Science

In the Kitchen

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Table of Contents

PREFACE. 9

INTRODUCTION. 11

Foods 13

THE DIGESTION OF FOODS. 20

COOKERY. 30

HOUSEHOLD WORKSHOP 41

CEREALS AND THEIR PREPARATION FOR THE TABLE 56

BREADSTUFFS AND BREADMAKING 81

FRUITS 124

LEGUMES 165

VEGETABLES 174

SOUPS 211

BREAKFAST DISHES 225

DESSERTS 233

GRAVIES AND SAUCES 281

BEVERAGES 287

MILK CREAM BUTTER 293

EGGS 307

MEATS 315

FOOD FOR THE SICK 338

FOOD FOR THE AGED AND THE VERY YOUNG. 357

FRAGMENTS & LEFT-OVER FOODS 368

THE ART OF DINING 371

AFTER MEAL TIME 382

A YEAR'S BREAKFASTS & DINNERS 390

TABLE SHOWING THE NUTRITIVE VALUES OF COMMON FOOD SUBSTANCES 392

BILLS OF FARE FOR EVERY DAY IN THE YEAR. 401
FIRST WEEK 402
SECOND WEEK 406
THIRD WEEK 410
FOURTH WEEK 414
FIFTH WEEK 418
SIXTH WEEK 422
SEVENTH WEEK 426
EIGHTH WEEK 430
NINTH WEEK 434
TENTH WEEK 438
ELEVENTH WEEK 442
TWELFTH WEEK 446
THIRTEENTH WEEK 450
FOURTEENTH WEEK 454
FIFTEENTH WEEK 458
SIXTEENTH WEEK 462
SEVENTEENTH WEEK 466
EIGHTEENTH WEEK 470
NINETEENTH WEEK 474
TWENTIETH WEEK 478
TWENTY-FIRST WEEK 482
TWENTY-SECOND WEEK 486
TWENTY-THIRD WEEK 490
TWENTY-FOURTH WEEK 494
TWENTY-FIFTH WEEK 498
TWENTY-SIXTH WEEK 502
TWENTY-SEVENTH WEEK 506
TWENTY-EIGHTH WEEK 510
TWENTY-NINTH WEEK 514
THIRTIETH WEEK 518
THIRTY-FIRST WEEK 522
THIRTY-SECOND WEEK 526

THIRTY-THIRD WEEK 530
THIRTY-FOURTH WEEK 534
THIRTY-FIFTH WEEK 538
THIRTY-SIXTH WEEK 542
THIRTY-SEVENTH WEEK 546
THIRTY-EIGHTH WEEK 550
THIRTY-NINTH WEEK 554
FORTIETH WEEK 558
FORTY-FIRST WEEK 562
FORTY-SECOND WEEK 566
FORTY-THIRD WEEK 570
FORTY-FOURTH WEEK 574
FORTY-FIFTH WEEK 578
FORTY-SIXTH WEEK 582
FORTY-SEVENTH WEEK 586
FORTY-EIGHTH WEEK 589
FORTY-NINTH WEEK. 592
FIFTIETH WEEK 595
FIFTY-FIRST WEEK 598
FIFTY-SECOND WEEK 602
COUNTING THE COST. 605
BILLS OF FARE. 606
TABLE TOPICS. 611
A BATCH OF DINNERS 612
THANKSGIVING MENUS 613
HOLIDAY MENUS. 613
SABBATH BILL OF FARE. 618

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SCIENCE IN THE KITCHEN.

A SCIENTIFIC TREATISE ON FOOD SUBSTANCES AND THEIR DIETETIC PROPERTIES, TOGETHER WITH

A PRACTICAL EXPLANATION OF THE PRINCIPLES OF HEALTHFUL COOKERY,

AND A LARGE NUMBER OF ORIGINAL, PALATABLE, AND WHOLESOME RECIPES.

BY

MRS. E.E. KELLOGG, A.M.

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PREFACE.

The interest in scientific cookery, particularly in cookery as related to health, has manifestly increased in this country within the last decade as is evidenced by the success which has attended every intelligent effort for the establishment of schools for instruction in cookery in various parts of the United States. While those in charge of these schools have presented to their pupils excellent opportunities for the acquirement of dexterity in the preparation of toothsome and tempting viands, but little attention has been paid to the science of dietetics, or what might be termed the hygiene of cookery.

A little less than ten years ago the Sanitarium at Battle Creek Mich., established an experimental kitchen and a school of cookery under the supervision of Mrs. Dr. Kellogg, since which time, researches in the various lines of cookery and dietetics have been in constant progress in the experimental kitchen, and regular sessions of the school of cookery have been held. The school has gradually gained in popularity, and the demand for instruction has become so great that classes are in session during almost the entire year.

During this time, Mrs. Kellogg has had constant oversight of the cuisine of both the Sanitarium and the Sanitarium Hospital, preparing bills of fare for the general and diet tables, and supplying constantly new methods and original recipes to meet the changing and growing demands of an institution numbering always from 500 to 700 inmates.

These large opportunities for observation, research, and experience, have gradually developed a system of cookery, the leading features of which are so entirely novel and so much in advance of the methods heretofore in use, that it may be justly styled, *A New System of Cookery*. It is a singular and lamentable fact, the evil consequences of which are wide-spread, that the preparation of food, although involving both chemical and physical processes, has been less advanced by the results of modern researches and discoveries in chemistry and physics, than any other department of human industry. Iron mining, glass-making, even the homely art of brick-making, and many of the operations of the farm and the dairy, have been advantageously modified by the results of the fruitful labors of modern scientific investigators. But the art of cookery is at least a century behind in the march of scientific progress. The mistress of the kitchen is still groping her way amid the uncertainties of mediæval methods, and daily bemoaning the sad results of the "rule of thumb." The chemistry of cookery is as little known to the average housewife as were the results of modern chemistry to the old alchemists; and the attempt to make wholesome, palatable, and nourishing food by the methods commonly employed, is rarely more successful than that of those misguided alchemists in transmuting lead and copper into silver and gold.

The new cookery brings order from out the confusion of mixtures and messes, often incongruence and incompatible, which surrounds the average cook, by the elucidation of the principles which govern the operations of the kitchen, with the same certainty with which the law of gravity rules the planets.

Those who have made themselves familiar with Mrs. Kellogg's system of cookery, invariably express themselves as trebly astonished: first, at the simplicity of the methods employed; secondly, at the marvelous results both as regards palatableness, wholesomeness, and attractiveness; thirdly, that it had never occurred to them "to do this way before."

This system does not consist simply of a rehash of what is found in every cook book, but of new methods, which are the result of the application of the scientific principles of chemistry and physics to the preparation of food in such a manner as to make it the most nourishing, the most digestible, and the most inviting to the eye and to the palate.

Those who have tested the results of Mrs. Kellogg's system of cookery at the Sanitarium tables, or in their own homes through the instruction of her pupils, have been most enthusiastic in their expressions of satisfaction and commendation. Hundreds of original recipes which have appeared in her department in *Good Health*, "Science in the Household", have been copied into other journals, and are also quite largely represented in the pages of several cook books which have appeared within the last few years.

The great success which attended the cooking school in connection with the Bay View Assembly (the Michigan Chautauqua), as well as the uniform success which has met the efforts of many of the graduates of the Sanitarium school of cookery who have undertaken to introduce the new system through the means of cooking classes in various parts of the United States, has created a demand for a fuller knowledge of the system.

This volume is the outgrowth of the practical and experimental work, and the popular demand above referred to. Its preparation has occupied the entire leisure time of the author during the last five or six years. No pains or expense has been spared to render the work authoritative on all questions upon which it treats, and in presenting it to the public, the publishers feel the utmost confidence that the work will meet the highest expectations of those who have waited impatiently for its appearance during the months which have elapsed since its preparation was first announced. PUBLISHERS.

INTRODUCTION.

No one thing over which we have control exerts so marked an influence upon our physical prosperity as the food we eat; and it is no exaggeration to say that well-selected and scientifically prepared food renders the partaker whose digestion permits of its being well assimilated, superior to his fellow-mortals in those qualities which will enable him to cope most successfully with life's difficulties, and to fulfill the purpose of existence in the best and truest manner. The brain and other organs of the body are affected by the quality of the blood which nourishes them, and since the blood is made of the food eaten, it follows that the use of poor food will result in poor blood, poor muscles, poor brains, and poor bodies, incapable of first-class work in any capacity. Very few persons, however, ever stop to inquire what particular foods are best adapted to the manufacture of good blood and the maintenance of perfect health; but whatever gratifies the palate or is most conveniently obtained, is cooked and eaten without regard to its dietetic value. Far too many meals partake of the characteristics of the one described in the story told of a clergyman who, when requested to ask a blessing upon a dinner consisting of bread, hot and tinged with saleratus, meat fried to a crisp, potatoes swimming in grease, mince pie, preserves, and pickles, demurred on the ground that the dinner was "not worth a blessing." He might with equal propriety have added, "and not worth eating."

The subject of diet and its relation to human welfare, is one deserving of the most careful consideration. It should be studied as a science, to enable us to choose such materials as are best adapted to our needs under the varying circumstances of climate growth, occupation, and the numerous changing conditions of the human system; as an art, that we may become so skilled in the preparation of the articles selected as to make them both appetizing and healthful. It is an unfortunate fact that even among experienced housekeepers the scientific principles which govern the proper preparation of food, are but little understood, and much unwholesome cookery is the result. The mechanical mixing of ingredients is not sufficient to secure good results; and many of the failures attributed to "poor material," "bad luck," and various other subterfuges to which cooks ignorance of scientific principles. The common method of blindly following recipes, with no knowledge of "the reason why," can hardly fail to be often productive of unsatisfactory results, which to the uninformed seem quite inexplicable.

Cookery, when based upon scientific principles, ceases to be the difficult problem it so often appears. Cause and effect follow each other as certainly in the preparation of food as in other things; and with a knowledge of the underlying principles, and faithfulness in carrying out the necessary details, failure becomes almost an impossibility. There is no department of human activity where applied science offers greater advantages than in that

of cookery, and in our presentation of the subjects treated in the following pages, we have endeavored, so far as consistent with the scope of this work, to give special prominence to the scientific principles involved in the successful production of wholesome articles of food. We trust our readers will find these principles so plainly elucidated and the subject so interesting, that they will be stimulated to undertake for themselves further study and research in this most important branch of household science. We have aimed also to give special precedence of space to those most important foods, the legumes, and grains and their products, which in the majority of cook books are given but little consideration or are even left out altogether, believing that our readers will be more interested in learning the many palatable ways in which these especially nutritious and inexpensive foods may be prepared, than in a reiteration of such dishes as usually make up the bulk of the average cook book.

For reasons stated elsewhere (in the chapter on Milk, Cream, and Butter), we have in the preparation of all recipes made use of cream in place of other fats; but lest there be some who may suppose because cream occupies so frequent a place in the recipes, and because of their inability to obtain that article, the recipes are therefore not adapted to their use, we wish to state that a large proportion of the recipes in which it is mentioned as seasoning, or for dressing, will be found to be very palatable with the cream omitted, or by the use of its place of some one of the many substitutes recommended. We ought also to mention in this connection, that wherever cream is recommended, unless otherwise designated, the quality used in the preparation of the recipes is that of single or twelve hour cream sufficiently diluted with milk, so that one fourth of each quart of milk is reckoned as cream. If a richer quality than this be used, the quantity should be diminished in proportion; otherwise, by the excess of fat, a wholesome food may become a rich, unhealthful dish. In conclusion, the author desires to state that no recipe has been admitted to this work which has not been thoroughly tested by repeated trials, by far the larger share of such being original, either in the combination of the materials used, the method employed, or both materials and method. Care has been taken not to cumber the work with useless and indifferent recipes. It is believed that every recipe will be found valuable, and that the variety offered is sufficiently ample, so that under the most differing circumstances, all may be well served.

We trust therefore that those who undertake to use the work as a guide in their culinary practice, will not consider any given recipe a failure because success does not attend their first efforts. Perseverance and a careful study of the directions given, will assuredly bring success to all who possess the natural or acquired qualities essential for the practice of that most useful of the arts,—"Healthful Cookery."

ELLA E. KELLOGG.

Battle Creek, April 20, 1892.

Foods

he purposes of food are to promote growth, to supply force and heat, and to furnish material to repair the waste which is constantly taking place in the body. Every breath, every thought, every motion, wears out some portion of the delicate and wonderful house in which we live. Various vital processes remove these worn and useless particles; and to keep the body in health, their loss must be made good by constantly renewed supplies of material properly adapted to replenish the worn and impaired tissues. This renovating material must be supplied through the medium of food and drink, and the best food is that by which the desired end may be most readily and perfectly attained. The great diversity in character of the several tissues of the body, makes it necessary that food should contain a variety of elements, in order that each part may be properly nourished and replenished.

The Food Elements.—The various elements found in food are the following: Starch, sugar, fats, albumen, mineral substances, indigestible substances.

The digestible food elements are often grouped, according to their chemical composition, into three classes; *vis.*, carbonaceous, nitrogenous, and inorganic. The carbonaceous class includes starch, sugar, and fats; the nitrogenous, all albuminous elements; and the inorganic comprises the mineral elements.

Starch is only found in vegetable foods; all grains, most vegetables, and some fruits, contain starch in abundance. Several kinds of *sugar* are made in nature's laboratory; *cane*, *grape*, *fruit*, and *milk* sugar. The first is obtained from the sugar-cane, the sap of maple trees, and from the beet root. Grape and fruit sugars are found in most fruits and in honey. Milk sugar is one of the constituents of milk. Glucose, an artificial sugar resembling grape sugar, is now largely manufactured by subjecting the starch of corn or potatoes to a chemical process; but it lacks the sweetness of natural sugars, and is by no means a proper substitute for them. *Albumen* is found in its purest, uncombined state in the white of an egg, which is almost wholly composed of albumen. It exists, combined with other food elements, in many other foods, both animal and vegetable. It is found abundant in oatmeal, and to some extent in the other grains, and in the juices of vegetables. All natural foods contain elements which in many respects resemble *albumen*, and are so closely allied to it that for convenience they are usually classified under the general name of "al-

bumen." The chief of these is *gluten*, which is found in wheat, rye, and barley. *Casein*, found in peas, beans, and milk, and the *fibrin* of flesh, are elements of this class.

Fats are found in both animal and vegetable foods. Of animal fats, butter and suet are common examples. In vegetable form, fat is abundant in nuts, peas, beans, in various of the grains, and in a few fruits, as the olive. As furnished by nature in nuts, legumes, grains, fruits, and milk, this element is always found in a state of fine subdivision, which condition is the one best adapted to its digestion. As most commonly used, in the form of free fats, as butter, lard, etc., it is not only difficult of digestion itself, but often interferes with the digestion of the other food elements which are mixed with it. It was doubtless never intended that fats should be so modified from their natural condition and separated from other food elements as to be used as a separate article of food. The same may be said of the other carbonaceous elements, sugar and starch, neither of which, when used alone, is capable of sustaining life, although when combined in a proper and natural manner with other food elements, they perform a most important part in the nutrition of the body. Most foods contain a percentage of the *mineral* elements. Grains and milk furnish these elements in abundance. The cellulose, or woody tissue, of vegetables, and the bran of wheat, are examples of *indigestible* elements, which although they cannot be converted into blood in tissue, serve an important purpose by giving bulk to the food.

With the exception of gluten, none of the food elements, when used alone, are capable of supporting life. A true food substance contains some of all the food elements, the amount of each varying in different foods.

