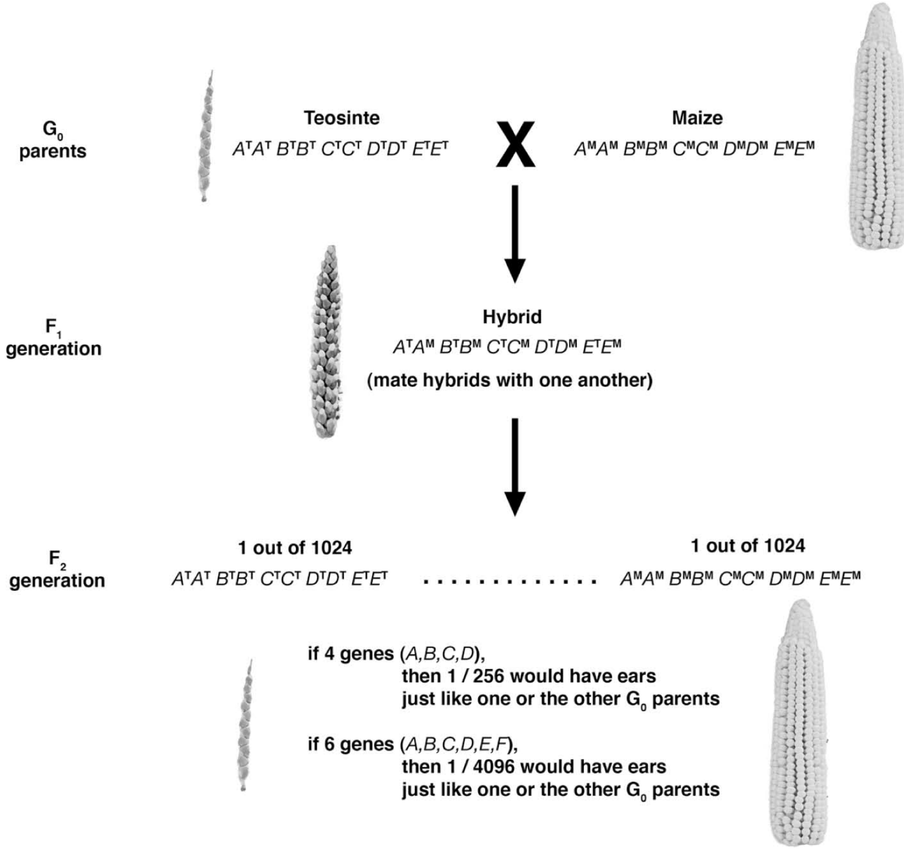

FIGURE 11.26. Beadle used a series of simple crosses to make a rough estimate of the number of genes that distinguish teosinte from maize ears. To begin, imagine that five genes (genes *A, B, C, D,* and *E*) control the difference between the two. Teosinte contains all teosinte alleles of the genes (A^TA^T, B^TB^T, etc.) and maize contains all maize alleles (A^MA^M, B^MB^M, etc.). The F_1 hybrids are heterozygous for all these alleles (A^TA^M, B^TB^M, etc.) and morphologically intermediate between the parents. When the F_1 hybrids are crossed to one another, many different genotypes and phenotypes are generated, but 1/1024 (4 x 4 x 4 x 4 x 4 x 4 = 1024) F_2 progeny will have the same genotype at the five loci as teosinte, and another 1/1024 will have the same genotype as maize. These ears are expected to look just like teosinte and maize, respectively, if these five genes are responsible for all the differences. If there had been four genes, the number would have been 1/256, and if six genes, 1/4096. Because Beadle got a number roughly 1/500, he estimated that about five genes were responsible for the difference between teosinte and maize ears. This is, of course, a very crude estimate as it does not take into account potential dominant/recessive relationships between alleles and genetic interactions between loci, but it did prove to be a remarkably accurate first estimation.

11.26, Nipam H. Patel, photo by John Doebley