

CHAPTER IV.

DAMAGE DONE BY THE NUISANCE.

ABOUT one-third of the coal consumed annually (eighty million tons) is wasted, and might be saved if a more scientific and sensible system were adopted in the burning of the coal.

Darkness.—Black smoke forms the best substance imaginable with which to darken the heavens, and cut off the light. It is as effective for this purpose as any material known to science.

The intensity of daylight is decreased, and consequently the cost of illumination is increased in all smoky towns, in two ways—(1) by the absorption of the daylight during its passage through the atmosphere; (2) by covering the skylights, windows, and other lighting fixtures with a black coating of soot. The average loss of light for the year in the smokiest towns is, in all probability, in the neighbourhood of 45 per cent. This means a large percentage increase in the cost of artificial illumination. Architects say they do not use skylights where it is possible to avoid them, for, unless they are cleared very often, they soon become useless, because of the accumulation of soot.

Buildings.—Figs. 3, 4, 5, and 6 are reproductions from the report of the Departmental Committee on "Smoke and Noxious Vapours Abatement."

Smoke defaces, disfigures, or destroys buildings, and restricts the style of architecture. Sulphuric acid, particularly, corrodes or disintegrates practically all kinds of building materials (slate and granite possibly

excepted); marble tends to turn green, and then black; limestone deteriorates very rapidly, turning to gypsum owing to its great affinity for sulphur. The combination with sulphur causes expansion, and it is rendered soluble

