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BOTANICAL DEPARTMENT.

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CROSSED VARIETIES OF CORN, SECOND AND THIRD YEARS.

During the two preceding seasons, a number of varieties of Indian corn were crossed by artificial pollination. The plan of effecting the desired cross was given in the First Annual Report of the Kansas Experiment Station, p. 316.

In 1888, forty-one varieties were used. The number of cases of cross-fertilization attempted was sixty-six, of which thirty-nine were successful. Of the latter, twenty-three were planted in 1889, and the results obtained were published in the Second Annual Report, pp. 334–346. Some of the ears were used as seed this year (1890), and the result of this planting is given in this Bulletin, under the heading "Crossed Corn the Third Year."

In 1889, artificial crosses were made with fifty-six varieties. Crossing was attempted in one hundred and eighty-eight cases, and of these, one hundred and seventy-five were successful. Many of the latter were planted in 1890, with the result as given under the heading "Crossed Corn the Second Year."

LIST OF VARIETIES.

The following list of varieties includes the parent forms of all the crosses named in this bulletin:

- Adams' Early Table; white, nearly smooth soft dent.
- Breck's Boston Market Ensilage; white dent.
- Breck's Premier Sugar; small white sweet.
- Bullock's White Prolific; smooth white dent.
- Calico; nearly white dent, irregularly streaked with red.

Champion White Pearl; white dent.
 Chester County Mammoth; light yellow dent.
 Clarage Yellow; yellow dent.
 Compton's Early; yellow flint.
 Conscience; white dent, grains long.
 Cranberry White; white dent, pinkish-tinged.
 Early California; yellow dent.
 Early Red Blazed; yellow flint.
 Early White Dent; white dent.
 Early Yellow Hathaway; yellow dent.
 Ellm's Early Yellow; yellow flint.
 Extra Early Adams' Table; nearly smooth soft dent.
 Farmers' Favorite; large yellow dent.
 Glick's Yellow; large yellow dent.
 Golden Beauty; large yellow dent.
 Golden Pop Corn; yellow smooth.
 Hickory King; white dent.
 Johnston's Mammoth Early White; white dent.
 King of the Earliest; yellow dent.
 King Philip; red-brown flint.
 King Philip (western seed); red semi-dent, tipped with white.
 Landreth Sugar; long white sweet.
 Leaming; yellow dent.
 Longfellow; yellow flint.
 Mammoth Cuban; yellow dent.
 Mammoth White Dent; white dent.
 Mammoth White Surprise; white dent.
 Maryland White Dent.
 Mason's Flour; soft corn.
 Mosby's Prolific; white dent.
 Murdock's; yellow dent.
 Normandy Giant; white dent.
 Parish White; white dent.
 Pride of the North; small yellow dent.
 Queen of the Prairie; small yellow dent.
 Red-Cob Ensilage; white dent.
 Red Dent.
 Rice Pop Corn; small white pointed.
 Riley's Favorite; yellow dent.
 Sanford's Ensilage; white flint.
 Self-Husking; reddish or brownish yellow flint.
 Shannon's Big Tennessee White; white dent.
 Shannon's Big Tennessee Yellow; yellowish dent.
 Silver Lace Pop Corn; large white smooth.

- Southern Horse Tooth; white dent.
- St. Charles; white dent.
- Thoroughbred White Flint; large white flint.
- Wauhakum; yellow flint.
- White Flat Ensilage; smooth white dent.
- Woodworth's Yellow; yellow dent.
- Yellow Mammoth; yellow dent.

CROSSED CORN THE SECOND YEAR.

About one hundred and twenty-one of the "crosses" obtained the previous year (1889), were planted on upland soil in a young orchard, May 3-7, 1890. The seed germinated satisfactorily, and the plants grew well until they were injured or killed by the severe drouth. Those not killed were injured to such an extent, that scarcely a well-filled ear of large or normal size was obtained. For this reason notes as to habits of growth, character of stalks, time of ripening, etc., are not given in the brief descriptions below.

The ears from which the descriptions below were prepared were inclosed before the silk appeared. Upon maturity of the pistils (silk) and anthers, some tassels were also inclosed for the purpose of securing pure pollen. The latter was applied to the silk of the inclosed ears, according to the method of pollinating employed in the preceding years. The pollen of each variety was applied to the ears of the same variety, thus insuring pure ears, *i. e.*, ears with grains in no case vitiated with any cross.

Of the sixty-two "crosses" harvested, five (82, 102, 107, 125, 145) were too imperfect for comparison. Of the remaining fifty-seven, forty-three (or 75.44 per cent.) showed evidence of the cross — *i. e.*, were intermediates (eight of them in color only) between the parental types. In the previous (first) year but fifteen (or 26.32 per cent.) of them showed evidence of cross. The tabulation below shows fully the classified results, and for comparison the record for the first year (1889) also is shown:

CHARACTER OF CROSS.	1890,					1889.			
	Number of crosses.	Evidence of cross	Doubtful evidence ...	No evidence.	Supposed previous cross	Evidence of cross ...	Doubtful evidence ...	No evidence.	Supposed previous cross
Dent crossed with dent.	37	23 ¹	9	3	4	13 ²	7	16	4
Flint crossed with dent.	13	13	.....	.....	.....	2 ³	1	10	.....
Dent crossed with flint.	2	2	.....	.....	.....	.....	1	1	.....
Flint crossed with flint.	1	1	.....	.....	.....	.....	1	.....	.....
Soft crossed with dent.	3	3	.....	.....	.....	.....	.....	.....	.....
Dent crossed with soft	1	1	.....	.....	.....	.....	.....	.....	.....
Totals.....	57	43	9	3	4	15	10	27	4

¹Eight of them in color only. ²Seven of them in color only. ³One of them in color only.

It was noticed that the more inferior ears mostly failed to present the blending of the two parental types to that degree which better ears usually

did. In some cases the parents were but slightly dissimilar, thus rendering the judgment uncertain as to evidences of cross.

The blending in some cases, as can be seen by consulting the descriptions below, was complete, and the resulting ears were exactly intermediate in character.

The flint character, however, is usually very marked in the second-year ears, whether the dent parent be the male or the female.

Of the crosses made in 1889, simply to improve varieties,¹ all were planted, but only the following arrived at maturity:

- 74. Leaming crossed with Farmers' Favorite.
- 75. Leaming crossed with Riley's Favorite.
- 82. Leaming crossed with Woodworth's Yellow.
- 83. Leaming crossed with Golden Beauty.
- 86. Leaming crossed with King of the Earliest.
- 97. Hickory King crossed with Johnston's Early Mammoth White.
- 99. Hickory King crossed with Conscience.
- 102. Hickory King crossed with Normandy Giant.
- 107 and 112. Golden Beauty crossed with Leaming.
- 114. Golden Beauty crossed with Woodworth's Yellow.
- 116. Golden Beauty crossed with Mammoth Cuban.
- 117. Golden Beauty crossed with Glick's Yellow.
- 118. Golden Beauty crossed with Farmers' Favorite.
- 145. St. Charles crossed with Normandy Giant.
- 146. St. Charles crossed with Mammoth White Dent.
- 164. Mason's Flour Corn crossed with Conscience.
- 165. Mason's Flour Corn crossed with Southern Horsetooth.
- 174. Mosby's Prolific crossed with Mason's Flour Corn.
- 178. Mosby's Prolific crossed with Shannon's Big Tennessee White.
- 182. Mosby's Prolific crossed with Bullock's White Prolific.
- 199. Clarage Yellow crossed with Pride of the North.
- 202. Clarage Yellow crossed with Early Yellow Hathaway.

Because of almost complete failure of the corn crop this season, it is evident that no comparison of significance can yet be made between the forms obtained by the crosses indicated above, and the varieties whose improvement by the crossing was attempted. However, the seed is not contaminated by unknown pollen, and therefore a continuation of the experiment is possible and contemplated.

