July, August, and September. The winds experienced were chiefly from the north-east.

THE POPULATION OF LONDON.

THE growth of this huge city presents a problem full of interest, says *Engineering*, and not without anxiety to those who are responsible for its government. It has already attained a population which overshadows that of every other city, both ancient and modern, and which, indeed, surpasses that of many a kingdom whose actions are now watched with concern by the leading statesmen of Europe. Scotland, Switzerland, and the Australasian colonies each contains less souls than London, while Norway, Servia, Greece, and Denmark can scarcely boast half so many. The famous cities of the world look small by comparison. Paris, Berlin, and Brussels cannot together equal the sum of its multitude, nor New York, Brooklyn, Hoboken, and Jersey City two-thirds of it. And the greater part of this aggregation of human beings has been gathered together within very recent times.

Since the commencement of the century the number of inhabitants has quadrupled, rising from 958,863 in 1801, to 3,816,483 in 1881; and the question to be answered is, how long will the attraction which London possesses for the people of the provinces and of foreign lands continue, and how long can it find accommodation for the yearly influx? When the attraction ceases, it is safe to predict the beginning of the end; for, as soon as the metropolis no longer draws to itself the best men from every part of the country, it will lose its supremacy, and other places will rival it, each being its superior in some department. But there is a sense in which London must in time become fixed, and incapable of further expansion. The area of the registration district is not likely to be extended, and consequently a time must arrive, if the growth be maintained, when it will be completely filled, and all additions must be confined to the surrounding district, the greater London, the size of which no one can foretell.

The length of time which will be occupied in filling the present metropolitan area formed one of the principal topics lately dealt with by Mr. Price-Williams in a paper on 'The population of London, 1801 to 1881,' recently read before the Statistical society. In this he traced the variation of the population in each district decade by decade, showing how many have attained a maximum, and then declined to be stationary at a point which appears to represent their permanent capability. The total area of London is 75,334 acres, or, omitting those occupied by water, 74,427 acres. Mr. Price-Williams estimates the maximum possible population within the metropolitan registration area at about 7,000,000, or about ninety-four people per acre, and that it will require thirty-six years for the density to be acquired over the entire area, assuming that the average rate of increase of population, which has obtained during the last eighty years, namely, 18.86 per cent per decade, to be maintained in the future. He points out, however, that the percentage of increase has been falling since 1851, and is now only 17.28 per cent; so that it is possible, or indeed probable, that the term of years mentioned by him may be exceeded.

Mr. Price-Williams bases his calculations on the capacity of the metropolis by observing that in all parts some area gets filled, and then in a little time the population decreases to a point which may be considered as a constant at which it will be maintained. In the districts which are completely built over, the tendency is for the population to be displaced by shops, offices, and the like; and thus it may safely be affirmed that in such parts the maximum will never be reached again. In the outlying districts there is generally some part which may be taken as fairly characteristic of the whole, and may be used as a basis for calculation.

The commencement of the marked increase coincided with the institution of the railways, which rendered it possible to persons to live at a distance and get backwards and forwards with facility. It is an interesting problem to consider how much further the system of suburban residence will be extended. Already there are signs that a part of the population is finding that it is not worth while to take a long journey to reside in a street which only differs from the street in which their business is conducted by being worse paved and lighted. The inhabitants which constitute 'society' always congregated in town, and now the rapid erection of mansions let out in flats testifies that their superior convenience and better sanitary arrangements serve as an equivalent to the fresher air of the country. If the co-operative system of housekeeping were to become general, it would greatly modify the estimate as to the possible maximum population. The average density of Paris is more than double that of London, and yet the streets are brighter and cleaner. The question probably turns more upon the prevention of smoke than upon any thing else. If the fog and gloom could be removed, and free access provided for the sunlight, there is no pleasanter or healthier place to live than the west end of London; and many who now endure, morning and evening, forty minutes' journey through choking tunnels, and walk long distances to railway termini, would stay in town if they could be relieved from the de-

pression which is the accompaniment of a murky atmosphere.

WASTE IN WHEAT-CROPS.