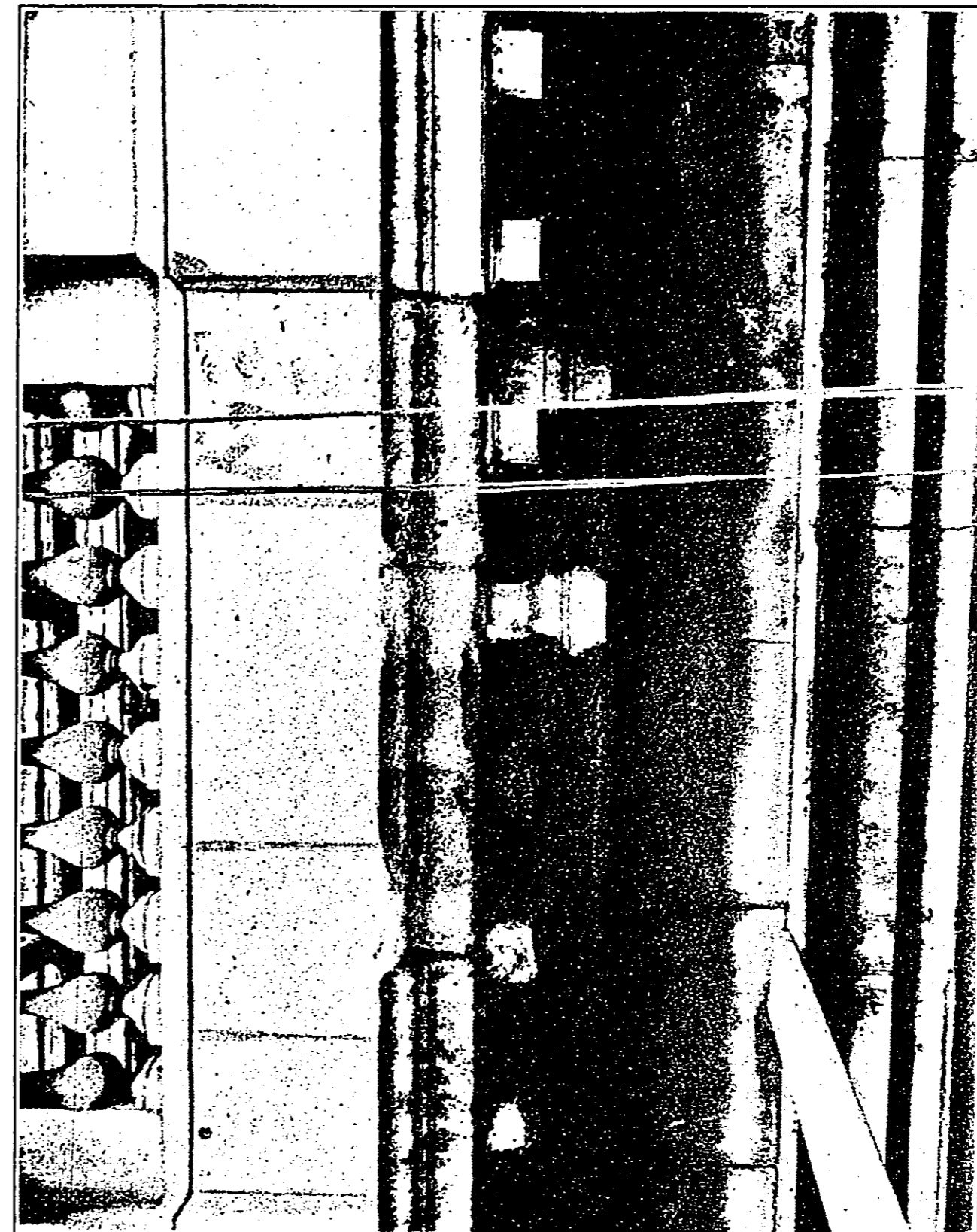


Fig. 3.—Somerset House (Quadrangle).
Portland Stone Cornice, showing decay and sooty incrustation.

and powders, so that particles are constantly washed or blown away. The very best stone obtainable was used in the new additions to the Houses of Parliament in London, and every care suggested by modern science

was taken to preserve the materials, yet the buildings were much eroded after a few years.