DESCRIPTIONS OF EARS OBTAINED.

No. 46. NORMANDY GIANT crossed with ST. CHARLES.

Second An. Rep., p. 308: "No evidence of cross; the yellow a result, perhaps, of a previous cross."

Length of ear, 5¾ inches; diameter, 1 5/8 inches; about 12-rowed, but very

²Second Annual Report of this Station, pp.290-291.

imperfect, no full rows, very smooth; grains very large, thick, broad, but irregular in shape and size, smooth to slightly indented, varying from pure white to yellowish-white; cob white, $1\frac{1}{4}$ inches in diameter.

Differs from both parents—perhaps vitiated by a previous cross, but too imperfect an ear for farther comparison.

No. 48. CHAMPION WHITE crossed with WAUSHAKUM.

Second An. Rep., p.308: "Evidence of cross only in intermediate color."

Two ears: length, $7\frac{1}{4}$ and 7 inches; diameter, $1\frac{1}{2}$ inches; very smooth and compact, not well filled; 10 and 12-rowed, several rows only partially filled; grains mostly light-yellow, about one-third of them almost pearly-white, mostly flint, but many of them slightly indented, short, $\frac{5}{8}$ in. long, $\frac{7}{16}$ in. wide, $\frac{5}{32}$ – $\frac{7}{32}$ in. thick, in section like flint grains—having a thick, corneous layer at summit; cobs white, firm, 1 inch in diameter.

Evidence of cross both in color and character of grains, the latter perhaps more nearly approaching the female parent.

No. 49. CHAMPION WHITE crossed with CHESTER Co. MAMMOTH.

Second An. Rep., p. 308: "Evidence of cross in intermediate color of grains; otherwise anomalous."

Length of ear, 8 inches; diameter, $1\frac{3}{4}$ inches; imperfectly filled, all the rows defective at base and tip, rough, compact; rows about 18, irregular; grains yellowish to pure white, summits usually white in case of the yellowish grains, dimple or crease-dented and wrinkled at summit, about $\frac{3}{8}$ in. long, $\frac{1}{4}$ in. wide and $\frac{3}{16}$ in. thick; cob red, very firm, $1\frac{1}{4}$ inches in diameter.

An imperfect ear, though in several respects intermediate between the two parents.

No. 50. PRIDE OF THE NORTH crossed with CHAMPION WHITE PEARL.

Second An. Rep., p. 308: "No evidence of cross except in the lighter color of grains."

Two ears: length, $8\frac{1}{2}$ inches; diameter, $1\frac{1}{2}$ inches; smooth and very compact, rounded, but not well filled at base, moderately well filled at tip; 12–14 rowed, rows in some places somewhat defective; grains rather small and pale in one ear, somewhat larger and bright yellowish in the other, very slightly indented, triangular in one ear, sub-quadrate in the other; about $\frac{3}{8}$ in. long, $\frac{5}{16}$ – $\frac{3}{8}$ in wide, and $\frac{5}{32}$ in. thick; cobs red, $\frac{11}{16}$ inch in diameter.

Evidence of cross in intermediate color; shape of grains in one ear strongly resembles the Pride of the North, in the other the resemblance to Champion White Pearl is more pronounced; three ears not inclosed likewise show intermediate forms; in size and color approaching Pride of the North, but in shape of grains like Champion White Pearl.

No. 51. PRIDE OF THE NORTH crossed with BULLOCK'S WHITE PROLIFIC. Second An. Rep., p. 309: "Evidence of cross in the intermediate color."

Length of ear 5 inches, diameter $1 \frac{3}{8}$ inches, very smooth and rather compact though an imperfect ear, about 14-rowed, rows incomplete and very irregular; grains mostly whitish yellow, but some of them pure white, smooth to slightly dented, small, roundish and irregular, about $\frac{3}{8}$ inch long, $\frac{5}{16}$ inch wide, and $\frac{3}{16}$ inch thick; cob light red, $\frac{13}{16}$ inch in diameter.

Evidence of cross manifest, though the ear is imperfect. Two other well-developed ears, though not inclosed, show that the characters are intermediate between those of the parents; the colors are mostly well blended; the grains are in shape more nearly like Pride of the North, though some of them are decidedly round, as in Bullock's White Prolific.

No. 53. LONGFELLOW crossed with PRIDE OF THE NORTH.

Second An. Rep., p. 309: "No evidence whatever of cross."

Four ears: from $6 \frac{1}{2}$ to $7 \frac{1}{2}$ inches long, from $1 \frac{3}{8}$ to $1 \frac{7}{16}$ inches in diameter, very smooth and rather compact, some of the ears well filled at base and tip, 8-, 10- and 12-rowed, lightish yellow in color; grains mostly flint in three ears, slightly dented in the fourth, in section with less corneous and more starchy matter than in pure flints, subtriangular, small, $\frac{3}{8}$ inch long, $\frac{5}{16}$ to $\frac{3}{8}$ inch wide, and $\frac{3}{16}$ inch thick; cobs red.

Intermediate between the two parents, though more like Longfellow in general appearance. The grains in color are intermediate between the two parents, and in general shape strongly approach Pride of the North.

No. 56. LONGFELLOW crossed with PRIDE OF THE NORTH.

Second An. Rep., p. 309: "No evidence of cross."

Four ears: 6 to $9 \frac{1}{2}$ inches long; diameter, $1 \frac{3}{8}$ inches; 10 to 12-rowed, very smooth and compact; deep yellowish color; grains flint (mostly) to slightly indented, in section showing less corneous and more starchy matter than in pure flints, $\frac{5}{16}$ inch long, $\frac{3}{8}$ inch wide, and $\frac{7}{32}$ inch thick. Cob red, one inch in diameter.

The general resemblance to Longfellow is very marked, though many grains, and in one ear all, are slightly indented. In color, there is a slight variation from Longfellow toward Pride of the North; in section the grains are evidently dent and flint blended.

No. 60. SELF-HUSKING crossed with EARLY YELLOW HATHAWAY.

Second An. Rep., p. 310: "No evidence of cross detected."

Three ears: $6 \frac{1}{2}$ to $10 \frac{1}{2}$ inches long, $1 \frac{3}{8}$ to $1 \frac{1}{4}$ inch in diameter, very smooth and moderately compact; not well filled at base and tip, 8 (in an imperfect ear) to 12-rowed, bright yellow color; grains slightly to scarcely

indented, rather small, short, $5/16 - 11/16$ inch long $9/32 - 13/32$ inch wide, and about $3/16$ inch thick; cobs light red, $1\ 1/16$ to $1\ 1/16$ inches in diameter.

Plainly intermediate in character between the two parents, though in general appearance much more strongly resembling Self-husking; the largest and best ear has grains more plainly and uniformly indented.

No. 61. SELF-HUSKING crossed with WOODWORTH'S YELLOW.

Second An. Rep., p. 310: "No evidence of cross."

Two ears: $8\ 1/2$ and $9\ 1/2$ inches in length, $13/16$ inch and $1\ 1/2$ inches in diameter; very smooth but not compact; well filled at rounded base but more or less defective at tip; 8 and 10-rowed, rows somewhat irregular and occasionally defective in part; dull yellow in color; grains short, flint exclusively on the smaller ear, both flint and slightly dented on the larger ear; in section showing less corneous matter than in pure flint, and less starch than in pure dent varieties, $1/4 - 3/8$ in. long, about $3/8$ in. wide and $5/32$ in. thick; cobs red, $5/8 - 15/16$ in. in diameter.

Clear evidence of cross in intermediate blended color and structure of grains; more pronounced in the larger than in the smaller and imperfect ear.

No. 66. KING PHILIP crossed with LEAMING.

Second An. Rep., 311: "A very inferior ear which showed no approach to the Leaming."

Two ears: $8\ 3/4$ inches long, $1\ 1/2$ inches in diameter; smooth, rather compact, well filled at rounded base and tapering tip; 12-rowed; one ear reddish yellow, the other yellowish red; grains smooth to plainly indented, in section showing less corneous matter than in pure flint and less starch than in pure dent varieties; triangular to sub-quadrangular; rather short, about $1\ 1/32$ in. long, $5/16$ in. wide, and $5/32$ in. thick; cobs red, $7/8$ to 1 inch in diameter.

Intermediate between the two parents, though in general more strongly resembling King Philip.

No. 68. KING PHILIP crossed with EARLY YELLOW HATHAWAY.

Second An. Rep., p. 311: "No evidence of cross."

Three ears: $8\ 1/8$ to 9 inches long, about $1\ 1/2$ inches in diameter, smooth, 12 to 14-rowed, rows somewhat irregular and more or less defective, moderately well filled at base and tip, color deep to pale reddish yellow. Grains short, small and flint to moderately large and plainly indented, in section showing mostly less corneous matter than in pure flint and less starch than in pure dent varieties, $5/16$ in. to $3/8$ in. long, $5/16$ to $7/16$ in. wide, and $1/8$ to $3/16$ in. thick; cobs red, $7/8$ inch in diameter.

One of the ears is plainly and exactly intermediate between the two parents; the second is like the former except the grains are seldom indented;

and the third more strongly resembles the female parent, both in color and structure.

No. 69. KING PHILIP crossed with RILEY'S FAVORITE.

Second An. Rep., p. 311: "No evidence of cross"

Three very imperfect, slender ears, with no full rows; the scattering grains rather large, short and broad, mostly somewhat indented, and in section showing less corneous matter than in pure flint, and less starch than in pure dent varieties; cobs red, rather firm.

In color and general appearance like typical King Philip, but approaching Riley's Favorite in character of grains; one ear not inclosed presented some characteristics of King Philip, but the color lighter.

No. 71. KING PHILIP crossed with KING OF THE EARLIEST.

Second An. Rep., p. 312: "Color lighter than typical King Philip, but no clear evidence of any cross."

Three more or less imperfect ears, 6 inches long, 1 3/8 inches in diameter, smooth, fairly well filled at base and tip, 10-rowed, two of the ears yellow, one ear yellowish brown; grains short and broad, varying from smooth to slightly indented, in section varying from pure flint to impure dent, about 9/32 inch long, and a little wider; cob light red, 7/8 inch in diameter.

Very strong resemblance to King Philip, but the best ear approaches somewhat the male parent.

No. 73. ELLM'S EARLY YELLOW crossed with EARLY YELLOW HATHAWAY.

Second An. Rep., p. 312: "No evidence of cross"

A very imperfect ear, with 33 yellow grains which though smooth at summit yet show in section a slight variation from pure flint by having somewhat less corneous matter.

No. 74. LEAMING crossed with FARMER'S FAVORITE.

Second An. Rep., p. 312: "No evidence of cross."

Two imperfect, smooth ears, 7 1/2 inches long, about 1 5/8 inches in diameter, about 14-rowed, rows more or less defective, deep yellow in color; grain slightly indented, rather short, about 1/32 inch long, and nearly as wide; cob red, 11/8 inches in diameter.

Plainly intermediate between the two parental types in shape; in size, smaller than either.

No. 75. LEAMING cowed with RILEY'S FAVORITE.

Second An. Rep., p. 312: "Slightly resembles the Leaming, though few rowed; no clear evidence of cross."

Four ears from 7 1/2 to 8 inches long, about 1 3/4 inches in diameter, smooth, compact, 14-rowed, yellow to reddish yellow and occasionally red-striped; grains slightly dented, smallish to rather large, narrow to rather wide, 1/4 in.

to 7/16 in. long, 9/32 in. to 3/8 in. wide, and about 1/8 in. thick; cobs deep to light red.

The ears are smoother than Riley's Favorite, more strongly resembling Leaming in this respect; those of the ears which most strongly resemble the Leaming are in the lighter yellow color more like Riley's Favorite.

No. 82. LEAMING crossed with WOODWORTH'S YELLOW.

Second An. Rep., p. 313: "No evidence of cross."

A small, imperfect ear with yellow, slightly dented short grains, about 11/32 in. long, 9/32 in. wide, and 5/32 in. thick.

Too imperfect for satisfactory comparison with the two types that produced it.

No. 83. LEAMING crossed with GOLDEN BEAUTY.

Second An. Rep., p. 314: "The grains rather shorter than in the typical Leaming, and in this respect" perhaps slightly approaching the Golden Beauty."

Two ears: 4½ and 7½ inches long; 1 3/4 in. in diameter; smooth, not well filled; 14-rowed, many rows defective; bright yellow color; grains slightly dented, not large, about 3/8 in. long, 5/16 in. wide and 3/16 in. thick; cobs, very light red, 1 3/16 inches in diameter.

Intermediate between the two parental types in shade of color and shape of grains.

No. 86. LEAMING crossed with KING OF THE EARLIEST.

Second An. Rep., p. 314: "Evidence of cross in the wrinkled and rough summits of grains — slightly approaching, in this respect, the male parent."

Two ears: about 6 inches in length and 1 9/16 inches in diameter; very smooth and compact, but not well filled at rounded base and tapering apex; 12 to 14-rowed; deep yellow in color; grains, bright reddish yellow, medium sized, about 7/16 in. long, varying from 9/32 to 13/32 inch in width and 5/32 inch thick; cobs, deep red, 11/16 in. in diameter.

No character of the ears detected intermediate between the two parental types; the resemblance to Learning is very marked, except in the deep, bright color of the grains.

No. 87. FARMER'S FAVORITE GOLDEN DENT crossed with PRIDE OF THE NORTH.

Second An. Rep., p. 314: "Cross evident in character of grains?"

Two ears: 7½ and 8½ inches long, 1 13/16 inches in diameter; rather smooth, not compact, not well filled at base and tip; 12-rowed, rows somewhat irregular and defective; bright yellow color; grains slightly to strongly crease-dented, and often much wrinkled at summit; subtriangular to subquadrangular, rather large, about 7/16 in. long, 3/8 in wide, and 3/16 in. thick; cobs light red.

Resemblance to Farmer's Favorite very marked though smooth, and in shape of grains intermediate between the two parental types.

No. 97. HICKORY KING crossed with JOHNSTON'S MAMMOTH EARLY WHITE. Second An. Rep., p. 316: "Possible evidence of cross, but perhaps vitiated by some other cross of the previous year."

Five ears: $5\frac{1}{4}$ to $7\frac{1}{2}$ inches in length, $1\frac{1}{2}$ to 2 inches in diameter; rather smooth, compact, well filled; rounded at base, and somewhat pointed at tip; 14-rowed; grains mostly white, but often with a deep yellow tinge; medium size to large; $5/16$ to $\frac{1}{2}$ in. long, $5/16$ to $3/8$ in. wide, and $1/8$ to $\frac{1}{4}$ in. thick; cobs white.

The shape of the grains is mostly that of the male parent, though a few are wide, as in Hickory King. The resemblance to the female parent is scarcely detectable, and the resemblance to the male parent is not marked. Some previous cross must have occurred.

No. 99. HICKORY KING crossed with CONSCIENCE.

Second An. Rep., p. 316: "No evidence of cross."

Three ears, not perfectly ripened; $6\frac{1}{2}$ to 8 inches long, about $1\frac{3}{4}$ inches in diameter; rows not compact, not well filled, 16-rowed, white; grains crease-dented and wrinkled at summit, mostly narrow and long, but occasionally very broad; $7/16$ to $\frac{1}{2}$ in. long, $5/16$ to $15/32$ in. wide, and $1/8$ to $3/16$ in. thick; cobs white, rather small.

