FOOD AND DIET.

Clinical Observations

AND

Experimental Investigations

undertaken with the view of

ascertaining their special

Physiological Action

and Therapeutic

Value.
I.

Summary of Principal Contents.

Section I - Page 1 - 20.
A short historical introduction with literature of the subject.

Section II - Page 21 - 86.
Dietaries of the various social grades. How they differ from Standards of Voit, Atwater, and Rubner.
Upper Middle Classes. page 21.
Middle Classes. page 24.
For Professional Men. page 30.
Comparisons with Chittenden's page 33.
Chittenden's Experiments with men of U.S.A.
    Army page 36.
English Out Door Labourer page 38.
Working Class Dietary for Towns page 40.
Young Persons living alone on small incomes, page 45.
Inadequate Dietaries. page 48.
Family Dietary of the Poor. page 50.
Ladies on small Incomes pages 54 & 56
Poor Aged People. pages 56 & 57
Dietary of Girls from 4 - 15 years of age.
    Experience of 17 years page 62
Comparisons of Jewish & Christian Children page 73.
Experience of Feeding page 360.
II.
Babies with Cow's Milk. . . . . . . . page 79
Is Cow's Milk a Common Clause of Tuberculosis. " 84

Section III. - Pages 86 - 91.
Vagaries of Diet. Probable Explanation of
Maintenance of Health thereon. . . . . . page 86

Section IV. - Page 91 - 93a.
Some comparative weights . . . . . . . page 91.
Literature with Comments on Foregoing Points page 92.

Section V. - Page 94 - 136. Food and Diet studied
more particularly from Physiological and
Therapeutical Standpoints. Importance of Fat
in a dietary. Rickets. . . . . . . . . . . page 94.
Tuberculous. . . . . . . . . . . . . . . page 96.
Vasomotor neuroses . . . . . . . . . . page 99.
Margarine as a food. . . . . . . . . . page 100.
The place of fat in Diabetes . . . . . . page 101.
Food Stuffs as Remedies - Vital or Life
supporting Principles. Nature of Vital
Principle. Search for this Principle . . . pages 105 -
110.

Experiments with Food Stuffs exhausted with
Alcohol Series. . . . . . . . . . . . . . page 111.
List of Food Stuffs rich in Lipoids or
Vital Principles. . . . . . . . . . . page 111.
Food Stuffs or Preparations employed as
Curative Agents. . . . . . . . . . . . page 115.
## Relative amounts of meat eaten by Various Social Grades

<table>
<thead>
<tr>
<th>Country</th>
<th>165</th>
</tr>
</thead>
<tbody>
<tr>
<td>England and Wheat</td>
<td>167</td>
</tr>
<tr>
<td>Scotland - Oatmeal, Barley</td>
<td>168</td>
</tr>
<tr>
<td>France, Germany, &amp;c. - Ergotism</td>
<td>169</td>
</tr>
<tr>
<td>Spain, Italy, U.S.A. - Maize</td>
<td>171</td>
</tr>
<tr>
<td>Italy - Macaroni</td>
<td>171</td>
</tr>
<tr>
<td>Rice &amp; Beri-beri</td>
<td>172</td>
</tr>
<tr>
<td>Action of Alcohol - Dietetic</td>
<td>172</td>
</tr>
</tbody>
</table>

### Literature of Section

- 184

### Special Food Preparations

- 184

### Changing Customs in Feeding - Effects on Health

- 187

### Bleached Flour

- 188

### Frozen & Chilled Meat - Effects on Health

- 188

## Section VIII. Page 189 - 196

### Rise in Standard of Living

- 189

### Rise in Price of Provisions

- 193

### Rise in Price of Beef and Mutton

- 194

### Prices in 1902 & 1912. Wages in same period - Effects of both on Health

- 196
Section IX - Experimental Notes page 197 - 223.

Comparisons between Home-fed and Frozen Meats. ... 197.
Macroscopic and Microscope Appearances of two Meats. .... 198.
Nitrogen Values of both .... 199.
Cold Storage of Food Stuffs -
Need for Observation .... 199-200.
Temperatures employed in Cold Storage .... 201.
Relative Digestibility of Breads -
Yeast and Chemical Raised and Predigested Breads. .... 203.
Expense of Fancy Breads .... 209.
Treatment of Oatmeal to render Cellulose less irritating. .... 206.
Boiling, dry baking, and re-cooking .... 209-210.
Corn-milling - changes in and Disease -
Stone in Bladder. .... 211.
Wheat - decorticated as a Food - Frumenty .... 212.
Digestive Action of Fruits and Fruit Juices -
Their Therapeutic Value .... 214.
Clean milk - Plan for Small Dealers .... 218.
Margarine - Manufacture and Adulterations .... 220.
The German Freibank .... 223.
Illustrations.

1 - 4 Charts showing yearly increase in height and weight of 30 girls from 4 - 15. Follow page 78.

5 Chart showing nitrogen and carbon contents and ratios of diets of various social grades, facing page 79.

6 Chart showing arterial systolic pressure of great meat eaters as compared with general public. Follows page 162.

7 Figures showing annual percentage increase of population cancer and meat eating - years 1896 - 1905. Follow page 164.

8 Diagram showing weekly consumption of meat of various social grades of United Kingdom. Follows page 165.

9 Photomicrograph of home-fed meat showing the large fibres. Follows page 198.

10 Same of frozen meat showing smaller fibres - due to freezing. Follows page 199.

11 Coloured discs showing the digestive action of repeated heating on oatmeal. Follow page 210.
Section I.  Page 1 - 20.

A short historical introduction.
In the preface to a "Manual of Dietetics" J. Milner Fothergill exclaims: "The day of Dietetics has arrived". It is a far cry from 1888 when his work was issued to the period when civilised man first began to realise that some method or rule was necessary in satisfying the calls of nature for nourishment; and if savage man paid no attention or too little attention to the laws of dieting there is a danger today that we go to the opposite extreme.

In the present chapter it will be my aim (1) to briefly describe the views which the physicians of antiquity held regarding food, in causing disease in excess and its therapeutic action in helping at least to remove the effects of excess when it was administered in right amount and in the right way.

(2) To note the various changes in opinion with regard to diet which have taken place up to the present time as mirrored in the literature of the various periods.

Diodorus, author of Bibliotheca Historica and contemporary of Julius Caesar, says that the Egyptian physicians looked upon excessive eating as the cause of all disease and this was the reason why they instituted fasts, but they were so convinced of prevention being better than cure that they laboured to impress their patients with the dangers attending overeating. They recognised the importance of unclean water in causing disease and recommended the drinking of filtered or boiled water. They too recognised the dangers of alcohol.

(1)
The physicians of India laid down minute rules as to diet, and among many castes meat and alcohol were forbidden entirely. These of the Asclepios School paid almost pain-
ful attention to rules of diet, and indeed the "Hippocratic Oath" read "I will employ dietetic measures to the use and benefit of the sick according to my ability and understanding. Pythagoras (B.C. 540 - 510) the Greek philosopher of Samos, was famous for the great attention he paid to rules of diet and of life generally and among his disciples he limited the use of meat and banned beans and fish entirely. Even the Empirics were not above directing attention to diet and one of them, Acron, a celebrated physician of Agrigentum (Girgenti) of the Vth Century B.C. wrote a work on diet for healthy people. So much time was spent debating on the influence of food on disease that it became a craze; and there can be little doubt that it was owing to the mind continually running in this train of thought that we owe the rise of the humoral pathology - food had caused disease - had changed the "humours" and to get rid of the bad "humours" must be the aim and object of the physician and how could this better be done than by purging and regulation of the intake of food? There was the usual reaction but it was a feeble reaction and was confined to a section of the Onidian School and this section neglected diet altogether and let their patients please themselves. The greater number of the Onidians stuck to the prevailing beliefs and held that certain diseases at least could be cured by a regulated
dietary and by purging. One of their number, Euryphon, believed that the causes of disease were ineffectual removal of the waste products of digestion which mounted to the head.

Hippocrates, the Great or Second (460 B.C.) taught that in acute affections the withholding of food in part was good and that in fevers a fluid diet was best for in wounds and fevers fluids were lost. He held that cooling drinks aided in the elimination of morbid "humours" -- good common sense views which might pass today. The Hippocratic collection on diet is now held to be spurious and probably the work of Polybius the son-in-law of the Father of Medicine. Hippocrates recognised the importance of habit, country and age in prescribing a dietary.

Many of the followers of Hippocrates and notably his sons Thessalos and Hippocrates III elaborated the theory of elimination and the evils of humours and they in general held fantastic views on food and feeding. So much did the subject dominate men's minds that one finds a pure philosopher like Plato (B.C. 428 - 347) contending that immoderate diet and disproportion between exercise and eating were causes of disease. Diocles (400 B.C.) a Dogmatist laid down minute rules about eating and what not to eat.

Herophilos (300 B.C.) an Empiric and a noted experimenter prescribed special diet in disease and one strikes us namely the giving of salted articles and bread and water in haemoptysis.

Erasistratos (330 B.C.) also an Empiric treated fever
by infusions and then tried to combat the loss of strength by nourishing food and wine. He ascribed most diseases to excess of nourishment and its undigested residue and here one had the genesis of disease.

Heracleides (1st Century B.C.) of Tarras, another Empiric best known to us as the writer who regulated the proper use of opium like many of the physicians of his day he must write on diet. Asclepiades (124 B.C.) who adapted Greek medicine to Roman notions possessed a fund of common sense and practical wisdom which saved him from the extreme views of his times. He forbade certain foods which might reasonably be supposed to aggravate certain diseases. He was one of the first if not the first to recommend a dry diet in dropsy and he shewed that the eating of much meat might be detrimental in epilepsy; he too shewed that wine might be employed as a drug, but above all he recognised the curative action of cold water.

One finds the Mr. Facing-both-Ways in those days and of such was Themison, the Laodicean (B.C. 50) the Formalist or Methodist and he and his followers accomplished nothing for they tried to combine the lowering and the stimulating principle in their dietetic rules.

Seneca (shortly before Christ) - L. Annaeus, the philosopher and son of M. Annaeus the rhetorician believed that luxury and debauchery were at the root of all disease shewing that the philosophers and physicians of old had before their view the strong desire to get at the genesis of disease. This
brings us to the most brilliant period in the history of Rome, but it was also the most dangerous in the history of that state and Senaca's views about luxury and debauchery have an ominous significance and he probably foresaw the first steps which marked the downfall of his adopted country. Rome began to be lazy and luxurious in her tastes and her famous physicians pandered to the tastes of her citizens; drugs were almost excluded from the list of remedies or if they were not entirely excluded only these which were rare and expensive and worthless were employed. Disease must be combated by fanciful dietetic rules. Celsus (50 A.D.) who lived at this time in Rome and unlike most if not all his contemporaries who wrote on medicines was not a medical man; but his views were so clear that for long they ruled the world of medicine. He said gruel was the best treatment in fever and he held that the treatment of disease could be divided into three - (1) treatment by diet (2) by medicines and (3) by manual operations.

In the first century A.D. there arose a small sect called the Pneumatists and Eclectics -- the first tried to apply stoic philosophy to physiology and pathology and the second or Eclectics tried to combine stoic philosophy and the rules of treatment or therapeutics. They might be respectively compared to the pure pathologist and pure pharmacologist of today. Athenaios who was a contemporary of Celsus was the chief exponent of this double sect and we remember chiefly because he was the first to employ food from the standpoint
of its nourishing qualities and he made an analysis of the staple foodstuffs the first instance of the idea of the caloric value of food. He also directed that all drinking water be filtered.

Saranos of Ephesus the greatest obstetrician of antiquity who lived in the reigns of Trajan and Hadrian (1st and 2nd centuries A.D.) had much to say on the diet of the pregnant woman. Medicine had now for a time exhausted itself but not for long for there arose one whose influence has extended down to our own day: this was Galen who was born at Pergamos 130 A.D. and he of all the ancients is the greatest writer on diet and for ages all who came after him copied him, although it is right to mention that he copied the methods of Athenaios. One finds that Galen watched the effects of special diet on the people of Alexandria where he first practised and later when he removed to Rome he observed the action of prescribed dietaries on the gladiators. He made a journey to Tabiae in Campania to see the milk cures. The result of these experiments and observations was that he elaborated a system of dietetics. One feels grateful to him for the inspiration of hope when he shewed that life could be prolonged and disease often cured in kidney disease, gout, asthma, epilepsy and liver disease by the adoption of a judicious dietary. Aretaeus (2nd Century A.D.) a contemporary of Galen and a native of Cappodocia one of the Roman Colonies is worth remembering because he said "Liquid food is proper in all febrile diseases". He employed decoctions of savoy, parsley and dill on account of their diuretic properties.
Another contemporary of Galen was Coelius Aurelianus. He was the last of the Latin authors. Antyllos (2nd Century A.D.) followed Galen on diet in disease but he carried his views too far and laboured the importance of the subject. Although best known for his work on aneurism he deserves to be remembered because he prescribed cold water for the fevered patient. This brings us to the fall of Rome and to the fall of scientific medicine for ages. Before resuming the thread of the narrative it may be of interest to state in a few lines the views of the Greeks and Romans in general on food and times for eating. The Greeks ate one large meal a day and this they took in family. Their other meals were only snacks. The principal meal was supper. They had a proverb which ran: "A good physician should be a good cook". Galen said people should not eat more than two meals a day; but Horace thought one meal was enough. Galen, Horace and Paulus Aeginata all objected to mixed diet while Asclepiades maintained that a mixed diet was most easily digested and posterity has confirmed his opinion. Paulus Aeginata (7th Century) copied Galen so closely that he also has been called Galen's Ape. The barbarians never thought of changing or altering their dietary when they were ill. They ate what they liked and when they liked so that a prescribed dietary meant that a people had advanced in civilisation.

We have now arrived at a period when medical writers were either mere copyists or pot boilers and the most successful of these was Orebasios or Oribasius (325 - 403) the friend and physician of Julian the Apostate and called the last of the
Pagan physicians. He compiled seventy books of Medical Collections culled from Greek and Roman authors and one of these books dealt with diet both food and drink and his rules of diet for children are especially good. From the fact of his slavish adherence to the ideas of Galen he too like Paulus Aeginata has been called the ape of Galen. Oribasius has been derived by many writers but in writing his Collection he conferred a distinct benefit to medicine in his day and for a long period afterwards.

Philagrios (4th Century) of Thessalonica is also known for his precise dietetic prescriptions; and Poseidonios his contemporary wrote on much the same lines.

The Fathers of the Church now began to give dietetic directions to their followers and from these we can form a notion of the state of society at the period. To turn a little back in our chronological order, one finds that Clement of Alexandria (150 A.D.) speaks strongly against gluttony and drunkenness but he doesn't prohibit the use of meat and wine although he admires those who only drink water and says youths and girls should not drink wine. Hieronymus (born 340) the most famous of the Latin Fathers, the translator of the Bible into Latin and known as the Vulgate. He is better known as St. Jerome. He treated very largely of food and diet and of the diets suitable for various people. He speaks warningly against excess of wine and meat. He believed that the excess of meat was particularly injurious to health and said that when people were ill they might recover simply by the adoption of a spare diet. Here we have the
beginning of fasts in the Latin Church. We pass over this subject with a reference to the Talmud or rule book of the Jews. This dates from the 3rd or late on in the 2nd century to the 5th or early on in the 6th Century A.D. Two Talmuds are known the Jerusalem Talmud and the Babylonian Talmud: the second is the more important and when the word Talmud is mentioned without qualification this is always meant. The dietetic rules of the Talmud are especially sensible. The use of fresh vegetables is insisted on. Warning is given against accustoming children to the use of wine and meat. Great care is paid to the dietetic treatment of the sick and foods and drinks are prescribed and even the food of incurable patients is selected: likewise those suffering from wounds are prescribed a dietary suitable to their condition. The Jews evidently liked roasted flesh and oily foods, for warning is given that these be not partaken of too soon after an illness and in case they bring back the disease. One more Greek physician calls for a short notice -- Alexander of Tralles (525 - 605) claimed to cure disease by a system of rational diet.

The Byzantine emperors took great interest in medicine and even prescribed medicinal drinks.

Actius (502 - 575) of Mesopotamia who is said to have been the first medical man of any note to profess Christianity dealt with the diet of pregnant women.

Demetrius Pepagomenus, Court Physician to Michael VIII Palaeologos (1261) who wrote at his master's request on gout, said this disease was caused through errors of diet and could
only be cured by dietetic rules. The Arabic physicians were expected to know the nature of food stuffs; and one of the most celebrated of the earlier members of the craft — Rhazes (850 – 932) had a favourite maxim "Where thou canst cure by diet use no drugs".

Haly-Abbas (980) a Persian, extolled sugar for infants and recommended milk and sugar in the treatment of consumption.

The Jewish physicians likewise paid great attention to diet and one of their greatest representatives Isaac ben Solomon (Isaac Judaeus or Israeli) who lived between 850 and 950 said like Rhazes "When a patient can be cured by diet use no drug and when simple remedies suffice avoid complicated ones".

Another Jewish physician of the Middle Ages was more than ordinarily painstaking in regard to the diet of his patients. Moses Ben Maimun better known as Maimonides (born at Cordova about 1135 – died 1204) who became physician to Saladin. He laid down rules which might well be accepted today. One should only eat or drink when the desire was present and hunger should be appeased at once: there should be no long lingering over meals. The bowels and bladder should be attended to and the stomach should not be overloaded. Eight hours are to be devoted to sleep. Fruits such as are laxative are to be eaten before meals. He recognised that certain foods are often poisonous such as large salt fish, old cheese, old pickled meat, bitter food and food that smelt. He said overeating was a poison and the cause of many diseases that attacked mankind and in fact he went so far as to say that most diseases were
due to overeating or to the eating of improper food. He believed in special dietetic and other rules of hygiene for each particular disease. He had no single line of treatment which would cure every disease and in this he was far ahead of his contemporaries and of many at the present day. The Bagdad Hospital which was founded in 977 had special attendants who undertook the preparation of the food of the sick, Avicenna (980 - 1037) or as he is known by his Persian name Abn Ali Alhosain Ben Sina the most celebrated of all the Arab physicians can hardly be passed although he wrote nothing special on diet. He was more concerned with somewhat needless ly multiplying the signs and symptoms of disease. He described some disease unknown to the Greeks and Romans. He has been called the Arab Galen.

The writers of the Salerno School during its golden age (1000 - 1300) dealt largely with regimen and diet and so did Arnoldus De Villa Nova (some time between 1235 & 1313) the great representative of the Montpellier School which was second in importance only to Salerno. Arnoldus may have borrowed something from the Salerno Regimen and copied it into his own Regimen Sanitatis. He did much for the chemical side of medicine, and he was the introducer of medicated wines, tinctures and brandy (which he called the elixer of life) into medical practice. Later on - that is after 1300 - the Salerno School became so immersed in drugs, drugging, antidotaries, alchemy, pharmacy and polypharmacy that all interest in dietary was completely lost and the new schools
of Europe followed its example and the subject received a set-back from which it did not recover for centuries.

The Lily of Medicine (Lilium Medicinae) of Bernard Gordon, a Scottish professor of Montpellier (written about 1307) although in the style of the Salerno School contained some original common-sense views on diet.

Anglo-Saxon and Celtic Medicine.

In the Anglo-Saxon manuscripts on medicine the question of diet occupies a very meagre place. The Medicinale Anglicum better known as the Leech Book of Bald contains few references to the subject. This is all the more remarkable because the Saxon leeches or medical practitioners were disciples of the great Greek and earlier Arabian physicians. Who Bald was is a matter for conjecture: some have supposed he was a physician who employed an amanuensis named Cild to write up the result of his ready and personal observation. Others have supposed Bald was an important person who was interested in medicine and urged upon Cild the duty of compiling a native work on medicine and this compilation was, as was common at the time, named after the inspirer of the work. This MS is supposed to have appeared some time in the Xth Century. From incidental remarks it appears that there were other works of a similar kind but they have been lost or are not yet discovered.

The Anglo-Saxon had a lusty appetite and as he has always been on the whole a clean feeder his leech probably thought it best to leave the patient to be guided by his own inclinations—and then the Anglo-Saxon has ever liked to have his own way.
When he was acutely ill he did as his dog did, that is abstained from food till appetite returned -- by no means a bad working rule which appealed to the common sense of the physician. Still the leech had an inkling of the utility of giving dietetic directions to his patient for here and there one meets with instances in which thick wine is forbidden or prescribed and where again thin wine is prescribed or forbidden. One exception is remarkable namely the somewhat minute dietetic rules laid down in cases of enlarged spleen -- probably malarial in origin. "The sick man's diet... juicy peas and bread in hot water... and shell fishes are to be taken and fowls those namely which are not dwellers in fens. This that followeth is to be foregone: let them not partake of fen fishes nor sea fishes which have hard flesh and let them take the before-named meats, oysters and periwinkles not the meats which puff up a man's strength nor let them take flesh of bullocks nor of swine nor of sheep nor of goats nor of kid nor let them drink thick wine nor food too extremely hot or too cold". The warning against the eating of fen fowls and fen fishes are significant as shewing that the leeches recognised the connection between enlarged spleen and "ague" and between fenland and ague. Mention must be made of John of Gaddesden (1280 - 1361) an English physician who was educated at Oxford and wrote the Rosa Anglica or Rosa Medicinae. This work is largely founded on the Laurea Anglica of Gilbertus Anglicus (1210) and on the Lily of Bernard Gorden, but deserves attention because of the forcible and commonsense experience of the author, and particularly with regard to his remarks on
the gross feeding of the times in which he lived.

In the "Scottish Collection of Gaelic MSS" there are a large number dealing with medicine. These were written for or by members of the famous Beatha or Beaton family of hereditary Gaelic physicians who spread themselves over Mull, Skye, Uist, Sutherland, Lovat and other parts of the Western and Northern Highlands. Another family of Highland physicians were the O'Conachers or MacConachers of Lord and their names are associated with Gaelic medical manuscripts. Both families were of Irish extraction so that the peculiar bias of Highland medicine has been largely influenced by the Erse temperament, and indeed several of the Beaton MSS were written by Irish scribes either in Ireland or in Scotland. The date of the MSS is later than the Leech Book of Bald; the earliest by five centuries. They are generally of Latin origin but the physicians who employed the original in their practice commented, added to them, and made important observations on the diseases prevalent in the various seasons and what is important to us in the present connection is that they systematically contributed notes on the foods and drinks appropriate to the several months of the year so that the subject of diet was treated on more scientific lines than in the Anglo-Saxon Leech Book.

After this period less and less attention was paid to diet and physicians began to think or at least appeared to think it was beneath their dignity to attend to such trifling matters as to the food their patients partook of although Sydenham said (1624 - 1689) "There are not a few diseases which can be cured
by the use of proper diet alone".

Boerhaave (1668 - 1738) says almost nothing about diet. Cullen (1712 - 1740) is equally silent on this important subject. Graves (1795 - 1853) in a "System of Clinical Medicine" (1843) created a sensation in medicine because he was represented as saying that he fed fevers but this is not a correct representation of his views. His words are: "For the first three or four days particularly if the patient is young and robust water, weak barley water and whey will be sufficient. After this it may be well to begin with some mild nutriment. What I generally give is some well boiled gruel made of groats and flavoured if there be no tendency to diarrhoea with sugar and a small quantity of lemon juice.... after two or three days you may add a little panado. As the fever advances you may add some mild animal jelly or broth. Give this but in small quantities and with great caution at first... If it brings on heaviness, sickness of stomach, flushing of the face, excitement of pulse and increased feverishness give it up and return for some time to the gruel and panado". Certainly a mild form of feeding fevers.

It is to the Spanish and Italian Schools that we owe the modern sensible line of treatment of febrile conditions namely in presenting fluids.

In 1837 J. A. Paris published a valuable "Treatise on Diet" but it was before its time and it remained little more than a curiosity.

The real advance however in treating the subject seriously was made in 1874 when Pavy published his "Treatise on Foods and
Dietetics. It is needless to say the subject was treated fully, interestingly and scientifically.

In 1885 William Roberts delivered "Lectures on Dietetics and Dyspepsia" and he introduced the Solutions of pepsine and pancreatin and the pre-digested food associated with his name and experimental work.

The next step in the scientific investigation of food values was made in 1876 when Voit of Munich as a result of accurate observation concluded that for the performance of moderate hard work 105 grams of absorbable protein; 56 grams of fat and 500 grams of carbohydrate or a total of over 3000 calories were necessary. Voit found that German soldiers in active service consumed about 3500 calories while Atwater (U.S.A) estimated that 125 protein; 125 fat and 400 carbohydrate grams or a total of 3315 calories were needed. Rubner's standard is much the same as that of Voit and Atwater. For severe muscular exercise these observers place the caloric standard at from 4500 to 5000. In 1901 the late Sir Michael Foster and other physiologists investigated the subject and they were all agreed that the appetite was satisfied and that health and vigour were maintained with a food value of about half that usually set up by experts; but they questioned whether health and vigour could be kept up indefinitely by a standard lower that generally considered necessary.

In 1902 Chittenden, professor of physiological chemistry in Yale University began experiments on himself and others and he found that he himself kept his weight constant and enjoyed the
the best of health for nine months on a total daily caloric food value ranging from 1285 to 1984 which contained 35 to 40 grams of absorbable protein or about one-third that of the Voit standard. Running alongside but somewhat off the main track one has to take note of lines of dieting which many look upon as hardly worthy of mention. This is to underrate their influence for although extreme they have done much to moderate the older views on food and feeding. One here refers to vegetarianism, fruitarianism and purin-free dieting. More extreme than these are the no-breakfast advocates, fasting advocates and advocates of vogaries of diet with small followings.

The Feeding of Infants and Children.
This subject merits a paragraph because of its importance; not because one finds the literature of the past bulky. On the contrary we may search the medical records in vain for centuries without any reference to the future citizen. This was due to two reasons (1) because child life was held cheap and (2) because breast feeding was the rule and artificial feeding the exception. If a child lost its mother it was fed by another woman. If the child was born with a silver spoon in its mouth it had a wet nurse provided for it and if it was of poor parents then it was fed from the breast of a relative or neighbour or it died and this it often did. (3) Children were suckled till two or even three years of age that is till the milk teeth had come, although doubtless it often got a large part of its nourishment from the table long before it reached
this age especially amongst the poor when perhaps a second child had appeared before two years had passed. The milk teeth appeared to be the rule which guided the mother as to the period at which a child should be finally weaned from the breast of its mother or wet nurse.--- did not Galen say so and that was enough?

In the XVIIIth Century a bold man here and there began to say that if a woman could not suckle her child, the wet nurse was not the only resource. There was artificial feeding and bread and water or pap was suggested and some even said why not give the milk of another animal? The period at which a child might be weaned was shortened and this was something gained; but the suggested improvements were only in the experimental stage. At the beginning of the XIXth Century children were beginning to be weaned by the eighth month if they had cut one two three or four teeth, according to the particular school to which the physician belonged. This was a most important change of view and its adoption led to the necessity for a consideration of the whole subject of infant feeding. Cow's milk was not being used as a substitute for the mother's milk although the wet nurse still had a place in the life of the nation. The use of cow's milk led to the evolution of the feeding bottle. But the middle of the XIXth Century had been reached before the subject was studied from the scientific standpoint and then the literature increased day by day. The wet nurse disappeared when the members of the medical profession and the community in general realised
that she could be dispensed with and indeed the country was well rid of her for many reasons. It seems strange to us that it took so long time for intelligent men to discover the fact that a simple essay in analysis might have proved that a substitute for human milk was quite a simple matter. The history of the feeding of older children till well on in the XIXth Century met with equal neglect. When the subject was studied it was not to the benefit of the child for he was denied this that and the other article of food which his tissues rather than his eye hungered for. Scientists measured the young growing tissues of the child by the fixed tissues of the adult and so it happened that even in the highest circles of society many a child was starved because the food he most needed was not considered to be good for him. Happily the child's health and diet is now being studied from the child's point of view.

Literature.

(1) History of medicine by Max Neuburger 1910.
(2) Medical Bibliography A. and B. by James Atkinson 1834.
(3) Aretaeus (Sydenham Society) by Francis Adams 1856.
(4) Hippocrates (Sydenham Society) by Francis Adams 1855.
(5) Paulus Aegineta by Francis Adams 1844.
(6) Boerhaave Academical Lectures - 1743.
(7) Celsus by James Grieve 1756.
(8) Cullen First Lines of Practice of Physic 1791.
(9) Physiological Economy in Nutrition by Chittenden

London 1905 besides other works mentioned in the text
Dietaries of the various Social Grades with a Study of their Protein, Fat, Carbohydrate and Caloric Values. The Virtues, Faults of the Dietaries and the Disorders they give rise to; and their Therapeutic value.

This part of the investigation has been undertaken with the purpose of discovering the actual number of Calories which the English people of the various social grades do consume. Each class has been taken by itself. Average helpings of foods have been weighed and the fuel values calculated. In some of the classes as many as one hundred families have been passed in review and the results noted. This has only been accomplished after some years of observation.

The results go to disprove the assertion that the English people at least do not in general consume neither so many calories nor so much protein as the tables of Voit, Atwater and Rubner appear to show.

The special disorders found in the various grades in so far as they are related to food have been noted and the whole subject throughout the essay has been studied with a view to
Section II. Pages 21 - 86.

Dietaries of Various Social Grades.
the physiological and therapeutical action of food stuffs.

The Upper Middle Classes.

A Typical Day's Menu.

**BREAKFAST.**

Porridge & Milk.
Fried Whiting.
Bacon & Egg.
Toast.
Bread & Butter.
Marmalade.
Tea or Coffee.
Orange or other fruit.

Counting small portions of such a meal the various constituents are:

<table>
<thead>
<tr>
<th></th>
<th>Protein</th>
<th>Fat</th>
<th>Carbohydrate</th>
<th>Calories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Porridge &amp; Milk</td>
<td>31</td>
<td>22</td>
<td>70 grams</td>
<td>764</td>
</tr>
<tr>
<td>or with fruit added</td>
<td>32</td>
<td>22</td>
<td>80</td>
<td>809</td>
</tr>
</tbody>
</table>

**LUNCHEON.**

Hare Soup.
Russian Steaks.
Potatoes boiled in their jackets,
Apple Dumpling.

Again calculating for small helpings one finds

<table>
<thead>
<tr>
<th></th>
<th>Protein</th>
<th>Fat</th>
<th>Carbohydrate</th>
<th>Calories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hare Soup &amp; Potatoes</td>
<td>45</td>
<td>15</td>
<td>43 grams or 487</td>
<td>487 Calories</td>
</tr>
</tbody>
</table>

**AFTERNOON TEA.**

This accounts for

<table>
<thead>
<tr>
<th></th>
<th>Protein</th>
<th>Fat</th>
<th>Carbohydrate</th>
<th>Calories</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8</td>
<td>8</td>
<td>40 grams</td>
<td>268</td>
</tr>
</tbody>
</table>

(21)
DINNER.

Tomato Soup.
Fried Cod Steaks.
Roast Duck.
Green Peas.
Roasted Potatoes.
Lettuce Salad.
Rice Pudding.
Fruit - Grapes, Bananas.
Coffee. Cheese.

or some such dinner.

The amounts are at least expressed in grams.

<table>
<thead>
<tr>
<th>Protein</th>
<th>Fat</th>
<th>Carbohydrate</th>
<th>Calories</th>
</tr>
</thead>
<tbody>
<tr>
<td>58</td>
<td>43</td>
<td>105</td>
<td>1057</td>
</tr>
</tbody>
</table>

The total daily grams and calories are

<table>
<thead>
<tr>
<th>Protein</th>
<th>Fat</th>
<th>Carbohydrate</th>
<th>Calories</th>
</tr>
</thead>
<tbody>
<tr>
<td>140 to 145</td>
<td>95 to 100</td>
<td>250 - 260</td>
<td>2500 to 2800</td>
</tr>
</tbody>
</table>

or if expressed in nitrogen and carbon grams are respectively 20 to 23 and 245 to 250 or 1 N to 11 or 12 C. If large helpings be taken these amounts may be greatly exceeded.

Objections to the Dietary. The great objection to this dietary is in its variety and there is a tendency to eat too profusely of the proteins and fats and too sparingly of the carbohydrate and so an unbalanced diet is the result for although the quantities quoted do not show a great excess of protein it is to be remembered that the eaters have had small helpings. The variety introduced into the dietary makes it difficult for the eater to satisfy hunger and yet to only partake of the physiological requirements of the tissues.
Illness which may reasonably be attributed to such a Dietary.

The people who live on this dietary do little or no physical labour unless it be in playing golf or other recreation and hence may be more susceptible to conditions which the dietary tends to excite.

(1) A large proportion of them (both men and women) put on too much fat soon after 30 unless they eat sparingly. When once a certain age is reached say 45 it is most difficult to cut down the weight for the individuals of this class as a rule have then more leisure time and they sit longer at the table and make eating more and more the business of life. Now and then they make feeble efforts at restricting their food intake but it is only for a short period.

(2) A large proportion suffer from articular gout. A certain number who appear to be otherwise healthy save for a feeling "of irritability" always express themselves as being free from this feeling when they are put on the "Kitchen Dietary" detailed later on.

(3) Some suffer from "muscular rheumatism" along with flatulence, pain in the abdomen and other symptoms of disordered digestion and a change to a simpler dietary completely removes the trouble.

(4) Perhaps the largest number are the subjects of perihepatitis with dyspeptic troubles.

(5) A large number of this class have every year to take the "cure" at Harrogate, Strathpeffer, Buxton or at one of the continental spas where alone they can be made to adopt
a restricted dietary and to undergo purgation.

**The Middle Classes.**

The middle classes live on a dietary which is not quite so varied as the foregoing but yet it is abundant and consists of something like the following:

**Breakfast.**
Porridge & Milk.
Bacon or Ham & Eggs.
Dry Toast. Hot Buttered Toast.
Marmalade.
Tea or Coffee.

Luncheon or dinner is similar to the luncheon of the upper middle classes.

Afternoon tea may or may not be taken but there is always a high tea of which an example is here given.

**High Tea.**
Fried Sole or Cod Steaks.
Boiled or Scrambled Eggs.
Toast. Potato Cakes.
Lettuce or Celery.
Hot buttered tea cake.
Jam. Preserved Ginger.
Tea.

**Faults of Dietary.**

The faults of this dietary are that all the meals are relatively too bulky, too rich and too varied with the result that if the guests eat well at each meal a large proportion suffer from the same disorders as the upper middle classes. There is a tendency to eat not because hunger is present but because the palate is being tickled by variety. The bulk too is a serious fault for the stomach may be loaded at each meal and unless the eater has a vigorous digestion a large portion
may remain undigested. This is aggravated by the circumstance that the lower middle classes do not spend so much time over their heaviest meal as do the upper middle classes, but are apt to fall into the list of bolters.

Value of the Dietary.

<table>
<thead>
<tr>
<th>Protein</th>
<th>Fat</th>
<th>Carbohydrate</th>
<th>Calories</th>
</tr>
</thead>
<tbody>
<tr>
<td>95</td>
<td>65</td>
<td>300 grams</td>
<td>2200</td>
</tr>
</tbody>
</table>

or Nitrogen 15; Carbon 215 grams or 1 N to 14 C.

A large proportion of the carbon is derived from the carbohydrates as opposed to the upper middle class dietary where a larger proportion of the carbon is from the protein and fat intake.

Disorders met with amongst this class. (1) The commonest condition is dyspepsia so called associated with dilated stomach as may be gathered from the remarks made in the last paragraph. This dyspeptic condition is helped by the tendency to drink too much tea with a "high tea" meal. (2) Tendency to deposit of fat is common but not so common as the tendency to dyspepsia. The other conditions incidental to the upper middle class dietary are less common but do occur.

The great difference between this class and the upper middle class is that gout is not so common and this may be accounted for that the average protein intake is only three-fourths that of the upper middle classes.

The Ideal Dietary: Sometimes called the Kitchen Dietary. This is called the Kitchen dietary because in what is sometimes design-
"good establishments". It is the food list of the servant staff as opposed to the diet list of the occupants of the hall. This or a dietary very like it is eaten by the best type of the working classes and by the lower middle classes of England. It is almost an ideal dietary for it is ample: it is plain and contains nothing that is likely to unduly tickle the appetite and so lead to overeating: it is nourishing and contains everything that is pleasing to a healthy appetite begotten of physical toil.

**Breakfast.**
- Bacon or Bacon & egg or Ham or Ham & Egg or Fish or Kidney & Bacon or Sausage Toast Bread & Butter Marmalade Jam Tea or Coffee.

**Food Value.**
- Protein 22
- Fat 46
- Carbohydrate 59 Grams or 744 Calories.

**Dinner.**
- Cold Beef or Roast Leg of Mutton or Haricot or Calf's Liver & Bacon or Roast Pork or Potato Pie or Roast Beef.
- Potatoes - Roasted, Boiled, Baked or Mashed. Carrots, Turnips, Stewed Tomatoes, Horseradish Sauce, Cabbage, Beans, or Peas according to meat provided.
- Pudding - Rice, Lemon, Roly-Poly, Fruit or other.

**Food Value.**
- Protein 30; Fat 26; Carbohydrate 102 grams; Calories 777.
High Tea.

1. Salad with or without
2. Fried Cod Steaks, Cockles, Mussels, Boiled Hake, Boiled Spanish Onions, Crab, Kippers or Boiled Egg.
3. Toast, Bread & Butter, Jam.
4. Cake, when 2 is not provided.

Food value.

Protein 31; Fat 46; Carbohydrate 103 grams or Calories 963.

Supper.

Many people do not take supper but the following is a common supper diet.

Coffee, Cocoa, Milk or Tea.
Bread and Butter or Bread and Cheese or Biscuits & Cheese.

Food Value for the Day.

Excluding supper this gives a daily food value of

Protein 83; Fat 118; Carbohydrate 264 grams, or Calories 2500.

Expressed in terms of Nitrogen & Carbon = 13 of Nitrogen and 235 grams of carbon, or 1 N to 18 C. as opposed to the standard 1 to 15. If supper consisting of milk, bread & butter be taken then the protein is increased to 94 grams, the fat to 130; and the carbohydrate to 300 making a total of 2785 Calories or 15 grams of Nitrogen and 263 of carbon or 1 N to 17.5 C. The actual quantities of food provided by these figures are liberal.

- 2 ounces of bacon, one egg, 3 ounces of bread with tea, sugar, butter and jam, - For breakfast.

For Dinner they allow of - four ounces of meat, six of potatoes, two of vegetables, one of bread, and one and a half of dry rice.
cooked with milk, butter and sugar. For high tea, four ounces of fish, 4 ounces of bread with tea, sugar, milk and jam or marmalade.

It is possible from such a dietary to increase the protein to such an extent that it is productive of much harm and many butlers - the class largely consuming it - eat enormous quantities of meat and they are sufferers from gout, rheumatism and like errors of metabolism. Still on the whole the consumers enjoy the best of health.

Faults of the Dietary. It is relatively expensive for no provision is made for the use of waste products such as bones in making soups or broths. This is a great disadvantage in large families and especially so where there are children from five to fifteen years of age, for they do not get all out of the bones and joints that they might get with a differently arranged dietary - such as the combined fat contained in the marrow and in the fat around joints and so on.

Advantages.

Absence of made-up dishes all being fresh food, so that there is less chance of the dietary causing dyspepsia. There is only one meat provided at each meal and this tends to keep the protein intake low. None of the meals need be too bulky. The dietary is well balanced so that the man who has a keen appetite or the man who performs hard physical work may make a large meal without taking in too large a proportion of protein. In like measure the small eater can hardly take in other than regulated proportions of protein, fat and carbohydrate. The two
heavy meals are thrown into the earlier part of the day and this is of advantage for despite the argument that the lower animals have a heavy meal before going to sleep experience teaches that many human beings do not rest well or comfortably unless some hours elapse between a heavy meal and the time of retiring. Supper can be cut out or not according to taste or inclination. Many people who habitually take a more varied dietary and become ill recover their comfort and well being when placed on this simple list and without the feelings of unpleasantness or even discomfort which apply to vegetarian, purin-free or other very restricted dietaries.

Although the dietary contains a larger proportion of fat than the two diet list already detailed there is less tendency to lay on fat. This is perhaps because the protein intake which prevents waste is less. In the "Kitchen Dietary" there is "good protein margin" and this is of value in times when more than ordinary fatigue has to be endured; and it is not wise to run too close to the dividing line between protein loss and gain. For literary men, who from the nature of their employment get little outdoor exercise or for men over 60 years of age, the dietary can be modified by substituting oatmeal porridge and milk for the bacon and egg at breakfast or the fish at tea-time. Still it cannot be denied but health may be maintained and real hard work carried out for years by men who live on a much smaller quantity of protein and the writer here gives his own experience.
III. Suggested Dietary for Professional Men having out-door exercise.

The writer who has now reached middle life has from the time he graduated twenty years ago maintained an almost constant weight of nine stones (126 pounds or 57.15 Kilograms) and perfect health. Height 5 feet 4½ inches or 64½ inches (1632 m. m.)

His dietary has practically not varied in the period mentioned. He has worked not less than ten hours a day for six days weekly and each day has been made up of at least five miles walking with the usual duties of a medical practitioner, to this has been added laboratory or literary work or both, as a recreation.

No attempt was ever made to cut down the dietary or to formulate a special dietary: the writer simply ate what he felt he liked and in such quantity as appetite demanded so that the figures here given may be accepted as the amounts necessary to maintain health under moderate conditions of labour physical and mental. No doubt by training one might maintain the equilibrium on less, but the writer had no special desire to try experiments in this direction.

Breakfast.

1. Tea with sugar and milk - 13 fluid ounces.

2. One fried egg with fried bacon or varied with boiled ham or occasionally fried fish.

3. White bread.

4. Marmalade or jam.
Dinner at 2 or 2-30.

1. Half a pint of soup of various kind—lentil, sago, potato or Scotch broth.
2. Meat—beef, veal, pork, mutton, or fowl.
3. Potatoes—always boiled or baked in their skins.
4. Pudding—made with barley, rice, sago, or tapioca.
5. Fruit, uncooked—strawberries, cherries, pears, apples, grapes, or oranges.
6. Drink—Cold water, aerated water or sweet lemonade.

Supper at 7-30.

1. Whole wheat made in the form of frumenty or oatmeal porridge, each with milk.
2. Small piece of fish (fried) or occasionally scrambled egg.
3. White bread.
5. Marmalade or jam.
6. Tea same as for breakfast.

The quantities are as follows:
<table>
<thead>
<tr>
<th>Metric equivalents within brackets.</th>
<th>Protein Grams.</th>
<th>Fat Grams.</th>
<th>Carbohydrate Grams</th>
<th>Calories.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk - One pint (567 grams)</td>
<td>18.33</td>
<td>22.50</td>
<td>27.50</td>
<td>406</td>
</tr>
<tr>
<td>Sugar - 3 ounces. (85 grams)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One egg - 2 ounces. (56 grams)</td>
<td>7.37</td>
<td>5.37</td>
<td></td>
<td>81</td>
</tr>
<tr>
<td>Soup - 8 to 9 ounces (226-255 grams)</td>
<td>7.50</td>
<td>2.10</td>
<td>10.00</td>
<td>96</td>
</tr>
<tr>
<td>Bacon - one ounce (28 grams)</td>
<td>2.50</td>
<td>16.82</td>
<td></td>
<td>167</td>
</tr>
<tr>
<td>Bread - 6 ounces (170 grams)</td>
<td>19.12</td>
<td>2.02</td>
<td>89.62</td>
<td>468</td>
</tr>
<tr>
<td>Marmalade (or Jam.) (28 grams)</td>
<td>0.23</td>
<td></td>
<td>18.93</td>
<td>76</td>
</tr>
<tr>
<td>Potatoes - 4 ounces (113 grams)</td>
<td>2.75</td>
<td></td>
<td>23.50</td>
<td>110</td>
</tr>
<tr>
<td>Beef etc. - 2 ounces (56 grams)</td>
<td>9.25</td>
<td>4.00</td>
<td></td>
<td>75</td>
</tr>
<tr>
<td>Strawberries &amp;c. 2 ows. (56 grams)</td>
<td>0.51</td>
<td>0.34</td>
<td>4.10</td>
<td>22</td>
</tr>
<tr>
<td>Fish - 2 ounces (56 grams)</td>
<td>9.62</td>
<td>0.28</td>
<td></td>
<td>42</td>
</tr>
<tr>
<td>Oatmeal etc. - 2 ows. (56 grams)</td>
<td>8.00</td>
<td>2.50</td>
<td>38.00</td>
<td>215</td>
</tr>
<tr>
<td>Butter - 1/2 ounce (14 grams)</td>
<td>0.14</td>
<td>12.03</td>
<td></td>
<td>112</td>
</tr>
<tr>
<td>Rice etc. 1 1/2 ounces (42.5 grams)</td>
<td>3.42</td>
<td>0.12</td>
<td>36.37</td>
<td>150</td>
</tr>
<tr>
<td>Total Grams for one day.1533.5</td>
<td>68.74</td>
<td>68.09</td>
<td>333.07</td>
<td>2368</td>
</tr>
</tbody>
</table>

| Standard Diet                    | 125.00         | 50.00      | 500.00             | 3020     |

| Difference (fractions not counted) | -37.00 | +18.00 | -167.00 | -552 |
| Grams. | Grams | Grams | Calories |       |

(32)
Expressed in terms of nitrogen and carbon $N = 14 \quad C = 236$
grams. Standard of Voit, Atwater and Rubner $N = 20 \quad C = 300$
grams or $N = 6$ and $C = 64$ grams less than the standard or $1 N$ to $17$
$C$ against the $1$ to $15$ standard proportions. In the writer's
dietary the term "beef, etc" means beef, mutton, lamb, veal,
pork, and the average has been calculated and the same applies
to "oatmeal etc." which includes wheat in grains and the aver-
age of the respective quantity of each has been taken. Fish
has been reckoned as cod steaks.

**Comparison with Chittenden's Low Protein Dietaries.**

It will be remarked that the dietary suggested by the writer
contains a much larger number of nitrogen grams and possesses
a much higher caloric value that the much discussed Chittenden
figures. For purposes of comparison one may here briefly
recall his work and figures. Chittenden who in November 1902
was aged 47 and weighed 10 stones 4 pounds (65 Kgm) and accus-
tomed to eat up to the usually accepted standard began to cut
down his food intake and particularly the protein intake. At
first this occasioned some physical discomfort but he gradually
got used to the change. By June 1903 his weight had fallen
to 9 stones 2 pounds (58 Kgm). From October 1903 (when he
had attained to a fixed dietary and constant weight) to June
1904 that is during a period of nine months he carefully noted
the variations in body weight and nitrogen metabolism. His
average daily nitrogen output was $5.699$ grams and his weight
remained stationary and he experienced the best of health. He
gives a list of diets for a few days in March and June 1904 and
in the former the daily fuel value is 1613 Calories and the Nitrogen intake 6.40 grams; and in the latter 1549 and 5.860 respectively.

A table is given shewing the kind of food partaken of and it will be observed it is concentrated and small in bulk compared with the diet sheet of the writer.

**Nitrogen Content of the Chittenden Dietary.**

<table>
<thead>
<tr>
<th>Grams</th>
<th>Nitrogen %</th>
<th>Total nitrogen.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coffee 154 (5 1/2 ozs)</td>
<td>x 0.045</td>
<td>= 0.069 gram</td>
</tr>
<tr>
<td>Sugar 44 (1 1/4 &quot; )</td>
<td>x 0.00</td>
<td>= 0.000</td>
</tr>
<tr>
<td>Milk 32 (1 1/8 &quot; )</td>
<td>x 0.51</td>
<td>= 0.163</td>
</tr>
<tr>
<td>Codfish )creamed 89 (3 &quot; )</td>
<td>x 1.78</td>
<td>= 1.584</td>
</tr>
<tr>
<td>Baked potato )95 (3 1/3 &quot; )</td>
<td>x 0.29</td>
<td>= 0.276</td>
</tr>
<tr>
<td>Butter 21 (336 grs)</td>
<td>x 0.13</td>
<td>= 0.027</td>
</tr>
<tr>
<td>Homing )germs 58 (20 ozs)</td>
<td>x 1.20</td>
<td>= 0.696</td>
</tr>
<tr>
<td>Strawberries 86 (3 1/12 &quot; )</td>
<td>x 0.11</td>
<td>= 0.095</td>
</tr>
<tr>
<td>Ginger )snaps 69 (2 1/7 ozs)</td>
<td>x 1.15</td>
<td>= 0.794</td>
</tr>
<tr>
<td>Cold tongue )14 (1 oz)</td>
<td>x 4.87</td>
<td>= 0.682</td>
</tr>
<tr>
<td>Fried potato )48 (1 3/4 ozs)</td>
<td>x 0.37</td>
<td>= 0.178</td>
</tr>
<tr>
<td>Peas 60 (2 1/8 ozs)</td>
<td>x 0.94</td>
<td>= 0.564</td>
</tr>
<tr>
<td>Wheat )germs. 30 (1 1/7 &quot; )</td>
<td>x 1.45</td>
<td>= 0.435</td>
</tr>
<tr>
<td>Lettuce) &amp; orange 155 (5 1/2 &quot; )</td>
<td>x 0.15</td>
<td>= 0.233</td>
</tr>
<tr>
<td>salad. ) Crackers 22(1276 grs)</td>
<td>x 1.40</td>
<td>= 0.308</td>
</tr>
<tr>
<td>Cream ) Cheese. 14(1 oz)</td>
<td>x 1.62</td>
<td>= 0.227</td>
</tr>
<tr>
<td>991 Grams</td>
<td>6.331 Grams</td>
<td></td>
</tr>
</tbody>
</table>

Total Nitrogen 6.331 grams.
Fat Content of the Foregoing: Criticism of the Chittenden Dietary.

If one examines this diet list it will be observed that an important point in it is not emphasised namely its large fat content which amounts to 80 grams instead of the standard 50 grams. The effect of a large amount of fat in a diet of small protein intake and having a comparatively small total fuel value is great and its occurrence is so constant in dietaries poor in protein that it must have a significance to which physiologists are not yet fully alive. As will be remarked from examples given in other parts of this essay people who are only able to afford a poor and limited food supply appear to instinctively formulate for themselves a diet rich in fat. Other points suggest themselves to the critical reader.

Chittenden was 47 before he started his experiments on himself and he had previously been well fed with an ample margin and he had not had much physical toil except when on holiday. The question one asks is: Can a man maintain health for years on the small quantities eaten by this interesting experimenter? It is doubtful if young men could, say men of 20 to 40. A man of over 40 provided he had up to that age eaten half as much again as Chittenden's allowance - might live comfortably on this reduced allowance. The concentrated nature of dietary is so striking as to again merit attention. Its total daily weight of about $2 \frac{3}{16}$ pounds (991 grams) against the $3 \frac{6}{18}$ pounds (1533 grams) eaten by the writer appears too lacking in bulk.
Chittenden's Experiments with young men on a Low Protein Intake.

Chittenden also experimented with thirteen men whose ages ranged from 21 to 27 except one who was 43. These men belonged to the Hospital Corps Detachment of the U.S. Army. They had to practise daily drill gymnasium work and the usual duties pertaining to a soldier's life.

Before starting his experiments Chittenden found during a period of sixteen days that their urine contained daily 16 to 17 grams of Nitrogen. This was when they were on the regular army dietary which contained an abundance of protein. After this the men were put on a dietary containing a low protein content - 8.5 to 9.5 grams daily. This quantity was continued for five months from October 1903 to April 1904. The total daily fuel value for each man ranged from 2500 to 2800 and on these amounts the nitrogen balance was maintained - the average daily nitrogen output was 7.80 grams. All thirteen men enjoyed perfect health and vigour and performed their duties with as great ease as they did under the former high protein dietary.

As to body weight, three had gained slightly in weight and ten had lost in weight at the end of the experiment, and the amounts will be readily seen from the following table.

(36)
### Weight of 13 men of U.S.A. Army.

<table>
<thead>
<tr>
<th>No.</th>
<th>Beginning Kilos</th>
<th>End Kilos</th>
<th>Gain or Loss Kilos</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>52.30</td>
<td>53.00</td>
<td>+ 0.700</td>
</tr>
<tr>
<td>2.</td>
<td>54.00</td>
<td>55.00</td>
<td>+ 1.00</td>
</tr>
<tr>
<td>3.</td>
<td>59.10</td>
<td>58.00</td>
<td>- 1.10</td>
</tr>
<tr>
<td>4.</td>
<td>59.20</td>
<td>59.00</td>
<td>- 0.20</td>
</tr>
<tr>
<td>5.</td>
<td>59.40</td>
<td>61.00</td>
<td>+ 1.60</td>
</tr>
<tr>
<td>6.</td>
<td>60.10</td>
<td>59.00</td>
<td>- 1.10</td>
</tr>
<tr>
<td>7.</td>
<td>61.30</td>
<td>60.60</td>
<td>- 0.70</td>
</tr>
<tr>
<td>8.</td>
<td>65.00</td>
<td>62.60</td>
<td>- 2.40</td>
</tr>
<tr>
<td>9.</td>
<td>66.70</td>
<td>62.10</td>
<td>- 4.60</td>
</tr>
<tr>
<td>10.</td>
<td>71.30</td>
<td>71.00</td>
<td>- 0.30</td>
</tr>
<tr>
<td>11.</td>
<td>76.00</td>
<td>72.60</td>
<td>- 3.40</td>
</tr>
<tr>
<td>12.</td>
<td>72.70</td>
<td>64.30</td>
<td>- 8.40</td>
</tr>
<tr>
<td>13.</td>
<td>59.30</td>
<td>57.20</td>
<td>- 2.10</td>
</tr>
</tbody>
</table>

**Criticism.** Here again one has to say that the experiment extended only over a short period and one might with justice ask: do the men still keep on with the restricted dietary? Further, one might ask: were the men otherwise than well when they took the ordinary Army dietary and excreted 16 to 17 grams of nitrogen? The same objection applies to these experiments as applied to Chittenden's experiment on himself namely that they had hitherto been well fed and possibly a period of restriction may have acted beneficially. The tissues can store up reserve supplies of both fat and protein and the one can act as a sparer of the other and the one can within certain limits replace the other in the process of
metabolism. Now if we examine the diet list of the men with whom Chittenden experimented it will be found that in the following example where Chittenden has calculated the total nitrogen content is 8.420 grams and the fuel value as 2466 Calories. The writer has found that the fat value is at least 75 grams daily or 50 per cent more than the usually accepted amounts. This is a point of great import. Thus Chittenden's soldiers worked on a low protein intake but on a high fat intake.

The actual diet contained:
Fried Indian-meal 100 grams; Syrup 75 grams; baked potato 250 grams; butter 40 grams; Coffee, 3 cups (1050 grams);
Tomato soup thick with potato and onions boiled together 300 grams; mashed potato 200 grams; scrambled egg 50 grams; bread 50 grams; fried bacon 20 grams; boiled potato 200 grams; bread pudding 150 grams; banana 200 grams.

It will now be interesting to turn from Chittenden's experiments to consider how the hardest working English labourer feeds himself by instinct.

The Food Value consumed by English Outdoor Labourers doing hard work. Average of 100 cases.

The writer has not been able to find any class of the English community who in a great number live on a dietary conforming to the Voit, Atwater or Rubner standard of 125 grams (4\frac{1}{2} ozs) of protein; 500 (18 ozs) of carbohydrate and 50 1\frac{4}{5} ozs) of fat, except the upper middle classes and they consume more protein, more fat and less carbohydrate. Their
large consumption of protein is due to a special cause as already explained. The nearest approach to the Voit, Atwater and Ruber figures is to be found among outdoor workers doing drainage and sewerage work who as a rule take breakfast and dinner away from home. The large proportion of them are too poor to go to the cheap restaurant and they live chiefly on dry food.

**Breakfast.** Often consists of 4 ounces of ham or bacon (133 grams), one egg boiled or fried, 4 to 6 ounces (113 to 170 grams) of white bread, and one pint of tea of the usual strength enjoyed by the working classes.

**Dinner.** Two ounces of American or Cheshire cheese (56 grams); 6 ounces (170 grams) of white bread; half an ounce (14 grams) of butter or margarine; and tea as before.

**Tea-Supper.** Four ounces of beef, mutton, pork or a protein equivalent of fish; 6 ounces of bread; half an ounce of butter, jam or margarine. Tea as at other meals. Occasionally lettuce, celery, radishes or onions.

On Sunday he has the only varied meal of the week; but on the diet sheet quoted he is able to do laborious work. Calculated out the value is found to be:
Protein 116; Fat 108; Carbohydrate 296 or Nitrogen 18.5;
Carbon 255 grams or 2700 Calories or nearly 1 Nitrogen to 14 Carbon.

Many of these men consume very much larger quantities of food and especially of cheese, bacon, ham, beef and mutton, and it is not an uncommon experience for men to eat 6 to 8 ounces
of bacon or ham for breakfast. Others again eat much less protein than that mentioned in the list. Others again have tea or cocoa: before going out in the morning. These various changes will, of course, modify the value of the dietary. Taking it altogether I believe the list as it stands represents fairly the food eaten by our hardest manual labourers.

Cost. This amounts to one shilling or a trifle under or over daily; but this tends to go upwards, especially in the past three years.

Comments and Faults. These are many but it is difficult to find a remedy. Some men do carry potatoes and vegetables which they heat up at meal times but sooner or later they give up the practice for they declare the heated up food causes "indigestion" more readily than the "dry" food and that on this account the monotony of the bread is preferable to the other. The men have so small a margin of money for food that they must have that which produces most energy at least cost.

A Good Average Dietary for Working Class Adults in Towns drawn from 200 Households.

In order to ascertain what might be considered a good average dietary for the industrious, sober and comparatively well-to-do artizan adults in towns, two hundred households were passed under review and the food they ate was noted and averaged. Thirty shilling incomes were looked upon as the limit of the class to include the man, wife and at most four children under working age. Many households did not have this sum coming in
and yet they appeared to be able to enjoy food up to the standard laid down in the list. Besides the artizan in this class we here include married clerks, for many clerks do not get more than the sum of thirty shillings a week.

The food eaten was noted, the quantities weighed, the manner in which it was cooked was also observed and the calculations were made therefrom. The man's food value is only in the present instance considered the purport of the enquiry being to find out how much food and the kind of food he usually ate of his own accord to enable him to perform his work and to maintain his health at equilibrium. The class included members of almost every working class trade taking their meals at home or in a good working class restaurant - and as already said clerks.

**Kind of Food.**

**Breakfast.** The most popular foods are undoubtedly bacon or bacon and egg or ham. The average quantity was 2 ounces of bacon (56 grams) and one egg (the average weight of an egg is 2 ounces or 56 grams). In winter, when eggs are dear, these were not eaten and perhaps a little more bacon was eaten instead. As the bread usually about 4 ounces (113 grams) but sometimes 6 ounces were eaten. White bread is generally eaten. Wheatmeal bread almost never; and even at the height of the craze Standard bread was almost never seen in the homes of this class. The beverage was in 95 per cent of the families tea with sugar and milk, and from ½ to one pint was drunk at each meal (about $\frac{1}{3}$ to $\frac{2}{3}$ litre). In making the infusion from $\frac{1}{16}$ to $\frac{1}{3}$ ounce (1.75 to 3.5 gram) of dry tea was employed along with $\frac{1}{2}$ an ounce each (14 grams) of milk.
and sugar. Seldom does one meet with a working man who does not take sugar in his tea. Coffee is not taken in one per cent of cases for breakfast among artisans and coffee is not met with in more than four per cent of cases at breakfast time.

Dinner.

Beef is the first favourite, next comes mutton, and next pork. Rabbit is also a favourite. The English working classes seldom eat fish for dinner except on Saturday when they eat small quantities of fried fish which they purchase ready cooked. A usual amount is 4 ounces of cooked meat (113 grams). A few eat five to six ounces but this is not common and some who may be called large meat eaters even take as much as half a pound but they consume small quantities of potatoes, bread and carbohydrates generally. Quite a large number are met with who even take as little as three ounces (84 grams) to dinner. Amongst this class chilled or frozen meat is almost universally eaten. This is probably because of its cheapness and excellent quality. On account of the great rise in the price of meat and of the dearness of home-fed meat it is safe to assert that most of this class would have had to go without meat but for the presence of the foreign article.

About six ounces (170 grams) of potatoes are consumed at dinner and often one ounce (before cooking) of either beans or peas - 28 grams. Pudding - rice, sago, or other or stewed fruit may occasionally be found in the dietary but not so often: more often a "pot" of tea with some bread is partaken of. Yorkshire pudding is however largely eaten and this is probably because
it can be more readily prepared along with meat and because it gives an opportunity of increasing the fat content of the dietary and uses up the gravy. Amongst the best type of this class beer is fast disappearing from the every-day dinner table. How the Dinner is served and the Cost.

(1) Roasting. This is where a joint is provided for the family as on Sunday. (2) Potato Pie. (3) Meat pie with crust. (4) Stewed. A woman of the cleverer type can give her husband a dinner costing only fourpence made up of potato pie containing 4 to 6 ounces of chilled meat, 6 ounces of potatoes, 1 ounce of onions, tomato and flavouring herbs, and one ounce of peas or beans (weight of ingredients before being cooked) and a pudding containing (weighed and measured before cooking) 1 ounce of rice or cornflour, 5 ounces of milk, $\frac{1}{4}$ to $\frac{1}{2}$ ounce sugar and 2 ounces of stewed rhubarb. For a like sum a woman can let her husband have four ounces of cooked meat (with some Gristle); 3 ounces of good gravy; $4\frac{1}{2}$ ounces of pie crust; and 7 ounces (cooked) potatoes. This sum includes half a pint of tea with two ounces of bread, the tea being made of $\frac{1}{16}$ ounce tea; $\frac{1}{2}$ ounce each sugar and milk. For the same sum she provides 3 to 4 ounces of roast beef (fat not counted), 4 ounces of cooked peas, 4 to 6 ounces of cooked potatoes; 4 ounces of Yorkshire pudding and three ounces of good gravy. Tea and bread as above included.

Many good restaurants for working men provide the last two for $5\frac{1}{2}$d to 6d and the food as well and cleanly cooked.
Tea.

For tea six to eight ounces of bread with half an ounce of butter, dripping, or margarine with the same of jam or marmalade are generally eaten. The beverage is of the same strength and quantity as for breakfast, Lettuce, celery, radishes and spring onions are largely consumed by this class at tea-time.

Cocoa is not largely drunk at tea-time from choice. People who believe that tea causes indigestion may drink cocoa instead.

Supper. Is not largely partaken of by this class. Coffee, cocoa or milk are the beverages taken. Some have porridge made from oatmeal or rolled oats, but oats as a food are not now much eaten by the English working man in health in the large towns.

Food Value of the Dietary. An average may be taken as Protein 77: Fat 82: Carbohydrate 275: or Nitrogen 12.25; Carbon 208 grams or 2200 Calories or 1 Nitrogen to 17 Carbon. This allows for 4 ounces (113 grams) of cooked meat. It does not allow for an egg for breakfast. This would increase the protein by nearly seven and the fat by six grams and the Calories by 83. Nor does it include supper. It however includes what the average working man eats, enjoys health on, and does his work on; and it is the dietary which no one has prescribed for him but which he has evolved for himself and that on 800 less Calories than the standard dietaries of Voit, Atwater and Rubner.
Virtues and Faults of the Dietary.

The simplicity of the dietary is its chief virtue. It contains almost no made-up dishes to cause dyspepsia; and it has not an excess of protein or carbo-hydrate so that there is no chance of those errors of metabolism which are often associated with gout and liver troubles. Its faults are that its cereal constituents are too rich in wheat. One fourth or even one third of the wheat might with advantage be replaced by oatmeal. This would supply a valuable constituent in the shape of combined fat. This is a tendency of the English working and other classes, namely the almost exclusive use of wheat. The money too spent on meat might be differently laid out as in buying a class of beef or mutton from which broths could be prepared. This would form a food suitable for children. This would further mean the use of barley, a cereal containing a large proportion of phosphoretted constituents. To put it in other words the dietary has in it rather too little of the food stuffs from which a growing child might be helped but this is a fault common to all English dietaries. It further means the provision of another diet list suitable to the children and thus adding to the cost of living in a household in which only a small margin can be afforded for food.

The Case of young men and women earning small wages upon which they have to live.

A class of small wage earners is met with in considerable numbers in all large towns. In it are to be found young men and young women who are living away from home and receive no
aid in their maintenance, or they are without parents, relatives or friends who can aid them. More often the unfortunate individual is a young woman engaged in business, whose total income ranges from ten to twelve shillings a week. The utmost that can be spent on food is five shillings and sixpence for generally a relatively large amount must be spent on dress. The rent of a room costs half-a-crown and only-a-crown or four shillings and sixpence remain for all other expenses. In a large household five shillings is a sufficient amount to ensure good food for each adult but for separate units it is much too small a sum, especially in towns.

**Breakfast and Tea.** These meals are generally taken at home and they are made up of tea or cocoa, bread and butter, or margarine or jam. For seven days the cost is two shillings and sixpence or two shillings and eightpence, and is laid out as follows:

One and three quarter pints (one litre) of fresh milk; four ounces (113 grams) tea; One and a half pounds of sugar; half a pound of butter (226 grams) or better still double this of margarine; half a pound of jam; six and a half pounds (3 Kilos) of bread.

**Dinner.** On Sunday this is taken at home and costs sixpence for which a good slice of roast beef (4 to 5 ounces) with 5 to 6 ounces of potatoes, vegetables and Yorkshire pudding can be got. On the other days of the week dinner is often taken at a cheap restaurant. On three days for four or five pence a fair portion of meat and potato pie or mashed potatoes
and sausage with a cup of tea can be had. On two days of the week the meal may be a little better and costs sixpence and in addition to the meat course a portion of rice pudding is taken. On Saturday the restaurants catering for this class of customer do not make a dinner at mid-day and this meal is generally made up of fried fish, chipped potatoes and tea.

The various food stuffs having been weighed and calculations made it is found that its value is: Protein 59; Fat 52; Carbohydrate 398; or Nitrogen ".40; Carbon 226 grams or a total of 2357 Calories or 1 Nitrogen to 24 of Carbon or a very low proportion of protein to carbon.

Comments on the dietary. It is monotonous, lacking in variety and in the elements of freshness. It contains too much bread and too little fat. Curious to relate this class often get into the habit of eating too much bread and too little fat, and the habit is difficult to break.

Faults and Disorders to which the Dietary leads. The comparatively large consumption of wheaten bread throws a strain on the digesting glands and there is a tendency to malnutrition. Constipation is common owing partly to this large consumption and partly to deficiency in fat. Dyspepsia is common for the same reasons. For the sums which they have to spend they might get a much better food supply but the fear of running into debt prevents many of them from venturing out of the common groove. A change to a convalescent home does them good by relieving from anxiety as to food and the variety has also a salutary effect. They are often found in the out-patient room.
and cod-liver oil, malt extract and digestive extracts which enable them to make the best use of their large bread intake always improve their nutrition.

This dietary barely answers to the test "sufficient".

Inadequate Dietaries.

Hitherto we have been dealing with dietaries which are sufficient and we now pass on to consider dietaries which are deficient from almost every point of view.

I. In every large community one meets with shop girls who are in receipt of small wages and who on account of being alone in the world must keep themselves entirely out of their earnings. Others of the class are factory hands who are handicapped by ill health or other defect and hence cannot earn good wages. The same applies to all girl and woman labour entirely dependent on its own exertions. This is one of the problems of female labour. Female labour is so abundant and cheap that in certain departments the poor woman can hardly live unless she is aided by her relatives in the shape of having free lodgings. The girl whose case we are now considering earns at the most nine shillings a week when she has full time and against this must be put time lost by ill health and times when work is slack. As often as not she lodges with a widow who charges her two shillings and sixpence for her room. Food costs her from two and six to three and six a week, and she has only three shillings left to meet all incidentals. What food does she get for the sums?
In every instance the foods which she obtains for the sums mentioned below have been purchased in the same shops, weighed and calculations made therefrom. As will be observed the fat content is sufficient and this is owing to the cheapness of dripping, margarine and to the practice of this class of woman of eating largely of the fish and chipped potatoes now everywhere to be obtained in all towns occupied by the industrial classes (see page 92).

**Breakfast.** Bacon 2 ounces or 113 grams - two days a week, with tea and bread. On the other five days she has to be content with tea, bread, margarine, dripping or jam.

**Dinner.** This meal is generally eaten at the workshop, factory, or cheap restaurant. It consists of pastry with custard and tea with plenty of milk and sugar varied with buns, bread, margarine on five days. On Saturday she has 3½ ounces (91 grams) of chipped potatoes and one and a quarter ounces (35 grams) of fried cod or hake with bread, jam and tea. On Sunday she has the real dinner of the week as she calls it. This is made up of four ounces of roast beef (113 grams), the same or perhaps 6 ounces (170 grams) of potatoes and a liberal supply of Yorkshire or other pudding.

**Late Tea or Supper.** (for one may call it by either name).

This resembles Saturday's dinner.

The dietary is varied with fruit - oranges, apples, bananas, strawberries, plums. These have without doubt a salutary effect on the tissues in helping to maintain them in health and all who have a true interest in the class of case with which we
are now dealing must feel thankful that this country is so liberally supplied with sound and cheap fruit.

**Fuel Value.** Allowing that the girl bought in the cheapest and best marked she could only obtain for the money she had at her command a daily caloric value of:

Protein 50; Fat 50; Carbohydrate 299 or Nitrogen 8; Carbon 181 grams or 1895 Calories. However it is more than likely that she did not obtain so much. This is 1 Nitrogen to 22.5 Carbon.

**Faults of the Dietary.** These are so self-evident that it is almost superfluous to name them. It is monotonous and this without any other cause has a depressing action on the tissues. It may lack freshness for despite the cheapness of fresh fruit the woman has in many instances not the sense to buy it. Many of them suffer from despondency, anaemia, conditions allied to scurvy, dyspepsia due to starving of the digestive glands; gastric ulcer is common: nearly all are thin and they often develop the tuberculous processes. Cod liver oil always does them good.

In the diet lists of the two families now to be quoted we find an illustration of the very different ways in which two people of the same class and both anxious to do their best lay out an almost equal sum of money in feeding their households. Labourer earning twenty shillings weekly. Wife, two young children and baby. Equal to three and a half adults. Spends on food less than 9/6 a week. Equal to a little over 2/6 for each adult.
For this sum they obtain:

- 3 lbs. sugar,
- 1 lb. tea,
- 1 lb. condensed milk,
- 5 lbs. oatmeal,
- 14 lbs. potatoes,
- 2 lbs. jam,
- 14 lbs. bread, (various sorts)
- 1 lb. butter,
- 7 lbs. skimmed milk (about 6 pints).

Meat, Fish, Rabbit, equal to 4 lbs. of beef.

- 1 lb. beans,
- 6 lbs. vegetables,
- 1 lb. rice.

The food value for each adult is approximately Protein 72;
Fat 32; Carbohydrate 376 or Nitrogen 11.50; Carbon 208 grams or 2034 Calories or 1 N to 18 C.

The housewife evidently varies the dietary as much as she can under the circumstances.

**Breakfast.** Porridge and milk or tea, bread and butter, or bread and jam. On Sunday fish tea, bread and butter are given.

**Dinner.** Shews good planning - mutton, vegetables and potatoes; Sheep's head with broth, potatoes and vegetables; stewed meat, haricot beans and potatoes; mince meat, potatoes and rice pudding.

**Tea.** Tea, bread and jam, or bread and butter.

**Faults.** The dietary is passable for adults not doing hard work, although it is even for them deficient in fat. Its variety is a recommendation considering the small sum at the command of the spender. The money spent on vegetables and on oatmeal has been well laid out, but the money spent on condensed and skim milk would have served the children better had it been used to buy fresh milk. This would have meant
more fat in which the dietary is deficient from the side of the growing child. Margarine might have replaced butter. This would have meant double the quantity at least of fat for the same amount of money expended.

**Diseases met with in children of this class.** Children in dietaries like the foregoing are frequently met in the out-patient room and are liable to local tuberculous affections and the giving of fat often works wonders with them.

**Labourer earning one pound (£1) weekly with broken time. Wife and Four Children.** One may quote another case of a labourer who out of one pound weekly with broken time for unfavourable weather has to support himself, wife and four children aged 10, 9, 7, and 5 years. The children are here reckoned as two adults. On food from 9/9 to 10/- are spent weekly when the man has full time. When he is not working this sum is very much reduced. In a full week the money is laid out on

- 28 lbs. of flour,
- ¼ lb. of cocoa,
- 4 lbs. of sugar,
- 2 lbs. of dripping,
- 4 lbs. of chilled beef,
- 1½ lbs. of bacon,
- 28 lbs. of potatoes,
- 7 pints of milk,
- ½ lb. of tea.