Uses of the Food Elements.—Concerning the purpose which these different elements serve, it has been demonstrated by the experiments of eminent physiologists that the carbonaceous elements, which in general comprise the greater bulk of the food, serve three purposes in the body;

1. They furnish material for the production of heat;

2. They are a source of force when taken in connection with other food elements;

3. They replenish the fatty tissues of the body. Of the carbonaceous elements,—starch, sugar, and fats,—fats produce the greatest amount of heat in proportion to quantity; that is, more heat is developed from a pound of fat than from an equal weight of sugar or starch; but this apparent advantage is more than counterbalanced by the fact that fats are much more difficult of digestion than are the other carbonaceous elements, and if relied upon to furnish adequate material for bodily heat, would be productive of much mischief in overtaxing and producing disease of the digestive organs. The fact that nature has made a much more ample provision of starch and sugars than of fats in man's natural diet, would seem to indicate that they were intended to be the chief source of carbonaceous food; nevertheless, fats, when taken in such proportion as nature supplies them, are necessary and important food elements.

The nitrogenous food elements especially nourish the brain, nerves, muscles, and all the more highly vitalized and active tissues of the body, and also serve as a stimulus to tissue change. Hence it may be said that a food deficient in these elements is a particularly poor food.

The inorganic elements, chief of which are the phosphates, in the carbonates of potash, soda, and lime, aid in furnishing the requisite building material for bones and nerves.

Proper Combinations of Foods.—While it is important that our food should contain some of all the various food elements, experiments upon both animals and human beings show it is necessary that these elements, especially the nitrogenous and carbonaceous, be used in certain definite proportions, as the system is only able to appropriate a certain amount of each; and all excess, especially of nitrogenous elements, is not only useless, but even injurious, since to rid the system of the surplus imposes an additional task upon the digestive and excretory organs. The relative proportion of these elements necessary to constitute a food which perfectly meets the requirements of the system, is six of carbonaceous to one of nitrogenous. Scientists have devoted much careful study and experimentation to the determination of the quantities of each of the food elements required for the daily nourishment of individuals under the varying conditions of life, and it has come to be commonly accepted that of the nitrogenous material which should constitute one sixth of the nutrients taken, about *three ounces* is all that can be made use of in twenty-four hours, by a healthy adult of average weight, doing a moderate amount of work. Many articles of food are, however, deficient in one or the other of these elements, and need to be supplemented by other articles containing the deficient element in superabundance, since to employ a dietary in which any one of the nutritive elements is lacking, although in bulk it may be all the digestive organs can manage, is really starvation, and will in time occasion serious results.

It is thus apparent that much care should be exercised in the selection and combination of food materials. The table, showing the nutritive values of various foods, should be carefully studied. Such knowledge is of first importance in the education of cooks and housekeepers, since to them falls the selection of the food for the daily needs of the household; and they should not only understand what foods are best suited to supply these needs, but how to combine them in accordance with physiological laws.

Condiments.—By condiments are commonly meant such substances as are added to season food, to give it "a relish" or to stimulate appetite, but which in themselves possess no real food value. To this category belong mustard, ginger, pepper, pepper sauce, Worcestershire sauce, cloves, spices, and other similar substances. That anything is needed to disguise or improve the natural flavor of food, would seem to imply either that the article used was not a proper alimentary substance, or that it did not answer the purpose for which the Creator designed it. True condiments, such as pepper, pepper sauce, ginger, spice, mustard, cinnamon, cloves, etc., are all strong irritants. This may be readily

demonstrated by their application to a raw surface. The intense smarting and burning occasioned are ample evidence of the irritating character. Pepper and mustard are capable of producing powerfully irritating effects, even when applied to the healthy skin where wholly intact. It is surprising that it does not occur to the mother who applies a mustard plaster to the feet of her child, to relieve congestion of the brain, that an article which is capable of producing a blister upon the external covering of the body, is quite as capable of producing similar effects when applied to the more sensitive tissues within the body. The irritating effects of these substances upon the stomach are not readily recognized, simply because the stomach is supplied with very few nerves of sensation. That condiments induce an intense degree of irritation of the mucous membrane of the stomach, was abundantly demonstrated by the experiments of Dr. Beaumont upon the unfortunate Alexis St. Martin. Dr. Beaumont records that when St. Martin took mustard, pepper, and similar condiments with his food, the mucous membrane of his stomach became intensely red and congested, appearing very much like an inflamed eye. It is this irritating effect of condiments which gives occasion for their extended use. They create an artificial appetite, similar to the incessant craving of the chronic dyspeptic, whose irritable stomach is seldom satisfied. This fact with regard to condiments is a sufficient argument against their use, being one of the greatest causes of gluttony, since they remove the sense of satiety by which Nature says, "Enough."

To a thoroughly normal and unperverted taste, irritating condiments of all sorts are very obnoxious. It is true that Nature accommodates herself to their use with food to such a degree that they may be employed for years without apparently producing very grave results; but this very condition is a source of injury, since it is nothing more nor less than the going to sleep of the sentinels which nature has posted at the portal of the body, for the purpose of giving warning of danger. The nerves of sensibility have become benumbed to such a degree that they no longer offer remonstrance against irritating substances, and allow the enemy to enter into the citadel of life. The mischievous work is thus insidiously carried on year after year until by and by the individual breaks down with some chronic disorder of the liver, kidneys, or some other important internal organ. Physicians have long observed that in tropical countries where curry powder and other condiments are very extensively used, diseases of the liver, especially acute congestion and inflammation, are exceedingly common, much more so that in countries and among nations where condiments are less freely used. A traveler in Mexico, some time ago, described a favorite Mexican dish as composed of layers of the following ingredients: "Pepper, mustard, ginger, pepper, potato, ginger; mustard, pepper, potato, mustard, ginger, pepper." The common use of such a dish is sufficient cause for the great frequency of diseases of the liver among the Mexicans, noted by physicians traveling in that country. That the use of condiments is wholly a matter of habit is evident from the fact that different nations employ as condiments articles which would be in the highest degree obnoxious to people of other countries. For example, the garlic so freely used in Russian cook-

ery, would be considered by Americans no addition to the natural flavors of food; and still more distasteful would be the asafetida frequently used as a seasoning in the cuisine of Persia and other Asiatic countries.

The use of condiments is unquestionably a strong auxiliary to the formation of a habit of using intoxicating drinks. Persons addicted to the use of intoxicating liquors are, as a rule, fond of stimulating and highly seasoned foods; and although the converse is not always true, yet it is apparent to every thoughtful person, that the use of a diet composed of highly seasoned and irritating food, institutes the conditions necessary for the acquirement of a taste for intoxicating liquors. The false appetite aroused by the use of food that "burns and stings," craves something less insipid than pure cold water to keep up the fever the food has excited. Again, condiments, like all other stimulants, must be continually increased in quantity, or their effect becomes diminished; and this leads directly to a demand for stronger stimulants, both in eating and drinking, until the probable tendency is toward the dram-shop.

A more serious reason why high seasonings leads to intemperance, is in the perversion of the use of the sense of taste. Certain senses are given us to add to our pleasure as well as for the practical, almost indispensable, use they are to us. For instance, the sense of sight is not only useful, but enables us to drink in beauty, if among beautiful surroundings, without doing us any harm. The same of music and other harmonics which may come to us through the sense of hearing. But the sense of taste and was given us to distinguish between wholesome and unwholesome foods, and cannot be used for merely sensuous gratification, without debasing and making of it a gross thing. An education which demands special enjoyment or pleasure through the sense of taste, is wholly artificial; it is coming down to the animal plane, or below it rather; for the instinct of the brute creation teaches it merely to eat to live.

Yet how wide-spread is this habit of sensuous gratification through the sense of taste! If one calls upon a neighbor, he is at once offered refreshments of some kind, as though the greatest blessing of life came from indulging the appetite. This evil is largely due to wrong education, which begins with childhood. When Johnnie sits down to the table, the mother says, "Johnnie, what would you like?" instead of putting plain, wholesome food before the child, and taking it as a matter of course that he will eat it and be satisfied. The child grows to think that he must have what he likes, whether it is good for him or not. It is not strange that an appetite thus pampered in childhood becomes uncontrollable at maturity; for the step from gormandizing to intoxication is much shorter than most people imagine. The natural, unperverted taste of a child will lead him to eat that which is good for him. But how can we expect the children to reform when the parents continually set them bad examples in the matter of eating and drinking?

The cultivation of a taste for spices is a degradation of the sense of taste. Nature never designed that pleasure should be divorced from use. The effects of gratifying the sense of

taste differ materially from those of gratifying the higher senses of sight and hearing. What we see is gone; nothing remains but the memory, and the same is true of the sweetest sounds which may reach us through the ears. But what we taste is taken into the stomach and what has thus given us brief pleasure through the gratification of the palate, must make work in the alimentary canal for fourteen hours before it is disposed of.

Variety in Food.—Simplicity of diet should be a point of first consideration with all persons upon whom falls the responsibility of providing the family bills of fare, since the simplest foods are, as a rule, the most healthful. Variety is needed; that is, a judicious mingling of fruits, grains, and vegetables; but the general tendency is to supply our tables with too many kinds and to prepare each dish in the most elaborate manner, until, in many households, the cooking of food has come to be almost the chief end of life. While the preparation of food should be looked upon as of so much importance as to demand the most careful consideration and thought as to its suitability, wholesomeness, nutritive qualities, and digestibility, it should by no means be made to usurp the larger share of one's time, when simpler foods and less labor would afford the partakers equal nourishment and strength.

A great variety of foods at one meal exerts a potent influence in creating a love of eating, and is likewise a constant temptation to overeat. Let us have well-cooked, nutritious, and palatable food, and plenty of it; variety from day to day, but not too great a variety at each meal.

The prevalent custom of loading the table with a great number of viands, upon occasions when guests are to be entertained in our homes, is one to be deplored, since it is neither conducive to good health nor necessary to good cheer, but on the contrary is still laborious and expensive a practice that many are debarred from social intercourse because they cannot afford to entertain after the fashion of their neighbors. Upon this subject a well-known writer has aptly said: "Simplify cookery, thus reducing the cost of living, and how many longing individuals would thereby be enabled to afford themselves the pleasure of culture and social intercourse! When the barbarous practice of stuffing one's guests shall have been abolished, a social gathering will not then imply, as it does now, hard labor, expensive outlay, and dyspepsia. Perhaps when that time arise, we shall be sufficiently civilized to demand pleasures of a higher sort. True, the entertainments will then, in one sense, be more costly, as culture is harder to come by than cake. The profusion of viands now heaped upon the table, betrays poverty of the worst sort. Having nothing better to offer, we offer victuals; and this we do with something of that complacent, satisfied air with which some more northern tribes present their tidbits of whale and walrus."

TABLE TOPICS.

"Let appetite wear reason's golden chain,
and find in due restrain its luxury."

A man's food, when he has the means and opportunity of selecting it, suggests his moral nature. Many a Christian is trying to do by prayer that which cannot be done except through corrected diet.—*Talmage.*

Our pious ancestors enacted a law that suicides should be buried where four roads meet, and that a cart-load of stones should be thrown upon the body. Yet, when gentlemen or ladies commit suicide, not by cord or steel, but by turtle soup or lobster salad, they may be buried on consecrated ground, and the public are not ashamed to read an epitaph upon their tombstones false enough to make the marble blush.—*Horace Mann.*

It is related by a gentleman who had an appointment to breakfast with the late A.T. Stewart, that the butler placed before them both an elaborate bill of fare; the visitor selected a list of rare dishes, and was quite abashed when Mr. Stewart said, "Bring me my usual breakfast,—oatmeal and boiled eggs." He then explained to his friend that he found simple food a necessity to him, otherwise he could not think clearly. That unobscured brain applied to nobler ends would have won higher results, but the principle remains the same.—*Sel.*

Study simplicity in the number of dishes, and a variety in the character of the meals.—*Sel.*

I have come to the conclusion that more than half the disease which embitters life is due to avoidable errors in diet, ... and that more mischief, in the form of actual disease, of impaired vigor, and of shortened life, accrues to civilized man from erroneous habits of eating than from the habitual use of alcoholic drink, considerable as I know that evil to be.—*Sir Henry Thompson.*

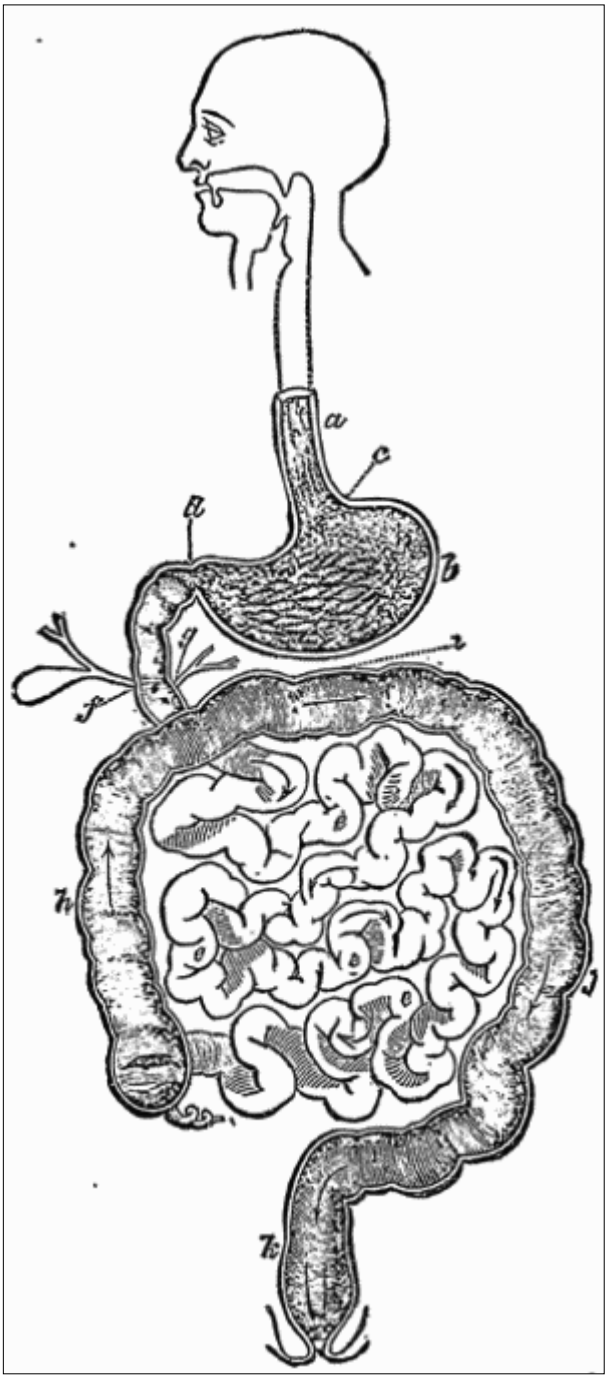
The ancient Gauls, who were a very brave, strong, and hearty race, lived very abstemiously. Their food was milk, berries, and herbs. They made bread of nuts. They had a very peculiar fashion of wearing a metal ring around the body, the size of which was regulated by act of Parliament. Any man who outgrew in circumference his metal ring was looked upon as a lazy glutton, and consequently was disgraced.

To keep in health this rule is wise:
Eat only when you need, and relish food,
chew thoroughly that it may do you good,
have it well cooked, unspiced, and undisguised.—*Leonardo da Vinci/*

THE DIGESTION OF FOODS.

t is important that the housekeeper not only understand the nature and composition of foods, but she should also know something of their digestive properties, since food, to be serviceable, must be not only nutritious, but easily digested. Digestion is the process by which food rendered soluble, and capable of being absorbed for use in carrying on the various vital processes.

