the animals giving the milk, the richness of the milk, and the mode of manufacture and age or ripeness of the cheese. The process of cheese-making may be described as follows :—The milk is first heated till it reaches a temperature of about 80° F., and converted into curds and whey by means of rennet. When annatto or other colouring matter is used it is usually stirred in with the rennet. The coagulation should be completed in an hour, and then the curd may be cut up or gently broken down and stirred and left to settle. As it is needful that the curd should develop a little acidity, this is effected in various ways. Thus the curds and whey are heated to a temperature of 98° F. and allowed to stand, or a little sour whey is added with the rennet, or the souring of the curd is not encouraged till the whey is drained off or

removed with a syphon. Sweet curd gathered in a heap, covered with a cloth, and allowed to stand for an hour or so, becomes slightly acid. Again, the curd may be put into the press-vats quite sweet, and the necessary acidity will be produced in a few hours. In cheese factories the breaking up of the curd is effected in curd-mills. If the curd is rich in fat only a little salt is needed to prevent excessive fermentation in the churn; if the curd is poor more salt is needed. Excess of salt spoils a cheese, preventing its ripening. The curd is pressed in cloths in the press-vat for two or three days, during which time the cheese is turned from time to time and the wet cloths changed for dry ones. From the press the cheese is taken to the curing-room (which is kept at a uniform temperature) to mellow and acquire flavour. The ripening is due to slow fermentative changes, and cannot be hastened. When it is complete the constituents of the cheese are similar to those of milk, except that the milk sugar is in part changed into lactic acid, and in part into alcohol and carbonic acid. There is also present some common salt, and usually a little colouring matter.

The best known cheeses produced in this country are probably Cheshire cheese, Cheddar cheese, double Gloucester cheese and Stilton cheese. The first three are made from whole milk, Stilton from a mixture of whole milk and cream. American cheese, largely consumed in this country, is ordinarily made from whole milk, and more uniform in quality than English cheese.

Adulterated Cheese.—Annatto, or some other vegetable colouring matter, is the only foreign ingredient ordinarily found in English cheese, and as long as this is not injurious it need not be considered as an adulteration. It is reported that starches have been occasionally worked up with the curd, which would constitute an adulteration, but the practice cannot be common and is easy of detection. Pastes and washes containing arsenic, lead or other poisonous metals, are sometimes applied to the surface of cheeses to preserve them from the attacks of insects. This may be termed injurious adulteration of the rind, and is easily tested for.

However, for some years past an inferior American cheese has been imported in which the natural milk-fat has been replaced by ordinary animal-fat. The fats used appear to be either lard or oleomargarine, and the cheeses thus made are known to the trade as *cheesine*. Probably a sort of artificial milk is first made by shaking up foreign fat with warmed skim milk, and then cheese is made as it would be from new milk. Such an article sold simply as cheese must be regarded as adulterated, and the adulteration can be detected by analysis. Cheese made in this way may be of good flavour, and is doubtless quite wholesome. There is no objection to it, if sold at a low price for what it is. Even the term "cheesine" is not definite enough. Cheese made with lard should be called *lard cheese*, and that made with oleomargarine should be called *margarine cheese*.

Good English or American cheese ordinarily contains from 30 to 40 per cent. of water, from 25 to 35 per cent. of fat, from 25 to 35 casein, under 1 per cent. free acid and under 2 per cent. of salt. A cheese containing less than 25 per cent. of fat is probably not a whole milk cheese, and a cheese containing less than 10 per cent. of fat should be classed as *skim cheese*. A very rich cheese, such as Stilton, ordinarily contains less than 30 per cent. of water and more than 35 per cent. of fat; and a very dry cheese, such as Parmesan, will contain less than 30 per cent. of water, much less than 20 of fat, and more than 40 per cent. of casein. Dutch cheese is also below the standard as regards fat, and has 4 or 5 per cent. of salt.

Soft cheeses.—In the manufacture of soft cheeses the rennet is ordinarily added to the milk at a low temperature, the development of acidity in the curd is not encouraged, and the cheese is subjected to very little pressure. The cheeses best known in this country are English cream cheese, which varies much in quality, but usually contains very little (say 5 per cent.) casein and upwards of 50 per cent. of fat, and Neufchatel cheese, containing 15 to 20 per cent. of casein, and about 40 per cent. of fat. There is a favourite soft cheese imported from France (Roquefort), which is made from ewe's milk. It contains less fat and much more casein than English or Neufchatel cream cheeses.

Parasites.—The blue mould, so much esteemed, and also the red mould, are vegetable fungoid growths, and specially affect the finer and richer kinds of cheese. The maggots, often found in new cheese, are the larvæ of the piophila fly. The cheese-mite (*acarus*) attacks, for the most part, old and dry cheeses. Ordinarily cheese is not considered unsound owing to the presence of parasites, but cheese may be so badly infected with multitudes of maggots or mites as to justify seizure.

Damaged cheese.—Cheese may be so damaged, from sea water for instance, as to warrant its being seized; or through being kept in an unsuitable place or otherwise, the butter fat in it may become rancid.

Lard is the fat of swine rendered at a temperature of 120° F., and freed from connective tissue. The fat is cut up and melted in a vessel heated by steam coil or otherwise, and then the clear liquid is run into bladders or kegs or tierces. Lard should be white and free from smell. It should also be free from all but the merest trace of water, not more than one part in 300. Sometimes a small portion of salt is added during melting. Its specific gravity usually ranges from 903·5 to 905 at 100° F.

Adulterated lard.—Flour or starch, it is said, is sometimes added to the lard, but this would only rarely be done, as the sophistication would be noticed by most housewives. There is no doubt water is often worked up with lard, even in considerable quantity, but this too is easily detected. Lately it has been found that cotton-seed oil, or other cheap flavourless oils, are used for the adulteration of lard. Experts are able to prove the adulteration, and estimate the quantity of foreign oils present.

Eggs, like milk, form a complete food, but only if the shell be included. As eaten, they are a highly nutritious food in a very digestible form. The eggs of the domestic fowl are those chiefly used for human food, but those of the duck, goose, turkey, guinea fowl, and plover are also used. Eggs of all birds have the same composition, but their flavour depends on the bird laying them and its food. The white of the egg consists of albumen and water, and a very small amount of fats and salts. The yolk consists of water and albuminous matter and fats, and a very small amount of colouring matter and salts. The egg albumen coagulates at 158° F.

The egg of the domestic fowl weighs from 600 to upwards of 950 grains. The average weight is 750 grains, of which 105 grains are shell, 405 white and 240 yolk. The white contains about 85 per cent. of water, the yolk about 51 per cent. An egg weighing two ounces is estimated to contain nearly 200 grains of solids.

The food inspector may often be called upon to judge of the freshness or otherwise of eggs exposed for sale. Dealers commonly test them by holding them up one after the other before a candle—fresh eggs are most transparent in the centre, old ones at the top. Another way of testing eggs is by putting them in salt water (two ounces of salt dissolved in a pint of water). Good eggs sink in salt water, indifferent ones swim. Really bad eggs float in fresh water, but these may sometimes be known by the smell even when the shell is whole.