**How cooked.** Dinner was fairly good—hot pot, potato pie or stewed meat, but breakfast and tea were unvaried from week to week; even jam was almost unknown. Here is a case where instruction might do much. The food value for each adult is:

- Protein 69;
- Fat 58;
- Carbohydrate 495 or Nitrogen 11;
- Carbon 275 grams or 2850 Calories or 1 Nitrogen to 25 Carbon.
Comments. The family enjoy fairly good health and on the whole the money has been well laid out. By purchasing dripping instead of butter a larger amount of fat has been obtained and this is important where young children have to be reared. The bread was baked at home and this saved so much. If one were to criticise the laying out of the money one might say that seven pounds of the flour might have been replaced by oatmeal this would have given more fat and more lipoids. The potatoes too might have been reduced by half and the difference spent on vegetables and milk. In making the calculations the four children have been reckoned as two adults but this is hardly a fair calculation for children of the ages of 10, 9 and 7 consume enormous quantities of wheaten bread when they have the opportunity. They appear to like bulk and the poor who are wise and observing say that it is profitable to give a growing active child plenty bulk and for this reason they give broths, soups or stews. They say this "stays their stomachs" and they point to so and so's children who never get broths and they are always eating bread and are never satisfied.

Since the calculations were made prices have advanced and wages have not risen so that the fat and carbohydrate contents of a dietary like the one now under discussion must be very much less. (see Page 193).

Disorders to which children are subject.

Children reared on a dietary in which much white flour is consumed and where vegetables are not provided are certainly
very often the subjects of scurvy or scurvy-rickets.

Ladies who spend three shillings and sixpence weekly on Food.

One turns next to consider the case of maiden ladies or widows, the daughters or widows of professional men who have been left with an almost insufficient income. They have no way of supplementing their income and they have to live in a house where rent and taxes are disproportionate to the amount of money they have, for tastes and inclination unfit them for living where rents are cheap. Below the writer gives an instance of two ladies who after paying rent and taxes had only 3/6 a week left with which to buy food — and all of this could not very well be expended on food for extras now and then came on and the food supply had to be curtailed. They however had some advantages for their superior education enabled them to devise appetising dishes, to introduce variety, and a sense of economy enabled them to use up every grain of their food by employing products which go to waste among the uneducated. They too can generally purchase a month’s supply of food which will keep and thus they can buy cheaper than the housewife who can only purchase a week’s supply or even less than this.

The Weekly Budget.

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 lb. tea</td>
<td></td>
</tr>
<tr>
<td>1 Rabbit</td>
<td></td>
</tr>
<tr>
<td>7 Pints of Milk</td>
<td></td>
</tr>
<tr>
<td>2 lbs. of sugar</td>
<td></td>
</tr>
<tr>
<td>1 lb. of Oatmeal</td>
<td></td>
</tr>
<tr>
<td>1 lb. of Bacon or equivalent of eggs</td>
<td></td>
</tr>
<tr>
<td>2 lbs of chilled meat or fish</td>
<td></td>
</tr>
<tr>
<td>5 lbs. of potatoes</td>
<td></td>
</tr>
<tr>
<td>1 lb. of lard or margarine</td>
<td></td>
</tr>
<tr>
<td>1 lb. of butter</td>
<td></td>
</tr>
<tr>
<td>1 lb. of rice or sago</td>
<td></td>
</tr>
<tr>
<td>1 lb. of barley</td>
<td></td>
</tr>
<tr>
<td>1 lbs of vegetables, 6 lbs of bread</td>
<td></td>
</tr>
<tr>
<td>1 lb. jam, Fruit to make 6/11</td>
<td></td>
</tr>
</tbody>
</table>
Food value = Protein 55; Fat 64; Carbohydrate 262; Nitrogen 9; Carbon 180 grams or 1875 Calories for each or 1 N to 20 C.

Today the food value is less than this on account of high rates.

Comments. It is difficulty to see how the money could have been laid out to better advantage. Of course these amounts may be very much reduced in lean weeks, but even allowing for this the dietary is ample for women who have not to work hard. Had it not been for chilled meat the protein content would have been much less, another example of the importance of an ample and cheap food supply for the poor. The existence of margarine proves a boon to poor people enabling them to increase the fat content of their dietaries.

Faults. These do not lie in the dietary but in the smallness of the sum available for supply of food for it entails anxiety and allows too little margin for varying the purchases. It can be imagined how much trouble an increase in prices causes in the breasts of these people.

Breakfast. Sunday and Tuesday - bacon or egg with tea and bread. Monday and Wednesday - porridge and milk with a small allowance of tea and bread. Other days Tea, bread and butter or jam.

Dinner. Rabbit pie with rice pudding. Monday - Remnants of pie with butter pudding. Tuesday, Broth with vegetables and dumplings, or meat and dumplings. Wednesday, minced meat with sago. Thursday - fresh meat with butter pudding. Friday - curry or rissoles or fish with rice and potatoes and a cup of tea. Saturday is the remnant day. Fruit - oranges, plums,
plums, greengages are eaten. The kind of fruit depends on its cheapness.

Tea - Tea, bread, butter, margarine, jam, with fried potatoes or other things left over from dinner.

Ladies who live on Five shillings weekly. In every community one finds ladies who are too old or too feeble to engage in any employment and who have only five shillings a week on which to live. Some of them are fortunate enough to have relatives or friends with whom they live and pay little or nothing; but the writer has come across several who somehow or other actually exist on this sum. Sometimes two live together and they obtain a small house for half a crown weekly which with taxes, fire and lighting and emergencies makes the sum up to five shillings leaving five shillings weekly for food for two. At other times a lady of this class obtains lodgings and washing for half a crown leaving the same amount for food and emergencies. At the best they can only obtain a food value of: Protein 39; Fat 46; Carbohydrate 173; or Nitrogen 6.24; Carbon 128 or 1297 Calories 6.24 or 1 Nitrogen to 20 Carbon. One says at the best but it is usually very much below this. A rise in prices is to them almost a matter of life and death. Their case is pitiable for often they are well bred people who when they are ill are too proud to seek help either from the Poor Law or from Charitable institutions. Fortunately they often know medical men who are only too willing to render them medical assistance. In time a few friends get to know their actual financial state and they get change of air and what is more important good food without
stint, and this builds them up for a time.

**Faults.** It is almost superfluous to point out the faults of such a dietary. It is much too small on every side and in every content and every tissue is starved almost to the breaking point - the small muscles, almost entire absence of fat, the flatulence, the palpitation, and the breathlessness have only one explanation, the cry of the cell for more nutriment.

**Aged People of the Artizan Class who live on five shillings weekly.**

A large number of people of both sexes have outlived all their relatives who might have helped them to make life pleasanter. The consequence is that when they are no longer able to work they find themselves with an income of perhaps not more than five shillings weekly on which to live. If a man and wife have each five shillings, they may obtain a house for two and six a week and after adding on fire and lighting expenses there remains six shillings only for food and other expenses. Friends give them clothes and occasionally they get a change of air to a convalescent home. One can imagine with what joy they receive an invitation to an old folks' tea or a Christmas or New Year tea. But hard though their lot be it is not so hard as the case of the educated woman who has to live on a like sum and with less likelihood of obtaining help from societies and associations.

Of the Artizan class the most pitiable case is that of the man of 70 and over who has nothing but the Old Age Pension and who has no relative. Here is a case in point. The man is 70 and is too fond of his own corner to go to the Poor House. His life has
been blameless. His wife is dead and all his children are dead. He cannot obtain any work that he is able to do, and for years he was just able to pay his house rent and to live. At last he earned so little that he had to give up his house and to part with his furniture. When he reached the age of 70 he obtained the Old Age Pension and on this he has to live. His room costs him one shilling weekly and coals cost about the same. His food costs about two shillings and ninepence weekly so that at the outside he has left over threepence weekly for incidentals. He lays the money out in:

- Bread - 5\(\frac{1}{2}\) lbs.
- Tea - \(\frac{1}{4}\) "
- Milk - 1\(\frac{1}{2}\) pint (about 1 litre)
- Kippered Herrings - Four.
- Sugar - 1 lb.
- Dripping - \(\frac{1}{4}\) lb.
- Butter - \(\frac{1}{4}\) lb.
- Chilled Steak - \(\frac{1}{2}\) lb. weekly.

Calculated on the most liberal fashion the values are or rather were for they are now less - Protein 60; Fat 50; Carbohydrate 260 or Nitrogen 9.5; Carbon 169 grams or 1812 Calories or 1 Nitrogen to 17.8 Carbon.

**Faults of the Dietary.** There is an absence of many of these articles of food which are so important in maintaining the cells in health and tone namely fresh vegetables. Then there is the usual fault where people have to calculate their week's supply within two coppers - depressing monotony. It is sufficient as far as the actual caloric content is concerned.
Virtues of the Dietary. While the dietary has faults it has also virtues and these consist in the fact that for actual value it could not have been better laid out. To take an example:— a kippered herring only costs a penny and its caloric value is equal to and is greater in protein value though less in fat value than a quarter of a pound of steak which would cost two-pence at least.

Therapeutic Value of the Diet. It is a matter of common observation that old people who have to exist on a limited and unvaried dietary nearly always choose kippered, smoked, or salted hERRINGS. This may partly be because of the salty appetising flavour but this is not the sole cause for there is good reason for believing that the large amount of amines containing in this form of food has an important action on an unfeebled circulation by stimulating it and maintaining it in a condition of tone.

Diseases common amongst these people. When such a dietary is continued for months or years without change dyspeptic troubles or eczematous conditions are met with and often disappear or improve after giving malt extract and codliver oil accompanied with bitters and mild alkalis — but they improve best of all with change of air and a more liberal and varied dietary.

Some deductions from the foregoing tables.

It is instructive to compare the different ways in which people with the same amount of money to spend on food do actually lay it out. Some expend it on a few simple food
stuffs and it is noticeable that they always obtain the best fuel value when they do so. Habit, instinct, the possession of a good appetite and surroundings have all something to do with their choice. People with a good lusty appetite inured to plain food in plenty always select simple food stuffs in which they are likely to have little waste in preparation of the same when money is a consideration. Some of these points find illustration in the following examples. The old man who for two shillings and ninepence weekly can obtain a daily fuel value of 9.5 grams of nitrogen and 169 of carbon because he purchases such simple and few articles as herring, bread, fat and milk as opposed to two women who each having the same amount to lay out only obtain 6.24 grams of nitrogen and 128 of carbon because they introduce more variety and therefore more waste into their dietary. Two families of almost each size and of the same social grade and with a like relative amount of money expend it so that one gets 11 grams and 275 respectively, while the other gets 11.50 nitrogen and only 208 carbon for each individual. The outdoor worker has really less money than the chiefly indoor worker and yet instinct teaches him so that he gets 18.5 grams of nitrogen and 255 grams of carbon while the other only obtains 12.25 grams of nitrogen but so much as 275 of carbon. But while habit is useful it must be directed and helped for habit in diet may degenerate into an evil as witness the Italians who emigrate to the United States of America and carry with them the macaroni habit to a climate not suitable to the eating of this
food with the result that the people who indulge in it as they did in their native land gradually fall ill and develop a peculiar neuritis. This shows the important part which one climate plays in keeping a people well on food stuffs which in another climate induces grave changes in the tissues. One other important point is worthy of mention, namely that in the tables of dietaries it will be observed that despite the views recently expressed against a large protein intake the majority of the classes of their own free will took a large amount of this food stuff.
Results of Feeding of Girls from Four to Fifteen
Years of Age. Experiments carried on for Seventeen
Years.

In the observations to be detailed, the writer has had the opportunity of observing the results of feeding in an institution thirty girls of the neglected classes, extending over a period of seventeen years. The dietary was made for the girls and not the girls for the dietary, or, in other words, the food was given in such a quantity and of such a quality as would maintain health and increase the growth of the tissues. Economy was considered but parsimony not encouraged. The only guide and rule were that the child was to have enough to eat of suitable food.

Character of the Children. In almost all the instances, the children had suffered want and neglect before they came under observation. Many of them had bad family histories in every sense of the word.

Surroundings. When once admitted to the institution, they were placed under hygienic conditions and they were plentifully supplied with fresh air, appropriate clothing for cold and warm weather respectively. Hours of sleep were carefully attended to. Children were admitted from four years of age up to twelve or thirteen, but the admission of the children at the latter age was not encouraged because of
the shortness of the training - for after the age of 15 was reached the children were sent out to service or they were sent to Canada to remove them as far as possible from old sources of contamination. They remained at school in the institution till the age of thirteen when they did work in the kitchen or laundry till the time of leaving. Exercise in the open air was regularly taken, wet or fine.

Each child was examined on admission, weighed, and the height noted, and at regular stated intervals the weight and height were taken during the entire period of stay in the institution.

Health. In all the 17 years, only two deaths took place amongst the many children who had moved out and in during these years. One death was due to acute septicaemia and the other to acute appendicitis. Cases of chronic ill health are unknown. Several epidemics of mild diphtheria, influenza and catarrhal colds occur, but practically nothing else, except during the first few years in which the observations were carried on when many cases of chilblains occurred every winter. Some of these were severe, ulcers forming and pieces of soft tissue even necrosing in one or two cases. For ten years no such case has been seen, and for the same period of time no child has been incapacitated from school or work, except from acute disease. The cause and prevention of this condition is discussed in another place and need not be further mentioned here.

One important point remains to be mentioned:
progressive rickets is never seen. A child may be admitted with a tendency to this condition, but in a short time it disappears.

Gross Week's Food Supply for Thirty Girls Aged 4 to 15.

1. Twenty-one pounds (9.520 Kgms.) meat free from bone.
2. Nine pounds (4.082 Kgms.) fish, chiefly cod or hake.
3. One hundred & forty-four pounds (65.310 Kgms.) of white flour.
5. Fourteen pounds (6.350 Kgms.) margarine.
6. Four pounds (1.814 Kgms.) rice, sago or tapioca.
7. Two pounds (0.907 Kgms.) raisins or currants.
9. Six pounds (2.722 Kgms.) each of pearl barley, peas and beans.
10. Forty-nine pounds (22.226 Kgms.) of a mixture of cabbage, carrots, cauliflowers.
11. Half a pound (0.277 Kgms.) tea.
12. Three pounds (1.361 Kgms.) cocoa.
13. One hundred and five pints equal to 131 pounds or 59.421 Kgms. of new milk.
14. Eight pounds (3.629 Kgms.) jam or syrup.
15. Six pounds (2.722 Kgms.) oatmeal.
16. Four pounds liver (1.814 Kgms.)
17. One pound bacon. (0.454 Kgms.)
18. Two pounds (0.908 Kgms.) suet.
These quantities may be increased on occasions by fruit grown in the garden or by gifts from friends in the shape of jam, cream, fruit and so on. The list, too is varied from time to time to obviate monotony, but the food value is never allowed to get lower than as stated later on. In cold weather a little fat is thrown in, and in hot weather the fat and animal protein are lessened and the carbohydrate is increased, as is done in every well regulated dietary.

Calculations made from the food list show that the daily average intake for each child is:

<table>
<thead>
<tr>
<th>Protein</th>
<th>Fat</th>
<th>Carbohydrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>56 grams</td>
<td>51 grams</td>
<td>259 grams</td>
</tr>
<tr>
<td>or Calories 1817</td>
<td>or Nitrogen 8.90 grams</td>
<td>or Carbon 168 grams</td>
</tr>
</tbody>
</table>

In view of recent pronouncements, it will be observed that the protein is comparatively large, but it is felt that not a gram too much has been given. The fat content too is comparatively large. The carbohydrate is comparatively small in amount, but it is evidently sufficient as will be seen from the results of the weighings.

**NINE MONTHS' EXPERIENCE WITH STANDARD FLOUR INSTEAD OF ORDINARY FLOUR.**

During the time when the use of Standard flour (80 per cent) was so much advocated as a feeding stuff the writer was asked if it might be substituted instead of ordinary white flour that had been in use for fifteen years. It was tried and continued for nine months, the writer having no hand or interest in the experiment. The children were weighed and observed but
no difference was noted in either weight or health and the use of the standard flour was gradually dropped by those who had urged its adoption. The employment of standard flour lowered the caloric value of each child's daily food content by about 70 Calories so that what was gained in lecithin or other organic phosphorus constitution was lost in actual feeding properties. Really no gain at all for there was never any reason to believe that the organic phosphorus content was other than what was equal to the maintenance of health and vigour.

How the Stuffs are Prepared - Dietary for the week.

**Sunday.**

**Breakfast.** All children under nine have porridge and milk with bread and syrup or jam. Children over nine have cocoa or tea with plenty of milk, bread, margarine, syrup or jam.

**Dinner.**

Same for all - beef-pie, potatoes, vegetables and milk pudding - rice, sago or tapioca - and fruit in season.
Tea.

Same for all. Cocoa or tea with plenty of milk, bread, butter, margarine, jam.

If the elder girls have to be up late they are allowed bread and cocoa. On Sunday, the protein intake as well as the fat and carbohydrate are comparatively large.

Monday.

Breakfast. As on Sunday.

Dinner. Barley Soup made from good stock and containing plenty of vegetables, with suet pudding containing currants or raisins, with potatoes.

Tea. Really cocoa of a good quality. Plenty of bread with margarine, syrup or jam.

The nitrogen intake is small on this day (only about 6 grams) while the carbon is large.

Tuesday.

Breakfast. Porridge and milk with bread and syrup.

Dinner. Meat stew, vegetables, potatoes and milk pudding.

Tea. Cocoa, as on Monday.

Protein intake nearly equal to average (8 grams), fat intake much above average.
Wednesday:

Breakfast. Same as Sunday.

Dinner. Pea soup, made from rich stock and containing a variety of vegetables with suet pudding containing currants or raisins, and potatoes.

Tea. Same as Monday.

Protein intake below average; fat also below; carbohydrate much above.

Thursday:

Breakfast. Same as Tuesday.

Dinner. Liver and bacon with potatoes, vegetables, and rice or sago milk pudding.

Tea. Same as Tuesday.

Protein intake average; fat above; carbohydrate average.

Friday:

Breakfast. Same as Sunday.

Dinner. Fish (cod or hake), potatoes, vegetables, dumplings served with syrup or jam.

Tea. Same as Monday.

The dietary of this day contains the smallest protein, fat and carbohydrate content, and in consequence the smallest number of calories of all the week.

Saturday:

Breakfast. Same as Tuesday.

Dinner. Bean soup with vegetables, potatoes and suet puddings, with bread and syrup or jam if desired.

Tea. Same as Tuesday.

The protein is small in amount, the fat equal to the average, and the carbohydrate high, making a large total of calories.
One of the objects of the dietary was to vary the intakes of protein, fat and carbohydrates. Meat was not given every day, and on these days vegetable protein was substituted. This was greatly relished by the children and the bean or pea soup dinner day is always a favourite day. In summer, the meat was cut down and an equivalent of eggs given. A large quantity of fresh fruit and vegetables (grown in the garden) is consumed. This makes the cost of feeding much smaller.

Margarine is used instead of butter and its cheapness is an advantage. No child is to have less than one ounce daily - the actual amount is 30.23 grams, rather more than an ounce. The bread is home-baked, compressed fresh yeast being employed; this probably has a salutary effect on the health of the children.

**Average weekly cost of feeding each child.** This is found to be two shillings and sixpence (up to 1911) exclusive of vegetables and fruit, otherwise than those given in the average weekly list of food stuffs.

**Proof of the Adequacy of the Food.** In the series of tables, the weight and height of the child are shown when she came into the Home and then for a series of years till she left - the records of weight and height always being taken at the same time of the year, and in fact as near as possible under similar conditions in every way. As will be observed, in almost every case in which the child was equal to the averages or above the averages
these were maintained as long as the girl remained in the Home, showing that the food was in every way adequate. But one may claim more than this for the dietary, for children who came in below the averages often left with records equal to or above the averages.

(Quetelet's Averages are here accepted)

Observation from 4 to 8 years of age.

<table>
<thead>
<tr>
<th>GIRL A</th>
<th>Weight</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Above Average on Admission.</td>
<td>Above Average on Admission.</td>
</tr>
<tr>
<td>Age 4.</td>
<td>2 6</td>
<td>15.42</td>
</tr>
<tr>
<td>&quot; 5.</td>
<td>2 11 1/2</td>
<td>17.75</td>
</tr>
<tr>
<td>&quot; 6.</td>
<td>3 1</td>
<td>19.52</td>
</tr>
<tr>
<td>&quot; 7.</td>
<td>3 11</td>
<td>24.04</td>
</tr>
<tr>
<td>&quot; 8.</td>
<td>3 12</td>
<td>24.50</td>
</tr>
<tr>
<td>Above Average on leaving.</td>
<td>Also above average on leaving.</td>
<td></td>
</tr>
</tbody>
</table>

Observation from 5 to 14 years of age.

<table>
<thead>
<tr>
<th>GIRL B</th>
<th>Weight</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Above Average on Admission.</td>
<td>Above Average on Admission.</td>
</tr>
<tr>
<td>Age 5.</td>
<td>2 11 1/2</td>
<td>17.91</td>
</tr>
<tr>
<td>&quot; 6.</td>
<td>2 10</td>
<td>17.25</td>
</tr>
<tr>
<td>&quot; 7.</td>
<td>2 13 1/2</td>
<td>18.80</td>
</tr>
<tr>
<td>&quot; 8.</td>
<td>3 2</td>
<td>19.97</td>
</tr>
<tr>
<td>&quot; 9.</td>
<td>3 9</td>
<td>23.14</td>
</tr>
<tr>
<td>&quot; 10.</td>
<td>3 13</td>
<td>24.95</td>
</tr>
<tr>
<td>&quot; 11)</td>
<td>Lost.</td>
<td>Lost.</td>
</tr>
<tr>
<td>&quot; 12)</td>
<td>Lost.</td>
<td>Lost.</td>
</tr>
<tr>
<td>&quot; 13</td>
<td>4.7</td>
<td>28.57</td>
</tr>
<tr>
<td>&quot; 14</td>
<td>5.12</td>
<td>37.20</td>
</tr>
<tr>
<td>Above Average on leaving.</td>
<td>Below average (4 inches).</td>
<td></td>
</tr>
</tbody>
</table>

Observation from 6 to 10 years of age.

<table>
<thead>
<tr>
<th>GIRL C</th>
<th>Weight</th>
<th>Above average on admission.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Below Average on Admission.</td>
<td>Above average on admission.</td>
</tr>
<tr>
<td>Age 6.</td>
<td>2 4 1/4</td>
<td>14.74</td>
</tr>
<tr>
<td>&quot; 7.</td>
<td>2 7 1/4</td>
<td>18.11</td>
</tr>
<tr>
<td>&quot; 8.</td>
<td>2 1 1/2</td>
<td>17.25</td>
</tr>
<tr>
<td>&quot; 9.</td>
<td>3 0</td>
<td>18.85</td>
</tr>
<tr>
<td>&quot; 10.</td>
<td>3 6</td>
<td>21.33</td>
</tr>
<tr>
<td>Below - 2 lbs below as against Above average on leaving.</td>
<td>3/2 on admission.</td>
<td></td>
</tr>
</tbody>
</table>

(69)
**GIRL D. Observation from 6 to 14 years of age.**

<table>
<thead>
<tr>
<th>Age</th>
<th>Weight</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>st.lbs</td>
<td>Kgms.</td>
</tr>
<tr>
<td>6</td>
<td>2 8½</td>
<td>16.55</td>
</tr>
<tr>
<td>7</td>
<td>3 10</td>
<td>17.24</td>
</tr>
<tr>
<td>8</td>
<td>2 13</td>
<td>18.59</td>
</tr>
<tr>
<td>9</td>
<td>3 2</td>
<td>19.97</td>
</tr>
<tr>
<td>10</td>
<td>3 7</td>
<td>22.10</td>
</tr>
<tr>
<td>11</td>
<td>4 0</td>
<td>24.95</td>
</tr>
<tr>
<td>12</td>
<td>4 4</td>
<td>27.22</td>
</tr>
<tr>
<td>13</td>
<td>4 13</td>
<td>31.30</td>
</tr>
<tr>
<td>14</td>
<td>6 0</td>
<td>37.08</td>
</tr>
</tbody>
</table>

Equal to average on admission. Below average on admission.

Ft.in. mms.

| 3 1½ | 953 |
| 3 4  | 1016|
| 3 5  | 1059|
| 3 7  | 1104|
| 3 8  | 1150|
| 3 11 | 1194|
| 4 2  | 1269|
| 4 3  | 1295|
| 4 5  | 1346|

Above average on leaving. Below average on leaving.

**GIRL E. Observation from 6 to 12 years of age.**

<table>
<thead>
<tr>
<th>Age</th>
<th>Weight</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>st.lbs</td>
<td>Kgms.</td>
</tr>
<tr>
<td>6</td>
<td>2 7½</td>
<td>16.11</td>
</tr>
<tr>
<td>7</td>
<td>2 8½</td>
<td>16.78</td>
</tr>
<tr>
<td>8</td>
<td>2 11</td>
<td>17.69</td>
</tr>
<tr>
<td>9</td>
<td>2 11</td>
<td>17.69</td>
</tr>
<tr>
<td>10</td>
<td>3 5</td>
<td>21.33</td>
</tr>
<tr>
<td>11</td>
<td>3 10</td>
<td>23.59</td>
</tr>
<tr>
<td>12</td>
<td>4 1</td>
<td>25.42</td>
</tr>
</tbody>
</table>

Equal to average on admission. One inch above average on admission.

Six pounds average on leaving. One inch above on leaving.

**GIRL F. Observation from 6 to 10 years of age.**

<table>
<thead>
<tr>
<th>Age</th>
<th>Weight</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>st.lbs</td>
<td>Kgms.</td>
</tr>
<tr>
<td>6</td>
<td>2 8</td>
<td>16.33</td>
</tr>
<tr>
<td>7</td>
<td>2 11</td>
<td>17.69</td>
</tr>
<tr>
<td>8</td>
<td>2 12</td>
<td>18.14</td>
</tr>
<tr>
<td>9</td>
<td>3 3</td>
<td>20.41</td>
</tr>
<tr>
<td>10</td>
<td>5 9</td>
<td>23.14</td>
</tr>
</tbody>
</table>

Equal to average on admission. Half inch below on admission.

One pound above on leaving. Two inches below on leaving.

**GIRL G. Observation from 8 to 13 years of age.**

<table>
<thead>
<tr>
<th>Age</th>
<th>Weight</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>2 12</td>
<td>18.14</td>
</tr>
<tr>
<td>9</td>
<td>3 6</td>
<td>21.73</td>
</tr>
<tr>
<td>10</td>
<td>3 11</td>
<td>24.04</td>
</tr>
<tr>
<td>11</td>
<td>3 10</td>
<td>23.59</td>
</tr>
<tr>
<td>12</td>
<td>4 5½</td>
<td>27.89</td>
</tr>
<tr>
<td>13</td>
<td>5 5</td>
<td>33.03</td>
</tr>
</tbody>
</table>

One pound below on admission. Equal to average on admission.

Four pounds above on leaving. Two inches below on leaving.
GIRL H. Observation from 8 to 14 years of age.

<table>
<thead>
<tr>
<th>Age</th>
<th>Weight</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>2 111/2</td>
<td>17.75</td>
</tr>
<tr>
<td>9</td>
<td>2 13</td>
<td>18.59</td>
</tr>
<tr>
<td>10</td>
<td>3 7</td>
<td>22.10</td>
</tr>
<tr>
<td>11</td>
<td>3 13</td>
<td>24.95</td>
</tr>
<tr>
<td>12</td>
<td>4 3</td>
<td>26.77</td>
</tr>
<tr>
<td>13</td>
<td>5 7</td>
<td>34.92</td>
</tr>
<tr>
<td>14</td>
<td>5 6</td>
<td>34.48</td>
</tr>
</tbody>
</table>

Two inches below on admission. Three inches below on leaving.

GIRL I. Observation from 9 to 15 years of age.

<table>
<thead>
<tr>
<th>Age</th>
<th>Weight</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>3 5 1/2</td>
<td>21.55</td>
</tr>
<tr>
<td>10</td>
<td>3 8</td>
<td>22.46</td>
</tr>
<tr>
<td>11</td>
<td>3 8</td>
<td>22.46</td>
</tr>
<tr>
<td>12</td>
<td>4 4</td>
<td>27.22</td>
</tr>
<tr>
<td>13</td>
<td>4 13</td>
<td>31.30</td>
</tr>
<tr>
<td>14</td>
<td>4</td>
<td>32.58</td>
</tr>
<tr>
<td>15</td>
<td>6 11</td>
<td>43.08</td>
</tr>
</tbody>
</table>

Equal on admission. Seven pounds above on leaving.

GIRL J. Observation from 10 to 15 years of age.

<table>
<thead>
<tr>
<th>Age</th>
<th>Weight</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>3 1 1/2</td>
<td>19.74</td>
</tr>
<tr>
<td>11</td>
<td>3 4 1/2</td>
<td>21.10</td>
</tr>
<tr>
<td>12</td>
<td>3 10 1/2</td>
<td>25.81</td>
</tr>
<tr>
<td>13</td>
<td>3 12</td>
<td>24.50</td>
</tr>
<tr>
<td>14</td>
<td>4 4</td>
<td>27.22</td>
</tr>
<tr>
<td>15</td>
<td>4 12</td>
<td>30.88</td>
</tr>
</tbody>
</table>

Six inches below on admission. Six inches below on leaving.

GIRL K. Observation from 10 to 15 years of age.

<table>
<thead>
<tr>
<th>Age</th>
<th>Weight</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>4 6 1/2</td>
<td>28.57</td>
</tr>
<tr>
<td>11</td>
<td>4 6</td>
<td>28.12</td>
</tr>
<tr>
<td>12</td>
<td>5 1</td>
<td>32.44</td>
</tr>
<tr>
<td>13</td>
<td>5 9 1/2</td>
<td>36.05</td>
</tr>
<tr>
<td>14</td>
<td>7 2</td>
<td>45.36</td>
</tr>
<tr>
<td>15</td>
<td>8 0</td>
<td>50.80</td>
</tr>
</tbody>
</table>

Two inches above on admission. Two inches above on leaving.
GIRL L. Observation from 11 to 16 years of age.

<table>
<thead>
<tr>
<th>Weight</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three &amp; a half pounds below on admission.</td>
<td>Equal to average on admission.</td>
</tr>
<tr>
<td>St.lbs.</td>
<td>Kgms.</td>
</tr>
<tr>
<td>Age 11.</td>
<td>3 10(\frac{1}{2})</td>
</tr>
<tr>
<td>12.</td>
<td>3 8(\frac{1}{2})</td>
</tr>
<tr>
<td>&quot; 13.</td>
<td>4 6(\frac{1}{2})</td>
</tr>
<tr>
<td>&quot; 14.</td>
<td>5 1</td>
</tr>
<tr>
<td>&quot; 15.</td>
<td>5 13</td>
</tr>
<tr>
<td>&quot; 16.</td>
<td>7 0</td>
</tr>
</tbody>
</table>

Three pounds above on leaving. Two inches above on leaving.

GIRL M. Observation from 11 to 15 years of age.

<table>
<thead>
<tr>
<th>Weight</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three &amp; a half pounds below on admission.</td>
<td>Five inches below on admission.</td>
</tr>
<tr>
<td>Age 11.</td>
<td>3 10(\frac{1}{2})</td>
</tr>
<tr>
<td>12.</td>
<td>3 12</td>
</tr>
<tr>
<td>&quot; 13.</td>
<td>4 13(\frac{1}{2})</td>
</tr>
<tr>
<td>&quot; 14.</td>
<td>5 9</td>
</tr>
<tr>
<td>&quot; 15.</td>
<td>7 4</td>
</tr>
</tbody>
</table>

Fourteen pounds above on leaving. One and a half inches below on leaving.

One hears to-day many deprecatory remarks concerning the weight and stature of the English child, and it must be admitted if the standard of the British Association be accepted there is ground for concern, for the writer has never yet in any north of England community, town or country, met with children who came up to this standard, and he has some difficulty in understanding how the standard came to be instituted. The only children who do come up to it, or near to it, are the Jewish children. In the writer's experience, the Belgian Tables of Quetelet more nearly approach the working class average of the north of England. In the series of tables which follow, the writer has laid out (1) the average weight and height of a

(72)
number of girls at ages from 7 to 15 (2) the highest and the lowest points reached at these ages (3) the British Association average, (4) the Quetelet average and (5) the Jewish child average for the same ages.

The Jewish figures are by no means accidental for they are taken from several thousands of cases. The writer's cases are likewise not unique for they are being confirmed by school officers. It will be remarked how much the Jewish children exceed in weight and height the English child. The question then is: do these figures portent evil to the English child? The answer is in the negative. Although there can be no doubt that many children are underfed a large number of children who get as much food as they can deal with are under weight and height according to the abnormally high standard and yet they are able to resist death and disease and are able to reach adult life, do laborious work and finally live to attain the allotted span of life.

Weight and height of children under care of Writer -

Comparison with British, Jewish, and Quetelet's Tables.

<table>
<thead>
<tr>
<th>Age 7.</th>
<th>Weight.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average in stones and pounds</td>
<td>3.12 = 43.75 lb. = 19.74 Kgms.</td>
</tr>
<tr>
<td>Highest.</td>
<td>3.11</td>
</tr>
<tr>
<td>Lowest.</td>
<td>2.71</td>
</tr>
<tr>
<td>British Average.</td>
<td>3.52 or 4 lbs. above writer's.</td>
</tr>
<tr>
<td>Quetelet's</td>
<td>2.11 &quot; 4 lbs. below &quot;</td>
</tr>
<tr>
<td>Jewish</td>
<td>3.7 &quot; 5 lbs. above &quot;</td>
</tr>
</tbody>
</table>
### Height

<table>
<thead>
<tr>
<th>Age 8</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average in feet and inches</td>
<td>3.1 = 43 lbs. = 19.50 Kgms.</td>
</tr>
<tr>
<td>Highest</td>
<td>3.13</td>
</tr>
<tr>
<td>Lowest</td>
<td>2.10</td>
</tr>
</tbody>
</table>

### Height

<table>
<thead>
<tr>
<th>Age 9</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average in feet and inches</td>
<td>3.9 = 51 lbs. = 23.35 Kgms</td>
</tr>
<tr>
<td>Highest</td>
<td>4.5</td>
</tr>
<tr>
<td>Lowest</td>
<td>2.13</td>
</tr>
</tbody>
</table>

### Height

<table>
<thead>
<tr>
<th>Age 10</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average in feet and inches</td>
<td>3.1 = 47 inches = 1193 mns</td>
</tr>
<tr>
<td>Highest</td>
<td>4.2</td>
</tr>
<tr>
<td>Lowest</td>
<td>3.71</td>
</tr>
</tbody>
</table>

### Height

<table>
<thead>
<tr>
<th>Age 11</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average in feet and inches</td>
<td>3.11 = to writer's average</td>
</tr>
<tr>
<td>Highest</td>
<td>4.12</td>
</tr>
<tr>
<td>Lowest</td>
<td>3.71</td>
</tr>
</tbody>
</table>

### Height

<table>
<thead>
<tr>
<th>Age 12</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average in feet and inches</td>
<td>3.11 = to writer's average</td>
</tr>
<tr>
<td>Highest</td>
<td>4.12</td>
</tr>
<tr>
<td>Lowest</td>
<td>3.71</td>
</tr>
</tbody>
</table>

### Height

<table>
<thead>
<tr>
<th>Age 13</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average in feet and inches</td>
<td>3.11 = to writer's average</td>
</tr>
<tr>
<td>Highest</td>
<td>4.12</td>
</tr>
<tr>
<td>Lowest</td>
<td>3.71</td>
</tr>
<tr>
<td>Age 10.</td>
<td>Weight</td>
</tr>
<tr>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>Average in stones and pounds</td>
<td>3.11 = 53 lbs. = 24.00 Kilos.</td>
</tr>
<tr>
<td>Highest</td>
<td>4.6(\frac{1}{2})</td>
</tr>
<tr>
<td>Lowest</td>
<td>3.12</td>
</tr>
<tr>
<td>British Average</td>
<td>4.6 or 7 lbs above writer's</td>
</tr>
<tr>
<td>Quetelet's</td>
<td>3.8 or 3 &quot; below</td>
</tr>
<tr>
<td>Jewish children</td>
<td>4.8 &quot; 12 &quot; above</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age 11.</th>
<th>Weight</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average in stones &amp; pounds</td>
<td>4.2 = 58 lbs = 2630 Kgps</td>
<td>4.3(\frac{1}{2}) = 51(\frac{1}{2}) inches = 1301 mms</td>
</tr>
<tr>
<td>Highest</td>
<td>5.5(\frac{1}{2})</td>
<td>4.5 or 1(\frac{1}{2}) inches above writer's</td>
</tr>
<tr>
<td>Lowest</td>
<td>3.8</td>
<td>4.2 or 1(\frac{1}{2}) &quot; below</td>
</tr>
<tr>
<td>British average</td>
<td>4.12 or 10 lbs above writer's</td>
<td>4.11 or 9 &quot; above</td>
</tr>
<tr>
<td>Quetelet's</td>
<td>4.0 or 2 lbs below</td>
<td>4.42 or 12 &quot; above</td>
</tr>
<tr>
<td>Jewish children</td>
<td>4.42 or 12 &quot; above</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age 12.</th>
<th>Weight</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average in stones &amp; pounds</td>
<td>4.5 = 61 lbs. = 27.66 Kgps</td>
<td>4.3 = 51 inches = 1275 mms</td>
</tr>
<tr>
<td>Highest</td>
<td>5.12</td>
<td>4.7(\frac{1}{2}) or 15(\frac{1}{2}) lbs above writer's</td>
</tr>
<tr>
<td>Lowest</td>
<td>3.12</td>
<td>4.7 or 2 &quot;</td>
</tr>
<tr>
<td>British Average</td>
<td>5.6(\frac{1}{2}) or 15(\frac{1}{2}) lbs above writer's</td>
<td>4.7 or 15 &quot;</td>
</tr>
<tr>
<td>Quetelet's</td>
<td>4.7 or 2 &quot;</td>
<td></td>
</tr>
<tr>
<td>Jewish Children</td>
<td>5.6 or 15 &quot;</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average in feet &amp; inches</td>
<td>4.3 = 51 inches = 1275 mms</td>
</tr>
<tr>
<td>Highest</td>
<td>4.8(\frac{1}{2})</td>
</tr>
<tr>
<td>Lowest</td>
<td>3.7(\frac{1}{2})</td>
</tr>
<tr>
<td>British Average</td>
<td>4.7(\frac{1}{2}) or 4(\frac{1}{2}) inches above writer's</td>
</tr>
<tr>
<td>Quetelet's</td>
<td>4.4 or 1 &quot;</td>
</tr>
<tr>
<td>Jewish children</td>
<td>4.7 or 4 &quot;</td>
</tr>
</tbody>
</table>
### Age 13.