One of the worst aspects of the smoke nuisance is the

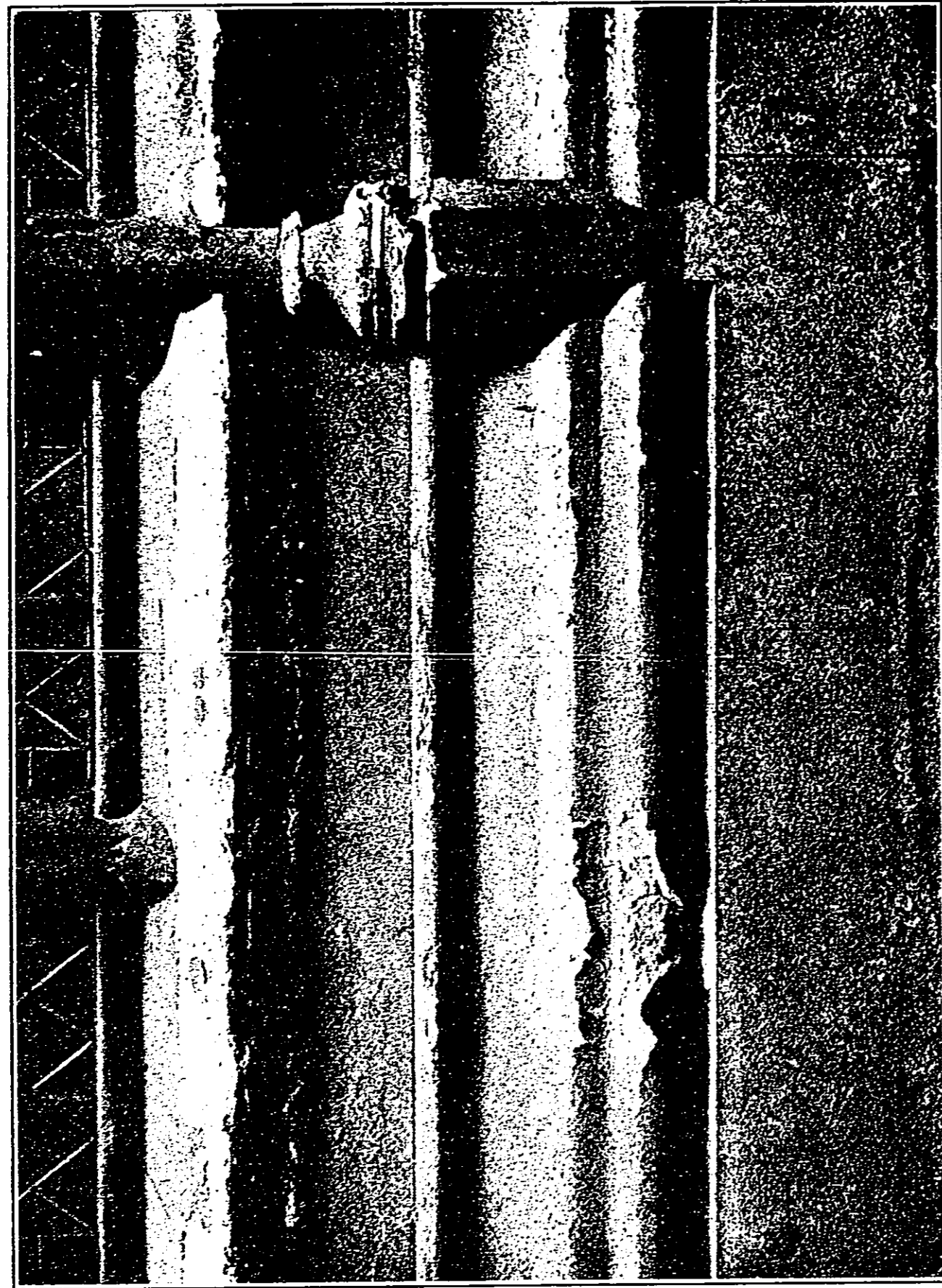


Fig. 4.—Houses of Parliament (Cloisters).
Caen Stone Plinth, showing exfoliation and serious decay.

insidiously destructive influence of smoke on ancient buildings, relics, or monuments.

Smoke not only shortens the life of building materials,

but it destroys the force of expression of the architecture, so that the buildings are reduced to a shabby mass

