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 XIX

APPLICATION OF REFRIGERATION IN AIR CONDITIONING

By N. A. HOLLISTER, Non-Member

THE advantages of one method of cooling air over another and the general factors governing the proportioning and design of air conditioning units are of interest to all whose work may bring them in contact with systems using refrigeration. It is the purpose of this chapter to give those not familiar with this important branch of air conditioning a better understanding of how refrigeration is applied in this work.

The producing of the refrigeration for an air conditioning installation is a problem for the engineer, and is the same as any other refrigerating problem with a varying load. The method of treatment of the air, and its distribution is a separate study involving the entire subject of air conditioning.

The remaining problem, then, in connection with the use of refrigeration in air conditioning is the actual application of refrigeration in a unit or apparatus for cooling the air.

The transfer of heat in air conditioning apparatus is usually accomplished by one of three methods:

1. Passing air through cold water or cold brine sprays
2. Passing air directly over cold coils
3. Combination of the above two methods

COLD SPRAYS VS. COLD COILS

A liquid spray which absorbs the heat from the air and transfers it to cooling coils is more frequently used than cooling coils in direct contact with the air, for the following reasons:

1: Fewer coils required, therefore lower first cost, less space and weight
2. Low power for driving compressor
3. Ease of keeping unit clean
4. Ease of controlling effect on air
5. Securing of air cleaning
6. Humidity control in winter

LESS COIL REQUIRED

Water is generally used for spraying when the lowest liquid temperature is not too close to freezing. For lower temperature calcium or brine solutions of varying strengths, according to the requirements, are used. A liquid spray has the following marked advantages: