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OF THE  
KANSAS STATE AGRICULTURAL COLLEGE,  
M A N H A T T A N .

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BOTANICAL DEPARTMENT.

[This bulletin is a record of experiments conducted by Prof. W. A. Kellerman, now of the Ohio State University, under whose direction the bulletin has been prepared by Mr. C. H. Thompson, acting assistant in the experiment of the past season. The future work of the Botanical Department of the Station will be in charge of Prof. A. S. Hitchcock, M. Sc., with M. A. Carleton, M. Sc., as assistant.]

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CROSSED VARIETIES OF CORN, THIRD YEAR.

The crossing of different varieties of corn was begun in this Station in 1888 with a result, the first year, of 43 ears, no two of which had the same parents. The following year (1889) other "crosses" were attempted with a result of about 121 different kinds. Since that time no new "crosses" have been tried, but those already obtained have been replanted each year and kept pure by artificial self-fertilization,

Last year the Botanical Department issued a bulletin (No. 17) on "Crossed Varieties of Corn, Second and Third Years." The work of this year in that line is in substance a repetition, with extension, of last year's work as explained in the Bulletin. The grain obtained from last year's "crosses" was used for seed this year, and each "cross" was kept absolutely pure from foreign pollen by the method of artificial pollination as described in First Annual Report of the Kansas Experiment Station, p. 316; also in Bulletin No. 17; p. 153.

For convenience of reference in the description of the various "crosses"  
(139)

obtained, a list of the varieties used in the crosses is given, with a short description of each.

Big Buckeye; yellow dent.  
 Bullock's White Prolific; smooth white dent.  
 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 Yellow Hathaway; yellow dent.  
 Ellm's Early Yellow; yellow flint.  
 Farmers' Favorite; large yellow dent.  
 Glick's Yellow; large yellow dent.  
 Golden Beauty; large yellow dent.  
 Hickory King; white dent; very small cob.  
 Johnston's Mammoth Early White; white dent.  
 King of the Earliest; yellow dent.  
 King Philip; red-brown flint.  
 Learning; yellow dent.  
 Longfellow; yellow flint.  
 Mammoth Cuban; yellow dent.  
 Mammoth White Dent; white dent.  
 Mason's Flour; soft corn.  
 Mosby's Prolific; white dent.  
 Murdock's; yellow dent.  
 Normandy Giant; white dent.  
 Pride of the North; small yellow dent.  
 Riley's Favorite; yellow dent.  
 Self-Husking; reddish or brownish-yellow flint.  
 Shannon's Big Tennessee White; white dent.  
 Shannon's Big Tennessee Yellow; yellowish dent.  
 Southern Horse Tooth; white dent.  
 St. Charles; white dent.  
 Thoroughbred White Flint; large white flint.  
 Waushakum; yellow flint.  
 White Flat Ensilage; smooth white dent.  
 Woodworth's Yellow; yellow dent.

CROSSED CORN THE THIRD YEAR.

In the season of 1890, 62 "crosses" were harvested. Of these, 49 were again planted this year, on rich, "second-bench" land between the plots used in spraying to prevent rust (Bulletin No. 22) and those of smuts of corn and sorghum. (Bulletin No. 23.) The grain germinated well, and the plants made an excellent growth. The ears set in abundance and a few in every plot were enclosed, but owing to the numerous

small showers through the summer it was a difficult matter to obtain dry pollen; hence not all the "crosses" were self-fertilized.

There were 43 "crosses" harvested. Eight of these showed no intermediate characteristics between the parents. Of this number, three (86, 102, 116) resembled the female parent, two (97, 178) the male parent, and three (117, 146, 202) showed no resemblance to either parent. The remaining 25 gave clear evidence of intermediate characteristics between the parents. This was shown in color only in five cases, in the character of grains only in 20 cases, and in both color and character of grains in 10 cases.

Of the "crosses" made in 1889 to improve varieties,<sup>1</sup> there were harvested this year the following numbers: <sup>2</sup> 74, 75, 82, 83, 86, 97, 99, 102, 114, 116, 117, 118, 146, 164, 165, 174, 178, 182, 199, and 202. Referring to the above, it will be seen that eight of these gave no indications of a cross. Of the remaining 12, some showed exactly intermediate characteristics between the parents, and others resembled one parent more than the other.

DESCRIPTIONS OF EARS OBTAINED.

No. 48. CHAMPION WHITE crossed with WAUSHAKUM.

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

Bulletin No. 17, p. 155: "Evidence of cross both in color and character of grains, the latter perhaps more nearly approaching the female parent."

Three ears: Small, 6 inches long, 1 3/8 to 1 1/2 inches in diameter, smooth, compact, 12- to 14-rowed; grains very small, smooth to dimple-dented, in section showing more corneous matter than in the dent varieties and more starch than in the flint varieties, transparent white to bright yellow, 5/16 inch long and broad, and 1/8 inch thick; cobs white, 13/16 to 1 inch in diameter.

Evidence of cross in color and character of grain, yet not resembling one parent more than the other.

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

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

Bulletin No. 17, p. 155: "An imperfect ear, though in several respects intermediate between the two parents."