#### Weight

<table>
<thead>
<tr>
<th>Average in stones &amp; pounds</th>
<th>4.12 $\frac{3}{4}$ = 60 $\frac{3}{4}$ lbs = 31.18 Kgms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest</td>
<td>7.1</td>
</tr>
<tr>
<td>Lowest</td>
<td>3.5</td>
</tr>
<tr>
<td>British average</td>
<td>6.3 or 18 $\frac{1}{3}$ lbs above writer's</td>
</tr>
<tr>
<td>Quetelet's</td>
<td>5.1 or 21 $\frac{1}{4}$ lbs</td>
</tr>
</tbody>
</table>

#### Height

<table>
<thead>
<tr>
<th>Average in feet and inches</th>
<th>4.5 = 53 inches = 1346 mms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest</td>
<td>5.12</td>
</tr>
<tr>
<td>Lowest</td>
<td>4.0</td>
</tr>
<tr>
<td>British average in feet and inches</td>
<td>4.10 or 51 ins. above writer's</td>
</tr>
<tr>
<td>Quetelet's</td>
<td>4.7 or 2 ins.</td>
</tr>
</tbody>
</table>

The Jewish figures are not available after twelve years of age, but it will be observed that the high averages of these children are being gradually lowered as one approaches the twelfth year, when they more nearly equal the high British average.

### Age 14.

#### Weight

<table>
<thead>
<tr>
<th>Average in stones and pounds</th>
<th>5.9 $\frac{1}{2}$ = 79 $\frac{1}{2}$ lbs = 36.17 Kgms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest</td>
<td>7.12</td>
</tr>
<tr>
<td>Lowest</td>
<td>3.9</td>
</tr>
<tr>
<td>British Average</td>
<td>6.12 $\frac{1}{4}$ or 17 lbs above writer's</td>
</tr>
<tr>
<td>Quetelet's</td>
<td>5.9 or $\frac{5}{4}$ lb. below</td>
</tr>
</tbody>
</table>

#### Height

<table>
<thead>
<tr>
<th>Average in feet and inches</th>
<th>4.6 $\frac{1}{2}$ = 54 $\frac{1}{2}$ inches = 1384 mms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest</td>
<td>5.1 $\frac{1}{2}$</td>
</tr>
<tr>
<td>Lowest</td>
<td>4.0</td>
</tr>
<tr>
<td>British average in feet and inches</td>
<td>4.10 or 5 $\frac{1}{2}$ ins. above writer's</td>
</tr>
<tr>
<td>Quetelet's</td>
<td>4.1 $\frac{1}{2}$</td>
</tr>
</tbody>
</table>

### Age 15.

#### Weight

<table>
<thead>
<tr>
<th>Average in stones &amp; pounds</th>
<th>6.3 $\frac{1}{2}$ = 91 lbs = 39.80 Kgms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest</td>
<td>8.0</td>
</tr>
<tr>
<td>Lowest</td>
<td>4.4</td>
</tr>
<tr>
<td>British average</td>
<td>7.8 $\frac{1}{2}$ or 16 $\frac{1}{2}$ lbs above writer's</td>
</tr>
<tr>
<td>Quetelet's</td>
<td>6.4 or $\frac{1}{2}$</td>
</tr>
</tbody>
</table>

#### Height

<table>
<thead>
<tr>
<th>Average in feet and inches</th>
<th>4.9 = 57 inches = 14.48 mms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest</td>
<td>5.3</td>
</tr>
<tr>
<td>Lowest</td>
<td>4.2</td>
</tr>
<tr>
<td>British average</td>
<td>5.1 or 6 ins, above writer's</td>
</tr>
<tr>
<td>Quetelet's</td>
<td>4.10 or 1</td>
</tr>
</tbody>
</table>
Attention may be called to the fact of the gradual lowering of the averages of both weight and height as the children advance in years. In the early years the children under the writer's care did not compare so unfavourably with either the British or Quetelet's tables but later on the comparisons were most unfavourable showing the great advantage which the well-fed, well-cared-for infant and young child possesses over the neglected child and it would appear as if the loss sustained in these very tender years can never be quite made up, even under the best future conditions of life.

Advantages of the Dietary with its Therapeutic Significance.

The protein content which is comparatively large depends chiefly on the meat, wheaten flour, beans, peas, and milk and oatmeal. But important as these may be the vegetables are almost as important from another side, namely because of their organic-phosphorus content or lipoid bodies. Without the presence of a due proportion of these in the best of dietaries the proteins, fats and carbohydrates could not be used to the best advantage in building up the tissues. Their presence is probably to stimulate or to set into activity the ferment of the glands of the organism so that it can deal with the food stuffs supplied to it. Herein may lie the secret of the health of one child and the ill-health of another child. The question of the place of fat in the dietary has already been noted. (See also Importance of Fat in the Dietary). At the risk of frequent reiteration of this point it may be mentioned that during a Government medical inspection in which the hands and feet of all thirty children were
examined at the end of a long spell of wintry weather only one child was found suffering from chilblains and that of a mild type.
Tables showing yearly increase in weight and stature.

Weight is shown in green and the numbers refer to pounds. Each pound nearly equals one-fifth of a kilogram.

Stature is shown in red, and the numbers refer to inches. Each inch nearly equals 25 millimetres.

Each black division represents one year.

**Girl: A. 4th to 8th year.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Weight</th>
<th>Stature</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.8y</td>
<td>5$\frac{1}{2}$</td>
<td>4 $\frac{3}{4}$</td>
</tr>
<tr>
<td>1y</td>
<td>4 $\frac{3}{4}$</td>
<td>2 $\frac{1}{4}$</td>
</tr>
<tr>
<td>1.8y</td>
<td>4</td>
<td>0.8</td>
</tr>
</tbody>
</table>

**Girl: B. 5th to 14th year.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Weight</th>
<th>Stature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.4y</td>
<td>3 $\frac{1}{2}$</td>
<td>1 $\frac{1}{4}$</td>
</tr>
<tr>
<td>2y</td>
<td>2</td>
<td>2 $\frac{2}{4}$</td>
</tr>
<tr>
<td>2.8y</td>
<td>2 $\frac{2}{4}$</td>
<td>1 $\frac{1}{8}$</td>
</tr>
<tr>
<td>5y</td>
<td>3</td>
<td>1 $\frac{1}{2}$</td>
</tr>
<tr>
<td>7y</td>
<td>4</td>
<td>2 $\frac{2}{4}$</td>
</tr>
<tr>
<td>11y</td>
<td>4</td>
<td>2 $\frac{2}{4}$</td>
</tr>
</tbody>
</table>

**Girl: C. 6th to 10th year.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Weight</th>
<th>Stature</th>
</tr>
</thead>
<tbody>
<tr>
<td>10y</td>
<td>3</td>
<td>1 $\frac{1}{2}$</td>
</tr>
<tr>
<td>1.2y</td>
<td>2 $\frac{2}{4}$</td>
<td>1 $\frac{1}{2}$</td>
</tr>
<tr>
<td>1.8y</td>
<td>2 $\frac{2}{4}$</td>
<td>1 $\frac{1}{2}$</td>
</tr>
<tr>
<td>2.4y</td>
<td>3</td>
<td>1 $\frac{1}{2}$</td>
</tr>
<tr>
<td>3y</td>
<td>5</td>
<td>3 $\frac{1}{2}$</td>
</tr>
<tr>
<td>4y</td>
<td>1 $\frac{1}{2}$</td>
<td>3</td>
</tr>
<tr>
<td>7y</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>10y</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

**Girl: D. 6th to 14th year.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Weight</th>
<th>Stature</th>
</tr>
</thead>
<tbody>
<tr>
<td>14y</td>
<td>2 $\frac{1}{2}$</td>
<td>2</td>
</tr>
<tr>
<td>1.2y</td>
<td>1 $\frac{1}{2}$</td>
<td>2 $\frac{2}{4}$</td>
</tr>
<tr>
<td>1.8y</td>
<td>2 $\frac{2}{4}$</td>
<td>3 $\frac{1}{4}$</td>
</tr>
<tr>
<td>2.4y</td>
<td>2 $\frac{2}{4}$</td>
<td>3 $\frac{1}{4}$</td>
</tr>
<tr>
<td>3y</td>
<td>3</td>
<td>3 $\frac{1}{4}$</td>
</tr>
<tr>
<td>4y</td>
<td>4</td>
<td>3 $\frac{1}{4}$</td>
</tr>
</tbody>
</table>

Fig. 1. Chart showing the yearly increase in height and weight of 30 girls aged from 4 to 15. A seventeen years' experience.
Fig. 2. — Continuation of Fig. 1.
Fig. 3. - Continuation of Fig. 2.
Fig. 4. - Continuation of Fig. 3.
Fig. 5. Chart showing the nitrogen and carbon contents and their ratios of the diets of the various social grades studied in the text in the foregoing pages.
The Feeding of Infants with modified Cows' Milk.
The result of 360 experiments.
To-day only one child in five is entirely breast-fed from birth and up to the age at which an infant is weaned. This fact means that the feeding of infants is a problem with which every mother and every medical practitioner has to deal daily. The circumstances giving rise to artificial feeding are various (1) The milk goes away of its own accord. (2) The mother may have to go out to work or in a higher grade of society the mother does not care to take the trouble of nursing. (3) For some reason or other the mother's milk disagrees with the infant.

Methods of Hand Feeding.

Unless the medical practitioner is more than usually assiduous in his enquiries he may find that the baby is fed on a plan supplied by a nurse, friend or newspaper advertisement, and indeed of simplicity the utmost complexity is introduced into the dietary of the child. It is difficult to make the laity understand that a baby may be successfully fed on a simple modified cow's milk. It is a common experience that a baby is fed on one of the dried foods. This means in the case of the artizan class an expense which they are ill able to bear to say the least of it. If cow's milk is employed without the addition of any dry powder more often than not the dilution is made with barley water, rice water, oatmeal water or lime water, almost never plain water.

Some years ago the writer made an effort to institute amongst the poorer people a feeding mixture for bottle fed
babies which would be cheap and at the same time sufficient, easy of digestion and easy to prepare. The mothers or nurses of all babies fed by hand were instructed to dilute ordinary cow’s milk with warm water so that the mixture was luke warm. To each four fluid ounces (113 grams by weight) was added about two-thirds of an ordinary teaspoonful (a spoon such as is now used in the kitchen) of lactose and also two teaspoonsfuls of cream. This should have been as near as need be in composition to human milk, namely water 87.163, fat 4.283, casein 1.046, milk sugar 7.407 per cent - ash not reckoned; but it did not succeed in working class homes for lactose had to be specially purchased and it was relatively dear and cream could not always be had. The plan was not evidently practicable amongst the poor and it was soon given up for the following.

A Cheap and Simple Modification of Cow’s milk.

It was now resolved to try simply equal parts of fresh cow’s milk and warm water so as to make a luke warm mixture. To each four fluid ounces (or 113 grams) two thirds of a kitchen teaspoonful of ordinary cane sugar - that is about 60 grains or 4 grams - were added. The dilution with water reduced the casein to near the level of human milk but left the mixture somewhat deficient in fat so that it was not an ideal food but its preparation was practicable and the results were found to be satisfactory in every respect. Notes were kept of 360 babies fed in this way extending over a period of ten years and the method of feeding has proved so successful that it has not been
changed or modified except in cases here and there which might be met with under any mode of feeding however good. At the age of three and a half or four months the proportions of milk and water are somewhat changed namely one part of water being added to two of milk, the proportion of sugar being kept the same. At the age of five or six months if the child can eat from a spoon and if there is much slavering showing the near eruption of the teeth, the child is fed with potato and milk, potato and gravy, bread and milk, or oatmeal porridge and bottle feeding gradually cut off till the infant is finally weaned.

Results. In fully 75 per cent of the 360 cases observed the dietary was successful and in no case was there a distinct failure but in a small percentage of the cases it was that the fat content was insufficient. Now this may have only been equal to the number of unsuccessful cases which is experienced in any line of feeding adopted for babies. In the class of case now under discussion the mother was directed to rub a teaspoonful of olive oil into the abdomen and legs after the evening bath or to add two to three drops of codliver oil to two of the bottles every day when improvement generally took place. In a certain number of cases the child appeared at times to be unable to digest the food, but the substitution of good clear golden syrup (which consists of 50 per cent of invert sugar) for the cane sugar or the addition of a few drops of an active malt extract to the food generally removed the dyspeptic troubles.
Advantages of the Dietary. (1) The first is in its cheapness and this is of the utmost importance among the artisan classes. (2) Its ease of preparation and the fact that contains nothing but that which is to be found in every household. (3) On it the baby thrives. (4) There is not the same tendency to the great accumulation of fat which follows in many babies on feeding with many foods and this is an advantage in children liable to respiratory troubles in the early months of their lives.

Comparison with other methods of feeding infants. With Condensed Chilled, Pasteurised, Humanised and Boiled milk.

Side by side with the foregoing experiments other methods of feeding were going on so that an opportunity was afforded for comparison. So much are tuberculosis and bacteria-borne disease dreaded by the laity that one finds in all communities a large number of people who refuse to allow a child to touch any untreated milk. Some years ago this was more stringently carried out than today and by a larger amount of people, so that the writer had no difficulty in observing the effects on babies who had been fed on milk treated in one of the ways mentioned and notes of over one hundred were kept. Two cases of distinct scurvy-rickets were seen and both occurred in babies who had never had a drop of milk that had not been boiled. Five had swollen epiphyses and tender muscles. Six suffered from dry skin and marasmus and all got well in a short time when placed on fresh untreated milk.
An attempt was made to discover if these hundred babies suffered in less proportion from diarrhoea and later on from tuberculosis in its various form that did babies fed on untreated milk. And the investigation was carried on after the collateral one was stopped but the evidence at no time pointed in this direction. As to diarrhoea this disorder existed in greatest numbers in the dirtiest households and conversely in fewest numbers in clean households and it appeared as if the source of diarrhoea lay in the main in the household itself.

To summarise then:

Out of 100 babies fed on Condensed, Boiled, Pasteurised, Chilled, or otherwise sterilised milk:

- Two had true scurvy-rickets.
- Five had acute rickets.
- Six suffered from "marasmus".

They did not appear to be less free from diarrhoea and later tuberculosis than children reared on unboiled milk.

The wonder is that so few of them suffered from scurvy and like diseases, seeing they were fed on food stuff largely deprived of life sustaining materials but it would appear as if certain tissues are capable of storing up compounds of phosphorus which can be slowly used up in the times of want. Other tissues again may have the faculty of being able to do with exceedingly small quantities of these important phosphorus compounds and other tissues again may possess the property of forming phosphorus compounds in another way removed from the normal. Other explanation may be that plenty of fresh air,
abundant clothing, personal hygiene, sanitary surroundings, and special exercises applied to groups of muscles may all help the tissues to resist the inroad, force and activity of microorganisms in the same way as do a plentiful supply of lipoids, lecithins, glycerophosphates, phosphatides, phytins, nucleoproteids or other of the nucleic acid series.

Another question raised by the happy results obtained in the feeding of 360 babies on unboiled milk is, the subject of the relationship of milk to tuberculosis, and this is worthy a paragraph of its own. The presumptive evidence is that to boil or otherwise to sterilise milk does not prevent the spread of tuberculosis among children while on the other hand it does lead to serious disorders of nutrition.

**Is Milk a common causative agent of Tuberculosis in Children?**

Or in other words is unboiled or uncooked cow's milk intimately associated with the spread of tuberculosis? This may well be a debatable point for in all the tuberculosis processes met with in young children very seldom is the bovine strain of the microorganism present.

**Record of 38 Cases.**

In a record of 38 death in young children due to tuberculous meningitis, peritonitis, and other tuberculous processes in which the intimate history was known, as to methods of feeding from birth up to death and also other circumstances likely to have an influence on the subject - the writer was unable to say that any method of using the milk had anything to do with the cause, genesis or onset of the tuberculosis. The disease im
all its protean forms occurred in equal proportions in breast-fed babies and in babies fed on unboiled and on milk treated by boiling, pasteurising or otherwise sterilising. It seemed as if the milk of itself had nothing to do with the disease. Other circumstances lend support to this view for in Germany where milk is and has been for some years largely boiled or pasteurised and yet in that country tuberculosis in all its forms is commoner than it is in the British Isles. Japan too furnishes an interesting and instructive illustration of the subject for it has a population almost equal to the British Isles and the tuberculosis incidence of the two countries is likewise almost alike; but there is an enormous difference in the quantity of milk consumed in the two countries. Japan may be described as a non-milk drinking community for the whole of its inhabitants only drink eight million gallons annually or about one and a half pint (5/6 litre) for each individual each year. In Japan out of one million death 75,000 were due to phthisis; 14,000 to tuberculosis of the intestines; 5000 to the same disease of the brain; and 63,000 to meningitis. Now supposing that only 13,000 of the latter were tuberculous in origin this would bring the number from tuberculosis up to 107,000. Now in England and Wales the numbers of deaths attributable to tuberculosis out of every million death is 107,000. Up to the last year or two Japan was practically a vegetarian country, its inhabitants living largely on rice, the cultivation of this cereal alone exceeding all the other agricultural products put together. Fish was also eaten but meat in all its forms was almost unknown amongst the bulk of
Section III. Pages 86 - 91.

Vagaries in Dieting.
the people (See also "Clean Milk").

Vagaries in Diet - Low and High Caloric Values - Inco-ordinate Protein, Fat and Carbohydrate Values - Probable Explanation of Maintenance of Health under their Use.

Besides the foregoing one meets with many individuals who live on dietaries which are opposed to custom and experience. Their true import cannot however be gauged till one carefully analyses them in all their details. When this is done they all reveal a value or values in which the diet is strong as may be observed from a study of the following:

Mr. Breckwoldt, a Dane, tells that when 48 years of age he stocked a vessel of the Danish East Asiatic Company from Copenhagen to Yokohama and back on a voyage of six months' duration on a daily dietary of three pounds (1.37 Kilograms) of apples, two pounds of white bread (0.907 Kilogram) 2 ounces (56 grams) of butter, about one ounce of sugar (28 grams) and unboiled water only. His health remained better than the men used to the work who were in most cases younger than he and they lived on a meat diet.

The food value on being analysed is as near as need be:
Protein 88; Fat 63; Carbohydrate 656; or Nitrogen 14; and Carbon 353 grams; or Calories 3726.

In considering this dietary it is to be remembered that apples contain one per cent of vegetable acids.
2. Man of 86 - living 23 years on Oatmeal, Sour Milk, Bread, Potatoes and Cocoa.

The writer knew of a working shoemaker who died at 86 and for the last 23 years of his life lived on 4 ounces (113 grams) of oatmeal made into porridge eaten with 10 fluid ounces (282 grams) of sour milk for breakfast, One pound (454 grams) of potatoes or an equivalent of caloric value of cornflour; and 10 fluid ounces of sour milk for dinner. For his last meal he had 5 ounces (141 grams) of wheaten bread and ten fluid ounces of sour milk or the like of cocoa.

He weighed every particle of food he took and minced up the solids into a fine mass. The cost of each item was noted and he calculated that he could live on two shillings a week. He rose and retired to rest with the regularity of the sun. He took graduated exercises in the shape of cycle riding besides following his trade as shoemaker.

Expressed in food value this dietary comes to:
Protein 65; Fat 15; Carbohydrate 259 or Nitrogen 10; Carbon 146 grams or Calories 1485. Its low fat value is to be noted.

In reckoning up the faults and advantages of the diet it is worthy of remark that this man laid a high store on the virtues of sour milk long before Metchnikoff's time.

3. Man of 90. Living for 40 years on Oatmeal porridge, Skimmed Milk, Bacon, Oat Cake.

The writer knew a literary man who lived for forty years whose dietary was made of:
Breakfast. Four ounces (113 grams) of oatmeal made into porridge and eaten with 10 fluid ounces (282 grams) of skimmed milk.

Dinner. Eight ounces (227 grams) of potatoes and four ounces (113 grams) of fried bacon.

Tea or Supper. Mint tea sweetened with one ounce (28 grams) of golden syrup and four ounces (113 grams) of fermented oatcake with a thin scraping of bacon fat or by way of variation he had fermented oat cake and blue (skimmed) milk.

The quantities never varied and their value may be set down as Protein 55; Fat 84; Carbohydrate 219; or Nitrogen 8.80; Carbon 176 or Calories 1897.

The man lived evidently in health on this monotonous dietary for 40 years. He believed there was some special virtue in skimmed milk and it was difficult to know why he rejected the cream. The bacon was taken probably because of its savoury stimulating effect on the taste glands. The same applies to the mint tea. The oatcake he ate is made by allowing a mixture of oatmeal and water to stand for a time till it just begins to ferment, whereby a portion of the albumin is changed into proteose. At this point the mass is run on to a hot iron plate and baked. It forms a not very appetising cake. (See Fermented Oatcake page 207).

One reads of many people who appear to live on dietaries which border on the starvation line. The late Professor Mayor of Cambridge who when engaged in certain literary duties in which he had to hunt up Greek and Latin passages, fasted eight days out of nineteen during the time he was so employed.
His fasting was a real fasting for he took nothing during the fasting days except cold water. During this period he lost 13 pounds (5.897 kgm) in weight. But his meals on the days on which he did eat were simple. His dinner consisted of dandelion salad and boiled nettles. He does not tell us definitely what his other meals were made up of so that precise details are wanting.

Again one reads of people who lived on threepence a day and even of some who have lived on a penny a day, but here again details are not given and one can only believe that all has not been told. Tolstoy advocated and actually adopted a simple dietary and he is often quoted as an example of the plain liver and high thinker but as in the case of many others we have no accurate account of the actual weights of the food and the kind of foods consumed.

In trying to explain the maintenance of health and the performance of hard mental and physical work on food stuffs which controvert all the known canon of dietetics and nutrition many points have to be considered. (1) One might say without fear of contradiction that all the practitioners of a peculiar dietary are persons of strong will (2) They have all reached well into adult life and have been fed on a liberal diet before they adopted their own peculiar system for children and young people unless by force do not take to dietaries out of the common run. Adults who have been well fed in early life often take to a simple dietary at middle or later life shewing that tissues which have been well nourished can be kept in health

(89)
with a small amount of food and the amount may be very small when pushed to its ultimate limit. (3) Again people vary in this respect and it is only those who possess this faculty of working on a very small food capital who try the experiment. The writer has never known nor heard of a person who had been fairly fed in early life to voluntarily adopt a meagre dietary in adult life. (4) Again unless food is actually weighed and the length of time stated over which experiments have extended can one be sure of results. Some people who are said to live on a simple dietary have been on inquiry found to consume very large weights of food as instance the man who eats two pounds of white bread, three pounds of apples, one ounce of sugar, and two ounces of butter. (5) People of the class now being discussed are regular livers, taking exercise, abundance of fresh air, and they generally possess good digestions, so that every particle of food is used up. The importance of fresh air can hardly be over-estimated in warding off disease, of which one could give many examples such as two sets of sailors eating the same food one under insanitary, the other under sanitary conditions. The former develop beri-beri, the second do not. The same applies to scurvy in adults and rickets in children. (6) Another consideration comes before one and it is that in almost all if not all oddities of diet one article is included which contains the vital principle in more than ordinary proportion such as milk, oatmeal, barley, whole wheat or some like article which has this principle as little as possible interfered with either by cooking, keeping, milling or
Section IV. Pages 91 - 93a.

Comparative Weights & Measures,
preparation in any way.

Some comparative weights. Packages are deceptive and the poor need to be warned against this species of fraud. One of the packages of rolled oats (2 pounds gross) commonly sold has actually one fourteenth of the whole made up of cardboard. Packet tea comes under the same category, as do all packet goods sold as gross weight. One kitchen teaspoonful of dry tea weighs 40 grains (2.60 grams). The same measureful of fine granulated sugar weighs 103 grains or 6.80 grams. A lump of sugar on the average weighs 75 grains or 5 grams. Dry peas and beans gain 100 per cent in cooking so that one pound of dry peas or beans becomes two pounds when they reach the table. Potatoes if they be carefully scraped and washed lose not more than ten per cent by weight. When boiled and carefully drained and served up at once they need not gain more than 6 per cent in weight. Cabbage, greens, cauliflower and like vegetables gain rather over 100 per cent in cooking.

Weights of fresh and kippered herrings. An ordinary-sized fresh herring weighs about seven ounces (197 grams) when freed from entrails. A kipper weighs five and a quarter ounces (148 grams) and when freed from all the uneatable portions — head, skin and bones it weighs a trifle over four ounces (113 grams). A handful of oatmeal weighs about one ounce and one fifth or about 34 grams. The same of fine wheaten flour one ounce and one quarter or about 35 grams. A thick slice of a wheaten loaf weighs about two ounces or 56 grams.
Beef Joints. The bone comes to about 1/11th of the gross weight. Within recent years a great change has taken place in the cooking of chip potatoes and fried fish. This is now generally carried on under conditions of cleanliness. For a half penny $\frac{3}{4}$ ounce of chip potatoes (93 grams) and for the same sum $\frac{15}{3}$ ounce (46 grams) of appetising fried fish (hake or cod) can be obtained.


These Reports contain a large amount of information on all topics relating to food and dietetics and they are to be found in all libraries.


Poverty — A Study of Town Life. Rowntree R.S. 1901. This inquiry began in 1899, covered the whole of the City of York, and was carried on by voluntary workers and paid agents. Particulars were obtained regarding 11560 families representing a population of 46,754 persons and deals with many points besides food and diet.

Study of Diet of Labouring Classes in Edinburgh, Noel Paton, Dunlop and Inglis, 1901. A study of 60 families as to their dietaries for one week. Contains valuable notes and shows that on the whole the dietary is fair.

Life and Labour of the People of London, 1891–7. A monumental work from which one may obtain information on the food of the (92)
very poor.

Subject List of Works on Domestic Economy, Foods, etc. Library of the Patent Office, price sixpence - Patent Office, Chancery Lane, E.C. London. Gives a list of all publications relating to every phase of the subject.

Essentials of School Diet - Dukes 1891.
Treatise on Diet and Food. A. Haig, 1898.
Economy of Food, J. Alan Murray, 1911.
Food and Feeding, Chalmers Watson, 1910.
Food and the Principles of Dietetics by Robert Hutchison.
The Works of Atwater, Rubner, and Voit are well known and have already been so often referred to that nothing need be added thereto.

Report upon the Study of the Diet of the Labouring Classes in the City of Glasgow, by Dorothy E. Lindsay, Issued by the Corporation of Glasgow, 1912.

Sixty families of the poorest districts of Glasgow were studied mainly as to the quantity and quality of their diet. The investigator finds that the figures for Edinburgh and Glasgow agree closely. There was a great lack of variety in the dietary - a common experience known to all observers. As in the case of the Noel Paton investigations in Edinburgh it was found that the dietary was at least as good as that found among the poor of London and New York.

Wage Earners' Budgets by L.B. More, 1907. An investigation among the artizans of Greenwich Village, a district of New York. Here again the results are like those met with in York, Edinburgh

The numerous works on vegetarianism may be mentioned. Although one may not agree with much which they contain they do contain a great deal which is interesting and instructive.

The Merry Past, by Ralph Nevill, 1909.
Modern Cornmilling, W. R. Valler, 1897.
Food Values, Locke, 1911.
Section V. Pages 94 - 136.

Food and Diet more particularly studied from Physiological and Therapeutic Points of View.
FOOD AND DIET STUDIED MORE PARTICULARLY FROM THE
PHYSIOLOGICAL AND THERAPEUTIC STANDPOINTS.

The importance of fat in a Dietary

(1) In Rickets. It is remarkable that Jewish children,
even in poor neighbourhoods, enjoy an immunity from
rickets. Some years ago, Mr. Wm. Hall, M.R.C.S.,
examined several thousands of children in Leeds with a
population of 445,000 of whom 20,000 or more are Jews
of the poorer class, and his results were:

(a) Well-to-do neighbourhoods:
   Jewish children - Rickety - 5 per cent.
   Christian " " 8 " "

(b) Poor neighbourhoods:
   Jewish children - Rickety - 7 per cent.
   Christian " " 50 " "

These results are striking, and although the
term rickety must have been very rigorously applied
when the children were examined, yet the disparity of
percentages existing in the poor class districts between
the Jewish and the Christian children leads one to enquire
into the cause of the difference. That the Jewish child
is not immune from the disease on account of racial
peculiarities is self-evident. What then is the cause
of the difference in the incidence of attack? Hygiene

(94)
cannot be said to protect the Jewish child, for the Christian child is surrounded by as much cleanliness as the Jewish child although neither have much to boast of in this direction. The cause is to be found in the dietary which contains a very large proportion of fat combined and uncombined in the case of the Jewish child. His diet is made up of wholemeal bread, eggs, oil, butter, fish, pudding and potatoes. The English Christian child on the other hand, while he gets more fresh air than the Jewish child, often has to subsist on food stuffs, poor in fat content. In poorer districts, he is often fed on condensed milk, tea, dry bread, dripping or jam, or a like combination, in which fat is lacking. Although one would be rash to assert that fat will entirely prevent or "cure" rickets, yet it will go a long way to prevent the disease, and the fact that fat is so largely present in the dietary of children little liable to rickets is a strong argument in its favour as an article of diet of great importance.

The German children who belong to a stock with close affinity to the English child are not liable to rickets to any great extent. Their dietary contains a relatively larger amount of fat as compared with the English child, and the staple cereal consumed in Germany contains infinitely more combined fat than wheat, the staple cereal eaten in England.
In Tuberculosis. In all forms of tuberculosis, medical and surgical fat plays a great part both as a preventive and as a curative agent; but this aspect of the subject has been dealt with in other sections. The best proof of the value of fat in this connection is shown in the immunity of the inhabitants of the Island of St. Kilda. The climate of the Island is damp and the sanitary arrangements of the houses are far from ideal, for the people live in small, ill-ventilated, stuffy rooms, and in the winter time, on account of the wet and lack of good clothing, they have to remain indoors for a large part of the 24 hours. The population is only one hundred and is almost stationary, and it goes without saying that intermarriage must be common. The food of the people is made up of milk, potatoes, oatmeal, and the Solan goose. The latter they eat in large quantities, and it contains so much fat that the bodies of the people smell of it and their skins are as smooth as velvet. May this not then account for their freedom from tuberculosis? Compared with the St. Kildans, the people of the neighbouring islands are prone to attack by the disease, and they live on a diet especially poor in fat. The death rate from all forms of tuberculosis is in England 1.6; Ireland, 2.7; Scotland, generally 2.1 for each thousand; and in the islands of the west coast of Scotland it is much higher than the general Scottish rate (year 1906.
for all the places named).

The Jews who at one time were thought to suffer in an uncommon degree are now, after careful inquiry, believed to be highly immune. If close confinement, sedentary occupations, intermarriage, a town life, insanitary surroundings, and a small cubic air space, count for anything in the causation of the disease, then the Jews should be especial sufferers. True the Jews eat only meat which has to answer to certain naked eye tests for signs of tuberculosis, but these are in the main not so severe as the tests imposed by trained meat inspectors in the British Isles. Besides, in the past twelve or fifteen years the meat supply of the British poor has come from South America and Australia, where tuberculosis is little or not at all known, and where the animals roam in the open air from birth. The Jewish adults consume large quantities of fat in the shape of butter, olive and other vegetable oils, and this habit of diet they carry out in every land they inhabit. They apparently instinctively crave for foods rich in fat, for the very poorest of them in our large towns, who must of necessity get the best they can for the small amount of money they have, live largely on herrings fresh, salted or kippered, Dutch cheese (both rich in fat) brown bread and coffee. The following illustrations of their immunity support the contentions made. In New South Wales, where the population of Jews is only 1,000,
and there easy of exact observation, only one death was known to be due to tuberculosis in three years, whereas if they had suffered in the same ratio as the general population of the district the deaths would have numbered 13 or 14. In Tunis, between the years 1894 - 1900, the tuberculosis death rate numbered among the Mohammedans, 11.30 a thousand; among the Europeans, 5.13; and among the Jews, only 0.75. In the United States of America as a whole, Bowditch found that of 1,000 deaths amongst the Jews, 36.37 were males and 34.02 were females, while in a like number of Americans the numbers were respectively 108.79 and 146.12.

Taking the general death rate in New York, out of every 100,000 the numbers that fell to tuberculosis were in every case where the nationality of the mother was known and noted.

<table>
<thead>
<tr>
<th>Nationality</th>
<th>Deaths per 100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russian and Polish Jews</td>
<td>98.21</td>
</tr>
<tr>
<td>Hungarian Jews</td>
<td>155.06</td>
</tr>
<tr>
<td>Coloured people</td>
<td>774.21</td>
</tr>
<tr>
<td>Irish</td>
<td>845.73</td>
</tr>
<tr>
<td>Native white people</td>
<td>233.35</td>
</tr>
<tr>
<td>Scottish</td>
<td>394.12</td>
</tr>
<tr>
<td>English</td>
<td>322.50</td>
</tr>
<tr>
<td>Germans</td>
<td>328.80</td>
</tr>
</tbody>
</table>

These figures are striking, and are in a measure confirmed by the figures for London published by the Burial Board of the United Synagogue, London. From 1897 - 1901 the deaths from phthisis numbered 5.2 per cent of the total, and in 1902 - 1906, 5.6. Compared with the deaths from phthisis, over the whole of London 1891 - 1900, the
percentage was 9.3, and in the year 1905 it was 9.2. Taking the two poor parishes in London (1) St. George's in the East, the rate was 10 and (2) in Bethnal Green, nearly 11 per cent., while in Stepney, occupied almost wholly by poor Jews, it was only 6.4 - all three for a period of ten years. The Jews believe in the "gospel" of fatness, and their ideal is to be fat and flourishing. Contrariwise, the Irish people live on a poor dietary into which potatoes largely enter, and this may make them highly susceptible to the ravages of tuberculosis.

(3) In the Vaso-motor Neuroses of Children - Rapid Changes of Colour, Chilblains, Susceptibility to Cold. Many children, more particularly of the poorer classes, get too little fat in their food, and amongst children who are born with an unstable vasomotor system this lack of fat often leads to suffering in very cold weather by the production of tingling in the extremities, or chilblains, with all the attendant tortures of the latter. It is worthy of note that chilblains are much more commonly met with amongst thin and wiry children than amongst those who are plump and well nourished. Some 17 years ago the writer had under his care an institution containing 30 children, who, previous to admission had been neglected, and of this number six to ten every winter suffered severely from chilblains on the fingers and toes. Most of the cases had simply the red, blue or purple, swellings,
but despite every possible care, two or three went on to the state known as "broken" chilblains. This led to disablement, and school, household or laundry work had to be given up. It was thought that the blood pressure was low, and at the beginning of the winter dry adrenal extract was administered to each susceptible child. This did good, without doubt, but it was felt that this was a remedy rather than a preventive, and therefore only applicable within narrow limits. Cod liver oil was also given a trial, and it gave more brilliant results, and this pointed to a probable preventive. It was decided to add more fat to the dietary of all the children all the year round, and therefore each child received an extra half ounce (14 grams) of margarine daily. The result has been satisfactory, for chilblains have practically disappeared. During a severe winter it is true one or two cases of mild chilblains may be seen for a week or two, but the condition has ceased to be a "plague" as it formerly was, and disablement from this cause has ceased to exist. In a recent hard winter, an inspection of the hands and feet of the 30 children in the month of February revealed the fact that only one child had mild chilblains.