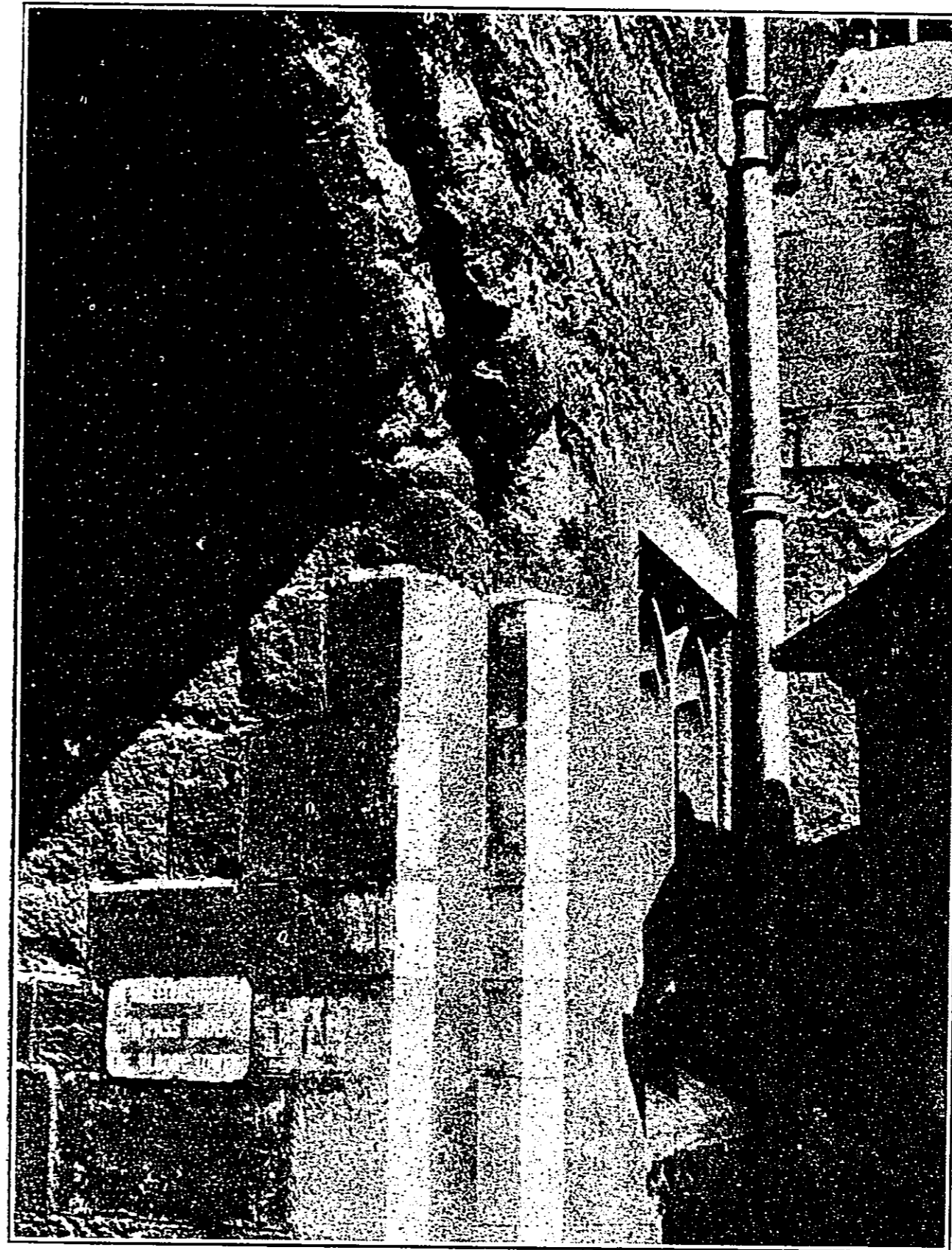


Fig. 5.—Tower of London (Bloody Tower).
Decayed Gatton Stone above and New Chilmark Stone below.

of begrimed masonry. Mouldings, designs, friezes, cornices, ornaments, and carvings—the essentially artistic in architectural construction—are not only rapidly

corroded, but they are obliterated by the dense deposit of tarry soot, or rendered invisible because of the diminished illumination caused by the murky palls of smoke that hang over our cities. Soot deposits



Fig. 6.—Chelsea Hospital.
Best Westmoreland Slates taken from roof, showing decay.

conceal the artistic effects, not only on stone and brick, but also on wood. The difficulty cannot be overcome entirely by cleaning, because cleaning tends to remove the sharp edges and outlines. In many cases owners of buildings have recently gone to the

great expense of cleaning their buildings with high-pressure steam.

The influence of smoke on metal work is equally pernicious. The sulphuretted hydrogen blackens, disfigures, or tarnishes nearly all metals—copper and bronze rapidly darken, iron rapidly corrodes, aluminium is affected, many metals become pitted from electrochemical action, and even gold or gilded articles become dull.

Outdoor statuary in metal in smoky cities suffers greatly, and in many cases the ironwork has been eaten away to such an extent as to endanger the structure.

Vegetation.*—There are, moreover, constituents in a town atmosphere which are deleterious to vegetation. Of these the gas that becomes sulphurous acid when dissolved in water is the most poisonous. It is a powerful deoxidising agent, and probably acts directly on the protoplasm entering the cells through the stomata of the leaves. This action is slow but sure, and it is interesting to note that the plant has time to withdraw its starchy stores into the stem from the leaf, which then drops as it would in the autumn. After several days of fog, when sulphurous acid fumes are excessive, there is a great shedding of leaves, which have been tested on several occasions, and found to be almost destitute of starch.