The digestive apparatus consists of a long and tortuous tube called the alimentary canal, varying in length from twenty-five to thirty feet, along which are arranged the various digestive organs,—the mouth, the stomach, the liver, and the pancreas,—each of which, together with the intestines, has an important function to perform. In these various organs nature manufactures five wonderful fluids for changing and dissolving the several food elements. The mouth supplies the saliva; in the walls of the stomach are little glands which produce the gastric juice; the pancreatic juice is made by the pancreas; the liver secretes bile; while scattered along the small intestines are minute glands which make the intestinal juice. Each of these fluids has a particular work to do in transforming some part of the food into suitable material for use in the body. The saliva acts upon the starch of the food, changing it into sugar; the gastric juice digests albumen and other nitrogenous elements; the bile digests fat, and aids in the absorption of other food elements after they are digested; the pancreatic juice is not confined in its action to a single element, but digests starch, fats, and the albuminous elements after they have been acted upon by the gastric juice; the intestinal juice is capable of acting upon all digestible food elements.



The Alimentary Canal

a. Esophagus;

b. Stomach;

c. Cardiac Orifice;

d. Pylorus;

e. Small Intestine;

f. Bile Duct;

g. Pancreatic Duct;

h. Ascending Colon;

i. Transverse Colon;

j. Descending Colon;

k. Rectum.

The Digestion of a Mouthful of Bread—A mouthful of bread represents all, or nearly all, the elements of nutrition. Taking a mouthful of bread as a representative of food in general, it may be said that its digestion begins the moment that it enters the mouth, and continues the entire length of the alimentary canal, or until the digestible portion of the food has been completely digested and absorbed. We quote the following brief description of the digestive process from Dr. J.H. Kellogg's Second Book in Physiology[A]:—

[A]

Good Health Pub. Co., Battle Creek, Mich.

"*Mastication.*—The first act of the digestive process is mastication, or chewing the food, the purpose of which is to crush the food and divide it into small particles, so that the various digestive fluids may easily and promptly come into contact with every part of it.

"*Salivary Digestion.*—During the mastication of the food, the salivary glands are actively pouring out the saliva, which mingles with the food, and by softening it, aids in its division and prepares it for the action of the other digestive fluids. It also acts upon the starch, converting a portion of it into grape-sugar.

"*Stomach Digestion.*—After receiving the food, the stomach soon begins to pour out the gastric juices, which first makes its appearance in little drops, like beads of sweat upon the face when the perspiration starts. As the quantity increases, the drops run together, trickle down the side of the stomach, and mingle with the food. The muscular walls of the stomach contract upon the food, moving it about with a sort of crushing action, thoroughly mixing the gastric juice with the food. During this process both the openings of the stomach are closed tightly. The gastric juice softens the food, digests albumen, and coagulates milk. The saliva continues its action upon starch for sometime after the food reaches the stomach.

"After the food has remained in the stomach from one to three hours, or even longer, if the digestion is slow, or indigestible foods have been eaten, the contractions of the stomach become so vigorous that the more fluid portions of the food are squeezed out through the pylorus, the lower orifice of the stomach, thus escaping into the intestine. The pylorus does not exercise any sort of intelligence in the selection of food, as was once supposed. The increasing acidity of the contents of the stomach causes its muscular walls to contract with increasing vigor, until finally those portions of the food which may be less perfectly broken up, but which the stomach has been unable to digest, are forced through the pylorus.

"*Intestinal Digestion.*—As it leaves the stomach, the partially digested mass of food is intensely acid, from the large quantity of gastric juices which it contains. Intestinal digestion cannot begin until the food becomes alkaline. The alkaline bile neutralizes the gastric juice, and renders the digesting mass slightly alkaline. The bile also acts upon the fatty elements of the food, converting them into an emulsion. The pancreatic juice converts the starch into grape-sugar, even acting upon raw starch. It also digest fats and albumen. The intestinal juice continues the work begun by the other digestive fluids, and, in addition, digests cane-sugar, converting it into grape-sugar.

"*Other Uses of the Digestive Fluids.*—In addition to the uses which we have already stated, several of the digestive fluids possess other interesting properties. The saliva aids the stomach by stimulating its glands to make gastric juice. The gastric juice and the bile are excellent antiseptics, by which the food is preserved from fermentation while undergoing digestion. The bile also stimulates the movements of the intestines by which the food is moved along, and aids absorption. It is remarkable and interesting that a fluid so useful as the bile should be at the same time composed of waste matters which are being removed from the body. This is an illustration of the wonderful economy shown by nature in her operations.

"The food is moved along the alimentary canal, from the stomach downward, by successive contractions of the muscular walls of the intestines, known as peristaltic movements, which occur with great regularity during digestion.

"*Absorption*.—The absorption of the food begins as soon as any portion has been digested. Even in the mouth and the esophagus a small amount is absorbed. The entire mucous membrane lining the digestive canal is furnished with a rich supply of blood-vessels, by which the greater part of the digestive food is absorbed.

"*Liver Digestion.*—The liver as well as the stomach is a digestive organ, and in a double sense. It not only secretes a digestive fluid, the bile, but it acts upon the food brought to it by the portal vein, and regulates the supply of digested food to the general system. It converts a large share of the grape-sugar and partially digested starch brought to it into a kind of liver starch, termed glycogen, which it stores up in its tissues. During the interval between the meals, the liver gradually redigests the glycogen, reconverting it into sugar, and thus supplying it to the blood in small quantities, instead of allowing the entire amount formed in digestion to enter the circulation at once. If too large an amount of sugar entered the system at once, it would be unable to use it all, and would be compelled to get rid of a considerable portion through the kidneys. The liver also completes the digestion of albumen and other food elements."

Time Required for Digestion.—The length of time required for stomach digestion varies with different food substances. The following table shows the time necessary for the stomach digestion of some of the more commonly used foods:—

	hrs	min
Rice	1	00
Sago	1	45
Tapioca	2	00
Barley	2	00
Beans, pod, boiled	2	30
Bread, wheaten	3	30
Bread, corn	3	15
Apples, sour and raw	2	00
Apples, sweet and raw	1	30

Parsnips, boiled	2	30
Beets, boiled	3	45
Potatoes, Irish, boiled	3	30
Potatoes, Irish, baked	2	30
Cabbage, raw	2	30
Cabbage, boiled	4	30
Milk, boiled	2	00
Milk, raw	2	15
Eggs, hard boiled	3	30
Eggs, soft boiled	3	00
Eggs, fried	3	30
Eggs, raw	2	00
Eggs, whipped	1	30
Salmon, salted, boiled	4	00
Oysters, raw	2	55
Oysters, stewed	3	30
Beef, lean, rare roasted	3	00
Beefsteak, boiled	3	00
Beef, lean, fried	4	00
Beef, salted, boiled	4	15
Pork, roasted	5	15
Pork, salted, fried	4	15

Mutton, roasted	3	15
Mutton, broiled	3	00
Veal, broiled	4	00
Veal, fried	4	30
Fowls, boiled	4	00
Duck, roasted	4	30
Butter, melted	3	30
Cheese	3	30
Soup, marrowbone	4	15
Soup, bean	3	00
Soup, mutton	3	30
Chicken, boiled	3	00

The time required for the digestion of food also depends upon the condition under which the food is eaten. Healthy stomach digestion requires at least five hours for its completion, and the stomach should have an hour for rest before another meal. If fresh food is taken before that which preceded it is digested, the portion of food remaining in the stomach is likely to undergo fermentation, thus rendering the whole mass of food unfit for the nutrition of the body, besides fostering various disturbances of digestion. It has been shown by recent observations that the length of time required for food to pass through the entire digestive process to which it is subjected in the mouth, stomach, and small intestines, is from twelve to fourteen hours.

Hygiene of Digestion.—With the stomach and other digestive organs in a state of perfect health, one is entirely unconscious of their existence, save when of feeling of hunger calls attention to the fact that food is required, or satiety warns us that a sufficient amount or too much has been eaten. Perfect digestion can only be maintained by careful observance of the rules of health in regard to habits of eating.

On the subject of Hygiene of Digestion, we again quote a few paragraphs from Dr. Kellogg's work on Physiology, in which is given a concise summary of the more important points relating to this:—

"The hygiene of digestion has to do with the quality and quantity of food eaten, in the manner of eating it.

"*Hasty Eating.*—If the food is eaten too rapidly, it will not be properly divided, and when swallowed in coarse lumps, the digestive fluids cannot readily act upon it. On account of the insufficient mastication, the saliva will be deficient in quantity, and, as a consequence, the starch will not be well digested, and the stomach will not secrete a sufficient amount of gastric juice. It is not well to eat only soft or liquid food, as we are likely to swallow it without proper chewing. A considerable proportion of hard food, which requires thorough mastication, should be eaten at every meal.

"*Drinking Freely at Meals* is harmful, as it not only encourages hasty eating, but dilutes the gastric juice, and thus lessens its activity. The food should be chewed until sufficiently moistened by saliva to allow it to be swallowed. When large quantities of fluid are taken into the stomach, digestion does not begin until a considerable portion of the fluid has been absorbed. If cold foods or drinks are taken with the meal, such as ice-cream, ice-water, iced milk or tea, the stomach is chilled, and a long delay in the digestive process is occasioned.

"The Indians of Brazil carefully abstain from drinking when eating, and the same custom prevails among many other savage tribes.

"*Eating between Meals.*—The habit of eating apples, nuts, fruits, confectionery, etc., between meals is exceedingly harmful, and certain to produce loss of appetite and indigestion. The stomach as well as the muscles and other organs of the body requires rest. The frequency with which meals should be taken depends somewhat upon the age and occupation of an individual. Infants take their food at short intervals, and owing to its simple character, are able to digest it very quickly. Adults should not take food oftener than three times a day; and persons whose employment is sedentary say, in many cases at least, adopt with advantage the plan of the ancient Greeks, who ate but twice a day. The latter custom is quite general among the higher classes in France and Spain, and in several South American countries.

"*Simplicity in Diet.*—Taking too many kinds of food at a meal is a common fault which is often a cause of disease of the digestive-organs. Those nations are the most hardy and enduring whose dietary is most simple. The Scotch peasantry live chiefly upon oatmeal, the Irish upon potatoes, milk, and oatmeal, the Italian upon peas, beans, macaroni, and chestnuts; yet all these are noted for remarkable health and endurance. The natives of the Canary Islands, an exceedingly well-developed and vigorous race, subsist almost chiefly

upon a food which they call gofio, consisting of parched grain, coarsely ground in a mortar and mixed with water.

"*Eating when Tired.*—It is not well to eat when exhausted by violent exercise, as the system is not prepared to do the work of digestion well. Sleeping immediately after eating is also a harmful practice. The process of digestion cannot well be performed during sleep, and sleep is disturbed by the ineffective efforts of the digestive organs. Hence the well-known evil effects of late suppers.

"*Eating too Much.*—Hasty eating is the greatest cause of over-eating. When one eats too rapidly, the food is crowded into the stomach so fast that nature has no time to cry, 'Enough,' by taking away the appetite before too much has been eaten. When an excess of food is taken, it is likely to ferment or sour before it can be digested. One who eats too much usually feels dull after eating.

"*How Much Food is Enough?*—The proper quantity for each person to take is what he is able to digest and utilize. This amount of various with each individual, at different times. The amount needed will vary with the amount of work done, mental or muscular; with the weather or the season of the year, more food being required in cold than in warm weather: with the age of an individual, very old and very young persons requiring less food than those of middle age. An unperverted appetite, not artificially stimulated, is a safe guide. Drowsiness, dullness, and heaviness at the stomach are indications of an excess of eating, and naturally suggest a lessening of the quantity of food, unless the symptoms are known to arise from some other cause.

"*Excess of Certain Food Elements.*—When sugar is too freely used, either with food or in the form of sweetmeats or candies, indigestion, and even more serious disease, is likely to result. Fats, when freely used, give rise to indigestion and 'biliousness.' An excess of albumen from the too free use of meat is harmful. Only a limited amount of this element can be used; an excess is treated as waste matter, and must be removed from the system by the liver and the kidneys. The majority of persons would enjoy better health by using meat more moderately than is customary in this country.

"*Deficiency of Certain Food Elements.*—A diet deficient in any important food element is even more detrimental to health than a diet in which certain elements are in excess.

"The popular notion that beef-tea and meat extracts contain the nourishing elements of meat in a concentrated form, is a dangerous error. Undoubtedly many sick persons have been starved by being fed exclusively upon these articles, which are almost wholly composed of waste substances. Prof. Paule Bernard, of Paris, found that dogs fed upon meat extracts died sooner than those which received only water."

Food combinations.—Some persons, especially those of weak digestive powers, often experience inconvenience in the use of certain foods, owing to their improper combinations with other articles. Many foods which are digested easily when partaken of alone or

in harmonious combinations, create much disturbance when eaten at the same meal with several different articles of food, or with some particular article with which they are especially incompatible. The following food combinations are among the best, the relative excellence of each being indicated by the order in which they are named: Milk and grains; grains and eggs; grains and vegetables or meats; grains and fruits.

Persons with sound stomachs and vigorous digestion will seldom experience inconvenience in making use of other and more varied combinations, but dyspeptics and persons troubled with slow digestion will find it to their advantage to select from the bill of fare such articles as best accord with each other, and to avoid such combinations as fruits and vegetables, milk and vegetables, milk and meats, sugar and milk, meat or vegetables, fats with fruits, meats, or vegetables, or cooked with grains.

TABLE TOPICS.

Now good digestion waits on appetite, and health on both—*Shakespeare.*

We live not upon what we eat, but upon what we digest.—*Abernethy.*

If we consider the amount of ill temper, despondency, and general unhappiness which arises from want of proper digestion and assimilation of our food, it seems obviously well worth while to put forth every effort, and undergo any sacrifice, for the purpose of avoiding indigestion, with its resulting bodily ills; and yet year after year, from the cradle to the grave, we go on violating the plainest and simplest laws of health at the temptation of Cooks, caterers, and confectioners, whose share in shortening the average term of human life is probably nearly equal to that of the combined armies and navies of the world.—*Richardson.*

Almost every human malady is connected, either by highway or byway, with the stomach.—*Sir Francis Head.*

It is a well-established fact that a leg of mutton caused a revolution in the affairs of Europe. Just before the battle of Leipsic, Napoleon the Great insisted on dining on boiled mutton, although his physicians warned him that it would disagree with him. The emperor's brain resented the liberty taken with its colleague, the stomach; the monarch's equilibrium was overturned, the battle lost, and a new page opened in history.—*Sel.*

Galloping consumption at the dinner table is one of the national disorders.—*Sel.*

The kitchen (that is, your stomach) being out of order, the garret (the head) cannot be right, and every room in the house becomes affected. Remedy the evil in the kitchen, and all will be right in parlor and chamber. If you put improper food into the stomach, you play the mischief with it, and with the whole machine besides.—*Abernethy.*

Cattle know when to go home from grazing, but a foolish man never knows his stomachs measures.—*Scandinavian proverb.*

Enough is as good as a feast.

Simplicity of diet is the characteristic of the dwellers in the Orient. According to Niebuhr, the sheik of the desert wants only a dish of pillau, or boiled rice, which he eats without fork or spoon. Notwithstanding their frugal fare, these sons of the desert are among the most hearty and enduring of all members of the human family. A traveler tells of seeing one of them run up to the top of the tallest pyramid and back in six minutes.

One fourth of what we eat keeps us, and the other three fourths we keep at the peril of our lives.—*Abernethy.*

COOKERY.

It is not enough that good and proper food material be provided; it must have such preparation as will increase and not diminish its alimentary value. The unwholesomeness of food is quite as often due to bad cookery as to improper selection of material. Proper cookery renders good food material more digestible. When scientifically done, cooking changes each of the food elements, with the exception of fats, in much the same manner as do the digestive juices, and at the same time it breaks up the food by dissolving the soluble portions, so that its elements are more readily acted upon by the digestive fluids. Cookery, however, often fails to attain the desired end; and the best material is rendered useless and unwholesome by a improper preparation.