Three ears: 4 3/4 to 6 inches long, 1 7/8 to 2 1/4 inches in diameter, medium rough, compact, well filled, 20-rowed; grains small to medium, summits crease-dented slightly and much wrinkled, pure white, body of kernel usually light yellow, sometimes white, 3/8 to 7/16 inch long, 9/32 to 5/16 inch

<sup>1</sup> Second Annual Report, pp. 290, 291.

<sup>2</sup> Bulletin No. 17, p. 154.

broad, and 1/8 inch thick; cobs, two red and one white, 1 1/8 to 1 1/2 inches in diameter.

Plainly intermediate between the parents, in the beautiful blending of the yellow and white.

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."

Bulletin No. 17, p. 155: "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."

Six ears: 5/4 to 7 1/2 inches long and 1 5/8 to 1 7/8 inches in diameter, smooth, compact, well filled, 12 to 18-rowed; grains medium size, moderately crease-dented, pure white to deep yellow, about 7/16 inch long) 9/32 to 3/8 inch broad, and 1/8 to 5/16 inch thick; cobs red, 7/8 to 11/8 inches in diameter.

Clearly intermediate between the two parents in shape of grains and almost uniform blending of colors.

No. 51. PRIDE OF THE NORTH crossed with BULLOCK'S WHITE PROLIFIC.

Second An. Rep., p. 309: "Evidence of cross in the intermediate color."

Bulletin No. 17, p. 156: "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."

Six ears: 6 to 7 1/8 inches long, 1 3/4 to 2 inches in diameter, smooth, compact, well filled, 14- to 16-rowed, light yellow; grains small to medium, crease-dented, mostly yellow, with a few white intermixed, 5/16 to 3/8 inch long, 9/32 to 5/16 inch broad, and 1/8 to 5/32 inch thick; cobs, three red and three white, 1 to 1 3/8 inches in diameter.

Plainly intermediate in character of grain, though strongly tending toward the female parent.

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

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

Bulletin No. 17, p. 156: "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."

Five inferior ears: 5 1/2 to 7 1/2 inches long, and about 1 1/2 inches in diameter, smooth, compact, well filled, rows usually regular, 8- to 12-rowed, glossy yellow; grains small to medium, slightly indented, in section showing less corneous matter than in the Longfellow and less starch

than in the dent variety, 5/16 to 3/8 inch long and broad, and 1/8 to 5/32 inch thick; cobs red, 7/8 inch in diameter.

Clearly intermediate between the two parental types—a beautiful blending of the characteristics of the parents, with no visible resemblance to one more than the other.

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

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

Bulletin No. 17, p. 156: "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.

Three ears: About 7½ inches long, 1 1/8 to 1½ inches in diameter, smooth, compact, not well filled, 8- to 12-rowed, glossy to light yellow; grains slightly dented and light-colored summits, in section showing less corneous matter than in the Longfellow and less starch than in the dent variety, 5/16 to 7/16 inch long, 5/16 to 3/8 inch broad, and 5/32 to 3/16 inch thick; cobs, two red and one white, 13/16 to 1 inch in diameter.

Distinctly intermediate between the two varieties in color, size, shape and structure of grains, with no apparent resemblance to one more than to the other.

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

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

Bulletin No. 17, p. 156: "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."

Two ears: 6½ and 9 inches long, 13/8 and 17/16 inches in diameter, very smooth, compact, not well filled at base and tip, 12-rowed, dark yellow; grains small, a few indented though mostly smooth, in section showing less corneous matter than in the flint varieties and less starch than in the dent varieties, 5/16 inch long, 5/16 to 3/8 inch broad, and 3/16 inch thick; cobs soft, dark red, 1 inch in diameter.

Strongly resembling Self-Husking in general appearance, though clearly intermediate between the parental types in character of grains.

No. 66. KING PHILIP crossed with LEAMING.

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

Bulletin No. 17, p. 157: "Intermediate between the two parents, though in general more strongly resembling King Philip."

One ear: 9¼ inches long, 15/8 inches in diameter, smooth, compact, not well filled, 12 defective rows, yellowish-red; grains medium sized, broad and short, smooth to dimple- or crease-dented, in section showing less corneous matter than the King Philip and less starch than the Leaming,

3/8 inch long, 7/16 inch broad, and 3/16 inch thick; cob red, 1 1/16 inches in diameter.

Distinctly intermediate between the two parental types in color and structure of grains, though slightly approaching the female parent in general appearance and shape of grains.

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

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

Bulletin No. 17, p. 157: "One of the ears is plainly end 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."

I. Two ears: 8 and 9 inches long, and 1 3/8 and 1 5/8 inches in diameter, smooth, compact, well filled, yellowish-red; grains smooth, very slightly crease-dented, summits of lighter color than body of grain, in section showing more starch than in pure flint varieties and more corneous matter than in the dent, 3/8 inch long, 5/16 to 3/8 inch broad, and 1/8 to 5/32 inch thick; cobs, one red and one white, 7/8 to 1 inch in diameter.

Plainly intermediate between the two parents in general appearance, also in shape, color and structure of the grains, though slightly approaching King Philip in all particulars.

II. Two inferior ears: 6 1/2 to 7 1/2 inches long, and 1 1/4 to 1 1/2 inches in diameter, smooth, loose on the cob, not well filled, about 12 very irregular rows, light yellow; grains small, dimple- to crease-dented, in section showing about the same proportion of starch and corneous matter as in Early Yellow Hathaway; too irregular in shape for measurement; cobs red, about 1 inch in diameter.

