NUTRITIVE VALUES OF HUMAN FOOD.

It is certain that the majority of men are more concerned with the palatability of the food they eat than they are with its nutritive value. For the gourmand (happily a rarer individual than he was a century ago), the toothsomeness of his viands is the first and only consideration, and their nutritive qualities are only suggested to his mind, and then painfully, by the ultimate and unmistakable evidence of corpulence and the gout.

Probably the only people in our midst who seriously consider the question with a view to giving it practical application are the athletes, all of whom, as a rule, know something about the relative fat and muscle-producing qualities of the standard articles of diet.

Some few years ago Congress appropriated funds to enable the United States Department of Agriculture "to investigate and report upon the nutritive value of the various articles and commodities used for human food." Careful work along this line has been carried on during the past three or four years in the New England and other Northern States, and with a view to making the investigation as representative as possible and securing definite information regarding the food supply and consumption of people living under different conditions, it was decided to select the University of Tennessee, at Knoxville, as a representative place for the study of food nutrition in the Southern States.

Prof. Chas. E. Wait, in the University of Tennessee Record, gives a valuable paper describing the results of interesting work recently published by the Department of Agriculture in its second bulletin on the subject. The paper is given in full in the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT. The investigations included dietary studies of students' clubs and mechanics' families in Tennessee; studies of the composition of Tennessee beef, mutton and chicken, and over a score of digestion experiments on healthy men.

The plan of the dietary studies includes the determination of the amounts and kinds of food bought and eaten during a stated period (from seven to thirty days), by a family or boarding club: the analysis of the food wasted, the record of the age, sex and occupation of the different subjects and the number of meals eaten by each. From the data so obtained, the actual amounts of nutrients contained in the foods were calculated. From these amounts were deducted the amount of nutrients in the waste. It is interesting to note the factors assumed in calculating meals consumed in these studies. One meal of a woman or of a boy 14 to 16 years of age is equivalent to 0·8 meal of a man at moderate muscular labor. One meal of a child 6 to 9 years of age is taken as equivalent to 0·5 meal of a man, while an average child under 2 years of age eats about 0·3 as much at a meal as a man engaged in moderate muscular labor.

Three of the studies given in the report represent the food consumption of families of mechanics, who were engaged in more or less active muscular work, which was moderately severe. Five of the studies are of clubs of college students, that is, persons engaged in mental rather than in muscular exercise. The tables show a considerable variation in the amount of protein actually consumed per man per day by the college club, ranging from 66 to 123 grammes, with an average of 92 grammes. The available energy or fuel value, however, was much more uniform, ranging from 3,450 to 3,650 calories, with an average of 3,545 calories per man per day. The daily waste of protein averaged 11 grammes or 11 per cent of the amount purchased, the waste of fuel ingredients being about 7 per cent.

The proportion of protein and the fuel value in the food of the mechanics' families was slightly larger than in that of the students' club, while it was found that the protein and energy of the dietaries examined in Tennessee differed but little from those of clubs and families examined in other parts of the United States.

The experiments to determine the composition of different kinds of meat showed that Texas range beef was the leanest of those tested, with Tennessee beef next, there being but little difference between the two. Next came the beef from the Colorado ranges, followed by that raised in New England. By far the fattest beef came from the grain-producing States, Illinois and the neighboring region, this last containing 250 per cent more fat than the Tennessee beef. The Southern and Eastern meat is superior in protein to the Western beef, but as regards the energy it is greatly inferior. Comparison of a side of Tennessee mutton with Western mutton showed again that the latter was fatter than the local meat.