Eggs may be preserved for many months by various devices which prevent the entrance of air through their porous shells. Thus they may be covered with salt which soon gathers moisture, or coated with gum, or buttered and wrapped in paper, or painted over with a solution of beeswax in warm oil, or placed in lime water containing a little cream of tartar. For a comparatively short time eggs may be kept by boiling them for half a minute. Eggs may be removed from their shells and dried, but they keep better if previously mixed with a little flour or ground rice.

CHAPTER XII.

Tea, Coffee, Cocoa and Sugars.

Tea—Compressed tea—Adulterated tea—Coffee—Adulterated coffee—Chicory—Cocoa—Adulterated cocoa—Chocolate—Sugars—Cane sugar—Beetroot sugar—Maple sugar—Jaggery—Treacle—Glucose—The sugar-mite—Sweetmeats—Honey.

Tea is the dried leaf of the Chinese plant *Thea sinensis*, the Assam plant *Thea Assamica*, &c. It is an evergreen, and in cultivation not allowed to attain to its full growth, but kept as a dwarf tree at from three to six feet. Only the young leaves are used, those from two inches long and under, but usually there are present portions of young branches and flower buds. The leaves are gathered several times a year, and the tea prepared from the first, or early spring gathering, is the best. The finest teas, other things being equal, are produced from young plants. The difference in the many varieties of teas imported depends not alone upon the age of the plant and leaves, the differences of soil, climate, and cultivation, &c., but largely also upon the process followed in manufacture. Whatever the mode of preparation adopted, the process proceeds on these general lines :—The leaves after gathering are artificially warmed, or thrown into a heap to develop heat, or beaten with the hand till they are sufficiently soft to roll, and then (with or without previous exposure to the air for some hours) dried over a charcoal fire. Except in rapidly made teas a certain amount of fermentation takes place before rolling and drying. After the drying is complete the tea is sorted and sifted and hand-picked. Ill-dried leaves are thus removed, and the whole gathering is divided into many parcels, each containing leaves of nearly the same size.

The difference between green tea and black is that the former is rapidly made from choice young leaves, more carefully

rolled and not subjected to fermentative change. Some of the best known varieties of green teas are Hyson, Young Hyson, Gunpowder, and Imperial; some of the best known varieties of black teas are Congou, Moning, Oolong, Souchong, Indian Souchong and Assam. Some teas are scented to impart an agreeable flavour, as scented Pekoe, the leaves of which are placed in contact with the flowers of the *Olea fragrans*.

Tea is not a food but a stimulant. Its most important constituent, which is easily isolated and identified by chemists, is a crystalline substance *theine*. Beside this, there is in tea a very small quantity of an essential oil (to which much of the smell of tea is due), albumen, tannin, woody fibre, resin, gum, &c., water and incombustible matter or ash. The proportion of theine in tea ranges from about 1½ to 3½ per cent., the proportion of albumen or vegetable casein is about 17 per cent., the proportion of tannin is from 10 to 27 per cent., the proportion of woody fibre is from 20 to 35 per cent., the proportion of resin, gum, &c., is 7 or 8 per cent., the proportion of water is from 5 to 12 per cent., and the proportion of ash from 3½ to 8 per cent.

Tea of good quality should have delicacy and fulness of flavour and a certain amount of body. Its value depends upon this rather than on the amount of theine it contains.

Compressed Tea.—Tea compressed into hard tablets differs in no respect from ordinary tea, except that the finer teas are not prepared in this way, and that sometimes a little starch water or similar preparation is used to assist the tea to bind. The brick-tea of Thibet differs from this—little care is bestowed on the cultivation of the tree, and the leaf is coarse. The leaves are exposed to the sun till flaccid, hand-rolled, and put aside to ferment, then pressed into wooden moulds and dried with charcoal fires.

Adulterated tea.—When tea was high-priced probably few articles were so generally adulterated. Now it is quite exceptional to find tea adulterated at all, and the little there is has been usually adulterated before being shipped to England. The adulterations which have been practised are as follows :—

1. Leaves from which an infusion has been obtained and which are partially exhausted have been re-dried and added.

2. Leaves from other plants such as the sloe, willow and elder, have been prepared and added.

3. Black teas have been coloured or "faced" with Dutch pink or plumbago. Green teas have been faced with Prussian blue or indigo, French chalk or sulphate of lime.

4. Sand, magnetic oxide (iron filings) and gum or rice water have been added.

Tea adulterated with partially exhausted leaves might be tested by making an extract from a given quantity of the

Fig. 16.

suspected tea, evaporating it down to dryness, and seeing if it was markedly below the amount of extract yielded by tea

Fig. 17.

of the description indicated. A considerable admixture of exhausted tea would be thus detected, but not a small admixture.

The adulteration of tea with the leaves of other plants is easily detected by making an infusion in the usual way and unrolling many of the leaves.

Fig. 18.

The appearance of the genuine tea leaf is given in Fig. 16, that of the sloe leaf in Fig. 17, the leaf of the willow in Fig. 18, and the leaf of the elder in Fig. 19.

Fig. 19.

Artificial colour or facing of tea may be washed off by shaking up the tea in cold water. The substances used may

then be seen under the microscope, or their presence proved by chemical tests.

The presence of sand and the amount of it can be demonstrated by reducing a weighed quantity of tea to ash. For demonstrating the presence of magnetic oxide the tea may be powdered and stirred with a magnet. Starch may be washed off the tea with cold water and tested for in the usual way.

Coffee is the seed of an evergreen plant, the *Caffea Arabica*. In cultivation it is not allowed to attain to a height of more than about six feet, a third of its natural height. The fruit of the plant is a dark scarlet berry, the size of a small cherry. Each berry usually contains two beans, enveloped in (1) an inner skin, (2) a tough envelope known as the parchment, and (3) an outer husk. The natives sun-dry the berries, and remove the outsides by passing them between rollers; but the European planter, dealing with large quantities, uses a "pulper," a kind of mill, into which the fresh berries are thrown, with a stream of water—the husk is thus removed as pulp and the beans left in parchment. Small portions of the inner skin of the husk are often attached to the bean. The coffee tree begins to produce when three or four years old. The beans are sorted according to size by machinery, and then roasted at a temperature of 320° F. A small proportion is retailed raw. Mocha coffee is considered the finest. The coffees of Java and Ceylon have also a good reputation for quality. Coffee is largely grown in Jamaica, India and Brazil.

Coffee, like tea, is not a food, but a stimulant. The most important constituent of coffee, raw or roasted, is a crystalline substance *caffeine*. Beside this there is in coffee, fat, legumen or albumen, caffeotannic acid, woody fibre, sugar and gum, water and incombustible matter or ash. As a result of roasting caffeone is produced, an oil which gives the coffee aroma, and the woody fibre is much changed and rendered more brittle. The proportion of caffeine in coffee is about one per cent. (roasting somewhat reduces the quantity), the proportion of fat is 12 or 13 per cent., the proportion of legumen or albumen is 10 to 13 per cent., the proportion of caffeotannic acid is from three to five per cent. (about twice as much in raw coffee), the

proportion of woody fibre is from 34 to 50 per cent. The proportion of sugar is about nine per cent. in raw coffee, nearly all of which is changed by roasting into caramel (burnt sugar), which gives to coffee infusion its rich brown colour. The proportion of gum is less than one per cent. in raw coffee, about 1⅓ per cent. in roasted coffee. The proportion of water is about nine per cent. in raw coffee and about one per cent. in roasted coffee. The incombustible matter, or ash, ordinarily amounts to nearly four per cent. in raw coffee, and nearly five per cent. in roasted coffee.

