A two-region non-equilibrium model of a two-dimensional spouted bed dryer has been developed. The model, based on heat and mass transfer interactions between the spout and downcomer regions, predicts the air and grain temperatures and moisture content throughout each elementary thin layer of grain in the spouted bed. The model was validated with the experimental results on batch drying of corn. Drying and heating processes are shown to occur in both the spout and downcomer regions. Overall, the agreement between experimental and simulated results is satisfactory.