Perhaps the most interesting investigation recorded in this report is the digestion experiments. The results are summarized in a table (for which and the other valuable tables the reader is referred to our current SUPPLEMENT) which brings out some very surprising facts. We learn, for instance, that the popular belief that a mixed diet is preferable to a diet composed of only one or two foods is fully indorsed by this scientific investigation, as the following facts will show: The average of ten experiments with an exclusively milk diet showed 92·1 per cent of the protein and 86·3 per cent of the carbohydrates to be digested. Five experiments with an exclusively bread diet or with bread and sugar showed 82 per cent of the protein and 99 per cent of the carbohydrates to be digested. On the other hand, five experiments with a diet of bread and milk showed 97·1 per cent of the protein and 98·7 per cent of the carbohydrates to be digested. That is to say, the protein in milk alone or in bread alone seems to be much less completely digested than when the two are eaten together. It has yet to be proved that similar results would follow if other food materials were made the subject of comparison; but the general conclusion is drawn by the author of this very interesting paper that more complete digestion would occur when the diet was nearly normal, that is to say, made up of a number of food materials.

OUR CONSULAR SERVICE IN RELATION TO AMERICAN MANUFACTURES.

American manufactures seem likely to make their greatest record in the fiscal year which will end on June 30 next. Advance reports show that in the last seven months the exportation of domestic manufactures is $23,000,000 greater than the highest record ever made in the corresponding month of any fiscal year. During the seven months ending February 1, 1899, the exports of domestic manufactures amounted to over $182,000,000, or an average of $1,000,000 a day for every business day of that period. A decade ago the imports of manufactures were more than double the exports of manufactures; now the exports of manufactured goods are twenty-five per cent greater than the imports of manufactured articles. In ten years exports of the articles which we are considering have increased from $78,751,433 to $182,336,503, and our magnificent trade balance is to-day the envy of the world.

The government of the United States has very wisely adopted a plan of obtaining information from abroad which is simple and which is working admirably. The various officers of the consular service are instructed to notify the Department of State of any opening for American trade, any large contracts to be awarded, and matters of a like nature; besides, they give news of new industries, valuable statistics, and information as to trade methods in vogue abroad. These reports are printed daily in what are called "Advance Sheets of the Consular Reports," which are issued to the press and interested parties, and each month they are gathered together in a neat little magazine called "Consular Reports."

At the present time the United States has 39 consul-generals, 260 consuls, and 33 commercial agents, 332 officials in all, who are gathering information in all parts of the world, in addition to the other duties which pertain to their office. These gentlemen are many of them trained business men, who are quick to seize upon the significant features of trade, and who are able to deal with them comprehensively. The value of their reports is freely acknowleged by foreign governments. We have deemed the reports of our consuls abroad to be of such importance, in view of our constantly increasing foreign trade, that we have decided to establish in our SUPPLEMENT a new department, where many of these reports will be published in full, or where, owing to their length, it is not possible to do this, a careful abstract will be made. We feel sure that this feature will be appreciated by the readers of our SUPPLEMENT, and doubtless many who are not at present regular subscribers to the SUPPLEMENT would be glad to become so, owing to the importance of this new feature. We shall also publish consular reports which do not deal specifically with trade, but with new industries, etc., both in our SCIENTIFIC AMERICAN and our SCIENTIFIC AMERICAN SUPPLEMENT, as has been our custom heretofore.

COST OF ELECTRIC LIGHT.

BY ALTAN D. ADAMS.

In the judgment of many persons the incandescent lamp furnishes the most agreeable and satisfactory form of artificial light.

This opinion is due to the fact that incandescent light is more like sun light than that of gas, and also to the absence of combustion, with its consequent gases and odors and fire risk.

The increased cost of electric light over gas, when taken from public supply, is, without doubt, the main hindrance to its greatly extended use, and a glance at comparative figures shows the difference in cost for many cases to be considerable.

Gas at one dollar per thousand feet costs one mill per cubic foot, and as a regular gas burner requires five cubic feet per hour for a nominal sixteen candle power light, the cost per burner is five mills per hour.

The cost of incandescent light to the consumer varies much in different places and even between different cases in the same place.

There are two ways in which the charge for electric light is regulated. One is based on a certain charge per lamp hour and an agreement as to the number of hours per day or month the lamps shall be presumed to have burned. Under this arrangement it is usually impossible to tell beforehand whether the supply company or the consumer has the worst end of the bargain. The other and more satisfactory way to regulate the charge for electric light is by meter, and the meter records the actual electric energy used, and no more. It is the fairest method for both parties. A charge of a certain sum per lamp hour is known as a contract rate, and is based on one cent per lamp hour in many cases, though it may be higher and is frequently lower than this.