**Margarine as a Food.** Margarine is a food which I believe is superior to butter in the families of the poor, because it is so much cheaper and therefore the poor can afford to eat freely of it. For them, butter (100)
is a food which is far too dear. Unfortunately there is a prejudice against it, but this could be in great part removed if those who could afford to eat butter took to eating margarine - if margarine became fashionable. Margarine is a mixture of fats, and, for some unknown reason, mixtures of fats are more useful all round than a single fat. It is made up usually of beef and mutton fat, lard, cotton seed oil, olive oil, sesame oil, arachnis oil (pea-nut oil), palm oil, cocoa nut oil, and other vegetable oils, and glucose. These are mixed and churned with milk to improve its flavour and to give it a "buttery" taste. An objection is urged against it, that when saponified, as in the process of digestion and when the fats are set free, there is a great deficiency of soluble fatty acids, as comparable with true butter fat. In spite of this, however, the fact remains that margarine is a valuable food. (see Page 99 & 77).

The part played by fat in maintaining equilibrium in a disease of the nature of diabetes is shown in the record of a case of this disorder under observation for some years.

Amount of Food Stuffs needed to keep weight constant in Diabetes Mellitus, - The Place of Fat.

In 1902, a man of 32 was in health and weighed 13 stones (82.553 Kgms.) but towards the end of the
year he began to lose weight, to pass up to 160 fluid ounces of urine (or about $4\frac{3}{4}$ litres) and to develop a corresponding thirst. The urine contained glucose (3 to 5 per cent.). He first came under treatment in the beginning of 1903 and was treated with morphine and dieting till the urine came down to a uniform rate of about 80 ounces (2.28 litres) till he ceased to lose weight and there was established a feeling of well being. He was given general directions as to food, but a strict diabetic dietary was not enforced, and within fairly wide limits he was allowed to eat what he liked. When he had constructed a diet list for himself it was found that the quantity of urine was as already stated, and the average percentage of sugar as shown by Fehling's test was seldom so high as 0.5, and was now and then absent altogether.

**Dietary:**

**Sunday:**

**Breakfast.** One pint of unsweetened tea; about two ounces of fat bacon (56 grams); 2 fried eggs; four slices of a special bread.

**Dinner.** Beef, cauliflower, cabbage, kidney beans, pickles, custard pudding, stewed apples.

**Tea.** One pint of unsweetened tea; four slices of bread with plenty of butter, tomatoes, and a little beef.

**Supper.** Bread and cheese, milk and aerated water.
Urine passed on Sunday - 75 ounces (2.14 litres).

MONDAY:
Breakfast. Tea as before, 2 fried eggs, bread as before with plenty of butter.
Dinner. As before, always a variety of vegetables.
Tea. As before. Always some vegetable such as tomato or cress.
Supper. Bread and cheese, milk and aerated water, whisky one fluid ounce (28 grams).
Urine passed - 85 fluid ounces (2.42 litres).

TUESDAY: Much same as Monday, except lettuce as vegetable at tea-time, and mushrooms as vegetable for supper. Whisky at night.
Urine passed - 80 fluid ounces (2.28 litres).

WEDNESDAY:
Breakfast. Much as before.
Dinner. As before.
Tea. Mutton chop, bread, lettuce.
Supper. Bread and cheese, milk and aerated water, potted meat, whisky.
Urine passed - 85 fluid ounces (2.42 litres).

THURSDAY:
Breakfast. Usual.
Dinner. Usual.
Tea. Usual, with beef and tomatoes.
Supper. Bread and butter, cheese, milk and aerated water. 
Urine passed - 85 fluid ounces (2.42 litres).
FRIDAY:
Breakfast. Usual.
Dinner. Usual, with plenty of meat, vegetables, stewed appropriate fruit, custard.
Tea. Usual, with portion of cold beef and tomatoes.
Supper. Bread and cheese, milk and aerated water.
Urine passed - 80 fluid ounces (2.28 litres).

SATURDAY:
Breakfast and dinner. Usual.
Tea. Bread and butter, with steak and tomatoes.
Supper. Bread, butter, cheese; milk and aerated water; whisky.
Urine passed - 80 fluid ounces (2.28 litres).

Daily Food Value, Average. The various quantities were noted and calculated for, and found to be: Protein, 181 grams; fat, 283; carbohydrate, 269; calories, 4475; or, if expressed in terms of nitrogen and carbon = N29; carbon, 412 grams. Of the carbon grams, only 107 were obtained from carbo-hydrates, the great bulk (218 at least) being obtained from fat. So that to check waste of fat this man had to consume almost six times as much as a man in normal health and doing severe muscular work.

For three years, the weight remained constant, namely, 10 stones 8 pounds (67.132 kgm). After this time, the man lost only a few pounds and was able to follow his business as manager of a large grocery business till within a few days of his death, when severe acidosis suddenly developed. He died comatose, more than seven years after first coming under observation, and aged 40.
Food stuffs which can be employed as remedies.

The Vital or Life Supporting Principles.

Primitive man lived on a small number of untreated staple food stuffs containing a relatively large proportion of vital or life-supporting principles and in consequence he knew nothing of the present day errors of malnutrition. When he did suffer on the side of food it was owing to overnutrition, or to a too-large proportion of refuse material in his dietary or to a total deficiency of food. As time went on he began to refine his limited dietary with the result that a certain number of his fellows deteriorated in health and the more observant came to recognise that some essential agent had been removed in the new processes of preparing the food supplies. It took many years to understand the nature of the agents associated with the changes in nutrition and even today they are imperfectly understood. Some authorities are content with the definition that the vital or life supporting principles of the organism are phosphorised bodies but this is not strictly accurate for some of the bodies which one cannot but believe are real supporters of life are combined not with phosphorus but with nitrogen and fatty acids and a better definition of a lipoid could be that it is centred around either a compound of phosphorus or around a compound of nitrogen and fatty acids or perhaps simplest of all that a lipoid — a vital principle — is a combined fat. As we shall see later this vital principle has been looked upon as being contained in such bodies as nuclein, nucleo-protein, nucleo-albumin, lecithin, protagon vitellin, casein, phytin and other extracts

(10§)
prepared from cells, glandular organs, food stuffs, and so on. The Nature of the Vital Principle more particularly considered.

For long protein alone was considered as the basis of life and synonymous with protoplasm, but later research has shewn that lecithins (phosphorus-holding) and cholesterol (non-phosphorus-holding) are as much associated with the process of life as protein and therefore have as much right to be considered as vital principles as protein. When the lecithins and cholesterol are examined they are found to be made up of fatty acids etc, combined with either phosphorus or nitrogen or both and bodies having this composition have been called lipoids or substances holding fat in combination. The name lipoid has been much criticised but it is as good as has yet been suggested for the whole class because they all contain fat in combination. Returning to the subject of protoplasm one may say that at least it is an emulsion of protein and lipoids. The older physiologists appear to have recognised the association of fat or oil with life when they described the "oily grains" of plant life meaning thereby the germ of the plant.

The combined-fats or lipoids may be divided into three.

1. The phospholipines are fatty acids holding in combination phosphorus and nitrogen. They include lecithins and can be prepared from various sources - plants, brain, nerve tissue, and so on. The name phosphatides is sometimes given to the phospholipines. They are the most important of all the
lipoïds.

(2) Galactolipines. Are fatty acids combined with galactose. They can also be obtained from brain extract.

(3) Lipines. Are simply fatty acids holding in combination nitrogen. They are sometimes known as cerebrin acids. The list is far from complete for various investigators described the same substances by different names. Perhaps a better name for the lipoids would be the fatty acid and glycerol series combined with either nitrogen or phosphorus or both.

Again one has to consider whether there may be not other vital or life supporting principles than protein and lipoid for a hydrolysed carbohydrate namely dextrose has in the nascent state an important effect in supporting life and maintaining health and the same is to be said of hydrolysed proteins namely amido-acids. If this be so one then has to note as supporters of life and maintainers of health and well being,

1 Protein
2 Combined Fats or Lipoids
3 Dextrose in the Nascent State
4 Amido-Acids in the Nascent State

They may be interchangeable but some of them (lipoids) may possess a greater importance than the others. German physiologists employ the terms Bausteine that is bricks or building stones in treating of the relative importance of food stuffs in the economy of life and it might be as well to
alter our conception of foods in their relationships in supporting life and maintaining health and metabolism and to call food by the names Bausteine placing them in the order of their importance. (1) protein; (2) fats; (3) dextrose; (4) Amido-acids. The people who live largely on a fruit dietary and yet remain in health may owe this to the circumstance that freshly hydrolysed dextrose is a life supporting principle and the frequent success of the grape sugar"cure" may be due to the same. As to amido-acids one is struck with the frequency with which poor people can live in health for years on a dietary composed of tea, fine wheaten bread, very little butter, dripping or margarine and kippered herrings (see Page 58)

Do the herrings contain a large proportion of hydrolysed proteins in the shape of amines or amido-acids? Neither dextrose nor the amido-acids are of the like importance with the lipoids. The fat present in the lipoid protects the enzyme and prevents its destruction. This statement, however, presupposes the presence of an enzyme and starts a new theory. This finds some support in the germ of the plant, snake venom and other examples - compounds of fatty acids, proteins, carbohydrates and enzymes.

The Search for the Active Principle which supports life.

This part of the work has been chiefly attacked by the biologist and from two sources (1) from the side of the cell itself and (2) from the side of the staple food stuffs:

The Cell: Nucleic or Nucleinic Acid Nuclein or Nucleol. It is known by all these names. The fact that the cell yields this
body and that the thymus which contains it in abundance has a
stimulant action on development has led physiologists to turn
their attention to this substance. It is a phosphorus-holding
body and the biologically active part of the cell and the inferences is that it is the seat of the active principle. Nucleic
acid is however difficult to obtain from the thymus gland but
it can be prepared on a commercial scale from yeast.

**Mode of Action of the Nucleins.**

Using the name in the plural for nuclein or nucleic
acid is not a very definite substance – the nucleins are supposed
to be broken up in the intestinal canal and any adhering protein
is set free and the nucleic acid is split up into nucleic or
xanthic bases, and these again into thymic acid and this acid
is credited with the property of a peculiar stimulant action
on leucocytes whereby they are driven into the alimentary canal
where they exercise an antibactericidal action and so help the
tissues to resist the inroads of disease. The acid is said to
be able to neutralise toxins in the blood. The phosphorus or
glycerophosphoric acid which is set free in the process is
absorbed and it is supposed forms the nucleus of the lipoid
known as lecithin. Theoretically this sounds all very well but
it must be admitted by the most credulous that in treating
disease at the bedside with either yeast or nucleic acid it is
difficult to believe that they possess any striking effect for the
toxic processes which they are supposed to combat are often
"cured" by many remedies. It is to be noted, however, that if
yeast be added to a dietary which has caused neuritis, the

(109)
neuritis may disappear and the patient get well. Thus there is a body which prevents or "cures" the neuritis caused by exclusive feeding with certain food stuffs.

The Search for an Active Principle in Life Supporting Food Stuffs and in Yeast.

It is well known that children or primitive people whose whole dietary is restricted to one or two simple food stuffs may suffer severe disease or even death if their food is deficient in or has been totally deprived of some principle normally present. One need only name rickets and scurvy in children exclusively fed on boiled, pasteurised or tinned milk; and polyneuritis just referred to in people living entirely on polished rice. Funk was able to isolate from fresh yeast cells, new milk and rice polishings a body named vitamine which he says cures and prevents the polyneuritis of beri-beri and it contains neither phosphorus, protein nor carbohydrate so that the old view of all vital principles containing phosphoretted nitrogenous compounds needs restatement. It is a pyrimidine base related to thymine and the formula

\[
\begin{align*}
\text{N} & \quad \text{H} \\
\text{C} & \quad \text{O} \\
\text{N} & \quad \text{H}
\end{align*}
\]

\[
\begin{align*}
\text{C} & \quad \text{O} \\
\text{16} & \quad \text{H} \quad \text{18} \quad \text{C} \\
\text{N} & \quad \text{H}
\end{align*}
\]

has been assigned it. It is a constituent of nucleic acid. This work however needs confirmation although it is in accord with clinical experience for in outbreaks of polyneuritis due to beri-beri in which the cause has been the eating of polish-
ed a return to an unpolished rice dietary has stopped the epidemic and has "cured" those not too severely attacked. The experiments may be reversed by feeding animals on food stuffs exhausted of their lipoids by washing with members of the alcohol series.

Moore and others also obtained from yeast a body which cured neuritis and they gave it the formula \( \text{C}_7\text{H}_{17}\text{N}_2\text{O}_5 \), so that the chemistry of the subject is not yet exactly worked out.

**Experiments in Feeding with Food Stuffs exhausted with the Alcohol Series. Importance of the Fat.**

If animals are fed on cereals, milk or other staple lipoid-holding food stuffs which have been repeatedly washed with ether, chloroform or other of the alcohol series they suffer from symptoms of malnutrition and polyneuritis and they finally die if the experiment be continued long enough. If the experiment be stopped before the tissues have become too seriously damaged and if the animal be fed on untreated cereal, milk or other like food or if the ether or chloroform washings be added to the exhausted food and given to the animal there is likewise a rapid return to health. On examination of the ether or chloroform washings they are found to consist of fat largely if not entirely and a combustion differs little or nothing from a similar weight of fat.

This shews the great part which fat plays in the nutrition of the tissues. It has likewise an important function in maintaining intact the protoplasmic emulsion of the cell for on removal of the fat the cell breaks down. This has an
interesting bearing on the subject of haemolysis or laking and on the probable narcotic action of ether, chloroform and the members of the alcohol group generally. Meyer and Overton have suggested that this group owes its narcotic property because it attacks the cells of the higher nerve centres and dissolves the lipoid and they become haemolysed. If this supposition be correct it shows the protective property which non-hydrolysed fats possess in keeping the cell intact. Another property of the fats has already been treated of, namely in protecting a probable ferment present in the cell.

As we have seen from the foregoing statement, deprivation of vital principles of food stuffs may be associated with another pathological condition namely rickets, scurvy and scurvy-rickets. This means that the two preventive agents present in the particular foods are closely associated with or related to each other and to come again to the other repeated supposition - that both are in turn closely associated with fat. To put it in the form of an equation both are united to fat with a double bond.

Antineuritic = Fat = Antiscorbutic.

**Food Stuffs rich in Lipoids.** We have now to consider for our present purpose, the food stuffs which are richest in the vital principles are represented by the lipoids. Man has in some measure decided this for himself for the foods generally known as "nourishing" are especially rich in lipoid. The marrows and more particularly the red bone marrow as Galen in
the first century of the Christian era said "The marrow is a
nourishment most perfectly elaboured by nature". Fresh milk
the "most perfect food" contains the two and as some assert
the only two constituents of cell existence protein and lipoid
and in accurate proportions for the casein is a phosphor-
protein and the cream is a perfect fat.
Yolk of egg one of the richest in organic phosphorus compounds
and fat. The cereals may be named but they differ in the manner
in which the lipoid is distributed in the meal. Oats, barley,
maize and rye have it uniformly divided throughout the ground
meal, while wheat has it nearly all contained in the germ and
hence if the germ has been rejected in the milling it means that
the flour will contain very little lipoid. Today all peoples
are fast becoming wheat-eaters. Plants in general contain more
or less lipoid - turnips, cabbage, cauliflower, potatoes, only
to name a few but in many of them the associated free fat is
only present in minute quantities. Potatoes contain the largest
proportion close to the "skin". A dietary containing a large
proportion of potatoes is often severely criticised but the
consumers often remain in health and vigour. This may be explain-
ed from the circumstance that if a large quantity of carbo-
hydrate is taken there is also a comparatively large proportion
of lipoid taken therewith in addition a quantity of carbo-
hydrate hydrolysing ferment which as we have seen may have
something to do in maintaining health. Then there is the large
range of animal tissues rich in lipoid. While fruits contain
more or less sugars and enzymes which have a beneficial
action on health they have also an appreciable amount of lipoid and free fats. The tissue fats must not be forgotten but they will be dealt with later.

Various Circumstances determining the activity and keeping properties of the Lipoids.

The Lipoids vary greatly in their activity and keeping properties. All deteriorate by keeping, chemical or electrical treatment, and a man living in a bothy during the winter on tea, tinned milk, bacon, white wheaten bread, and summer - salted butter, may develop scurvy by the end of the season. Long cold storage may prove equally dangerous to food stuffs and this has to be kept in mind now that the process has been extended to all foods. (See page 199).

Fruits can be boiled and yet retain their life-supporting qualities for a long time and hence jams have become an important article of food in expeditions which have to be for a long time away from sources of fresh supply (See page 134).

The most important thing is a judicious variety of fresh food. This is exceptionally important in the case of young children and we must emphasise the need for keeping a watch on dried milk preparations.

The well-to-do seldom suffer from malnutrition because their bread is perhaps too thin and their butter too thick. The poor suffer because their bread is too thick and their butter too thin. The latter often consume large quantities of white wheaten bread which taxes the digestive glands unduly and the products of dyspepsia are set free to poison the already over

(114)
strained tissues.

Food Stuffs or Preparations of Food Stuffs employed as Therapeutic Agents.

Yoke of egg, bone marrow, or glycerine extract of the same, extract of malt, preparations of the pancreas, fresh extracts of meat, fats, plain or emulsified with malt pancreatin or both and most important of all cod liver oil either plain or in various combinations with malt pancreatic extract or in emulsion form with egg-yolk and white. Combinations of the various named substances act better than singly. One of the most successful combinations is a mixture of yolk of egg, bone marrow and extract of malt (See Formula) and in Compounds of this class one can obtain a therapeutic agent which will prevent and "cure" the various forms of malnutrition - neutitis, scurvy and loss of fat.

A Review of so-called Active Agents present in Lipoid-Holding Foods and of Built-up Food Stuffs rich in Lipoids.

Within recent years a great stimulus has been given to the manufacture of concentrated extracts of the lipoids and the compound which for some time was considered to contain the essential principle of the life supporting food stuff was named lecithin. It is prepared commercially either from yolk of egg or from germinating seeds, The lecithins for they are many are not exact chemical compounds but they are in essence phosphorated nitrogenous fats. They are present in all tissues animal and vegetable which are in a state of metabolism present in the protoplasm of the cell and also abundantly present in every well-
balanced dietary — good reasons for believing that this lecithin was the real life supporter and all that one had to do was to extract it from the food stuffs which contained it and then to employ it therapeutically and to obtain brilliant results. Experience has not confirmed these preconceived views.

Chemical Composition of Lecithins.

The isolation of the lecithins has done something to teach one the nature of the lipid or of the nature of the most important of the lipoids for lecithin is alone present in the phospholipines. Roughly speaking this lipid when split up resolves into (1) a complex mixture of esters and free alcohols (cholesterol) which do not here concern us (2) Into a mono-ester-glycerophosphoric acid combined with the nitrogenous base choline on the one side and on the other side with a glyceride but the glyceride is not always the same. These constitute lecithin. To put it in another way lecithin is a triglyceride containing two fatty acid radicles and one acid radicle of phosphoric acid. Lecithin is also known as phospholutein and as choline di-stearoglycerophosphate. Lecithin itself in turn splits up into Glycerophosphoric acid, fats (stearic acid) and choline. When lecithin is regenerated in the tissues one begins with glycerophosphoric acid which takes up a fatty acid and the lecithin so formed is united to the protoplasm of the cell. Thus glycerophosphoric acid has come to be called the mother of lecithin. This is probably why glycerophosphoric acid has come to be employed so extensively and in the hope that lecithin might be formed from it and that
it might build up the devitalised tissues. Clinical experience has failed to establish these expectations.

**Glycerophosphoric Acid, Its Salts and Compounds.**

Lecithin has its phosphorus in the form of glycerophosphoric acid and this acid is the chief constituent of the living cell and for this reason its salts and compounds have been extensively employed in treatment. The glycerophosphates of various metals have been mixed with dried casein (phosphoprotein) and extolled for their virtues. Various organic compounds of phosphorus have been prepared from plants – salts of an oxymethylene diphasphoric acid. This may be looked upon as representing the hydroxyl group of a lecithin which instead of being united to choline as in lecithin is here joined to a calcium or other base. It may be regarded as a split up lecithin. The fats are the other constituent of the lecithins and will be considered later.

**Artificially Prepared Food rich in Lecithin.**

Everyone must sympathise with every effort to obtain a food stuff rich in life-supporting properties, clean, portable and not readily decomposable, but we must at the same time watch that in avoiding bacterial infection one does not fall into the error of having a rich compound which becomes devitalised the more it is dried. The dried milk preparations are open to the same objection for although milk fat is added to them it is a dried fat and drying often alters the whole being of food stuffs and in the case of many of them may entirely destroy their life-supporting virtues.
Physiology of the Lipoid-bearing Foods.

The lipoids being crude compounds cannot be so accurately observed as to their physiological action as the lecithins or nucleins but that they have a definite action is sufficiently evident. Their great function is to enable the tissues to make use of the protein with which they are supplied for when lipoids are insufficiently given the tissues themselves are drained of the lipoids they do contain and with this there is a great nitrogenous loss. The nerve tissue suffers most and this is the reason why polyneuritis is so common in deprivation of lipoids. Deprivation of lipoids likewise has a detrimental effect on digestion and in all such conditions there is more or less disorder of the digestive processes. Does this tax on digestion have anything to do with a drain on acid sodium phosphate to furnish hydrochloric acid from sodium chloride? The phosphaturia so often accompanying deprivation of lipoids shows the bearing which phosphorus in some shape or form has in the condition for when an abundance of lipoids are supplied and nutrition again established the phosphaturia ceases. It would appear that the tissue lecithins and nucleins are quite different from the isolated bodies of the same name and that the latter can directly pass into the former. This is proved by the trifling effect which the administration of lecithins and nucleins have on disordered nutrition. The administration of the lipoids in foodstuffs does however profoundly act in this direction tending to shew that the tissues synthetise their own lecithin out of some body or bodies specially supplied by the
lipoids or the lipoid-containing foods.

**Physiological Action of Lecithin.**

It must be admitted that clinical experiments carried out with the lecithins do not give brilliant results. In no case has the writer obtained the successes which he has had with the food stuffs rich in lipoids so that lecithins cannot be said to represent the active agents present in the crude food stuffs. In the process of extraction something vital has been lost or destroyed, and while lecithin may contain the actual vital principle it may have been deprived of something which enables the tissues to use it as such for tissue-lecithin is probably not formed from isolated-lecithin but from some other body or bodies. So that when lecithin is ingested it is broken down and performs no important part in metabolism.

**Glycerophosphoric Acid and the Glycerophosphates.**

When one comes to study the physiological action of the phosphorus-bearing portions of lecithins namely glycerophosphoric acid and its salts, one finds that although theoretically they appear to be the starting point for building up the life supporting principles they give disappointing results. When added to synthetic dietaries they do not support life and clinical experience bears out laboratory experiment and the writer was unable to obtain the results he got from the use of extracts of crude food stuffs in cases of malnutrition.

**Physiology of Mixtures of Casein Milk Fat and Glycerophosphates of Calcium and other like metals.**

Combinations of the above-named have been largely
recommended in the hope that they would in the process of metabolism be formed into tissue-lecithin and hence they have been employed in the treatment of those diseases attended by debility such as phthisis, rickets, neurasthenia. They cannot take the place of the crude food stuffs for the writer made experiments with one of the Compounds for over twelve months and employed no less than 14 pounds weight (6.350 Kgm) in his experiments without obtaining any of the striking results which attended the use of the cod liver oil, yolk of egg, bone marrow and malt preparations.

Fats.

To describe all fats as a part of the lipoid is an anomaly, for most fats not only include lipoids but something more. For example tissue fats may be made up of

1. Fatty acids - saturated and unsaturated.
2. Glycerol and glycerides.
3. Other alcohols and their fatty acids.
4. And phospholipines, galactolipines and the lipines already described -

so that the part would appear to be greater than the whole.

It is only the free, treated fats, neutral fats, expressed fats or prepared fats which can justly be looked upon as being a part of the lipoids examples of which we have in purified olive oil, cod liver oil and purified lard; and even those are not entirely free from a varying admixture of lipoid or combined fat depending upon the age of the fat. It is the possession of this admixture which makes the fats so useful in all cases attended by malnutrition. Enough has been said to show the complex nature of the fats.

(120)
The Fats in General: Composition and Physiological Action.

Before discussing the claim of fats, to possess a definite and special physiological action in nutrition we may be pardoned for giving a short general elementary description of these bodies in order to make clear claims which may be made in favour of fats and oils. They are widely distributed in the animal and vegetable kingdom and are said to be derived from carbohydrates. They occur as neutral glyceryl ethers or triglycerides or neutral oils and fats (for they are known by all three names). Besides these there are the fats which contain more or less fatty acids which have resulted from the neutral fats whereby diglycerides monoglycerides, free fatty acids and glycerol are formed. All fats have associated with them enzymes which appear to play the double part of synthesis and hydrolysis. Rancidity is quite another process and is due to bacteria. Vegetable fats contain phytosterol (or sitosterol) as opposed to the cholesterol of animal fats. By keeping, by chemical or electrical treatment fats may become so changed that they cease to hold nitrogen or phosphorus and with this change their life supporting virtues diminish, although they may still possess a high value as a food stuff. The processes of salting and curing bacon, butter and other fat-containing foods all act in this direction. The sodium chloride potassium nitrate and other salts employed bring about the change.

The vegetable fats are not so rich as the animal fats and for this reason they are probably not so easy of digestion.
but a combination of the two would appear to make a mixture at once easy of digestion cheap and useful as a food stuff and as a preventive of malnutrition (see Page 220).

Margarine is such a mixture and everything should be done to encourage its use amongst the poor who cannot afford butter. Dripping which is a mixture of meat fat, meat juice and if made from fresh meat is a wholesome food and rich in life-supporting substances.

The importance of fat as a food is illustrated by the readiness with which the poor so instinctively turn to cheap fat-containing foods — the herring which either fresh or kippered is so rich in fat (and amines). The unsaturated fatty acids play an important part in checking the great waste of diabetes mellitus and if a diabetic patient is left to himself it will be found that he consumes an enormous amount of fat in his food (See Page 101).

One comes to the most important of all the fats and one which is more extensively employed in the domain of treatment than all the others put together, cod liver oil. To what agent or agents it owes its special action has been for long as much a subject of debate as the composition of the oil. Some have said that a highly hydrolysed oil is of greater therapeutic value than an oil rich in unsaturated fatty acids while others again hold the opposite view, and some even go so far as to say that cod liver oil owes its peculiar therapeutic action entirely to the presence of the unsaturated fatty acids and to the readiness with which they are absorbed. (122)
Some authorities assert that cod liver oil is poor in or almost devoid of lipoid or combined fat while others on the other hand hold that it owes its activity to the fact that it contains a large proportion of lipoid and therefore rich in easily assimilable fat. Williams of Liverpool who has recently re-investigated cod liver oil from the pharmacological and therapeutical standpoint says it contains almost no lipoid (that is combined fat made up of fatty acid and glycerophosphate acid and a compound containing nitrogen and often described as phosphatides) but that it owes its great activity to the circumstance that it is rich in unsaturated fatty acids which are in the state immediately prepared for absorption and for combining with the cell to which it imparts energy. He believes that these unsaturated fatty acids can in the body dissolve the waxy envelope which surrounds the tubercle bacillus. According to his view the best oils are those which have the highest iodine values and the largest proportion of unsaturated fatty acids (they certainly have the least taste and smell).

Whether cod liver oil contains true lipoid is of little moment to the clinician, for observation has abundantly shewn that it is not only itself absorbable but that it also stimulates fat absorption generally, that it checks the rapid and excessive break down of fat which accompanies all debilitating process, that it aids in the utilisation of protein and in the retention of nitrogen. It is thus an ideal food stuff.
Therapeutics.

It is unnecessary to further labour the subject for enough has been said under the heading of physiology and besides the therapeutics can best be considered by detailing a few illustrative cases. It is no new idea to employ food stuffs as therapeutive agents, for a hundred years ago physicians sent patients suffering from wasting due to tuberculosis and other diseases to the Highlands not for fresh air alone but to drink fresh milk, to eat fresh (unsalted) butter and fresh eggs, and many "cures" resulted. Later on cod liver oil was added to the physician's list of curative agents. Today the list has been somewhat extended and the preparations have been made so handy that they can be employed in an extensive circle of those who cannot afford the additional aid of fresh and stimulating air.

This line of treatment finds its most striking results in the case of the poor who cannot obtain food rich in the vital principles.

Choice of a Preparation most useful in the various forms of disease.

One may say that provided there be not severe diarrhoea, cod liver oil either alone or in some of its numerous combinations can be given in every case of malnutrition due to all cases. Even when given by itself it may restore health to the tissues proving that whether or not it contains combined fat it has a wonderful effect as a life supporter. In all diseases accompanied by great wasting it is
our best remedy (see Page 128 and on).

In the malnutrition, marasmus, rickets, scurvy and scurvy-rickets of children the red bone marrow compound often works wonders. The addition of five to ten drops of codliver oil extract to each teaspoonful of the compound appears in many instances to make it more active - the old idea of polypharmacy (see Formula Page 135).

In a dietary lacking in variety there is no food stuff which is so potent in preventing the pathological conditions which would be set up by this lack of variety as a plentiful supply of fresh fat, so that fat is one of the most important foods and therapeutic agents we possess.

Mode of Administration.

The various preparations are most effective when given not exactly with a meal but some little time apart as for example 15 to 30 minutes after food.

Vasomotor Disorders in Children resembling the appearance in Congenital Heart Disease.

A child of two with very deep red (almost purple) colour of the lobes of the ears, lips, cheeks, fingers, toes more especially of the terminal joints, and glazed smooth appearance of the parts with heat, the parts affected being evidently the junction of the venules and arterioles. There was no evident pallor. The child was peevish and not inclined to play, so that there was apparently discomfort in exertion. On looking at the child casually one thought of
congenital heart disease except that there was no breathlessness on movement, but examination by the stethoscope revealed no cardiac mischief. The condition occurred in the early summer and could hardly be said to be associated with cold. Strophanthus and digitalis and general tonics and warm wrapping were tried for six weeks without much benefit, but a month's trial of one-and-a-half teaspoonful of cod liver oil daily in egg emulsion form was followed by great improvement and in three months the condition had completely cleared up.

I have already referred to the beneficial effect of half an ounce of margarine (1/2 grams) added to the daily dietary of children subject to local syncopes and asphyxias of the fingers and toes (severe chilblains).
The favourable results obtained by increasing the fat in the dietary of children subject to chilblains is illustrated in a series of cases given under the section "Importance of Fat in the Dietary" (see pages 94 & 99).

Cod Liver Oil in the Flaccid Palsies due to Polio-Encephalitis.

Case 1. A boy of 12 months who had just commenced to walk was attacked by fever and after the acute condition had passed off it was observed that the left leg was palsied. On examination it was found that the wasting was limited to the peronci and tibialis anticus. He was treated with syrup of the hypophosphites and strychnine, massage and galvanism, but without any return of power in the limb, At the end of eight months he was given half a teaspoonful of cod liver oil in emulsion form three times a day and the limb was rubbed daily
with strong mercurial ointment. By the end of one month the child could move the limb freely and in three months' time he could walk round the room by holding on to chairs and tables and improvement was steadily maintained.

**Case 2.** This case is so striking that no apology is needed for quoting it. A boy of thirteen months who had been walking for two months had the usual febrile attack and on convalescence it was discovered by the medical attendant that the left leg had suffered the usual palsy seen in polio-encephalitis. He was treated in the usual manner by tonics, massage and galvanism, but thirteen months after the attack he had not improved, the limb being helpless and flail-like. He was now put on half a teaspoonful of cod liver oil in emulsion form three times a day and the limb was well massaged once daily with the strong blue ointment. Six weeks after this treatment was commenced he was able to move the limb and in two months he could walk round a chair and in three months he was able to wear a boot and to walk by himself.

**Cod Liver Oil in Atony of the Stomach Walls.**

In a certain number of cases of "dyspepsia" accompanied by dilation of the stomach and splashing it would appear as if the condition was due to malnutrition and starvation of the tissues and the exhibition of an easy assimilable fat like cod liver oil does good.

A man of 38 came to the out-patient department complaining of "indigestion" with wind after meals, great discomfort in the abdomen, constipation and loss of weight which
had lasted over 12 months, He said he could hear the "wind and the water meeting in his inside". Examination proved that he had dilation of the stomach with well-marked splashing. He was prescribed the usual remedies such as laxatives, bismuth, pepsine, and as he said his troubles were much the same under any kind of dietary he was told to take plenty of butter and fat food stuffs. He improved perhaps a little but not much. At the end of six weeks he was ordered half a tablespoonful of cod liver oil in egg emulsion form three times a day and the improvement was so rapid that he put on weight at the rate of one pound (0.454 Kgm) every week and at the end of a month of this treatment he was able to resume his work.

Cod Liver Oil in Diseases of the Chest.

It is however in diseases of the chest in which cod liver oil gives the most brilliant results.

Unresolved Pneumonia - Great increase in weight.

A woman of 36 whose height was 5 feet 2 inches (1575 m.m.) and weight 8 st. 4½ lbs. (52.84 Kgm) came to the outpatient room and said that six months previously she had had pneumonia and had never got completely well. She had lost one stone (6.350 Kgm) in weight and was now short of breath, listless, unable to do her house-work, was troubled with cough and expectoration which was now and then tinged with blood. On examination the front of the chest from the clavicle to the third rib was found to be dull to percussion and on listening with the stethoscope the breathing was bronchial accompanied by soft mucous rales. The sputum was examined for tubercle
bacillus but with a negative result although the skin reaction with old tuberculin was positive.

Comparatively speaking she was well-fed. She was put on one tablespoonful of cod liver oil in egg emulsion form three times a day and in 15 months she had gained 9\frac{1}{2} pounds (4.359 Kgm), the lung had retracted, the bronchial breathing had largely disappeared, no mucous rales could be heard and the expectoration had ceased. The actual weights at different periods were

<table>
<thead>
<tr>
<th></th>
<th>st.</th>
<th>lbs.</th>
<th>Kgm</th>
</tr>
</thead>
<tbody>
<tr>
<td>August</td>
<td>8</td>
<td>4\frac{1}{2}</td>
<td>52.843</td>
</tr>
<tr>
<td>October</td>
<td>8</td>
<td>4\frac{1}{2}</td>
<td>52.843</td>
</tr>
<tr>
<td>December</td>
<td>8</td>
<td>7</td>
<td>53.977</td>
</tr>
<tr>
<td>January</td>
<td>8</td>
<td>7</td>
<td>53.977</td>
</tr>
<tr>
<td>April</td>
<td>8</td>
<td>12</td>
<td>56.245</td>
</tr>
<tr>
<td>May</td>
<td>8</td>
<td>12</td>
<td>56.245</td>
</tr>
<tr>
<td>July</td>
<td>8</td>
<td>11</td>
<td>55.792</td>
</tr>
<tr>
<td>September</td>
<td>8</td>
<td>11</td>
<td>55.792</td>
</tr>
<tr>
<td>October</td>
<td>8</td>
<td>13</td>
<td>56.699</td>
</tr>
<tr>
<td>November</td>
<td>9</td>
<td>0</td>
<td>57.153</td>
</tr>
</tbody>
</table>

Unresolved Pneumonia Cavity in Lung. Drying up under Cod Liver Oil.

In 1908 a girl of ten came to the out-patient department with the history that she had had pneumonia which had never cleared up. There was complaint of great loss of weight, shortness of breath, profuse expectoration of foul smelling mucus, night sweating. Examination showed the usual
signs of a cavity on the left side below the clavicle and the sputum contained the tubercle bacillus in great numbers. She got a fair amount of good food but despite this the loss of weight had been progressive.

At 10¾ years of age her weight was as follows:

<table>
<thead>
<tr>
<th>Date</th>
<th>Kgm</th>
<th>Average Kgm</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 1908</td>
<td>3 st. 9 lbs.</td>
<td>23.13</td>
</tr>
<tr>
<td>October 1908</td>
<td>4 st. 8 lbs.</td>
<td>28.12</td>
</tr>
</tbody>
</table>

She was thus 11 lbs before the average of the British Tables. She was placed on three teaspoonfuls of cod liver oil daily in emulsion form, and the loss of weight was stopped and there was even a gain as the tables show.

