respect to contracts made by an urban authority under that Act, the following regulations shall be observed:—(1) Every contract whereof the value or amount exceeds £50 is to be in writing, and sealed with the common seal of such authority; and (2) Every such contract is to specify the works, materials, matters, or things to be furnished, had, or done, the price to be paid, and the time or times within which the contract is to be performed, and shall specify some pecuniary penalty to be paid in case the terms of the contract are not duly performed.

In the present case, it appears that in November, 1892, the plaintiffs and defendants entered into a contract in writing, duly sealed with the seal of the defendants, whereby the plaintiffs agreed to light the streets of the defendants' district by means of electricity for a period of five years.

The contract contained stipulations as to the materials to be supplied, prices to be paid, etc., and also an arbitration clause; but it did not contain any clause specifying pecuniary penalties to be paid in case its terms were not duly performed.

The plaintiffs had duly performed their part of the contract, and would be entitled to the sums claimed in the action if the contract was valid and binding upon and enforceable against the defendants.

The question for the Court was whether the contract was void, by reason that it did not specify some pecuniary penalty to be paid in case the terms were not duly performed.

The Court (Pollock, B., and Wright, J.) held that the provisions of Section 174 of the Public Health Act, 1875, with respect to penalty, were not directory merely, but essential and obligatory, and that the contract could not be enforced against the urban authority.

The case is reported in *Law Reports* (1895), 2 Q.B., p. 463; and in 11 *Times Law Reports*, p. 557.

THE BRITISH INSULATED WIRE COMPANY (LIMITED) *v.* THE PRESCOT URBAN DISTRICT COUNCIL. (On Appeal).

Contract by Urban Authority—Validity—Omission to specify Penalty—Public Health Act, 1875, s. 174.

This was an appeal against the decision of the Divisional Court in the last-mentioned case.

Upon the hearing of the appeal, it was stated that the Local Government Board would sanction the payment of the arrears due under the contract which the Divisional Court had held to be invalid, and that it had been arranged that a new contract, containing a penalty clause, should be entered into in place of the invalid contract.

The Court thereupon dismissed the appeal, without delivering any judgment.

The case is reported in *Law Reports* (1895), 2 Q.B., p. 538.

H. T.

A STUDY OF THE LAWS OF INCREASE OF POPULATION.

By M. JOSEPH KÖRÖSI, Director of the Municipal Bureau of Statistics in Budapest.

It is of the utmost importance, both for statistical and general purposes, to know the limit of human fecundity and the rapidity with which the human kind propagates. The greater or less fecundity of a nation is one of the conditions of its political power and influence. On the other hand are produced the evils of over-population and deficient work for each. Thus are produced the misery of the masses, the great movements of socialism, communism, and anarchism which occupy to such an extent the attention of the present generation.

The principal cause of the augmentation of population is conjugal fecundity. The exact statistical expression of this is very embarrassing. The most usual comparison is between the marriages contracted in the course of a year, and the infants born during the same year, the uncertainty of which, as a measure, is well known to statisticians. The uncertainty is increased when we come to inquire what changes in fecundity are produced by race, social position, well-being, and, above all, the decisive factor of age. The influence of the last factor must be measured in the most exact fashion, as we are here dealing with a purely physiological phenomena, which can be treated by the quantitative method. Fecundity is a function of age, reaching its maximum at a certain age, and terminating more slowly at zero. One might imagine, therefore, that the variations of fecundity produced by the advance of age, ought to follow a regular course, and that its graphic representation would describe a regular curve. To arrive at this law, observations should be for single years, rather than for quinquennia. Further, as every conception is the product of two factors, and the potential power of one of the parents is modified by that of the other, particularly by age, the law according to which fecundity is modified by age can only be ascertained by combined observations of the age of the two parents. Assuming, then, the duration of the fecundity of the male is about 50 years, and that of the female about 40 years, the question as to the degree of conjugal fecundity, which at first appears so simple, can only be solved by a division into at least 2,000 questions, since each year of age of one parent ought to be combined with each year of the age of the other.

Results of these observations are given in *tables of natality*. A similar table will give us for each year the probability of a birth for each combination of ages of fecundity. There has been a possibility of constructing such tables of natality in Budapest since 1889, as the birth-returns state *inter alia* the ages of parents, previous births in same family, &c.

What is still required, is to know the number

of couples living among the same combinations of ages, and then, by the comparison of these figures with the corresponding births, we learn the probability of a birth for each combination of ages. This is possible by means of the census returns of 1891.

