with respect to quantity and quality of dirt content. The determination of the cleaning efficiency may be made according to some standard method such as that described by A. M. Goodloe, member, A. S. H. & V. E. in the February 1924, JOURNAL. The percentage of dust removal as determined by the method of testing for all commercial air cleaning devices should lie between 80 and 95 per cent and the minimum removal under such conditions should be specified and guaranteed by the manufacturer.

The efficiency of dust removal may be expressed by the following formula:

$$E = 1 - \frac{\text{Weight any sample leaving}}{\text{Weight any sample entering}}$$

In case the resistance method is used in accordance with the Anderson-Armspach method of dust determination, the formula will become

$$E = \frac{\text{Time required to give a definite resistance increment with entering sample}}{\text{Time required to give the same increment with leaving sample}}$$

or, if the same time be used in obtaining both samples, which is preferable then

$$E = 1 - \frac{\text{The resistance increment of outgoing sample}}{\text{The resistance increment of ingoing sample}}$$

RATING OF AIR WASHERS AND FILTERS

Air washers and filters are rated as follows:

1.—Capacity in cubic feet of air handled per minute.

2.—Resistance in inches of water which the washer or filter offers to the flow of air at its rated capacity.

3.—Percentage of dust removal at its rated capacity.

4.—Percentage of entrained moisture remaining in the air after passing through the washer while operated at its rated capacity.

5.—If considered as a humidifying agent, the humidfying efficiency, or the percentage of reduction in the initial wet bulb depression without external alteration of heating the circulating water.

CHAPTER XX

AIR CONDITIONING

INTRODUCTION

IT seems that the logical exposition of this subject is the one which most clearly can show the attitude of those expert in it. Like all of the sciences, of which this is surely one, it is made up in its entirety of two parts: *the first*, which is the basis of course, is composed of the fundamental principles and laws, the mathematics, graphs and tables; *the second*, is the application of the science to industry, which constitutes, its reason for existing. It has been demonstrated so many times that the science of air conditioning has many ramifications, each of which has its governing law possible of explanation and mathematically reducible to visible and (to the initiated) easily legible chart and table. The development of each of such underlying principles may be made the subject of an article such as this, and at its conclusion the reader will know—only that single phase. The subject should, however, as far as general interest is concerned, be developed from the second rather than the first of the divisions of the science; that is, from its economic side. Only in this way can a general survey be made and an understanding of the value to industry be obtained.

RANKS AS AN IMPORTANT INDUSTRIAL SCIENCE

It may be well to point out here, how essentially an industrial science air conditioning is; being recognized by, and having its great usefulness, through its effects—and not through the means whereby such effects are obtained. So the expert, knowing the principles and the apparatus, and having the background of industrial experience, solves each problem as it is presented, not as a new engineering development painstakingly to be worked out step by step, but surely and accurately—secure in the knowledge that such a treatment of air must, and unfailingly will, produce such an effect upon the material or process under consideration. In the face of such sureness of *effect*, what interest attaches to the means used, in comparison? For it is as true as in manufacturing, in the final analysis, that the finished product is the thing; the ultimate purchaser does not care what the raw materials, or what the process through which they travel. So in this case, not even the delivered *manufactured* air is the goal, but only the materials and the processes as they are changed, modified or varied, by the primary effects of the controlled climate or weather by which they are surrounded.

Material for this section was prepared especially for THE GUIDE by A. M. Lissauer, Louisville, Ky.