Sulphuric acid is another poisonous constituent of smoke. It acts as a caustic, always withdrawing water from foliage cells, to replace any lost by evaporation of itself. The result on foliage is that of scorching. The rain that should cleanse the plant at the same time brings fresh supplies of the acid washed from the air. But it is the solid deposits that most visibly affect foliage. Everyone is familiar with the sooty appearance of town

* Abstract from paper by Miss M. Agar, Landscape Gardener to the Metropolitan Public Gardens Association, International Smoke Abatement Conference.

gardens. The deposit acts harmfully in two ways; first, it darkens the epidermis, and cuts off the light rays without which the green chlorophyll cannot perform its functions; it clogs the pores of the leaves, arresting transpiration and the absorption of nutrient gases. Leaves that have definite upper and under surfaces have their stomata on the under side, and the clogging is minimised, but such trees as conifers, with stomata on both sides and sunk in pits as well, soon become choked. The oily matter, which is another product of partial combustion of coal, clings very closely, and rain has hardly any cleansing effect where there is an oily deposit.

The damage to foliage is so striking, that the damage to soil by the same agent is often overlooked. Soil has its own germ life, which is interfered with, fertility is affected. The extraordinary benefit to town soil from a dressing of lime shows how excessive is its acidity. The oily sooty deposits cut off all benefits from aeration, and without oxygen chemical action ceases, and root action is checked. Shrubs planted in a ball of soil in the Bank of England garden at the end of a year had not put out a single root into their new environment. Bulbs make less root than if they were planted in fibre, while grass merely roots on the surface, clinging to every chance of air, and is so lightly attached that a broom would brush it off like the nap from shoddy cloth. Apart from the question of deposits and poisons, is that of deficient illumination which prevails in towns from the beginning of November to February. The mere withdrawal of light induces partial starvation, and transpiration is also checked. But warmth and water enable the roots to continue their work, and consequently the cells of the plant are distended with water, the machinery is out of gear, and the plant is a ready victim to any disease.

Some very interesting observations as to the lowered

vitality of town vegetation have been made by Mr. Arthur G. Ruston. The observations are on ash trees in the Leeds district, where he finds that some trees throw off their leaves from four to six weeks earlier than others, owing to poisonous gases. "Thus, during the autumn at Roundham, with total suspended matter 90 lbs. per acre and acidity nil, ash trees were found in full leaf on November 17th. At Weetwood Lane, with suspended matter 9,147 lbs. and acidity equal to 11 lbs. of sulphuric acid per acre, the leaves had all fallen before the end of October; at Kirkstall, with suspended matter 352 lbs. and acidity 8 lbs. per acre, one ash only could be found in leaf on October 5th, while at Headingley, with suspended matter 659 lbs. and acidity 11 lbs. per acre, all leaves had fallen from the ash trees at that date." This is a valuable record of the baleful effect of impure atmosphere.

In London it is very noticeable how premature is the shedding of soft foliated leaves, such as limes. Taking the average time a tree is in full leaf as five months, it is a serious loss to it to be deprived of six weeks of its manufacturing period.

No wonder town trees are sickly and stunted in growth. And the pity of it is that vegetation is the natural antidote to the exhaustion of the air by animal life.

Sunshine.—About 30 per cent. of sunshine is shut off by the smoke.

Professor Leonard Hill, Director of the Department of Applied Physiology at the National Institute of Medical Research, Hampstead, says:—"Most people do not get sufficient sunshine. Open air and sunshine keep up the breeding power of animals, and one of the reasons for falling off in the breeding power of men and women is that they are living too much indoor life, protected by clothes, staying behind glass windows, and not getting the sun and air as the old Romans did. A particularly grave menace to the health of the people