Character of the two parents somewhat blended in size of cob and shape of grains, though the most of the latter are nearly like Conscience, except not so rough at the summit.

No. 102. HICKORY KING crossed with NORMANDY GIANT.

Second An. Rep., p. 317: "Shape of grains unlike either parent, but the summits resemble Normandy Giant; there may be partial evidence of cross, but it is probable that the seed planted was not pure."

One imperfect ear with only 30 large, thick, short, white grains, and medium-sized pinkish cob.

Too imperfect for comparison with parental types. Of three ears not inclosed, several of the grains were yellow or yellowish, indicating a probable earlier cross.

No. 107. GOLDEN BEAUTY crossed with LEAMING.

Second An. Rep., p. 317: "Varies from the typical Golden Beauty, yet does not resemble Leaming — perhaps due to seed impure by a cross of the previous year."

Two very defective ears with only a few small, yellow grains.

Too imperfect for comparison with parental types.

No. 110. GOLDEN BEAUTY crossed with WHITE FLAT ENSILAGE.

Second An. Rep., p. 318: "Evidence of cross in character of grains."

A very defective ear with only three perfect grains, two of which are yellowish and the other white.

Too imperfect for comparison with parental types. Three inferior ears not inclosed present characters in some respect intermediate between the parents.

No. 112. GOLDEN BEAUTY crossed with LEAMING.

Second An. Rep., p. 318: "Evidence of cross only in character of the summit of the grain."

A very imperfect ear, with only ten well-developed grains.

Too defective for comparison; but an ear not inclosed shows grains intermediate in size and shape between the two parental types; though the ear is slender; cob of both ears white.

No. 114. GOLDEN BEAUTY crossed with WOODWORTH'S YELLOW.

Second An. Rep., p. 319: "Not clearly intermediate between the two parental types; i. e., evidence of cross doubtful."

Three ears: about 7 inches long, smooth, very imperfectly filled, about 12-rowed, deep yellow color; grains very irregular in shape, rather small, 5/16 to 13/32 in. long, 3/16 to 3/8 in. wide, and 1/8 to 3/16 in. thick; cobs light red, one inch in diameter.

Evidence of cross between Golden Beauty and Woodworth's Yellow not very clear, though a few of the grains strongly resemble the former, and a few others strongly resemble the latter; better developed ears might show more uniform grains.

No. 116. GOLDEN BEAUTY crossed with MAMMOTH CUBAN.

Second An. Rep., p. 319: "Grains thicker and of deeper color than the Golden Beauty, but not resembling the Mammoth Cuban."

Two partially filled ears, 8½ and 9½ inches long, 1 5/8 inches in diameter, 16-rowed, deep yellow color; grains rather small, somewhat dented, and usually slightly wrinkled, about 3/8 in. long, 5/16 in. wide, and 3/16 in. thick; cobs light red, 1 1/16 and 1¼ inches in diameter.

Unlike either parent, but not plainly intermediate; grains smaller than in the Golden Beauty; cobs smaller and rows of grains less than in Mammoth Cuban.

No. 117. GOLDEN BEAUTY crossed with GLICK'S YELLOW.

Second An. Rep., p. 319: "Evidence of cross in color and shape of grains, the latter resembling more nearly the female type, though the two parents are not very different."

Three ears: 7 to 5 inches long, 1¼ to 1 9/16 inches in diameter; rather smooth, not compact, and very imperfectly filled; 10 to 12-rowed, rows

irregular and not complete; light golden yellow; grains rather short, very broad, deeply crease-dented and wrinkled at summit; sub-quadrangular, about 7/16 inch long, the same in width, and nearly 3/16 inch in diameter.

In color more like Golden Beauty, and shape of grains like Glick's Yellow; ears too imperfect for further comparison.

No. 118. GOLDEN BEAUTY crossed with FARMER'S FAVORITE GOLDEN DENT. Second An. Rep., p. 319: "Presents evidence of a previous cross, but none between the parents given above."

Two very imperfect ears quite insufficient for description and comparison, though the color of grains (white to yellow) indicate a previous cross of some other (white) variety.

No. 123. GOLDEN BEAUTY crossed with a RED DENT. Second An. Rep., p. 320: "No evidence of cross."

One imperfect ear: 5¾ inches long, only partially filled; seventeen of the (inferior) grains at tip, yellow; all the others deep red; grains, medium sized, dimple dented, 7/16 inch long, 3/8 inch wide, and between 3/16 and ¼ inch thick; cob red.

In shape of grains like the (unstable) Red Dent, and like it also in color except 17 grains which resemble the Golden Beauty. The ears not covered were usually either wholly red or wholly yellow, and in the latter case approached Golden Beauty in shape.

No. 125. MURDOCK'S crossed with a RED DENT. Second An. Rep. p. 320: "Varies from the type in color, otherwise like the female parent, and no evidence of a cross."

Two very imperfect ears, each with but few yellowish or white, rather deeply dented grains.

No evidence of cross in color; otherwise ears too inferior for comparison.

No. 131. WAUSHAKUM crossed with RILEY'S FAVORITE. Second An. Rep., p. 321: "Evidence of cross in size of ear, size and color of grains, structure of grains as seen in section (strongly resembling or quite like the dent), and in color of cob."

Five ears varying from 5 to 9½ inches in length and 1¼ to 1½ inches in diameter, very smooth, compact, usually well filled, 10 to 14-rowed; grains varying from pale to deep yellow, smooth and somewhat flint-like to moderately dented, in section varying from typical dent to nearly pure flint, 5/16 to 3/8 inch long, 5/16 to 3/8 inch broad, and 3/32 to 7/32 inch wide; cobs red, 13/16 to 1 inch in diameter.

All the ears intermediate between the two parental varieties, though some resemble the female parent and others the male parent more closely; the grains on each ear are quite uniform.

No. 145. ST. CHARLES crossed with NORMANDY GIANT.

Second An. Rep., p. 323: "Evidence of cross not visible."

One imperfect ear, with about 20 large, white grains, not admitting of fair comparison with parental types.

No. 146. ST. CHARLES crossed with MAMMOTH WHITE DENT.

Second An. Rep., p. 324: "No evidence of cross."

Three imperfect ears: from 4 to 6½ inches long, 1¾ inches wide, rather smooth, compact, not well filled, 14 to 18-rowed, white; grains medium size, subtriangular, deeply dented, about 3/18 in. long, 5/16 in. wide and 5/32 in. thick; cobs light pink, 1¼ inches in diameter.

Unlike either parent, but not intermediate between the two in character of grains.

No. 151. YELLOW MAMMOTH crossed with MARYLAND WHITE DENT.

Second An. Rep., p. 324: "Evidence of cross in intermediate color"

One ear: 7¼ inches long, 1 15/16; inches in diameter; rough, not compact; 20-rowed, rows irregular; about half the grains white, the others yellowish to deep yellow, rather small or medium-sized, mostly dimple-dented, wrinkled at summit and tipped on chit side, about 3/8 in. long, 5/16 in. wide and 3/16 in. thick; cob red, 1 3/8 inches in diameter.

Intermediate between the two parental types in color, but the grains not uniform; shape of grains also irregular, and not strongly resembling either parental type.

No. 155. EARLY RED BLAZED crossed with EARLY YELLOW HATHAWAY.

Second An. Rep., p. 324: "No evidence of cross."

Three very imperfect ears: 4½ to 8¼ inches long, 1 5/16 in diameter; very smooth; about 10-rowed, rows mostly imperfect; grains bright yellow, short and broad, nearly or quite smooth to slightly but plainly indented, in section nearly like pure flint in most cases, but sometimes with nearly as much starch as in pure dent varieties, about 5/16 in. long, 3/8 in. broad, and ¼ in. thick; cob red, 15/16 inch in diameter.

