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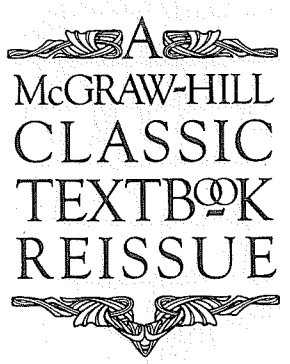

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A thin film of liquid running down the inside of a vertical pipe, with gas flowing either cocurrently or countercurrently, constitutes a wetted-wall tower. Such devices have been used for theoretical studies of mass transfer, as described in Chap. 3, because the interfacial surface between the phases is readily kept under control and is measurable. Industrially, they have been used as absorbers for hydrochloric acid, where absorption is accompanied by a very large evolution of heat [63]. In this case the wetted-wall tower is surrounded with rapidly flowing cooling water. Multitube devices have also been used for distillation, where the liquid film is generated at the top by partial condensation of the rising vapor. Gas-pressure drop in these towers is probably lower than in any other gas-liquid contacting device, for a given set of operating conditions.

SPRAY TOWERS AND SPRAY CHAMBERS

The liquid can be sprayed into a gas stream by means of a nozzle which disperses the liquid into a fine spray of drops. The flow may be countercurrent, as in vertical towers with the liquid sprayed downward, or parallel, as in horizontal spray chambers (see Chap. 7). These devices have the advantage of low pressure drop for the gas but also have a number of disadvantages. There is a relatively high pumping cost for the liquid, owing to the pressure drop through the spray nozzle. The tendency for entrainment of liquid by the gas leaving is considerable, and mist eliminators will almost always be necessary. Unless the diameter/length ratio is very small, the gas will be fairly thoroughly mixed by the spray and full advantage of countercurrent flow cannot be taken. Ordinarily, however, the diameter/length ratio cannot be made very small since then the spray would quickly reach the walls of the tower and become ineffective as a spray.

PACKED TOWERS

Packed towers, used for continuous contact of liquid and gas in both countercurrent and cocurrent flow, are vertical columns which have been filled with packing or devices of large surface, as in Fig. 6.27. The liquid is distributed over, and trickles down through, the packed bed, exposing a large surface to contact the gas.

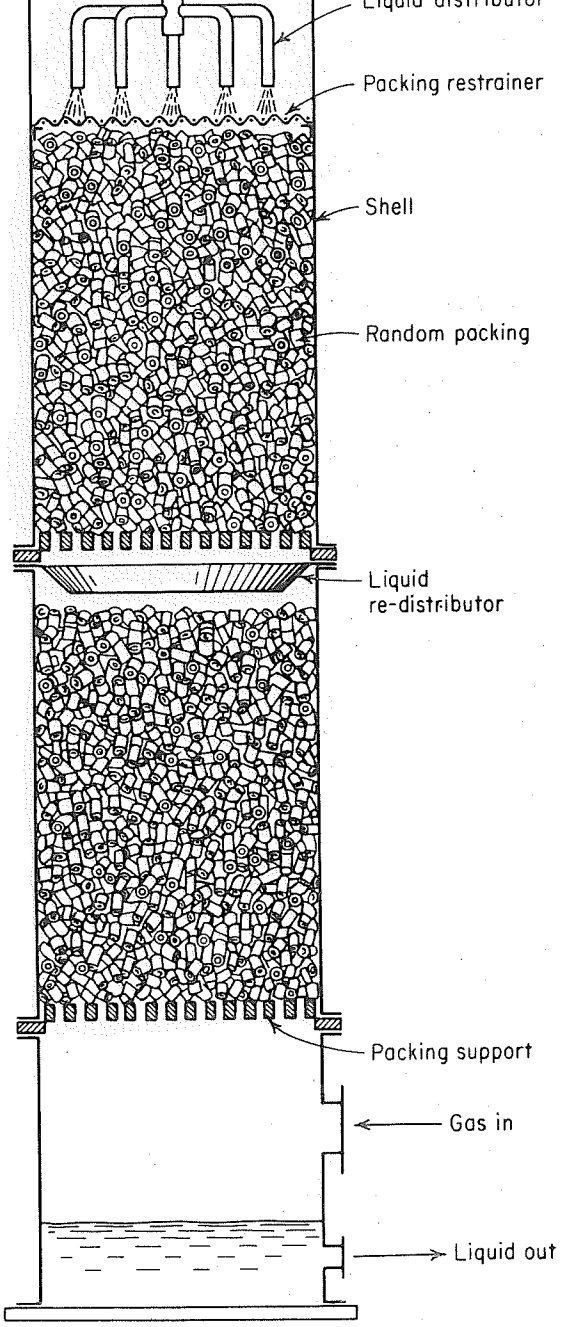

Figure 6.27 Packed tower.

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