Identical with the male parent in color and structure of grains, and resembling King Philip only in shape of ear and shape of the few normal grains.

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."

Bulletin No. 17, p. 158: "Very strong resemblance to King Philip, but the beet ear approaches somewhat the male parent."

I. One ear: About 7 inches long and 1 1/4 inches in diameter, smooth, compact, well filled, light yellow, 10-rowed; grains smooth, slightly crease-dented, about 1/4 inch long, 5/16 inch broad and 1/8 inch thick, in section showing the proportions of starch and corneous matter intermediate between the flint and the dent varieties; cob red, 3/4 inch in diameter.

Distinctly intermediate between the two parental types in structure of grains and not approaching one more than the other. The color is exactly that of the male parent (light yellow), while the shape of the ear and of the grains approaches very close to King Philip.

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

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

Bulletin No. 17, p. 158: "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."

One ear: 7 inches long, 1½ inches in diameter, smooth, compact, well filled, 14-rowed, glossy, light yellow; grains small, summits smooth, in section showing much less corneous matter than in the flint varieties and less starch than in the dent corn, corneous covering very thin at the summits, 5/16 to 3/8 inch long, 5/16 to 3/8 inch broad, and 5/32 to 3/16 inch thick; cob white, 1 inch in diameter.

Plainly intermediate between the parental types. Resembles the female in general appearance and color of cob, and the male in structure and shape of grains and the number of rows.

No. 74. LEAMING crossed with FARMERS' FAVORITE.

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

Bulletin No. 17, p. 158: "Plainly intermediate between the two parental types in shape; in size, smaller than either."

Eight ears (two are too imperfect for satisfactory comparison): 6 to 8½ inches long, 1 3/8 to 1 15/16 inches in diameter, smooth, well filled in about half of the number of ears, 12- to 16-rowed, glossy yellow; grains small to medium, smooth to dimple- or crease-dented, two ears with very flinty grains, 5/16 to ½ inch long, broad and 1/8 to 5/32 inch thick; cobs light, red, 1 1/16 to 1 3/16 inches in diameter.

Four ears show intermediate characteristics between the two parents, though smaller than either. Two are decidedly flinty, thus not resembling either parent.

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

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

Bulletin No., 17, p. 159: "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."

Ten ears: 5¾ to 8 inches long, 1 5/8 to 2 inches in diameter, six smooth and four rough, compact, well filled, 12- to 16-rowed, rows irregular in about half the ears, nine light to bright yellow and one reddish-yellow; grains medium sized, slightly crease-dented to wrinkled, 5/16 to 7/16 inch long, 5/16 to 3/8 inch broad, and 3/32 to 5/32 inch thick; cobs red, 1 to 1¼ inches in diameter.

Intermediate between the parental types, in shape and size of grains more nearly resembling Leaming, but in shade of yellow and character of

summits (usually a more or less sharpened projection on the chit side) more like Riley's Favorite.

No. 82 LEAMING crossed with WOODWORTH'S YELLOW.

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

Bulletin No. 17, p. 159: "Too imperfect for Satisfactory Comparison with the two types that produced it."

"Two small ears: One smooth and flint-like and cannot well be compared with the parents; the other compact, well filled, 18-rowed, rows irregular, yellow; grains small, dimple-dented and slightly wrinkled at the summits,  $\frac{3}{8}$  inch long,  $\frac{5}{16}$  inch broad, and  $\frac{1}{8}$  inch thick; cob red, 1 inch in diameter.

Intermediate between the two parental types only in shade of color of grains, in general appearance more nearly approaching Leaming,

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."

Bulletin No. 17, p. 159: "Intermediate between the two parental types in shade of color and shape of grains."

Five ears:  $5\frac{7}{8}$  to  $7\frac{3}{4}$  inches long,  $1\frac{3}{4}$  to  $1\frac{7}{8}$  inches in diameter, four ears are smooth and compact and one is very rough and loose on the cob, not well filled at the tip, 12- to 16-rowed, bright yellow; grains medium to large, summits crease-dented and slightly wrinkled as in the Leaming, to much wrinkled as in the Golden Beauty,  $\frac{3}{8}$  to  $\frac{7}{16}$  inch long,  $\frac{5}{16}$  to  $\frac{3}{8}$  inch broad, and about  $\frac{1}{8}$  inch thick; cobs, one white, one delicate pink, and three light red, 1 to  $1\frac{1}{4}$  inches in diameter.

Plainly intermediate between the two parents in general appearance and in color and size 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."

Bulletin No. 17, p. 159: "No. character of the ears detected intermediate between the two parental types; the resemblance to Leaming is very marked, except in the deep, bright color of the grains."

Three ears:  $6\frac{3}{4}$  to 8 inches long,  $1\frac{3}{4}$  to 2 inches in diameter, smooth, compact, well filled, 12- to 14-rowed, bright yellow in color; grains bright yellow, in one ear reddish-yellow, light-colored summits, dimple-dented to wrinkled,  $\frac{7}{16}$  inch long,  $\frac{5}{16}$  to  $\frac{3}{8}$  inch broad, and  $\frac{1}{8}$  to  $\frac{3}{16}$  inch thick; cobs red,  $1\frac{1}{8}$  to  $1\frac{1}{4}$  inches in diameter,

In character of grains and general appearance, very strongly resembling Leaming.