Clearly intermediate between Early Red Blazed and Early Yellow Hathaway, though more strongly resembling the former.

No. 156. EARLY RED BLAZED crossed with EARLY YELLOW HATHAWAY.

Second An. Rep., p. 325: "No evidence of cross."

Three imperfect ears; 7 to 8 inches long, 13 to 1½ inches in diameter; very smooth; 10- to 12-rowed, only partially filled; glossy yellow; grains short, mostly smooth, but occasionally dented slightly, in section mostly with nearly as much corneous matter as in true flints, but varying to nearly as much starch as in true dents; about 3/8 in. long and wide, and 3/16 in. thick; cobs red, about 1 inch in diameter.

Strongly resembling the typical Red Blazed, but rows more numerous, and some of the grains approaching the dent parent.

No. 157. EARLY YELLOW HATHAWAY crossed with COMPTON'S EARLY.

Second An. Rep., p. 325: "No evidence of cross, unless in the less deeply dented and smoother summits of the grains."

Four ears: varying from 7 to 9¼ inches in length, and 1 5/16 to 1 9/16 inches in diameter, very smooth, compact, well filled, 12-rowed, glossy yellow ; grains small, short, mostly nearly smooth and flint-like, but in many cases very slightly dented, in section showing mostly, but not always, as much corneous matter as in the true flints, about 5/16 in. long and broad, and 3/8 in. thick; cobs red, 15/16 to 1 1/8 inches in diameter.

Plainly intermediate between the two parental types, yet very strongly resembling typical Compton's Early.

No. 158. EARLY YELLOW HATHAWAY crossed with PRIDE OF THE NORTH.

Second An. Rep., p. 32.5: "No clear evidence of cross."

Three ears: two very imperfect, and the other short (5 inches) though well filled, compact, 16-rowed, deep yellow; grains triangular to sub-quadrangular, deeply dented and wrinkled at summit, about 7/16 in. long, 5/16 in. wide, and 5/32 in. thick; cob red, 1 3/16 inches in diameter.

In general appearance of ear and summits of grain much like Early Yellow Hathaway, but the color and shape of grains more like Pride of the North.

No. 159. EARLY YELLOW HATHAWAY crossed with CHAMPION WHITE PEARL.

Second An. Rep., p. 325: "No evidence of cross."

A very imperfect ear, with a few dimple dented, light-yellowish or whitish grains.

Too imperfect for comparison with parental types, but plainly intermediate in color.

No. 160. EARLY YELLOW HATHAWAY crossed with LONGFELLOW.

Second An. Rep., p. 326: "No clear evidence of cross."

An imperfect ear: 6 inches long and 1 3/16 inches in diameter, 12-rowed, yellow; grains small, short, and broad; all flint, but in section showing rather less corneous matter and more starch than in pure flint varieties; about 9/32 inch long, and 11/32 inch broad; cob red, 13/16 inch in diameter.

Strongly resembles Longfellow, though the grains are much smaller and proportionally narrow, and have mostly rather more starch than in pure flints; otherwise, no evidence of cross.

No. 162. MASON'S FLOUR CORN crossed with BIG BUCKEYE.

Second An. Rep., p. 326: "Evidence of cross only in color of grains."

One ear: 6 inches in length, 2 inches in diameter, smooth, not compact,

well filled, 16-rowed; about half the grains yellow, others yellowish, and many pure white, medium sized, mostly smooth, about one-third or one-fourth very slightly indented, in section varying in imperceptible degrees from typical dent to typical flint; about $\frac{3}{8}$ inch long, $\frac{9}{32}$ to $\frac{3}{8}$ inch wide, and $\frac{3}{16}$ inch thick; cob light red, $1\frac{3}{8}$ inches in diameter.

Plainly intermediate in general appearance of the ear between the two parental types. The shape of the grains is more like Big Buckeye, but the character of summit more like the Flour Corn.

No. 164. MASON'S FLOUR CORN crossed with CONSCIENCE.

Second An. Rep. p. 326: "No evidence of cross."

One ear: $7\frac{1}{2}$ inches long, $1\frac{13}{16}$ inches in diameter; smooth, compact, not well filled at base, 14-rowed; grains mostly white but often with a deep yellowish tinge; rather large, smooth to slightly indented; $\frac{7}{16}$ inch long, $\frac{5}{16}$ to $\frac{7}{16}$ inch broad and $\frac{5}{32}$ to $\frac{7}{32}$, inch thick; cob white, $1\frac{1}{16}$ inches in diameter.

Plainly intermediate in all respects between dent and soft corn, but more strongly resembling the latter.

No. 165. MASON'S FLOUR CORN crossed with SOUTHERN HORSE TOOTH.

Second An. Rep. p. 326: "No evidence of cross."

One defective ear: about $6\frac{1}{2}$ inches long, only partially filled with large, white smooth grains, which in section show less starch than in pure soft varieties; cob white.

Plainly intermediate between the typical soft and dent varieties, though the general resemblance to the female parent is more marked.

No. 172. PARISH WHITE crossed with a RED DENT.

Second An. Rep., p. 327: "Evidence of cross doubtful."

Two imperfect ears: the better one $5\frac{1}{4}$ inches long and $1\frac{1}{4}$ inches in diameter, smooth, compact, 14-rowed, white; grains triangular to subquad-rangular, moderately indented, and somewhat wrinkled at summit, $\frac{7}{16}$ inch long, $\frac{3}{8}$ inch wide, and $\frac{5}{32}$ inch thick; cob light pink, $1\frac{1}{16}$ inches in diameter. The other ear very defective; grains inferior, and a few of them yellow or yellowish.

Evidence of cross not clear, except, perhaps, in shape of grains, which resemble those of the (unstable) Red Dent more than those of Parish White.

No. 174. MOSBY'S PROLIFIC crossed with MASON'S FLOUR CORN.

Second An. Rep., p. 327: "Differing from both parental types, but scarcely intermediate — perhaps evidence of cross in the smoother grains."

Four imperfectly filled ears: $5\frac{3}{4}$ to 8 inches in length, about $1\frac{1}{2}$ inches in diameter; about 12-rowed, white, except two light-yellow grains; grains, smooth to slightly indented; in section, showing less starch than in the

pure soft variety, and usually more than in dents; $3/8$ inch long, $5/16$ to $7/16$ inch broad, $1/8$ to $3/8$ inch thick; cobs white, 1 to $1\ 3/16$ inches in diameter.

Plainly intermediate between soft and dent types, though the general resemblance to Mason's soft is very marked.

No. 178. MOSBY'S PROLIFIC crossed with SHANNON'S BIG TENNESSEE WHITE. Second An. Rep., p. 328: "No clear evidence of cross."

One ear: $7\ 1/2$ inches long, $1\ 9/16$ inches in diameter, 12-rowed, not completely filled, white; grains moderately indented, slightly if at all wrinkled at summit, $7/16$ to $15/32$ inch long, $3/8$ to $7/16$ inch wide, and $1/8$ to $3/16$ inch thick; cob white, $15/16$ inch in diameter.

Ear smoother than either parent; general appearance more nearly that of Mosby's Prolific, but shape of grain approaching more nearly that of male parent.

No. 179. MOSBY'S PROLIFIC crossed with a RED DENT.

Second An. Rep., p. 328: "No evidence of cross."

Two very defective ears, with loose or scattering grains, deeply indented, wrinkled at summit and often tipped on chit side, white; some of the grains with slightly yellowish tinge, about $3/8$ in. long, $5/16$ in. wide, and $3/16$ in. thick; cob white.

No evidence of cross in color, grains quite unlike typical Mosby's Prolific, more nearly resembling the (unstable) Red Dent.

No. 182. MOSEY'S PROLIFIC crossed with BULLOCK'S WHITE PROLIFIC.