in London, and all big towns in this country, were the smoke clouds which shut off the sun's ultra-violet rays, which were essential to health and happiness. At one time I was tubercular, but ultra-violet rays and fresh air made me fit, and daily exposure to them produced a ruddy, sun-burned complexion," and the Professor further says—"It is very significant that when 10, or even more, degrees of ultra-violet rays have been recorded at Peppard, in Oxfordshire, only half a degree has been measured here at Hampstead, and none at all in Kingsway. So we have proof enough of how smoke clouds rob us of ultra-violet rays." We are also told, "deprived of sunshine, the human skin assumes a pale greenish hue like the skin of the people in the polar regions. This is probably due to the absence of the blue and ultra-violet rays of the sun, which dilate the blood-vessels and brings the blood to the surface, and to the absence of the infra-red rays which are associated with heat. Sunshine promotes transpiration and perspiration, and thus favours the elimination of toxic products through the skin. Bright sunny days lessen the strain on the kidneys. The amount of blood and the per cent. of hæmoglobin are increased by sunlight and decreased by darkness. The rays of the sun, specifically the blue and ultra-violet rays, thus exercise a tonic or stimulating action on the organs of circulation, transpiration, and elimination, and very probably also directly stimulate the nervous system. The stimulating effect is probably due to the chemical action of the short rays of light. These rays probably penetrate the deeper tissues of the body just like the X-rays. It is well known that persons suffering from chronic joint disease, particularly from joints affected with tubercular sinuses, can be greatly benefited or entirely cured by constantly exposing the affected limbs to the direct rays. It is evident that the problem can be formulated largely in terms of sunshine dynamics. On the other hand, we have the psychic

and physiological influences of positive states of sunshine, brightness, luminosity, warmth, dryness, the presence of the infra-red spectral and ultra-violet rays of high electrical potential (because of dryness). On the other hand, we have the effects of the negative states, gloom, darkness, cloudiness, fogginess, rain, moisture, cold, and low electrical potential."

"It is utterly impossible to separate all of these components, and it will, therefore, be no easy task to measure the influences of each component."

Literature, both poetry and prose, contains frequent allusions to the effect of sunshine (or the absence of sunshine) on the feelings of man.

Charles Lamb "felt himself immortal," "a great deal taller," on bright days. Moore took delight in sitting in the sunshine, and the Italian proverb—

"Where comes no sun, the doctor comes,"

summarises the baneful effects of smoke.

Fogs.—It is said that from 25 to 30 per cent. of the fogs are due to smoke.

Dr. J. S. Owens, on Atmospheric Pollution, records

MEAN MONTHLY DEPOSIT OF TOTAL SOLIDS IN ENGLISH
TONS PER SQUARE MILE, YEAR ENDING MARCH 31ST,
1921.

Birmingham,	.	.	.	.	54.2
London,	.	.	.	.	25.4
Malvern,	.	.	.	.	6.3

The quantity of smoke to produce a dense smoke fog over London is about 200 tons, but considerably more than this amount is emitted by London chimneys between 6 a.m. and 10 a.m. every morning during the winter months.

One of the causes of smoke fog is the inversion of the

temperature gradient from the ground upwards. Ordinarily the temperature of the air falls as the distance from the ground increases, and the smoke under such

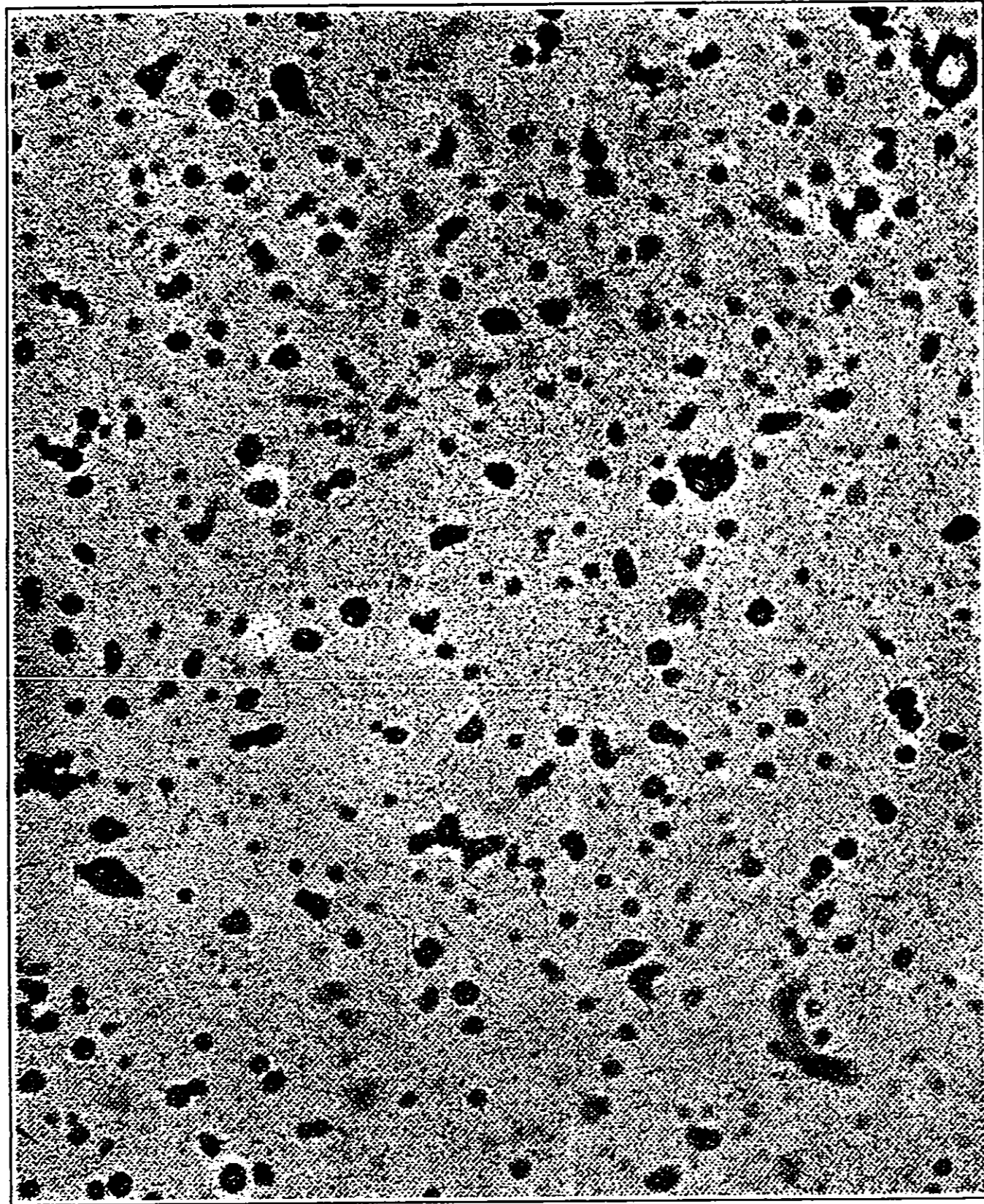


Fig. 7.—What is Breathed during Fog. Fog magnified 22,000 times.

conditions rises from warmer to colder air and escapes, but when the air near the ground is colder than the air overhead, as may happen in still, frosty weather, there is formed what is known as a "deck," the hot air having

risen from the low strata, presently reaches a layer of air at the same temperature as itself, which it cannot penetrate, the smoke, therefore, collects and forms a dense smoke fog.

It is stated "that a person inhales 600 cubic inches of air per minute; in each inch there are 475,000 particles of dirt, making a total of 285 million particles. Also daily 40 lbs. of air charged with soot, tar, acids, etc., are taken into the lungs, hence in a comparatively short period of time the lungs of a town-dweller are changed from a pinky colour to black. This foreign matter, by preventing proper oxygenation of the blood, causes depression, lowers the power of resistance to diseases; then follows rickets in the young, and many and varied diseases in the adult, and, especially in the old; croup, asthma, bronchitis, tuberculosis, pneumonia, and irreparable and incalculable injury is done to health, and after a few days of fog the mortality is increased by over 100 per cent.

The cost of the nuisance in coal wasted, damage done by it to property, extra laundry, etc., may be approximated, and may amount to £3 or £4 per head of the population per annum, but it is impossible to estimate the damage done to public health (which is the nation's wealth) and the increased mortality, especially infantile.