The value of coffee depends upon the country or district from which it comes, and its aroma and flavour, more than upon the amount of any of its constituents.

Adulterated coffee.—As coffee beans vary much in size and weight and quality, it is possible, by careful sorting, out of one crop to obtain varieties so different in appearance that they may be sold as Mocha, Java and Ceylon. Though a green colour is ordinarily evidence of immaturity, small beans of Brazil coffee, according to a recent report, are dyed green, and sold as a choice product of Arabia. Adulterated ground coffee has also been compressed by machinery into the shape of coffee beans.

Coffee, as ordinarily sold, that is roasted and ground, may be adulterated with chicory, dandelion root, mangolds, carrots, parsnips and turnips, peas, beans, acorns, date stones, locust beans and pods, corn and figs. These roots, seeds, &c., after roasting and grinding, sufficiently resemble coffee in general appearance to permit of their being added to it in varying quantities without attracting attention. There is not one of them, however, which resembles coffee under the microscope or has the same chemical composition; thus coffee adulteration may always be detected by microscopical examination and chemical analysis.

One coffee adulterant, chicory, is so much more used than all others that it may almost be regarded as the sole adulterant of coffee in this country. Roast chicory has little in common with roast coffee, except burnt sugar, and it has a large proportion of this. The strong taste of burnt sugar, and the

increased depth of colour it gives to the infusion apparently leads many consumers to prefer coffee and chicory to pure coffee. Indeed, a beverage resembling in flavour and colour that made from a mixture of coffee and chicory may be made from a mixture of coffee and burnt sugar.

The presence of chicory in coffee is easily detected by microscopic examination, by the specific gravity and depth of colour of an infusion, by the examination of the ash, &c. There is also a direct chemical test.

There are several ready ways by which the food inspector may come to an opinion as to whether a sample is adulterated and should be submitted to an expert for examination. Thus, if coffee cakes when pressed between the fingers, or in the paper in which it is folded, it is probably adulterated. When grains of coffee, spread on a piece of glass, are moistened with a few drops of water, the coffee should remain hard; any particles softening indicates adulteration. Thirdly, there is the colour test. When a few grains of coffee containing chicory are let fall on the surface of cold water in a glass, a yellowish brown colour is given off by each particle of chicory, which soon spreads through the water. This is due to chicory in cold water having four times the colouring power of coffee. The difference in taste between coffee and chicory is also some guide to the food inspector.

Chiccry, otherwise known as succory, grows wild in this country. In many parts its bright blue blossoms are very abundant in August and September. The stem is from one to three feet high, higher when cultivated. The root grows deep into the ground, is white and fleshy, and yields a milky juice. Foreign chicory is considered superior to that of English growth. It is pulled before the plant blossoms and the root is carefully dried. When roasted 2 lbs. of lard or butter is added to each cwt. of dried root. Usually it is ground before being sold. It has some outward resemblance to ground coffee, but lacks its characteristic aroma. Roast chicory differs from roast coffee chiefly in containing a much larger proportion of burnt sugar, a much smaller proportion of fatty matter, and no caffeine or caffeotannic acid. In chicory the ash is for the most part

insoluble, in this respect also differing from coffee. Chicory also absorbs moisture freely, which coffee does not.

Chicory may be adulterated with dandelion root, mangolds, carrots, parsnips, and turnips. The quantity of sugar in these is nearly as great as in chicory. Chicory may be distinguished from these roots, and other possible adulterants, by means of the microscope. All substances employed to adulterate coffee may be used to adulterate chicory. Indeed, when adulterants, other than chicory, are found in coffee, it is commonly due to their having been first used to adulterate the chicory added.

Rust of iron, or other mineral red, may occasionally be added to give colour. It is easily detected by analysis.

It is stated that in the preparation of inferior chicory rancid fat is used.

Cocoa is prepared from the seed of the plant *Theobroma cacao*. It is extensively cultivated in the West Indies, Brazil, and Guiana, and usually attains a height of from 12 to 20 feet.

The tree begins to bear when three years old, and the fruit is chiefly gathered in June and December. The fruit is from 5 to 12 inches long and 3 inches thick, or smaller. The rind is fleshy, and within the seeds are arranged in five rows embedded in pulp. After removal from the fruit the seeds are left in pits or heaps for four or five days to ferment, and then dried in the sun, or otherwise. They are next roasted over a charcoal fire, in the process losing about 10 per cent. in weight. The seeds are broken in a machine, and finally the husks are separated from the cocoa nibs by winnowing. Only a small portion of the cocoa imported is sold as nibs, the bulk is reduced to paste. A cheap form of cocoa is prepared from the whole roasted seed, which is ground and made into a coarse paste, and when dry, sold as "flake cocoa." What is called "rock cocoa," is prepared from the nibs ground to a paste with sugar, with or without the addition of some starchy substance. So-called "soluble cocoas" are various kinds of rock cocoa reduced to powder. The starchy substance added to prepared cocoa absorbs the fat of the cocoa, and the whole is easily miscible with boiling water.

There is a preparation of cocoa known as "cocoa essence" or otherwise, in which a portion of the cocoa fat is removed by hot-pressing the nibs. Cocoa thus treated agrees better with invalids and others.

In cocoa nibs are nearly all the substances constituting a perfect food. About half of the raw nibs is cocoa fat or butter. There is about 13 per cent. of albuminous matter, and 4 or 5 per cent. of starch. The proportion of moisture and woody fibre is relatively very low. Its most important constituent is theobromine, a crystalline substance resembling theine. There is a volatile principle which gives cocoa its characteristic odour, but which is not an essential oil, and an astringent principle, of the nature of tannin, part of which is changed into a colouring matter during roasting, besides a very small quantity of gum-like matter. The ash, or incombustible matter, in the nibs ranges from about 3 to 6 per cent.

Working up sugar and prepared starches with ground cocoa nibs cannot fairly be termed an adulteration of cocoa. The product is sold as prepared or soluble cocoa, or by some fancy name, and neither the trade nor the public are induced to believe that the manufactured article is pure ground nibs.

Prepared or soluble cocoas contain from 23 to 28 per cent. of non-fatty cocoa, from 17 to 25 per cent. of fat, and about the same proportion of added starch, from 23 to 33 per cent. of sugar, and about 5 per cent. of moisture.

Adulterated cocoa.—It is said that cocoa nibs are sometimes adulterated with portions of roast chicory root. This could be detected, even after grinding, by a microscopic examination, and by the high colour of a cold water extract. The addition of chalk or sulphate of lime, with or in place of starch, has been reported, and also the addition of mineral red colouring matter. The presence and amount of such adulterants would be at once indicated on analysis. Ordinarily the only substances added to manufactured cocoa are sugar and prepared starches, and so long as these are not in great excess, or the mixture is not sold as pure cocoa, manufactured cocoa is not considered an adulterated article.

