irrigated lands, and with the exception of regions in the center of each doab, large contiguous masses of saline ground water do not occur. As stated previously, it will be necessary to mine some of the saline ground water in order to prevent it from migrating to regions in which the ground water is of good quality. Tubewells used for this purpose should be located insofar as possible in the smaller areas of saline ground water. Extensive mining of large bodies of highly mineralized water should be avoided, or at least postponed during the first level of development, to prevent excessive cost of exporting saline water to lagoons and desert areas.

The other wells, those used for supplying water for irrigation, are of two types: (i) regular deep tubewells used both for mining and for recovery of recharge-water; and (ii) small, shallow, closely-spaced skimming wells in the fringes of the project areas where the depth and rate of drop of the water table will be small. Wells of this type can be used for the recovery of recharge for an interim period where the project areas are not contiguous. After all the project areas are in operation they also may be used in peripheral regions and in zones near major recharge sources where a thin layer of fresh recharge water forms over a deep layer of saline water. The essential difference between the two types of wells is that the former are used in regions where extensive mining occurs and where the thickness of the layer of water of good quality is large; the latter are used only to recapture recharge-water where the layer of fresh water is thin and where the interface between fresh and saline water remains at a constant elevation or is slowly being lowered by salt-export wells.

We have attempted a mathematical analysis of the skimming operation of wells to elucidate the interrelation between well spacing, depth and rate of pumping and the depth and densities of the fresh and saline zones in the ground water. Although theoretical analysis does not take into account certain real phenomena that may be expected to occur, such as the mixing of fresh and saline waters at the surface of the salt-water cone beneath each well, it does provide useful guidelines for proper design and efficient operation of wells in regions where a layer of fresh water overlies a deep layer of saline water.

The following symbols are used in the analysis (see sketch): A well of radius r_w penetrates an aquifer partially to a depth D. The aquifer is bordered externally by the circle $r = r_e$ concentric with the well. The fresh water being pumped forms a layer of thickness m in the aquifer, which is assumed to be saturated. The fresh water has a density ρf and overlies saline water of density ρs. The well screen lies entirely within the fresh water layer. It is desired to determine (i) the maximum pumping rate as