It is rare to find a table, some portion of the food upon which is not rendered unwholesome either by improper preparatory treatment, or by the addition of some deleterious substance. This is doubtless due to the fact that the preparation of food being such a commonplace matter, its important relations to health, mind, and body have been overlooked, and it has been regarded as a menial service which might be undertaken with little or no preparation, and without attention to matters other than those which relate to the pleasure of the eye and the palate. With taste only as a criterion, it is so easy to disguise the results of careless and improper cookery of food by the use of flavors and condiments, as well as to palm off upon the digestive organs all sorts of inferior material, that poor cookery has come to be the rule rather than the exception.

Another reason for this prevalence of bad cookery, is to be found in the fact that in so many homes the cooking is intrusted to an ignorant class of persons having no knowledge whatever of the scientific principles involved in this most important and practical of arts. An ethical problem which we have been unable to solve is the fact that women who would never think of trusting the care of their fine china and bric-a-brac to unskilled hands, unhesitatingly intrust to persons who are almost wholly untrained, the preparation of their daily food. There is no department of life where superior intelligence is more needed than in the selection and preparation of food, upon which so largely depend the health and physical welfare of the family circle.

The evils of bad cookery and ill-selected food are manifold, so many, in fact, that it has been calculated that they far exceed the mischief arising from the use of strong drink; indeed, one of the evils of unwholesome food is its decided tendency to create a craving for

intoxicants. Bad cookery causes indigestion, indigestion causes thirst, and thirst perpetuates drunkenness. Any one who has suffered from a fit of indigestion, and can recollect the accompanying headache and the lowness of spirits, varying in degree from dejection or ill-humor to the most extreme melancholy, until the intellectual faculties seemed dazed, and the moral feelings blunted, will hardly wonder that when such a condition becomes chronic, as is often the case from the use of improperly prepared food, the victim is easily led to resort to stimulants to drown depression and enliven the spirits.

A thorough practical knowledge of simple, wholesome cookery ought to form a part of the education of every young woman, whatever her station in life. No position in life is more responsible than that of the person who arranges the bills of fare and selects the food for the household; and what higher mission can one conceive than to intelligently prepare the wherewithal to make shoulders strong to bear life's burdens and heads clear to solve its intricate problems? what worthier work than to help in the building up of bodies into pure temples fit for guests of noble thoughts and high purposes? Surely, no one should undertake such important work without a knowledge of the principles involved.

THE PRINCIPLES OF SCIENTIFIC COOKERY.

Cookery is the art of preparing food for the table by dressing, or by the application of heat in some manner.

Fuels.—Artificial heat is commonly produced by combustion, caused by the chemical action of the oxygen of the air upon the hydrogen and carbon found in fuel. The different fuels in common use for cooking purposes are hard wood, soft wood, charcoal, anthracite coal, bituminous coal, coke, lignite, kerosene oil, gasoline, and gas. As to their respective values, much depends upon the purpose for which they are to be used. Wood charcoal produces a greater amount of heat than an equal weight of any other fuel. Soft wood burns quicker and gives a more intense heat than hard wood, and hence is best for a quick fire. Hard wood burns slowly, produces a larger mass of coals, and is best where long-continued heat is desired. Anthracite coal kindles slowly, and burns with little flame or smoke, but its vapor is sulphurous, and on that account it should never be burned in an open stove, nor in one with an imperfect draft. Its heat is steady and intense. Bituminous coal ignites readily, burns with considerable flame and smoke, and gives a much less intense heat than anthracite, Lignite, or brown coal, is much less valuable as fuel. Coke is useful when a short, quick fire is needed. Kerosene and gas are convenient and economical fuels.

Making Fires.—If coal is the fuel to be used, first clean out the stove by shaking the grate and removing all ashes and cinders. Remove the stove covers, and brush the soot and ashes out of all the flues and draft holes into the fire-box. Place a large handful of shavings or loosely twisted or crumpled papers upon the grate, over which lay some fine

pieces of dry kindling-wood, arranged crosswise to permit a free draft, then a few sticks of hard wood, so placed as to allow plenty of air spaces. Be sure that the wood extends out to both ends of the fire-box. Replace the covers, and if the stove needs blacking, mix the polish, and apply it, rubbing with a dry brush until nearly dry, then light the fuel, as a little heat will facilitate the polishing. When the wood is burning briskly, place a shovelful or two of rather small pieces of coal upon the wood, and, as they ignite, gradually add more, until there is a clear, bright body of fire, remembering, however, never to fill the stove above the fire bricks; then partly close the direct draft. When wood or soft coal is used, the fuel may be added at the same time with the kindling.

Care of Fires.—Much fuel is wasted through the loss of heat from too much draft. Only just enough air should be supplied to promote combustion. A coal fire, when well kindled, needs only air enough to keep it burning. When the coal becomes red all through, it has parted with the most of its heat, and the fire will soon die unless replenished. To keep a steady fire, add but a small amount of fuel at a time, and repeat often enough to prevent any sensible decrease of the degree of heat. Rake the fire from the bottom, and keep it clear of ashes and cinders. If a very hot fire is needed, open the drafts; at other times, keep them closed, or partially so, and not waste fuel. There is no economy in allowing a fire to get low before fuel is added; for the fresh fuel cools the fire to a temperature so low that it is not useful, and thus occasions a direct waste of all fuel necessary to again raise the heat to the proper degree, to say nothing of the waste of time and patience. The addition of small quantities of fuel at short intervals so long as continuous heat is needed, is far better than to let the fuel burn nearly out, and then add a larger quantity. The improper management of the drafts and dampers has also much to do with waste of fuel. As stoves are generally constructed, it is necessary for the heat to pass over the top, down the back, and under the bottom of the oven before escaping into the flue, in order to properly heat the oven for baking. In order to force the heat to make this circuit, the direct draft of the stove needs to be closed. With this precaution observed, a quick fire from a small amount of fuel, used before its force is spent, will produce better results than a fire-box full under other circumstances.

An item of economy for those who are large users of coal, is the careful sifting of the cinders from the ashes. They can be used to good advantage to put first upon the kindlings, when building the fire, as they ignite more readily than fresh coal, and give a greater, quicker heat, although much less enduring.

Methods of Cooking.—A proper source of heat having been secured, the next step is to apply it to the food in some manner. The principal methods commonly employed are roasting, broiling, baking, boiling, stewing, simmering, steaming, and frying.

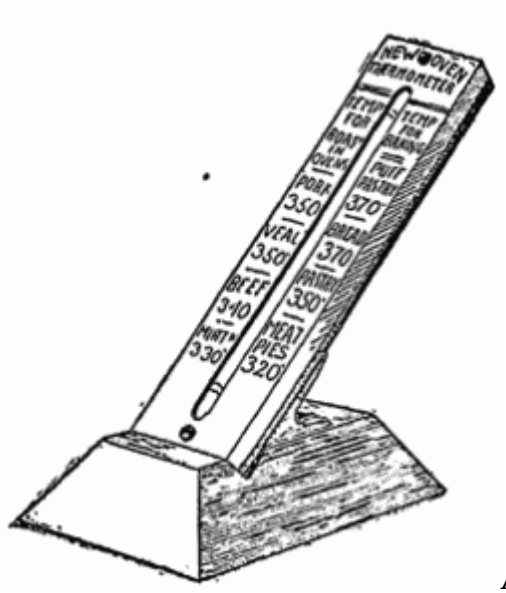
Roasting is cooking food in its own juices before an open fire. A clear fire with intense heat is necessary.

Broiling, or *grilling*, is cooking by radiant heat over glowing coals. This method is only adapted to thin pieces of food with a considerable amount of surface. Larger and more compact foods should be roasted or baked. Roasting and broiling are allied in principle. In both, the work is chiefly done by the radiation of heat directly upon the surface of the food, although some heat is communicated by the hot air surrounding the food. The intense heat applied to the food soon sears its outer surfaces, and thus prevents the escape of its juices. If care be taken frequently to turn the food so that its entire surface will be thus acted upon, the interior of the mass is cooked by its own juices.

Baking is the cooking of food by dry heat in a closed oven. Only foods containing a considerable degree of moisture are adapted for cooking by this method. The hot, dry air which fills the oven is always thirsting for moisture, and will take from every moist substance to which it has access a quantity of water proportionate to its degree of heat. Foods containing but a small amount of moisture, unless protected in some manner from the action of the heated air, or in some way supplied with moisture during the cooking process, come from the oven dry, hard, and unpalatable.

Proper cooking by this method depends greatly upon the facility with which the heat of the oven can be regulated. When oil or gas is the fuel used, it is an easy matter to secure and maintain almost any degree of heat desirable, but with a wood or coal stove, especial care and painstaking are necessary.

It is of the first importance that the mechanism of the oven to be used, be thoroughly understood by the cook, and she should test its heating capacity under various conditions, with a light, quick fire and with a more steady one; she should carefully note the kind and amount of fuel requisite to produce a certain degree of heat; in short, she should thoroughly know her "machine" and its capabilities before attempting to use it for the cooking of food. An oven thermometer is of the utmost value for testing the heat, but unfortunately, such thermometers are not common. They are obtainable in England, although quite expensive. It is also possible at the present time to obtain ranges with a very reliable thermometer attachment to the oven door.



An Oven Thermometer

A cook of good judgment by careful observation and comparison of results, can soon learn to form quite a correct idea of the heat of her oven by the length of time she can hold her hand inside it without discomfort, but since much depends upon the construction of stoves and the kind of fuel used, and since the degree of heat bearable will vary with every hand that tries it, each person who depends upon this test must make her own standard. When the heat of the oven is found to be too great, it may be lessened by placing in it a dish of cold water.

Boiling is the cooking of food in a boiling liquid. Water is the usual medium employed for this purpose. When water is heated, as its temperature is increased, minute bubbles of air which have been dissolved by it are given off. As the temperature rises, bubbles of steam will begin to form at the bottom of the vessel. At first these will be condensed as they rise into the cooler water above, causing a simmering sound; but as the heat increases, the bubbles will rise higher and higher before collapsing, and in a short time will pass entirely through the water, escaping from its surface, causing more or less agitation, according to the rapidity with which they are formed. Water boils when the bubbles thus rise to the surface, and steam is thrown off. If the temperature is now tested, it will be found to be about 212° F. When water begins to boil, it is impossible to increase its temperature, as the steam carries off the heat as rapidly as it is communicated to the water. The only way in which the temperature can be raised, is by the confinement of the steam; but owing to its enormous expansive force, this is not practicable with ordinary cooking utensils. The mechanical action of the water is increased by rapid bubbling, but not the heat; and to boil anything violently does not expedite the cooking process, save that by the mechanical action of the water the food is broken into smaller pieces, which are for this reason more readily softened. But violent boiling occasions an enormous waste of fuel, and by driving away in the steam the volatile and savory elements of the food, ren-

ders it much less palatable, if not altogether tasteless. The solvent properties of water are so increased by heat that it permeates the food, rendering its hard and tough constituents soft and easy of digestion.

The liquids mostly employed in the cooking of foods are water and milk. Water is best suited for the cooking of most foods, but for such farinaceous foods as rice, macaroni, and farina, milk, or at least part milk, is preferable, as it adds to their nutritive value. In using milk for cooking purposes, it should be remembered that being more dense than water, when heated, less steam escapes, and consequently it boils sooner than does water. Then, too, milk being more dense, when it is used alone for cooking, a little larger quantity of fluid will be required than when water is used.

The boiling point for water at the sea level is 212°. At all points above the sea level, water boils at a temperature below 212°, the exact temperature depending upon the altitude. At the top of Mt. Blanc, an altitude of 15,000 feet, water boils at 185°. The boiling point is lowered one degree for every 600 feet increase in altitude. The boiling point may be increased by adding soluble substances to the water. A saturated solution of common baking soda boils at 220°. A saturated solution of chloride of sodium boils at 227°. A similar solution of sal-ammoniac boils at 238°. Of course such solutions cannot be used advantageously, except as a means of cooking articles placed in hermetically sealed vessels and immersed in the liquid.

Different effects upon food are produced by the use of hard and soft water. Peas and beans boiled in hard water containing lime or gypsum, will not become tender, because these chemical substances harden vegetable casein, of which element peas and beans are largely composed. For extracting the juices of meat and the soluble parts of other foods, soft water is best, as it more readily penetrates the tissue; but when it is desired to preserve the articles whole, and retain their juices and flavors, hard water is preferable.

Foods should be put to cook in cold or boiling water, in accordance with the object to be attained in their cooking. Foods from which it is desirable to extract the nutrient properties, as for broths, extracts, etc., should be put to cook in cold water. Foods to be kept intact as nearly as may be, should be put to cook in boiling water.

Hot and cold water act differently upon the different food elements. Starch is but slightly acted upon by cold water. When starch is added to several times its bulk of hot water, all the starch granules burst on approaching the boiling point, and swell to such a degree as to occupy nearly the whole volume of the water, forming a pasty mess. Sugar is dissolved readily in the either hot or cold water. Cold water extracts albumen. Hot water coagulates it.

Steaming, as its name implies, is the cooking of food by the use of steam. There are several ways of steaming, the most common of which is by placing the food in a perforated dish over a vessel of boiling water. For foods not needing the solvent powers of water, or

which already contain a large amount of moisture, this method is preferable to boiling. Another form of cooking, which is usually termed steaming, is that of placing the food, with or without water, as needed, in a closed vessel which is placed inside another vessel containing boiling water. Such an apparatus is termed a double boiler. Food cooked in its own juices in a covered dish in a hot oven, is sometimes spoken of as being *steamed* or *smothered*.

Stewing is the prolonged cooking of food in a small quantity of liquid, the temperature of which is just below the boiling point. Stewing should not be confounded with simmering, which is slow, steady boiling. The proper temperature for stewing is most easily secured by the use of the double boiler. The water in the outer vessel boils, while that in the inner vessel does not, being kept a little below the temperature of the water from which its heat is obtained, by the constant evaporation at a temperature a little below the boiling point.

Frying, which is the cooking of food in hot fat, is a method not to be recommended—Unlike all the other food elements, fat is rendered less digestible by cooking. Doubtless it is for this reason that nature has provided those foods which require the most prolonged cooking to fit them for use with only a small proportion of fat, and it would seem to indicate that any food to be subjected to a high degree of heat should not be mixed and compounded largely of fats. The ordinary way of frying, which the French call *sauteing*, is by the use of only a little fat in a shallow pan, into which the food is put and cooked first on one side and then the other. Scarcely anything could be more unwholesome than food prepared in this manner. A morsel of food encrusted with fat remains undigested in the stomach because fat is not acted upon by the gastric juice, and its combination with the other food elements of which the morsel is composed interferes with their digestion also. If such foods are habitually used, digestion soon becomes slow and the gastric juice so deficient in quantity that fermentation and putrefactive changes are occasioned, resulting in serious disturbance of health. In the process of frying, the action of the heat partially decomposes the fat; in consequence, various poisonous substances are formed, highly detrimental to the digestion of the partaker of the food.

Adding Foods to Boiling Liquids.—Much of the soddenness of improperly cooked foods might be avoided, if the following facts were kept in mind:—

When vegetables, or other foods of ordinary temperature, are put into boiling water, the temperature of the water is lowered in proportion to the quantity and the temperature of the food thus introduced, and will not again boil until the mass of food shall have absorbed more heat from the fire. The result of this is that the food is apt to become more or less water-soaked before the process of cooking begins. This difficulty may be avoided by introducing but small quantities of the food at one time, so as not to greatly lower the temperature of the liquid, and then allowing the latter to boil between the introduction of each fresh supply, or by heating the food before adding it to the liquid.

Evaporation is another principle often overlooked in the cooking of food, and many a sauce or gravy is spoiled because the liquid, heated in a shallow pan, from which evaporation is rapid, loses so much in bulk that the amount of thickening requisite for the given quantity of fluid, and which, had less evaporation occurred, would have made it of the proper consistency, makes the sauce thick and unpalatable. Evaporation is much less, in slow boiling, than in more rapid cooking.