Chocolate is ordinarily manufactured from ground cocoa nibs, a large quantity of sugar, and a little sago flour or arrowroot, or other prepared starch. It is flavoured with vanilla, cinnamon or other aromatic substance. The proportions vary much. Thus the sugar may be absent or may amount to 60 per cent.; the starch may be absent or may amount to 30 per cent., or may be replaced by wheat flour, &c. In many preparations a portion of the cocoa fat is removed.

The addition of red earth or colouring matter is rightly regarded as an adulteration, and can be detected on analysis.

Sugars have been divided into the fermentable and non-fermentable sugars. To the latter class belong many sweet principles found in plants, but with these the food-inspector has nothing to do. The ordinary commercial sugars are all fermentable, that is to say, cane sugar, beetroot and maple sugar, jaggery, molasses and glucose.

Cane sugar is derived from many varieties of sugar cane cultivated in tropical or sub-tropical climates. The cane matures in from 12 to 16 months, and after being cut down fresh stems spring up. The plantation is renewed every five or six years. The cane, stripped of leaves and top joints, is crushed between rollers to express the juice, which is then heated. A little sulphate of lime, or similar substance, is added to neutralise any acid present and prevent fermentation, and the impurities which rise to the top are skimmed off. The juice, thus evaporated down and crystallised, is known as "raw sugar." Much of this is refined in this country. The refiner dissolves it in a small quantity of water, and usually heats it with bullock's blood and filters it. The syrup is again heated and run through animal charcoal, and passed on to a vacuum pan to be concentrated, after which it is allowed to crystallise. If loaf sugar is required, the air is admitted when the liquor has got just beyond the crystallising point, and the temperature is raised. The hot liquid and crystals are then thrown rapidly into moulds, in which it drains and hardens. After two days a saturated solution of pure white sugar is passed through the moulds to remove any impure syrup. The sugar is then turned out of the moulds and slowly dried in a stove.

Beetroot sugar is prepared from the fresh roots washed and trimmed. They are reduced to pulp, from which the juice is pressed; or sliced, and treated with warm water. The expressed juice or juice and water is heated with milk of lime to a temperature of about 140° F., and the scum removed. Carbonic acid is then forced in to free the liquid from all trace of lime. The liquid is next passed through animal charcoal into a vacuum pan, and evaporated to a thick syrup, about half of which is pure sugar. The loaf sugar is made as already described.

Maple sugar is prepared from the sugar-maple, a tree abundant in parts of America. The tree is tapped in the spring, and the sap drawn is freed from gross impurities, boiled down, run into small moulds and dried.

Jaggery.—This name is given to a coarse kind of raw sugar obtained by boiling down the sap of various palm trees, such as the cocoanut and the wild date-palm. It is ordinarily the cheapest sugar imported.

Treacle or molasses.—This is the name given to the liquor left after the crystallisation of raw sugar. The liquor left after the crystallisation of refined sugar is ordinarily called "golden syrup." These vary in composition, but always contain a large quantity of uncrystallisable sugar derived from the cane sugar, the change being aided by the heat employed. Since the introduction of the vacuum pan sugar liquor is boiled at a lower temperature than previously, more sugar crystallises, and less treacle is produced. The product corresponding to treacle resulting from the manufacture of beetroot sugar is of inferior quality, and not commonly sold for domestic use.

Glucose is altogether different from the other fermentable sugars. It exists ready formed in some fruits, and honey is largely composed of it. Its manufacture from grain and other substances containing starch is carried on extensively in this country. There are two or three processes of manufacture. The following is an approved method. The grain or other substance is ground and mixed in a vat with about four times its weight of water and 2 to 4 per cent. of sulphuric acid. The mixture is heated to a temperature of 306° F. for nearly half-an-hour, by which the starch is converted into sugar. Chalk is

then added to remove sulphuric acid, and the syrup is filtered and partially evaporated in a vacuum pan, and run through charcoal. It is then boiled down in a vacuum pan, the boiling taking place at a temperature, not exceeding 150° F., run into moulds, and allowed to cool, when it is quite solid. A liquid form of glucose is also sold. Glucose is largely used as a substitute for malt in the brewing of beer.

Glucose may occasionally be used to adulterate cane sugar, but the expert would have no difficulty in proving the quantity present. However, sugar is now so low-priced it would hardly pay to adulterate it. Moist sugars having very little colour are not necessarily of a superior quality, as they may be made from the lower products of the refiner.

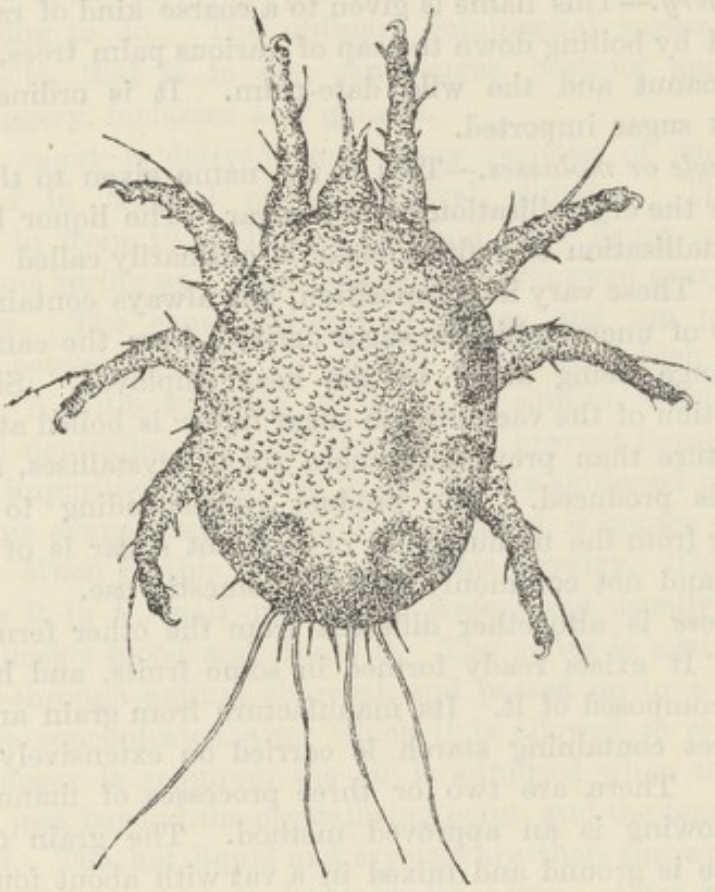

FIG. 20.

The sugar mite (*acarus*) is sometimes found in raw sugar. Like the cheese mite it is plainly visible without the use of a

magnifying glass. In samples of sugar containing these insects they and their eggs are present in great numbers. The sugar mite was first detected by Dr. Hassall in 1851. Figure 20 is copied from his drawing of the insect.

Sporules of fungus are also found in raw sugar, and small portions of woody fibre and grit.