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

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

Bulletin No. 17, p. 160: "Resemblance to Farmers' Favorite very marked though smooth, and in shape of grains intermediate between the two parental types."

Six inferior ears: Ranging from 5 to 8 5/8 inches in length and 1 5/8 to 2 inches in diameter, moderately smooth, compact, well filled except at tip, bright yellow; grains medium sized, slightly wrinkled and crease-dented at summits, 7/16 to 1/2 inch long, 5/16 to 3/8 inch broad, and 5/16 inch thick; many grains scattered over the ear are spoiled by a sort of dry rot; cobs red, 1 to 1 1/4 inches in diameter.

Plainly intermediate characters of parents in size, shape and color of grains, scarcely approaching one more than the other.

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."

Bulletin No. 17, p. 160: "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."

Five ears: Three ears are small and yellow in color, so cannot well be compared with the white parents; two ears, 7 3/4 to 8 inches long, and 1 7/8 to 2 inches in diameter, white, well filled, compact, rough, 14- to 16-rowed, rows regular; grains medium sized, much wrinkled summits, 7/16 to 1/2 inch long, 1/4 to 5/16 inch broad, and 1/8 inch thick; cobs white, 1 1/16 inches in diameter.

No resemblance to Hickory King. Much like the male parent in size of ear and general appearance of grain, except the more wrinkled summits of the kernels.

No. 99. HICKORY KING crossed with CONSCIENCE.

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

Bulletin No. 17, p. 160 "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."

Two ears: 6 inches long and about 1 3/4 inches in diameter, rough, one ear compact and one not, well filled throughout and rows regular and uniform, 14-rowed, white; grains medium in size, much wrinkled at summits, about 1/2 inch long, 9/32 to 11/32 inch broad, and 3/32 to 1/8 inch thick; cobs white, 7/8 to 1 inch in diameter.

Clearly intermediate characters between the two parental types. The grains are much wrinkled, and are comparatively longer than the Hickory King but shorter than Conscience. The general shape of the ear is that of the female parent.

No. 102. HICKORY KING crossed with NORMANDY GIANT.

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

Bulletin No. 17, p. 160: "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."

One ear: 5 7/8 inches long and 1 3/4 inches in diameter, smooth, compact, not well filled at tip, 12-rowed, rows regular, white; grains above the medium size, crease-dented, about 3/8 inch long, 7/16 inch broad, and 1/8 to 5/32 inch thick; cob white, 1 inch in diameter.

Difficult to detect any evidence of a cross. The size, shape and character of summits of grains like those of Hickory King.

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

Second An. Rep., p. 318: "Evidence of cross in character of grain."  
 Bulletin No. 17, p. 161: "Too imperfect for comparison with parental types. Three inferior ears not inclosed present characters in some respect intermediate between the parents."

One ear: 7 1/4 inches long, and 1 7/8 inches in diameter, moderately smooth, compact, 10-rowed, rows irregular; grains above medium in size, light yellow in body with lighter yellow or white summits, crease-dented and wrinkled, about 1/2 inch long, 3/8 inch broad, and 1/8 to 5/32 inch thick; cob pink, about 1 inch in diameter.

Plainly intermediate between the two parents in the well-blended colors, of yellow and white, approaching Golden Beauty in size of grains and in the wrinkled summits.

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."

Bulletin No. 17, p. 161: "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."

Three ears: 7 to 9 inches long, 1 7/8 to 2 1/4 inches in diameter; one ear blasted and grains loose on the cob, the other two well filled, firm, smooth, 16- to 20-rowed; grains medium sized, moderately indented, 1/2 inch long, 5/16 inch broad, and 1/8 inch thick; cobs, two red and one white, 1 to 1 1/4 inches in diameter.

Intermediate between the two parents in shape and character of grains, though darker in color than either.

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."

Bulletin No. 17, p. 161: "Unlike either parent, but not plainly intermediate; grains smaller than in the Golden Beauty; cobs smaller and rows of grain less than in Mammoth Cuban."

Two very imperfect ears:  $5\frac{3}{4}$  to 6 inches long and  $1\frac{5}{8}$  to  $1\frac{7}{8}$  inches in diameter, 12-rowed, firm; grains large, wrinkled summits, crease-dented,  $\frac{3}{8}$  inch long and broad, and  $\frac{1}{8}$  to  $\frac{3}{16}$  inch thick; cobs white,  $1\frac{1}{8}$  to  $1\frac{1}{4}$  inches in diameter.

Identical with Golden Beauty in size and shape of grains, and color of cob; no resemblance whatever to 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."

Bulletin No. 17, p. 162: "In color more like Golden Beauty, and shape of grains like Glick's Yellow; ears too imperfect for further comparison."

Three ears:  $6\frac{1}{2}$  to  $7\frac{1}{2}$  inches long,  $1\frac{7}{8}$  to  $2\frac{3}{8}$  inches in diameter, moderately smooth, compact in two ears, grains loose on the cob of the other ear, well filled, 14- to 20-rowed, bright yellow; grains medium sized, crease-dented and very slightly wrinkled at summit,  $\frac{3}{8}$  to  $\frac{7}{16}$  inch long,  $\frac{5}{16}$  to  $\frac{11}{32}$  inch broad; and  $\frac{1}{8}$  to  $\frac{5}{32}$  inch thick; cobs, two white and one red,  $1\frac{1}{8}$  to  $1\frac{3}{8}$  inches in diameter.

