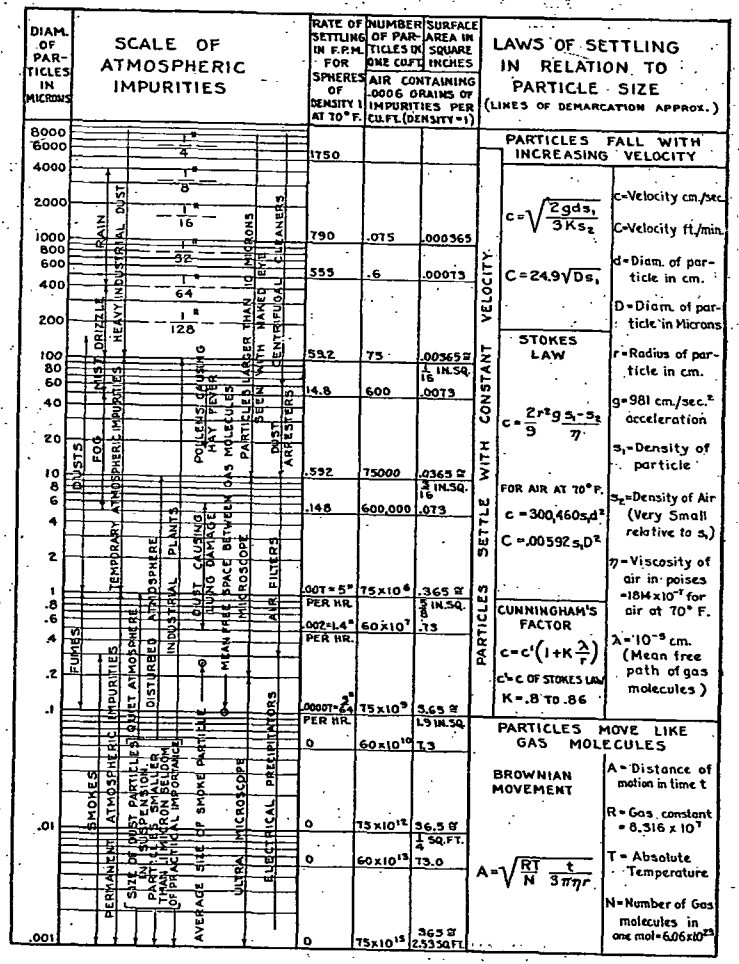

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FIG. 1. SIZES AND CHARACTERISTICS OF AIRBORNE PARTICULATE MATTER

present to be of any practical importance, possibly due to their exceedingly small mass in comparison with the balance of airborne matter. In fact, particles this small may become the *permanent* atmospheric impurities that have little if any opportunity of settling because of the continual motion imparted to them by air currents and the molecular activity of their supporting gases (Brownian Movement).

The survey [1] of atmospheric pollution in 14 American cities conducted from 1931 to 1933 indicated the average size of outdoor dust particle to be 0.5 micron, as collected by the Owens jet dust counter and measured under the microscope. The inability of the *light field* microscope to

reveal particles in the 0.1 micron vicinity may have influenced the determination of average particle size.

The lower limit of particle size visible to the naked eye cannot be stated definitely. It depends not only upon the individual eye, but also upon the shape and color of the particle, the intensity and quality of the light, and the nature of the background or the opportunity for contrast. Under ideal conditions a particle of 10-micron size might be recognized, while under less favorable conditions it may be impossible to distinguish a particle smaller than 50 microns. The lower limit of visibility probably ranges from 10 to 50 microns.

Dusts, powders and granular materials are frequently classified by reference to the size of screens used for separation. Particles above 40 microns are said to be the *screen sizes* and those below, the *sub-screen* or microscopic sizes. The approximate or theoretical sizes of particles corresponding to the mesh scale of the U. S. Standard Sieve Series are given in Table 1.

Microscopic examination of screened dust indicates that the average diameter of a sample of irregular particles may be substantially larger than the openings of the screen through which it has passed, if the particle

TABLE 1. RELATION OF SCREEN MESH TO PARTICLE SIZE

U. S. Standard Sieve Mesh	400	325	200	140	100	60	35	18
Nominal Sieve Opening in Microns	37	44	74	105	149	250	500	1000

shapes deviate considerably from the spherical form [2]. The smallest dimension of many such particles will correspond with the maximum permissible distance between the wires of commercial screens made to *ASTM* Standard specifications. Screening does not give sharp separation into size groups, and accordingly such a classification is statistical rather than absolute.

AIR POLLUTION BY SMOKE, ASH AND CINDERS

The total airborne solids settling in urban areas are usually reported as *soot fall* in tons per (square mile) (month). Such data published for the cities in this country range from 20 to 200 tons per (square mile) (month). To the air conditioning engineer this information may indicate the effectiveness of smoke abatement or fuel combustion control methods in his locality, but it does not provide a suitable index of the suspended dust that air cleaners in a ventilating system are expected to capture [3, 4, 5]. Gravimetric or weight data of the type given in Table 2 are preferable. In some cases airborne particle counts may be necessary, as for pollen, bacteria, spores, and insoluble dusts causing illness or lung disease.

Dust concentrations by weight cannot be converted readily to concentrations by particle count because of the variability of particle size, shape and specific gravity, and the inherent characteristics of dust counting and weighing procedures. One milligram of dust per cubic