The observations have been continued through four years, and embrace 46,931 births. From these we learn that of 1,000 total marriages existing in Budapest, there were, in the course of a year, 163 births. This result cannot be scientifically utilised, inasmuch as many of the total marriages have passed the period of prolificity. It is necessary to apply the same principle as in statistics of mortality, giving a separate statement for each year of life. I had the honour to present such tables to the Royal Society of London, just 200 years after the first tables of mortality, by Halley, first saw the light. (Phil. Trans.)

The facts may be stated first mono-sexually. They show that the fecundity of the female reaches its maximum between the eighteenth and nineteenth year, descending thence in a regular line to the age of 45-50 years, when it ceases. Young mothers under 18 years of age do not seem to be yet in full possession of their reproductive power. Of 100 marriages at these ages there are 36 to 38 infants. From 18 to 20 years, fecundity reaches its maximum of 40 per cent. At 25 years it is 32 per cent., at 30 years it is 24 per cent., at 35 years 17 per cent., at 40 years scarcely 7 per cent., at 50 years 0.1 per cent.

Men attain the maximum of their fecundity at 25-26 years, when it is 35 per cent., at 35 years it has fallen to 23 per cent., at 45 to 9.5 per cent., at 55 to 2.2 per cent., and at 65 to 0.5 per cent. The figures relate to effective, and not to physiological fecundity. The fecundity of marriages newly-contracted will approach most nearly to physiological fecundity, prudential considerations frequently operating later in married life. At the last census in Budapest, inquiry was made as to the duration of marriage and the number of children. From these were obtained the following results as to fecundity of marriage :—

	For Women Newly Married.	For all Women.
Age 30—34 years ...	32.9%	20.6%
„ 35—39 „ ...	32.7%	14.7%
„ 40—44 „ ...	21.4%	5.9%

The two columns show a difference increasing with age.

Thus, at the age of 40-45, it is a rare thing to see a woman with an infant; but among newly-contracted marriages at this age the frequency of births is four times as great.

The facts may be next considered bi-sexually, *i.e.*, according to the change in age of both parents.

For 100 females of the following ages, the

probability of a birth varies with the age of the man as follows :—

Age of Father.	Age of Mother.		
	25 years.	30 years.	35 years.
25—29 years ...	35.6%	25.0%	21.2%
30—34 „ ...	31.2%	23.6%	19.9%
35—39 „ ...	27.5%	21.8%	19.4%
40—44 „ ...	—	16.7%	14.0%
45—49 „ ...	—	14.4%	10.9%
50—54 „ ...	—	—	10.9%

On the other hand, the fecundity of the fathers varies as follows with the age of the mothers :—

Age of Mother.	Age of Father.			
	25 yrs.	35 yrs.	45 yrs.	55 yrs.
Under 20 years ...	49.1%	—	—	—
20—24 „ ...	43.0%	31.3%	16.0%	—
25—29 „ ...	30.8%	27.3%	18.5%	—
30—34 „ ...	33.5%	23.7%	14.4%	8.1%
35—39 „ ...	—	18.9%	11.8%	6.7%
40—44 „ ...	—	6.6%	6.1%	3.0%

These probabilities of birth may in time be practically utilised in the same way as the probabilities of mortality tables. The latter are the basis of life assurance, the former may furnish the basis of a new branch of assurance.

The same tables answer the question as to the appropriate age of the female to secure the greatest fecundity. Thus a man aged 25 years ought, from this standpoint, to choose a wife aged 19 years; a man aged 35 a wife aged 21 years; at 40 years a wife of 24; at 45 a wife of 29 years old. They may also be employed in ascertaining the difference between the ages of man and wife which is most conducive to fecundity. Thus, from this standpoint, a woman aged 18-19 years ought to marry a man 7 years older than herself; a woman of 25, a man 3 years older. At 29 years of age the greatest average fecundity is obtained with a husband of the same age, beyond 30 years with a younger husband.

In a contribution to the Royal Society on my tables, Mr. Francis Galton made an ingenious attempt to reduce to a single formula the probability of births for numerous combinations of ages, and made further combinations of ages of the same fecundity with geographical maps for places of the same temperature and altitude. These lines, analogous to his isotherms and isobars, may be described as *isogènes*.