Grains much smaller than either parent, and in shape not resembling either—being longer in proportion to the width; in color like Glick's Yellow. The characteristics can hardly be considered intermediate between those of the parents.

No. 118. GOLDEN BEAUTY crossed with FARMERS' FAVORITE GOLDEN DENT.

Second An. Rep., p. 319: "Presents evidence of a previous cross, but none between the parents given above."

Bulletin No. 17, p. 162: "Two very imperfect ears, quite insufficient for description and comparison, though the color of grains (white to yellow) indicates a previous cross of some other (white) variety."

Five ears:  $6\frac{1}{8}$  to  $6\frac{7}{8}$  inches long,  $1\frac{3}{4}$  to 2 inches in diameter, moderately smooth, compact, well filled at rounding base and tip, 12- to 16-rowed; grains medium sized, slightly wrinkled at the summit, white to yellow, and yellow with white summits,  $\frac{1}{2}$  inch long,  $\frac{5}{16}$  to  $\frac{3}{8}$  inch broad, and  $\frac{1}{8}$  to  $\frac{5}{32}$  inch thick; cobs, three white and two pink,  $1\frac{1}{8}$  inches in diameter.

Two ears are intermediate between the parental types in shape of grains, but are much smaller ears than either parent. Three ears are very much mixed with white — probably the result of a previous cross.

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."

Bulletin No. 17, p. 162: "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."

Four ears:  $7\frac{1}{2}$  to  $8\frac{3}{8}$  inches long,  $1\frac{5}{8}$  to  $1\frac{7}{8}$  inches in diameter, smooth, somewhat loose on cob, well filled throughout the ear, 12- to 16-rowed, rows regular and uniform, light yellow; grains smallish to medium, uniform in size for each ear, very slightly dimpled or crease-dented, in section showing about the same proportion of corneous matter and starch as in the male parent,  $\frac{5}{16}$  to  $\frac{7}{16}$  inch long,  $\frac{9}{32}$  to  $\frac{3}{8}$  inch broad, and  $\frac{1}{8}$  to  $\frac{5}{16}$  inch thick; cobs red, 1 to  $1\frac{1}{8}$  inches in diameter.

Clearly intermediate between the two parental types in size and general appearances, though more strongly resembling the dent. The ears have the character of Riley's Favorite in color and structure of grains, but show the influence of Waushakum in the smoothness and length of ear.

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

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

Bulletin No. 17, p. 163: "Unlike either parent, but not intermediate between the two in character of grains."

Four very uniform ears:  $5\frac{7}{8}$  to 7 inches long,  $2\frac{1}{8}$  to  $2\frac{1}{2}$  inches in diameter, rough, compact, 18- to 22-rowed, rows regular, white; grains medium sized, long, crease-dented and wrinkled at the summits, very uniform in size and shape throughout the ears,  $\frac{1}{2}$  inch long, about  $\frac{5}{16}$  inch broad and  $\frac{1}{8}$  to  $\frac{5}{32}$  inch thick; cobs pink,  $1\frac{1}{4}$  to  $1\frac{3}{8}$  inches in diameter.

Does not resemble either parent, and is not intermediate between them. The ears are larger in diameter but shorter than the parents.

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

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

Bulletin No. 17, p. 163: "Clearly intermediate between Early Red Blazed and Early Yellow Hathaway, though more strongly resembling the former."

One ear:  $5\frac{1}{2}$  inches long and  $1\frac{1}{2}$  inches in diameter, smooth, compact, well filled, 14-rowed, rows regular and uniform, yellow; grains small and uniform in size, summits smooth to slightly dented, and light colored, in section showing a predominance of corneous matter, though not so much as in pure flint, about  $\frac{5}{16}$  inch long and broad, and  $\frac{1}{8}$  inch thick; cob red, about 1 inch in diameter.

Plainly intermediate between the two parental types in general appearance and structure of grains, and not perceptibly resembling one more than the other.

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."

Bulletin No. 17, p. 164: "Plainly intermediate between the two parental types, yet very strongly resembling typical Compton's Early."

Three ears: One very imperfect, the others good, 7 to 8 ½ inches long and 1¼ to 1 7/8 inches in diameter, smooth, well filled, compact, 10- to 12-rowed, glossy yellow; grains small, about half of them smooth and half slightly indented, in section showing more corneous matter than the dent and less than the flint parents, 5/16 to 3/8 inch long, 3/8 inch broad, and 3/16 inch thick; cobs red, 1 3/16 to 1 5/16 inches in diameter.

Plainly intermediate between the two parental types, though slightly more resembling Compton's Early.

No. 160. EARLY YELLOW HATHAWAY crossed with LONGFELLOW.

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

Bulletin No. p. 164: "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."

One imperfect ear: 10½ inches long and 1½ inches in diameter, smooth, compact, not at all well filled, 14-rowed, rows irregular, yellow; grains medium sized, dimple-dented with light-colored summits, in section showing less corneous matter than in pure flint varieties, and less starch than in pure dent, grains not well filled out, 3/8 inch long 5/16 to 7/16 inch broad, and about 3/16 inch thick; cob red, about 1 inch in diameter.