The unit of electric energy measured by the meter is the watt-hour, and a charge of fifteen cents per one thousand watt-hours is common, though contracts covering service for a large number of lamps can usually be made at a better figure. Incandescent lamps of sixteen candle power can be had from the large makers at twenty-five cents each in small lots and at twenty cents each in lots of two hundred; from the small makers these prices can be improved on by several cents per lamp. In nearly all large cities and many small ones electric current is sold on the meter method, and the cost of light to any consumer will depend to a large extent on the efficiency of the lamps he uses. By the efficiency of a lamp is of course meant the power or watts required to run it compared with its candle power.

Incandescent lamps of sixteen candle power look much alike, but they vary fully forty per cent in the watts required for the same light. Thus, sixteen candle lamps may be had from the same makers at the same price which require from fifty to seventy watts to operate per lamp. To get the more efficient lamps it is only necessary to so order, and then, if their quality is doubted, have a test made by a disinterested engineer. At the rate of fifteen cents per thousand watts per hour, the cost per hour for a fifty watt lamp will evidently be seven and one-half mills, or one and one-half the cost of gas, while for a seventy watt lamp the cost per hour will be ten and one-half mills, or slightly more than twice the cost of gas. A large per cent of the charge for operating incandescent lamps may thus be saved by using only those of high efficiency.

If the light from an incandescent lamp remained constant until the lamp gave out, the only thing necessary for economy would be to select the most efficient lamp; but, unfortunately, the light decreases rapidly in amount as the lamp grows older, while the power required by the lamp remains nearly constant. It is common for incandescent lamps to burn as long as one thousand hours, and many lamps, after burning this long, give less than half the light given at the start. The cheapest thing to do with a lamp that has fallen as much as twenty per cent in candle power is to destroy it and put in a new one, as the cost of a lamp is small compared with the cost of energy required to operate it during its life. Consider a seventy watt lamp that has burned one thousand hours. It has evidently consumed seventy thousand watt-hours, which, at fifteen cents each, have cost ten dollars and fifty cents. The lamp cost twenty cents.

Again, take a fifty watt lamp that has burned eight hundred hours. Forty thousand watt-hours have been consumed, which, at fifteen cents, amount to six dollars, the cost of lamp being again but twenty cents. In the first case the cost of lamp is about two per cent and in the last about three and one-third per cent of the energy consumed. Were fifty watt lamps burned only four hundred hours and only three-fourths as many used as when burned for eight hundred, more light would be had at a less total cost. The fact that consumers put up with electric lamps that have burned eight, ten, and even twelve hundred hours and lost fully half their candle power, shows that a sixteen candle power lamp is not required in many places, and this is confirmed by the many gas jets which, through poor gas or dirty pipes, give but ten or twelve candles.

It can also be shown that the great advantage of the electric light is in its quality rather than its volume, which, together with above facts, leads to the conclusion that a smaller lamp, say of ten candle power, could well be used instead of the sixteen candle incandescent lamp in many places, at a large saving in cost of operation. Above opinion is strengthened by the very general use of the ten candle incandescent lamp in England and the continent of Europe, for places where the sixteen candle lamp would be used by us. Ten candle power lamps can readily be had that require but thirty-five watts, costing, at fifteen cents per thousand watts per hour, but five and one-quarter mills per lamp hour, or about that of gas. These ten candle lamps, if burned only two or three hundred hours each, give about the same average light as the sixteen candle lamp burned eight hundred hours, and at about two-thirds the cost.

THE Congressional Library at Washington has a set of The London Times from 1796. It is not strange that a file of this newspaper is now of great value, for in 1800 only 1,000 copies were printed. The set in the Boston Public Library dates from 1808 and consists of two hundred and thirty-two bound volumes.