When one represents graphically the tables of natality, the diagrams being set out from left to right according to the age of the mothers, and from above downwards according to the age of the fathers, the following results will be seen. Each combination of age will be represented by a square like that shown on geographical maps by increase of degrees of latitude and longitude. If one marks on each square the height of each degree of fecundity, one obtains a mountain in relief, whose highest points are in the left upper angle, *i.e.*, in the youngest ages, while it declines then in all directions. But as men of 24-29 years are at the

apogee of their reproductive force, there will be formed at the upper part of the relief corresponding to these years a ridge crossing the relief. If one follows the female fecundity for each year of age, one ought to cross this ridge at the 24th year of masculine age. In descending, one arrives by degrees at the same point of apogee that has been crossed from the other side in ascent. This shows that the fecundity of the female reaches its maximum at various ages. For example, women of 23 years, have with men of 23 years, a fecundity of 36 per cent., and the same with men of 30 years, whilst with men at intermediate ages they attain the maximum degree of fertility. For women aged 24 years, the same degree of fertility is found with men of 24 years and of 30 years of age, and so on; women 31 years old having a fecundity of 25 per cent., on the one hand, with men 26 years old, and on the other hand with men 30 years old.

REPORTS OF MEDICAL OFFICERS OF HEALTH.

ST. GEORGE, HANOVER SQUARE.

Enteric Fever and the Use of Thames Water after Flood.—Professor Corfield states:—Of the sixty-five cases of enteric fever in 1894, no fewer than twenty-nine were certified in November and December, and only fourteen in the three previous months, when the seasonal prevalence of that disease usually takes place; and, on investigation, I find that this is usually the case, as is shown by the following table:—

CASES OF ENTERIC FEVER.

YEAR.	Aug., Sept., and Oct.		Nov. and Dec.	
	Number of Cases.	Average per Month.	Number of Cases.	Average per Month.
1891... ..	6	2	12	6
1892... ..	15	5	15	7.5
1893... ..	16	5.3	18	9
1894... ..	14	4.6	29	14.5

This follows upon the delivery of insufficiently filtered Thames water when the river is in flood, which was especially noticeable last year, the samples taken in November being very bad indeed. Some cases of this disease in London and elsewhere were believed to have been traced to the consumption of sewage-polluted oysters, but this cause would apply equally to September and October.

Alkalised Gas Creosote as a Disinfectant.—At the request of your committee of works, I had a series of bacteriological investigations made into the power of various disinfectants to destroy

organisms, the result of which confirmed the advice I gave to the Vestry many years ago—to use alkalised gas creosote as the general disinfectant, and not to distribute carbolic acid to the public.

ANNOTATIONS.

THE PROBLEM OF RE-HOUSING PERSONS DISPLACED BY IMPROVEMENT SCHEMES.

The great difficulty in all improvement schemes is re-housing the persons displaced. Demolition being for the purpose of opening up to light and air, it is often not desirable to re-house on all or even part of a site. To measure the amount of re-housing desirable by the number of persons displaced is very misleading, for whereas the old occupiers were housed in a minimum of cubic space, the new occupiers will demand a maximum; the amount of re-housing should therefore be measured by cubic space rather than by number of persons. It would seem a reasonable course to pursue to ascertain the amount of inhabited cubic housing space to be demolished, and to replace as much of this cubic housing space upon as much of the area as is compatible with the London Building Act. If it is absolutely necessary for the Authority to provide the rest of the required re-housing space, it is placed in a difficult position. Surrounded on all sides by crowded areas this can only be accomplished, either by building upon open spaces—such a remedy being worse than the disease—or by erecting dwellings out of town, and this can be done as well, if not better, by private effort as by a Public Authority. It might be worth considering whether a Public Authority could not contract with a private individual to supply the requisite cubic re-housing space as near the site of demolition as possible, or, if need be, out of town. But, after all, however the accommodation is supplied, who is to undertake that the persons displaced shall go into any new buildings provided? The only reasonable conclusion that can be come to with regard to re-housing after demolition is that it should be made incumbent upon the Authority *to utilise the space to the best advantage and to the fullest extent permitted by the London Building Act.* To demand more than this is to demand the impossible.—*From Dr. Sykes' Annual Report, St. Pancras, 1894.*

THE REMOVAL OF OFFENSIVE MATTER.

Dr. T. O. Dudfield, in his eleventh monthly report for 1895, draws attention to the practical difficulties arising in connection with the removal of fish offal and other offensive matter before 10 a.m. This means that the offensive matter is often left on the premises from Saturday to Monday morning, thus causing a much more serious nuisance than would be produced by a Saturday