Measuring.—One of the most important principles to be observed in the preparation of food for cooking, is accuracy in measuring. Many an excellent recipe proves a failure simply from lack of care in this respect. Measures are generally more convenient than weights, and are more commonly used. The common kitchen cup, which holds a half pint, is the one usually taken as the standard; if any other size is used, the ingredients for the entire recipe should be measured by the same. The following points should be observed in measuring:—

1. The teaspoons and tablespoons to be used in measuring, are the silver spoons in general use.

2. Any material like flour, sugar, salt, that has been packed, should either be sifted or stirred up lightly before measuring.

3. A cupful of dry material is measured level with the top of the cup, without being packed down.

4. A cupful of liquid is all the cup will contain without running over. Hold the cup in a saucer while measuring, to prevent spilling the liquid upon the floor or table.

Comparative Table of Weights and Measures.—The following comparative table of weights and measurements will aid in estimating different materials:—

One heaping tablespoonful of sugar weighs one ounce.

Two round tablespoonfuls of flour weigh one ounce.

Two cupfuls of granulated sugar weigh one pound.

Two cupfuls of meal weigh one pound.

Four cupfuls of sifted flour weigh one pound.

One pint of oatmeal, cracked wheat, or other coarse grains, weighs about one pound.

One pint of liquid weighs one pound.

One pint of meat chopped and packed solid weighs one pound.

Seven heaping tablespoonfuls of sugar = one cupful.

Five heaping tablespoonfuls of flour = one cupful.

Two cupfuls of liquid or dry material = one pint

Four cupfuls of liquid or dry material = one quart.

Mixing Materials.—In the compounding of recipes, various modes are employed for mingling together the different ingredients, chief of which are *stirring*, *beating*, and *kneading*.

By *stirring* is meant a continuous motion round and round with a spoon, without lifting it from the mixture, except to scrape occasionally from the sides of the dish any portion of the material that may cling to it. It is not necessary that the stirring should be all in one direction, as many cooks suppose. The object of the stirring is to thoroughly blend the ingredients, and this may be accomplished as well by stirring—in one direction as in another.

Beating is for the purpose of incorporating as much air in the mixture as possible. It should be done by dipping the spoon in and out, cutting clear through and lifting from the bottom with each stroke. The process must be continuous, and must never be interspersed with any stirring if it is desired to retain the air within the mixture.

Kneading is the mode by which materials already in the form of dough are more thoroughly blended together; it also serves to incorporate air. The process is more fully described in the chapter on "Bread,"

Temperature.—Many a cook fails and knows not why, because she does not understand the influence of temperature upon materials and food. Flour and liquids for unfermented breads cannot be too cold, while for bread prepared with yeast, success is largely dependent upon a warm and equable temperature throughout the entire process.

Cooking Utensils.—The earliest cookery was probably accomplished without the aid of any utensils, the food being roasted by burying it in hot ashes or cooked by the aid of heated stones; but modern cookery necessitates the use of a greater or less variety of cooking utensils to facilitate the preparation of food, most of which are so familiar to the reader as to need no description. (A list of those needed for use will be found) Most of these utensils are manufactured from some kind of metal, as iron, tin, copper, brass, etc. All metals are dissolvable in certain substances, and some of those employed for making household utensils are capable of forming most poisonous compounds when used for cooking certain foods. This fact should lead to great care on the part of the housewife, both in purchasing and in using utensils for cooking purposes.

Iron utensils, although they are, when new, apt to discolor and impart a disagreeable flavor to food cooked in them, are not objectionable from a health standpoint, if kept clean and free from rust. Iron rust is the result of the combination of the iron with oxygen, for which it has so great an affinity that it will decompose water to get oxygen to unite with; hence it is that iron utensils rust so quickly when not carefully dried after using, or if left where they can collect moisture. This is the reason why a coating of tallow,

which serves to exclude the air and moisture, will preserve ironware not in daily use from rusting.

"Porcelain ware" is iron lined with a hard, smooth enamel, and makes safe and very desirable cooking utensils. German porcelain ware is unexcelled for culinary purposes.

"Granite ware" is a material quite recently come into use, the composition of which is a secret, although pronounced by eminent chemists to be free from all injurious qualities. Utensils made from it are light in weight, easily kept clean, and for most cooking purposes, are far superior to those made from any other material.

What is termed "galvanized iron" is unsuitable for cooking utensils, it being simply sheet iron coated with zinc, an exceedingly unsafe metal to be used for cooking purposes.

Tin, which is simply thin sheet iron coated with tin by dipping several times into vats of the melted metal, is largely employed in the manufacture of cooking utensils. Tinware is acted upon by acids, and when used for holding or cooking any acid foods, like sour milk, sour fruits, tomatoes, etc., harmful substances are liable to be formed, varying in quantity and harmfulness with the nature of the acid contained in the food.

In these days of fraud and adulteration, nearly all the cheaper grades of tinware contain a greater or less amount of lead in their composition, which owing to its greater abundance and less price, is used as an adulterant of tin. Lead is also used in the solder with which the parts of tinware are united. The action of acids upon lead form very poisonous compounds, and all lead-adulterated utensils should be wholly discarded for cooking purposes.

Test for Lead-Adulterated Tin.—Place upon the metal a small drop of nitric acid, spreading it to the size of a dime, dry with gentle heat, apply a drop of water, then add a small crystal of iodide of potash. If lead is present, a yellowish color will be seen very soon after the addition of the iodide. Lead glazing, which is frequently employed on crockery and ironware in the manufacture of cooking utensils, may also be detected in the same manner.

Cooking utensils made of copper are not to be recommended from the point of healthfulness, although many cooks esteem them because copper is a better conductor of heat than iron or tin. The acids of many fruits combine with copper to form extremely poisonous substances. Fatty substances, as well as salt and sugar, act upon copper to a greater or less degree, also vegetables containing sulfur in their composition and produce harmful compounds.

Utensils made of brass, which is a compound of copper and zinc, are not safe to use for cooking purposes.

TABLE TOPICS.

Bad cooking diminishes happiness and shortens life.—*Wisdom of Ages.*

Says Mrs. Partington: "Many a fair home has been desiccated by poor cooking, and a man's table has been the rock on which his happiness has split."

SIGNIFICANT FACT.—*Lady*—"Have you had much experience as a cook?" *Applicant*—"Oh, indeed I have. I was the cook of Mr. and Mrs. Peterby for three years."

L.—"Why did you leave them?"

A.—"I didn't leave them. They left me. They both died."

L.—"What of?"

A.—"Dyspepsia."

Cooking is generally bad because people falling to routine; habit dulls their appreciation, and they do not think about what they are eating.—*Didsbury.*

Lilly (Secretary of the cooking class)—"Now girls, we've learned nine cakes, two kinds of angel food, and seven pies. What next?"

Susie (engaged)—"Dick's father says I must learn to bake bread."

Indignant chorus—"Bread? How absurd! What are bakers for?"

It is told of Philip Hecgnet, a French, physician who lived in the 17th, century, that when calling upon his wealthy patients, he used often to go to the kitchen and pantry, embrace the cooks and butlers, and exhort them to do their duty well. "I owe you so much gratitude, my dear friends," he would say; "you are so useful to us doctors; for if you did not keep on poisoning the people, we should all have to go to the poorhouse."

There are innumerable books of recipes for cooking, but unless the cook is master of the principles of his art, and unless he knows the why and the wherefore of its processes, he cannot choose a recipe intelligently and execute it successfully.—*Richard Estcourt.*

They who provide the food for the world, decide the health of the world. You have only to go on some errands amid the taverns and hotels of the United States and Great Britain, to appreciate the fact that a vast multitude of the human race are slaughtered by incompetent cookery. Though a young woman may have taken lessons in music, and may have taken lessons in painting, and lessons in astronomy, she is not well educated unless she has taken lessons in dough!—*Talmage.*

HOUSEHOLD WORKSHOP



t is a mistake to suppose that any room, however small and unpleasantly situated, is "good enough" for a kitchen. This is the room where housekeepers pass a great portion of their time, and it should be one of the brightest and most convenient rooms in the house; for upon the results of no other department of woman's domain depend so greatly the health and comfort of the family as upon those involved in this "household workshop." The character of a person's work is more or less dependent upon his surroundings, hence is it to be greatly wondered at that a woman immured in a small, close, dimly-lighted room, whose only outlook may be the back alley or the woodshed, supplies her household with products far below the standard of health and housewifely skill?

Every kitchen should have windows on two sides of the room, and the sun should have free entrance through them; the windows should open from the top to allow a complete change of air, for light and fresh air are among the chief essentials to success in all departments of the household. Good drainage should also be provided, and the ventilation of the kitchen ought to be even more carefully attended to than that of a sleeping room. The ventilation of the kitchen should be so ample as to thoroughly remove all gases and odors, which, together with steam from boiling and other cooking processes, generally invade and render to some degree unhealthful every other portion of the house. It is the steam from the kitchen which gives a fusty odor to the parlor air and provides a wet-sheet pack for the occupant of the "spare bed." The only way of wholly eradicating this evil, is the adoption of the suggestion of the sanitary philosopher who places the kitchen at the top of the house.

To lessen to discomforts from heat, a ventilator may be placed above the range, that shall carry out of the room all superfluous heat, and aid in removing the steam and odors from cooking food. The simplest form of such a ventilator this inverted hopper of sheet iron fitted above the range, the upper and smaller end opening into a large flue adjacent to the smoke flue for the range. Care must be taken, however, to provide an ample ventilating shaft for this purpose, since a strong draft is required to secure the desired results.

There should be ample space for tables, chairs, range, sink, and cupboards, yet the room should not be so large as to necessitate too many steps. A very good size for the ordinary dwelling is 16 x 18 feet.

Undoubtedly much of the distaste for, and neglect of, "housework," so often deplored in these days, arises from unpleasant surroundings. If the kitchen be light, airy, and tidy,

and the utensils bright and clean, the work of compounding those articles of food which grace the table and satisfy the appetite will be a pleasant task, and one entirely worthy of the most intelligent and cultivated woman.

It is desirable, from a sanitary standpoint, that the kitchen floor be made impervious to moisture; hence, concrete or tile floors are better than wooden floors. If wooden floors are used, they should be constructed of narrow boards of hard wood, carefully joined and thoroughly saturated with hot linseed oil, well rubbed in to give polish to the surface.

Cleanliness is the great *desideratum*, and this can be best attained by having all woodwork in and about the kitchen coated with varnish; substances which cause stain and grease spots, do not penetrate the wood when varnished, and can be easily removed with a damp cloth. Paint is preferable to whitewash or calcimine for the walls, since it is less affected by steam, and can be more readily cleaned. A carpet on a kitchen floor is as out of place as a kitchen sink would be in a parlor.

The elements of beauty should not be lacking in the kitchen. Pictures and fancy articles are inappropriate; but a few pots of easily cultivated flowers on the window ledge or arranged upon brackets about the window in winter, and a window box arranged as a jardiniere, with vines and blooming plants in summer, will greatly brighten the room, and thus serve to lighten the task of those whose daily labor confines them to the precincts of the kitchen.

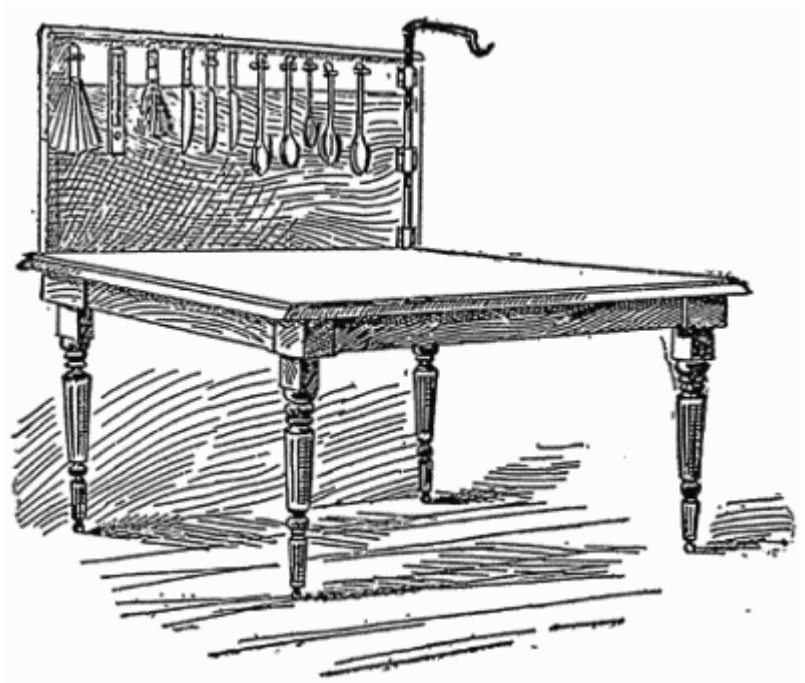
The Kitchen Furniture.—The furniture for a kitchen should not be cumbersome, and should be so made and dressed as to be easily cleaned. There should be plenty of cupboards, and each for the sake of order, should be devoted to a special purpose. Cupboards with sliding doors are much superior to closets. They should be placed upon casters so as to be easily moved, as they, are thus not only more convenient, but admit of more thorough cleanliness.

Cupboards used for the storage of food should be well ventilated; otherwise, they furnish choice conditions for the development of mold and germs. Movable cupboards may be ventilated by means of openings in the top, and doors covered with very fine wire gauze which will admit the air but keep out flies and dust. All stationary cupboards and closets should have a ventilating flue connected with the main shaft by which the house is ventilated, or directly communicating with the outer air.

No kitchen can be regarded as well furnished without a good timepiece as an aid to punctuality and economy of time. An eight-day clock with large dial and plain case is the most suitable.

Every kitchen should also be provided with a slate, with sponge and pencil attached, on one side of which the market orders and other memoranda may be jotted down, and on the other the bills of fare for the day or week. In households where servants are kept, the slate will save many a vexatious blunder and unnecessary call to the kitchen, while if

one is herself mistress, cook, and housekeeper, it may prove an invaluable aid and time-saver if thus used.



A Convenient Kitchen Table.

Lack of sufficient table room is often a great source of inconvenience to the housekeeper. To avoid this, arrange swinging tables or shelves at convenient points upon the wall, which may be put up or let down as occasion demands. For ordinary kitchen uses, small tables of suitable height on easy-rolling casters, and with zinc tops, are the most convenient and most easily kept clean. It is quite as well that they be made without drawers, which are too apt to become receptacles for a heterogeneous mass of rubbish. If desirable to have some handy place for keeping articles which are frequently required for use, an arrangement similar to that represented in the accompanying cut may be made at very small expense. It may be also an advantage to arrange small shelves about and above the range, on which may be kept various articles necessary for cooking purposes.

One of the most indispensable articles of furnishing for a well-appointed kitchen, is a sink; however, a sink must be properly constructed and well cared for, or it is likely to become a source of great danger to the health of the inmates of the household. Earthenware is the best material for kitchen sinks. Iron is very serviceable, but corrodes, and if painted or enameled, this soon wears off. Wood is objectionable from a sanitary standpoint. A sink made of wood lined with copper answers well for a long time if properly cared for.

The sink should if possible stand out from the wall, so as to allow free access to all sides of it for the sake of cleanliness, and under no circumstances should there be any in-

closure of woodwork or cupboards underneath to serve as a storage place for pots and kettles and all kinds of rubbish, dust, and germs. It should be supported on legs, and the space below should be open for inspection at all times. The pipes and fixtures should be selected and placed by a competent plumber.