IN most of the wheat-producing regions of North America a yield of thirty bushels per acre is exceptional, and one of forty or more, remarkable or extraordinary. Most farmers are content to get a return of fifteen or eighteen bushels, and only twelve and one-half is the average yield throughout the United States. The usual increase is thus only about ten or twelve fold, and only very exceptionally thirty or more fold. Doubtless most persons who have given the subject any attention wonder why it is that among all farm products the return should be so small for the amount of seed sown. In a late number of the *Contemporary review*, Dr. Paley has discussed this subject, and brought out a number of interesting facts.

A single grain of wheat will produce from five to seven ear-bearing stalks: experiments seem to show that the latter is the normal number. The single blade 'spears' first into three, then into five or more side-shoots, every one of which, separated and transplanted by hand, will form a new plant. Each ear contains, on fairly good land, from fifty to sixty, sometimes even seventy, grains. Three or four of the terminal grains are generally smaller, or otherwise defective, and are rejected in winnowing and screening the wheat. But as a fair average, on a moderate estimate, a single grain can produce three hundred, and there is a possibility of four hundred, or even more. This means, of course, that every bushel sown can, theoretically at least, yield three hundred bushels; but, as we have seen, the actual yield is only a small portion of this.

In tracing, then, the bushel sown to the twelve or fifteen bushels that come into the farmer's granary, we have to inquire what proportion of the seed germinates, how much of it is destroyed by birds, mice, insects, and how much grain is shed from over-ripeness, or lost in harvesting and threshing. A very considerable quantity, without doubt, is the aggregate loss from these causes combined. Still the immense difference between the quantity that can be, and theoretically ought to be, produced, and that which actually goes into the wheat-bin, remains to be accounted for. The loss of grain in the various processes of harvesting evidently must be much greater than is commonly supposed. If one take a ripe wheat-ear, and strike it on a table, he will see some grains fall out; and, if he examine where a wheat-sheaf has fallen, he will find not a few kernels that have been shed. Certainly the 'volunteer' growths after harvesting are sufficient evidence of waste.

To ascertain, with something like accuracy, the actual produce of the wheat-plant, Dr. Paley planted a small piece of garden-ground, of moderate wheat-growing quality, with three separate parcels, each of fifty average wheat-grains. Of these three parcels, the first (A) was sown broadcast; the second (B) was set in two rows, after the manner of drilled wheat; the third (C) in separate grains six inches apart, — all carefully covered with earth. Besides these, he planted twelve grains three and a half inches deep (D), and three grains in each of three holes, one inch deep (E). Of group A, twenty-five came up, and produced one plant of three stalks, six of four, three of five, seven of seven, and three of nine, with a total of one hundred and forty-eight ear-bearing stalks; of B, thirty plants grew, giving two of two stalks, eight of three, one of four, ten of five, six of seven, two of ten, and one of eleven, with a total of one hundred and fifty-one; of C, thirty-two plants grew, producing a total of one hundred and forty-eight ear-bearing stalks; of D, not a single one germinated; and of E, only one, which did not thrive well. The nearness of the totals of the first three is remarkable. If thus we estimate an average of three stalks from each grain sown, and for each ear fifty sound grains, we should have a yield of one hundred and fifty fold.

What, then, are the reasons of such an extraordinary difference between theory and practice? Besides the various kinds of blight, such as smut and mildew, affecting the straw or the ear, and greatly diminishing the production, there are other causes why wheat is said to thresh out badly, which are less visible while the crop is standing. One of these is the partial filling of the ear: there is more chaff than there should be in proportion to the grain. There is a popular idea about the wheat-plant which is entirely erroneous. It is thought, that, if high winds prevail while the wheat is in flower, the anthers, which are seen dangling from the ears, will be blown off, and the grain will not set through the loss of pollen. Year after year we see this stated in agricultural papers and grain reports. But the fact is, these anthers, when protruded, have already performed the office of impregnation, which takes place within the closed glumes. The 'flowers' seen hanging down are exhausted anthers, and wholly useless. The following experiments seem conclusive proof of this. Let one gather a dozen green wheat-ears from a plant that is just beginning to flower, and keep them for an hour or two in a warm room in a glass of water. The anthers may then be watched in succession in the very act of being protruded