ON THE DESTRUCTIVE EFFECT OF SMOKE IN RELATION TO PLANT LIFE.

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THE joint Committee of the Coal Smoke Abatement Society and The Royal Sanitary Institute, having requested that some representative of the Royal Botanic Society should read a paper at the forthcoming Conference on the above subject, the Council of the Royal Botanic Society have requested me to perform this part, and I trust to be able to add something of interest to your proceedings.

The subject arose out of remarks in the *Westminster Gazette* on the evil consequences of black smoke to the plants belonging to the Royal Botanic Society. It has, however, been again and again before the Society, and no further back than 1880 Mr. Sowerby says: "Plants cultivated in London suffer at all times and seasons more or less from the dull atmosphere, charged as it is with smoke, and the unprecedented amount (in January, 1880) and duration of soot-charged fog which during many consecutive days hung over the Gardens, prevented the sun's light from reaching the plants, and thus retarded their healthy development. In some cases flower buds have fallen, without coming to maturity; in others unnatural and sickly growth has been the result, and this especially at the greenhouses, the lower natural temperature of the open garden keeping the plants and trees generally in a state of sleep or rest, in which the action of light is not so essential to their vitality."

So far as London is concerned, there seems to have been no appreciable improvement or reduction in the number of its fogs, or their density, during the 25 years since that complaint was written, and the evergreens, with other plants, are still crusted as thickly as ever with a black slimy product which comes down as fog. So damaging is this mud to the plants, that it becomes necessary to keep washing their leaves, and it may be taken as a general rule that a London garden costs twice as much as a

country garden of the same size, and this is entirely due to fogs and their constant companion smoke. Indeed, it is noticeable that West End gardens lose much of their due amount of sunshine owing to the pall of smoke (even when there is no fog) that sunlight cannot penetrate, until high noon has passed, and the afternoons in West End gardens get far the largest amount of life-giving sunlight.

In considering the evil effects of coal-gas, when burnt, upon the life of plants, and no doubt of animals also, it should be remembered that the carbon produced by imperfect combustion does no direct or poisonous harm, but it closes up the pores of the leaves and prevents the performance of their proper functions.

As there is much sulphuric acid in the substance of the fog, it follows that a poisonous action takes place, whereby plants are greatly injured: it is, therefore, very desirable that there should occasionally be a good top dressing of the waste plaster of houses and ceilings, being pulled down, or lime where this cannot be got. This applies to window-box gardens, and to gardens of every size. Those plants which flower near the ground, such as pansies, suffer most from the poisonous surface of the ground, and no plants can be found which are in any way the better for the conditions under which they have to grow in a London garden.

In order to get some idea of the amount of smoke or other items which fall upon the leaves of an evergreen plant (the aucuba), a quantity has been gathered and carefully washed. The difference in appearance of washed and unwashed leaves shows the extent of this evil, and it is no wonder that such a deposit damages the plants that carry on a precarious existence in a London garden. The general consistency of the mud-laden water approximates if it does not exceed that of ink.

In order to learn which plants or trees can live or cannot live in London, as compared with a different climate, namely, that of his estate in Ireland, Mr. Marlay has been making, during many years past, a series of experiments, and the results he has most kindly supplied to the author, who has thus been enabled to publish an extremely interesting comparison. It is curious to note that some plants, as for example the white oak (*Quercus alba*), will flourish in Regent's Park better than in Ireland, where it enjoys apparently the finest conditions.

It must be remembered that London has variations of climate and more than one soil, and that fogs, into which soot and sulphur largely enter, are prevalent during a great part of the year. Of trees generally, especially deciduous ones, such as the plane, several forms of acer, poplar and birch, will live fairly well in London atmosphere. The

scarlet oak, introduced by Mr. Marlay, has surprised him by its success up to the present.

In regard to common wild flowers, we must not expect to grow these with the same amount of success as we can do in a purer air.

Most evergreen shrubs are very doubtful, and the pine tribe may be given up. Some evergreens will thrive well for a certain time, the aucuba and broad-leaved holly being the best; others will struggle on like the yew and box, for varying periods, but are of no use except in carefully tended gardens.

Fruit-trees might be tried in London on a more extended scale than at present. The experimental garden belonging to the Royal Botanic Society shows very interesting examples of vegetable and fruit growth.

In conclusion, it can be taken as a general rule that all trees or plants with smooth leaves can better resist the action of fogs than those with rough or hairy leaves, such as the foxglove, salvia, and common primrose. These and others of their class suffer the most injury.

So far as plants under glass are concerned, similar conditions prevail, affecting such plants as, for instance, the Chinese primula and cineraria.

In all cases, however, it is necessary to keep the glass clean by washing after the occurrence of fog.