Second An. Rep., p. 329: "No evidence of cross."

Two very imperfect ears with loose or scattering grains of medium to large size, moderately to deeply indented and slightly wrinkled at summit, mostly pure white but often more or less deeply tinged with yellow; cobs white.

Too imperfect and grains too irregular for comparison with parental types, though the character of summits of the grains intermediate between the two.

No. 183. THOROUGHbred WHITE FLINT crossed with LONGFELLOW.

Second An. Rep., p. 329: "Evidence of cross only in color."

Three ears: two very imperfect, with but few grains; the other, slender, 9 inches long, but the eight rows not full; grains flint, rather small, varying from deep yellow (in the inferior ears) to pale or whitish.

Evidence of cross in color; the ears too defective for further comparison with parental types.

No. 184. THOROUGHbred WHITE FLINT crossed with EARLY CALIFORNIA.
 Second An. Rep., p. 329: "No evidence of cross except in color of grains."

One ear : $8\frac{1}{4}$ inches in length, $1\frac{5}{16}$ in. in diameter, smooth, compact, 12-rowed, not perfectly filled toward the base; grains mostly yellow, but many of them dull white, mostly smooth, but a few faintly indented in section scarcely differing from a pure flint variety, about $\frac{3}{8}$ in. long, $\frac{5}{16}$ in. wide, and $\frac{5}{32}$ in. thick; cob red, $\frac{13}{16}$ in. in diameter.

In general appearance plainly intermediate between flint and dent; grain smaller than in flint parent; in shape approaching typical Early California.

No. 186. KING OF THE EARLIEST crossed with EARLY YELLOW HATHAWAY.
 Second An. Rep. p. 329: "Like the female parent, but smoother; no evidence of cross."

One inferior ear: $6\frac{1}{4}$ inches in length, $1\frac{5}{8}$ inches in diameter; not compact, 14-rowed, several of the rows incomplete; deep yellow; grains rather large, sub-quadrangular, deeply indented and usually much wrinkled at summit, $\frac{3}{8}$ to $\frac{7}{16}$ in. long, $\frac{5}{6}$ to $\frac{3}{8}$ in. in width, $\frac{1}{8}$ to $\frac{3}{16}$ in. thick; cob red, $\frac{15}{16}$ inch in diameter.

Not plainly if at all intermediate between King of the Earliest and Early Yellow Hathaway, having larger grains than either ear, not so rough; in shade of yellow, quite like the male parent.

No. 190. MAMMOTH CUBAN crossed with a RED DENT.

Second An. Rep. p. 329: "No evidence of cross?"

Two ears: 6 inches in length, $1\frac{3}{4}$ inches in diameter; not perfectly filled, smooth, about 16-rowed, deep yellow. grains, medium size or large, moderately indented, and slightly wrinkled at summit, $\frac{3}{8}$ to $\frac{7}{16}$ inch in length, $\frac{5}{16}$ to $\frac{3}{8}$ inch wide, and $\frac{3}{16}$ inch thick; cobs red, $1\frac{3}{16}$ inches in diameter.

Unlike either parent; would not be taken for a cross, but ears not inclosed were red, and in shape of grains strongly resembled the (unstable) Red Dent, used a year ago.

No. 192. EARLY CALIFORNIA crossed with CRANBERRY WHITE.

Second An. Rep., p. 330: "No clear evidence of cross."

One very imperfect ear, with about 50 grains, which are irregular in size and shape, mostly rather large, dimple dented, and white or yellowish to deep yellow.

Too imperfect for satisfactory comparison, though evidence of cross in color. Some ears, not inclosed, showed on a few of the grains the marking characteristic of Cranberry White.

No. 194. CRANBERRY WHITE crossed with CLARAGE YELLOW.

Second An. Rep. p. 330: "No clear evidence of cross."

Two very imperfect ears: $4\frac{1}{2}$ to $5\frac{1}{2}$ inches long, but only partially filled;

about 14-rowed; grains white or yellowish white, in some cases nearly or quite yellow, very irregular in shape and size, varying from nearly smooth to moderately indented; cob light red.

Intermediate between two parental types in color, but otherwise not strongly resembling either parent.

No. 199. CLARAGE YELLOW crossed with PRIDE OF THE NORTH.

Second An. Rep. p. 331: "Nuclear evidence Of cross."

One inferior ear: $7\frac{1}{2}$ inches in length, $1\frac{1}{2}$ inches in diameter, smooth, 12-rowed, but all the rows defective on one side, yellow; grains rather small, tapering slightly below, not deeply indented, about $\frac{3}{8}$ inch long, $\frac{5}{16}$ inch wide, and $\frac{5}{32}$ inch thick; cob deep red, $\frac{15}{16}$ inch in diameter.

Resembles Pride of the North, but not the Clarage Yellow; can scarcely be considered as intermediate between the two, though the grains are not as narrow as in Pride of the North.

No. 202, CLARAGE YELLOW crossed with EARLY YELLOW HATHAWAY.

Second An. Rep., p. 331: "Not resembling either parent, but not intermediate, and hence no evidence of cross."

One inferior ear: $4\frac{1}{2}$ inches long, $1\frac{5}{8}$ inches in diameter, smooth, 12-rowed; grains varying from white to yellowish, or in a few cases deep yellow, short, broad and thick, moderately indented; cob light red.

Unlike either parent and not clearly intermediate, except in shape of grains; vitiated doubtless by previous cross.

No. 205. CLARAGE YELLOW crossed with CRANBERRY WHITE.

Second An. Rep., p. 331: "Doubtful evidence of cross in shape and color of grains."

Two inferior ears: $5\frac{1}{2}$ inches long, $1\frac{5}{8}$ inches in diameter, smooth, 14-rowed; grains varying from white and pinkish tinged to yellow, not deeply indented, $\frac{5}{16}$ to $\frac{7}{8}$ inch long, $\frac{19}{32}$ to $\frac{11}{32}$ inch wide; one cob white, the other light pink, about 1 inch in diameter.

Not a well-blended cross — showing more plainly characteristics of Cranberry White, though in shape and color of some of the grains slightly approaching Clarage Yellow.

No. 207. GLICIK'S YELLOW crossed with NORMANDY GIANT.

Second An. Rep., p. 332: "Evidence of cross in color of grains."

Two very inferior ears with only a few large, thick and broad, light yellowish grains.

Too imperfect for comparison with parental types, though intermediate in blended color.

No. 214. SHANNON'S BIG TENNESSEE YELLOW crossed with a RED DENT.

Second An. Rep., p. 333: "Evidence of cross only in color."

One inferior ear: $5\frac{1}{2}$ inches in length, $1\frac{7}{8}$ inches in diameter; 16-rowed, many of the rows imperfect; grains, faint reddish yellow, summits lighter

yellow, slightly indented, about 7/16 in. long, 3/8 in. broad and 1/8 to 3/16 in. thick; cob red, 1 1/8 inches in diameter.

Varies considerably from female parent, though can scarcely be said to approach the Red Dent.

No. 217. RED-COB ENSILAGE crossed with EARLY CALIFORNIA.

Second An. Rep., p. 333: "No evidence of cross."

One very inferior ear: about 18-rowed, with white and yellowish and occasionally yellow grains, deeply indented and often much wrinkled at summit, variable in size and shape; cob red.

Too imperfect (and mouldy) for satisfactory comparison with parental types, though intermediate in color, which, however, is not always well blended.

CROSSED CORN THE THIRD YEAR.

Seed selected from the second year crossed corn (of the previous year, 1889)¹ was planted on May 10, in a young orchard on rich creek bottom land. From each "cross" of 1889, the most diverse kernels were selected and planted; especial care was taken to select also any intermediate kernels that seemed likely to furnish a valuable variety. The germination in all cases was good, and for a month or more after planting, the growth was all that could be desired. A very severe drouth followed, however, which greatly injured all of the crosses planted. In many cases scarcely a single ear was produced, and none of the crosses produced good ears.