Great pains should be taken to keep the pipes clean and well disinfected. Refuse of all kinds should be kept out. Thoughtless housekeepers and careless domestics often allow greasy water and bits of table waste to find their way into the pipes. Drain pipes usually have a bend, or trap, through which water containing no sediment flows freely; but the melted grease which often passes into the pipes mixed with hot water, becomes cooled and solid as it descends, adhering to the pipes, and gradually accumulating until the drain is blocked, or the water passes through very slowly. A grease-lined pipe is a hotbed for disease germs.

Water containing much grease should be cooled and the grease removed before being turned into the kitchen sink, while bits of refuse should be disposed of elsewhere, since prevention of mischief is in this case, as in most others, far easier than cure. It is customary for housekeepers to pour a hot solution of soda or potash down the sink pipes occasionally, to dissolve any grease which may tend to obstruct the passage; but this is only a partial safeguard, as there is no certainty that all the grease will be dissolved, and any particles adhering to the pipes very soon undergo putrefaction.

A frequent flushing with hot water is important; besides which the pipes should be disinfected two or three times a week by pouring down a gallon of water holding in solution a pound of good chloride of lime.

Stoves and Ranges.—The furnishing of a modern kitchen would be quite incomplete without some form of stove or range. The multiplicity of these articles, manufactured each with some especial merit of its own, renders it a somewhat difficult task to make a choice among them. Much must, however, depend upon the kind of fuel to be used, the size of the household, and various other circumstances which make it necessary for each individual housekeeper to decide for herself what is best adapted to her wants. It may be said, in brief, that economy of fuel, simplicity of construction, and efficiency in use are the chief points to be considered in the selection of stoves and ranges.

A stove or range of plain finish is to be preferred, because it is much easier to keep clean, and will be likely to present a better appearance after a few months' wear than one of more elaborate pattern. But whatever stove or range is selected, its mechanism should be thoroughly understood in every particular, and it should be tested with dampers open, with dampers closed, and in every possible way, until one is perfectly sure she understands its action under all conditions.

Oil and Gas Stoves.—In many households, oil, gas, and gasoline stoves have largely taken the place of the kitchen range, especially during the hot weather of summer. They

can be used for nearly every purpose for which a wood or a coal range is used; they require much less labor and litter, and can be instantly started into full force and as quickly turned out when no longer required, while the fact that the heat can be regulated with exactness, makes them superior for certain processes of cooking to any other stove. But while these stoves are convenient and economical, especially in small families, they should be used with much care. Aside from the danger from explosion, which is by no means inconsiderable in the use of gasoline and oil stoves, they are not, unless well cared for altogether healthful. Unless the precaution is taken to use them in well-ventilated rooms or to connect them with a chimney, they vitiate the atmosphere to a considerable extent with the products of combustion. Oil stoves, unless the wicks are kept well trimmed, are apt to smoke, and this smoke is not only disagreeable, but extremely irritating to the mucous membrane of the nose and throat. Oil stoves are constructed on the same principle as ordinary oil lamps, and require the same care and attention.

Quite recently there has been invented by Prof. Edward Atkinson a very unique apparatus for cooking by means of the heat of an ordinary kerosene lamp, called the "Aladdin Cooker." The food to be cooked is placed in a chamber around which hot water, heated by the flame of the lamp, circulates. The uniform heat thus obtained performs the process of cooking, slowly, but most satisfactorily and economically, the result being far superior to that obtained by the ordinary method of cooking by quick heat. The cooker is only used for stewing and steaming; but Mr. Atkinson has also invented an oven in which the heat is conveyed to the place where it is needed by a column of hot air instead of hot water. With this oven, which consists of an outer oven made of non-conducting material, and an inner oven made of sheet iron, with an intervening space between, through which the hot air circulates, no smoke or odor from the lamp can reach the interior.

Kitchen. Utensils.—The list of necessary kitchen utensils must of course be governed somewhat by individual circumstances, but it should not be curtailed for the sake of display in some other department, where less depends upon the results. A good kitchen outfit is one of the foundation-stones of good housekeeping. The following are some of the most essential:—

Two dish pans; two or more *papier-maché* tubs for washing glassware; one kneading board; one bread board; one pair scales, with weights; scrubbing and stove brushes; brooms; dustpans; roller for towel; washbowl; soap dish; vegetable brushes.



A Double Boiler.

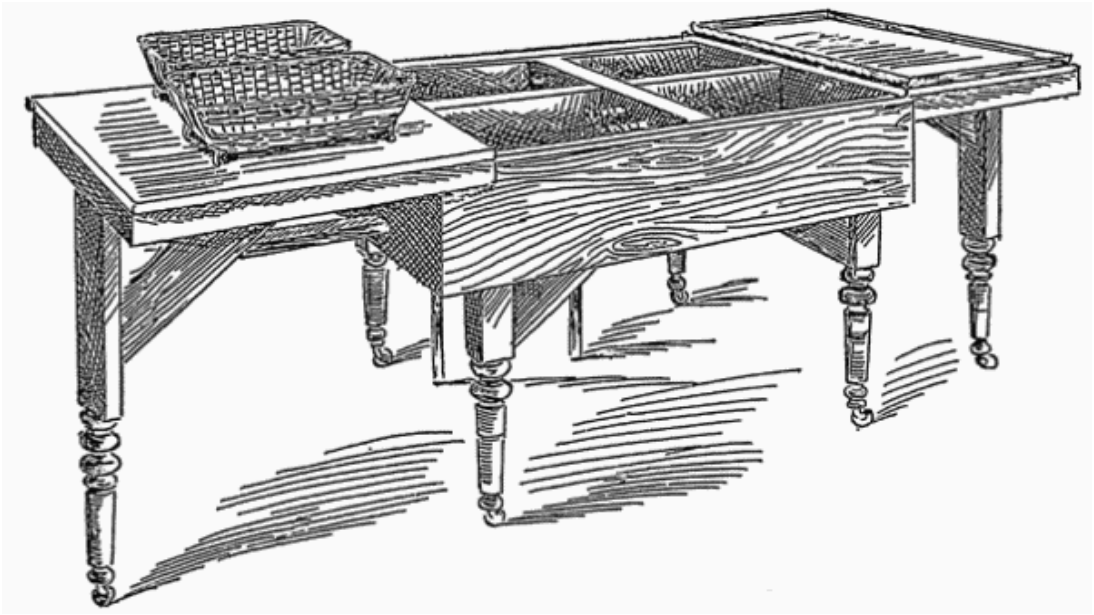
For the Tin Closet.-One dipper; one egg-beater; one two-quart pail; one four-quart pail; six brick-loaf bread pans; three shallow tins; three granite-ware pie tins; two perforated sheet iron pans for rolls, etc.; one set of measures, pint, quart, and two quart; two colanders; two fine wire strainers; one flour sifter; one apple corer; one set patty pans; two dripping pans; two sets gem irons; one set muffin rings; one toaster; one broiler; the six saucepans, different sizes; two steamers; six milk-pans; one dozen basins, different sizes; one chopping bowl and knife; six double boilers; two funnels, large and small; one can opener; griddle; kettles, iron and granite ware; two water baths.

For the Dish Closet.—One half dozen iron-stone china cups; three quart bowls; three pint bowls; two large mixing bowls; two quart bowls with lip; six deep plates; three kitchen pitchers; one glass rolling pin; six wooden and six iron spoons, assorted sizes; six kitchen teaspoons; one stone baking pot; glass jars for stores; crocks and jars.

The Pantry.—The pantry and china closet should have direct light and good ventilation. The dark, dingy places sometimes used for this purpose are germ breeders. There should be plenty of shelf room and cupboards for the fine glass and china-ware, with a well-arranged sink for washing the dishes. The sink for this purpose is preferably one lined with tinned or planished copper; for dishes will be less liable to become injured and broken then when washed in an iron or earthen-ware sink. Extension or folding shelves are a great convenience, and can be arranged for the sink if desired. The accompanying cuts illustrate a sink of four compartments for dish-washing, devised by the writer for use in the Sanitarium Domestic Economy kitchen, which can be closed and used as a table. Two zinc trays fit the top, upon which to place the dish drainers. If preferred, the top might be arranged as a drainer, by making it of well-seasoned hard wood, with a number of inclined grooves to allow the water to run into the sink. If the house be heated by steam, a plate-warmer is an important part of the pantry furnishing.

The Storeroom.—If possible to do so, locate the room for the keeping of the kitchen supplies on the cool side of the house. Plenty of light, good ventilation, and absolute cleanliness are essential, as the slightest contamination of air is likely to render the food supply unfit for use.

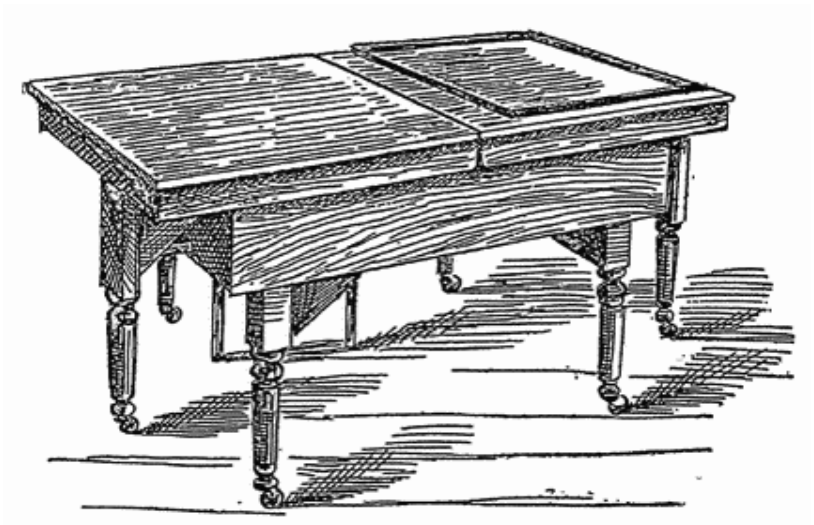
The refrigerator should not be connected with the kitchen drain pipe, and the greatest care should be taken to keep it clean and sweet. It should be thoroughly scrubbed with borax or sal-soda and water, and well aired, at least once a week. Strongly flavored foods and milk should not be kept in the same refrigerator. The ice to be used should always be carefully washed before putting in the refrigerator.



Compartment Sink for Dish-Washing. Open.

Care should also be taken to replenish it before the previous supply is entirely melted, as the temperature rises when the ice becomes low, and double the quantity will be required to cool the refrigerator that would be necessary to keep it of uniform temperature if added before the ice was entirely out.

The Water Supply.—The water used for drinking and cooking purposes should receive equal consideration with the food supply, and from whatever source obtained, it should be frequently tested for impurities, since that which looks the most refreshing may be contaminated with organic poison of the most treacherous character.



Compartment Sink for Dish-Washing. Closed.

A good and simple test solution, which any housewife can use, may be prepared by dissolving twelve grains of caustic potash and three of permanganate of potash in an ounce of distilled water, or filtered soft water. Add a drop of this solution to a glass of the water to be tested. If the pink color imparted by the solution disappears at once, add another drop of the solution, and continue adding drop by drop until the pink color will remain for half an hour or more. The amount of the solution necessary to security permanent color is very fair index to the quality of the water. If the color imparted by the first one or two drops disappears within a half hour, the water should be rejected as probably dangerous. Water which is suspected of being impure may be rendered safe by boiling. Filters are only of service in removing suspended particles and the unpleasant taste of rain water; a really dangerous water is not rendered safe by filtering in the ordinary manner.

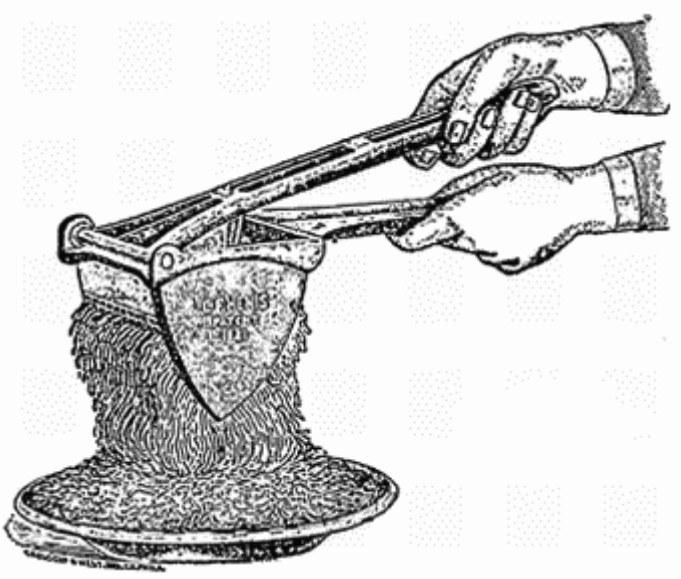
Cellars.—Sanitarians tell us that cellars should never be built under dwelling houses. Because of improper construction and neglect, they are undoubtedly the cause of much disease and many deaths. A basement beneath the house is advantageous, but the greatest of care should be given to construct it in accord with sanitary laws. It should be thoroughly drained that there may be no source of dampness, but should not be connected with a sewer or a cesspool. It should have walls so made as to be impervious to air and water. An ordinary brick or stone wall is inefficient unless well covered with good Portland cement polished smooth. The floors should likewise be covered with cement, otherwise the cellar is likely to be filled with impure air derived from the soil, commonly spoken of as "ground air," and which offers a constant menace to the health of those who live over cellars with uncemented walls and floors.

Light and ventilation are quite as essential to the healthfulness of a cellar as to other rooms of the dwelling. Constantly during warm weather, and at least once a day during the winter season, windows should be opened wide, thus effecting a free interchange of air. All mold and mustiness should be kept out by thorough ventilation and frequent coats of whitewash to the walls. Vegetables and other decomposable articles, if stored in the basement, should be frequently sorted, and all decaying substances promptly removed. This is of the utmost importance, since the germs and foul gases arising from decomposing food stuffs form a deadly source of contamination through every crack and crevice.

KITCHEN CONVENIENCES.

In these days of invention and progress, much thought and ingenuity have been expended in making and perfecting labor-saving articles and utensils, which serve to make housework less of a burden and more of a delight.



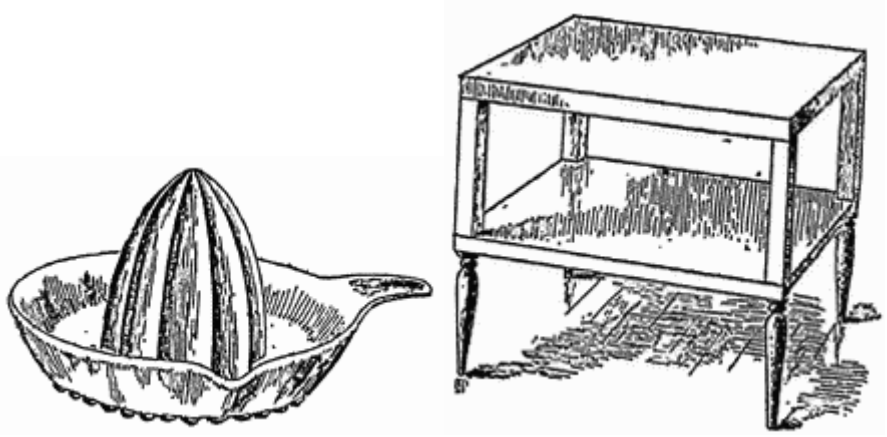


The Steam-Cooker. Vegetable Press.

The Steam-Cooker.—One of the most unique of these conveniences is the steam-cooker, one kind of which is illustrated by the accompanying cut. Steaming is, for many foods, a most economical and satisfactory method of cooking. Especially is this true respecting fruits, grains, and vegetables, the latter of which often have the larger proportion of their best nutritive elements dissolved and thrown away in the water in which they are boiled. In the majority of households it is, however, the method least depended upon, because the ordinary steamer over a pot of boiling water requires too much attention, takes up too much stove room, and creates too much steam in the kitchen, to prove a

general favorite. The steam-cooker has an escape-steam tube through which all excess of steam and odors passes into the fire, and thus its different compartments may contain and cook an entire dinner, if need be, and over one stove hole or one burner of an oil or gasoline stove.