Plainly intermediate between the two parents in structure of grains and in general appearance, though approaching more nearly the Longfellow in the latter.

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

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

Bulletin No. 17, p. 15: "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."

Two ears: 6 to 7 inches long, 1½ to 2 inches in diameter, smooth, compact, one is well filled, the other is not, 12- to 16-rowed, rows very irregular, light yellow; grains medium sized, mostly smooth, a few slightly crease-dented, in section showing a great variation from typical flint and dent to grains with almost as much starch as in the Flour Corn, about 7/16 inch long, 5/16 to 7/16 inch broad, and 5/32 to 7/32 inch thick; cobs red, 1 to 1 3/8 inches in diameter.

Plainly intermediate between the two parents in general appearance and structure of grains, though more strongly resembling Big Buckeye.

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

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

Bulletin No. 17, p. 165: "Plainly intermediate in all respects between dent and soft corn, but more strongly resembling the latter."

Five very imperfect ears: Grains medium sized, ranging in color from transparent white to deep yellow, and usually with a flinty luster; in two ears, summits of grains crease-dented and slightly wrinkled, in section showing in all cases more corneous matter than in Conscience.

(a) One ear not well filled, at tip end showing in section of grains and in general appearance characteristics of Flour Corn, but differing from it in having a very thin layer of corneous matter all over the grain; grains dimple-dented and much larger than those of Flour Corn, though somewhat resembling them in shape.

(b) Four ears not well filled; though they show general intermediate characteristics between the parents, they are impure, from the great amount of yellow present. They show no indication of improvement over the Flour Corn.

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

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

Bulletin No. 17, p. 165: "Plainly intermediate between the typical soft and dent varieties, though the general resemblance to the female parent is more marked."

Three ears:  $4\frac{1}{2}$  to 8 inches long and  $1\frac{3}{4}$  to  $1\frac{7}{8}$  inches in diameter, smooth, compact, well filled, 10- to 12-rowed, white; grains medium sized, dimple- to crease-dented, a few smooth, in section showing some corneous matter, also much more starch than in the Southern Horse Tooth,  $\frac{3}{8}$  to  $\frac{7}{16}$  inch long,  $\frac{7}{16}$  inch broad, and  $\frac{3}{16}$  inch thick; cobs white, 1 to  $1\frac{1}{8}$  inches in diameter.

Plainly intermediate between the two parental types in structure and character of summits of grains, though in general appearance slightly more resembling the Flour Corn.

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

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

Bulletin No. 17, p. 166: "Too imperfect and grains too irregular for comparison with parental types, though the character of summits of the grains intermediate between the two."

Three ears:  $7\frac{1}{4}$  to  $7\frac{7}{8}$  inches long and  $1\frac{3}{4}$  to  $2\frac{1}{4}$  inches in diameter, 14- to 18-rowed, rough, loose on the cob, not well filled at base, but well filled at tapering tip; grains medium sized, moderately wrinkled at summits, not well filled out, deep yellow to white,  $\frac{7}{16}$  to  $\frac{9}{16}$  inch long,  $\frac{5}{16}$  to  $\frac{3}{8}$  inch broad, and  $\frac{1}{8}$  to  $\frac{3}{16}$  inch thick; cobs white,  $\frac{7}{8}$  to  $1\frac{1}{8}$  inches in diameter.

Character and shape of grains are intermediate between the two parental types, but there is evidence of a probable previous cross in that

nearly 25 percent. of the grains are yellow, whereas the parents are both white.

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

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

Bulletin No. 17, p. 166: "Plainly intermediate between soft and dent types, though the general resemblance to Mason's soft is very marked."

Three ears: 7 to 8  $\frac{3}{8}$  inches long and  $1\frac{3}{4}$  to 1  $\frac{7}{8}$  inches in diameter, 12- to 16-rowed, smooth and compact in two ears, one ear rough and grains loose on the cob; grains smooth or dimple- to crease dented, broad and short in two ears, like the male parent, though in section showing considerable corneous matter, long and narrow in the other ear, resembling the female parent, except that in section the grain shows much more flour than in dent corn,  $\frac{3}{8}$  to  $\frac{7}{16}$  inch long,  $\frac{5}{16}$  to  $\frac{3}{8}$  inch broad, and  $\frac{1}{8}$  to  $\frac{3}{8}$  inch thick; cobs white, 1  $\frac{1}{8}$  to 1  $\frac{3}{16}$  inches in diameter.

Plainly intermediate between the two parental types.

(a) Two ears in general appearance resemble Mason's Flour Corn, but in structure of grains show characteristics of Mosby's Prolific.

(b) One ear in general appearance resembles more nearly Mosby's Prolific, but in section shows a greater tendency to Mason's Flour Corn.

No. 178. MOSBY'S PROLIFIC crossed with SHANNON'S BIG TENNESSEE WHITE.

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

Bulletin No. 17, p. 166: "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."

