ture difference. In the theoretical case of a dehumidifier having 100 per cent saturating efficiency, and where this air is delivered directly to the room without temperature increases due to heat gain, then the effectual temperature difference is the difference between room temperature and apparatus dew-point temperature. If duct heat gains are considered a part of the room load, this still holds true. The apparatus dew-point, as outlined previously, is fixed by the latent and sensible loads of the space, but in many cases, it is desirable to deliver more air to the spaces than is indicated by the difference between the room temperature and the apparatus dew-point.

It has been indicated that where a percentage of air is passed through the dehumidifier without being treated, the relationship is modified in direct proportion, and that if room air is passed through untreated, no effect on the heat balance results. Similarly, if room air is passed around the dehumidifier and mixed with the treated air, the heat balance is not adversely affected. Therefore, if the quantity of air passed through the dehumidifier is determined by the usual methods, room air can be passed around the dehumidifier and mixed with the dehumidified air, increasing the supply air quantity and temperature and decreasing the effectual temperature difference. Thus if the difference between the room temperature and the apparatus dew-point indicates that 10,000 cfm at 30 deg below room temperature will be required to hold conditions, that quantity can be passed through the dehumidifier and cooled to 30 deg below the room temperature, then mixed with 10,000 cfm of room air, resulting in a supply air quantity of 20,000 cfm and an effectual temperature difference of 15 deg instead of 30 deg. Air supply outlets and grilles that have a high induction ratio are available, and cause a large amount of room air to be mixed with the air leaving the outlet within a short distance of the outlet through the induction effect of the air stream. A proper selection of outlets may make it possible to introduce air at low temperatures and high velocities without causing objectionable drafts or cold spots, but care must be used to see that too little air motion is not a result. Low effectual temperature differences may be required for this reason. While the use of a high effectual temperature difference results in a saving in initial cost of fans and ducts, and in the operating cost of fans, this difference should be carefully considered. If the sensible heat load of a space is subjected to substantial variations, low effectual temperature differences should be considered, since systems employing low effectual temperature differences require less precision in controls.

Reduction of air quantity by slowing down the fans for the winter season, and increasing the temperature difference, often is feasible. A saving in fan power can thus be effected, provided the air distribution remains adequate.

Extremes should be avoided in all cases. For summer air conditioning, low supply air temperatures result in larger heat gains to the air passing through the ducts, as well as in poor control. Too high a supply air temperature may result in excessive initial and operating costs. Suggested limits for the effectual temperature difference are from 12 to 20 deg, the actual selection being based on the requirements of the particular case. For winter air conditioning, too high supply air temperatures result in excessive heat losses from the ducts and stratification within the room unless thorough mixing is assured, while too low supply air temperatures may cause drafts, high operating costs, etc. Suggested limits are from

15 to 35 deg. There can be no set rule, and each case should be judged according to its particular requirements of the installation.

Reference may be made to Chapter 30 for further discussion of the most satisfactory design difference between the entering air temperature and volume in relation to the desired room condition.

INDUCTION CONVECTORS—LOW PRESSURE TYPE

Induction convectors located in the room that is to be served, utilize a jet of conditioned air (or primary air) to induce a flow of room or secondary air which mixes with the primary air Fig. 4. The mixture is discharged into the room through a grille at the top of the convector. Heating coils are located in the secondary air stream. The output is controlled either by manually or automatically throttling the air jet. Heat may be supplied to the coil in summer as well as in winter. These induction con-

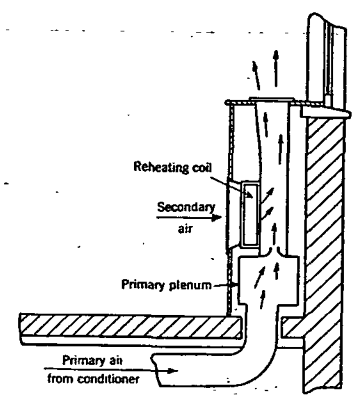

Fig. 4. Induction Unit (Low Pressure Type)

vectors present several advantages. Since the secondary air stream is thoroughly mixed with the high velocity low temperature air stream before leaving the discharge outlet of the device, the resultant temperature of the mixture is satisfactory even though the primary air is introduced at a temperature too low for ordinary methods of distribution. One of these devices usually is provided under each window in place of the customary direct radiator, and combines the air distribution system with the heating system. With a conventional system it may be necessary to provide supplementary heating in the form of direct radiation. Induction convectors may be selected with heating coils having sufficient capacity under gravity conditions (that is, with the fan system shut off and no primary air entering the device) to maintain the room at a reasonable temperature in winter. The use of low temperature, dehumidified air which has not been reheated or mixed with room air before delivery to the room, may permit a reduction in fan capacity and the use of smaller ducts. In some cases a by-pass may be desirable in order to maintain the primary air volume and to provide additional control. This system can provide a degree of zoning that is usually difficult with conventional design since the air delivered by each unit can be controlled individually.