

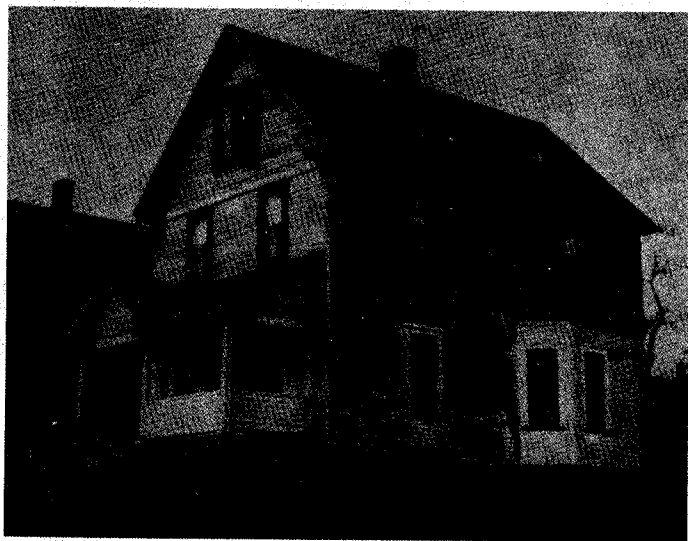


Fig. 8. Paint damage caused by air pollution. In this case, the pollutant was hydrogen sulfide.

pollution. Because England imports limited quantities of high-grade fossil fuels, the typical London "pea souper" consists mainly of sulfur compounds, particularly SO_2 , which are produced by the combustion of bituminous coal, low-grade heating oil, acid manufacture, ore smelting, and other industrial manufacturing processes.

In the United States, New York and Chicago have record quantities of SO_2 in their atmospheres that are second only to London's. In all, about 60 percent of the American population is exposed to continuous peril from atmospheric contaminants (see Fig. 7). And it does not require a medical opinion to suggest that pollutants capable of corroding metal, darkening white paint (Fig. 8), disintegrating stone, dissolving nylon hose, and cracking rubber are somewhat less than beneficial to human lung tissue. There is ample circumstantial evidence to link air pollution with asthma, pneumonia, tuberculosis, pulmonary emphysema, lung cancer, and even the common cold. In 1962, the chairman of a panel of medical experts at the National Conference on Air Pollution Control stated: "The evidence that air pollution contributes to the pathogenesis of chronic respiratory disease is overwhelming."

During the symposium on the clean air problem at the recent American Power Conference, Dr. Dinman, in his opening statement, gave a concise description of the pathological effects of sulfur dioxide:

"To understand the effects of SO_2 on health, it is neces-

sary to delineate those mechanisms whereby sulfur oxides alter human function. On a mechanistic basis, we may conceive of air conduction tubes (the tracheobronchial tree) as a series of interconnecting ducts. These ducts have the unusual capacity of changing their cross-sectional area. This is accomplished by contraction of circumferentially aligned muscles. Thus, given a proper stimulus at certain receptors in the wall of this air conduction system, input from these receivers arrives at the brain. A flow of impulses, in turn, is transmitted to these surrounding muscles, which leads to their contraction with a decrease in cross-sectional area.

"The consequences of such decrease in cross-sectional area are apparent. Consider that a fixed volume of air per unit time must be available for oxygen extraction by the blood. Therefore, an increase in velocity is the only method whereby this fixed volume may be moved through this attenuated system. Obviously, the energy required per unit time to obtain this work function is increased. In individuals who have cardiac disease, these increased demands are met with difficulty and subsequent deterioration. Another complication stems from one other consequence of SO_2 or SO_3 (sulfur trioxide) or H_2SO_4 (sulfuric acid) impingement on the lining of the gas-blood exchange surfaces. Impingement of these irritant polar compounds stimulates the release of a diluent at such affected surfaces. While this dilution increases pH toward normal levels, at the same time it imposes a *thickened barrier* to gas transfer across the membrane. Since this barrier is but a few hundred microns thick, this imposes no significant load on gas transfer in the normal person,