<table>
<thead>
<tr>
<th>Date</th>
<th>Kgm</th>
</tr>
</thead>
<tbody>
<tr>
<td>November 1908</td>
<td>3 st. 10 lbs.</td>
</tr>
<tr>
<td>December 1908</td>
<td>3 ½ lbs.</td>
</tr>
<tr>
<td>February 1909</td>
<td>3 st. 11 lbs</td>
</tr>
<tr>
<td>March 1909 (age 11)</td>
<td>3 st. 10½ lbs</td>
</tr>
</tbody>
</table>

The expectoration was now so much lessened and the general health had so much improved that she did not come to the outpatient department for nine months. In January 1910 she again came up complaining of cough although examination showed that the lung had retracted and the condition in general had greatly improved. The oil was again prescribed.

<table>
<thead>
<tr>
<th>Date</th>
<th>Kgm</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 1910</td>
<td>4 st. 1½ lbs.</td>
</tr>
<tr>
<td>March 1910 (aged 12)</td>
<td>4 st. 2 lbs</td>
</tr>
<tr>
<td>April</td>
<td>4 lbs. 3 lbs.</td>
</tr>
<tr>
<td>May</td>
<td>4 lbs. 6 lbs.</td>
</tr>
</tbody>
</table>

At this period she had an opportunity of being sent to a sanatorium where she remained for six months and when she returned home she remained well and started work when she was (130)
13\frac{3}{4} in a cloth factory and remained well for three months. This was in March 1912 when she again appeared complaining of not feeling well and of cough with slight expectoration. The lung condition shewed steady improvement but perhaps some soft rales in the neighbourhood of the retracted lung. She was again placed on cod liver oil and the good effect is apparent from the table.

```
Weight March 1912 (aged 14) = 4 sts. 8 lbs. = 29.03 Kgm
   May 1912      = 4 " 10 " = 29.937 "
   August       = 4. " 11 " = 30.391 "
   Octr.        = 5 " 0 " = 31.751 "
```

She had now again got so well that she was only seen at intervals and had continued her work without intermission. She was not seen from October 1912 till January 1913 during which period she had taken no cod liver oil and said she believed she had got a little thinner and attributed the loss to the circumstance that she had had no oil during the interval.

She was weighed and it was found that she had lost four pounds (1.814 Kgm) The lung condition was satisfactory. There was practically no cough and no expectoration.

The points of importance to note are that cod liver oil is of the highest service amongst the poor who cannot improve their dietary, that it has a beneficial effect on lung conditions lessening the cough, diminishing the expectoration, giving the organism the best chance of ridding itself of an unwelcome guest. Its very marked action in increasing weight is noteworthy. (See also "Importance of Fat in the Dietary".)
In Exophthalmic Goitre Cod Liver oil influence in checking the activity of nitrogenous metabolism and loss of fat present in many cases of this affection and the rapidity with which a thin patient puts on fat after the exhibition of cod liver oil shows that the oil has an action more extensive than could be accounted for by the mere ingestion of so much fat.

Acute Rickets - Action of Preparations made from Food Stuffs rich in Vital Principles.

A baby girl ages 12 months plump and well fed but on closer examination was found to have swollen epiphyses and on handling the muscles were found to be tender. There was a history of intermittent sickness, vomiting, diarrhoea, constipation and general malaise. She had been treated with bismuth, pepsine and general tonics with only partial success. So far as one could gather the feeding of the child had been appropriate to her age except that in the case of many children of her class she had had too much white bread.

Treatment. She was at once put on a teaspoonful of bone marrow, malt extract and yolk of egg mixture three times a day an hour after meals. In six weeks the child was quite well. The epiphyseal swelling had disappeared, and the tenderness in the muscles had gone and the child was able to move about without discomfort and she soon became quite well.

Marasmus, Malnutrition.

It is however in the treatment of cases which are somewhat loosely placed in the list marasmus and malnutrition that the bone marrow compound gives the most striking results. These are the cases which are so often met with in the medical
outpatient departments of our large industrial centres and preparations of the class now under discussion are the only ones which give any measure of success. The efficacy may be increased by adding five drops of cod liver oil to each teaspoonful. The following is a good illustration of the kind of child met with and the success attending treatment.

A baby aged six months was brought up on account of extreme wasting. It weighed only 7 lbs. 4 ozs. (3.36 Kgm). The history was that it had been fed on cow's milk sugar and water and throve well till it was 4½ months old when it had an attack of vomiting and diarrhoea from which it never got well and it wasted rapidly and from being a plump healthy baby lost flesh so that at the time of examination it was no heavier than a new born baby. It had been treated with predigested foods, bismuth and similar remedies but with no success beyond somewhat improving the diarrhoea and sickness, and the tissue waste proceeded.

The child was at once placed on equal parts of cow's milk and warm water sweetened with cane sugar and three times a day it was given one teaspoonful of the bone marrow mixture at times between the bottles. The child improved rapidly and in one month after beginning treatment it had gained two pounds (0.907 Kgm) and presented the appearance of a healthy child.

Other Food Stuffs and Preparations which influence Nutrition and Metabolism less markedly.

Extract of Malt and malted preparations, and preparations made from the digestive glands often increase the body
weight by enabling the tissues to make fuller use of the ingested food stuffs (see ).
In the same way so do carefully prepared jams (see end of this section) so that nutrition may be favourably affected by apparently unimportant articles of diet - an illustration of the value of mixed foods.

**Loss of Weight due to leaving off Malted Liquors.**

A man of 43, height 5 ft. 8½ inches (1740 mm) was in the habit of taking one pint of beer daily to dinner. He gradually increased in weight till he reached 14½ stones (92.215 Kgm) and found this burdensome and it hindered him in his daily work. He was advised to leave off the beer with the result that he gradually lost weight till at the end of 12 months he had lost 21 pounds (9525 Kgm) and at this remained for years much to his personal comfort.

**The Action of Malted Liquors in increasing weight abnormally.**

A man of 46 whose height was 5 ft. 10 ins. (1778 m.m.) and weight 15 st. 7 lbs. (98.430 Kgm) had taken three to four pints of beer every day for years. He had an illness and his beer was stopped off and he lost in weight at the rate of 2 lbs. (0.907 Kgm) every month for four months when the rate stopped and he began to lose half this amount every month for other four months when he was lost sight of. The loss was attended by a great improvement in his sense of well being.

**Action of Jams on Nutrition.**

That freshly prepared jams have a profound action on nutrition and metabolism is borne out by the following experience
A man of 26 whose height was 5 ft. 9 ins. (1753 mm) and whose weight was 9 st. 13 lbs. (63.05 Kg) was never able to increase his weight. He became technical chemist to a large jam factory and took two ounces (56 grams) of the freshly prepared jam every day with the result that in nine months he increased his weight by 1½ stones (9.525 Kg) and maintained this even weight for the three years he was under observation.

The Red Bond Marrow Compounds.

Hardly need description. They should contain not less than ten per cent of bone marrow; the malt extract should be of full diastatic value; they should contain both the yolk and white of egg. Their value is much increased by the addition of cod liver oil and glycerine extract of haemoglobin. This was the mixture employed in the writer's experiments.

Cod Liver Oil Emulsion.

This preparation is most useful when made with yolk of egg. The whites should also be added. When it is desired to add iron to the emulsion the egg white can be employed to form a less albuminate of iron with which the emulsion can be mixed at the time of dispensing. For outpatient departments where economy is a great consideration the following may be employed. Whites of six eggs. Fine granulated sugar 6 ounces. Beat up together then add water to make 18 fluid ounces. Add one fluid ounce of strong perchloride of iron solution, and mix well. Then make up with chloroform water to 40 fluid ounces. This preparation should be exposed to sun light for a day or two in order to allow of the chemical change to take place. It forms a loose compound of iron albuminate.
If the 40 fluid ounces of iron albuminate be mixed with one gallon of cod liver oil emulsion it forms a mixture containing 40 per cent of cod liver oil and each tablespoonful contains equal to 10 fluid minims of solution of perchloride of iron.

The emulsion and albuminate should be kept separate and only mixed at the time of dispensing.

Literature.

1. The Substance from Yeast and certain Food Stuffs. which prevent Polyneuritis -

2. The Function of Lipoids in Vital Processes -
   Vernon, same p. 790.

3. Action of Cod Liver Oil in Phthisis.
   Williams. Same. Page 701.

While ingestion of food has to be considered, there is also another side to the question, equally important from the therapeutic standpoint, and that is the withholding of food or the withholding of certain kinds of food, or the changing from one kind of food to another, in the treatment of certain kinds of disease. One passes over the aspect of the subject which deals with the dietetic treatment of acute disease, for all are agreed today that the less food given in the acute stages of all diseases the better, for one no longer clings to the fetish of "keeping up the strength". The best guide is the patient's own desire. When he longs for solid food, then, in the majority of cases it is wise to give solid food.

The Food of Acute Disease. Liquid food of small caloric value is the food of acute disease, and the patient has today practically settled this for himself. It is generally some form of milk in dilution.

In an epidemic of influenza, extending over six weeks in a certain year, the writer allowed the patients to name what they liked, and in almost every instance milk was the food stuff selected. In another epidemic of the same disease, beef tea or meat extract or solid food was prescribed, and in almost every instance a protest was made with a request that some form of milk be allowed instead.
The value of a fluid diet in acute disease is well illustrated in the case of children, and some figures are quoted to show its utility in the treatment of measles. It is, however, in the treatment of chronic disease that diet may be made to yield its most brilliant therapeutic effects.

The advantages of a Fluid Diet in preventing Chronic Middle Ear Disease in Measles. Note on 177 cases.

Cases of running ears with a greater or less degree of permanent deafness following attacks of measles in children have long been the bane of medical men. Although the poison of the disease is primarily the cause of the dreaded after-effects, it is without doubt aided by the surroundings of the patient, such as hot and badly ventilated rooms, inattention to the secretions of the mouth and nose, and other like unfavourable circumstances. But one very important unfavourable condition is often neglected, and that is inappropriate diet.

Formerly, children suffering from the disease were allowed, or even had forced upon them, all kinds of solid food, particles of which lay in the crypts of the tonsils or around the teeth and gums, and becoming fermented increased the catarrhal condition of the pharynx and naso-pharynx, and this passed on to the eustachian tube and aggravated the condition, and thus greatly endangered the middle ear. Among the poor who cannot be made to pay attention to the hygiene of the
mouth, the danger of chronic middle ear disease is greater than among the well-to-do members of the community. The question then was how to prevent this unfortunate after-effect of the disease amongst the poor. In an epidemic of moderate severity, 177 cases occurring amongst children of the poor, in whom 75 per cent. of them were under five years of age, all or were treated with cold water, aerated water for the first 36 or 48 hours. This was a pleasant form of treatment from the patients' standpoint, for the mothers nearly all told me the children longed for nothing but cold water. By the end of 48 hours the very acute symptoms, such as rhinitis, had subsided, and if the child desired food it was given bread and milk or tea and bread and butter, or some such food. If there was no desire for food it was urged to take some milk and water, or tea with milk or cocoa. In all cases, for one week the mouth was kept as free as possible from particles of food stuffs by draughts of cold water, aerated water, or home made lemonade, according to the tastes of the patient. Besides this line of treatment, the ventilation of the room was carried out as carefully as circumstances permitted, and the skin was sponged two to three times as well as could be done by a mother in her own home, with its many disadvantages from the standpoint of hygiene.
Results.  

Two cases of Middle Ear Diseases.

Out of the 177 cases, three - aged 6, 3 and 2 - had running ears before the onset of the measles, one left after scarlet fever and the other two due to teething, and they were left out of count.

Of the 177, six died all from severe broncho-pneumonia; one was aged two, and the others were all under 18 months: equal to 3.38 per cent. in the 177 cases.

Of the 174 cases (the three cases suffering from the ear trouble before the onset of the measles not being counted) two only developed running ears, equal to 1.14 per cent. One of the cases completely dried up at the end of ten days.

The Therapeutics of Change of Diet with Special Reference to Vegetarian and Purin-free Diets.

In most diseases, change of diet has an important action but particularly in the vague conditions designated by the names dyspepsia and indigestion. A change of air with a change of food or change of cooking the same food will often completely remove an affection which has baffled all medical treatment. A change to a simpler dietary - say if two meats or two animal proteins are taken at dinner then only one should be taken - or animal proteins may have to be cut off entirely. A most
useful dietary is the modified vegetarian, one noted below. A course of two to four weeks of this may cause dyspeptic troubles to cease, and some people, especially those who have hitherto taken a large amount of animal proteins, do well on it for longer periods, although to most people it becomes irksome after a few weeks. Many men who are too corpulent may, on this diet, actually lose weight, although the fat and carbohydrate intake may be larger than under their usual dietary. For those who only have a poor dietary or a dry dietary the better food of a hospital or convalescent home often works equal wonders. Where the food value is sufficient it would seem as if it is the change that does good. In the same manner, chronic rheumatic affections, as evidenced by pains in the joints and muscles, are improved by change in the dietary. A purin-free dietary acts in a similar manner, and its good effect in gout and rheumatism can be explained on the principle of change and not because it is as free as possible from nucleoprotein. It soon becomes so irksome that few can be persuaded to continue it for any great length of time. The writer has patients who have continued its use for years from choice. They have all lost flesh - two to three stones, or 12.70 to 19.00 kilograms, but it is a question if a point had not been reached when all benefit ceased, and on the whole a return to a dietary eaten by the majority of mankind might have done them more good. In the condition known as
periodic headache, sick headache, biliousness or bilious headache, a change in dietary is in many instances successful in warding off attacks or in lengthening the periods of attack. Although it is not the writer's experience that the affection is due to any particular dietary or foodstuff — largely proteid, fatty or carbohydrate, a sufferer who eats largely of proteins may be benefited when he changes to a dietary largely composed of fats and carbohydrates, and the reverse is also often experienced.

Chief Faults of Vegetarian Diet. Its bulk, and the fact that much protein is lost in the Alimentary tract, which in men is too short to deal with large quantities of protein, for vegetable protein is so to speak so firmly locked up that it is difficult to separate from its union with the accompanying carbohydrate. This is probably the explanation of the fact that so many people lose weight and stamina on a vegetarian diet, which contains more than all the needs of hard work.

Another fault is that the great bulk of cellulose present in the diet tends to increase peristalsis so much that the food is hurried down into the sigmoid flexure before absorption has had time to take place.

Still, a modified vegetarian diet is often of great service when employed for a short time, and so to say, as a Therapeutic measure.
Modified Vegetarian Dietary.

Breakfast. Can be selected from the following:-

Porridge and milk, wholemeal bread, butter, marmalade, fresh fruit. If something more elaborate is desired then boiled eggs, scrambled eggs, Swiss eggs or eggs and tomatoes, or spinach and eggs may be added. If eggs disagree the porridge may be supplemented by vegetable pasties, or by tomatoes or mushrooms, baked or scalloped onions, or cooked tomatoes may be taken. The bread too can be varied - toast, milk rolls, oat-cakes, scones.

Marmalade may be varied with stewed fruit, various jams or honey.

Wholemeal bread is apt to disagree with many people and so it should be eaten sparingly at first.

The vegetable pasties referred to above are made with a short crust which contains flour, salt, baking powder, butter and water. The "inside" of the pasty is made of tomatoes cooked potatoes, chopped onion, sugar, pepper, and sauce. A favourite sauce contains milk, celery, peppercorns, salt, cayenne, butter, flour, carrots, onions, and it is flavoured with such herbs as thyme, parsley, bay leaf, and others.

Tea, coffee, cocoa or chocolate.

The other vegetarian beverages replacing these are not very palatable, and if it believed that tea, coffee and cocoa are injurious so are the substitutes drunk by the extreme vegetarian.
Dinner.

1. Lentil, pea, bean, tomato or celery soup.
   Or instead curried vegetables, mushroom pie, vegetable
chicken with bread sauce, potatoes and Brussels sprouts,
or stewed macaroni, celery, potatoes and cabbage.

2. Macaroni cheese, rissoles, or balls made from potatoes,
greens, butter, egg, seasoning and bread crumb.

3. Fruit sponges, junket and cream, fruit puddings, rice,
semolina or other like pudding, fruit custards with or
without fresh fruit.


The difficulty with a vegetarian dietary is to get a substi-
tute for meat. The nearest approach to a real substitute
is macaroni cheese while the others such as balls, pies, or
rissoles are all too much alike, hence dinner is the least
successful of all the meals

Tea.— Ordinary meal.

Supper. A good and appetising supper can be made from stewed
Spanish onion, vegetable Irish stewed, stewed butter beans,
baked potatoes, potato and cauliflower, pie or variously
prepared mushrooms with salad and one of the numerous puddings
with milk, cream, custard and cheese if desired.

Purin— Free Dietary.

The purin-free dietary may be described as a severe
vegetarian dietary with milk and eggs included and tea, coffee
cocoa, the pulses (peas, beans, lentils) and the vegetable
lipoids or combined fats excluded.

(143)
Breakfast. A passable meal can be made from eggs, milk, white bread, butter and fruit, syrup, honey or jam.

Dinner. Is always a difficult meal for the only substitute which at all resembles meat is a dish prepared from cheese and macaroni, but one gets tired of this. Soups may be prepared of all vegetables with the important exception of the pulses already named.

Puddings may be made of apple dumplings, jellies, syrup or jam rolls, pancakes, milk puddings of rice, sago, semolina, tapioca or vermicelli. Here one ends.

Supper. Must be made up from the foregoing list.

To all except the strong-minded it soon becomes so irksome that it has to be given up. What most people appear to miss most is the tea and coffee, and the writer has come to the conclusion that in some way these are almost essential to the needs of our modern life. What the writer finds is that for a fortnight or a month all goes well, but after this the dietary does more harm than good unless the patient of his or her own will chooses to continue. Further it seems to be the experience that in a period of a month it will do as much good as the ordinary individual can expect to derive from it.

Of its utility there cannot be any denial but to derive the greatest good from it it should be given up at once on the patient making complaint and it can be again resumed for a short period when he or she again shows signs of over-loaded cells. The chief virtue of a purin-free dietary is in freeing the tissues from extractives or the products of extractives.
and when continued for a long period its chief apparent effect is to starve the cells.

**Fasting: Its Physiology and the Question of its Therapeutic Value with Illustrations.**

The old belief that life could not for many days be sustained without food has been exploded, for it has been conclusively proved that if water be given life may be sustained for long periods without solid food. Formerly the great aim of the clinician was to keep the strength up by the administration of nourishing food. Today the tendency is to go to the opposite extreme and to withhold food for too long a time in acute disease; and indeed an extreme school has arisen and faddists are met with who find in prolonged fasting a cure for all diseases and who look upon the ingestion of food or of large quantities of food and the accumulation of waste products in the tissues as the cause of all diseases. As in most other extreme views there is an element of truth in them. The truth and the error will appear as one considers the physiology of the process. One can understand the idea running through the mind of the clinician who only looks at the subject from one of its sides namely the organism as a machine whose mechanism is clogged up with waste products which are to be washed away by a liberal supply of fluids. But it is a machine that has to be fed while it is being purged and if it is not supplied from without it will draw upon the store within and waste products still appear and of a more dangerous nature.

(145)
The Physiology of Fasting. In children fasting is attended with more disastrous effects than in the Adult for the young tissues waste in greater proportion than could merely be accounted for by the mere withholding of food and in a child the process remains for a much shorter time as a simple physiological act. The writer has made observations in the case of thirty children who from one cause or another were unable to take any food for the period of 48 hours and in every one of the cases acidosis developed after this time - idiopathic acidosis being excluded. This shows that there is a great danger in keeping children from all food in cases of operation. In adults on the other hand acidosis does not often appear to take place before a period of seven days' entire deprivation of food. In fasting anaemia occurs readily proving the danger of fasting enforced or voluntary. Every now and then in a case of fasting great showers of urates appear in the urine showing that fasting does not alter the bias of the tissue nor "break a vicious circle" nor will it eliminate waste products so-called. It may probably accentuate the vicious circle and lead to the break-down of fats and proteins and so cause acidosis and further the alimentary canal is deprived of the wholesome stimulus of ingested food and this salutary influence tends to retain rather than to eliminate waste products.

Does Fasting possess a Therapeutic value?

Before trying to find out if fasting possesses a curative value it will be necessary to determine the limits of physiological fasting and this can only be arrived at by a
consideration of several points. (1) The length of time taken for a meal to reach the sigmoid flexure, that is the point of the alimentary tract where all absorption of food stuffs ceases. This can be done by giving a bismuth meal and examining its passage along the tract. It is found that in the normal person the sigmoid flexure is reached in 24 hours at latest. If the bowels are moved at the end of this time practically the whole of the unabsorbed and unabsorbable parts of the meal will have passed out of the alimentary tract. A trace may remain for 48 or even for 72 hours in some persons. Provided no food has been given after this bismuth meal the patient will feel the pangs of hunger at the end of 24 hours and this sensation will continue for 24 hours after which it ceases. This is exactly the experience of those who voluntarily fast - at the end of two days all longing for food ceases and they no longer experience the torments of an empty stomach. This means that the vital centres have now formed a new source of nourishment or in other words a "vicious circle" has been established - showing that the tissues themselves have begun to be drawn upon.

The deduction which one draws is that absolute fasting as a remedy ceases in two days' time. Within this period it may have a useful action in giving rest to the alimentary tract and its glands, as witness the aborting of a "bilious attack" by a 24 hours' absolute fast or the "cure" of an acute dyspepsia by a like period of abstinence from food but there is no sound physiological basis for the prolonges fasts prescribed by certain physicians.
Illustrative Cases.

One needs but mention the experience of every physician who has seen many cases of biliousness after the vomiting stage has been well passed, say after a period of 24 hours. If no food be taken for another 24 hours the tongue may remain clean and the breath sweet but not for much longer. Now and again one meets with a patient who wishes to be more than ordinarily careful and the fast is continued with the common result that the tongue becomes coated and the breath foul, or a mild state of acidosis may be set up.

Notes on a Thirty Days' Fast.

The record published under the above title is instructive and is illustrative of many of the points mentioned in the foregoing statements. Mr. F. Penny, M.R.C.S., undertook a fast when he was 46 and weighed 10 stones 3 lbs. (64.864 Kgm). He wished to discover if the accumulation of waste products and unnecessary material in the system were the real causes of disease and whether a prolonged fast is a sound method of elimination and as such conducive to bettered health. Up to the sixteenth day of the fast nothing was taken except distilled water. At this period a little sodium chloride in the shape of table salt (amount not stated) was added to the distilled water. He passed the time in reading, conversation and regulated exercise. Twelve to fourteen hours were passed in bed every day with the windows wide open. He walked 3½ miles and cycled 5½ miles daily. He felt no hunger after the second day. He lost in weight one pound (0.454 Kgm) daily. The temperature
as taken in the rectum fell to 95.4° F (35.2° C) and to 94° F (34.4° C) in the mouth. The pulse had a tendency to rise as the fast proceeded. The specific gravity of the urine fell from 1.022 to 1.008. The urine remained acid and clear till the twenty-second day of the fast after which there was a deposit of urates and uric acid crystals. He had been subject to these bouts for years when living on a mixed diet. The bowels only acted by enemata. All through the fast the tongue was coated and the breath offensive. During the last eight days he had no inclination for exertion of any kind. He felt he could not continue the fast for more than 30 days.

Summary:

Prolonged absolute fasting is not a therapeutic measure. The therapeutic value of fasting ceases as soon as the alimentary tract is empty. This period ceases at the end of 48 hours or a little longer in adults and earlier in children.

The coated tongue, foul breath, cessation of the pangs of hunger, acidosis, all point to the termination of the period of "physiological fasting".

How long can a man fast? And some Notable Cases of Fasting.

Mr. Penny it will be noted tells us in his interesting account of his 30 days' fast that this was his limit, and this would appear to be not far from the limit of man's endurance.

Pliny mentions the case of a man who voluntarily fasted for eleven days and this was at the time thought to be something wonderful.
Buchanan tells of a man John Scot who having been "overthrown in a law suit" and having no money to pay sought sanctuary in Holyrood House and remained some days without eating or drinking. When the matter was related to the King he commanded that the man's apparel should be changed and searched and he be kept as a prisoner in Edinburgh Castle and bread and water laid before him every day. Scot refused to take food and continued this for 32 days. Thereafter he was exhibited as a curiosity. He went to Rome and was imprisoned by Pope Clement but proved to his Holiness' satisfaction that he could fast for the period asserted. Later on Scot visited Venice and there showed his ability to fast for the usual period.

For long these statements were discredited and it is only within the past twenty years that the scientific mind has actually realised and accepted it as proved that one can exist without food for so long a time as 30 days. Since John Scot's day many exhibitions of fasting have been held and it has been shown that if water or aerated water be given, life can be sustained for 40 days. Some have gone on for 42 days, but this is evidently near the extreme limit and few can endure the privation for more than 40 days while doing a certain amount of work.

All medical men have had experience of patients who while confined to bed have had no solid food for 30, 40 or even 60 days, but in former years at least some form of alcoholic beverage has been added to the water or aerated or an attempt has been made to feed by the rectum and the
alcohol or the rectal feeding has been credited with keeping the patient alive. It is doubtful however how much either the one or the other has had to do with keeping the patient alive. In other cases alcohol has been absolutely refused and although the patient has had almost no physical exercise there has been what is even more devitalising namely the disease from which he or she has been suffering. It is curious that it was not earlier recognised that life could be maintained for very long periods on cold water alone.

More wonderful records of the faculty of endurance of the animal tissues are to be found in the stories of travellers who have gone for many days without food under the trial of great physical toil. A.H. Savage Landor tells us that he and his two Brazilian companions in their eighteen months' journey across South America had to wander for sixteen days without any food beyond plenty of good water. His words are: "When I left Rio in March last year (1911), I took enough provisions to last for a year, but owing to wastage on the part of my men and loss, these eventually gave out, and towards the end of that part of the expedition through the unexplored portion of Brazil we remained for sixteen days without a morsel of anything to eat. Happily there was plenty of water, but there was no game, no fruit, no fish, and no inhabitants, and neither my men nor myself had sufficient food to cover a sixpence. Our experiences were terrible and it was one of the most tragic marches I have ever had. At this time I had with me two carriers - my only companions - and they suffered even more than I did. Both wanted to put an end to
their sufferings, and it was only with difficulty that I prevented them from committing suicide. For myself, although accustomed to roughing it, I nearly died. Starvation brought on anaemia, which was succeeded by beri-beri in the right leg, causing atrophy of two toes. Eventually we came through, but in a terrible plight. I lost fifty pounds in weight.

Literature.

1. Pliny. Natural History.
5. Landor A.H. Savage. Eighteen months' "Wanderings across America".

The Question of the Baneful Effects of certain Common Foods.

A constant cry amongst us is that one or other of our staple foods causes alarming symptoms of this or that disease. One time it is tea, another time it is meat, wheaten flour or some particular preparation of a food. The cry is generally founded on the experience gained by the study of one or two isolated cases. In the following notes the writer has made a study of such numbers of cases as may at least be reckoned upon as likely to give something like definite results. The food commonly consumed by the majority of the people has alone been passed under review.
The Beverages of the Artizan Classes. Tea - Coffee - Cocoa.

The Question of their baneful action.

(1) Amongst outdoor Labourers who carry their meals, 100 Cases.

It is often stated by authorities that tea is productive of dyspepsia and functional heart troubles amongst this class who drink large quantities of the beverage. In order to prove or disprove the statement 100 outdoor workers such as bricklayers, road workers, and others, were from time to time under review. These men on the average drink from three to three-and-a-half pints daily (about two litres) on working days. They generally have half a pint before going out in the morning, a pint at 8 o'clock breakfast, another pint at mid-day dinner and a third at tea-time when they get home. Generally speaking it is not made strong, consisting of about one drachm (2 grams) of dry tea, $\frac{1}{4}$ to $\frac{1}{2}$ an ounce (7 to 14 grams) of sugar and a tablespoonful to two tablespoonfuls of milk to each pint. Sometimes condensed milk is employed instead of fresh milk. Now-a-days the beverage is freshly made for each meal opportunities being generally provided for doing so. Occasionally the men have to drink a heated-up beverage. The men may often have only bread and butter or margarine but may have bread and bacon or ham or fried egg, and occasionally men have fried steak or chop. They food is dry as they put it and they say this is the reason why they require so much fluid.

When asked why they take tea they generally answer that they prefer it to coffee, cocoa, milk or beer. They nearly all assert that as a beverage having to be taken year in and year
out none is so refreshing and that it is the only one that does not pall. Coffee they said had a peculiar taste, cocoa was tasteless, and beer they only liked (those who were not teetotalers) when they had leisure to enjoy it as on Sundays when they had a proper dinner.

The impression left on the writer's mind was that beer was only taken when they wanted to experience some peculiar sensation.

Untoward Effects attributable to the Tea.

In three per cent of the cases dyspepsia with "wind" was a troublesome symptom but the sufferers had very bad teeth and this circumstance may have had something to do with the trouble. Four per cent complained of "heaviness" in the region of the stomach. Ten per cent complained of severe constipation why they attributed to the "dryness" of their dietary and to getting too little vegetable food. To correct this they took a dose of Epsom salt at the end of the week and they said this was a common practice amongst their fellows. When pressed one or two of the men complained of "fluttering" in the region of the heart now and then but rapid heart action was not a prominent symptom. Altogether one felt that tea was a blessing to these men.

(2) A Study of 100 Families drinking large quantities of Tea.

These families belonged to the poor classes who generally had just enough food or even barely enough. They were often the wives and children of out-door workers who did not get home to dinner, or the head of the house was a widow who went out to work with children at school so that no one was at home to prepare dinner, and they had to get what could be most readily and
quickly placed on the table. In other cases they were lazy thriftless or ignorant people who did not know how to make the most of their means. In all the families a woman was at the head of the household. All drank tea - at all the meals.

**Deleterious Effects due to Tea.**

Five per cent of the women made complaint of being full of wind after certain meals, or of a "load" at the pit of the stomach. None of the children had any symptoms of dyspepsia. Five per cent had "fluttering" at the heart. Constipation appeared to be more common than usual. In no instance could any prominent deleterious action be laid to the charge of tea alone. The strength of the beverage drunk was much the same as amongst out-door workers.

As in the case of outdoor workers when questioned as to why they took tea and not beer, coffee or cocoa, the answers were all in the same strain. Tea for some hidden reason had taken hold of them: in short it was the beverage which suited them best.

These people who eat substantial meals with the tea do not suffer any ill effects from it. On the other hand nervous men and women who indulge in several "afternoon teas" daily do have palpitation and dyspeptic symptoms in many cases.

**Choice of a Beverage for the British Climate.**

The writer's experience in the matter of tea among artisans leads him to believe that their instincts and inclinations teach them aright, and he is convinced that it is better that they drink tea than the very light beers so often advocated.
by those who have observed the drinking customs of the Continent. This view was endorsed in some measure by an experience met with among German visitors. During the year 1911 (tropically warm) over one hundred German working men paid a visit to some of the important English towns in one of the summer months. The writer had the privilege of mixing with these men and he was struck with the remark of one of the leaders of the party a learned professor of mathematics who in talking of the heat and the thirst said that during the first two days of the tour he constantly heard the exclamations Ach Gott: ein Glas Bier! but after the men experienced the refreshing qualities of the tea and soda water he heard no such remarks.

The inhabitants of the British Isles are a tea consuming people as may be seen from a comparison of the relative amounts used of the three xanthine beverages.

Tea 6.48 pounds a head yearly - 1910
Cocoa 1.61 " " " " "
Coffee 0.62 " " " " "

Cocoa includes raw and prepared products.

Flour - Standard Flour.

From time to time the cry is raised that the decay of our nation is at hand and that this is due to the circumstance that we now eat fine wheaten flour instead of the less fine wholewheat meal of the days of our forefathers. The fine flour of today contains only 70 to 73 per cent of the wheat grain and consists almost entirely of the endosperm or kernel. This result has been brought about by the gradual adoption of improved
means of milling. Iron rollers are now universally employed and these rather crush than grind the grain so that the products of milling are separated into portions of (1) the germ or embryo (2) the semolina which is removed from the central portion of hard grain and is rich in gluten (3) the bran and (4) the endosperm. The first three are rejected as offal and the fourth is as already said, the fine flour of today. The germ contains a large amount of phosphorus nitrogen and the semolina contains a large amount of gluten; and the bran is made up of cellulose and silica. The old method of stone milling ground the wheat more evenly so that the product was very largely a mixture of all four portions mentioned above—the coarse gross particles alone being rejected. The stone ground flour was darker than the roller crushed flour and the product was something like an 80 per cent flour. The extra 10 or 7 per cent was however very largely not made up of substances useful in building up the tissues for the stone ground wheat contained much more moisture than a white flour and in addition dirt and adulteration of various kinds might be included, such as rye, peas, beans, spelt, grass, oats, ground stone, vetches, barley, maize. The darker colour of the wholemeal making detection of added substances difficult without expert knowledge.

Aim of the Advocates of Standard Flour. - Its effect.

The aim of the advocates of the eating of standard flour that is 80 per cent flour although laudable in intention is perhaps
not so wise in act as would on first consideration appear to be. Let us shortly examine the question from the economic standpoint. The germ is only three per cent of the whole grain so that its rejection is a small part of the whole. The semolina is also a small portion and the same applies to the cellulose and besides it is non-nutritious. Thus the buyer of Standard flour does not relatively get so good value for the money expended as does the buyer of fine white flour. Another consideration must not be lost sight of, namely that the retention of the germ is apt to produce a flour less pleasant to the palate especially when its fat becomes rancid. The absence of the germ can be made good by the eating of substitutes such as butter, oatmeal, and by the many organic phosphorus compounds contained in a well-balanced dietary of today. The numerous vegetables and jams supply the cellulose removed in the bran (see experiments on feeding with standard bread Page 65 and 155).


Meat-eating and Septic Wounds.

Meat-eating and Gout. Gout is perhaps commoner in England than in any other country in the world and it affects not the rich alone but all sections in the community as can be discovered from a study of the medical records of the charitable institutions of the country. Out of every 10000 admissions to
George's Hospital, London - 210 suffered in some shape or form from distinctive gout, while in the Munich hospitals (a great beer drinking community) only 24 suffer and in Paris (a wine drinking town) only one out of 10,000 is gouty. Objection may be taken to the inclusion of the figures from St. George's Hospital because it stands in that part of London which draws a large proportion of its inpatients from the class of butlers, gentlemen's servants and other servants of well-to-do people, and a class given to the consumption of large quantities of meat. That this is not a unique experience may be shown from charitable institutions whose patients are entirely of the artisan class. Out of 22,512 patients visited at their own homes by the resident medical officers of the Leeds Public Dispensary no less than 107 were found to be suffering from gout of one or more joints, that is 1 in 210. There is thus good reason for the view that the eating of large quantities of meat does conduce to this important disease.

The English people have been for centuries large consumers of meat, as compared with other Europeans. Constantly in the reports of Ambassadors from other states from the eleventh century onwards one reads that they were astonished at the large quantities of meat which were consumed at the feasts of English Kings. The Ancient Britons were a frugal people, but the Saxons were great eaters, and as early as the Norman Conquest a Saxon Squire's dinner consisted of pork dressed in various ways, with venison, hares, and perhaps goat's flesh. This they washed down with morat, a beverage made from honey and flavoured
with mulberry juice. Some of them who had a finer taste drunk pigment, a sweet rich liquor composed of highly spiced wines sweetened with honey. All drank ale and meat. Wheaten bread was eaten even at this early date. Thus the dietary of the Saxon was highly concentrated and especially rich in protein. The retainers were in these days plentifully supplied with meat as well as their masters. Here then were the "elements" out of which Gout might easily be built up. That the dietary was rich and evidently productive of disease may be gathered from the circumstance that the Knight Templars who after the Conquest had made their headquarters at Templenewsam were forbidden by their prior to eat meat more than three times a week and the other three days they had to subsist on pottage, roots and gruel. Water was their drink. The Normans were not quite so gross eaters as the people whom they conquered and they helped to modify the dietary of the country but even with this modification meat was consumed in too great quantities and down to the XIXth Century the English Squire was noted for his dinners: as may be gathered from the following account of a foxhunter's dinner of 1800.

First - Salmon and a quarter of lamb flanked with every vegetable in season.

Second - A goose, a ham, and a leash of chickens flanked as above.

Third - A couple of ducks, with green peas; turkey poults and three hunting puddings.

Cheese - Alfreton, York, Colwick & Stilton.

Lastly - three bottles of port to each man.
Other Food Stuffs contributing to Gout.- Wheat, Fermented Drinks.

Meat is not the only factor determining the presence of Gout in the English race, for other large meat-eating peoples have not suffered from Gout to the same degree. As hinted the selection of wheat as the staple cereal - a cereal causing a great tax on the digestive glands has had something to do with the disease. And the Englishman's favourite beverage, ale or beer has had much to do with making him a gouty animal.