The Vegetable Press.—The accompanying cut represents this handy utensil, which is equally useful as a potato and vegetable masher; as a sauce, gruel, and gravy strainer; as a fruit press, and for many other purposes for which a colander or strainer is needed, while it economizes both time and labor.



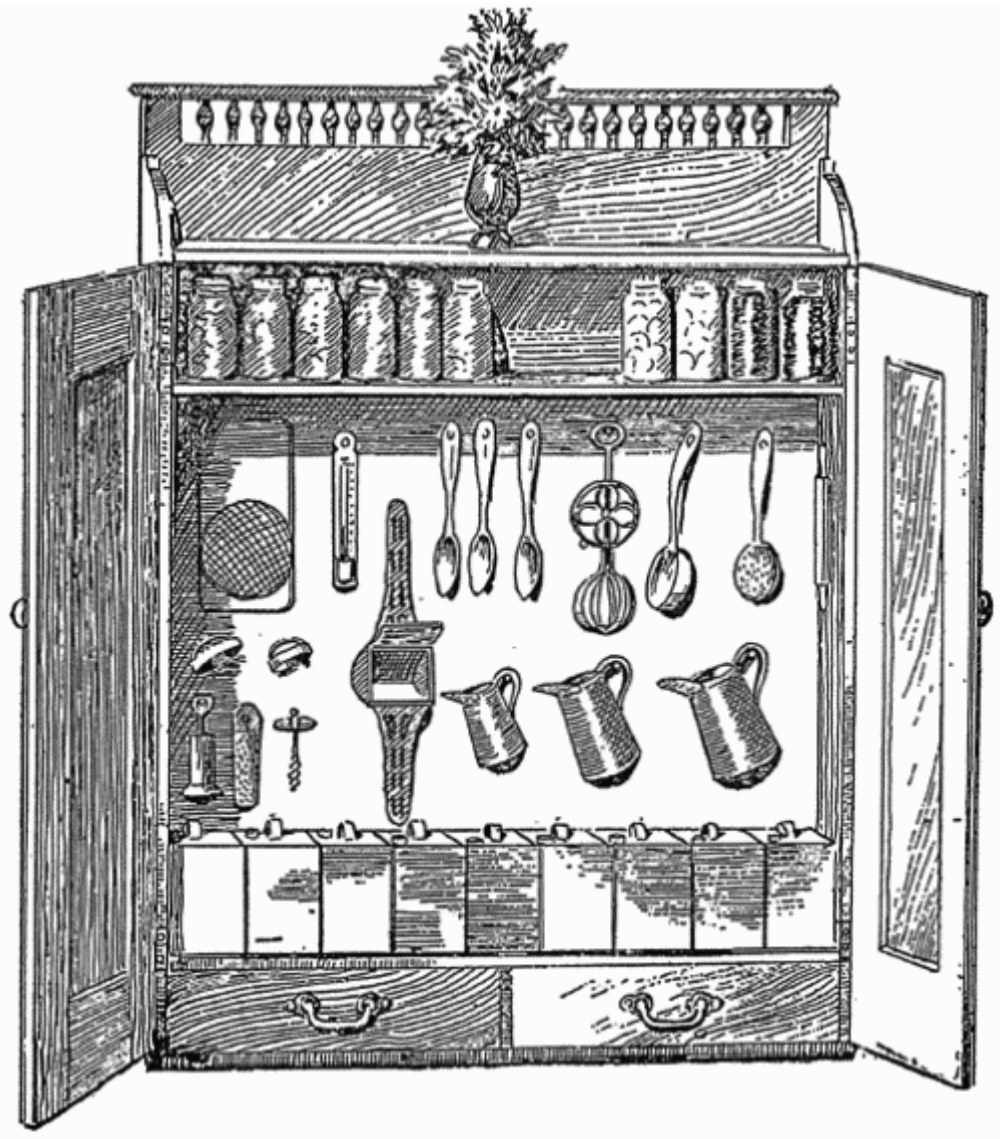
Lemon Drill. The Handy Waiter.

Lemon Drill.—This little article for extracting the juice of the lemon, and which can be purchased of most hardware dealers, is quite superior to the more commonly used lemon squeezer. Being made of glass, its use is not open to the danger that the use of metal squeezer is are from poisonous combinations of the acid and metal, while the juice extracted is free from pulp, seeds, and the oil of the skin.

A Handy Waiter.—In many households where no help is employed, a labor-saving device like the one represented in the accompanying illustration, will be found of great service. It is a light double table on easy-rolling casters, and can be readily constructed by anyone handy in the use of tools. If preferred, the top may be covered with zinc. In setting or clearing the table, the dishes may be placed on the lower shelf, with the food on the top, and the table rolled from pantry to dining room, and from dining room to kitchen; thus accomplishing, with one trip, what is ordinarily done with hundreds of steps by the weary housewife. If desirable to reset the table at once after a meal, the waiter will be found most serviceable as a place whereon the glassware and silverware may be washed. It is equally serviceable for holding the utensils and material needed when cooking; being so easily moved, they can be rolled to the stove and is always convenient.

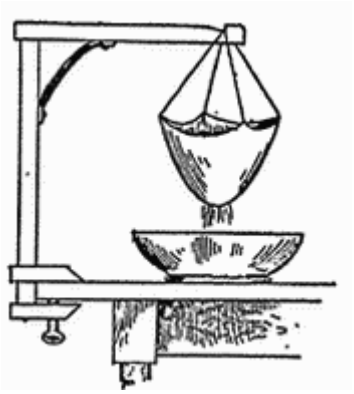
Wall cabinet.—where cupboard space is limited, or where for convenience it is desirable to have some provision for supplies and utensils near the range and baking table, a

wall cabinet offers a most convenient arrangement. It may be made of a size to fit in any convenient niche, and constructed plainly or made as ornamental as one pleases, with doors to exclude the dust, shelves on which to keep tin cans filled with rice, oatmeal, cracked wheat, and other grains; glass jars of raisins, sugar, citron, cornstarch, etc.; hooks on which may hang the measures, egg-beater, potato masher, and such frequently needed utensils; and with drawers for paring knives, spoons, and similar articles, the wall cabinet becomes a *multum in parvo* of convenience which would greatly facilitate work in many households.



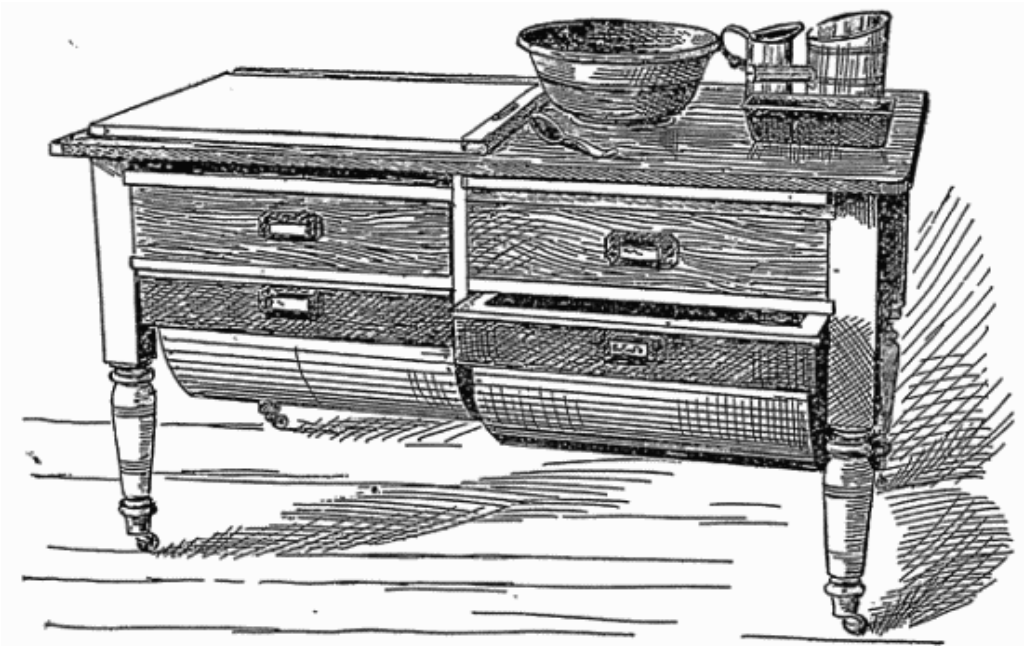
Wall Cabinet.

Percolate Holder.—The accompanying cut illustrates an easily-constructed device for holding a jelly bag or percolate. It may be so made as to be easily screwed to any ordinary table, and will save the housekeeper far more than its cost in time and patience.



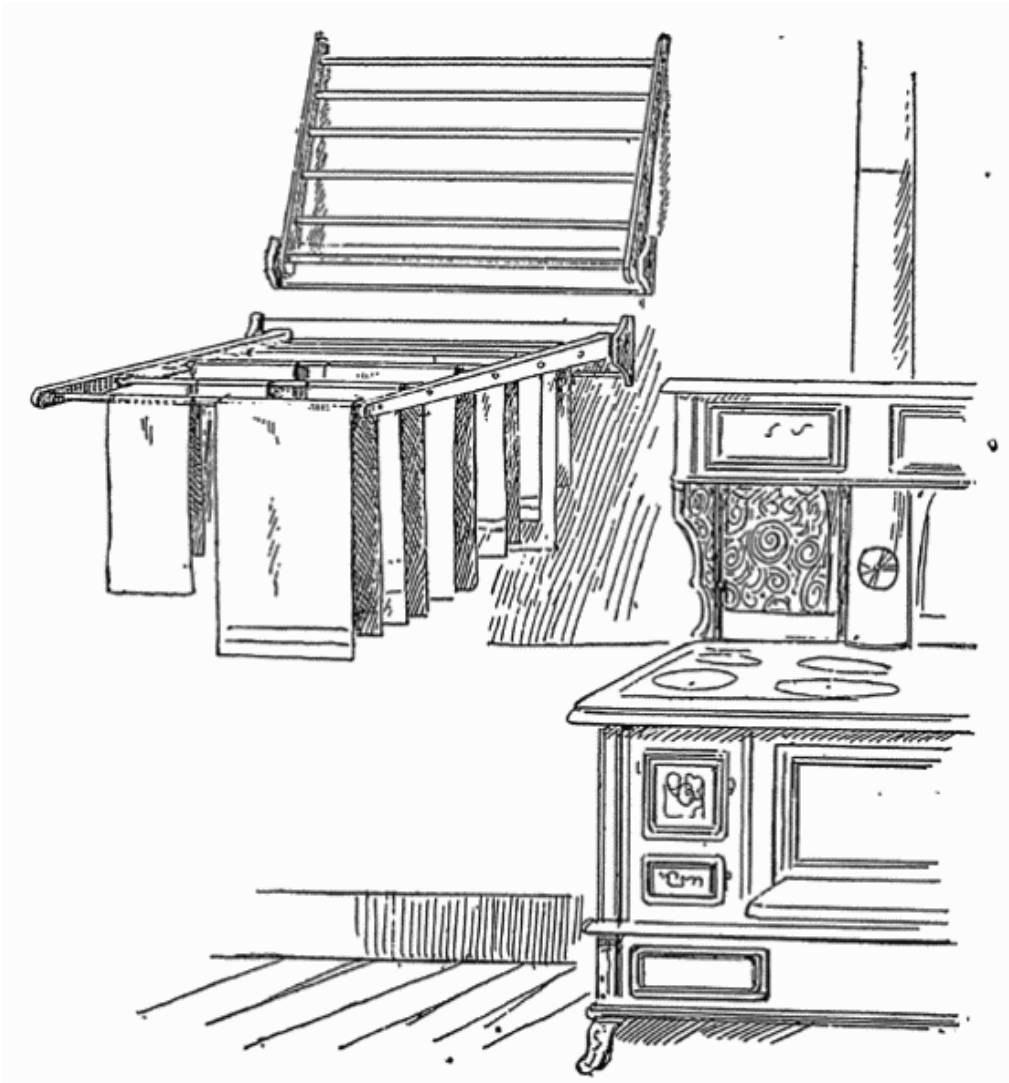
Percolate Holder.

Kneading Table.—Much of the tiresome labor of bread-making can be avoided if one is supplied with some convenient table similar to the one represented in the cut, wherein the needed material and utensils may be kept in readiness at all times. The table illustrated has two large tin drawers, each divided into two compartments, in which may be kept corn meal, entire wheat, and Graham and white flours. Two drawers above provide a place for rolling-pin, bread mallet, gem irons, spoons, etc., while a narrow compartment just beneath the hardwood top affords a place for the kneading board. The table being on casters is easily moved to any part of the kitchen for use.

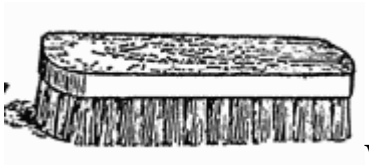


Kneading Table.

Dish-Towel Rack.—Nothing adds more to the ease and facility with which the frequent dish-washings of the household may be accomplished than clean, well-dried towels. For quick drying,—an item of great importance if one would keep the towels fresh and sweet,—the towel rack represented in the cut, and which can be made by any carpenter, is a most handy device. When not in use, it can be turned up against the wall as illustrated. It is light, affords sufficient drying space so that no towel need be hung on top of another, and projecting out from the wall as it does, the free circulation of air between the towels soon dries them.



Dish-Towel Rack.



Vegetable Brush. Kitchen Brushes.—These useful little articles can be put to such a variety of uses that they are among the chiefest of household conveniences. They are also so inexpensive, costing but five cents apiece without handles and seven cents with handles, that no housewife can afford to be without a supply of them. For the washing of dishes with handles, the outside of iron kettles, and other cooking utensils made of iron, they are especially serviceable. The smaller sizes are likewise excellent for cleaning cut glass ware, Majolica ware,—in fact, any kind of ware with raised figures or corrugated surfaces. For cleaning a grater, nothing is superior to one of these little brushes. Such a brush is also most serviceable for washing celery, as the corrugated surface of the stalk makes a thorough cleaning with the hands a difficult operation. Then if one uses a brush with handle, ice water, which adds to the crispness of the celery, may be used for the cleaning, as there will be no necessity for putting the hands in the water. A small whisk broom is also valuable for the same purpose. Such vegetables as potatoes, turnips, etc., are best cleaned with a brush. It makes the work less disagreeable, as the hands need not be soiled by the process, and in no other way can the cleaning be so well and thoroughly done.

All brushes after being used should be carefully scalded and placed brush downward in a wire sponge basket, or hung up on hooks. If left around carelessly, they soon acquire the musty smell of a neglected dishcloth.

TABLE TOPICS.

The kitchen is a chemical laboratory, in which are conducted a number of chemical processes by which our food is converted from its crudest state to condition more suitable for digestion and nutrition, and made more agreeable to the palate.—*Prof. Matthew Williams.*

Half the trouble between mistresses and maids arises from the disagreeable surroundings to which servants are confined. There is no place more dismal than the ordinary kitchen in city dwellings. It is half underground, ill-lighted, and unwholesome. What wonder, then, in the absence of sunlight, there is a lack of sunny temper and cheerful service? An ill-lighted kitchen is almost sure to be a dirty one, where germs will thrive and multiply. Let sanitary kitchens be provided, and we shall have more patient mistresses and more willing servants.—*Sel.*

A sluggish housemaid exclaimed, when scolded for the uncleanliness of her kitchen, "I'm sure the room would be clean enough if it were not for the nasty sun, which is always showing the dirty corners."—*Sel.*

If we would look for ready hands and willing hearts in our kitchens, we should make them pleasant and inviting for those who literally bear the "burden and heat of the day" in this department of our homes, where, emphatically, "woman's work is never done." We should no longer be satisfied to locate our kitchens in the most undesirable corner of the house. We should demand ample light,—sunshine if possible,—and justly too; for the very light itself is inspiring to the worker. It will stir up cheer and breed content in the minds of those whose lot is cast in this work-a-day room.—*Sel.*

Any invention on the part of the housekeeper intended to be a substitute for watchfulness, will prove a delusion and a snare.—*Sel.*

"The first wealth is health," says Emerson.