Sweetmeats.—Sugar confectionery as sold in this country is generally wholesome, the ingredients being sugar, gum, citric or tartaric acid, butter, gelatine, albumen, and some innocent flavourings. The colouring matter is, however, not always harmless. Cochineal, saffron, and the colours derived from beetroot and many fruits are not objectionable, but metallic colouring matters are all more or less injurious. The food inspector should look with suspicion on bright opaque colours, especially emerald green. It is stated that what are called "Scotch mixtures" are occasionally adulterated with plaster of Paris or chalk. All injurious foreign substances are readily detected by analysis.

Honey is exuded from the nectaries of flowers, collected by bees, and stored by them in the cells of the comb. It may be removed from the comb without injuring it by means of a special apparatus, but usually the comb is cut and the honey allowed to drain from it. Honey contains about 70 per cent. of glucose sugars, from 5 to 10 per cent. of other sugars, from 17 to 23 per cent. of moisture, and very minute quantities of wax, gum, pollen and mineral matter. The odour and flavour of honey depends on the blossoms from which it has been collected. When new it is transparent and flows freely, but after a time it crystallises and becomes nearly solid. Thus honey not removed from the comb when fairly fresh has to be extracted with heat and pressure. Honey is faintly acid, and undergoes slight fermentation.

The only substances likely to be used as adulterants of honey are cane sugar and glucose. Any amount of the former is easily detected; but the addition of a small quantity of glucose would be difficult to prove. Water, also, may occasionally be added. Adulteration with starches is not now practised.

CHAPTER XIII.

Condiments, Spices, &c.

Mustard—Adulterated mustard—Pepper—Adulterated pepper—Cayenne pepper—Ginger—Adulterated ginger—Cinnamon—Adulterated cinnamon—Nutmegs—Adulterated nutmegs—Mace—Cloves—Allspice—Mixed spice—Olive oil—Vinegar—The vinegar plant—Lemon-juice and lime-juice—Certain foods sold cooked.

Mustard is made from the seeds of black mustard, or white mustard, or a mixture of both. The seeds are first finely ground and then sifted two or three times. What passes through is pure flour of mustard. The "dressings" sifted out are subjected to pressure and yield a fixed oil. Mustard, as sold, always contains more or less husk. Both black and white mustard contain about 28 per cent. of myrosin and albumen, 35 per cent. of fixed oil, about 16 per cent. of woody fibre, about 5 per cent. of moisture, and 5 per cent. of ash. Black mustard also contains about 5 per cent. of myronic acid, and 3½ per cent. of acrid salt; while white mustard contains no myronic acid and about 11 per cent. of acrid salt. The myronic acid in black mustard exists as myronate of potash, but the acid is converted into the volatile oil of mustard through the agency of myrosin when the two are brought into contact through the medium of water. The acrid bitter salt, sulphocyanate of sinapin, exists in both black and white mustard. The pungency and acridity are due to this volatile oil and bitter salt.

Adulterated mustard.—It is a question whether the addition of wheat flour, or some prepared starch, to mustard should be regarded as an adulteration. It is said that without some such addition the whole of the fixed oil cannot be retained, and is absorbed by the papers in which the mustard is packed. Certainly whatever is sold as pure mustard should be simply mustard flour. Mixtures containing wheat flour or starch should be sold as

mixtures. Mustard diluted largely with wheat flour, or any allied substance, is deficient in pungency and colour, and attempts are made to restore these qualities by the addition of Cayenne pepper, ginger or ground radish seed, turmeric, gamboge, yellow ochre or chromate of potash. The ground seed of the common charlock is also used as an adulterant, probably because the husk of the seed resembles very closely the husk of black mustard. The adulterants in use may all be detected by analysis or microscopical examination.

Three or four different qualities of mustard are ordinarily supplied by the manufacturer. When these are all genuine the higher qualities contain larger proportions of black mustard, and the lower qualities little or no black mustard.

Pepper.—Black pepper is the dried immature fruit of the black pepper plant, one of the pepperworts. White pepper is the same, deprived of its outer black husk. Some varieties are, however, always sold as white pepper. To these may be added the long pepper derived from another plant belonging to the pepperworts. It is chiefly used for culinary purposes.

The black pepper plant grows in India and the Islands of Sumatra, Java, Borneo and the West Indies. It is a climbing plant, which in cultivation attains to a height of from 8 to 12 feet. The peppercorns grow on terminal flower-stalks; they are at first green, then red, and if left ungathered turn black. When any of the peppercorns on a flower-stalk have begun to turn red, the whole are gathered and dried in the sun. In drying the outside becomes contracted and wrinkled. The plant begins to produce about the third year, and continues producing for ten or twelve years. Two crops are yielded annually. The best peppercorns are those which are not too small nor too shrivelled; they are heavy, and sink readily in water. There are many commercial varieties of pepper, the names, Malabar, Penang, Tellicherry and Sumatra, signifying the localities in which they are grown. Ground pepper, as sold, is probably always a mixture of two or more varieties.

The active properties of pepper depend on the presence of a volatile oil, an acrid resin, and a crystalline substance called piperin. The proportion of volatile oil is about 1½ per cent.,

and the proportion of piperin about 5 per cent. Pepper also contains from about 12 to 18 per cent. of starch and nearly 30 per cent. of woody fibre, about 5 per cent. of ash, a little gum and albumen, and from 9 to 16 per cent. of moisture. Long pepper is not nearly as strong as the other kinds of pepper. It yields less than half the proportion of piperin and about 3 per cent. more ash. The cheaper sorts of pepper are often dirty, mixed with stalks and dust.

Adulterated pepper.—Pepper is said to be adulterated with wheat, sago, rice, and pea flour, linseed meal, mustard husk, and a preparation known to the trade as poivrette, which is believed to be ground olive stones. Peppercorns are also liable to an injurious method of adulteration. As their value depends, among other things, upon their weight, the lighter sorts may be soaked in brine for twenty-four hours, and thus made heavier. It is reported also that peppercorns have been artificially manufactured from oilcake, pepper dust, clay, &c. Experts are able to detect and estimate the amount of all adulterants.

Cayenne pepper consists of the pods or seed vessels of different species of *capsicum* ground to a coarse powder. It is a native of America, but cultivated in India and the West Indies, and (in greenhouses) in European countries. The pods are sold entire under the name of *chillies*, and are used both in the green and in the red state for pickling. They vary much in size and shape, and are termed long-podded, short-podded, and heart-shaped. A minute portion of Cayenne pepper, if heated strongly, volatilises an acrid vapour, causing intense irritation to the throat and eyes; thus, any particles in a sample, suspected of being some added foreign substance, might be carefully separated and tested by heat. If they did not give off an acrid vapour they could not be Cayenne. The vapour appears to be due to a crystalline substance which has been called capsaicin. Besides about 2 or 3 per cent. of acrid oil, Cayenne contains starchy matter, albuminous matter, gum, wax, woody fibre, 10 to 13 per cent. of moisture, and about 6 per cent. of ash.

Cayenne pepper is rarely adulterated. In the past, starches, brick-dust, and metallic red colours are said to have been added.

The chief spices ordinarily sold in this country are ginger, cinnamon, nutmegs, mace, cloves and allspice.