Butchers and Gout. One may approach the question from another side and ask if butchers who are notoriously large meat eaters - having meat sometimes as many as four times a day and are in addition more given to the use of alcohol than others in the same social scale - if they suffer more from gout than other members of the community. Observations carried on for a period of years amongst 100 killers, buyers, sellers and others in the wholesale trade who had been so engaged all their lives showed that five per cent had period attacks of gout of the various joints. Observations among a like number of men who had not the opportunity of eating large quantities of meat showed not more than half per cent could be said to suffer from the disease and this is borne out by the figures already quoted in hospital practice.

The Incidence of Gout in England and Scotland.

One is always tempted to compare England and Scotland as to their relative rate of incidence of Gout. For many centuries oats have been grown in Scotland and oatmeal the
staple cereal. Meat was not much eaten up to the Union of the Crowns (1603) and indeed long afterwards for although cattle were largely raised they were exported to England. Wheat was not widely employed as a food till the XIXth Century. As late as 1660 wheaten bread was only eaten at holiday times even in the most prosperous parts of Scotland. Wheat could only be grown in certain favoured parts of the country such as in the South Midlands, and in small parts of Aberdeenshire, Banffshire, Ross-shire, Morayshire. The following will give something like a correct estimate of the relative quantities of cereals used in Scotland in the XVIth Century. In an account of the revenues of the Priory of Pluscardine, Morayshire, of the year 1563, these are set down as 17 bushels of wheat, 272 of barley and 280 of oats. The question of alcohol as a factor does not appear in Scottish life to any great extent till well on in the XVIIIth Century. Up to this time very small beer or ale was the drink. (See Literature).

In certain parts of the Highlands and Islands of Scotland the natives hardly grew any cereal till the beginning of the XIXth century and they lived on meat and fish almost exclusively and drank a very weak alcoholic beverage made from heather. They did not suffer from gout but from an eczematic condition of the skin which the introduction of the potato and the increasing production of oatmeal completely removed.

Meat-Eating and the Arterial Blood Pressure.

There is a prevailing belief that more than moderate-eating conduces to high arterial pressure but as far as the River
Rocci manometer registers this is not borne out by experiment for if ten men be taken from a large meat-eating community such

LEWIS'S BLOOD PRESSURE AND PULSE CHART.

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>290</td>
</tr>
<tr>
<td></td>
<td>280</td>
</tr>
<tr>
<td></td>
<td>270</td>
</tr>
<tr>
<td></td>
<td>260</td>
</tr>
<tr>
<td></td>
<td>250</td>
</tr>
<tr>
<td></td>
<td>240</td>
</tr>
<tr>
<td></td>
<td>230</td>
</tr>
<tr>
<td></td>
<td>220</td>
</tr>
<tr>
<td></td>
<td>210</td>
</tr>
<tr>
<td></td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>190</td>
</tr>
<tr>
<td></td>
<td>180</td>
</tr>
<tr>
<td></td>
<td>170</td>
</tr>
<tr>
<td></td>
<td>160</td>
</tr>
<tr>
<td></td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>140</td>
</tr>
<tr>
<td></td>
<td>130</td>
</tr>
<tr>
<td></td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>110</td>
</tr>
<tr>
<td></td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>30</td>
</tr>
</tbody>
</table>

Fig. 6. Chart showing the arterial systolic pressure of great meat eaters as compared with the general public (Kidney disease excluded). The readings are practically uniform in both.
Rocci manometer registers this is not borne out by experiment for if ten men be taken from a large meat-eating community such as butchers and ten men from the same social grade (Kidney disease being excluded in both sets of observations) the results are almost alike as may be seen from the charts.

Meat-Eating and Rheumatism.

It would appear however that butchers do suffer in great measure from the indefinite condition called by the names chronic rheumatism, muscular rheumatism, lumbago, sciatica, and of 100 men under review close on fifty percent of them complained of one or more of these as against 20 per cent out of the same number of general workers. The general surroundings of the work of the butcher such as moisture, lifting "sides" of beef may have had to do with the onset of the affection but on the other hand it was always remarked that when the patients were placed on a reduced meat dietary or when meat was stopped altogether the men always improved or even lost their rheumatism.

Other Diseases specially prevalent among large Meat-Eaters.

Septic Wounds, Liver Diseases.

Butchers suffer more from poisoned wounds than do joiners, plumbers, iron workers, or others equally exposed to wounds and scratches. The wounds and scratches in the latter heal up readily without so often producing lymphatic infection. Butchers were found to be the subjects of liver affections or other evident disorders of metabolism.

Meat-Eating and Cancer.

This is such a large subject and one so difficult of considering in an unbiased spirit that it is dealt with in some detail.

If one takes the mean annual percentage increase of population in England and Wales and Scotland and reads it in connection with the mean annual percentage increase of cancer rates for an equal period of ten years it would at first sight appear as if the cancer rate had increased at a faster rate than the population rate. This is not the case for if one takes the years 1896 - 1901 the annual increase of population was 1.10 per cent and the cancer rate was 2.41 and meat eating had increased 60 per cent. For the period 1901 - 1905 the population rate was 1.10; the cancer rate 1.65 and the increase in meat eating 70 per cent.

These are enormous increases in the use of meat and if its consumption had much or anything to do with cancer there should have been as great or even greater increase of the cancer rates in the years 1901 - 1905 as in the years 1896 - 1901 for more meat was eaten in the years 1901 - 1905 than in the years 1896 - 1901.

Two other arguments tell against the meat theory of cancer. (1) Cancer is not more prevalent amongst the well-to-do than it is among the poor and the former eat twice as much meat as the latter.

(2) Butchers who eat very large amounts of meat do not suffer more from cancer than do the general community and yet they eat, as we have seen, meat sometimes four times a day and in large quantities. Again cancer of the hands is not a common disease in butchers as is cancer of the hands in paraffin workers.
Fig. 7. Shows annual percentage increase in rate of population in cancer incidence and in rate of meat eating from years 1896 to 1905. It will be observed that they bear no intimate relationship to one another.
**Diagram showing Weekly Consumption of Meat.**

<table>
<thead>
<tr>
<th>Social Grade</th>
<th>Weekly Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labourers</td>
<td>1.65 lbs.</td>
</tr>
<tr>
<td>Artizans</td>
<td>2.06 lbs.</td>
</tr>
<tr>
<td>Lower Middle Classes</td>
<td>2.35 lbs.</td>
</tr>
<tr>
<td>Middle Classes</td>
<td>3.50 lbs.</td>
</tr>
<tr>
<td>Upper Classes</td>
<td>5.77 lbs.</td>
</tr>
</tbody>
</table>

Fig. 8. Diagram showing the amount of meat consumed weekly by the various social grades.
on the part of man and what did or would grow was always suitable for the maintenance of life and health. Hence wheat grew readily over the rich soil of England, oats grew in the poorer soil of Scotland, rye grew luxuriantly in Scandanavia and northern Germany and in large parts of France, and so it became the staple cereal of these peoples. Maize, a native of America, was largely employed on that continent. Rice the cereal of Japan, India, China, has an importance in these countries greater than all the other known cereals put together. The cultivation, use and effects of each cereal followed the lines of least resistance and hence each people that ate exclusively of any particular one suffered from certain diseases. In time, however, people found by experiment that many gross natural disadvantages could be overcome and it was discovered that wheat could be grown in many countries to which it was hitherto unknown, that maize could grow in many parts of eastern Europe, that oats flourished in the New World and that the range of cultivation of rice could be extended, and so on. In this way the diseases directly or indirectly connected with a particular cereal extended its range. Rice has come to be one of the most extensively eaten cereal and so the particular disease associated with it has invaded the temperate zone of the British Isles. Wheat which has been called the King of Cereals, is now invading every country in the world owing to the rapid means of transit and the increasing wealth of almost every nation.
England and Wheat.

Wheat then from an early date became the cereal of England. The ease with which it could be made into bread, its sustaining properties as a food, its pleasant taste and flavour, its freedom from attack of smut, ergot and insect, and its pleasant colour all recommended it to the practical English mind. Year by year improved forms of milling produced a flour pleasant-er and pleasanter to the eye and the palate. Despite the many advantages of wheat England has to some extent been unfortunate in its selection of a cereal as a food stuff for young children because wheat has its phosphorus content almost exclusively confined to the germ and parts which are removed and thrown away. The germ is apt to ferment and its fat may become ran-cid and so give to the contained flour a disagreeable flavour and hence its removal. Added to this oatmeal has come to be less and less used so that the English child unless it had a varied diet was and is ever in danger of living on a cereal which has been deprived of those amino-acid groupings which are only set into activity by the enzymes of the protein of the flour. The child is in danger of having its tissues starved in the midst of plenty - the protein is there but it can not be unlocked. The result was more particularly in the past that the poor who were largely confined to a diet of this denaturalised wheat suffered from rickets, scurvy and scurvy-rickets and the condition was recognised by physicians. To add to the difficulty fresh fats were not obtainable by the poor especially in winter and so the tendency to rickets was increased. Fat bacon was
generally to be had but at the end of a long winter it has lost its freshness and its lipoids, and therefore lacked activity. Rickets was thus so common by the time of Francis Glesson (1597) that he was able to describe the disease and since his day it has been so intimately associated with the life of England that it has come to be called "the English Disease".

There is something to be said on the other side, however, for if England has acquired rickets it has not suffered to any extent from ergotism so long the pest of countries using rye as its staple cereal. Only three small epidemics of ergotism are recorded in England. One in 1110, another in 1128-29, and both are now regarded as unauthentic. They were both probably small localised epidemics of scurvy, for scurvy and mild ergotism have often been confounded. The third and only genuine epidemic occurred in 1676 at Wattisham in Suffolk when a peasant, his wife and six children suffered from a moderate and mixed type of ergotism due to the eating of ergotised wheat.

From our standpoint this freedom from ergotism has had a most important bearing on the comparative absence and mildness of certain diseases in England.

Scotland and Oatmeal and Barley.

For many centuries oatmeal was in Scotland the staple cereal. In some districts was largely mixed with barley but over the greater part of the country oatmeal alone was used. Although inferior to wheat in many ways it is on the whole
better than wheat if a people is to be fed on a dietary largely made up of one or other of those cereals and especially where the tendency to milling becomes finer and finer, and for the reasons (1) that oatmeal contains more fat (2) its phosphorus content is largely distributed throughout the meal and hence removal of the germ does not as in the case of wheat deprive it of its lipoid constituent. Barley although containing no more fat than wheat has the same advantages as oatmeal in regard to its distributed phosphorus content. The possession of this property in both oatmeal and barley means that the proteins and starch are perhaps more advantageously used up by the tissues than are the proteins and starch in an almost purely wheat dietary. Further the presence and wide distribution of this phosphorus constituent has a highly beneficial action in the young child by stimulating the various glands and so helping them to resist the inroad and attack of microorganism and may account for the comparative absence of rickets in former years in a country whose inhabitants were to some extent poorly fed.

France, Germany, Switzerland, Scandinavia, and Ergotism.

The inhabitants of the above countries by instinct found a cereal growing readily in their midst which had a gluten content next to wheat, capable of being made into a good bread, highly nutritious, easy of digestion, and especially suitable for feeding the young child because it contained an almost evenly distributed phosphorus compound which stimulated the tissues of the young child and favoured their health and growth.
Rickets for this reason in great part was almost unknown when rye was the staple food of these countries. But the choice of rye was attended by an accidental evil of the greatest magnitude to more particularly France and Germany. Rye became infected with the ergot fungus *Claviceps purpurea* Tulasne and by its action on the blood vessels produced either the gangrenous or the convulsive form of ergotism the former being the commoner. These occurred in epidemics spreading over large areas and often killing and maiming hundreds and even thousands of people. Epidemics are recorded as early as 591 A.D. and recurred down to recent years. Not less than forty are described in French history and all with one exception were of the gangrenous type. Not less than thirty-five epidemics took place in Germany, thirty of them being of the convulsive and five of the gangrenous type. A small number of visitations occurred in Switzerland, Scandanavia, Russia and Holland. Leaving out of account all the countries except France and Germany one stops and enquires if these epidemics had a far-reaching effect on the present-day prevailing diseases in the two countries named. Did the numerous epidemics of ergotism stamp the fine blood vessels with a permanent pathological bias or susceptibility to disease? Perhaps it did. Ergotism has disappeared from both France and Germany but the peoples of both countries are much more susceptible to diseases of the nervous system than the English people. Is the ergotism of former centuries the cause?
Spain, Italy, Roumania, Corfu, United States of America — and Maize.

Indian-corn or maize on being introduced into Europe was received with favour in such countries as Spain, Italy, Southern France and Eastern Europe. About 1730 there was first noticed among the maize eaters certain morbid conditions of the skin, mucous membranes of the alimentary tract and of the cerebro-spinal system. A like disease was in time met with in the maize eating districts of Italy, France, and the other countries just named. The view was advanced that this pellagra or mal de la rosa or mal roxo was a toxic process comparable to ergotism and directly or indirectly due to the eating of damaged maize. The disease is still common and within recent years it has made itself manifest in the United States of America. Here again is an example of the great battle that man has to wage till he has conquered all the dangers of his staple food supply. Maize may not be directly the offending agent in pellagra as some authorities assert but all are agreed that it is at least indirectly connected with the disease and to all intents and purposes that is the same thing, Italy and the Macaroni Habit.

Macaroni is not a cereal but is the glutinous product of a hard wheat. It is so associated with the life of the Italian that he carries his macaroni habit with him to other countries in which he makes his home, with the result that in many of the countries to which he emigrates macaroni
is a food altogether inadequate to the calls of the tissues under the new conditions of life and the poor man suffers in health. Extreme debility and inability to do the daily round result and he falls out of the race.

**Rice and Beri-Beri.**

Countries like Japan, China, India, whose staple cereal is rice have suffered and continue to suffer from outbreaks of this disease directly or indirectly due to the removal of the phosphorus containing cortex of the rice.

**The Action of Alcohol: Dietetic.**

One does not here stop to debate the point as to whether or not alcohol is a food. Thousands of people have settled that for us - they have employed it as a food. Our object is to interpret its action as we find it in the tissues of those who have partaken of in large or small doses as the case may be. Comparisons between two small communities - one abstaining, the other moderate drinking.

Sixty years before the writer's observations commenced two small communities of working men of a district formed themselves into two Friendly Societies - one abstaining which on the average numbered 82; the other non-abstaining of moderate drinking which averaged 110. Both were drawn from the same social scale, many of them were related, many followed the same employment and at the start and for some time all were of the same age and new members were in both nearly of an age. The only real difference as far as could be ascertained was that one set took no alcohol as a beverage while the other in
many instances did and in fairness it must be stated that some did now and then exceed the bounds of what is called moderation but certainly no known habitual drinker would be admitted a member.

Both Societies were observed for ten years as to death-rate, sickness, incidence and longevity.

Deaths. - Of the 82 teetotalers 11 died in the ten years or 1.10 each year or a rate of 1.37 per cent the ages being 68, 80, 53, 66, 77, 55, 80, 67, 77, 83, 76 or an average age at death of 71.09. Of the 110 moderate drinkers 22 died in the ten years or 2.20 each year or a rate of 2 percent each year, the ages being 65, 46, 33, 45, 81, 50, 50, 84, 49, 41, 37, 76, 38, 60, 55, 39, 25, 55, 39, 27, 55, 32 or an average of 49.04 years at death. The difference in the two sets of lives is distinctly in favour of the teetotalers. That both were representatives of good lives is proved by the smallness of the death rate in both societies. The longevity is in favour of the abstainers for while the two societies started with an almost equal age rate the non-abstainers dying off at any earlier age than the abstainers left the latter with a much higher age rate and if the non-abstainers had not been recruited in much larger proportion than the abstainers their numbers would have fallen much below that of the abstainers.

Sickness-Rate.

The average number of visits paid to each teetotaler during the ten years was 6.64 and to each moderate drinker 6.73.
This on first sight points to the moderate drinker as being nearly as healthy as the teetotaler but it needs to be explained that twenty per cent of the visits paid to the teetotalers were to two men of advanced years who lingered long in their last illnesses. Besides, when one considers that the average age of death among the abstainers was 71.09 a period of life is reached when in most people the aid of medicine is needed. It is difficult to reconcile the statements of the two warring sects on this question of alcohol and the facts are here given without comment. That there may be something in total abstinence from alcohol as opposed to even a moderate indulgence in the same finds support in the tables issued by the Sceptre Life Association. It has a teetotal section and a general section including persons who are not abstainers but are individuals of the highest respectability such as clergymen, medical men, lawyers and like professional men who may be looked upon as leaders of regular lives. The figures for 28 years up to the year 1911 are:

Teetotal Section:

Expected Deaths 2446. Actual numbers 1283 or 52.45 per cent.

General Section:

Expected Deaths 3487. Actual numbers 2779 or 79.70 per cent.

The Action of Alcoholic - Pharmacological - In Pneumonia, Diphtheria Septicaemia and like Toxic Processes.

While the dietetic action of alcohol was being observed another set of experiments were being reviewed in the pharmacolog-
ical action when it was considered necessary to prescribe alcohol in the above-named conditions with the view of stimulating the heart and keeping up the strength it was given by no niggardly hand and it was no uncommon experience to find that five to twenty fluid ounces (142 - 568 C.C.) of whisky or brandy or equal to half the amounts named of absolute alcohol were given in the 24 hours. But was the action one of actual stimulation? The hard pulse was reduced in rate; the high temperature fell; the dry skin became moist. Did these effects not point to a depression of the vasometer system? In addition there was drowsiness with or without muttering delirium and a sense of well-being. Did this not point to a depression of the centres of the brain? When the larger doses were administered there was observed a failure of the heart muscle more profound than could be attributed to the action of the toxin of the disease from which the patient was originally suffering. If this view be correct the alcohol actually aided the heart failure it was intended to ward off. Side by side with these observations one could see another set of experiments being conducted for him by patients themselves for many people either from prejudice or dislike actually refused to take alcohol in any shape or form, their drink being cold water or aerated water and one was bound to confess that they at least did as well as those to whom alcohol was freely administered.

(3) The Action of Alcohol-Toxicological.

In the following 50 cases the writer was able to follow the history intimately for a few years and so observe the gradual
or rapid damage physical, moral or mental done by the alcohol. No drinkseller is included in the list. This class of individual is so much exposed to the temptations that his inclusion would bias any conclusions which one might draw from figures.

1. Wife of a mechanic began to drink more beer than usual at 40. Occasionally took whisky. In five years developed paralysis of lower extremities. Lost sight of: thought to be dead.

2. Man of 35 began to drink more than he used to. Loss of all self-respect. Neglect of family. Often noisy and nuisance to neighbours. Beer drinker now going on for 15 years.

3. Man - cabinet-maker - at 30 started to exceed dietetic quantity of beer: Became cruel to and jealous of wife. Duration now 20 years.

4. Man at 30 was observed to neglect his business and it was then found that he was drinking and this went on for 15 years without evident lesion. His family suffered hardship on account of his neglect of business.

5. Case of a man who drank ten to twelve pints of beer daily and had done this for 15 years; became querulous but yet was able to do his work as a mason and earn good wages. At the week-ends he drank till it was time to return to work and in one of these maudlin fits he fell down stairs and broke his neck.

6. Woman of 30 left a widow without children, gradually increased her daily supply of beer, became immoral and was lost sight of at the end of five years.
7. Woman of 35 left a widow in comfortable circumstances gradually took to drink: immoral contracted syphilis and in time drifted so low that she encouraged if she did not force her daughters into immorality. Known for ten years and then thought to be dead.


9. Man at 37 was observed to drink enormous quantities of beer daily and beyond getting violent now and then he was able to carry on his work and has been carrying it on for 17 years.

10. Another man, a neighbour of the foregoing, began to take too much beer at 25 and in ten years had completely wrecked himself.

11. Man who had now and then drunk too much started to drink large quantities of beer, brandy, and whisky at 55. This went on for ten years without evident effect on him but he suddenly developed dementia and died at 67.

12. Man of 60 who has been drinking to excess for ten years at least was able to maintain his situation as an excellent workman but became dirty almost beyond endurance.

13. A woman of 41, a known beer drinker for ten years, had evidently no deviation from the normal except the development of great personal uncleanness.

14. A case of a man who has been known to have a beer can on his bench at work for 12 years and to drink beer in the evenings without intermission. He is able to carry on his
work and except that now and then he becomes violent he seems little affected.

15. This shows that deep down some drinkers have a remnant of conscience. A man of 45 who had been drinking for ten years was warned again and again by his employers but without effect. At last he was dismissed and the affront so stung him that he died shortly after and without evident cause.

16. Man of 30 took to beer in great quantities to which he latterly added whisky. In two or three years' time he developed paralysis of the lower limbs from which he partially recovered, then married a prostitute and drifted from respectable society.

17. A man of 50 who had been drinking in secret for 20 years had no lesion except that of untruthfulness for which he had to be dismissed his situation.

18. An instance of a constant heavy drinker (32) who is able to carry on his work but now and then becomes maniacal. Lost sight of after 7 years.

19. Unmarried woman of 45 who from being one of the tidiest of persons became dirty beyond description. Evidently secret drinking for years before discovery. Cirrhosis of liver. Known 10 years.

20. Shows how evidently small quantities of alcohol prove destructive to nerve tissue. A married woman of 35 began at this time to take nor more than two fluid ounces of brandy daily. She gradually developed neuritis of nerves of the lower extremities followed by general neuritis, the heart
being specially affected and in ten years she died, the heart slowly dying.

21. Woman at 32 was known to drink beer in excess and this went on for seven years when she developed cirrhosis of the liver.

22. A woman living near the last took to wine drinking in secret at 37 with moral lapses.

23. A working man of 45 had some money left him when he took to drinking from visiting the public house at six in the morning and generally remaining there till eleven at night except for short intervals at meals - on six days a week. The amount he drunk is difficult to estimate but he spent over one hundred pounds yearly in the public house. After 5 years he developed cirrhosis of the liver and improved when he was kept in bed but relapsed when he got out again.

24. A case of rapid death in a working man of 35 who having had money left him drank beer and spirits, had several attacks of acute alcoholism in one of which he died.

25. Another case of rapid death in a man of 38 who having been a heavy beer drinker for ten years died in his first attacks of acute alcoholism.

26. A third case of rapid death in a man of 40 who had drunk enormous quantities of beer for two years, developed Bright's disease and died.

27. A married woman of 34 became possessed of £200 took to beer drinking the whole day long, spent every penny of this sum in 3 years and died of acute alcoholism.
28. A man of 50 who had drunk beer for years gave up his work, made drinking the business of his life, developed tabes of which he eventually died at 58.

29. This is a case of what might with truth be called drinking to death. A man of 40 had drunk beer in considerable quantities for years: at this period started drinking without intermission save for the time he spent in sleep and eating the little food he partook of and at the end of five years he had practically drunk himself to death.

30. An instance of a man drinking beer and spirits continuously for 35 years. A man at 25 left his work, and let his wife support the two children while he spent his time in drinking. For twenty years he suffered from gastric and every particle of the little food he took was rejected. For the greater portion of the twenty years his only food was a cup of tea twice a day and this appeared to be rejected and if he lived on anything it was on beer and whisky. He was as thin as it was almost possible to be and he died at 60 of what for a better name one must call gradual failure of the "vital powers".

31. A respectable married woman of 60 took to beer drinking - doubtful if she had previously drunk in secret - and continued this without intermission for 5 years when one day she committed suicide by placing her head in a bucketful of water.

32. A married woman of 57 who had taken beer in moderate quantities for 20 years suddenly developed an inordinate
liking for the beverage: and to this she later on added a liking for whisky and brandy. She lost all sense of locality and wandered about for days till she was fortunately looked up and this was followed by periods of recovery. Strange to relate she had never been in a railway train in her life and had no desire to ride by this conveyance; but one day she wandered ten miles from home and returned by train - the first and only time in her life. Next day she was evidently well and intelligent but she deliberately climbed over a high wooden fence and walked into the middle of a deep pond and was drowned. Aged 65 and eight years after commencing heavy drinking.

33. An iron worker of 62 has taken for 30 years over twenty pints of beer daily — equal to 16 fluid ounces or nearly half a litre of absolute alcohol. He weighs 22 stones (139.706 Kgm): at 62 he had to give up work on account of heart trouble but the extraordinary circumstance is that a man could do laborious work for such a long period and drink so heavily.

34. As a contrast to this one may mention a case of a man who died at 49 of cirrhosis. For twenty years he had drunk 22 pints of beer daily and was able to follow his employment of iron worker till within 12 months of his death. He weighed 17 stones (107.955 Kgm).

The remainder of the cases are associated in groups --- some of them occur in man and wife or in families or otherwise show a close relationship.

(181)
35, 36, 37. These were in father, mother and son, and they formed a drinking party, the beer jug being seldom empty. They carried this on for seven years when they all became very dirty, got into debt and disappeared.

38, 39, 40, 41. A midwife died at 75 and for 15 years had lived in a state of intoxication yet able to perform her duties in an intelligent fashion. She prescribed brandy for all ailments and by example had taught her children to drink. One died at 36 having drunk heavily for five years when she developed acute alcoholism followed by pneumonia and death. Another daughter had drunk for years, had neuritis and paralysis of the lower limbs from which she died at the end of two years, and aged 40. The husband of this last patient died of acute alcoholism one year after his wife.

42, 43. A man aged 31 and his wife aged 29 had for five years done nothing but drink owing to inheriting some property. They had been in a constant state of intoxication for years and ultimately died from this.

44, 45. Man and wife aged respectively 67 and 62 had carried on a large business with success but gradually took to excessive drinking. The woman had cirrhosis of the liver and died at 62; the man lost his business owing to drinking and at 67 was lost sight of.

46, 47. Man and wife aged 52 and 49 were excessive beer drinkers, but appeared to suffer no evil effects whatever, yet both had successively attacks of simple acute bronchitis and died within one month of each other.
A mother, son and his wife all lived together. The mother and wife drank beer continuously for 15 years and the son while at home joined them in their carousals. At 70 the mother died of gastric "Catarrh" apparently due to excessive beer drinking. After her death the man and wife drank more than before. In time the woman lost all sense of self respect and the home became so dirty that it was uninhabitable and she had to be sent to an asylum where she died a month afterwards - of dementia, aged 52.

The man who was a compositor of a high order of intelligence was never sober and yet he was able to perform his duties to the satisfaction of his employers, and able to set up type of a highly technical character. It is difficult to understand how he could do this unless it was that his heart was in his work for as soon as his work was done he went straight home, drank beer continuously while he read books on general science. He was found dead in bed one month after his wife's removal to the asylum.

If one roughly analyses these 50 cases whose histories were closely noted for a period of years it is found that

42 had drunk heavily for over five years and out of the 42

<table>
<thead>
<tr>
<th>9 had drunk 5 years or over</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
</tr>
<tr>
<td>16</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

(183)
Of the 50 no less than 16 showed no gross lesions after drinking five years at least.
Of the 50 so large a number as 15 had moral lapses in the shape of being openly immoral, or grossly dirty, showed great loss of self-respect or were cruel or jealous.
Six suffered from Cirrhosis of the liver.
Five from acute alcoholism,
Two passed into dementia.
One had maniacal attacks.
Two committed suicide.

No attempt was made to estimate mental damage for this is a quantity capable of such varying interpretations as to be little comparative value.

Literature.

Statistical Account of Scotland. This was written between the years 1791 - 1799 and was the work of the parish ministers. It is one of the most valuable documents possessed by any people for it tells of the manners and customs of the parishioners of the date dealt with. As a rule the documents are highly human and in most cases interesting. If one takes the account dealing with Banffshire it is specially instructive because it deals largely with alcohol, potatoes, tea and other food stuffs. In the parish of Aberdour one learns that potatoes and turnips were then grown in fields: and previously to this time they were grown in small quantities in gardens.
In Banff in the year 1760 potatoes were only grown as rarities in gardens. In Gamrie the parish minister tells that he was

(184)
the first to introduce potatoes and turnips.

In Boharm, Inveravon and Keith, whisky drinking was common, and in the two last named distilleries were set up and in Inveravon the parish minister says the *aqua vitae* had corrupted the morals of the people. In Keith Mr. Humphrey the parish minister (evidently an Englishman) says oats was the commonest crop next flax and that black cattle were reared for export. In Tomintoul (today famous for its whisky) the recorder tells that 37 families in the parish sold whisky and that all drank it. He also says that tea was used. In Mortlach parish Mr. Gordon says "the drinking of whisky instead of good ale is a miserable change and so is the very general use of tea". So that we may take it that whisky drinking and whisky distilling was not common in Scotland till the end of the XVIIIth Century although whisky or *aqua vitae* as it was then called was introduced into Scotland about 1550. In 1579 it was furnished to the King and was looked upon as a rare drug.

It was enacted that no one be allowed to sell it from the first of December to the first of October except earls, lords, barons and gentlemen for their own use. Apothecaries or doctors were permitted to see it. It was, however, secretly sold for the records of Edinburgh tell that on March 20th 1557 one Bessie Campbell was charged before the city bailies with the offence of selling whisky or *aqua vitae*. She was the first keeper of a whisky shop in Scotland and she was allowed to ply her trade under prescribed restrictions. In Glasgow the first whisky seller did not come on the scene till 1653. Her name was Elspeth Hamilton and she paid £40 for the permit (yearly
evident) so that it was apparently a profitable trade. When Christiana left the House of the Interpreter she was furnished with a "little bottle of spirits" to strengthen her on the way so that in Bunyan's day (Pilgrim's Progress 1678) it was evidently regarded as of the nature of a remedy rather than a food.

Sketches of early Scottish History, Cosmo Innes 1861. The author says that so early as 1600 the habit of whisky drinking was known. At that date wheaten bread was only used on holidays even in the best parts of Scotland.

Extracts from the Records of Glasgow. For the year 1641 the records show the deacon of the bakers was ordered to see to it that wheat bread was not abused.

Shakespeare (1564-1616) was acquainted with distilled alcoholic liquors although as we find he did not like the Scottish writers clearly distinguish between the varieties. Perhaps he did recognise that there was an absolute alcohol for Cassio refers to an "invisible spirit of wine". In the Merry Wives of Windsor aqua vitae is referred to and the great man probably meant whisky. In other works aqua vitae probably referred to brandy as for example when Dromio of Syracuse speaks of this liquor. Burnt sack too was more than likely brandy,

Beer is referred to by Shakespeare as thin or small or double and strong beers generally when he wishes to pour scorn on the former. He oftener refers to the wines which were largely imported for the consumption of the well-to-do. We may
take it that moderately strong beer containing 3 to 4 per cent of alcohol was so common that it would not be worth while speaking about. In Scotland on the other hand the beer and ale which was in common use would be a very poor article (1 per cent) brewed from heather in many cases and beneath the notice of writers. At this time wheat too was in fairly common use in the South of England at least. These points are worthy of mention when one is considering the genesis of gout in England and its comparative absence in Scotland. Special Food Preparations or Special Methods of Treating Foods: Changing Customs in Feeding: Their Effects on the Health of the People.

The making and selling of bread deeply concerns the people and medical men should interest themselves in this in order to be able to call attention to the vices of unscrupulous traders. The disadvantages of fancy breads, baking powder-raised bread, the dearness of digested bread, the presence of chemicals in milk, the presence of deleterious substances in margarine, the question as to how long foods should be kept in cold storage, the question as to the nutritive value and value from a health standpoint of frozen meat more especially and many other like points are of vital importance to us. Lastly the subject of condensed milk needs consideration anew. In this section some of these are discussed while others have been the subject of experiment are more fully debated in the section entitled "Experimental
Bleached Flour. Should it be a punishable offence to sell flour bleached with the oxides of nitrogen? The writer has no doubt on this point. The flour loses in its nutritive value and bread made from it has much less flavour so that it has less stimulating action on the taste glands and it is therefore less appetising. This is a question on which the members of the medical profession should interest and on which it should give a clear pronouncement.

Frozen Meat and Chilled Meat and their Effect on the Health of the People.

Frozen meat is not now so commonly met with in the butchers' shops as it formerly was, for it has been replaced by so-called chilled meat or meat at a temperature much higher than that formerly imported. The great imports of this kind of meat are coincident with the great rise in price in home-fed meat so that the introduction of frozen or chilled meat has been a great benefit to the artizans of the British Isles who could hardly have been able to obtain British fed meat, and although foreign meat is today much dearer than it was ten years ago it is still cheaper than the home-fed has been for nearly a century. If one contrasts this with the state of affairs prevailing in France and Germany where foreign meat has hitherto been debarred the differences are great. In these countries meat has become so dear that the artizan class can only afford to eat horse, donkey and dog flesh, and in Germany the Freibank or municipal market has been introduced. In this institution meat taken from diseased animals is sterilised by
Section VIII. Pages 189 - 196.

Points to be noted -

Rise in prices etc.
the authorities and sold cheap to the poor.

In the British Isles on the other hand the consumption of good sound meat - beef, veal, mutton, lamb and pig has enormously increased as may be seen from the figures - The rate has been increasing enormously from 1876 onwards and the amounts consumed a head and the proportions eaten by the various social grades are more easily grasped from tables which follow. Without labouring the subject one is justified in asserting that had it not been for the incoming of foreign meat the labouring classes of our country would have suffered keenly from the great increase of prices of all provisions during the past few years (See "Frozen Meat and Home-fed Meat" where the subject is treated from the standpoint of its action on the health of the people Page 158 & on).

Rise in the Standard of Living, Increase prices - Their Effects on the Health of the Poor - Condensed Milk, Chipped Potatoes and Fish.

In addition to increased prices the standard of living has been constantly rising owing to circumstances over which the people have no control. This has pressed heavily on the poor for the reason that however much a poor man might wish to live cheaply and plainly he has some considerable difficulty in doing so. The man or woman who wishes to use oatmeal finds in many districts in England that he cannot easily buy it for the reason that rolled oats in packages have largely taken the place of ordinary ground oatmeal. Rolled Oats are sold in packages of one pound and one half ounce and

(189)
two pounds and one ounce gross weight and as the two pound cardboard package itself weighs 776 to 850 grains it comes that in a stone (14 pounds; 6.350 Kg) of rolled oats more than five ounces have to be deducted for package. Fourteen pounds weight of rolled oats cannot be bought at a cheaper rate than three shillings and one and a half penny and if the weight of the package is added to this it increases the price by one penny at least. Oatmeal can be bought in English towns at a cost of two shillings and two pence for 14 pounds or a difference of one shilling on this quantity. But this is not all. While it must be admitted that no one is forced to eat anything unless of his own choice it will be readily granted that owing to high sounding advertisements the poor may be led to spend money which they can ill afford on food which could be obtained at one third less cost. The same applies to concentrated preparations of wheat partially cooked with which the market is too well supplied. These in addition to their excessive cost possess the demerit of lacking that quality of freshness which is so necessary to people who can only afford a dietary limited in quantity and in variety. Rice, sago, tapioca, semolina and like cereals have largely replaced pearled barley in Scotland in the country districts, and all of them have an almost equal caloric value: barley is a more valuable food for it is much richer in fat and it is especially rich in phosphates and iron. In a like manner the cereals named have replaced whole or pearled wheat in England where it was used as a porridge called frumenty or was made into a pudding. Both pearled wheat and barley are much cheaper than rice, sago, tapioca or other like
food. Another circumstance which has raised the standard of living is the fact that the bye-products of killed animals — lungs, blood, and other tissues are not now so often available for the food of the poorer people. The reason for this deficiency may be that they command a higher price than formerly because they are now largely employed in the preparation of solutions and dry extracts in organotherapy.

The large increase in the number of dried concentrated foods of all kinds too has had a detrimental influence in raising the standard of living and in raising prices of food and this presses as it has always done on those lowest in the social scale. As an example one may mention that in certain districts of England in which dried milk and condensed milk are prepared the whole of the milk or nearly the whole in this particular district may be contracted for and the people in the near neighbourhood do not get enough milk and the little they can buy is sold at a high price.

This leads us to discuss the question of the condensed milk from the health and economic standpoints. That condensed milk is largely employed amongst a certain class of the artizan population in England cannot be denied. The writer has calculated that five per cent of the people employ condensed milk to the exclusion of fresh milk and that ten per cent use partly condensed and partly fresh milk. A certain number use condensed milk from principle because they believe fresh milk carries "germs" of disease while a certain number use it because they are not at home at the time at which the
milkman comes round; that is in those parts of England where there are few milk shops. There is much to be said in favour of condensed milk in poor neighbourhoods because of the difficulty of getting clean fresh milk but at the same time the people who use this milk exclusively are often restricted or perhaps from usage or from lack of knowledge restrict themselves to a dietary largely made up of dried or preserved stuffs. This tells most on the young children who live largely on milk food or soft food. Children from these households are often seen in the out-patient room and pick up wonderfully on cod-liver oil and on an orange or a banana daily. The physician who practises in poor districts should always enquire about the kind of milk used by his patients. Price for sweetened condensed milk is rather cheaper than fresh milk and a pound of condensed milk diluted four times with water contains nearly the total calories of four pounds of milk but it contains only about the total amount of fat of two pounds of fresh milk. The exact amounts are as follows: One pound fresh milk protein grams 15; fat grams 18.1; carbohydrate grams 22.7; calories 325. One pound sweetened condensed milk the figures are 39.9; 37.6; 245; 1520. Various other points pertaining to milk and condensed milk are discussed under special headings.