Several ears from each plat were inclosed in cloth sacks, and were fertilized with pollen from several plants in the same plat. Usually the ears were pollinated from two to four times; because of the drouth many of these ears failed to produce a single grain.

The following list shows the crossed corn planted. The Roman numerals under each numbered cross indicate the different kinds of grains that were selected for planting. Full descriptions of all of the varieties are given in the Second Annual Report of this Station, pp. 335-344. A brief statement of the characters of the grains of the parental varieties is given in this bulletin, pp. 151-153.

LIST OF SECOND YEAR CROSSED CORN PLANTED IN 1890.

2. *King Philip* crossed with *Longfellow*.
 - I. Yellow flint.
 - II. Red flint.
3. *King Philip* crossed with *Early Red Blazed*.
 - I. Yellow flint.
 - II. Red flint.
4. *King Philip* crossed with *Early Yellow Hathaway*.
 - I. Red flint.
 - II. Yellow flint.
 - III. Yellowish red dent.

¹Second Annual Report Experiment Station, Kansas State Agricultural College for 1889, pp. 334-346.

5. *Longfellow* crossed with *Early Yellow Hathaway*.
 - I. Yellow flint.
 - II. Yellow intermediate.
 - III. Yellow dent.
8. *Pride of the North* crossed with *Mammoth White Surprise*.
 - I. Yellow dent.
 - II. Yellowish white dent.
 - III. White dent.
 - IV. Reddish dent.
9. *Bullock's White Prolific* crossed with *Golden Pop Corn*.
 - I. White dent.
 - II. White flint.
 - III. Yellow flint.
 - IV. Yellow semi-dent.
 - V. White and yellowish white flint.
14. *Early White Dent* crossed with *Golden Pop Corn*.
 - I. White flint.
 - II. Yellow flint.
 - III. White dent.
15. *Early Yellow Hathaway* crossed with *Sanford's Ensilage*.
 - I. White dent.
 - II. Yellow flint.
17. *Early Red Blazed* crossed with *Early White Dent*.
 - I. Light yellow to yellowish white dent, some kernels tinged with red.
19. *Yellow Mammoth* crossed with *Queen of the Prairie*.
 - I. Yellow dent with white cob.
 - II. Yellow dent with red cob.
20. *Yellow Mammoth* crossed with *King Philip*.
 - I. Yellow flint.
 - II. Reddish yellow flint.
21. *Self-Husking* crossed with *Extra Early Adams' Table*.
 - I. Yellow flint.
 - II. Yellowish-red flint.
24. *White Flat Ensilage* crossed with *Landreth Sugar*.
 - I. White dent.
 - II. White sweet.
25. *Calico* crossed with *Adams' Early Table*.
 - I. Small red-streaked dent.
 - II. Larger white dent.
26. *Adams' Early Table* crossed with *King Philip (Western form)*.
 - I. Reddish dent with white-tipped kernels.
27. *Extra Early Adams' Table* crossed with *Ellm's Early Yellow*.
 - I. White dent.
 - II. White flint.

- III. Yellow flint.
- IV. Pinkish white flint.
- 28. *Early Landreth Market* crossed with *Early Golden Lenawee*.
 - I. White sweet.
 - II. Yellow sweet.
 - III. White dent.
 - IV. Yellow dent.
- 38. *Breck's Premier Sugar* crossed with *Compton's Early*.
 - I. Yellow flint.
 - II. White flint.
 - III. Sweet.
- 39. *Breck's Premier Sugar* crossed with *Silver Lace Pop Corn*.
 - I. White sweet.
 - II. White flint.
- 41. *Rice Pop Corn* crossed with *Breck's Boston Market Ensilage*.
 - I. White dent.
 - II. White flint.

DESCRIPTION OF EARS OBTAINED.

The ears obtained from the above seed are briefly described in the following notes. With few exceptions, only those ears are noted that were inclosed before flowering and artificially pollinated. Since in many of the plats none of the in closed ears developed, a number of the kinds of corn planted are not represented in this list.

- 2. *King Philip* crossed with *Longfellow*.

- II. Planted red flint.

- A single inclosed ear was like the corn planted.

- 3. *King Philip* crossed with *Early Red Blazed*.

- I. Planted yellow flint.

- One small inclosed ear was like the corn planted except a few grains which were of a yellowish white color.

- 4. *King Philip* crossed with *Early Yellow Hathaway*.

- II. Planted yellow flint.

- A single inclosed ear was of a yellow color, but showed more of the dent character than did the kernels planted.

- 5. *Longfellow* crossed with *Early Yellow Hathaway*.

- II. Planted yellow corn between dent and flint.

- None of the inclosed ears ripened, but on a large plat most of the ears were of a pronounced flinty character, though a few were dent-like. Almost all the ears were yellow, but a few bore scattering sweet and yellowish white flint kernels.

- 8. *Pride of the North* crossed with *Mammoth White Surprise*.

- III. Planted white dent.

- Two inclosed ears differed considerably from each other. One was a slightly reddish white dent with white-tipped grains, while the other was a yellowish white dent.

9. *Bullock's White Prolific* crossed with *Golden Pop Corn*.

V. Planted white and yellowish-white flint.

Several inclosed ears were a white flint. The unenclosed ears from a large plat were mostly white flint, but many ears had a mixture of yellow, yellowish white and white flint grains. A very few ears were of a dent character. This seems to be a cross of some value. It much resembles the white flint ears of 14 I and 41 II.

14. *Early White Dent* crossed with *Golden Pop Corn*.

I. Planted white flint.

Three inclosed ears were all a fine flint, like dent. The kernels are often smooth, but are tipped with white. This is like the last, a promising cross, but is somewhat earlier, (blooming about 10 days before 9 V.) In both 9 V and 14 I the yellow color of the pop corn seems much more easily lost than the flinty character, which it imparts to the dent.

15. *Early Yellow Hathaway* crossed with *Sanford's Ensilage*.

I. Planted white dent.

Two inclosed ears were white dent, with an admixture of many yellow dent kernels.

II. Planted yellow dent.

Two inclosed ears were a yellow flint-like dent, with an admixture of some yellowish-white and white kernels.

17. *Early Red Blazed* crossed with *Early White Dent*.

I. Planted light yellow to yellowish white dent with some kernels tinged with red.

Two inclosed ears were like the seed planted, but had no red-tinged kernels.

19. *Yellow Mammoth* crossed with *Queen of the Prairie*.

II. Planted yellow dent from a red cob.

The single inclosed ear was a yellow dent with a white cob.

20. *Yellow Mammoth* crossed with *King Philip*.

I. Planted yellow flint.

Two inclosed ears were like the seed planted.

II. Planted reddish yellow flint,

Two inclined ears were like the seed planted.

21. *Self-Husking* crossed with *Extra Early Adams' Table*.

I. Planted yellow flint.

Three inclosed ears were like the seed planted.

II. Planted yellowish red flint.

Two inclosed ears were both yellow flint, but one ear had a few yellowish white flint grains. 21 II flowered several days earlier than 21 I.

24. *White Flat Ensilage* crossed with *Landreth Sugar*.

(See Plate XI in the Second Annual Report of this station.)

I. Planted white dent.

Two inclosed ears were principally white dent, but had intermixed some entirely sweet grains.

II. Planted white sweet.

Two inclosed ears were almost entirely sweet, there being no dent grains on one ear, while the other ear had but five to ten grains.

From this result it would seem that the sweet grains reproduced themselves much more exactly than did the dent grains from the same ear.

25. *Calico* crossed with *Adams' Early Table*.

(See Plate XI, in Second Annual Report.)