Ginger is the root or *rhizome* of the ginger plant, which grows in many tropical countries. It is dug up when the plant is about a year old, and washed; what is called white ginger is also scraped. Ginger of good quality should have no outer coat; it should be plump, of a whitish or faint straw colour, soft in texture, with a short fracture showing a reddish ring round the outside; the taste should be hot and aromatic.

The taste and aroma of ginger appear to be due to a volatile oil and soft resin. Ginger also contains gum, starch, woody fibre and some undetermined ingredients. It has about 12 per cent. of moisture.

Adulterated ginger.—Ginger may be rubbed over with lime to improve its colour, or washed in chalk and water, or exposed to the fumes of sulphur, or bleached with chloride of lime. As the object of such whitewashing is to give an inferior ginger the appearance of better descriptions, it is a form of adulteration. Ground ginger is often adulterated with wheat flour, ground rice, or some kind of prepared starch; and when much is added the loss of strength and colour may be masked by the admixture of small quantities of mustard husks and turmeric. All the adulterations named are easily detected.

Cinnamon is the bark of a tree belonging to the laurel family, which is chiefly cultivated in Ceylon. Branches about three years old (from half-an-inch to two or three inches in diameter) are selected and cut off. Two or more cuts are then made lengthwise, and the bark gently lifted with a peeling knife. In twenty-four hours the outer skin of the bark and the pulpy matter are scraped off. The smaller quills are introduced into the larger ones, and the bark is dried in the sun. Cinnamon has a sweet taste and aromatic flavour. It is light brown in colour, well curled, and scarcely thicker than drawing paper. It breaks with an uneven fibrous margin. It contains a volatile oil, tannin, mucilage, colouring matter, resin, an acrid principle, woody fibre, starch, and a little moisture.

Cassia, the bark of another tree belonging to the laurel family, is sometimes substituted for cinnamon. Cassia bark is

brown, much stouter than cinnamon, and breaks short off, without splintering. Cassia is also redder in colour and stronger in taste, but less sweet.

Adulterated cinnamon.—Ground cassia may be substituted for ground cinnamon, or mixed with it. Wheat flour or some prepared starch has also been used to adulterate cinnamon, the flour or starch being first browned by baking. Bark from which the cinnamon oil has been removed may also be ground and used for mixing. The expert finds no difficulty in detecting any of these frauds.

Nutmegs are the seeds of three species of the *myristica*, a tree said to resemble a pear tree. In the Banda Islands three crops are obtained yearly. The fruit of the nutmeg tree is about as big as a peach; outside is a fleshy covering, next the *mace*, which, when recent, is of a bright scarlet colour, and inside this the nutmeg in its hard smooth shell. After the shell is broken the nutmeg is found to be closely invested with a thin coat, sending off prolongations which enter the substance of the seed, giving it the characteristic mottled appearance. There are two kinds of nutmeg known to trade, the true, round or female nutmeg, and the inferior description, called the false, long or male nutmeg.

After the fruit is gathered the mace is separated, and the nutmegs dried in their shells, on hurdles, over a slow wood fire. The drying takes about two months. Sometimes they are first dried in the sun for a few days. When the drying is complete the nuts rattle in their shells, and these are cracked. On account of their liability to the attacks of the "nutmeg insect," the nuts are frequently rubbed with lime or dipped in a mixture of lime and water. This is considered to injure their flavour, and brown unlimed nutmegs are preferred.

Nutmegs contain a considerable proportion of volatile oil (about 6 per cent.), beside about 30 per cent. of fat and 54 per cent. of woody fibre. There are present also small quantities of starch, gum and acid.

Adulterated nutmegs.—As nutmegs are never sold ground they are not as liable to adulteration as powdered spices. However, the following frauds are practised, which are practically

adulterations. Nutmegs are deprived of a portion of their essential oil by distillation and sold as entire nutmegs. Good long nutmegs are mixed with wild long nutmegs having scarcely any flavour or odour. Nutmegs riddled by insects are "stopped" and mixed with sound nutmegs; or the thick paste used for stopping, made of flour, oil and nutmeg powder, has been moulded into false nutmegs. Damaged or shrivelled and refuse nutmegs have been ground and moulded with clay into false nutmegs. An analyst will be able to prove the abstraction of the volatile oil. The size and form of the wild nutmeg will serve to distinguish it from the cultivated kinds. Stopped nutmegs or false ones may be discovered by soaking them in water. The story that wooden nutmegs are manufactured in America may be true; that they are imported to this country is doubtful.

Mace, as already described, forms when recent a bright scarlet coat, enveloping the hard shell of the nutmeg. It is cured by drying. There are two kinds of mace, corresponding to the two kinds of nutmeg, the produce of the same plants. The inferior kind is darker in colour and deficient in flavour and aroma. The composition of mace closely resembles that of nutmeg.

Mace, like the nutmeg, may be deprived of its essential oil by distillation, and may be mixed with wild mace.

Cloves are the unexpanded flower-buds of a tree, belonging to the myrtle tribe, from 15 to 30 feet in height. The flower-buds are arranged on terminal flower-stalks. They are gathered and dried in the sun or by a fire. Cloves contain about 20 per cent. of volatile oil, 6 per cent. of resin, 13 per cent. of gum, 13 per cent. of tannin, &c., 28 per cent. of woody fibre, and 18 per cent. of moisture. The volatile oil is composed of two oils, the light oil of cloves and the heavy oil of cloves.

The fruit, called "mother cloves," shaped like olives, but smaller, are occasionally met with. They have the odour and taste of cloves in a mild degree.

The quality of cloves may be impaired in two ways; by abstracting from them a portion of their volatile oil, and by placing them in damp places where they absorb moisture and increase in weight.

Allspice, sometimes called pimento, is the fruit of a beautiful tree belonging to the myrtles, growing to a height of nearly 30 feet. It is imported from the West Indies. It is gathered while yet green, and sun-dried or kiln-dried. When dried the fruit is reddish brown. The essential oil is a mixture of a light and heavy oil, and has the characteristic smell of allspice—the yield is about 4 or 5 per cent. It also contains starch, resinous and gummy matter, an astringent extract, colouring matter, sugar, &c., woody fibre and very little moisture.

Allspice is divided into husk and seed. The husk is soft and brittle when dried, and holds its seeds in two compartments.

Though allspice is sold ground it appears to be too cheap to tempt the adulterator. The only adulteration ordinarily referred to is the addition of mustard husk.

Mixed spice.—What is sold under this name is a mixture of various spices ground. It is usually composed of ginger, cinnamon or cassia, and allspice, with sometimes a small quantity of powdered cloves. Whatever the constituents or proportions it should contain nothing but spice. It is, however, frequently adulterated with wheat flour and ground rice and similar substances.

Olive oil is expressed from olives, the fruit of a well-known tree cultivated in many European countries. Olives should furnish from 20 to 25 per cent. of their weight of oil, but the whole yield is not usually of the same quality. The pure oil is pale yellow, transparent, of agreeable odour and bland taste. It keeps well, being little liable to become rancid.

Olive oil is not infrequently adulterated with cotton-seed oil, rape oil and other cheap vegetable oils. Taking the specific gravity is often sufficient to show there is an adulterant present and to warrant the food inspector in sending a sample to an expert. The specific gravity of olive oil is 917·6 at 59° F.