A great change has within recent years come over the methods of dieting among the working classes. On Saturdays hardly any dinner is now prepared in many homes. This is partly
due to the practice of economy owing to the high price of food and dinner is generally made up of fried fish and potatoes and one or two pennyworth of this food along with a pint of tea serves as meal for an adult man or woman (see page 92).

Although it cannot yet be said that the various changes in fashion and prices have seriously affected the health of the masses, the subject is of such importance that we as guardians and directors of the health of the people should make it our duty to divert attention to the points discussed. The great rise in prices has however been felt by those people who live on the verge of starvation, that is old people whose total income is about five shillings weekly and the actual significance of this will be apparent when one comes to see what they can actually buy with the portion of five shillings remaining after the rent is paid (see ).

In order to more fully appreciate many of the afore-mentioned points it is necessary to note the great rise in prices in ten years' time.

Rise in the Price of Provisions in the ten years 1902-1912. During these years the prices of provisions included under the terms sugar, flour, tinned meats, tinned foods generally, raisins, currants, jams, biscuits, butter, lard, bacon, rice, sago, tapioca, tea and like articles have risen over 20 per cent. During the same period wages have remained practically at the same standard so that the purchasing power of 100 shillings have been reduced to 80 shillings. The prices are (193)
the average retail prices and have been taken from the invoices of a retail provision merchant in a working class district. When one looks at the articles which have advanced in price it will be observed that nearly every important food stuff has had an upward tendency with the exception of cheese, eggs, potatoes, and some vegetables. In the case of some of the articles the advance has been alarming when one thinks of the importance of the feeding of the artizan class from a health standpoint, of the dangers of adulteration, of the dangers of less nutritious food-stuffs being substituted or eaten in place of the articles prohibited by price. Sugar has advanced 39%; Flour 22, Jams 13, dried fruits 35, tinned salmon 31, butter 7.5, bacon 25, rice 8.2, tapioca 42, tea 33, tinned beef - with an all-round average of 20 per cent.

Rise in the Price of Beef and Mutton.

Ten years ago home-fed beef had risen to an extraordinary extent and this was coincident with the popularising of chilled and frozen meat in the British Isles, but in the last ten years now being considered chilled and frozen meat have risen in price almost exactly 20 per cent on the retail price in the large industrial centres of England. During the same period, the price of home-fed meat has risen proportionately but as it now-a-days is only largely consumed by the comparatively well-to-do it does not so much concern us.

(194)
Prices in 1902 and 1912

<table>
<thead>
<tr>
<th></th>
<th>1902</th>
<th>1912</th>
<th>1912 Home-Fed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lamb</td>
<td>5d to 7d a pound.</td>
<td>7d to 9d.</td>
<td>10½d to 12d</td>
</tr>
<tr>
<td>Mutton</td>
<td>(Shoulder) 4d to 5d do.</td>
<td>5d to 6d.</td>
<td>9½d</td>
</tr>
<tr>
<td></td>
<td>(Legs) 5d to 5½d do</td>
<td>5½d to 6d.</td>
<td>10½d</td>
</tr>
<tr>
<td>Beef</td>
<td>3½d to 6d</td>
<td>4½d to 7d.</td>
<td>10d</td>
</tr>
<tr>
<td>Steak</td>
<td>6d</td>
<td>8d</td>
<td>15d</td>
</tr>
</tbody>
</table>

But in the second half of the ten years named the advance has been even at a higher rate than all through the ten years and if one examined the price of 16 staple articles of food (named below) in 1905 and in 1912 the contrasts are striking — the average advance on the 16 food stuffs being 29.4 per cent between the two years.

<table>
<thead>
<tr>
<th>Article</th>
<th>Retain prices 1905.</th>
<th>Index Numbers 1912.</th>
<th>Increase %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tapioca</td>
<td>85.8</td>
<td>145.5</td>
<td>73.1</td>
</tr>
<tr>
<td>Oatmeal</td>
<td>101.3</td>
<td>123.4</td>
<td>21.8</td>
</tr>
<tr>
<td>Marmalade</td>
<td>114.3</td>
<td>126.8</td>
<td>12.5</td>
</tr>
<tr>
<td>Rice</td>
<td>92.9</td>
<td>111.2</td>
<td>19.7</td>
</tr>
<tr>
<td>Sugar</td>
<td>133.8</td>
<td>137.7</td>
<td>2.9</td>
</tr>
<tr>
<td>Cheese</td>
<td>93.5</td>
<td>117.3</td>
<td>25.5</td>
</tr>
<tr>
<td>Bread</td>
<td>109.0</td>
<td>113.6</td>
<td>4.4</td>
</tr>
<tr>
<td>Beef</td>
<td>99.2</td>
<td>113.6</td>
<td>14.5</td>
</tr>
<tr>
<td>Flour</td>
<td>108.5</td>
<td>118.5</td>
<td>9.2</td>
</tr>
<tr>
<td>Bacon</td>
<td>103.3</td>
<td>132.3</td>
<td>22.2</td>
</tr>
<tr>
<td>Butter</td>
<td>99.1</td>
<td>113.8</td>
<td>14.8</td>
</tr>
<tr>
<td>Mutton</td>
<td>103.1</td>
<td>103.5</td>
<td>0.4</td>
</tr>
<tr>
<td>Eggs</td>
<td>98.1</td>
<td>114.1</td>
<td>16.3</td>
</tr>
<tr>
<td>Raisins</td>
<td>79.6</td>
<td>119.5</td>
<td>50.1</td>
</tr>
<tr>
<td>Pork</td>
<td>95.3</td>
<td>103.3</td>
<td>5.1</td>
</tr>
<tr>
<td>Potatoes</td>
<td>80.3</td>
<td>95.9</td>
<td>19.4</td>
</tr>
</tbody>
</table>

(195)
Experimental Notes.
Experimental Notes and Observations, illustrating or confirming some of the Statements contained in the Essay.

Comparisons between Home-fed and Foreign, Frozen, or Chilled Meats.

It is difficult to say if freezing or chilling to any great extent reduces the nutritive value of meat. Without doubt, meat which has been kept in cold storage for a few weeks must have lost some of its "elements of freshness", but the practical question for us to decide is "Does this process of treatment so change the proteins and fats that the eating of the meat is a real danger to health?" So far as one can judge from the crude and extensive experiments carried on for us by the people themselves, there is no evidence of this, but in order to help one in coming to some decision the writer submits the results of certain experiments carried on by himself.

The Result of Freezing or Chilling. If a joint of meat be kept in a basement larder, not specially cooled, for 48 hours, and then a wedge be cut from the centre (a 5 cr 6-lb. joint) by means of a sharp knife, the mass is found to be brittle as opposed to the tough spongy cut from a home-fed joint of the same size. If the two cuts be pounded in a glass mortar, the same quality of comparative brittleness is observed. The wedge from
the home-fed meat remains sticky, while the frozen wedge can be rubbed up and comes away "clear" from the pestle.

**Roasting.** If two joints of the same size be roasted in the same oven and examined, the same relative differences are noted. When cut, the frozen meat is found to be firm and compact in texture, and it cuts clear away from the bone instead of being tough and spongy near the bone, as is a home-fed joint. It possesses much less of the "meaty" flavour, and this is its great objection in the eyes of the real meat lover.

**Digestibility.** If thirty grains (about 2 grams) each unboiled, frozen and home-fed beef, be well rubbed up in a glass mortar and then transferred to separate and marked bottles containing a 0.2 per cent. hydrochloric acid solution of pepsine, and maintained at a temperature of 105° F (405° C) for three hours with frequent shaking, it is found the frozen meat is quite digested, while the home-fed portion has not entirely disappeared. Thus it would appear that frozen meat is more easy of digestion than home-fed meat.

**Macroscopic and Microscopic appearances.** If two sections be cut from two joints of equal size and compared by the naked eye it is at once apparent that the fibres of the section from the frozen joint are smaller and much more compressed together than the fibres in the section cut
Fig. 9.

Coloured photomicrograph of a section of home-fed beef showing that the fibres are larger than in frozen meat. This is a common experience. The colour of the meat is brighter than in frozen meat.
from home-fed beef. This difference is also seen in a microscopic section made without freezing and a photomicrograph coloured by hand shows this readily, as will be observed by comparing the pictures.

Nitrogen Value of the Two Meats. On making estimations of the nitrogen value by a modified Kjeldahl process, it is always found that frozen gives a higher reading than home-fed meat, the average being 15 per cent. higher, so that weight for weight frozen meat is more economical than home-fed. In the last estimation made by the writer, the figures were:

1 Frozen beef nitrogen value = 3.73 per cent.
2 Home-fed beef " = 3.17 "

Cold Storage in Preserving Food. Need for Careful Observation. From the accompanying table, it will be observed that a very large number of articles of food are kept in cold storage. For the proper carrying out of this, a large amount of money has been expended in laying down plant; and skill and industry have been displayed in arriving at methods for attaining the purpose in view.

The man who did most, if not nearly all in this direction, is Charles Tellier, a Frenchman still living at the age of 84, who thirty years ago began his researches in this direction, employing at first methylene ether and trimethylamine in freezing food stuffs. Tellier built laboratories at Anteuil in the neighbourhood of Paris, where he extended
Fig. 10.

Coloured photomicrograph of a section of frozen beef. The fibres are smaller than in home-fed beef. The writer believes this to be due to the freezing; they are also darker in colour owing to the length of time that the meat is necessarily kept.
his researches till his efforts were finally crowned with success. The invention has added wealth to the South American cattle-rearing countries, and it has provided cheap food to the poor of the British Isles, that country being the first to avail itself of his invention.

There is, however, always a danger or disadvantage attaching to even the best of inventions, and we are face to face with two dangers in the present connection.

(1) If one looks down the list of food stuffs capable of being stored by this method, it is evident that many of them may be kept in store for a period sufficiently long to artificially inflate prices and to "corner" food vital to the life of a nation - thus actually undoing what the invention was intended to do.

(2) There is a danger of certain articles of food being kept so long at a temperature so low as to destroy the vital principles of the same. There again the invention may be made to hasten what it was meant to obviate, and it is the duty of the medical man to observe and to point out to the public if at any time there is a danger to health by the eating of food subjected to cold for too long a period.

From the accompanying table, it will be seen that the process of cold storage is applied to almost 200.
every food stuff. This will further impress one with the need there is for vigilance on the part of the custodians of the health of the people.

**Temperatures employed in Storing Food.**

<table>
<thead>
<tr>
<th>°F</th>
<th>°C</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>10°</td>
<td>-12.2°</td>
<td>Frozen Mutton, Frozen Eggs.</td>
</tr>
<tr>
<td>15°</td>
<td>-9.4°</td>
<td>Game, Ham, Butter.</td>
</tr>
<tr>
<td>20°</td>
<td>-6.6°</td>
<td>Meat in General, Rabbits, Margarine.</td>
</tr>
<tr>
<td>24°</td>
<td>-4.4°</td>
<td>Poultry and Game (if not wished frozen).</td>
</tr>
<tr>
<td>28°</td>
<td>-2.2°</td>
<td>Chilled Meat, Fresh Fish, Hops.</td>
</tr>
<tr>
<td>32°F</td>
<td>(0°C)</td>
<td>Celery, Oysters.</td>
</tr>
<tr>
<td>32°</td>
<td>(0° - 1.1°C)</td>
<td>Apples, Eggs, Cheese, Milk, Butter (short period), Lard, Pork, Ham.</td>
</tr>
<tr>
<td>36°F</td>
<td>(2.2°C)</td>
<td>Vegetables, Fresh Fruit, Berries, Canned goods, syrup. Cigars, Tobacco, Cider, Grapes, Potatoes, Lemons, Onions, Nuts, Ales, Beer.</td>
</tr>
<tr>
<td>38°F</td>
<td>(3.3°C)</td>
<td>Bananas, Tomatoes, Peaches.</td>
</tr>
<tr>
<td>40°</td>
<td>(4.4° - 7.2°C)</td>
<td>Dates, Figs, Dried Fruits, Sugar, Wines, Flour.</td>
</tr>
<tr>
<td>45°</td>
<td>(7.2°C - 10°C)</td>
<td>Oranges, Ales, Beer, Porter (in bottle, the lower temperatures 38° - 40°F being for casks.)</td>
</tr>
<tr>
<td>50°F</td>
<td>(10°C)</td>
<td>Claret.</td>
</tr>
</tbody>
</table>

To freeze fish, a temperature of 0° - 5°F (-17.7° - 15°C) is employed.

**Bread Baking.** In bread baking and bread selling the poor suffer much, because of the roguery of tradesmen in poor districts, and of the indifference of the prosecuting authorities. Good bread, as made by a public baker, is 201.
composed of:

Flour - 280 pounds
Water - 150 " or 15 gallons.
Potatoes - 8 "
Salt - 2½ to 3 "
Yeast (compressed) ½ pound.

This makes about 90 loaves of 4-pound weight, but as many as 95 to 100 can sometimes be made from the mass. Should potatoes be allowed? Many will say No! Many bakers add too much water in order to increase the number of loaves. Fresh yeast should be employed. Many bakers allow the yeast to ferment, with the result that a sour loaf is produced and may be the cause of dyspepsia. The dough, too, is sometimes allowed to stand till it becomes sour, and bread baked from it may also be the cause of dyspepsia. Yeast is now known to have a favourable action on tissue nutrition and metabolism, and it should be employed in niggardly fashion. This is a point worthy of the attention of medical men, especially where children are concerned. The employment of plain bread raised by chemical substances, or by aeratum, is to be condemned. The addition of alum and other substances to give whiteness to the bread need only be mentioned in order to be banned.

Fancy Bread, Bread Raised with Baking Powder, and Digested Breads. The medical man has an important duty.
to perform in advising the public as to a choice of its bread stuffs. It is not sufficiently recognised either by medical men or by the public that fancy loaves need not be sold by weight, hence they are generally expensive, the sevenpenny or eightpenny loaf weighing much under four pounds, besides not being so nutritive as common yeast-raised bread. Baking powder raised bread has its fats and organic phosphorus compounds partially destroyed by the powder.

Relative Digestibility of Yeast, Baking Powder, Predigested and Malted Breads – Action on the Flow of Saliva. The digestion of breads as of other foods begins in the mouth, and the bread which stimulates the salivary secretion the most is to begin with at least the most easy of digestion. Definite/equal weights of all three breads were chewed for a certain time, and then the mass weighed and noted. This was repeated five times and on different days, the order being changed each time – the yeast being chewed first in one set of experiments, then the malted, next other predigested, and next the baking powder bread, and so on. The malted and predigested caused the smallest amount of salivary flow, next the baking powder, and the yeast-raised bread caused a flow of 50 per cent. more than the baking powder bread.

Action of Alkaline Solution of Pancreatin. Equal portions of the crumb of the various breads were passed
through a fine sieve and then treated with an alkaline solution of pancreatin, sufficient in amount to render the whole faintly alkaline, for all breads are acid in reaction and baking powder breads are more acid than the others.

(1) Baking powder bread more readily softens than yeast breads when both kinds are subjected to the requisite temperature for carrying on digestion, and it forms itself into an emulsion rather than a digested mixture. Even on standing three days in a cool place, the baking powder bread mass remains a homogeneous mixture which separates very little, and on being shaken up again becomes an emulsion. When examined microscopically, the fat globules are seen to be finely divided; unacted-on starch granules are also seen.

(2) Ordinary yeast-raised bread takes longer time to soften than the former, but it readily digests. Its oil globules are larger, and when the mixture has stood for two days it separates into three layers of fat, soluble protein, (albumose, peptone ?) and unacted-on starch.

(3) Malted and Other Partially Digested (Yeast-Raised) Breads do not readily soften, but this appears to be due to the circumstance that these breads have a tendency to run into sticky masses which the pancreatin fails to attach so readily as in (1) and (2). Under the microscope, the fat is found to be

(204)
in five particles as in (1). It seems to be as if this bread is really more difficult of digestion than ordinary bread. When it has stood for 48 hours the solution, as in (2), separates into three layers, easily miscible on shaking.

It is doubtful if these pre- or partially digested breads are really what they are said to be, namely, easier of digestion when eaten. They are certainly very dear, and this should be pointed out by the physician.

Expensive Fancy Bread. The poor need to be warned against the great expense of many of the digestive breads which are on the market.

One is found to cost a penny half-penny and only weighs 12 ounces. Another weighs a pound and a half and costs threepence. Another only weighs 14 ounces and costs threepence, while an ordinary two-pound loaf can be bought for threepence halfpenny.
Oatmeal is such a valuable cereal that anything or any argument or series of experiments which will induce people to employ it more generally as a food stuff hardly call for apology in stating them.

The Treatment of Oatmeal in order to avoid the irritation of the Cellulose Particles.

This end can be attained in various ways such as prolonged boiling as in well made porridge by the process of rolling and heat but this has been discussed and the objection is the increased cost. In addition the oatmeal may be fermented as in the oatcake made in many parts of England. The cakes are somewhat insipid otherwise they are a good food. In the north of England where oatcakes are daily eaten in the home the oatmeal previous to being baked is mixed with a small percentage (0.6) of sodium bicarbonate. This softens the cellulose and the good firing which the cakes receive on the open girdle dries up and renders brittle the cellulose particles. Other methods are touched upon in the experiments detailed in the next few pages.

Oat Cake as made in the Homes of the People.

For centuries oatmeal has been made into cakes in Scotland and was for the same period the staple food of the people but today as a staple food it is limited to the northern parts of Scotland. It is made as follows.

Four or five handfuls of oatmeal (or about 12 ounces) (337 grams) are placed in a basin along with a pinch each of sodium bicarbonate and table salt (12 grains) or about 0.6 per
cent). The mixture is then stirred up with lukewarm water so that a mass is formed which can be easily rolled out on a board. After this it is at once placed on a hot girdle and cut into four and well browned first on one side and then on the other. It is then set up on end in front of the fire. In many cases dripping or lard is added to the mass so that the oatcake is a nourishing food and easier of digestion than is supposed by those who judge without knowing anything of the preparation in the homes of those who most use this food. As made by the professional baker oat cakes are generally too little browned and often contain too much fat. Oat cakes when toasted till quite hot and placed in a cloth and ground into a powder with a roller and at once stirred into milk make a mess which is appetising and comparatively easy of digestion and useful in cases of constipation. The addition of golden syrup renders all preparations of oatmeal more effective as remedies against constipation.

Fermented Oatcake as made in England.

One and a half pound of fine oatmeal; one teaspoonful of table salt (55 grains); a piece of compressed yeast the size of the first joint of the thumb (75 grains). Mix the salt and the yeast up together with two tablespoonfuls of warm water and place this mixture in a hollow in the mass of oatmeal and stand in front of the fire for half an hour, after which beat the whole mass up with water or if preferred milk and water till it assumes the consistence of a thin mass
which will readily run. It is then allowed to stand till it has fermented and has "risen". Oatmeal on account of the comparative absence of gluten does not rise like rye or wheat but the presence of fermentation is known by the bubbling up of the carbonic acid gas and when this stage has been reached the mass is run on to warm girdles or flat stones (the latter are to be preferred) and baked over the fire till brown.

The cakes can be baked to a thickness of from an eighth to a quarter of an inch, the thinner ones being the more favoured. When warm the cakes are crisp but in standing they become soft and "doughy". Heating over the fire in an oven makes them again crisp. They may be eaten with syrup or butter.

They have a very slightly bitter taste due to the presence of a small amount of proteose as can be proved by the rosy red colour given when a solution of copper sulphate and caustic potass is added to a watery filtered solution of the cakes.

Dry Baking of Oatmeal.

If coarse oatmeal be spread in a thin layer on plates and placed in a hot oven for 15 minutes and then rolled out with a wooden roller such as is used in domestic baking purposes the meal is rendered easier of digestion. The cellulose becomes brittle and in subsequent cooking the sharp particles easily break down. The meal is very slightly browned but the taste is not unpleasant. If treatment in the oven be continued for longer than 15 minutes the meal acquires an
unpleasant taste chiefly owing to charring of the fat. 15 minutes baking converts only a small portion of the protein into albumose and a proportionately small quantity of starch into dextrin as may be proved by examining treated and untreated oatmeals by the usual tests.

Oatmeal Porridge.

Of all the methods of cooking oatmeal none so completely breaks up or softens the cellulose as the process of porridge making. It used to be asserted that oatmeal cooked in any shape or form was irritating to the alimentary tract. Under the old methods of milling this was no doubt true but to-day milling has been so perfected that oatmeal when properly cooked as porridge is a food which anyone may with safety eat and enjoy— but old traditions die hard. In fact there is a tendency to overcook oatmeal, and especially so is in porridge making.


Water is placed in a saucepan and brought to the boiling point and nothing more, for if boiling be continued too long before the meal is added the flavour of the porridge is less pleasant. The water then having been brought to the boiling point meal is gradually and in small quantities added the mess being still kept at the boiling point while continuous stirring with a wooden spoon is being kept up. Salt is added to taste. The meal is allowed to pass through the fingers and crumbled or rubbed through the points of the fingers as it falls into the water: this expedient prevents
the formation of "Knots". When sufficient meal has been added and a mess formed that will run easily no more meal is added but the mixture is kept on the fire for five more minutes and stirred without ceasing, after which the pan is removed from the fire, placed on the hob and allowed to simmer for half an hour or one hour at the most. Longer cooking destroys the "sharp" flavour of the oatmeal and gives the mess a slightly bitter flavour and taste.

Cooking in the above way changes very little of the protein into soluble albumose and only a trifling amount of the starch is changed into dextrin and soluble sugars.

The English Method.

The English people have always had a genius for fermenting and baking cereals and this they have carried into their method of preparing oatmeal porridge. In most parts of England the oatmeal is made into a stiffish porridge which is set aside in a cool place and a portion taken out each day from the mass and heated up by placing in a pan over the fire or in a slow oven, water or milk and water being added to the mass to make it of the proper consistence. Day by day the porridge becomes increasingly bitter and sweet, and up to a certain point it becomes more easy of digestion, that is till it begins to get sour, but what it gains in ease of digestion it loses in its quality as a vital agent. The bitterness is due to a change of protein into albumoses and the sweetness is due to starch being changed into sugars.
The following experiments show the effect of cooking and repeated cooking on oatmeal as tested by the Lovibond tintometer.

1. Porridge prepared in the usual way and boiled half an hour. If half an ounce (14 grams) be treated with water, filtered and the copper sulphate and liquor potassa test applied and the solution again filtered a very faint pink colour results. This is examined in a column depth of \( \frac{3}{4} \) inch (18 m.m.) and it is found that it gives a reading of a 0.70 standard red and 0.70 standard yellow. The red probably depends on Albumose or proteose; the yellow probably to dextrin.

2. The same batch of porridge which has been heated up on two occasions by baking in the oven. Examined in the same manner the readings are 3.00 red and 0.70 yellow or a difference of nearly five times deeper colour. The red colouring in both cases is due to the presence as revealed by the copper and potass test. The yellow shows the presence of dextrin or glucose, probably more of the latter than the former. A freshly prepared porridge hardly reduces Fehling's solution but a porridge that has been twice re-cooked contains enough glucose to readily reduce the solution.

Milling and the part it played in the Causation of Stone in the Kidney and Bladder.

The modern process of corn milling has done much good for it has produced at least a clean meal. Formerly meals contained particles of stone chaff, many impurities such as
garlic, grass, vetches, beans, peas, and various scented plants and particles of dirt in general. This applied to meals from wheat, oats, barley, maize and so on, and the impurities were more than likely responsible for the large numbers of cases of stone in the bladder which were so commonly met with 60 years ago particularly in the purely agricultural districts of England and Scotland.

Methods of using Pearled or Decorticated Wheat as an Economical Food.

Wheat does not lend itself to being made into porridge or puddings. This is owing partly to its insipidity when cooked as porridge and to the same cause with the addition of the length of cooking needed to soften it when it is cooked as a pudding. The ingenious trader has taken advantages of these defects and he has placed on the market numerous wheat preparations which have been cooked, then dried and put up in handy and attractive forms easily prepared for the table and when so served up easy of digestion. These are the advantages but they are far outweighed by the objections to food preparations of this character. (1) They are expensive. (2) They possess the objection so often mentioned but not too often if reiteration will impress the importance of the point namely the food is deprived of its freshness. (3) Lastly the food is concentrated and so has removed from it necessary refuse and bulk -- too much a tendency of present day articles of diet placed before the public.
Frumenty. In this old-fashioned article of diet pearled or decorticated wheat can be cooked and served up without any of the objection just named. It need only be prepared twice a week at the most and in winter once a week is often enough. Formerly it was in common use but within the last twenty years it has fallen into disuse; but within the last five years there is happily a return to its use, in certain quarters.

The wheat from which frumenty is prepared can be bought at twopence or twopence halfpenny a pound. Frumenty is prepared as follows:

Half a pound of decorticated wheat, half an ounce or less of butter, one ounce or less of sugar (according to taste) three or four pieces of lemon rind to flavour. Wash the wheat to free from adhering particles of dust and loose pieces of husk: when clean place in a stew jar and cover with cold water and set the jar in a good oven. When it comes to the boiling point stir well and add all the other ingredients.

Allow to cook for four hours stirring occasionally and adding water when necessary as evaporation takes place. The mass when done is of the consistence that it will just drop off a spoon. It is now placed in moulds and set in cool place. It is eaten cold as a pudding with milk and cream or it can be warmed up or it may be eaten like porridge by pouring hot milk over it.

Decorticated Barley or Coarse Pearled Barley.

Barley being especially rich in phosphates is a valuable food for young children and might with advantage replace rice sago and tapioca. In soups it might be employed instead of rice sago and tapioca.
as is done in Scotch broth. It has a distinct and pleasing flavour which gives it an advantage over rice.

Barley Pudding.

In Scotland barley was formerly a common article of diet cooked with milk in the shape of a pudding but boiled in place of being baked. Six to eight ounces washed barley were stirred into one pint of boiling milk after which the mixture was kept simmering for two hours, another pint of milk and about half an ounce of butter and about one ounce of sugar being added. Flavouring and one or two eggs if desired.

If desired as a thick baked pudding it was at the end of two hours run into a pudding dish and finished off by placing one hour or less in an oven at a suitable temperature.

The whole aim and object of these remarks is to emphasise the need there is today for replacing concentrated and treated food stuffs by fresh, home-made articles of dietary. This is important from the health point of view. It is impressed upon us that constipation, gastric ulcer, duodenal ulcer, appendicitis and other affections of the alimentary tract are becoming more increasingly common amongst us and they are said to be especially common in the United States of America, the home of concentrated foods. There may be a connection between the two.

Experiments showing the Digestive Action of Simple Fruits and Fruit Juices. Their Therapeutic Value.

It is well known that pineapple contains a ferment called bromelaine which has an action not unlike pepsine in digesting
protein; but it is not so generally recognised that such common home-grown fruits as strawberries, cherries, pears and apples possess like properties although in a milder degree. Orange juice too acts somewhat like the juice of the pineapple. A short recital of experiments will illustrate the degree of digestibility possessed by some of the fruits named:

The Action of Fresh Strawberries on Coagulated Egg Albumin.

Fresh ripe strawberries are cut in thin slices and spread in double layers over the bottom of a crystallising dish and on the top of this layer a thin layer of rubbed-up coagulated egg albumin and on the top of this again another double layer of sliced strawberry so that the egg albumin is sandwiched between and is continually bathed with strawberry juice. The dish is covered with a glass cover and is set aside for eight hours at a summer temperature and when the albumin is examined it is found to be soft and pulpy. The mass is mixed up with cold distilled water and filtered twice through paper. Examination of a portion of the filtrate reveals the presence of a considerable amount of albumose, and when excess of ammonium sulphate is added to another portion a dense precipitate of albumose falls down. Compared with this similar weights of strawberry and albumin examined without standing yield a sparing precipitate with the ammonia sulphate.

The Action of Strawberry Juice on Serum Albumin.

In this experiment small masses of coagulated serum albumin (prepared from fresh meat) were placed as detailed above and exposed for the like time when the masses of albumin
were found to be eroded and softened. A watery solution of the contents of the dish was dialysed through parchment and the dialysate on being examined for protein gave a decided rose pink with copper sulphate solution and caustic potass solution. The mere fact of the protein substance being capable of passing through parchment was alone a proof of the presence of a high albumose and of considerable digestive activity of the strawberry juice on the albumin.

The Action of Ripe Cherries on Egg and Serum Albumins.

Ripe cherries were split open and filled with rubbed-up coagulated egg albumin and others were treated in like manner but filled with coagulated serum albumin. Both were kept at summer heat for eight hours and the resulting mass was mixed with cold distilled water and the whole filtered at once through paper. The filtrate yielded a large precipitate on being treated with saturated solution of ammonium sulphate shewing the presence of soluble protein.

Cherries contain as is well known a large proportion of a ferment capable of splitting up amygdalin into hydrocyanic acid and oil of bitter almonds but as would appear from the foregoing experiment they also contain an enzyme of the nature of pancreatin and capable of digesting protein to some considerable extent.
The Action of Orange Juice on Protein.

Orange juice filtered to free it from rind and other solid particles can also be shown to digest egg and serum Albumin when applied in the manner detailed above.

The Action of Pear and Apple Juice.

The juices of ripe pears and apples were examined as to their digestibility on both serum and egg albumins and both were found active especially on serum albumin. In some of the experiments 0.2 per cent hydrochloric acid was added but its presence appeared rather to retard than to hasten the digestive action. Unfortunately the addition of an alkali was not tried.

The Juice of tinned fruits - pears, apples, pineapples - on being examined were found to possess almost no action on either egg or serum albumin when examined under the same conditions. Probably the prolonged and high temperature necessary for their preservation killed all or nearly all the contained ferment.

All the experiments were controlled.

Practical Note.

If these experiments mean anything they show that fruits and fruit juices possess a digestive value and they prove the value of a mixed dietary by enabling the tissues to make the most of proteins.

The probability of the enzymes of fruits having an action somewhat like the lipoids has already been referred to. Thos may explain why people remain in health on dietaries which run counter to all-known usages and traditions of feeding.
Jams when scientifically prepared have two valuable properties of a like nature.

Jam. Feeding Properties of. Is a good feeding substance and retains its elements of freshness for a long time unimpaired hence can be employed as an antiscorbutic. The composition of most jams varies little and on the average they contain 69 per cent of sugar, 26 of water and 5 of cellulose due to the fruit from which they are prepared. In the best brands cane sugar (of 99.9 per cent value) only is employed. The acid fruit converts the sugar partly into invert sugar and the jam-maker endeavours to boil only so long time as is necessary to change half the cane sugar into invert sugar. If too much boiling is employed too much invert sugar results and the jam becomes mouldy; if too little boiling is employed then too little inversion takes place and the cane sugar crystallises out.

Clean Milk Plan for small dairies.

The great need is not that milk should be boiled, sterilised or treated with preservatives but that it should be clean. It is sometimes said that it is only in large establishments that really clean milk can be obtained. This is a mistake for the writer has carried on some experiments with a dairyman who keeps eight cows with a view to having milk which would keep sweet in the warmest weather. Our plan was to have the cans washed out with boiling water as soon as possible after which they are simply set aside on a clean shelf in a cool room till ready to be used. At milking time the cans are brought out and each canful of milk is strained into the can

(218)
and as soon as this is full it is closed up and if not ready to be delivered it is again set aside in the cool place till the time for removal. In summer the cans as soon as they are scalded out are placed in a barrel of water till milking time and then again each canful of milk is strained into the large can which is closed up when full and left in the barrel of cold water till time for delivery. The teats of the cows are washed before milking and it does not take long to prove to a dairyman the need for this proceeding when he sees the amount of dirt which comes off the udder of a cow and he wonders how he never thought of doing this before it was pointed out to him.

The essential is a good water supply and also a hot water supply in order that all vessels in which milk is stored may be thoroughly cleaned.

In our experiments we found that during the tropical summer of 1911 milk treated as detailed above almost never turned sour within a reasonable time so that the great point to begin with is cleanliness.

Exposing milk in large open vessels in dairies should be forbidden and in the case in which milk is delivered for sale in shops it should be stored in bottles which can be handed unopened to the purchaser.
Margarine. Margarine is various in composition, but the following is a compound commonly sold under the name:

Neutral Fat. 31.88 per cent.
Olive Oil. 28.84 "
Cotton Seed Oil. 4.34 "
Salt. 6.83 "
Milk. 16.13 "
Butter & Butter fat. 7.10 "

with small quantities of sesame oil, colouring matter, sugar, stearine, glycerine and glucose, and the approximate analysis is:

Water. 12.01 per cent.
Palmitin. 18.31 "
Stearine. 38.50 "
Olein. 24.95 "
Butyrin, Caproin, caprylm 00.26 "
Casein. 00.74 "
Salto. 5.23 "

The compound nature of margarine gives opportunity for ingenious adulteration, and the introduction of fats and other substances which should not be employed. Horse fat, bone fat, and even waste grease have been detected, and so have rape, linseed, hop, and mustard oils. Certainly not one of these should enter into the composition of the product. When once it is known that their presence may be suspected, (220)
their detection is easy. Mustard oil can be detected by Tolman & Munson's test. This consists of saponifying with alcoholic solution of alkali when a piece of clean silver placed in the mixture becomes tarnished. Rape, linseed, hop, palm and pea-nut oils are detected by shaking 160 fluid minims (10 c.c.) of the filtered suspected fat along with a like volume of acetic anhydride, adding one drop of 1.530 sulphuric acid when various colour reactions are struck with the various oils named. This is known as the Lieberman-Storch test.

Manufacture of Margarine. The best varieties of margarine contain as their base oleo-oil, which is obtained from the best portions of beef fat of newly killed animals. These portions are chilled at a low temperature and then subjected to pressure, when the oleo-oil drops out. It is worked up with the other oils of which the margarine is to be composed. The product is now churned with milk which has been pasteurised. The churn is then cooled, when salt and preservatives are added. Various restrictions are placed on the manufacturers of margarine in our own and other countries. With us it is illegal for margarine to contain more than 10 per cent. of butter and 16 per cent. of water. It is highly important that the medical man should interest himself in the composition of this food, for from time to time he may be called upon to say what oils should or should not enter into its composition, as well as to say what proportion of the various substances are to be employed.
The German Freibank or Municipal Market.

In many German towns there is a Freibank or municipal market where meat is sold at 25% lower rate as compared with meat sold in the shops. The large towns may have more than one, as for example Berlin has four. The meat sold in the Freibank may come from ox, sheep, lamb, pig, horse or dog, and it is not meat coming from a sound animal but is obtained from animals which have died in consequence of accident or animals that have been feverish for more than 24 hours and have been killed. As an example eighty-nine dogs were killed suffering from pneumonia, sarcoma, carcinoma, disease of the kidneys, anthracosis, and of these only two were set aside as unfit for human food and the best were sent to the Freibank after the diseased parts had been removed and the carcasse had been sterilised. Indeed animals may be condemned entirely as unfit for food, but the fat may be removed and placed on the Freibank. The German authorities say that the Freibank is the only way out for if they did not have the Freibank that the people would eat diseased meat without this police supervision because of high tariffs prevailing in Germany, and consequent high price of sound meat.

Precautions. The Freibank is under the supervision of the police and numerous meat inspectors, and hotels, eating houses and restaurants are not allowed except by special permit to buy in the Freibank and no one can buy more than 3 Kilograms (6 lbs. 6 ounces) daily.

Methods of Sterilisation. Meat from animals dying of diseases which are not specially injurious to human beings is treated
by salting and freezing or Durchkühlung for 21 days. Meat from animals dying of diseases likely to be dangerous to human beings is sterilised by heat in a closed chamber for two hours, the steriliser being started at 100°F (212°F) and continued at this degree throughout the process. The pieces of meat must not weigh more than 3 Kilograms (6 lbs. 6 ounces).

On account of the sterilisation meat sold in the Freibank is of a dark and rather forbidding appearance.

If the Freibank be the only alternative left provided that the importation of frozen or chilled meat is forbidden then few will be found to accept the alternative.

Literature.


Contemporary Review, December 1910, Article by C. Smith Rossie on Freibank.