A knowledge of sanitary principles should be regarded as an essential part of every woman's education, and obedience to sanitary laws should be ranked, as it was in the Mosaic code, as a religious duty.—*Sel.*

Much of the air of the house comes from the cellar. A heated house acts like a chimney. A German experimenter states that one half of the cellar air makes its way into the first story, one third into the second, and one fifth into the third.

CEREALS AND THEIR PREPARATION FOR THE TABLE

ereal is the name given to those seeds used as food (wheat, rye, oats, barley, corn, rice, etc.), which are produced by plants belonging to the vast order known as the grass family. They are used for food both in the unground state and in various forms of mill products.

The grains are pre-eminently nutritious, and when well prepared, easily digested foods. In composition they are all similar, but variations in their constituent elements and the relative amounts of these various elements, give them different degrees of alimentary value. They each contain one or more of the nitrogenous elements,—gluten, albumen, caseine, and fibrin,—together with starch, dextrine, sugar, and fatty matter, and also mineral elements and woody matter, or cellulose. The combined nutritive value of the grain foods is nearly three times that of beef, mutton, or poultry. As regards the proportion of the food elements necessary to meet the various requirements of the system, grains approach more nearly the proper standard than most other foods; indeed, wheat contains exactly the correct proportion of the food elements.

Being thus in themselves so nearly perfect foods, and when properly prepared, exceedingly palatable and easy of digestion, it is a matter of surprise that they are not more generally used; yet scarcely one family in fifty makes any use of the grains, save in the form of flour, or an occasional dish of rice or oatmeal. This use of grains is far too meager to adequately represent their value as an article of diet. Variety in the use of grains is as necessary as in the use of other food material, and the numerous grain preparations now to be found in market render it quite possible to make this class of foods a staple article of diet, if so desired, without their becoming at all monotonous.

In olden times the grains were largely depended upon as a staple food, and it is a fact well authenticated by history that the highest condition of man has always been associated with wheat-consuming nations. The ancient Spartans, whose powers of endurance are proverbial, were fed on a grain diet, and the Roman soldiers who under Caesar conquered the world, carried each a bag of parched grain in his pocket as his daily ration.

Other nationalities at the present time make extensive use of the various grains. Rice used in connection with some of the leguminous seeds, forms the staple article of diet for a large proportion of the human race. Rice, unlike the other grain foods, is deficient in the

nitrogenous elements, and for this reason its use needs to be supplemented by other articles containing an excess of the nitrogenous material. It is for this reason, doubtless, that the Hindoos use lentils, and the Chinese eat peas and beans in connection with rice.

We frequently meet people who say they cannot use the grains,—that they do not agree with them. With all deference to the opinion of such people, it may be stated that the difficulty often lies in the fact that the grain was either not properly cooked, not properly eaten, or not properly accompanied. A grain, simply because it is a grain, is by no means warranted to faithfully fulfil its mission unless properly treated. Like many another good thing excellent in itself, if found in bad company, it is prone to create mischief, and in many cases the root of the whole difficulty may be found in the excessive amount of sugar used with the grain.

Sugar is not needed with grains to increase their alimentary value. The starch which constitutes a large proportion of their food elements must itself be converted into sugar by the digestive processes before assimilation, hence the addition of cane sugar only increases the burden of the digestive organs, for the pleasure of the palate. The Asiatics, who subsist largely upon rice, use no sugar upon it, and why should it be considered requisite for the enjoyment of wheat, rye, oatmeal, barley, and other grains, any more than it is for our enjoyment of bread or other articles made from these same grains? Undoubtedly the use of grains would become more universal if they were served with less or no sugar. The continued use of sugar upon grains has a tendency to cloy the appetite, just as the constant use of cake or sweetened bread in the place of ordinary bread would do. Plenty of nice, sweet cream or fruit juice, is a sufficient dressing, and there are few persons who after a short trial would not come to enjoy the grains without sugar, and would then as soon think of dispensing with a meal altogether as to dispense with the grains.

Even when served without sugar, the grains may not prove altogether healthful unless they are properly eaten. Because they are made soft by the process of cooking and on this account do not require masticating to break them up, the first process of digestion or insalivation is usually overlooked. But it must be remembered that grains are largely composed of starch, and that starch must be mixed with the saliva, or it will remain undigested in the stomach, since the gastric juice only digests the nitrogenous elements. For this reason it is desirable to eat the grains in connection with some hard food. Whole-wheat wafers, nicely toasted to make them crisp and tender, toasted rolls, and unfermented zwieback, are excellent for this purpose. Break two or three wafers into rather small pieces over each individual dish before pouring on the cream. In this way, a morsel of the hard food may be taken with each spoonful of the grains. The combination of foods thus secured, is most pleasing. This is a specially advantageous method of serving grains for children, who are so liable to swallow their food without proper mastication.

Cooking of Grains.—All grains, with the exception of rice, and the various grain meals, require prolonged cooking with gentle and continuous heat, in order to so disinte-

grate their tissues and change their starch into dextrine as to render them easy of digestion. Even the so-called "steam-cooked" grains, advertised to be ready for use in five or ten minutes, require a much longer cooking to properly fit them for digestion. These so-called quickly prepared grains are simply steamed before grinding, which has the effect to destroy any low organisms contained in the grain. They are then crushed and shredded. Bicarbonate of soda and lime is added to help dissolve the albuminoids, and sometimes diastase to aid the conversion of the starch into sugar; but there is nothing in this preparatory process that so alters the chemical nature of the grain as to make it possible to cook it ready for easy digestion in five or ten minutes. An insufficiently cooked grain, although it may be palatable, is not in a condition to be readily acted upon by the digestive fluids, and is in consequence left undigested to act as a mechanical irritant.



A Double Boiler.

For the proper cooking of grains the double boiler is the best and most convenient utensil for ordinary purposes. If one does not possess a double boiler, a very fair substitute may be improvised by using a covered earthen crock placed within a kettle of boiling water, or by using two pails, a smaller within a larger one containing boiling water.

A closed steamer or steam-cooker is also valuable for the cooking of grains. Grains may be cooked in an ordinary kettle, but the difficulties to be encountered, in order to prolong the cooking sufficiently and prevent burning, make it the least desirable utensil for this purpose.

Water is the liquid usually employed for cooking grains, but many of them are richer and finer flavored when milk is mixed with the water,—one part to two of water. Especially is this true of rice, hominy, and farina. When water is used, soft water is preferable to hard. No salt is necessary, but if used at all, it is generally added to the water before stirring in the grain or meal.

The quantity of liquid required varies with the different grains, the manner in which they are milled, the method by which they are cooked, and the consistency desired for the cooked grain, more liquid being required for a porridge than for a mush. The following table gives the time necessary for cooking and the quantity of liquid required for the various grains, with the exception of rice, when cooked in a double boiler or closed steamer, to produce a mush of ordinary consistency. If an ordinary kettle is used for cooking the grains, a larger quantity of water will be needed:—

TABLE SHOWING PROPORTION OF GRAIN AND LIQUID REQUIRED, WITH APPROXIMATE TIME, WHEN A DOUBLE BOILER IS USED.

	Quantity of Grain.	Water Required.	Hours to Cook.
Graham Grits	1 part	4 parts	3 to 5
Rolled Wheat	1 "	3 "	3 to 4
Cracked Wheat	1 "	4-1/2 "	3 to 4
Pearl Wheat	1 "	4 "	4 to 5
Whole Wheat	1 "	5 "	6 to 8
Rolled Oats	1 "	3 "	3 to 4
Coarse Oatmeal	1 "	4 "	4 to 6
Rolled Rye	1 "	3 "	3 to 4
Pearl Barley	1 "	5 "	4 to 5
Coarse Hominy	1 "	5 "	6 to 10
Fine Hominy	1 "	4 "	4 to 6
Cerealine	1 "	1 part	1/2

All grains should be carefully looked over before being put to cook.

In the cooking of grains, the following points should be observed:—

1. Measure both liquid and grain accurately with the same utensil, or with two of equal size.

2. Have the water boiling when the grain is introduced, but do not allow it to boil for a long time previous, until it is considerably evaporated, as that will change the proportion of water and grain sufficiently to alter the consistency of the mush when cooked. Introduce the grain slowly, so as not to stop the sinking to the bottom, and the whole becomes thickened. If the grain is cooked in a double boiler, this first boiling should be done with the inner dish directly over the fire, and when the grain has thickened or become "set," as

it is termed, the dish should at once be placed in the outer boiler, the water in which should be boiling. It will then require no further care during the entire cooking, safe to keep the outer boiler filled and the water boiling. If the grain is to be cooked in a steam-cooker, as soon as set it may be turned into a china or an earthen dish, suitable for use on the table, and placed at once in the steamer to complete the cooking. If an ordinary kettle is used, it is well to place it upon an iron ring or brick on some part of the range were it will just simmer, for the remainder of the cooking.

3. Stir the grain continuously until it has set, but not at all afterward. Grains are much more appetizing if, while properly softened, they can still be made to retain their original form. Stirring renders the preparation pasty, and destroys its appearance. Grains cooked in a double boiler will require no stirring, and there will be little danger of their being lumpy, underdone on top, and scorched at the bottom, as is so often the case when cooked in a single boiler.

4. Cook continuously. If it be necessary to replenish the water in the outer boiler at anytime, let it be done with water of boiling temperature. If it is desired to have the mush quite thick and dry, the boiler should be left uncovered during the latter part of the cooking. If preferred moist, keep the cover on.

In the preparation of all mushes with meal or flour, it is a good plan to make the material into a batter with a portion of the liquid retained from the quantity given, before introducing it into the boiling water. This prevents the tendency to cook in lumps, so frequent when dry meal is scattered into boiling liquid. Care must be taken, however, to add the moistened portion very slowly, stirring vigorously meantime, so that the boiling will not be checked. Use warm water for moistening. The other directions given for the whole or broken grains are applicable to the ground products.

Grains for Breakfast.—Since hasty preparation will not suffice for the grains, they cannot be conveniently cooked in the morning in time for breakfast. This difficulty may be obviated by cooking the day previous, and reheating in the following way:—

Place the grain, when sufficiently cooked, in the refrigerator or in some place where it will cool quickly (as slow cooling might cause fermentation), to remain overnight. If cooked in a porcelain-lined or granite-ware double boiler, it may be left undisturbed, if uncovered. If cooked in tin or iron, turn the grain into a large earthen or china dish. To heat in the morning, fill the outer boiler with boiling water, place the inner dish containing the grain therein, and steam until thoroughly heated. No stirring and no additional liquid will be necessary, and if placed upon the stove when beginning the preparations for breakfast, it will be ready for serving in good season. If the grain has been kept in an earthen dish, it may best be reheated by placing that inside the steam cooker or an ordinary steamer over a kettle of boiling water.

Cracked wheat, pearl wheat, oatmeal, and other course grain preparations to be reheated, require for cooking a half cup of water in addition to the quantity given in the table. For rolled wheat, rolled oats, rolled rye, and other crushed grains, no more is needed. Grains may be used for breakfast without reheating, if served with hot milk or cream. If one has an Aladdin oven, the problem of grains for breakfast may be easily solved by cooking them all night, and if started late in the evening, they may be thus cooked over a single burner oil stove with the flame turned low.

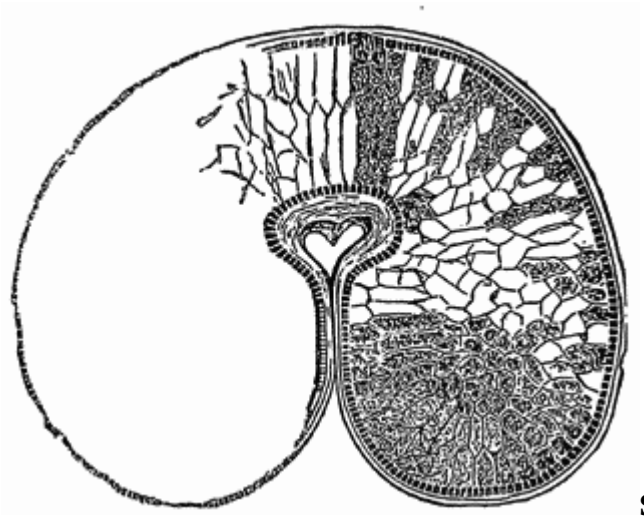
Grains an economical food.—While grains are pre-eminently among the most nutritious of foods, they are also among the most economical, the average price being from five to seven cents a pound, and even less when purchased in bulk. If it be objected that they require much fuel to secure the prolonged cooking necessary, we would say that a few cents' worth of oil a week and a small lamp stove will accomplish the cooking in a most efficient manner. For a hot-weather food there are few articles which give greater satisfaction and require less time and labor on the part of the housewife than grains, cooked by the aid of a small lamp stove.

WHEAT.

Description.—Wheat is the most important of the grain foods. It is probably a native of Southwestern Asia, though like most grains cultivated from the earliest periods, its history is extremely obscure.

Wheat is of two principal kinds, characterized as soft and hard wheat, though there are hundreds of named varieties of the grain. The distinction between many of these is due to variation in the relative proportions of starch and nitrogenous matter. Some contain not more than eight per cent of nitrogenous elements, while others contain eighteen or twenty per cent, with a corresponding decrease in carbonaceous elements. This difference depends upon the soil, cultivation, season, climate, and other conditions under which the grain is produced.

The structure of the wheat grain consists of an external tegument of a hard, woody nature, so coherent that it appears in the form of scales or bran when the wheat is ground, and an inner portion, more soft and friable, consisting of several cellular layers. The layer nearest the outer husk contains vegetable fibrin and fatty matter. The second layer is largely composed of gluten cells; while the center comprising the bulk of the grain, is chiefly made up of starch granules with a small proportion of gluten.



Sectional View of Wheat Kernel.

The structure of a wheat kernel is well illustrated in the accompanying cut. As will be seen, the different food elements are situated in different parts of the grain, and not uniformly distributed throughout its structure. The outer husk of the berry is composed wholly of innutritious and indigestible matter, but the thin layers which lie next this outer covering contain the larger proportion of the nitrogenous elements to be found in the entire kernel. The central portion consists almost wholly of farinaceous matter.

Phosphates and other mineral matter are present to some extent throughout the entire grain, but preponderates in the external part. Here is also found a peculiar, soluble, active principle called diastase, which possesses the power of converting starch into sugar. The dark color and marked flavor of Graham bread is undoubtedly due to the influence of this element.

Until within a few years the unground grain was rarely used as an article of food, but people are beginning to appreciate its wholesomeness, and cracked, rolled, and pearled wheats are coming rapidly into favor. Cracked wheat is the grain cleaned and then cut into two or more pieces; in rolled wheat the grains are mashed between rollers, by which process they are thoroughly softened in every part, and are then easily cooked. Pearl wheat is the whole grain cleaned and dressed. The whole grain is also cooked sometimes in its natural state.

Preparation and cooking.—Few articles of food show greater difference between good and poor cooking than the various grains. Dry, harsh, or underdone, they are as unwholesome as unpalatable. Like most of the grains, wheat, with the exception of new wheat boiled whole, should be put into boiling water and allowed to cook continuously but slowly until done. Any of the unground preparations require prolonged cooking. The average length of time and the approximate amount of water needed in cooking *one cupful* of the various wheat preparations in a double boiler.