Vinegar.—Commercial vinegar is a more or less impure acetic acid. Besides acetic acid it usually contains some alcohol, acetic ether, sugar, gum, various salts, &c., its composition depending to some extent on the substances from which it has been produced.

The different varieties of vinegar, according to their source, are malt, wine, cider, beet, sugar and wood vinegars. Acetic acid is the volatile principle in all, to the presence of which vinegar mainly owes its aroma and pungency. It may be generated by the fermentation of many vegetable and some animal substances. Any vegetable infusion capable of yielding alcohol will furnish vinegar. In most cases, when vinegar is made on a large scale, the alcoholic fermentation precedes the acetous, the vinegar being formed entirely at the expense of the alcohol. A condition essential to acetification is the presence of atmospheric air or oxygen. Two other conditions which greatly facilitate acetification are the presence of a ferment and an increased temperature.

The great majority of commercial vinegars in this country are derived from the acetous fermentation of a wort made from mixtures of malt and barley or other grain. Malt vinegar is brown in colour, and has a specific gravity of 1017 to 1018. It is made of several strengths, the strongest containing about 4½ per cent. of acetic acid.

In France and other Continental countries vinegar is prepared from grape juice and inferior new wine. The product is white or red, according to the colour of the wine from which it is prepared. That made from white wine is most esteemed. All wine vinegar has an alcoholic odour. The specific gravity is from 1014 to 1022. Wine vinegar is often flavoured by the addition of a little wine.

Vinegar is occasionally made from other substances besides those named, as beer, pears, gooseberries, currants, and other fruit, and even seaweed.

A pure and wholesome vinegar may be prepared from a mixture of sugar and water, or treacle and water, fermented by the agency of a fungus called *the vinegar plant*. Legally, vinegar is not allowed to contain more than one-thousandth part of its weight of pure sulphuric acid.

Adulterated vinegar.—The principal adulterations of vinegar are with water, sulphuric acid, and burnt sugar, and sometimes with chillies, grains of paradise and pyroligneous acid, &c. All these are easily detected, except the addition of water, which

is difficult to prove, as each manufacturer makes four or five different strengths of vinegar. A rough test is afforded by the specific gravity—anything below 1014 points to watering.

Vinegar is not unfrequently contaminated with arsenic, this being introduced through sulphuric acid used in its adulteration. It may contain traces of copper, lead, zinc or tin from the solvent action of the acid on metallic surfaces with which it has been in contact.

Lemon-juice and lime-juice are expressed from the fruit when ripe or nearly ripe. They contain about 32 grains of citric acid per ounce, a little malic acid, sugar, vegetable albumen and mucus. It is largely prepared in Sicily and the West Indies. As found in commerce it is frequently mixed with varying proportions of spirit to make it keep better, but it may be obtained pure. Sometimes olive oil is poured on the top to exclude the air. Good lime-juice or lemon-juice is free from turbidity or stringiness, keeps well, has a pleasant acid taste, but is not bitter. It should not contain more than 5 per cent. of alcohol.

It is adulterated with water, tartaric acid, or sulphuric acid or other acid. Artificial lemon-juice, made from citric acid and water and essence of lemons, may be substituted for the genuine article. It is, however, deficient in flavour, and the fraud can be detected by evaporation.

Foods sold cooked.—Many of the articles of food already referred to come under this description, as bread, tinned milk, preserved fruit, &c.; yet it appears desirable to draw the food inspector's special attention to some of the victuals for sale in poor neighbourhoods.

Biscuits, cakes, pastry, &c.—At the cheap pastrycook's, and little shops frequented by children, are sold biscuits damaged with damp and attacked with mould, cakes and pastry originally made with butter beginning to be rancid, and stale beyond all possibility of wholesomeness. Then what are the contents of the penny meat pies in such shops? They are usually so highly seasoned with pepper that it is impossible to judge by the taste. A few purchases by intelligent inspectors might be the means of improving the quality and wholesomeness of what may be called the dainties of the poor.

Coffee, and bread and butter.—There are many shops and stalls where working men are provided with early breakfasts, and in which the staple of the business is coffee and bread and butter. This is what the customer asks for, and what he probably never gets. Why should the grocer be so frequently prosecuted for selling chicory for coffee, and the coffeeshop-keeper escape? Why should the butterman be so frequently prosecuted for selling margarine as butter and the vendor of slices of bread and margarine escape? The difficulty of proving an offence against a coffeeshop-keeper or stall-keeper are not insurmountable.

Polonies, black-puddings, brawn, &c., have a large sale among the poor. Undoubtedly cheap cooked sausages are not unfrequently made with horseflesh or adulterated with it. Indeed, there is a distinct advantage in using horseflesh, as it is firmer and keeps better. Such sausages are commonly made and cooked on the premises where they are sold, and those imported and sold as "small Germans" are not above suspicion. They are also more liable than uncooked sausages to contain diseased meat. Black-puddings are made from pig's blood and fat with herbs and spice. They are ordinarily genuine, but often prepared in close little living-rooms. Collared brawn is supposed to be potted pig's head, and may contain portions of tongue and beef, to which there is no objection. However, objectionable offal is sometimes added, and the best brawn is liable to be injured by the sun from exposure in the window. Spiced balls, otherwise known as "savoury ducks," are a favourite delicacy with the poor. They are supposed to be made from pig's lungs, but "lights" from sheep and oxen are doubtless also used, to which there is no objection. There is reason, however, to believe that "graped" lungs find their way into the food market in this form. Boiled cow's udder is usually sold cold in slices, with or without vinegar. Udders more or less inflamed, or even containing abscesses, may thus be got rid of. Boiled tripe, too, though generally of good quality, may be the subject of inflammation, as is often indicated by its dark colour.

THE END.

INDEX.

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	PAGE
Actinomycosis	35
Allspice	126
Alum in flour	83
,, bread	85
Anchovy paste	63
Anthrax (meat)	32
,, (milk)	87
Arrowroot	97
Arsenical liquid—spraying with	70
Artichokes	74
Asparagus	74
Barrelled cod	64
Beans	74
Beetroot	76
Beetroot sugar	117
Birkenhead Corporation Act, 1881, Section 74	10
Biscuits, cakes, pastry, &c.	128
Blackcock	49
Black-puddings	129
Black-quarter	32
Bloaters	66
"Blue disease"	36
Blue milk	92
Brawn	129
Braxy in sheep	32
Bread	84
Brill	56
Brocoli	75
"Buckhorn"	64
Bunt	81

PAGE

Butter 99
,, adulterated 101
,, rancid 101
Butter milk 94
Cabbage 75
Cane sugar 116
Capercailzie 49
Capon 45
Carcases 21
Carrots 76
Cassia 123
Cattle-plague (meat) 31
,, (milk) 87
Cauliflower 75
Cayenne pepper 122
Celery 76
Charr 62
Cheese 102
,, adulterated 103
,, damaged 105
,, lard 104
,, margarine 104
,, parasites 105
,, soft 104
Cheesine 104
Chicken-cholera 47
Chicory 113
Chillies 122
Chip 46
Chocolate 116
Cinnamon... 123
,, adulterated 124
Clotted cream 94
Cloves 125
Cockles 67
Cocoa 114
,, adulterated 115
Cod 56