I. Planted small dent streaked with red.

The single inclosed ear was fully white dent; most of the unin-closed ears in the plat were much streaked with red, like calico, but some ears were entirely white, like the one inclosed.

II. Planted white dent.

A very poor inclosed ear had a few grains which were white dent like the seed planted; the unclosed ears were nearly all white dent, but some of them showed traces of the red streaks of the calico.

Both this year (1890) and last, this cross had all the kernels on an ear alike, though different ears varied. Quite the opposite is true of No. 24, where both years the ears showed an admixture of two entirely distinct kinds of grains.

26. *Adams' Early Table* crossed with *King Philip* (Western form.)

(See Plate XI in Second Annual Report.)

I. Planted reddish dent with white-tipped kernels.

The inclosed ears failed to develop, but the unclosed ears were much like the seed planted, though varying from nearly white to nearly red. All of the grains on any one ear were, however, the same.

27. *Extra Early Adams' Table* crossed with *Ellm's Early Yellow*.

II. Planted white flint.

Two very poor inclosed ears were like the seed planted.

III. Planted yellow flint.

The single very poor inclosed ear had kernels of a yellow color, but of a character intermediate between flint and dent.

28. *Early Landreth Market* crossed with *Early Golden Lenawee*.

IV. Planted yellow dent.

A single very poor inclined ear had yellow, flint-like dent kernels, intermixed with which were a very few white kernels of the same character.

38. *Breck's Premier Sugar* crossed with *Compton's Early*.

(See Plate XI, in Second Annual Report.)

II. Planted white flint.

The single very poor inclosed ear was like the seed planted.

39. *Breck's Premier Sugar* crossed with *Silver Lace Pop Corn*.

I. Planted white sweet.

The single inclosed ear was pure sweet, and like the seed planted, except that a few of the grains had a yellowish tinge.

41. *Rice Pop Corn* crossed with *Breck's Boston Market Ensilage*.
(See Plate XI, in Second Annual Report.)

I. Planted white dent.

Two inclosed ears were white, but had kernels intermediate in character between dent and flint.

II. Planted white flint. (Like the ear shown in Plate XI.)

Two inclosed ears were both intermediate between flint and dent, some of the kernels having a slight furrow on the top. One ear was slightly tinged with red, the other white. The unenclosed ears were much the same, but were almost all white.

This seems a promising variety. It flowered about the same time as 14 I, and is much like that cross.

PRACTICAL SUMMARY.

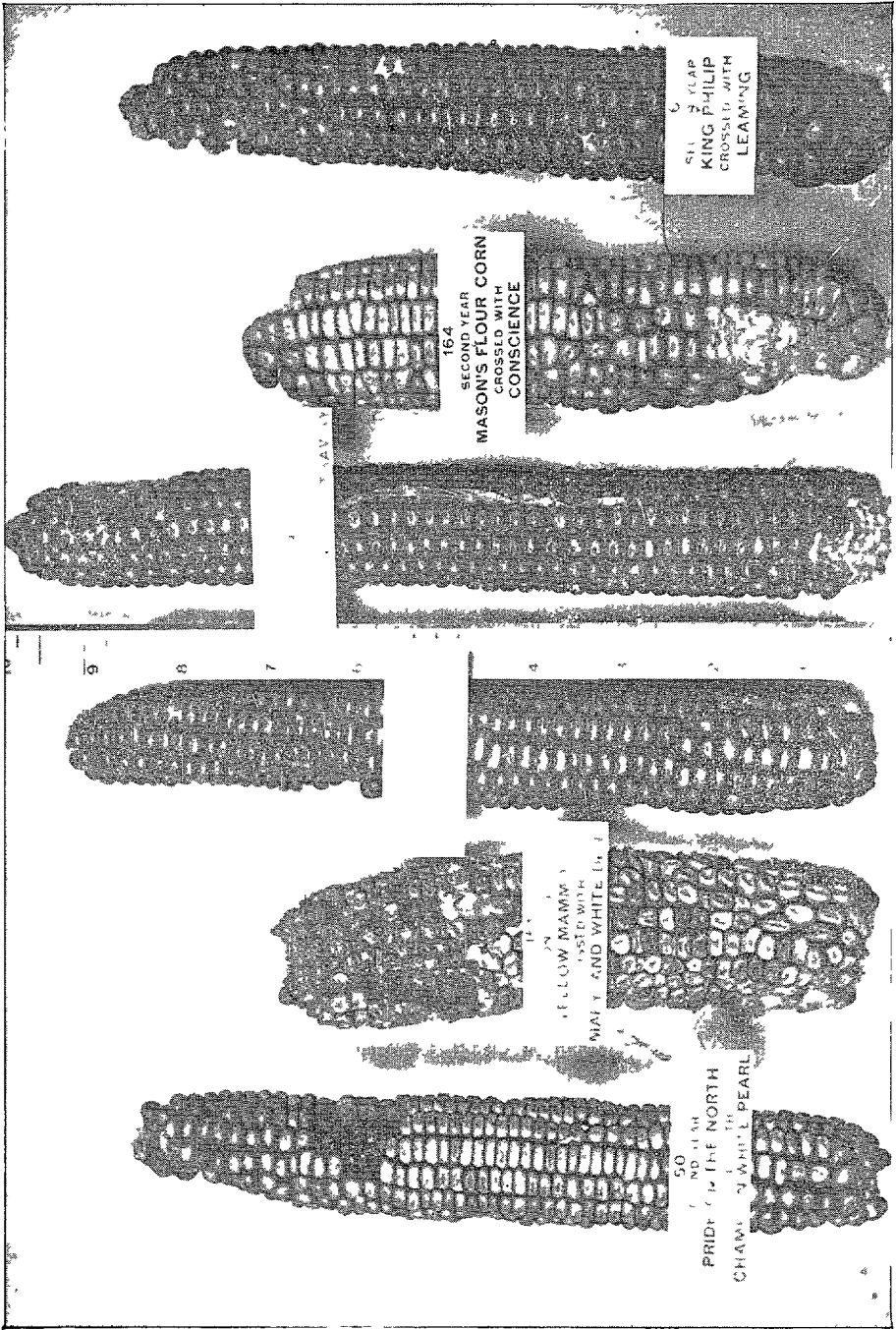
Numerous crosses between varieties of maize by means of artificial pollination were mostly successful, the different races (as dent, flint, soft, sweet, and pop corn) crossing apparently with equal non-resistance.

The effects of the crossing are in comparatively few cases (mostly in sweet varieties) visible the first year. The second year (or second generation) shows generally ears more or less completely blended, often exactly intermediate between the two parental types; more rarely the grains of a single ear are unlike each other, and each may resemble closely or remotely either parent. The product of the third year is generally true to the seed planted (as shown by record of this year only); by selecting diverse grains from any ear, or from different ears, ears are obtained with grains usually like those planted. Any desired form of a "cross" can therefore apparently be perpetuated.

In view of the above, it is possible to effect desired points of improvement in varieties by crossing (and of course, fixing or perfecting by subsequent selection). But the experiments were the past season much reduced in value by reason of serious drouth; favorable seasons will doubtless furnish more favorable, or at least more conclusive results in the efforts to improve varieties.

EXPLANATION OF PLATE.

- PLATE III. Crossed Corn the Second Year. From photograph.
No. 50. *Pride of the North* crossed with *Champion White Pearl*.
No. 60. *Self-Husking* crossed with *Early Hathaway*.
No. 61. *Self-Husking* crossed with *Woodworth's Yellow*.
No. 66. *King Philip* crossed with *Learning*.
No. 151. *Yellow Mammoth* crossed with *Maryland White Dent*.
No. 164. *Mason's Flour Corn* crossed with *Conscience*.



CROSSED CORN—SECOND YEAR.

(From Photograph by Kellerman & Swingle.)