Five ears:  $5\frac{3}{4}$  to  $6\frac{1}{2}$  inches long and 2 to  $2\frac{1}{4}$  inches in diameter, rough, well filled except at the tip, three ears compact and two loose on the cob, three ears white and two of a reddish-yellow color, 14- to 18-rowed; grains medium sized, crease-dented to wrinkled summits,  $\frac{9}{16}$  inch long,  $\frac{5}{16}$  to  $\frac{3}{8}$  inch broad, and  $\frac{1}{8}$  to  $\frac{5}{32}$  inch thick; cobs white, 1 to 1  $\frac{3}{6}$  inches in diameter.

All ears resemble the male parent in shape, though much smaller. Two ears of a reddish-yellow color resemble Shannon's Big Tennessee Yellow, probably the result of a previous cross.

No. 184. THOROUGHbred WHITE FLINT crossed with EARLY CALIFORNIA.

Second An. Rep., p. 329: "No evidence of cross except in color of grains."

Bulletin No. 17, p. 167: "In general appearance plainly intermediate between flint and dent; grain smaller than in flint parent; in shape approaching typical Early California."

Four ears: 6 to 7 inches long and  $1\frac{1}{2}$  to  $1\frac{3}{4}$  inches in diameter,

smooth, compact, well filled, rows irregular, 12- to 16-rowed; grains medium sized, all yellow in one ear, in three ears about equally divided, either yellow or white— all with summits of lighter color than the body of the grain; summits crease-dented, in section showing intermediate proportions of corneous matter and starch between the flint and dent varieties; in shape longer and narrower than the flint, and shorter and broader than the Early California, 7/16 inch long, 5/16 to 3/8 inch broad, and 1/8 to 5/32 inch thick; cobs, three red and one white, 7/8 to 1 inch in diameter.

Plainly intermediate between the two parents in general appearance and structure, shape and color of grains, though in all slightly approaching 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."

Bulletin No. 17, p. 167: "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."

One small ear: Compact, well filled, 14-rowed, rows mostly irregular, light yellow; grains small, slightly wrinkled at the summits, about 5/16 inch long and broad, and 1/8 inch thick; cobs red, 1 inch in diameter.

Plainly intermediate between the parental types in character of grains, though in color resembling more nearly King of the Earliest.

No. 192. EARLY CALIFORNIA crossed with CRANBERRY WHITE.

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

Bulletin No. 17, p. 167: "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."

Four ears, of very different characters: Two have medium-sized long grains, varying in color—pure white, yellow with white summits, and pure yellow; one like the above, except that it has large, broad, flat grains; and one ear has red, white and yellow grains with either yellow or white summits — grains of which are very strongly marked with the pink of Cranberry White; ears 5 3/8 to 7 1/2 inches long, 1 5/8 to 2 inches in diameter, rough, compact, fairly well filled, 14 to 18 irregular rows; grains crease-dented to wrinkled at the summits, 7/16 to 9/16 inch long, 1/4 to 3/8 inch broad, and about 1/8 inch thick; cobs, three red and one white, 1 to 1 1/4 inches in diameter.

Three ears show intermediate characteristics between the parents in

color of grains, though the ears are much smaller than either. One ear with large kernels resembles neither parent.

No. 194. CRANBERRY WHITE crossed with CLARAGE YELLOW.

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

Bulletin No. 17, p. 168: "Intermediate between two parental types in color, but otherwise not strongly resembling either parent."

Two ears: One too imperfect for comparison, the other  $5 \frac{7}{8}$  inches long and  $1 \frac{7}{8}$  inches in diameter, smooth, compact, not well filled at the base, 18-rowed; grains small to medium sized, moderately indented and wrinkled at summit, deep yellow to white in color,  $\frac{7}{16}$  to  $\frac{1}{2}$  inch long,  $\frac{5}{16}$  inch broad, and  $\frac{1}{8}$  inch thick; cob white, 1 inch in diameter.

Plainly intermediate between the two parents in color, though more nearly approaching Cranberry White in size and shape of grain.

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

Second An. Rep., p. 331: "No clear evidence of cross"

Bulletin No. 17, p. 168: "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."

Six ears: 6 to  $7 \frac{1}{4}$  inches long,  $1 \frac{3}{4}$  to  $1 \frac{7}{8}$  inches in diameter, smooth, compact, well filled at base but not at tip, bright yellow, 14-rowed; grains medium sized, moderately crease-dented to slightly wrinkled, about  $\frac{7}{16}$  inch long,  $\frac{5}{16}$  to  $\frac{11}{32}$  inch broad,  $\frac{1}{8}$  to  $\frac{5}{32}$  inch thick; cobs red,  $\frac{7}{8}$  to  $1 \frac{1}{8}$  inches in diameter.

Distinctly intermediate between the parental types in size of grains, character of summits, and in shade of yellow.

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."

Bulletin No. 17, p. 168: "Unlike either parent and not clearly intermediate, except in shape of grains; vitiated doubtless by previous cross."

Five ears:  $6 \frac{1}{2}$  to  $7 \frac{1}{2}$  inches long,  $1 \frac{5}{8}$  to  $1 \frac{7}{8}$  inches in diameter, smooth, compact, well filled from rounded base to tapering tip, 10- to 16-rowed, rows mostly regular, nearly white; grains medium sized, slightly wrinkled at summits, nearly all white, a few light yellow,  $\frac{7}{16}$  inch long,  $\frac{5}{16}$  to  $\frac{3}{8}$  inch broad, and  $\frac{5}{32}$  inch thick; cobs, three white, one pink and one red, 1 to  $1 \frac{3}{16}$  inches in diameter.