PAGE

Cod barrelled 64
„ dried salt 65
Coffee 111
„ adulterated 112
„ and bread and butter 129
Conger eels 57
Consumption 33
Corn 81
„ flour 98
Corncrake 50
Crabs 66
Cream 94
Cucumber 76
Cured salmon 65
Cysticercus 37
Destroying meat, &c., unfit for food 12
Devonshire cream 94
"Diamonds" 43
Diseases of corn 81
„ rendering meat unfit for food 30
„ „ milk „ 87
Dried salt cod 65
„ salted or smoked fish 64
„ sprats 66
Dropsy 41
Eels 57
Eggs 105
„ preserving 106
„ tests for fresh 106
Elder leaf 110
Endive 76
Ergot 82
Farina 99
Feathered game 48
Filaria 42
Fish, bruised 55
„ diseased 55
„ dried, salted or smoked 64

PAGE

Fish, freshness of 54
,, from foul water 55
,, when in season 54
,, shell... 66
Flounder 58
Flour 82
Food inspector, appointment of 2
,, duties 5
,, qualifications and obligations 3
Foods sold cooked 128
Foot and mouth disease (meat) 40
,, ,, (milk) 88
Front teeth of ox at 2 years 27
,, ,, 3 ,, ... 28
,, ,, 4 ,, ... 28
,, ,, 5 ,, ... 28
Frozen meat 29
Fruit 68
,, diseased or decayed 71
,, preserved 72
,, stone 70
,, when in season 69
Galazyme 95
Game 48
,, Act of 1831 49
,, diseases of 52
,, for invalids 51
,, when in season 49
Gapes 47
Garget 88
Ginger 123
,, adulterated 123
Glanders and farcy 39
Glucose 117
"Grapes"... 33
Grilse 59
Grouse 49
Haddock 58

PAGE

Haddock, smoked 65
Hake 58
Halibut 58
Hares 48
Hendon cow disease 91
Herring 58
,, red 66
Hog cholera 36
Homelyn ray 62
Honey 119
Hoof-rot 41
Horse, fat and flesh of 25
,, heart and liver of 25
,, skeleton of 23
,, tongue of 24
Horse-radish 77
Immature veal or lamb 29
Jaggery 117
Joint-ill or joint-felon 36
Kefyr 95
Kelts 59
Kippers 66
Koumiss 94
Lactometer, correction for temperature 87
Lard 105
,, adulterated 105
,, cheese 104
Le Dansk... 102
Lemon-juice 128
Lettuce 77
Lime-juice 128
Live animals 21
Liver-fluke 42
Lobsters 66
Logwood test for alum in bread 85
,, ,, flour 83
Lung-plague 31
Macaroni 99

PAGE

Mace 125
Mackerel 58
,, horse 59
Maple sugar 117
Margarine 101
,, cheese 104
,, definition of 19
Markets and Fairs Clauses Act, 1847 7
Meat, bruised 26
,, characteristics of good 22
,, frozen 29
,, not of description represented 22
Meat kept too long or ill kept 25
,, of aged animals 27
,, of animals not killed by man 25
,, ,, killed when moribund 25
,, ,, injured by accident 26
,, ,, newly landed or off a journey... ... 27
,, ,, over-driven or frightened 27
,, ,, recently physicked 27
Milk 86
,, adulterated 92
,, unwholesome 87
,, infected from animal disease 90
,, ,, human ,, ... 90
,, sour 91
,, blue or red 92
,, tainted 92
,, skimmed 93
,, separated 93
,, preserved 94
Milk-fever... 44
Mite in sugar 118
Mixed spice 126
Molasses 117
Moor-fowl... 49
Mushrooms 77
Mussels 67

PAGE

Mustard 120
„ adulterated 120
Nutmegs 124
„ adulterated 125
Nuts 71
"Oath," meaning of 13
"Offal," meaning of 21
Olive oil 126
Onions 77
Oysters 66
Ox, skeleton of 23
„ tongue of 24
Parasites in cheese 105
Parsnips 76
Partridge 50
Parturient animals 43
„ fever 44
Pearl disease 33
Pearl sago... 98
Peas 78
Pepper 121
„ adulterated 122
Periwinkles 67
Pheasant 50
Pigeons 48
Pimento 126
Pip 46
"Place," meaning of 11
Plaice 59
Pleuro-pneumonia (meat) 31
„ (milk) 88
Plover 51
Poisoned animals 44
Polonies 129
Potatoes 73
Poularde 45
Poultry 45
Prawns 67

PAGE

Prepared starches 96
Preserved milk 94
Preventing or obstructing an inspector 12
Ptarmigan 50
Public Health Act, 1875, Sections 116 to 119 7
Public Health Act Amendment Act, 1890, Section 28 ... 10
Public Health (London) Act, 1891, Section 47 13
Quail 50
Quinsy in swine 36
Rabbits 48
Rancid butter 101
"Reasonable times," meaning of 9
Red herrings 66
Red milk 92
"Red soldier" 36
Revalenta-arabica 99
Rheumatism 36
Rinderpest 31
"Rot" in sheep 42
Roup 46
Sago 97
Sale of Horseflesh, &c., Regulation Act, 1889 15
,, as beef 22
Salmon 59
,, cured 65
Salmon Fishery Act, 1873, Section 19 54
Scad 59
"Scour" 46
Sea kale 78
Search warrant 13
Semolina 99
Separated milk 93
Sewen 62
Sheep-pox... 33
Sheep scab 43
Shell fish 66
Shrimps 67
Skate 62

PAGE

Skeleton of horse 23
,, ox 23
Skimmed milk 93
Sloe leaf 109
Smelt 62
Smoked haddock 65
Smolts 59
Smut 81
Snipe 51
Soft cheeses 104
Soles 63
Sourkraut 75
Sour milk 91
Sparling 62
Spiced balls 129
Sprats 62
,, dried 66
Spinach 78
Splenic fever 32
Starches 96
"Strangles" 36
Sugar 116
,, beetroot 117
,, cane 116
,, maple 117
,, mite 118
Sweetmeats 119
Tapioca 98
Tainted milk 92
Tea 107
,, adulterated 108
,, compressed 108
,, leaf 109
Teal 51
Texan fever 32
Thornback skate 62
Tinned fruit and vegetables 80
Tomatoes 78

	PAGE
Tongue of horse	24
,, ox	24
Tous les mois	99
Treacle	117
Trout	62
Tuberculosis (meat)	33
,, (milk)	88
Turbot	63
"Turn"	46
Turnips	79
Trichina	38
Truffles	79
Typhoid fever of swine	36
Unwholesome milk...	87
Vegetables	73
Vegetable marrow	80
Vegetables, when in season	73
Venison	48
Vermicelli...	99
Vinegar	126
,, adulterated	127
,, plant	127
Wheat	82
Whelks	67
Whitebait	64
Whiting	64
Widgeon	51
Wild-duck...	51
Willow leaf	110
Woodcock...	51
Worms affecting swine	37

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