No visible resemblance to either parent.

No. 205. CLARAGE YELLOW crossed with CRANBERRY WHITE.

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

Bulletin No. 17, p. 168: "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."

Four ears:  $6\frac{3}{4}$  to  $7\frac{7}{8}$  inches long, and  $1\frac{3}{4}$  to 2 inches in diameter, three smooth and one decidedly rough, compact, well filled throughout, 12- to 14-rowed; grains medium sized, moderately crease-dented, and in one wrinkled to a sharp point on chit side of summit, pure white to bright yellow with faint markings of Cranberry White in three ears, and very prominent markings of the pink in the other,  $\frac{3}{8}$  to  $\frac{7}{16}$  inch long,  $\frac{5}{16}$  to  $\frac{3}{8}$  inch broad, and  $\frac{1}{8}$  to  $\frac{5}{32}$  inch thick; cobs, one white and three red, 1 to  $1\frac{3}{16}$  inches in diameter.

Clearly intermediate in color, but in shape and size of grains more nearly resembling Cranberry White.

#### CROSSED CORN THE FOURTH YEAR.

No. 14. EARLY WHITE DENT crossed with GOLDEN POP CORN.\*— Seven excellent ears, of a flinty dent character, pure white in color, 7 to 9 inches long and  $1\frac{3}{8}$  to  $1\frac{3}{4}$  inches in diameter. Each ear is uniform in size throughout, and the rows are straight and entirely filled out in all ears. The grains are medium sized and uniform for all the ears, slightly dimple- to slightly crease-dented,  $\frac{3}{8}$  to  $\frac{7}{16}$  inch long, about  $\frac{5}{16}$  inch broad, and  $\frac{1}{8}$  inch thick. The cobs are small,  $\frac{7}{8}$  to 1 inch in diameter.

From the uniformity of these ears, it seems that this cross is now fixed as a distinct "variety."

#### MISCELLANEOUS EXPERIMENTS WITH CORN.

No. 25. One ear. The seed planted, that produced this ear, was taken from No. 25 of "crossed corn."

The kernels were reversed on the cob so that the germ side of each faced toward the butt end of the ear. These grains were found scattered throughout the ear with no regularity. The method adopted in fertilizing the crosses was also used in this case.

The result is a good, sound ear, 6 inches long and 2 inches in diameter, well developed, rows straight and uniform. The germ side of all the grains faced toward the tip end. This seems to prove the reversed position of the grains to be abnormal—a true sport.

No. 41. Six ears were obtained. The seed was selected and planted, and pollination enacted the same as with No. 25, with the same results, thus verifying the results obtained there.

BLUE CORN. In the spring of 1891, Assistant W. T. Swingle, while

\*See Bulletin No. 17, p. 172.

assorting some corn in this department, noticed a few ears having blue kernels upon them. The immediate parents of this corn were known to have shown no blue kernels. Accordingly he preserved a number of these grains to plant, with a view to determine whether the blue was a sport, or the product of atavism, or "breeding back" to some blue variety. Although Mr. Swingle resigned his position as assistant botanist before corn-planting time, Professor Kellerman carried out this plan. The ears were carefully inclosed in closely-woven cloth sacks before the silk made its appearance, as in the method adopted in "Crossed Varieties of Corn." Owing to unavoidable circumstances, only one ear was artificially fertilized; however, this was with pollen from the same stalk, thus keeping it absolutely free from any possible intermediate cross. The ear remained inclosed until perfectly ripe.

The ear is 10 inches long and 1 5/8 inches in diameter, 8-rowed, firm, entirely filled out. The grains are large and broad, 7/16 inch long, 1/2 inch broad, and 3/16 inch thick, crease-dented, in section showing but very little corneous matter. In color the grains vary considerably, being deep blue, pink, orange-yellow, and pure white, with occasionally one almost pure green. By actual count, there were 370 kernels on the ear. Of these, 206 were blue, 71 pink, 71 orange-yellow, and 22 pure white.

This result seems to be conclusive evidence that the blue of the grains planted was the product of atavism, and from the fact that all the planted grains were blue, the pink, yellow and white grains in like manner must have reverted to other varieties. Five other ears from the same seed, but not inclosed — thus being exposed to the pollen of other varieties — showed the same variation in color with a slightly smaller per cent. of blue.

To show the prepotency of the blue corn, a large number of ears of other plots, growing within a radius of 25 yards, were examined. About half the number of unenclosed ears had from one to five blue kernels, while not one of the inclosed gave any traces of blue. This also proves that the method adopted to keep out foreign pollen can be relied upon with perfect safety.

#### PRACTICAL CONCLUSION.

That the characters of so-called distinct varieties of corn can, by means of cross-fertilization, be made to blend more or less completely no longer admits of doubt. From which it follows that by this process desired forms may in general be secured at will, provided the characters sought exist in the varieties used in crossing.

Moreover, the blended form, or "cross," so far as our experiments as yet indicate, does not generally (if kept free from contamination by

foreign pollen) revert perceptibly to the parental types. From which it follows that the characters secured by crossing can be retained.

These two propositions furnish the basis for rational "breeding up" of corn. If complemented by judicious selection, it is believed that results can be attained similar to those in the remarkable success in establishing the improved breeds of domestic animals.